Appendix J:
Transportation Impact Study

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TRANSPORTATION IMPACT STUDY FOR THE CITYWALK MASTER PLAN PROJECT

SAN RAMON, CALIFORNIA

MARCH 2020

PREPARED FOR

SUNSET DEVELOPMENT COMPANY

PREPARED BY

Gibson
transportation consulting, inc.

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March 2020

Prepared for:

SUNSET DEVELOPMENT COMPANY

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Chapter 1

Introduction

This study presents the transportation impact analysis for the CityWalk project (Project) on the Bishop Ranch campus (Project Site) of the City of San Ramon, California (City). The methodology and base assumptions used in the analysis were established in conjunction with the City Public Works Department Engineering Services Division.

PROJECT DESCRIPTION

Sunset Development Company (Applicant) proposes to construct a mixed-use development in the urban core of the City to complement the existing uses on site. The Project would be developed in multiple phases within five sites that include the following program:

- BR 2600 NW
  - Up to 1,372 multi-family residential units
- BR 2600 NE
  - Up to 1,128 multi-family residential units
- BR 2600 SE
  - Up to 558 multi-family residential units
  - 96,600 square feet (sf) retail/restaurant/creative office
- BR 3A
  - Up to 791 multi-family residential units
  - 169 hotel rooms
  - 70,000 sf retail/restaurant
- BR 1A
  - Up to 651 multi-family residential units

In total, the Project would construct 4,500 multi-family residential units, 169 hotel rooms, and up to 166,600 sf of retail/restaurant uses. The Project Site is currently occupied with approximately 1,921,000 sf of office uses adjacent to the BR 2600 NW, BR 2600 NE, and BR 2600 SE sites. BR 3A and BR1A are currently vacant lots. The Project components would be constructed in either vacant lots or existing surface parking lots; no existing buildings will be removed as part of the Project.

Existing parking for the current uses on the Project Site is provided within on-site surface parking lots and one parking structure. The Project would remove the surface parking lots, construct additional parking structures, and reconfigure some remaining parking lots to accommodate the parking demands of the existing uses as well as the uses that will be constructed as part of the Project. Vehicular access to the Project Site would be provided via existing and proposed driveways along Bishop Drive, Executive Parkway, Camino Ramon, and Bollinger Canyon Road. The conceptual Project Site plan is shown in Figure 1.

In addition to the land use development program, the Project also proposes to install additional mobility hubs and bus stops within the campus and expand the existing internal shuttle system for Project patrons.

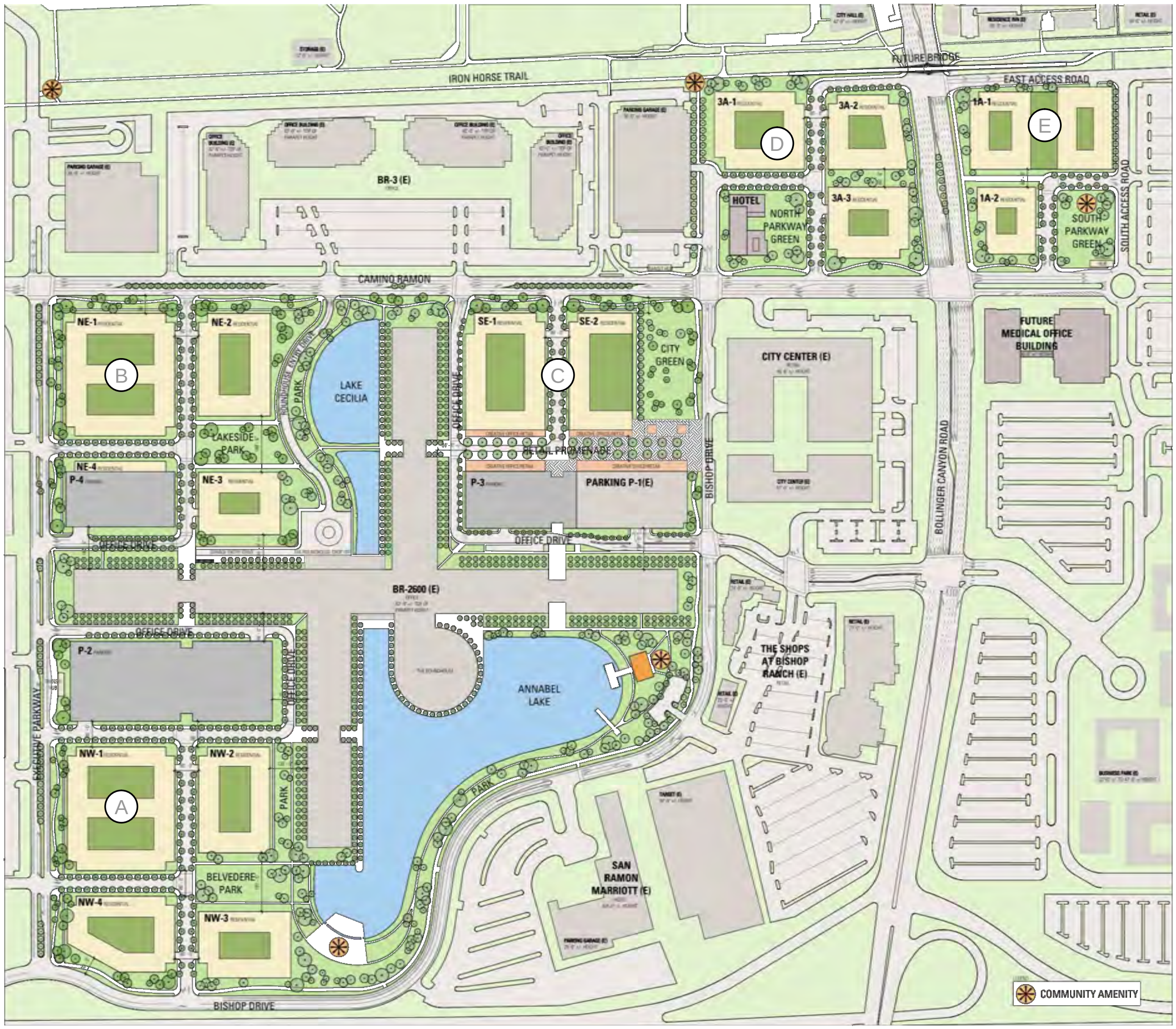
The five sites of the Project are projected to be developed over a 20 to 25-year time period. The long-range travel projections used in this report are based on the latest Contra Costa Transportation Authority (CCTA) Travel Demand Forecast Model (CCTA Model) which assumes travel and land use conditions for Year 2040. Thus, consistent with the longest future forecasts available, the conditions in this analysis assume that the full buildout of the Project would take place by Year 2040.

PROJECT LOCATION

Generally, the Project Site is bounded by Executive Parkway to the north, the Iron Horse Regional Trail to the east, Bollinger Canyon Road to the south, and Interstate 680 (I-680) to the west. Other nearby uses include office and commercial developments.

NEIGHBORHOODS

A	BR2600 NW
B	BR2600 NE
C	BR2600 SE
D	BR3A
E	BR1A



Source: Bishop Ranch. January, 2020.

PROJECT SITE PLAN

FIGURE 1

The Project Site is adjacent to I-680, which provides regional access between the City of Pleasanton (approximately 8.5 miles southeast) and the City of Walnut Creek (approximately 10.0 miles northwest). Regional and local access to the Project Site is provided via several arterials, including Crow Canyon Road, Bollinger Canyon Road, Camino Ramon, Alcosta Boulevard, and Executive Parkway.

In addition to the internal shuttle system, the Project Site is located less than 0.25 miles west of the San Ramon Transit Center, which is located east of the intersection of Camino Ramon & Executive Parkway. The San Ramon Transit Center serves several bus routes, including Central Contra Costa Transit Authority (CCCTA or County Connection) Routes 21, 35, 92X, 95X, 96X, 97X, and 321. The existing transit lines provide service to the Bay Area Rapid Transit (BART) rail stations in Dublin/Pleasanton, West Dublin/Pleasanton, and Walnut Creek, as well as Park-N-Ride lots in Danville and Walnut Creek.

TRAFFIC ANALYSIS METHODOLOGY

Study Scope and Analysis Conditions

The scope of analysis for this study was developed in consultation with City staff. The base assumptions and technical methodologies (i.e., trip generation, study locations, analysis methodology, etc.) were identified as part of the study approach and were outlined in a Scoping Form which was reviewed and approved by City staff. A copy of the Scoping Form is provided in Appendix A.

This study analyzed the potential Project-generated transportation impacts on the street system in the vicinity of the Project Site as compared to existing conditions and projected future conditions at the time the Project is expected to be completed and occupied (Year 2040). Potential intersection impacts were evaluated for typical weekday morning (7:00 AM to 9:00 AM) and afternoon (4:00 PM to 6:00 PM) peak periods. A total of 31 study intersections, including 28 signalized and three unsignalized intersections, in the vicinity of the Project Site were selected for detailed traffic analysis and are listed in Table 1 and shown in Figure 2.

TABLE 1
ANALYZED STUDY INTERSECTION LIST

No	North / South Street	East / West Street	Jurisdiction
1.	Bollinger Canyon Road	Crow Canyon Road	City of San Ramon
2.	San Ramon Valley Boulevard	Crow Canyon Road	City of San Ramon
3.	I-680 Southbound Ramps	Crow Canyon Road	Caltrans
4.	I-680 Northbound Ramps	Crow Canyon Road	Caltrans
5.	Crow Canyon Place	Crow Canyon Road	City of San Ramon
6.	Camino Ramon	Crow Canyon Road	City of San Ramon
7.	Alcosta Boulevard	Crow Canyon Road	City of San Ramon
8.	Dougherty Road	Crow Canyon Road	City of San Ramon
9. [a]	Bollinger Canyon Road	Norris Canyon Road	City of San Ramon
10.	San Ramon Valley Boulevard	Norris Canyon Road	City of San Ramon
11.	Bishop Drive/Annabel Lane	Norris Canyon Road	City of San Ramon
12.	Camino Ramon	Norris Canyon Road	City of San Ramon
13.	Alcosta Boulevard	Norris Canyon Road	City of San Ramon
14. [b]	Bishop Drive	Executive Parkway	City of San Ramon
15.	Camino Ramon	Executive Parkway	City of San Ramon
16.	Sunset Drive	Bishop Drive	City of San Ramon
17.	Camino Ramon	Bishop Drive	City of San Ramon
18.	Sunset Drive	Shops at Bishop Ranch/City Center	City of San Ramon
19.	San Ramon Valley Boulevard	Bollinger Canyon Road	City of San Ramon
20.	I-680 Southbound Ramps	Bollinger Canyon Road	Caltrans
21.	I-680 Northbound Ramps	Bollinger Canyon Road	Caltrans
22.	Sunset Drive	Bollinger Canyon Road	City of San Ramon
23.	Camino Ramon/Bishop Ranch 1	Bollinger Canyon Road	City of San Ramon
24.	Bishop Ranch 1 East	Bollinger Canyon Road	City of San Ramon
25.	Market Place	Bollinger Canyon Road	City of San Ramon
26.	Alcosta Boulevard	Bollinger Canyon Road	City of San Ramon
27.	Dougherty Road	Bollinger Canyon Road	City of San Ramon
28.	San Ramon Valley Boulevard	Montevideo Drive	City of San Ramon
29.	Alcosta Boulevard	Montevideo Drive	City of San Ramon
30. [a]	Alcosta Boulevard	Old Ranch Road	City of San Ramon
31.	Dougherty Road	Old Ranch Road	City of San Ramon

Notes

[a] Intersection operates with all-way stop-controlled (AWSC) under Existing Conditions. Intersection is signalized under Future Conditions.

[b] Intersection operates with two-way stop-controlled (TWSC).

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LEGEND

Project Site

Analyzed Intersection

N
Not to Scale

STUDY AREA & ANALYZED INTERSECTIONS

FIGURE 2

Consistent with Chapter 12 of *Engineering Design, Grading and Procedures Manual: City of San Ramon* (San Ramon Public Works Department Engineering Services Division, April 2010) (Traffic Study Guidelines), the following traffic conditions were developed and analyzed as part of this study:

- Existing Conditions (Year 2019) – The analysis of existing traffic conditions provides a basis for the assessment of future traffic conditions. The Existing Conditions analysis includes a description of key area streets and highways, traffic volumes and current operating conditions, and transit service in the Study Area. Fieldwork (lane configurations and signal phasing) for the analyzed intersections is provided in Appendix B. Intersection turning movement counts were collected at each of the selected study intersections during the weekday morning and afternoon peak periods in March and May 2019, and the detailed traffic count worksheets are provided in Appendix C. Detailed level of service (LOS) worksheets are provided in Appendix D.

- Existing with Project Conditions (Year 2019) – This analysis condition projects the potential intersection operating conditions that could be expected if the Project components were fully occupied and added to existing Year 2019 traffic levels. This represents a conservative, worst-case scenario for traffic conditions as the Project is scheduled to be constructed over a 20-25 year time period.

- Future without Project Conditions (Year 2040) – This analysis condition projects the potential intersection operating conditions that could be expected as a result of regional growth and related project traffic in the Study Area by Year 2040. This analysis provides the conditions by which the Project impacts are evaluated in the future at full buildout. This scenario includes roadway improvements constructed by the City's Capital Improvement Project and by other projects in the Study Area that will be in place prior to the full occupancy of the Project. The Future without Project Conditions (Year 2040) were projected using the CCTA Model.

- Future with Project Conditions (Year 2040) – This analysis condition projects the potential intersection operating conditions that could be expected if the Project components were fully occupied in the projected buildout year. In this scenario, the traffic generated by the Project is added to Future without Project Conditions.

Intersection Analysis Methodology

In accordance with the City's Traffic Study Guidelines and the current *CCTA Technical Procedures* (CCTA, January 16, 2013), the intersection capacity analysis was conducted using the Synchro 10th Edition software to implement the *Highway Capacity Manual, 6th Edition* (Transportation Research Board, 2016) (HCM) methodology to determine the overall intersection delay. The HCM methodology calculates the average delay, in seconds, of a vehicle passing through the intersection in any direction. The average delay is used to determine the intersection LOS according to the LOS definitions provided in Table 2. The analysis worksheets for each scenario are provided in Appendix D.

IMPACT CRITERIA AND SIGNIFICANCE THRESHOLDS

The significance of the potential impacts of Project generated traffic at the study intersections was determined using criteria identified in the Traffic Study Guidelines, as detailed in Table 3. The Traffic Study Guidelines indicate that a project is considered to have a significant transportation impact when the project causes any of the thresholds to be exceeded under any scenario.

The relative impact of the added traffic volumes to be generated by the Project was evaluated based on analysis of existing and future operating conditions at the study intersections, with and without the Project.

Signal Warrants

To assess the need for signalization of a stop-controlled intersection, *California Manual on Uniform Traffic Control Devices* (California Department of Transportation [Caltrans], 2014) (CA MUTCD) presents nine signal warrants. Satisfying one or more of the signal warrants could justify signalization of an intersection; however, the full set of warrants should be considered as part of an evaluation and an engineering study should be conducted before the decision to install a signal is made.

TABLE 2
LEVEL OF SERVICE DEFINITIONS FOR INTERSECTIONS

Level of Service	Description	Delay [a]	
		Signalized Intersections	Unsignalized Intersections
A	EXCELLENT. No vehicle waits longer than one red light and no approach phase is fully used.	≤ 10	0.0 - 10.0
B	VERY GOOD. An occasional approach phase is fully utilized; many drivers begin to feel somewhat restricted within groups of vehicles.	> 10 and ≤ 20	10.1 - 15.0
C	GOOD. Occasionally drivers may have to wait through more than one red light; backups may develop behind turning vehicles.	> 20 and ≤ 35	15.1 - 25.0
D	FAIR. Delays may be substantial during portions of the rush hours, but enough lower volume periods occur to permit clearing of developing lines, preventing excessive backups.	> 35 and ≤ 55	25.1 - 35.0
E	POOR. Represents the most vehicles intersection approaches can accommodate; may be long lines of waiting vehicles through several signal cycles.	> 55 and ≤ 80	35.1 - 50.0
F	FAILURE. Backups from nearby locations or on cross streets may restrict or prevent movement of vehicles out of the intersection approaches. Tremendous delays with continuously increasing queue lengths.	> 80	> 50.0

Notes

Source: *Highway Capacity Manual, 6th Edition* (Transportation Research Board, 2016).

[a] Measured in seconds.

TABLE 3
IMPACT CRITERIA AND SIGNIFICANCE THRESHOLDS

Intersection Control Type	Significant Impact Threshold
Signalized	The Project... • ...causes an acceptable LOS (LOS D or better) to decline to an unacceptable LOS (LOS E or F), or • ...increases the average delay by more than 5 seconds per vehicle at an intersection having an unacceptable LOS without project traffic
All-Way Stop	The Project... • ...causes an acceptable LOS to decline to an unacceptable LOS, or • ...increases the average delay by more than 5 seconds per vehicle at an intersection that has an unacceptable LOS without the project and the intersection also meets the peak hour volume signal warrant.
Two-Way Stop	• The Project causes a turning movement's acceptable LOS to decline to an unacceptable LOS and the peak hour volume signal warrant is met.

Notes
Source: *Engineering Design, Grading and Procedures Manual: City of San Ramon* (Public Works Department Engineering Services Division, April 2010)

In addition, satisfaction of one or more signal warrants does not in itself require an installation of a traffic signal. The peak hour volume warrant (Warrant 3) analysis for urban conditions was conducted for the unsignalized study intersections that are candidates for signalization.

ADDITIONAL TRAFFIC ANALYSES

CCTA

The CCTA is the Congestion Management Agency for Contra Costa County. The CCTA oversees implementation of sub-regional Action Plans for Routes of Regional Significance, which sets forth performance objectives for Routes of Regional Significance. In the San Ramon Valley, the Tri-Valley Transportation Council Action Plan includes Routes of Regional Significance. I-680, Crow Canyon Road, Bollinger Canyon Road, San Ramon Valley Boulevard, Alcosta Boulevard, and the Iron Horse Trail are considered Routes of Regional Significance within the Study Area.

State of California Senate Bill No. 743

Senate Bill No. 743 (Steinberg, 2013) (SB 743), made effective in January 2014, requires the Governor's Office of Planning and Research to change the California Environmental Quality Act (CEQA) guidelines regarding the analysis of transportation impacts. Under SB 743, the focus of transportation analysis will shift from driver delay to vehicle miles traveled (VMT) to promote a reduction of greenhouse gas emissions (GHG) and to encourage creation of multimodal networks and promotion of mixed-use developments. Although originally scheduled to be fully implemented in guidelines by January 1, 2016, an extension has allowed cities more time to establish an analysis methodology. Under the latest guidelines, all cities and jurisdictions in California are supposed to adopt new VMT guidelines by July 1, 2020. The City is in the process of updating its transportation impact methodology, and CCTA is in the process of updating *CCTA Technical Procedures* to include thresholds based on VMT as well. To better align with the State's multimodal transportation and environmental action goals, Caltrans is also pursuing VMT as a metric of Project impacts, which is outlined in *Local Development - Intergovernmental Review (LD-IGR) Interim Guidance* (Caltrans, Approved September 2016) (Caltrans Interim Guidance). The Caltrans Interim Guidance, which is provided in Appendix E, discusses the shift away from congestion and toward VMT as a measure of environmental impact.

In addition, SB 743 adds Public Resources Code Section 21099, which provides that "aesthetic and parking impacts of a residential, mixed-use residential, or employment center project on an infill site within a transit priority area shall not be considered significant impacts on the environment." A transit priority area is defined as an area within 0.5 miles of an existing or planned major transit stop. Public Resources Code Section 21064.3 defines a major transit stop as a "site containing an existing rail transit station, a ferry terminal served by either a bus or rail transit service, or the intersection of two or more major bus routes with a frequency of service interval of 15 minutes or less during the morning and afternoon commute periods." The Project Site is well served by public transit and, thus, the Project qualifies as a transit priority area. As previously described, the San Ramon Transit Center is located less than 0.25 miles from the Project Site and serves CCCTA bus lines, which serve the entire area with average headways of 10 to 30 minutes in each direction during the morning and afternoon peak hours and connect the Project to the Dublin/Pleasanton, West Dublin/Pleasanton, and Walnut Creek BART stations, and the Altamont Commuter Express train in Pleasanton. The existing transit service within the Study Area is further detailed in Chapter 2.

The Project characteristics (e.g., its location, proximity to transit, access to other nearby destinations, pedestrian connections, bicycle amenities, etc.) would encourage non-auto and non-single occupant auto modes of transportation such as walking, bicycling, carpool, vanpool, transit, etc. Furthermore, the addition of residential and retail land uses to the existing employment and retail-rich Project area is consistent with the goals of SB 743 in that the new infill land uses create a more diverse mixed-use development area. The Project will provide the opportunity for office employees to live in the new residential communities within Bishop Ranch and, thus, directly contribute to potentially significant reductions in VMT. Overall, the Project would also reduce vehicle trips by encouraging walking, public transit ridership and bicycle travel, thus resulting in corresponding reductions in VMT, air quality emissions and transportation-related GHG emissions.

Caltrans

The Caltrans Interim Guidance discusses the importance of transit, alternate modes of travel, and pedestrian considerations as part of project evaluation and suggests the approach with which Caltrans can recommend improvements to enhance pedestrian safety and increase pedestrian accessibility to help meet the goals and targets of *Caltrans Strategic Management Plan 2015-2020* (Caltrans, March 2015) and *California Transportation Plan 2040* (Caltrans, June 2016). The Caltrans Interim Guidance directs lead agencies to consider "multi-modal solutions from existing regional transportation plans, regional plans, transit plans, bicycle plans, and pedestrian plans."

The Caltrans Interim Guidance states that Caltrans' "comments henceforth should take into consideration whether the project exhibits low or high VMT (by place type e.g., urban, suburban, and rural areas) and should focus recommendations on smart land use, multimodal access, safety for all users, and reducing single occupant vehicle trips. Well planned urban infill projects which are located close to transit, bike and pedestrian facilities… which also have proximity benefits to employment centers, services and goods – will reduce travel demand on the entire transportation system and will therefore require significantly less review and mitigation than rural fringe projects (Project Type 5), which generate proportionately higher number of trips and vehicle miles traveled. Senate Bill 743 (2013) mandated that CEQA review of transportation impacts of proposed development be modified by eliminating consideration of delay- and capacity- based metrics such as LOS and instead focusing analysis on another metric of impact."

The Governor's Office of Planning and Research has proposed that VMT be the primary metric used in identifying transportation impacts.

While the City and CCTA are finalizing their VMT methodology and thresholds, the analysis of the Caltrans facilities was conducted using the HCM methodology and is summarized in Chapter 8, with supporting data in Appendix F. Given that the City has not yet adopted a transportation impact policy that incorporates a VMT policy and VMT thresholds, VMT per capita results for the Project were also analyzed and calculated for informational purposes and is detailed in Appendix G.

Project Access and Circulation

In addition to the various intersection and Caltrans analyses, this study includes a review of the Project access and circulation.

ORGANIZATION OF REPORT

This report is divided into nine chapters, including this introduction. Chapter 2 describes the existing circulation system, traffic volumes, and transportation conditions in the Study Area. Chapter 3 forecasts the Future without Project Conditions. Chapter 4 describes the procedure used to forecast Project traffic volumes and distribution through the Study Area. Chapter 5 presents the intersection operating conditions associated with both Existing with Project and Future with Project Conditions (Year 2040). Chapter 6 identifies the potential significant transportation impacts, prior to mitigation, of the proposed Project under both Existing with Project and Future with Project Conditions and describes the transportation mitigation program designed to reduce the impacts of the Project. Chapter 7 presents the analysis of Caltrans facilities. Chapter 8 describes site access and internal circulation. Chapter 9 provides a summary of the report. The Appendices contain supporting documentation and additional details of the technical analyses, as well as the additional analysis described above.

Chapter 2
Existing Conditions

A comprehensive data collection effort was undertaken to develop a detailed description of existing conditions in the Project's Study Area. The Existing Conditions analysis includes an assessment of the existing freeway and street systems, an analysis of traffic volumes and current operating conditions, and an assessment of the existing public transit service, as well as pedestrian and bicycle circulation in Year 2019.

STUDY AREA

The Project's Study Area, shown in Figure 2, is generally bounded by Crow Canyon Road to the north, Dougherty Road to the east, Montevideo Drive and Old Ranch Road to the south, and Bollinger Road and I-680 to the west. The Study Area was established in consultation with the City to encompass those intersections with a reasonable potential to experience significant transportation impacts due to Project traffic.

A total of 31 intersections, including 28 signalized and three unsignalized intersections, were identified during the MOU process for detailed analysis of the above conditions. Figure 2 illustrates the location of the Project Site in relation to the surrounding street system and the 31 study intersections. The existing lane configurations at the analyzed intersections are provided in Appendix B.

EXISTING STREET SYSTEM

The existing street system in the Study Area consists of a regional roadway system including freeways, arterials, collectors, and local streets which provide regional, sub-regional, or local access and circulation within the Study Area. These transportation facilities generally provide two to eight travel lanes and may allow parking on either side of the street. Typically, the speed limits range between 25 and 50 miles per hour (mph) on the streets and 65 mph on freeways.

Street classifications for roadways within the City are designated in *City of San Ramon General Plan 2035* (City of San Ramon, Effective May 28, 2015) (General Plan). The available facilities in the Study Area are defined by the following in the General Plan:

- Freeways are high-volume, high-speed roadways with limited access provided by interchanges that carry regional traffic through and do not provide local access to adjacent land uses.
- Arterial Streets are major roadways that serve higher traffic volumes and accommodate intercity circulation, as well as provide access to major commercial activity centers. Typically, Arterial Streets provide two to four travel lanes in each direction separated by a center median.
- Collector Streets are generally located in residential neighborhoods and employment areas and provide access to and from arterial streets for local traffic and are not intended for cut-through traffic. Typically, Collector Streets provide one to two travel lanes in each direction with no center median.
- Local Streets are intended to accommodate lower volumes of vehicle traffic and used to travel within neighborhoods. Typically, Local Streets provide one travel lane in each direction with parking on both sides of the street.
- Routes of Regional Significance are major arterials and freeways that serve regional traffic and generally serve as a means of travel across Contra Costa County or between Contra Costa County and adjacent counties.

Primary regional access to the Project Site is provided by I-680. The major arterials providing regional and sub-regional access to the Study Area include Crow Canyon Road, Bollinger Canyon Road, and Alcosta Boulevard. The following is a brief description of the major roadways in the transportation analysis Study Area, including their classification under the General Plan:

Freeways

- I-680 – I-680 is a classified Route of Regional Significance and generally runs in the north-south direction, less than 0.25 miles west of the Project Site. In the vicinity of the Study

Area, I-680 provides three travel lanes, one High Occupancy Vehicle Toll/Express lane, and one auxiliary lane in each direction north of Crow Canyon Road, and three travel lanes and one Express lane in each direction south of Crow Canyon Road. An auxiliary lane is present in the northbound direction between Bollinger Canyon Road and Crow Canyon Road. Access to and from I-680 is available via interchanges at Crow Canyon Road, Bollinger Canyon Road, and Alcosta Boulevard.

Roadways

- Bollinger Canyon Road – Bollinger Canyon Road is a classified Arterial Street east and west of San Ramon Valley Boulevard and a Route of Regional Significance east of San Ramon Valley Boulevard. It generally travels in the north-south direction west of San Ramon Valley Boulevard and in the east-west direction east of San Ramon Valley Boulevard. In the core of the Study Area, it is generally located south of the Project Site (except BR 1A). West of San Ramon Valley Boulevard, the roadway provides one to two travel lanes in each direction, with left-turn lanes at some intersections. Class II bicycle lanes are provided to Ascension Drive on both sides of the street. Between San Ramon Valley Boulevard and Alcosta Boulevard, it provides three to four travel lanes in each direction, with left-turn lanes at intersections. Between Alcosta Boulevard and Dougherty Road, it provides three travel lanes in each direction, with left-turn lanes at intersections, and Class II bicycle lanes on both sides of the street. East of Dougherty Road, it provides two travel lanes in each direction, with left-turn lanes at intersections, and Class II bicycle lanes on both sides of the street. Between Crow Canyon Road and Ascension Drive, parking is generally available on both sides of the street within the Study Area.

- San Ramon Valley Boulevard – San Ramon Valley Boulevard is an Arterial Street and a classified Route of Regional Significance. It travels in the north-south direction and is located west of the Project Site. It generally provides two travel lanes in each direction, with left-turn lanes at intersections and Class II bicycle lanes on both sides of the street. Parking is generally not available on either side of the street within the Study Area.

- Alcosta Boulevard – Alcosta Boulevard is a classified Arterial Street between Crow Canyon Road and Village Parkway and a Route of Regional Significance west of Village Parkway. It generally travels in the north-south direction and is located east of the Project Site. It generally provides two travel lanes in each direction, with left-turn lanes at intersections. Class II bicycle lanes are provided on both sides of the street north of Veracruz Drive/Terra Alta Drive. Parking is generally only available on the west side of the street along a frontage road south of Veracruz Drive/Terra Alta Drive within the Study Area.

- Dougherty Road – Dougherty Road is an Arterial Street and a classified Route of Regional Significance north of Bollinger Canyon Road and an Arterial Street south of Bollinger Canyon Road. It travels in the north-south direction and is located east of the Project Site. It generally provides three travel lanes in each direction, with left turns at intersections and Class II bicycle lanes on both sides of the street. Parking is generally not available on either side of the street within the Study Area.

- Crow Canyon Road – Crow Canyon Road is an Arterial Street and a classified Route of Regional Significance. It travels in the east-west direction and is located north of the Project Site. It generally provides one lane in each direction west of Bollinger Canyon Road, and three to four travel lanes in each direction, with left-turn lanes at intersections, between Bollinger Canyon Road and Alcosta Boulevard. It provides two travel lanes in each direction, with left-turn lanes at intersections and Class II bicycle lanes on both sides of the street east of Alcosta Boulevard. Parking is generally not available on either side of the street within the Study Area.

- Old Ranch Road – Old Ranch Road is a classified Arterial Street. It travels in the east-west direction and is located south of the Project Site. It generally provides two travel lanes in each direction, with left-turn lanes at most intersections. Parking is generally not available on either side of the street within the Study Area.

- Camino Ramon – Camino Ramon is a classified Arterial Street. It travels in the north-south direction and runs between BR 2600 and the BR 3A/BR 1A. It generally provides two travel lanes in each direction, with left-turn lanes at intersections and driveways. Parking is generally not available on either side of the street within the Study Area.

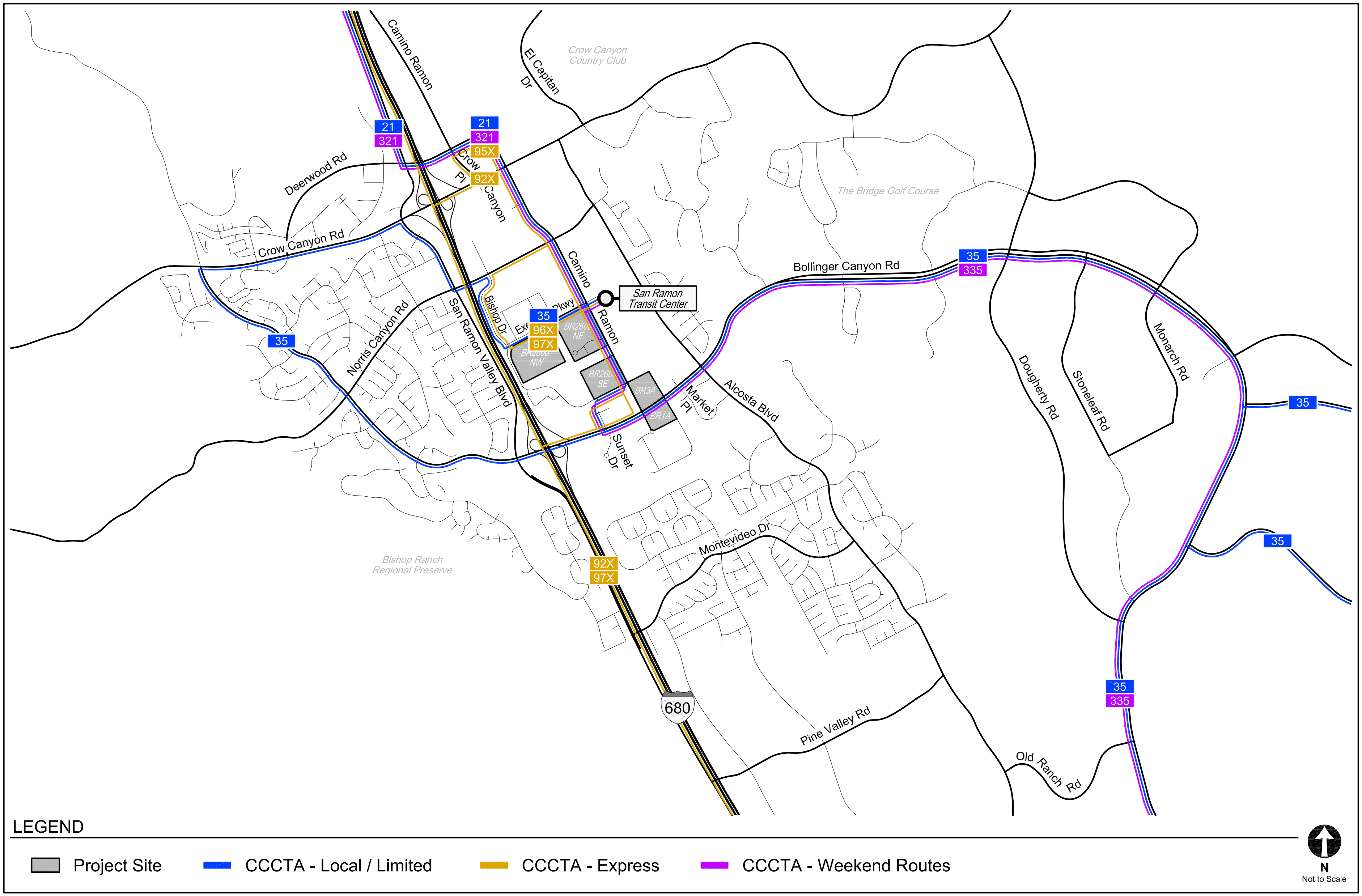
- Norris Canyon Road – Norris Canyon Road is a classified Collector Street west of San Ramon Valley Boulevard and an Arterial street east of San Ramon Valley Boulevard. It travels in the east-west direction and is located north of the Project Site. It generally provides one to two travel lanes in each direction west of San Ramon Valley Boulevard and Class II bicycle lanes west of Bollinger Canyon Road. It provides two travel lanes in each direction, with left-turn lanes at most intersections, and Class II bicycle lanes on both sides of the street east of San Ramon Valley Boulevard. Parking is generally available on both sides of the street between Bollinger Canyon Road and San Ramon Valley Boulevard within the Study Area.

- Montevideo Drive – Montevideo Drive is a classified Collector Street. It travels in the east-west direction and is located south of the Project Site. It generally provides one travel lane in each direction. Parking is generally available on both sides of the street within the Study Area.

- Bishop Drive – Bishop Drive is a classified Local Street. It travels in the north-south direction west of Sunset Drive and in the east-west direction east of Sunset Drive. It is located along the western and southern boundaries of BR 2600 NW and BR 2600 SE, respectively. It generally provides one travel lane in each direction and Class II bicycle lanes on both sides of the street west of Sunset Drive. Parking is generally not available on either side of the street within the Study Area.

EXISTING TRANSIT SYSTEM

The Study Area is served by bus lines operated by CCCTA via routes 21, 35, 92X, 95X, 96X, and 97X, in addition to weekend routes 321 and 335. Figure 3A illustrates the existing transit service



EXISTING TRANSIT SERVICE

FIGURE 3A

in the Study Area. Table 4 summarizes the transit lines operating in the Study Area for each of the service providers in the region, the type of service (peak vs. off-peak, express vs. local), and frequency of service, as described above. The average frequency of transit service during the peak hour was derived from the number of peak period stops made at the stop nearest the Project Site.

BICYCLE AND PEDESTRIAN NETWORK

Existing Bicycle System

Based on *City of San Ramon Bicycle Master Plan* (City of San Ramon, April 2018) (Bicycle Master Plan), the existing bicycle system in the Study Area consists of a limited coverage of multi-use paths (Class I), bicycle lanes (Class II), and bicycle routes (Class III). Multi-use paths are two-way paved facilities, physically separated from vehicle traffic and can be used by bicyclists, pedestrians and other non-motorized users. Bicycle lanes are a component of street design with dedicated striping and symbols on the roadway surface, separating vehicular traffic from bicycle traffic. Buffered bicycle lanes provide a striped-painting flush buffer zone between a bicycle lane and adjacent travel lane. Bicycle routes are identified as bicycle-friendly streets where motorists and cyclists share the roadway and there is no dedicated striping of a bicycle lane. Bicycle routes are preferably located on Local, Collector, and lower volume Arterial Streets as part of a signed route or bicycle boulevard, which is typically applied on quiet streets such as residential neighborhoods. The following bicycle facilities are provided along corridors within the Study Area:

Multi-Use Paths (Class I)

- Iron Horse Trail

Bicycle Lanes (Class II)

- San Ramon Valley Boulevard
- Bishop Drive
- Alcosta Boulevard between Crow Canyon Road and Veracruz Drive/Terra Alta Drive and Pine Valley Road

TABLE 4
EXISTING TRANSIT SERVICE IN STUDY AREA

Provider, Route, and Service Area		Service Type	Hours of Operation	Average Headway (minutes)	
CCCTA - Weekdays Only				**Peak**	**Off-Peak**
21	BART Walnut Creek - San Ramon	Local	5:30 AM - 10:30 PM	30	60
35	BART Dublin/Pleasanton - San Ramon	Local	6:00 AM - 8:30 PM	15-20	30-60
92X	ACE Express	Express	5:30 AM - 9:00 AM 3:30 PM - 7:30 PM	60	--
95X	San Ramon - BART Walnut Creek	Express	6:00 AM - 9:00 AM 3:30 PM - 7:30 PM	20 min peak only	--
96X	BART Walnut Creek - Bishop Ranch	Express	5:30 AM - 7:15 PM	20 min peak only	3 peak trips
97X	BART Dublin/Pleasonton - Bishop Ranch	Express	6:30 AM - 9:00 AM 4:00 PM - 6:00 PM	60 min peak only	--
Provider, Route, and Service Area		**Service Type**	**Hours of Operation**	**Average Headway (minutes)**	
CCCTA - Weekends Only				**Peak**	**Off-Peak**
321	BART Walnut Creek - San Ramon	Limited	7:30 AM - 10:30 PM	60	60
335	BART Dublin/Pleasonton - San Ramon	Limited	7:45 AM - 7:15 PM	60	60

Notes

Transit peak hours generally occur during 6:00 AM - 9:00 AM and 3:00 PM - 6:00 PM.

CCCTA: Central Contra Costa Transit Authority

BART: Bay Area Rapid Transit

ACE: Altamont Corridor Express

- Crow Canyon Road east of Alcosta Boulevard
- Norris Canyon Road west of Bollinger Canyon Road and east of San Ramon Valley Boulevard
- Executive Parkway
- Bollinger Canyon Road west of San Ramon Valley Boulevard and east of Canyon Lakes Drive/Canyon View Circle

Bicycle Routes (Class III)

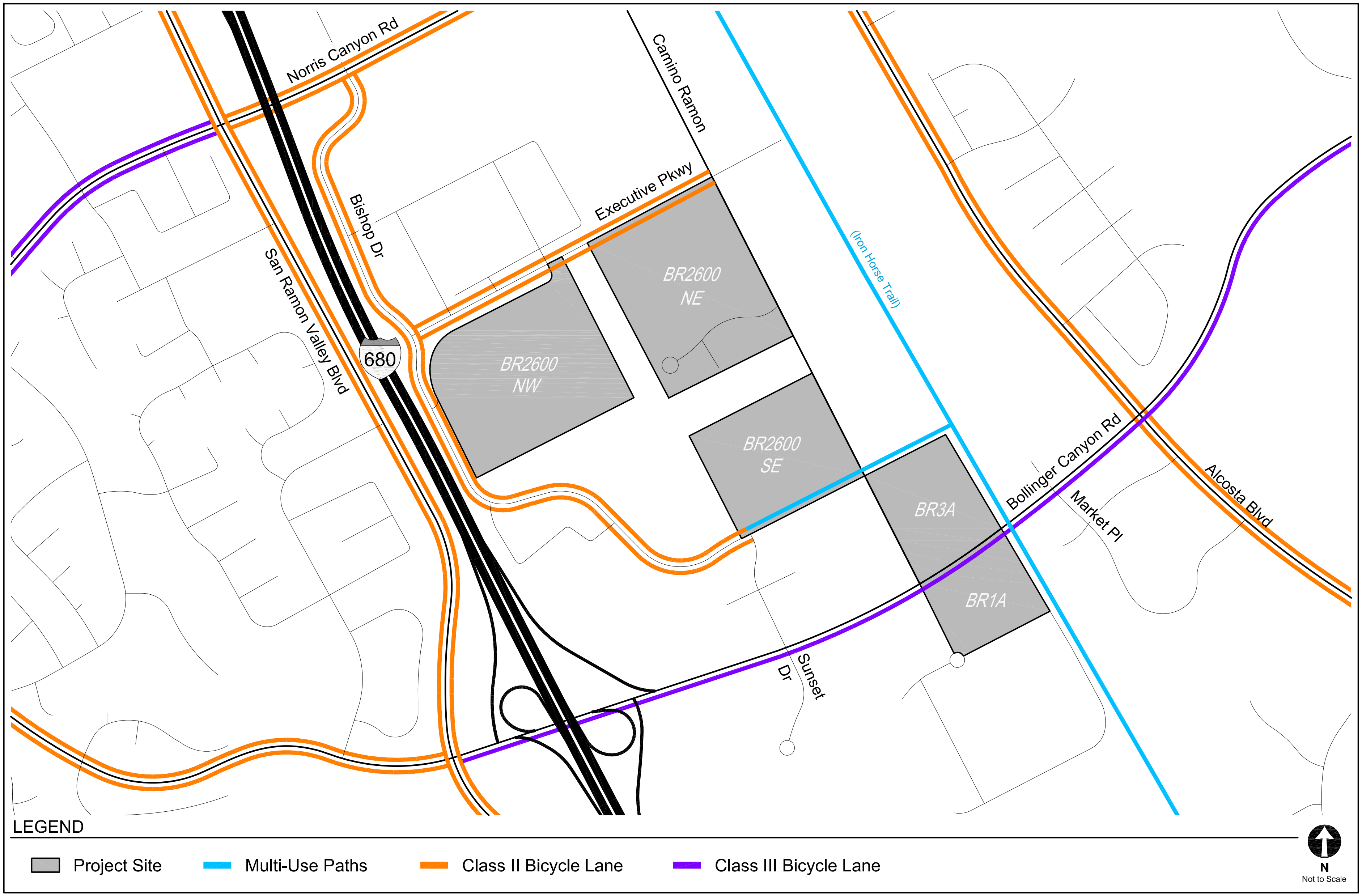
- Bollinger Canyon Road between San Ramon Valley Boulevard and Canyon Lakes Drive/Canyon View Circle
- Davona Drive
- Broadmoor Drive
- Alcosta Boulevard south of Veracruz Drive/Terra Alta Drive and Pine Valley Road
- Norris Canyon Road between Bollinger Canyon Road and San Ramon Valley Boulevard
- Montevideo Drive

Figure 3B depicts the existing bicycle network within the Project vicinity.

Existing Pedestrian Facilities

The walkability of existing facilities is based on the availability of pedestrian routes necessary to accomplish daily tasks without the use of an automobile. The Project area is comprised of employment and retail land uses and cultural facilities served by transit stops, a bicycle network, and an extensive sidewalk system. There are wide sidewalks lining the streets, crosswalks available at the intersections, and many shops, restaurants, and other services within walking distance of the Project Site.

The sidewalks that serve as routes to the Project Site provide proper connectivity and adequate widths to pedestrian crossings at intersections for a comfortable and safe pedestrian environment. The following signalized intersections provide pedestrian facilities to limit illegal mid-block crossings to the Project Site (all intersections have marked pedestrian crossings):



EXISTING BICYCLE NETWORK

FIGURE 3B

- Camino Ramon & Executive Parkway (Intersection #15)
- Sunset Drive & Bishop Drive (Intersection #16)
- Camino Ramon & Bishop Drive (Intersection #17)
- Camino Ramon/Bishop Ranch 1 & Bollinger Canyon Road (Intersection #23)
- Bishop Ranch 1E & Bollinger Canyon Road (Intersection #24)
- Camino Ramon & Bishop Ranch 3/Bishop Ranch 2700
- Bishop Drive & City Center breezeway (High-intensity Activated crossWalK [HAWK] signal)

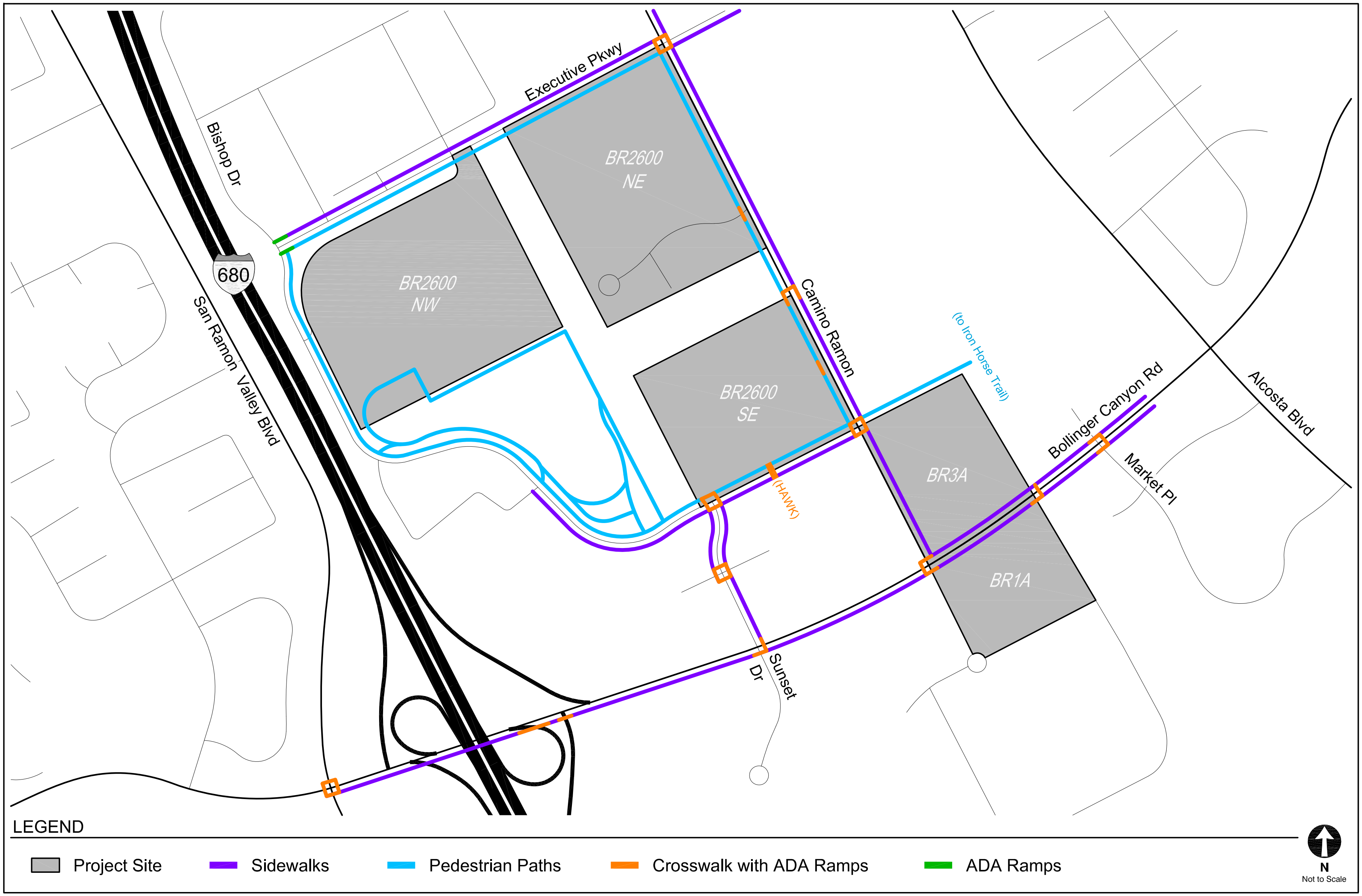
Each of the listed signalized intersections provides pedestrian phasing, crosswalk striping, and Americans with Disabilities Act wheelchair ramps.

Figure 3C illustrates the existing sidewalk and crosswalk systems along the project frontages.

EXISTING TRANSPORTATION DEMAND MANAGEMENT (TDM) PROGRAM

The Applicant currently manages a TDM Program that includes a set of strategies designed to reduce peak hour vehicular traffic to and from the Bishop Ranch Business Park, which encompasses the Bishop Ranch Campus and the Project Site. It is a comprehensive program of design features, transportation services, education programs, and incentive programs intended to reduce the impact of traffic from employees and visitors to Bishop Ranch during the most congested time periods of the day. Consistent with the goals outlined in SB 743 and the City's TDM Ordinance, the TDM Program promotes non-auto travel and reduces the use of single-occupant vehicle trips. The incentive programs outlined in the TDM Program include the following:

- A Bishop Ranch Transportation Center with travel information kiosks and on-site TDM coordinators to provide transportation information educational programs
- Tenant Employee Transportation Coordinator
- Fully subsidized transit passes on CCCTA buses
- Partially subsidized transit passes on San Francisco express buses



EXISTING PEDESTRIAN NETWORK

FIGURE 3C

- Promotion and support of carpools, vanpools, and rideshare
- Bicycle amenities such as secure racks and showers
- Incentives for using alternative travel modes, including access to the 511 Contra Costa Guaranteed Ride Home Program
- Promotion of TDM Public Outreach Campaigns – 511 Contra Costa
- New employee orientation meetings detailing TDM opportunities
- Meetings with City TDM Advisory Committee

A detailed list of the programs in the TDM Program is provided in Appendix H.

The combined effect of the various strategies implemented as part of the TDM Program results in a reduction in peak hour trip generation by offering services, actions, specific facilities, etc., aimed at encouraging use of alternative transportation modes (e.g., transit, bus, walking, bicycling, carpool, vanpool, etc.) *Trip Generation Handbook, 3rd Edition* (Institute of Transportation Engineers, 2017) provides a summary of research of TDM programs at many different employers. At places that had the most comprehensive programs, including both economic incentives (e.g., transit passes, etc.) and support services, the programs resulted in an average 24% reduction in commuter vehicles. Based on a Year 2018 employee survey conducted by 511 Contra Costa and the City at Bishop Ranch, it was shown that approximately 29% of employees do not drive alone and either travel via carpool, vanpool, or transit, or they work at home (telecommuting). Although the Applicant manages an intensive TDM Program at the Bishop Ranch Business Park, in order to provide an overly conservative traffic analysis, a 10% trip reduction for walk-in and transit usage was applied.

EXISTING TRAFFIC VOLUMES AND LEVELS OF SERVICE

This section presents the existing peak hour turning movement traffic volumes for the intersections analyzed in this study, describes the methodology used to assess the traffic conditions at each intersection, and analyzes the resulting operating conditions at each intersection indicating delay and LOS.

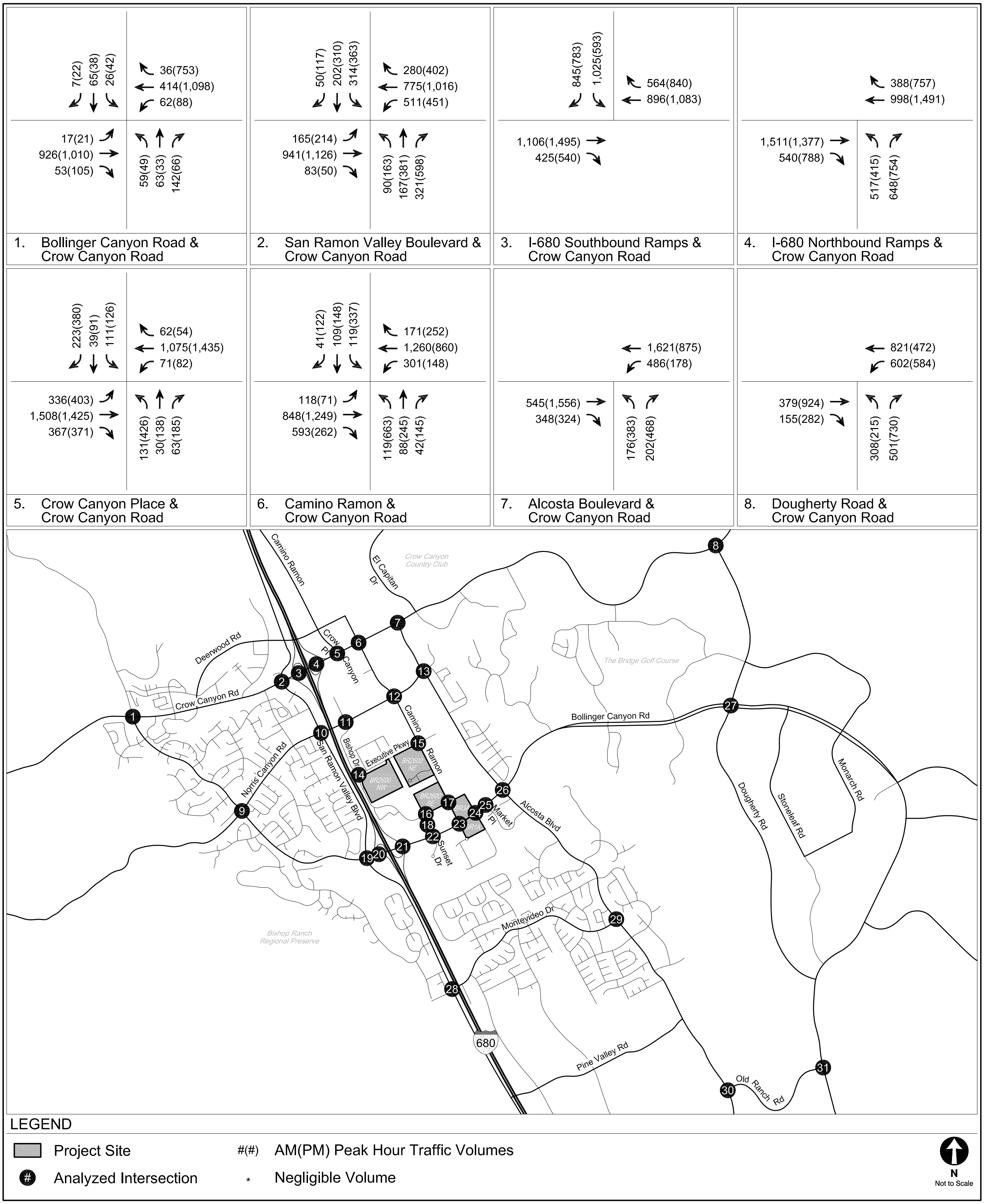
Existing Traffic Volumes

Intersection turning movement counts were conducted at the 31 study intersections during the weekday morning (7:00 AM to 10:00 AM) and afternoon (4:00 PM and 6:00 PM) peak periods in March and May 2019 in accordance with the Traffic Study Guidelines. Local schools were in session and the weather conditions were typical when all traffic counts were conducted. The existing intersection peak hour traffic volumes are illustrated in Figure 4. Traffic count worksheets are provided in Appendix C.

Existing Intersection Levels of Service

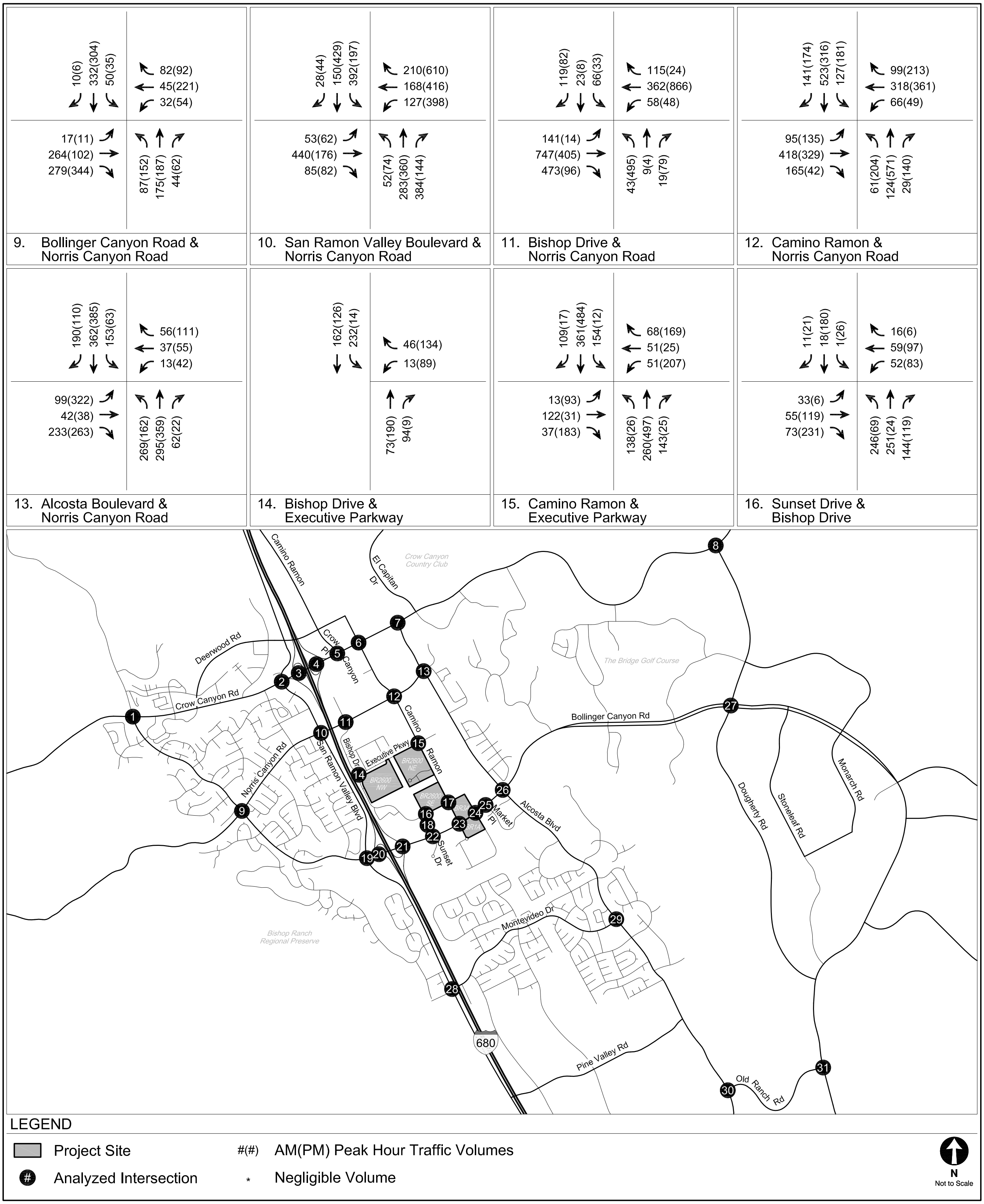
Table 5 summarizes the weekday morning and afternoon peak hour LOS results for each of the study intersections under Existing Conditions. As shown in Table 5, 30 of the 31 study intersections currently operate at LOS D or better during both the morning and afternoon peak hours. The remaining study intersection of Alcosta Boulevard & Bollinger Canyon Road (Intersection 26) currently operates at LOS D during the morning peak hour and LOS E during the afternoon peak hour.

The LOS calculation worksheets are provided in Appendix D.



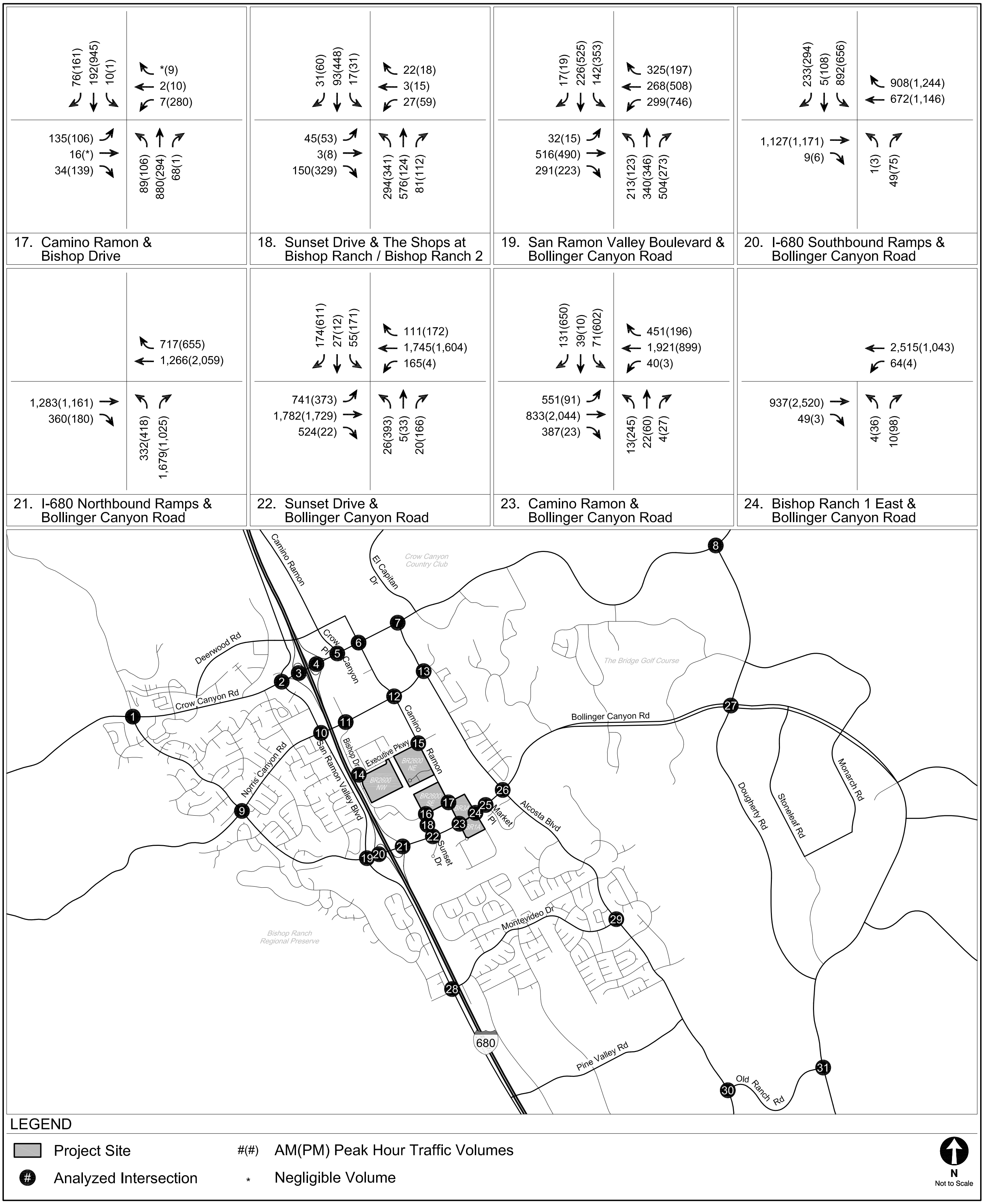
EXISTING CONDITIONS (YEAR 2019)
PEAK HOUR TRAFFIC VOLUMES

FIGURE 4



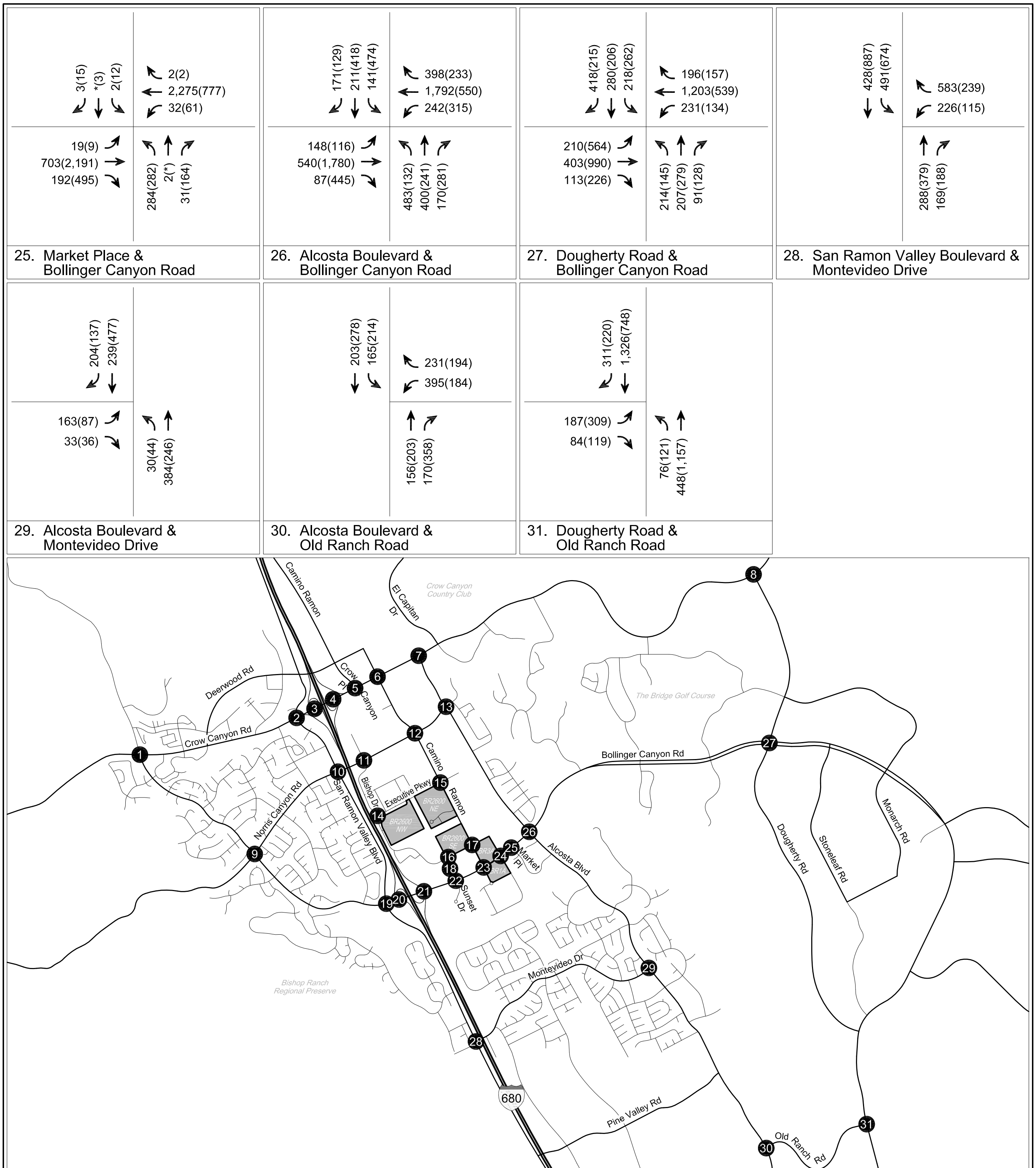
EXISTING CONDITIONS (YEAR 2019)
PEAK HOUR TRAFFIC VOLUMES

FIGURE 4 (CONT.)



EXISTING CONDITIONS (YEAR 2019)
PEAK HOUR TRAFFIC VOLUMES

FIGURE 4 (CONT.)



LEGEND

- Project Site
- Analyzed Intersection
- #(#) AM(PM) Peak Hour Traffic Volumes
- * Negligible Volume

N
Not to Scale

EXISTING CONDITIONS (YEAR 2019)
PEAK HOUR TRAFFIC VOLUMES

FIGURE 4 (CONT.)

TABLE 5
EXISTING CONDITIONS (YEAR 2019)
INTERSECTION LEVELS OF SERVICE ANALYSIS

No.	Intersection	Peak Hour	Existing Conditions	
			Delay	LOS
1.	Bollinger Canyon Road & Crow Canyon Road	AM PM	32.2 33.5	C C
2.	San Ramon Valley Boulevard & Crow Canyon Road	AM PM	44.0 49.0	D D
3.	I-680 Southbound Ramps & Crow Canyon Road	AM PM	20.3 15.9	C B
4.	I-680 Northbound Ramps & Crow Canyon Road	AM PM	16.2 14.2	B B
5.	Crow Canyon Place & Crow Canyon Road	AM PM	29.1 38.8	C D
6.	Camino Ramon & Crow Canyon Road	AM PM	26.1 33.2	C C
7.	Alcosta Boulevard & Crow Canyon Road	AM PM	17.0 16.3	B B
8.	Dougherty Road & Crow Canyon Road	AM PM	26.9 33.4	C C
9. [a]	Bollinger Canyon Road & Norris Canyon Road	AM PM	19.8 34.5	C D
10.	San Ramon Valley Boulevard & Norris Canyon Road	AM PM	42.4 45.9	D D
11.	Bishop Drive/Annabel Lane & Norris Canyon Road	AM PM	22.0 29.9	C C
12.	Camino Ramon & Norris Canyon Road	AM PM	34.9 43.8	C D
13.	Alcosta Boulevard & Norris Canyon Road	AM PM	36.8 38.2	D D
14. [b]	Bishop Drive & Executive Parkway	AM PM	11.6 12.4	B B
15.	Camino Ramon & Executive Parkway	AM PM	29.6 23.0	C C
16.	Sunset Drive & Bishop Drive	AM PM	36.0 35.0	D C
17.	Camino Ramon & Bishop Drive	AM PM	35.6 31.2	D C
18.	Sunset Drive & Shops at Bishop Ranch/City Center	AM PM	42.2 51.1	D D
19.	San Ramon Valley Boulevard & Bollinger Canyon Road	AM PM	43.5 50.8	D D
20.	I-680 Southbound Ramps & Bollinger Canyon Road	AM PM	29.9 23.3	C C

TABLE 5 (CONTINUED)
EXISTING CONDITIONS (YEAR 2019)
INTERSECTION LEVELS OF SERVICE ANALYSIS

No.	Intersection	Peak Hour	Existing Conditions	
			Delay	LOS
21.	I-680 Northbound Ramps & Bollinger Canyon Road	AM PM	17.7 29.5	B C
22.	Sunset Drive & Bollinger Canyon Road	AM PM	16.4 45.7	B D
23.	Camino Ramon & Bollinger Canyon Road	AM PM	26.8 24.6	C C
24.	Bishop Ranch 1 East & Bollinger Canyon Road	AM PM	13.5 3.0	B A
25.	Market Place & Bollinger Canyon Road	AM PM	10.4 14.1	B B
26.	Alcosta Boulevard & Bollinger Canyon Road	AM PM	48.6 65.7	D E
27.	Dougherty Road & Bollinger Canyon Road	AM PM	49.8 46.6	D D
28.	San Ramon Valley Boulevard & Montevideo Drive	AM PM	29.4 38.5	C D
29.	Alcosta Boulevard & Montevideo Drive	AM PM	14.2 14.8	B B
30. [a]	Alcosta Boulevard & Old Ranch Road	AM PM	14.2 20.9	B C
31.	Dougherty Road & Old Ranch Road	AM PM	23.2 15.8	C B

Notes

Delay is measured in seconds per vehicle

[a] Intersection operates with all-way stop-controlled (AWSC) under Existing Conditions. Intersection is signalized under Future Conditions.

[b] Intersection operates with two-way stop-controlled (TWSC).

Chapter 3
Future without Project Conditions

Estimates of future traffic conditions both with and without the Project, representing cumulative conditions, were developed to evaluate the potential impacts of the Project on the local street system. This chapter details the assumptions used to develop the Future without Project Conditions in Year 2040.

CEQA GUIDELINES REGARDING FUTURE TRAFFIC CONDITIONS

The forecast of Future without Project Conditions was prepared in accordance with procedures outlined in the CEQA guidelines. Specifically, two options are provided for developing the cumulative traffic volume forecast:

> "(A) A list of past, present, and probable future projects producing related or cumulative impacts, including, if necessary, those projects outside the control of the [lead] agency, or
>
> "(B) A summary of projections contained in an adopted general plan or related planning document, or in a prior environmental document which has been adopted or certified, which described or evaluated regional or area wide conditions contributing to the cumulative impact. Any such planning document shall be referenced and made available to the public at a location specified by the lead agency."

As described in detail below, this analysis includes traffic growth both from future projects (Option "A" above, the "Related Projects") and from regional growth projections (Option "B" above, or ambient growth) based on the CCTA Model. The CCTA Model provides a method to analyze and project traffic relative to the policies and development as well as the effects of regional growth within the Study Area. Therefore, the CCTA Model traffic projections are inclusive of local and regional development when applied to the freeways and arterial/surface streets.

CCTA MODEL ANALYSIS METHODOLOGY

The development of the future travel forecasts was accomplished through the use of the CCTA Model[1]. The CCTA Model was used to distribute the Project trips on the network based on a dynamic trip distribution[2] methodology from each Project traffic analysis zone (TAZ). This same methodology was used to develop the background traffic growth. The following describes the use of the CCTA Model to develop the future weekday traffic volumes incorporating the Project's proposed development and is further detailed in Appendix I:

1. It is anticipated that several cumulative development projects within the Study Area will be constructed by the Project Buildout Year. Assumptions related to the cumulative development in the unaffected non-Project TAZs and the development of background traffic conditions were not changed from the model's approved future land use assumptions.

2. The model runs were performed by adding the Project development in the Project TAZ to distribute the additional Project trip origin and destinations to other origins and destinations using the CCTA model distribution and subsequently assigning the resulting trip tables to the model network.

3. The results of each model run were provided as intersection approach/departure link volumes at each analyzed location during morning and afternoon peak hours. The peak hour intersection approach/departure link volumes were further developed into specific intersection level turning movement volumes via the Furness process, which allows the preparation of the intersection LOS analysis.

4. The CCTA Model outputs for the future 2040 and base year were compared to determine the incremental difference in traffic volumes at each study intersection. If volumes showed

[1] The version of the CCTA Model obtained consists of the Metropolitan Transportation Commission Plan Bay Area 2040 and 2017 Regional Transportation Plan Update (documented in April 2019)

[2] Dynamic trip distribution takes into account the congested locations projected to occur on the model network as a result of assigning background traffic and the trips generated by specific zones. During a model run, the model will distribute trips to the least congested routes in an iterative process until equilibrium is reached. Trips are distributed to locations within the street network and not based on a fixed/predetermined route. Trip patterns between model scenarios may vary, even though identical parameters are used.

a decrease in the incremental difference, the volume was conservatively overridden so that the intersection turning movement estimates would show a minimum of existing traffic levels for each movement.

5. The adjusted incremental difference between future 2040 and base year was applied to actual existing Year 2019 count volumes to reflect Future with Project Conditions.

6. The Project traffic volumes discussed in Chapter 4 were isolated and subtracted from Future with Project Conditions to develop the Future without Project Conditions.

This methodology is the standard state of the practice approach to long-range travel demand forecasting when empirical data is available to compare to base year model run information.

FUTURE IMPROVEMENTS

The analysis of future conditions considered roadway and intersection improvements via capital projects that are reasonably expected to be implemented prior to the buildout of the proposed Project (Year 2040). The City has developed a comprehensive five-year plan in which it identifies needed capital projects in the area and the coordination of financing and timing of such improvements. The latest update to this plan is outlined in *Capital Improvement Program 2019/2020 – 2023/24 Final Report* (City of San Ramon, Adopted June 11, 2019) (CIP). These include the following improvements:

Future Segment Improvements

- Project #5327: Crow Canyon Road Widening Four to Six Lanes (West Branch to Dougherty) – Crow Canyon Road will be widened to provide a total of six travel lanes between West Branch/Reedland Circle and Dougherty Road.

- Project #905328: Crow Canyon Road Widening Four to Six Lanes (Alcosta to West Branch) – Crow Canyon Road will be widened to provide a total of six travel lanes between Alcosta Boulevard and West Branch/Reedland Circle. Project construction will begin in Year 2020/2021.

Future Intersection Improvements

- Project #905325: Bollinger Canyon Road Widening Alcosta to Canyon Lakes (Intersection #26) – The widening improvement along Bollinger Canyon Road between Alcosta Boulevard and Canyon Lakes Drive, which widened the roadway to provide six travel lanes, three lanes in each direction, has been completed. Improvements began in 2008 with an additional traffic operational study performed in 2012. Alcosta Boulevard will be widened to provide an exclusive right-turn lane in the northbound direction. The resulting northbound lane configuration will include two left-turn lanes, two through lanes, and one right-turn lane. LOS analysis was conducted at this location under future operating conditions prior to any improvements. The intersection would operate at unacceptable LOS operations (LOS F during the afternoon peak hour) and would, therefore, warrant the widening improvement at Alcosta Boulevard under Future without Project Conditions. The LOS calculation worksheets are provided in Appendix J.

- Project #5335: Bollinger Canyon Road & Norris Canyon Road (Intersection #9) – The intersection will be improved via signalization, when warranted. LOS analysis was conducted at this location under future operating conditions prior to any improvements. The intersection would operate at unacceptable LOS operations (LOS E during the morning peak hour and LOS F during the afternoon peak hour) and was, therefore, subject to a signal warrant analysis to determine whether the projected volumes warrant the installation of a traffic signal. The intersection was analyzed accordingly to Warrant 3 (peak hour) of CA MUTCD. The intersection meets the minimum peak hour traffic volume threshold of Warrant 3 under Future without Project Conditions and, therefore, would warrant the signalization improvement. The LOS calculation worksheets and signal warrant analysis are provided in Appendix J. A full warrant analysis shall be completed prior to the installation of a signal.

- Project #5340: Alcosta Boulevard & Old Ranch Road (Intersection #30) – The intersection will be improved via signalization, when warranted. LOS analysis was conducted at this location under future operating conditions prior to any improvements. The intersection would operate at unacceptable LOS operations (LOS F during the afternoon peak hour) and was, therefore, subject to a signal warrant analysis to determine whether the projected volumes warrant the installation of a traffic signal. The intersection was analyzed accordingly to Warrant 3 (peak hour) of the CA MUTCD. The intersection meets the minimum peak hour traffic volume threshold of Warrant 3 under Future without Project Conditions and, therefore, would warrant the signalization. The LOS calculation worksheets and signal warrant analysis are provided in Appendix J. A full warrant analysis shall be completed prior to the installation of a signal.

- Project #905530: Bollinger Canyon Road/Iron Horse Trail Bicycle Pedestrian Overcrossing – Provide a grade-separated bicycle/pedestrian overcrossing connecting the Iron Horse Trail across Bollinger Canyon Road. The City has highlighted this CIP as a priority project.

Prior to construction, planned improvements that are not currently funded will be programmed for funding from various sources including bond proceeds, development impact fees, grants, taxes, etc. A number of the improvements are also mitigation measures for larger projects that have already undergone CEQA review (e.g., Project #5335 and #5340). Project #905530 has also undergone National Environmental Policy Act review. Therefore, substantial evidence supports the conclusion that these capital projects will be completed when warranted prior to any phase of the Project that could cause a significant impact.

The following intersection improvements detailed in the CIP are not warranted at this time or deferred indefinitely and, therefore, were conservatively assumed to not be implemented by the Project buildout year of 2040:

- Project #5311: Bollinger Canyon Road & Crow Canyon Road (Intersection #1) – Crow Canyon Road would be widened to provide an exclusive right-turn lane in the southbound direction. The resulting southbound lane configuration will include one left-turn lane, one through lane, and one right-turn lane. The 2040 LOS analysis showed that this intersection would operate at an acceptable LOS operation under future operating conditions prior to any improvements (LOS C during the morning peak hour and LOS D during the afternoon peak hour). Therefore, no future improvement was assumed under Future without Project Conditions.

- Project #5329: Crow Canyon Road & Dougherty Road (Intersection #8) – Crow Canyon Road would be widened to provide an exclusive right-turn lane in the eastbound direction. The resulting eastbound lane configuration will include two through lanes and one right-turn lane. The 2040 LOS analysis showed that this intersection would operate at an acceptable LOS operation under future operating conditions prior to any improvements (LOS C during the morning peak hour and LOS D during the afternoon peak hour). Therefore, no future improvement was assumed under Future without Project Conditions.

- Project #5498: Camino Ramon & Bishop Drive (Intersection #17) – Camino Ramon would be widened to provide an exclusive right-turn lane in the southbound direction. The resulting southbound lane configuration will include one left-turn lane, two through lanes, and one right-turn lane. The 2040 LOS analysis showed that this intersection would operate at an acceptable LOS operation under future operating conditions prior to any improvements (LOS D during the morning and afternoon peak hours). Therefore, no future improvement was assumed under Future without Project Conditions.

- Project #7116: Crow Canyon Road / I-680 Northbound Off-Ramp (Intersection #4) – The I-680 Northbound Off-Ramp would be widened to provide an additional right-turn lane. The resulting northbound lane configuration would include one left-turn lane, one shared left/right-turn lane, and two right-turn lanes.

- Project #7117: Crow Canyon Road / I-680 Southbound Off-Ramp (Intersection #3) – The I-680 Southbound Off-Ramp existing right-turn lane would be restriped to provide a shared left/right-turn lane under the planned CIP improvement. The resulting southbound lane configuration would include two left-turn lanes, one shared left-turn/right-turn lane, and one right-turn lane.

- Project #975609: Norris Canyon Road & Bishop Drive/Annabel Lane (Intersection #11) – Bishop Drive will be widened to provide an additional left-turn lane in the northbound direction. The resulting northbound lane configuration will include one left-turn lane, one shared through/left-turn lane, and one shared through/right-turn lane. In addition, the project includes the replacement of the signal pole on the northeast corner and upgrades to the pedestrian ramps on the north side of Norris Canyon Road. The 2040 LOS analysis showed that this intersection would operate at an acceptable LOS operation under future operating conditions prior to any improvements (LOS C during the morning peak hour and LOS D during the afternoon peak hour). Based on discussions with the City, the improvement has been deferred indefinitely due to geometric constraints. Therefore, no future improvement was assumed under Future without Project Conditions.

Future Interchange Improvements

- Bollinger Canyon Road & I-680 Northbound On-Ramp Continuous Green – The interchange at Bollinger Canyon Road & I-680 Northbound On-Ramp will be improved with a continuous green operation that provides westbound vehicles on Bollinger Canyon Road with a permanent green phase that will allow vehicles to bypass the signal at the intersection of Bollinger Canyon Road & I-680 Northbound Off-Ramp, which will potentially reduce congestion and queue lengths for westbound Bollinger Canyon Road. This improvement will be completed and in operation by mid-Year 2020; as such, it was included under the Future without Project and Future with Project Conditions.

Future Bicycle Improvements

The Bicycle Master Plan identifies the City's vision for a more integrated bicycle network throughout the City, including within the Study Area. It proposes the following bicycle facilities within the Study Area:

Multi-Use Path (Class I)

- Marsh Drive between Norris Canyon Road and Bollinger Canyon Road
- Camino Ramon

- Alcosta Boulevard between Veracruz Drive/Terra Alta Drive and Pine Valley Road
- Bishop Drive east of Sunset Drive
- Bollinger Canyon Road between San Ramon Valley Boulevard and Canyon Lakes Drive/Canyon View Circle
- Along the northern edge of Montevideo Elementary School and through Inverness Park
- San Ramon Cross Valley Trail
- Old Ranch Road

Bicycle Lanes (Class II)

- Executive Parkway west of Camino Ramon (installed)

Bicycle Routes (Class III)

- Park Place/Creekside Drive
- Marsh Drive
- Morgan Drive
- Twin Creeks Drive
- Davona Drive
- Broadmoor Drive
- Bluemound Drive
- Olympia Fields Drive
- Alcosta Boulevard between Crow Canyon Road and Norris Canyon Road, between Pine Valley Road and Olympia Fields Drive, and between Davona Drive and Interlachen Avenue
- Dos Rios Drive
- Canyon Creek Drive
- Montevideo Drive
- Northland Avenue
- Blue Fox Way
- Interlachen Avenue

Separated Bicycle Lanes (Class IV)

- Bollinger Canyon Road between Crow Canyon Road and San Ramon Valley Boulevard and east of Canyon Lakes Drive/Canyon View Circle
- San Ramon Valley Boulevard north of Montevideo Drive and south of Westside Drive
- Alcosta Boulevard between Norris Canyon Road and Veracruz Drive/Terra Alta Drive, between Interlachen Avenue and Olympia Fields Drive, and between San Ramon Valley Boulevard and Davona Drive
- Dougherty Road
- Crow Canyon Road
- Norris Canyon Road east of Twin Creeks Drive

The following bicycle improvements have been identified in the CIP within the Study Area. Although the improvements would not change any vehicular lane configurations, they were not assumed in the future analysis as many of the designs have not been finalized and the improvements are not definitively scheduled for implementation.

- Project #5310: Bollinger Canyon Road Bike Lane Project (Crow Canyon/Norris Canyon) – Provide Class II bike lanes along Bollinger Canyon Road between Crow Canyon Road and Norris Canyon Road. This would require a four-foot widening into the existing median strip in each direction.

- Project #5531: Crow Canyon Road/Iron Horse Trail Bicycle Pedestrian Overcrossing – Provide a grade-separated bicycle/pedestrian overcrossing connecting the Iron Horse Trail across Crow Canyon Road.

- Project #7123: Old Ranch Road Bicycle Path – Complete Phase 2 of the bicycle improvement and provide a bicycle path from the Old Ranch Park to the Senior Center area. This Project is currently on hold due to environmental constraints and priority needs.

OTHER FUTURE TRANSPORTATION IMPROVEMENT PROGRAMS

As described below, there are several other transportation programs in various stages of development that could have a substantial effect on the transportation system performance in the Study Area. For conservative purposes, the effects of these potential programs were not considered in the analysis of the Project.

Freeway Express Lane Improvements

Caltrans is currently constructing express lanes on I-680 between the Benicia-Martinez Bridge and US 101, which will provide a continuous express lane for approximately 55 miles between the Carquinez Strait and the City of San Jose. This project will reduce travel times for carpools, buses, and rideshares, which in turn will lead to a reduction in single-occupancy vehicle travel. Portions of the project have already been completed and are in operation; the remaining segments are scheduled for completion by 2030.

Innovate 680

CCTA has identified seven strategies for improving the operations of I-680 through the City:

1. Complete Express Lanes
2. Cool Corridor "Hot Spots"
3. Enhance Transit Service with Bus-On-Shoulder Operations
4. Innovative Operational Strategies
5. Provide First/Last Mile Connections with Shared Autonomous Vehicles
6. Prepare the Corridor for the Future
7. TDM

Project #975606 Bollinger Canyon & Crow Canyon Roads Traffic Signals Automated Traffic Signal Performance Measures (ATSPM)

ATSPM systems provide real-time metrics for signal system functionality that allow City traffic engineers to adjust the traffic signal timing to ensure the system is operating at peak capacity with reduced congestion. The City is currently in the process of installing ATSPM equipment along major corridors that will allow the City to monitor and improve the performance of the traffic signal system. ATSPM would be implemented along Crow Canyon Road from Bollinger Canyon Road to Dougherty Road and along Bollinger Canyon Road from Talavera Drive to Dougherty Road. This CIP is scheduled to be completed in Year 2020.

FUTURE TRAFFIC VOLUMES

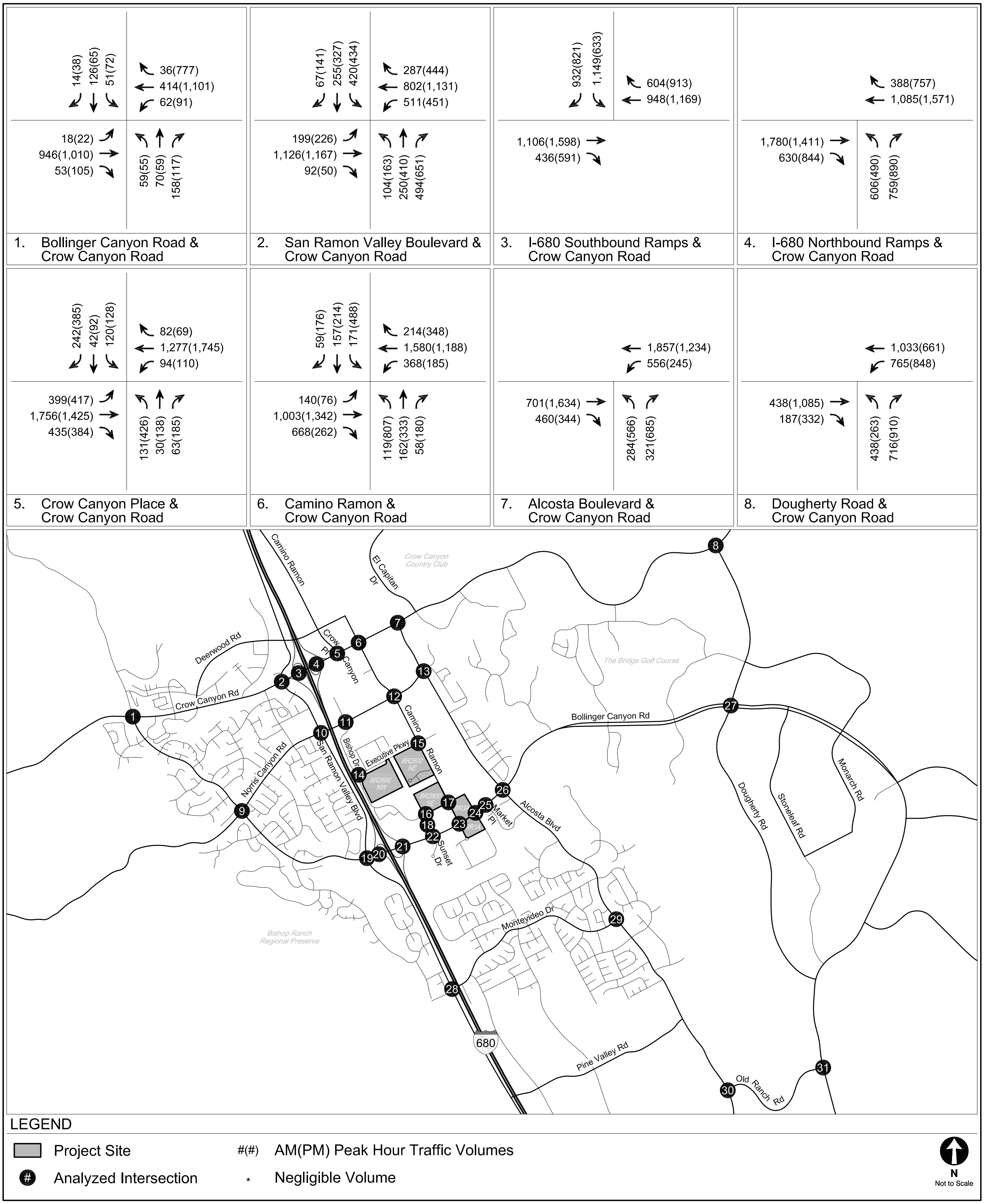
CCTA Model Traffic Volumes

The process for developing the weekday morning and afternoon peak hour traffic volumes from the CCTA Model is described above. Figure 5 illustrates the weekday morning and afternoon peak hour volumes for the Future without Project scenario. The traffic volumes illustrated in the figures above formed the basis of the intersection LOS analyses for the Future without Project Conditions.

FUTURE WITHOUT PROJECT INTERSECTION LEVELS OF SERVICE

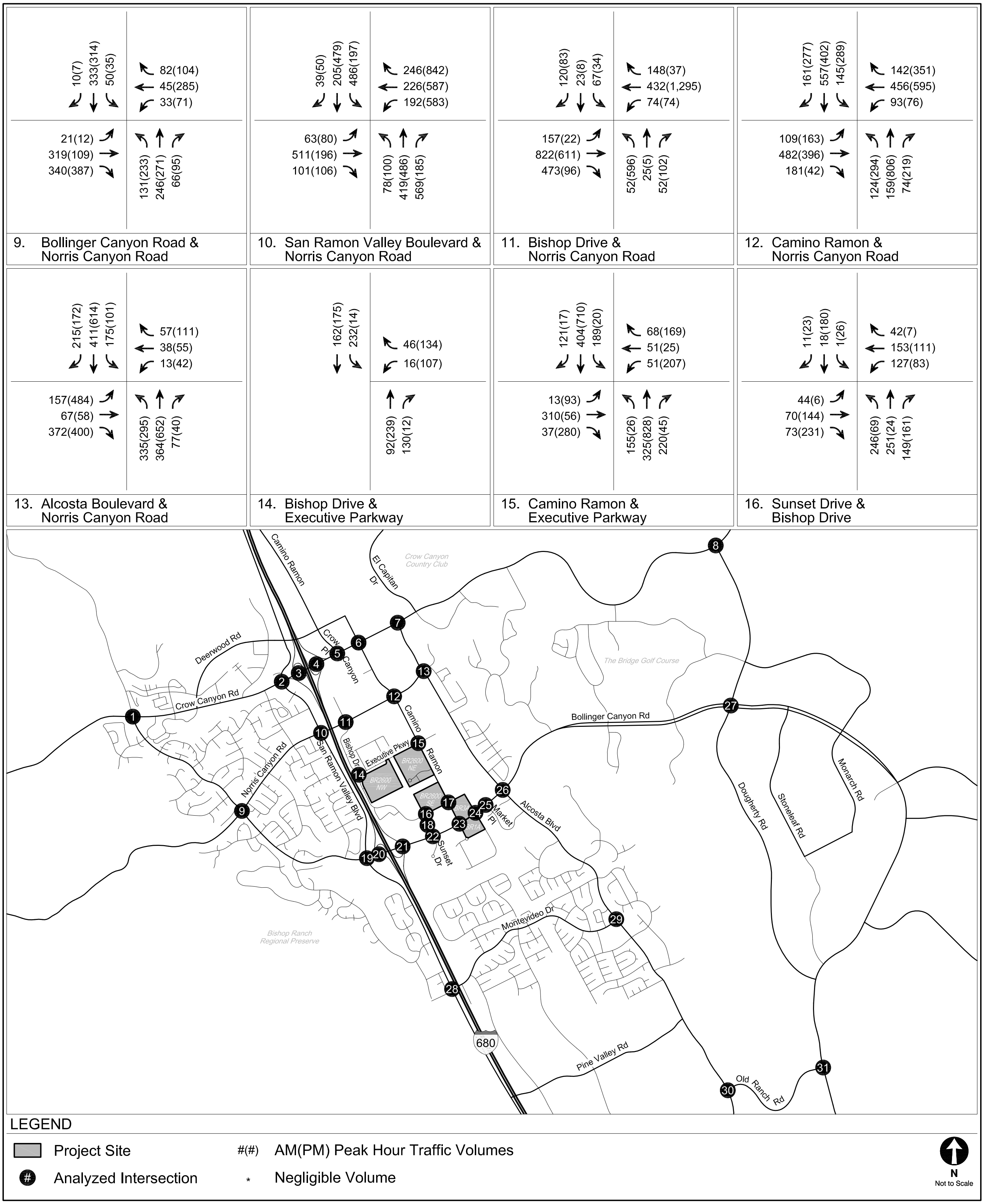
Table 6 summarizes the weekday morning and afternoon peak hour LOS results for each of the signalized study intersections under Future without Project Conditions. As shown, 27 of the 31 study intersections are anticipated to continue to operate at LOS D or better during both the weekday morning and afternoon peak hours. The following four study intersections are anticipated to operate at LOS E or F during at least one of the analyzed peak hours:

- Intersection 12. Camino Ramon & Norris Canyon Road (LOS F during the afternoon peak hour)



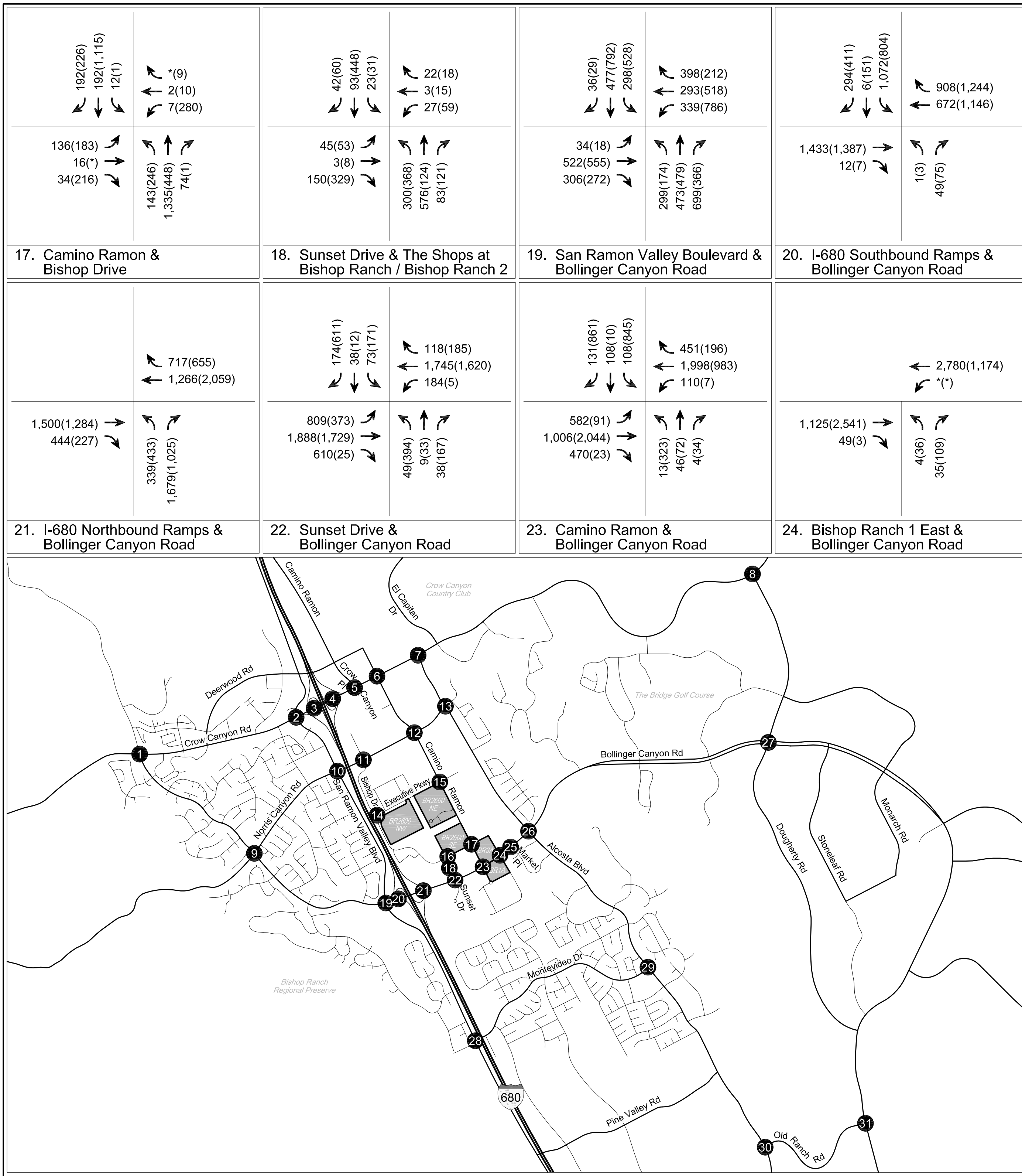
FUTURE WITHOUT PROJECT CONDITIONS (YEAR 2040)
PEAK HOUR TRAFFIC VOLUMES

FIGURE 5



FUTURE WITHOUT PROJECT CONDITIONS (YEAR 2040)
PEAK HOUR TRAFFIC VOLUMES

FIGURE 5 (CONT.)



LEGEND

Project Site

Analyzed Intersection

#(#) AM(PM) Peak Hour Traffic Volumes

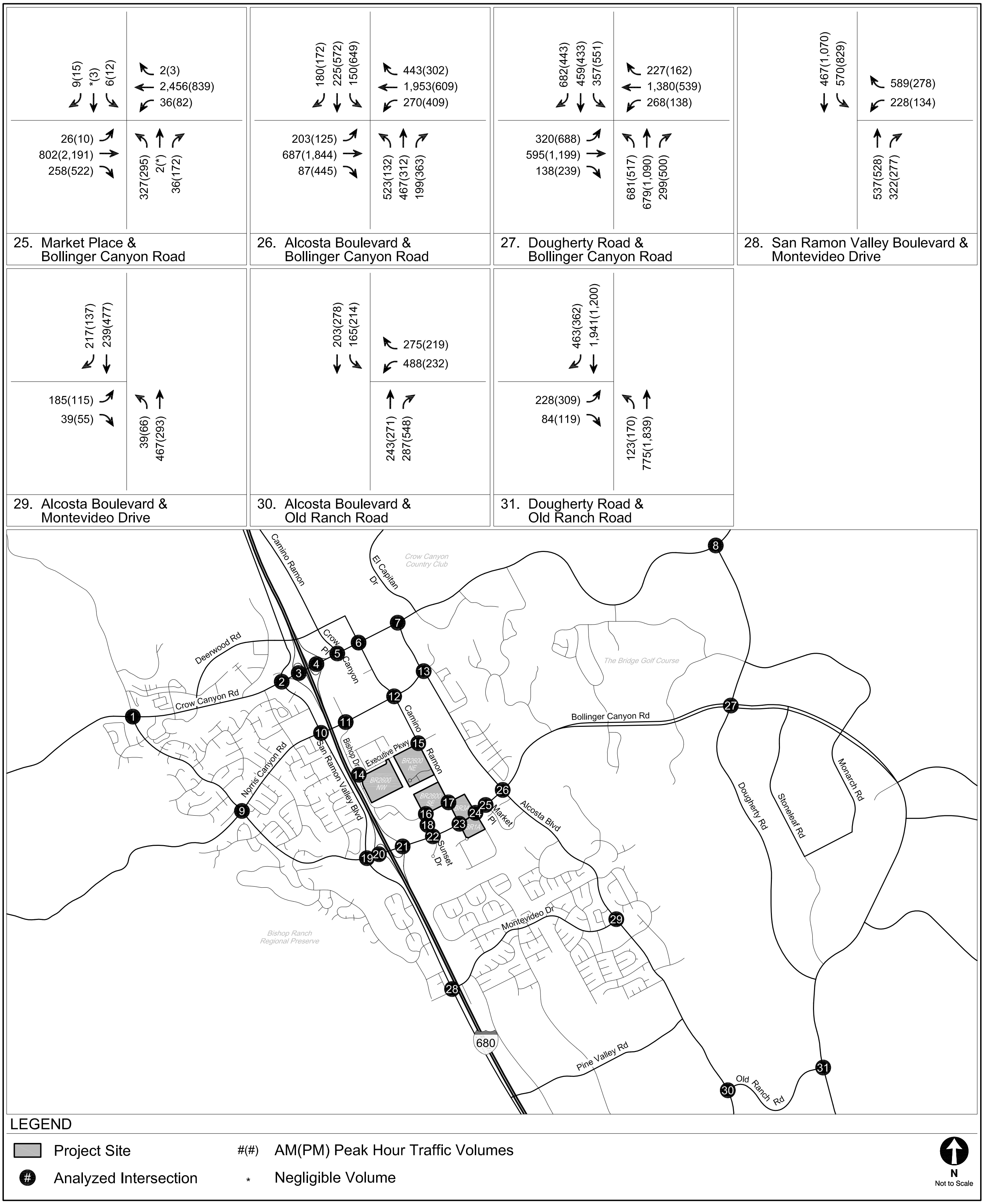
* Negligible Volume

N
Not to Scale

FUTURE WITHOUT PROJECT CONDITIONS (YEAR 2040)
PEAK HOUR TRAFFIC VOLUMES

FIGURE 5 (CONT.)

Gibson transportation consulting, inc.



FUTURE WITHOUT PROJECT CONDITIONS (YEAR 2040)
PEAK HOUR TRAFFIC VOLUMES

FIGURE 5 (CONT.)

TABLE 6
FUTURE WITHOUT PROJECT CONDITIONS (YEAR 2040)
INTERSECTION LEVELS OF SERVICE ANALYSIS

No.	Intersection	Peak Hour	Future without Project Conditions	
			Delay	LOS
1.	Bollinger Canyon Road & Crow Canyon Road	AM PM	33.1 33.5	C C
2.	San Ramon Valley Boulevard & Crow Canyon Road	AM PM	50.8 49.6	D D
3.	I-680 Southbound Ramps & Crow Canyon Road	AM PM	21.1 15.8	C B
4.	I-680 Northbound Ramps & Crow Canyon Road	AM PM	16.4 14.9	B B
5.	Crow Canyon Place & Crow Canyon Road	AM PM	28.8 40.8	C D
6.	Camino Ramon & Crow Canyon Road	AM PM	24.3 41.1	C D
7.	Alcosta Boulevard & Crow Canyon Road	AM PM	18.3 19.6	B B
8.	Dougherty Road & Crow Canyon Road	AM PM	28.4 49.1	C D
9. [a]	Bollinger Canyon Road & Norris Canyon Road	AM PM	38.3 42.9	D D
10.	San Ramon Valley Boulevard & Norris Canyon Road	AM PM	46.7 43.7	D D
11.	Bishop Drive/Annabel Lane & Norris Canyon Road	AM PM	27.4 53.2	C D
12.	Camino Ramon & Norris Canyon Road	AM PM	44.3 88.2	D F
13.	Alcosta Boulevard & Norris Canyon Road	AM PM	42.4 53.0	D D
14. [b]	Bishop Drive & Executive Parkway	AM PM	12.6 14.4	B B
15.	Camino Ramon & Executive Parkway	AM PM	27.8 22.3	C C
16.	Sunset Drive & Bishop Drive	AM PM	40.1 34.7	D C
17.	Camino Ramon & Bishop Drive	AM PM	39.3 47.9	D D
18.	Sunset Drive & Shops at Bishop Ranch/City Center	AM PM	42.6 51.3	D D
19.	San Ramon Valley Boulevard & Bollinger Canyon Road	AM PM	51.7 65.0	D E
20.	I-680 Southbound Ramps & Bollinger Canyon Road	AM PM	24.2 29.0	C C

TABLE 6 (CONTINUED)
FUTURE WITHOUT PROJECT CONDITIONS (YEAR 2040)
INTERSECTION LEVELS OF SERVICE ANALYSIS

No.	Intersection	Peak Hour	Future without Project Conditions	
			Delay	LOS
21.	I-680 Northbound Ramps & Bollinger Canyon Road	AM PM	32.1 29.1	C C
22.	Sunset Drive & Bollinger Canyon Road	AM PM	36.3 40.8	D D
23.	Camino Ramon & Bollinger Canyon Road	AM PM	24.7 34.7	C C
24.	Bishop Ranch 1 East & Bollinger Canyon Road	AM PM	1.7 3.2	A A
25.	Market Place & Bollinger Canyon Road	AM PM	12.3 17.6	B B
26. [c]	Alcosta Boulevard & Bollinger Canyon Road	AM PM	41.3 95.7	D F
27.	Dougherty Road & Bollinger Canyon Road	AM PM	91.1 81.1	F F
28.	San Ramon Valley Boulevard & Montevideo Drive	AM PM	42.5 42.7	D D
29.	Alcosta Boulevard & Montevideo Drive	AM PM	13.2 13.6	B B
30. [a]	Alcosta Boulevard & Old Ranch Road	AM PM	21.3 23.6	C C
31.	Dougherty Road & Old Ranch Road	AM PM	28.2 20.7	C C

Notes

Delay is measured in seconds per vehicle

[a] Intersection operates with all-way stop-controlled (AWSC) under Existing Conditions. Intersection is signalized under Future Conditions.

[b] Intersection operates with two-way stop-controlled (TWSC).

[c] Intersection includes intersection improvements under Future Conditions per CIP as warranted.

- Intersection 19. San Ramon Valley Boulevard & Bollinger Canyon Road (LOS E during the morning and afternoon peak hours)

- Intersection 26. Alcosta Boulevard & Bollinger Canyon Road (LOS F during the afternoon peak hour)

- Intersection 27. Dougherty Road & Bollinger Canyon Road (LOS F during the morning and afternoon peak hours)

The LOS calculation worksheets are provided in Appendix D.

Chapter 4
Project Traffic

This chapter describes the assumptions and methodology used in developing the traffic volumes associated with the Project.

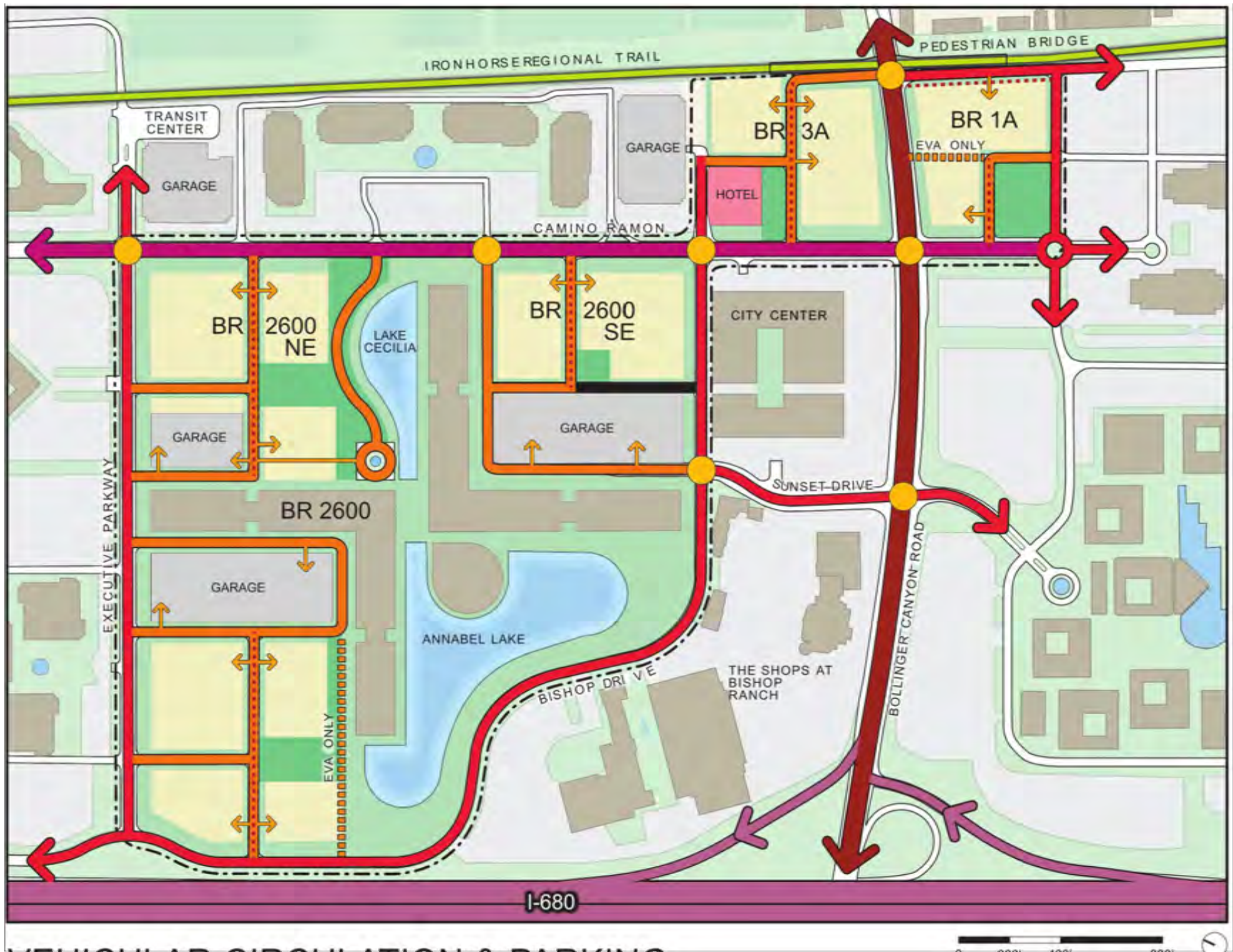
PROJECT DESCRIPTION

As described in Chapter 1, the Project proposes to construct a mixed-use development in the urban core of the City to complement the existing uses on site. The Project would be developed within five sub-sites: BR 2600 NW, BR 2600 NE, BR 2600 SE, BR 3A, and BR 1A. In total, the Project would construct up to 4,500 multi-family residential units, 169 hotel rooms, and up to 166,600 sf of retail/restaurant uses. The Project Site is currently occupied with approximately 1,921,000 sf of office uses within BR 2600 NW, BR 2600 NE, and BR 2600 SE. BR 3A and BR1A are currently vacant lots. The conceptual Project Site plan is shown in Figure 1.

The vehicular access and circulation plan for the Project is provided in Figure 6 and summarized below:

- Vehicular access to BR 2600 NW would be provided via one existing driveway along Bishop Drive and three proposed driveways along Executive Parkway. In addition, one access street for emergency vehicles only would serve BR 2600 NW from Bishop Drive.

- Vehicular access to BR 2600 NE would be provided via two proposed driveways along Executive Parkway, one proposed limited-access driveway along Camino Ramon, and one existing driveway along Camino Ramon south of the proposed limited-access driveway.



VEHICULAR CIRCULATION & PARKING

- ARTERIAL STREETS
- COLLECTOR STREETS
- LOCAL STREETS
- PROPOSED LOCAL STREETS
- AERIAL APPARATUS FIRE ACCESS ROAD
- GARAGE ACCESS

Source: Bishop Ranch. August, 2019.

VEHICULAR CIRCULATION & PARKING	FIGURE 6

- Vehicular access to BR 2600 SE would be provided via one existing signalized driveway along Camino Ramon, one proposed limited-access driveway along Camino Ramon immediately south of the existing driveway, and one existing signalized driveway along Bishop Drive at Sunset Drive.

- Vehicular access to BR 3A would be provided via one existing signalized driveway at the intersection of Camino Ramon and Bishop Drive, one proposed limited-access driveway along Camino Ramon south of the signalized intersection at Bishop Drive, and one existing signalized driveway at the intersection of BR 1E and Bollinger Canyon Road.

- Vehicular access to BR 1A would be provided via existing signalized driveways at the intersection of Camino Ramon/Bishop Ranch 1 and Bollinger Canyon Road as well as BR 1E and Bollinger Canyon Road.

PROJECT DESIGN FEATURES

The following proposed roadway improvements, which are neither included as part of the planned roadway improvements detailed in the CIP nor required to reduce the Project's impacts to less than significant levels have been assumed as part of the Project design features:

Roadway Segment Improvements

- Executive Parkway between Bishop Drive and Camino Ramon – Executive Parkway will be reconfigured to provide a wider center median while still retaining the existing on-street bike lanes. A new separated multi-use, off-street trail would be provided along the south side of the street. In addition, the existing landscape median will be reconfigured to provide additional left-turn lanes into parcels along both the north and south sides of the street. As proposed, Executive Parkway will provide one through lane in each direction with left-turn lanes protected by the wider raised median.

- Camino Ramon between Norris Canyon Road and Bishop Drive – Camino Ramon will be reconfigured to provide a landscape median with left-turn pockets. A landscaped center median will also be constructed between Bishop Drive and Bollinger Canyon Road that provides left-turn pockets where necessary.

- Bishop Drive between Executive Parkway and Sunset Drive along lake frontage – Bishop Drive is proposed to be reconfigured to allow parking along the east curb frontage along the lake with the existing bike lane moving to the west side of the parking lane. A new separated, off-street, multi-use trail will be provided along the east side of the street.

Intersection Improvements

- Camino Ramon & Executive Parkway (Intersection #15) – Executive Parkway will be reconfigured to provide an exclusive left-turn lane in the eastbound direction. The resulting eastbound lane configuration will include one left-turn lane, one through lane, and one right-turn lane.

- Bishop Ranch 1E & Bollinger Canyon Road (Intersection #24) – The intersection is currently designed as a T-intersection and will provide direct access to and from BR 3A as part of the Project design features. An internal roadway within the BR3A site would be constructed to provide a connection to Camino Ramon & Bishop Drive (Intersection #17) and the south parking garage at BR 3. The north leg will be constructed to provide an exclusive left-turn lane and a shared through/right-turn lane in the southbound direction. As a result of the improved intersection, access to the BR 3A site will be permitted from the three other approaches. This intersection configuration will also be altered by the construction of the Iron Horse Trail overcrossing. The current westbound left-turn lane will be removed in order to construct a support column for the overpassing, as such existing trips have been redistributed accordingly.

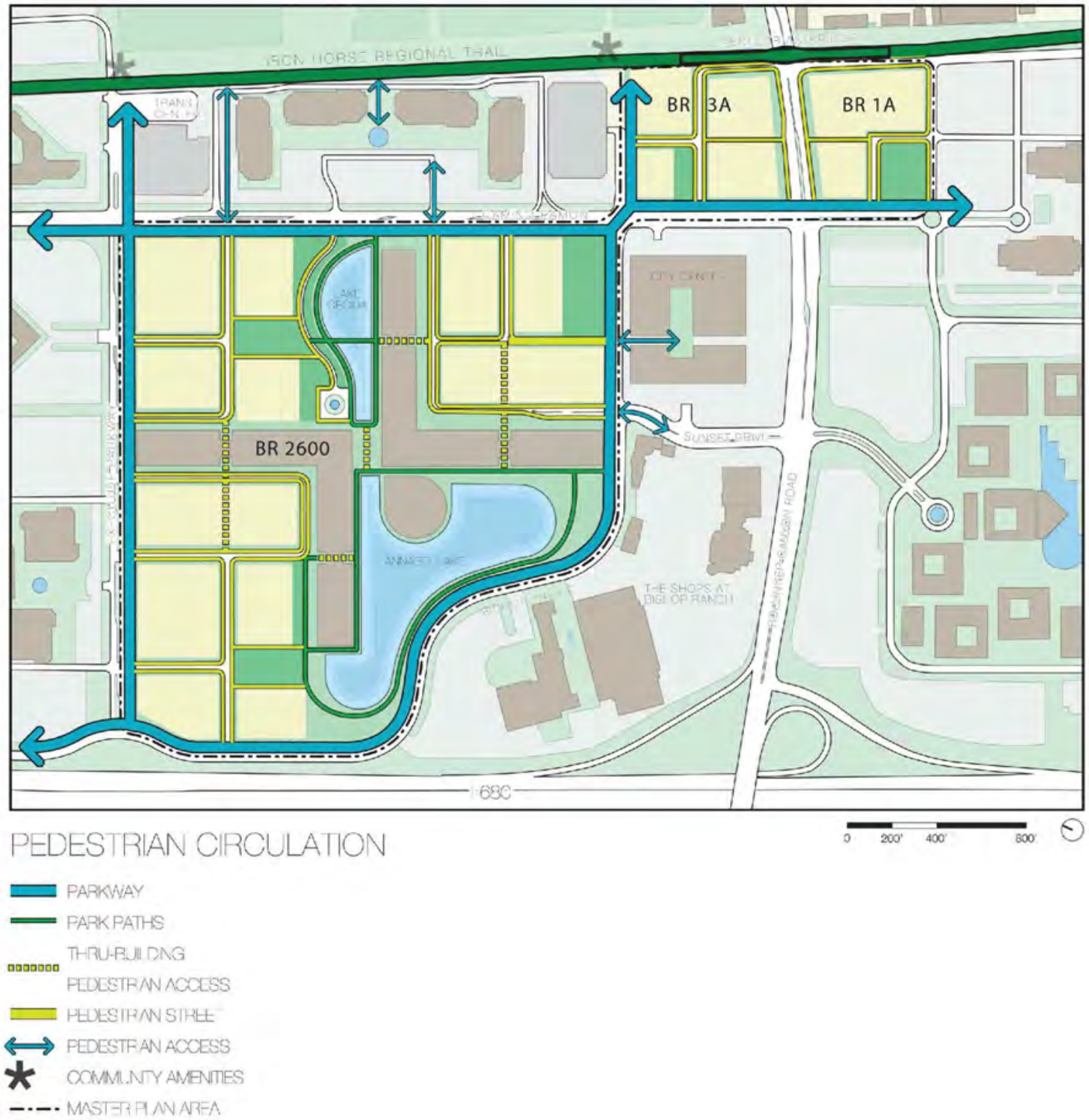
Pedestrian and Bicycle Improvements

The Project will enhance bicycle and pedestrian connectivity through separated bicycle paths along the Project perimeter roads. Currently, a separated bicycle path is provided along Bishop Drive between Sunset Drive and the Iron Horse Trail. The Project proposes to extend this network all along the Project frontages along Camino Ramon, Bishop Drive, and Executive Parkway. In addition, the Project includes a proposed HAWK signalized/controlled midblock crosswalk along Executive Parkway, immediately west of the new parking structure within BR 2600 NW. This midblock crosswalk would provide pedestrians an accessible pathway between the Bishop Ranch campuses as well as direct access to one of the three new mobility hubs the Project proposes to install. The Project also proposes to provide a managed street connecting BR 2600 NE directly to the City Center shopping center. The managed street would be restricted to pedestrians and emergency vehicle access. Figures 7 and 8, respectively, show the proposed pedestrian and bicycle improvements to be provided as part of the Project.

The Project is consistent with the goals and priorities of the City's bike and pedestrian network plans and would not preclude the implementation of any improvements detailed in those plans.

Transit Improvements

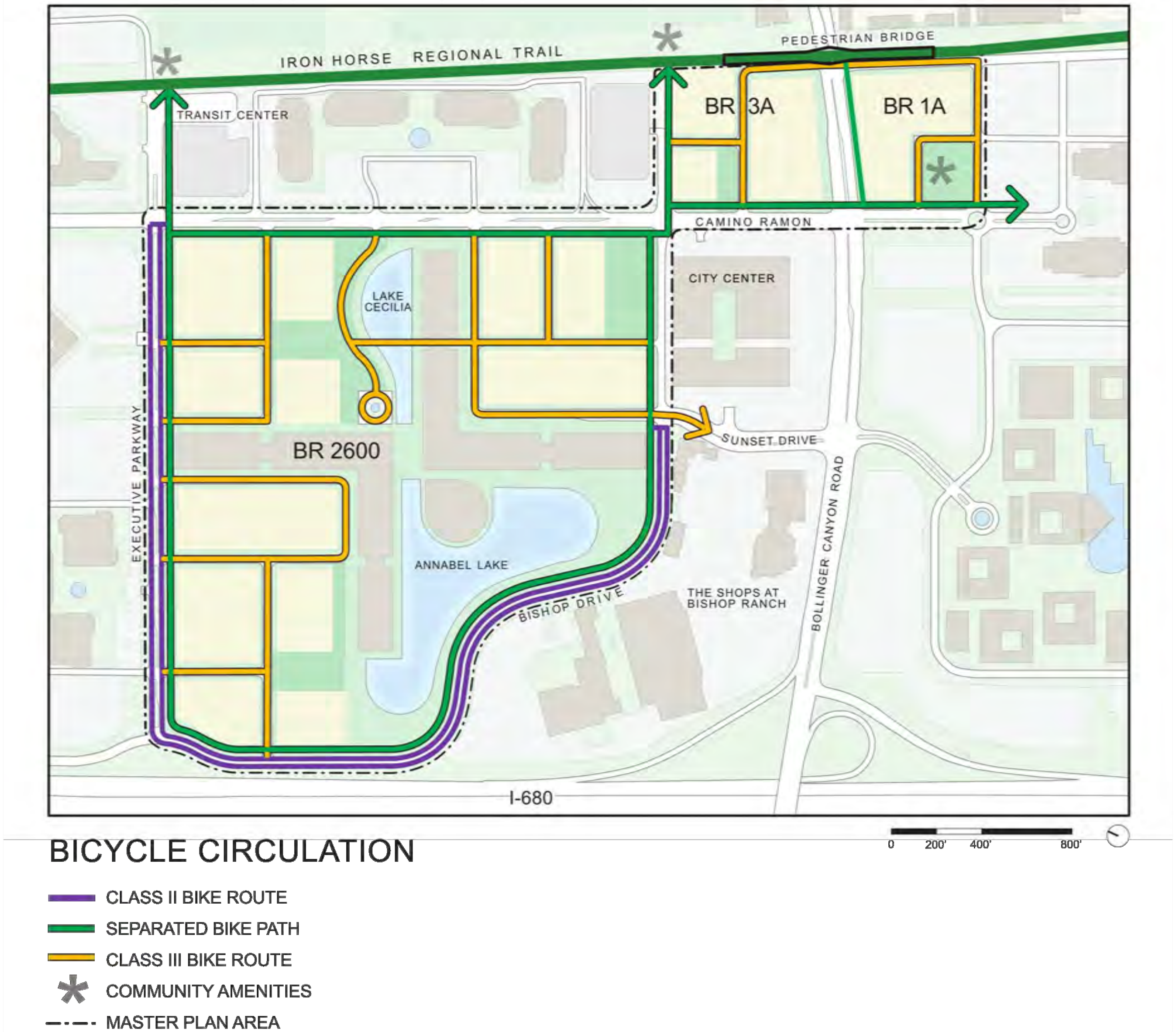
As mentioned previously, the Project proposes to integrate three new mobility hubs into the Bishop Ranch campus to serve both the residential neighborhoods and office park community. The mobility hubs will accommodate multi-modal transportation and serve as a stop location for local buses and shuttles, a mobility hub for shared bikes, scooters, and rideshares, and a waiting area with indoor and outdoor shaded seating. The mobility hubs will also provide storage lockers and bicycle lockers for public use. The Project proposes one mobility hub along Executive Parkway, adjacent to the new parking structure within BR2600 NW, and two mobility hubs along Camino Ramon, one north of Bishop Drive across BR 2600 SE and one south of Bollinger Canyon Road adjacent to BR 1A.



Source: Bishop Ranch. March, 2020.

PEDESTRIAN CIRCULATION

FIGURE 7



Source: Bishop Ranch. March, 2020.

BICYCLE CIRCULATION

FIGURE 8

The primary focus of the mobility hubs is to provide a more comfortable and reliable user experience for transit passengers. Each mobility hub will provide off-street capacity for two buses simultaneously boarding or alighting. There will be additional space allocated for micro-mobility system operations such as bike/scooter-sharing. The mobility hubs will provide additional indoor amenities facilitating comfort and commute coordination, real-time arrival displays and comfortable seating.

Increases to bus headways are not anticipated. The mobility hubs will be located along existing routes in locations that will improve headways by reducing the number of total stops.

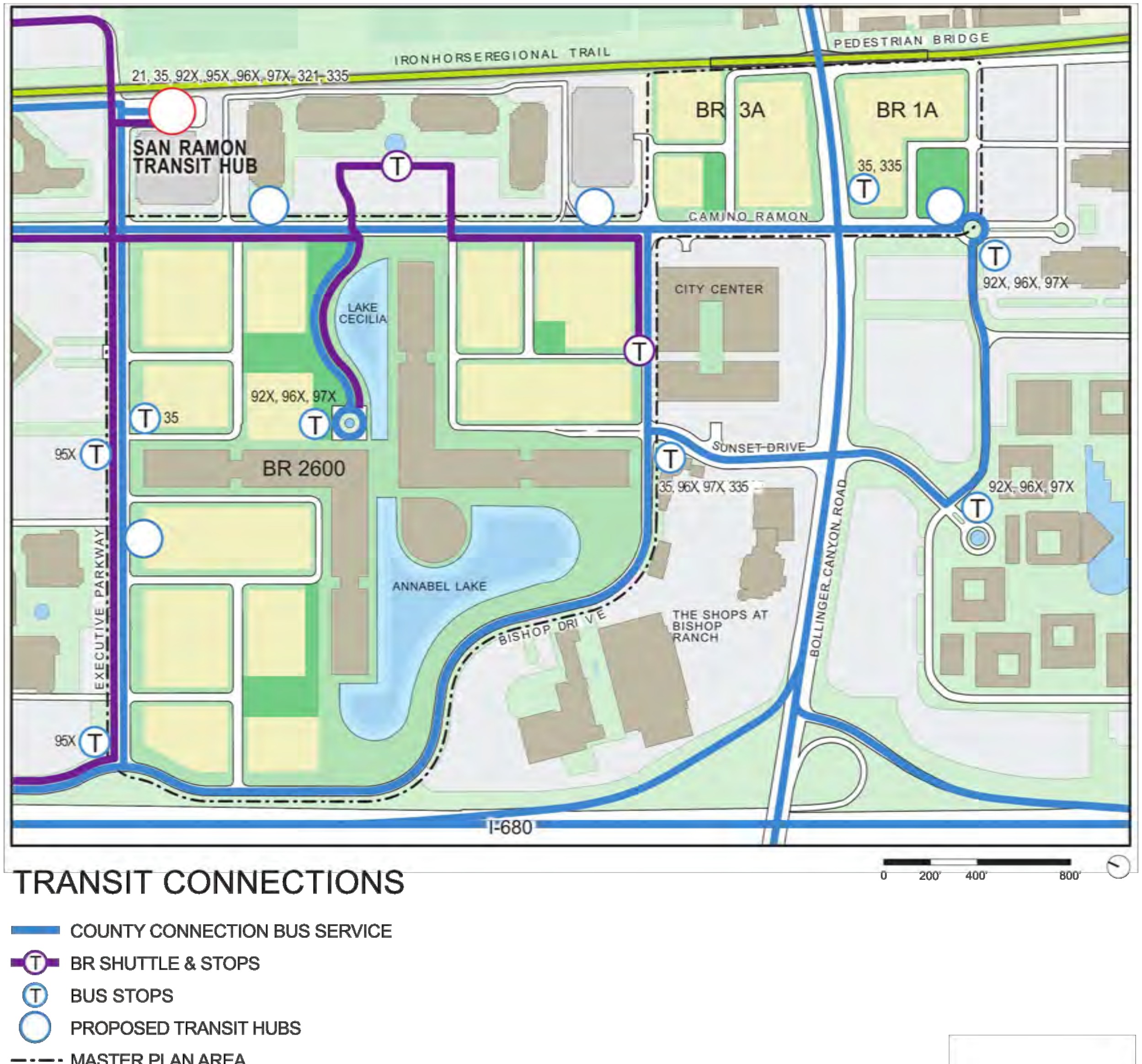
Providing additional service will further reduce headways. Micro-mobility options and improved pedestrian connections help cover the last-mile needs generated by fewer total stops.

The San Ramon Transit Center will continue to provide six to eight bays and be the central layover location for bus operator breaks and the most opportunities for coordinated transfers.

Figure 9 illustrates the proposed transit improvements to be built as part of the Project.

Additional Project TDM Measures

The Applicant will further expand the TDM Program by providing fully subsidized transit passes to all residents within the 4,500 multi-family units. These transit passes will provide access to CCCTA bus routes to major stations, such as the BART rail stations in Dublin/Pleasanton, West Dublin/Pleasanton, and Walnut Creek via existing transit services. Furthermore, the transit passes will complement the three new mobility hubs proposed to be constructed. The additional TDM measures align with the multimodal transportation and environmental action goals outlined in SB 743 by encouraging non-auto modes of transportation such as walking, bicycling, carpool, vanpool, transit, etc.



Source: Bishop Ranch. August, 2019.

TRANSIT CONNECTIONS

FIGURE 9

PROJECT TRIP GENERATION

The number of trips expected to be generated by the Project was estimated using rates published in *Trip Generation, 10th Edition* (Institute of Transportation Engineers, September 2017) based on developments located in "General Urban/Suburban" location. These rates are based on surveys of similar land uses at sites around the country and are provided as both daily rates and morning and afternoon peak hour rates. The number of vehicle trips traveling to and from the Project Site is related to the size of development and type of land use proposed.

Trip generation adjustments to account for internal capture, mode split, and pass-by trips were made in consultation with the City and were based on a combination of engineering judgment, the nationally-accepted mixed-use internal capture spreadsheet tool found in *Trip Generation Handbook, 3rd Edition*, and experience supported by surveys conducted at similar land use developments.

The Project proposes to develop additional housing and commercial uses to complement existing office and retail uses in the Project area. It is anticipated that patrons from the existing adjacent uses will be drawn to the Project Site, and vice versa, and would use either non-auto modes of travel or make trips without using the off-site road system. These trips are considered internally captured within the Bishop Ranch campus. The internal capture adjustments were developed based on the NCHRP 8-51 Internal Trip Capture Estimation Tool (*National Cooperative Highway Research Program Report 684 – Enhancing Internal Trip Capture Estimation for Mixed-Use Developments*, Transportation Research Board and National Research Council, 2011) and applied to each land use to account for person trips made between distinct land uses within a mixed-use development (e.g., residents working at the office uses or office employees visiting the commercial uses). The results derived from the NCHRP 8-51 Internal Trip Capture Estimation Tool were compared to actual experience at several large-scale developments across the country similar in size and land use mix to the Project. This experience is demonstrated in a number of technical studies contained in Appendix K.

Although the NCHRP 8-51 Internal Trip Capture Estimation Tool estimated a range of 1% to 47% of trips would be internally captured, a maximum of 25% of internal capture adjustment was conservatively assumed for any one land use at the five Project sub-sites. As a result, the aggregate mixed-use internal capture adjustment applied to the Project equated to approximately 4% in the morning peak hour and 17% in the afternoon peak hour, with a total daily adjustment of 11%. The results of the mixed-use internal capture worksheets are provided in Appendix K.

Additionally, a 10% mode split adjustment was applied to the residential component of the Project to account for multimodal non-auto usage, including transit, bicycle, and walking arrivals. A 5% mode split adjustment was applied to the hotel and commercial components of the Project. A 25% pass-by reduction was also applied to the commercial component of the Project to account for trips made as an intermediate stop on the way from an origin to a primary trip destination without route diversion.

After accounting for the adjustments above, the Project is anticipated to generate 24,912 new daily trips, including 1,457 new morning peak hour trips (442 inbound, 1,015 outbound) and 1,829 new afternoon peak hour trips (1,065 inbound, 764 outbound), as summarized in Table 7.

Appendix K provides a range of sample studies from around California detailing reduced trip generation rates for urban infill projects and mixed-use districts. The reports show reductions in trip generation that are in line with the adjustments taken for this Project.

PROJECT TRIP DISTRIBUTION

The Project trip distribution was developed based on the trip distribution detailed in *Traffic Operations Evaluation for San Ramon City Center Project* (DMJM Harris & AECOM, July 2007). These trip distribution patterns were compared to the distribution patterns developed in the CCTA Model. The trip distribution patterns were then adjusted to account for characteristics of the street system serving the Project Site, the land use pattern changes that have taken place since the 2007 study referenced above, the level of accessibility of the routes to and from the Project Site, existing intersection traffic volumes, the Project ingress/egress availability based on the proposed site access and circulation scheme, the location of the proposed driveways, and input from City staff.

TABLE 7
PROJECT TRIP GENERATION

Land Use	ITE Land Use	Rate	Daily	Morning Peak Hour In	Morning Peak Hour Out	Morning Peak Hour Total	Afternoon Peak Hour In	Afternoon Peak Hour Out	Afternoon Peak Hour Total
TRIP GENERATION RATES [a]									
Multi-Family Housing (Mid-Rise)	221	per Dwelling Unit	[b]	26%	74%	[b]	61%	39%	[b]
Hotel	310	per room	8.36	59%	41%	0.47	51%	49%	0.60
Shopping Center	820	per ksf	37.75	62%	38%	0.94	48%	52%	3.81
MIXED-USE INTERNAL CAPTURE [c]									
BR 2600 NW - *Residential*	221	1,372 du	3%	0%	2%	2%	4%	4%	4%
BR 2600 NE - *Residential*	221	1,128 du	7%	2%	3%	3%	11%	8%	10%
BR 2600 SE - *Residential*	221	558 du	14%	2%	3%	3%	25%	25%	25%
BR 2600 SE - *Retail*	820	96.6 ksf	20%	25%	8%	19%	19%	23%	21%
BR 3A - *Residential*	221	791 du	14%	2%	3%	3%	25%	25%	25%
BR 3A - *Retail*	820	70.0 ksf	15%	7%	7%	8%	16%	25%	21%
BR 3A - *Hotel*	310	169 rm	16%	0%	25%	10%	25%	16%	21%
BR 1A - *Residential*	221	651 du	14%	2%	3%	3%	25%	25%	25%
Aggregate Mixed-Use Internal Capture Adjustment			**11%**	**4%**	**4%**	**4%**	**16%**	**18%**	**17%**
TRIP GENERATION ESTIMATES									
BR 2600 NW									
Multi-Family Housing (Mid-Rise)	221	1,372 du	7,476	116	330	446	334	213	547
Internal Capture Adjustment [c]			*(224)*	*0*	*(7)*	*(7)*	*(13)*	*(9)*	*(22)*
Mode Split Adjustment - 10% [d]			*(725)*	*(12)*	*(32)*	*(44)*	*(32)*	*(21)*	*(53)*
BR 2600 NE									
Multi-Family Housing (Mid-Rise)	221	1,128 du	6,146	96	272	368	277	177	454
Internal Capture Adjustment [c]			*(430)*	*(2)*	*(8)*	*(10)*	*(30)*	*(14)*	*(44)*
Mode Split Adjustment - 10% [d]			*(572)*	*(9)*	*(27)*	*(36)*	*(25)*	*(16)*	*(41)*
BR 2600 SE									
Multi-Family Housing (Mid-Rise)	221	558 du	3,039	48	137	185	141	90	231
Internal Capture Adjustment [c]			*(425)*	*(1)*	*(4)*	*(5)*	*(35)*	*(23)*	*(58)*
Mode Split Adjustment - 10% [d]			*(261)*	*(5)*	*(13)*	*(18)*	*(11)*	*(6)*	*(17)*
Retail	820	96.6 ksf	3,647	56	35	91	177	191	368
Internal Capture Adjustment [c]			*(729)*	*(14)*	*(3)*	*(17)*	*(34)*	*(44)*	*(78)*
Mode Split Adjustment - 5% [d]			*(146)*	*(2)*	*(2)*	*(4)*	*(7)*	*(8)*	*(15)*
Pass-By Trip Adjustment - 25% [e]			*(693)*	*(10)*	*(8)*	*(18)*	*(34)*	*(35)*	*(69)*
BR 3A									
Multi-Family Housing (Mid-Rise)	221	791 du	4,309	68	192	260	197	126	323
Internal Capture Adjustment [c]			*(603)*	*(1)*	*(6)*	*(7)*	*(49)*	*(32)*	*(81)*
Mode Split Adjustment - 10% [d]			*(371)*	*(7)*	*(18)*	*(25)*	*(15)*	*(9)*	*(24)*
Retail	820	70.0 ksf	2,643	41	25	66	128	139	267
Internal Capture Adjustment [c]			*(396)*	*(3)*	*(2)*	*(5)*	*(20)*	*(35)*	*(55)*
Mode Split Adjustment - 5% [d]			*(112)*	*(2)*	*(1)*	*(3)*	*(5)*	*(6)*	*(11)*
Pass-By Trip Adjustment - 25% [e]			*(534)*	*(9)*	*(6)*	*(15)*	*(26)*	*(24)*	*(50)*
Hotel	310	169 rms	1,413	47	32	79	52	49	101
Internal Capture Adjustment [c]			*(226)*	*0*	*(8)*	*(8)*	*(13)*	*(8)*	*(21)*
Mode Split Adjustment - 5% [d]			*(59)*	*(2)*	*(2)*	*(4)*	*(2)*	*(2)*	*(4)*
BR 1A									
Multi-Family Housing (Mid-Rise)	221	651 du	3,546	56	159	215	163	105	268
Internal Capture Adjustment [c]			*(496)*	*(1)*	*(5)*	*(6)*	*(41)*	*(26)*	*(67)*
Mode Split Adjustment - 10% [d]			*(305)*	*(6)*	*(15)*	*(21)*	*(12)*	*(8)*	*(20)*
TOTAL - NEW PROJECT TRIPS			**24,912**	**442**	**1,015**	**1,457**	**1,065**	**764**	**1,829**

Notes:

ksf: 1,000 square feet

[a] Trip generation rates are from *Trip Generation Manual, 10th Edition* (Institute of Transportation Engineers, 2017) and are based on developments located in "General Urban/Suburban" location.

[b] Trip generation rate based on the best-fit curve formula listed in the *Trip Generation Manual, 10th Edition* for the Multi-Family Housing (Mid-Rise) land use.

Daily - $T = 5.45 (X) - 1.75$ T = Average Vehicle Trips X = Gross Leasable Area (ksf)

A.M. Peak Hour - $Ln (T) = 0.98 Ln (X) - 0.98$

P.M. Peak Hour - $Ln (T) = 0.96 Ln (X) - 0.63$

[c] The internal capture adjustments were taken into account for person trips made between distinct land uses within a mixed-use development without using an off-site road system, as well as short vehicle trips made within a quarter-mile walking distance of each of the five Project sites. These trips travel within close proximity of the Project and thus do not affect the external study intersections in the Study Area. The internal capture adjustments are based on the National Cooperative Highway Research Program (NCHRP) 8-51 Internal Trip Capture Estimation Tool of the *NCHRP Report 684 – Enhancing Internal Trip Capture Estimation for Mixed-Use Developments* (Transportation Research Board and National Research Council, 2011) and is provided in Appendix H.

Although the NCHRP 8-51 Internal Capture Estimate Tool estimated a range of 1% to 47% of internally captured trips, a maximum of 25% of internal/local trip capture was assumed for any one land use at the five Project sites.

[d] Residential was adjusted by a 10% and hotel and retail uses were adjusted by a 5% mode split adjustment to account for city transit, bike, and shuttle usage.

[e] Retail use was adjusted by a 25% pass-by adjustment to account for Project trips made as an intermediate stop on the way from an origin to a primary trip destination without route diversion per San Ramon City Center FEIR.

Based on these considerations, traffic entering and exiting the Project Site was assigned to the surrounding street system. The trip distribution patterns within the Study Area for the residential, hotel, and retail components of the Project are shown in Figures 10A, 10B, and 10C, respectively.

It should be noted that the residential trip generation rates include school trips during the peak hours. Parents taking their children to local schools are included in the inbound and outbound residential trip generation rates. Special consideration was given to the residential project trip distribution patterns so that the appropriate connections between the Project residential buildings and the local schools were taken into account.

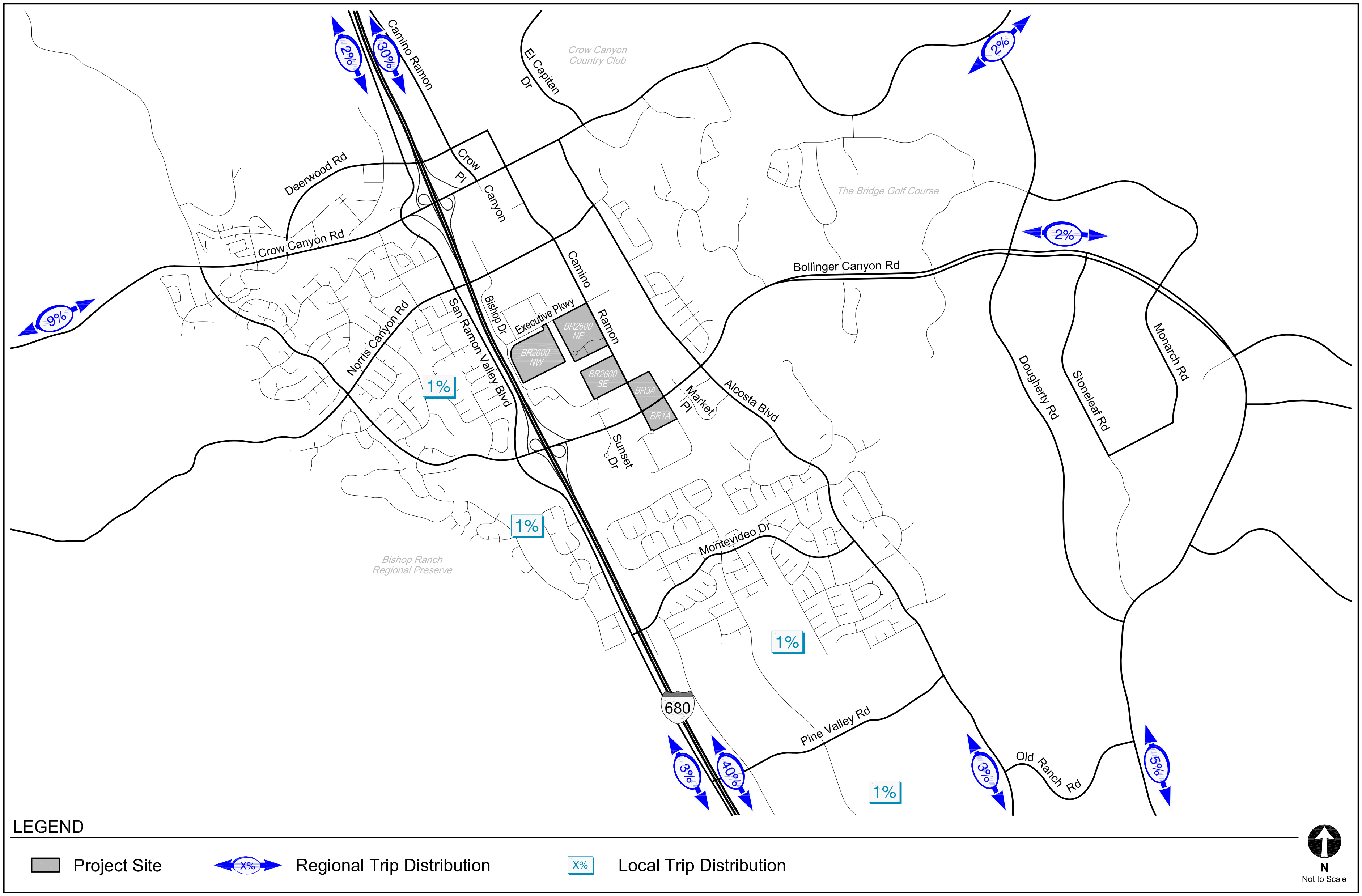
PROJECT TRIP ASSIGNMENT

The Project trip generation estimates summarized in Table 7 and the trip distribution patterns shown in Figures 10A, 10B, and 10C were used to assign the Project-generated traffic through the study intersections. Figure 11 illustrates the total combined Project-only traffic volumes, including external Project-only trips and internal Project-only trips that would travel within the Bishop Ranch campus using the adjacent localized roadway system at the study intersections during typical weekday morning and afternoon peak hours.

REDISTRIBUTION OF EXISTING TRAFFIC

As detailed above, Bishop Ranch 1E & Bollinger Canyon Road (Intersection #24) would be improved to provide a four-leg approach signalized intersection as part of the Project. In addition, an internal roadway within the BR3A site would provide a connection to the intersection of Camino Ramon & Bishop Drive (Intersection #17) and the south parking garage located at BR 3.

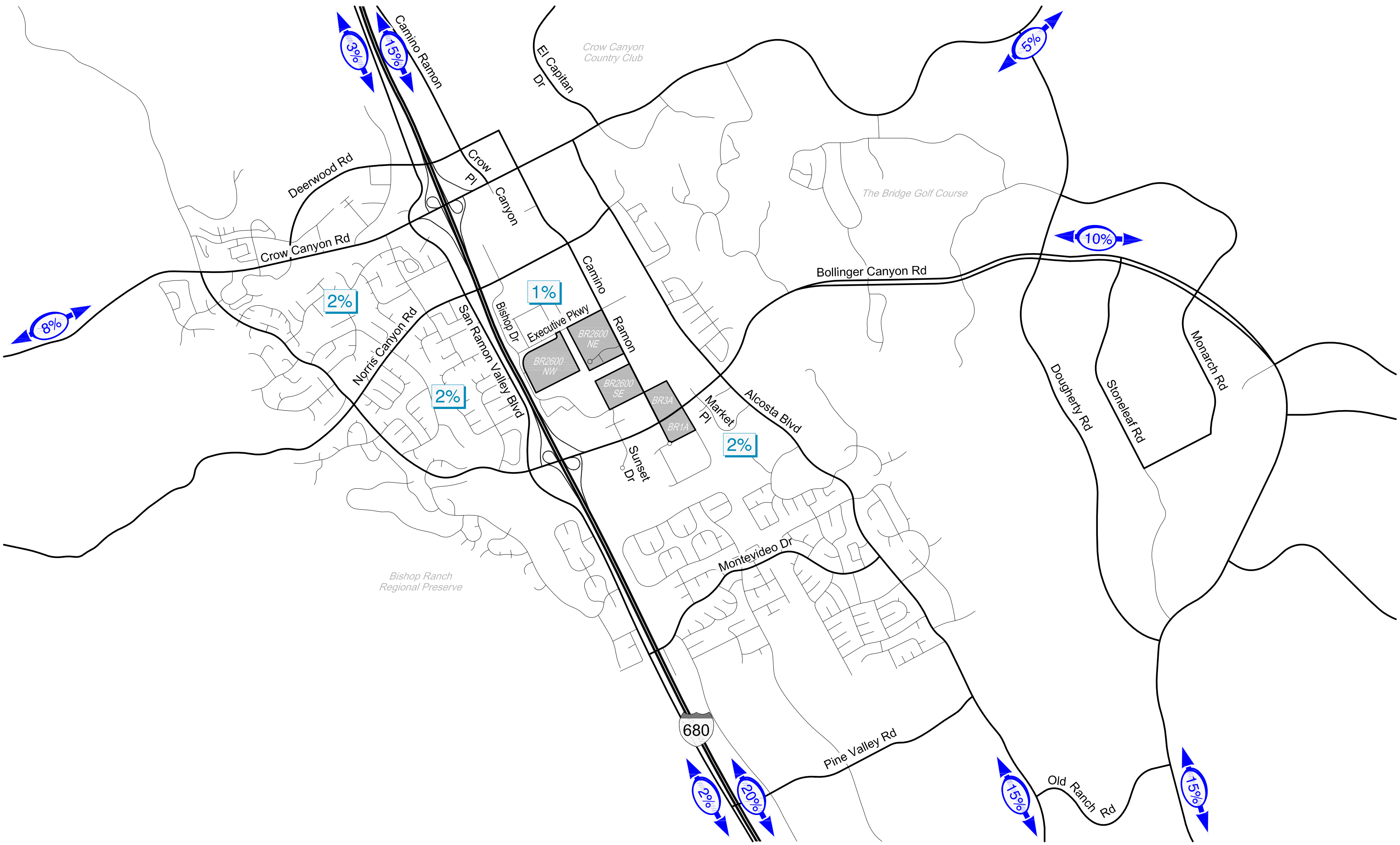
As a result of the new internal roadway system, it is anticipated that some existing traffic would shift to the new adjacent roadway. Existing traffic that would otherwise exit Bishop Drive to Camino Ramon toward eastbound Bollinger Canyon Road has the opportunity to use the new driveway at Bollinger Canyon Road. As discussed previously, the construction of the Iron Horse Trail overcrossing of Bollinger Canyon Road will require the elimination of the westbound left-turn lane



PROJECT TRIP DISTRIBUTION
RESIDENTIAL

FIGURE
10A

Gibson transportation consulting, inc.



LEGEND

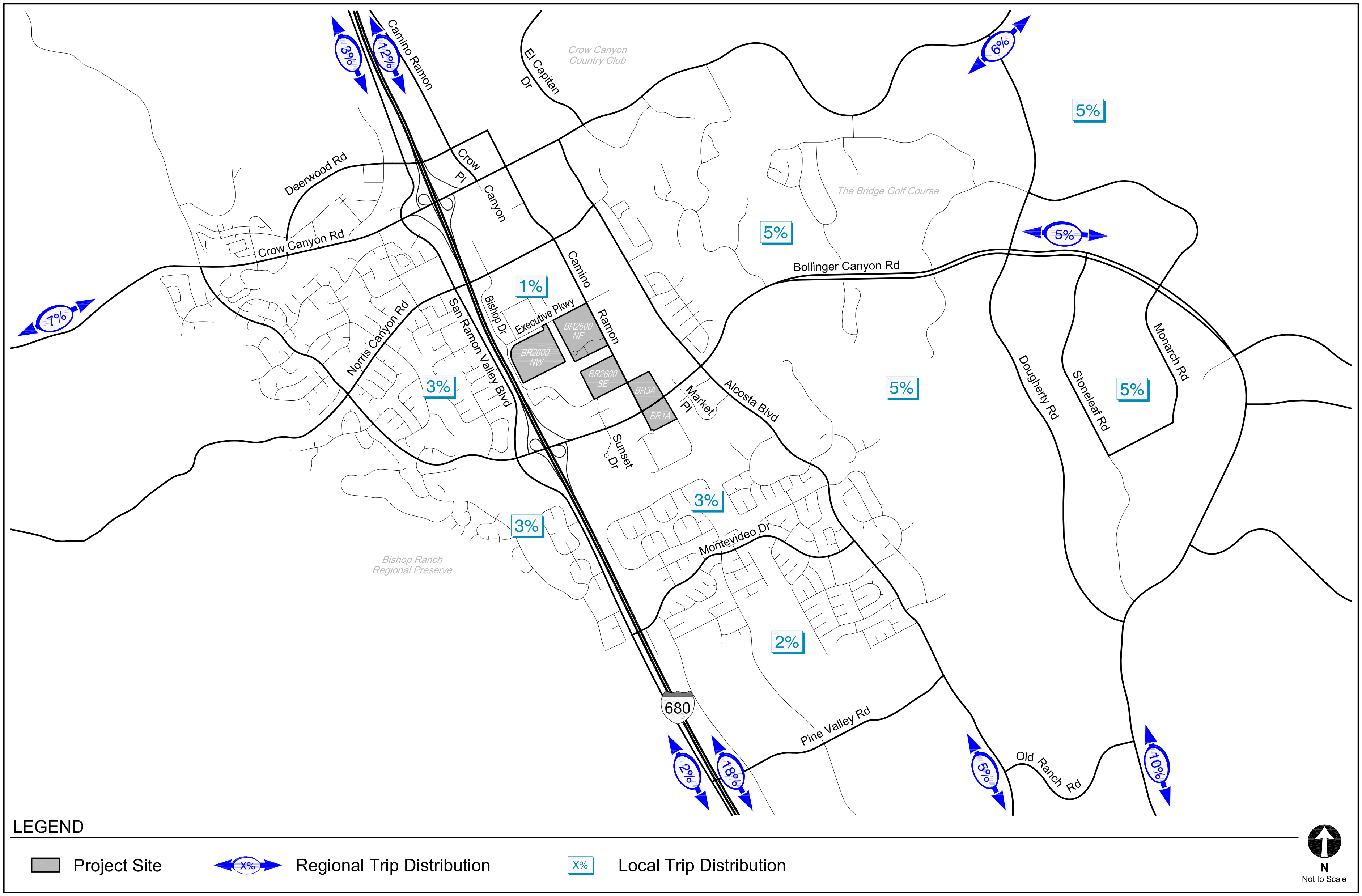
Project Site
Regional Trip Distribution
Local Trip Distribution

N
Not to Scale

PROJECT TRIP DISTRIBUTION
HOTEL

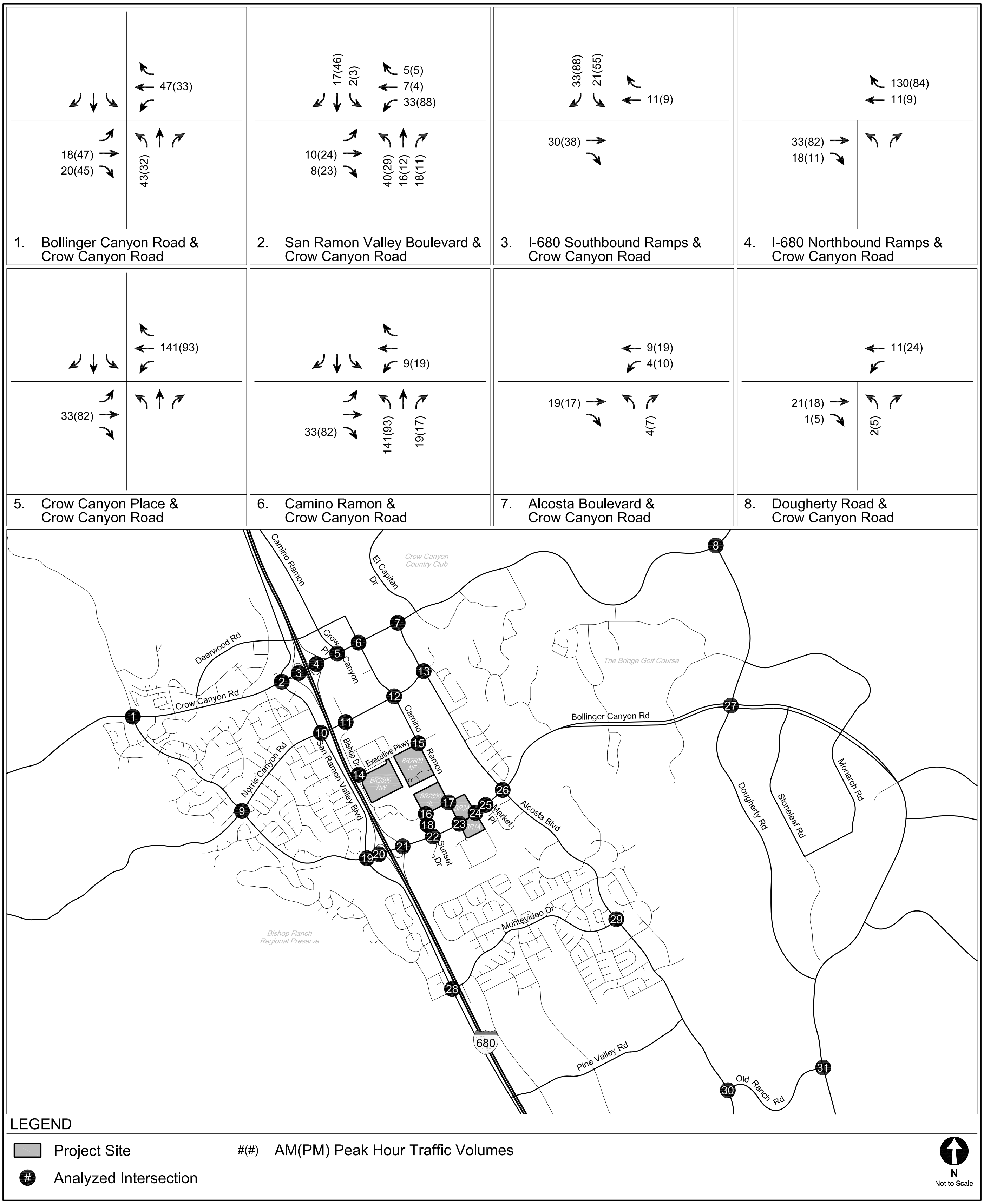
FIGURE 10B

Gibson transportation consulting, inc.



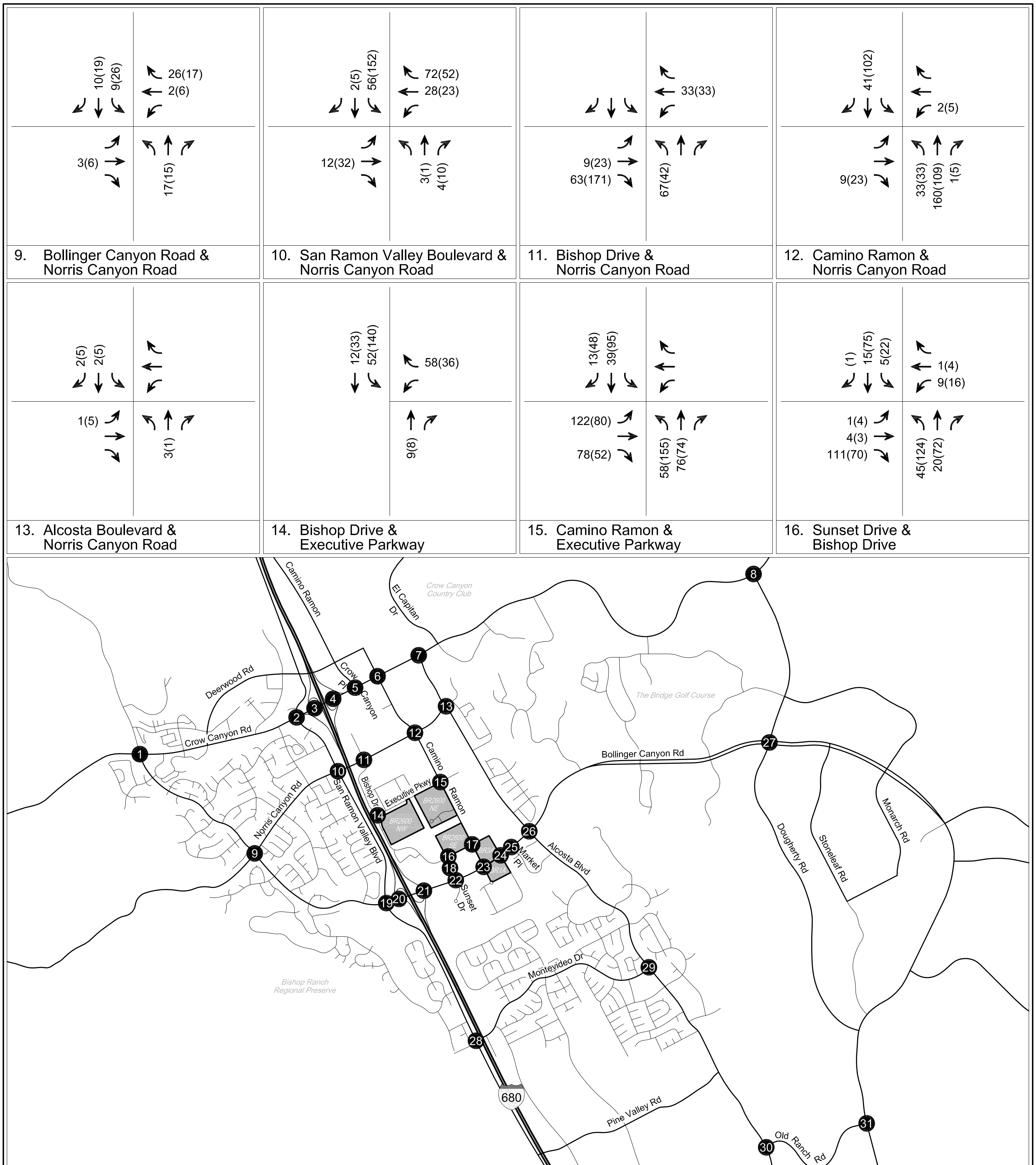
PROJECT TRIP DISTRIBUTION
COMMERCIAL

FIGURE
10C



TOTAL PROJECT-ONLY
PEAK HOUR TRAFFIC VOLUMES

FIGURE
11



LEGEND

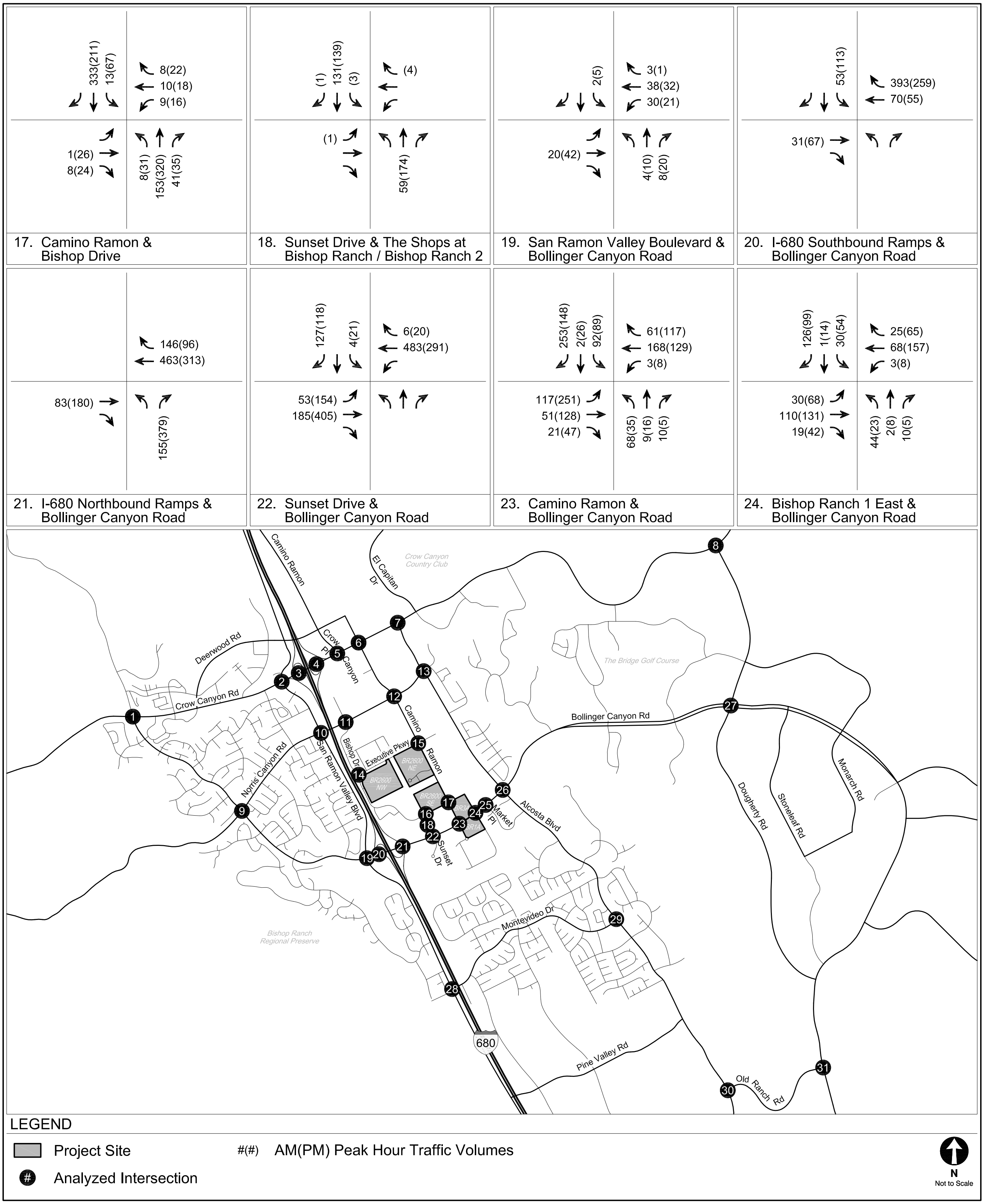
Project Site

Analyzed Intersection

#(#) AM(PM) Peak Hour Traffic Volumes

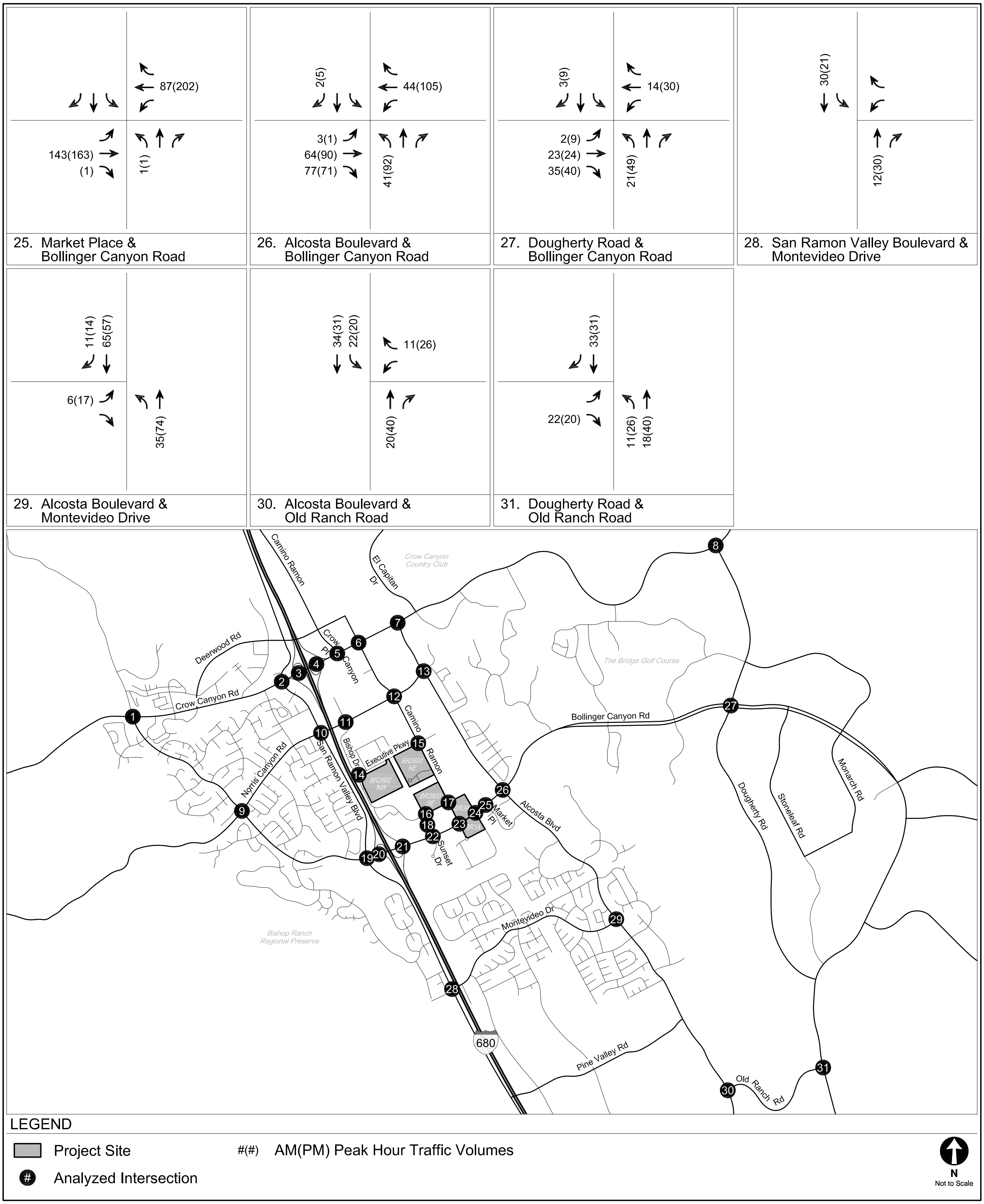
TOTAL PROJECT-ONLY
PEAK HOUR TRAFFIC VOLUMES

FIGURE
11 (CONT.)



TOTAL PROJECT-ONLY PEAK HOUR TRAFFIC VOLUMES

FIGURE 11 (CONT.)



TOTAL PROJECT-ONLY
PEAK HOUR TRAFFIC VOLUMES

FIGURE
11 (CONT.)

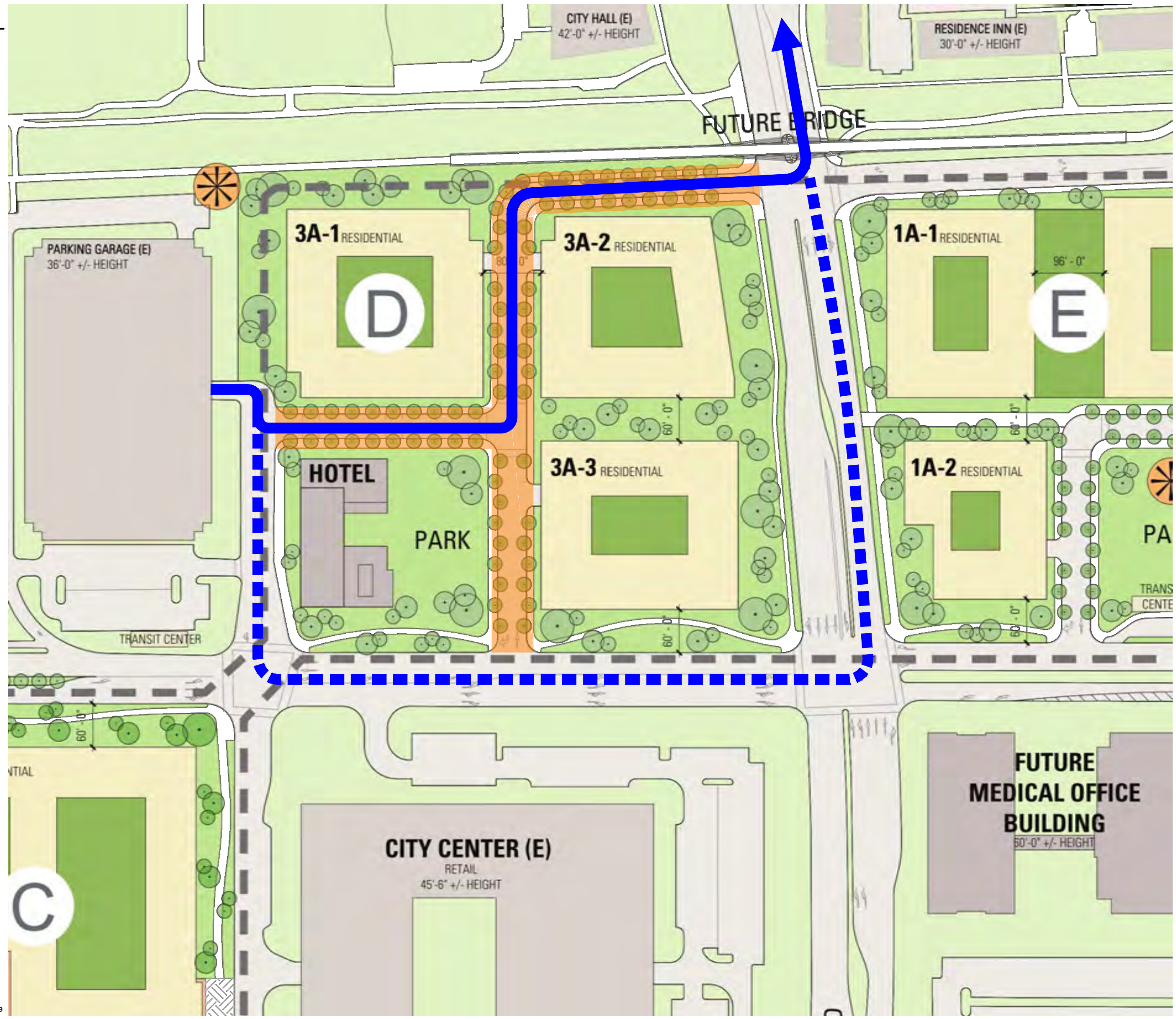
at the intersection of Bollinger Canyon Road & Bishop Ranch 1E. Figure 12 illustrates the redistribution of existing traffic circulation due to the new internal roadway system and driveway.

LEGEND

Project Design Feature (Roadway Network)

Distribution without Project Design Feature

Distribution with Project Design Feature



Source: Bishop Ranch. August, 2019.

REDISTRIBUTION OF EXISTING TRAFFIC

FIGURE 12

Chapter 5
Existing and Future with Project Conditions

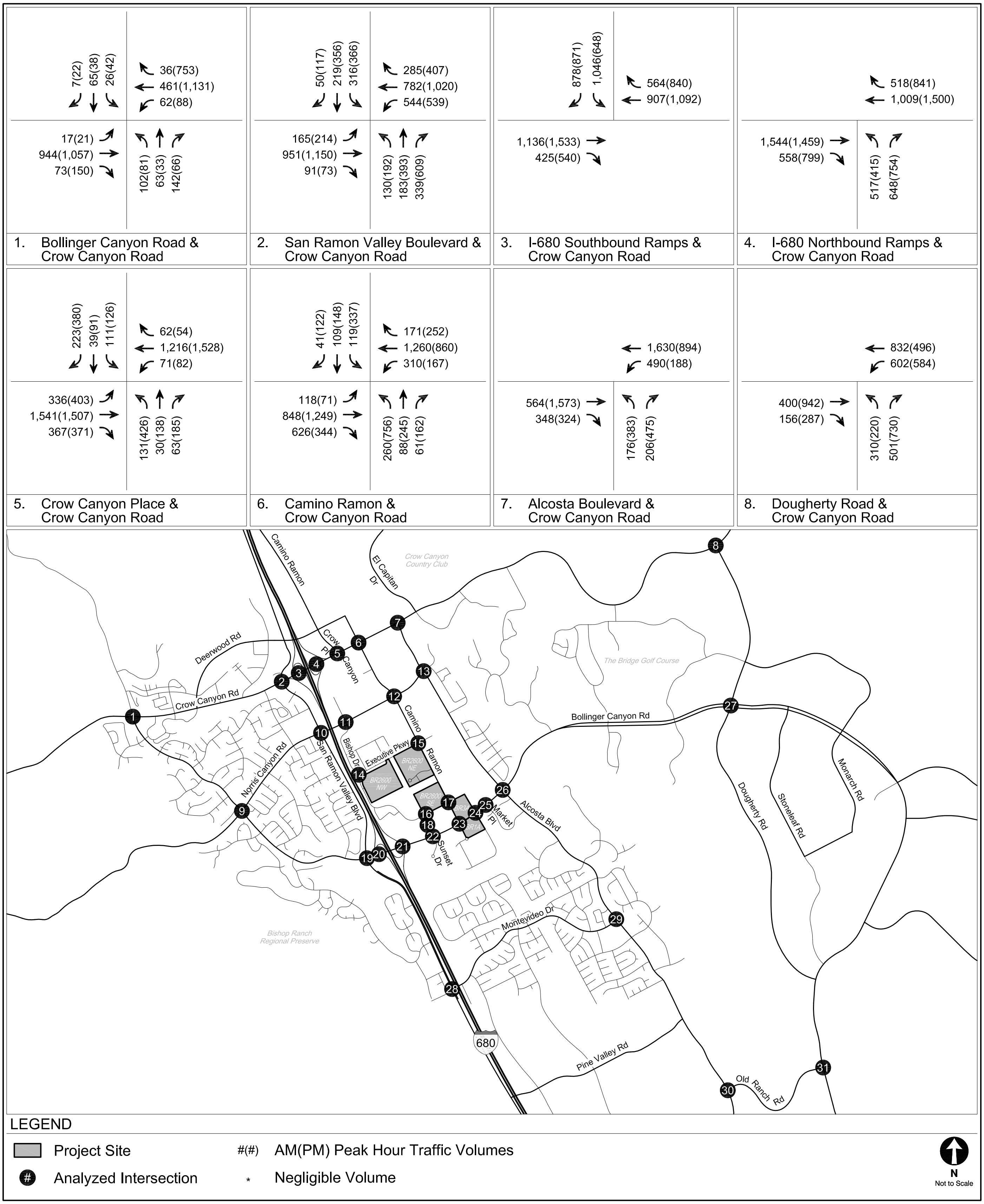
This chapter describes the results of the intersection operating conditions analysis when the Future with Project Conditions are compared to Future without Project Conditions. The analysis year of 2040 corresponds to the anticipated buildout year of the Project. All future cumulative traffic growth and transportation infrastructure improvements described in Chapter 3 are incorporated into this analysis.

EXISTING WITH PROJECT TRAFFIC VOLUMES

The Project-only morning and afternoon peak hour traffic volumes described in Chapter 4 and shown in Figure 11 were added to the Existing morning and afternoon peak hour traffic volumes shown in Figure 4. The resulting volumes are illustrated in Figure 13 and represent Existing with Project Conditions under the assumption that the full development of the Project would occur in one development phase and would be completed virtually immediately.

EXISTING WITH PROJECT INTERSECTION LEVELS OF SERVICE

Table 8 summarizes the results of the Existing with Project Conditions during the weekday morning and afternoon peak hours for the 31 study intersections. As shown, 28 of the 31 study intersections are anticipated to operate at LOS D or better during both the morning and afternoon peak hours under Existing with Project Conditions. The following three study intersections are anticipated to operate at LOS E during the afternoon peak hour under Existing with Project Conditions:



EXISTING WITH PROJECT CONDITIONS (YEAR 2019)
PEAK HOUR TRAFFIC VOLUMES

FIGURE 13

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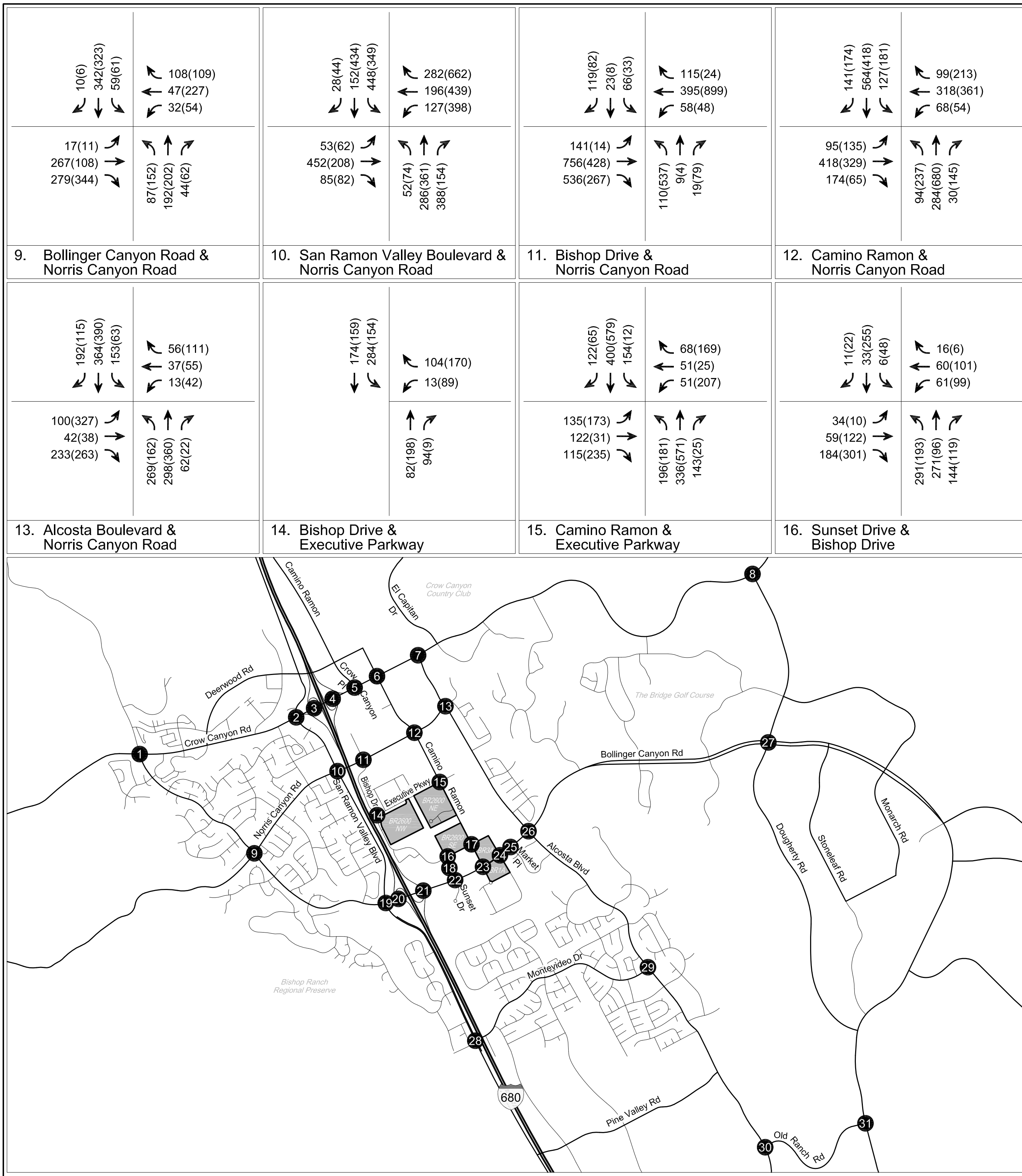


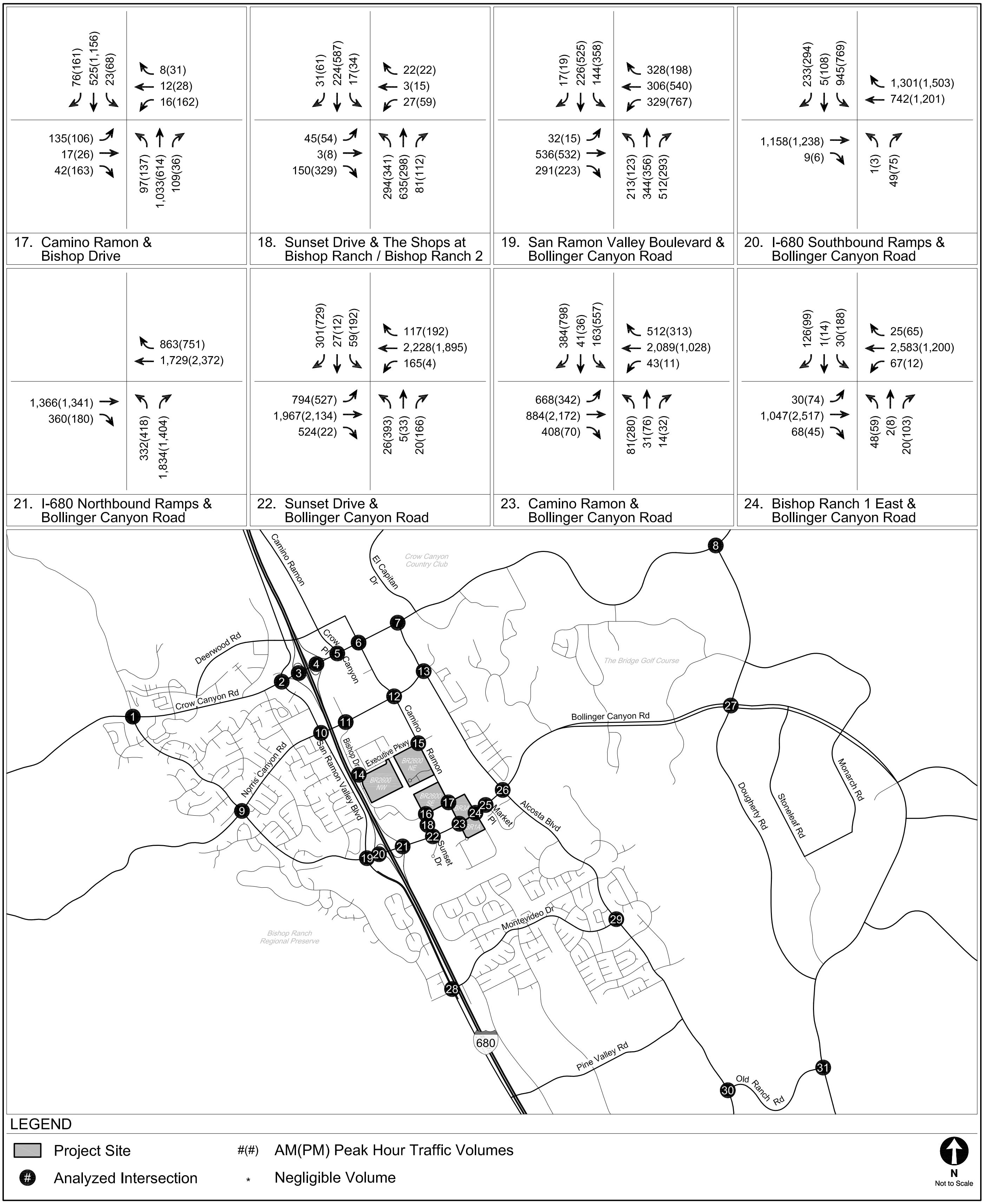
LEGEND

Project Site	#(#) AM(PM) Peak Hour Traffic Volumes
# Analyzed Intersection	* Negligible Volume

N
Not to Scale

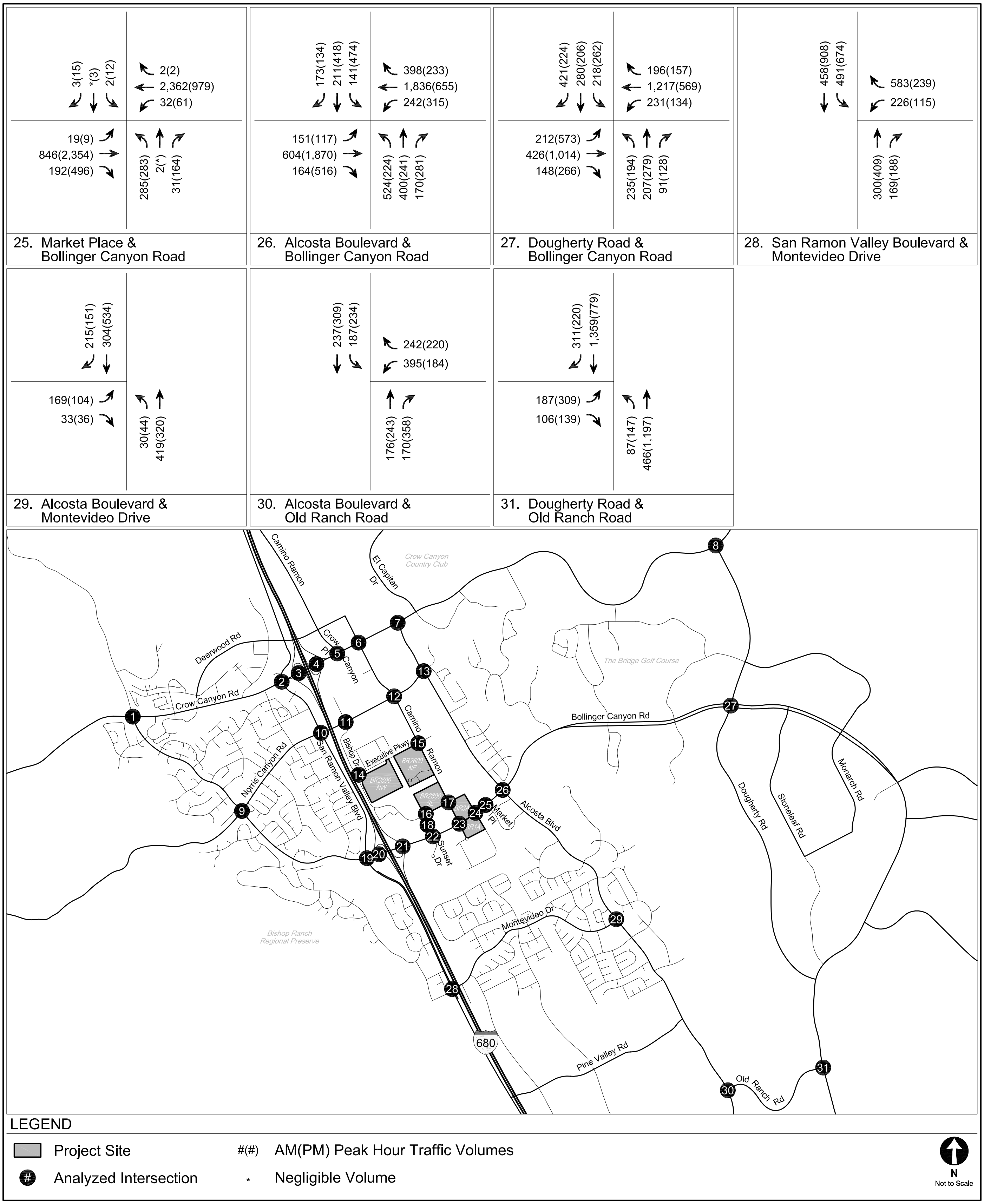
EXISTING WITH PROJECT CONDITIONS (YEAR 2019)
PEAK HOUR TRAFFIC VOLUMES

FIGURE
13 (CONT.)



EXISTING WITH PROJECT CONDITIONS (YEAR 2019)
PEAK HOUR TRAFFIC VOLUMES

FIGURE 13 (CONT.)



EXISTING WITH PROJECT CONDITIONS (YEAR 2019)
PEAK HOUR TRAFFIC VOLUMES

FIGURE 13 (CONT.)

TABLE 8
EXISTING WITH PROJECT CONDITIONS (YEAR 2019)
SIGNIFICANT IMPACT ANALYSIS

No.	Intersection	Peak Hour	Existing Conditions		Existing with Project Conditions			
			Delay	LOS	Delay	LOS	Change in Delay [d]	Significant Impact [e]
1.	Bollinger Canyon Road & Crow Canyon Road	AM PM	32.2 33.5	C C	33.6 35.1	C D	1.4 1.6	NO NO
2.	San Ramon Valley Boulevard & Crow Canyon Road	AM PM	44.0 49.0	D D	46.8 51.3	D D	2.8 2.3	NO NO
3.	I-680 Southbound Ramps & Crow Canyon Road	AM PM	20.3 15.9	C B	20.2 16.2	C B	-0.1 0.3	NO NO
4.	I-680 Northbound Ramps & Crow Canyon Road	AM PM	16.2 14.2	B B	16.0 13.9	B B	-0.2 -0.3	NO NO
5.	Crow Canyon Place & Crow Canyon Road	AM PM	29.1 38.8	C D	28.2 37.9	C D	-0.9 -0.9	NO NO
6.	Camino Ramon & Crow Canyon Road	AM PM	26.1 33.2	C C	26.5 35.1	C D	0.4 1.9	NO NO
7.	Alcosta Boulevard & Crow Canyon Road	AM PM	17.0 16.3	B B	16.9 16.3	B B	-0.1 0.0	NO NO
8.	Dougherty Road & Crow Canyon Road	AM PM	26.9 33.4	C C	27.0 33.6	C C	0.1 0.2	NO NO
9. [a]	Bollinger Canyon Road & Norris Canyon Road	AM PM	19.8 34.5	C D	21.5 40.5	C E	1.7 6.0	NO **YES**
10.	San Ramon Valley Boulevard & Norris Canyon Road	AM PM	42.4 45.9	D D	46.6 54.3	D D	4.2 8.4	NO NO
11.	Bishop Drive/Annabel Lane & Norris Canyon Road	AM PM	22.0 29.9	C C	22.8 33.8	C C	0.8 3.9	NO NO
12.	Camino Ramon & Norris Canyon Road	AM PM	34.9 43.8	C D	37.0 50.2	D D	2.1 6.4	NO NO
13.	Alcosta Boulevard & Norris Canyon Road	AM PM	36.8 38.2	D D	36.9 38.4	D D	0.1 0.2	NO NO
14. [b]	Bishop Drive & Executive Parkway	AM PM	11.6 12.4	B B	11.6 18.3	B C	0.0 5.9	NO NO
15. [c]	Camino Ramon & Executive Parkway	AM PM	29.6 23.0	C C	30.8 27.3	C C	1.2 4.3	NO NO
16.	Sunset Drive & Bishop Drive	AM PM	36.0 35.0	D C	37.9 37.6	D D	1.9 2.6	NO NO
17.	Camino Ramon & Bishop Drive	AM PM	35.6 31.2	D C	40.8 46.1	D D	5.2 14.9	NO NO
18.	Sunset Drive & Shops at Bishop Ranch/City Center	AM PM	42.2 51.1	D D	42.9 52.2	D D	0.7 1.1	NO NO
19.	San Ramon Valley Boulevard & Bollinger Canyon Road	AM PM	43.5 50.8	D D	43.7 52.9	D D	0.2 2.1	NO NO
20.	I-680 Southbound Ramps & Bollinger Canyon Road	AM PM	29.9 23.3	C C	29.2 28.3	C C	-0.7 5.0	NO NO

TABLE 8 (CONTINUED)
EXISTING WITH PROJECT CONDITIONS (YEAR 2019)
SIGNIFICANT IMPACT ANALYSIS

No.	Intersection	Peak Hour	Existing Conditions		Existing with Project Conditions			
			Delay	LOS	Delay	LOS	Change in Delay [d]	Significant Impact [e]
21.	I-680 Northbound Ramps &	AM	17.7	B	19.6	B	1.9	NO
	Bollinger Canyon Road	PM	29.5	C	53.6	D	24.1	NO
22.	Sunset Drive &	AM	16.4	B	15.0	B	-1.4	NO
	Bollinger Canyon Road	PM	45.7	D	72.8	E	27.1	**YES**
23.	Camino Ramon &	AM	26.8	C	30.8	C	4.0	NO
	Bollinger Canyon Road	PM	24.6	C	31.2	C	6.6	NO
24.	Bishop Ranch 1 East &	AM	13.5	B	12.6	B	-0.9	NO
[c]	Bollinger Canyon Road	PM	3.0	A	14.9	B	11.9	NO
25.	Market Place &	AM	10.4	B	9.7	A	-0.7	NO
	Bollinger Canyon Road	PM	14.1	B	10.0	A	-4.1	NO
26.	Alcosta Boulevard &	AM	48.6	D	50.2	D	1.6	NO
	Bollinger Canyon Road	PM	65.7	E	73.3	E	7.6	**YES**
27.	Dougherty Road &	AM	49.8	D	50.5	D	0.7	NO
	Bollinger Canyon Road	PM	46.6	D	47.4	D	0.8	NO
28.	San Ramon Valley Boulevard &	AM	29.4	C	29.5	C	0.1	NO
	Montevideo Drive	PM	38.5	D	42.4	D	3.9	NO
29.	Alcosta Boulevard &	AM	14.2	B	14.5	B	0.3	NO
	Montevideo Drive	PM	14.8	B	14.7	B	-0.1	NO
30.	Alcosta Boulevard &	AM	14.2	B	15.2	C	1.0	NO
[a]	Old Ranch Road	PM	20.9	C	25.0	C	4.1	NO
31.	Dougherty Road &	AM	23.2	C	24.9	C	1.7	NO
	Old Ranch Road	PM	15.8	B	16.2	B	0.4	NO

Notes

Delay is measured in seconds per vehicle

[a] Intersection operates with AWSC under Existing Conditions. Intersection is signalized under Future Conditions per CIP.

[b] Intersection operates with TWSC.

[c] Intersection includes intersection improvements under "with Project" Conditions per Project Design Feature.

[d] Average delay at an intersection may decrease with the addition of traffic when additional traffic is added to a movement or direction with less congestion than the overall intersection. Therefore, the average delay per vehicle at an intersection actually decreases.

[e] Significant impacts based on thresholds outlined in Table 3 and detailed below.

Signalized Intersection	The Project worsens intersection operations from LOS D or better to LOS E or F, or the change in average delay is more than 5 seconds per vehicle at an intersection operating at LOS E or F without project traffic.
All-Way Stop-Controlled (AWSC)	The Project worsens intersection operations from LOS D or better to LOS E or F, or the change in average delay is more than 5 seconds per vehicle at an intersection operating at LOS E or F without project traffic and the intersection also meets the peak hour volume signal warrant.
Two-Way Stop-Controlled (TWSC)	The Project causes a turning movement's acceptable LOS to decline to an unacceptable LOS and the peak hour volume signal warrant is met.

- Intersection 9. Bollinger Canyon Road & Norris Canyon Road
- Intersection 22. Sunset Drive & Bollinger Canyon Road
- Intersection 26. Alcosta Boulevard & Bollinger Canyon Road

EXISTING WITH PROJECT SIGNIFICANT IMPACTS, BEFORE MITIGATION

The impact of adding Project traffic volumes during the peak hours to the Existing Conditions was evaluated based on analysis of operating conditions at the study intersections without and with the Project. The previously discussed significance criteria and thresholds summarized in Chapter 1 were then used to determine the significance of a transportation impact caused by the Project on each study intersection, prior to any Project mitigation or trip reduction measures.

The Existing with Project Conditions during the weekday morning and afternoon peak hours are shown in Table 8. As shown, the Project is expected to result in significant impacts at three of the 31 study intersections during the afternoon peak hour under Existing with Project conditions prior to Project mitigation. The remaining 28 study intersections would operate at LOS D or better under Existing with Project Conditions and, therefore, would not have any significant impacts.

The three impacted intersections are:

- Intersection 9. Bollinger Canyon Road & Norris Canyon Road
- Intersection 22. Sunset Drive & Bollinger Canyon Road
- Intersection 26. Alcosta Boulevard & Bollinger Canyon Road

Project mitigation for these locations is detailed in Chapter 6.

FUTURE WITH PROJECT TRAFFIC VOLUMES

The Project-only morning and afternoon peak hour traffic volumes described in Chapter 4 and shown in Figure 11 were added to the Future without Project morning and afternoon peak hour traffic volumes shown in Figure 5. The resulting volumes are illustrated in Figure 14 and represent Future with Project Conditions after the full development of the Project by Year 2040.

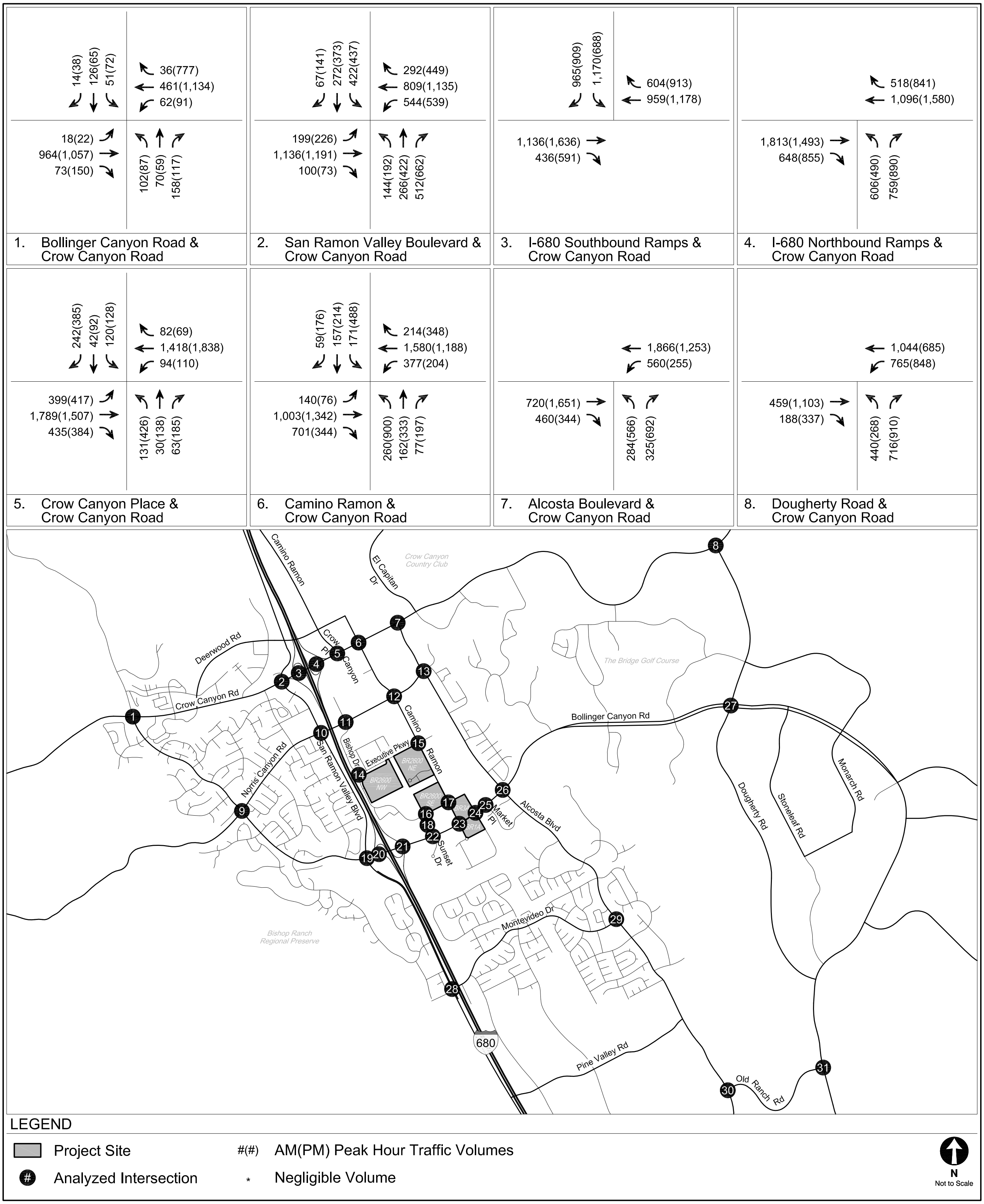
FUTURE WITH PROJECT INTERSECTION LEVELS OF SERVICE

Table 9 summarizes the results of the Future with Project Conditions during the weekday morning and afternoon peak hours for the 31 study intersections. As shown, 26 of the 31 study intersections are anticipated to operate at LOS D or better during both the morning and afternoon peak hours under Future with Project Conditions. The following five study intersections are anticipated to operate at LOS E or F during one or both peak hours under Future with Project Conditions:

- Intersection 11. Bishop Drive/Annabel Lane & Norris Canyon Road (LOS E in the afternoon peak hour)
- Intersection 12. Camino Ramon & Norris Canyon Road (LOS F during the afternoon peak hour)
- Intersection 19. San Ramon Valley Boulevard & Bollinger Canyon Road (LOS E during the afternoon peak hour)
- Intersection 26. Alcosta Boulevard & Bollinger Canyon Road (LOS F during the afternoon peak hour)
- Intersection 27. Dougherty Road & Bollinger Canyon Road (LOS F during the morning and afternoon peak hours)

FUTURE WITH PROJECT SIGNIFICANT IMPACTS, BEFORE MITIGATION

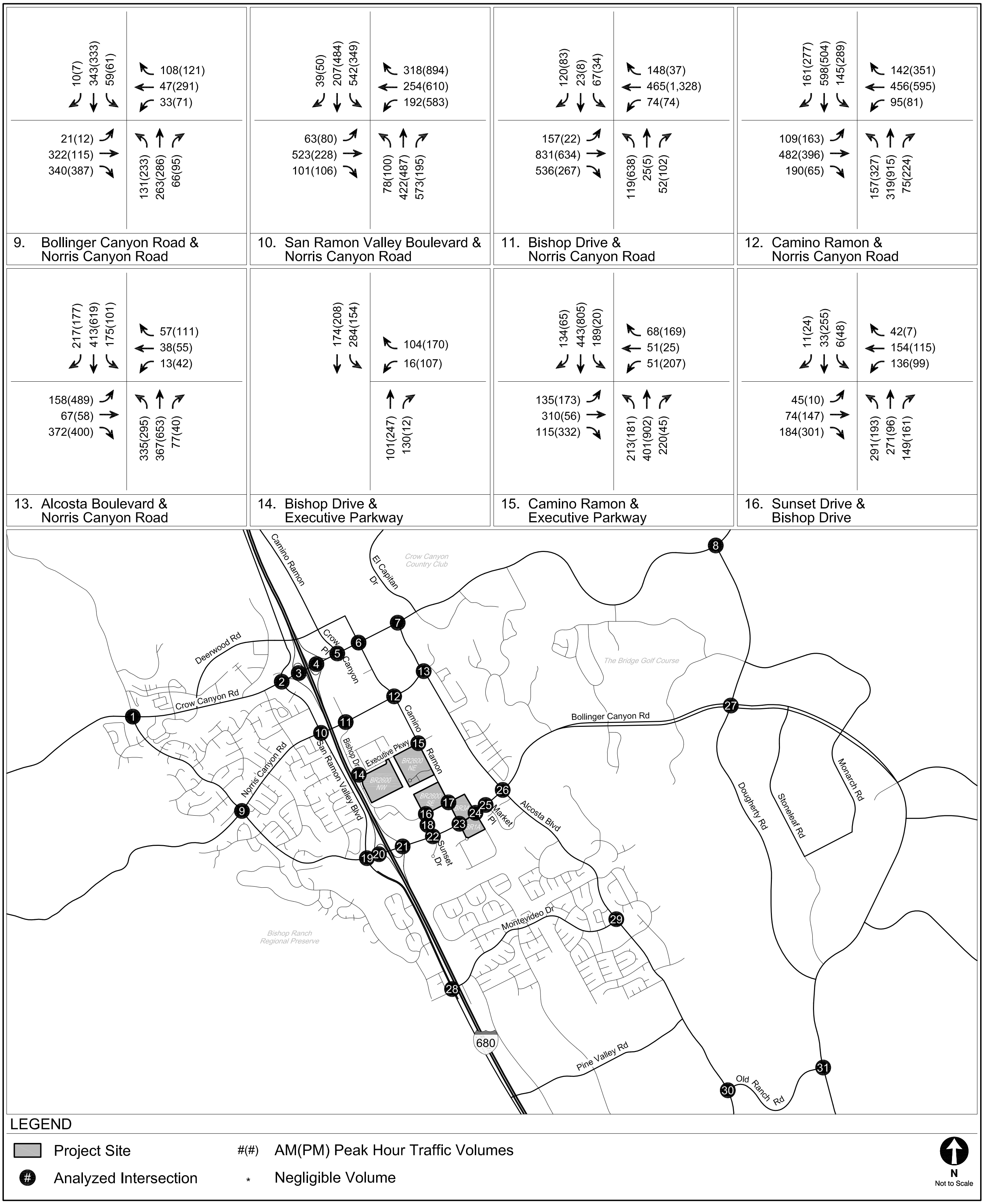
The relative impact of the added Project traffic volumes during the peak hours was evaluated based on analysis of future operating conditions at the study intersections without and with the Project. The previously discussed significance criteria and thresholds summarized in Chapter 1 were then used to determine the significance of a transportation impact caused by the Project on each study intersection, prior to any Project mitigation or trip reduction measures.



FUTURE WITH PROJECT CONDITIONS (YEAR 2040)
PEAK HOUR TRAFFIC VOLUMES

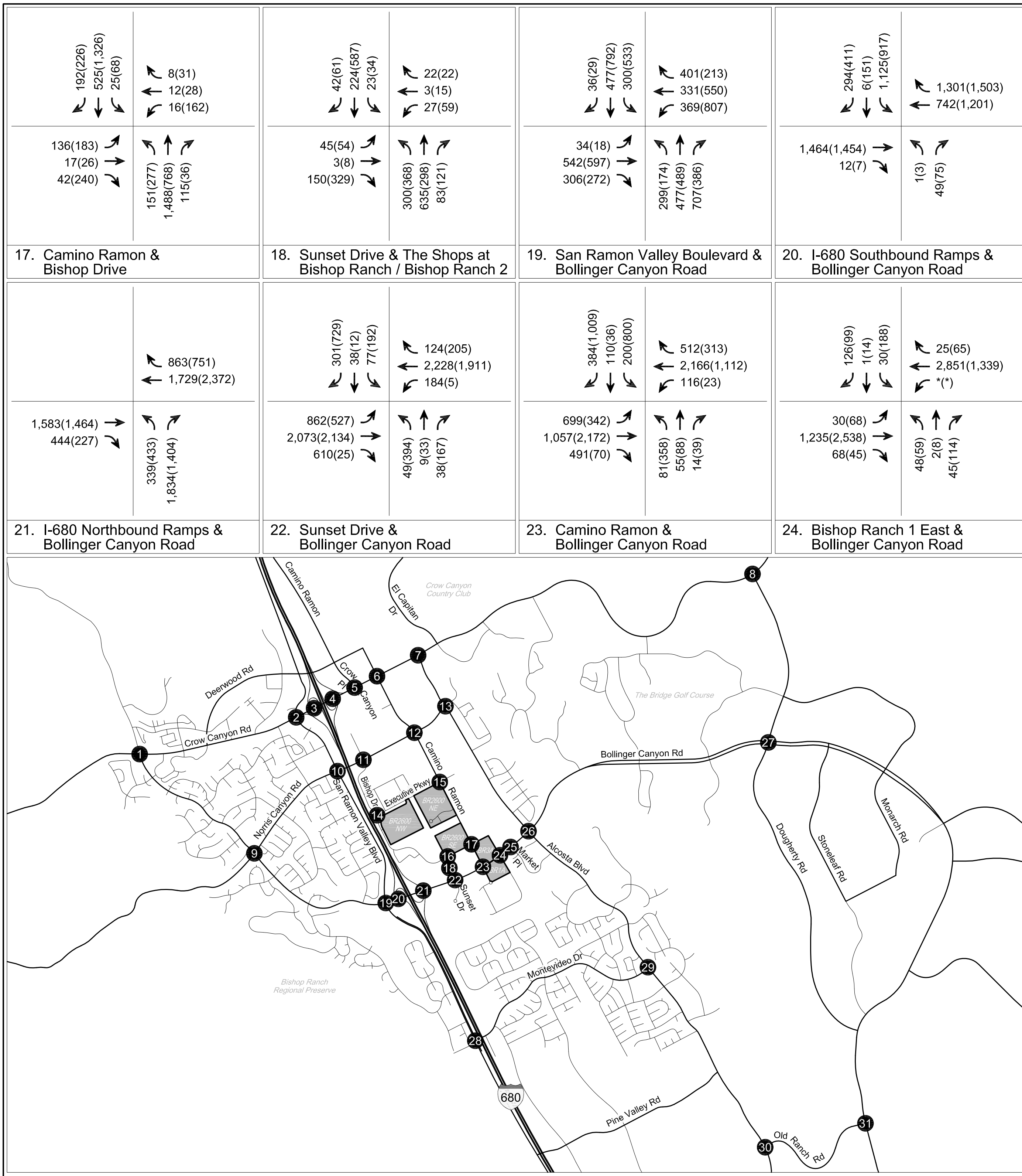
FIGURE 14

Gibson transportation consulting, inc.



FUTURE WITH PROJECT CONDITIONS (YEAR 2040)
PEAK HOUR TRAFFIC VOLUMES

FIGURE 14 (CONT.)



LEGEND

Project Site

Analyzed Intersection

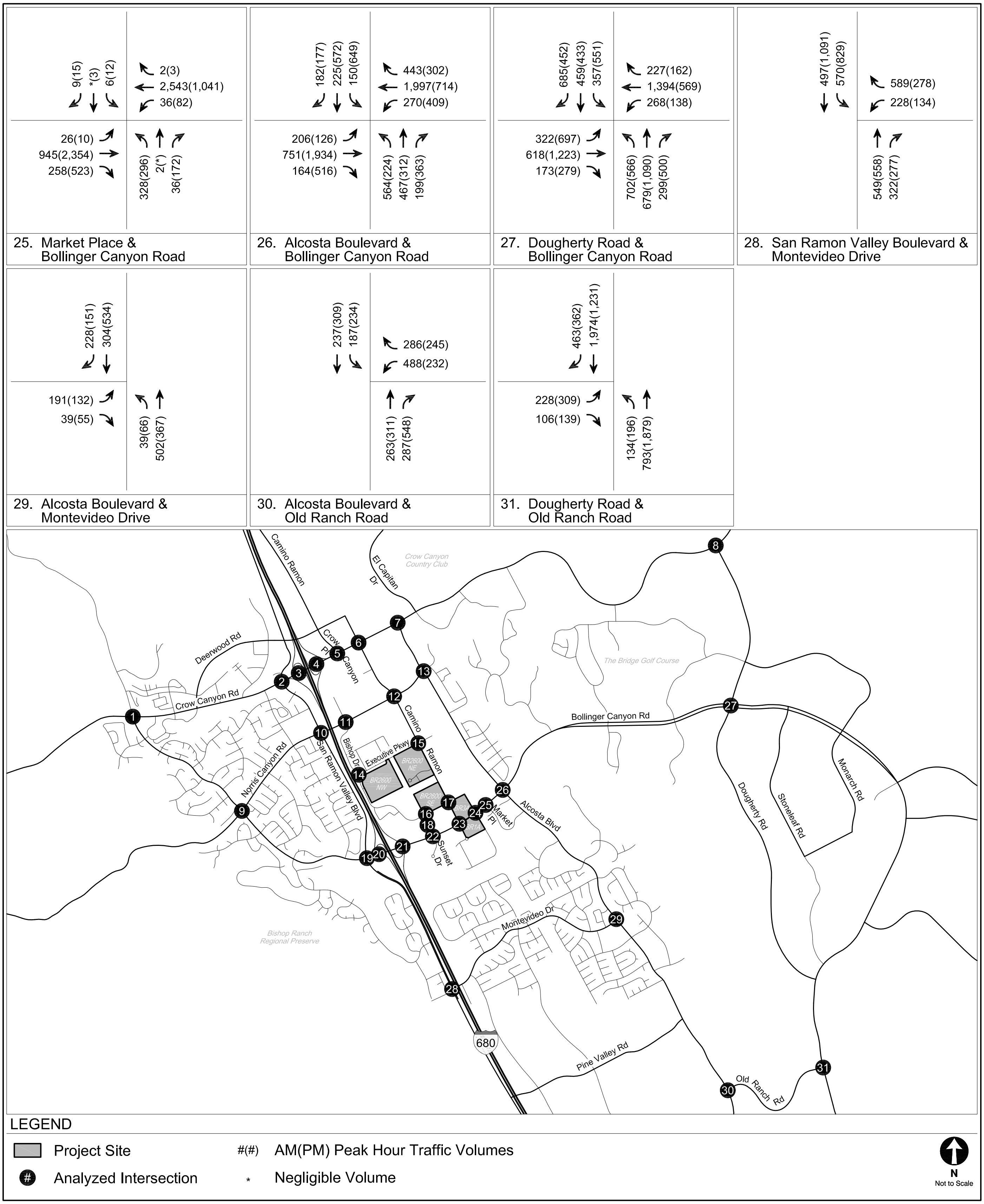
#(#) AM(PM) Peak Hour Traffic Volumes

* Negligible Volume

N Not to Scale

FUTURE WITH PROJECT CONDITIONS (YEAR 2040)
PEAK HOUR TRAFFIC VOLUMES

FIGURE 14 (CONT.)



FUTURE WITH PROJECT CONDITIONS (YEAR 2040)
PEAK HOUR TRAFFIC VOLUMES

FIGURE 14 (CONT.)

TABLE 9
FUTURE WITH PROJECT CONDITIONS (YEAR 2040)
SIGNIFICANT IMPACT ANALYSIS

No.	Intersection	Peak Hour	Future without Project Conditions		Future with Project Conditions			
			Delay	LOS	Delay	LOS	Change in Delay [e]	Significant Impact [f]
1.	Bollinger Canyon Road &	AM	33.1	C	34.3	C	1.2	NO
	Crow Canyon Road	PM	33.5	C	34.9	C	1.4	NO
2.	San Ramon Valley Boulevard &	AM	50.8	D	52.6	D	1.8	NO
	Crow Canyon Road	PM	49.6	D	52.9	D	3.3	NO
3.	I-680 Southbound Ramps &	AM	21.1	C	21.3	C	0.2	NO
	Crow Canyon Road	PM	15.8	B	15.8	B	0.0	NO
4.	I-680 Northbound Ramps &	AM	16.4	B	16.3	B	-0.1	NO
	Crow Canyon Road	PM	14.9	B	14.8	B	-0.1	NO
5.	Crow Canyon Place &	AM	28.8	C	23.5	C	-5.3	NO
	Crow Canyon Road	PM	40.8	D	40.1	D	-0.7	NO
6.	Camino Ramon &	AM	24.3	C	25.9	C	1.6	NO
	Crow Canyon Road	PM	41.1	D	43.7	D	2.6	NO
7.	Alcosta Boulevard &	AM	18.3	B	18.3	B	0.0	NO
	Crow Canyon Road	PM	19.6	B	19.6	B	0.0	NO
8.	Dougherty Road &	AM	28.4	C	28.6	C	0.2	NO
	Crow Canyon Road	PM	49.1	D	50.3	D	1.2	NO
9.	Bollinger Canyon Road &	AM	38.3	D	39.8	D	1.5	NO
[a]	Norris Canyon Road	PM	42.9	D	43.7	D	0.8	NO
10.	San Ramon Valley Boulevard &	AM	46.7	D	50.3	D	3.6	NO
	Norris Canyon Road	PM	43.7	D	54.7	D	11.0	NO
11.	Bishop Drive/Annabel Lane &	AM	27.4	C	28.5	C	1.1	NO
	Norris Canyon Road	PM	53.2	D	57.2	E	4.0	**YES**
12.	Camino Ramon &	AM	44.3	D	50.1	D	5.8	NO
	Norris Canyon Road	PM	88.2	F	97.4	F	9.2	**YES**
13.	Alcosta Boulevard &	AM	42.4	D	42.4	D	0.0	NO
	Norris Canyon Road	PM	53.0	D	53.3	D	0.3	NO
14.	Bishop Drive &	AM	12.6	B	12.7	B	0.1	NO
[b]	Executive Parkway	PM	14.4	B	25.8	D	11.4	NO
15.	Camino Ramon &	AM	27.8	C	33.8	C	6.0	NO
[c]	Executive Parkway	PM	22.3	C	32.2	C	9.9	NO
16.	Sunset Drive &	AM	40.1	D	41.2	D	1.1	NO
	Bishop Drive	PM	34.7	C	36.7	D	2.0	NO
17.	Camino Ramon &	AM	39.3	D	40.4	D	1.1	NO
	Bishop Drive	PM	47.9	D	53.5	D	5.6	NO
18.	Sunset Drive &	AM	42.6	D	43.4	D	0.8	NO
	Shops at Bishop Ranch/City Center	PM	51.3	D	54.7	D	3.4	NO
19.	San Ramon Valley Boulevard &	AM	51.7	D	53.5	D	1.8	NO
	Bollinger Canyon Road	PM	65.0	E	66.9	E	1.9	NO
20.	I-680 Southbound Ramps &	AM	24.2	C	25.0	C	0.8	NO
	Bollinger Canyon Road	PM	29.0	C	52.3	D	23.3	NO

TABLE 9 (CONTINUED)
FUTURE WITH PROJECT CONDITIONS (YEAR 2040)
SIGNIFICANT IMPACT ANALYSIS

No.	Intersection	Peak Hour	Future without Project Conditions		Future with Project Conditions			
			Delay	LOS	Delay	LOS	Change in Delay [e]	Significant Impact [f]
21.	I-680 Northbound Ramps &	AM	32.1	C	34.0	C	1.9	NO
	Bollinger Canyon Road	PM	29.1	C	26.9	C	-2.2	NO
22.	Sunset Drive &	AM	36.3	D	46.2	D	9.9	NO
	Bollinger Canyon Road	PM	40.8	D	54.3	D	13.5	NO
23.	Camino Ramon &	AM	24.7	C	35.0	C	10.3	NO
	Bollinger Canyon Road	PM	34.7	C	35.9	D	1.2	NO
24.	Bishop Ranch 1 East &	AM	1.7	A	8.7	A	7.0	NO
[c]	Bollinger Canyon Road	PM	3.2	A	18.1	B	14.9	NO
25.	Market Place &	AM	12.3	B	9.8	A	-2.5	NO
	Bollinger Canyon Road	PM	17.6	B	12.8	B	-4.8	NO
26.	Alcosta Boulevard &	AM	41.3	D	45.3	D	4.0	NO
[d]	Bollinger Canyon Road	PM	95.7	F	100.9	F	5.2	**YES**
27.	Dougherty Road &	AM	91.1	F	92.5	F	1.4	NO
	Bollinger Canyon Road	PM	81.1	F	84.5	F	3.4	NO
28.	San Ramon Valley Boulevard &	AM	42.5	D	43.1	D	0.6	NO
	Montevideo Drive	PM	42.7	D	44.3	D	1.6	NO
29.	Alcosta Boulevard &	AM	13.2	B	13.4	B	0.2	NO
	Montevideo Drive	PM	13.6	B	13.7	B	0.1	NO
30.	Alcosta Boulevard &	AM	21.3	C	22.6	C	1.3	NO
[a]	Old Ranch Road	PM	23.6	C	24.1	C	0.5	NO
31.	Dougherty Road &	AM	28.2	C	30.3	C	2.1	NO
	Old Ranch Road	PM	20.7	C	22.4	C	1.7	NO

Notes

Delay is measured in seconds per vehicle

[a] Intersection operates with AWSC under Existing Conditions. Intersection is signalized under Future Conditions per CIP.

[b] Intersection operates with TWSC.

[c] Intersection includes intersection improvements under "with Project" Conditions per Project Design Feature.

[d] Intersection includes intersection improvements under Future Conditions per CIP as warranted.

[e] Average delay at an intersection may decrease with the addition of traffic when additional traffic is added to a movement or direction with less congestion than the overall intersection. Therefore, the average delay per vehicle at an intersection actually decreases.

[f] Significant impacts based on thresholds outlined in Table 3 and detailed below.

Signalized Intersection	The Project worsens intersection operations from LOS D or better to LOS E or F, or the change in average delay is more than 5 seconds per vehicle at an intersection operating at LOS E or F without project traffic.
All-Way Stop-Controlled (AWSC)	The Project worsens intersection operations from LOS D or better to LOS E or F, or the change in average delay is more than 5 seconds per vehicle at an intersection operating at LOS E or F without project traffic and the intersection also meets the peak hour volume signal warrant.
Two-Way Stop-Controlled (TWSC)	The Project causes a turning movement's acceptable LOS to decline to an unacceptable LOS and the peak hour volume signal warrant is met.

The Future with Project Conditions during the weekday morning and afternoon peak hours are shown in Table 9. As shown, the Project is expected to result in significant impacts at three of the 31 study intersections in Year 2040 prior to Project mitigation. Of the 31 study intersections, 26 are anticipated to operate at LOS D or better under Future with Project Conditions and therefore are not subject to any significant impacts. The incremental increases in delay at the remaining two study intersections would be less than significant by Project traffic under Future with Project Conditions. The three significant impacts occur during the afternoon peak hour at the following intersections:

- Intersection 11. Bishop Drive/Annabel Lane & Norris Canyon Road
- Intersection 12. Camino Ramon & Norris Canyon Road
- Intersection 26. Alcosta Boulevard & Bollinger Canyon Road

Project mitigation for these locations is discussed in Chapter 6.

FUTURE WITH PROJECT VMT EVALUATION

Though the City has not yet adopted formal guidelines for VMT evaluation, for informational purposes, the CCTA Model was utilized to evaluate the effects of the Project on VMT. The results of that analysis are presented in Appendix G.

Chapter 6
Transportation Impact Mitigation

This section describes the transportation mitigation measures considered in order to mitigate the significant transportation impacts at the four impacted study intersections. The mitigation program for the Project includes implementation of signal phasing improvements, a travel lane reassignment, and a physical improvement.

TRANSPORTATION FUTURE IMPROVEMENTS AND MITIGATION PROGRAM

Existing with Project with Future Improvements

If the entire Project were constructed in one Phase and the Project traffic were added to Existing Conditions, the Project traffic would cause a significant impact at three existing intersections, as shown in Table 8. The following mitigation measures were developed for the impacted intersections:

- Bollinger Canyon Road & Norris Canyon Road (Intersection #9). The Project impact could be mitigated through the installation of a traffic signal at this all-way stop-controlled intersection, when warranted. This intersection would operate at unacceptable LOS conditions and meet peak hour signal warrants under Future without Project Conditions, and, therefore, it is assumed to be signalized under Future without Project Conditions. Thus, this would be a temporary Project impact that would be mitigated by a CIP improvement (Project #5335). The Project Applicant will either install the signal when warranted or provide equitable share fees to the City for the installation of the signal, when a full warrant analysis shows the signal warrants are met.

- Sunset Drive & Bollinger Canyon Road (Intersection #22). The Project impact would be mitigated by an interchange improvement at Bollinger Canyon Road & I-680 Northbound

On-Ramp. The interchange will be improved with the installation of a westbound continuous green operation that provides westbound vehicles on Bollinger Canyon Road with a permanent green phase that will allow them to bypass the signal at the intersection of Bollinger Canyon Road & I-680 Northbound Off-Ramp, which is anticipated to reduce congestion and queue lengths for westbound Bollinger Canyon Road to less than significant levels by providing more westbound through capacity at the Sunset Drive intersection. This improvement will be completed and in operation by mid-Year 2020. Once this improvement is in place, Sunset Drive & Bollinger Canyon Road would no longer be significantly impacted by Project traffic.

- Alcosta Boulevard & Bollinger Canyon Road (Intersection #26). Full buildout of the Project under Existing Conditions would worsen the LOS E conditions currently experienced during the afternoon peak hour. The addition of Project traffic would result in an increase in delay of 7.6 seconds in the afternoon peak hour, which exceeds the City's threshold of significance. The CIP includes an improvement at this location consisting of the addition of a northbound right-turn lane. While the proposed CIP improvement would not lessen the intersection operations to LOS D or better, the incremental impact of the Project traffic on this improved intersection would still not fall below the significance threshold and, thus, the Project would have a significant impact at this location. The impact could be mitigated by the addition of a signal modification that provides a northbound right-turn overlap phase with the westbound protected left-turn phase. If the full Project were built under Existing Conditions, there would be a temporary impact until the CIP improvement and the overlap signal phase were implemented.

Future with Project with Mitigation

As part of the Future with Project mitigation program, the Project would contribute toward signal phasing improvements that would better accommodate traffic operations at the specific intersections. The intersection improvements discussed below and summarized in Table 9 were considered to alleviate the significant impacts of the Future with Project to less than significant levels.

- Bishop Drive/Annabel Lane & Norris Canyon Road (Intersection #11). The significant transportation impact at this intersection could be mitigated and reduced to less than significant levels by restriping the northbound approach to provide one exclusive left-turn lane and one shared left-turn/through/right-turn lane. In addition, modifications to the signal phasing and signal equipment (signal poles, mast arms) would be required to provide a split phase for the northbound and southbound approaches. This improvement could be accommodated within the existing right-of-way and would reduce the significant transportation impact caused by the addition of Project traffic to less than significant levels.

- Camino Ramon & Norris Canyon Road (Intersection #12). The significant transportation impact at this intersection could be mitigated and reduced to less than significant levels by widening the westbound approach to add an exclusive right turn lane. This mitigation would require additional right-of-way and would reduce the significant transportation impact to less than significant levels.

- Alcosta Boulevard and Bollinger Canyon Road (Intersection #26). The significant transportation impact at this intersection could be mitigated and reduced to less than significant levels by providing a northbound right-turn overlap phase during the protected westbound left-turn phase. Currently, the westbound approach does not permit U-turn movements. Thus, no changes to the westbound approach operations would be required. This improvement could reduce the significant transportation impact caused by the addition of Project traffic to less than significant levels.

MITIGATION EFFECTIVENESS

The specific intersection improvements described in the list of future improvements and Project's mitigation program were analyzed under Existing with Project with Future Improvements Conditions and Future with Project with Mitigation Conditions. The intersections were analyzed using the methodology described in Chapter 1. Tables 10 and 11 summarize the results of the Existing with Project with Future Improvements Conditions and Future with Project with Mitigation

TABLE 10
EXISTING WITH PROJECT WITH FUTURE IMPROVEMENTS CONDITIONS (YEAR 2019)
SIGNIFICANT IMPACT ANALYSIS

No.	Intersection	Peak Hour	Existing Conditions		Existing with Project Conditions				Existing with Project with Future Improvements Conditions			
			Delay	LOS	Delay	LOS	Change in Delay	Significant Impact [a]	Delay	LOS	Change in Delay	Significant Impact [a]
9.	Bollinger Canyon Road &	AM	19.8	C	21.5	C	1.7	NO	35.4	D	15.6	NO
[b]	Norris Canyon Road	PM	34.5	D	40.5	E	6.0	**YES**	36.5	D	2.0	NO
22.	Sunset Drive &	AM	16.4	B	15.0	B	-1.4	NO	15.0	B	-1.4	NO
[c]	Bollinger Canyon Road	PM	45.7	D	72.8	E	27.1	**YES**	54.7	D	9.0	NO
26.	Alcosta Boulevard &	AM	48.6	D	50.2	D	1.6	NO	46.8	D	-1.8	NO
[d]	Bollinger Canyon Road	PM	65.7	E	73.3	E	7.6	**YES**	63.0	E	-2.7	NO

Notes

[a] Significant impacts based on thresholds outlined in Table 3 and detailed below.

Signalized Intersection — The Project worsens intersection operations from LOS D or better to LOS E or F, or the change in average delay is more than 5 seconds per vehicle at an intersection operating at LOS E or F without project traffic.

All-Way Stop — The Project worsens intersection operations from LOS D or better to LOS E or F, or the change in average delay is more than 5 seconds per vehicle at an intersection operating at LOS E or F without project traffic and the intersection also meets the peak hour volume signal warrant.

Two-Way Stop — The Project causes a turning movement's acceptable LOS to decline to an unacceptable LOS and the peak hour volume signal warrant is met.

[b] This intersection operates with AWSC under Existing Conditions and is warranted for signalization under Future Conditions per CIP. Thus, the Project impact is temporary until the traffic signal is warranted and installed. The impact would be mitigated by a CIP improvement (Project #5335).

[c] This intersection would be improved through the installation of the Bollinger Canyon Road westbound continuous green at I-680 interchanges. Thus, the Project impact is temporary and would be mitigated once this improvement is in place, which is expected to be prior to the commencement of any Project construction.

[d] This intersection is warranted for widening improvements to provide an exclusive right-turn lane in the northbound approach under Existing Conditions per CIP. Additionally, Project mitigation includes modification to the signal phasing to provide a northbound right-turn overlap phase with the westbound protected left-turn phase. The impact would be mitigated through a combination of a CIP improvement (Project #905325) and Project mitigation. Until that time, the Project impact is temporary.

TABLE 11
FUTURE WITH PROJECT WITH MITIGATION CONDITIONS (YEAR 2040)
SIGNIFICANT IMPACT ANALYSIS

No.	Intersection	Peak Hour	Future without Project Conditions		Future with Project Conditions				Future with Project with Mitigation Conditions			
			Delay	LOS	Delay	LOS	Change in Delay	Significant Impact [a]	Delay	LOS	Change in Delay	Significant Impact [a]
11.	Bishop Drive/Annabel Lane &	AM	27.4	C	28.5	C	1.1	NO	47.0	D	19.6	NO
[b]	Norris Canyon Road	PM	53.2	D	57.2	E	4.0	**YES**	44.1	D	-9.1	NO
12.	Camino Ramon &	AM	44.3	D	50.1	D	5.8	NO	48.2	D	3.9	NO
[c]	Norris Canyon Road	PM	88.2	F	97.4	F	9.2	**YES**	82.4	F	-5.8	NO
26.	Alcosta Boulevard &	AM	41.3	D	45.3	D	4.0	NO	45.5	D	4.2	NO
[d]	Bollinger Canyon Road	PM	95.7	F	100.9	F	5.2	**YES**	86.4	F	-9.3	NO

Notes

[a] Significant impacts based on thresholds outlined in Table 3 and detailed below.

Signalized Intersection: The Project worsens intersection operations from LOS D or better to LOS E or F, or the change in average delay is more than 5 seconds per vehicle at an intersection operating at LOS E or F without project traffic.

All-Way Stop: The Project worsens intersection operations from LOS D or better to LOS E or F, or the change in average delay is more than 5 seconds per vehicle at an intersection operating at LOS E or F without project traffic and the intersection also meets the peak hour volume signal warrant.

Two-Way Stop: The Project causes a turning movement's acceptable LOS to decline to an unacceptable LOS and the peak hour volume signal warrant is met.

[b] Project mitigation includes roadway restriping along northbound Bishop Drive to provide one exclusive left-turn lane and one shared left/through/right-turn lane. This mitigation would also require modification to the signal phasing to provide a split phase for the northbound and southbound approaches.

[c] Project mitigation includes roadway widening along westbound Norris Canyon Road to provide an exclusive right-turn lane. This cannot be accommodated within the existing right-of-way.

[d] Project mitigation includes modification to the signal phasing to provide a northbound right-turn overlap phase with the westbound protected left-turn phase.

Conditions during the weekday morning and afternoon peak hours at the impacted study intersections. Under Existing with Project with Future Improvements Conditions, all significant impacts would be temporary until improvements are put into place. Under Future with Project with Mitigation Conditions, all three study intersections would be reduced to less than significant levels with implementation of the mitigation program and no significant impacts would remain.

Chapter 7
Caltrans Analysis

This chapter presents an analysis of Caltrans facilities, including freeway mainline segments, Caltrans intersections, ramp sections, and off-ramp queuing to provide further information to the decision makers.

VMT

As previously noted, the focus of transportation analysis will shift from driver delay to reduction of GHG, creation of multimodal networks, and promotion of mixed-use developments. To better align with the State's multimodal transportation and environmental action goals, Caltrans is pursuing VMT as a metric of Project impacts, as outlined in the Caltrans Interim Guide. This interim guidance will remain in effect until superseded by new Caltrans transportation impact study guidelines, which are currently under development.

The Project characteristics (e.g., its location, proximity to transit, access to other nearby destinations, pedestrian connections, bicycle amenities, etc.) would encourage non-auto modes of transportation such as walking, bicycling, carpool, vanpool, transit, etc. and would, therefore, reduce VMT to/from the Project Site. By so doing, the placement of the Project land uses in an infill mixed-use development should assist in reducing associated transportation-related GHG emissions.

The Project Site is located within walking distance of numerous transit line bus stops and the San Ramon Transit Center. The location efficiency of the Project Site would result in synergistic benefits that would reduce vehicle trips and VMT. Further, the Project would be located within an area that offers access to other nearby retail destinations. The combined effects of these factors would reduce the Project's anticipated vehicle trips and VMT and encourage walking and non-auto forms of transportation and transit ridership, which results in corresponding reductions in transportation-related emissions.

ANALYZED FACILITIES

As shown in Table 12, the analyses conducted of Caltrans facilities included freeway mainline segments, signalized ramp intersections, and off-ramp queuing. Freeway mainline segments were analyzed using proprietary spreadsheets implementing the HCM methodology. Intersections and off-ramp queue analyses were assessed using Synchro software. Three freeway mainline segments (or a total of six freeway mainline sections) on I-680 were analyzed using HCM methodology to determine density, speed, and LOS. The LOS definitions for freeway mainline segments based on HCM methodology are presented in Table 13. Four signalized intersections located at freeway ramps and under partial Caltrans jurisdiction were analyzed using HCM methodology to identify average vehicle delay and LOS. Four freeway off-ramps were analyzed for ramp queue lengths using the Synchro software to estimate queues. Detailed LOS worksheets for each type of analysis are included in Appendix F.

The cumulative analysis of freeway facilities discussed in this chapter includes projections of Year 2040 conditions without and with Project traffic, which coincides with the Project buildout year.

FREEWAY MAINLINE SEGMENTS

Three freeway mainline segments on I-680 were analyzed using the HCM methodology. Existing Year 2018 freeway volume data was collected from the CCTA Model outputs and adjusted to reflect Existing Year 2019 Conditions and are summarized in Table 14. These volumes are consistent with Caltrans Performance Management System volumes for the latest published data available. Traffic volumes were also projected for Year 2040 utilizing the CCTA Model to reflect the Project buildout year and are summarized in Table 14. The CCTA Model outputs for Future Year 2040 and base year were compared to determine the incremental difference in traffic volumes.

TABLE 12
ANALYZED CALTRANS FACILITIES

ID	Location
Freeway Mainline Segments	
FS-1.	I-680 north of Crow Canyon Road
FS-2.	I-680 between Crow Canyon Road and Bollinger Canyon Road
FS-3.	I-680 south of Bollinger Canyon Road
Signalized Intersections	
S-1.	I-680 Southbound Ramps & Crow Canyon Road (Intersection #3)
S-2.	I-680 Northbound Ramps & Crow Canyon Road (Intersection #4)
S-3.	I-680 Southbound Ramps & Bollinger Canyon Road (Intersection #20)
S-4.	I-680 Northbound Ramps & Bollinger Canyon Road (Intersection #21)
Off-Ramp Queues	
Q-1.	I-680 Southbound Ramps & Crow Canyon Road (Intersection #3)
Q-2.	I-680 Northbound Ramps & Crow Canyon Road (Intersection #4)
Q-3.	I-680 Southbound Ramps & Bollinger Canyon Road (Intersection #20)
Q-4.	I-680 Northbound Ramps & Bollinger Canyon Road (Intersection #21)

TABLE 13
FREEWAY SEGMENT LEVEL OF SERVICE DEFINITIONS - DENSITY

Level of Service	Description	Density [a]
A	Free-flow speeds prevail. Vehicles are almost completely unimpeded in their ability to maneuver within the traffic stream.	≤ 11
B	Free-flow speeds are maintained. The ability to maneuver with the traffic stream is only slightly restricted.	> 11 and ≤ 18
C	Flow with speeds at or near free-flow speeds. Freedom to maneuver within the traffic stream is noticeably restricted, and lane changes require more care and vigilance on the part of the driver.	> 18 and ≤ 26
D	Speeds decline slightly with increasing flows. Freedom to maneuver with the traffic stream is more noticeably limited, and the driver experiences reduced physical and psychological comfort.	> 26 and ≤ 35
E	Operation at capacity. There are virtually no usable gaps within the traffic stream, leaving little room to maneuver. Any disruption can be expected to produce a breakdown with queuing.	> 35 and ≤ 45
F	Represents a breakdown in flow and oversaturated conditions.	> 45

Notes
Source: *Highway Capacity Manual, 6th Edition, A Guide for Multimodal Mobility Analysis* (Transportation Research Board, 2016) and Caltrans.
[a] Density is defined in vehicles per mile per lane and describes the proximity to other vehicles and is related to the freedom to maneuver within the traffic stream (*Highway Capacity Manual, 6th Edition, A Guide for Multimodal Mobility Analysis).*

TABLE 14
FREEWAY MAINLINE SEGMENT TRAFFIC VOLUMES

ID	Freeway Mainline Segment	Peak Hour	Direction	Vehicles per Hour (VPH)			
				Existing Conditions (Year 2019) [a]	**Existing with Project Conditions (Year 2019)**	**Future without Project Conditions (Year 2040)**	**Future with Project Conditions (Year 2040)**
FS-1.	I-680 north of Crow Canyon Road	AM	NB	5,672	5,966	6,596	6,890
			SB	7,961	8,067	7,955	8,061
		PM	NB	7,681	7,872	8,728	8,919
			SB	6,732	6,988	7,903	8,159
FS-2.	I-680 between Crow Canyon Road & Bollinger Canyon Road	AM	NB	5,520	5,666	6,405	6,551
			SB	7,993	8,046	7,914	7,967
		PM	NB	7,009	7,105	7,728	7,824
			SB	6,640	6,753	7,762	7,875
FS-3.	I-680 south of Bollinger Canyon Road	AM	NB	5,638	5,793	6,306	6,461
			SB	7,191	7,584	7,120	7,513
		PM	NB	6,708	7,087	6,860	7,239
			SB	6,175	6,434	6,853	7,112

Notes
[a] 2019 freeway traffic volumes based on 2018 weekday traffic volume data from CCTA Model. These volumes are consistent with Caltrans' Performance Management System (PeMS) volumes for 2017 (the latest published data available).

Any decrease in the incremental volume difference was conservatively overridden to assume no negative growth, in the same manner as future traffic volumes were developed for Year 2040 in Chapter 3.

Freeway Mainline Segments Analysis

Table 15 summarizes the results of the HCM analysis for Existing Conditions and Existing with Project Conditions. As shown, the Project is not anticipated to change the LOS operations at any of the six freeway mainline sections (three northbound and three southbound) during the morning peak hour or at five of the six freeway mainline sections during the afternoon peak hour under Existing with Project Conditions. Only the I-680 segment south of Bollinger Canyon Road would change LOS in the northbound direction in the afternoon peak hour when operating conditions would change from LOS D to LOS E, with a change in density of 2.3 vehicles per mile per lane.

Table 16 summarizes the results of the HCM analysis for Future without Project Conditions and Future with Project Conditions Year 2040. As shown, the Project is not anticipated to change the LOS operations at five of the six freeway mainline sections during the morning peak hour and four of the six freeway mainline sections during the afternoon peak hour under Future with Project Conditions. The Year 2040 LOS changes that are anticipated as a result of Project traffic are as follows:

- I-680 between Crow Canyon Road and Bollinger Canyon Road – Northbound changes from LOS C to LOS D (morning peak), with a change in density of 0.6 vehicles per mile per lane
- I-680 South of Bollinger Canyon Road – Northbound and Southbound changes from LOS D to LOS E (afternoon peak), with a maximum change in density of 2.5 vehicles per mile per lane

In the cases above, the Future without Project Density levels were very close to the upper threshold of the LOS range and, therefore, it took only a small amount of Project traffic to change the LOS when Project traffic was added to the Future Base conditions.

TABLE 15
EXISTING OPERATING CONDITIONS (YEAR 2019)
FREEWAY SEGMENT LEVEL OF SERVICE EVALUATION

ID	Freeway Segment	Peak Hour	Direction	Existing Conditions			Existing with Project Conditions			
				Speed [a][b]	**Density** [b][c]	**LOS**	**Speed** [a][b]	**Density** [b][c]	**LOS**	**Δ Density**
FS-1.	I-680 north of Crow Canyon Road	AM	NB	55.0	22.8	C	55.0	24.0	C	1.2
			SB	55.0	32.0	D	55.0	32.5	D	0.5
		PM	NB	55.0	30.9	D	55.0	31.7	D	0.8
			SB	55.0	27.1	D	55.0	28.1	D	1
FS-2.	I-680 between Crow Canyon Road & Bollinger Canyon Road	AM	NB	55.0	22.2	C	55.0	22.8	C	0.6
			SB	55.0	32.2	D	55.0	32.4	D	0.2
		PM	NB	55.0	28.2	D	55.0	28.6	D	0.4
			SB	55.0	26.7	D	55.0	27.2	D	0.5
FS-3.	I-680 south of Bollinger Canyon Road	AM	NB	55.0	28.4	D	55.0	29.1	D	0.7
			SB	54.1	36.8	E	52.8	39.8	E	3
		PM	NB	54.9	33.8	D	54.4	36.1	E	2.3
			SB	55.0	31.1	D	55.0	32.4	D	1.3

Notes

[a] Mean speed measured in miles per hour (mph).
[b] Methodology from *Highway Capacity Manual, 6th Edition, A Guide for Multimodal Mobility Analysis* (Transportation Research Board, 2016).
[c] Measured in vehicles per mile per lane (v/m/l) for freeways with a free-flow speed of 55 mph. Free-flow speed, as defined in HCM 6th Edition, is the theoretical speed when the density and flow rate of the freeway mainline segment are both zero.

TABLE 16
FUTURE OPERATING CONDITIONS (YEAR 2040)
FREEWAY SEGMENT LEVEL OF SERVICE EVALUATION

ID	Freeway Segment	Peak Hour	Direction	Future without Project Conditions			Future with Project Conditions			
				Speed [a][b]	**Density** [b][c]	**LOS**	**Speed** [a][b]	**Density** [b][c]	**LOS**	**Δ Density**
FS-1.	I-680 north of Crow Canyon Road	AM	NB	55.0	26.6	D	55.0	27.7	D	1.1
			SB	55.0	32.0	D	55.0	32.4	D	0.4
		PM	NB	54.6	35.4	E	54.2	36.4	E	1.0
			SB	55.0	31.8	D	55.0	32.8	D	1
FS-2.	I-680 between Crow Canyon Road & Bollinger Canyon Road	AM	NB	55.0	25.8	C	55.0	26.4	D	0.6
			SB	55.0	31.9	D	55.0	32.1	D	0.2
		PM	NB	55.0	31.1	D	55.0	31.5	D	0.4
			SB	55.0	31.2	D	55.0	31.7	D	0.5
FS-3.	I-680 south of Bollinger Canyon Road	AM	NB	55.0	31.7	D	55.0	32.5	D	0.8
			SB	54.3	36.3	E	53.1	39.2	E	2.9
		PM	NB	54.8	34.6	D	54.0	37.1	E	2.5
			SB	54.8	34.6	D	54.3	36.2	E	1.6

Notes

[a] Mean speed measured in miles per hour (mph).
[b] Methodology from *Highway Capacity Manual, 6th Edition, A Guide for Multimodal Mobility Analysis* (Transportation Research Board, 2016).
[c] Measured in vehicles per mile per lane (v/m/l) for freeways with a free-flow speed of 55 mph. Free-flow speed, as defined in HCM 6th Edition, is the theoretical speed when the density and flow rate of the freeway mainline segment are both zero.

INTERSECTION OPERATIONS

As described in Chapter 2, a total of 31 study intersections located in the City were analyzed as part of this study according to the significance thresholds established by the lead agency (the City). As shown in Table 12, this Caltrans analysis focused on the four signalized freeway ramp locations associated with the I-680 interchanges at Crow Canyon Road and Bollinger Canyon Road. The operations of all four intersections are shared between Caltrans and the City.

Overview

Caltrans does not have specific criteria to determine the significance of incremental changes in intersection operations. Therefore, the significance of the traffic-related impacts on Caltrans facilities is identified by the analyses based on the lead agency's significance thresholds, which is presented in Chapters 1 through 7 of this study.

The intersections under Caltrans jurisdiction, listed in Table 12, were analyzed using the HCM methodology and implemented using the Synchro software in the same manner as the analysis presented in Chapters 1 through 6 of this study. Table 17 summarizes the LOS definitions for signalized intersections.

Intersection Analysis

The analysis of Year 2019 conditions was conducted using the traffic volumes for Year 2019 utilized for the Existing Conditions analysis presented in Chapter 2. Table 18 summarizes the results of the signalized HCM analysis for Existing Conditions and Existing with Project Conditions for Year 2019. As shown, all intersections operate at LOS D or better during both the analyzed peak hours under Existing Conditions and Existing with Project Conditions.

The Year 2040 traffic volumes were developed based on the CCTA Model outputs in the same manner as future traffic volumes were developed for Year 2040 in Chapter 3 of this study.

TABLE 17
CALTRANS INTERSECTION LEVEL OF SERVICE DEFINITIONS

Level of Service	Description	Delay [a] Signalized Intersections
A	EXCELLENT. No vehicle waits longer than one red light and no approach phase is fully used.	≤ 10
B	VERY GOOD. An occasional approach phase is fully utilized; many drivers begin to feel somewhat restricted within groups of vehicles.	> 10 and ≤ 20
C	GOOD. Occasionally drivers may have to wait through more than one red light; backups may develop behind turning vehicles.	> 20 and ≤ 35
D	FAIR. Delays may be substantial during portions of the rush hours, but enough lower volume periods occur to permit clearing of developing lines, preventing excessive backups.	> 35 and ≤ 55
E	POOR. Represents the most vehicles intersection approaches can accommodate; may be long lines of waiting vehicles through several signal cycles.	> 55 and ≤ 80
F	FAILURE. Backups from nearby locations or on cross streets may restrict or prevent movement of vehicles out of the intersection approaches. Tremendous delays with continuously increasing queue lengths.	> 80

Notes

Source: *Highway Capacity Manual, 6th Edition, A Guide for Multimodal Mobility Analysis* (Transportation Research Board, 2016).

[a] Measured in seconds.

TABLE 18
EXISTING WITH PROJECT CONDITIONS (YEAR 2019)
SIGNALIZED INTERSECTION PEAK HOUR LEVELS OF SERVICE

No.	Intersection	Peak Hour	Existing Conditions		Existing with Project Conditions		
			Delay	LOS	Delay	LOS	Δ Delay
S-1.	I-680 Southbound Ramps & Crow Canyon Road (Intersection #3)	A.M. P.M.	20.3 15.9	C B	20.2 16.2	C B	-0.1 0.3
S-2.	I-680 Northbound Ramps & Crow Canyon Road (Intersection #4)	A.M. P.M.	16.2 14.2	B B	16.0 13.9	B B	-0.2 -0.3
S-3.	I-680 Southbound Ramps & Bollinger Canyon Road (Intersection #20)	A.M. P.M.	29.9 23.3	C C	29.2 28.3	C C	-0.7 5.0
S-4.	I-680 Northbound Ramps & Bollinger Canyon Road (Intersection #21)	A.M. P.M.	17.7 29.5	B C	19.6 53.6	B D	1.9 24.1

Delay is measured in seconds per vehicle

LOS = Level of service

Results per Synchro 10 (HCM 6th Edition methodology).

Table 19 summarizes the results of the signalized HCM analysis for Future without Project Conditions and Future with Project Conditions for Year 2040. As shown, all intersections operate at LOS D or better during both the analyzed peak hours under Future without and with Project Conditions.

OFF-RAMP QUEUES

Four off-ramps from I-680 were analyzed to determine whether the lengths of the ramps were sufficient to accommodate vehicle queue lengths. The queue lengths were estimated using Synchro, which reports the 95^{th} percentile queue length for each approach lane on the off-ramp. Synchro queue results are expressed in feet and converted to the number of vehicles. These vehicle lengths were converted to storage length in feet by multiplying each vehicle by 25 feet to account for the length of the vehicle plus a distance between vehicles in the queue.

The assessment of the off-ramps includes a review of the vehicle queue length as compared to the total available queuing capacity of the ramp to determine whether the vehicle queue would extend beyond the length of the ramp onto the mainline. To this end, the queuing analysis looked at two separate components of ramp capacity: the first is the length of each approach lane to the intersection, and the remaining length of the ramp, behind any approach lane delineation lines, to the gore point where the ramp diverges from the freeway mainline. The queue may exceed the striped length of a given approach lane, as long as there is sufficient additional queuing capacity on the ramp, it will not spill over onto the mainline.

Off-Ramp Queue Analysis

The analysis of Year 2019 conditions was conducted using available traffic count data utilized for the Existing Conditions analysis presented in Chapter 2. Table 20 summarizes the results of the queuing analysis for Existing Conditions and Existing with Project Conditions for Year 2019. The queues at all four off-ramps do not extend beyond the available storage capacity under Existing Conditions, regardless of Project traffic additions.

TABLE 19

FUTURE WITH PROJECT CONDITIONS (YEAR 2040)

SIGNALIZED INTERSECTION PEAK HOUR LEVELS OF SERVICE

No.	Intersection	Peak Hour	Future without Project Conditions		Future with Project Conditions		
			Delay	LOS	Delay	LOS	Δ Delay
S-1.	I-680 Southbound Ramps & Crow Canyon Road (Intersection #3)	A.M. P.M.	21.1 15.8	C B	21.3 15.8	C B	0.2 0.0
S-2.	I-680 Northbound Ramps & Crow Canyon Road (Intersection #4)	A.M. P.M.	16.4 14.9	B B	16.3 14.8	B B	-0.1 -0.1
S-3.	I-680 Southbound Ramps & Bollinger Canyon Road (Intersection #20)	A.M. P.M.	24.2 29.0	C C	25.0 52.3	C D	0.8 23.3
S-4.	I-680 Northbound Ramps & Bollinger Canyon Road (Intersection #21)	A.M. P.M.	32.1 29.1	C C	34.0 26.9	C C	1.9 -2.2

Delay is measured in seconds per vehicle

LOS = Level of service

Results per Synchro 10 (HCM 6th Edition methodology).

Intersection S-4 assumes that the continuous green improvement is implemented under both scenarios above.

TABLE 20
FREEWAY OFF-RAMP QUEUE EVALUATION
EXISTING OPERATING CONDITIONS (YEAR 2019)

ID	Freeway Off-ramp	Ramp and Lane Description	Vehicle Storage Capacity [a]	Existing Conditions		Existing with Project Conditions	
				AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
				Vehicle Queue Length [b]	Vehicle Queue Length [b]	Vehicle Queue Length [b]	Vehicle Queue Length [b]
Q-1.	I-680 Southbound Ramps &	I-680 Southbound Off-Ramp					
	Crow Canyon Road	Left (two 740-ft lanes and one 660-ft lane on ramp)	2,140	1,236	716	1,240	740
	(Intersection #3)	Right (two 570-ft lanes and one 830-ft lane on ramp)	1,970	1,060	1,070	1,096	1,166
Q-2.	I-680 Northbound Ramps &	I-680 Northbound Off-Ramp					
	Crow Canyon Road	Left (one 565-ft lane and one 760-ft lane on ramp)	1,325	508	510	510	510
	(Intersection #4)	Right (one 590-ft shared left/right lane, one 590-ft exclusive right lane, and one 760-ft lane on ramp)	1,940	1,076	1,060	1,076	1,060
Q-3.	I-680 Southbound Ramps &	I-680 Southbound Off-Ramp					
	Bollinger Canyon Road	Left (one 455-ft exclusive left lane, one 470-ft shared left-through lane, and one 855-ft lane on ramp)	1,780	1,296	1,150	1,390	1,370
	(Intersection #20)	Right (two 225-lanes and one 855-ft lane on ramp	1,305	376	480	370	470
Q-4.	I-680 Northbound Ramps &	I-680 Northbound Off-Ramp					
	Bollinger Canyon Road	Left (one 525-ft lane and one 785-ft lane on ramp)	1,310	450	733	433	643
	(Intersection #21)	Right (two 525-ft lanes, one 300-ft lane, and one 785-ft lane on ramp)	2,135	1,965	1,470	2,124	2,010

[a] Expressed in feet.
[b] 95th Percentile queue results per Synchro 10 (HCM 6th Edition Methodology). Synchro queue results expressed in number of vehicles and were converted to feet; vehicle length is assumed to be 25 feet.

The Year 2040 traffic volumes were developed based on the CCTA Model outputs in the same manner as future traffic volumes were developed for Year 2040 in Chapter 3 of this study. Table 21 summarizes the results of the queuing analysis for Future without Project Conditions and Future with Project Conditions for Year 2040. The queues at all four off-ramps do not extend beyond the available storage capacity under Future Conditions, regardless of Project traffic additions.

TABLE 21
FREEWAY OFF-RAMP QUEUE EVALUATION
FUTURE OPERATING CONDITIONS (YEAR 2040)

ID	Freeway Off-ramp	Ramp and Lane Description	Vehicle Storage Capacity [a]	Future without Project Conditions		Future with Project Conditions	
				AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
				Vehicle Queue Length [b]	Vehicle Queue Length [b]	Vehicle Queue Length [b]	Vehicle Queue Length [b]
Q-1.	I-680 Southbound Ramps &	I-680 Southbound Off-Ramp					
	Crow Canyon Road	Left (two 740-ft lanes and one 660-ft lane on ramp)	2,140	1,346	750	1,350	776
	(Intersection #3)	Right (two 570-ft lanes and one 830-ft lane on ramp)	1,970	1,130	1,120	1,166	1,210
Q-2.	I-680 Northbound Ramps &	I-680 Northbound Off-Ramp					
	Crow Canyon Road	Left (one 565-ft lane and one 760-ft lane on ramp)	1,325	580	573	580	575
	(Intersection #4)	Right (one 590-ft shared left/right lane, one 590-ft exclusive right lane, and one 760-ft lane on ramp)	1,940	1,236	1,200	1,236	1,210
Q-3.	I-680 Southbound Ramps &	I-680 Southbound Off-Ramp					
	Bollinger Canyon Road	Left (one 455-ft exclusive left lane, one 470-ft shared left-through lane, and one 855-ft lane on ramp)	1,780	1,456	1,300	1,516	1,440
	(Intersection #20)	Right (two 225-lanes and one 855-ft lane on ramp	1,305	416	586	406	560
Q-4.	I-680 Northbound Ramps &	I-680 Northbound Off-Ramp					
	Bollinger Canyon Road	Left (one 525-ft lane and one 785-ft lane on ramp)	1,310	460	728	438	655
	(Intersection #21)	Right (two 525-ft lanes, one 300-ft lane, and one 785-ft lane on ramp)	2,135	1,959	1,419	2,094	1,959

[a] Expressed in feet.
[b] 95th Percentile queue results per Synchro 10 (HCM 6th Edition Methodology). Synchro queue results expressed in number of vehicles and were converted to feet; vehicle length is assumed to be 25 feet.

Chapter 8

Site Access and Internal Circulation

This chapter summarizes the site access and internal circulation of the Project Site.

VEHICULAR ACCESS AND CIRCULATION

Vehicular access to the Project Site would be maintained at some existing driveways as well as provided at new driveways. The driveways would provide access to the existing on-site parking garages and to the new parking structures serving the existing office uses as well as subterranean parking levels serving the residential and retail/commercial uses. The vehicular access and circulation plan for the Project is shown in Figure 8 and summarized below:

- Vehicular access to BR 2600 NW would be provided via one existing driveway along Bishop Drive and three new driveways along Executive Parkway. All driveways to BR 2600 NW would provide full access. In addition, a new driveway for emergency vehicle access only would be provided along the south boundary of the site from Bishop Drive.

- Vehicular access to BR 2600 NE would be provided via two new driveways along Executive Parkway and one new and one existing driveway along Camino Ramon. All driveways to BR2600 NE, with the exception of the new driveway along Camino Ramon, would provide full access. The new driveway along Camino Ramon would provide limited, right-turn in/out access only.

- Vehicular access to BR 2600 SE would be provided via one existing signalized driveway and one new driveway along Camino Ramon and one existing signalized driveway at the intersection of Sunset Drive & Bishop Drive. All driveways to BR2600 SE, with the exception of the new driveway along Camino Ramon, would provide full access. The new driveway along Camino Ramon would provide limited, right-turn in/out access only.

- Vehicular access to BR 3A would be provided via one existing signalized driveway at the intersection of Camino Ramon & Bishop Drive, one new driveway along Camino Ramon, and one existing signalized driveway at the intersection of BR 1E & Bollinger Canyon Road. All driveways to BR 3A, with the exception of the new driveway along Camino Ramon, would provide full access. The new driveway along Camino Ramon would provide limited, right-turn in/out access only.

- Vehicular access to BR 1A would be provided via existing signalized driveways at the intersection of Camino Ramon/Bishop Ranch 1 & Bollinger Canyon Road and BR 1E & Bollinger Canyon Road. All driveways to BR 1A would provide full access with the exception of BR 1E, which would not allow westbound inbound left turns after the construction of the Iron Horse Trail overcrossing.

QUEUING ANALYSIS

Table 22 shows the projected volumes at each Project driveway after completion of the entire Project, including the traffic generated by the existing office uses in the Bishop Ranch campus.

Queuing measures storage capacity by movement at intersections. The purpose of a queuing analysis is to identify turning movements that may not provide sufficient storage capacity at peak-hour conditions and determine whether the left turn should be lengthened or an additional left-turn should be added. It should be noted that many of the existing left-turn lanes have been extended to the maximum allowed per the existing geometry and additional right-of-way would be required to add a second left-turn lane.

Table 23 provides the results of the left-turn queuing analysis at the following driveways and intersections adjacent to the Project:

TABLE 22
PROJECT DRIVEWAY INGRESS/EGRESS VOLUMES

Project Driveways			Weekday Morning Peak Hour												Weekday Afternoon Peak Hour											
Access	**N/S Street**	**E/W Street**	**SBR**	**SBT**	**SBL**	**WBR**	**WBT**	**WBL**	**NBR**	**NBT**	**NBL**	**EBR**	**EBT**	**EBL**	**SBR**	**SBT**	**SBL**	**WBR**	**WBT**	**WBL**	**NBR**	**NBT**	**NBL**	**EBR**	**EBT**	**EBL**
Full	Bishop Drive	BR 2600 NW Dwy			10	9		126	125								29	5		150	142					
Full	BR 2600 NW Dwy 1	Executive Parkway						7	64		15	8								20	40		9	23		
Full	BR 2600 NW Dwy 2	Executive Parkway						145	97		51	246								71	194		224	88		
Full	BR 2600 NW Dwy 3	Executive Parkway		0				194	38	1	36	259				1				37	235	1	222	50		
Full	BR 2600 NE Dwy 1	Executive Parkway						186	31		14	115								36	189		85	25		
Full	BR 2600 NE Dwy 2	Executive Parkway		0				48	61	1	26	26				3				136	41	1	16	69		
Right In/Out	Camino Ramon	BR 2600 NE Dwy 1	130									178			54								0	244		
Full	Camino Ramon	BR 2600 NE Dwy 2	21				0				27	12	1	11	19				0				7	27	0	21
Right In/Out	Camino Ramon	BR 2600 SE Dwy	7									98			16									50		
Right In/Out	Camino Ramon	BR 3A Dwy				44			34									68			82					
Right In/Out	Bishop Ranch 1	BR 1A Dwy W				87			0									55			0					
Full	Camino Ramon	BR 2700 / BR 3 Dwy	272				1				275	36	0	71	92				5				169	231	3	311
Full	Sunset Drive	Bishop Drive	11	33	6	42				271				45	24	255	48	7				96				10
Full	Camino Ramon	Bishop Drive			25	8	12	16	115				17				68	31	28	162	36				26	
Full	Bishop Ranch 1 East	Bollinger Canyon Road	126	1	30	25				2				30	99	14	188	65				8				68

TABLE 23
INTERSECTION QUEUE ANALYSIS

No.	Intersection	Movement	Queue Storage Measured (feet)	Future without Project Conditions (Year 2040)		Future with Project with Mitigation Conditions (Year 2040)			
				AM Peak Hour	PM Peak Hour	AM Peak Hour		PM Peak Hour	
				95th Queue Length (ft)	95th Queue Length (ft)	LOS	95th Queue Length (ft)	LOS	95th Queue Length (ft)
11.	Bishop Drive/Annabel Lane &	SBLT	320	45	50	D	68	D	65
[a]	Norris Canyon Road	WBL	110	**233**	**165**		**248**		**143**
		NBLTR [a]	1500	35	1033		165		468
		EBL	200	65	100		108		98
12.	Camino Ramon &	SBL	235	185	**558**	D	200	F	**478**
	Norris Canyon Road	WBL	190	155	160		168		163
		NBL	180	175	**520**		**218**		**473**
		EBL	180	150	**360**		163		**315**
14.	Bishop Drive &	SBLT	1500	18	0	B	23	D	10
	Executive Parkway	WBLR	2225	10	50		20		113
15.	Camino Ramon &	SBL	160	140	110	C	155	C	115
[b]	Executive Parkway	WBLT	380	43	98		48		163
		NBL	200	113	143		158		183
		EBL [b]	150	165	58		68		105
16.	Sunset Drive &	SBLT	275	8	58	E	15	D	90
	Bishop Drive	WBL	175	150	**235**		165		178
		NBLT	240	123	33		165		115
		EBL	215	203	25		188		50
17.	Camino Ramon &	SBL	180	65	5	D	133	D	128
	Bishop Drive	WBL	200	5	**345**		13		213
		NBL	325	128	**383**		163		313
		EBL	135	100	**215**		128		135
18.	Sunset Drive &	SBL	105	125	**145**	E	125	D	**138**
	Shops at Bishop Ranch/City Center	WBL	100	23	28		15		30
		NBL	195	70	200		75		**238**
		EBLT	95	20	38		23		43
22.	Sunset Drive &	SBL	195	120	168	D	125	D	213
	Bollinger Canyon Road	SBLT	390	140	168		148		213
		WBL	370	118	3		108		5
		NBL	500	55	388		55		388
		NBLT	500	55	388		55		388
		EBL	770	788	405		**850**		580
23.	Camino Ramon &	SBL	535	108	558	C	165	C	**588**
	Bollinger Canyon Road	WBL	230	113	20		118		30
		NBL	450	75	**593**		223		**498**
		EBL	515	465	93		**570**		280
24.	Bishop Ranch 1 East &	SBL [d]	400	--	--	B	118	B	398
[c]	Bollinger Canyon Road	WBL [c]	165	--	--		--		--
[d]		NBL	320	8	65		123		310
		EBL	220	--	--		**260**		**255**
###	Denotes a queue length greater than 25 feet more than available storage			1	10		5		9
###	Denotes an increase of more than 25 feet over Future Without Project Conditions			NA	NA		4		3

Notes

[a] This intersection would be restriped to provide an exclusive northbound left-turn lane and a shared left/through/right-turn lane as part of the Project mitigation program.

[b] This intersection would be improved to include an exclusive eastbound left-turn lane as part of the Project.

[c] This intersection would prohibit WBL in the future due to the installation of the pedestrian bridge overpass and the placement of the bridge column support.

[d] This intersection would be improved to include all four approach legs, including BR 3A driveway as the southbound approach.

11. Bishop Drive/Annabel Lane & Norris Canyon Road
12. Camino Ramon & Norris Canyon Road
14. Bishop Drive & Executive Parkway (unsignalized)
15. Camino Ramon & Executive Parkway
16. Sunset Drive & Bishop Drive
17. Camino Ramon & Bishop Drive
18. Sunset Drive & Shops at Bishop Ranch/City Center
22. Sunset Drive & Bollinger Canyon Road
23. Camino Ramon & Bollinger Canyon Road
24. Bishop Ranch 1 East & Bollinger Canyon Road

Table 23 shows the worst-case peak hour left-turn queuing analysis results for Year 2040 Future without Project and Future with Project conditions. The table shows:

- Queue Storage Measured or the total queue length capacity for the current or proposed storage at each left-turn lane (or left-turn/through lane if a separate left-turn lane is not provided) based on existing or proposed improvements.

  The queue length capacity is assumed to be the striped left-turn lane area plus the potential for one car to be shadowed in the taper area of the turn lane (two cars in the taper area for dual left-turn lanes).

- 95^{th} Percentile Queue Length, which provides the results of a Synchro analysis for the peak hour conditions that measures the probability that a queue length will reach a certain length.

  In this case, the Synchro analysis identifies the maximum queue length for each left-turn lane that would not be exceeded 95% of the time. In other words, the queue would exceed the values in Table 23 only 5% of the time.

  To explain the concept of the 95^{th} percentile, if the signal cycle length is 120 seconds (typical in the Study Area), that means there would be 30 cycles during the peak hour. If one observed 100 cycles and 95 of them had queues equal or less than the 95^{th} percentile length shown in the table, only five cycles in 100 cycles would exceed the queue length shown in the table. With 30 signal cycles per hour, there would be five cycles every 3.3 hours that exceeded the calculated queue – or about one to two cycles during the peak hour of any given day.

In some cases, the addition of Project traffic resulted in shorter queues than conditions without the Project. This occurred because the Project added internal streets which gave Study Area traffic more choices after the completion of the Project than they had under Future without Project conditions. Intersection 17 (Camino Ramon & Bishop Drive), for example, showed a shorter westbound left-turn queue in the afternoon peak hour because the development parcel BR3A added an internal street system that allowed the BR3 office traffic to reach Bollinger Canyon Road without using the westbound left-turn lane at the Camino Ramon & Bishop Drive intersection.

Queuing Assumptions

The Synchro worksheets show the left-turn queues in feet and convert them to the number of vehicles in the queue (to the tenth of a car). These vehicle lengths were converted to storage length requirements in feet by multiplying each vehicle by 25 feet to account for the length of the vehicle plus a distance between vehicles in the queue.

Queuing Results

The queuing analysis shown in Table 23 indicates that 10 left-turn movements would experience queuing overflow of one or more vehicles under Future without Project conditions. Under Future with Project conditions, seven intersections would exceed the storage capacity.

As shown in Table 23, the Future with Project intersections where the Project adds one vehicle or more to the left-turn queue exceedance (when compared to Future without Project Conditions) are projected to operate at LOS D or better during the peak hours. This means that there is flexibility in the signal timing such that additional time added to the left-turn phases could alleviate the incremental Project queuing impact. The intersections where the exceedances occur should be monitored and the signal timing adjusted if the left-turn queues become an operational problem.

PEDESTRIAN ACCESS AND CIRCULATION

As shown in Figure 9, pedestrian access to the Project Site would be provided via the sidewalks along Camino Ramon, Bishop Drive, and Executive Parkway, as well as a pedestrian-only access along pathways within the Project Site. The Project would minimize pedestrian and automobile traffic conflicts by utilizing controlled crosswalks at the signalized intersections. Pedestrian circulation internal to the Project Site would be provided via sidewalks and off-street pedestrian pathways. Pedestrian crossings across local streets internal to the site would be focused on intersections where marked crosswalks would be provided subject to City review and approval.

One controlled mid-block crosswalk is proposed as part of the Master Plan. There is an existing controlled mid-block crosswalk connection from the City Center shopping center to BR2600 SE across Bishop Drive east of Sunset Drive, which is controlled by a HAWK signal. The proposed mid-block crosswalk would cross Executive Parkway east of Bishop Drive. The intent of this HAWK-controlled crosswalk would be to connect the BR2600 office and residential development to the commercial development to the north and to connect the north development to the proposed mobility hub on Executive Parkway.

The Project will enhance the existing pedestrian network with new parkways, park paths, and internal sidewalks serving the project. None of the proposed improvements will conflict with or preclude the implementation of the City’s pedestrian network.

BICYCLE ACCESS AND CIRCULATION

As shown in Figure 10, the Project seeks to implement and even supplement the City Bicycle Plan adjacent to and within the Project blocks so that visitors and employees arriving by bicycle would have a continuous access system similar to that provided to pedestrians and vehicles. In order to encourage and facilitate bicycle use, the Project would provide code-required bicycle parking spaces on all of the Project blocks.

The Project will enhance the bicycle network with separated bike paths and Class III bike routes. None of the proposed improvements will conflict with or preclude the implementation of the City's Bicycle Master Plan, as provided in Appendix L.

Chapter 9

Summary and Conclusions

This study was undertaken to analyze the potential transportation impacts of the Project on the local street system. The following summarizes the results of this analysis:

- The Project proposes to construct a mixed-use development in the urban core of the City to complement the existing uses on site. The Project would be developed within five sites: BR 2600 NW, BR 2600 NE, BR 2600 SE, BR 3A, and BR 1A. In total, the Project would construct up to 4,500 multi-family residential units, 169 hotel rooms, and up to 166,600 sf of retail/restaurant uses. The Project Site is currently occupied with approximately 1,921,000 sf of office uses within BR 2600 NW, BR 2600 NE, and BR 2600 SE. BR 3A and BR1A are currently vacant lots.

- The five sub-sites of the Project are projected to be developed over a 20- to 25-year time period. For purposes of being consistent with the longest future forecasts available in the CCTA Model, the conditions in this analysis assume that the full buildout of the Project would take place by Year 2040.

- Vehicular access to the Project Site would be provided via existing and proposed driveways along Bishop Drive, Executive Parkway, Camino Ramon, and Bollinger Canyon Road.

- A detailed transportation impact analysis was conducted at a total of 31 study intersections. 30 of the 31 study intersections currently operate at LOS D or better during both the morning and afternoon peak hours under Existing Conditions (Year 2019). The remaining intersection of Alcosta Boulevard & Bollinger Canyon Road currently operates at LOS D during the morning peak hour and LOS E during the afternoon peak hour.

- Under Future without Project Conditions (Year 2040), 27 of the 31 study intersections are anticipated to operate at LOS D or better during both the morning and afternoon peak hours. The remaining four intersections are anticipated to operate at LOS E or F during at least one of the analyzed peak hours.

- As part of the Project, the intersections of Camino Ramon & Executive Parkway (Intersection #15) and Bishop Ranch 1E & Bollinger Canyon Road (Intersection #24) would be improved to provide additional roadway capacity. Intersection improvements would also include upgrades to pedestrian and bicycle facilities directly located at the two intersections.

- In an effort to further align with the multimodal transportation and environmental action goals outlined in SB 743, the Project proposes a multitude of Project design features to encourage non-auto modes of transportation. The Project design features include roadway segment improvements along Executive Parkway, Camino Ramon and Bishop Drive, pedestrian and bicycle improvements along the Project perimeter roads to enhance connectivity, and three new mobility hubs within the Bishop Ranch campus. Furthermore, the Project would expand on its existing comprehensive TDM Program for the Bishop Ranch Business Park to support the additional amenities.

- The Project is anticipated to generate a total of approximately 24,912 new daily trips, including 1,457 new morning peak hour trips and 1,829 new afternoon peak hour trips.

- Under Existing with Project Conditions, there would be a significant impact at three of the 31 study intersections. Two of the three study intersections would be temporary impacts until an already anticipated improvement is implemented. The significant impact at the remaining location would be mitigated through a combination of an anticipated improvement and Project mitigation that would be implemented according to the development phasing of the Project.

- Analysis of anticipated Future with Project Conditions (Year 2040) indicates that the Project is anticipated to have a significant impact at three of the 31 study intersections, each during the afternoon peak hour, based on the City significance criteria.

- The mitigation program includes implementation of intersection signal and physical improvements:

    - The intersection of Bishop Drive/Annabel Lane & Crow Canyon Road (Intersection #11) would be restriped along the northbound approach to provide one exclusive northbound left-turn lane and one shared left-turn/through/right-turn lane. In addition, the signal operations would be modified to provide split signal phasing for the northbound and southbound approaches.
    - The intersection of Camino Ramon & Norris Canyon Road (Intersection #12) would be widened to provide an exclusive westbound right turn lane. This widening would require the Applicant to dedicate additional right-of-way at the intersection.
    - Alcosta Boulevard & Bollinger Canyon Road (Intersection #26) would have its signal operations modified to include a northbound right-turn overlap phase with the westbound protected left-turn phase.

  With implementation of the mitigation program, the impacts at the three study intersections would be reduced to less than significant levels. No significant impacts would remain under Future with Project with Mitigation Conditions.

- Supplemental analyses of Caltrans facilities and ramps were conducted and provided for informational purposes. According to the analysis the project will not create any queueing issues on any analyzed freeway ramp or intersection.

- The Project provides adequate parking and internal circulation to accommodate vehicular traffic without impeding through traffic movements on City streets.

- The Project represents an infill, mixed-use development in a transit priority area, which is the type of development consistent with the goals and objectives of Senate Bill 743. The Project will provide the opportunity for office employees to live in the new residential communities within Bishop Ranch and will also reduce vehicle trips by encouraging walking, public transit ridership and bicycle travel, thus resulting in corresponding reductions in VMT, air quality emissions and transportation-related GHG emissions.

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California Transportation Plan 2040, California Department of Transportation, June 2016.

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City of San Ramon General Plan 2035, City of San Ramon, Effective May 28, 2015.

Engineering Design, Grading and Procedures Manual: City of San Ramon, Public Works Department Engineering Services Division, April 2010.

Getting Trip Generation Right Eliminating the Bias Against Mixed Use Development, American Planning Association, May 2013.

Highway Capacity Manual, 6th Edition, Transportation Research Board, 2016.

Local Development - Intergovernmental Review (LD-IGR) Interim Guidance, California Department of Transportation, Approved September 2016.

National Cooperative Highway Research Program Report 684 – Enhancing Internal Trip Capture Estimation for Mixed-Use Developments, Transportation Research Board and National Research Council, 2011.

Recommended Refinements to Trip Generation Methodology, Nelson | Nygaard Consulting Associates, April 12, 2006

State of California Senate Bill No. 743, Steinberg, 2013.

TCRP Report 128 Effects of TOD on Housing, Parking, and Travel, Transportation Research Board of the National Academies, 2008.

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Traffic and Parking Study Shattuck & University Mixed Use Project, Abrams Associates Traffic Engineers, Inc., March 1, 2012.

Traffic Operations Evaluation for San Ramon City Center Project, DMJM Harris & AECOM, July 2007.

Trip Generation, 10th Edition, Institute of Transportation Engineers, 2017.

Trip Generation Handbook, 3rd Edition, Institute of Transportation Engineers, 2017.

Trip Generation Rates for Urban Infill Land Uses in California, Association of Bay Area Governments, April 24, 2008.

Appendix A

Scoping Form

Appendix H

San Ramon

DRAFT SCOPE FOR TRAFFIC IMPACT ANALYSIS

Date: 10/24/19
Application No.:
Project Name: Bishop Ranch Center City Mixed-Use Master Plan
Developer: Sunset Development
Project Description: See Figure 1 and Table 3
Traffic Consultant: Gibson Transportation Consulting, Inc.

Traffic Impact Analysis for the above listed project shall encompass the following scope, in accordance with the City of San Ramon's Traffic Study Guidelines:

General Information and Assumptions

1. Limits of the Study Area: See Figure 2 and Table 1

2. Assumed Year of Project Completion: 2040

3. Project Phasing (units/phase and years): None assumed in Traffic Study

4. Scenarios to be studied (check if applicable):

- ☑ Existing Conditions (Year: 2019) and Existing Plus Project
- ☐ Short-Term Conditions: existing + approved/pending projects
- ☐ Short-Term Plus Project: existing + approved/pending projects + project
- ☑ Cumulative 2040 Conditions
- ☑ Cumulative 2040 Plus Project

5. Approved and Pending Projects List: Not required

6. Programmed Transportation Improvements: See Figure A

7. Assumptions for trip generation, reductions, distribution, and any model land use changes must be submitted for pre-approval prior to the draft traffic study.

Data Requirements

8. Data Collection and Periods (check if applicable):

- ☑ Weekday AM peak hour turning movements
- ☐ Weekday midday peak hour turning movements
- ☑ Weekday PM peak hour turning movements
- ☐ Saturday mid-day peak hour turning movements
- ☐ Sunday mid-day peak hour turning movements
- ☐ Daily total traffic
- ☐ Radar speed survey- location:
- ☐ License plate survey – location:

- ☐ Pedestrian counts – location: ______________________
- ☐ Determine actual grade(s) – location: ______________________
- ☑ Other data collection: Year 2040 CCTA Model Runs

Intersections and Roadway Segments

9. Study Roadway Segments:

1	See Figure 2 for Study Intersections	11	
2		12	
3		13	
4		14	
5		15	
6		16	
7		17	
8		18	
9		19	
10		20	

Required Analysis Elements

10. Traffic Analysis (check if applicable):

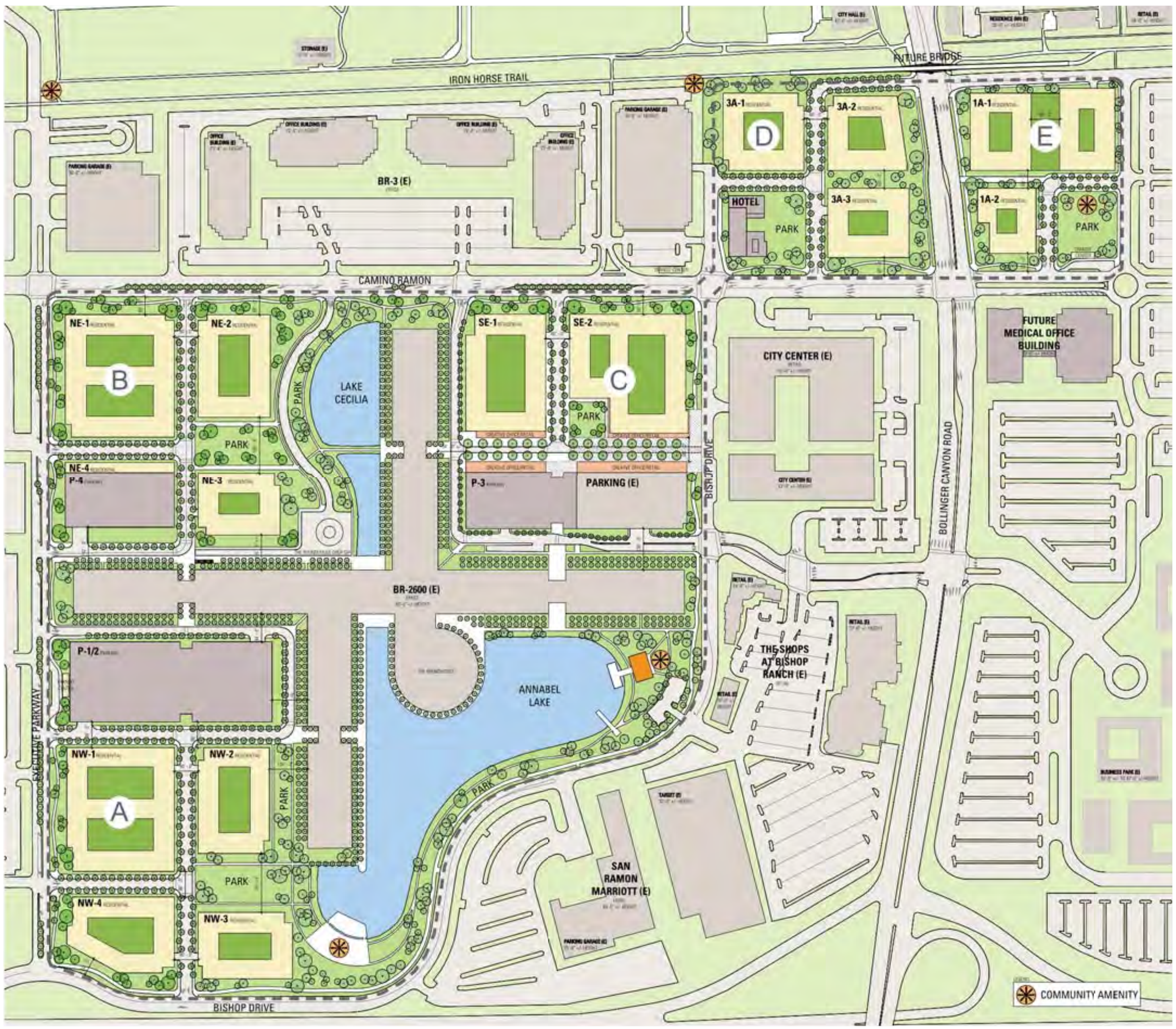
- ☑ Intersection level of service (LOS)
- ☑ Queue analysis
- ☑ Signal warrants
- ☐ Roadway segment analysis
- ☐ Coordinated corridor analysis
- ☐ Average and 85th percentile speeds
- ☐ Collision history and collision rate analysis
- ☑ Pedestrian and bicycle facilities
- ☑ Transit Services
- ☑ Project access analysis
- ☑ On-site parking and circulation
- ☐ On-Street Parking
- ☐ Drive-thru queuing analysis
- ☐ Traffic calming recommendations
- ☑ Freeway LOS
- ☐ Weaving section LOS
- ☐ Ramp merge and diverge LOS
- ☑ Project and mitigation phasing analysis
- ☐ Fair share calculation
- ☐ Cost estimates for mitigation
- ☐ Financing plan for improvements
- ☐ Other analysis:

SIGNED: Richard Gibson Date: 10/24/19
Applicant or Consultant

SIGNED: ______________________ Date: __________
City of San Ramon Representative

NEIGHBORHOODS

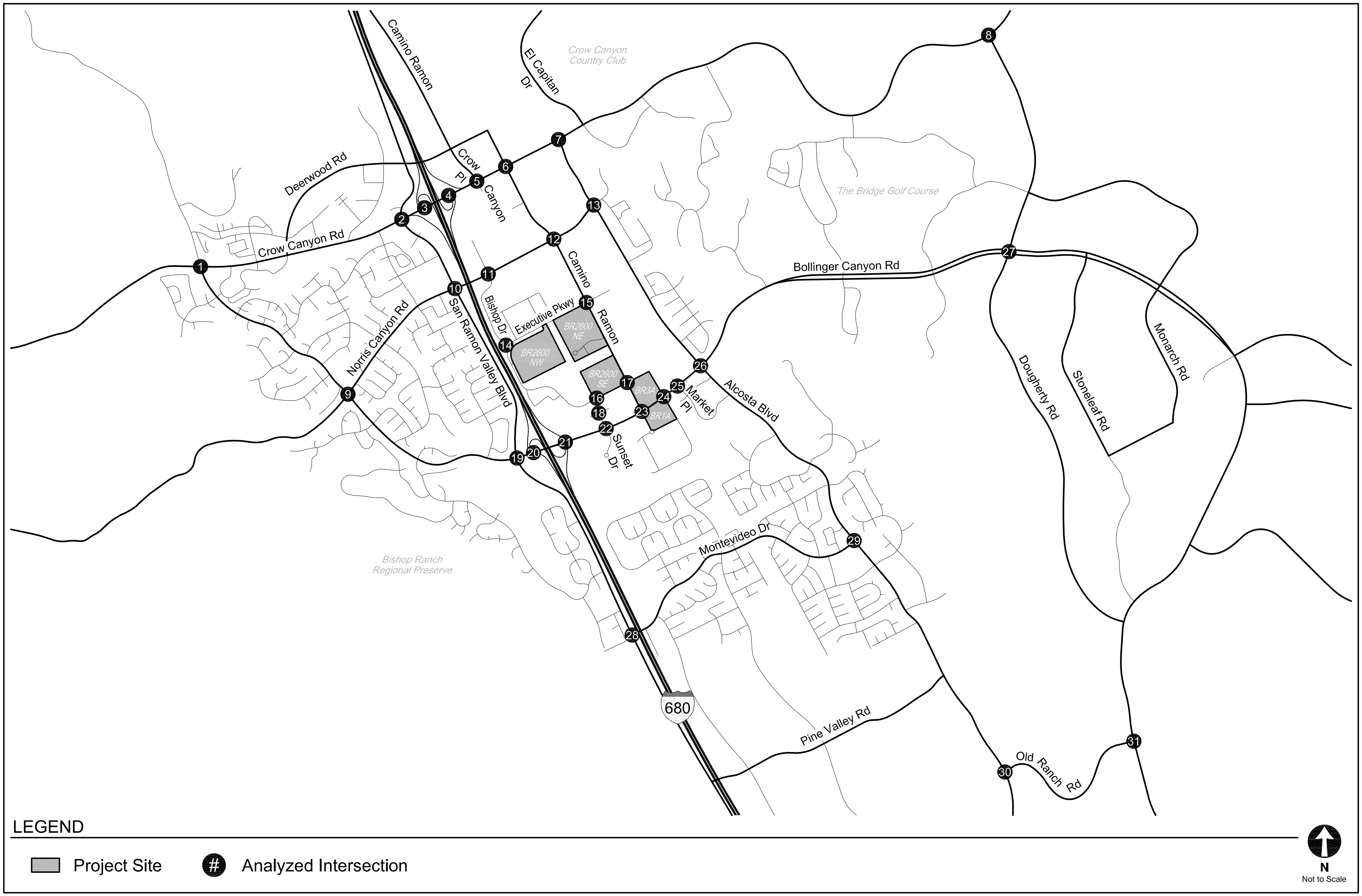
A	BR2600 NW
B	BR2600 NE
C	BR2600 SE
D	BR3A
E	BR1A



Source: Bishop Ranch. August, 2019.

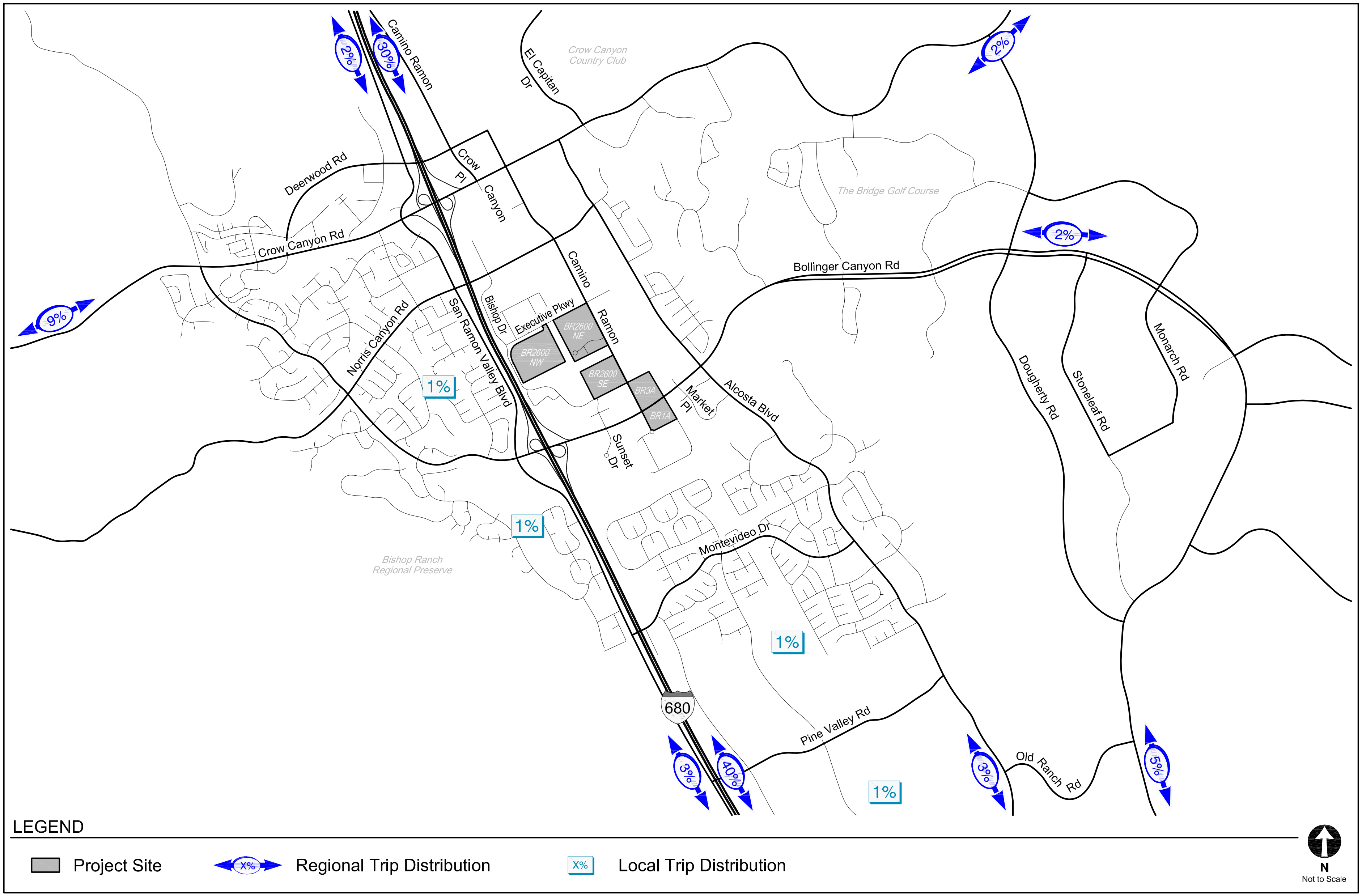
PROJECT SITE PLAN

FIGURE 1



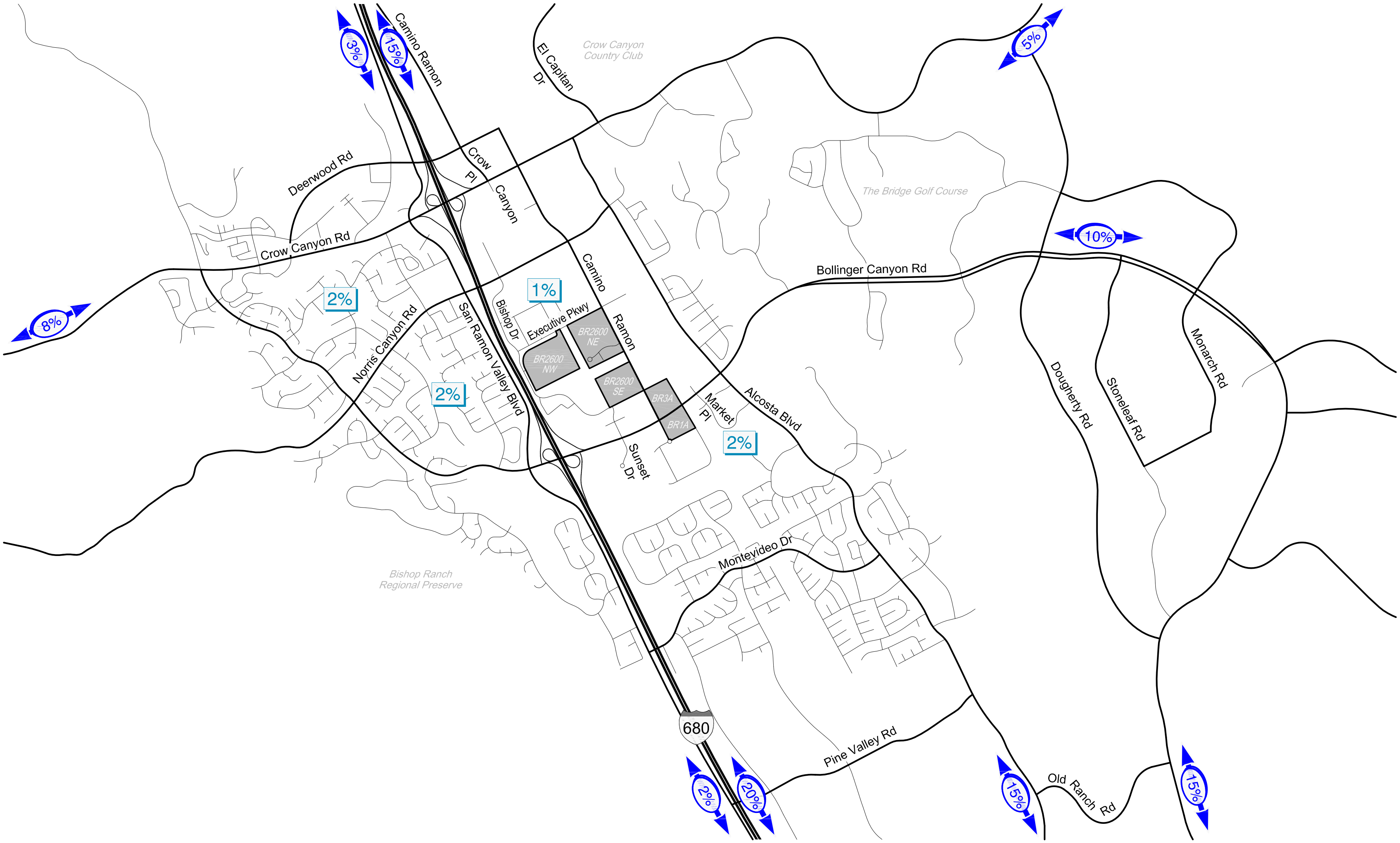
STUDY AREA & ANALYZED INTERSECTIONS

FIGURE 2



PROJECT TRIP DISTRIBUTION
RESIDENTIAL

FIGURE
3A

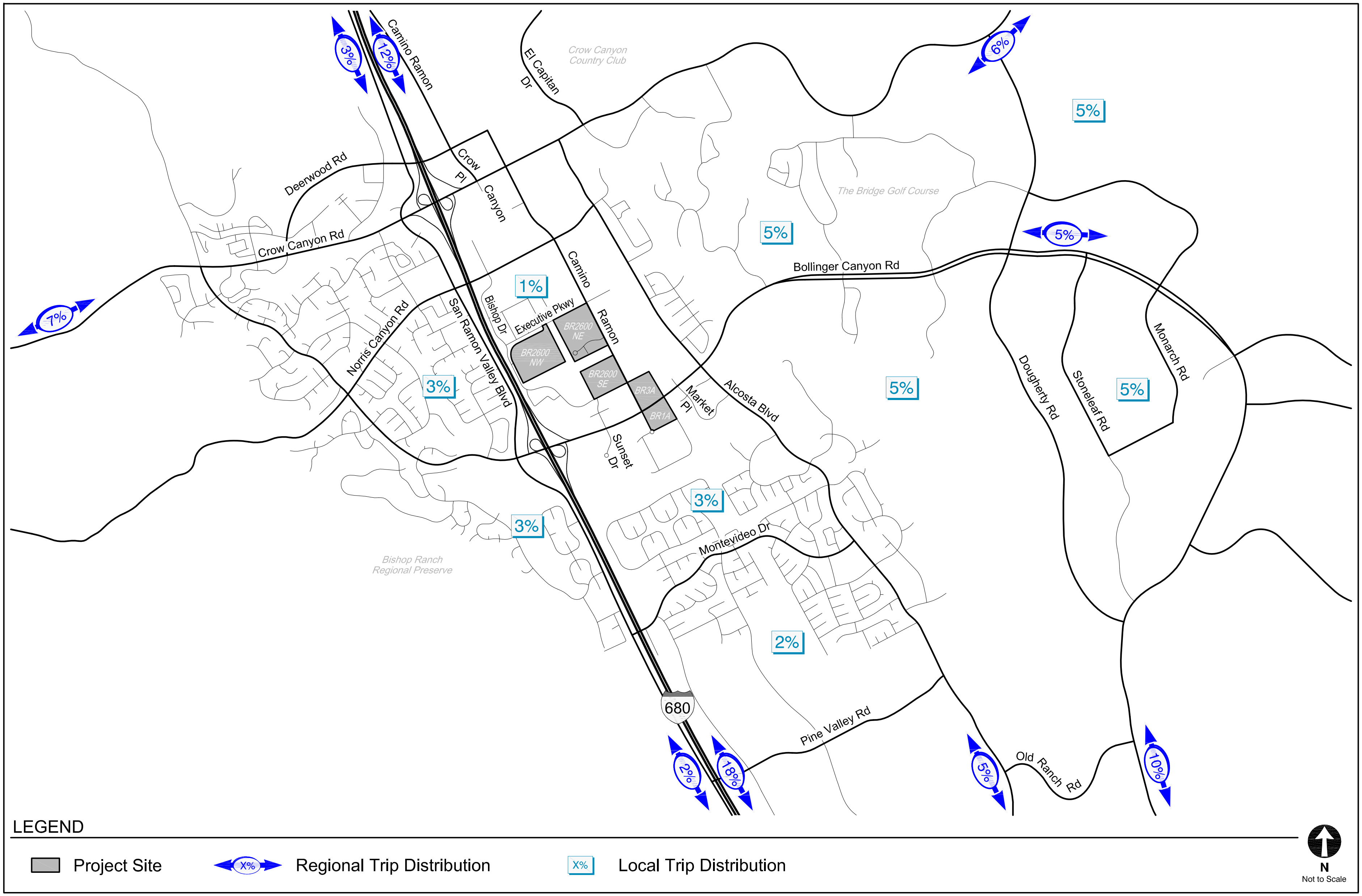


LEGEND

Project Site | Regional Trip Distribution | Local Trip Distribution

PROJECT TRIP DISTRIBUTION
HOTEL

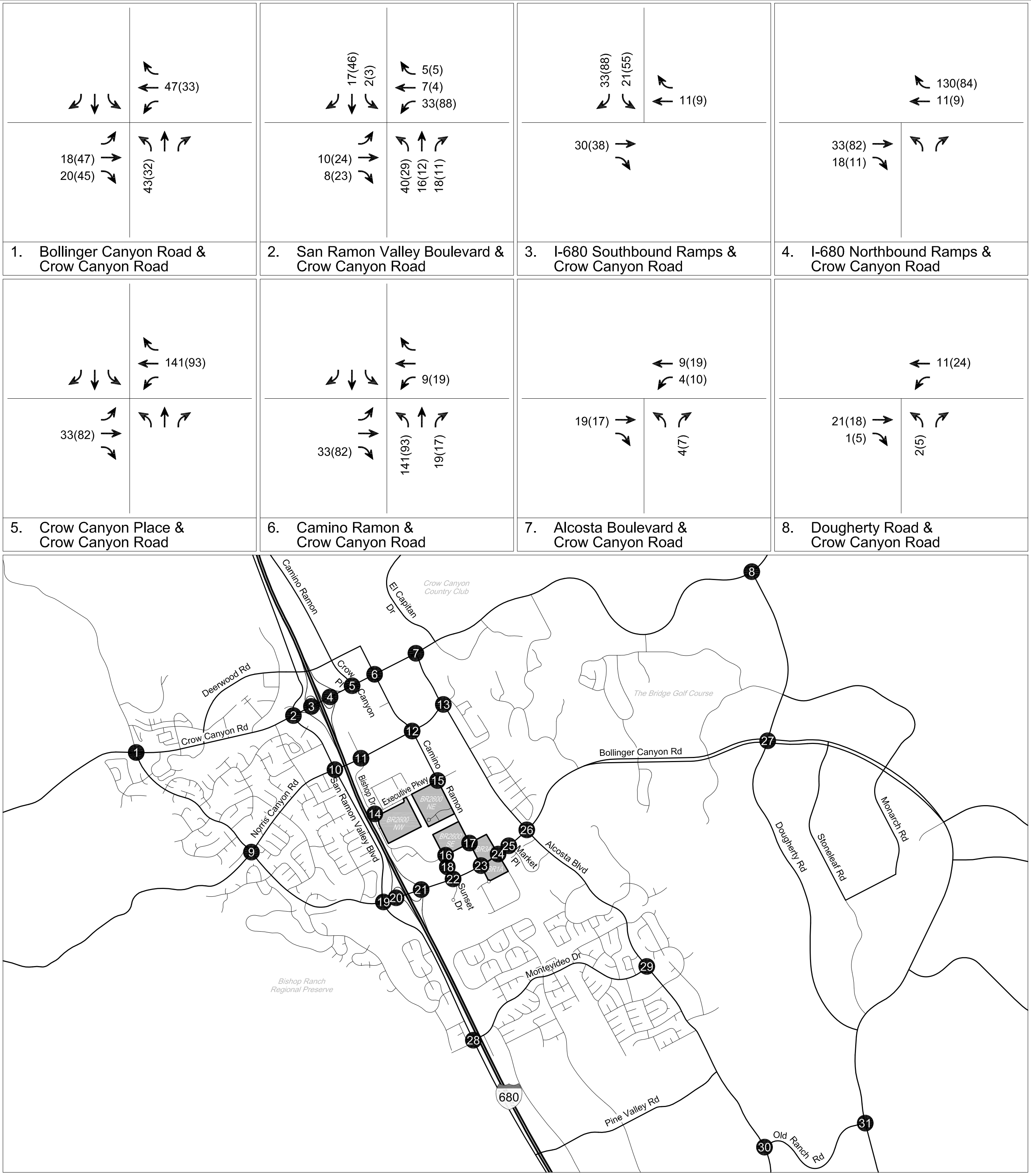
FIGURE
3B



PROJECT TRIP DISTRIBUTION
COMMERCIAL

FIGURE
3C

Gibson transportation consulting, inc.



LEGEND

Project Site

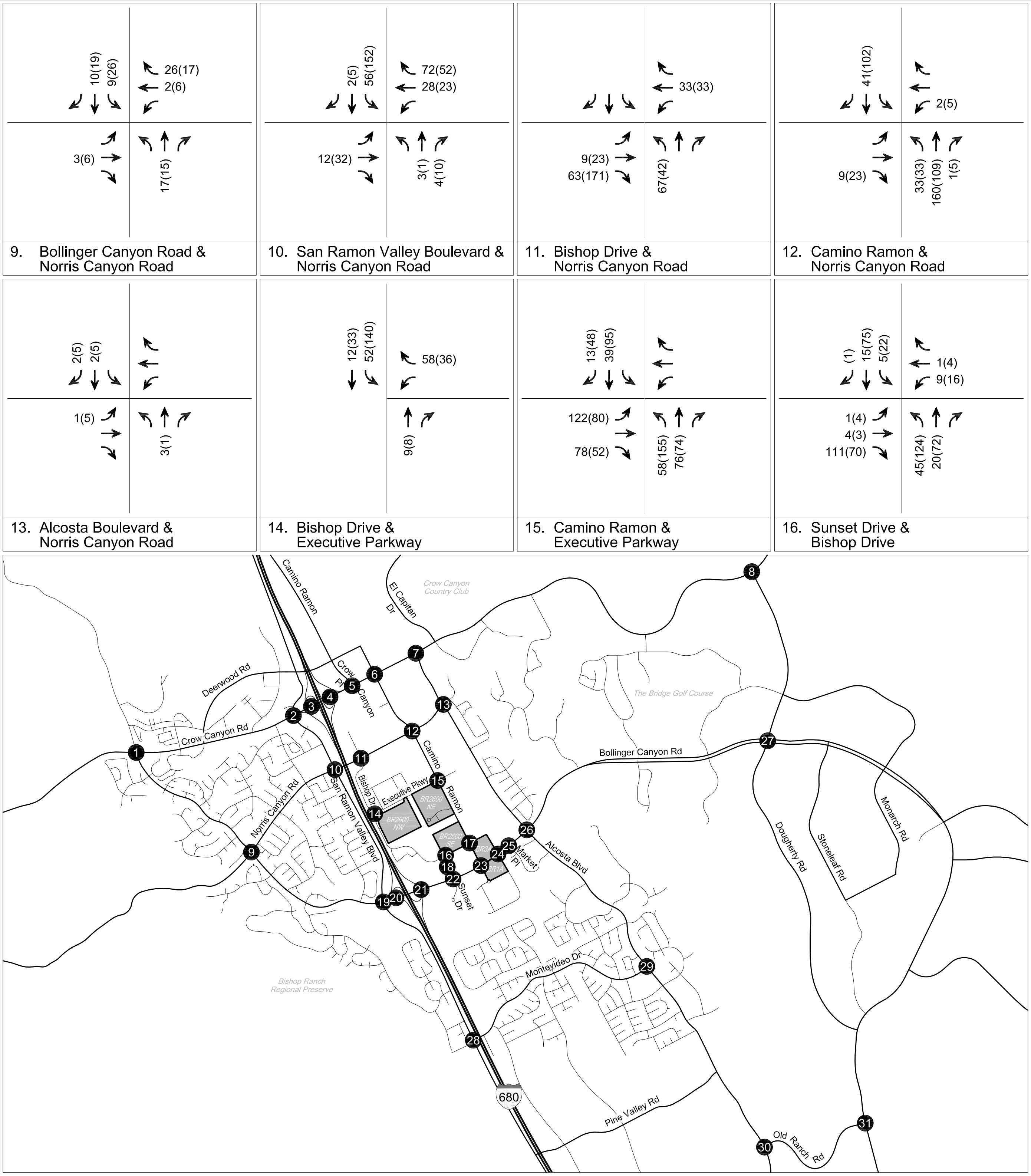
#(#) AM(PM) Peak Hour Traffic Volumes

Analyzed Intersection

N
Not to Scale

TOTAL PROJECT-ONLY
PEAK HOUR TRAFFIC VOLUMES

FIGURE
4



LEGEND

Project Site

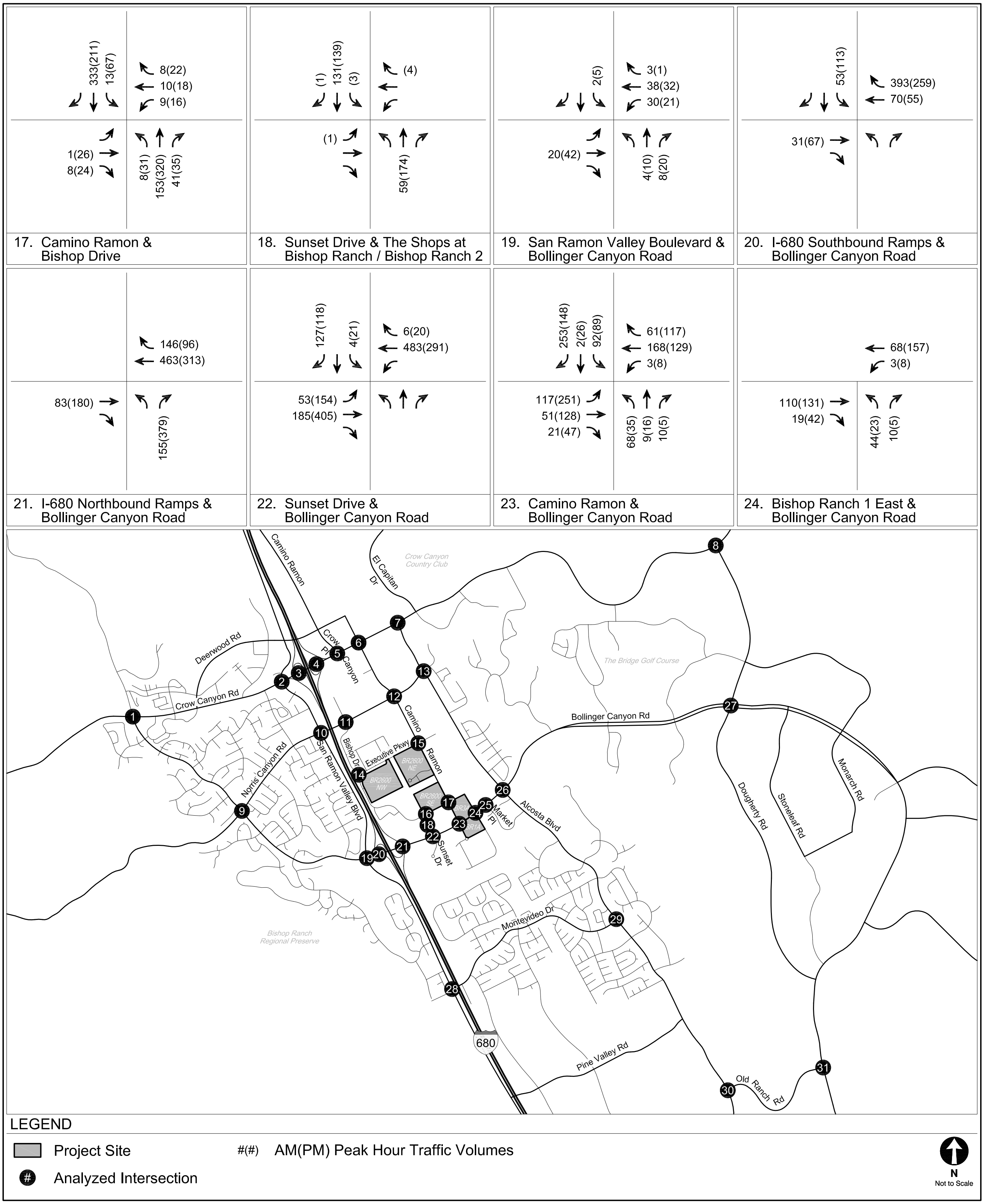
Analyzed Intersection

#(#) AM(PM) Peak Hour Traffic Volumes

N
Not to Scale

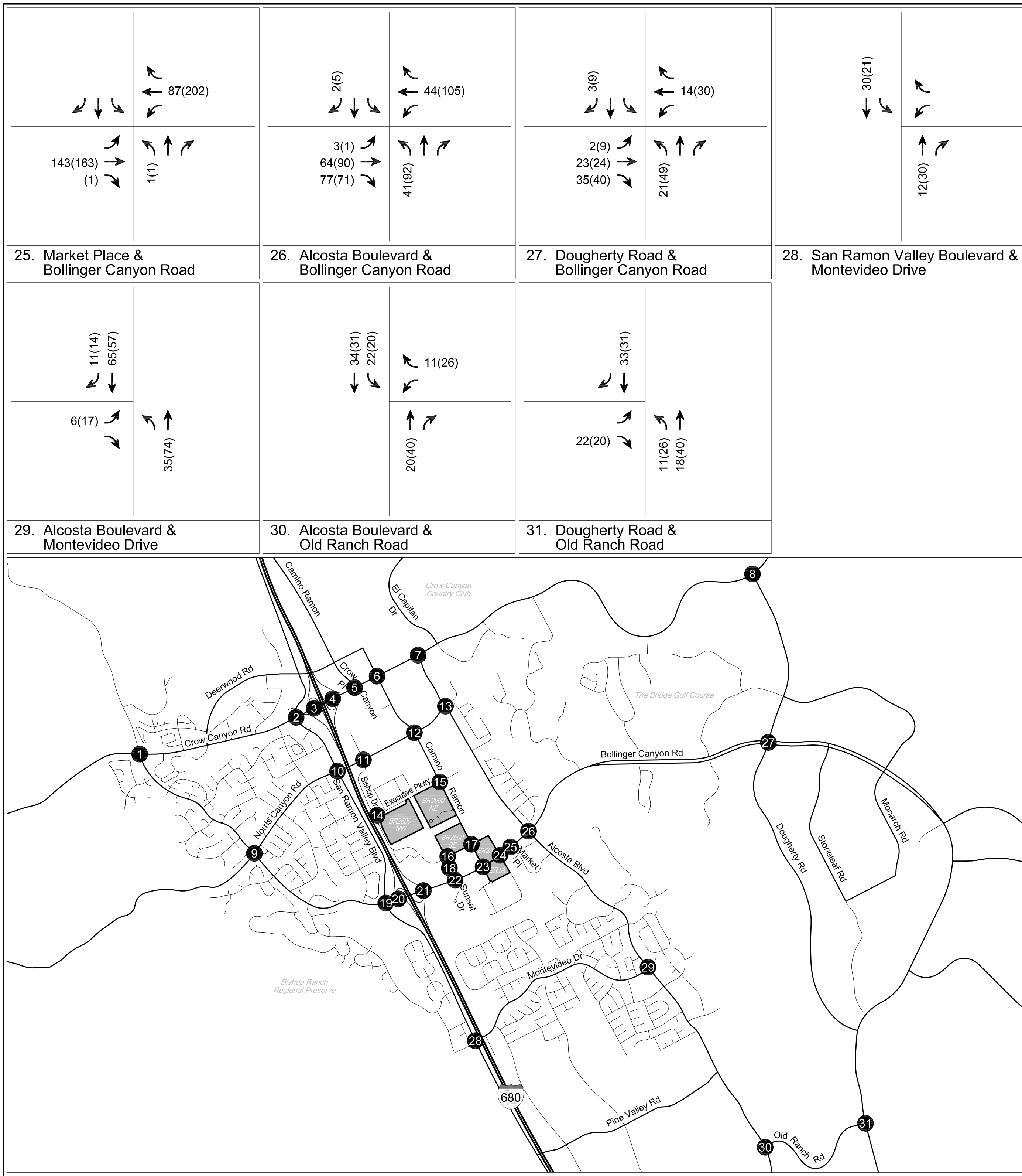
TOTAL PROJECT-ONLY
PEAK HOUR TRAFFIC VOLUMES

FIGURE
4 (CONT.)



TOTAL PROJECT-ONLY
PEAK HOUR TRAFFIC VOLUMES

FIGURE
4 (CONT.)



LEGEND

Project Site

#(#) AM(PM) Peak Hour Traffic Volumes

Analyzed Intersection

N
Not to Scale

TOTAL PROJECT-ONLY
PEAK HOUR TRAFFIC VOLUMES

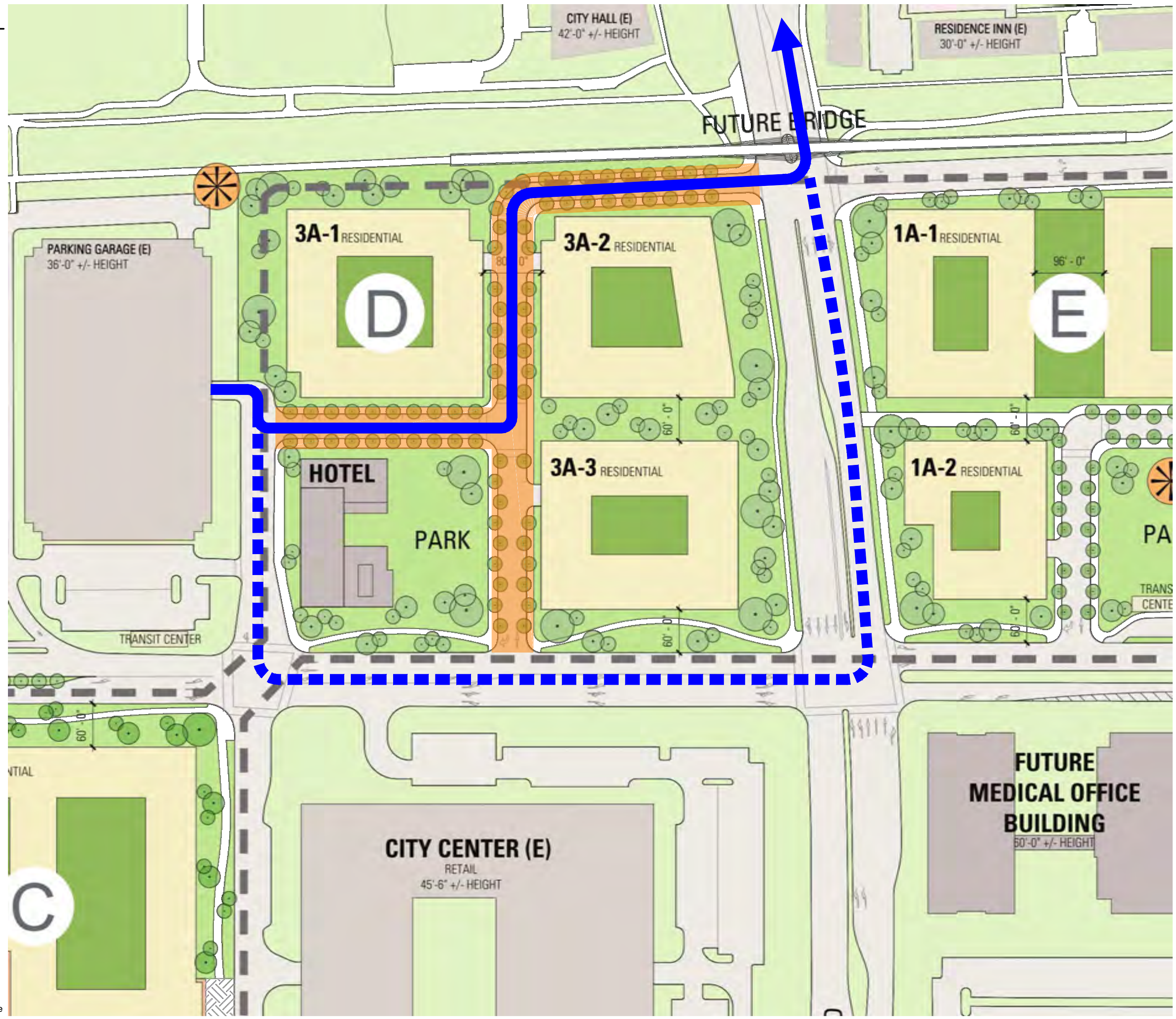
FIGURE
4 (CONT.)

LEGEND

Project Design Feature (Roadway Network)

Distribution without Project Design Feature

Distribution with Project Design Feature



Source: Bishop Ranch. August, 2019.

REDISTRIBUTION OF EXISTING TRAFFIC

FIGURE 5

TABLE 1
ANALYZED STUDY INTERSECTION

No	North / South Street	East / West Street	Jurisdiction
1.	Bollinger Canyon Road	Crow Canyon Road	City of San Ramon
2.	San Ramon Valley Boulevard	Crow Canyon Road	City of San Ramon
3.	I-680 Southbound Ramps	Crow Canyon Road	City of San Ramon / Caltrans
4.	I-680 Northbound Ramps	Crow Canyon Road	City of San Ramon / Caltrans
5.	Crow Canyon Place	Crow Canyon Road	City of San Ramon
6.	Camino Ramon	Crow Canyon Road	City of San Ramon
7.	Alcosta Boulevard	Crow Canyon Road	City of San Ramon
8.	Dougherty Road	Crow Canyon Road	City of San Ramon
9. [a]	Bollinger Canyon Road	Norris Canyon Road	City of San Ramon
10.	San Ramon Valley Boulevard	Norris Canyon Road	City of San Ramon
11.	Bishop Drive/Annabel Lane	Norris Canyon Road	City of San Ramon
12.	Camino Ramon	Norris Canyon Road	City of San Ramon
13.	Alcosta Boulevard	Norris Canyon Road	City of San Ramon
14. [b]	Bishop Drive	Executive Parkway	City of San Ramon
15.	Camino Ramon	Executive Parkway	City of San Ramon
16.	Sunset Drive	Bishop Drive	City of San Ramon
17.	Camino Ramon	Bishop Drive	City of San Ramon
18.	Sunset Drive	The Shops at Bishop Ranch/Bishop Ranch 2	City of San Ramon
19.	San Ramon Valley Boulevard	Bollinger Canyon Road	City of San Ramon
20.	I-680 Southbound Ramps	Bollinger Canyon Road	City of San Ramon / Caltrans
21.	I-680 Northbound Ramps	Bollinger Canyon Road	City of San Ramon / Caltrans
22.	Sunset Drive	Bollinger Canyon Road	City of San Ramon
23.	Camino Ramon/Bishop Ranch 1	Bollinger Canyon Road	City of San Ramon
24.	Bishop Ranch 1 East	Bollinger Canyon Road	City of San Ramon
25.	Market Place	Bollinger Canyon Road	City of San Ramon
26.	Alcosta Boulevard	Bollinger Canyon Road	City of San Ramon
27.	Dougherty Road	Bollinger Canyon Road	City of San Ramon
28.	San Ramon Valley Boulevard	Montevideo Drive	City of San Ramon
29.	Alcosta Boulevard	Montevideo Drive	City of San Ramon
30. [a]	Alcosta Boulevard	Old Ranch Road	City of San Ramon
31.	Dougherty Road	Old Ranch Road	City of San Ramon

Notes

[a] Intersection operates with all-way stop-controlled (AWSC) under Existing Conditions. Intersection is signalized under Future Conditions.

[b] Intersection operates with two-way stop-controlled (TWSC).

TABLE 2
LEVEL OF SERVICE DEFINITIONS FOR INTERSECTIONS

Level of Service	Description	Delay [a]	
		Signalized Intersections	Unsignalized Intersections
A	EXCELLENT. No vehicle waits longer than one red light and no approach phase is fully used.	≤ 10	0.0 - 10.0
B	VERY GOOD. An occasional approach phase is fully utilized; many drivers begin to feel somewhat restricted within groups of vehicles.	> 10 and ≤ 20	10.1 - 15.0
C	GOOD. Occasionally drivers may have to wait through more than one red light; backups may develop behind turning vehicles.	> 20 and ≤ 35	15.1 - 25.0
D	FAIR. Delays may be substantial during portions of the rush hours, but enough lower volume periods occur to permit clearing of developing lines, preventing excessive backups.	> 35 and ≤ 55	25.1 - 35.0
E	POOR. Represents the most vehicles intersection approaches can accommodate; may be long lines of waiting vehicles through several signal cycles.	> 55 and ≤ 80	35.1 - 50.0
F	FAILURE. Backups from nearby locations or on cross streets may restrict or prevent movement of vehicles out of the intersection approaches. Tremendous delays with continuously increasing queue lengths.	> 80	> 50.0

Notes

Source: *Highway Capacity Manual, 6th Edition* (Transportation Research Board, 2016).

[a] Measured in seconds.

TABLE 3
PROJECT TRIP GENERATION

Land Use	ITE Land Use	Rate	Daily	Morning Peak Hour			Afternoon Peak Hour		
				In	Out	Total	In	Out	Total
TRIP GENERATION RATES [a]									
Multi-Family Housing (Mid-Rise)	221	per Dwelling Unit	[b]	26%	74%	[b]	61%	39%	[b]
Hotel	310	per room	8.36	59%	41%	0.47	51%	49%	0.60
Shopping Center	820	per ksf	37.75	62%	38%	0.94	48%	52%	3.81
MIXED-USE INTERNAL CAPTURE [c]									
Land Use	**ITE Land Use**	**Rate**	**Daily**	**In**	**Out**	**Total**	**In**	**Out**	**Total**
BR 2600 NW - *Residential*	221	1,372 du	3%	0%	2%	2%	4%	4%	4%
BR 2600 NE - *Residential*	221	1,128 du	7%	2%	3%	3%	11%	8%	10%
BR 2600 SE - *Residential*	221	558 du	14%	2%	3%	3%	25%	25%	25%
BR 2600 SE - *Retail*	820	96.6 ksf	20%	25%	8%	19%	19%	23%	21%
BR 3A - *Residential*	221	791 du	14%	2%	3%	3%	25%	25%	25%
BR 3A - *Retail*	820	70.0 ksf	15%	7%	7%	8%	16%	25%	21%
BR 3A - *Hotel*	310	169 rm	16%	0%	25%	10%	25%	16%	21%
BR 1A - *Residential*	221	651 du	14%	2%	3%	3%	25%	25%	25%
Aggregate Mixed-Use Internal Capture Adjustment			**11%**	**4%**	**4%**	**4%**	**16%**	**18%**	**17%**
TRIP GENERATION ESTIMATES									
BR 2600 NW									
Multi-Family Housing (Mid-Rise)	221	1,372 du	7,476	116	330	446	334	213	547
Internal Capture Adjustment [c]			*(224)*	*0*	*(7)*	*(7)*	*(13)*	*(9)*	*(22)*
Mode Split Adjustment - 10% [d]			*(725)*	*(12)*	*(32)*	*(44)*	*(32)*	*(21)*	*(53)*
BR 2600 NE									
Multi-Family Housing (Mid-Rise)	221	1,128 du	6,146	96	272	368	277	177	454
Internal Capture Adjustment [c]			*(430)*	*(2)*	*(8)*	*(10)*	*(30)*	*(14)*	*(44)*
Mode Split Adjustment - 10% [d]			*(572)*	*(9)*	*(27)*	*(36)*	*(25)*	*(16)*	*(41)*
BR 2600 SE									
Multi-Family Housing (Mid-Rise)	221	558 du	3,039	48	137	185	141	90	231
Internal Capture Adjustment [c]			*(425)*	*(1)*	*(4)*	*(5)*	*(35)*	*(23)*	*(58)*
Mode Split Adjustment - 10% [d]			*(261)*	*(5)*	*(13)*	*(18)*	*(11)*	*(6)*	*(17)*
Retail	820	96.6 ksf	3,647	56	35	91	177	191	368
Internal Capture Adjustment [c]			*(729)*	*(14)*	*(3)*	*(17)*	*(34)*	*(44)*	*(78)*
Mode Split Adjustment - 5% [d]			*(146)*	*(2)*	*(2)*	*(4)*	*(7)*	*(8)*	*(15)*
Pass-By Trip Adjustment - 25% [e]			*(693)*	*(10)*	*(8)*	*(18)*	*(34)*	*(35)*	*(69)*
BR 3A									
Multi-Family Housing (Mid-Rise)	221	791 du	4,309	68	192	260	197	126	323
Internal Capture Adjustment [c]			*(603)*	*(1)*	*(6)*	*(7)*	*(49)*	*(32)*	*(81)*
Mode Split Adjustment - 10% [d]			*(371)*	*(7)*	*(18)*	*(25)*	*(15)*	*(9)*	*(24)*
Retail	820	70.0 ksf	2,643	41	25	66	128	139	267
Internal Capture Adjustment [c]			*(396)*	*(3)*	*(2)*	*(5)*	*(20)*	*(35)*	*(55)*
Mode Split Adjustment - 5% [d]			*(112)*	*(2)*	*(1)*	*(3)*	*(5)*	*(6)*	*(11)*
Pass-By Trip Adjustment - 25% [e]			*(534)*	*(9)*	*(6)*	*(15)*	*(26)*	*(24)*	*(50)*
Hotel	310	169 rms	1,413	47	32	79	52	49	101
Internal Capture Adjustment [c]			*(226)*	*0*	*(8)*	*(8)*	*(13)*	*(8)*	*(21)*
Mode Split Adjustment - 5% [d]			*(59)*	*(2)*	*(2)*	*(4)*	*(2)*	*(2)*	*(4)*
BR 1A									
Multi-Family Housing (Mid-Rise)	221	651 du	3,546	56	159	215	163	105	268
Internal Capture Adjustment [c]			*(496)*	*(1)*	*(5)*	*(6)*	*(41)*	*(26)*	*(67)*
Mode Split Adjustment - 10% [d]			*(305)*	*(6)*	*(15)*	*(21)*	*(12)*	*(8)*	*(20)*
TOTAL - NEW PROJECT TRIPS			**24,912**	**442**	**1,015**	**1,457**	**1,065**	**764**	**1,829**

Notes:

ksf: 1,000 square feet

[a] Trip generation rates are from *Trip Generation Manual, 10th Edition* (Institute of Transportation Engineers, 2017) and are based on developments located in "General Urban/Suburban" location.

[b] Trip generation rate based on the best-fit curve formula listed in the *Trip Generation Manual, 10th Edition* for the Multi-Family Housing (Mid-Rise) land use.

Daily -	T = 5.45 (X) - 1.75	T = Average Vehicle Trips	X = Gross Leasable Area (ksf)
A.M. Peak Hour -	Ln (T) = 0.98 Ln (X) - 0.98		
P.M. Peak Hour -	Ln (T) = 0.96 Ln (X) - 0.63		

[c] The internal capture adjustments were taken into account for person trips made between distinct land uses within a mixed-use development without using an off-site road system, as well as short vehicle trips made within a quarter-mile walking distance of each of the five Project sites. These trips travel within close proximity of the Project and thus do not affect the external study intersections in the Study Area. The internal capture adjustments are based on the National Cooperative Highway Research Program (NCHRP) 8-51 Internal Trip Capture Estimation Tool of the *NCHRP Report 684 – Enhancing Internal Trip Capture Estimation for Mixed-Use Developments* (Transportation Research Board and National Research Council, 2011) and is provided in the Attachment. Although the NCHRP 8-51 Internal Capture Estimate Tool estimated a range of 1% to 47% of internally captured trips, a maximum of 25% of internal/local trip capture was assumed for any one land use at the five Project sites.

[d] Residential was adjusted by a 10% and hotel and retail uses were adjusted by a 5% mode split adjustment to account for city transit, bike, and shuttle usage.

[e] Retail use was adjusted by a 25% pass-by adjustment to account for Project trips made as an intermediate stop on the way from an origin to a primary trip destination without route diversion per San Ramon City Center FEIR.

Attachment

Attachment

NCHRP 8-51 Internal Trip Capture Estimation Tool

Project Name:	J1705 - Bishop Ranch	**Organization:**	Gibson Transportation
Project Location:	San Ramon, CA	**Performed By:**	
Scenario Description:	BR 2600 NW	**Date:**	
Analysis Year:	2019	**Checked By:**	
Analysis Period:	**AM Street Peak Hour**	**Date:**	

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)			Estimated Vehicle-Trips		
	ITE LUCs[1]	Quantity	Units	Total	Entering	Exiting
Office	710	2,148	ksf	2046	1760	286
Retail				0		
Restaurant				0		
Cinema/Entertainment				0		
Residential	221	1,372	du	446	116	330
Hotel				0		
All Other Land Uses[2]				0		
Total				2492	1876	616

Table 2-A: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00			1.00		
Retail	1.00			1.00		
Restaurant	1.00			1.00		
Cinema/Entertainment	1.00			1.00		
Residential	1.00			1.00		
Hotel	1.00			1.00		
All Other Land Uses[2]	1.00			1.00		

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-A: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	0	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	7	0	0	0		0
Hotel	0	0	0	0	0	

Table 5-A: Computations Summary

	Total	Entering	Exiting
All Person-Trips	2,492	1,876	616
Internal Capture Percentage	1%	0%	1%
External Vehicle-Trips[3]	2,478	1,869	609
External Transit-Trips[4]	0	0	0
External Non-Motorized Trips[4]	0	0	0

Table 6-A: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	0%	0%
Retail	N/A	N/A
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	0%	2%
Hotel	N/A	N/A

[1]Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.
[2]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator
[3]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A
[4]Person-Trips
*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	J1705 - Bishop Ranch
Analysis Period:	**AM Street Peak Hour**

Table 7-A: Conversion of Vehicle-Trip Ends to Person-Trip Ends

Land Use	Table 7-A (D): Entering Trips			Table 7-A (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	1760	1760	1.00	286	286
Retail	1.00	0	0	1.00	0	0
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	116	116	1.00	330	330
Hotel	1.00	0	0	1.00	0	0

Table 8-A (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		80	180	0	3	0
Retail	0		0	0	0	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	7	3	66	0		0
Hotel	0	0	0	0	0	

Table 8-A (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	70		0	0	2	0
Restaurant	246	0		0	6	0
Cinema/Entertainment	0	0	0		0	0
Residential	53	0	0	0		0
Hotel	53	0	0	0	0	

Table 9-A (D): Internal and External Trips Summary (Entering Trips)

Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	7	1753	1760	1753	0	0
Retail	0	0	0	0	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	116	116	116	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses[3]	0	0	0	0	0	0

Table 9-A (O): Internal and External Trips Summary (Exiting Trips)

Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	0	286	286	286	0	0
Retail	0	0	0	0	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	7	323	330	323	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses[3]	0	0	0	0	0	0

[1]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A
[2]Person-Trips
[3]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator
*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal Trip Capture Estimation Tool			
Project Name:	J1705 - Bishop Ranch	**Organization:**	Gibson Transportation
Project Location:	San Ramon, CA	**Performed By:**	
Scenario Description:	BR 2600 NW	**Date:**	
Analysis Year:	2019	**Checked By:**	
Analysis Period:	**PM Street Peak Hour**	**Date:**	

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)			Estimated Vehicle-Trips		
	ITE LUCs[1]	Quantity	Units	Total	Entering	Exiting
Office	710	2,148	ksf	2098	336	1762
Retail				0		
Restaurant				0		
Cinema/Entertainment				0		
Residential	221	1,372	du	547	334	213
Hotel				0		
All Other Land Uses[2]				0		
Total				2645	670	1975

Table 2-P: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00			1.00		
Retail	1.00			1.00		
Restaurant	1.00			1.00		
Cinema/Entertainment	1.00			1.00		
Residential	1.00			1.00		
Hotel	1.00			1.00		
All Other Land Uses[2]	1.00			1.00		

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	13	0
Retail	0		0	0	0	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	9	0	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary

	Total	Entering	Exiting
All Person-Trips	2,645	670	1,975
Internal Capture Percentage	2%	3%	1%
External Vehicle-Trips[3]	2,601	648	1,953
External Transit-Trips[4]	0	0	0
External Non-Motorized Trips[4]	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	3%	1%
Retail	N/A	N/A
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	4%	4%
Hotel	N/A	N/A

[1]Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.
[2]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator
[3]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P
[4]Person-Trips
*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	J1705 - Bishop Ranch
Analysis Period:	**PM Street Peak Hour**

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends

Land Use	Table 7-P (D): Entering Trips				Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*		Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	336	336		1.00	1762	1762
Retail	1.00	0	0		1.00	0	0
Restaurant	1.00	0	0		1.00	0	0
Cinema/Entertainment	1.00	0	0		1.00	0	0
Residential	1.00	334	334		1.00	213	213
Hotel	1.00	0	0		1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		352	70	0	35	0
Retail	0		0	0	0	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	9	89	45	0		6
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	13	0
Retail	104		0	0	154	0
Restaurant	101	0		0	53	0
Cinema/Entertainment	20	0	0		13	0
Residential	192	0	0	0		0
Hotel	0	0	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)

Destination Land Use	Person-Trip Estimates				External Trips by Mode*		
	Internal	External	Total		Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	9	327	336		327	0	0
Retail	0	0	0		0	0	0
Restaurant	0	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0	0
Residential	13	321	334		321	0	0
Hotel	0	0	0		0	0	0
All Other Land Uses[3]	0	0	0		0	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)

Origin Land Use	Person-Trip Estimates				External Trips by Mode*		
	Internal	External	Total		Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	13	1749	1762		1749	0	0
Retail	0	0	0		0	0	0
Restaurant	0	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0	0
Residential	9	204	213		204	0	0
Hotel	0	0	0		0	0	0
All Other Land Uses[3]	0	0	0		0	0	0

[1]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

[2]Person-Trips

[3]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal Trip Capture Estimation Tool			
Project Name:	J1705 - Bishop Ranch	**Organization:**	Gibson Transportation
Project Location:	San Ramon, CA	**Performed By:**	
Scenario Description:	BR 2600 NE	**Date:**	
Analysis Year:	2019	**Checked By:**	
Analysis Period:	**AM Street Peak Hour**	**Date:**	

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)			Estimated Vehicle-Trips		
	ITE LUCs[1]	Quantity	Units	Total	Entering	Exiting
Office	710	5,321	ksf	5028	4324	704
Retail	820	97	ksf	91	56	35
Restaurant				0		
Cinema/Entertainment				0		
Residential	221	3,058	du	978	254	724
Hotel				0		
All Other Land Uses[2]				0		
Total				6097	4634	1463

Table 2-A: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00			1.00		
Retail	1.00			1.00		
Restaurant	1.00			1.00		
Cinema/Entertainment	1.00			1.00		
Residential	1.00			1.00		
Hotel	1.00			1.00		
All Other Land Uses[2]	1.00			1.00		

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-A: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		18	0	0	0	0
Retail	10		0	0	5	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	14	7	0	0		0
Hotel	0	0	0	0	0	

Table 5-A: Computations Summary

	Total	Entering	Exiting
All Person-Trips	6,097	4,634	1,463
Internal Capture Percentage	2%	1%	4%
External Vehicle-Trips[3]	5,989	4,580	1,409
External Transit-Trips[4]	0	0	0
External Non-Motorized Trips[4]	0	0	0

Table 6-A: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	1%	3%
Retail	45%	43%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	2%	3%
Hotel	N/A	N/A

[1]Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

[2]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

[3]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A

[4]Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	J1705 - Bishop Ranch
Analysis Period:	**AM Street Peak Hour**

Table 7-A: Conversion of Vehicle-Trip Ends to Person-Trip Ends

Land Use	Table 7-A (D): Entering Trips				Table 7-A (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*		Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	4324	4324		1.00	704	704
Retail	1.00	56	56		1.00	35	35
Restaurant	1.00	0	0		1.00	0	0
Cinema/Entertainment	1.00	0	0		1.00	0	0
Residential	1.00	254	254		1.00	724	724
Hotel	1.00	0	0		1.00	0	0

Table 8-A (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		197	444	0	7	0
Retail	10		5	0	5	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	14	7	145	0		0
Hotel	0	0	0	0	0	

Table 8-A (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		18	0	0	0	0
Retail	173		0	0	5	0
Restaurant	605	4		0	13	0
Cinema/Entertainment	0	0	0		0	0
Residential	130	10	0	0		0
Hotel	130	2	0	0	0	

Table 9-A (D): Internal and External Trips Summary (Entering Trips)

Destination Land Use	Person-Trip Estimates				External Trips by Mode*		
	Internal	External	Total		Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	24	4300	4324		4300	0	0
Retail	25	31	56		31	0	0
Restaurant	0	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0	0
Residential	5	249	254		249	0	0
Hotel	0	0	0		0	0	0
All Other Land Uses[3]	0	0	0		0	0	0

Table 9-A (O): Internal and External Trips Summary (Exiting Trips)

Origin Land Use	Person-Trip Estimates				External Trips by Mode*		
	Internal	External	Total		Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	18	686	704		686	0	0
Retail	15	20	35		20	0	0
Restaurant	0	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0	0
Residential	21	703	724		703	0	0
Hotel	0	0	0		0	0	0
All Other Land Uses[3]	0	0	0		0	0	0

[1]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A
[2]Person-Trips
[3]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator
*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal Trip Capture Estimation Tool			
Project Name:	J1705 - Bishop Ranch	**Organization:**	
Project Location:	San Ramon, CA	**Performed By:**	
Scenario Description:	BR 2600 NE	**Date:**	
Analysis Year:	2019	**Checked By:**	
Analysis Period:	**PM Street Peak Hour**	**Date:**	

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)			Estimated Vehicle-Trips		
	ITE LUCs[1]	Quantity	Units	Total	Entering	Exiting
Office	710	5,321	ksf	4966	795	4171
Retail	820	97	ksf	368	177	191
Restaurant				0		
Cinema/Entertainment				0		
Residential	221	3,058	du	1181	720	461
Hotel				0		
All Other Land Uses[2]				0		
Total				6515	1692	4823

Table 2-P: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00			1.00		
Retail	1.00			1.00		
Restaurant	1.00			1.00		
Cinema/Entertainment	1.00			1.00		
Residential	1.00			1.00		
Hotel	1.00			1.00		
All Other Land Uses[2]	1.00			1.00		

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		14	0	0	29	0
Retail	4		0	0	50	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	18	18	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary

	Total	Entering	Exiting
All Person-Trips	6,515	1,692	4,823
Internal Capture Percentage	4%	8%	3%
External Vehicle-Trips[3]	6,249	1,559	4,690
External Transit-Trips[4]	0	0	0
External Non-Motorized Trips[4]	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	3%	1%
Retail	18%	28%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	11%	8%
Hotel	N/A	N/A

[1]Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.
[2]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator
[3]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P
[4]Person-Trips
*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	J1705 - Bishop Ranch
Analysis Period:	**PM Street Peak Hour**

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends

Land Use	Table 7-P (D): Entering Trips				Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*		Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	795	795		1.00	4171	4171
Retail	1.00	177	177		1.00	191	191
Restaurant	1.00	0	0		1.00	0	0
Cinema/Entertainment	1.00	0	0		1.00	0	0
Residential	1.00	720	720		1.00	461	461
Hotel	1.00	0	0		1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		834	167	0	83	0
Retail	4		55	8	50	10
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	18	194	97	0		14
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		14	0	0	29	0
Retail	246		0	0	331	0
Restaurant	239	89		0	115	0
Cinema/Entertainment	48	7	0		29	0
Residential	453	18	0	0		0
Hotel	0	4	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)

Destination Land Use	Person-Trip Estimates				External Trips by Mode*		
	Internal	External	Total		Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	22	773	795		773	0	0
Retail	32	145	177		145	0	0
Restaurant	0	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0	0
Residential	79	641	720		641	0	0
Hotel	0	0	0		0	0	0
All Other Land Uses[3]	0	0	0		0	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)

Origin Land Use	Person-Trip Estimates				External Trips by Mode*		
	Internal	External	Total		Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	43	4128	4171		4128	0	0
Retail	54	137	191		137	0	0
Restaurant	0	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0	0
Residential	36	425	461		425	0	0
Hotel	0	0	0		0	0	0
All Other Land Uses[3]	0	0	0		0	0	0

[1]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P
[2]Person-Trips
[3]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator
*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal Trip Capture Estimation Tool			
Project Name:	J1705 - Bishop Ranch	**Organization:**	Gibson Transportation
Project Location:	San Ramon, CA	**Performed By:**	
Scenario Description:	BR 2600 SE	**Date:**	
Analysis Year:	2019	**Checked By:**	
Analysis Period:	**AM Street Peak Hour**	**Date:**	

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)			Estimated Vehicle-Trips		
	ITE LUCs[1]	Quantity	Units	Total	Entering	Exiting
Office	710	2,162	ksf	2059	1771	288
Retail	820 / 850	551	ksf	802	490	312
Restaurant				0		
Cinema/Entertainment				0		
Residential	221	2,477	du	795	207	588
Hotel	310	169	rms	79	47	32
All Other Land Uses[2]				0		
Total				3735	2515	1220

Table 2-A: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00			1.00		
Retail	1.00			1.00		
Restaurant	1.00			1.00		
Cinema/Entertainment	1.00			1.00		
Residential	1.00			1.00		
Hotel	1.00			1.00		
All Other Land Uses[2]	1.00			1.00		

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-A: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		81	0	0	0	0
Retail	71		0	0	4	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	12	6	0	0		0
Hotel	24	4	0	0	0	

Table 5-A: Computations Summary

	Total	Entering	Exiting
All Person-Trips	3,735	2,515	1,220
Internal Capture Percentage	11%	8%	17%
External Vehicle-Trips[3]	3,331	2,313	1,018
External Transit-Trips[4]	0	0	0
External Non-Motorized Trips[4]	0	0	0

Table 6-A: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	6%	28%
Retail	19%	24%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	2%	3%
Hotel	0%	88%

[1]Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

[2]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

[3]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A

[4]Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	J1705 - Bishop Ranch
Analysis Period:	**AM Street Peak Hour**

Table 7-A: Conversion of Vehicle-Trip Ends to Person-Trip Ends

Land Use	Table 7-A (D): Entering Trips				Table 7-A (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*		Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	1771	1771		1.00	288	288
Retail	1.00	490	490		1.00	312	312
Restaurant	1.00	0	0		1.00	0	0
Cinema/Entertainment	1.00	0	0		1.00	0	0
Residential	1.00	207	207		1.00	588	588
Hotel	1.00	47	47		1.00	32	32

Table 8-A (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		81	181	0	3	0
Retail	90		41	0	44	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	12	6	118	0		0
Hotel	24	4	3	0	0	

Table 8-A (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		157	0	0	0	0
Retail	71		0	0	4	0
Restaurant	248	39		0	10	2
Cinema/Entertainment	0	0	0		0	0
Residential	53	83	0	0		0
Hotel	53	20	0	0	0	

Table 9-A (D): Internal and External Trips Summary (Entering Trips)

Destination Land Use	Person-Trip Estimates				External Trips by Mode*		
	Internal	External	Total		Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	107	1664	1771		1664	0	0
Retail	91	399	490		399	0	0
Restaurant	0	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0	0
Residential	4	203	207		203	0	0
Hotel	0	47	47		47	0	0
All Other Land Uses[3]	0	0	0		0	0	0

Table 9-A (O): Internal and External Trips Summary (Exiting Trips)

Origin Land Use	Person-Trip Estimates				External Trips by Mode*		
	Internal	External	Total		Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	81	207	288		207	0	0
Retail	75	237	312		237	0	0
Restaurant	0	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0	0
Residential	18	570	588		570	0	0
Hotel	28	4	32		4	0	0
All Other Land Uses[3]	0	0	0		0	0	0

[1]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A
[2]Person-Trips
[3]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator
*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal Trip Capture Estimation Tool				
Project Name:	J1705 - Bishop Ranch		**Organization:**	Gibson Transportation
Project Location:	San Ramon, CA		**Performed By:**	
Scenario Description:	BR 2600 SE		**Date:**	
Analysis Year:	2019		**Checked By:**	
Analysis Period:	**PM Street Peak Hour**		**Date:**	

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)				Estimated Vehicle-Trips		
	ITE LUCs[1]	Quantity	Units		Total	Entering	Exiting
Office	710	2,162	ksf		2111	338	1773
Retail	820 / 850	551	ksf		2635	1292	1343
Restaurant					0		
Cinema/Entertainment					0		
Residential	221	2,477	du		965	589	376
Hotel	310	169	rms		101	52	49
All Other Land Uses[2]					0		
Total					5812	2271	3541

Table 2-P: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips				Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized		Veh. Occ.	% Transit	% Non-Motorized
Office	1.00				1.00		
Retail	1.00				1.00		
Restaurant	1.00				1.00		
Cinema/Entertainment	1.00				1.00		
Residential	1.00				1.00		
Hotel	1.00				1.00		
All Other Land Uses[2]	1.00				1.00		

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		103	0	0	24	0
Retail	27		0	0	271	9
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	15	129	0	0		6
Hotel	0	8	0	0	0	

Table 5-P: Computations Summary

	Total	Entering	Exiting
All Person-Trips	5,812	2,271	3,541
Internal Capture Percentage	20%	26%	17%
External Vehicle-Trips[3]	4,628	1,679	2,949
External Transit-Trips[4]	0	0	0
External Non-Motorized Trips[4]	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	12%	7%
Retail	19%	23%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	50%	40%
Hotel	29%	16%

[1]Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

[2]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

[3]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

[4]Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	J1705 - Bishop Ranch
Analysis Period:	**PM Street Peak Hour**

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends

Land Use	Table 7-P (D): Entering Trips				Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*		Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	338	338		1.00	1773	1773
Retail	1.00	1292	1292		1.00	1343	1343
Restaurant	1.00	0	0		1.00	0	0
Cinema/Entertainment	1.00	0	0		1.00	0	0
Residential	1.00	589	589		1.00	376	376
Hotel	1.00	52	52		1.00	49	49

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		355	71	0	35	0
Retail	27		389	54	349	67
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	15	158	79	0		11
Hotel	0	8	33	0	1	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		103	0	0	24	0
Retail	105		0	0	271	9
Restaurant	101	646		0	94	37
Cinema/Entertainment	20	52	0		24	1
Residential	193	129	0	0		6
Hotel	0	26	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)

Destination Land Use	Person-Trip Estimates				External Trips by Mode*		
	Internal	External	Total		Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	42	296	338		296	0	0
Retail	240	1052	1292		1052	0	0
Restaurant	0	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0	0
Residential	295	294	589		294	0	0
Hotel	15	37	52		37	0	0
All Other Land Uses[3]	0	0	0		0	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)

Origin Land Use	Person-Trip Estimates				External Trips by Mode*		
	Internal	External	Total		Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	127	1646	1773		1646	0	0
Retail	307	1036	1343		1036	0	0
Restaurant	0	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0	0
Residential	150	226	376		226	0	0
Hotel	8	41	49		41	0	0
All Other Land Uses[3]	0	0	0		0	0	0

[1]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P
[2]Person-Trips
[3]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator
*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal Trip Capture Estimation Tool

Project Name:	J1705 - Bishop Ranch	**Organization:**	Gibson Transportation
Project Location:	San Ramon, CA	**Performed By:**	
Scenario Description:	BR 3A	**Date:**	
Analysis Year:	2019	**Checked By:**	
Analysis Period:	**AM Street Peak Hour**	**Date:**	

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)			Estimated Vehicle-Trips		
	ITE LUCs[1]	Quantity	Units	Total	Entering	Exiting
Office	710	242	ksf	253	218	35
Retail	820	452	ksf	425	264	161
Restaurant				0		
Cinema/Entertainment				0		
Residential	221	2,000	du	645	168	477
Hotel	310	169	rms	79	47	32
All Other Land Uses[2]	730	45	ksf	150	113	37
Total				1552	810	742

Table 2-A: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00			1.00		
Retail	1.00			1.00		
Restaurant	1.00			1.00		
Cinema/Entertainment	1.00			1.00		
Residential	1.00			1.00		
Hotel	1.00			1.00		
All Other Land Uses[2]	1.00			1.00		

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-A: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		10	0	0	0	0
Retail	9		0	0	3	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	7	5	0	0		0
Hotel	7	4	0	0	0	

Table 5-A: Computations Summary

	Total	Entering	Exiting
All Person-Trips	1,552	810	742
Internal Capture Percentage	6%	6%	6%
External Vehicle-Trips[3]	1,462	765	697
External Transit-Trips[4]	0	0	0
External Non-Motorized Trips[4]	0	0	0

Table 6-A: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	11%	29%
Retail	7%	7%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	2%	3%
Hotel	0%	34%

[1]Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.
[2]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator
[3]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A
[4]Person-Trips
*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	J1705 - Bishop Ranch
Analysis Period:	**AM Street Peak Hour**

Table 7-A: Conversion of Vehicle-Trip Ends to Person-Trip Ends

Land Use	Table 7-A (D): Entering Trips				Table 7-A (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*		Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	218	218		1.00	35	35
Retail	1.00	264	264		1.00	161	161
Restaurant	1.00	0	0		1.00	0	0
Cinema/Entertainment	1.00	0	0		1.00	0	0
Residential	1.00	168	168		1.00	477	477
Hotel	1.00	47	47		1.00	32	32

Table 8-A (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		10	22	0	0	0
Retail	47		21	0	23	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	10	5	95	0		0
Hotel	24	4	3	0	0	

Table 8-A (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		84	0	0	0	0
Retail	9		0	0	3	0
Restaurant	31	21		0	8	2
Cinema/Entertainment	0	0	0		0	0
Residential	7	45	0	0		0
Hotel	7	11	0	0	0	

Table 9-A (D): Internal and External Trips Summary (Entering Trips)

Destination Land Use	Person-Trip Estimates				External Trips by Mode*		
	Internal	External	Total		Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	23	195	218		195	0	0
Retail	19	245	264		245	0	0
Restaurant	0	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0	0
Residential	3	165	168		165	0	0
Hotel	0	47	47		47	0	0
All Other Land Uses[3]	0	113	113		113	0	0

Table 9-A (O): Internal and External Trips Summary (Exiting Trips)

Origin Land Use	Person-Trip Estimates				External Trips by Mode*		
	Internal	External	Total		Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	10	25	35		25	0	0
Retail	12	149	161		149	0	0
Restaurant	0	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0	0
Residential	12	465	477		465	0	0
Hotel	11	21	32		21	0	0
All Other Land Uses[3]	0	37	37		37	0	0

[1]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A

[2]Person-Trips

[3]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal Trip Capture Estimation Tool			
Project Name:	J1705 - Bishop Ranch	**Organization:**	Gibson Transportation
Project Location:	San Ramon, CA	**Performed By:**	
Scenario Description:	BR 3A	**Date:**	
Analysis Year:	2019	**Checked By:**	
Analysis Period:	**PM Street Peak Hour**	**Date:**	

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)			Estimated Vehicle-Trips		
	ITE LUCs[1]	Quantity	Units	Total	Entering	Exiting
Office	710	242	ksf	263	42	221
Retail	820	452	ksf	1723	827	896
Restaurant				0		
Cinema/Entertainment				0		
Residential	221	2,000	du	786	479	307
Hotel	310	169	rms	101	52	49
All Other Land Uses[2]	730	45	ksf	77	19	58
Total				2950	1419	1531

Table 2-P: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00			1.00		
Retail	1.00			1.00		
Restaurant	1.00			1.00		
Cinema/Entertainment	1.00			1.00		
Residential	1.00			1.00		
Hotel	1.00			1.00		
All Other Land Uses[2]	1.00			1.00		

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		44	0	0	4	0
Retail	13		0	0	220	9
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	12	83	0	0		6
Hotel	0	8	0	0	0	

Table 5-P: Computations Summary

	Total	Entering	Exiting
All Person-Trips	2,950	1,419	1,531
Internal Capture Percentage	27%	28%	26%
External Vehicle-Trips[3]	2,152	1,020	1,132
External Transit-Trips[4]	0	0	0
External Non-Motorized Trips[4]	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	60%	22%
Retail	16%	27%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	47%	33%
Hotel	29%	16%

[1]Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.
[2]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator
[3]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P
[4]Person-Trips
*Indicates computation that has been rounded to the nearest whole number.
Estimation Tool Developed by the Texas Transportation Institute

Project Name:	J1705 - Bishop Ranch
Analysis Period:	**PM Street Peak Hour**

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends

Land Use	Table 7-P (D): Entering Trips				Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*		Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	42	42		1.00	221	221
Retail	1.00	827	827		1.00	896	896
Restaurant	1.00	0	0		1.00	0	0
Cinema/Entertainment	1.00	0	0		1.00	0	0
Residential	1.00	479	479		1.00	307	307
Hotel	1.00	52	52		1.00	49	49

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		44	9	0	4	0
Retail	18		260	36	233	45
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	12	129	64	0		9
Hotel	0	8	33	0	1	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		66	0	0	19	0
Retail	13		0	0	220	9
Restaurant	13	414		0	77	37
Cinema/Entertainment	3	33	0		19	1
Residential	24	83	0	0		6
Hotel	0	17	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)

Destination Land Use	Person-Trip Estimates				External Trips by Mode*		
	Internal	External	Total		Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	25	17	42		17	0	0
Retail	135	692	827		692	0	0
Restaurant	0	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0	0
Residential	224	255	479		255	0	0
Hotel	15	37	52		37	0	0
All Other Land Uses[3]	0	19	19		19	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)

Origin Land Use	Person-Trip Estimates				External Trips by Mode*		
	Internal	External	Total		Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	48	173	221		173	0	0
Retail	242	654	896		654	0	0
Restaurant	0	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0	0
Residential	101	206	307		206	0	0
Hotel	8	41	49		41	0	0
All Other Land Uses[3]	0	58	58		58	0	0

[1]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P
[2]Person-Trips
[3]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator
*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal Trip Capture Estimation Tool

Project Name:	J1705 - Bishop Ranch	**Organization:**	Gibson Transportation
Project Location:	San Ramon, CA	**Performed By:**	
Scenario Description:	BR 1A	**Date:**	
Analysis Year:	2019	**Checked By:**	
Analysis Period:	**AM Street Peak Hour**	**Date:**	

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)			Estimated Vehicle-Trips		
	ITE LUCs[1]	Quantity	Units	Total	Entering	Exiting
Office	710	243	ksf	255	219	36
Retail	820	356	ksf	334	207	127
Restaurant				0		
Cinema/Entertainment				0		
Residential	221	1,442	du	468	122	346
Hotel	310	169	rms	79	47	32
All Other Land Uses[2]	730	45	ksf	150	113	37
Total				1286	708	578

Table 2-A: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00			1.00		
Retail	1.00			1.00		
Restaurant	1.00			1.00		
Cinema/Entertainment	1.00			1.00		
Residential	1.00			1.00		
Hotel	1.00			1.00		
All Other Land Uses[2]	1.00			1.00		

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-A: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		10	0	0	0	0
Retail	9		0	0	2	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	7	3	0	0		0
Hotel	7	4	0	0	0	

Table 5-A: Computations Summary

	Total	Entering	Exiting
All Person-Trips	1,286	708	578
Internal Capture Percentage	7%	6%	7%
External Vehicle-Trips[3]	1,202	666	536
External Transit-Trips[4]	0	0	0
External Non-Motorized Trips[4]	0	0	0

Table 6-A: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	11%	28%
Retail	8%	9%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	2%	3%
Hotel	0%	34%

[1]Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.
[2]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator
[3]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A
[4]Person-Trips
*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	J1705 - Bishop Ranch
Analysis Period:	**AM Street Peak Hour**

Table 7-A: Conversion of Vehicle-Trip Ends to Person-Trip Ends

Land Use	Table 7-A (D): Entering Trips				Table 7-A (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*		Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	219	219		1.00	36	36
Retail	1.00	207	207		1.00	127	127
Restaurant	1.00	0	0		1.00	0	0
Cinema/Entertainment	1.00	0	0		1.00	0	0
Residential	1.00	122	122		1.00	346	346
Hotel	1.00	47	47		1.00	32	32

Table 8-A (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		10	23	0	0	0
Retail	37		17	0	18	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	7	3	69	0		0
Hotel	24	4	3	0	0	

Table 8-A (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		66	0	0	0	0
Retail	9		0	0	2	0
Restaurant	31	17		0	6	2
Cinema/Entertainment	0	0	0		0	0
Residential	7	35	0	0		0
Hotel	7	8	0	0	0	

Table 9-A (D): Internal and External Trips Summary (Entering Trips)

Destination Land Use	Person-Trip Estimates				External Trips by Mode*		
	Internal	External	Total		Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	23	196	219		196	0	0
Retail	17	190	207		190	0	0
Restaurant	0	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0	0
Residential	2	120	122		120	0	0
Hotel	0	47	47		47	0	0
All Other Land Uses[3]	0	113	113		113	0	0

Table 9-A (O): Internal and External Trips Summary (Exiting Trips)

Origin Land Use	Person-Trip Estimates				External Trips by Mode*		
	Internal	External	Total		Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	10	26	36		26	0	0
Retail	11	116	127		116	0	0
Restaurant	0	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0	0
Residential	10	336	346		336	0	0
Hotel	11	21	32		21	0	0
All Other Land Uses[3]	0	37	37		37	0	0

[1]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A
[2]Person-Trips
[3]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator
*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal Trip Capture Estimation Tool			
Project Name:	J1705 - Bishop Ranch	**Organization:**	Gibson Transportation
Project Location:	San Ramon, CA	**Performed By:**	
Scenario Description:	BR 1A	**Date:**	
Analysis Year:	2019	**Checked By:**	
Analysis Period:	**PM Street Peak Hour**	**Date:**	

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)			Estimated Vehicle-Trips		
	ITE LUCs[1]	Quantity	Units	Total	Entering	Exiting
Office	710	243	ksf	264	42	222
Retail	820	356	ksf	1355	650	705
Restaurant				0		
Cinema/Entertainment				0		
Residential	221	1,442	du	574	350	224
Hotel	310	169	rms	101	52	49
All Other Land Uses[2]	730	45	ksf	77	19	58
Total				2371	1113	1258

Table 2-P: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00			1.00		
Retail	1.00			1.00		
Restaurant	1.00			1.00		
Cinema/Entertainment	1.00			1.00		
Residential	1.00			1.00		
Hotel	1.00			1.00		
All Other Land Uses[2]	1.00			1.00		

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		44	0	0	4	0
Retail	13		0	0	161	9
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	9	65	0	0		6
Hotel	0	8	0	0	0	

Table 5-P: Computations Summary

	Total	Entering	Exiting
All Person-Trips	2,371	1,113	1,258
Internal Capture Percentage	27%	29%	25%
External Vehicle-Trips[3]	1,733	794	939
External Transit-Trips[4]	0	0	0
External Non-Motorized Trips[4]	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	52%	22%
Retail	18%	26%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	47%	36%
Hotel	29%	16%

[1]Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.
[2]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator
[3]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P
[4]Person-Trips
*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	J1705 - Bishop Ranch
Analysis Period:	**PM Street Peak Hour**

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends

Land Use	Table 7-P (D): Entering Trips				Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*		Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	42	42		1.00	222	222
Retail	1.00	650	650		1.00	705	705
Restaurant	1.00	0	0		1.00	0	0
Cinema/Entertainment	1.00	0	0		1.00	0	0
Residential	1.00	350	350		1.00	224	224
Hotel	1.00	52	52		1.00	49	49

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		44	9	0	4	0
Retail	14		204	28	183	35
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	9	94	47	0		7
Hotel	0	8	33	0	1	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		52	0	0	14	0
Retail	13		0	0	161	9
Restaurant	13	325		0	56	37
Cinema/Entertainment	3	26	0		14	1
Residential	24	65	0	0		6
Hotel	0	13	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)

Destination Land Use	Person-Trip Estimates				External Trips by Mode*		
	Internal	External	Total		Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	22	20	42		20	0	0
Retail	117	533	650		533	0	0
Restaurant	0	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0	0
Residential	165	185	350		185	0	0
Hotel	15	37	52		37	0	0
All Other Land Uses[3]	0	19	19		19	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)

Origin Land Use	Person-Trip Estimates				External Trips by Mode*		
	Internal	External	Total		Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	48	174	222		174	0	0
Retail	183	522	705		522	0	0
Restaurant	0	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0	0
Residential	80	144	224		144	0	0
Hotel	8	41	49		41	0	0
All Other Land Uses[3]	0	58	58		58	0	0

[1]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

[2]Person-Trips

[3]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

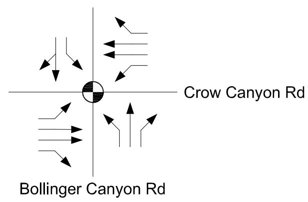
*Indicates computation that has been rounded to the nearest whole number.

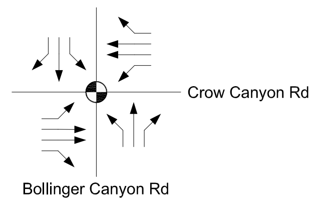
Gibson transportation consulting, inc.

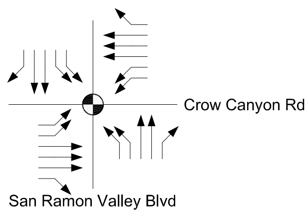
LEGEND

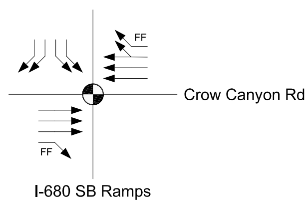
- Traffic Signal
- DF DeFacto Right
- CH Channelized
- FF Free Flow
- Stop Sign

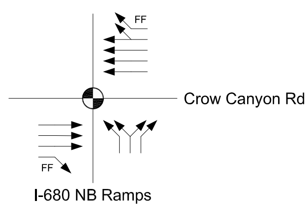
Intersection	EXISTING CONDITIONS (YEAR 2019)	FUTURE WITHOUT PROJECT CONDITIONS (YEAR 2040)	PROJECT DESIGN FEATURE / MITIGATION
1. Bollinger Canyon Road & Crow Canyon Road	See diagram 1	See diagram 2	None
2. San Ramon Valley Boulevard & Crow Canyon Road	See diagram 3	Same as Existing Conditions	None
3. I-680 Southbound Ramps & Crow Canyon Road	See diagram 4	Same as Existing Conditions	None
4. I-680 Northbound Ramps & Crow Canyon Road	See diagram 5	Same as Existing Conditions	None
5. Crow Canyon Place & Crow Canyon Road	See diagram 6	Same as Existing Conditions	None
6. Camino Ramon & Crow Canyon Road	See diagram 7	Same as Existing Conditions	None

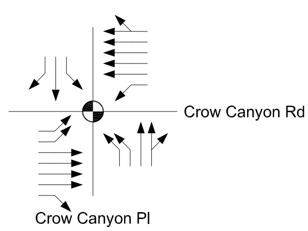


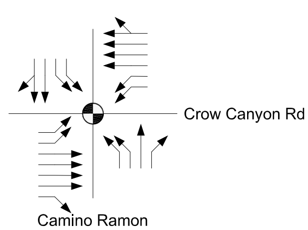












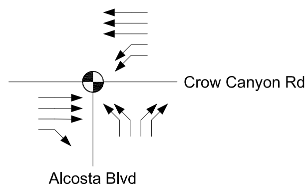
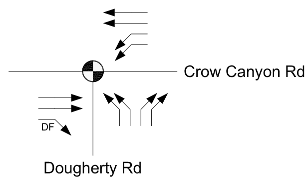
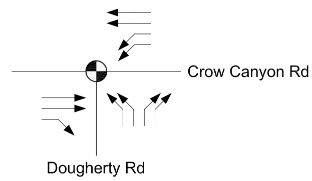
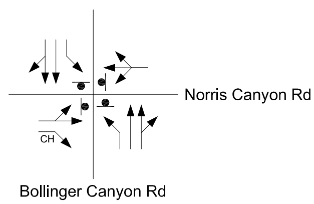
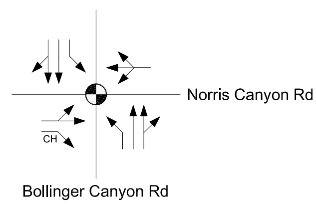
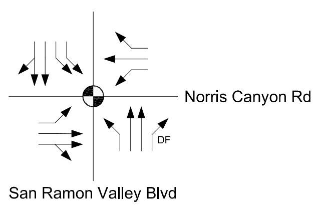
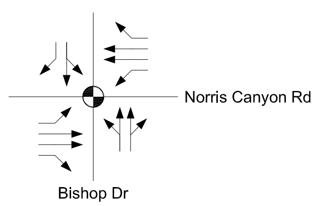
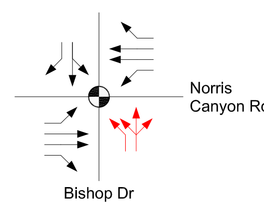
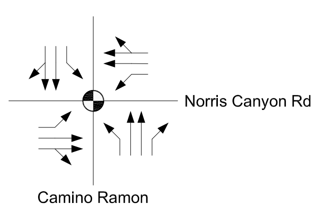
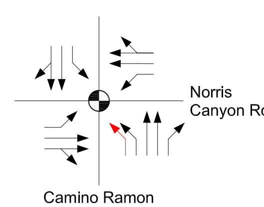
INTERSECTION LANE CONFIGURATIONS

FIGURE A

Gibson
transportation consulting, inc.

LEGEND

- Traffic Signal
- DF DeFacto Right
- CH Channelized
- FF Free Flow
- Stop Sign

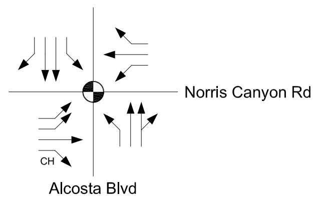
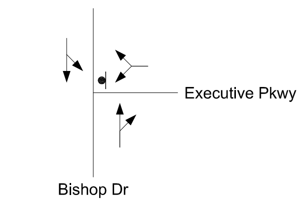
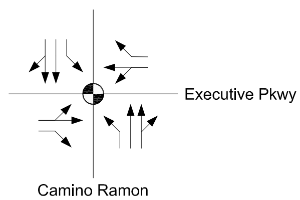
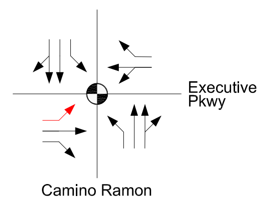
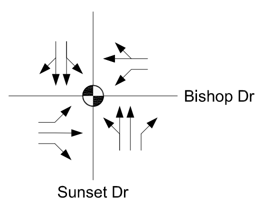
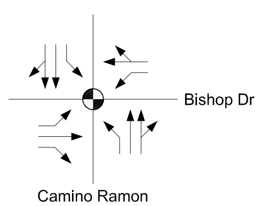
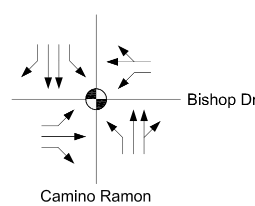
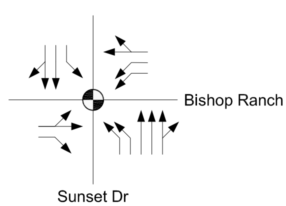
	EXISTING CONDITIONS (YEAR 2019)	FUTURE WITHOUT PROJECT CONDITIONS (YEAR 2040)	PROJECT DESIGN FEATURE / MITIGATION
7. Alcosta Boulevard & Crow Canyon Road		Same as Existing Conditions	None
8. Dougherty Road & Crow Canyon Road			None
9. Bollinger Canyon Road & Norris Canyon Road			None
10. San Ramon Valley Boulevard & Norris Canyon Road		Same as Existing Conditions	None
11. Bishop Drive & Norris Canyon Road		Same as Existing Conditions	
12. Camino Ramon & Norris Canyon Road		Same as Existing Conditions	

INTERSECTION LANE CONFIGURATIONS

FIGURE A (CONT.)

LEGEND

- Traffic Signal
- DF DeFacto Right
- CH Channelized
- FF Free Flow
- Stop Sign

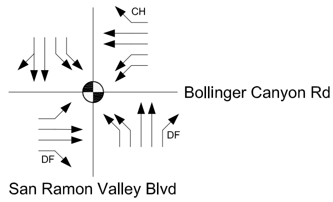
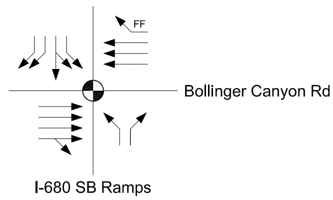
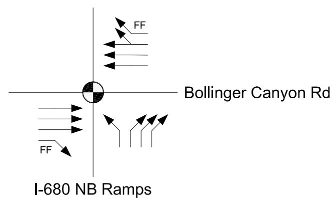
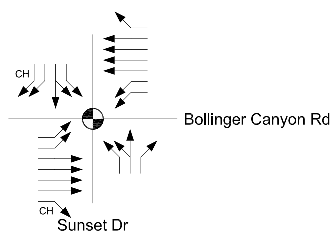
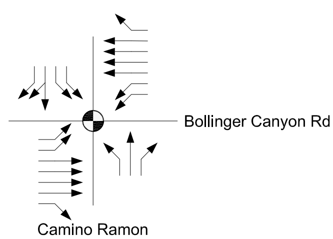
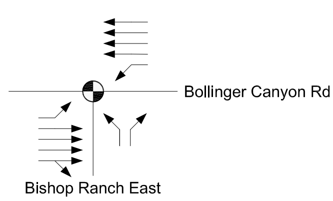
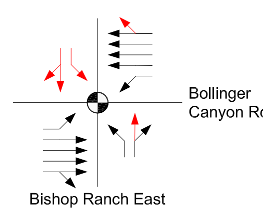
	EXISTING CONDITIONS (YEAR 2019)	FUTURE WITHOUT PROJECT CONDITIONS (YEAR 2040)	PROJECT DESIGN FEATURE / MITIGATION
13. Alcosta Boulevard & Norris Canyon Road		Same as Existing Conditions	None
14. Bishop Drive & Executive Parkway		Same as Existing Conditions	None
15. Camino Ramon & Executive Parkway		Same as Existing Conditions	
16. Sunset Drive & Bishop Drive		Same as Existing Conditions	None
17. Camino Ramon & Bishop Drive			None
18. Sunset Drive & The Shops at Bishop Ranch / Bishop Ranch 2		Same as Existing Conditions	None

INTERSECTION LANE CONFIGURATIONS

FIGURE A (CONT.)

LEGEND

- Traffic Signal
- DF DeFacto Right
- CH Channelized
- FF Free Flow
- Stop Sign

	EXISTING CONDITIONS (YEAR 2019)	FUTURE WITHOUT PROJECT CONDITIONS (YEAR 2040)	PROJECT DESIGN FEATURE / MITIGATION
19. San Ramon Valley Boulevard & Bollinger Canyon Road		Same as Existing Conditions	None
20. I-680 Southbound Ramps & Bollinger Canyon Road		Same as Existing Conditions	None
21. I-680 Northbound Ramps & Bollinger Canyon Road		Same as Existing Conditions	None
22. Sunset Drive & Bollinger Canyon Road		Same as Existing Conditions	None
23. Camino Ramon & Bollinger Canyon Road		Same as Existing Conditions	None
24. Bishop Ranch 1 East & Bollinger Canyon Road		Same as Existing Conditions	

INTERSECTION LANE CONFIGURATIONS

FIGURE A (CONT.)

Gibson transportation consulting, inc.

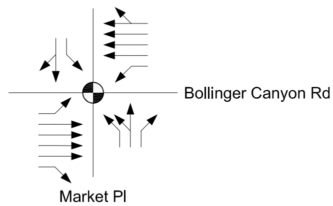
LEGEND

- Traffic Signal
- DF DeFacto Right
- CH Channelized
- FF Free Flow
- Stop Sign

	EXISTING CONDITIONS (YEAR 2019)	FUTURE WITHOUT PROJECT CONDITIONS (YEAR 2040)	PROJECT DESIGN FEATURE / MITIGATION

25. Market Place & Bollinger Canyon Road

Existing Conditions (Year 2019):

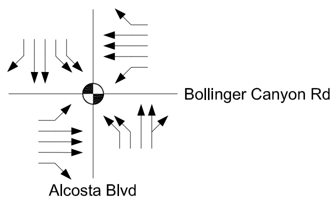


Future Without Project Conditions (Year 2040): Same as Existing Conditions

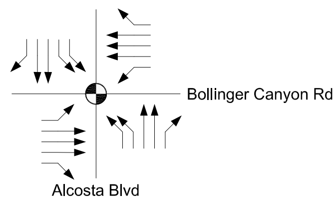
Project Design Feature / Mitigation: None

26. Alcosta Boulevard & Bollinger Canyon Road

Existing Conditions (Year 2019):



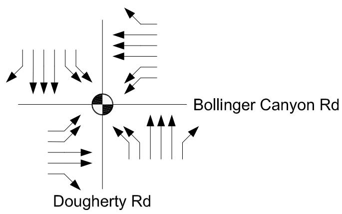
Future Without Project Conditions (Year 2040):



Project Design Feature / Mitigation: None

27. Dougherty Road & Bollinger Canyon Road

Existing Conditions (Year 2019):

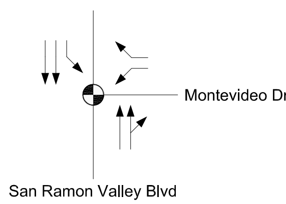


Future Without Project Conditions (Year 2040): Same as Existing Conditions

Project Design Feature / Mitigation: None

28. San Ramon Valley Boulevard & Montevideo Drive

Existing Conditions (Year 2019):

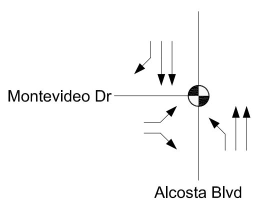


Future Without Project Conditions (Year 2040): Same as Existing Conditions

Project Design Feature / Mitigation: None

29. Alcosta Boulevard & Montevideo Drive

Existing Conditions (Year 2019):

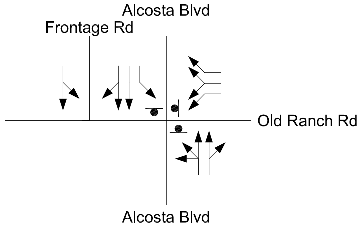


Future Without Project Conditions (Year 2040): Same as Existing Conditions

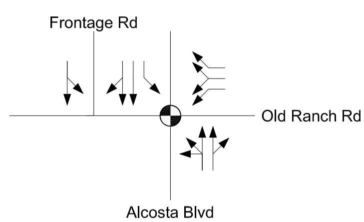
Project Design Feature / Mitigation: None

30. Alcosta Boulevard & Old Ranch Road

Existing Conditions (Year 2019):



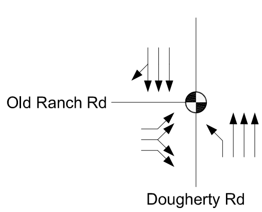
Future Without Project Conditions (Year 2040):



Project Design Feature / Mitigation: None

31. Dougherty Road & Old Ranch Road

Existing Conditions (Year 2019):



Future Without Project Conditions (Year 2040): Same as Existing Conditions

Project Design Feature / Mitigation: None

INTERSECTION LANE CONFIGURATIONS

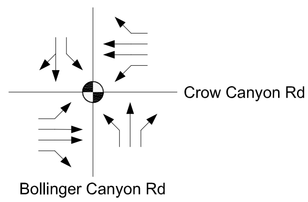
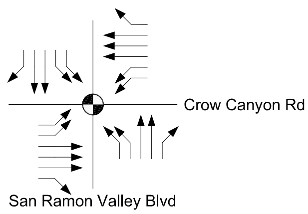
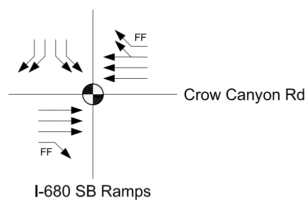
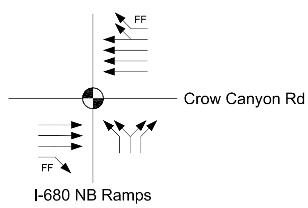
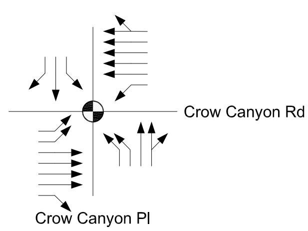
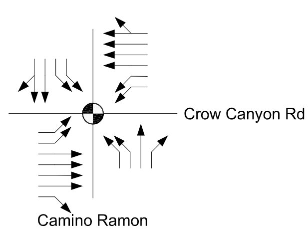
FIGURE A (CONT.)

Appendix B

Intersection Lane Configurations

LEGEND

- Traffic Signal
- DF DeFacto Right
- CH Channelized
- FF Free Flow
- Stop Sign

	EXISTING CONDITIONS (YEAR 2019)	FUTURE WITHOUT PROJECT CONDITIONS (YEAR 2040)	PROJECT DESIGN FEATURE / MITIGATION
1. Bollinger Canyon Road & Crow Canyon Road		Same as Existing Conditions	None
2. San Ramon Valley Boulevard & Crow Canyon Road		Same as Existing Conditions	None
3. I-680 Southbound Ramps & Crow Canyon Road		Same as Existing Conditions	None
4. I-680 Northbound Ramps & Crow Canyon Road		Same as Existing Conditions	None
5. Crow Canyon Place & Crow Canyon Road		Same as Existing Conditions	None
6. Camino Ramon & Crow Canyon Road		Same as Existing Conditions	None

INTERSECTION LANE CONFIGURATIONS

APPENDIX B

transportation consulting, inc.

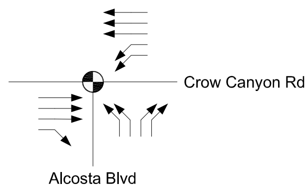
LEGEND

- Traffic Signal
- DF DeFacto Right
- CH Channelized
- FF Free Flow
- Stop Sign

Columns: EXISTING CONDITIONS (YEAR 2019) | FUTURE WITHOUT PROJECT CONDITIONS (YEAR 2040) | PROJECT DESIGN FEATURE / MITIGATION

7. Alcosta Boulevard & Crow Canyon Road

EXISTING CONDITIONS (YEAR 2019):

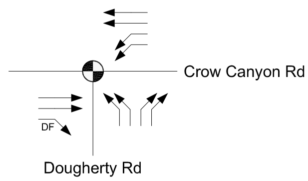


FUTURE WITHOUT PROJECT CONDITIONS (YEAR 2040): Same as Existing Conditions

PROJECT DESIGN FEATURE / MITIGATION: None

8. Dougherty Road & Crow Canyon Road

EXISTING CONDITIONS (YEAR 2019):

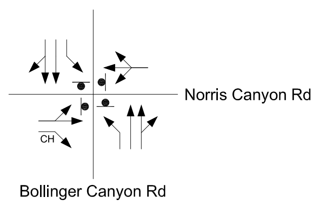


FUTURE WITHOUT PROJECT CONDITIONS (YEAR 2040): Same as Existing Conditions

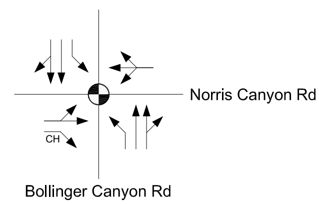
PROJECT DESIGN FEATURE / MITIGATION: None

9. Bollinger Canyon Road & Norris Canyon Road

EXISTING CONDITIONS (YEAR 2019):



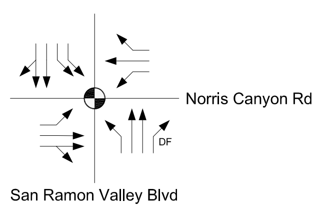
FUTURE WITHOUT PROJECT CONDITIONS (YEAR 2040):



PROJECT DESIGN FEATURE / MITIGATION: None

10. San Ramon Valley Boulevard & Norris Canyon Road

EXISTING CONDITIONS (YEAR 2019):

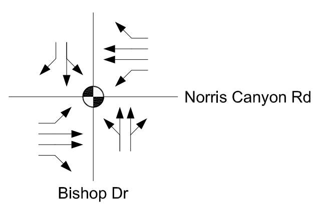


FUTURE WITHOUT PROJECT CONDITIONS (YEAR 2040): Same as Existing Conditions

PROJECT DESIGN FEATURE / MITIGATION: None

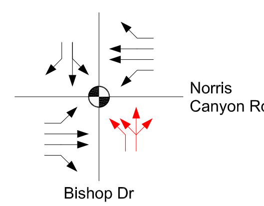
11. Bishop Drive & Norris Canyon Road

EXISTING CONDITIONS (YEAR 2019):



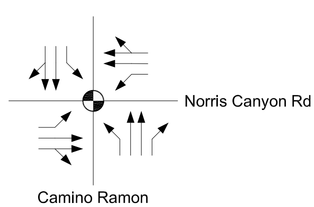
FUTURE WITHOUT PROJECT CONDITIONS (YEAR 2040): Same as Existing Conditions

PROJECT DESIGN FEATURE / MITIGATION:



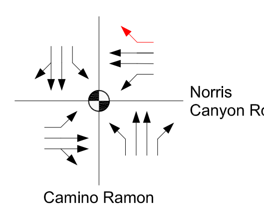
12. Camino Ramon & Norris Canyon Road

EXISTING CONDITIONS (YEAR 2019):



FUTURE WITHOUT PROJECT CONDITIONS (YEAR 2040): Same as Existing Conditions

PROJECT DESIGN FEATURE / MITIGATION:



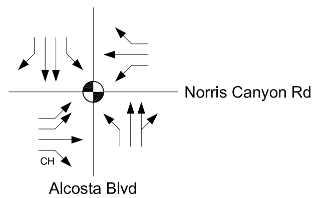
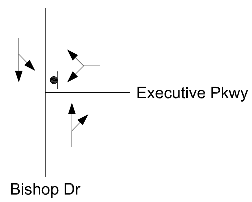
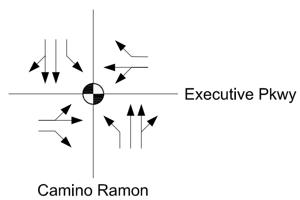
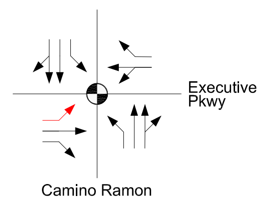
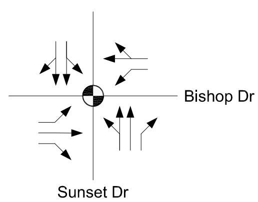
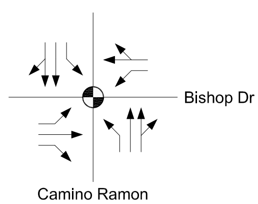
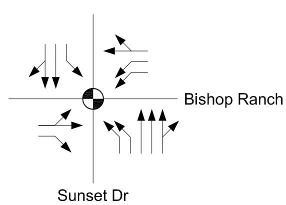
INTERSECTION LANE CONFIGURATIONS

APPENDIX B (CONT.)

Gibson transportation consulting, inc.

LEGEND

- Traffic Signal
- DF DeFacto Right
- CH Channelized
- FF Free Flow
- Stop Sign

	EXISTING CONDITIONS (YEAR 2019)	FUTURE WITHOUT PROJECT CONDITIONS (YEAR 2040)	PROJECT DESIGN FEATURE / MITIGATION
13. Alcosta Boulevard & Norris Canyon Road		Same as Existing Conditions	None
14. Bishop Drive & Executive Parkway		Same as Existing Conditions	None
15. Camino Ramon & Executive Parkway		Same as Existing Conditions	
16. Sunset Drive & Bishop Drive		Same as Existing Conditions	None
17. Camino Ramon & Bishop Drive		Same as Existing Conditions	None
18. Sunset Drive & The Shops at Bishop Ranch / Bishop Ranch 2		Same as Existing Conditions	None

INTERSECTION LANE CONFIGURATIONS

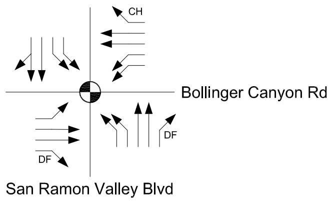
APPENDIX B (CONT.)

LEGEND

- Traffic Signal
- DF DeFacto Right
- CH Channelized
- FF Free Flow
- Stop Sign

	EXISTING CONDITIONS (YEAR 2019)	FUTURE WITHOUT PROJECT CONDITIONS (YEAR 2040)	PROJECT DESIGN FEATURE / MITIGATION

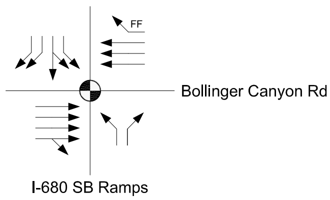
19. San Ramon Valley Boulevard & Bollinger Canyon Road



Future Without Project Conditions (Year 2040): Same as Existing Conditions

Project Design Feature / Mitigation: None

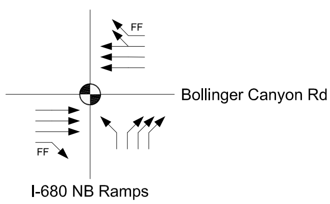
20. I-680 Southbound Ramps & Bollinger Canyon Road



Future Without Project Conditions (Year 2040): Same as Existing Conditions

Project Design Feature / Mitigation: None

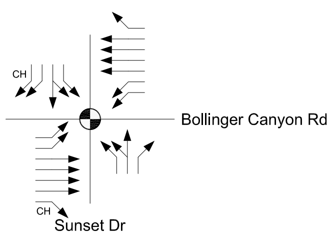
21. I-680 Northbound Ramps & Bollinger Canyon Road



Future Without Project Conditions (Year 2040): Same as Existing Conditions

Project Design Feature / Mitigation: None

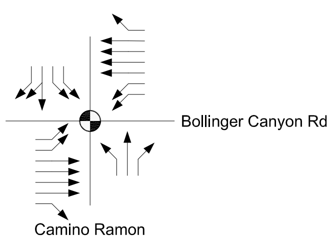
22. Sunset Drive & Bollinger Canyon Road



Future Without Project Conditions (Year 2040): Same as Existing Conditions

Project Design Feature / Mitigation: None

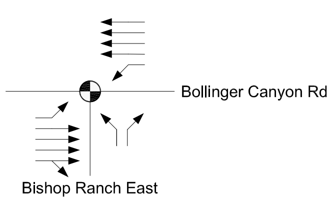
23. Camino Ramon & Bollinger Canyon Road



Future Without Project Conditions (Year 2040): Same as Existing Conditions

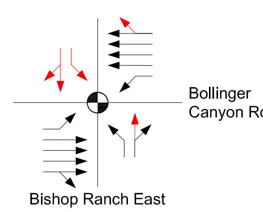
Project Design Feature / Mitigation: None

24. Bishop Ranch 1 East & Bollinger Canyon Road



Future Without Project Conditions (Year 2040): Same as Existing Conditions

Project Design Feature / Mitigation:



INTERSECTION LANE CONFIGURATIONS

APPENDIX B (CONT.)

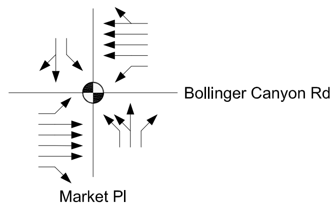
Gibson transportation consulting, inc.

LEGEND

- Traffic Signal
- DF DeFacto Right
- CH Channelized
- FF Free Flow
- Stop Sign

	EXISTING CONDITIONS (YEAR 2019)	FUTURE WITHOUT PROJECT CONDITIONS (YEAR 2040)	PROJECT DESIGN FEATURE / MITIGATION

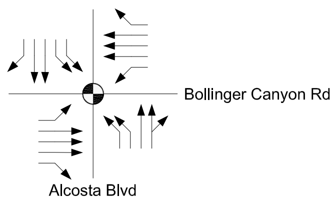
25. Market Place & Bollinger Canyon Road

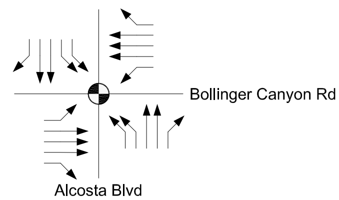


Same as Existing Conditions

None

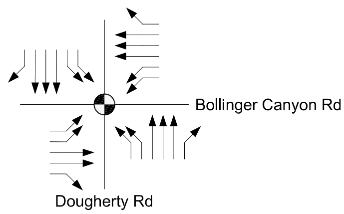
26. Alcosta Boulevard & Bollinger Canyon Road





None

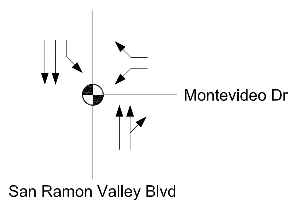
27. Dougherty Road & Bollinger Canyon Road



Same as Existing Conditions

None

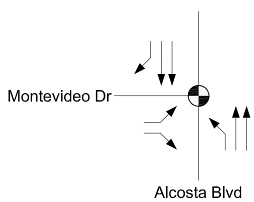
28. San Ramon Valley Boulevard & Montevideo Drive



Same as Existing Conditions

None

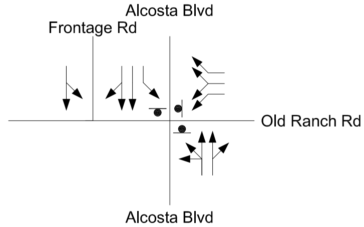
29. Alcosta Boulevard & Montevideo Drive

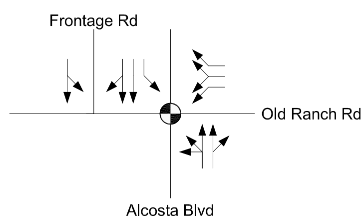


Same as Existing Conditions

None

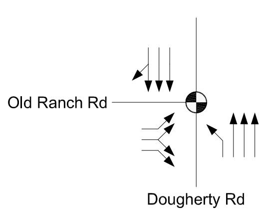
30. Alcosta Boulevard & Old Ranch Road





None

31. Dougherty Road & Old Ranch Road



Same as Existing Conditions

None

INTERSECTION LANE CONFIGURATIONS

APPENDIX B (CONT.)

Appendix C

Traffic Counts

WILTEC Phone: (626) 564-1944 Fax: (626) 564-0969 info@wiltecusa.com

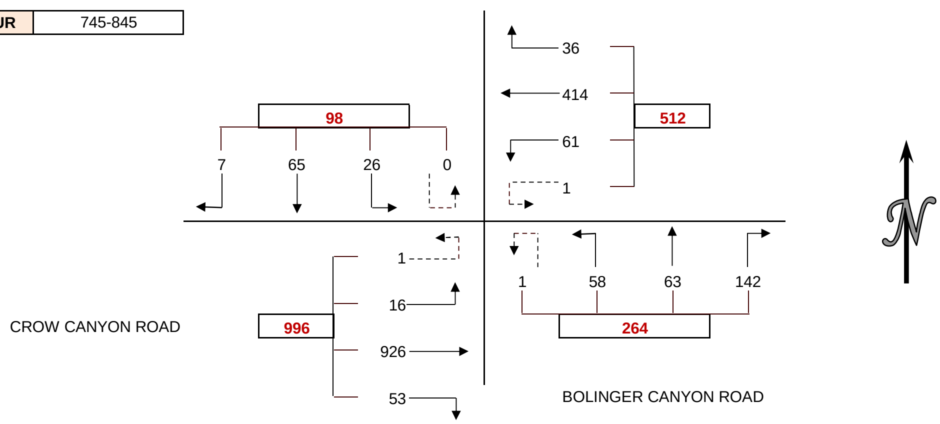
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT: GIBSON TRANSPORTATION
PROJECT: BISHOP RANCH STUDY, CITY OF SAN RAMON
DATE: WEDNESDAY MAY 22, 2019
PERIOD: 7:00 AM TO 9:00 AM
INTERSECTION: N/S BOLINGER CANYON ROAD
E/W CROW CANYON ROAD
CITY: SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-715	6	0	6	0	6	133	8	0	15	2	16	0	6	129	3	0	330
715-730	3	6	18	0	7	125	6	0	20	5	21	1	14	180	2	0	408
730-745	6	23	11	0	4	104	20	0	28	5	22	0	16	192	6	0	437
745-800	1	37	5	0	7	122	35	0	46	23	16	0	15	230	5	0	542
800-815	3	7	12	0	10	112	7	0	39	16	14	0	8	216	4	0	448
815-830	2	12	6	0	8	87	10	1	22	13	14	1	17	239	2	1	435
830-845	1	9	3	0	11	93	9	0	35	11	14	0	13	241	5	0	445
845-900	8	11	5	0	13	88	14	1	22	7	13	0	9	237	7	0	435
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-800	16	66	40	0	24	484	69	0	109	35	75	1	51	731	16	0	1717
715-815	13	73	46	0	28	463	68	0	133	49	73	1	53	818	17	0	1835
730-830	12	79	34	0	29	425	72	1	135	57	66	1	56	877	17	1	1862
745-845	7	65	26	0	36	414	61	1	142	63	58	1	53	926	16	1	1870
800-900	14	39	26	0	42	380	40	2	118	47	55	1	47	933	18	1	1763

PEAK HOUR	745-845



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	0	0	0
715-730	0	1	0	0	1
730-745	0	1	0	0	1
745-800	0	2	2	0	4
800-815	0	1	0	0	1
815-830	0	0	0	0	0
830-845	0	0	0	0	0
845-900	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	0	4	2	0	6
715-815	0	5	2	0	7
730-830	0	4	2	0	6
745-845	0	3	2	0	5
800-900	0	1	0	0	1

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	0	0	0
715-730	0	0	0	0	0
730-745	0	0	0	0	0
745-800	0	0	0	0	0
800-815	0	0	0	0	0
815-830	0	0	0	0	0
830-845	0	0	0	0	0
845-900	0	0	2	0	2
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	0	0	0	0	0
715-815	0	0	0	0	0
730-830	0	0	0	0	0
745-845	0	0	0	0	0
800-900	0	0	2	0	2

WILTEC

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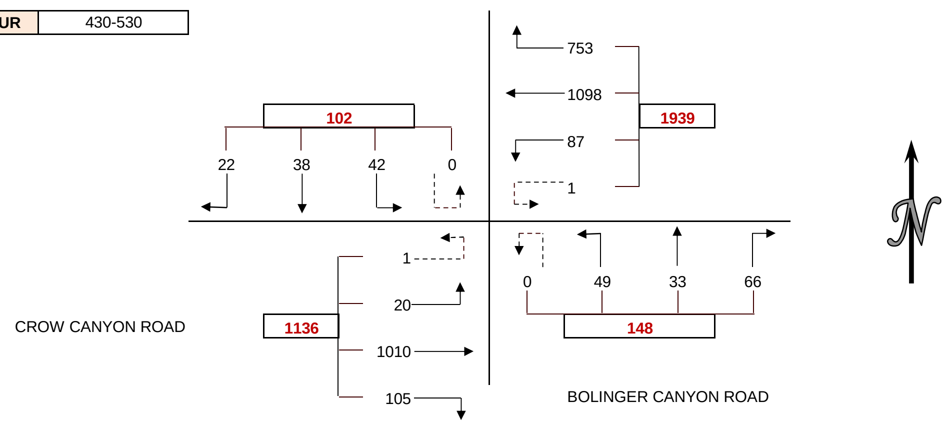
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT: GIBSON TRANSPORTATION
PROJECT: BISHOP RANCH STUDY, CITY OF SAN RAMON
DATE: WEDNESDAY MAY 22, 2019
PERIOD: 4:00 PM TO 6:00 PM
INTERSECTION: N/S BOLINGER CANYON ROAD
E/W CROW CANYON ROAD
CITY: SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-415	4	7	8	1	172	249	14	0	20	4	12	0	34	277	4	0	806
415-430	3	6	17	0	166	252	14	1	20	8	8	0	27	217	5	0	744
430-445	6	7	15	0	187	283	18	0	16	8	8	0	27	227	4	0	806
445-500	5	8	7	0	182	256	12	0	17	9	14	0	29	234	3	0	776
500-515	6	8	13	0	199	273	28	1	16	6	18	0	28	272	11	1	880
515-530	5	15	7	0	185	286	29	0	17	10	9	0	21	277	2	0	863
530-545	5	5	5	0	154	268	15	0	19	12	19	0	24	238	3	1	768
545-600	4	6	11	0	170	272	16	0	20	16	7	0	22	219	9	0	772
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-500	18	28	47	1	707	1040	58	1	73	29	42	0	117	955	16	0	3132
415-515	20	29	52	0	734	1064	72	2	69	31	48	0	111	950	23	1	3206
430-530	22	38	42	0	753	1098	87	1	66	33	49	0	105	1010	20	1	3325
445-545	21	36	32	0	720	1083	84	1	69	37	60	0	102	1021	19	2	3287
500-600	20	34	36	0	708	1099	88	1	72	44	53	0	95	1006	25	2	3283

PEAK HOUR	430-530



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	1	0	0	1
415-430	0	0	0	0	0
430-445	0	0	0	0	0
445-500	0	1	1	0	2
500-515	0	0	0	0	0
515-530	0	0	0	0	0
530-545	0	0	0	0	0
545-600	0	0	1	0	1
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	0	2	1	0	3
415-515	0	1	1	0	2
430-530	0	1	1	0	2
445-545	0	1	1	0	2
500-600	0	0	1	0	1

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	0	0	0
415-430	0	0	1	0	1
430-445	0	0	0	0	0
445-500	0	1	0	0	1
500-515	0	3	1	0	4
515-530	0	0	0	0	0
530-545	0	0	0	0	0
545-600	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	0	1	1	0	2
415-515	0	4	2	0	6
430-530	0	4	1	0	5
445-545	0	4	1	0	5
500-600	0	3	1	0	4

WILTEC

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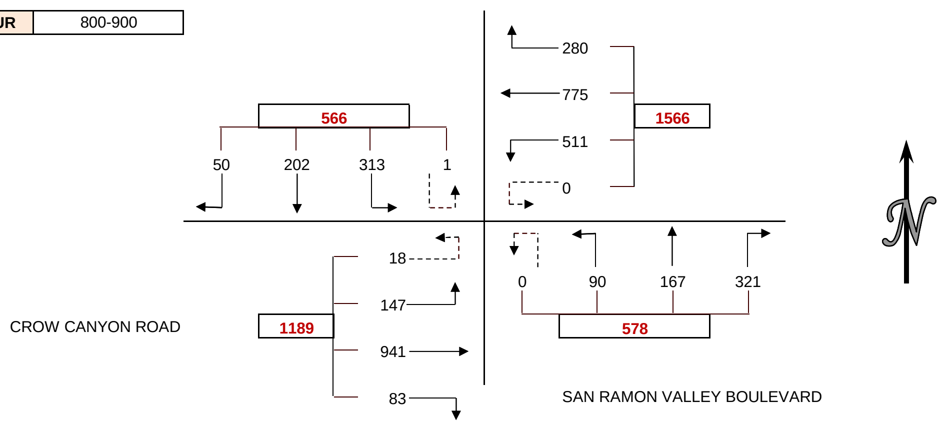
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT:		GIBSON TRANSPORTATION
PROJECT:		BISHOP RANCH STUDY, CITY OF SAN RAMON
DATE:		WEDNSEDAY MAY 22, 2019
PERIOD:		7:00 AM TO 9:00 AM
INTERSECTION:	N/S	SAN RAMON VALLEY BOULEVARD
	E/W	CROW CANYON ROAD
CITY:		SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-715	10	23	49	0	56	170	87	0	43	12	10	0	13	184	10	3	670
715-730	12	34	53	0	52	169	106	0	64	22	12	0	17	209	23	7	780
730-745	11	32	65	0	82	203	126	0	63	23	5	0	19	214	20	2	865
745-800	13	40	59	0	92	213	114	0	60	40	4	0	19	273	30	4	961
800-815	12	46	68	0	84	195	120	0	58	30	23	0	15	254	33	7	945
815-830	8	51	99	1	70	195	133	0	89	46	22	0	18	247	30	4	1013
830-845	14	57	71	0	68	183	102	0	75	39	19	0	22	234	43	3	930
845-900	16	48	75	0	58	202	156	0	99	52	26	0	28	206	41	4	1011
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-800	46	129	226	0	282	755	433	0	230	97	31	0	68	880	83	16	3276
715-815	48	152	245	0	310	780	466	0	245	115	44	0	70	950	106	20	3551
730-830	44	169	291	1	328	806	493	0	270	139	54	0	71	988	113	17	3784
745-845	47	194	297	1	314	786	469	0	282	155	68	0	74	1008	136	18	3849
800-900	50	202	313	1	280	775	511	0	321	167	90	0	83	941	147	18	3899

PEAK HOUR	800-900



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	0	0	0
715-730	0	0	0	0	0
730-745	0	0	0	1	1
745-800	0	0	0	0	0
800-815	0	0	0	0	0
815-830	0	0	0	0	0
830-845	0	0	0	0	0
845-900	0	0	0	4	4
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	0	0	0	1	1
715-815	0	0	0	1	1
730-830	0	0	0	1	1
745-845	0	0	0	0	0
800-900	0	0	0	4	4

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	0	0	0
715-730	0	0	0	0	0
730-745	0	0	0	0	0
745-800	0	0	0	0	0
800-815	0	0	0	0	0
815-830	0	0	0	0	0
830-845	0	0	0	0	0
845-900	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	0	0	0	0	0
715-815	0	0	0	0	0
730-830	0	0	0	0	0
745-845	0	0	0	0	0
800-900	0	0	0	0	0

WILTEC

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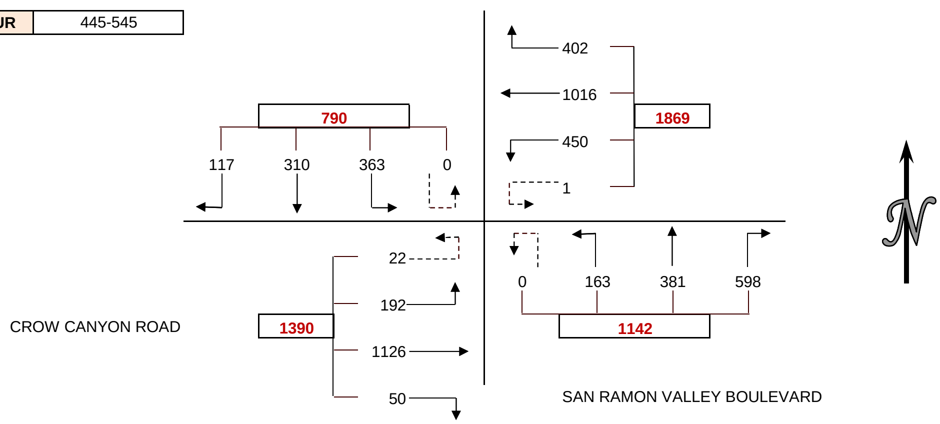
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT:		GIBSON TRANSPORTATION
PROJECT:		BISHOP RANCH STUDY, CITY OF SAN RAMON
DATE:		THURSDAY MAY 22, 2019
PERIOD:		4:00 PM TO 6:00 PM
INTERSECTION:	N/S	SAN RAMON VALLEY BOULEVARD
	E/W	CROW CANYON ROAD
CITY:		SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-415	21	77	81	0	94	192	126	0	127	76	34	0	12	269	51	9	1169
415-430	21	57	74	0	101	247	107	0	114	85	25	0	13	304	50	3	1201
430-445	37	73	82	0	97	225	98	1	126	82	33	0	10	284	39	5	1192
445-500	27	64	94	0	110	249	109	0	137	81	44	0	15	262	43	4	1239
500-515	37	83	103	0	90	251	109	0	161	99	25	0	8	270	42	5	1283
515-530	27	85	88	0	108	265	121	1	157	106	53	0	9	301	50	9	1380
530-545	26	78	78	0	94	251	111	0	143	95	41	0	18	293	57	4	1289
545-600	32	67	77	0	95	232	108	1	123	73	42	0	18	267	50	5	1190
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-500	106	271	331	0	402	913	440	1	504	324	136	0	50	1119	183	21	4801
415-515	122	277	353	0	398	972	423	1	538	347	127	0	46	1120	174	17	4915
430-530	128	305	367	0	405	990	437	2	581	368	155	0	42	1117	174	23	5094
445-545	117	310	363	0	402	1016	450	1	598	381	163	0	50	1126	192	22	5191
500-600	122	313	346	0	387	999	449	2	584	373	161	0	53	1131	199	23	5142

PEAK HOUR	445-545



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	0	0	0
415-430	0	0	0	0	0
430-445	0	1	0	1	2
445-500	0	0	0	0	0
500-515	0	0	0	0	0
515-530	0	0	1	2	3
530-545	0	0	2	0	2
545-600	0	0	0	1	1
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	0	1	0	1	2
415-515	0	1	0	1	2
430-530	0	1	1	3	5
445-545	0	0	3	2	5
500-600	0	0	3	3	6

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	0	0	0
415-430	0	0	0	0	0
430-445	0	0	0	0	0
445-500	0	0	0	0	0
500-515	0	0	0	0	0
515-530	0	0	0	0	0
530-545	0	0	0	0	0
545-600	0	0	1	2	3
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	0	0	0	0	0
415-515	0	0	0	0	0
430-530	0	0	0	0	0
445-545	0	0	0	0	0
500-600	0	0	1	2	3

WILTEC

Phone: (626) 564-1944 Fax: (626) 564-0969 info@wiltecusa.com

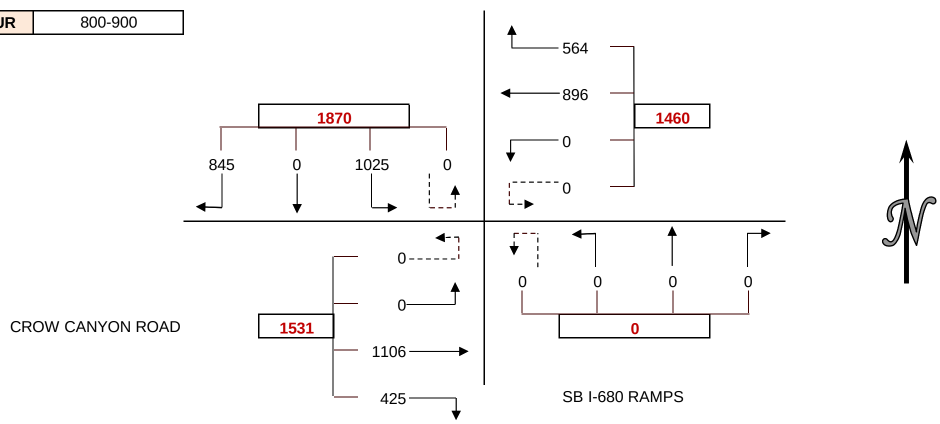
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT:		GIBSON TRANSPORTATION
PROJECT:		BISHOP RANCH STUDY, CITY OF SAN RAMON
DATE:		WEDNSEDAY MAY 22, 2019
PERIOD:		7:00 AM TO 9:00 AM
INTERSECTION:	N/S	SB I-680 RAMPS
	E/W	CROW CANYON ROAD
CITY:		SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-715	211	0	176	0	108	103	0	0	0	0	0	0	90	178	0	0	866
715-730	218	0	211	0	104	141	0	0	0	0	0	0	116	240	0	0	1030
730-745	218	0	246	0	153	168	0	0	0	0	0	0	112	253	0	0	1150
745-800	245	0	284	0	143	180	0	0	0	0	0	0	100	275	0	0	1227
800-815	216	0	223	0	153	188	0	0	0	0	0	0	98	303	0	0	1181
815-830	224	0	253	0	145	203	0	0	0	0	0	0	109	275	0	0	1209
830-845	186	0	272	0	140	188	0	0	0	0	0	0	106	293	0	0	1185
845-900	219	0	277	0	126	317	0	0	0	0	0	0	112	235	0	0	1286
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-800	892	0	917	0	508	592	0	0	0	0	0	0	418	946	0	0	4273
715-815	897	0	964	0	553	677	0	0	0	0	0	0	426	1071	0	0	4588
730-830	903	0	1006	0	594	739	0	0	0	0	0	0	419	1106	0	0	4767
745-845	871	0	1032	0	581	759	0	0	0	0	0	0	413	1146	0	0	4802
800-900	845	0	1025	0	564	896	0	0	0	0	0	0	425	1106	0	0	4861

PEAK HOUR	800-900



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	1	0	1
715-730	0	0	0	0	0
730-745	0	0	0	0	0
745-800	0	0	0	0	0
800-815	0	0	0	0	0
815-830	0	0	1	0	1
830-845	0	0	0	0	0
845-900	0	0	1	0	1
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	0	0	1	0	1
715-815	0	0	0	0	0
730-830	0	0	1	0	1
745-845	0	0	1	0	1
800-900	0	0	2	0	2

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	0	0	0
715-730	0	0	0	0	0
730-745	0	0	0	0	0
745-800	0	0	0	0	0
800-815	0	0	0	0	0
815-830	0	0	0	0	0
830-845	0	0	0	0	0
845-900	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	0	0	0	0	0
715-815	0	0	0	0	0
730-830	0	0	0	0	0
745-845	0	0	0	0	0
800-900	0	0	0	0	0

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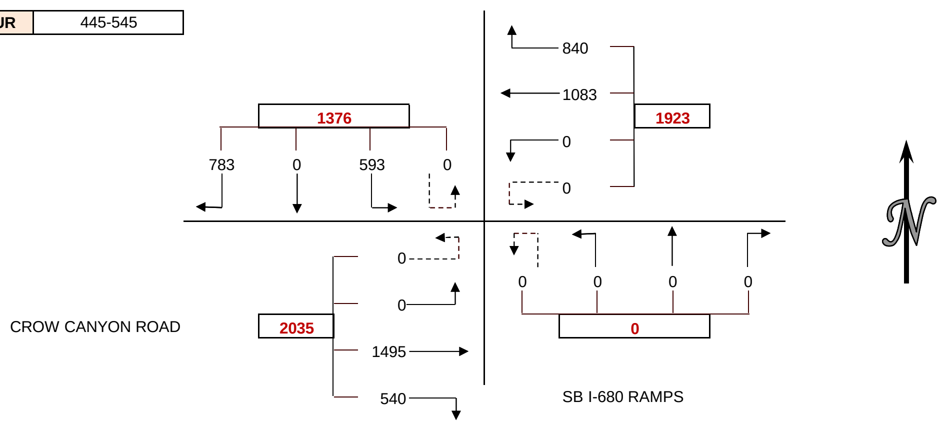
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT:		GIBSON TRANSPORTATION
PROJECT:		BISHOP RANCH STUDY, CITY OF SAN RAMON
DATE:		WEDNSEDAY MAY 22, 2019
PERIOD:		4:00 PM TO 6:00 PM
INTERSECTION:	N/S	SB I-680 RAMPS
	E/W	CROW CANYON ROAD
CITY:		SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-415	166	0	135	0	202	249	0	0	0	0	0	0	127	370	0	0	1249
415-430	186	0	114	0	196	252	0	0	0	0	0	0	134	397	0	0	1279
430-445	173	0	126	0	217	263	0	0	0	0	0	0	139	350	0	0	1268
445-500	215	0	156	0	212	256	0	0	0	0	0	0	143	357	0	0	1339
500-515	189	0	158	0	229	273	0	0	0	0	0	0	150	369	0	0	1368
515-530	179	0	152	0	215	286	0	0	0	0	0	0	118	406	0	0	1356
530-545	200	0	127	0	184	268	0	0	0	0	0	0	129	363	0	0	1271
545-600	166	0	150	0	200	272	0	0	0	0	0	0	118	372	0	0	1278
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-500	740	0	531	0	827	1020	0	0	0	0	0	0	543	1474	0	0	5135
415-515	763	0	554	0	854	1044	0	0	0	0	0	0	566	1473	0	0	5254
430-530	756	0	592	0	873	1078	0	0	0	0	0	0	550	1482	0	0	5331
445-545	783	0	593	0	840	1083	0	0	0	0	0	0	540	1495	0	0	5334
500-600	734	0	587	0	828	1099	0	0	0	0	0	0	515	1510	0	0	5273

PEAK HOUR	445-545



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	0	0	0
415-430	0	0	0	0	0
430-445	0	0	0	0	0
445-500	0	0	0	0	0
500-515	0	0	0	0	0
515-530	0	0	0	0	0
530-545	0	0	0	0	0
545-600	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	0	0	0	0	0
415-515	0	0	0	0	0
430-530	0	0	0	0	0
445-545	0	0	0	0	0
500-600	0	0	0	0	0

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	0	0	0
415-430	0	0	0	0	0
430-445	0	0	0	0	0
445-500	0	0	0	0	0
500-515	0	0	0	0	0
515-530	0	0	0	0	0
530-545	0	0	0	0	0
545-600	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	0	0	0	0	0
415-515	0	0	0	0	0
430-530	0	0	0	0	0
445-545	0	0	0	0	0
500-600	0	0	0	0	0

WILTEC

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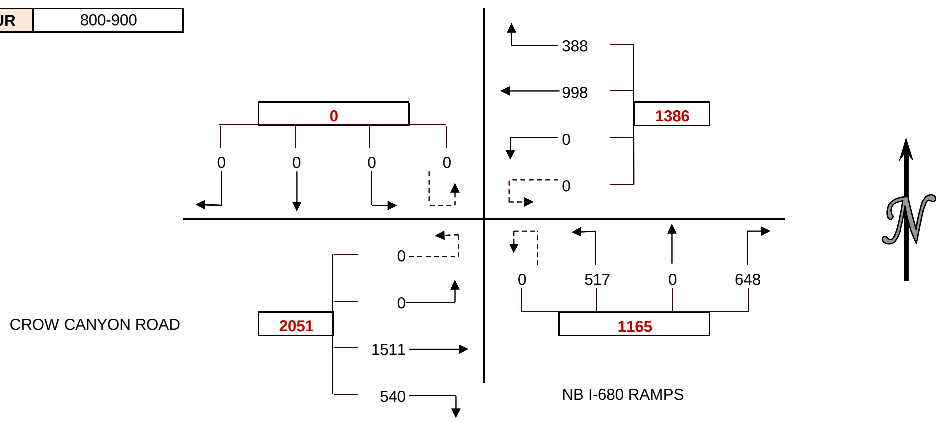
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT:		GIBSON TRANSPORTATION
PROJECT:		BISHOP RANCH STUDY, CITY OF SAN RAMON
DATE:		WEDNESDAY MAY 22 ,2019
PERIOD:		7:00 AM TO 9:00 AM
INTERSECTION:	N/S	NB I-680 RAMPS
	E/W	CROW CANYON ROAD
CITY:		SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-715	0	0	0	0	110	140	0	0	106	0	63	0	118	268	0	0	805
715-730	0	0	0	0	115	165	0	0	148	0	74	0	109	289	0	0	900
730-745	0	0	0	0	101	200	0	0	160	0	91	0	135	336	0	0	1023
745-800	0	0	0	0	104	232	0	0	184	0	103	0	127	419	0	0	1169
800-815	0	0	0	0	92	227	0	0	143	0	127	0	169	371	0	0	1129
815-830	0	0	0	0	107	242	0	0	178	0	88	0	149	365	0	0	1129
830-845	0	0	0	0	114	257	0	0	175	0	109	0	139	367	0	0	1161
845-900	0	0	0	0	75	272	0	0	152	0	193	0	83	408	0	0	1183
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-800	0	0	0	0	430	737	0	0	598	0	331	0	489	1312	0	0	3897
715-815	0	0	0	0	412	824	0	0	635	0	395	0	540	1415	0	0	4221
730-830	0	0	0	0	404	901	0	0	665	0	409	0	580	1491	0	0	4450
745-845	0	0	0	0	417	958	0	0	680	0	427	0	584	1522	0	0	4588
800-900	0	0	0	0	388	998	0	0	648	0	517	0	540	1511	0	0	4602

PEAK HOUR	800-900



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	1	0	1
715-730	0	0	0	0	0
730-745	0	0	0	0	0
745-800	0	0	0	0	0
800-815	0	0	0	0	0
815-830	0	0	1	0	1
830-845	0	0	0	0	0
845-900	0	0	1	0	1
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	0	0	1	0	1
715-815	0	0	0	0	0
730-830	0	0	1	0	1
745-845	0	0	1	0	1
800-900	0	0	2	0	2

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	0	0	0
715-730	0	0	0	0	0
730-745	0	0	0	0	0
745-800	0	0	0	0	0
800-815	0	0	0	0	0
815-830	0	0	0	0	0
830-845	0	0	0	0	0
845-900	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	0	0	0	0	0
715-815	0	0	0	0	0
730-830	0	0	0	0	0
745-845	0	0	0	0	0
800-900	0	0	0	0	0

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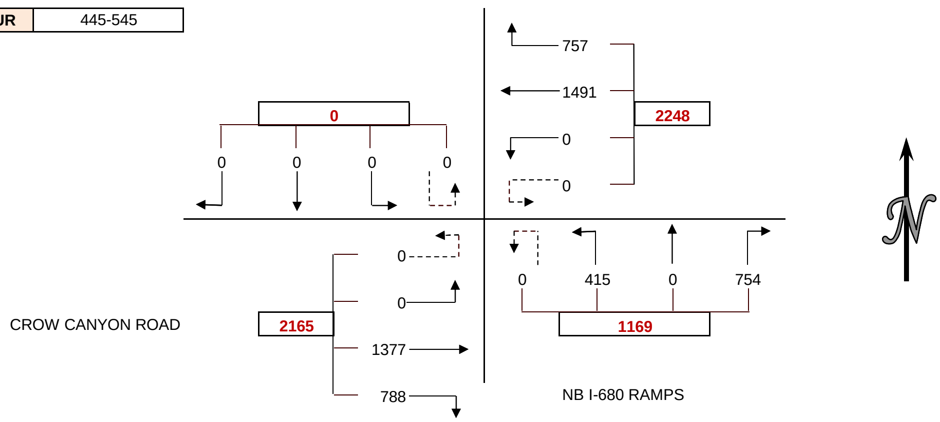
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT:		GIBSON TRANSPORTATION
PROJECT:		BISHOP RANCH STUDY, CITY OF SAN RAMON
DATE:		WEDNESDAY MAY 22, 2019
PERIOD:		4:00 PM TO 6:00 PM
INTERSECTION:	N/S	NB I-680 RAMPS
	E/W	CROW CANYON ROAD
CITY:		SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-415	0	0	0	0	196	345	0	0	170	0	92	0	178	344	0	0	1325
415-430	0	0	0	0	152	319	0	0	149	0	110	0	190	322	0	0	1242
430-445	0	0	0	0	184	392	0	0	173	0	104	0	158	332	0	0	1343
445-500	0	0	0	0	166	371	0	0	166	0	97	0	195	350	0	0	1345
500-515	0	0	0	0	220	413	0	0	186	0	92	0	174	340	0	0	1425
515-530	0	0	0	0	186	373	0	0	186	0	126	0	207	359	0	0	1437
530-545	0	0	0	0	185	334	0	0	216	0	100	0	212	328	0	0	1375
545-600	0	0	0	0	153	307	0	0	199	0	107	0	166	396	0	0	1328
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-500	0	0	0	0	698	1427	0	0	658	0	403	0	721	1348	0	0	5255
415-515	0	0	0	0	722	1495	0	0	674	0	403	0	717	1344	0	0	5355
430-530	0	0	0	0	756	1549	0	0	711	0	419	0	734	1381	0	0	5550
445-545	0	0	0	0	757	1491	0	0	754	0	415	0	788	1377	0	0	5582
500-600	0	0	0	0	744	1427	0	0	787	0	425	0	759	1423	0	0	5565

PEAK HOUR	445-545



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	2	0	2
415-430	0	0	1	0	1
430-445	0	0	0	0	0
445-500	0	0	1	0	1
500-515	0	0	0	0	0
515-530	0	0	1	0	1
530-545	0	0	1	0	1
545-600	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	0	0	4	0	4
415-515	0	0	2	0	2
430-530	0	0	2	0	2
445-545	0	0	3	0	3
500-600	0	0	2	0	2

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	0	0	0
415-430	0	0	0	0	0
430-445	0	0	0	0	0
445-500	0	0	0	0	0
500-515	0	0	0	0	0
515-530	0	0	2	0	2
530-545	0	0	1	0	1
545-600	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	0	0	0	0	0
415-515	0	0	0	0	0
430-530	0	0	2	0	2
445-545	0	0	3	0	3
500-600	0	0	3	0	3

WILTEC

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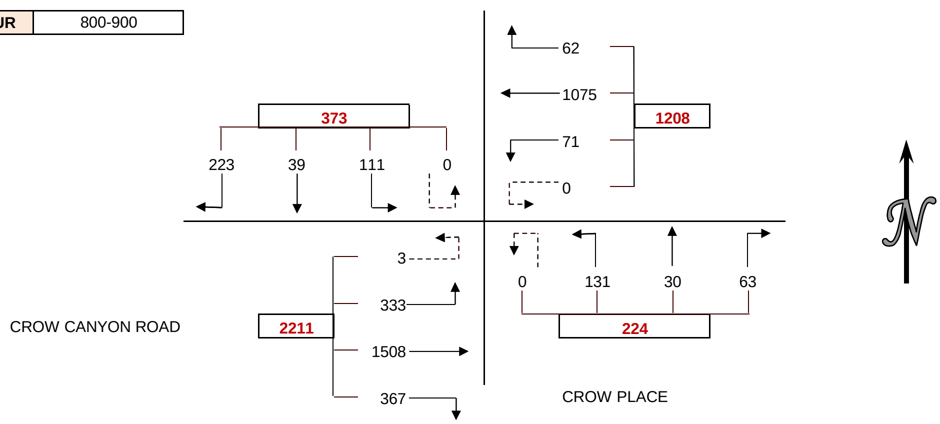
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT:		GIBSON TRANSPORTATION
PROJECT:		BISHOP RANCH STUDY, CITY OF SAN RAMON
DATE:		WEDNESDAY MAY 22, 2019
PERIOD:		7:00 AM TO 9:00 AM
INTERSECTION:	N/S	CROW PLACE
	E/W	CROW CANYON ROAD
CITY:		SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-715	38	4	17	0	12	220	5	0	8	2	12	0	59	279	39	1	696
715-730	52	7	16	0	18	235	8	0	16	9	25	0	87	327	49	0	849
730-745	32	8	13	0	6	211	0	0	19	8	31	0	87	338	65	0	818
745-800	57	16	26	0	14	262	8	0	16	7	22	0	104	390	69	0	991
800-815	59	10	34	0	16	249	15	0	12	10	28	0	110	348	68	1	960
815-830	49	8	22	0	12	290	20	0	21	6	30	0	85	379	87	2	1011
830-845	67	10	27	0	24	266	10	0	20	8	26	0	98	387	88	0	1031
845-900	48	11	28	0	10	270	26	0	10	6	47	0	74	394	90	0	1014
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-800	179	35	72	0	50	928	21	0	59	26	90	0	337	1334	222	1	3354
715-815	200	41	89	0	54	957	31	0	63	34	106	0	388	1403	251	1	3618
730-830	197	42	95	0	48	1012	43	0	68	31	111	0	386	1455	289	3	3780
745-845	232	44	109	0	66	1067	53	0	69	31	106	0	397	1504	312	3	3993
800-900	223	39	111	0	62	1075	71	0	63	30	131	0	367	1508	333	3	4016

PEAK HOUR	800-900



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	0	0	0
715-730	0	1	0	0	1
730-745	1	1	0	0	2
745-800	0	0	0	0	0
800-815	0	0	0	0	0
815-830	0	0	0	0	0
830-845	0	2	0	0	2
845-900	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	1	2	0	0	3
715-815	1	2	0	0	3
730-830	1	1	0	0	2
745-845	0	2	0	0	2
800-900	0	2	0	0	2

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	0	0	0
715-730	0	0	0	0	0
730-745	0	0	0	0	0
745-800	0	0	0	0	0
800-815	0	0	0	0	0
815-830	0	0	0	0	0
830-845	0	0	0	0	0
845-900	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	0	0	0	0	0
715-815	0	0	0	0	0
730-830	0	0	0	0	0
745-845	0	0	0	0	0
800-900	0	0	0	0	0

WILTEC

Phone: (626) 564-1944 Fax: (626) 564-0969 info@wiltecusa.com

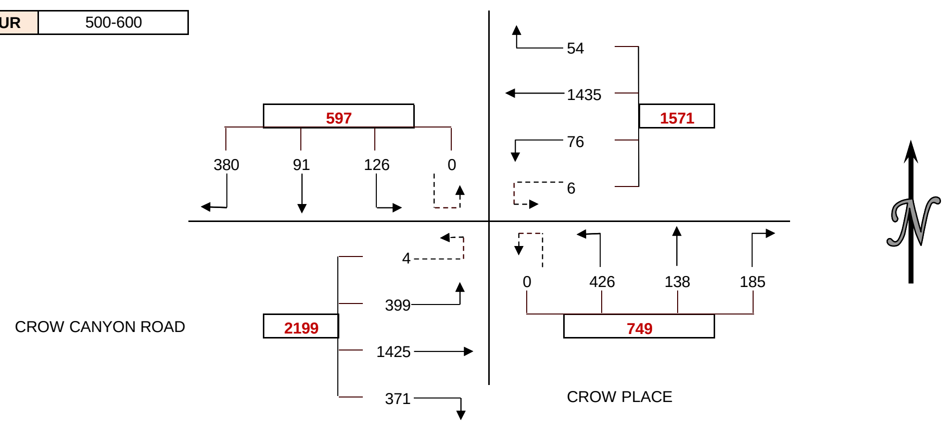
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT:		GIBSON TRANSPORTATION
PROJECT:		BISHOP RANCH STUDY, CITY OF SAN RAMON
DATE:		WEDNESDAY MAY 22nd, 2019
PERIOD:		4:00 PM TO 6:00 PM
INTERSECTION:	N/S	CROW PLACE
	E/W	CROW CANYON ROAD
CITY:		SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-415	99	27	27	0	15	350	20	2	44	27	109	0	85	318	84	0	1207
415-430	84	20	28	0	21	341	12	1	40	27	94	0	93	342	89	1	1193
430-445	79	22	36	0	17	390	17	3	38	39	115	0	84	290	98	0	1228
445-500	95	29	50	0	17	341	14	1	40	30	96	0	82	324	103	0	1222
500-515	114	19	26	0	17	398	22	0	50	30	111	0	78	310	98	1	1274
515-530	101	27	33	0	9	368	20	1	42	31	124	0	96	352	94	1	1299
530-545	78	26	35	0	13	360	16	3	57	42	103	0	98	363	113	0	1307
545-600	87	19	32	0	15	309	18	2	36	35	88	0	99	400	94	2	1236
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-500	357	98	141	0	70	1422	63	7	162	123	414	0	344	1274	374	1	4850
415-515	372	90	140	0	72	1470	65	5	168	126	416	0	337	1266	388	2	4917
430-530	389	97	145	0	60	1497	73	5	170	130	446	0	340	1276	393	2	5023
445-545	388	101	144	0	56	1467	72	5	189	133	434	0	354	1349	408	2	5102
500-600	380	91	126	0	54	1435	76	6	185	138	426	0	371	1425	399	4	5116

PEAK HOUR	500-600



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	3	1	0	4
415-430	0	3	1	0	4
430-445	0	0	0	0	0
445-500	0	4	1	0	5
500-515	0	0	2	0	2
515-530	0	2	0	0	2
530-545	0	0	0	0	0
545-600	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	0	10	3	0	13
415-515	0	7	4	0	11
430-530	0	6	3	0	9
445-545	0	6	3	0	9
500-600	0	2	2	0	4

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	0	0	0
415-430	0	0	0	0	0
430-445	0	0	0	0	0
445-500	0	0	0	0	0
500-515	0	0	0	0	0
515-530	0	0	0	0	0
530-545	0	0	0	0	0
545-600	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	0	0	0	0	0
415-515	0	0	0	0	0
430-530	0	0	0	0	0
445-545	0	0	0	0	0
500-600	0	0	0	0	0

WILTEC

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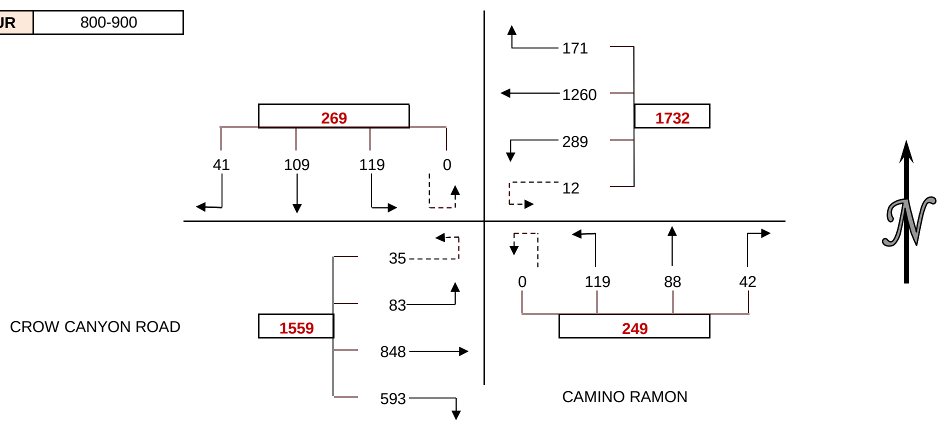
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT:		GIBSON TRANSPORTATION
PROJECT:		BISHOP RANCH STUDY, CITY OF SAN RAMON
DATE:		WEDNESDAY MAY 22, 2019
PERIOD:		7:00 AM TO 9:00 AM
INTERSECTION:	N/S	CAMINO RAMON
	E/W	CROW CANYON ROAD
CITY:		SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-715	10	16	20	1	12	230	28	2	4	8	12	0	98	152	14	5	612
715-730	10	12	23	0	12	269	43	0	7	8	19	0	135	171	23	3	735
730-745	9	24	24	0	20	289	45	2	9	3	15	0	159	227	17	4	847
745-800	12	22	24	0	28	299	69	4	10	9	24	0	158	220	22	6	907
800-815	5	20	30	0	41	303	62	1	10	23	30	0	136	185	17	3	866
815-830	15	28	23	0	31	344	79	5	16	12	30	0	158	213	21	13	988
830-845	13	29	27	0	47	288	74	5	6	22	28	0	133	185	14	5	876
845-900	8	32	39	0	52	325	74	1	10	31	31	0	166	265	31	14	1079
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-800	41	74	91	1	72	1087	185	8	30	28	70	0	550	770	76	18	3101
715-815	36	78	101	0	101	1160	219	7	36	43	88	0	588	803	79	16	3355
730-830	41	94	101	0	120	1235	255	12	45	47	99	0	611	845	77	26	3608
745-845	45	99	104	0	147	1234	284	15	42	66	112	0	585	803	74	27	3637
800-900	41	109	119	0	171	1260	289	12	42	88	119	0	593	848	83	35	3809

PEAK HOUR	800-900



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	0	0	0
715-730	0	0	0	0	0
730-745	2	0	0	1	3
745-800	0	5	1	0	6
800-815	0	0	0	1	1
815-830	0	2	0	0	2
830-845	1	1	4	0	6
845-900	0	0	2	1	3
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	2	5	1	1	9
715-815	2	5	1	2	10
730-830	2	7	1	2	12
745-845	1	8	5	1	15
800-900	1	3	6	2	12

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	0	0	0
715-730	0	0	0	0	0
730-745	0	0	0	0	0
745-800	0	0	0	0	0
800-815	0	0	0	0	0
815-830	0	0	0	0	0
830-845	0	0	0	0	0
845-900	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	0	0	0	0	0
715-815	0	0	0	0	0
730-830	0	0	0	0	0
745-845	0	0	0	0	0
800-900	0	0	0	0	0

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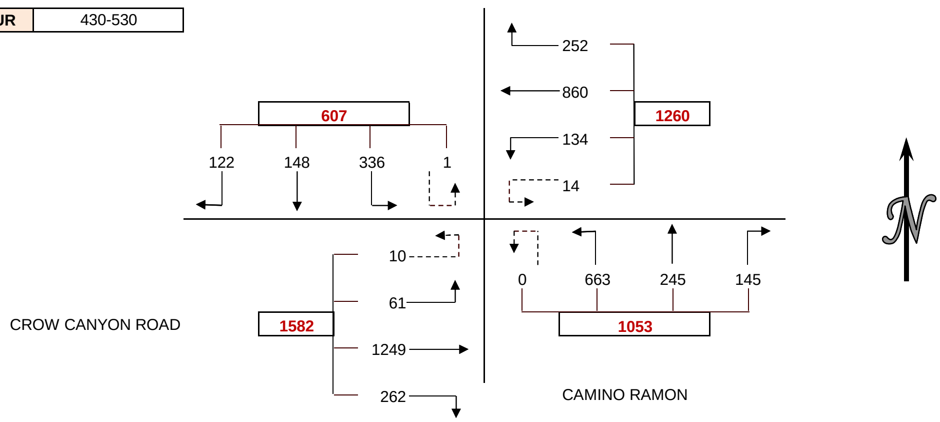
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT: GIBSON TRANSPORTATION
PROJECT: BISHOP RANCH STUDY, CITY OF SAN RAMON
DATE: WEDNESDAY MAY 22nd, 2019
PERIOD: 4:00 PM TO 6:00 PM
INTERSECTION: N/S CAMINO RAMON
E/W CROW CANYON ROAD
CITY: SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-415	37	47	96	0	58	202	33	2	37	58	131	0	62	293	21	7	1084
415-430	28	36	77	0	52	195	40	3	27	57	117	0	68	263	21	4	988
430-445	38	43	74	0	74	237	36	2	34	60	172	0	61	281	18	3	1133
445-500	25	32	76	1	72	199	41	5	33	49	149	0	71	307	11	0	1071
500-515	31	38	72	0	57	230	30	3	38	74	192	0	59	305	13	5	1147
515-530	28	35	114	0	49	194	27	4	40	62	150	0	71	356	19	2	1151
530-545	30	39	90	0	52	179	42	1	26	61	134	0	54	332	13	2	1055
545-600	26	27	97	0	53	187	46	0	32	57	130	0	60	340	20	7	1082
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-500	128	158	323	1	256	833	150	12	131	224	569	0	262	1144	71	14	4276
415-515	122	149	299	1	255	861	147	13	132	240	630	0	259	1156	63	12	4339
430-530	122	148	336	1	252	860	134	14	145	245	663	0	262	1249	61	10	4502
445-545	114	144	352	1	230	802	140	13	137	246	625	0	255	1300	56	9	4424
500-600	115	139	373	0	211	790	145	8	136	254	606	0	244	1333	65	16	4435

PEAK HOUR	430-530



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	3	8	4	2	17
415-430	0	0	0	5	5
430-445	0	2	0	1	3
445-500	0	0	0	3	3
500-515	0	0	2	0	2
515-530	0	0	1	0	1
530-545	0	0	0	0	0
545-600	0	1	1	3	5
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	3	10	4	11	28
415-515	0	2	2	9	13
430-530	0	2	3	4	9
445-545	0	0	3	3	6
500-600	0	1	4	3	8

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	0	0	0
415-430	0	0	0	0	0
430-445	0	0	0	0	0
445-500	0	0	0	0	0
500-515	0	0	0	0	0
515-530	0	0	0	0	0
530-545	0	0	0	1	1
545-600	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	0	0	0	0	0
415-515	0	0	0	0	0
430-530	0	0	0	0	0
445-545	0	0	0	1	1
500-600	0	0	0	1	1

WILTEC

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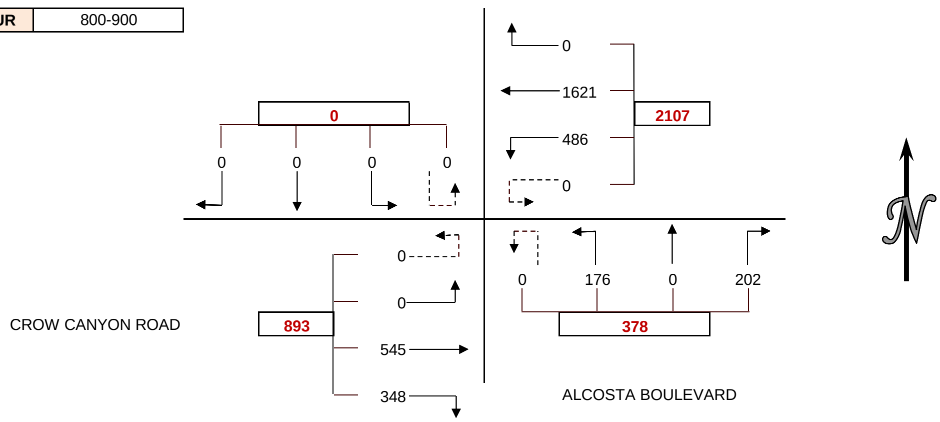
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT:		GIBSON TRANSPORTATION
PROJECT:		BISHOP RANCH STUDY, CITY OF SAN RAMON
DATE:		WEDNSEDAY MAY 22, 2019
PERIOD:		7:00 AM TO 9:00 AM
INTERSECTION:	N/S	ALCOSTA BOULEVARD
	E/W	CROW CANYON ROAD
CITY:		SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-715	0	0	0	0	0	244	44	0	15	0	22	0	77	78	0	0	480
715-730	0	0	0	0	0	334	45	0	32	0	18	0	75	81	0	0	585
730-745	0	0	0	0	0	347	51	0	28	0	35	0	89	111	0	0	661
745-800	0	0	0	0	0	358	78	0	33	0	33	0	91	137	0	0	730
800-815	0	0	0	0	0	388	100	0	51	0	36	0	59	129	0	0	763
815-830	0	0	0	0	0	418	114	0	47	0	30	0	75	141	0	0	825
830-845	0	0	0	0	0	390	107	0	50	0	39	0	109	136	0	0	831
845-900	0	0	0	0	0	425	165	0	54	0	71	0	105	139	0	0	959
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-800	0	0	0	0	0	1283	218	0	108	0	108	0	332	407	0	0	2456
715-815	0	0	0	0	0	1427	274	0	144	0	122	0	314	458	0	0	2739
730-830	0	0	0	0	0	1511	343	0	159	0	134	0	314	518	0	0	2979
745-845	0	0	0	0	0	1554	399	0	181	0	138	0	334	543	0	0	3149
800-900	0	0	0	0	0	1621	486	0	202	0	176	0	348	545	0	0	3378

PEAK HOUR	800-900



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	0	0	0
715-730	0	0	1	0	1
730-745	0	1	1	0	2
745-800	0	0	1	0	1
800-815	0	0	0	0	0
815-830	0	0	1	0	1
830-845	0	0	0	0	0
845-900	0	0	1	0	1
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	0	1	3	0	4
715-815	0	1	3	0	4
730-830	0	1	3	0	4
745-845	0	0	2	0	2
800-900	0	0	2	0	2

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	0	0	0
715-730	0	0	0	0	0
730-745	0	0	0	0	0
745-800	0	0	0	0	0
800-815	0	0	0	0	0
815-830	0	0	0	0	0
830-845	0	0	0	0	0
845-900	0	0	1	0	1
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	0	0	0	0	0
715-815	0	0	0	0	0
730-830	0	0	0	0	0
745-845	0	0	0	0	0
800-900	0	0	1	0	1

WILTEC

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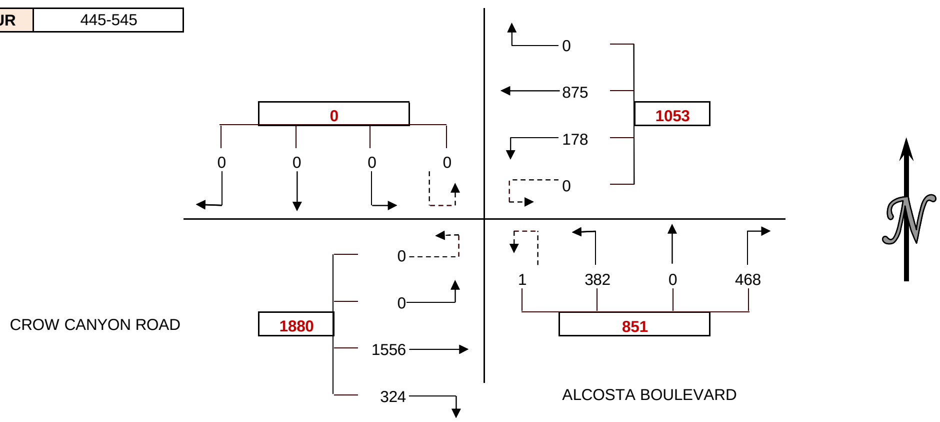
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT:		GIBSON TRANSPORTATION
PROJECT:		BISHOP RANCH STUDY, CITY OF SAN RAMON
DATE:		WEDNSEDAY MAY 22, 2019
PERIOD:		4:00 PM TO 6:00 PM
INTERSECTION:	N/S	ALCOSTA BOULEVARD
	E/W	CROW CANYON ROAD
CITY:		SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-415	0	0	0	0	0	229	39	0	94	0	88	1	89	331	0	0	871
415-430	0	0	0	0	0	227	43	0	99	0	87	0	68	302	0	0	826
430-445	0	0	0	0	0	219	50	0	98	0	113	0	72	317	0	0	869
445-500	0	0	0	0	0	250	67	0	106	0	87	0	84	354	0	0	948
500-515	0	0	0	0	0	206	30	0	134	0	125	0	64	367	0	0	926
515-530	0	0	0	0	0	210	35	0	121	0	89	1	94	424	0	0	974
530-545	0	0	0	0	0	209	46	0	107	0	81	0	82	411	0	0	936
545-600	0	0	0	0	0	220	42	0	102	0	73	1	66	409	0	0	913
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-500	0	0	0	0	0	925	199	0	397	0	375	1	313	1304	0	0	3514
415-515	0	0	0	0	0	902	190	0	437	0	412	0	288	1340	0	0	3569
430-530	0	0	0	0	0	885	182	0	459	0	414	1	314	1462	0	0	3717
445-545	0	0	0	0	0	875	178	0	468	0	382	1	324	1556	0	0	3784
500-600	0	0	0	0	0	845	153	0	464	0	368	2	306	1611	0	0	3749

PEAK HOUR	445-545



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	0	0	0
415-430	0	0	1	0	1
430-445	0	0	0	0	0
445-500	0	0	0	0	0
500-515	0	0	0	0	0
515-530	0	0	0	0	0
530-545	0	0	0	0	0
545-600	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	0	0	1	0	1
415-515	0	0	1	0	1
430-530	0	0	0	0	0
445-545	0	0	0	0	0
500-600	0	0	0	0	0

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	0	0	0
415-430	0	0	0	0	0
430-445	0	0	0	0	0
445-500	0	0	0	0	0
500-515	0	0	0	0	0
515-530	0	1	2	0	3
530-545	0	0	0	0	0
545-600	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	0	0	0	0	0
415-515	0	0	0	0	0
430-530	0	1	2	0	3
445-545	0	1	2	0	3
500-600	0	1	2	0	3

WILTEC Phone: (626) 564-1944 Fax: (626) 564-0969 info@wiltecusa.com

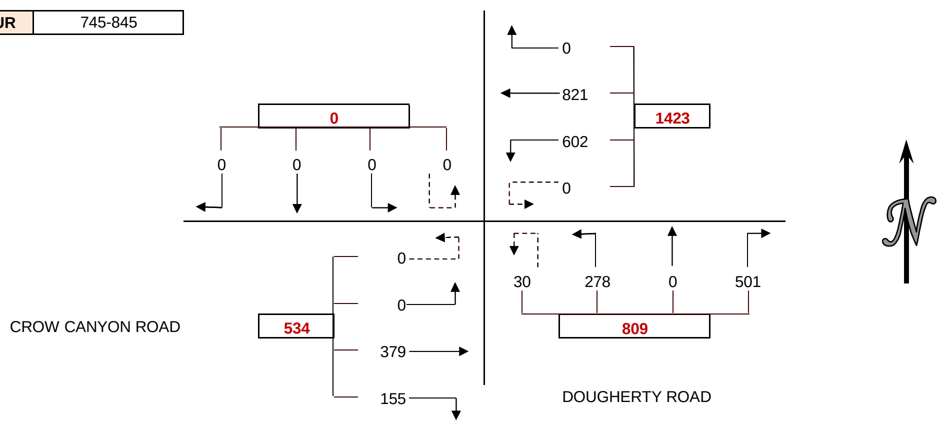
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT:		GIBSON TRANSPORTATION
PROJECT:		BISHOP RANCH STUDY, CITY OF SAN RAMON
DATE:		THURSDAY MAY 23, 2019
PERIOD:		7:00 AM TO 9:00 AM
INTERSECTION:	N/S	DOUGHERTY ROAD
	E/W	CROW CANYON ROAD
CITY:		SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-715	0	0	0	0	0	118	80	0	50	0	29	3	27	47	0	0	354
715-730	0	0	0	0	0	128	93	0	66	0	52	4	27	49	0	0	419
730-745	0	0	0	0	0	154	126	0	85	0	36	8	30	51	0	0	490
745-800	0	0	0	0	0	205	144	0	120	0	59	11	30	77	0	0	646
800-815	0	0	0	0	0	242	185	0	120	0	74	10	39	95	0	0	765
815-830	0	0	0	0	0	201	156	0	137	0	69	6	43	109	0	0	721
830-845	0	0	0	0	0	173	117	0	124	0	76	3	43	98	0	0	634
845-900	0	0	0	0	0	178	118	0	111	0	63	4	32	83	0	0	589
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-800	0	0	0	0	0	605	443	0	321	0	176	26	114	224	0	0	1909
715-815	0	0	0	0	0	729	548	0	391	0	221	33	126	272	0	0	2320
730-830	0	0	0	0	0	802	611	0	462	0	238	35	142	332	0	0	2622
745-845	0	0	0	0	0	821	602	0	501	0	278	30	155	379	0	0	2766
800-900	0	0	0	0	0	794	576	0	492	0	282	23	157	385	0	0	2709

PEAK HOUR	745-845



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	1	0	0	1
715-730	0	0	0	0	0
730-745	0	0	0	0	0
745-800	0	0	0	0	0
800-815	0	0	0	0	0
815-830	0	0	0	0	0
830-845	0	0	0	0	0
845-900	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	0	1	0	0	1
715-815	0	0	0	0	0
730-830	0	0	0	0	0
745-845	0	0	0	0	0
800-900	0	0	0	0	0

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	1	0	1
715-730	0	0	1	0	1
730-745	0	0	0	0	0
745-800	0	1	1	0	2
800-815	0	0	0	0	0
815-830	0	0	0	0	0
830-845	0	0	0	0	0
845-900	0	1	1	0	2
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	0	1	3	0	4
715-815	0	1	2	0	3
730-830	0	1	1	0	2
745-845	0	1	1	0	2
800-900	0	1	1	0	2

WILTEC Phone: (626) 564-1944 Fax: (626) 564-0969 info@wiltecusa.com

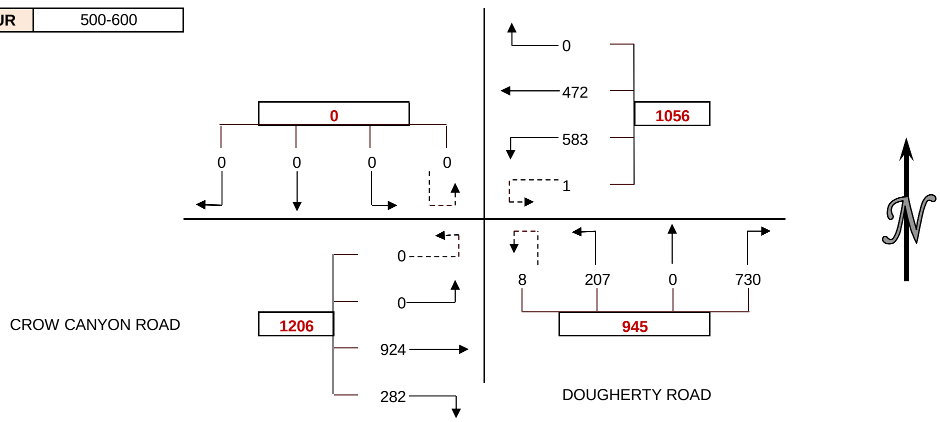
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT: GIBSON TRANSPORTATION
PROJECT: BISHOP RANCH STUDY, CITY OF SAN RAMON
DATE: THURSDAY MAY 23, 2019
PERIOD: 4:00 PM TO 6:00 PM
INTERSECTION: N/S DOUGHERTY ROAD
E/W CROW CANYON ROAD
CITY: SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-415	0	0	0	0	0	154	129	0	135	0	42	4	34	188	0	0	686
415-430	0	0	0	0	0	118	117	2	197	0	45	1	48	165	0	0	693
430-445	0	0	0	0	0	131	126	0	136	0	46	1	52	195	0	0	687
445-500	0	0	0	0	0	106	114	0	145	0	47	1	67	213	0	0	693
500-515	0	0	0	0	0	107	149	1	161	0	43	1	60	207	0	0	729
515-530	0	0	0	0	0	136	157	0	201	0	60	4	68	259	0	0	885
530-545	0	0	0	0	0	105	136	0	192	0	51	0	71	229	0	0	784
545-600	0	0	0	0	0	124	141	0	176	0	53	3	83	229	0	0	809
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-500	0	0	0	0	0	509	486	2	613	0	180	7	201	761	0	0	2759
415-515	0	0	0	0	0	462	506	3	639	0	181	4	227	780	0	0	2802
430-530	0	0	0	0	0	480	546	1	643	0	196	7	247	874	0	0	2994
445-545	0	0	0	0	0	454	556	1	699	0	201	6	266	908	0	0	3091
500-600	0	0	0	0	0	472	583	1	730	0	207	8	282	924	0	0	3207

PEAK HOUR	500-600



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	0	0	0
415-430	0	0	0	0	0
430-445	0	0	0	0	0
445-500	0	0	0	0	0
500-515	0	0	0	0	0
515-530	0	0	0	0	0
530-545	0	0	0	0	0
545-600	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	0	0	0	0	0
415-515	0	0	0	0	0
430-530	0	0	0	0	0
445-545	0	0	0	0	0
500-600	0	0	0	0	0

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	0	0	0
415-430	0	1	0	0	1
430-445	0	0	0	0	0
445-500	0	0	0	0	0
500-515	0	0	1	0	1
515-530	0	0	0	0	0
530-545	0	0	1	0	1
545-600	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	0	1	0	0	1
415-515	0	1	1	0	2
430-530	0	0	1	0	1
445-545	0	0	2	0	2
500-600	0	0	2	0	2

WILTEC

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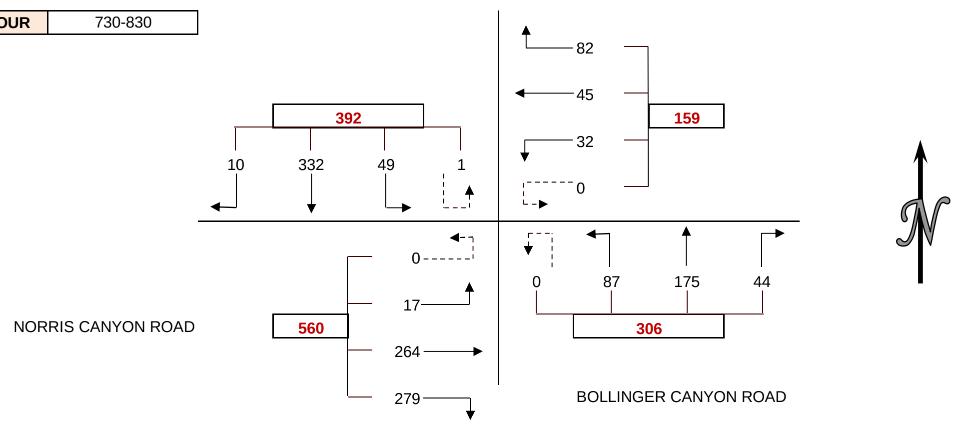
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT:		GIBSON TRANSPORTATION
PROJECT:		BISHOP RANCH STUDY, CITY OF SAN RAMON
DATE:		WEDNESDAY MAY 29, 2018
PERIOD:		7:00 AM TO 9:00 AM
INTERSECTION:	N/S	BOLLINGER CANYON ROAD
	E/W	NORRIS CANYON ROAD
CITY:		SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-715	1	26	10	0	5	4	1	0	10	19	13	0	22	21	2	0	134
715-730	1	44	7	0	10	13	7	0	23	24	16	0	36	48	1	0	230
730-745	5	78	8	1	21	21	11	0	8	37	19	0	62	55	1	0	327
745-800	1	116	18	0	27	4	11	0	10	44	29	0	98	62	5	0	425
800-815	2	98	11	0	24	11	3	0	8	43	19	0	70	68	2	0	359
815-830	2	40	12	0	10	9	7	0	18	51	20	0	49	79	9	0	306
830-845	4	30	25	0	6	18	7	0	16	58	29	0	48	65	3	0	309
845-900	3	40	21	0	8	10	10	0	22	65	14	0	31	79	5	0	308
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-800	8	264	43	1	63	42	30	0	51	124	77	0	218	186	9	0	1116
715-815	9	336	44	1	82	49	32	0	49	148	83	0	266	233	9	0	1341
730-830	10	332	49	1	82	45	32	0	44	175	87	0	279	264	17	0	1417
745-845	9	284	66	0	67	42	28	0	52	196	97	0	265	274	19	0	1399
800-900	11	208	69	0	48	48	27	0	64	217	82	0	198	291	19	0	1282

PEAK HOUR	730-830



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	0	2	2
715-730	0	1	0	1	2
730-745	0	0	0	0	0
745-800	0	0	0	1	1
800-815	0	1	0	0	1
815-830	0	1	1	0	2
830-845	0	4	0	1	5
845-900	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	0	1	0	4	5
715-815	0	2	0	2	4
730-830	0	2	1	1	4
745-845	0	6	1	2	9
800-900	0	6	1	1	8

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	0	0	0
715-730	0	0	0	0	0
730-745	0	0	0	0	0
745-800	1	0	0	3	4
800-815	0	0	0	0	0
815-830	0	0	0	1	1
830-845	0	0	0	0	0
845-900	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	1	0	0	3	4
715-815	1	0	0	3	4
730-830	1	0	0	4	5
745-845	1	0	0	4	5
800-900	0	0	0	1	1

WILTEC

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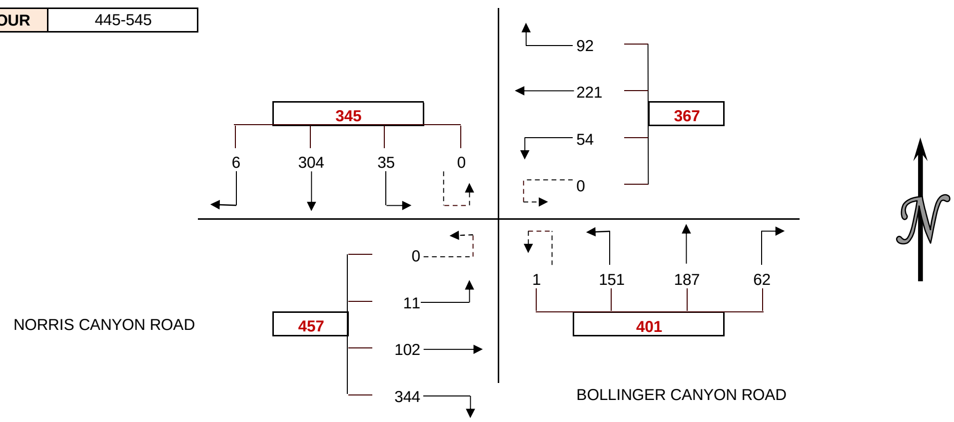
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT:		GIBSON TRANSPORTATION
PROJECT:		BISHOP RANCH STUDY, CITY OF SAN RAMON
DATE:		WEDNESDAY MAY 29, 2018
PERIOD:		4:00 PM TO 6:00 PM
INTERSECTION:	N/S	BOLLINGER CANYON ROAD
	E/W	NORRIS CANYON ROAD
CITY:		SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-415	2	63	6	0	10	35	8	0	14	41	26	0	70	21	2	0	298
415-430	2	53	6	0	15	43	11	0	17	41	33	0	67	30	5	0	323
430-445	3	50	8	0	9	45	11	0	20	45	21	0	82	30	0	0	324
445-500	1	66	9	0	20	45	9	0	14	39	40	1	81	24	2	0	351
500-515	3	74	7	0	19	64	16	0	13	42	31	0	82	29	5	0	385
515-530	1	86	11	0	19	57	15	0	17	45	37	0	111	32	1	0	432
530-545	1	78	8	0	34	55	14	0	18	61	43	0	70	17	3	0	402
545-600	6	54	4	0	17	34	10	0	16	40	41	0	70	30	5	0	327
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-500	8	232	29	0	54	168	39	0	65	166	120	1	300	105	9	0	1296
415-515	9	243	30	0	63	197	47	0	64	167	125	1	312	113	12	0	1383
430-530	8	276	35	0	67	211	51	0	64	171	129	1	356	115	8	0	1492
445-545	6	304	35	0	92	221	54	0	62	187	151	1	344	102	11	0	1570
500-600	11	292	30	0	89	210	55	0	64	188	152	0	333	108	14	0	1546

PEAK HOUR	445-545



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	1	2	0	3
415-430	0	0	0	0	0
430-445	0	1	2	0	3
445-500	0	0	0	0	0
500-515	0	0	1	0	1
515-530	1	0	0	0	1
530-545	0	0	0	0	0
545-600	1	0	0	3	4
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	0	2	4	0	6
415-515	0	1	3	0	4
430-530	1	1	3	0	5
445-545	1	0	1	0	2
500-600	2	0	1	3	6

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	0	0	0
415-430	0	0	0	0	0
430-445	1	0	0	0	1
445-500	0	0	0	0	0
500-515	0	0	0	0	0
515-530	0	0	0	0	0
530-545	0	0	0	1	1
545-600	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	1	0	0	0	1
415-515	1	0	0	0	1
430-530	1	0	0	0	1
445-545	0	0	0	1	1
500-600	0	0	0	1	1

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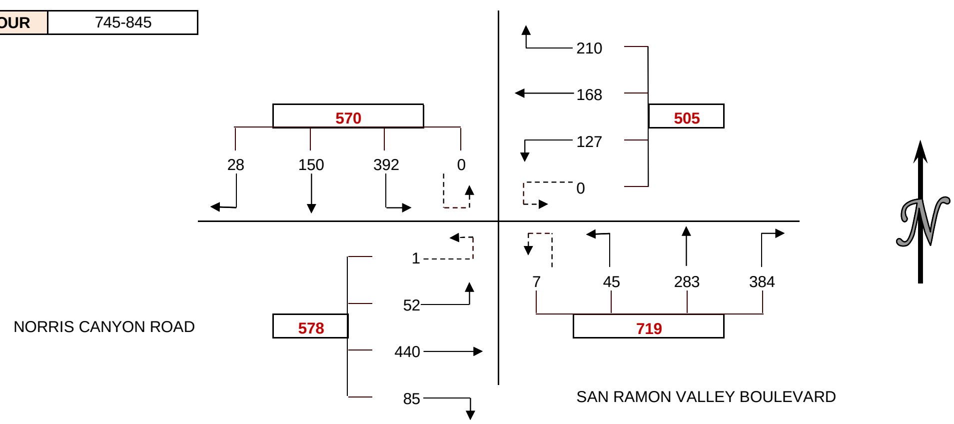
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT:		GIBSON TRANSPORTATION
PROJECT:		BISHOP RANCH STUDY, CITY OF SAN RAMON
DATE:		THURSEDAY MAY 23, 2019
PERIOD:		7:00 AM TO 9:00 AM
INTERSECTION:	N/S	SAN RAMON VALLEY BOULEVARD
	E/W	NORRIS CANYON ROAD
CITY:		SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-715	3	17	56	1	33	13	11	0	36	30	5	0	17	36	7	0	265
715-730	4	19	80	0	33	7	12	0	42	44	6	0	20	59	13	0	339
730-745	8	29	77	0	31	20	18	0	63	35	4	2	22	87	9	0	405
745-800	1	26	103	0	31	37	22	0	113	70	15	6	28	151	17	1	621
800-815	8	37	116	0	61	58	36	0	125	78	8	0	24	134	9	0	694
815-830	9	38	91	0	70	38	40	0	83	69	11	1	18	80	12	0	560
830-845	10	49	82	0	48	35	29	0	63	66	11	0	15	75	14	0	497
845-900	13	35	69	0	71	12	25	0	45	65	11	0	14	86	9	0	455
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-800	16	91	316	1	128	77	63	0	254	179	30	8	87	333	46	1	1630
715-815	21	111	376	0	156	122	88	0	343	227	33	8	94	431	48	1	2059
730-830	26	130	387	0	193	153	116	0	384	252	38	9	92	452	47	1	2280
745-845	28	150	392	0	210	168	127	0	384	283	45	7	85	440	52	1	2372
800-900	40	159	358	0	250	143	130	0	316	278	41	1	71	375	44	0	2206

PEAK HOUR	745-845



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	1	0	0	1	2
715-730	2	0	0	0	2
730-745	2	0	0	2	4
745-800	3	0	0	1	4
800-815	1	0	0	0	1
815-830	1	0	0	0	1
830-845	0	1	0	0	1
845-900	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	8	0	0	4	12
715-815	8	0	0	3	11
730-830	7	0	0	3	10
745-845	5	1	0	1	7
800-900	2	1	0	0	3

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	1	1	0	2
715-730	0	0	1	0	1
730-745	2	0	2	0	4
745-800	1	0	4	1	6
800-815	0	0	3	1	4
815-830	0	1	1	0	2
830-845	1	0	0	0	1
845-900	1	0	1	3	5
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	3	1	8	1	13
715-815	3	0	10	2	15
730-830	3	1	10	2	16
745-845	2	1	8	2	13
800-900	2	1	5	4	12

WILTEC

Phone: (626) 564-1944 Fax: (626) 564-0969 info@wiltecusa.com

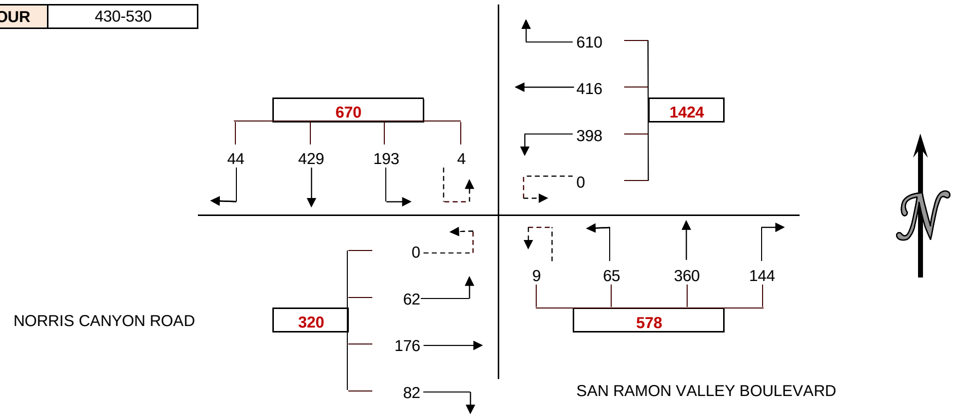
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT:		GIBSON TRANSPORTATION
PROJECT:		BISHOP RANCH STUDY, CITY OF SAN RAMON
DATE:		THURSEDAY MAY 23, 2019
PERIOD:		4:00 PM TO 6:00 PM
INTERSECTION:	N/S	SAN RAMON VALLEY BOULEVARD
	E/W	NORRIS CANYON ROAD
CITY:		SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-415	18	78	49	0	137	84	68	0	33	74	18	3	15	37	11	0	625
415-430	22	79	53	0	122	74	61	0	29	81	9	2	17	52	10	0	611
430-445	19	97	43	1	132	101	85	0	32	78	14	3	18	39	17	0	679
445-500	10	106	55	1	130	95	80	0	40	95	14	2	14	46	17	0	705
500-515	9	125	44	1	194	113	126	0	35	96	22	2	28	43	17	0	855
515-530	6	101	51	1	154	107	107	0	37	91	15	2	22	48	11	0	753
530-545	18	109	64	0	101	68	75	0	36	86	13	5	19	31	17	0	642
545-600	17	105	61	2	93	47	65	0	35	128	12	1	15	37	14	0	632
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-500	69	360	200	2	521	354	294	0	134	328	55	10	64	174	55	0	2620
415-515	60	407	195	3	578	383	352	0	136	350	59	9	77	180	61	0	2850
430-530	44	429	193	4	610	416	398	0	144	360	65	9	82	176	62	0	2992
445-545	43	441	214	3	579	383	388	0	148	368	64	11	83	168	62	0	2955
500-600	50	440	220	4	542	335	373	0	143	401	62	10	84	159	59	0	2882

PEAK HOUR	430-530



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	6	0	0	0	6
415-430	0	0	0	1	1
430-445	3	0	0	0	3
445-500	0	0	0	0	0
500-515	0	0	0	0	0
515-530	2	0	1	1	4
530-545	1	0	0	1	2
545-600	3	1	0	0	4
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	9	0	0	1	10
415-515	3	0	0	1	4
430-530	5	0	1	1	7
445-545	3	0	1	2	6
500-600	6	1	1	2	10

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	2	1	3
415-430	3	0	0	0	3
430-445	1	0	0	0	1
445-500	0	0	0	1	1
500-515	1	0	0	1	2
515-530	0	0	1	0	1
530-545	1	0	0	1	2
545-600	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	4	0	2	2	8
415-515	5	0	0	2	7
430-530	2	0	1	2	5
445-545	2	0	1	3	6
500-600	2	0	1	2	5

WILTEC

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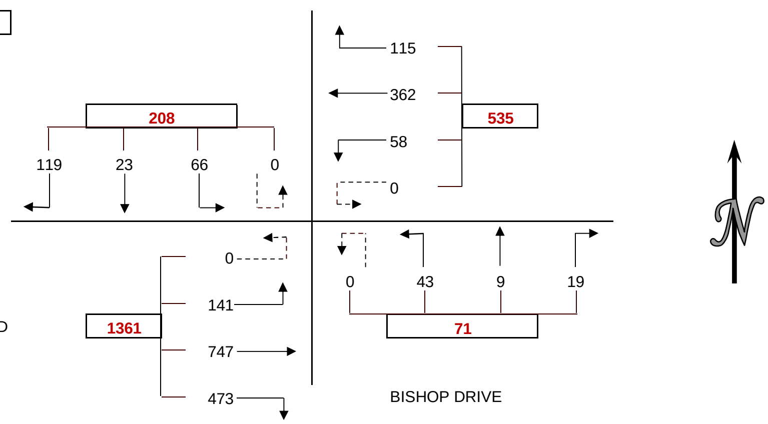
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT:		GIBSON TRANSPORTATION
PROJECT:		BISHOP RANCH STUDY, CITY OF SAN RAMON
DATE:		WEDNESDAY MAY 29, 2018
PERIOD:		7:00 AM TO 9:00 AM
INTERSECTION:	N/S	BISHOP DRIVE
	E/W	NORRIS CANYON ROAD
CITY:		SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-715	3	1	1	0	3	68	10	0	3	2	6	0	50	93	15	0	255
715-730	3	0	0	0	6	88	3	0	7	2	14	0	82	167	16	0	388
730-745	4	6	2	0	9	96	6	0	4	2	13	0	95	115	19	0	371
745-800	5	1	2	0	7	84	13	0	5	4	6	0	108	166	33	0	434
800-815	20	3	14	0	40	67	9	0	3	3	8	0	113	175	44	0	499
815-830	70	13	41	0	61	81	17	0	4	3	6	0	114	159	67	0	636
830-845	22	6	10	0	9	102	19	0	5	0	11	0	120	200	17	0	521
845-900	7	1	1	0	5	112	13	0	7	3	18	0	126	213	13	0	519
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-800	15	8	5	0	25	336	32	0	19	10	39	0	335	541	83	0	1448
715-815	32	10	18	0	62	335	31	0	19	11	41	0	398	623	112	0	1692
730-830	99	23	59	0	117	328	45	0	16	12	33	0	430	615	163	0	1940
745-845	117	23	67	0	117	334	58	0	17	10	31	0	455	700	161	0	2090
800-900	119	23	66	0	115	362	58	0	19	9	43	0	473	747	141	0	2175

PEAK HOUR	800-900



NORRIS CANYON ROAD

PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	0	0	0
715-730	1	2	0	0	3
730-745	4	4	1	1	10
745-800	3	1	0	0	4
800-815	2	0	0	0	2
815-830	1	0	0	0	1
830-845	3	1	0	0	4
845-900	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	8	7	1	1	17
715-815	10	7	1	1	19
730-830	10	5	1	1	17
745-845	9	2	0	0	11
800-900	6	1	0	0	7

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	0	0	0
715-730	1	0	1	0	2
730-745	0	0	0	0	0
745-800	0	0	1	0	1
800-815	2	0	1	0	3
815-830	1	0	0	0	1
830-845	1	0	0	0	1
845-900	2	0	2	0	4
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	1	0	2	0	3
715-815	3	0	3	0	6
730-830	3	0	2	0	5
745-845	4	0	2	0	6
800-900	6	0	3	0	9

WILTEC

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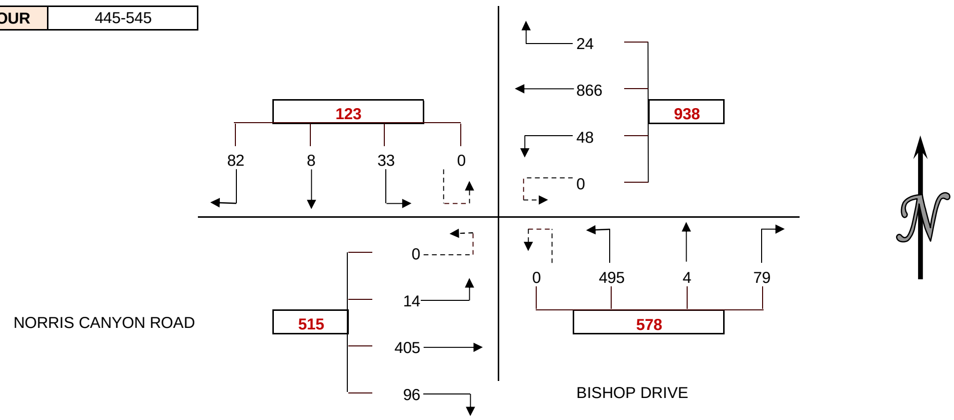
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT: GIBSON TRANSPORTATION
PROJECT: BISHOP RANCH STUDY, CITY OF SAN RAMON
DATE: WEDNESDAY MAY 29, 2018
PERIOD: 4:00 PM TO 6:00 PM
INTERSECTION: N/S BISHOP DRIVE
E/W NORRIS CANYON ROAD
CITY: SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-415	26	4	7	0	3	140	8	0	25	3	84	0	15	78	4	0	397
415-430	15	2	2	0	4	136	18	0	15	1	90	0	27	87	2	0	399
430-445	20	4	6	0	6	174	12	0	19	4	102	0	21	91	6	0	465
445-500	8	2	9	0	4	192	13	0	20	0	102	0	27	97	5	0	479
500-515	35	1	11	0	6	238	9	0	24	1	158	0	23	108	3	0	617
515-530	27	4	11	0	9	222	15	0	25	2	125	0	23	100	5	0	568
530-545	12	1	2	0	5	214	11	0	10	1	110	0	23	100	1	0	490
545-600	10	2	1	0	3	150	3	0	17	0	72	0	27	118	1	0	404
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-500	69	12	24	0	17	642	51	0	79	8	378	0	90	353	17	0	1740
415-515	78	9	28	0	20	740	52	0	78	6	452	0	98	383	16	0	1960
430-530	90	11	37	0	25	826	49	0	88	7	487	0	94	396	19	0	2129
445-545	82	8	33	0	24	866	48	0	79	4	495	0	96	405	14	0	2154
500-600	84	8	25	0	23	824	38	0	76	4	465	0	96	426	10	0	2079

PEAK HOUR	445-545



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	1	2	0	0	3
415-430	1	0	0	0	1
430-445	2	0	0	0	2
445-500	3	2	0	0	5
500-515	4	1	2	2	9
515-530	1	1	0	0	2
530-545	4	2	1	0	7
545-600	2	0	1	0	3
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	7	4	0	0	11
415-515	10	3	2	2	17
430-530	10	4	2	2	18
445-545	12	6	3	2	23
500-600	11	4	4	2	21

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	1	0	0	0	1
415-430	0	0	0	0	0
430-445	2	0	0	0	2
445-500	0	0	0	0	0
500-515	3	2	2	0	7
515-530	0	0	0	0	0
530-545	4	0	1	0	5
545-600	2	0	0	0	2
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	3	0	0	0	3
415-515	5	2	2	0	9
430-530	5	2	2	0	9
445-545	7	2	3	0	12
500-600	9	2	3	0	14

WILTEC

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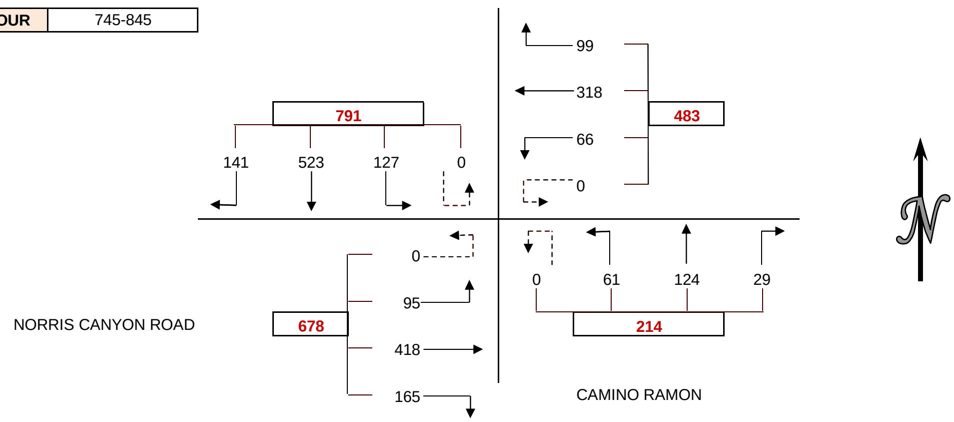
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT:		GIBSON TRANSPORTATION
PROJECT:		BISHOP RANCH STUDY, CITY OF SAN RAMON
DATE:		THURSDAY MAY 23, 2019
PERIOD:		7:00 AM TO 9:00 AM
INTERSECTION:	N/S	CAMINO RAMON
	E/W	NORRIS CANYON ROAD
CITY:		SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-715	31	75	22	0	10	28	6	0	5	21	6	0	16	38	6	0	264
715-730	18	94	18	0	13	35	18	0	9	13	3	0	18	40	14	0	293
730-745	34	117	26	0	17	35	8	0	7	18	7	0	17	50	17	0	353
745-800	30	130	34	0	25	57	13	0	9	25	15	0	41	121	27	0	527
800-815	31	138	35	0	22	79	22	0	11	43	32	0	54	162	21	0	650
815-830	39	121	25	0	24	110	13	0	5	33	13	0	33	81	25	0	522
830-845	41	134	33	0	28	72	18	0	4	23	1	0	37	54	22	0	467
845-900	33	116	35	0	29	64	18	0	12	40	9	0	35	52	25	0	468
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-800	113	416	100	0	65	155	45	0	30	77	31	0	92	249	64	0	1437
715-815	113	479	113	0	77	206	61	0	36	99	57	0	130	373	79	0	1823
730-830	134	506	120	0	88	281	56	0	32	119	67	0	145	414	90	0	2052
745-845	141	523	127	0	99	318	66	0	29	124	61	0	165	418	95	0	2166
800-900	144	509	128	0	103	325	71	0	32	139	55	0	159	349	93	0	2107

PEAK HOUR	745-845



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	2	1	3
715-730	1	0	0	0	1
730-745	1	1	0	0	2
745-800	0	10	0	1	11
800-815	1	-10	0	0	-9
815-830	1	0	1	1	3
830-845	0	0	0	1	1
845-900	0	0	1	3	4
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	2	11	2	2	17
715-815	3	1	0	1	5
730-830	3	1	1	2	7
745-845	2	0	1	3	6
800-900	2	-10	2	5	-1

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	0	0	0
715-730	0	0	0	0	0
730-745	1	1	2	0	4
745-800	1	0	0	0	1
800-815	2	0	0	0	2
815-830	0	0	1	0	1
830-845	0	0	0	0	0
845-900	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	2	1	2	0	5
715-815	4	1	2	0	7
730-830	4	1	3	0	8
745-845	3	0	1	0	4
800-900	2	0	1	0	3

WILTEC

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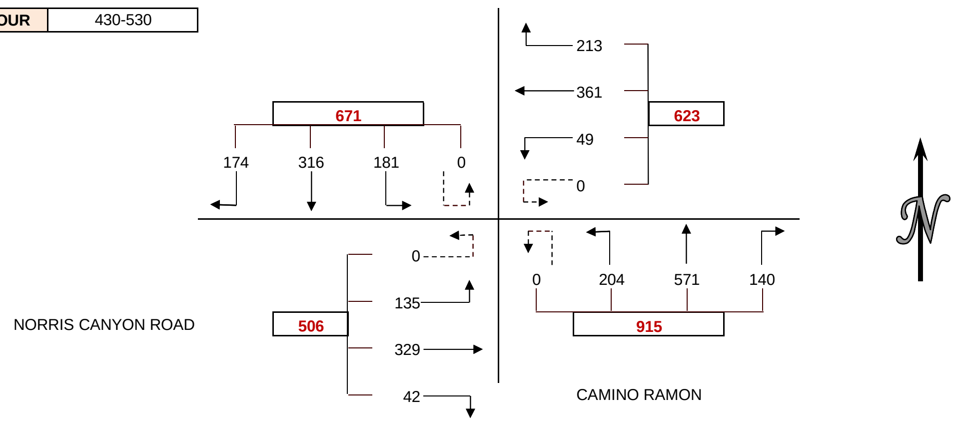
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT: GIBSON TRANSPORTATION
PROJECT: BISHOP RANCH STUDY, CITY OF SAN RAMON
DATE: THURSDAY MAY 23, 2019
PERIOD: 4:00 PM TO 6:00 PM
INTERSECTION: N/S CAMINO RAMON
E/W NORRIS CANYON ROAD
CITY: SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-415	42	67	32	0	58	87	11	0	30	122	32	0	9	63	28	0	581
415-430	34	56	23	0	46	88	18	0	25	117	21	0	10	78	41	0	557
430-445	54	64	40	0	48	86	19	0	34	141	37	0	9	69	37	0	638
445-500	39	81	48	0	48	81	8	0	30	117	49	0	11	88	31	0	631
500-515	40	77	53	0	59	108	12	0	53	157	52	0	10	85	30	0	736
515-530	41	94	40	0	58	86	10	0	23	156	66	0	12	87	37	0	710
530-545	39	84	45	0	40	64	11	0	26	136	25	0	7	75	37	0	589
545-600	36	59	31	0	40	59	7	0	17	123	26	0	11	66	28	0	503
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-500	169	268	143	0	200	342	56	0	119	497	139	0	39	298	137	0	2407
415-515	167	278	164	0	201	363	57	0	142	532	159	0	40	320	139	0	2562
430-530	174	316	181	0	213	361	49	0	140	571	204	0	42	329	135	0	2715
445-545	159	336	186	0	205	339	41	0	132	566	192	0	40	335	135	0	2666
500-600	156	314	169	0	197	317	40	0	119	572	169	0	40	313	132	0	2538

PEAK HOUR	430-530



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	2	0	0	2	4
415-430	2	0	0	2	4
430-445	2	0	0	0	2
445-500	2	1	0	0	3
500-515	2	2	0	1	5
515-530	2	0	0	0	2
530-545	0	0	0	1	1
545-600	2	1	0	0	3
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	8	1	0	4	13
415-515	8	3	0	3	14
430-530	8	3	0	1	12
445-545	6	3	0	2	11
500-600	6	3	0	2	11

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	1	0	1	0	2
415-430	0	0	0	0	0
430-445	1	0	0	0	1
445-500	0	0	0	0	0
500-515	0	0	0	1	1
515-530	0	0	0	0	0
530-545	0	1	1	0	2
545-600	0	1	0	0	1
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	2	0	1	0	3
415-515	1	0	0	1	2
430-530	1	0	0	1	2
445-545	0	1	1	1	3
500-600	0	2	1	1	4

WILTEC Phone: (626) 564-1944 Fax: (626) 564-0969 info@wiltecusa.com

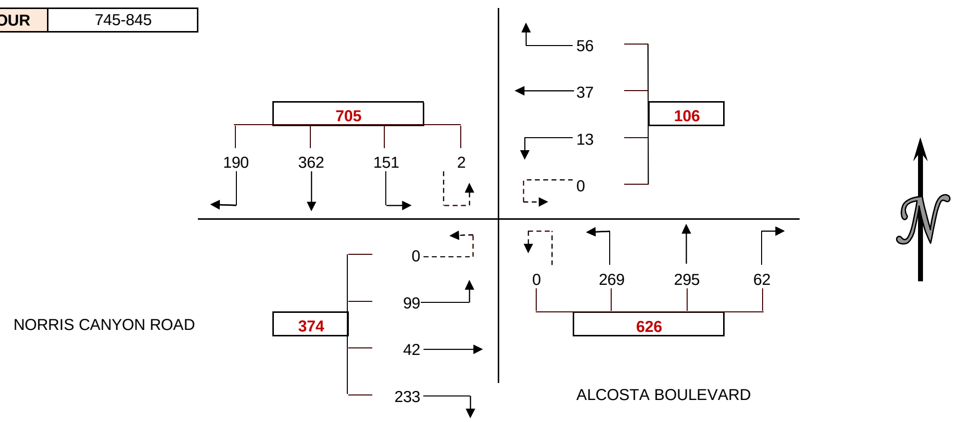
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT: GIBSON TRANSPORTATION
PROJECT: BISHOP RANCH STUDY, CITY OF SAN RAMON
DATE: THURSEDAY MAY 23, 2019
PERIOD: 7:00 AM TO 9:00 AM
INTERSECTION: N/S ALCOSTA BOULEVARD
E/W NORRIS CANYON ROAD
CITY: SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-715	19	55	22	0	7	9	1	0	2	17	22	0	25	3	15	0	197
715-730	27	43	21	0	21	13	1	0	8	39	20	0	15	12	14	0	234
730-745	30	67	32	0	10	12	4	0	7	46	43	1	28	10	16	0	306
745-800	25	122	41	1	12	15	5	0	13	72	54	0	97	13	12	0	482
800-815	53	118	23	0	14	6	5	0	19	135	85	0	77	12	34	0	581
815-830	68	69	47	1	17	4	2	0	17	45	78	0	37	10	33	0	428
830-845	44	53	40	0	13	12	1	0	13	43	52	0	22	7	20	0	320
845-900	49	71	48	1	10	13	4	0	10	58	42	1	19	14	22	0	362
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-800	101	287	116	1	50	49	11	0	30	174	139	1	165	38	57	0	1219
715-815	135	350	117	1	57	46	15	0	47	292	202	1	217	47	76	0	1603
730-830	176	376	143	2	53	37	16	0	56	298	260	1	239	45	95	0	1797
745-845	190	362	151	2	56	37	13	0	62	295	269	0	233	42	99	0	1811
800-900	214	311	158	2	54	35	12	0	59	281	257	1	155	43	109	0	1691

PEAK HOUR	745-845



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	1	0	0	0	1
715-730	1	0	1	0	2
730-745	0	0	0	0	0
745-800	0	0	0	0	0
800-815	0	0	0	1	1
815-830	1	0	0	1	2
830-845	0	0	0	0	0
845-900	0	0	1	0	1
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	2	0	1	0	3
715-815	1	0	1	1	3
730-830	1	0	0	2	3
745-845	1	0	0	2	3
800-900	1	0	1	2	4

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	1	0	1
715-730	0	0	1	0	1
730-745	0	0	0	0	0
745-800	0	0	2	0	2
800-815	0	1	0	0	1
815-830	0	0	0	0	0
830-845	0	0	0	1	1
845-900	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	0	0	4	0	4
715-815	0	1	3	0	4
730-830	0	1	2	0	3
745-845	0	1	2	1	4
800-900	0	1	0	1	2

WILTEC

Phone: (626) 564-1944 Fax: (626) 564-0969 info@wiltecusa.com

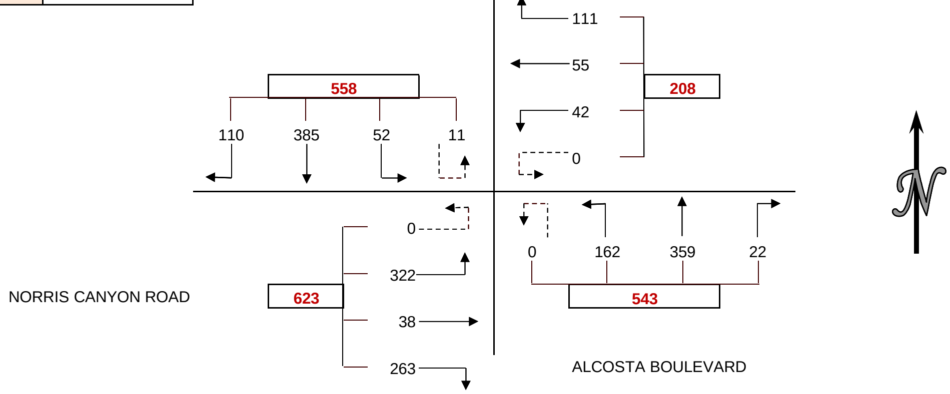
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT:		GIBSON TRANSPORTATION
PROJECT:		BISHOP RANCH STUDY, CITY OF SAN RAMON
DATE:		THURSEDAY MAY 23, 2019
PERIOD:		4:00 PM TO 6:00 PM
INTERSECTION:	N/S	ALCOSTA BOULEVARD
	E/W	NORRIS CANYON ROAD
CITY:		SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-415	38	78	11	0	48	22	10	0	9	75	53	0	51	14	59	0	468
415-430	39	75	14	4	28	18	13	0	10	100	45	1	47	6	55	0	455
430-445	26	68	9	2	42	19	14	0	6	64	39	0	67	8	68	0	432
445-500	32	83	17	3	30	18	12	0	4	96	41	0	56	10	71	0	473
500-515	33	117	12	1	39	17	14	0	10	92	39	0	79	6	103	0	562
515-530	24	97	13	3	20	13	7	0	5	75	47	0	68	7	85	0	464
530-545	21	88	10	4	22	7	9	0	3	96	35	0	60	15	63	0	433
545-600	26	97	9	1	29	6	2	0	1	84	35	0	53	9	50	0	402
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-500	135	304	51	9	148	77	49	0	29	335	178	1	221	38	253	0	1828
415-515	130	343	52	10	139	72	53	0	30	352	164	1	249	30	297	0	1922
430-530	115	365	51	9	131	67	47	0	25	327	166	0	270	31	327	0	1931
445-545	110	385	52	11	111	55	42	0	22	359	162	0	263	38	322	0	1932
500-600	104	399	44	9	110	43	32	0	19	347	156	0	260	37	301	0	1861

PEAK HOUR	445-545



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	0	0	0
415-430	2	0	0	0	2
430-445	0	0	0	0	0
445-500	0	0	1	0	1
500-515	1	0	1	0	2
515-530	0	0	1	0	1
530-545	0	0	1	0	1
545-600	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	2	0	1	0	3
415-515	3	0	2	0	5
430-530	1	0	3	0	4
445-545	1	0	4	0	5
500-600	1	0	3	0	4

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	0	0	0
415-430	0	0	0	0	0
430-445	0	0	0	0	0
445-500	0	0	0	1	1
500-515	0	2	0	0	2
515-530	0	0	0	0	0
530-545	0	0	0	1	1
545-600	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	0	0	0	1	1
415-515	0	2	0	1	3
430-530	0	2	0	1	3
445-545	0	2	0	2	4
500-600	0	2	0	1	3

WILTEC Phone: (626) 564-1944 Fax: (626) 564-0969 info@wiltecusa.com

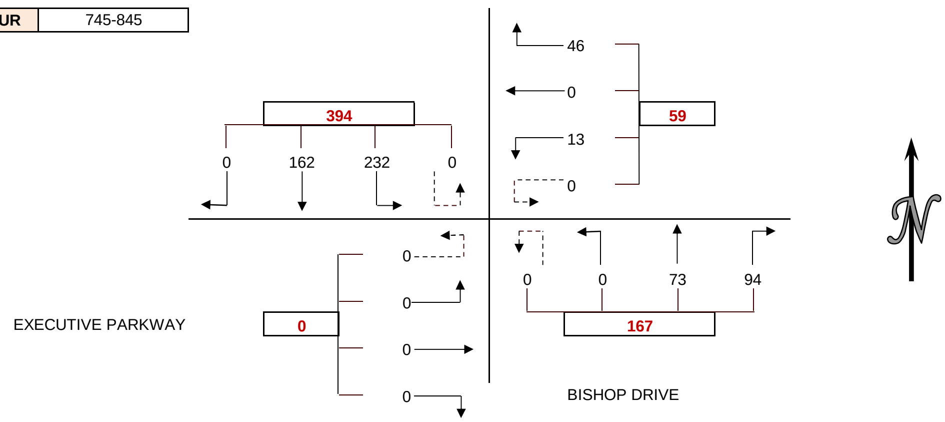
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT: GIBSON TRANSPORTATION
PROJECT: SAN RAMON
DATE: WEDNESDAY MARCH 13, 2019
PERIOD: 7:00 AM TO 9:00 AM
INTERSECTION: N/S BISHOP DRIVE
E/W EXECUTIVE PARKWAY
CITY: SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-715	0	13	20	0	1	0	1	0	10	16	0	0	0	0	0	0	61
715-730	0	24	25	0	2	0	0	0	19	19	0	0	0	0	0	0	89
730-745	0	18	36	0	2	0	1	0	25	12	0	0	0	0	0	0	94
745-800	0	33	84	0	10	0	1	0	24	22	0	0	0	0	0	0	174
800-815	0	46	82	0	28	0	5	0	16	21	0	0	0	0	0	0	198
815-830	0	38	32	0	6	0	4	0	25	18	0	0	0	0	0	0	123
830-845	0	45	34	0	2	0	3	0	29	12	0	0	0	0	0	0	125
845-900	0	44	28	0	4	0	3	0	23	21	0	0	0	0	0	0	123
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-800	0	88	165	0	15	0	3	0	78	69	0	0	0	0	0	0	418
715-815	0	121	227	0	42	0	7	0	84	74	0	0	0	0	0	0	555
730-830	0	135	234	0	46	0	11	0	90	73	0	0	0	0	0	0	589
745-845	0	162	232	0	46	0	13	0	94	73	0	0	0	0	0	0	620
800-900	0	173	176	0	40	0	15	0	93	72	0	0	0	0	0	0	569

PEAK HOUR	745-845



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	0	0	0
715-730	0	4	0	0	4
730-745	0	0	0	0	0
745-800	0	4	0	0	4
800-815	0	0	0	0	0
815-830	0	2	0	0	2
830-845	0	0	0	0	0
845-900	0	1	0	0	1
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	0	8	0	0	8
715-815	0	8	0	0	8
730-830	0	6	0	0	6
745-845	0	6	0	0	6
800-900	0	3	0	0	3

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	0	0	0
715-730	0	0	0	0	0
730-745	0	0	0	0	0
745-800	0	0	0	0	0
800-815	0	0	0	0	0
815-830	0	0	0	0	0
830-845	0	0	0	0	0
845-900	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	0	0	0	0	0
715-815	0	0	0	0	0
730-830	0	0	0	0	0
745-845	0	0	0	0	0
800-900	0	0	0	0	0

WILTEC

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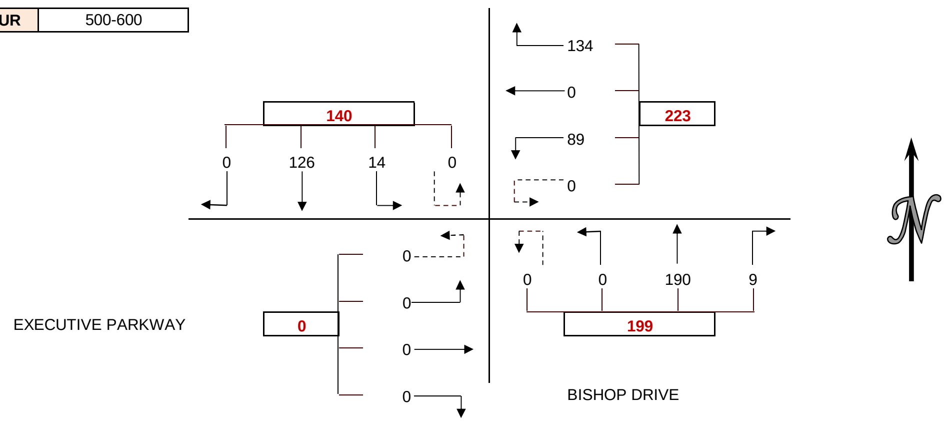
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT:		GIBSON TRANSPORTATION
PROJECT:		SAN RAMON
DATE:		WEDNESDAY MARCH 13, 2019
PERIOD:		4:00 PM TO 6:00 PM
INTERSECTION:	N/S	BISHOP DRIVE
	E/W	EXECUTIVE PARKWAY
CITY:		SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-415	0	33	2	0	20	0	17	0	0	44	0	0	0	0	0	0	116
415-430	0	23	5	0	21	0	19	0	3	39	0	0	0	0	0	0	110
430-445	0	32	7	0	38	0	29	0	1	32	0	0	0	0	0	0	139
445-500	0	25	5	0	28	0	25	0	3	43	0	0	0	0	0	0	129
500-515	0	30	4	0	48	0	26	0	0	48	0	0	0	0	0	0	156
515-530	0	25	3	0	39	0	18	0	3	42	0	0	0	0	0	0	130
530-545	0	34	2	0	24	0	18	0	2	46	0	0	0	0	0	0	126
545-600	0	37	5	0	23	0	27	0	4	54	0	0	0	0	0	0	150
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-500	0	113	19	0	107	0	90	0	7	158	0	0	0	0	0	0	494
415-515	0	110	21	0	135	0	99	0	7	162	0	0	0	0	0	0	534
430-530	0	112	19	0	153	0	98	0	7	165	0	0	0	0	0	0	554
445-545	0	114	14	0	139	0	87	0	8	179	0	0	0	0	0	0	541
500-600	0	126	14	0	134	0	89	0	9	190	0	0	0	0	0	0	562

PEAK HOUR	500-600



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	2	0	0	2
415-430	0	0	0	0	0
430-445	0	1	0	0	1
445-500	0	1	0	0	1
500-515	0	0	0	0	0
515-530	0	1	0	0	1
530-545	0	2	0	0	2
545-600	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	0	4	0	0	4
415-515	0	2	0	0	2
430-530	0	3	0	0	3
445-545	0	4	0	0	4
500-600	0	3	0	0	3

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	0	0	0
415-430	0	0	0	0	0
430-445	0	0	0	0	0
445-500	0	1	0	0	1
500-515	0	0	0	0	0
515-530	0	0	0	0	0
530-545	0	0	0	0	0
545-600	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	0	1	0	0	1
415-515	0	1	0	0	1
430-530	0	1	0	0	1
445-545	0	1	0	0	1
500-600	0	0	0	0	0

WILTEC

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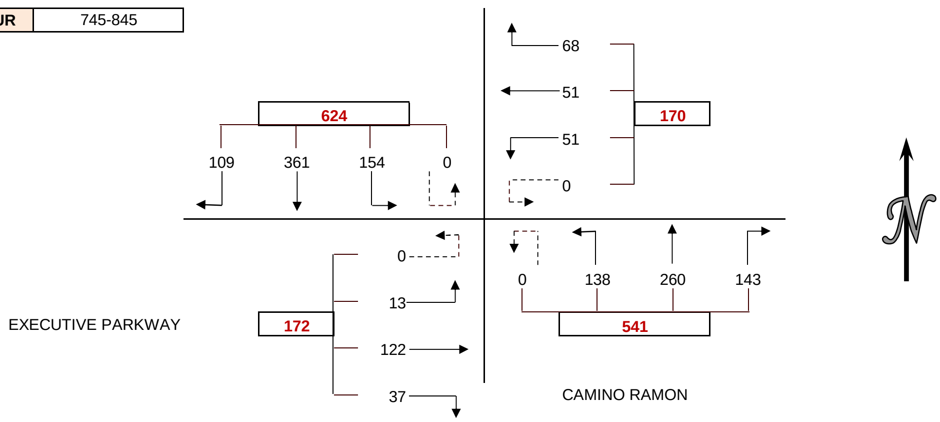
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT: GIBSON TRANSPORTATION
PROJECT: SAN RAMON
DATE: THURSDAY MARCH 14, 2019
PERIOD: 7:00 AM TO 9:00 AM
INTERSECTION: N/S CAMINO RAMON
E/W EXECUTIVE PARKWAY
CITY: SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-715	19	60	7	0	2	2	4	0	19	32	15	0	10	3	0	0	173
715-730	10	84	14	0	0	6	2	0	18	43	23	0	6	5	7	0	218
730-745	15	76	23	0	5	8	5	0	22	47	19	0	9	12	5	0	246
745-800	21	99	46	0	22	11	19	0	32	74	43	0	13	45	4	0	429
800-815	29	87	39	0	38	25	20	0	31	69	35	0	5	53	5	0	436
815-830	30	96	34	0	6	10	5	0	36	49	28	0	11	16	2	0	323
830-845	29	79	35	0	2	5	7	0	44	68	32	0	8	8	2	0	319
845-900	23	102	43	0	3	6	3	0	48	64	34	0	7	10	3	0	346
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-800	65	319	90	0	29	27	30	0	91	196	100	0	38	65	16	0	1066
715-815	75	346	122	0	65	50	46	0	103	233	120	0	33	115	21	0	1329
730-830	95	358	142	0	71	54	49	0	121	239	125	0	38	126	16	0	1434
745-845	109	361	154	0	68	51	51	0	143	260	138	0	37	122	13	0	1507
800-900	111	364	151	0	49	46	35	0	159	250	129	0	31	87	12	0	1424

PEAK HOUR	745-845



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	1	0	1
715-730	0	0	0	0	0
730-745	1	0	2	0	3
745-800	0	0	1	1	2
800-815	0	0	0	0	0
815-830	1	0	0	0	1
830-845	0	0	0	2	2
845-900	1	0	0	2	3
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	1	0	4	1	6
715-815	1	0	3	1	5
730-830	2	0	3	1	6
745-845	1	0	1	3	5
800-900	2	0	0	4	6

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	0	0	0
715-730	0	0	0	0	0
730-745	0	0	1	0	1
745-800	1	0	0	0	1
800-815	0	0	0	0	0
815-830	0	0	0	1	1
830-845	0	0	0	0	0
845-900	1	0	1	0	2
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	1	0	1	0	2
715-815	1	0	1	0	2
730-830	1	0	1	1	3
745-845	1	0	0	1	2
800-900	1	0	1	1	3

WILTEC

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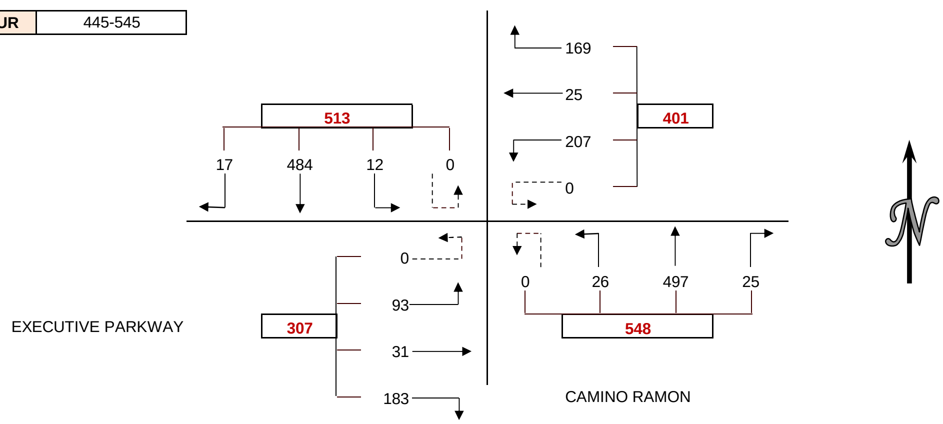
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT:		GIBSON TRANSPORTATION
PROJECT:		SAN RAMON
DATE:		THURSDAY MARCH 14, 2019
PERIOD:		4:00 PM TO 6:00 PM
INTERSECTION:	N/S	CAMINO RAMON
	E/W	EXECUTIVE PARKWAY
CITY:		SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-415	6	85	7	0	14	2	27	0	0	120	8	0	26	4	13	0	312
415-430	4	96	4	0	26	9	42	0	4	102	6	0	30	8	9	0	340
430-445	5	79	4	0	37	7	39	0	7	133	5	0	21	15	21	0	373
445-500	3	113	1	0	28	2	51	0	7	103	9	0	37	9	27	0	390
500-515	5	137	5	0	64	11	67	0	6	141	5	0	61	10	22	0	534
515-530	6	122	2	0	40	4	52	0	7	128	9	0	48	5	27	0	450
530-545	3	112	4	0	37	8	37	0	5	125	3	0	37	7	17	0	395
545-600	2	89	3	0	32	8	44	0	4	108	5	0	25	4	16	0	340
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-500	18	373	16	0	105	20	159	0	18	458	28	0	114	36	70	0	1415
415-515	17	425	14	0	155	29	199	0	24	479	25	0	149	42	79	0	1637
430-530	19	451	12	0	169	24	209	0	27	505	28	0	167	39	97	0	1747
445-545	17	484	12	0	169	25	207	0	25	497	26	0	183	31	93	0	1769
500-600	16	460	14	0	173	31	200	0	22	502	22	0	171	26	82	0	1719

PEAK HOUR	445-545



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	1	2	3
415-430	0	0	1	1	2
430-445	3	0	0	3	6
445-500	0	0	1	0	1
500-515	1	1	1	1	4
515-530	0	0	1	1	2
530-545	0	0	0	0	0
545-600	1	0	1	3	5
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	3	0	3	6	12
415-515	4	1	3	5	13
430-530	4	1	3	5	13
445-545	1	1	3	2	7
500-600	2	1	3	5	11

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	0	1	1
415-430	0	0	0	0	0
430-445	0	0	0	0	0
445-500	0	0	0	0	0
500-515	0	0	1	0	1
515-530	0	0	1	0	1
530-545	0	0	0	0	0
545-600	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	0	0	0	1	1
415-515	0	0	1	0	1
430-530	0	0	2	0	2
445-545	0	0	2	0	2
500-600	0	0	2	0	2

WILTEC

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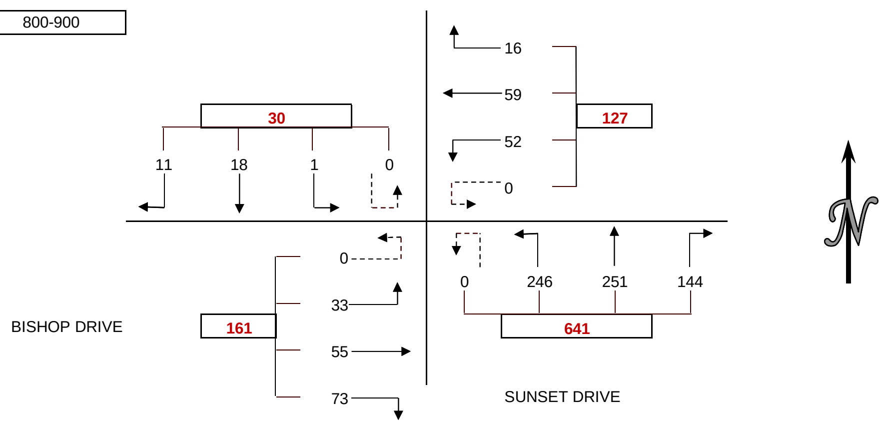
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT:		GIBSON TRANSPORTATION
PROJECT:		SAN RAMON
DATE:		THURSDAY MARCH 14, 2019
PERIOD:		7:00 AM TO 9:00 AM
INTERSECTION:	N/S	SUNSET DRIVE
	E/W	BISHOP DRIVE
CITY:		SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-715	1	4	0	0	4	4	5	0	17	23	38	0	11	5	0	0	112
715-730	3	2	1	0	2	4	10	0	23	18	59	0	11	10	3	0	146
730-745	1	4	0	0	3	6	10	0	28	38	40	0	18	13	3	0	164
745-800	1	2	0	0	6	12	7	0	45	42	63	0	20	13	5	0	216
800-815	1	6	1	0	3	16	12	0	42	57	67	0	23	10	6	0	244
815-830	4	3	0	0	5	14	8	0	37	70	50	0	18	20	5	0	234
830-845	3	4	0	0	5	15	9	0	23	57	59	0	20	14	9	0	218
845-900	3	5	0	0	3	14	23	0	42	67	70	0	12	11	13	0	263
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-800	6	12	1	0	15	26	32	0	113	121	200	0	60	41	11	0	638
715-815	6	14	2	0	14	38	39	0	138	155	229	0	72	46	17	0	770
730-830	7	15	1	0	17	48	37	0	152	207	220	0	79	56	19	0	858
745-845	9	15	1	0	19	57	36	0	147	226	239	0	81	57	25	0	912
800-900	11	18	1	0	16	59	52	0	144	251	246	0	73	55	33	0	959

PEAK HOUR	800-900



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	1	2	0	3
715-730	0	1	2	0	3
730-745	0	1	3	5	9
745-800	1	1	8	5	15
800-815	6	5	3	8	22
815-830	4	3	3	5	15
830-845	3	3	1	9	16
845-900	6	4	3	4	17
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	1	4	15	10	30
715-815	7	8	16	18	49
730-830	11	10	17	23	61
745-845	14	12	15	27	68
800-900	19	15	10	26	70

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	1	0	0	0	1
715-730	0	0	0	0	0
730-745	0	0	0	0	0
745-800	0	0	0	0	0
800-815	0	0	0	0	0
815-830	0	0	0	0	0
830-845	0	0	0	0	0
845-900	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	1	0	0	0	1
715-815	0	0	0	0	0
730-830	0	0	0	0	0
745-845	0	0	0	0	0
800-900	0	0	0	0	0

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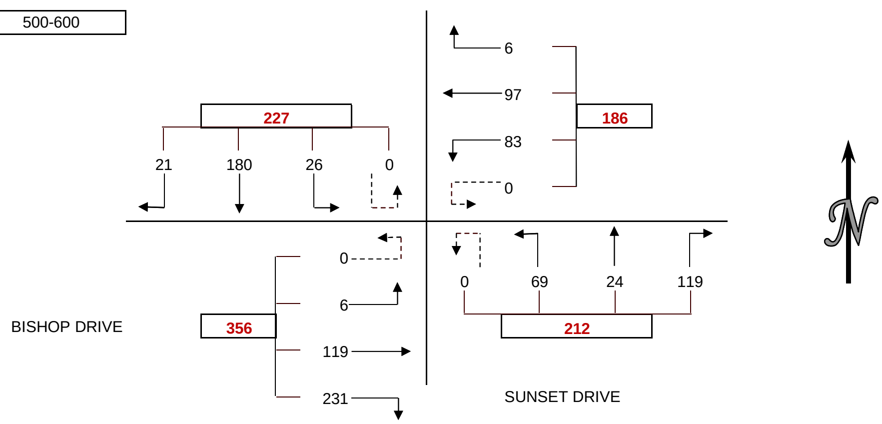
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT: GIBSON TRANSPORTATION
PROJECT: SAN RAMON
DATE: THURSDAY MARCH 14, 2019
PERIOD: 4:00 PM TO 6:00 PM
INTERSECTION: N/S SUNSET DRIVE
E/W BISHOP DRIVE
CITY: SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-415	3	30	2	0	1	24	28	0	19	2	8	0	75	25	1	0	218
415-430	5	32	5	0	1	23	23	0	23	6	14	0	65	27	1	0	225
430-445	3	43	7	0	1	28	20	0	20	4	13	0	74	29	1	0	243
445-500	3	56	6	0	2	21	28	0	21	9	17	0	36	23	3	0	225
500-515	8	53	9	0	0	18	21	0	25	4	15	0	68	28	2	0	251
515-530	5	47	4	0	1	27	24	0	27	7	19	0	58	32	3	0	254
530-545	1	43	9	0	4	31	20	0	38	2	11	0	57	32	0	0	248
545-600	7	37	4	0	1	21	18	0	29	11	24	0	48	27	1	0	228
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-500	14	161	20	0	5	96	99	0	83	21	52	0	250	104	6	0	911
415-515	19	184	27	0	4	90	92	0	89	23	59	0	243	107	7	0	944
430-530	19	199	26	0	4	94	93	0	93	24	64	0	236	112	9	0	973
445-545	17	199	28	0	7	97	93	0	111	22	62	0	219	115	8	0	978
500-600	21	180	26	0	6	97	83	0	119	24	69	0	231	119	6	0	981

PEAK HOUR	500-600



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	2	1	3
415-430	0	2	1	4	7
430-445	0	0	1	3	4
445-500	0	0	3	5	8
500-515	0	0	1	3	4
515-530	0	0	4	5	9
530-545	0	0	4	3	7
545-600	0	1	2	2	5
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	0	2	7	13	22
415-515	0	2	6	15	23
430-530	0	0	9	16	25
445-545	0	0	12	16	28
500-600	0	1	11	13	25

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	0	0	0
415-430	0	1	0	0	1
430-445	0	0	0	0	0
445-500	0	0	0	0	0
500-515	0	0	0	0	0
515-530	0	0	0	0	0
530-545	0	0	0	0	0
545-600	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	0	1	0	0	1
415-515	0	1	0	0	1
430-530	0	0	0	0	0
445-545	0	0	0	0	0
500-600	0	0	0	0	0

WILTEC

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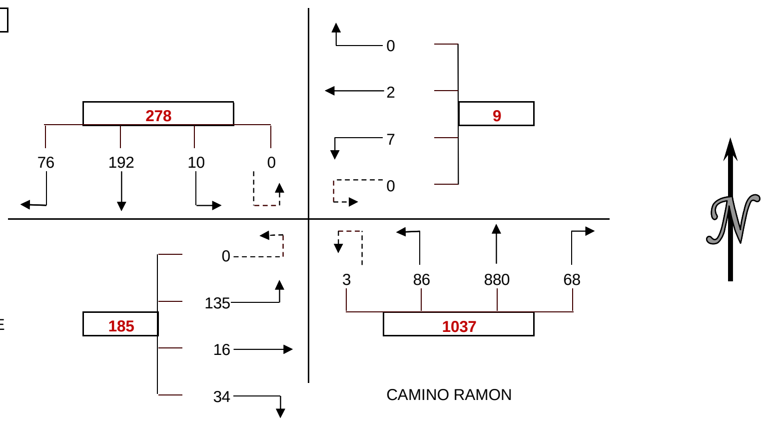
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT:		GIBSON TRANSPORTATION
PROJECT:		SAN RAMON
DATE:		THURSDAY MARCH 14, 2019
PERIOD:		7:00 AM TO 9:00 AM
INTERSECTION:	N/S	CAMINO RAMON
	E/W	BISHOP DRIVE
CITY:		SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-715	7	33	1	0	1	1	4	0	10	94	2	0	7	1	17	0	178
715-730	10	43	2	0	0	1	2	0	13	106	9	0	4	0	21	0	211
730-745	11	34	4	0	1	1	0	0	17	139	7	0	12	3	31	0	260
745-800	17	57	6	0	1	1	2	0	31	207	16	0	10	8	35	0	391
800-815	15	54	2	0	0	2	0	0	24	210	14	0	12	5	42	0	380
815-830	12	46	2	0	0	0	2	0	17	211	26	1	10	6	33	0	366
830-845	22	38	2	0	0	0	3	0	17	231	22	2	3	3	26	0	369
845-900	27	54	4	0	0	0	2	0	10	228	24	0	9	2	34	0	394
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-800	45	167	13	0	3	4	8	0	71	546	34	0	33	12	104	0	1040
715-815	53	188	14	0	2	5	4	0	85	662	46	0	38	16	129	0	1242
730-830	55	191	14	0	2	4	4	0	89	767	63	1	44	22	141	0	1397
745-845	66	195	12	0	1	3	7	0	89	859	78	3	35	22	136	0	1506
800-900	76	192	10	0	0	2	7	0	68	880	86	3	34	16	135	0	1509

PEAK HOUR	800-900



BISHOP DRIVE

PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	2	1	1	1	5
715-730	0	1	2	0	3
730-745	0	0	0	0	0
745-800	5	0	0	4	9
800-815	7	2	2	6	17
815-830	2	0	0	0	2
830-845	0	1	0	0	1
845-900	1	0	2	1	4
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	7	2	3	5	17
715-815	12	3	4	10	29
730-830	14	2	2	10	28
745-845	14	3	2	10	29
800-900	10	3	4	7	24

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	0	0	0
715-730	0	0	0	0	0
730-745	0	0	0	0	0
745-800	0	0	0	0	0
800-815	0	0	0	0	0
815-830	3	0	0	0	3
830-845	0	0	0	0	0
845-900	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	0	0	0	0	0
715-815	0	0	0	0	0
730-830	3	0	0	0	3
745-845	3	0	0	0	3
800-900	3	0	0	0	3

WILTEC

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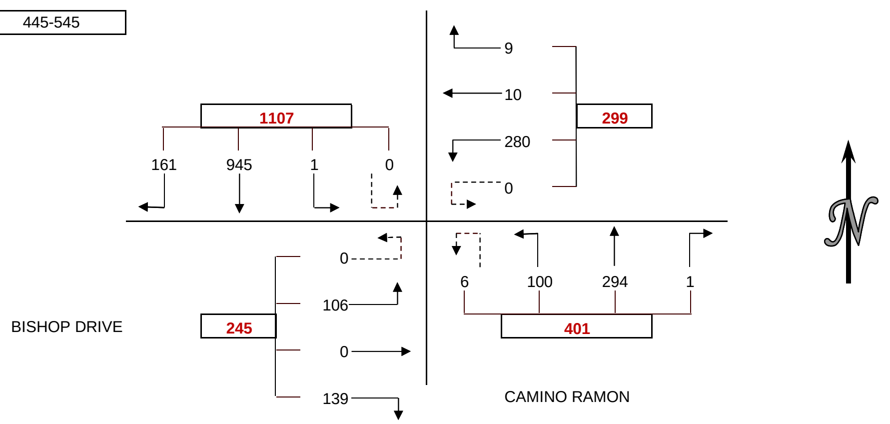
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT: GIBSON TRANSPORTATION
PROJECT: SAN RAMON
DATE: THURSDAY MARCH 14, 2019
PERIOD: 4:00 PM TO 6:00 PM
INTERSECTION: N/S CAMINO RAMON
E/W BISHOP DRIVE
CITY: SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-415	33	174	0	0	3	6	45	0	3	57	20	1	17	0	32	0	391
415-430	22	189	1	1	2	10	35	0	1	62	18	1	32	0	28	0	402
430-445	24	203	0	0	0	1	38	0	0	65	33	5	28	0	36	0	433
445-500	29	204	1	0	1	1	57	0	0	86	23	0	29	0	19	0	450
500-515	45	291	0	0	5	4	95	0	0	58	17	1	30	0	29	0	575
515-530	41	246	0	0	2	5	66	0	1	76	28	5	38	0	28	0	536
530-545	46	204	0	0	1	0	62	0	0	74	32	0	42	0	30	0	491
545-600	46	165	1	0	1	1	54	0	0	54	26	3	23	0	27	0	401
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-500	108	770	2	1	6	18	175	0	4	270	94	7	106	0	115	0	1676
415-515	120	887	2	1	8	16	225	0	1	271	91	7	119	0	112	0	1860
430-530	139	944	1	0	8	11	256	0	1	285	101	11	125	0	112	0	1994
445-545	161	945	1	0	9	10	280	0	1	294	100	6	139	0	106	0	2052
500-600	178	906	1	0	9	10	277	0	1	262	103	9	133	0	114	0	2003

PEAK HOUR	445-545



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	3	1	3	3	10
415-430	2	3	1	2	8
430-445	0	1	0	2	3
445-500	0	0	0	0	0
500-515	1	0	0	0	1
515-530	2	0	1	0	3
530-545	0	1	4	1	6
545-600	0	0	-10	-10	-20
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	5	5	4	7	21
415-515	3	4	1	4	12
430-530	3	1	1	2	7
445-545	3	1	5	1	10
500-600	3	1	-5	-9	-10

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	0	0	0
415-430	0	0	0	0	0
430-445	0	0	0	0	0
445-500	7	0	0	0	7
500-515	0	0	0	0	0
515-530	0	0	0	0	0
530-545	0	0	0	0	0
545-600	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	7	0	0	0	7
415-515	7	0	0	0	7
430-530	7	0	0	0	7
445-545	7	0	0	0	7
500-600	0	0	0	0	0

WILTEC

Phone: (626) 564-1944 Fax: (626) 564-0969 info@wiltecusa.com

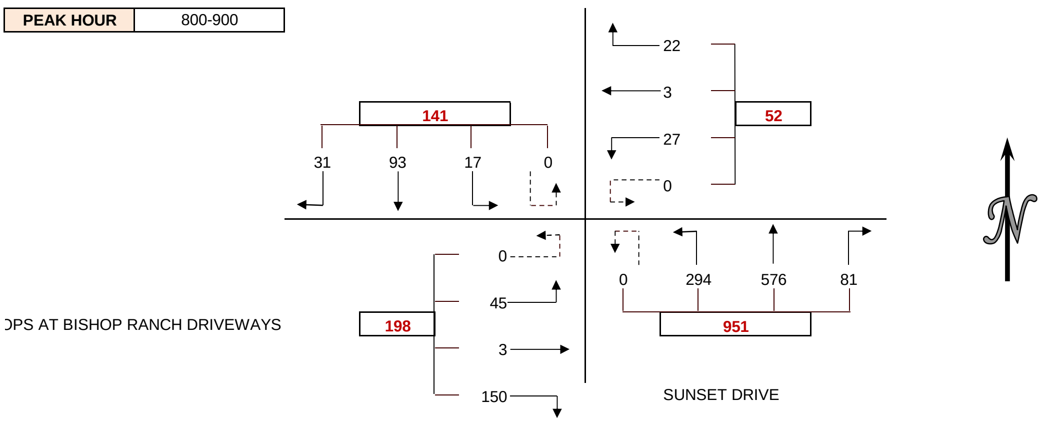
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT:		GIBSON TRANSPORTATION
PROJECT:		SAN RAMON
DATE:		THURSDAY MARCH 14, 2019
PERIOD:		7:00 AM TO 9:00 AM
INTERSECTION:	N/S	SUNSET DRIVE
	E/W	SHOPS AT BISHOP RANCH DRIVEWAYS
CITY:		SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-715	0	17	2	0	5	0	6	0	18	75	45	0	33	0	4	0	205
715-730	6	20	0	0	3	0	6	0	12	88	57	0	38	0	7	0	237
730-745	4	26	0	0	2	1	4	0	18	104	51	0	29	0	6	0	245
745-800	5	25	2	0	10	1	10	0	18	121	51	0	34	1	14	0	292
800-815	6	28	4	0	6	0	7	0	20	136	55	0	35	1	14	0	312
815-830	4	25	3	0	6	0	7	0	18	141	66	0	35	0	10	0	315
830-845	6	21	4	0	3	2	5	0	18	135	89	0	33	2	7	0	325
845-900	15	19	6	0	7	1	8	0	25	164	84	0	47	0	14	0	390
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-800	15	88	4	0	20	2	26	0	66	388	204	0	134	1	31	0	979
715-815	21	99	6	0	21	2	27	0	68	449	214	0	136	2	41	0	1086
730-830	19	104	9	0	24	2	28	0	74	502	223	0	133	2	44	0	1164
745-845	21	99	13	0	25	3	29	0	74	533	261	0	137	4	45	0	1244
800-900	31	93	17	0	22	3	27	0	81	576	294	0	150	3	45	0	1342

PEAK HOUR	800-900



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	1	1	4	2	8
715-730	4	2	6	1	13
730-745	1	3	4	1	9
745-800	1	1	1	4	7
800-815	3	2	5	7	17
815-830	3	5	3	3	14
830-845	1	1	5	0	7
845-900	5	5	2	0	12
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	7	7	15	8	37
715-815	9	8	16	13	46
730-830	8	11	13	15	47
745-845	8	9	14	14	45
800-900	12	13	15	10	50

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	0	0	0
715-730	0	0	0	0	0
730-745	0	0	0	0	0
745-800	1	1	0	0	2
800-815	0	0	0	0	0
815-830	0	0	0	0	0
830-845	0	0	0	0	0
845-900	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	1	1	0	0	2
715-815	1	1	0	0	2
730-830	1	1	0	0	2
745-845	1	1	0	0	2
800-900	0	0	0	0	0

WILTEC Phone: (626) 564-1944 Fax: (626) 564-0969 info@wiltecusa.com

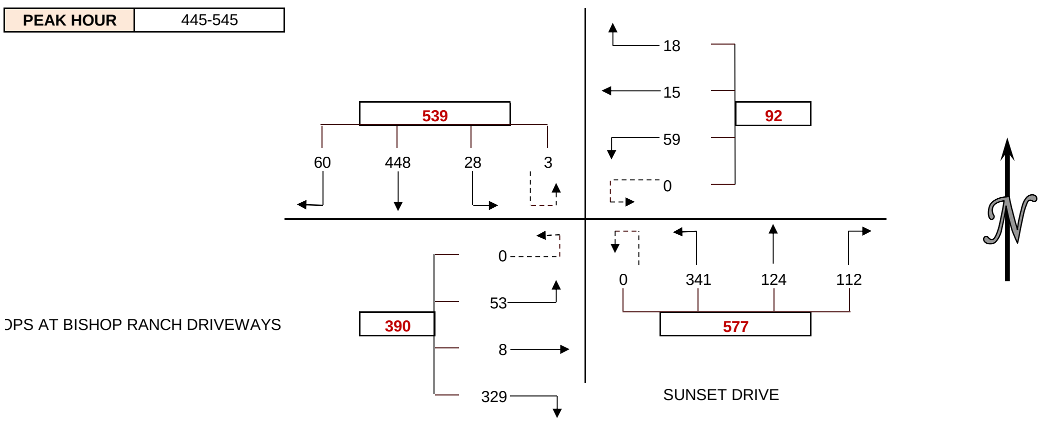
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT: GIBSON TRANSPORTATION
PROJECT: SAN RAMON
DATE: THURSDAY MARCH 14, 2019
PERIOD: 4:00 PM TO 6:00 PM
INTERSECTION: N/S SUNSET DRIVE
E/W SHOPS AT BISHOP RANCH DRIVEWAYS
CITY: SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-415	14	102	5	0	5	3	22	0	26	13	84	0	85	2	10	0	371
415-430	13	118	5	0	7	6	24	0	24	28	82	0	87	2	10	0	406
430-445	12	105	11	0	5	2	16	0	25	26	91	0	81	1	7	0	382
445-500	14	106	9	0	2	3	16	0	30	36	72	0	89	1	10	0	388
500-515	13	121	3	0	5	4	11	0	31	28	104	0	77	3	11	0	411
515-530	12	110	10	1	3	5	21	0	25	27	79	0	90	3	20	0	406
530-545	21	111	6	2	8	3	11	0	26	33	86	0	73	1	12	0	393
545-600	9	81	7	1	9	6	13	0	35	40	77	0	90	2	5	0	375
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-500	53	431	30	0	19	14	78	0	105	103	329	0	342	6	37	0	1547
415-515	52	450	28	0	19	15	67	0	110	118	349	0	334	7	38	0	1587
430-530	51	442	33	1	15	14	64	0	111	117	346	0	337	8	48	0	1587
445-545	60	448	28	3	18	15	59	0	112	124	341	0	329	8	53	0	1598
500-600	55	423	26	4	25	18	56	0	117	128	346	0	330	9	48	0	1585

PEAK HOUR	445-545



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	4	1	3	0	8
415-430	2	1	11	1	15
430-445	1	0	15	1	17
445-500	3	0	9	1	13
500-515	2	2	8	4	16
515-530	9	0	3	2	14
530-545	3	0	3	1	7
545-600	4	1	15	3	23
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	10	2	38	3	53
415-515	8	3	43	7	61
430-530	15	2	35	8	60
445-545	17	2	23	8	50
500-600	18	3	29	10	60

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	0	1	1
415-430	0	1	0	2	3
430-445	2	0	0	0	2
445-500	0	0	0	0	0
500-515	0	0	0	1	1
515-530	0	0	0	0	0
530-545	0	1	0	0	1
545-600	1	1	0	0	2
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	2	1	0	3	6
415-515	2	1	0	3	6
430-530	2	0	0	1	3
445-545	0	1	0	1	2
500-600	1	2	0	1	4

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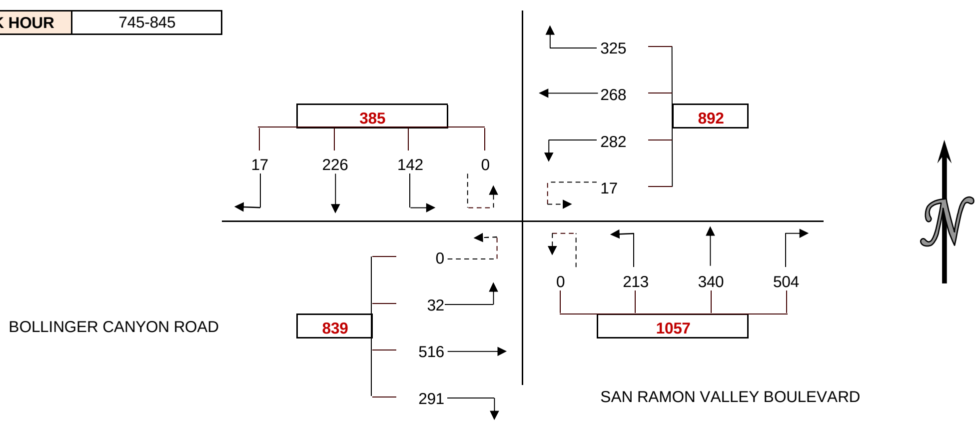
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT: GIBSON TRANSPORTATION
PROJECT: SAN RAMON
DATE: THURSDAY MARCH 14, 2019
PERIOD: 7:00 AM TO 9:00 AM
INTERSECTION: N/S SAN RAMON VALLEY BOULEVARD
E/W BOLLINGER CANYON ROAD
CITY: SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-715	2	18	15	0	41	34	48	1	83	35	14	0	46	78	1	0	416
715-730	2	39	20	0	51	40	59	4	119	34	38	0	66	91	3	0	566
730-745	2	30	26	0	51	45	54	0	126	59	43	0	54	118	2	0	610
745-800	5	63	31	0	62	72	63	1	121	86	66	0	91	134	12	0	807
800-815	3	75	27	0	89	72	89	4	112	79	34	0	100	147	13	0	844
815-830	7	49	37	0	118	56	66	9	133	85	66	0	76	129	3	0	834
830-845	2	39	47	0	56	68	64	3	138	90	47	0	24	106	4	0	688
845-900	0	51	31	0	64	46	61	4	103	76	30	0	30	114	5	0	615
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-800	11	150	92	0	205	191	224	6	449	214	161	0	257	421	18	0	2399
715-815	12	207	104	0	253	229	265	9	478	258	181	0	311	490	30	0	2827
730-830	17	217	121	0	320	245	272	14	492	309	209	0	321	528	30	0	3095
745-845	17	226	142	0	325	268	282	17	504	340	213	0	291	516	32	0	3173
800-900	12	214	142	0	327	242	280	20	486	330	177	0	230	496	25	0	2981

PEAK HOUR	745-845



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	2	2	4
715-730	0	1	1	0	2
730-745	0	0	1	0	1
745-800	0	0	0	2	2
800-815	0	0	0	1	1
815-830	0	0	0	1	1
830-845	0	0	11	0	11
845-900	0	0	2	0	2
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	0	1	4	4	9
715-815	0	1	2	3	6
730-830	0	0	1	4	5
745-845	0	0	11	4	15
800-900	0	0	13	2	15

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	1	1	2
715-730	0	0	0	0	0
730-745	0	0	0	0	0
745-800	0	0	0	0	0
800-815	0	0	0	0	0
815-830	0	0	1	0	1
830-845	0	0	0	0	0
845-900	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	0	0	1	1	2
715-815	0	0	0	0	0
730-830	0	0	1	0	1
745-845	0	0	1	0	1
800-900	0	0	1	0	1

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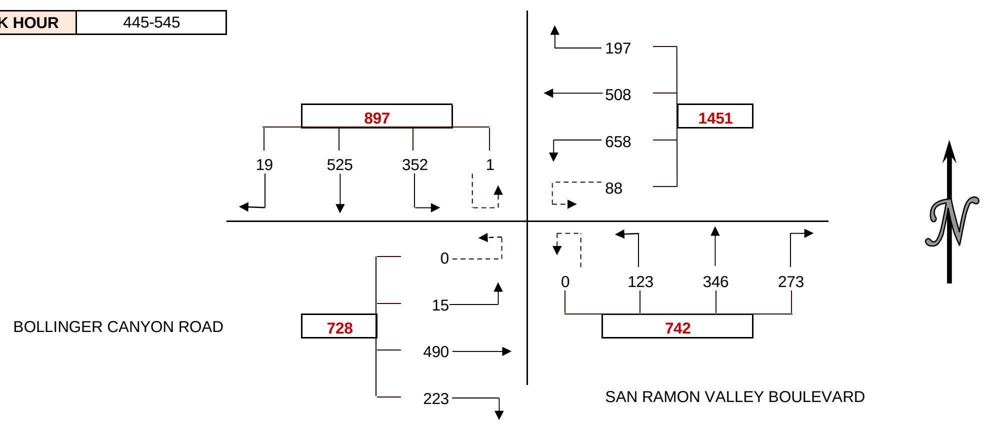
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT: GIBSON TRANSPORTATION
PROJECT: SAN RAMON
DATE: THURSDAY MARCH 14, 2019
PERIOD: 4:00 PM TO 6:00 PM
INTERSECTION: N/S SAN RAMON VALLEY BOULEVARD
E/W BOLLINGER CANYON ROAD
CITY: SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-415	8	77	62	0	46	97	102	6	83	56	19	0	37	101	2	0	696
415-430	4	71	46	0	45	90	126	12	77	72	21	0	44	96	10	0	714
430-445	3	91	65	0	45	111	131	13	81	71	34	0	60	110	3	2	820
445-500	4	114	80	0	50	122	161	13	69	85	28	0	43	115	5	0	889
500-515	6	130	93	0	41	118	153	17	67	81	31	0	71	123	5	0	936
515-530	5	150	89	0	53	137	167	32	68	104	35	0	66	131	2	0	1039
530-545	4	131	90	1	53	131	177	26	69	76	29	0	43	121	3	0	954
545-600	4	123	60	0	50	106	121	26	85	81	20	1	44	86	7	0	814
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-500	19	353	253	0	186	420	520	44	310	284	102	0	184	422	20	2	3119
415-515	17	406	284	0	181	441	571	55	294	309	114	0	218	444	23	2	3359
430-530	18	485	327	0	189	488	612	75	285	341	128	0	240	479	15	2	3684
445-545	19	525	352	1	197	508	658	88	273	346	123	0	223	490	15	0	3818
500-600	19	534	332	1	197	492	618	101	289	342	115	1	224	461	17	0	3743

PEAK HOUR	445-545



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	0	0	0
415-430	0	0	0	2	2
430-445	0	1	3	1	5
445-500	0	4	6	0	10
500-515	0	0	3	1	4
515-530	0	0	10	1	11
530-545	0	1	0	0	1
545-600	1	1	0	0	2
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	0	5	9	3	17
415-515	0	5	12	4	21
430-530	0	5	22	3	30
445-545	0	5	19	2	26
500-600	1	2	13	2	18

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	1	0	0	1
415-430	0	0	0	0	0
430-445	0	0	0	1	1
445-500	0	1	0	2	3
500-515	0	3	0	0	3
515-530	0	1	0	0	1
530-545	0	0	0	1	1
545-600	1	0	0	0	1
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	0	2	0	3	5
415-515	0	4	0	3	7
430-530	0	5	0	3	8
445-545	0	5	0	3	8
500-600	1	4	0	1	6

WILTEC

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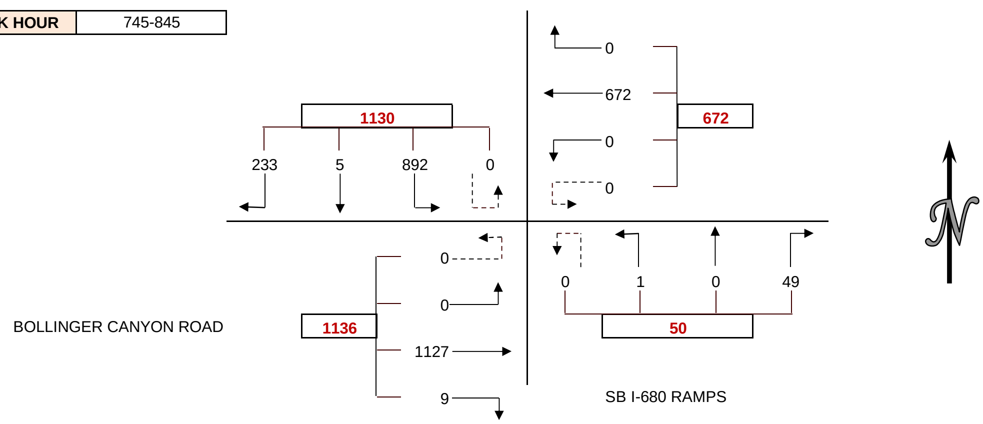
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT:		GIBSON TRANSPORTATION
PROJECT:		SAN RAMON
DATE:		THURSDAY MARCH 14, 2019
PERIOD:		7:00 AM TO 9:00 AM
INTERSECTION:	N/S	SB I-680 RAMPS
	E/W	BOLLINGER CANYON ROAD
CITY:		SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-715	43	1	196	0	0	84	0	0	4	0	0	0	3	179	0	0	510
715-730	54	0	200	0	0	98	0	0	10	0	0	0	1	241	0	0	604
730-745	53	3	210	0	0	101	0	0	12	0	1	0	1	274	0	0	655
745-800	64	0	230	0	0	142	0	0	26	0	0	0	1	261	0	0	724
800-815	68	3	219	0	0	191	0	0	13	0	0	0	2	296	0	0	792
815-830	50	0	212	0	0	185	0	0	2	0	0	0	5	307	0	0	761
830-845	51	2	231	0	0	154	0	0	8	0	1	0	1	263	0	0	711
845-900	53	0	217	0	0	135	0	0	10	0	0	0	1	261	0	0	677
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-800	214	4	836	0	0	425	0	0	52	0	1	0	6	955	0	0	2493
715-815	239	6	859	0	0	532	0	0	61	0	1	0	5	1072	0	0	2775
730-830	235	6	871	0	0	619	0	0	53	0	1	0	9	1138	0	0	2932
745-845	233	5	892	0	0	672	0	0	49	0	1	0	9	1127	0	0	2988
800-900	222	5	879	0	0	665	0	0	33	0	1	0	9	1127	0	0	2941

PEAK HOUR	745-845



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	0	0	0
715-730	0	0	0	0	0
730-745	0	0	0	0	0
745-800	0	0	0	0	0
800-815	0	0	0	0	0
815-830	0	0	0	0	0
830-845	0	0	0	0	0
845-900	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	0	0	0	0	0
715-815	0	0	0	0	0
730-830	0	0	0	0	0
745-845	0	0	0	0	0
800-900	0	0	0	0	0

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	0	0	0
715-730	0	0	1	0	1
730-745	0	0	0	0	0
745-800	0	0	0	0	0
800-815	0	0	0	0	0
815-830	0	0	1	0	1
830-845	0	0	0	0	0
845-900	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	0	0	1	0	1
715-815	0	0	1	0	1
730-830	0	0	1	0	1
745-845	0	0	1	0	1
800-900	0	0	1	0	1

WILTEC

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INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

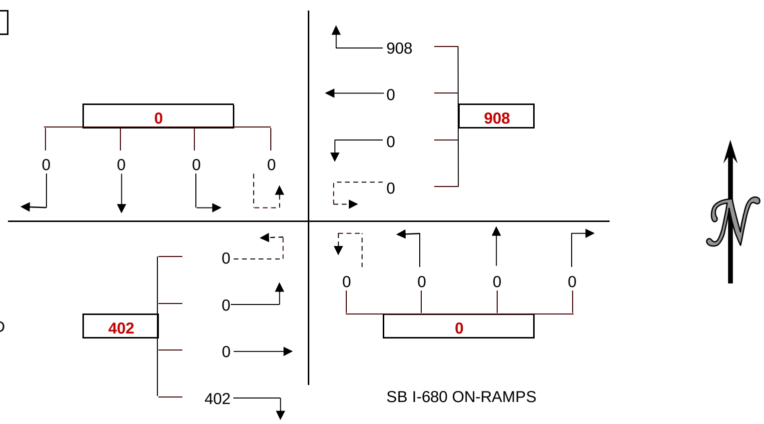
CLIENT:		GIBSON TRANSPORTATION
PROJECT:		SAN RAMON
DATE:		THURSDAY MARCH 14, 2019
PERIOD:		7:00 AM TO 9:00 AM
INTERSECTION:	N/S	SB I-680 ON-RAMPS
	E/W	BOLLINGER CANYON ROAD
CITY:		SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-715	0	0	0	0	158	0	0	0	0	0	0	0	62	0	0	0	220
715-730	0	0	0	0	176	0	0	0	0	0	0	0	75	0	0	0	251
730-745	0	0	0	0	192	0	0	0	0	0	0	0	84	0	0	0	276
745-800	0	0	0	0	215	0	0	0	0	0	0	0	107	0	0	0	322
800-815	0	0	0	0	232	0	0	0	0	0	0	0	107	0	0	0	339
815-830	0	0	0	0	238	0	0	0	0	0	0	0	106	0	0	0	344
830-845	0	0	0	0	223	0	0	0	0	0	0	0	82	0	0	0	305
845-900	0	0	0	0	209	0	0	0	0	0	0	0	92	0	0	0	301
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-800	0	0	0	0	741	0	0	0	0	0	0	0	328	0	0	0	1069
715-815	0	0	0	0	815	0	0	0	0	0	0	0	373	0	0	0	1188
730-830	0	0	0	0	877	0	0	0	0	0	0	0	404	0	0	0	1281
745-845	0	0	0	0	908	0	0	0	0	0	0	0	402	0	0	0	1310
800-900	0	0	0	0	902	0	0	0	0	0	0	0	387	0	0	0	1289

PEAK HOUR	745-845

BOLLINGER CANYON ROAD



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	0	0	0
715-730	0	0	0	0	0
730-745	0	0	0	0	0
745-800	0	0	0	0	0
800-815	0	0	0	0	0
815-830	0	0	0	0	0
830-845	0	0	0	0	0
845-900	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	0	0	0	0	0
715-815	0	0	0	0	0
730-830	0	0	0	0	0
745-845	0	0	0	0	0
800-900	0	0	0	0	0

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	0	0	0
715-730	0	0	0	0	0
730-745	0	0	0	0	0
745-800	0	0	0	0	0
800-815	0	0	0	0	0
815-830	0	0	0	0	0
830-845	0	0	0	0	0
845-900	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	0	0	0	0	0
715-815	0	0	0	0	0
730-830	0	0	0	0	0
745-845	0	0	0	0	0
800-900	0	0	0	0	0

WILTEC

Phone: (626) 564-1944 Fax: (626) 564-0969 info@wiltecusa.com

INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

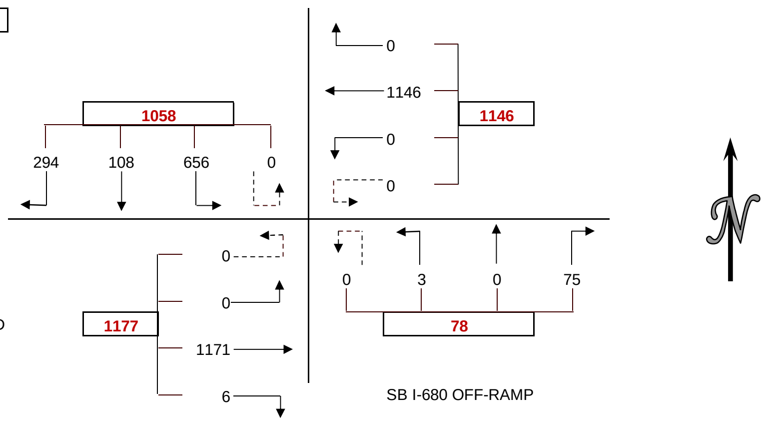
CLIENT:		GIBSON TRANSPORTATION
PROJECT:		SAN RAMON
DATE:		THURSDAY MARCH 14, 2019
PERIOD:		4:00 PM TO 6:00 PM
INTERSECTION:	N/S	SB I-680 OFF-RAMP
	E/W	BOLLINGER CANYON ROAD
CITY:		SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-415	68	3	157	0	0	197	0	0	5	0	0	0	0	244	0	0	674
415-430	79	8	157	0	0	218	0	0	3	0	1	0	3	239	0	0	708
430-445	74	26	152	0	0	244	0	0	7	0	0	0	2	237	0	0	742
445-500	89	18	164	0	0	254	0	0	16	0	1	0	3	275	0	0	820
500-515	63	32	169	0	0	278	0	0	16	0	0	0	0	293	0	0	851
515-530	61	33	152	0	0	322	0	0	30	0	2	0	3	339	0	0	942
530-545	81	25	171	0	0	292	0	0	13	0	0	0	0	264	0	0	846
545-600	93	24	188	0	0	225	0	0	7	0	0	0	4	243	0	0	784
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-500	310	55	630	0	0	913	0	0	31	0	2	0	8	995	0	0	2944
415-515	305	84	642	0	0	994	0	0	42	0	2	0	8	1044	0	0	3121
430-530	287	109	637	0	0	1098	0	0	69	0	3	0	8	1144	0	0	3355
445-545	294	108	656	0	0	1146	0	0	75	0	3	0	6	1171	0	0	3459
500-600	298	114	680	0	0	1117	0	0	66	0	2	0	7	1139	0	0	3423

PEAK HOUR	445-545

BOLLINGER CANYON ROAD



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	0	0	0
415-430	0	0	0	0	0
430-445	0	0	7	0	7
445-500	0	0	2	0	2
500-515	0	0	0	0	0
515-530	0	0	2	0	2
530-545	0	0	2	0	2
545-600	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	0	0	9	0	9
415-515	0	0	9	0	9
430-530	0	0	11	0	11
445-545	0	0	6	0	6
500-600	0	0	4	0	4

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	0	0	0
415-430	0	0	0	0	0
430-445	0	0	0	0	0
445-500	0	0	0	0	0
500-515	0	0	0	0	0
515-530	0	0	0	0	0
530-545	0	0	0	0	0
545-600	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	0	0	0	0	0
415-515	0	0	0	0	0
430-530	0	0	0	0	0
445-545	0	0	0	0	0
500-600	0	0	0	0	0

WILTEC Phone: (626) 564-1944 Fax: (626) 564-0969 info@wiltecusa.com

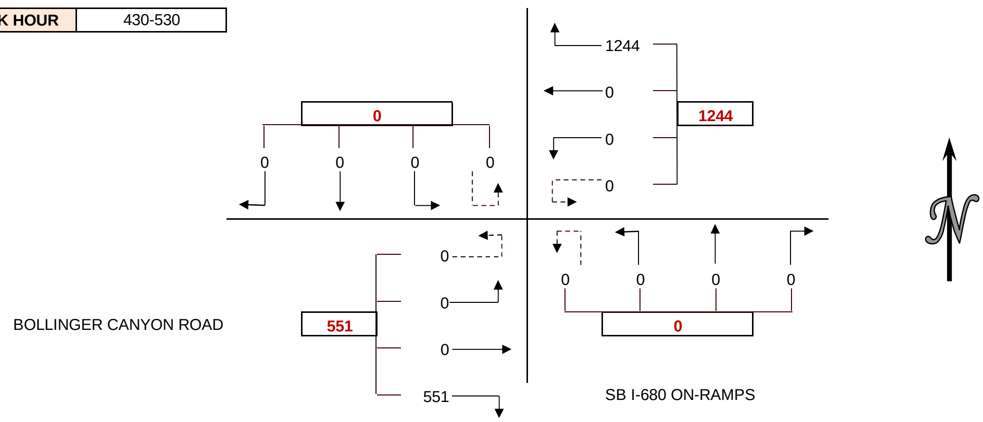
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT: GIBSON TRANSPORTATION
PROJECT: SAN RAMON
DATE: THURSDAY MARCH 14, 2019
PERIOD: 4:00 PM TO 6:00 PM
INTERSECTION: N/S SB I-680 ON-RAMPS
E/W BOLLINGER CANYON ROAD
CITY: SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-415	0	0	0	0	297	0	0	0	0	0	0	0	102	0	0	0	399
415-430	0	0	0	0	356	0	0	0	0	0	0	0	98	0	0	0	454
430-445	0	0	0	0	335	0	0	0	0	0	0	0	123	0	0	0	458
445-500	0	0	0	0	313	0	0	0	0	0	0	0	121	0	0	0	434
500-515	0	0	0	0	291	0	0	0	0	0	0	0	153	0	0	0	444
515-530	0	0	0	0	305	0	0	0	0	0	0	0	154	0	0	0	459
530-545	0	0	0	0	291	0	0	0	0	0	0	0	155	0	0	0	446
545-600	0	0	0	0	298	0	0	0	0	0	0	0	109	0	0	0	407
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-500	0	0	0	0	1301	0	0	0	0	0	0	0	444	0	0	0	1745
415-515	0	0	0	0	1295	0	0	0	0	0	0	0	495	0	0	0	1790
430-530	0	0	0	0	1244	0	0	0	0	0	0	0	551	0	0	0	1795
445-545	0	0	0	0	1200	0	0	0	0	0	0	0	583	0	0	0	1783
500-600	0	0	0	0	1185	0	0	0	0	0	0	0	571	0	0	0	1756

PEAK HOUR	430-530



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	0	0	0
415-430	0	0	0	0	0
430-445	0	0	0	0	0
445-500	0	0	0	0	0
500-515	0	0	0	0	0
515-530	0	0	0	0	0
530-545	0	0	0	0	0
545-600	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	0	0	0	0	0
415-515	0	0	0	0	0
430-530	0	0	0	0	0
445-545	0	0	0	0	0
500-600	0	0	0	0	0

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	0	0	0
415-430	0	0	0	0	0
430-445	0	0	0	0	0
445-500	0	0	0	0	0
500-515	0	0	0	0	0
515-530	0	0	0	0	0
530-545	0	0	0	0	0
545-600	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	0	0	0	0	0
415-515	0	0	0	0	0
430-530	0	0	0	0	0
445-545	0	0	0	0	0
500-600	0	0	0	0	0

WILTEC

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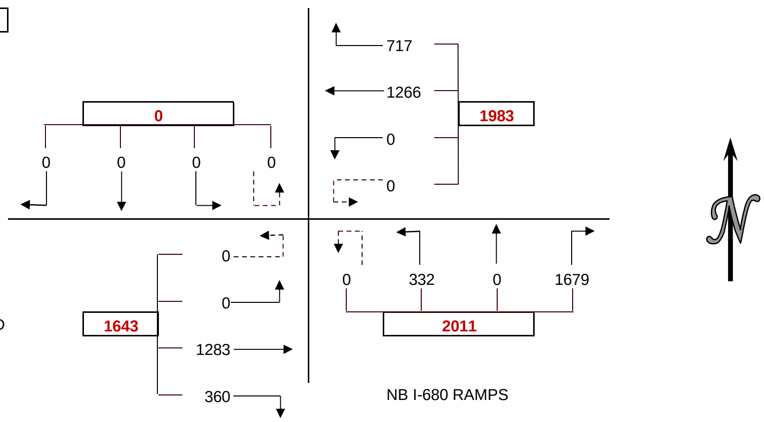
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT:		GIBSON TRANSPORTATION
PROJECT:		SAN RAMON
DATE:		THURSDAY MARCH 14, 2019
PERIOD:		7:00 AM TO 9:00 AM
INTERSECTION:	N/S	NB I-680 RAMPS
	E/W	BOLLINGER CANYON ROAD
CITY:		SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-715	0	0	0	0	180	229	0	0	263	0	61	0	65	253	0	0	1051
715-730	0	0	0	0	222	242	0	0	318	0	64	0	115	264	0	0	1225
730-745	0	0	0	0	214	255	0	0	390	0	71	0	113	282	0	0	1325
745-800	0	0	0	0	181	245	0	0	450	0	81	0	87	325	0	0	1369
800-815	0	0	0	0	191	338	0	0	415	0	95	0	102	338	0	0	1479
815-830	0	0	0	0	159	315	0	0	447	0	119	0	110	310	0	0	1460
830-845	0	0	0	0	157	327	0	0	399	0	-445	0	66	328	0	0	832
845-900	0	0	0	0	210	286	0	0	418	0	563	0	82	307	0	0	1866
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-800	0	0	0	0	797	971	0	0	1421	0	277	0	380	1124	0	0	4970
715-815	0	0	0	0	808	1080	0	0	1573	0	311	0	417	1209	0	0	5398
730-830	0	0	0	0	745	1153	0	0	1702	0	366	0	412	1255	0	0	5633
745-845	0	0	0	0	688	1225	0	0	1711	0	150	0	365	1301	0	0	5440
800-900	0	0	0	0	717	1266	0	0	1679	0	332	0	360	1283	0	0	5637

PEAK HOUR	800-900



BOLLINGER CANYON ROAD

PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	0	0	0
715-730	0	0	2	0	2
730-745	0	0	1	0	1
745-800	0	0	0	0	0
800-815	0	0	0	0	0
815-830	0	0	1	0	1
830-845	0	0	1	0	1
845-900	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	0	0	3	0	3
715-815	0	0	3	0	3
730-830	0	0	2	0	2
745-845	0	0	2	0	2
800-900	0	0	2	0	2

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	0	0	0
715-730	0	0	1	0	1
730-745	0	0	0	0	0
745-800	0	0	0	0	0
800-815	0	0	1	0	1
815-830	0	0	0	0	0
830-845	0	0	0	0	0
845-900	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	0	0	1	0	1
715-815	0	0	2	0	2
730-830	0	0	1	0	1
745-845	0	0	1	0	1
800-900	0	0	1	0	1

WILTEC
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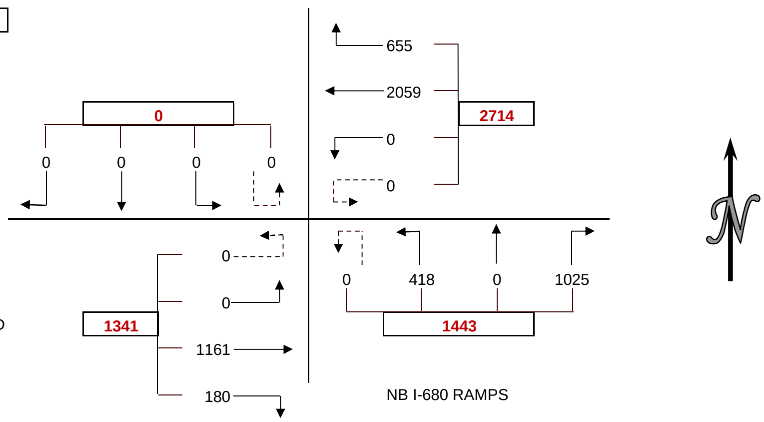
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT: GIBSON TRANSPORTATION
PROJECT: SAN RAMON
DATE: THURSDAY MARCH 14, 2019
PERIOD: 4:00 PM TO 6:00 PM
INTERSECTION: N/S NB I-680 RAMPS
E/W BOLLINGER CANYON ROAD
CITY: SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-415	0	0	0	0	206	419	0	0	162	0	79	0	61	249	0	0	1176
415-430	0	0	0	0	206	472	0	0	172	0	69	0	49	247	0	0	1215
430-445	0	0	0	0	188	474	0	0	166	0	85	0	56	241	0	0	1210
445-500	0	0	0	0	198	487	0	0	179	0	88	0	46	284	0	0	1282
500-515	0	0	0	0	162	518	0	0	214	0	95	0	47	280	0	0	1316
515-530	0	0	0	0	172	569	0	0	242	0	127	0	49	298	0	0	1457
530-545	0	0	0	0	153	506	0	0	267	0	105	0	36	282	0	0	1349
545-600	0	0	0	0	168	466	0	0	302	0	91	0	48	301	0	0	1376
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-500	0	0	0	0	798	1852	0	0	679	0	321	0	212	1021	0	0	4883
415-515	0	0	0	0	754	1951	0	0	731	0	337	0	198	1052	0	0	5023
430-530	0	0	0	0	720	2048	0	0	801	0	395	0	198	1103	0	0	5265
445-545	0	0	0	0	685	2080	0	0	902	0	415	0	178	1144	0	0	5404
500-600	0	0	0	0	655	2059	0	0	1025	0	418	0	180	1161	0	0	5498

PEAK HOUR	500-600



BOLLINGER CANYON ROAD

PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	0	0	0
415-430	0	0	0	0	0
430-445	0	0	7	0	7
445-500	0	0	2	0	2
500-515	0	0	0	0	0
515-530	0	0	0	0	0
530-545	0	0	2	0	2
545-600	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	0	0	9	0	9
415-515	0	0	9	0	9
430-530	0	0	9	0	9
445-545	0	0	4	0	4
500-600	0	0	2	0	2

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	1	0	1
415-430	0	0	0	0	0
430-445	0	0	0	0	0
445-500	0	0	0	0	0
500-515	0	0	1	0	1
515-530	0	0	0	0	0
530-545	0	0	0	0	0
545-600	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	0	0	1	0	1
415-515	0	0	1	0	1
430-530	0	0	1	0	1
445-545	0	0	1	0	1
500-600	0	0	1	0	1

WILTEC

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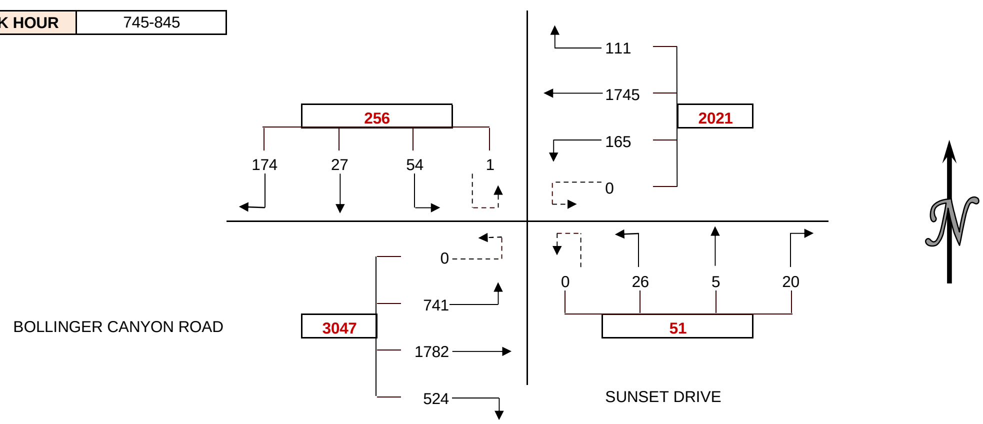
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT:		GIBSON TRANSPORTATION
PROJECT:		SAN RAMON
DATE:		THURSDAY MARCH 14, 2019
PERIOD:		7:00 AM TO 9:00 AM
INTERSECTION:	N/S	SUNSET DRIVE
	E/W	BOLLINGER CANYON ROAD
CITY:		SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-715	35	9	9	0	13	281	31	0	3	4	10	0	115	317	113	0	940
715-730	47	7	13	0	17	341	35	0	3	0	9	0	131	361	132	0	1096
730-745	41	10	7	0	15	362	40	0	2	6	5	0	124	394	142	0	1148
745-800	43	11	14	1	18	438	42	0	2	2	5	0	147	468	169	0	1360
800-815	47	6	14	0	27	434	43	0	1	2	11	0	130	394	184	0	1293
815-830	49	5	12	0	34	476	45	0	5	1	4	0	134	438	196	0	1399
830-845	35	5	14	0	32	397	35	0	12	0	6	0	113	482	192	0	1323
845-900	53	8	16	0	36	372	38	0	4	0	7	0	92	447	225	0	1298
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-800	166	37	43	1	63	1422	148	0	10	12	29	0	517	1540	556	0	4544
715-815	178	34	48	1	77	1575	160	0	8	10	30	0	532	1617	627	0	4897
730-830	180	32	47	1	94	1710	170	0	10	11	25	0	535	1694	691	0	5200
745-845	174	27	54	1	111	1745	165	0	20	5	26	0	524	1782	741	0	5375
800-900	184	24	56	0	129	1679	161	0	22	3	28	0	469	1761	797	0	5313

PEAK HOUR	745-845



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	4	0	0	4
715-730	0	5	0	0	5
730-745	0	7	0	0	7
745-800	0	1	0	0	1
800-815	0	9	0	0	9
815-830	0	9	0	0	9
830-845	0	11	0	0	11
845-900	0	4	0	0	4
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	0	17	0	0	17
715-815	0	22	0	0	22
730-830	0	26	0	0	26
745-845	0	30	0	0	30
800-900	0	33	0	0	33

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	0	0	0
715-730	0	0	0	0	0
730-745	0	0	0	0	0
745-800	0	1	0	0	1
800-815	0	2	0	1	3
815-830	0	0	0	0	0
830-845	0	0	0	0	0
845-900	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	0	1	0	0	1
715-815	0	3	0	1	4
730-830	0	3	0	1	4
745-845	0	3	0	1	4
800-900	0	2	0	1	3

WILTEC Phone: (626) 564-1944 Fax: (626) 564-0969 info@wiltecusa.com

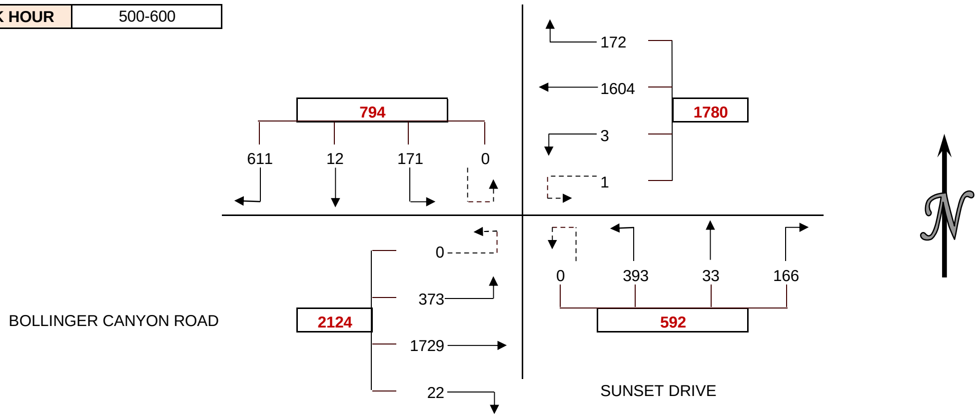
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT:		GIBSON TRANSPORTATION
PROJECT:		SAN RAMON
DATE:		THURSDAY MARCH 14, 2019
PERIOD:		4:00 PM TO 6:00 PM
INTERSECTION:	N/S	SUNSET DRIVE
	E/W	BOLLINGER CANYON ROAD
CITY:		SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-415	173	1	30	0	35	415	6	0	23	4	121	0	17	314	83	0	1222
415-430	170	2	42	1	44	410	3	0	25	10	102	0	12	334	76	0	1231
430-445	169	3	39	0	45	372	5	0	27	20	126	0	5	347	73	0	1231
445-500	167	4	45	0	37	408	2	0	44	12	91	0	3	377	75	2	1267
500-515	163	3	39	0	41	445	1	1	42	10	103	0	4	377	101	0	1330
515-530	150	4	45	0	53	441	0	0	47	10	91	0	3	438	72	0	1354
530-545	163	1	43	0	32	375	2	0	46	8	103	0	6	444	100	0	1323
545-600	135	4	44	0	46	343	0	0	31	5	96	0	9	470	100	0	1283
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-500	679	10	156	1	161	1605	16	0	119	46	440	0	37	1372	307	2	4951
415-515	669	12	165	1	167	1635	11	1	138	52	422	0	24	1435	325	2	5059
430-530	649	14	168	0	176	1666	8	1	160	52	411	0	15	1539	321	2	5182
445-545	643	12	172	0	163	1669	5	1	179	40	388	0	16	1636	348	2	5274
500-600	611	12	171	0	172	1604	3	1	166	33	393	0	22	1729	373	0	5290

PEAK HOUR	500-600



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	2	0	0	2
415-430	0	1	3	0	4
430-445	0	4	1	0	5
445-500	0	1	2	0	3
500-515	0	3	0	0	3
515-530	0	0	0	0	0
530-545	0	1	0	0	1
545-600	0	5	1	0	6
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	0	8	6	0	14
415-515	0	9	6	0	15
430-530	0	8	3	0	11
445-545	0	5	2	0	7
500-600	0	9	1	0	10

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	0	1	1
415-430	0	0	0	0	0
430-445	0	0	0	0	0
445-500	0	0	0	0	0
500-515	0	1	0	0	1
515-530	0	1	0	0	1
530-545	0	1	0	0	1
545-600	0	1	0	0	1
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	0	0	0	1	1
415-515	0	1	0	0	1
430-530	0	2	0	0	2
445-545	0	3	0	0	3
500-600	0	4	0	0	4

WILTEC

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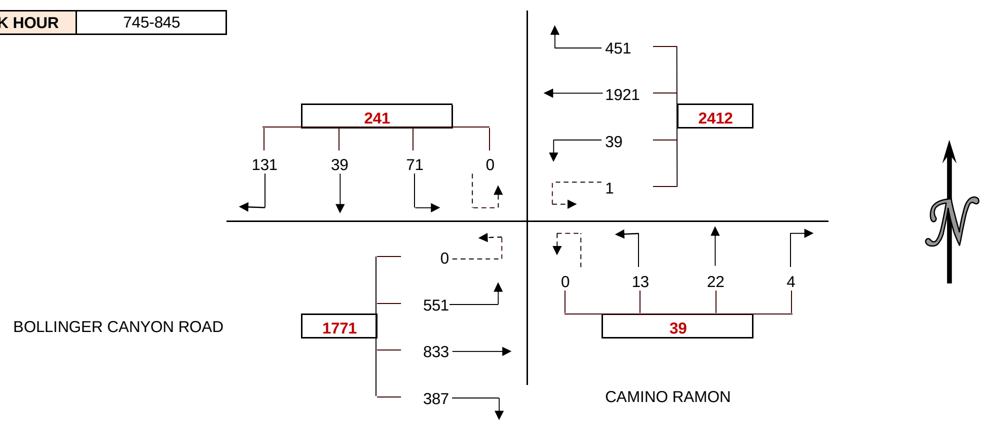
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT:		GIBSON TRANSPORTATION
PROJECT:		SAN RAMON
DATE:		WEDNESDAY MARCH 13, 2019
PERIOD:		7:00 AM TO 9:00 AM
INTERSECTION:	N/S	CAMINO RAMON
	E/W	BOLLINGER CANYON ROAD
CITY:		SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-715	18	12	11	0	33	309	7	0	0	6	5	0	67	144	85	0	697
715-730	27	8	10	0	41	368	8	0	2	2	3	0	75	182	99	0	825
730-745	24	21	13	0	60	433	10	0	0	9	7	0	88	193	115	0	973
745-800	32	11	17	0	93	472	12	0	2	7	3	0	129	189	138	0	1105
800-815	36	8	16	0	113	502	7	1	0	6	4	0	100	201	139	0	1133
815-830	29	13	17	0	111	486	11	0	1	5	4	0	81	228	130	0	1116
830-845	34	7	21	0	134	461	9	0	1	4	2	0	77	215	144	0	1109
845-900	19	7	23	0	110	382	4	0	1	6	4	0	72	230	154	0	1012
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-800	101	52	51	0	227	1582	37	0	4	24	18	0	359	708	437	0	3600
715-815	119	48	56	0	307	1775	37	1	4	24	17	0	392	765	491	0	4036
730-830	121	53	63	0	377	1893	40	1	3	27	18	0	398	811	522	0	4327
745-845	131	39	71	0	451	1921	39	1	4	22	13	0	387	833	551	0	4463
800-900	118	35	77	0	468	1831	31	1	3	21	14	0	330	874	567	0	4370

PEAK HOUR	745-845



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	2	0	2
715-730	0	0	0	1	1
730-745	1	0	1	1	3
745-800	0	0	3	1	4
800-815	1	0	2	2	5
815-830	0	0	0	5	5
830-845	1	0	0	2	3
845-900	0	0	0	3	3
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	1	0	6	3	10
715-815	2	0	6	5	13
730-830	2	0	6	9	17
745-845	2	0	5	10	17
800-900	2	0	2	12	16

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	0	0	0
715-730	0	0	0	0	0
730-745	0	0	1	0	1
745-800	0	0	0	0	0
800-815	0	0	0	0	0
815-830	0	0	0	0	0
830-845	0	0	0	0	0
845-900	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	0	0	1	0	1
715-815	0	0	1	0	1
730-830	0	0	1	0	1
745-845	0	0	0	0	0
800-900	0	0	0	0	0

WILTEC

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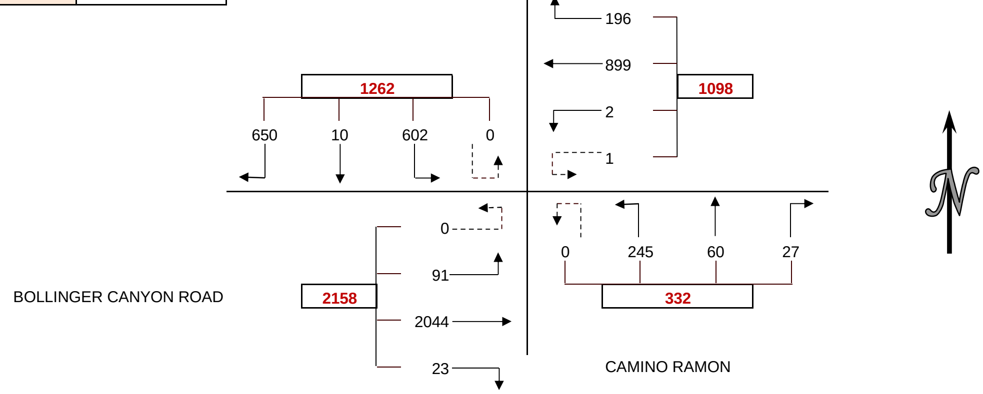
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT:		GIBSON TRANSPORTATION
PROJECT:		SAN RAMON
DATE:		WEDNESDAY MARCH 13, 2019
PERIOD:		4:00 PM TO 6:00 PM
INTERSECTION:	N/S	CAMINO RAMON
	E/W	BOLLINGER CANYON ROAD
CITY:		SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-415	141	1	78	0	46	243	2	0	4	14	74	0	1	319	37	0	960
415-430	143	1	114	0	47	192	0	0	0	8	49	0	3	372	35	0	964
430-445	150	0	106	0	56	225	1	0	5	10	98	0	3	331	25	0	1010
445-500	146	4	136	0	54	193	0	0	4	18	69	0	7	435	37	0	1103
500-515	208	1	161	0	46	216	0	0	4	19	65	0	8	521	22	0	1271
515-530	180	4	179	0	54	232	0	0	8	13	64	0	6	422	21	0	1183
530-545	129	2	140	0	44	220	2	0	6	15	61	0	6	554	33	0	1212
545-600	133	3	122	0	52	231	0	1	9	13	55	0	3	547	15	0	1184
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-500	580	6	434	0	203	853	3	0	13	50	290	0	14	1457	134	0	4037
415-515	647	6	517	0	203	826	1	0	13	55	281	0	21	1659	119	0	4348
430-530	684	9	582	0	210	866	1	0	21	60	296	0	24	1709	105	0	4567
445-545	663	11	616	0	198	861	2	0	22	65	259	0	27	1932	113	0	4769
500-600	650	10	602	0	196	899	2	1	27	60	245	0	23	2044	91	0	4850

PEAK HOUR	500-600



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	1	1	2
415-430	1	0	0	4	5
430-445	3	0	1	0	4
445-500	2	0	0	0	2
500-515	0	0	1	3	4
515-530	1	0	0	1	2
530-545	2	0	5	3	10
545-600	0	0	2	0	2
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	6	0	2	5	13
415-515	6	0	2	7	15
430-530	6	0	2	4	12
445-545	5	0	6	7	18
500-600	3	0	8	7	18

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	0	0	0
415-430	0	0	1	0	1
430-445	0	0	0	0	0
445-500	0	0	0	0	0
500-515	0	0	1	0	1
515-530	0	0	1	3	4
530-545	3	0	0	0	3
545-600	0	0	1	0	1
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	0	0	1	0	1
415-515	0	0	2	0	2
430-530	0	0	2	3	5
445-545	3	0	2	3	8
500-600	3	0	3	3	9

WILTEC

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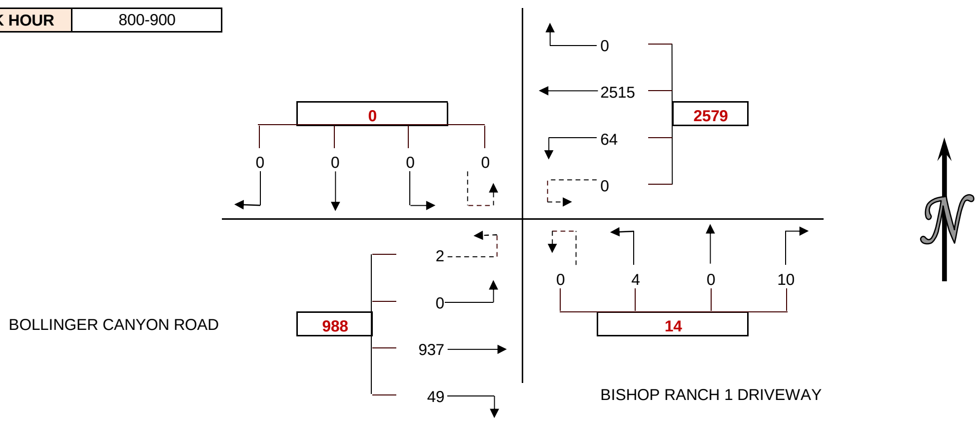
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT:		GIBSON TRANSPORTATION
PROJECT:		SAN RAMON
DATE:		WEDNESDAY MARCH 13, 2019
PERIOD:		7:00 AM TO 9:00 AM
INTERSECTION:	N/S	BISHOP RANCH 1 DRIVEWAY
	E/W	BOLLINGER CANYON ROAD
CITY:		SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-715	0	0	0	0	0	385	16	0	1	0	1	0	29	111	0	1	544
715-730	0	0	0	0	0	430	6	0	1	0	1	0	20	129	0	1	588
730-745	0	0	0	0	0	535	16	0	0	0	2	0	16	186	0	1	756
745-800	0	0	0	0	0	555	15	0	0	0	1	0	21	183	0	2	777
800-815	0	0	0	0	0	659	26	0	5	0	0	0	15	221	0	2	928
815-830	0	0	0	0	0	594	20	0	3	0	2	0	16	230	0	0	865
830-845	0	0	0	0	0	654	12	0	1	0	1	0	8	227	0	0	903
845-900	0	0	0	0	0	608	6	0	1	0	1	0	10	259	0	0	885
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-800	0	0	0	0	0	1905	53	0	2	0	5	0	86	609	0	5	2665
715-815	0	0	0	0	0	2179	63	0	6	0	4	0	72	719	0	6	3049
730-830	0	0	0	0	0	2343	77	0	8	0	5	0	68	820	0	5	3326
745-845	0	0	0	0	0	2462	73	0	9	0	4	0	60	861	0	4	3473
800-900	0	0	0	0	0	2515	64	0	10	0	4	0	49	937	0	2	3581

PEAK HOUR	800-900



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	1	3	0	4
715-730	1	1	0	0	2
730-745	0	1	1	0	2
745-800	0	4	3	0	7
800-815	1	7	1	0	9
815-830	0	10	0	0	10
830-845	1	4	3	0	8
845-900	0	8	0	0	8
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	1	7	7	0	15
715-815	2	13	5	0	20
730-830	1	22	5	0	28
745-845	2	25	7	0	34
800-900	2	29	4	0	35

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	1	0	0	1
715-730	0	6	0	0	6
730-745	0	3	1	0	4
745-800	0	5	0	0	5
800-815	0	16	1	0	17
815-830	0	3	0	0	3
830-845	0	2	0	0	2
845-900	0	3	0	0	3
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	0	15	1	0	16
715-815	0	30	2	0	32
730-830	0	27	2	0	29
745-845	0	26	1	0	27
800-900	0	24	1	0	25

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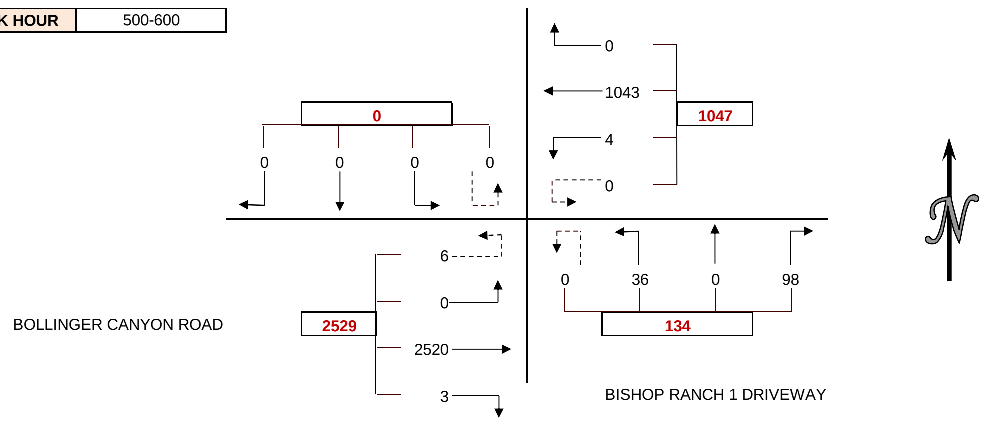
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT: GIBSON TRANSPORTATION
PROJECT: SAN RAMON
DATE: WEDNESDAY MARCH 13, 2019
PERIOD: 4:00 PM TO 6:00 PM
INTERSECTION: N/S BISHOP RANCH 1 DRIVEWAY
E/W BOLLINGER CANYON ROAD
CITY: SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-415	0	0	0	0	0	285	2	0	9	0	15	0	0	431	0	1	743
415-430	0	0	0	0	0	216	0	0	11	0	9	0	2	475	0	0	713
430-445	0	0	0	0	0	270	0	1	22	0	12	0	0	519	0	2	826
445-500	0	0	0	0	0	239	4	0	28	0	19	0	3	552	0	0	845
500-515	0	0	0	0	0	251	2	0	37	0	14	0	0	594	0	3	901
515-530	0	0	0	0	0	276	0	0	20	0	8	0	0	630	0	1	935
530-545	0	0	0	0	0	253	0	0	22	0	12	0	2	645	0	0	934
545-600	0	0	0	0	0	263	2	0	19	0	2	0	1	651	0	2	940
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-500	0	0	0	0	0	1010	6	1	70	0	55	0	5	1977	0	3	3127
415-515	0	0	0	0	0	976	6	1	98	0	54	0	5	2140	0	5	3285
430-530	0	0	0	0	0	1036	6	1	107	0	53	0	3	2295	0	6	3507
445-545	0	0	0	0	0	1019	6	0	107	0	53	0	5	2421	0	4	3615
500-600	0	0	0	0	0	1043	4	0	98	0	36	0	3	2520	0	6	3710

PEAK HOUR	500-600



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	12	1	0	13
415-430	0	2	0	0	2
430-445	3	7	1	0	11
445-500	1	5	0	0	6
500-515	1	8	1	0	10
515-530	1	12	0	0	13
530-545	3	17	3	0	23
545-600	1	10	2	0	13
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	4	26	2	0	32
415-515	5	22	2	0	29
430-530	6	32	2	0	40
445-545	6	42	4	0	52
500-600	6	47	6	0	59

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	6	0	0	6
415-430	0	3	0	0	3
430-445	0	6	0	0	6
445-500	1	5	0	0	6
500-515	0	7	1	0	8
515-530	0	7	1	0	8
530-545	3	9	0	0	12
545-600	0	2	1	0	3
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	1	20	0	0	21
415-515	1	21	1	0	23
430-530	1	25	2	0	28
445-545	4	28	2	0	34
500-600	3	25	3	0	31

WILTEC

Phone: (626) 564-1944   Fax: (626) 564-0969   info@wiltecusa.com

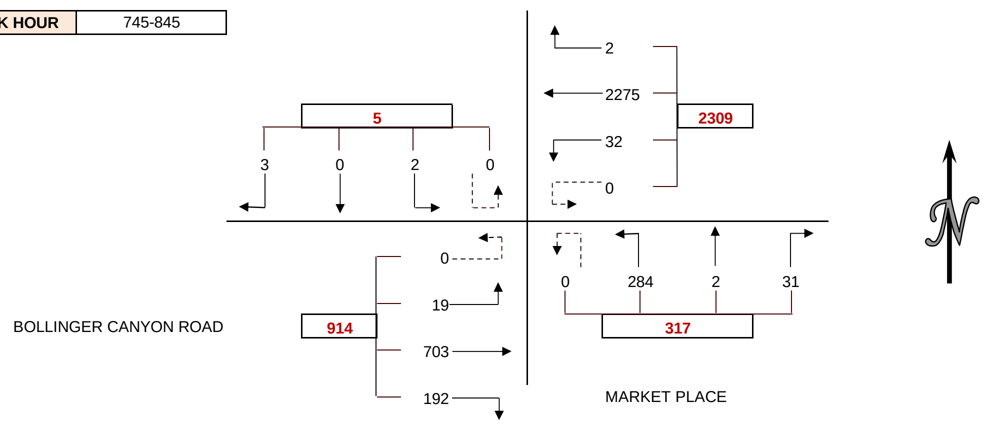
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT:		GIBSON TRANSPORTATION
PROJECT:		SAN RAMON
DATE:		WEDNESDAY MARCH 13, 2019
PERIOD:		7:00 AM TO 9:00 AM
INTERSECTION:	N/S	MARKET PLACE
	E/W	BOLLINGER CANYON ROAD
CITY:		SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-715	0	0	0	0	0	327	2	1	5	0	42	0	23	114	0	0	514
715-730	2	0	0	0	0	385	2	0	4	0	46	0	23	140	2	0	604
730-745	1	0	0	0	0	426	2	0	6	0	66	0	28	144	3	0	676
745-800	0	0	0	0	0	553	7	0	7	0	75	0	46	166	2	0	856
800-815	0	0	0	0	1	625	10	0	8	0	70	0	33	171	3	0	921
815-830	1	0	0	0	0	570	10	0	9	1	74	0	56	188	6	0	915
830-845	2	0	2	0	1	527	5	0	7	1	65	0	57	178	8	0	853
845-900	0	1	0	0	1	460	9	1	2	0	46	0	51	181	7	0	759
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-800	3	0	0	0	0	1691	13	1	22	0	229	0	120	564	7	0	2650
715-815	3	0	0	0	1	1989	21	0	25	0	257	0	130	621	10	0	3057
730-830	2	0	0	0	1	2174	29	0	30	1	285	0	163	669	14	0	3368
745-845	3	0	2	0	2	2275	32	0	31	2	284	0	192	703	19	0	3545
800-900	3	1	2	0	3	2182	34	1	26	2	255	0	197	718	24	0	3448

PEAK HOUR	745-845



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	1	0	1
715-730	0	0	0	0	0
730-745	2	6	2	0	10
745-800	0	5	2	0	7
800-815	0	1	0	0	1
815-830	3	4	1	0	8
830-845	1	3	0	0	4
845-900	-6	2	1	0	-3
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	2	11	5	0	18
715-815	2	12	4	0	18
730-830	5	16	5	0	26
745-845	4	13	3	0	20
800-900	-2	10	2	0	10

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	0	0	0
715-730	0	0	1	0	1
730-745	2	0	0	0	2
745-800	0	0	1	0	1
800-815	0	1	2	0	3
815-830	0	0	1	0	1
830-845	0	2	0	0	2
845-900	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	2	0	2	0	4
715-815	2	1	4	0	7
730-830	2	1	4	0	7
745-845	0	3	4	0	7
800-900	0	3	3	0	6

WILTEC Phone: (626) 564-1944 Fax: (626) 564-0969 info@wiltecusa.com

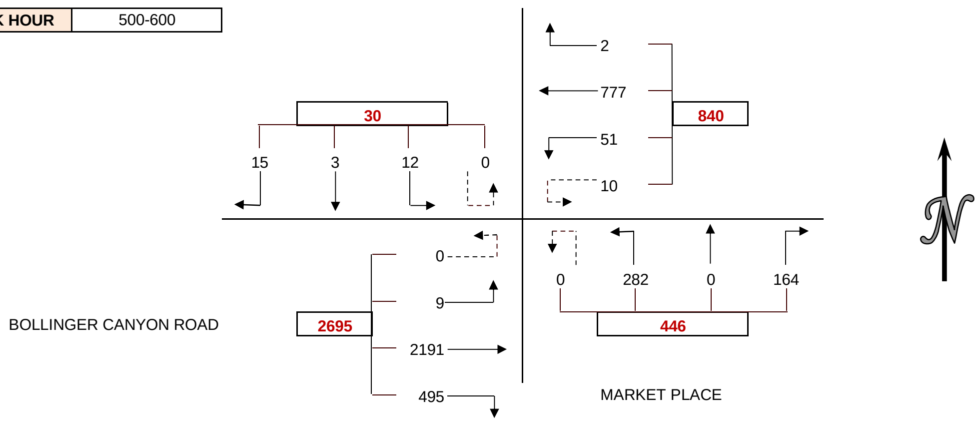
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT: GIBSON TRANSPORTATION
PROJECT: SAN RAMON
DATE: WEDNESDAY MARCH 13, 2019
PERIOD: 4:00 PM TO 6:00 PM
INTERSECTION: N/S MARKET PLACE
E/W BOLLINGER CANYON ROAD
CITY: SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-415	2	0	2	0	0	198	19	1	36	1	66	0	87	371	3	0	786
415-430	1	1	1	0	0	172	14	3	30	0	73	0	109	382	2	1	789
430-445	5	2	0	0	1	182	9	3	35	2	82	0	111	430	2	1	865
445-500	0	1	3	0	0	181	9	1	35	0	79	0	118	477	5	0	909
500-515	2	1	0	0	1	193	11	0	40	0	57	0	117	514	3	0	939
515-530	7	1	5	0	1	205	16	4	32	0	64	0	125	561	1	0	1022
530-545	3	0	5	0	0	177	13	6	60	0	94	0	141	563	2	0	1064
545-600	3	1	2	0	0	202	11	0	32	0	67	0	112	553	3	0	986
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-500	8	4	6	0	1	733	51	8	136	3	300	0	425	1660	12	2	3349
415-515	8	5	4	0	2	728	43	7	140	2	291	0	455	1803	12	2	3502
430-530	14	5	8	0	3	761	45	8	142	2	282	0	471	1982	11	1	3735
445-545	12	3	13	0	2	756	49	11	167	0	294	0	501	2115	11	0	3934
500-600	15	3	12	0	2	777	51	10	164	0	282	0	495	2191	9	0	4011

PEAK HOUR	500-600



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	12	0	0	12
415-430	1	1	4	0	6
430-445	0	6	2	0	8
445-500	0	0	0	0	0
500-515	1	3	1	0	5
515-530	2	4	3	0	9
530-545	6	1	0	0	7
545-600	1	1	1	0	3
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	1	19	6	0	26
415-515	2	10	7	0	19
430-530	3	13	6	0	22
445-545	9	8	4	0	21
500-600	10	9	5	0	24

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	0	0	0
415-430	1	0	1	0	2
430-445	0	1	0	0	1
445-500	0	0	1	0	1
500-515	0	3	1	0	4
515-530	0	0	2	0	2
530-545	0	2	2	0	4
545-600	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	1	1	2	0	4
415-515	1	4	3	0	8
430-530	0	4	4	0	8
445-545	0	5	6	0	11
500-600	0	5	5	0	10

WILTEC

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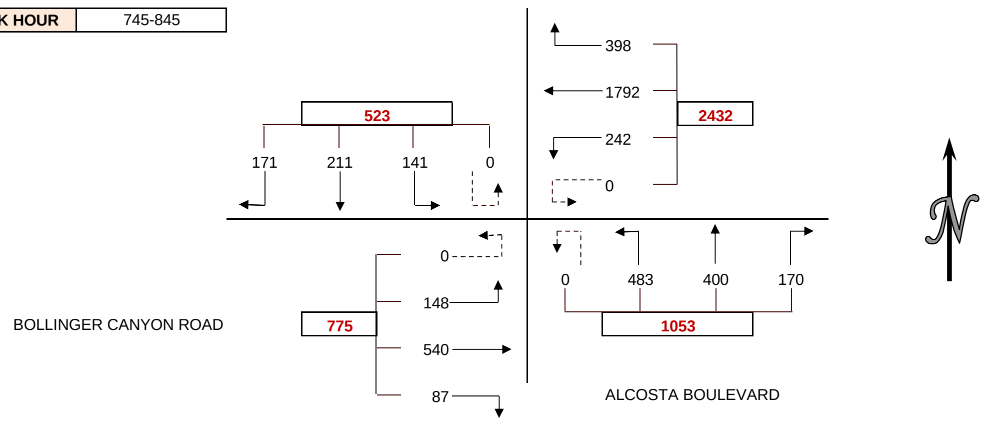
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT:		GIBSON TRANSPORTATION
PROJECT:		SAN RAMON
DATE:		WEDNESDAY MARCH 13, 2019
PERIOD:		7:00 AM TO 9:00 AM
INTERSECTION:	N/S	ALCOSTA BOULEVARD
	E/W	BOLLINGER CANYON ROAD
CITY:		SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-715	18	8	14	0	26	257	31	0	20	22	59	0	11	78	9	0	553
715-730	10	18	14	0	36	330	35	0	38	32	56	0	23	47	11	0	650
730-745	25	23	27	0	56	344	33	0	33	45	101	0	18	69	27	0	801
745-800	46	52	32	0	83	418	44	0	42	136	105	0	18	194	33	0	1203
800-815	71	72	54	0	130	481	80	0	39	117	127	0	21	106	40	0	1338
815-830	34	57	34	0	101	431	79	0	43	79	134	0	27	118	42	0	1179
830-845	20	30	21	0	84	462	39	0	46	68	117	0	21	122	33	0	1063
845-900	16	50	30	0	80	381	58	0	47	92	88	0	19	137	38	0	1036
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-800	99	101	87	0	201	1349	143	0	133	235	321	0	70	388	80	0	3207
715-815	152	165	127	0	305	1573	192	0	152	330	389	0	80	416	111	0	3992
730-830	176	204	147	0	370	1674	236	0	157	377	467	0	84	487	142	0	4521
745-845	171	211	141	0	398	1792	242	0	170	400	483	0	87	540	148	0	4783
800-900	141	209	139	0	395	1755	256	0	175	356	466	0	88	483	153	0	4616

PEAK HOUR	745-845



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	0	0	0
715-730	0	0	0	1	1
730-745	0	0	0	2	2
745-800	0	1	1	4	6
800-815	0	0	0	1	1
815-830	1	1	0	1	3
830-845	0	0	0	2	2
845-900	0	0	1	2	3
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	0	1	1	7	9
715-815	0	1	1	8	10
730-830	1	2	1	8	12
745-845	1	2	1	8	12
800-900	1	1	1	6	9

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	0	0	0
715-730	0	0	0	0	0
730-745	0	0	0	0	0
745-800	0	0	0	4	4
800-815	0	1	2	6	9
815-830	0	0	0	1	1
830-845	0	1	1	0	2
845-900	0	1	1	0	2
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	0	0	0	4	4
715-815	0	1	2	10	13
730-830	0	1	2	11	14
745-845	0	2	3	11	16
800-900	0	3	4	7	14

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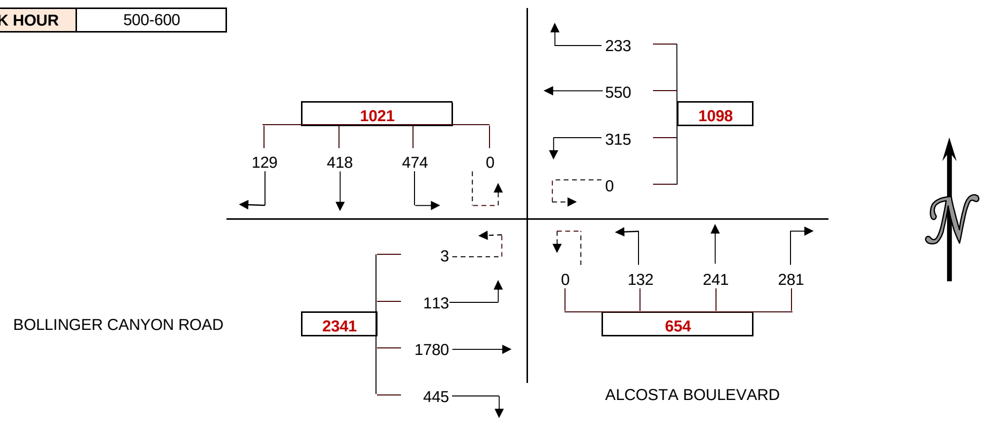
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT:		GIBSON TRANSPORTATION
PROJECT:		SAN RAMON
DATE:		WEDNESDAY MARCH 13, 2019
PERIOD:		4:00 PM TO 6:00 PM
INTERSECTION:	N/S	ALCOSTA BOULEVARD
	E/W	BOLLINGER CANYON ROAD
CITY:		SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-415	47	77	73	0	51	198	55	0	46	43	24	0	62	296	28	1	1001
415-430	36	91	63	0	33	149	54	0	45	53	31	0	40	260	31	1	887
430-445	31	97	67	0	40	145	47	1	61	48	38	0	76	350	36	3	1040
445-500	28	88	83	0	50	142	59	0	60	60	26	0	88	411	26	0	1121
500-515	39	111	103	0	43	123	82	0	73	55	43	0	103	441	28	0	1244
515-530	37	114	125	0	65	145	74	0	69	62	24	0	115	440	32	0	1302
530-545	30	111	142	0	56	130	66	0	72	69	31	0	103	385	21	0	1216
545-600	23	82	104	0	69	152	93	0	67	55	34	0	124	514	32	3	1352
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-500	142	353	286	0	174	634	215	1	212	204	119	0	266	1317	121	5	4049
415-515	134	387	316	0	166	559	242	1	239	216	138	0	307	1462	121	4	4292
430-530	135	410	378	0	198	555	262	1	263	225	131	0	382	1642	122	3	4707
445-545	134	424	453	0	214	540	281	0	274	246	124	0	409	1677	107	0	4883
500-600	129	418	474	0	233	550	315	0	281	241	132	0	445	1780	113	3	5114

PEAK HOUR	500-600



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	1	0	1
415-430	0	0	1	1	2
430-445	0	1	1	0	2
445-500	0	0	0	1	1
500-515	0	0	0	1	1
515-530	0	0	2	4	6
530-545	0	0	1	1	2
545-600	0	0	1	1	2
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	0	1	3	2	6
415-515	0	1	2	3	6
430-530	0	1	3	6	10
445-545	0	0	3	7	10
500-600	0	0	4	7	11

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	0	0	0
415-430	0	1	0	1	2
430-445	0	0	0	0	0
445-500	0	0	0	0	0
500-515	0	1	0	1	2
515-530	0	0	2	0	2
530-545	0	1	1	0	2
545-600	0	0	1	0	1
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	0	1	0	1	2
415-515	0	2	0	2	4
430-530	0	1	2	1	4
445-545	0	2	3	1	6
500-600	0	2	4	1	7

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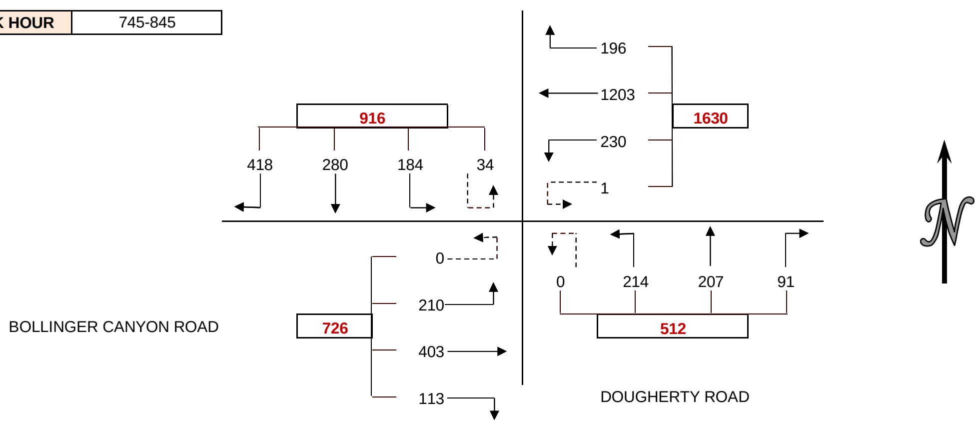
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT: GIBSON TRANSPORTATION
PROJECT: BISHOP RANCH STUDY, CITY OF SAN RAMON
DATE: THURSDAY MAY 23, 2019
PERIOD: 7:00 AM TO 9:00 AM
INTERSECTION: N/S DOUGHERTY ROAD
E/W BOLLINGER CANYON ROAD
CITY: SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-715	52	43	24	5	28	148	18	0	7	12	26	0	26	46	22	0	457
715-730	52	47	22	1	22	183	25	0	17	24	25	0	22	96	23	0	559
730-745	73	57	29	7	38	219	58	1	13	29	41	0	43	81	46	2	737
745-800	90	62	53	6	53	305	55	0	32	51	43	0	28	116	52	0	946
800-815	100	87	66	6	59	299	97	0	22	54	54	0	37	147	50	0	1078
815-830	129	74	36	14	46	322	43	1	30	55	70	0	26	90	58	0	994
830-845	99	57	29	8	38	277	35	0	7	47	47	0	22	50	50	0	766
845-900	69	47	26	12	31	248	35	1	10	41	44	0	35	52	62	0	713
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-800	267	209	128	19	141	855	156	1	69	116	135	0	119	339	143	2	2699
715-815	315	253	170	20	172	1006	235	1	84	158	163	0	130	440	171	2	3320
730-830	392	280	184	33	196	1145	253	2	97	189	208	0	134	434	206	2	3755
745-845	418	280	184	34	196	1203	230	1	91	207	214	0	113	403	210	0	3784
800-900	397	265	157	40	174	1146	210	2	69	197	215	0	120	339	220	0	3551

PEAK HOUR	745-845



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	0	0	0
715-730	1	0	1	1	3
730-745	0	0	0	0	0
745-800	0	0	2	1	3
800-815	0	0	1	0	1
815-830	0	0	0	0	0
830-845	0	0	0	0	0
845-900	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	1	0	3	2	6
715-815	1	0	4	2	7
730-830	0	0	3	1	4
745-845	0	0	3	1	4
800-900	0	0	1	0	1

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	1	0	1	2
715-730	0	0	0	0	0
730-745	0	0	0	0	0
745-800	0	0	0	0	0
800-815	0	1	0	0	1
815-830	0	0	0	0	0
830-845	0	0	1	0	1
845-900	0	0	0	1	1
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	0	1	0	1	2
715-815	0	1	0	0	1
730-830	0	1	0	0	1
745-845	0	1	1	0	2
800-900	0	1	1	1	3

WILTEC

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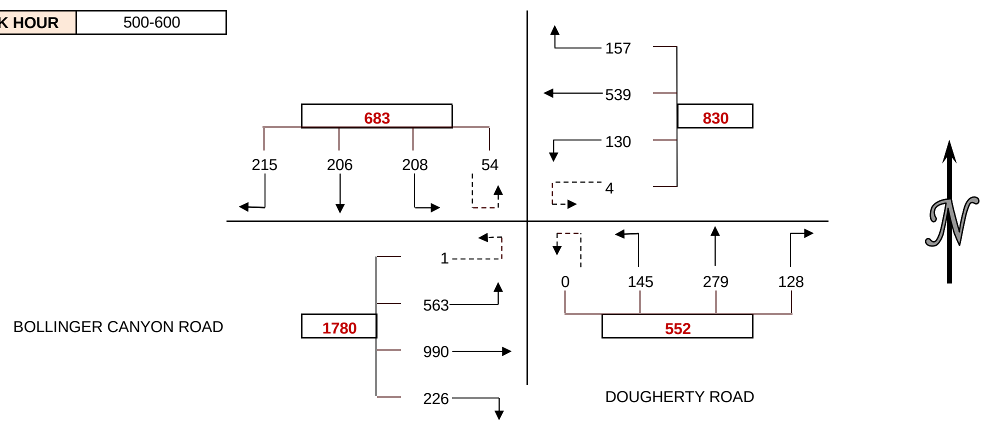
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT: GIBSON TRANSPORTATION
PROJECT: BISHOP RANCH STUDY, CITY OF SAN RAMON
DATE: THURSDAY MAY 22, 2019
PERIOD: 4:00 PM TO 6:00 PM
INTERSECTION: N/S DOUGHERTY ROAD
E/W BOLLINGER CANYON ROAD
CITY: SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-415	51	51	48	16	31	113	24	1	12	59	26	1	35	165	120	0	753
415-430	35	46	56	10	42	135	27	1	24	53	31	0	46	174	127	1	808
430-445	36	41	38	11	30	116	17	1	16	63	22	2	46	177	119	0	735
445-500	50	44	30	8	27	132	24	1	18	69	25	0	56	201	116	0	801
500-515	50	45	48	14	37	125	36	0	26	60	35	0	65	215	129	0	885
515-530	58	59	51	16	31	150	32	1	29	79	44	0	61	283	151	0	1045
530-545	53	55	49	17	43	130	27	1	47	76	34	0	58	240	143	1	974
545-600	54	47	60	7	46	134	35	2	26	64	32	0	42	252	140	0	941
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-500	172	182	172	45	130	496	92	4	70	244	104	3	183	717	482	1	3097
415-515	171	176	172	43	136	508	104	3	84	245	113	2	213	767	491	1	3229
430-530	194	189	167	49	125	523	109	3	89	271	126	2	228	876	515	0	3466
445-545	211	203	178	55	138	537	119	3	120	284	138	0	240	939	539	1	3705
500-600	215	206	208	54	157	539	130	4	128	279	145	0	226	990	563	1	3845

PEAK HOUR	500-600



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	2	0	1	0	3
415-430	3	0	2	0	5
430-445	0	0	0	0	0
445-500	1	0	0	0	1
500-515	1	1	0	0	2
515-530	0	0	0	0	0
530-545	0	0	0	0	0
545-600	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	6	0	3	0	9
415-515	5	1	2	0	8
430-530	2	1	0	0	3
445-545	2	1	0	0	3
500-600	1	1	0	0	2

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	0	0	0
415-430	0	0	0	0	0
430-445	0	0	0	0	0
445-500	0	0	0	0	0
500-515	0	0	0	0	0
515-530	0	0	0	0	0
530-545	0	4	0	0	4
545-600	0	1	1	1	3
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	0	0	0	0	0
415-515	0	0	0	0	0
430-530	0	0	0	0	0
445-545	0	4	0	0	4
500-600	0	5	1	1	7

WILTEC

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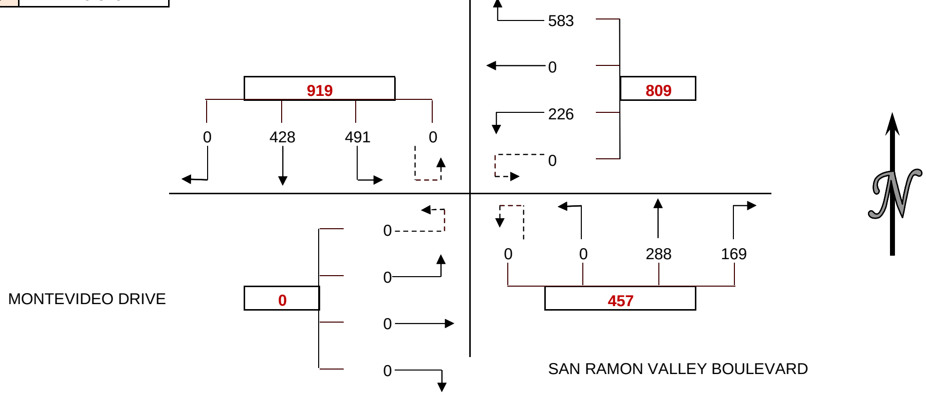
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT: GIBSON TRANSPORTATION
PROJECT: BISHOP RANCH STUDY, CITY OF SAN RAMON
DATE: WEDNSEDAY MAY 29, 2019
PERIOD: 7:00 AM TO 9:00 AM
INTERSECTION: N/S SAN RAMON VALLEY BOULEVARD
E/W MONTEVIDEO DRIVE
CITY: SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-715	0	35	27	0	62	0	43	0	6	36	0	0	0	0	0	0	209
715-730	0	43	40	0	67	0	47	0	9	56	0	0	0	0	0	0	262
730-745	0	63	78	0	95	0	46	0	20	57	0	0	0	0	0	0	359
745-800	0	76	142	0	135	0	44	0	42	65	0	0	0	0	0	0	504
800-815	0	177	164	0	127	0	68	0	68	70	0	0	0	0	0	0	674
815-830	0	109	135	0	191	0	72	0	44	75	0	0	0	0	0	0	626
830-845	0	66	50	0	130	0	42	0	15	78	0	0	0	0	0	0	381
845-900	0	70	44	0	91	0	39	0	14	90	0	0	0	0	0	0	348
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-800	0	217	287	0	359	0	180	0	77	214	0	0	0	0	0	0	1334
715-815	0	359	424	0	424	0	205	0	139	248	0	0	0	0	0	0	1799
730-830	0	425	519	0	548	0	230	0	174	267	0	0	0	0	0	0	2163
745-845	0	428	491	0	583	0	226	0	169	288	0	0	0	0	0	0	2185
800-900	0	422	393	0	539	0	221	0	141	313	0	0	0	0	0	0	2029

PEAK HOUR	745-845



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	3	0	3
715-730	0	0	0	0	0
730-745	0	0	2	0	2
745-800	0	0	2	0	2
800-815	0	0	1	0	1
815-830	0	0	1	0	1
830-845	0	0	1	0	1
845-900	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	0	0	7	0	7
715-815	0	0	5	0	5
730-830	0	0	6	0	6
745-845	0	0	5	0	5
800-900	0	0	3	0	3

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	0	0	0
715-730	0	0	0	0	0
730-745	0	0	2	0	2
745-800	0	0	2	0	2
800-815	0	0	7	0	7
815-830	0	0	0	0	0
830-845	0	0	0	0	0
845-900	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	0	0	4	0	4
715-815	0	0	11	0	11
730-830	0	0	11	0	11
745-845	0	0	9	0	9
800-900	0	0	7	0	7

WILTEC

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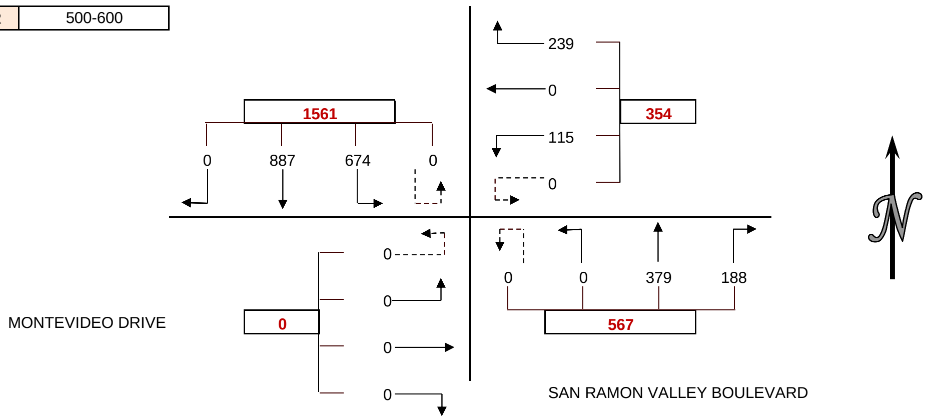
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT:		GIBSON TRANSPORTATION
PROJECT:		BISHOP RANCH STUDY, CITY OF SAN RAMON
DATE:		THURSDAY MAY 29, 2019
PERIOD:		4:00 PM TO 6:00 PM
INTERSECTION:	N/S	SAN RAMON VALLEY BOULEVARD
	E/W	MONTEVIDEO DRIVE
CITY:		SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-415	0	104	71	0	53	0	22	0	24	85	0	1	0	0	0	0	360
415-430	0	127	84	0	69	0	34	0	33	83	0	0	0	0	0	0	430
430-445	0	128	86	0	57	0	34	0	28	86	0	0	0	0	0	0	419
445-500	0	166	102	0	52	0	34	0	38	80	0	0	0	0	0	0	472
500-515	0	206	153	0	56	0	27	0	39	91	0	0	0	0	0	0	572
515-530	0	236	198	0	60	0	24	0	48	90	0	0	0	0	0	0	656
530-545	0	229	179	0	69	0	36	0	53	110	0	0	0	0	0	0	676
545-600	0	216	144	0	54	0	28	0	48	88	0	0	0	0	0	0	578
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-500	0	525	343	0	231	0	124	0	123	334	0	1	0	0	0	0	1681
415-515	0	627	425	0	234	0	129	0	138	340	0	0	0	0	0	0	1893
430-530	0	736	539	0	225	0	119	0	153	347	0	0	0	0	0	0	2119
445-545	0	837	632	0	237	0	121	0	178	371	0	0	0	0	0	0	2376
500-600	0	887	674	0	239	0	115	0	188	379	0	0	0	0	0	0	2482

PEAK HOUR	500-600



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	1	0	1
415-430	0	0	3	0	3
430-445	0	0	0	0	0
445-500	0	0	1	0	1
500-515	0	0	0	0	0
515-530	0	1	1	0	2
530-545	0	0	4	0	4
545-600	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	0	0	5	0	5
415-515	0	0	4	0	4
430-530	0	1	2	0	3
445-545	0	1	6	0	7
500-600	0	1	5	0	6

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	0	1	1
415-430	0	0	0	0	0
430-445	0	0	0	0	0
445-500	0	0	2	0	2
500-515	0	0	0	0	0
515-530	0	0	0	0	0
530-545	0	0	0	0	0
545-600	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	0	0	2	1	3
415-515	0	0	2	0	2
430-530	0	0	2	0	2
445-545	0	0	2	0	2
500-600	0	0	0	0	0

WILTEC

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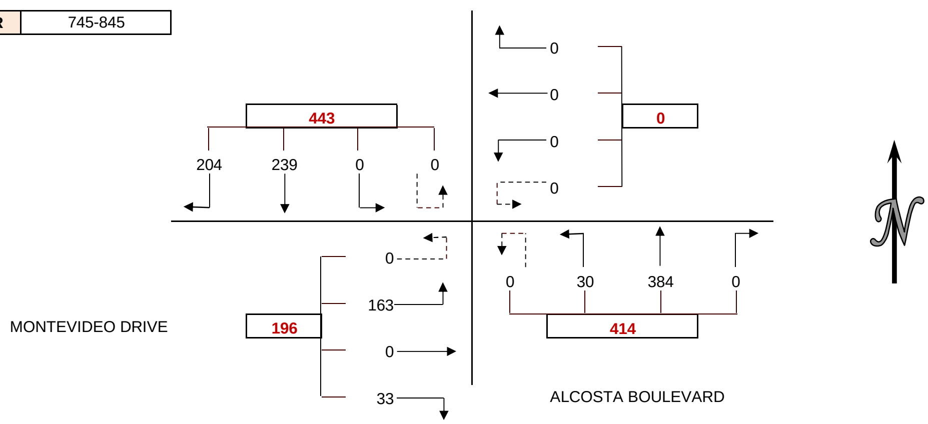
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT:		GIBSON TRANSPORTATION
PROJECT:		BISHOP RANCH STUDY, CITY OF SAN RAMON
DATE:		THURSDAY MAY 23, 2019
PERIOD:		7:00 AM TO 9:00 AM
INTERSECTION:	N/S	ALCOSTA BOULEVARD
	E/W	MONTEVIDEO DRIVE
CITY:		SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-715	9	21	0	0	0	0	0	0	0	23	4	0	3	0	19	0	79
715-730	37	41	0	0	0	0	0	0	0	47	5	0	5	0	28	0	163
730-745	25	37	0	0	0	0	0	0	0	67	4	0	7	0	49	0	189
745-800	26	49	0	0	0	0	0	0	0	88	4	0	7	0	32	0	206
800-815	82	44	0	0	0	0	0	0	0	97	10	0	10	0	40	0	283
815-830	84	86	0	0	0	0	0	0	0	108	10	0	10	0	61	0	359
830-845	12	60	0	0	0	0	0	0	0	91	6	0	6	0	30	0	205
845-900	10	52	0	0	0	0	0	0	0	73	5	1	6	0	19	0	166
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-800	97	148	0	0	0	0	0	0	0	225	17	0	22	0	128	0	637
715-815	170	171	0	0	0	0	0	0	0	299	23	0	29	0	149	0	841
730-830	217	216	0	0	0	0	0	0	0	360	28	0	34	0	182	0	1037
745-845	204	239	0	0	0	0	0	0	0	384	30	0	33	0	163	0	1053
800-900	188	242	0	0	0	0	0	0	0	369	31	1	32	0	150	0	1013

PEAK HOUR	745-845



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	0	1	1
715-730	0	0	0	1	1
730-745	0	0	0	0	0
745-800	0	0	0	0	0
800-815	0	0	0	0	0
815-830	0	0	0	0	0
830-845	0	0	0	0	0
845-900	0	0	0	2	2
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	0	0	0	2	2
715-815	0	0	0	1	1
730-830	0	0	0	0	0
745-845	0	0	0	0	0
800-900	0	0	0	2	2

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	0	0	0
715-730	0	0	0	0	0
730-745	0	0	0	0	0
745-800	0	0	0	0	0
800-815	0	0	1	0	1
815-830	0	0	0	0	0
830-845	0	0	0	0	0
845-900	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	0	0	0	0	0
715-815	0	0	1	0	1
730-830	0	0	1	0	1
745-845	0	0	1	0	1
800-900	0	0	1	0	1

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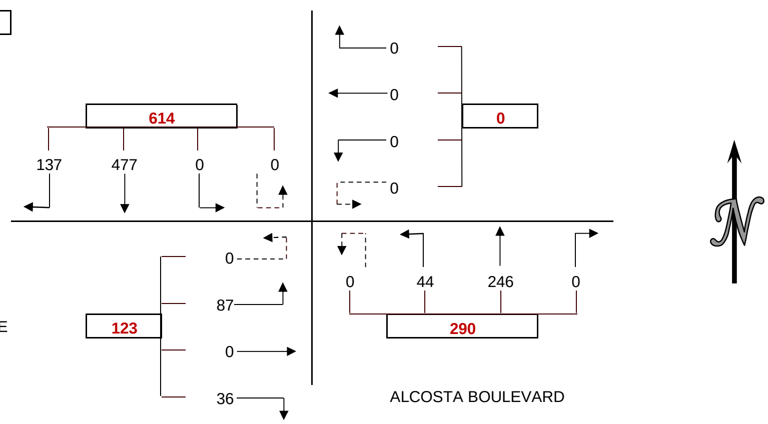
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT: GIBSON TRANSPORTATION
PROJECT: BISHOP RANCH STUDY, CITY OF SAN RAMON
DATE: THURSDAY MAY 23, 2019
PERIOD: 4:00 PM TO 6:00 PM
INTERSECTION: N/S ALCOSTA BOULEVARD
E/W MONTEVIDEO DRIVE
CITY: SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-415	28	71	0	0	0	0	0	0	0	58	12	0	0	0	25	0	194
415-430	26	84	0	0	0	0	0	0	0	57	7	0	3	0	28	0	205
430-445	28	82	0	0	0	0	0	0	0	55	7	0	5	0	21	0	198
445-500	36	92	0	0	0	0	0	0	0	51	20	0	8	0	19	0	226
500-515	40	116	0	0	0	0	0	0	0	76	8	0	10	0	23	0	273
515-530	27	135	0	0	0	0	0	0	0	52	7	0	13	0	19	0	253
530-545	38	130	0	0	0	0	0	0	0	61	15	0	6	0	16	0	266
545-600	32	96	0	0	0	0	0	0	0	57	14	0	7	0	29	0	235
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-500	118	329	0	0	0	0	0	0	0	221	46	0	16	0	93	0	823
415-515	130	374	0	0	0	0	0	0	0	239	42	0	26	0	91	0	902
430-530	131	425	0	0	0	0	0	0	0	234	42	0	36	0	82	0	950
445-545	141	473	0	0	0	0	0	0	0	240	50	0	37	0	77	0	1018
500-600	137	477	0	0	0	0	0	0	0	246	44	0	36	0	87	0	1027

PEAK HOUR	500-600



MONTEVIDEO DRIVE

ALCOSTA BOULEVARD

PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	0	0	0
415-430	0	0	0	0	0
430-445	0	0	1	1	2
445-500	0	0	0	0	0
500-515	0	0	0	0	0
515-530	0	0	0	0	0
530-545	0	0	0	0	0
545-600	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	0	0	1	1	2
415-515	0	0	1	1	2
430-530	0	0	1	1	2
445-545	0	0	0	0	0
500-600	0	0	0	0	0

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	0	0	0
415-430	0	0	0	0	0
430-445	0	0	0	1	1
445-500	0	0	0	0	0
500-515	0	0	0	0	0
515-530	0	0	0	0	0
530-545	0	0	0	0	0
545-600	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	0	0	0	1	1
415-515	0	0	0	1	1
430-530	0	0	0	1	1
445-545	0	0	0	0	0
500-600	0	0	0	0	0

WILTEC Phone: (626) 564-1944 Fax: (626) 564-0969 info@wiltecusa.com

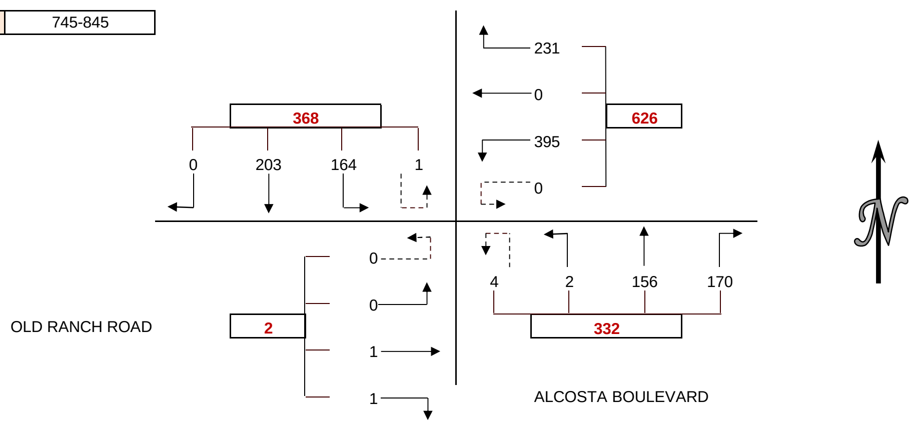
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT:		GIBSON TRANSPORTATION
PROJECT:		BISHOP RANCH STUDY, CITY OF SAN RAMON
DATE:		THURSDAY MAY 23, 2019
PERIOD:		7:00 AM TO 9:00 AM
INTERSECTION:	N/S	ALCOSTA BOULEVARD
	E/W	OLD RANCH ROAD
CITY:		SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-715	0	22	20	0	28	0	26	0	18	12	0	0	0	1	0	0	127
715-730	0	32	31	0	48	0	48	0	20	30	0	0	0	0	0	0	209
730-745	0	37	41	0	35	1	97	0	32	38	0	1	0	1	0	0	283
745-800	0	44	27	0	56	0	99	0	43	46	0	1	1	1	0	0	318
800-815	0	53	35	0	87	0	89	0	46	37	1	0	0	0	0	0	348
815-830	0	61	55	0	59	0	117	0	37	40	0	1	0	0	0	0	370
830-845	0	45	47	1	29	0	90	0	44	33	1	2	0	0	0	0	292
845-900	0	40	24	0	29	0	62	0	35	23	0	2	0	1	0	0	216
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-800	0	135	119	0	167	1	270	0	113	126	0	2	1	3	0	0	937
715-815	0	166	134	0	226	1	333	0	141	151	1	2	1	2	0	0	1158
730-830	0	195	158	0	237	1	402	0	158	161	1	3	1	2	0	0	1319
745-845	0	203	164	1	231	0	395	0	170	156	2	4	1	1	0	0	1328
800-900	0	199	161	1	204	0	358	0	162	133	2	5	0	1	0	0	1226

PEAK HOUR	745-845



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	0	0	0
715-730	0	0	0	0	0
730-745	0	1	0	0	1
745-800	0	1	0	0	1
800-815	0	0	0	0	0
815-830	0	0	0	0	0
830-845	0	0	0	0	0
845-900	2	0	0	2	4
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	0	2	0	0	2
715-815	0	2	0	0	2
730-830	0	2	0	0	2
745-845	0	1	0	0	1
800-900	2	0	0	2	4

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-715	0	0	0	0	0
715-730	0	0	0	0	0
730-745	0	1	0	0	1
745-800	0	0	0	0	0
800-815	1	0	0	0	1
815-830	0	0	0	0	0
830-845	0	0	0	0	0
845-900	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
700-800	0	1	0	0	1
715-815	1	1	0	0	2
730-830	1	1	0	0	2
745-845	1	0	0	0	1
800-900	1	0	0	0	1

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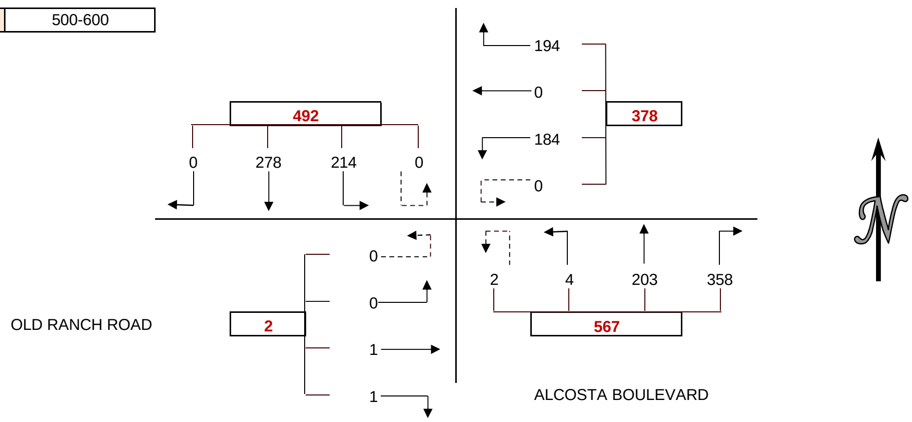
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT:		GIBSON TRANSPORTATION
PROJECT:		BISHOP RANCH STUDY, CITY OF SAN RAMON
DATE:		THURSDAY MAY 23, 2019
PERIOD:		4:00 PM TO 6:00 PM
INTERSECTION:	N/S	ALCOSTA BOULEVARD
	E/W	OLD RANCH ROAD
CITY:		SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-415	0	53	37	0	42	0	43	0	65	47	0	0	0	0	0	0	287
415-430	0	45	32	0	40	0	39	0	69	46	1	2	0	0	0	0	274
430-445	0	60	38	0	36	0	41	0	70	43	0	1	1	0	0	0	290
445-500	0	54	40	0	29	1	37	0	68	38	1	3	0	0	0	0	271
500-515	0	78	58	0	41	0	34	0	88	56	0	0	0	0	0	0	355
515-530	0	75	59	0	56	0	58	0	79	41	0	1	1	0	0	0	370
530-545	0	72	56	0	49	0	45	0	96	62	2	0	0	1	0	0	383
545-600	0	53	41	0	48	0	47	0	95	44	2	1	0	0	0	0	331
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-500	0	212	147	0	147	1	160	0	272	174	2	6	1	0	0	0	1122
415-515	0	237	168	0	146	1	151	0	295	183	2	6	1	0	0	0	1190
430-530	0	267	195	0	162	1	170	0	305	178	1	5	2	0	0	0	1286
445-545	0	279	213	0	175	1	174	0	331	197	3	4	1	1	0	0	1379
500-600	0	278	214	0	194	0	184	0	358	203	4	2	1	1	0	0	1439

PEAK HOUR	500-600



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	0	0	0
415-430	1	0	0	0	1
430-445	2	0	0	0	2
445-500	0	2	0	0	2
500-515	1	0	0	0	1
515-530	1	1	0	0	2
530-545	0	0	0	0	0
545-600	1	1	0	0	2
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	3	2	0	0	5
415-515	4	2	0	0	6
430-530	4	3	0	0	7
445-545	2	3	0	0	5
500-600	3	2	0	0	5

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	1	0	0	1
415-430	0	0	0	0	0
430-445	0	0	0	1	1
445-500	1	0	0	0	1
500-515	0	0	0	0	0
515-530	0	0	0	0	0
530-545	2	0	0	0	2
545-600	0	1	0	0	1
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	1	1	0	1	3
415-515	1	0	0	1	2
430-530	1	0	0	1	2
445-545	3	0	0	0	3
500-600	2	1	0	0	3

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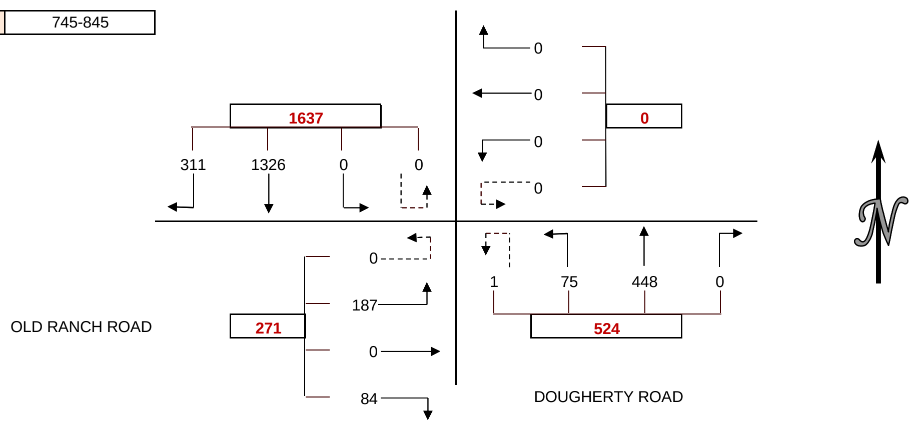
INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

CLIENT: GIBSON TRANSPORTATION
PROJECT: BISHOP RANCH STUDY, CITY OF SAN RAMON
DATE: THURSEDAY MAY 23, 2019
PERIOD: 7:00 AM TO 9:00 AM
INTERSECTION: N/S DOUGHERTY ROAD
E/W OLD RANCH ROAD
CITY: SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-715	16	247	0	0	0	0	0	0	0	114	9	0	18	0	29	0	433
715-730	47	275	0	0	0	0	0	0	0	104	19	0	25	0	37	0	507
730-745	59	267	0	0	0	0	0	0	0	92	17	0	23	0	48	0	506
745-800	66	326	0	0	0	0	0	0	0	125	26	0	11	0	43	0	597
800-815	91	335	0	0	0	0	0	0	0	122	16	0	23	0	53	0	640
815-830	87	334	0	0	0	0	0	0	0	91	12	0	29	0	55	0	608
830-845	67	331	0	0	0	0	0	0	0	110	21	1	21	0	36	0	587
845-900	53	259	0	0	0	0	0	0	0	107	17	0	23	0	35	0	494
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
700-800	188	1115	0	0	0	0	0	0	0	435	71	0	77	0	157	0	2043
715-815	263	1203	0	0	0	0	0	0	0	443	78	0	82	0	181	0	2250
730-830	303	1262	0	0	0	0	0	0	0	430	71	0	86	0	199	0	2351
745-845	311	1326	0	0	0	0	0	0	0	448	75	1	84	0	187	0	2432
800-900	298	1259	0	0	0	0	0	0	0	430	66	1	96	0	179	0	2329

PEAK HOUR	745-845



PEDESTRIAN COUNTS

15 MIN COUNTS PERIOD	NORTH LEG	EAST LEG	SOUTH LEG	WEST LEG	TOTAL
700-715	0	0	0	0	0
715-730	0	0	0	0	0
730-745	0	0	0	0	0
745-800	0	0	0	0	0
800-815	1	0	0	0	1
815-830	0	0	0	0	0
830-845	0	0	0	0	0
845-900	0	0	0	0	0
HOUR TOTALS PERIOD	NORTH LEG	EAST LEG	SOUTH LEG	WEST LEG	TOTAL
700-800	0	0	0	0	0
715-815	1	0	0	0	1
730-830	1	0	0	0	1
745-845	1	0	0	0	1
800-900	1	0	0	0	1

BICYCLE COUNTS

15 MIN COUNTS PERIOD	NORTH LEG	EAST LEG	SOUTH LEG	WEST LEG	TOTAL
700-715	1	0	0	1	2
715-730	0	0	0	0	0
730-745	0	0	0	0	0
745-800	0	0	0	0	0
800-815	1	0	0	0	1
815-830	2	0	0	0	2
830-845	2	0	0	0	2
845-900	0	0	0	0	0
HOUR TOTALS PERIOD	NORTH LEG	EAST LEG	SOUTH LEG	WEST LEG	TOTAL
700-800	1	0	0	1	2
715-815	1	0	0	0	1
730-830	3	0	0	0	3
745-845	5	0	0	0	5
800-900	5	0	0	0	5

WILTEC

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INTERSECTION CAR/PED/BIKE TRAFFIC COUNT RESULTS SUMMARY

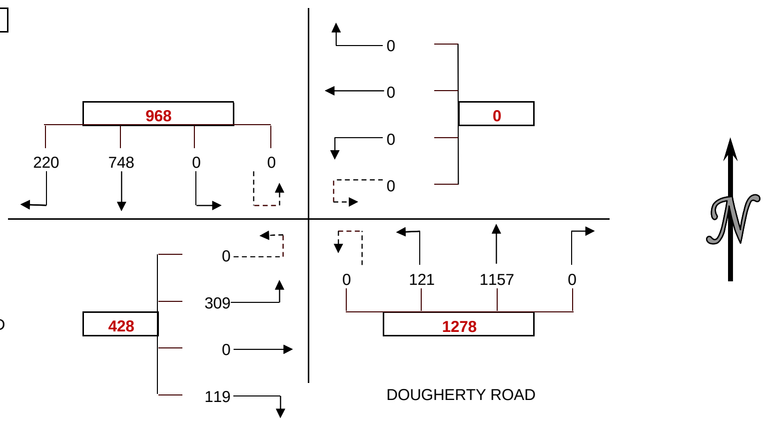
CLIENT:		GIBSON TRANSPORTATION
PROJECT:		BISHOP RANCH STUDY, CITY OF SAN RAMON
DATE:		THURSEDAY MAY 23, 2019
PERIOD:		4:00 PM TO 6:00 PM
INTERSECTION:	N/S	DOUGHERTY ROAD
	E/W	OLD RANCH ROAD
CITY:		SAN RAMON

VEHICLE COUNTS

15 MIN COUNTS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-415	48	164	0	0	0	0	0	0	0	184	24	0	21	0	51	0	492
415-430	43	183	0	0	0	0	0	0	0	211	29	0	29	0	51	0	546
430-445	35	193	0	0	0	0	0	0	0	218	27	0	18	0	60	0	551
445-500	40	165	0	0	0	0	0	0	0	244	13	0	19	0	80	0	561
500-515	48	175	0	0	0	0	0	0	0	264	30	0	31	0	69	0	617
515-530	65	203	0	0	0	0	0	0	0	287	36	0	33	0	79	0	703
530-545	58	183	0	0	0	0	0	0	0	294	26	0	26	0	74	0	661
545-600	49	187	0	0	0	0	0	0	0	312	29	0	29	0	87	0	693
HOUR TOTALS	1	2	3	3U	4	5	6	6U	7	8	9	9U	10	11	12	12U	
PERIOD	SBRT	SBTH	SBLT	SBUT	WBRT	WBTH	WBLT	WBUT	NBRT	NBTH	NBLT	NBUT	EBRT	EBTH	EBLT	EBUT	TOTAL
400-500	166	705	0	0	0	0	0	0	0	857	93	0	87	0	242	0	2150
415-515	166	716	0	0	0	0	0	0	0	937	99	0	97	0	260	0	2275
430-530	188	736	0	0	0	0	0	0	0	1013	106	0	101	0	288	0	2432
445-545	211	726	0	0	0	0	0	0	0	1089	105	0	109	0	302	0	2542
500-600	220	748	0	0	0	0	0	0	0	1157	121	0	119	0	309	0	2674

PEAK HOUR	500-600

OLD RANCH ROAD



PEDESTRIAN COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	1	0	0	1	2
415-430	0	0	0	0	0
430-445	0	0	0	0	0
445-500	0	0	0	2	2
500-515	0	0	0	0	0
515-530	0	0	0	0	0
530-545	0	0	0	0	0
545-600	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	1	0	0	3	4
415-515	0	0	0	2	2
430-530	0	0	0	2	2
445-545	0	0	0	2	2
500-600	0	0	0	0	0

BICYCLE COUNTS

15 MIN COUNTS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-415	0	0	0	0	0
415-430	0	0	0	0	0
430-445	0	0	0	0	0
445-500	0	0	0	0	0
500-515	1	0	0	1	2
515-530	0	0	0	0	0
530-545	0	0	0	0	0
545-600	0	0	0	0	0
HOUR TOTALS	NORTH	EAST	SOUTH	WEST	TOTAL
PERIOD	LEG	LEG	LEG	LEG	
400-500	0	0	0	0	0
415-515	1	0	0	1	2
430-530	1	0	0	1	2
445-545	1	0	0	1	2
500-600	1	0	0	1	2

Appendix D

Level of Service Worksheets

HCM 6th Signalized Intersection Summary
1: Crow Canyon Rd & Bollinger Canyon 03/16/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	17	926	53	62	414	36	59	63	142	26	65	7
Future Volume (veh/h)	17	926	53	62	414	36	59	63	142	26	65	7
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	18	1007	31	67	450	23	64	68	89	28	71	8
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	74	1451	647	148	1599	713	148	421	357	89	316	36
Arrive On Green	0.04	0.41	0.41	0.08	0.45	0.45	0.08	0.22	0.22	0.05	0.19	0.19
Sat Flow, veh/h	1781	3554	1585	1781	3554	1585	1781	1870	1585	1781	1651	186
Grp Volume(v), veh/h	18	1007	31	67	450	23	64	68	89	28	0	79
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1777	1585	1781	1870	1585	1781	0	1837
Q Serve(g_s), s	1.2	28.1	1.4	4.3	9.6	1.0	4.1	3.5	5.5	1.8	0.0	4.4
Cycle Q Clear(g_c), s	1.2	28.1	1.4	4.3	9.6	1.0	4.1	3.5	5.5	1.8	0.0	4.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.10
Lane Grp Cap(c), veh/h	74	1451	647	148	1599	713	148	421	357	89	0	352
V/C Ratio(X)	0.24	0.69	0.05	0.45	0.28	0.03	0.43	0.16	0.25	0.31	0.00	0.22
Avail Cap(c_a), veh/h	74	1451	647	148	1599	713	148	421	357	89	0	352
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	0.98	0.98	0.98	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	55.7	29.3	21.4	52.4	20.8	18.4	52.3	37.4	38.2	55.0	0.0	41.0
Incr Delay (d2), s/veh	1.7	2.8	0.1	2.1	0.4	0.1	2.0	0.2	0.4	2.0	0.0	0.3
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(95%),veh/ln	1.0	17.6	1.0	3.5	7.0	0.7	3.5	3.0	3.9	1.5	0.0	3.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	57.3	32.1	21.6	54.5	21.2	18.5	54.3	37.6	38.5	57.0	0.0	41.3
LnGrp LOS	E	C	C	D	C	B	D	D	D	E	A	D
Approach Vol, veh/h		1056			540			221			107	
Approach Delay, s/veh		32.2			25.2			42.8			45.4	
Approach LOS		C			C			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	13.8	71.7	10.5	24.0	9.6	75.9	13.7	20.8
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	12.0	51.0	8.0	29.0	7.0	56.0	12.0	25.0
Max Q Clear Time (g_c+I1), s	6.3	30.1	3.8	7.5	3.2	11.6	6.1	6.4
Green Ext Time (p_c), s	0.1	4.9	0.0	0.6	0.0	2.1	0.1	0.2

Intersection Summary	
HCM 6th Ctrl Delay	32.2
HCM 6th LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	165	941	83	511	775	280	90	167	321	314	202	50
Future Volume (veh/h)	165	941	83	511	775	280	90	167	321	314	202	50
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	179	1023	52	555	842	195	98	182	213	341	220	21
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	647	1849	574	571	1736	539	100	427	452	349	914	407
Arrive On Green	0.19	0.72	0.36	0.17	0.68	0.34	0.03	0.12	0.12	0.17	0.26	0.26
Sat Flow, veh/h	3456	5106	1585	3456	5106	1585	3456	3554	1585	2102	3554	1585
Grp Volume(v), veh/h	179	1023	52	555	842	195	98	182	213	341	220	21
Grp Sat Flow(s),veh/h/ln	1728	1702	1585	1728	1702	1585	1728	1777	1585	1051	1777	1585
Q Serve(g_s), s	6.7	13.8	3.2	24.0	11.8	9.0	4.3	7.1	16.6	24.2	7.4	1.0
Cycle Q Clear(g_c), s	6.7	13.8	3.2	24.0	11.8	9.0	4.3	7.1	16.6	24.2	7.4	1.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	647	1849	574	571	1736	539	100	427	452	349	914	407
V/C Ratio(X)	0.28	0.55	0.09	0.97	0.49	0.36	0.98	0.43	0.47	0.98	0.24	0.05
Avail Cap(c_a), veh/h	647	1849	574	622	1736	539	184	770	605	406	1256	560
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.72	0.72	0.72	1.00	1.00	1.00	0.97	0.97	0.97	1.00	1.00	1.00
Uniform Delay (d), s/veh	52.2	15.1	31.6	62.3	17.7	15.6	72.8	61.2	44.3	62.3	44.1	18.2
Incr Delay (d2), s/veh	0.2	0.9	0.2	28.2	1.0	1.9	40.6	0.7	0.7	36.4	0.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	5.2	6.6	2.4	18.5	6.7	6.5	4.4	5.9	10.9	13.0	6.0	1.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	52.4	16.0	31.8	90.5	18.7	17.5	113.4	61.9	45.0	98.6	44.3	18.2
LnGrp LOS	D	B	C	F	B	B	F	E	D	F	D	B
Approach Vol, veh/h		1254			1592			493			582	
Approach Delay, s/veh		21.8			43.6			64.8			75.2	
Approach LOS		C			D			E			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	31.8	61.3	31.9	25.0	35.1	58.0	11.3	45.6
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	29.0	36.0	31.0	34.5	12.0	53.0	10.0	55.0
Max Q Clear Time (g_c+I1), s	26.0	15.8	26.2	18.6	8.7	13.8	6.3	9.4
Green Ext Time (p_c), s	0.8	5.2	0.7	1.4	0.2	5.4	0.1	1.1

Intersection Summary	
HCM 6th Ctrl Delay	44.0
HCM 6th LOS	D

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	1106	896	0	1025	845
Future Volume (veh/h)	0	1106	896	0	1025	845
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	0	1870	1870	0	1870	1870
Adj Flow Rate, veh/h	0	1140	924	0	1057	665
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	2	2	0	2	2
Cap, veh/h	0	2773	2773		1257	1015
Arrive On Green	0.00	1.00	1.00	0.00	0.36	0.36
Sat Flow, veh/h	0	5443	5443	0	3456	2790
Grp Volume(v), veh/h	0	1140	924	0	1057	665
Grp Sat Flow(s),veh/h/ln	0	1702	1702	0	1728	1395
Q Serve(g_s), s	0.0	0.0	0.0	0.0	42.1	29.9
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	42.1	29.9
Prop In Lane	0.00			0.00	1.00	1.00
Lane Grp Cap(c), veh/h	0	2773	2773		1257	1015
V/C Ratio(X)	0.00	0.41	0.33		0.84	0.66
Avail Cap(c_a), veh/h	0	2773	2773		1797	1451
HCM Platoon Ratio	1.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	43.7	39.9
Incr Delay (d2), s/veh	0.0	0.5	0.3	0.0	2.6	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.0	0.2	0.1	0.0	25.5	15.7
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.0	0.5	0.3	0.0	46.3	40.6
LnGrp LOS	A	A	A		D	D
Approach Vol, veh/h		1140	924	A	1722	
Approach Delay, s/veh		0.5	0.3		44.1	
Approach LOS		A	A		D	

Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		88.4		61.6		88.4
Change Period (Y+Rc), s		5.0		5.0		5.0
Max Green Setting (Gmax), s		60.0		80.0		60.0
Max Q Clear Time (g_c+I1), s		2.0		44.1		2.0
Green Ext Time (p_c), s		6.5		12.5		4.9

Intersection Summary		
HCM 6th Ctrl Delay		20.3
HCM 6th LOS		C

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1511	0	0	998	517	648
Future Volume (veh/h)	1511	0	0	998	517	648
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	0	0	1870	1870	1870
Adj Flow Rate, veh/h	1591	0	0	1051	701	356
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	0	0	2	2	2
Cap, veh/h	3325	0	0	4190	910	405
Arrive On Green	1.00	0.00	0.00	1.00	0.26	0.26
Sat Flow, veh/h	5443	0	0	6958	3563	1585
Grp Volume(v), veh/h	1591	0	0	1051	701	356
Grp Sat Flow(s),veh/h/ln	1702	0	0	1609	1781	1585
Q Serve(g_s), s	0.0	0.0	0.0	0.0	27.4	32.3
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	27.4	32.3
Prop In Lane		0.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	3325	0	0	4190	910	405
V/C Ratio(X)	0.48	0.00	0.00	0.25	0.77	0.88
Avail Cap(c_a), veh/h	3325	0	0	4190	1544	687
HCM Platoon Ratio	2.00	1.00	1.00	2.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	51.8	53.6
Incr Delay (d2), s/veh	0.5	0.0	0.0	0.1	1.4	7.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.3	0.0	0.0	0.1	18.2	19.8
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.5	0.0	0.0	0.1	53.2	60.6
LnGrp LOS	A	A	A	A	D	E
Approach Vol, veh/h	1591			1051	1057	
Approach Delay, s/veh	0.5			0.1	55.7	
Approach LOS	A			A	E	

Timer - Assigned Phs	2	4	6
Phs Duration (G+Y+Rc), s	104.7	45.3	104.7
Change Period (Y+Rc), s	5.0	5.0	5.0
Max Green Setting (Gmax), s	73.0	67.0	73.0
Max Q Clear Time (g_c+I1), s	2.0	34.3	2.0
Green Ext Time (p_c), s	11.0	6.0	5.8

Intersection Summary	
HCM 6th Ctrl Delay	16.2
HCM 6th LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	336	1508	367	71	1075	62	131	30	63	111	39	223
Future Volume (veh/h)	336	1508	367	71	1075	62	131	30	63	111	39	223
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	357	1604	390	76	1144	66	139	32	67	118	41	237
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	381	2402	667	448	3821	219	163	84	75	252	265	399
Arrive On Green	0.04	0.75	0.12	0.25	1.00	0.51	0.05	0.05	0.05	0.14	0.14	0.14
Sat Flow, veh/h	3456	6434	1585	1781	7429	425	3456	1777	1585	1781	1870	1585
Grp Volume(v), veh/h	357	1604	390	76	931	279	139	32	67	118	41	237
Grp Sat Flow(s),veh/h/ln	1728	1609	1585	1781	1515	1794	1728	1777	1585	1781	1870	1585
Q Serve(g_s), s	15.5	18.9	32.6	5.0	0.0	3.7	6.0	2.6	6.3	9.1	2.9	19.7
Cycle Q Clear(g_c), s	15.5	18.9	32.6	5.0	0.0	3.7	6.0	2.6	6.3	9.1	2.9	19.7
Prop In Lane	1.00		1.00	1.00		0.24	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	381	2402	667	448	3117	923	163	84	75	252	265	399
V/C Ratio(X)	0.94	0.67	0.59	0.17	0.30	0.30	0.85	0.38	0.90	0.47	0.15	0.59
Avail Cap(c_a), veh/h	576	2402	667	448	3117	923	438	225	201	416	436	545
HCM Platoon Ratio	0.33	2.00	0.33	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.92	0.92	0.92	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	71.7	14.3	48.4	43.9	0.0	4.4	70.9	69.3	71.1	59.2	56.5	49.4
Incr Delay (d2), s/veh	17.5	1.5	3.7	0.2	0.2	0.8	11.7	2.8	27.9	1.4	0.3	1.4
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(95%),veh/ln	12.8	7.8	22.2	4.0	0.1	2.4	5.3	2.3	5.7	7.6	2.5	12.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	89.2	15.8	52.2	44.1	0.2	5.2	82.6	72.2	99.0	60.6	56.8	50.8
LnGrp LOS	F	B	D	D	A	A	F	E	F	E	E	D
Approach Vol, veh/h		2351			1286			238			396	
Approach Delay, s/veh		33.0			3.9			85.8			54.3	
Approach LOS		C			A			F			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	44.7	63.0		28.2	23.5	84.1		14.1				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	14.0	58.0		37.0	27.0	45.0		21.0				
Max Q Clear Time (g_c+I1), s	17.5	34.6		21.7	17.5	5.7		8.3				
Green Ext Time (p_c), s	0.1	11.5		1.5	1.1	6.4		0.8				

Intersection Summary		
HCM 6th Ctrl Delay		29.1
HCM 6th LOS		C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	118	848	593	301	1260	171	119	88	42	119	109	41
Future Volume (veh/h)	118	848	593	301	1260	171	119	88	42	119	109	41
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	123	883	410	314	1312	176	132	92	25	124	114	41
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.90	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	124	4014	1055	342	3972	531	144	97	83	134	127	44
Arrive On Green	0.04	1.00	0.62	0.10	1.00	0.69	0.04	0.05	0.05	0.04	0.05	0.05
Sat Flow, veh/h	3456	6434	1585	3456	5784	773	3456	1870	1585	3456	2593	894
Grp Volume(v), veh/h	123	883	410	314	1094	394	132	92	25	124	77	78
Grp Sat Flow(s),veh/h/ln	1728	1609	1585	1728	1609	1731	1728	1870	1585	1728	1777	1710
Q Serve(g_s), s	5.3	0.0	17.5	13.5	0.0	6.7	5.7	7.4	1.9	5.4	6.4	6.9
Cycle Q Clear(g_c), s	5.3	0.0	17.5	13.5	0.0	6.7	5.7	7.4	1.9	5.4	6.4	6.9
Prop In Lane	1.00		1.00	1.00		0.45	1.00		1.00	1.00		0.52
Lane Grp Cap(c), veh/h	124	4014	1055	342	3314	1189	144	97	83	134	87	84
V/C Ratio(X)	0.99	0.22	0.39	0.92	0.33	0.33	0.92	0.95	0.30	0.93	0.88	0.93
Avail Cap(c_a), veh/h	184	4014	1055	806	3314	1189	783	673	571	184	332	319
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.89	0.89	0.89	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00
Uniform Delay (d), s/veh	72.3	0.0	11.3	67.0	0.0	3.8	71.6	70.9	46.7	71.9	70.9	71.1
Incr Delay (d2), s/veh	50.5	0.1	1.0	9.7	0.3	0.7	19.2	29.7	1.9	38.7	22.5	31.6
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(95%),veh/ln	5.8	0.1	10.3	10.4	0.1	3.8	5.3	7.7	1.7	5.6	6.3	6.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	122.8	0.1	12.3	76.7	0.3	4.5	90.9	100.6	48.6	110.6	93.4	102.6
LnGrp LOS	F	A	B	E	A	A	F	F	D	F	F	F
Approach Vol, veh/h		1416			1802			249			279	
Approach Delay, s/veh		14.3			14.5			90.2			103.6	
Approach LOS		B			B			F			F	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	21.8	100.6	12.8	14.8	12.4	110.0	13.2	14.4
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	37.0	27.0	10.0	56.0	10.0	54.0	36.0	30.0
Max Q Clear Time (g_c+I1), s	15.5	19.5	7.4	9.4	7.3	8.7	7.7	8.9
Green Ext Time (p_c), s	1.3	3.7	0.1	0.5	0.1	8.8	0.6	0.5

Intersection Summary	
HCM 6th Ctrl Delay	26.1
HCM 6th LOS	C

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	545	348	486	1621	176	202
Future Volume (veh/h)	545	348	486	1621	176	202
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	592	242	528	1762	191	138
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	3210	997	574	4297	225	645
Arrive On Green	1.00	0.63	0.17	1.00	0.07	0.07
Sat Flow, veh/h	5274	1585	3456	5274	3456	2790
Grp Volume(v), veh/h	592	242	528	1762	191	138
Grp Sat Flow(s),veh/h/ln	1702	1585	1728	1702	1728	1395
Q Serve(g_s), s	0.0	10.0	22.6	0.0	8.2	6.0
Cycle Q Clear(g_c), s	0.0	10.0	22.6	0.0	8.2	6.0
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	3210	997	574	4297	225	645
V/C Ratio(X)	0.18	0.24	0.92	0.41	0.85	0.21
Avail Cap(c_a), veh/h	3210	997	991	4297	783	1096
HCM Platoon Ratio	2.00	1.00	1.00	2.00	1.00	1.00
Upstream Filter(I)	0.99	0.99	0.29	0.29	1.00	1.00
Uniform Delay (d), s/veh	0.0	12.2	61.6	0.0	69.4	46.6
Incr Delay (d2), s/veh	0.1	0.6	2.6	0.1	8.5	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.1	6.5	12.8	0.1	7.0	3.8
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.1	12.8	64.2	0.1	77.9	46.8
LnGrp LOS	A	B	E	A	E	D
Approach Vol, veh/h	834			2290	329	
Approach Delay, s/veh	3.8			14.9	64.9	
Approach LOS	A			B	E	

Timer - Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	31.9	101.3				133.2		16.8
Change Period (Y+Rc), s	5.0	5.0				5.0		5.0
Max Green Setting (Gmax), s	45.0	54.0				104.0		36.0
Max Q Clear Time (g_c+I1), s	24.6	12.0				2.0		10.2
Green Ext Time (p_c), s	2.4	4.2				13.5		1.6

Intersection Summary	
HCM 6th Ctrl Delay	17.0
HCM 6th LOS	B

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↱	↰↰	↑↑	↰↰	↱↱
Traffic Volume (veh/h)	379	155	602	821	308	501
Future Volume (veh/h)	379	155	602	821	308	501
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	412	103	654	892	335	328
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	1036	462	922	2191	922	1488
Arrive On Green	0.29	0.29	0.27	0.62	0.27	0.27
Sat Flow, veh/h	3647	1585	3456	3647	3456	2790
Grp Volume(v), veh/h	412	103	654	892	335	328
Grp Sat Flow(s),veh/h/ln	1777	1585	1728	1777	1728	1395
Q Serve(g_s), s	11.1	5.9	20.5	15.4	9.4	7.5
Cycle Q Clear(g_c), s	11.1	5.9	20.5	15.4	9.4	7.5
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	1036	462	922	2191	922	1488
V/C Ratio(X)	0.40	0.22	0.71	0.41	0.36	0.22
Avail Cap(c_a), veh/h	1036	462	922	2191	922	1488
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.83	0.83	0.99	0.99
Uniform Delay (d), s/veh	34.1	32.2	39.8	11.8	35.7	14.8
Incr Delay (d2), s/veh	1.1	1.1	2.1	0.5	0.2	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	8.4	4.2	13.1	9.2	6.9	4.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	35.2	33.3	41.9	12.2	36.0	14.9
LnGrp LOS	D	C	D	B	D	B
Approach Vol, veh/h	515			1546	663	
Approach Delay, s/veh	34.8			24.8	25.5	
Approach LOS	C			C	C	

Timer - Assigned Phs	1	2	6	8
Phs Duration (G+Y+Rc), s	34.5	56.3	90.8	29.2
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	34.0	37.0	76.0	34.0
Max Q Clear Time (g_c+I1), s	22.5	13.1	17.4	11.4
Green Ext Time (p_c), s	2.4	2.2	4.5	3.0

Intersection Summary	
HCM 6th Ctrl Delay	26.9
HCM 6th LOS	C

Intersection	
Intersection Delay, s/veh	19.8
Intersection LOS	C

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	50	332	10	87	175	44	17	264	279	32	45	82
Future Vol, veh/h	50	332	10	87	175	44	17	264	279	32	45	82
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	54	361	11	95	190	48	18	287	303	35	49	89
Number of Lanes	1	2	0	1	2	0	0	1	1	0	1	1

Approach	SE	NW	NE	SW
Opposing Approach	NW	SE	SW	NE
Opposing Lanes	3	3	2	2
Conflicting Approach Left	SW	NE	SE	NW
Conflicting Lanes Left	2	2	3	3
Conflicting Approach Right	NE	SW	NW	SE
Conflicting Lanes Right	2	2	3	3
HCM Control Delay	19	15.1	24.4	14.2
HCM LOS	C	C	C	B

Lane	NELn1	NELn2	NWLn1	NWLn2	NWLn3	SELn1	SELn2	SELn3	SWLn1	SWLn2
Vol Left, %	6%	0%	100%	0%	0%	100%	0%	0%	42%	0%
Vol Thru, %	94%	0%	0%	100%	57%	0%	100%	92%	58%	0%
Vol Right, %	0%	100%	0%	0%	43%	0%	0%	8%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	281	279	87	117	102	50	221	121	77	82
LT Vol	17	0	87	0	0	50	0	0	32	0
Through Vol	264	0	0	117	58	0	221	111	45	0
RT Vol	0	279	0	0	44	0	0	10	0	82
Lane Flow Rate	305	303	95	127	111	54	241	131	84	89
Geometry Grp	8	8	8	8	8	8	8	8	8	8
Degree of Util (X)	0.691	0.624	0.247	0.313	0.265	0.138	0.575	0.311	0.22	0.211
Departure Headway (Hd)	8.142	7.405	9.395	8.877	8.566	9.115	8.599	8.539	9.463	8.538
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	446	491	382	405	419	393	419	421	379	420
Service Time	5.842	5.105	7.153	6.635	6.323	6.87	6.353	6.293	7.226	6.299
HCM Lane V/C Ratio	0.684	0.617	0.249	0.314	0.265	0.137	0.575	0.311	0.222	0.212
HCM Control Delay	27.1	21.6	15.2	15.7	14.4	13.3	22.4	15.1	14.9	13.6
HCM Lane LOS	D	C	C	C	B	B	C	C	B	B
HCM 95th-tile Q	5.2	4.2	1	1.3	1.1	0.5	3.5	1.3	0.8	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	53	440	85	127	168	210	52	283	384	392	150	28
Future Volume (veh/h)	53	440	85	127	168	210	52	283	384	392	150	28
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	58	478	59	138	183	136	57	308	281	426	163	30
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	146	937	418	194	544	461	146	808	360	503	875	158
Arrive On Green	0.08	0.26	0.26	0.11	0.29	0.29	0.08	0.23	0.23	0.15	0.29	0.29
Sat Flow, veh/h	1781	3554	1585	1781	1870	1585	1781	3554	1585	3456	3007	542
Grp Volume(v), veh/h	58	478	59	138	183	136	57	308	281	426	95	98
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1870	1585	1781	1777	1585	1728	1777	1773
Q Serve(g_s), s	3.4	12.6	3.1	8.2	8.5	7.3	3.3	8.1	18.3	13.2	4.4	4.6
Cycle Q Clear(g_c), s	3.4	12.6	3.1	8.2	8.5	7.3	3.3	8.1	18.3	13.2	4.4	4.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.31
Lane Grp Cap(c), veh/h	146	937	418	194	544	461	146	808	360	503	517	516
V/C Ratio(X)	0.40	0.51	0.14	0.71	0.34	0.29	0.39	0.38	0.78	0.85	0.18	0.19
Avail Cap(c_a), veh/h	146	937	418	194	544	461	146	808	360	503	517	516
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	47.9	34.5	31.0	47.3	30.7	30.3	47.9	36.0	39.9	45.8	29.2	29.3
Incr Delay (d2), s/veh	1.8	0.5	0.2	11.4	0.4	0.4	1.7	0.3	10.5	12.8	0.2	0.2
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(95%),veh/ln	2.9	9.4	2.1	7.5	6.8	5.0	2.7	6.2	12.6	10.6	3.3	3.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	49.7	34.9	31.1	58.7	31.0	30.6	49.6	36.3	50.4	58.6	29.4	29.5
LnGrp LOS	D	C	C	E	C	C	D	D	D	E	C	C
Approach Vol, veh/h		595			457			646			619	
Approach Delay, s/veh		36.0			39.3			43.6			49.5	
Approach LOS		D			D			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	17.1	28.7	21.9	23.8	12.8	33.1	12.7	32.9
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	14.0	31.0	18.0	27.0	11.0	34.0	11.0	34.0
Max Q Clear Time (g_c+I1), s	10.2	14.6	15.2	10.1	5.4	10.5	5.3	6.6
Green Ext Time (p_c), s	0.1	1.9	0.6	0.5	0.1	1.2	0.0	0.7

Intersection Summary	
HCM 6th Ctrl Delay	42.4
HCM 6th LOS	D

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	141	747	473	58	362	115	43	9	19	66	23	119
Future Volume (veh/h)	141	747	473	58	362	115	43	9	19	66	23	119
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	153	812	269	63	393	43	47	10	21	72	25	96
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	356	1777	793	196	1457	650	231	88	185	234	72	285
Arrive On Green	0.20	0.50	0.50	0.11	0.41	0.41	0.18	0.18	0.18	0.18	0.18	0.18
Sat Flow, veh/h	1781	3554	1585	1781	3554	1585	883	489	1028	950	402	1585
Grp Volume(v), veh/h	153	812	269	63	393	43	47	0	31	97	0	96
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1777	1585	883	0	1517	1352	0	1585
Q Serve(g_s), s	7.5	14.8	10.2	3.3	7.3	1.6	3.4	0.0	1.7	5.0	0.0	5.3
Cycle Q Clear(g_c), s	7.5	14.8	10.2	3.3	7.3	1.6	8.9	0.0	1.7	7.4	0.0	5.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.68	0.74		1.00
Lane Grp Cap(c), veh/h	356	1777	793	196	1457	650	231	0	273	306	0	285
V/C Ratio(X)	0.43	0.46	0.34	0.32	0.27	0.07	0.20	0.00	0.11	0.32	0.00	0.34
Avail Cap(c_a), veh/h	356	1777	793	196	1457	650	231	0	273	306	0	285
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	35.0	16.2	15.1	41.1	19.6	17.9	39.7	0.0	34.3	37.1	0.0	35.8
Incr Delay (d2), s/veh	0.8	0.2	0.3	0.9	0.1	0.0	0.4	0.0	0.2	0.6	0.0	0.7
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(95%),veh/ln	5.8	9.5	6.2	2.6	5.2	1.1	1.9	0.0	1.2	3.9	0.0	3.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	35.8	16.4	15.3	42.0	19.7	17.9	40.2	0.0	34.5	37.7	0.0	36.5
LnGrp LOS	D	B	B	D	B	B	D	A	C	D	A	D
Approach Vol, veh/h		1234			499			78			193	
Approach Delay, s/veh		18.6			22.3			37.9			37.1	
Approach LOS		B			C			D			D	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	13.7	42.2		20.5	23.8	32.1		20.5
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	13.0	52.0		20.0	22.0	43.0		20.0
Max Q Clear Time (g_c+I1), s	5.3	16.8		10.9	9.5	9.3		9.4
Green Ext Time (p_c), s	0.1	5.6		0.1	0.4	1.9		0.5

Intersection Summary			
HCM 6th Ctrl Delay			22.0
HCM 6th LOS			C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	95	418	165	66	318	99	61	124	29	127	523	141
Future Volume (veh/h)	95	418	165	66	318	99	61	124	29	127	523	141
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	103	454	179	72	346	108	66	135	10	138	568	153
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	158	665	260	119	654	201	119	869	387	198	800	215
Arrive On Green	0.09	0.27	0.27	0.07	0.24	0.24	0.07	0.24	0.24	0.11	0.29	0.29
Sat Flow, veh/h	1781	2496	976	1781	2676	823	1781	3554	1585	1781	2770	744
Grp Volume(v), veh/h	103	322	311	72	228	226	66	135	10	138	364	357
Grp Sat Flow(s),veh/h/ln	1781	1777	1695	1781	1777	1722	1781	1777	1585	1781	1777	1736
Q Serve(g_s), s	5.0	14.6	14.8	3.5	10.0	10.3	3.2	2.7	0.4	6.7	16.5	16.6
Cycle Q Clear(g_c), s	5.0	14.6	14.8	3.5	10.0	10.3	3.2	2.7	0.4	6.7	16.5	16.6
Prop In Lane	1.00		0.58	1.00		0.48	1.00		1.00	1.00		0.43
Lane Grp Cap(c), veh/h	158	474	452	119	434	421	119	869	387	198	513	502
V/C Ratio(X)	0.65	0.68	0.69	0.61	0.52	0.54	0.56	0.16	0.03	0.70	0.71	0.71
Avail Cap(c_a), veh/h	158	474	452	119	434	421	119	869	387	198	513	502
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	39.6	29.6	29.6	40.9	29.5	29.6	40.7	26.7	25.9	38.5	28.6	28.6
Incr Delay (d2), s/veh	9.0	3.9	4.3	8.5	1.2	1.3	5.6	0.1	0.0	10.2	4.5	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(95%),veh/ln	4.6	10.8	10.6	3.3	7.7	7.7	2.9	2.0	0.3	6.2	11.9	11.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	48.7	33.5	34.0	49.4	30.6	30.9	46.3	26.8	25.9	48.8	33.1	33.3
LnGrp LOS	D	C	C	D	C	C	D	C	C	D	C	C
Approach Vol, veh/h		736			526			211			859	
Approach Delay, s/veh		35.8			33.3			32.8			35.7	
Approach LOS		D			C			C			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	11.3	27.4	15.3	25.3	13.3	25.4	11.1	29.4
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	8.0	26.0	12.0	24.0	10.0	24.0	8.0	28.0
Max Q Clear Time (g_c+I1), s	5.5	16.8	8.7	4.7	7.0	12.3	5.2	18.6
Green Ext Time (p_c), s	0.0	1.9	0.1	0.5	0.1	1.5	0.0	2.3

Intersection Summary	
HCM 6th Ctrl Delay	34.9
HCM 6th LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	99	42	233	13	37	56	269	295	62	153	362	190
Future Volume (veh/h)	99	42	233	13	37	56	269	295	62	153	362	190
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	108	46	0	14	40	34	292	321	65	166	393	120
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	173	486		53	449	380	428	797	159	285	675	380
Arrive On Green	0.05	0.26	0.00	0.03	0.24	0.24	0.24	0.27	0.27	0.16	0.19	0.19
Sat Flow, veh/h	3456	1870	1585	1781	1870	1585	1781	2951	590	1781	3554	1585
Grp Volume(v), veh/h	108	46	0	14	40	34	292	192	194	166	393	120
Grp Sat Flow(s),veh/h/ln	1728	1870	1585	1781	1870	1585	1781	1777	1764	1781	1777	1585
Q Serve(g_s), s	3.1	1.9	0.0	0.8	1.7	1.7	14.9	8.8	9.0	8.6	10.1	6.2
Cycle Q Clear(g_c), s	3.1	1.9	0.0	0.8	1.7	1.7	14.9	8.8	9.0	8.6	10.1	6.2
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.33	1.00		1.00
Lane Grp Cap(c), veh/h	173	486		53	449	380	428	480	476	285	675	380
V/C Ratio(X)	0.63	0.09		0.26	0.09	0.09	0.68	0.40	0.41	0.58	0.58	0.32
Avail Cap(c_a), veh/h	173	486		53	449	380	428	480	476	285	675	380
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	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	46.6	28.1	0.0	47.4	29.5	29.5	34.5	29.9	29.9	38.9	36.9	31.2
Incr Delay (d2), s/veh	6.9	0.1	0.0	2.6	0.1	0.1	4.4	0.5	0.6	3.0	1.3	0.5
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(95%),veh/ln	2.7	1.5	0.0	0.7	1.4	1.2	11.2	6.8	7.0	7.2	7.9	4.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	53.5	28.2	0.0	50.0	29.6	29.6	39.0	30.4	30.5	41.9	38.2	31.7
LnGrp LOS	D	C		D	C	C	D	C	C	D	D	C
Approach Vol, veh/h		154	A		88			678			679	
Approach Delay, s/veh		45.9			32.8			34.1			37.9	
Approach LOS		D			C			C			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.3	23.1	19.4	29.8	10.9	20.4	26.8	22.3
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	5.0	28.0	18.0	29.0	7.0	26.0	26.0	21.0
Max Q Clear Time (g_c+I1), s	2.8	3.9	10.6	11.0	5.1	3.7	16.9	12.1
Green Ext Time (p_c), s	0.0	0.1	0.3	1.4	0.1	0.2	0.8	1.6

Intersection Summary	
HCM 6th Ctrl Delay	36.8
HCM 6th LOS	D

Notes
Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Intersection						
Int Delay, s/veh	4.2					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	13	46	73	94	232	162
Future Vol, veh/h	13	46	73	94	232	162
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	14	50	79	102	252	176

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	810	130	0	0	181	0
Stage 1	130	-	-	-	-	-
Stage 2	680	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	349	920	-	-	1394	-
Stage 1	896	-	-	-	-	-
Stage 2	503	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	279	920	-	-	1394	-
Mov Cap-2 Maneuver	279	-	-	-	-	-
Stage 1	896	-	-	-	-	-
Stage 2	402	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.6	0	4.8
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	611	1394	-
HCM Lane V/C Ratio	-	-	0.105	0.181	-
HCM Control Delay (s)	-	-	11.6	8.2	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.3	0.7	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	13	122	37	51	51	68	138	260	143	154	361	109
Future Volume (veh/h)	13	122	37	51	51	68	138	260	143	154	361	109
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	14	133	18	55	55	41	150	283	153	167	392	116
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	59	439	396	186	170	396	392	698	367	410	868	254
Arrive On Green	0.25	0.25	0.25	0.25	0.25	0.25	0.22	0.31	0.31	0.23	0.32	0.32
Sat Flow, veh/h	78	1758	1585	530	679	1585	1781	2251	1183	1781	2711	793
Grp Volume(v), veh/h	147	0	18	110	0	41	150	222	214	167	255	253
Grp Sat Flow(s),veh/h/ln	1836	0	1585	1209	0	1585	1781	1777	1657	1781	1777	1728
Q Serve(g_s), s	0.0	0.0	0.9	3.8	0.0	2.0	7.2	9.8	10.2	8.0	11.4	11.6
Cycle Q Clear(g_c), s	6.4	0.0	0.9	11.1	0.0	2.0	7.2	9.8	10.2	8.0	11.4	11.6
Prop In Lane	0.10		1.00	0.50		1.00	1.00		0.71	1.00		0.46
Lane Grp Cap(c), veh/h	498	0	396	356	0	396	392	551	514	410	569	553
V/C Ratio(X)	0.29	0.00	0.05	0.31	0.00	0.10	0.38	0.40	0.42	0.41	0.45	0.46
Avail Cap(c_a), veh/h	498	0	396	356	0	396	392	551	514	410	569	553
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	30.5	0.0	28.4	32.6	0.0	28.9	33.2	27.2	27.3	32.7	27.0	27.1
Incr Delay (d2), s/veh	0.3	0.0	0.0	0.5	0.0	0.1	0.6	0.5	0.5	0.7	0.6	0.6
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(95%),veh/ln	5.2	0.0	0.6	4.2	0.0	1.4	5.5	7.3	7.1	6.1	8.3	8.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	30.9	0.0	28.5	33.1	0.0	29.0	33.8	27.7	27.9	33.4	27.6	27.7
LnGrp LOS	C	A	C	C	A	C	C	C	C	C	C	C
Approach Vol, veh/h		165			151			586			675	
Approach Delay, s/veh		30.6			32.0			29.3			29.0	
Approach LOS		C			C			C			C	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	22.7	28.8		25.2	21.7	29.8		25.2				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	25.0	33.0		27.0	24.0	34.0		27.0				
Max Q Clear Time (g_c+I1), s	10.0	12.2		8.4	9.2	13.6		13.1				
Green Ext Time (p_c), s	0.5	1.6		0.5	0.4	1.9		0.4				
Intersection Summary												
HCM 6th Ctrl Delay			29.6									
HCM 6th LOS			C									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	33	55	73	52	59	16	246	251	144	1	18	11
Future Volume (veh/h)	33	55	73	52	59	16	246	251	144	1	18	11
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	36	60	41	57	64	16	267	273	92	1	20	11
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	107	430	365	143	361	90	428	426	380	19	376	204
Arrive On Green	0.06	0.23	0.23	0.08	0.25	0.25	0.24	0.24	0.24	0.17	0.17	0.17
Sat Flow, veh/h	1781	1870	1585	1781	1444	361	1781	1777	1585	111	2210	1199
Grp Volume(v), veh/h	36	60	41	57	0	80	267	273	92	17	0	15
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	0	1805	1781	1777	1585	1865	0	1655
Q Serve(g_s), s	1.9	2.6	2.0	3.0	0.0	3.5	13.4	13.8	4.7	0.8	0.0	0.8
Cycle Q Clear(g_c), s	1.9	2.6	2.0	3.0	0.0	3.5	13.4	13.8	4.7	0.8	0.0	0.8
Prop In Lane	1.00		1.00	1.00		0.20	1.00		1.00	0.06		0.72
Lane Grp Cap(c), veh/h	107	430	365	143	0	451	428	426	380	317	0	281
V/C Ratio(X)	0.34	0.14	0.11	0.40	0.00	0.18	0.62	0.64	0.24	0.05	0.00	0.05
Avail Cap(c_a), veh/h	107	430	365	143	0	451	428	426	380	317	0	281
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	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	45.1	30.6	30.4	43.7	0.0	29.4	34.0	34.1	30.7	34.8	0.0	34.8
Incr Delay (d2), s/veh	1.8	0.1	0.1	1.8	0.0	0.2	2.8	3.2	0.3	0.1	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	1.6	2.1	1.4	2.5	0.0	2.7	10.1	10.4	3.3	0.6	0.0	0.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	46.9	30.8	30.6	45.5	0.0	29.6	36.8	37.3	31.0	34.8	0.0	34.8
LnGrp LOS	D	C	C	D	A	C	D	D	C	C	A	C
Approach Vol, veh/h		137			137			632			32	
Approach Delay, s/veh		35.0			36.2			36.2			34.8	
Approach LOS		C			D			D			C	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		26.9	12.0	20.1		17.0	10.6	21.5				
Change Period (Y+Rc), s		5.0	5.0	5.0		5.0	5.0	5.0				
Max Green Setting (Gmax), s		26.0	10.0	25.0		19.0	8.0	27.0				
Max Q Clear Time (g_c+I1), s		15.8	5.0	4.6		2.8	3.9	5.5				
Green Ext Time (p_c), s		2.0	0.0	0.6		0.1	0.0	0.6				

Intersection Summary			
HCM 6th Ctrl Delay			36.0
HCM 6th LOS			D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↱		↰	↑↱		↰	↑↱	
Traffic Volume (veh/h)	135	16	34	7	2	0	89	880	68	10	192	76
Future Volume (veh/h)	135	16	34	7	2	0	89	880	68	10	192	76
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	147	17	21	8	2	0	97	957	72	11	209	81
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	257	584	495	43	359	0	185	1394	105	43	849	319
Arrive On Green	0.14	0.31	0.31	0.02	0.19	0.00	0.10	0.42	0.42	0.02	0.34	0.34
Sat Flow, veh/h	1781	1870	1585	1781	1870	0	1781	3350	252	1781	2528	949
Grp Volume(v), veh/h	147	17	21	8	2	0	97	508	521	11	145	145
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	0	1781	1777	1825	1781	1777	1700
Q Serve(g_s), s	9.6	0.8	1.2	0.6	0.1	0.0	6.5	29.2	29.2	0.8	7.4	7.7
Cycle Q Clear(g_c), s	9.6	0.8	1.2	0.6	0.1	0.0	6.5	29.2	29.2	0.8	7.4	7.7
Prop In Lane	1.00		1.00	1.00		0.00	1.00		0.14	1.00		0.56
Lane Grp Cap(c), veh/h	257	584	495	43	359	0	185	739	759	43	597	571
V/C Ratio(X)	0.57	0.03	0.04	0.19	0.01	0.00	0.52	0.69	0.69	0.26	0.24	0.25
Avail Cap(c_a), veh/h	257	584	495	43	359	0	185	739	759	43	597	571
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	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	49.9	29.9	30.0	59.8	40.8	0.0	53.1	29.8	29.8	59.9	30.0	30.1
Incr Delay (d2), s/veh	3.1	0.0	0.0	2.1	0.0	0.0	2.7	2.7	2.6	3.1	0.2	0.2
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(95%),veh/ln	8.0	0.7	0.8	0.5	0.1	0.0	5.4	18.4	18.8	0.7	5.7	5.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	53.0	29.9	30.0	61.9	40.9	0.0	55.7	32.5	32.4	63.0	30.2	30.4
LnGrp LOS	D	C	C	E	D	A	E	C	C	E	C	C
Approach Vol, veh/h		185			10			1126			301	
Approach Delay, s/veh		48.3			57.7			34.5			31.5	
Approach LOS		D			E			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.3	53.2	8.1	32.8	16.6	44.9	20.9	20.0
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	5.0	54.0	5.0	41.0	15.0	44.0	20.0	26.0
Max Q Clear Time (g_c+I1), s	2.8	31.2	2.6	3.2	8.5	9.7	11.6	2.1
Green Ext Time (p_c), s	0.0	11.3	0.0	0.1	0.1	3.0	0.3	0.0

Intersection Summary	
HCM 6th Ctrl Delay	35.6
HCM 6th LOS	D

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	45	3	150	27	0	22	294	576	81	17	93	31
Future Volume (veh/h)	45	3	150	27	0	22	294	576	81	17	93	31
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	49	3	81	29	0	23	320	626	86	18	101	33
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	377	23	355	774	0	355	498	1309	178	71	490	154
Arrive On Green	0.22	0.22	0.22	0.22	0.00	0.22	0.14	0.29	0.29	0.04	0.18	0.18
Sat Flow, veh/h	1683	103	1585	3456	0	1585	3456	4546	617	1781	2662	835
Grp Volume(v), veh/h	52	0	81	29	0	23	320	467	245	18	66	68
Grp Sat Flow(s),veh/h/ln	1786	0	1585	1728	0	1585	1728	1702	1759	1781	1777	1720
Q Serve(g_s), s	2.9	0.0	5.2	0.8	0.0	1.4	10.9	14.1	14.4	1.2	3.9	4.2
Cycle Q Clear(g_c), s	2.9	0.0	5.2	0.8	0.0	1.4	10.9	14.1	14.4	1.2	3.9	4.2
Prop In Lane	0.94		1.00	1.00		1.00	1.00		0.35	1.00		0.49
Lane Grp Cap(c), veh/h	400	0	355	774	0	355	498	980	507	71	327	316
V/C Ratio(X)	0.13	0.00	0.23	0.04	0.00	0.06	0.64	0.48	0.48	0.25	0.20	0.21
Avail Cap(c_a), veh/h	400	0	355	774	0	355	498	980	507	71	327	316
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	38.8	0.0	39.7	38.0	0.0	38.2	50.5	36.7	36.8	58.2	43.2	43.3
Incr Delay (d2), s/veh	0.1	0.0	0.3	0.0	0.0	0.1	2.8	0.4	0.7	1.8	0.3	0.3
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(95%),veh/ln	2.4	0.0	3.8	0.6	0.0	1.0	8.6	10.0	10.5	1.1	3.2	3.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	38.9	0.0	40.0	38.0	0.0	38.3	53.3	37.1	37.5	60.0	43.5	43.7
LnGrp LOS	D	A	D	D	A	D	D	D	D	E	D	D
Approach Vol, veh/h		133			52			1032			152	
Approach Delay, s/veh		39.6			38.1			42.2			45.5	
Approach LOS		D			D			D			D	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	9.7	33.9		23.8	21.9	21.6		22.1
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	7.0	38.0		30.0	20.0	25.0		30.0
Max Q Clear Time (g_c+I1), s	3.2	16.4		7.2	12.9	6.2		3.4
Green Ext Time (p_c), s	0.0	3.3		0.5	0.9	0.4		0.2

Intersection Summary	
HCM 6th Ctrl Delay	42.2
HCM 6th LOS	D

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	32	516	291	299	268	325	213	340	504	142	226	17
Future Volume (veh/h)	32	516	291	299	268	325	213	340	504	142	226	17
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	35	561	180	325	291	0	232	370	331	154	246	18
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	83	916	370	484	1283		369	1303	581	253	1120	81
Arrive On Green	0.05	0.47	0.23	0.23	0.65	0.00	0.11	0.37	0.37	0.07	0.33	0.33
Sat Flow, veh/h	1781	3928	1585	3456	3928	1585	3456	3554	1585	3456	3359	244
Grp Volume(v), veh/h	35	561	180	325	291	0	232	370	331	154	129	135
Grp Sat Flow(s),veh/h/ln	1781	1964	1585	1728	1964	1585	1728	1777	1585	1728	1777	1826
Q Serve(g_s), s	2.9	16.0	14.7	12.8	4.5	0.0	9.6	11.0	25.1	6.5	7.9	8.0
Cycle Q Clear(g_c), s	2.9	16.0	14.7	12.8	4.5	0.0	9.6	11.0	25.1	6.5	7.9	8.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.13
Lane Grp Cap(c), veh/h	83	916	370	484	1283		369	1303	581	253	592	609
V/C Ratio(X)	0.42	0.61	0.49	0.67	0.23		0.63	0.28	0.57	0.61	0.22	0.22
Avail Cap(c_a), veh/h	83	916	370	484	1283		369	1303	581	253	592	609
HCM Platoon Ratio	1.00	2.00	1.00	1.67	2.00	1.67	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.99	0.99	0.99	0.83	0.83	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	69.5	34.9	49.7	54.3	18.3	0.0	64.2	33.6	38.0	67.4	36.0	36.0
Incr Delay (d2), s/veh	3.3	3.0	4.5	3.0	0.3	0.0	3.4	0.1	1.3	4.1	0.2	0.2
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(95%),veh/ln	2.5	10.8	10.3	8.8	3.6	0.0	7.8	8.3	14.9	5.3	6.1	6.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	72.9	37.9	54.2	57.3	18.6	0.0	67.6	33.7	39.3	71.5	36.1	36.2
LnGrp LOS	E	D	D	E	B		E	C	D	E	D	D
Approach Vol, veh/h		776			616	A		933			418	
Approach Delay, s/veh		43.3			39.1			44.1			49.2	
Approach LOS		D			D			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	24.4	68.3	15.8	41.5	11.4	81.2	20.1	37.3
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	23.0	37.0	13.0	57.0	9.0	51.0	18.0	52.0
Max Q Clear Time (g_c+I1), s	14.8	18.0	8.5	13.0	4.9	6.5	11.6	10.0
Green Ext Time (p_c), s	0.9	1.7	0.2	1.9	0.0	1.3	0.5	2.6

Intersection Summary	
HCM 6th Ctrl Delay	43.5
HCM 6th LOS	D

Notes

User approved pedestrian interval to be less than phase max green.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1127	9	0	672	908	0	0	49	892	5	233
Future Volume (veh/h)	0	1127	9	0	672	908	0	0	49	892	5	233
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	0	2067	1870	0	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	0	1162	9	0	693	0	0	0	51	924	0	137
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	2	2	0	2	2	2	2	2	2	2	2
Cap, veh/h	0	4079	32	0	3139		0	0	25	1025	0	912
Arrive On Green	0.00	1.00	0.56	0.00	1.00	0.00	0.00	0.00	0.02	0.29	0.00	0.29
Sat Flow, veh/h	0	7623	57	0	6016	0	0	0	1585	3563	0	3170
Grp Volume(v), veh/h	0	845	326	0	693	0	0	0	51	924	0	137
Grp Sat Flow(s),veh/h/ln	0	1778	2057	0	1881	0	0	0	1585	1781	0	1585
Q Serve(g_s), s	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	2.4	37.4	0.0	4.8
Cycle Q Clear(g_c), s	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	2.4	37.4	0.0	4.8
Prop In Lane	0.00		0.03	0.00		0.00	0.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	0	2967	1144	0	3139		0	0	25	1025	0	912
V/C Ratio(X)	0.00	0.28	0.29	0.00	0.22		0.00	0.00	2.01	0.90	0.00	0.15
Avail Cap(c_a), veh/h	0	2967	1144	0	3139		0	0	85	1401	0	1247
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.67	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	0.74	0.74	0.00	1.00	0.00	0.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	73.8	51.4	0.0	39.8
Incr Delay (d2), s/veh	0.0	0.2	0.5	0.0	0.2	0.0	0.0	0.0	502.1	6.5	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.0	0.1	0.5	0.0	0.1	0.0	0.0	0.0	8.1	24.5	0.0	3.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	0.2	0.9	0.0	0.2	0.0	0.0	0.0	575.9	57.9	0.0	39.8
LnGrp LOS	A	A	A	A	A		A	A	F	E	A	D
Approach Vol, veh/h		1171			693	A		51			1061	
Approach Delay, s/veh		0.4			0.2			575.9			55.6	
Approach LOS		A			A			F			E	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		90.4		50.2		90.4		9.4				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		64.0		61.0		64.0		10.0				
Max Q Clear Time (g_c+I1), s		2.4		39.4		2.0		4.4				
Green Ext Time (p_c), s		14.2		5.8		7.3		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			29.9									
HCM 6th LOS			C									

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1283	360	0	1266	717	332	0	1679	0	0	0
Future Volume (veh/h)	0	1283	360	0	1266	717	332	0	1679	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	0	2067	1870	0	2067	1870	1870	0	1870			
Adj Flow Rate, veh/h	0	1309	0	0	1631	0	339	0	1407			
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98			
Percent Heavy Veh, %	0	2	2	0	2	2	2	0	2			
Cap, veh/h	0	2719		0	2988		757	0	1536			
Arrive On Green	0.00	0.96	0.00	0.00	0.96	0.00	0.42	0.00	0.42			
Sat Flow, veh/h	0	5830	1585	0	6202	1585	1781	0	3614			
Grp Volume(v), veh/h	0	1309	0	0	1631	0	339	0	1407			
Grp Sat Flow(s),veh/h/ln	0	1881	1585	0	2067	1585	1781	0	1205			
Q Serve(g_s), s	0.0	2.4	0.0	0.0	3.0	0.0	20.3	0.0	55.0			
Cycle Q Clear(g_c), s	0.0	2.4	0.0	0.0	3.0	0.0	20.3	0.0	55.0			
Prop In Lane	0.00		1.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	0	2719		0	2988		757	0	1536			
V/C Ratio(X)	0.00	0.48		0.00	0.55		0.45	0.00	0.92			
Avail Cap(c_a), veh/h	0	2719		0	2988		926	0	1879			
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.00	1.00	0.00	0.00	0.85	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	0.0	1.5	0.0	0.0	1.5	0.0	30.6	0.0	40.6			
Incr Delay (d2), s/veh	0.0	0.6	0.0	0.0	0.6	0.0	0.4	0.0	6.6			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(95%),veh/ln	0.0	1.3	0.0	0.0	1.6	0.0	13.8	0.0	23.9			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	2.1	0.0	0.0	2.1	0.0	31.1	0.0	47.2			
LnGrp LOS	A	A		A	A		C	A	D			
Approach Vol, veh/h		1309	A		1631	A		1746				
Approach Delay, s/veh		2.1			2.1			44.1				
Approach LOS		A			A			D				

Timer - Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		79.3				79.3		70.7
Change Period (Y+Rc), s		5.0				5.0		5.0
Max Green Setting (Gmax), s		60.0				60.0		80.0
Max Q Clear Time (g_c+I1), s		4.4				5.0		57.0
Green Ext Time (p_c), s		29.7				38.5		8.7

Intersection Summary			
HCM 6th Ctrl Delay			17.7
HCM 6th LOS			B

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	741	1782	524	165	1745	111	26	5	20	55	27	174
Future Volume (veh/h)	741	1782	524	165	1745	111	26	5	20	55	27	174
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	780	1876	0	174	1837	64	31	0	19	43	49	130
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	843	3252		1060	3700	825	56	0	25	59	62	879
Arrive On Green	0.24	0.91	0.00	0.31	1.00	0.52	0.02	0.00	0.02	0.03	0.03	0.03
Sat Flow, veh/h	3456	7111	1585	3456	7111	1585	3563	0	1585	1781	1870	3170
Grp Volume(v), veh/h	780	1876	0	174	1837	64	31	0	19	43	49	130
Grp Sat Flow(s),veh/h/ln	1728	1778	1585	1728	1778	1585	1781	0	1585	1781	1870	1585
Q Serve(g_s), s	33.1	7.1	0.0	5.5	0.0	3.0	1.3	0.0	1.8	3.6	3.9	4.6
Cycle Q Clear(g_c), s	33.1	7.1	0.0	5.5	0.0	3.0	1.3	0.0	1.8	3.6	3.9	4.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	843	3252		1060	3700	825	56	0	25	59	62	879
V/C Ratio(X)	0.93	0.58		0.16	0.50	0.08	0.55	0.00	0.76	0.72	0.79	0.15
Avail Cap(c_a), veh/h	1152	4362		1060	3700	825	190	0	85	107	112	963
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.53	0.53	0.00	0.83	0.83	0.83	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	55.4	3.8	0.0	37.9	0.0	18.0	73.3	0.0	73.5	71.8	72.0	40.9
Incr Delay (d2), s/veh	5.9	0.4	0.0	0.1	0.4	0.2	8.1	0.0	36.1	15.3	19.2	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	19.5	2.8	0.0	4.2	0.2	2.1	1.2	0.0	1.8	3.4	4.0	3.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	61.3	4.2	0.0	38.0	0.4	18.1	81.3	0.0	109.7	87.2	91.1	40.9
LnGrp LOS	E	A		D	A	B	F	A	F	F	F	D
Approach Vol, veh/h		2656	A		2075			50			222	
Approach Delay, s/veh		21.0			4.1			92.1			61.0	
Approach LOS		C			A			F			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	53.0	75.6		9.4	43.6	85.0		12.0
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	15.0	94.0		10.0	52.0	57.0		11.0
Max Q Clear Time (g_c+I1), s	7.5	9.1		3.8	35.1	5.0		6.6
Green Ext Time (p_c), s	0.4	61.4		0.1	3.5	41.8		0.4

Intersection Summary		
HCM 6th Ctrl Delay		16.4
HCM 6th LOS		B

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary
23: Bishop Ranch 1/Camino Ramon & Bollinger Canyon

03/16/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	551	833	387	40	1921	451	13	22	4	71	39	131
Future Volume (veh/h)	551	833	387	40	1921	451	13	22	4	71	39	131
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	592	896	308	43	2066	324	14	24	3	76	84	70
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	622	3556	793	911	4149	925	2	58	50	66	91	362
Arrive On Green	0.18	1.00	0.50	0.26	1.00	0.58	0.00	0.03	0.03	0.02	0.05	0.05
Sat Flow, veh/h	3456	7111	1585	3456	7111	1585	1781	1870	1585	3563	1870	1585
Grp Volume(v), veh/h	592	896	308	43	2066	324	14	24	3	76	84	70
Grp Sat Flow(s),veh/h/ln	1728	1778	1585	1728	1778	1585	1781	1870	1585	1781	1870	1585
Q Serve(g_s), s	25.4	0.0	15.6	1.4	0.0	16.1	0.2	1.9	0.2	2.8	6.7	5.3
Cycle Q Clear(g_c), s	25.4	0.0	15.6	1.4	0.0	16.1	0.2	1.9	0.2	2.8	6.7	5.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	622	3556	793	911	4149	925	2	58	50	66	91	362
V/C Ratio(X)	0.95	0.25	0.39	0.05	0.50	0.35	5.62	0.41	0.06	1.15	0.93	0.19
Avail Cap(c_a), veh/h	737	3556	793	911	4149	925	95	387	328	190	387	613
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.92	0.92	0.92	0.89	0.89	0.89	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	60.9	0.0	17.4	41.2	0.0	16.4	74.9	71.3	30.6	73.6	71.1	46.7
Incr Delay (d2), s/veh	19.2	0.2	1.3	0.0	0.4	0.9	2253.4	4.6	0.5	97.4	29.0	0.3
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(95%),veh/ln	18.3	0.1	9.9	1.1	0.2	10.0	3.0	1.8	0.2	3.9	7.1	3.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	80.1	0.2	18.7	41.2	0.4	17.3	2328.3	75.9	31.1	171.0	100.1	47.0
LnGrp LOS	F	A	B	D	A	B	F	E	C	F	F	D
Approach Vol, veh/h		1796			2433			41			230	
Approach Delay, s/veh		29.7			3.4			841.7			107.4	
Approach LOS		C			A			F			F	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	46.5	82.0	9.8	11.7	34.0	94.5	7.2	14.3
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	10.0	77.0	10.0	33.0	34.0	53.0	10.0	33.0
Max Q Clear Time (g_c+I1), s	3.4	17.6	4.8	3.9	27.4	18.1	2.2	8.7
Green Ext Time (p_c), s	0.0	20.5	0.1	0.1	1.6	32.3	0.0	0.6

Intersection Summary	
HCM 6th Ctrl Delay	26.8
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	937	49	64	2515	4	10
Future Volume (veh/h)	937	49	64	2515	4	10
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	1018	53	70	2734	4	9
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	5171	268	71	5830	1	1
Arrive On Green	1.00	0.82	0.04	0.91	0.00	0.00
Sat Flow, veh/h	6572	327	1781	6696	1781	1585
Grp Volume(v), veh/h	777	294	70	2734	4	9
Grp Sat Flow(s),veh/h/ln	1609	1812	1781	1609	1781	1585
Q Serve(g_s), s	0.0	1.0	5.9	10.4	0.1	0.1
Cycle Q Clear(g_c), s	0.0	1.0	5.9	10.4	0.1	0.1
Prop In Lane		0.18	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	3954	1484	71	5830	1	1
V/C Ratio(X)	0.20	0.20	0.98	0.47	3.37	8.52
Avail Cap(c_a), veh/h	3954	1484	178	5830	309	275
HCM Platoon Ratio	2.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.99	0.99	0.86	0.86	1.00	1.00
Uniform Delay (d), s/veh	0.0	0.5	72.0	1.2	75.0	75.0
Incr Delay (d2), s/veh	0.1	0.3	41.9	0.2	1416.1	3757.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.1	0.6	6.4	2.4	0.9	2.1
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.1	0.8	113.9	1.4	1491.1	3832.6
LnGrp LOS	A	A	F	A	F	F
Approach Vol, veh/h	1071			2804	13	
Approach Delay, s/veh	0.3			4.2	3112.2	
Approach LOS	A			A	F	

Timer - Assigned Phs	1	2	6	8
Phs Duration (G+Y+Rc), s	13.0	129.9	142.9	7.1
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	17.0	90.5	112.5	28.0
Max Q Clear Time (g_c+I1), s	7.9	3.0	12.4	2.1
Green Ext Time (p_c), s	0.1	24.3	97.1	0.0

Intersection Summary	
HCM 6th Ctrl Delay	13.5
HCM 6th LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	19	703	192	32	2275	2	284	2	31	2	0	3
Future Volume (veh/h)	19	703	192	32	2275	2	284	2	31	2	0	3
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	21	764	133	35	2473	2	310	0	32	2	0	3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	36	5014	1118	36	5214	4	339	0	151	1	0	1
Arrive On Green	0.02	1.00	0.71	0.02	1.00	0.71	0.10	0.00	0.10	0.00	0.00	0.00
Sat Flow, veh/h	1781	7111	1585	1781	7394	6	3563	0	1585	1781	0	1585
Grp Volume(v), veh/h	21	764	133	35	1784	691	310	0	32	2	0	3
Grp Sat Flow(s),veh/h/ln	1781	1778	1585	1781	1778	2066	1781	0	1585	1781	0	1585
Q Serve(g_s), s	1.8	0.0	4.1	2.9	0.0	0.1	12.9	0.0	2.8	0.1	0.0	0.1
Cycle Q Clear(g_c), s	1.8	0.0	4.1	2.9	0.0	0.1	12.9	0.0	2.8	0.1	0.0	0.1
Prop In Lane	1.00		1.00	1.00		0.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	36	5014	1118	36	3761	1457	339	0	151	1	0	1
V/C Ratio(X)	0.59	0.15	0.12	0.98	0.47	0.47	0.91	0.00	0.21	1.68	0.00	2.84
Avail Cap(c_a), veh/h	119	5014	1118	119	3761	1457	665	0	296	95	0	85
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.99	0.99	0.99	0.54	0.54	0.54	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	72.9	0.0	7.1	73.5	0.0	0.0	67.2	0.0	62.7	75.0	0.0	75.0
Incr Delay (d2), s/veh	14.4	0.1	0.2	47.2	0.2	0.6	9.7	0.0	0.7	675.3	0.0	1214.5
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(95%),veh/ln	1.7	0.0	2.6	3.3	0.1	0.5	10.5	0.0	2.1	0.5	0.0	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	87.3	0.1	7.3	120.7	0.2	0.6	76.9	0.0	63.3	750.3	0.0	1289.5
LnGrp LOS	F	A	A	F	A	A	E	A	E	F	A	F
Approach Vol, veh/h		918			2510			342			5	
Approach Delay, s/veh		3.1			2.0			75.7			1073.8	
Approach LOS		A			A			E			F	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	10.0	112.8		5.9	10.0	112.8		21.3				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	12.0	78.0		10.0	12.0	78.0		30.0				
Max Q Clear Time (g_c+I1), s	4.9	6.1		2.1	3.8	2.1		14.9				
Green Ext Time (p_c), s	0.0	18.2		0.0	0.0	70.8		1.4				
Intersection Summary												
HCM 6th Ctrl Delay			10.4									
HCM 6th LOS			B									

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	148	540	87	242	1792	398	483	400	170	141	211	171
Future Volume (veh/h)	148	540	87	242	1792	398	483	400	170	141	211	171
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	161	587	68	263	1948	297	525	435	183	153	229	104
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	373	2410	677	271	2086	586	564	462	192	157	253	113
Arrive On Green	0.07	0.85	0.43	0.15	0.74	0.37	0.16	0.19	0.19	0.05	0.07	0.07
Sat Flow, veh/h	1781	5644	1585	1781	5644	1585	3456	2445	1019	3456	3554	1585
Grp Volume(v), veh/h	161	587	68	263	1948	297	525	315	303	153	229	104
Grp Sat Flow(s),veh/h/ln	1781	1881	1585	1781	1881	1585	1728	1777	1687	1728	1777	1585
Q Serve(g_s), s	13.0	2.9	3.9	22.0	43.6	21.8	22.5	26.2	26.6	6.6	9.6	7.5
Cycle Q Clear(g_c), s	13.0	2.9	3.9	22.0	43.6	21.8	22.5	26.2	26.6	6.6	9.6	7.5
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.60	1.00		1.00
Lane Grp Cap(c), veh/h	373	2410	677	271	2086	586	564	336	319	157	253	113
V/C Ratio(X)	0.43	0.24	0.10	0.97	0.93	0.51	0.93	0.94	0.95	0.97	0.91	0.92
Avail Cap(c_a), veh/h	373	2410	677	404	2107	592	576	474	450	253	616	275
HCM Platoon Ratio	0.33	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.99	0.99	0.99	1.00	1.00	1.00	0.89	0.89	0.89	1.00	1.00	1.00
Uniform Delay (d), s/veh	61.3	6.5	25.7	63.3	18.0	36.7	61.9	60.0	60.1	71.5	69.2	40.5
Incr Delay (d2), s/veh	0.8	0.2	0.3	30.6	9.3	3.1	20.0	20.1	23.2	37.8	11.6	24.1
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(95%),veh/ln	10.5	2.0	2.8	17.9	15.9	14.0	16.7	19.4	19.1	6.8	8.4	6.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	62.0	6.7	26.0	93.8	27.3	39.8	81.9	80.0	83.4	109.3	80.7	64.6
LnGrp LOS	E	A	C	F	C	D	F	F	F	F	F	E
Approach Vol, veh/h		816			2508			1143			486	
Approach Delay, s/veh		19.2			35.7			81.8			86.3	
Approach LOS		B			D			F			F	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	13.8	35.3	38.4	62.4	31.5	17.7	29.8	71.1
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	13.0	42.0	17.0	58.0	27.0	28.0	36.0	39.0
Max Q Clear Time (g_c+I1), s	18.6	28.6	15.0	45.6	24.5	11.6	24.0	5.9
Green Ext Time (p_c), s	0.2	1.7	0.1	11.9	0.7	1.1	0.7	10.4

Intersection Summary	
HCM 6th Ctrl Delay	48.6
HCM 6th LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	210	403	113	231	1203	196	214	207	91	218	280	418
Future Volume (veh/h)	210	403	113	231	1203	196	214	207	91	218	280	418
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	228	438	69	251	1308	115	233	225	50	237	304	291
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	235	1364	550	261	2002	562	240	1483	460	247	1493	463
Arrive On Green	0.07	0.35	0.35	0.08	0.35	0.35	0.07	0.29	0.29	0.07	0.29	0.29
Sat Flow, veh/h	3456	3928	1585	3456	5644	1585	3456	5106	1585	3456	5106	1585
Grp Volume(v), veh/h	228	438	69	251	1308	115	233	225	50	237	304	291
Grp Sat Flow(s),veh/h/ln	1728	1964	1585	1728	1881	1585	1728	1702	1585	1728	1702	1585
Q Serve(g_s), s	8.6	10.7	3.9	9.4	25.3	6.6	8.7	4.3	3.0	8.9	5.8	20.7
Cycle Q Clear(g_c), s	8.6	10.7	3.9	9.4	25.3	6.6	8.7	4.3	3.0	8.9	5.8	20.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	235	1364	550	261	2002	562	240	1483	460	247	1493	463
V/C Ratio(X)	0.97	0.32	0.13	0.96	0.65	0.20	0.97	0.15	0.11	0.96	0.20	0.63
Avail Cap(c_a), veh/h	346	1364	550	399	2002	562	346	1483	460	399	1493	463
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	60.4	31.2	29.0	59.9	35.2	29.2	60.3	34.2	33.8	60.2	34.6	39.9
Incr Delay (d2), s/veh	33.0	0.6	0.5	27.8	1.7	0.8	33.7	0.2	0.5	26.0	0.3	6.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	8.4	9.0	2.8	8.9	17.5	4.8	8.6	3.3	2.2	8.4	4.5	13.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	93.5	31.8	29.4	87.7	36.9	30.0	94.1	34.5	34.3	86.2	34.9	46.2
LnGrp LOS	F	C	C	F	D	C	F	C	C	F	C	D
Approach Vol, veh/h		735			1674			508			832	
Approach Delay, s/veh		50.7			44.1			61.8			53.5	
Approach LOS		D			D			E			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	16.8	52.1	16.0	45.0	15.9	53.1	16.3	44.8
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	17.0	38.0	15.0	40.0	15.0	40.0	17.0	38.0
Max Q Clear Time (g_c+I1), s	11.4	12.7	10.7	22.7	10.6	27.3	10.9	6.3
Green Ext Time (p_c), s	0.4	3.2	0.3	2.9	0.3	7.6	0.4	1.7

Intersection Summary		
HCM 6th Ctrl Delay		49.8
HCM 6th LOS		D

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	226	583	288	169	491	428
Future Volume (veh/h)	226	583	288	169	491	428
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	246	417	313	130	534	465
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	386	1017	452	184	757	2369
Arrive On Green	0.22	0.22	0.18	0.18	0.43	0.67
Sat Flow, veh/h	1781	1585	2558	1002	1781	3647
Grp Volume(v), veh/h	246	417	224	219	534	465
Grp Sat Flow(s),veh/h/ln	1781	1585	1777	1690	1781	1777
Q Serve(g_s), s	15.1	15.4	14.1	14.6	29.5	6.0
Cycle Q Clear(g_c), s	15.1	15.4	14.1	14.6	29.5	6.0
Prop In Lane	1.00	1.00		0.59	1.00	
Lane Grp Cap(c), veh/h	386	1017	326	310	757	2369
V/C Ratio(X)	0.64	0.41	0.69	0.71	0.71	0.20
Avail Cap(c_a), veh/h	386	1017	326	310	757	2369
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	42.7	10.5	45.8	46.0	28.3	7.7
Incr Delay (d2), s/veh	3.5	0.3	11.2	12.8	3.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	11.4	9.1	11.4	11.4	18.3	3.7
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	46.2	10.7	57.0	58.8	31.3	7.9
LnGrp LOS	D	B	E	E	C	A
Approach Vol, veh/h	663		443			999
Approach Delay, s/veh	23.9		57.9			20.4
Approach LOS	C		E			C

Timer - Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	48.1	38.9				87.0		28.6
Change Period (Y+Rc), s	5.0	5.0				5.0		5.0
Max Green Setting (Gmax), s	53.0	24.0				82.0		28.0
Max Q Clear Time (g_c+I1), s	31.5	16.6				8.0		17.4
Green Ext Time (p_c), s	1.6	1.4				3.1		1.9

Intersection Summary		
HCM 6th Ctrl Delay		29.4
HCM 6th LOS		C

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Volume (veh/h)	239	204	30	384	163	33
Future Volume (veh/h)	239	204	30	384	163	33
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	260	146	33	417	177	20
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	1066	476	148	1777	475	423
Arrive On Green	0.30	0.30	0.08	0.50	0.27	0.27
Sat Flow, veh/h	3647	1585	1781	3647	1781	1585
Grp Volume(v), veh/h	260	146	33	417	177	20
Grp Sat Flow(s),veh/h/ln	1777	1585	1781	1777	1781	1585
Q Serve(g_s), s	3.3	4.3	1.0	4.0	4.9	0.6
Cycle Q Clear(g_c), s	3.3	4.3	1.0	4.0	4.9	0.6
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	1066	476	148	1777	475	423
V/C Ratio(X)	0.24	0.31	0.22	0.23	0.37	0.05
Avail Cap(c_a), veh/h	1066	476	148	1777	475	423
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	15.9	16.2	25.7	8.5	17.9	16.3
Incr Delay (d2), s/veh	0.5	1.7	0.7	0.3	0.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	2.4	2.9	0.8	2.5	3.4	1.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	16.4	17.9	26.4	8.8	18.4	16.4
LnGrp LOS	B	B	C	A	B	B
Approach Vol, veh/h	406			450	197	
Approach Delay, s/veh	16.9			10.1	18.2	
Approach LOS	B			B	B	

Timer - Assigned Phs		2		4	5	6
Phs Duration (G+Y+Rc), s		37.0		17.5	9.6	27.4
Change Period (Y+Rc), s		5.0		5.0	5.0	5.0
Max Green Setting (Gmax), s		32.0		18.0	7.0	20.0
Max Q Clear Time (g_c+I1), s		6.0		6.9	3.0	6.3
Green Ext Time (p_c), s		2.9		0.4	0.0	1.8

Intersection Summary			
HCM 6th Ctrl Delay			14.2
HCM 6th LOS			B

Intersection	
Intersection Delay, s/veh	14.2
Intersection LOS	B

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	395	231	156	170	165	203
Future Vol, veh/h	395	231	156	170	165	203
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	429	251	170	185	179	221
Number of Lanes	2	1	2	0	1	2

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	3	2
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	2	0	3
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	3	3	0
HCM Control Delay	14.4	14.9	13.2
HCM LOS	B	B	B

Lane	NBLn1	NBLn2	WBLn1	WBLn2	WBLn3	SBLn1	SBLn2	SBLn3
Vol Left, %	0%	0%	100%	78%	0%	100%	0%	0%
Vol Thru, %	100%	23%	0%	0%	0%	0%	100%	100%
Vol Right, %	0%	77%	0%	22%	100%	0%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	104	222	263	169	194	165	102	102
LT Vol	0	0	263	132	0	165	0	0
Through Vol	104	52	0	0	0	0	102	102
RT Vol	0	170	0	37	194	0	0	0
Lane Flow Rate	113	241	286	183	211	179	110	110
Geometry Grp	8	8	7	7	7	8	8	8
Degree of Util (X)	0.238	0.471	0.577	0.356	0.251	0.398	0.229	0.175
Departure Headway (Hd)	7.578	7.03	7.255	6.989	4.292	7.998	7.488	5.719
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	475	514	501	519	842	450	480	627
Service Time	5.315	4.768	4.955	4.689	1.992	5.735	5.224	3.455
HCM Lane V/C Ratio	0.238	0.469	0.571	0.353	0.251	0.398	0.229	0.175
HCM Control Delay	12.7	15.9	19.4	13.5	8.4	15.9	12.4	9.7
HCM Lane LOS	B	C	C	B	A	C	B	A
HCM 95th-tile Q	0.9	2.5	3.6	1.6	1	1.9	0.9	0.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	187	84	76	448	1326	311
Future Volume (veh/h)	187	84	76	448	1326	311
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	203	58	83	487	1441	336
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	216	192	52	3339	2122	493
Arrive On Green	0.12	0.12	0.03	0.65	0.51	0.51
Sat Flow, veh/h	1781	1585	1781	5274	4308	962
Grp Volume(v), veh/h	203	58	83	487	1184	593
Grp Sat Flow(s),veh/h/ln	1781	1585	1781	1702	1702	1697
Q Serve(g_s), s	7.0	2.1	1.8	2.3	16.2	16.3
Cycle Q Clear(g_c), s	7.0	2.1	1.8	2.3	16.2	16.3
Prop In Lane	1.00	1.00	1.00			0.57
Lane Grp Cap(c), veh/h	216	192	52	3339	1745	870
V/C Ratio(X)	0.94	0.30	1.60	0.15	0.68	0.68
Avail Cap(c_a), veh/h	572	509	286	5409	2677	1335
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	27.1	25.0	30.2	4.1	11.3	11.4
Incr Delay (d2), s/veh	17.2	0.9	290.0	0.0	0.5	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	6.9	0.1	8.8	0.8	8.0	8.2
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	44.3	25.8	320.2	4.1	11.8	12.3
LnGrp LOS	D	C	F	A	B	B
Approach Vol, veh/h	261			570	1777	
Approach Delay, s/veh	40.2			50.2	12.0	
Approach LOS	D			D	B	

Timer - Assigned Phs		2		4	5	6
Phs Duration (G+Y+Rc), s		47.7		14.6	8.8	38.9
Change Period (Y+Rc), s		5.0		5.0	5.0	5.0
Max Green Setting (Gmax), s		68.0		22.0	12.0	51.0
Max Q Clear Time (g_c+I1), s		4.3		9.0	3.8	18.3
Green Ext Time (p_c), s		3.3		0.6	0.1	15.6

Intersection Summary			
HCM 6th Ctrl Delay			23.2
HCM 6th LOS			C

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	21	1010	105	88	1098	753	49	33	66	42	38	22
Future Volume (veh/h)	21	1010	105	88	1098	753	49	33	66	42	38	22
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	23	1098	60	96	1193	57	53	36	39	46	41	23
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	89	1451	647	178	1629	726	119	358	304	119	216	121
Arrive On Green	0.05	0.41	0.41	0.10	0.46	0.46	0.07	0.19	0.19	0.07	0.19	0.19
Sat Flow, veh/h	1781	3554	1585	1781	3554	1585	1781	1870	1585	1781	1125	631
Grp Volume(v), veh/h	23	1098	60	96	1193	57	53	36	39	46	0	64
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1777	1585	1781	1870	1585	1781	0	1757
Q Serve(g_s), s	1.5	31.7	2.8	6.2	32.8	2.4	3.4	1.9	2.4	3.0	0.0	3.7
Cycle Q Clear(g_c), s	1.5	31.7	2.8	6.2	32.8	2.4	3.4	1.9	2.4	3.0	0.0	3.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.36
Lane Grp Cap(c), veh/h	89	1451	647	178	1629	726	119	358	304	119	0	337
V/C Ratio(X)	0.26	0.76	0.09	0.54	0.73	0.08	0.45	0.10	0.13	0.39	0.00	0.19
Avail Cap(c_a), veh/h	89	1451	647	178	1629	726	119	358	304	119	0	337
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	0.98	0.98	0.98	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	54.9	30.4	21.8	51.4	26.5	18.3	53.9	40.0	40.2	53.7	0.0	40.7
Incr Delay (d2), s/veh	1.5	3.7	0.3	3.2	2.9	0.2	2.6	0.1	0.2	2.1	0.0	0.3
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(95%),veh/ln	1.2	19.6	1.9	5.1	19.6	1.6	2.9	1.6	1.7	2.5	0.0	2.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	56.4	34.1	22.1	54.5	29.4	18.5	56.5	40.1	40.4	55.7	0.0	41.0
LnGrp LOS	E	C	C	D	C	B	E	D	D	E	A	D
Approach Vol, veh/h		1181			1346			128			110	
Approach Delay, s/veh		33.9			30.7			47.0			47.1	
Approach LOS		C			C			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	16.4	70.0	12.4	21.2	10.3	76.1	12.7	20.9
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	14.0	51.0	10.0	25.0	8.0	57.0	10.0	25.0
Max Q Clear Time (g_c+I1), s	9.2	34.7	6.0	5.4	4.5	35.8	6.4	6.7
Green Ext Time (p_c), s	0.1	5.1	0.0	0.2	0.0	6.2	0.0	0.1

Intersection Summary	
HCM 6th Ctrl Delay	33.5
HCM 6th LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	214	1126	50	451	1016	402	163	381	598	363	310	117
Future Volume (veh/h)	214	1126	50	451	1016	402	163	381	598	363	310	117
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	233	1224	32	490	1104	274	177	414	541	395	337	84
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	752	1586	492	534	1264	393	206	784	595	419	1003	447
Arrive On Green	0.22	0.62	0.31	0.15	0.50	0.25	0.06	0.22	0.22	0.12	0.28	0.28
Sat Flow, veh/h	3456	5106	1585	3456	5106	1585	3456	3554	1585	3456	3554	1585
Grp Volume(v), veh/h	233	1224	32	490	1104	274	177	414	541	395	337	84
Grp Sat Flow(s),veh/h/ln	1728	1702	1585	1728	1702	1585	1728	1777	1585	1728	1777	1585
Q Serve(g_s), s	8.2	25.3	2.1	20.3	27.9	17.0	7.4	14.9	32.0	16.4	10.9	3.5
Cycle Q Clear(g_c), s	8.2	25.3	2.1	20.3	27.9	17.0	7.4	14.9	32.0	16.4	10.9	3.5
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	752	1586	492	534	1264	393	206	784	595	419	1003	447
V/C Ratio(X)	0.31	0.77	0.07	0.92	0.87	0.70	0.86	0.53	0.91	0.94	0.34	0.19
Avail Cap(c_a), veh/h	752	1586	492	643	1796	558	310	784	595	429	1003	447
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.72	0.72	0.72	1.00	1.00	1.00	0.97	0.97	0.97	1.00	1.00	1.00
Uniform Delay (d), s/veh	47.6	23.7	35.2	60.4	34.6	27.7	67.6	49.8	43.0	63.2	41.3	14.2
Incr Delay (d2), s/veh	0.2	2.7	0.2	16.3	8.5	9.9	14.0	0.6	17.7	29.3	0.2	0.2
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(95%),veh/ln	6.2	10.8	1.5	15.1	15.0	12.0	6.6	10.9	28.4	13.8	8.4	4.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	47.8	26.4	35.4	76.7	43.1	37.6	81.6	50.5	60.6	92.5	41.5	14.4
LnGrp LOS	D	C	D	E	D	D	F	D	E	F	D	B
Approach Vol, veh/h		1489			1868			1132			816	
Approach Delay, s/veh		30.0			51.1			60.2			63.4	
Approach LOS		C			D			E			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	29.4	52.0	24.6	39.0	38.5	42.9	15.6	47.9
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	29.0	42.0	20.0	34.0	18.0	53.0	15.0	39.0
Max Q Clear Time (g_c+I1), s	23.3	28.3	19.4	35.0	11.2	30.9	10.4	13.9
Green Ext Time (p_c), s	1.2	5.3	0.1	0.0	0.5	7.0	0.3	1.8

Intersection Summary			
HCM 6th Ctrl Delay			49.0
HCM 6th LOS			D

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	1495	1083	0	593	783
Future Volume (veh/h)	0	1495	1083	0	593	783
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	0	1870	1870	0	1870	1870
Adj Flow Rate, veh/h	0	1625	1177	0	645	742
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	0	2	2
Cap, veh/h	0	3010	3010		1085	876
Arrive On Green	0.00	1.00	1.00	0.00	0.31	0.31
Sat Flow, veh/h	0	5443	5443	0	3456	2790
Grp Volume(v), veh/h	0	1625	1177	0	645	742
Grp Sat Flow(s),veh/h/ln	0	1702	1702	0	1728	1395
Q Serve(g_s), s	0.0	0.0	0.0	0.0	22.8	36.0
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	22.8	36.0
Prop In Lane	0.00			0.00	1.00	1.00
Lane Grp Cap(c), veh/h	0	3010	3010		1085	876
V/C Ratio(X)	0.00	0.54	0.39		0.59	0.85
Avail Cap(c_a), veh/h	0	3010	3010		1501	1212
HCM Platoon Ratio	1.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	42.0	46.5
Incr Delay (d2), s/veh	0.0	0.7	0.4	0.0	0.5	4.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.0	0.4	0.2	0.0	15.0	18.9
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.0	0.7	0.4	0.0	42.5	50.7
LnGrp LOS	A	A	A		D	D
Approach Vol, veh/h		1625	1177	A	1387	
Approach Delay, s/veh		0.7	0.4		46.9	
Approach LOS		A	A		D	

Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		92.5		52.5		92.5
Change Period (Y+Rc), s		5.0		5.0		5.0
Max Green Setting (Gmax), s		70.0		65.0		70.0
Max Q Clear Time (g_c+I1), s		3.0		39.0		3.0
Green Ext Time (p_c), s		11.4		8.5		6.8

Intersection Summary			
HCM 6th Ctrl Delay			15.9
HCM 6th LOS			B

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1377	0	0	1491	415	754
Future Volume (veh/h)	1377	0	0	1491	415	754
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	0	0	1870	1870	1870
Adj Flow Rate, veh/h	1497	0	0	1621	387	779
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	0	0	2	2	2
Cap, veh/h	3145	0	0	3962	512	912
Arrive On Green	1.00	0.00	0.00	1.00	0.29	0.29
Sat Flow, veh/h	5443	0	0	6958	1781	3170
Grp Volume(v), veh/h	1497	0	0	1621	387	779
Grp Sat Flow(s),veh/h/ln	1702	0	0	1609	1781	1585
Q Serve(g_s), s	0.0	0.0	0.0	0.0	28.7	33.7
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	28.7	33.7
Prop In Lane		0.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	3145	0	0	3962	512	912
V/C Ratio(X)	0.48	0.00	0.00	0.41	0.76	0.85
Avail Cap(c_a), veh/h	3145	0	0	3962	811	1443
HCM Platoon Ratio	2.00	1.00	1.00	2.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	47.0	48.8
Incr Delay (d2), s/veh	0.5	0.0	0.0	0.3	2.3	3.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.3	0.0	0.0	0.2	19.0	19.8
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.5	0.0	0.0	0.3	49.3	51.9
LnGrp LOS	A	A	A	A	D	D
Approach Vol, veh/h	1497			1621	1166	
Approach Delay, s/veh	0.5			0.3	51.0	
Approach LOS	A			A	D	

Timer - Assigned Phs	2	4	6
Phs Duration (G+Y+Rc), s	96.3	48.7	96.3
Change Period (Y+Rc), s	5.0	5.0	5.0
Max Green Setting (Gmax), s	67.0	68.0	67.0
Max Q Clear Time (g_c+I1), s	3.0	36.7	3.0
Green Ext Time (p_c), s	9.9	7.0	11.4

Intersection Summary	
HCM 6th Ctrl Delay	14.2
HCM 6th LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

HCM 6th Signalized Intersection Summary
5: Crow Canyon Place & Crow Canyon Rd

03/16/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	403	1425	371	82	1435	54	426	138	185	126	91	380
Future Volume (veh/h)	403	1425	371	82	1435	54	426	138	185	126	91	380
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	438	1549	240	89	1560	57	463	150	199	137	99	304
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	490	1799	690	416	2823	103	539	277	247	246	258	443
Arrive On Green	0.14	0.56	0.28	0.23	0.74	0.37	0.16	0.16	0.16	0.14	0.14	0.14
Sat Flow, veh/h	3456	6434	1585	1781	7603	277	3456	1777	1585	1781	1870	1585
Grp Volume(v), veh/h	438	1549	240	89	1243	374	463	150	199	137	99	304
Grp Sat Flow(s),veh/h/ln	1728	1609	1585	1781	1515	1820	1728	1777	1585	1781	1870	1585
Q Serve(g_s), s	18.1	29.7	14.6	5.8	13.0	15.1	18.9	11.3	17.6	10.4	7.0	20.0
Cycle Q Clear(g_c), s	18.1	29.7	14.6	5.8	13.0	15.1	18.9	11.3	17.6	10.4	7.0	20.0
Prop In Lane	1.00		1.00	1.00		0.15	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	490	1799	690	416	2250	676	539	277	247	246	258	443
V/C Ratio(X)	0.89	0.86	0.35	0.21	0.55	0.55	0.86	0.54	0.81	0.56	0.38	0.69
Avail Cap(c_a), veh/h	715	2352	826	416	2250	676	691	355	317	246	258	443
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.75	0.75	0.75	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	61.1	29.6	27.2	44.8	13.4	16.7	59.7	56.4	59.1	58.4	56.9	46.5
Incr Delay (d2), s/veh	10.0	5.7	1.4	0.2	0.7	2.4	8.7	1.6	11.1	2.8	0.9	4.4
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(95%),veh/ln	18.3	13.9	12.0	4.7	5.7	8.2	13.9	9.0	12.4	8.5	6.1	15.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	71.2	35.2	28.6	45.0	14.1	19.1	68.3	58.1	70.2	61.2	57.8	50.9
LnGrp LOS	E	D	C	D	B	B	E	E	E	E	E	D
Approach Vol, veh/h		2227			1706			812			540	
Approach Delay, s/veh		41.6			16.8			66.9			54.8	
Approach LOS		D			B			E			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	40.9	47.6		27.0	27.6	60.8		29.6				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	17.0	55.0		22.0	32.0	40.0		31.0				
Max Q Clear Time (g_c+I1), s	18.8	32.7		23.0	21.1	18.1		21.9				
Green Ext Time (p_c), s	0.1	9.9		0.0	1.5	8.3		2.7				

Intersection Summary		
HCM 6th Ctrl Delay		38.8
HCM 6th LOS		D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	71	1249	262	148	860	252	663	245	145	337	148	122
Future Volume (veh/h)	71	1249	262	148	860	252	663	245	145	337	148	122
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	77	1358	176	161	935	272	721	266	93	366	161	131
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	95	2729	1032	186	2257	644	784	395	334	408	196	149
Arrive On Green	0.03	0.85	0.42	0.05	0.90	0.45	0.23	0.21	0.21	0.12	0.10	0.10
Sat Flow, veh/h	3456	6434	1585	3456	5009	1429	3456	1870	1585	3456	1921	1463
Grp Volume(v), veh/h	77	1358	176	161	900	307	721	266	93	366	148	144
Grp Sat Flow(s),veh/h/ln	1728	1609	1585	1728	1609	1613	1728	1870	1585	1728	1777	1607
Q Serve(g_s), s	3.2	8.0	2.1	6.7	4.3	17.4	29.6	19.0	7.1	15.1	11.8	12.8
Cycle Q Clear(g_c), s	3.2	8.0	2.1	6.7	4.3	17.4	29.6	19.0	7.1	15.1	11.8	12.8
Prop In Lane	1.00		1.00	1.00		0.89	1.00		1.00	1.00		0.91
Lane Grp Cap(c), veh/h	95	2729	1032	186	2174	727	784	395	334	408	181	164
V/C Ratio(X)	0.81	0.50	0.17	0.86	0.41	0.42	0.92	0.67	0.28	0.90	0.82	0.88
Avail Cap(c_a), veh/h	167	2729	1032	238	2174	727	929	568	481	548	343	310
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.68	0.68	0.68	0.94	0.94	0.94	0.46	0.46	0.46	1.00	1.00	1.00
Uniform Delay (d), s/veh	70.1	7.0	3.3	68.1	4.2	24.2	54.7	52.6	48.0	63.1	63.8	64.2
Incr Delay (d2), s/veh	10.7	0.4	0.2	21.2	0.5	1.7	6.6	0.9	0.2	14.2	8.7	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(95%),veh/ln	2.8	3.5	1.6	6.3	2.1	10.8	17.6	12.3	4.8	12.0	9.8	9.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	80.8	7.4	3.5	89.2	4.7	25.9	61.3	53.6	48.2	77.2	72.5	77.9
LnGrp LOS	F	A	A	F	A	C	E	D	D	E	E	E
Approach Vol, veh/h		1611			1368			1080			658	
Approach Delay, s/veh		10.5			19.4			58.3			76.3	
Approach LOS		B			B			E			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	14.8	68.5	24.1	37.6	11.0	72.3	39.9	21.8
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	12.0	42.0	25.0	46.0	9.0	45.0	41.0	30.0
Max Q Clear Time (g_c+I1), s	9.7	11.0	18.1	22.0	6.2	20.4	32.6	15.8
Green Ext Time (p_c), s	0.1	9.0	1.0	1.4	0.0	6.1	2.4	1.0

Intersection Summary	
HCM 6th Ctrl Delay	33.2
HCM 6th LOS	C

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1556	324	178	875	383	468
Future Volume (veh/h)	1556	324	178	875	383	468
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	1691	243	193	951	416	400
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	3212	997	225	3792	556	631
Arrive On Green	1.00	0.63	0.07	1.00	0.16	0.16
Sat Flow, veh/h	5274	1585	3456	5274	3456	2790
Grp Volume(v), veh/h	1691	243	193	951	416	400
Grp Sat Flow(s),veh/h/ln	1702	1585	1728	1702	1728	1395
Q Serve(g_s), s	0.0	9.7	8.0	0.0	16.7	18.8
Cycle Q Clear(g_c), s	0.0	9.7	8.0	0.0	16.7	18.8
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	3212	997	225	3792	556	631
V/C Ratio(X)	0.53	0.24	0.86	0.25	0.75	0.63
Avail Cap(c_a), veh/h	3212	997	405	3792	786	817
HCM Platoon Ratio	2.00	1.00	1.00	2.00	1.00	1.00
Upstream Filter(I)	0.99	0.99	0.29	0.29	1.00	1.00
Uniform Delay (d), s/veh	0.0	11.8	67.1	0.0	58.0	50.7
Incr Delay (d2), s/veh	0.6	0.6	2.8	0.0	2.5	1.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.3	6.3	5.3	0.0	12.0	10.9
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.6	12.4	69.9	0.0	60.5	51.8
LnGrp LOS	A	B	E	A	E	D
Approach Vol, veh/h	1934			1144	816	
Approach Delay, s/veh	2.1			11.8	56.2	
Approach LOS	A			B	E	

Timer - Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	16.5	98.2				114.7		30.3
Change Period (Y+Rc), s	5.0	5.0				5.0		5.0
Max Green Setting (Gmax), s	19.0	76.0				100.0		35.0
Max Q Clear Time (g_c+I1), s	11.0	12.7				3.0		21.8
Green Ext Time (p_c), s	0.4	14.9				5.1		3.5

Intersection Summary	
HCM 6th Ctrl Delay	16.3
HCM 6th LOS	B

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	924	282	584	472	215	730
Future Volume (veh/h)	924	282	584	472	215	730
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	1004	198	635	513	234	684
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	1214	542	778	2221	893	1348
Arrive On Green	0.34	0.34	0.22	0.63	0.26	0.26
Sat Flow, veh/h	3647	1585	3456	3647	3456	2790
Grp Volume(v), veh/h	1004	198	635	513	234	684
Grp Sat Flow(s),veh/h/ln	1777	1585	1728	1777	1728	1395
Q Serve(g_s), s	31.1	11.3	20.9	7.6	6.5	20.1
Cycle Q Clear(g_c), s	31.1	11.3	20.9	7.6	6.5	20.1
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	1214	542	778	2221	893	1348
V/C Ratio(X)	0.83	0.37	0.82	0.23	0.26	0.51
Avail Cap(c_a), veh/h	1214	542	778	2221	893	1348
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.83	0.83	0.99	0.99
Uniform Delay (d), s/veh	36.2	29.7	44.2	9.9	35.4	21.2
Incr Delay (d2), s/veh	6.5	1.9	5.7	0.2	0.2	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	20.1	7.9	13.8	4.9	4.8	10.2
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	42.8	31.6	49.9	10.1	35.6	21.5
LnGrp LOS	D	C	D	B	D	C
Approach Vol, veh/h	1202			1148	918	
Approach Delay, s/veh	40.9			32.1	25.1	
Approach LOS	D			C	C	

Timer - Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	32.2	53.1				85.3		34.7
Change Period (Y+Rc), s	5.0	5.0				5.0		5.0
Max Green Setting (Gmax), s	29.0	43.0				77.0		33.0
Max Q Clear Time (g_c+I1), s	23.9	34.1				10.6		23.1
Green Ext Time (p_c), s	1.4	3.8				2.3		3.3

Intersection Summary	
HCM 6th Ctrl Delay	33.4
HCM 6th LOS	C

Intersection	
Intersection Delay, s/veh	34.5
Intersection LOS	D

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	35	304	6	152	187	62	11	102	344	54	221	92
Future Vol, veh/h	35	304	6	152	187	62	11	102	344	54	221	92
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	38	330	7	165	203	67	12	111	374	59	240	100
Number of Lanes	1	2	0	1	2	0	0	1	1	0	1	1

Approach	SE	NW	NE	SW
Opposing Approach	NW	SE	SW	NE
Opposing Lanes	3	3	2	2
Conflicting Approach Left	SW	NE	SE	NW
Conflicting Lanes Left	2	2	3	3
Conflicting Approach Right	NE	SW	NW	SE
Conflicting Lanes Right	2	2	3	3
HCM Control Delay	24.5	20.5	50.1	39.6
HCM LOS	C	C	F	E

Lane	NELn1	NELn2	NWLn1	NWLn2	NWLn3	SELn1	SELn2	SELn3	SWLn1	SWLn2
Vol Left, %	10%	0%	100%	0%	0%	100%	0%	0%	20%	0%
Vol Thru, %	90%	0%	0%	100%	50%	0%	100%	94%	80%	0%
Vol Right, %	0%	100%	0%	0%	50%	0%	0%	6%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	113	344	152	125	124	35	203	107	275	92
LT Vol	11	0	152	0	0	35	0	0	54	0
Through Vol	102	0	0	125	62	0	203	101	221	0
RT Vol	0	344	0	0	62	0	0	6	0	92
Lane Flow Rate	123	374	165	136	135	38	220	117	299	100
Geometry Grp	8	8	8	8	8	8	8	8	8	8
Degree of Util (X)	0.334	0.936	0.491	0.383	0.368	0.115	0.633	0.334	0.835	0.257
Departure Headway (Hd)	9.78	9.013	10.706	10.18	9.813	10.871	10.345	10.303	10.062	9.244
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	368	404	337	354	366	330	350	349	362	389
Service Time	7.535	6.768	8.471	7.945	7.577	8.634	8.107	8.066	7.82	7.001
HCM Lane V/C Ratio	0.334	0.926	0.49	0.384	0.369	0.115	0.629	0.335	0.826	0.257
HCM Control Delay	17.4	60.8	23.4	19.2	18.2	15	29.4	18.2	47.7	15.2
HCM Lane LOS	C	F	C	C	C	B	D	C	E	C
HCM 95th-tile Q	1.4	10.3	2.6	1.7	1.7	0.4	4.1	1.4	7.5	1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	62	176	82	398	416	610	74	360	144	197	429	44
Future Volume (veh/h)	62	176	82	398	416	610	74	360	144	197	429	44
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	67	191	46	433	452	500	80	391	103	214	466	47
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	96	765	341	521	849	719	123	683	305	292	677	68
Arrive On Green	0.05	0.22	0.22	0.29	0.45	0.45	0.07	0.19	0.19	0.08	0.21	0.21
Sat Flow, veh/h	1781	3554	1585	1781	1870	1585	1781	3554	1585	3456	3261	328
Grp Volume(v), veh/h	67	191	46	433	452	500	80	391	103	214	253	260
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1870	1585	1781	1777	1585	1728	1777	1811
Q Serve(g_s), s	4.8	5.8	3.0	29.5	22.6	32.7	5.7	13.0	7.3	7.9	17.1	17.3
Cycle Q Clear(g_c), s	4.8	5.8	3.0	29.5	22.6	32.7	5.7	13.0	7.3	7.9	17.1	17.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.18
Lane Grp Cap(c), veh/h	96	765	341	521	849	719	123	683	305	292	369	376
V/C Ratio(X)	0.70	0.25	0.13	0.83	0.53	0.70	0.65	0.57	0.34	0.73	0.69	0.69
Avail Cap(c_a), veh/h	96	765	341	521	849	719	123	683	305	292	369	376
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	60.5	42.3	41.2	43.0	25.6	28.3	59.0	47.6	45.4	58.1	47.6	47.6
Incr Delay (d2), s/veh	20.0	0.2	0.2	11.0	0.6	2.9	11.3	1.2	0.6	9.1	5.2	5.3
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(95%),veh/ln	4.9	4.7	2.2	20.5	15.1	18.6	5.3	9.8	5.3	6.8	12.7	13.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	80.4	42.5	41.4	54.0	26.2	31.2	70.3	48.8	46.0	67.1	52.8	52.9
LnGrp LOS	F	D	D	D	C	C	E	D	D	E	D	D
Approach Vol, veh/h		304			1385			574			727	
Approach Delay, s/veh		50.7			36.7			51.3			57.1	
Approach LOS		D			D			D			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	41.8	26.8	17.0	27.9	13.1	55.6	14.6	30.3
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	40.0	30.0	13.0	27.0	9.0	61.0	11.0	29.0
Max Q Clear Time (g_c+I1), s	31.5	8.8	10.9	16.0	7.8	35.7	8.7	20.3
Green Ext Time (p_c), s	1.1	1.0	0.2	1.7	0.0	4.4	0.0	1.4

Intersection Summary	
HCM 6th Ctrl Delay	45.9
HCM 6th LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	14	405	96	48	866	24	495	4	79	33	8	82
Future Volume (veh/h)	14	405	96	48	866	24	495	4	79	33	8	82
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	15	440	61	52	941	15	538	4	85	36	9	88
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	59	1185	528	139	1343	599	593	23	493	356	81	564
Arrive On Green	0.03	0.33	0.33	0.08	0.38	0.38	0.36	0.36	0.36	0.36	0.36	0.36
Sat Flow, veh/h	1781	3554	1585	1781	3554	1585	1442	65	1387	799	229	1585
Grp Volume(v), veh/h	15	440	61	52	941	15	538	0	89	45	0	88
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1777	1585	1442	0	1452	1028	0	1585
Q Serve(g_s), s	0.7	8.5	2.4	2.5	20.2	0.5	29.0	0.0	3.8	1.5	0.0	3.4
Cycle Q Clear(g_c), s	0.7	8.5	2.4	2.5	20.2	0.5	32.0	0.0	3.8	10.6	0.0	3.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.96	0.80		1.00
Lane Grp Cap(c), veh/h	59	1185	528	139	1343	599	593	0	516	437	0	564
V/C Ratio(X)	0.25	0.37	0.12	0.38	0.70	0.03	0.91	0.00	0.17	0.10	0.00	0.16
Avail Cap(c_a), veh/h	59	1185	528	139	1343	599	593	0	516	437	0	564
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	42.4	22.8	20.8	39.4	23.7	17.6	29.4	0.0	19.9	23.3	0.0	19.8
Incr Delay (d2), s/veh	2.2	0.2	0.1	1.7	1.6	0.0	17.9	0.0	0.2	0.1	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.6	6.1	1.5	2.0	12.8	0.3	20.5	0.0	2.3	1.3	0.0	2.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	44.6	23.0	20.9	41.1	25.3	17.6	47.3	0.0	20.1	23.4	0.0	19.9
LnGrp LOS	D	C	C	D	C	B	D	A	C	C	A	B
Approach Vol, veh/h		516			1008			627			133	
Approach Delay, s/veh		23.4			26.0			43.4			21.1	
Approach LOS		C			C			D			C	

Timer - Assigned Phs	1	2	4	5	6	8
Phs Duration (G+Y+Rc), s	11.5	33.3	39.0	8.3	36.5	39.0
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	9.0	32.0	34.0	5.0	36.0	34.0
Max Q Clear Time (g_c+I1), s	5.5	11.5	35.0	3.7	23.2	13.6
Green Ext Time (p_c), s	0.0	2.1	0.0	0.0	3.8	0.5

Intersection Summary	
HCM 6th Ctrl Delay	29.9
HCM 6th LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	135	329	42	49	361	213	204	571	140	181	316	174
Future Volume (veh/h)	135	329	42	49	361	213	204	571	140	181	316	174
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	147	358	45	53	392	230	222	621	87	197	343	187
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	214	858	107	125	477	276	303	817	365	267	470	251
Arrive On Green	0.12	0.27	0.27	0.07	0.22	0.22	0.17	0.23	0.23	0.15	0.21	0.21
Sat Flow, veh/h	1781	3179	397	1781	2167	1255	1781	3554	1585	1781	2236	1196
Grp Volume(v), veh/h	147	199	204	53	321	301	222	621	87	197	271	259
Grp Sat Flow(s),veh/h/ln	1781	1777	1799	1781	1777	1644	1781	1777	1585	1781	1777	1655
Q Serve(g_s), s	7.9	9.2	9.3	2.9	17.2	17.5	11.8	16.3	4.5	10.6	14.2	14.6
Cycle Q Clear(g_c), s	7.9	9.2	9.3	2.9	17.2	17.5	11.8	16.3	4.5	10.6	14.2	14.6
Prop In Lane	1.00		0.22	1.00		0.76	1.00		1.00	1.00		0.72
Lane Grp Cap(c), veh/h	214	480	486	125	391	362	303	817	365	267	373	348
V/C Ratio(X)	0.69	0.41	0.42	0.43	0.82	0.83	0.73	0.76	0.24	0.74	0.73	0.74
Avail Cap(c_a), veh/h	214	480	486	125	391	362	303	817	365	267	373	348
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	42.2	30.0	30.1	44.6	37.1	37.2	39.3	35.9	31.4	40.6	36.8	37.0
Incr Delay (d2), s/veh	8.9	0.6	0.6	2.3	13.0	15.2	8.8	4.2	0.3	10.2	6.9	8.4
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(95%),veh/ln	7.0	7.0	7.2	2.4	13.4	13.0	9.7	11.7	3.1	9.1	11.0	10.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	51.1	30.6	30.6	46.9	50.1	52.5	48.2	40.1	31.7	50.9	43.8	45.4
LnGrp LOS	D	C	C	D	D	D	D	D	C	D	D	D
Approach Vol, veh/h		550			675			930			727	
Approach Delay, s/veh		36.1			50.9			41.2			46.3	
Approach LOS		D			D			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	11.8	33.4	20.4	28.0	17.4	27.7	22.0	26.3
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	9.0	29.0	17.0	25.0	14.0	24.0	19.0	23.0
Max Q Clear Time (g_c+I1), s	15.9	12.3	13.6	19.3	10.9	20.5	14.8	17.6
Green Ext Time (p_c), s	0.0	1.3	0.2	1.7	0.1	0.9	0.3	1.1

Intersection Summary	
HCM 6th Ctrl Delay	43.8
HCM 6th LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	322	38	263	42	55	111	162	359	22	63	385	110
Future Volume (veh/h)	322	38	263	42	55	111	162	359	22	63	385	110
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	350	41	0	46	60	78	176	390	23	68	418	87
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	484	585		126	456	387	251	907	53	125	693	531
Arrive On Green	0.14	0.31	0.00	0.07	0.24	0.24	0.14	0.27	0.27	0.07	0.19	0.19
Sat Flow, veh/h	3456	1870	1585	1781	1870	1585	1781	3411	200	1781	3554	1585
Grp Volume(v), veh/h	350	41	0	46	60	78	176	203	210	68	418	87
Grp Sat Flow(s),veh/h/ln	1728	1870	1585	1781	1870	1585	1781	1777	1834	1781	1777	1585
Q Serve(g_s), s	9.7	1.5	0.0	2.5	2.5	3.9	9.4	9.4	9.5	3.7	10.7	3.9
Cycle Q Clear(g_c), s	9.7	1.5	0.0	2.5	2.5	3.9	9.4	9.4	9.5	3.7	10.7	3.9
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.11	1.00		1.00
Lane Grp Cap(c), veh/h	484	585		126	456	387	251	473	488	125	693	531
V/C Ratio(X)	0.72	0.07		0.36	0.13	0.20	0.70	0.43	0.43	0.55	0.60	0.16
Avail Cap(c_a), veh/h	484	585		126	456	387	251	473	488	125	693	531
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	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	41.1	24.1	0.0	44.3	29.5	30.1	40.9	30.4	30.4	45.0	36.7	23.4
Incr Delay (d2), s/veh	5.3	0.1	0.0	1.7	0.1	0.3	8.4	0.6	0.6	4.9	1.5	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	7.8	1.2	0.0	2.0	2.0	2.7	8.1	7.2	7.4	3.2	8.2	2.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	46.4	24.2	0.0	46.0	29.7	30.3	49.3	31.0	31.0	49.8	38.2	23.5
LnGrp LOS	D	C		D	C	C	D	C	C	D	D	C
Approach Vol, veh/h		391	A		184			589			573	
Approach Delay, s/veh		44.1			34.0			36.5			37.4	
Approach LOS		D			C			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	11.5	29.9	12.4	30.3	19.6	21.9	19.3	23.3
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	9.1	33.3	9.0	28.6	16.0	26.4	16.1	21.5
Max Q Clear Time (g_c+I1), s	5.5	4.5	6.7	12.5	12.7	6.9	12.4	13.7
Green Ext Time (p_c), s	0.0	0.1	0.0	1.4	0.5	0.4	0.2	1.4

Intersection Summary	
HCM 6th Ctrl Delay	38.2
HCM 6th LOS	D

Notes

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	5.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	89	134	190	9	14	126
Future Vol, veh/h	89	134	190	9	14	126
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	97	146	207	10	15	137

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	379	212	0	0	217	0
Stage 1	212	-	-	-	-	-
Stage 2	167	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	623	828	-	-	1353	-
Stage 1	823	-	-	-	-	-
Stage 2	863	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	616	828	-	-	1353	-
Mov Cap-2 Maneuver	616	-	-	-	-	-
Stage 1	823	-	-	-	-	-
Stage 2	853	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.4	0	0.8
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	728	1353	-
HCM Lane V/C Ratio	-	-	0.333	0.011	-
HCM Control Delay (s)	-	-	12.4	7.7	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	1.5	0	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	93	31	183	207	25	169	26	497	25	12	484	17
Future Volume (veh/h)	93	31	183	207	25	169	26	497	25	12	484	17
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	101	34	145	225	27	130	28	540	26	13	526	17
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	525	167	634	592	62	634	99	1150	55	59	1093	35
Arrive On Green	0.40	0.40	0.40	0.40	0.40	0.40	0.06	0.33	0.33	0.03	0.31	0.31
Sat Flow, veh/h	1138	418	1585	1290	155	1585	1781	3451	166	1781	3513	113
Grp Volume(v), veh/h	135	0	145	252	0	130	28	278	288	13	266	277
Grp Sat Flow(s),veh/h/ln	1556	0	1585	1445	0	1585	1781	1777	1840	1781	1777	1850
Q Serve(g_s), s	0.0	0.0	5.4	5.1	0.0	4.8	1.4	11.1	11.1	0.6	10.9	10.9
Cycle Q Clear(g_c), s	4.5	0.0	5.4	10.8	0.0	4.8	1.4	11.1	11.1	0.6	10.9	10.9
Prop In Lane	0.75		1.00	0.89		1.00	1.00		0.09	1.00		0.06
Lane Grp Cap(c), veh/h	692	0	634	654	0	634	99	592	613	59	553	576
V/C Ratio(X)	0.20	0.00	0.23	0.39	0.00	0.21	0.28	0.47	0.47	0.22	0.48	0.48
Avail Cap(c_a), veh/h	692	0	634	654	0	634	99	592	613	59	553	576
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	17.5	0.0	17.8	19.3	0.0	17.6	40.8	23.7	23.7	42.4	25.1	25.1
Incr Delay (d2), s/veh	0.1	0.0	0.2	0.4	0.0	0.2	1.5	0.6	0.6	1.8	0.6	0.6
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(95%),veh/ln	3.2	0.0	3.5	6.7	0.0	3.1	1.1	7.9	8.2	0.5	7.9	8.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	17.7	0.0	18.0	19.7	0.0	17.8	42.3	24.3	24.3	44.2	25.8	25.7
LnGrp LOS	B	A	B	B	A	B	D	C	C	D	C	C
Approach Vol, veh/h		280			382			594			556	
Approach Delay, s/veh		17.9			19.0			25.1			26.2	
Approach LOS		B			B			C			C	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	8.2	29.5		31.7	9.8	27.9		31.7
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	5.0	32.0		38.0	7.0	30.0		38.0
Max Q Clear Time (g_c+I1), s	3.6	14.1		8.4	4.4	13.9		13.8
Green Ext Time (p_c), s	0.0	2.0		1.2	0.0	1.9		1.6

Intersection Summary	
HCM 6th Ctrl Delay	23.0
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	6	119	231	83	97	6	69	24	119	26	180	21
Future Volume (veh/h)	6	119	231	83	97	6	69	24	119	26	180	21
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	7	129	169	90	105	6	75	26	96	28	196	22
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	143	430	365	196	456	26	374	373	333	68	496	58
Arrive On Green	0.08	0.23	0.23	0.11	0.26	0.26	0.21	0.21	0.21	0.17	0.17	0.17
Sat Flow, veh/h	1781	1870	1585	1781	1752	100	1781	1777	1585	400	2918	341
Grp Volume(v), veh/h	7	129	169	90	0	111	75	26	96	129	0	117
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	0	1852	1781	1777	1585	1850	0	1809
Q Serve(g_s), s	0.4	5.7	9.2	4.7	0.0	4.7	3.5	1.2	5.1	6.2	0.0	5.7
Cycle Q Clear(g_c), s	0.4	5.7	9.2	4.7	0.0	4.7	3.5	1.2	5.1	6.2	0.0	5.7
Prop In Lane	1.00		1.00	1.00		0.05	1.00		1.00	0.22		0.19
Lane Grp Cap(c), veh/h	143	430	365	196	0	482	374	373	333	315	0	308
V/C Ratio(X)	0.05	0.30	0.46	0.46	0.00	0.23	0.20	0.07	0.29	0.41	0.00	0.38
Avail Cap(c_a), veh/h	143	430	365	196	0	482	374	373	333	315	0	308
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	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	42.5	31.8	33.2	41.7	0.0	29.1	32.6	31.7	33.2	37.0	0.0	36.8
Incr Delay (d2), s/veh	0.1	0.4	0.9	1.7	0.0	0.2	0.3	0.1	0.5	0.9	0.0	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(95%),veh/ln	0.3	4.7	6.5	3.9	0.0	3.8	2.7	0.9	3.6	5.2	0.0	4.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	42.6	32.2	34.1	43.4	0.0	29.4	32.8	31.7	33.7	37.9	0.0	37.6
LnGrp LOS	D	C	C	D	A	C	C	C	C	D	A	D
Approach Vol, veh/h		305			201			197			246	
Approach Delay, s/veh		33.5			35.6			33.1			37.8	
Approach LOS		C			D			C			D	

Timer - Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		20.9	15.1	24.4		19.4	10.4	29.0
Change Period (Y+Rc), s		5.0	5.0	5.0		5.0	5.0	5.0
Max Green Setting (Gmax), s		23.0	13.0	25.0		19.0	10.0	28.0
Max Q Clear Time (g_c+I1), s		8.1	7.7	12.2		9.2	3.4	7.7
Green Ext Time (p_c), s		0.6	0.1	1.5		0.6	0.0	0.9

Intersection Summary		
HCM 6th Ctrl Delay		35.0
HCM 6th LOS		C

Notes
User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	106	0	139	280	10	9	106	294	1	1	945	161
Future Volume (veh/h)	106	0	139	280	10	9	106	294	1	1	945	161
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	115	0	124	304	11	9	115	320	0	1	1027	173
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	418	505	428	433	257	210	178	1741	0	53	1278	215
Arrive On Green	0.27	0.00	0.27	0.27	0.27	0.27	0.10	0.49	0.00	0.03	0.42	0.42
Sat Flow, veh/h	1392	1870	1585	1418	952	779	1781	3647	0	1781	3043	512
Grp Volume(v), veh/h	115	0	124	304	0	20	115	320	0	1	599	601
Grp Sat Flow(s),veh/h/ln	1392	1870	1585	1418	0	1730	1781	1777	0	1781	1777	1778
Q Serve(g_s), s	6.8	0.0	6.2	20.3	0.0	0.9	6.2	5.0	0.0	0.1	29.5	29.6
Cycle Q Clear(g_c), s	8.9	0.0	6.2	21.8	0.0	0.9	6.2	5.0	0.0	0.1	29.5	29.6
Prop In Lane	1.00		1.00	1.00		0.45	1.00		0.00	1.00		0.29
Lane Grp Cap(c), veh/h	418	505	428	433	0	467	178	1741	0	53	746	747
V/C Ratio(X)	0.28	0.00	0.29	0.70	0.00	0.04	0.65	0.18	0.00	0.02	0.80	0.80
Avail Cap(c_a), veh/h	418	505	428	433	0	467	178	1741	0	53	746	747
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	30.8	0.0	28.9	35.3	0.0	27.0	43.3	14.3	0.0	47.1	25.4	25.4
Incr Delay (d2), s/veh	0.4	0.0	0.4	5.0	0.0	0.0	7.8	0.1	0.0	0.1	6.3	6.4
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(95%),veh/ln	4.1	0.0	4.3	12.0	0.0	0.6	5.5	3.4	0.0	0.0	18.7	18.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	31.1	0.0	29.3	40.3	0.0	27.0	51.1	14.3	0.0	47.2	31.7	31.8
LnGrp LOS	C	A	C	D	A	C	D	B	A	D	C	C
Approach Vol, veh/h		239			324			435			1201	
Approach Delay, s/veh		30.2			39.5			24.1			31.8	
Approach LOS		C			D			C			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	7.6	55.2		32.2	15.5	47.3		32.2				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	5.0	51.0		29.0	12.0	44.0		29.0				
Max Q Clear Time (g_c+I1), s	3.1	8.0		11.9	9.2	32.6		24.8				
Green Ext Time (p_c), s	0.0	3.8		0.9	0.1	8.0		0.5				

Intersection Summary			
HCM 6th Ctrl Delay			31.2
HCM 6th LOS			C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	53	8	329	59	0	18	341	124	112	31	448	60
Future Volume (veh/h)	53	8	329	59	0	18	341	124	112	31	448	60
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	58	9	276	64	0	19	371	135	120	34	487	64
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	310	48	317	665	0	305	558	1152	536	96	729	95
Arrive On Green	0.20	0.20	0.20	0.19	0.00	0.19	0.16	0.34	0.34	0.05	0.23	0.23
Sat Flow, veh/h	1552	241	1585	3456	0	1585	3456	3404	1585	1781	3159	413
Grp Volume(v), veh/h	67	0	276	64	0	19	371	135	120	34	273	278
Grp Sat Flow(s),veh/h/ln	1793	0	1585	1728	0	1585	1728	1702	1585	1781	1777	1796
Q Serve(g_s), s	4.0	0.0	21.9	2.0	0.0	1.3	13.1	3.6	7.0	2.4	18.2	18.3
Cycle Q Clear(g_c), s	4.0	0.0	21.9	2.0	0.0	1.3	13.1	3.6	7.0	2.4	18.2	18.3
Prop In Lane	0.87		1.00	1.00		1.00	1.00		1.00	1.00		0.23
Lane Grp Cap(c), veh/h	359	0	317	665	0	305	558	1152	536	96	410	414
V/C Ratio(X)	0.19	0.00	0.87	0.10	0.00	0.06	0.66	0.12	0.22	0.35	0.67	0.67
Avail Cap(c_a), veh/h	359	0	317	665	0	305	558	1152	536	96	410	414
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	43.2	0.0	50.4	43.2	0.0	42.9	51.2	29.6	30.8	59.3	45.4	45.5
Incr Delay (d2), s/veh	0.2	0.0	22.1	0.1	0.0	0.1	3.0	0.0	0.2	2.2	4.1	4.2
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(95%),veh/ln	3.3	0.0	16.1	1.6	0.0	0.9	10.0	2.7	5.0	2.1	13.4	13.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	43.5	0.0	72.5	43.3	0.0	43.0	54.2	29.7	31.0	61.5	49.5	49.7
LnGrp LOS	D	A	E	D	A	D	D	C	C	E	D	D
Approach Vol, veh/h		343			83			626			585	
Approach Delay, s/veh		66.8			43.2			44.4			50.3	
Approach LOS		E			D			D			D	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	11.4	46.2		31.7	25.1	32.6		21.0
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	9.0	46.0		28.0	23.0	32.0		27.0
Max Q Clear Time (g_c+I1), s	15.4	10.0		24.9	16.1	21.3		5.0
Green Ext Time (p_c), s	0.0	1.2		0.5	1.0	1.8		0.3

Intersection Summary	
HCM 6th Ctrl Delay	51.1
HCM 6th LOS	D

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	15	490	223	746	508	197	123	346	273	353	525	19
Future Volume (veh/h)	15	490	223	746	508	197	123	346	273	353	525	19
Initial Q (Qb), veh	0	0	0	16	15	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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	16	533	133	811	552	0	134	376	188	384	571	20
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	59	734	328	1014	1658		253	569	254	530	841	29
Arrive On Green	0.03	0.41	0.21	0.29	0.93	0.00	0.07	0.16	0.16	0.15	0.24	0.24
Sat Flow, veh/h	1781	3554	1585	3456	3554	1585	3456	3554	1585	3456	3503	123
Grp Volume(v), veh/h	16	533	133	811	552	0	134	376	188	384	289	302
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1728	1777	1585	1728	1777	1585	1728	1777	1848
Q Serve(g_s), s	1.3	18.9	10.9	32.5	2.3	0.0	5.6	14.9	17.0	15.9	22.2	22.2
Cycle Q Clear(g_c), s	1.3	18.9	10.9	32.5	2.3	0.0	5.6	14.9	17.0	15.9	22.2	22.2
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.07
Lane Grp Cap(c), veh/h	59	734	328	1014	1658		253	569	254	530	426	444
V/C Ratio(X)	0.27	0.73	0.41	0.80	0.33		0.53	0.66	0.74	0.72	0.68	0.68
Avail Cap(c_a), veh/h	59	734	328	1014	1658		253	569	254	530	426	444
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.99	0.99	0.99	0.29	0.29	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	70.7	40.4	51.5	50.2	2.9	0.0	67.0	59.2	60.0	60.5	51.7	51.8
Incr Delay (d2), s/veh	2.4	6.1	3.7	1.4	0.2	0.0	2.1	2.8	11.0	4.9	4.3	4.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	9.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	1.1	11.8	8.1	20.3	1.6	0.0	4.5	11.1	12.0	11.6	15.5	16.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	73.1	46.6	55.2	60.6	3.9	0.0	69.1	62.0	71.1	65.4	56.0	55.9
LnGrp LOS	E	D	E	E	A		E	E	E	E	E	E
Approach Vol, veh/h		682			1363	A		698			975	
Approach Delay, s/veh		48.9			37.6			65.8			59.7	
Approach LOS		D			D			E			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	47.2	46.4	27.4	29.0	9.7	83.9	15.9	40.5
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	46.0	33.0	25.0	26.0	7.0	72.0	13.0	38.0
Max Q Clear Time (g_c+I1), s	15.5	21.9	18.9	20.0	4.3	5.3	8.6	25.2
Green Ext Time (p_c), s	3.0	2.3	0.9	2.1	0.0	2.6	0.2	4.2

Intersection Summary	
HCM 6th Ctrl Delay	50.8
HCM 6th LOS	D

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1171	6	0	1146	1244	0	0	75	656	108	294
Future Volume (veh/h)	0	1171	6	0	1146	1244	0	0	75	656	108	294
Initial Q (Qb), veh	0	20	0	0	30	0	0	0	0	7	7	7
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	0	1870	1870	0	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	0	1273	7	0	1246	0	0	0	82	797	0	266
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	0	2	2	2	2	2	2	2	2
Cap, veh/h	0	3738	20	0	2863		0	0	85	884	0	777
Arrive On Green	0.00	1.00	1.00	0.00	1.00	0.00	0.00	0.00	0.05	0.24	0.00	0.24
Sat Flow, veh/h	0	6915	37	0	5443	0	0	0	1585	3563	0	3170
Grp Volume(v), veh/h	0	923	357	0	1246	0	0	0	82	797	0	266
Grp Sat Flow(s),veh/h/ln	0	1609	1864	0	1702	0	0	0	1585	1781	0	1585
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.7	32.7	0.0	10.4
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.7	32.7	0.0	10.4
Prop In Lane	0.00		0.02	0.00		0.00	0.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	0	2711	1047	0	2863		0	0	85	884	0	777
V/C Ratio(X)	0.00	0.34	0.34	0.00	0.44		0.00	0.00	0.97	0.90	0.00	0.34
Avail Cap(c_a), veh/h	0	2715	1048	0	2872		0	0	85	950	0	845
HCM Platoon Ratio	1.00	2.00	2.00	1.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	0.67	0.67	0.00	1.00	0.00	0.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	70.9	55.2	0.0	47.2
Incr Delay (d2), s/veh	0.0	0.2	0.6	0.0	0.5	0.0	0.0	0.0	87.6	11.1	0.0	0.3
Initial Q Delay(d3),s/veh	0.0	0.3	0.2	0.0	1.4	0.0	0.0	0.0	0.0	4.6	0.0	0.9
%ile BackOfQ(95%),veh/ln	0.0	0.2	0.4	0.0	0.6	0.0	0.0	0.0	9.0	23.9	0.0	8.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	0.6	0.8	0.0	1.9	0.0	0.0	0.0	158.5	70.8	0.0	48.3
LnGrp LOS	A	A	A	A	A		A	A	F	E	A	D
Approach Vol, veh/h		1280			1246	A		82			1063	
Approach Delay, s/veh		0.6			1.9			158.5			65.2	
Approach LOS		A			A			F			E	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		91.4		43.6		91.4		15.0				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		83.0		42.0		83.0		10.0				
Max Q Clear Time (g_c+I1), s		3.0		35.7		3.0		10.7				
Green Ext Time (p_c), s		16.8		2.9		17.5		0.0				

Intersection Summary			
HCM 6th Ctrl Delay			23.3
HCM 6th LOS			C

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1161	180	0	2059	655	418	0	1025	0	0	0
Future Volume (veh/h)	0	1161	180	0	2059	655	418	0	1025	0	0	0
Initial Q (Qb), veh	0	25	0	0	80	0	8	0	36			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	0	1870	1870	0	1870	1870	1870	0	1870			
Adj Flow Rate, veh/h	0	1262	0	0	2238	0	454	0	897			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	0	2	2	0	2	2	2	0	2			
Cap, veh/h	0	3142		0	3321		533	0	1130			
Arrive On Green	0.00	1.00	0.00	0.00	1.00	0.00	0.29	0.00	0.29			
Sat Flow, veh/h	0	5274	1585	0	5611	1585	1781	0	3614			
Grp Volume(v), veh/h	0	1262	0	0	2238	0	454	0	897			
Grp Sat Flow(s),veh/h/ln	0	1702	1585	0	1870	1585	1781	0	1205			
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	0.0	36.6	0.0	35.3			
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	0.0	0.0	36.6	0.0	35.3			
Prop In Lane	0.00		1.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	0	3142		0	3321		533	0	1130			
V/C Ratio(X)	0.00	0.40		0.00	0.67		0.85	0.00	0.79			
Avail Cap(c_a), veh/h	0	3167		0	3480		641	0	1301			
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.00	1.00	0.00	0.00	0.64	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	50.7	0.0	49.8			
Incr Delay (d2), s/veh	0.0	0.4	0.0	0.0	0.7	0.0	9.3	0.0	3.0			
Initial Q Delay(d3),s/veh	0.0	0.8	0.0	0.0	12.8	0.0	11.0	0.0	35.4			
%ile BackOfQ(95%),veh/ln	0.0	0.4	0.0	0.0	4.3	0.0	27.8	0.0	22.5			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	1.1	0.0	0.0	13.5	0.0	70.9	0.0	88.3			
LnGrp LOS	A	A		A	B		E	A	F			
Approach Vol, veh/h		1262	A		2238	A		1351				
Approach Delay, s/veh		1.1			13.5			82.4				
Approach LOS		A			B			F				
Timer - Assigned Phs		2				6		8				
Phs Duration (G+Y+Rc), s		100.0				100.0		50.0				
Change Period (Y+Rc), s		5.0				5.0		5.0				
Max Green Setting (Gmax), s		84.0				84.0		56.0				
Max Q Clear Time (g_c+I1), s		3.0				3.0		39.6				
Green Ext Time (p_c), s		33.1				70.3		5.4				
Intersection Summary												
HCM 6th Ctrl Delay			29.5									
HCM 6th LOS			C									

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	373	1729	22	4	1604	172	393	33	166	171	12	611
Future Volume (veh/h)	373	1729	22	4	1604	172	393	33	166	171	12	611
Initial Q (Qb), veh	16	30	0	0	60	0	10	10	0	0	0	16
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	405	1879	0	4	1743	122	453	0	126	195	0	664
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	495	2712		524	2617	636	562	0	283	333	0	753
Arrive On Green	0.13	0.75	0.00	0.19	0.88	0.44	0.15	0.00	0.15	0.09	0.00	0.09
Sat Flow, veh/h	3456	7111	1585	3456	7111	1585	3563	0	1585	3563	0	3170
Grp Volume(v), veh/h	405	1879	0	4	1743	122	453	0	126	195	0	664
Grp Sat Flow(s),veh/h/ln	1728	1778	1585	1728	1778	1585	1781	0	1585	1781	0	1585
Q Serve(g_s), s	17.3	20.7	0.0	0.1	8.3	7.0	18.6	0.0	11.0	7.9	0.0	14.0
Cycle Q Clear(g_c), s	17.3	20.7	0.0	0.1	8.3	7.0	18.6	0.0	11.0	7.9	0.0	14.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	495	2712		524	2617	636	562	0	283	333	0	753
V/C Ratio(X)	0.82	0.69		0.01	0.67	0.19	0.81	0.00	0.45	0.59	0.00	0.88
Avail Cap(c_a), veh/h	576	2987		673	3147	701	879	0	391	333	0	705
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.70	0.70	0.00	0.81	0.81	0.81	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	63.7	13.9	0.0	54.4	18.3	29.5	61.8	0.0	55.2	65.2	0.0	56.6
Incr Delay (d2), s/veh	5.7	1.0	0.0	0.0	1.1	0.5	3.1	0.0	1.1	2.7	0.0	13.1
Initial Q Delay(d3),s/veh	41.6	2.9	0.0	0.0	11.3	0.0	11.8	0.0	0.0	0.0	0.0	27.6
%ile BackOfQ(95%),veh/ln	16.2	8.5	0.0	0.1	14.7	5.3	15.5	0.0	7.8	6.7	0.0	24.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	111.0	17.8	0.0	54.4	30.7	30.0	76.6	0.0	56.3	67.9	0.0	97.3
LnGrp LOS	F	B		D	C	C	E	A	E	E	A	F
Approach Vol, veh/h		2284	A		1869			579			859	
Approach Delay, s/veh		34.3			30.7			72.2			90.6	
Approach LOS		C			C			E			F	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	36.2	63.5		29.3	26.4	73.4		21.0				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	10.0	65.0		39.0	27.0	48.0		16.0				
Max Q Clear Time (g_c+I1), s	13.1	23.7		21.6	20.3	11.3		17.0				
Green Ext Time (p_c), s	0.0	34.8		2.7	1.0	30.4		0.0				

Intersection Summary		
HCM 6th Ctrl Delay		45.7
HCM 6th LOS		D

Notes

User approved volume balancing among the lanes for turning movement.

User approved changes to right turn type.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	91	2044	23	3	899	196	245	60	27	602	10	650
Future Volume (veh/h)	91	2044	23	3	899	196	245	60	27	602	10	650
Initial Q (Qb), veh	0	50	0	0	20	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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	99	2222	14	3	977	131	266	65	24	654	0	606
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	126	3595	801	2	3270	729	281	80	67	978	0	620
Arrive On Green	0.04	1.00	1.00	0.00	0.92	0.92	0.16	0.04	0.04	0.27	0.00	0.16
Sat Flow, veh/h	3456	7111	1585	3456	7111	1585	1781	1870	1585	3563	0	3170
Grp Volume(v), veh/h	99	2222	14	3	977	131	266	65	24	654	0	606
Grp Sat Flow(s),veh/h/ln	1728	1778	1585	1728	1778	1585	1781	1870	1585	1781	0	1585
Q Serve(g_s), s	4.3	0.0	0.0	0.1	2.3	0.4	22.2	5.2	2.1	24.5	0.0	20.7
Cycle Q Clear(g_c), s	4.3	0.0	0.0	0.1	2.3	0.4	22.2	5.2	2.1	24.5	0.0	20.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	126	3595	801	2	3270	729	281	80	67	978	0	620
V/C Ratio(X)	0.79	0.62	0.02	1.30	0.30	0.18	0.95	0.82	0.36	0.67	0.00	0.98
Avail Cap(c_a), veh/h	599	3595	801	184	3270	729	344	262	222	978	0	771
HCM Platoon Ratio	1.00	2.00	2.00	1.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.87	0.87	0.87	0.99	0.99	0.99	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	71.7	0.0	0.0	75.0	3.4	0.4	62.5	71.2	61.7	48.3	0.0	35.6
Incr Delay (d2), s/veh	9.1	0.7	0.0	388.2	0.2	0.5	31.4	17.9	3.2	1.8	0.0	24.4
Initial Q Delay(d3),s/veh	0.0	3.6	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	3.7	1.2	0.0	0.3	1.6	0.9	18.3	5.2	1.7	16.5	0.0	15.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	80.8	4.3	0.0	463.2	4.1	1.0	93.9	89.1	64.9	50.1	0.0	60.0
LnGrp LOS	F	A	A	F	A	A	F	F	E	D	A	E
Approach Vol, veh/h		2335			1111			355			1260	
Approach Delay, s/veh		7.6			4.9			91.1			54.9	
Approach LOS		A			A			F			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	5.6	82.8	48.2	13.4	12.5	76.0	30.7	30.9
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	10.0	56.0	41.0	23.0	28.0	38.0	31.0	33.0
Max Q Clear Time (g_c+I1), s	3.1	3.0	27.5	8.2	7.3	5.3	25.2	23.7
Green Ext Time (p_c), s	0.0	48.0	2.6	0.2	0.3	16.5	0.5	2.2

Intersection Summary	
HCM 6th Ctrl Delay	24.6
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	2520	3	4	1043	36	98
Future Volume (veh/h)	2520	3	4	1043	36	98
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	2739	3	4	1134	39	85
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	5202	6	36	6398	111	98
Arrive On Green	1.00	1.00	0.04	1.00	0.06	0.06
Sat Flow, veh/h	6949	7	1781	7930	1781	1585
Grp Volume(v), veh/h	1976	766	4	1134	39	85
Grp Sat Flow(s),veh/h/ln	1609	1869	1781	1515	1781	1585
Q Serve(g_s), s	0.0	0.0	0.3	0.0	3.1	8.0
Cycle Q Clear(g_c), s	0.0	0.0	0.3	0.0	3.1	8.0
Prop In Lane		0.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	3754	1454	36	6398	111	98
V/C Ratio(X)	0.53	0.53	0.11	0.18	0.35	0.86
Avail Cap(c_a), veh/h	3754	1454	95	6398	333	296
HCM Platoon Ratio	2.00	2.00	2.00	2.00	1.00	1.00
Upstream Filter(I)	0.74	0.74	0.97	0.97	1.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	70.7	0.0	67.5	69.7
Incr Delay (d2), s/veh	0.4	1.0	1.3	0.1	1.9	19.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.2	0.7	0.3	0.0	2.7	6.8
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.4	1.0	72.1	0.1	69.4	88.8
LnGrp LOS	A	A	E	A	E	F
Approach Vol, veh/h	2742			1138	124	
Approach Delay, s/veh	0.6			0.3	82.7	
Approach LOS	A			A	F	

Timer - Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	10.0	123.7				133.7		16.3
Change Period (Y+Rc), s	5.0	5.0				5.0		5.0
Max Green Setting (Gmax), s	10.0	95.0				110.0		30.0
Max Q Clear Time (g_c+I1), s	2.3	3.0				3.0		11.0
Green Ext Time (p_c), s	0.0	85.9				34.9		0.4

Intersection Summary		
HCM 6th Ctrl Delay		3.0
HCM 6th LOS		A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑↑↑	↱	↰	↑↑↑↱		↰	↰↑	↱		↰↑	↱
Traffic Volume (veh/h)	9	2191	495	61	777	2	282	0	164	12	3	15
Future Volume (veh/h)	9	2191	495	61	777	2	282	0	164	12	3	15
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	10	2382	375	66	845	2	307	0	156	13	3	11
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	36	4160	1025	78	4474	11	406	0	181	13	3	15
Arrive On Green	0.03	0.86	0.86	0.09	1.00	1.00	0.11	0.00	0.11	0.01	0.01	0.01
Sat Flow, veh/h	1781	6434	1585	1781	6677	16	3563	0	1585	1460	337	1585
Grp Volume(v), veh/h	10	2382	375	66	611	236	307	0	156	16	0	11
Grp Sat Flow(s),veh/h/ln	1781	1609	1585	1781	1609	1868	1781	0	1585	1797	0	1585
Q Serve(g_s), s	0.8	15.3	7.3	5.5	0.0	0.0	12.5	0.0	14.5	1.3	0.0	1.0
Cycle Q Clear(g_c), s	0.8	15.3	7.3	5.5	0.0	0.0	12.5	0.0	14.5	1.3	0.0	1.0
Prop In Lane	1.00		1.00	1.00		0.01	1.00		1.00	0.81		1.00
Lane Grp Cap(c), veh/h	36	4160	1025	78	3234	1251	406	0	181	16	0	15
V/C Ratio(X)	0.28	0.57	0.37	0.85	0.19	0.19	0.76	0.00	0.86	0.97	0.00	0.76
Avail Cap(c_a), veh/h	95	4160	1025	143	3234	1251	618	0	275	96	0	85
HCM Platoon Ratio	1.33	1.33	1.33	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.84	0.84	0.84	0.97	0.97	0.97	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	71.9	4.8	4.2	68.0	0.0	0.0	64.4	0.0	65.3	74.3	0.0	74.1
Incr Delay (d2), s/veh	3.5	0.5	0.8	21.0	0.1	0.3	2.9	0.0	16.0	94.9	0.0	55.2
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(95%),veh/ln	0.7	5.9	3.8	5.1	0.1	0.2	9.9	0.0	10.9	1.9	0.0	1.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	75.5	5.3	5.1	89.0	0.1	0.3	67.3	0.0	81.3	169.2	0.0	129.3
LnGrp LOS	E	A	A	F	A	A	E	A	F	F	A	F
Approach Vol, veh/h		2767			913			463			27	
Approach Delay, s/veh		5.5			6.6			72.0			152.9	
Approach LOS		A			A			E			F	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	13.5	104.0		8.4	10.0	107.5		24.1
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	14.0	78.0		10.0	10.0	82.0		28.0
Max Q Clear Time (g_c+I1), s	2.8	18.3		4.3	3.8	3.0		17.5
Green Ext Time (p_c), s	0.1	56.4		0.0	0.0	16.6		1.6

Intersection Summary	
HCM 6th Ctrl Delay	14.1
HCM 6th LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	116	1780	445	315	550	233	132	241	281	474	418	129
Future Volume (veh/h)	116	1780	445	315	550	233	132	241	281	474	418	129
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	2067	1870	1870	2067	1870
Adj Flow Rate, veh/h	126	1935	430	342	598	231	143	262	283	515	454	86
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	139	1844	518	333	2456	690	581	314	280	484	518	209
Arrive On Green	0.08	0.65	0.33	0.19	0.87	0.44	0.17	0.16	0.16	0.14	0.13	0.13
Sat Flow, veh/h	1781	5644	1585	1781	5644	1585	3456	1964	1752	3456	3928	1585
Grp Volume(v), veh/h	126	1935	430	342	598	231	143	262	283	515	454	86
Grp Sat Flow(s),veh/h/ln	1781	1881	1585	1781	1881	1585	1728	1964	1752	1728	1964	1585
Q Serve(g_s), s	10.5	49.0	37.6	28.0	2.6	8.4	5.4	19.4	24.0	21.0	17.0	5.3
Cycle Q Clear(g_c), s	10.5	49.0	37.6	28.0	2.6	8.4	5.4	19.4	24.0	21.0	17.0	5.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	139	1844	518	333	2456	690	581	314	280	484	518	209
V/C Ratio(X)	0.90	1.05	0.83	1.03	0.24	0.33	0.25	0.83	1.01	1.06	0.88	0.41
Avail Cap(c_a), veh/h	226	1844	518	333	2456	690	581	314	280	484	890	359
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.77	0.77	0.77	1.00	1.00	1.00	0.89	0.89	0.89	1.00	1.00	1.00
Uniform Delay (d), s/veh	68.6	26.0	46.7	61.0	5.7	9.6	54.1	61.1	63.0	64.5	63.9	30.0
Incr Delay (d2), s/veh	19.9	33.1	11.4	56.9	0.2	1.3	0.2	15.6	53.2	59.2	5.2	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(95%),veh/ln	8.9	26.6	22.0	25.0	1.8	5.5	4.3	16.1	20.8	19.7	13.7	5.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	88.4	59.1	58.1	117.9	5.9	10.9	54.3	76.7	116.2	123.7	69.2	31.3
LnGrp LOS	F	F	E	F	A	B	D	E	F	F	E	C
Approach Vol, veh/h		2491			1171			688			1055	
Approach Delay, s/veh		60.4			39.6			88.3			92.7	
Approach LOS		E			D			F			F	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	28.0	31.0	18.7	72.3	32.2	26.8	35.0	56.0
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	23.0	26.0	21.0	60.0	13.0	36.0	30.0	51.0
Max Q Clear Time (g_c+I1), s	24.0	27.0	13.5	11.4	8.4	20.0	31.0	52.0
Green Ext Time (p_c), s	0.0	0.0	0.2	11.4	0.2	1.8	0.0	0.0

Intersection Summary	
HCM 6th Ctrl Delay	65.7
HCM 6th LOS	E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	564	990	226	134	539	157	145	279	128	262	206	215
Future Volume (veh/h)	564	990	226	134	539	157	145	279	128	262	206	215
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	613	1076	137	146	586	106	158	303	85	285	224	158
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	675	1221	545	176	1017	316	188	1424	442	323	1623	504
Arrive On Green	0.20	0.34	0.34	0.05	0.20	0.20	0.05	0.28	0.28	0.09	0.32	0.32
Sat Flow, veh/h	3456	3554	1585	3456	5106	1585	3456	5106	1585	3456	5106	1585
Grp Volume(v), veh/h	613	1076	137	146	586	106	158	303	85	285	224	158
Grp Sat Flow(s),veh/h/ln	1728	1777	1585	1728	1702	1585	1728	1702	1585	1728	1702	1585
Q Serve(g_s), s	20.8	34.2	7.5	5.0	12.5	6.9	5.4	5.5	4.9	9.8	3.8	9.1
Cycle Q Clear(g_c), s	20.8	34.2	7.5	5.0	12.5	6.9	5.4	5.5	4.9	9.8	3.8	9.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	675	1221	545	176	1017	316	188	1424	442	323	1623	504
V/C Ratio(X)	0.91	0.88	0.25	0.83	0.58	0.34	0.84	0.21	0.19	0.88	0.14	0.31
Avail Cap(c_a), veh/h	893	1421	634	288	1149	357	288	1424	442	461	1623	504
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	47.2	37.1	28.3	56.4	43.5	41.2	56.2	33.2	33.0	53.7	29.2	31.0
Incr Delay (d2), s/veh	10.7	6.1	0.2	10.1	0.6	0.6	12.5	0.3	1.0	13.5	0.2	1.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	14.8	21.5	5.0	4.3	8.9	4.8	4.7	4.0	3.5	8.3	2.7	6.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	57.9	43.2	28.5	66.6	44.0	41.9	68.7	33.5	33.9	67.2	29.4	32.6
LnGrp LOS	E	D	C	E	D	D	E	C	C	E	C	C
Approach Vol, veh/h		1826			838			546			667	
Approach Delay, s/veh		47.0			47.7			43.8			46.3	
Approach LOS		D			D			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	18.2	40.5	13.1	48.2	13.5	45.1	30.4	30.9
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	18.0	20.0	12.0	50.0	12.0	26.0	33.0	29.0
Max Q Clear Time (g_c+I1), s	22.8	8.5	8.0	37.2	8.4	12.1	23.8	15.5
Green Ext Time (p_c), s	0.4	1.5	0.1	6.0	0.1	1.5	1.6	3.3

Intersection Summary	
HCM 6th Ctrl Delay	46.6
HCM 6th LOS	D

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	115	239	379	188	674	887
Future Volume (veh/h)	115	239	379	188	674	887
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	125	151	412	202	733	964
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	277	933	412	200	772	2448
Arrive On Green	0.16	0.16	0.18	0.18	0.43	0.69
Sat Flow, veh/h	1781	1585	2414	1125	1781	3647
Grp Volume(v), veh/h	125	151	314	300	733	964
Grp Sat Flow(s),veh/h/ln	1781	1585	1777	1668	1781	1777
Q Serve(g_s), s	5.7	3.9	15.9	16.0	35.7	10.4
Cycle Q Clear(g_c), s	5.7	3.9	15.9	16.0	35.7	10.4
Prop In Lane	1.00	1.00		0.67	1.00	
Lane Grp Cap(c), veh/h	277	933	316	297	772	2448
V/C Ratio(X)	0.45	0.16	1.00	1.01	0.95	0.39
Avail Cap(c_a), veh/h	277	933	316	297	772	2448
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	34.5	8.4	37.0	37.0	24.6	6.0
Incr Delay (d2), s/veh	1.1	0.1	49.3	54.9	21.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	4.6	2.3	16.2	16.1	24.6	5.1
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	35.7	8.5	86.3	91.9	45.6	6.1
LnGrp LOS	D	A	F	F	D	A
Approach Vol, veh/h	276		614			1697
Approach Delay, s/veh	20.8		89.0			23.1
Approach LOS	C		F			C

Timer - Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	45.2	23.0				68.2		17.6
Change Period (Y+Rc), s	5.0	5.0				5.0		5.0
Max Green Setting (Gmax), s	41.0	18.0				64.0		16.0
Max Q Clear Time (g_c+I1), s	37.7	19.0				13.4		8.7
Green Ext Time (p_c), s	0.7	0.0				7.6		0.5

Intersection Summary		
HCM 6th Ctrl Delay		38.5
HCM 6th LOS		D

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Volume (veh/h)	477	137	44	246	87	36
Future Volume (veh/h)	477	137	44	246	87	36
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	518	95	48	267	95	28
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	1125	502	178	1895	416	370
Arrive On Green	0.32	0.32	0.10	0.53	0.23	0.23
Sat Flow, veh/h	3647	1585	1781	3647	1781	1585
Grp Volume(v), veh/h	518	95	48	267	95	28
Grp Sat Flow(s),veh/h/ln	1777	1585	1781	1777	1781	1585
Q Serve(g_s), s	7.0	2.6	1.5	2.3	2.6	0.8
Cycle Q Clear(g_c), s	7.0	2.6	1.5	2.3	2.6	0.8
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	1125	502	178	1895	416	370
V/C Ratio(X)	0.46	0.19	0.27	0.14	0.23	0.08
Avail Cap(c_a), veh/h	1125	502	178	1895	416	370
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	16.4	14.9	25.0	7.1	18.6	18.0
Incr Delay (d2), s/veh	0.3	0.2	0.8	0.0	0.3	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	4.5	1.5	1.1	1.2	1.9	1.5
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	16.7	15.1	25.8	7.1	18.9	18.0
LnGrp LOS	B	B	C	A	B	B
Approach Vol, veh/h	613			315	123	
Approach Delay, s/veh	16.4			9.9	18.7	
Approach LOS	B			A	B	

Timer - Assigned Phs		2		4	5	6
Phs Duration (G+Y+Rc), s		32.2		15.5	10.4	21.8
Change Period (Y+Rc), s		5.0		5.0	5.0	5.0
Max Green Setting (Gmax), s		34.0		16.0	8.0	21.0
Max Q Clear Time (g_c+I1), s		5.3		5.6	4.5	10.0
Green Ext Time (p_c), s		1.6		0.2	0.0	2.7

Intersection Summary			
HCM 6th Ctrl Delay			14.8
HCM 6th LOS			B

Intersection	
Intersection Delay, s/veh	20.9
Intersection LOS	C

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	184	194	203	358	214	278
Future Vol, veh/h	184	194	203	358	214	278
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	200	211	221	389	233	302
Number of Lanes	2	1	2	0	1	2

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	3	2
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	2	0	3
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	3	3	0
HCM Control Delay	12.1	31.9	15
HCM LOS	B	D	B

Lane	NBLn1	NBLn2	WBLn1	WBLn2	WBLn3	SBLn1	SBLn2	SBLn3
Vol Left, %	0%	0%	100%	45%	0%	100%	0%	0%
Vol Thru, %	100%	16%	0%	0%	0%	0%	100%	100%
Vol Right, %	0%	84%	0%	55%	100%	0%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	135	426	123	135	120	214	139	139
LT Vol	0	0	123	61	0	214	0	0
Through Vol	135	68	0	0	0	0	139	139
RT Vol	0	358	0	74	120	0	0	0
Lane Flow Rate	147	463	133	147	131	233	151	151
Geometry Grp	8	8	7	7	7	8	8	8
Degree of Util (X)	0.298	0.86	0.296	0.299	0.182	0.517	0.314	0.24
Departure Headway (Hd)	7.294	6.695	7.998	7.331	5.01	8.004	7.493	5.723
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	493	541	451	490	715	451	480	627
Service Time	5.033	4.433	5.733	5.066	2.744	5.746	5.235	3.464
HCM Lane V/C Ratio	0.298	0.856	0.295	0.3	0.183	0.517	0.315	0.241
HCM Control Delay	13.1	37.9	14.1	13.2	8.9	19	13.6	10.3
HCM Lane LOS	B	E	B	B	A	C	B	B
HCM 95th-tile Q	1.2	9.3	1.2	1.2	0.7	2.9	1.3	0.9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	309	119	121	1157	748	220
Future Volume (veh/h)	309	119	121	1157	748	220
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	336	75	132	1258	813	237
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	395	351	139	2670	1247	361
Arrive On Green	0.22	0.22	0.08	0.52	0.32	0.32
Sat Flow, veh/h	1781	1585	1781	5274	4100	1138
Grp Volume(v), veh/h	336	75	132	1258	703	347
Grp Sat Flow(s),veh/h/ln	1781	1585	1781	1702	1702	1666
Q Serve(g_s), s	9.9	2.1	4.0	8.5	9.7	9.8
Cycle Q Clear(g_c), s	9.9	2.1	4.0	8.5	9.7	9.8
Prop In Lane	1.00	1.00	1.00			0.68
Lane Grp Cap(c), veh/h	395	351	139	2670	1080	528
V/C Ratio(X)	0.85	0.21	0.95	0.47	0.65	0.66
Avail Cap(c_a), veh/h	1073	954	488	4938	1925	942
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	20.5	17.4	25.2	8.3	16.1	16.1
Incr Delay (d2), s/veh	5.2	0.3	25.1	0.1	0.7	1.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	7.7	0.1	4.4	3.7	5.6	5.7
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	25.7	17.7	50.3	8.4	16.8	17.5
LnGrp LOS	C	B	D	A	B	B
Approach Vol, veh/h	411			1390	1050	
Approach Delay, s/veh	24.2			12.4	17.0	
Approach LOS	C			B	B	
Timer - Assigned Phs		2		4	5	6
Phs Duration (G+Y+Rc), s		35.7		19.1	11.3	24.4
Change Period (Y+Rc), s		5.0		5.0	5.0	5.0
Max Green Setting (Gmax), s		55.0		35.0	17.0	33.0
Max Q Clear Time (g_c+I1), s		11.5		12.9	7.0	12.8
Green Ext Time (p_c), s		10.8		1.3	0.2	6.5

Intersection Summary		
HCM 6th Ctrl Delay		15.8
HCM 6th LOS		B

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	17	944	73	62	461	36	102	63	142	26	65	7
Future Volume (veh/h)	17	944	73	62	461	36	102	63	142	26	65	7
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	18	1026	52	67	501	23	111	68	89	28	71	8
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	74	1451	647	148	1599	713	148	421	357	89	316	36
Arrive On Green	0.04	0.41	0.41	0.08	0.45	0.45	0.08	0.22	0.22	0.05	0.19	0.19
Sat Flow, veh/h	1781	3554	1585	1781	3554	1585	1781	1870	1585	1781	1651	186
Grp Volume(v), veh/h	18	1026	52	67	501	23	111	68	89	28	0	79
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1777	1585	1781	1870	1585	1781	0	1837
Q Serve(g_s), s	1.2	28.8	2.4	4.3	10.8	1.0	7.3	3.5	5.5	1.8	0.0	4.4
Cycle Q Clear(g_c), s	1.2	28.8	2.4	4.3	10.8	1.0	7.3	3.5	5.5	1.8	0.0	4.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.10
Lane Grp Cap(c), veh/h	74	1451	647	148	1599	713	148	421	357	89	0	352
V/C Ratio(X)	0.24	0.71	0.08	0.45	0.31	0.03	0.75	0.16	0.25	0.31	0.00	0.22
Avail Cap(c_a), veh/h	74	1451	647	148	1599	713	148	421	357	89	0	352
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	0.98	0.98	0.98	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	55.7	29.5	21.7	52.4	21.1	18.4	53.8	37.4	38.2	55.0	0.0	41.0
Incr Delay (d2), s/veh	1.7	2.9	0.2	2.1	0.5	0.1	18.7	0.2	0.4	2.0	0.0	0.3
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(95%),veh/ln	1.0	18.0	1.7	3.5	7.8	0.7	7.3	3.0	3.9	1.5	0.0	3.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	57.3	32.5	22.0	54.5	21.6	18.5	72.4	37.6	38.5	57.0	0.0	41.3
LnGrp LOS	E	C	C	D	C	B	E	D	D	E	A	D
Approach Vol, veh/h		1096			591			268			107	
Approach Delay, s/veh		32.4			25.2			52.3			45.4	
Approach LOS		C			C			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	13.8	69.8	10.5	25.8	9.6	74.0	15.6	20.8
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	12.0	51.0	8.0	29.0	7.0	56.0	12.0	25.0
Max Q Clear Time (g_c+I1), s	6.3	30.8	3.8	7.5	3.2	12.8	9.3	6.4
Green Ext Time (p_c), s	0.1	5.1	0.0	0.6	0.0	2.3	0.1	0.2

Intersection Summary			
HCM 6th Ctrl Delay			33.6
HCM 6th LOS			C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑↑	↱	↰↰	↑↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Traffic Volume (veh/h)	165	951	91	544	782	285	130	183	339	316	219	50
Future Volume (veh/h)	165	951	91	544	782	285	130	183	339	316	219	50
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	179	1034	61	591	850	201	141	199	232	343	238	21
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	612	1755	545	600	1736	539	143	459	480	351	906	404
Arrive On Green	0.18	0.69	0.34	0.17	0.68	0.34	0.04	0.13	0.13	0.17	0.25	0.25
Sat Flow, veh/h	3456	5106	1585	3456	5106	1585	3456	3554	1585	2102	3554	1585
Grp Volume(v), veh/h	179	1034	61	591	850	201	141	199	232	343	238	21
Grp Sat Flow(s),veh/h/ln	1728	1702	1585	1728	1702	1585	1728	1777	1585	1051	1777	1585
Q Serve(g_s), s	6.7	16.0	3.9	25.6	12.0	9.3	6.1	7.7	17.9	24.4	8.0	1.0
Cycle Q Clear(g_c), s	6.7	16.0	3.9	25.6	12.0	9.3	6.1	7.7	17.9	24.4	8.0	1.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	612	1755	545	600	1736	539	143	459	480	351	906	404
V/C Ratio(X)	0.29	0.59	0.11	0.99	0.49	0.37	0.99	0.43	0.48	0.98	0.26	0.05
Avail Cap(c_a), veh/h	612	1755	545	622	1736	539	184	770	618	406	1256	560
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.72	0.72	0.72	1.00	1.00	1.00	0.97	0.97	0.97	1.00	1.00	1.00
Uniform Delay (d), s/veh	53.6	17.9	33.6	61.8	17.8	15.6	71.9	60.2	42.7	62.2	44.6	19.1
Incr Delay (d2), s/veh	0.2	1.1	0.3	32.0	1.0	2.0	55.5	0.6	0.7	36.6	0.2	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	5.3	7.5	2.9	19.8	6.8	6.7	6.9	6.4	11.5	13.0	6.5	1.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	53.7	18.9	33.9	93.8	18.7	17.6	127.4	60.9	43.4	98.8	44.8	19.2
LnGrp LOS	D	B	C	F	B	B	F	E	D	F	D	B
Approach Vol, veh/h		1274			1642			572			602	
Approach Delay, s/veh		24.5			45.6			70.2			74.7	
Approach LOS		C			D			E			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	33.0	58.5	32.0	26.4	33.6	58.0	13.2	45.2
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	29.0	36.0	31.0	34.5	12.0	53.0	10.0	55.0
Max Q Clear Time (g_c+I1), s	27.6	18.0	26.4	19.9	8.7	14.0	8.1	10.0
Green Ext Time (p_c), s	0.4	5.1	0.7	1.5	0.2	5.5	0.1	1.2

Intersection Summary	
HCM 6th Ctrl Delay	46.8
HCM 6th LOS	D

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	1136	907	0	1046	878
Future Volume (veh/h)	0	1136	907	0	1046	878
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	0	1870	1870	0	1870	1870
Adj Flow Rate, veh/h	0	1171	935	0	1078	699
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	2	2	0	2	2
Cap, veh/h	0	2732	2732		1284	1037
Arrive On Green	0.00	1.00	1.00	0.00	0.37	0.37
Sat Flow, veh/h	0	5443	5443	0	3456	2790
Grp Volume(v), veh/h	0	1171	935	0	1078	699
Grp Sat Flow(s),veh/h/ln	0	1702	1702	0	1728	1395
Q Serve(g_s), s	0.0	0.0	0.0	0.0	42.7	31.5
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	42.7	31.5
Prop In Lane	0.00			0.00	1.00	1.00
Lane Grp Cap(c), veh/h	0	2732	2732		1284	1037
V/C Ratio(X)	0.00	0.43	0.34		0.84	0.67
Avail Cap(c_a), veh/h	0	2732	2732		1797	1451
HCM Platoon Ratio	1.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	43.0	39.5
Incr Delay (d2), s/veh	0.0	0.5	0.3	0.0	2.6	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.0	0.2	0.2	0.0	25.8	16.4
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.0	0.5	0.3	0.0	45.7	40.3
LnGrp LOS	A	A	A		D	D
Approach Vol, veh/h		1171	935	A	1777	
Approach Delay, s/veh		0.5	0.3		43.5	
Approach LOS		A	A		D	

Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		87.3		62.7		87.3
Change Period (Y+Rc), s		5.0		5.0		5.0
Max Green Setting (Gmax), s		60.0		80.0		60.0
Max Q Clear Time (g_c+I1), s		2.0		44.7		2.0
Green Ext Time (p_c), s		6.8		13.0		5.0

Intersection Summary			
HCM 6th Ctrl Delay			20.2
HCM 6th LOS			C

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑			↑↑↑↑	↖↖	↱
Traffic Volume (veh/h)	1544	0	0	1009	517	648
Future Volume (veh/h)	1544	0	0	1009	517	648
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	0	0	1870	1870	1870
Adj Flow Rate, veh/h	1625	0	0	1062	701	356
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	0	0	2	2	2
Cap, veh/h	3325	0	0	4190	910	405
Arrive On Green	1.00	0.00	0.00	1.00	0.26	0.26
Sat Flow, veh/h	5443	0	0	6958	3563	1585
Grp Volume(v), veh/h	1625	0	0	1062	701	356
Grp Sat Flow(s),veh/h/ln	1702	0	0	1609	1781	1585
Q Serve(g_s), s	0.0	0.0	0.0	0.0	27.4	32.3
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	27.4	32.3
Prop In Lane		0.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	3325	0	0	4190	910	405
V/C Ratio(X)	0.49	0.00	0.00	0.25	0.77	0.88
Avail Cap(c_a), veh/h	3325	0	0	4190	1544	687
HCM Platoon Ratio	2.00	1.00	1.00	2.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	51.8	53.6
Incr Delay (d2), s/veh	0.5	0.0	0.0	0.1	1.4	7.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.3	0.0	0.0	0.1	18.2	19.8
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.5	0.0	0.0	0.1	53.2	60.6
LnGrp LOS	A	A	A	A	D	E
Approach Vol, veh/h	1625			1062	1057	
Approach Delay, s/veh	0.5			0.1	55.7	
Approach LOS	A			A	E	

Timer - Assigned Phs	2	4	6
Phs Duration (G+Y+Rc), s	104.7	45.3	104.7
Change Period (Y+Rc), s	5.0	5.0	5.0
Max Green Setting (Gmax), s	73.0	67.0	73.0
Max Q Clear Time (g_c+I1), s	2.0	34.3	2.0
Green Ext Time (p_c), s	11.5	6.0	5.9

Intersection Summary	
HCM 6th Ctrl Delay	16.0
HCM 6th LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	336	1541	367	71	1216	62	131	30	63	111	39	223
Future Volume (veh/h)	336	1541	367	71	1216	62	131	30	63	111	39	223
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	357	1639	390	76	1294	66	139	32	67	118	41	237
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	381	2402	667	448	3848	195	163	84	75	252	265	399
Arrive On Green	0.04	0.75	0.12	0.25	1.00	0.51	0.05	0.05	0.05	0.14	0.14	0.14
Sat Flow, veh/h	3456	6434	1585	1781	7483	379	3456	1777	1585	1781	1870	1585
Grp Volume(v), veh/h	357	1639	390	76	1047	313	139	32	67	118	41	237
Grp Sat Flow(s),veh/h/ln	1728	1609	1585	1781	1515	1802	1728	1777	1585	1781	1870	1585
Q Serve(g_s), s	15.5	19.7	32.6	5.0	0.0	3.8	6.0	2.6	6.3	9.1	2.9	19.7
Cycle Q Clear(g_c), s	15.5	19.7	32.6	5.0	0.0	3.8	6.0	2.6	6.3	9.1	2.9	19.7
Prop In Lane	1.00		1.00	1.00		0.21	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	381	2402	667	448	3117	927	163	84	75	252	265	399
V/C Ratio(X)	0.94	0.68	0.59	0.17	0.34	0.34	0.85	0.38	0.90	0.47	0.15	0.59
Avail Cap(c_a), veh/h	576	2402	667	448	3117	927	438	225	201	416	436	545
HCM Platoon Ratio	0.33	2.00	0.33	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.89	0.89	0.89	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	71.7	14.4	48.4	43.9	0.0	3.9	70.9	69.3	71.1	59.2	56.5	49.4
Incr Delay (d2), s/veh	17.5	1.6	3.7	0.2	0.3	0.9	11.7	2.8	27.9	1.4	0.3	1.4
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(95%),veh/ln	12.8	7.9	22.2	4.0	0.1	2.5	5.3	2.3	5.7	7.6	2.5	12.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	89.2	16.0	52.2	44.1	0.3	4.8	82.6	72.2	99.0	60.6	56.8	50.8
LnGrp LOS	F	B	D	D	A	A	F	E	F	E	E	D
Approach Vol, veh/h		2386			1436			238			396	
Approach Delay, s/veh		32.9			3.6			85.8			54.3	
Approach LOS		C			A			F			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	14.7	63.0		28.2	23.5	84.1		14.1				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	14.0	58.0		37.0	27.0	45.0		21.0				
Max Q Clear Time (g_c+I1), s	17.5	34.6		21.7	17.5	5.8		8.3				
Green Ext Time (p_c), s	0.1	11.8		1.5	1.1	7.5		0.8				

Intersection Summary			
HCM 6th Ctrl Delay			28.2
HCM 6th LOS			C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	118	848	626	310	1260	171	260	88	61	119	109	41
Future Volume (veh/h)	118	848	626	310	1260	171	260	88	61	119	109	41
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	123	883	444	323	1312	176	289	92	45	124	114	41
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.90	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	124	3675	1050	351	3683	492	316	98	83	304	127	44
Arrive On Green	0.04	1.00	0.57	0.10	1.00	0.64	0.09	0.05	0.05	0.09	0.05	0.05
Sat Flow, veh/h	3456	6434	1585	3456	5784	773	3456	1870	1585	3456	2593	894
Grp Volume(v), veh/h	123	883	444	323	1094	394	289	92	45	124	77	78
Grp Sat Flow(s),veh/h/ln	1728	1609	1585	1728	1609	1731	1728	1870	1585	1728	1777	1710
Q Serve(g_s), s	5.3	0.0	19.7	13.9	0.0	7.9	12.4	7.4	3.4	5.1	6.4	6.9
Cycle Q Clear(g_c), s	5.3	0.0	19.7	13.9	0.0	7.9	12.4	7.4	3.4	5.1	6.4	6.9
Prop In Lane	1.00		1.00	1.00		0.45	1.00		1.00	1.00		0.52
Lane Grp Cap(c), veh/h	124	3675	1050	351	3073	1103	316	98	83	304	87	84
V/C Ratio(X)	0.99	0.24	0.42	0.92	0.36	0.36	0.91	0.93	0.54	0.41	0.88	0.93
Avail Cap(c_a), veh/h	184	3675	1050	806	3073	1103	783	673	571	304	332	319
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.88	0.88	0.88	0.95	0.95	0.95	0.90	0.90	0.90	1.00	1.00	1.00
Uniform Delay (d), s/veh	72.3	0.0	11.9	66.8	0.0	5.1	67.6	70.8	46.8	64.7	70.9	71.1
Incr Delay (d2), s/veh	50.2	0.1	1.1	9.5	0.3	0.9	9.5	26.6	4.8	0.9	22.5	31.6
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(95%),veh/ln	5.8	0.1	11.3	10.6	0.2	4.6	9.7	7.5	3.2	4.1	6.3	6.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	122.5	0.1	13.0	76.3	0.3	5.9	77.1	97.4	51.6	65.6	93.4	102.6
LnGrp LOS	F	A	B	E	A	A	E	F	D	E	F	F
Approach Vol, veh/h		1450			1811			426			279	
Approach Delay, s/veh		14.4			15.1			78.8			83.6	
Approach LOS		B			B			E			F	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	12.2	92.7	20.2	14.9	12.4	102.5	20.7	14.4				
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0				
Max Green Setting (Gmax), s	37.0	27.0	10.0	56.0	10.0	54.0	36.0	30.0				
Max Q Clear Time (g_c+I1), s	15.9	21.7	7.1	9.4	7.3	9.9	14.4	8.9				
Green Ext Time (p_c), s	1.4	2.9	0.1	0.5	0.1	8.7	1.3	0.5				
Intersection Summary												
HCM 6th Ctrl Delay			26.5									
HCM 6th LOS			C									

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	564	348	490	1630	176	206
Future Volume (veh/h)	564	348	490	1630	176	206
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	613	242	533	1772	191	142
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	3202	994	579	4296	226	650
Arrive On Green	1.00	0.63	0.17	1.00	0.07	0.07
Sat Flow, veh/h	5274	1585	3456	5274	3456	2790
Grp Volume(v), veh/h	613	242	533	1772	191	142
Grp Sat Flow(s),veh/h/ln	1702	1585	1728	1702	1728	1395
Q Serve(g_s), s	0.0	10.1	22.8	0.0	8.2	6.2
Cycle Q Clear(g_c), s	0.0	10.1	22.8	0.0	8.2	6.2
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	3202	994	579	4296	226	650
V/C Ratio(X)	0.19	0.24	0.92	0.41	0.85	0.22
Avail Cap(c_a), veh/h	3202	994	991	4296	783	1100
HCM Platoon Ratio	2.00	1.00	1.00	2.00	1.00	1.00
Upstream Filter(I)	0.99	0.99	0.29	0.29	1.00	1.00
Uniform Delay (d), s/veh	0.0	12.3	61.4	0.0	69.4	46.5
Incr Delay (d2), s/veh	0.1	0.6	2.7	0.1	8.4	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.1	6.6	12.9	0.1	7.0	3.9
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.1	12.9	64.1	0.1	77.8	46.7
LnGrp LOS	A	B	E	A	E	D
Approach Vol, veh/h	855			2305	333	
Approach Delay, s/veh	3.7			14.9	64.5	
Approach LOS	A			B	E	

Timer - Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	32.1	101.1				133.2		16.8
Change Period (Y+Rc), s	5.0	5.0				5.0		5.0
Max Green Setting (Gmax), s	45.0	54.0				104.0		36.0
Max Q Clear Time (g_c+I1), s	24.8	12.1				2.0		10.2
Green Ext Time (p_c), s	2.4	4.3				13.7		1.6

Intersection Summary	
HCM 6th Ctrl Delay	16.9
HCM 6th LOS	B

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↱	↰↰	↑↑	↰↰	↱↱
Traffic Volume (veh/h)	400	156	602	832	310	501
Future Volume (veh/h)	400	156	602	832	310	501
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	435	105	654	904	337	328
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	1036	462	922	2191	922	1488
Arrive On Green	0.29	0.29	0.27	0.62	0.27	0.27
Sat Flow, veh/h	3647	1585	3456	3647	3456	2790
Grp Volume(v), veh/h	435	105	654	904	337	328
Grp Sat Flow(s),veh/h/ln	1777	1585	1728	1777	1728	1395
Q Serve(g_s), s	11.9	6.0	20.5	15.7	9.5	7.5
Cycle Q Clear(g_c), s	11.9	6.0	20.5	15.7	9.5	7.5
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	1036	462	922	2191	922	1488
V/C Ratio(X)	0.42	0.23	0.71	0.41	0.37	0.22
Avail Cap(c_a), veh/h	1036	462	922	2191	922	1488
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.83	0.83	0.99	0.99
Uniform Delay (d), s/veh	34.3	32.2	39.8	11.8	35.8	14.8
Incr Delay (d2), s/veh	1.2	1.1	2.1	0.5	0.2	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	8.9	4.3	13.1	9.3	7.0	4.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	35.6	33.4	41.9	12.3	36.0	14.9
LnGrp LOS	D	C	D	B	D	B
Approach Vol, veh/h	540			1558	665	
Approach Delay, s/veh	35.1			24.7	25.6	
Approach LOS	D			C	C	

Timer - Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	34.5	56.3				90.7		29.3
Change Period (Y+Rc), s	5.0	5.0				5.0		5.0
Max Green Setting (Gmax), s	34.0	37.0				76.0		34.0
Max Q Clear Time (g_c+I1), s	22.5	13.9				17.7		11.5
Green Ext Time (p_c), s	2.4	2.3				4.6		3.0

Intersection Summary	
HCM 6th Ctrl Delay	27.0
HCM 6th LOS	C

Intersection	
Intersection Delay, s/veh	21.5
Intersection LOS	C

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	59	342	10	87	192	44	17	267	279	32	47	108
Future Vol, veh/h	59	342	10	87	192	44	17	267	279	32	47	108
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	64	372	11	95	209	48	18	290	303	35	51	117
Number of Lanes	1	2	0	1	2	0	0	1	1	0	1	1

Approach	SE	NW	NE	SW
Opposing Approach	NW	SE	SW	NE
Opposing Lanes	3	3	2	2
Conflicting Approach Left	SW	NE	SE	NW
Conflicting Lanes Left	2	2	3	3
Conflicting Approach Right	NE	SW	NW	SE
Conflicting Lanes Right	2	2	3	3
HCM Control Delay	20.7	16.1	27.2	15.3
HCM LOS	C	C	D	C

Lane	NELn1	NELn2	NWLn1	NWLn2	NWLn3	SELn1	SELn2	SELn3	SWLn1	SWLn2
Vol Left, %	6%	0%	100%	0%	0%	100%	0%	0%	41%	0%
Vol Thru, %	94%	0%	0%	100%	59%	0%	100%	92%	59%	0%
Vol Right, %	0%	100%	0%	0%	41%	0%	0%	8%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	284	279	87	128	108	59	228	124	79	108
LT Vol	17	0	87	0	0	59	0	0	32	0
Through Vol	267	0	0	128	64	0	228	114	47	0
RT Vol	0	279	0	0	44	0	0	10	0	108
Lane Flow Rate	309	303	95	139	117	64	248	135	86	117
Geometry Grp	8	8	8	8	8	8	8	8	8	8
Degree of Util (X)	0.725	0.65	0.256	0.356	0.291	0.168	0.615	0.332	0.233	0.288
Departure Headway (Hd)	8.451	7.712	9.744	9.224	8.928	9.447	8.929	8.871	9.763	8.841
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	429	467	369	390	403	380	404	406	368	406
Service Time	6.201	5.462	7.504	6.985	6.688	7.204	6.685	6.627	7.528	6.606
HCM Lane V/C Ratio	0.72	0.649	0.257	0.356	0.29	0.168	0.614	0.333	0.234	0.288
HCM Control Delay	30.6	23.8	15.8	17	15.3	14.1	25	16	15.5	15.2
HCM Lane LOS	D	C	C	C	C	B	C	C	C	C
HCM 95th-tile Q	5.7	4.6	1	1.6	1.2	0.6	4	1.4	0.9	1.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑	↱	↰	↑↑	↱	↰↰	↑↱	
Traffic Volume (veh/h)	53	452	85	127	196	282	52	286	388	448	152	28
Future Volume (veh/h)	53	452	85	127	196	282	52	286	388	448	152	28
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	58	491	59	138	213	215	57	311	286	487	165	30
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	146	937	418	194	544	461	146	808	360	503	877	156
Arrive On Green	0.08	0.26	0.26	0.11	0.29	0.29	0.08	0.23	0.23	0.15	0.29	0.29
Sat Flow, veh/h	1781	3554	1585	1781	1870	1585	1781	3554	1585	3456	3013	537
Grp Volume(v), veh/h	58	491	59	138	213	215	57	311	286	487	96	99
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1870	1585	1781	1777	1585	1728	1777	1774
Q Serve(g_s), s	3.4	13.0	3.1	8.2	10.0	12.2	3.3	8.2	18.7	15.4	4.5	4.6
Cycle Q Clear(g_c), s	3.4	13.0	3.1	8.2	10.0	12.2	3.3	8.2	18.7	15.4	4.5	4.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.30
Lane Grp Cap(c), veh/h	146	937	418	194	544	461	146	808	360	503	517	516
V/C Ratio(X)	0.40	0.52	0.14	0.71	0.39	0.47	0.39	0.39	0.79	0.97	0.19	0.19
Avail Cap(c_a), veh/h	146	937	418	194	544	461	146	808	360	503	517	516
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	47.9	34.6	31.0	47.3	31.2	32.0	47.9	36.0	40.1	46.8	29.2	29.3
Incr Delay (d2), s/veh	1.8	0.5	0.2	11.4	0.5	0.7	1.7	0.3	11.6	32.2	0.2	0.2
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(95%),veh/ln	2.9	9.6	2.1	7.5	7.9	8.2	2.7	6.3	12.9	13.5	3.4	3.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	49.7	35.1	31.1	58.7	31.7	32.7	49.6	36.3	51.7	78.9	29.4	29.5
LnGrp LOS	D	D	C	E	C	C	D	D	D	E	C	C
Approach Vol, veh/h		608			566			654			682	
Approach Delay, s/veh		36.1			38.7			44.2			64.8	
Approach LOS		D			D			D			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	17.1	28.9	22.8	23.8	12.8	33.3	12.7	33.9
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	14.0	31.0	18.0	27.0	11.0	34.0	11.0	34.0
Max Q Clear Time (g_c+I1), s	10.2	15.0	17.4	10.2	5.4	14.2	5.3	6.6
Green Ext Time (p_c), s	0.1	1.9	0.2	0.5	0.1	1.6	0.0	0.7

Intersection Summary	
HCM 6th Ctrl Delay	46.6
HCM 6th LOS	D

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑	↱		↰↑↱			↰↑	↱
Traffic Volume (veh/h)	141	756	536	58	395	115	110	9	19	66	23	119
Future Volume (veh/h)	141	756	536	58	395	115	110	9	19	66	23	119
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	153	822	338	63	429	43	120	10	21	72	25	96
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	356	1777	793	196	1457	650	231	88	185	224	69	285
Arrive On Green	0.20	0.50	0.50	0.11	0.41	0.41	0.18	0.18	0.18	0.18	0.18	0.18
Sat Flow, veh/h	1781	3554	1585	1781	3554	1585	883	489	1028	898	384	1585
Grp Volume(v), veh/h	153	822	338	63	429	43	120	0	31	97	0	96
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1777	1585	883	0	1517	1282	0	1585
Q Serve(g_s), s	7.5	15.0	13.6	3.3	8.1	1.6	9.1	0.0	1.7	5.0	0.0	5.3
Cycle Q Clear(g_c), s	7.5	15.0	13.6	3.3	8.1	1.6	14.6	0.0	1.7	8.3	0.0	5.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.68	0.74		1.00
Lane Grp Cap(c), veh/h	356	1777	793	196	1457	650	231	0	273	293	0	285
V/C Ratio(X)	0.43	0.46	0.43	0.32	0.29	0.07	0.52	0.00	0.11	0.33	0.00	0.34
Avail Cap(c_a), veh/h	356	1777	793	196	1457	650	231	0	273	293	0	285
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	35.0	16.3	15.9	41.1	19.8	17.9	42.3	0.0	34.3	37.8	0.0	35.8
Incr Delay (d2), s/veh	0.8	0.2	0.4	0.9	0.1	0.0	2.1	0.0	0.2	0.7	0.0	0.7
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(95%),veh/ln	5.8	9.6	8.1	2.6	5.8	1.1	5.3	0.0	1.2	3.9	0.0	3.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	35.8	16.4	16.3	42.0	19.9	17.9	44.3	0.0	34.5	38.4	0.0	36.5
LnGrp LOS	D	B	B	D	B	B	D	A	C	D	A	D
Approach Vol, veh/h		1313			535			151			193	
Approach Delay, s/veh		18.7			22.3			42.3			37.5	
Approach LOS		B			C			D			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	13.7	42.6		23.4	23.7	32.6		23.4				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	13.0	52.0		20.0	22.0	43.0		20.0				
Max Q Clear Time (g_c+I1), s	5.3	17.0		16.6	9.5	10.1		10.3				
Green Ext Time (p_c), s	0.1	6.2		0.2	0.4	2.1		0.5				

Intersection Summary			
HCM 6th Ctrl Delay			22.8
HCM 6th LOS			C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	95	418	174	68	318	99	94	284	30	127	564	141
Future Volume (veh/h)	95	418	174	68	318	99	94	284	30	127	564	141
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	103	454	189	74	346	108	102	309	11	138	613	153
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	158	654	270	119	654	201	119	869	387	198	814	203
Arrive On Green	0.09	0.27	0.27	0.07	0.24	0.24	0.07	0.24	0.24	0.11	0.29	0.29
Sat Flow, veh/h	1781	2452	1013	1781	2676	823	1781	3554	1585	1781	2819	702
Grp Volume(v), veh/h	103	328	315	74	228	226	102	309	11	138	386	380
Grp Sat Flow(s),veh/h/ln	1781	1777	1688	1781	1777	1722	1781	1777	1585	1781	1777	1744
Q Serve(g_s), s	5.0	14.9	15.1	3.6	10.0	10.3	5.1	6.5	0.5	6.7	17.8	17.8
Cycle Q Clear(g_c), s	5.0	14.9	15.1	3.6	10.0	10.3	5.1	6.5	0.5	6.7	17.8	17.8
Prop In Lane	1.00		0.60	1.00		0.48	1.00		1.00	1.00		0.40
Lane Grp Cap(c), veh/h	158	474	450	119	434	421	119	869	387	198	513	504
V/C Ratio(X)	0.65	0.69	0.70	0.62	0.52	0.54	0.86	0.36	0.03	0.70	0.75	0.75
Avail Cap(c_a), veh/h	158	474	450	119	434	421	119	869	387	198	513	504
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	39.6	29.7	29.8	40.9	29.5	29.6	41.6	28.1	25.9	38.5	29.1	29.1
Incr Delay (d2), s/veh	9.0	4.3	4.8	9.7	1.2	1.3	42.9	0.2	0.0	10.2	6.2	6.4
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(95%),veh/ln	4.6	11.0	10.8	3.4	7.7	7.7	6.5	4.9	0.3	6.2	12.9	12.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	48.7	34.0	34.5	50.6	30.6	30.9	84.5	28.4	25.9	48.8	35.2	35.5
LnGrp LOS	D	C	C	D	C	C	F	C	C	D	D	D
Approach Vol, veh/h		746			528			422			904	
Approach Delay, s/veh		36.2			33.6			41.9			37.4	
Approach LOS		D			C			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	11.4	27.5	15.3	27.0	13.3	25.6	12.3	30.0
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	8.0	26.0	12.0	24.0	10.0	24.0	8.0	28.0
Max Q Clear Time (g_c+I1), s	15.6	17.1	8.7	8.5	7.0	12.3	7.1	19.8
Green Ext Time (p_c), s	0.0	1.9	0.1	1.2	0.1	1.5	0.0	2.2

Intersection Summary			
HCM 6th Ctrl Delay			37.0
HCM 6th LOS			D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	100	42	233	13	37	56	269	298	62	153	364	192
Future Volume (veh/h)	100	42	233	13	37	56	269	298	62	153	364	192
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	109	46	0	14	40	34	292	324	65	166	396	122
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	173	486		53	449	380	428	798	158	285	675	380
Arrive On Green	0.05	0.26	0.00	0.03	0.24	0.24	0.24	0.27	0.27	0.16	0.19	0.19
Sat Flow, veh/h	3456	1870	1585	1781	1870	1585	1781	2956	586	1781	3554	1585
Grp Volume(v), veh/h	109	46	0	14	40	34	292	193	196	166	396	122
Grp Sat Flow(s),veh/h/ln	1728	1870	1585	1781	1870	1585	1781	1777	1765	1781	1777	1585
Q Serve(g_s), s	3.1	1.9	0.0	0.8	1.7	1.7	14.9	8.9	9.1	8.6	10.2	6.3
Cycle Q Clear(g_c), s	3.1	1.9	0.0	0.8	1.7	1.7	14.9	8.9	9.1	8.6	10.2	6.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.33	1.00		1.00
Lane Grp Cap(c), veh/h	173	486		53	449	380	428	480	477	285	675	380
V/C Ratio(X)	0.63	0.09		0.26	0.09	0.09	0.68	0.40	0.41	0.58	0.59	0.32
Avail Cap(c_a), veh/h	173	486		53	449	380	428	480	477	285	675	380
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	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	46.6	28.1	0.0	47.4	29.5	29.5	34.5	29.9	30.0	38.9	36.9	31.3
Incr Delay (d2), s/veh	7.2	0.1	0.0	2.6	0.1	0.1	4.4	0.5	0.6	3.0	1.3	0.5
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(95%),veh/ln	2.7	1.5	0.0	0.7	1.4	1.2	11.2	6.9	7.0	7.2	8.0	4.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	53.8	28.2	0.0	50.0	29.6	29.6	39.0	30.4	30.5	41.9	38.2	31.8
LnGrp LOS	D	C		D	C	C	D	C	C	D	D	C
Approach Vol, veh/h		155	A		88			681			684	
Approach Delay, s/veh		46.2			32.8			34.1			38.0	
Approach LOS		D			C			C			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.3	23.1	19.4	29.8	11.0	20.4	26.8	22.4
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	5.0	28.0	18.0	29.0	7.0	26.0	26.0	21.0
Max Q Clear Time (g_c+I1), s	2.8	3.9	10.6	11.1	5.1	3.7	16.9	12.2
Green Ext Time (p_c), s	0.0	0.1	0.3	1.4	0.1	0.2	0.8	1.6

Intersection Summary	
HCM 6th Ctrl Delay	36.9
HCM 6th LOS	D

Notes

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Intersection						
Int Delay, s/veh	5					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	13	104	82	94	284	174
Future Vol, veh/h	13	104	82	94	284	174
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	14	113	89	102	309	189

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	947	140	0	0	191	0
Stage 1	140	-	-	-	-	-
Stage 2	807	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	290	908	-	-	1383	-
Stage 1	887	-	-	-	-	-
Stage 2	439	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	218	908	-	-	1383	-
Mov Cap-2 Maneuver	218	-	-	-	-	-
Stage 1	887	-	-	-	-	-
Stage 2	329	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.6	0	5.2
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	672	1383	-
HCM Lane V/C Ratio	-	-	0.189	0.223	-
HCM Control Delay (s)	-	-	11.6	8.3	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.7	0.9	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	135	122	115	51	51	68	196	336	143	154	400	122
Future Volume (veh/h)	135	122	115	51	51	68	196	336	143	154	400	122
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	147	133	103	55	55	41	213	365	153	167	435	131
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	328	468	396	184	167	396	392	760	314	410	863	258
Arrive On Green	0.25	0.25	0.25	0.25	0.25	0.25	0.22	0.31	0.31	0.23	0.32	0.32
Sat Flow, veh/h	1300	1870	1585	518	668	1585	1781	2453	1012	1781	2697	805
Grp Volume(v), veh/h	147	133	103	110	0	41	213	263	255	167	285	281
Grp Sat Flow(s),veh/h/ln	1300	1870	1585	1187	0	1585	1781	1777	1688	1781	1777	1725
Q Serve(g_s), s	10.2	5.7	5.2	4.0	0.0	2.0	10.6	12.0	12.3	8.0	13.0	13.2
Cycle Q Clear(g_c), s	15.5	5.7	5.2	10.8	0.0	2.0	10.6	12.0	12.3	8.0	13.0	13.2
Prop In Lane	1.00		1.00	0.50		1.00	1.00		0.60	1.00		0.47
Lane Grp Cap(c), veh/h	328	468	396	351	0	396	392	551	523	410	569	552
V/C Ratio(X)	0.45	0.28	0.26	0.31	0.00	0.10	0.54	0.48	0.49	0.41	0.50	0.51
Avail Cap(c_a), veh/h	328	468	396	351	0	396	392	551	523	410	569	552
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	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	36.3	30.3	30.1	32.4	0.0	28.9	34.6	27.9	28.0	32.7	27.5	27.6
Incr Delay (d2), s/veh	1.0	0.3	0.3	0.5	0.0	0.1	1.5	0.6	0.7	0.7	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(95%),veh/ln	5.9	4.7	3.6	4.2	0.0	1.4	8.1	8.6	8.5	6.1	9.2	9.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	37.3	30.6	30.4	32.9	0.0	29.0	36.1	28.6	28.7	33.4	28.2	28.4
LnGrp LOS	D	C	C	C	A	C	D	C	C	C	C	C
Approach Vol, veh/h		383			151			731			733	
Approach Delay, s/veh		33.1			31.9			30.8			29.5	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	22.7	31.5		27.8	23.6	30.7		27.8
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	25.0	33.0		27.0	24.0	34.0		27.0
Max Q Clear Time (g_c+I1), s	10.0	14.3		17.5	12.6	15.2		12.8
Green Ext Time (p_c), s	0.5	1.9		1.1	0.6	2.1		0.5

Intersection Summary	
HCM 6th Ctrl Delay	30.8
HCM 6th LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	34	59	184	61	60	16	291	271	144	6	33	11
Future Volume (veh/h)	34	59	184	61	60	16	291	271	144	6	33	11
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	37	64	162	66	65	16	316	295	92	7	36	11
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	107	430	365	143	362	89	428	426	380	78	405	127
Arrive On Green	0.06	0.23	0.23	0.08	0.25	0.25	0.24	0.24	0.24	0.17	0.17	0.17
Sat Flow, veh/h	1781	1870	1585	1781	1449	357	1781	1777	1585	456	2383	745
Grp Volume(v), veh/h	37	64	162	66	0	81	316	295	92	28	0	26
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	0	1806	1781	1777	1585	1848	0	1736
Q Serve(g_s), s	2.0	2.7	8.8	3.5	0.0	3.5	16.4	15.1	4.7	1.3	0.0	1.2
Cycle Q Clear(g_c), s	2.0	2.7	8.8	3.5	0.0	3.5	16.4	15.1	4.7	1.3	0.0	1.2
Prop In Lane	1.00		1.00	1.00		0.20	1.00		1.00	0.25		0.43
Lane Grp Cap(c), veh/h	107	430	365	143	0	452	428	426	380	314	0	295
V/C Ratio(X)	0.35	0.15	0.44	0.46	0.00	0.18	0.74	0.69	0.24	0.09	0.00	0.09
Avail Cap(c_a), veh/h	107	430	365	143	0	452	428	426	380	314	0	295
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	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	45.1	30.7	33.0	43.9	0.0	29.4	35.1	34.6	30.7	35.0	0.0	35.0
Incr Delay (d2), s/veh	1.9	0.2	0.9	2.3	0.0	0.2	6.7	4.7	0.3	0.1	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	1.7	2.2	6.2	3.0	0.0	2.8	12.4	11.3	3.3	1.1	0.0	1.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	47.0	30.9	33.9	46.3	0.0	29.6	41.8	39.4	31.0	35.1	0.0	35.1
LnGrp LOS	D	C	C	D	A	C	D	D	C	D	A	D
Approach Vol, veh/h		263			147			703			54	
Approach Delay, s/veh		35.0			37.1			39.4			35.1	
Approach LOS		C			D			D			D	
Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		28.2	12.3	23.4		17.0	10.6	25.1				
Change Period (Y+Rc), s		5.0	5.0	5.0		5.0	5.0	5.0				
Max Green Setting (Gmax), s		26.0	10.0	25.0		19.0	8.0	27.0				
Max Q Clear Time (g_c+I1), s		18.4	5.5	10.8		3.3	4.0	5.5				
Green Ext Time (p_c), s		1.9	0.1	1.0		0.1	0.0	0.6				
Intersection Summary												
HCM 6th Ctrl Delay			37.9									
HCM 6th LOS			D									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	135	17	42	16	12	8	97	1033	109	23	525	76
Future Volume (veh/h)	135	17	42	16	12	8	97	1033	109	23	525	76
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	147	18	30	17	13	9	105	1123	116	25	571	81
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	257	584	495	43	198	137	185	1353	140	43	1050	149
Arrive On Green	0.14	0.31	0.31	0.02	0.19	0.19	0.10	0.42	0.42	0.02	0.34	0.34
Sat Flow, veh/h	1781	1870	1585	1781	1029	713	1781	3251	335	1781	3125	442
Grp Volume(v), veh/h	147	18	30	17	0	22	105	613	626	25	324	328
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	0	1742	1781	1777	1810	1781	1777	1791
Q Serve(g_s), s	9.6	0.8	1.7	1.2	0.0	1.3	7.0	38.5	38.6	1.7	18.5	18.6
Cycle Q Clear(g_c), s	9.6	0.8	1.7	1.2	0.0	1.3	7.0	38.5	38.6	1.7	18.5	18.6
Prop In Lane	1.00		1.00	1.00		0.41	1.00		0.19	1.00		0.25
Lane Grp Cap(c), veh/h	257	584	495	43	0	334	185	739	753	43	597	602
V/C Ratio(X)	0.57	0.03	0.06	0.40	0.00	0.07	0.57	0.83	0.83	0.58	0.54	0.55
Avail Cap(c_a), veh/h	257	584	495	43	0	334	185	739	753	43	597	602
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	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	49.9	29.9	30.2	60.1	0.0	41.3	53.3	32.5	32.6	60.4	33.7	33.7
Incr Delay (d2), s/veh	3.1	0.0	0.1	5.9	0.0	0.1	4.0	7.9	7.9	18.8	1.0	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(95%),veh/ln	8.0	0.7	1.2	1.1	0.0	1.0	5.9	24.3	24.8	1.8	12.6	12.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	53.0	29.9	30.2	66.0	0.0	41.4	57.3	40.4	40.4	79.2	34.7	34.8
LnGrp LOS	D	C	C	E	A	D	E	D	D	E	C	C
Approach Vol, veh/h		195			39			1344			677	
Approach Delay, s/veh		47.3			52.1			41.7			36.4	
Approach LOS		D			D			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.0	57.0	8.6	32.7	17.0	49.0	20.9	20.4
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	5.0	54.0	5.0	41.0	15.0	44.0	20.0	26.0
Max Q Clear Time (g_c+I1), s	3.7	40.6	3.2	3.7	9.0	20.6	11.6	3.3
Green Ext Time (p_c), s	0.0	9.4	0.0	0.2	0.1	6.8	0.3	0.0

Intersection Summary		
HCM 6th Ctrl Delay		40.8
HCM 6th LOS		D

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	45	3	150	27	0	22	294	635	81	17	224	31
Future Volume (veh/h)	45	3	150	27	0	22	294	635	81	17	224	31
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	49	3	81	29	0	23	320	690	86	18	243	33
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	377	23	355	774	0	355	498	1326	164	71	579	78
Arrive On Green	0.22	0.22	0.22	0.22	0.00	0.22	0.14	0.29	0.29	0.04	0.18	0.18
Sat Flow, veh/h	1683	103	1585	3456	0	1585	3456	4603	569	1781	3149	423
Grp Volume(v), veh/h	52	0	81	29	0	23	320	509	267	18	136	140
Grp Sat Flow(s),veh/h/ln	1786	0	1585	1728	0	1585	1728	1702	1768	1781	1777	1794
Q Serve(g_s), s	2.9	0.0	5.2	0.8	0.0	1.4	10.9	15.6	15.9	1.2	8.4	8.6
Cycle Q Clear(g_c), s	2.9	0.0	5.2	0.8	0.0	1.4	10.9	15.6	15.9	1.2	8.4	8.6
Prop In Lane	0.94		1.00	1.00		1.00	1.00		0.32	1.00		0.24
Lane Grp Cap(c), veh/h	400	0	355	774	0	355	498	980	509	71	327	330
V/C Ratio(X)	0.13	0.00	0.23	0.04	0.00	0.06	0.64	0.52	0.53	0.25	0.42	0.42
Avail Cap(c_a), veh/h	400	0	355	774	0	355	498	980	509	71	327	330
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	38.8	0.0	39.7	38.0	0.0	38.2	50.5	37.2	37.3	58.2	45.1	45.1
Incr Delay (d2), s/veh	0.1	0.0	0.3	0.0	0.0	0.1	2.8	0.5	1.0	1.8	0.8	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	2.4	0.0	3.8	0.6	0.0	1.0	8.6	10.9	11.5	1.1	6.9	7.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	38.9	0.0	40.0	38.0	0.0	38.3	53.3	37.7	38.3	60.0	45.9	46.0
LnGrp LOS	D	A	D	D	A	D	D	D	D	E	D	D
Approach Vol, veh/h		133			52			1096			294	
Approach Delay, s/veh		39.6			38.1			42.4			46.8	
Approach LOS		D			D			D			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	9.7	35.5		23.8	21.9	23.3		22.1				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	7.0	38.0		30.0	20.0	25.0		30.0				
Max Q Clear Time (g_c+I1), s	3.2	17.9		7.2	12.9	10.6		3.4				
Green Ext Time (p_c), s	0.0	3.6		0.5	0.9	0.9		0.2				

Intersection Summary		
HCM 6th Ctrl Delay		42.9
HCM 6th LOS		D

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	32	536	291	329	306	328	213	344	512	144	226	17
Future Volume (veh/h)	32	536	291	329	306	328	213	344	512	144	226	17
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	35	583	180	358	333	0	232	374	340	157	246	18
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	83	916	370	484	1283		369	1303	581	253	1120	81
Arrive On Green	0.05	0.47	0.23	0.23	0.65	0.00	0.11	0.37	0.37	0.07	0.33	0.33
Sat Flow, veh/h	1781	3928	1585	3456	3928	1585	3456	3554	1585	3456	3359	244
Grp Volume(v), veh/h	35	583	180	358	333	0	232	374	340	157	129	135
Grp Sat Flow(s),veh/h/ln	1781	1964	1585	1728	1964	1585	1728	1777	1585	1728	1777	1826
Q Serve(g_s), s	2.9	16.9	14.7	14.4	5.3	0.0	9.6	11.2	25.9	6.6	7.9	8.0
Cycle Q Clear(g_c), s	2.9	16.9	14.7	14.4	5.3	0.0	9.6	11.2	25.9	6.6	7.9	8.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.13
Lane Grp Cap(c), veh/h	83	916	370	484	1283		369	1303	581	253	592	609
V/C Ratio(X)	0.42	0.64	0.49	0.74	0.26		0.63	0.29	0.59	0.62	0.22	0.22
Avail Cap(c_a), veh/h	83	916	370	484	1283		369	1303	581	253	592	609
HCM Platoon Ratio	1.00	2.00	1.00	1.67	2.00	1.67	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.99	0.99	0.99	0.64	0.64	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	69.5	35.2	49.7	54.9	18.4	0.0	64.2	33.6	38.3	67.5	36.0	36.0
Incr Delay (d2), s/veh	3.3	3.3	4.5	3.9	0.3	0.0	3.4	0.1	1.5	4.5	0.2	0.2
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(95%),veh/ln	2.5	11.2	10.3	9.2	4.1	0.0	7.8	8.4	15.3	5.5	6.1	6.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	72.9	38.5	54.2	58.8	18.7	0.0	67.6	33.7	39.8	72.0	36.1	36.2
LnGrp LOS	E	D	D	E	B		E	C	D	E	D	D
Approach Vol, veh/h		798			691	A		946			421	
Approach Delay, s/veh		43.6			39.5			44.2			49.5	
Approach LOS		D			D			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	25.1	67.5	15.9	41.4	11.4	81.2	20.1	37.3
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	23.0	37.0	13.0	57.0	9.0	51.0	18.0	52.0
Max Q Clear Time (g_c+I1), s	16.4	18.9	8.6	13.2	4.9	7.3	11.6	10.0
Green Ext Time (p_c), s	0.9	1.8	0.2	1.9	0.0	1.5	0.5	2.6

Intersection Summary	
HCM 6th Ctrl Delay	43.7
HCM 6th LOS	D

Notes

User approved pedestrian interval to be less than phase max green.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1158	9	0	742	1301	0	0	49	945	5	233
Future Volume (veh/h)	0	1158	9	0	742	1301	0	0	49	945	5	233
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	0	2067	1870	0	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	0	1194	9	0	765	0	0	0	51	978	0	137
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	2	2	0	2	2	2	2	2	2	2	2
Cap, veh/h	0	3968	30	0	3053		0	0	25	1080	0	961
Arrive On Green	0.00	1.00	0.54	0.00	1.00	0.00	0.00	0.00	0.02	0.30	0.00	0.30
Sat Flow, veh/h	0	7625	55	0	6016	0	0	0	1585	3563	0	3170
Grp Volume(v), veh/h	0	868	335	0	765	0	0	0	51	978	0	137
Grp Sat Flow(s),veh/h/ln	0	1778	2057	0	1881	0	0	0	1585	1781	0	1585
Q Serve(g_s), s	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	2.4	39.6	0.0	4.7
Cycle Q Clear(g_c), s	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	2.4	39.6	0.0	4.7
Prop In Lane	0.00		0.03	0.00		0.00	0.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	0	2885	1113	0	3053		0	0	25	1080	0	961
V/C Ratio(X)	0.00	0.30	0.30	0.00	0.25		0.00	0.00	2.01	0.91	0.00	0.14
Avail Cap(c_a), veh/h	0	2885	1113	0	3053		0	0	85	1401	0	1247
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.67	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	0.72	0.72	0.00	1.00	0.00	0.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	73.8	50.2	0.0	38.1
Incr Delay (d2), s/veh	0.0	0.2	0.5	0.0	0.2	0.0	0.0	0.0	502.1	7.2	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.0	0.1	0.5	0.0	0.1	0.0	0.0	0.0	8.1	25.8	0.0	3.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	0.2	0.9	0.0	0.2	0.0	0.0	0.0	575.9	57.4	0.0	38.1
LnGrp LOS	A	A	A	A	A		A	A	F	E	A	D
Approach Vol, veh/h		1203			765	A		51			1115	
Approach Delay, s/veh		0.4			0.2			575.9			55.1	
Approach LOS		A			A			F			E	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		88.1		52.5		88.1		9.4				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		64.0		61.0		64.0		10.0				
Max Q Clear Time (g_c+I1), s		2.4		41.6		2.0		4.4				
Green Ext Time (p_c), s		14.8		5.9		8.3		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			29.2									
HCM 6th LOS			C									

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary
21: I-680 NB Off/I-680 NB On & Bollinger Canyon

03/16/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1366	360	0	1729	863	332	0	1834	0	0	0
Future Volume (veh/h)	0	1366	360	0	1729	863	332	0	1834	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	0	2067	1870	0	2067	1870	1870	0	1870			
Adj Flow Rate, veh/h	0	1394	0	0	2094	0	339	0	1565			
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98			
Percent Heavy Veh, %	0	2	2	0	2	2	2	0	2			
Cap, veh/h	0	2493		0	2740		828	0	1680			
Arrive On Green	0.00	0.88	0.00	0.00	0.88	0.00	0.46	0.00	0.46			
Sat Flow, veh/h	0	5830	1585	0	6202	1585	1781	0	3614			
Grp Volume(v), veh/h	0	1394	0	0	2094	0	339	0	1565			
Grp Sat Flow(s),veh/h/ln	0	1881	1585	0	2067	1585	1781	0	1205			
Q Serve(g_s), s	0.0	8.5	0.0	0.0	18.2	0.0	18.9	0.0	61.3			
Cycle Q Clear(g_c), s	0.0	8.5	0.0	0.0	18.2	0.0	18.9	0.0	61.3			
Prop In Lane	0.00		1.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	0	2493		0	2740		828	0	1680			
V/C Ratio(X)	0.00	0.56		0.00	0.76		0.41	0.00	0.93			
Avail Cap(c_a), veh/h	0	2493		0	2740		926	0	1879			
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.00	1.00	0.00	0.00	0.68	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	0.0	5.4	0.0	0.0	5.9	0.0	26.5	0.0	37.9			
Incr Delay (d2), s/veh	0.0	0.9	0.0	0.0	1.4	0.0	0.3	0.0	8.4			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(95%),veh/ln	0.0	4.0	0.0	0.0	6.0	0.0	12.9	0.0	26.3			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	6.3	0.0	0.0	7.4	0.0	26.8	0.0	46.3			
LnGrp LOS	A	A		A	A		C	A	D			
Approach Vol, veh/h		1394	A		2094	A		1904				
Approach Delay, s/veh		6.3			7.4			42.8				
Approach LOS		A			A			D				

Timer - Assigned Phs		2				6		8				
Phs Duration (G+Y+Rc), s		73.3				73.3		76.7				
Change Period (Y+Rc), s		5.0				5.0		5.0				
Max Green Setting (Gmax), s		60.0				60.0		80.0				
Max Q Clear Time (g_c+I1), s		10.5				20.2		63.3				
Green Ext Time (p_c), s		30.1				35.9		8.4				

Intersection Summary			
HCM 6th Ctrl Delay			19.6
HCM 6th LOS			B

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	794	1967	524	165	2228	117	26	5	20	59	27	301
Future Volume (veh/h)	794	1967	524	165	2228	117	26	5	20	59	27	301
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	836	2071	0	174	2345	70	31	0	19	45	52	264
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	899	3492		852	3395	757	56	0	25	107	112	1015
Arrive On Green	0.26	0.98	0.00	0.25	0.95	0.48	0.02	0.00	0.02	0.06	0.06	0.06
Sat Flow, veh/h	3456	7111	1585	3456	7111	1585	3563	0	1585	1781	1870	3170
Grp Volume(v), veh/h	836	2071	0	174	2345	70	31	0	19	45	52	264
Grp Sat Flow(s),veh/h/ln	1728	1778	1585	1728	1778	1585	1781	0	1585	1781	1870	1585
Q Serve(g_s), s	35.4	1.9	0.0	6.0	6.6	3.6	1.3	0.0	1.8	3.7	4.0	9.0
Cycle Q Clear(g_c), s	35.4	1.9	0.0	6.0	6.6	3.6	1.3	0.0	1.8	3.7	4.0	9.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	899	3492		852	3395	757	56	0	25	107	112	1015
V/C Ratio(X)	0.93	0.59		0.20	0.69	0.09	0.55	0.00	0.76	0.42	0.46	0.26
Avail Cap(c_a), veh/h	1152	4362		852	3395	757	190	0	85	107	112	1015
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.42	0.42	0.00	0.54	0.54	0.54	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	54.2	0.7	0.0	44.8	1.9	21.4	73.3	0.0	73.5	68.0	68.2	37.8
Incr Delay (d2), s/veh	5.4	0.3	0.0	0.1	0.6	0.1	8.1	0.0	36.1	2.6	3.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	20.0	0.7	0.0	4.5	2.0	2.5	1.2	0.0	1.8	3.2	3.7	6.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	59.6	1.0	0.0	44.9	2.6	21.6	81.3	0.0	109.7	70.6	71.1	38.0
LnGrp LOS	E	A		D	A	C	F	A	F	E	E	D
Approach Vol, veh/h		2907	A		2589			50			361	
Approach Delay, s/veh		17.9			5.9			92.1			46.8	
Approach LOS		B			A			F			D	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	44.0	80.7		9.4	46.0	78.6		16.0
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	15.0	94.0		10.0	52.0	57.0		11.0
Max Q Clear Time (g_c+I1), s	8.0	3.9		3.8	37.4	8.6		11.0
Green Ext Time (p_c), s	0.4	71.8		0.1	3.6	45.4		0.0

Intersection Summary			
HCM 6th Ctrl Delay			15.0
HCM 6th LOS			B

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	668	884	408	43	2089	512	81	31	14	163	41	384
Future Volume (veh/h)	668	884	408	43	2089	512	81	31	14	163	41	384
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	718	951	331	46	2246	390	87	33	14	175	0	399
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	725	3556	793	595	3289	733	55	172	145	176	0	1015
Arrive On Green	0.21	1.00	0.50	0.17	0.93	0.62	0.03	0.09	0.09	0.05	0.00	0.11
Sat Flow, veh/h	3456	7111	1585	3456	7111	1585	1781	1870	1585	3563	0	3170
Grp Volume(v), veh/h	718	951	331	46	2246	390	87	33	14	175	0	399
Grp Sat Flow(s),veh/h/ln	1728	1778	1585	1728	1778	1585	1781	1870	1585	1781	0	1585
Q Serve(g_s), s	31.1	0.0	15.9	1.7	9.6	21.1	4.6	2.4	0.9	7.4	0.0	14.7
Cycle Q Clear(g_c), s	31.1	0.0	15.9	1.7	9.6	21.1	4.6	2.4	0.9	7.4	0.0	14.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	725	3556	793	595	3289	733	55	172	145	176	0	1015
V/C Ratio(X)	0.99	0.27	0.42	0.08	0.68	0.53	1.59	0.19	0.10	1.00	0.00	0.39
Avail Cap(c_a), veh/h	737	3556	793	595	3289	733	95	387	328	190	0	1320
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.89	0.89	0.89	0.83	0.83	0.83	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	59.1	0.0	15.4	52.1	3.4	19.6	72.7	63.0	33.9	71.3	0.0	39.7
Incr Delay (d2), s/veh	28.7	0.2	1.4	0.0	1.0	2.3	327.1	0.5	0.3	62.3	0.0	0.2
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(95%),veh/ln	22.6	0.1	9.9	1.3	3.2	11.6	12.5	2.2	0.9	8.5	0.0	9.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	87.9	0.2	16.8	52.1	4.4	21.9	399.8	63.5	34.2	133.6	0.0	39.9
LnGrp LOS	F	A	B	D	A	C	F	E	C	F	A	D
Approach Vol, veh/h		2000			2682			134			574	
Approach Delay, s/veh		34.4			7.7			278.8			68.5	
Approach LOS		C			A			F			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	32.9	82.0	14.4	20.7	38.5	76.4	11.6	23.6
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	10.0	77.0	10.0	33.0	34.0	53.0	10.0	33.0
Max Q Clear Time (g_c+I1), s	3.7	17.9	9.4	4.4	33.1	23.1	6.6	16.7
Green Ext Time (p_c), s	0.0	22.4	0.0	0.1	0.4	28.7	0.1	1.9

Intersection Summary	
HCM 6th Ctrl Delay	30.8
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	30	1047	68	67	2583	25	48	2	20	30	1	126
Future Volume (veh/h)	30	1047	68	67	2583	25	48	2	20	30	1	126
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	33	1138	74	73	2808	27	52	2	20	33	1	137
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	36	4075	264	74	5305	51	53	15	154	21	1	138
Arrive On Green	0.04	1.00	0.66	0.04	1.00	1.00	0.03	0.11	0.11	0.01	0.09	0.09
Sat Flow, veh/h	1781	6221	403	1781	7841	75	1781	146	1461	1781	11	1575
Grp Volume(v), veh/h	33	882	330	73	2170	665	52	0	22	33	0	138
Grp Sat Flow(s),veh/h/ln	1781	1609	1798	1781	1515	1857	1781	0	1607	1781	0	1587
Q Serve(g_s), s	2.8	0.0	2.9	6.1	0.0	0.0	4.4	0.0	1.9	1.7	0.0	13.0
Cycle Q Clear(g_c), s	2.8	0.0	2.9	6.1	0.0	0.0	4.4	0.0	1.9	1.7	0.0	13.0
Prop In Lane	1.00		0.22	1.00		0.04	1.00		0.91	1.00		0.99
Lane Grp Cap(c), veh/h	36	3161	1178	74	4100	1256	53	0	169	21	0	139
V/C Ratio(X)	0.93	0.28	0.28	0.99	0.53	0.53	0.99	0.00	0.13	1.60	0.00	1.00
Avail Cap(c_a), veh/h	309	3161	1178	143	4100	1256	309	0	354	83	0	148
HCM Platoon Ratio	2.00	2.00	1.00	1.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.96	0.96	0.96	0.84	0.84	0.84	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	71.9	0.0	2.1	71.9	0.0	0.0	72.8	0.0	60.9	74.1	0.0	68.4
Incr Delay (d2), s/veh	51.6	0.2	0.6	43.6	0.4	1.3	55.0	0.0	0.3	313.7	0.0	71.2
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(95%),veh/ln	3.1	0.1	1.9	6.6	0.2	0.8	5.1	0.0	1.4	4.7	0.0	12.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	123.4	0.2	2.7	115.5	0.4	1.3	127.7	0.0	61.2	387.9	0.0	139.7
LnGrp LOS	F	A	A	F	A	A	F	A	E	F	A	F
Approach Vol, veh/h		1245			2908			74			171	
Approach Delay, s/veh		4.1			3.5			107.9			187.6	
Approach LOS		A			A			F			F	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	13.2	105.3	11.4	20.1	10.0	108.5	8.7	22.8
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	14.0	72.0	28.0	16.0	28.0	58.0	9.0	35.0
Max Q Clear Time (g_c+I1), s	8.1	4.9	6.4	15.0	4.8	2.0	3.7	3.9
Green Ext Time (p_c), s	0.1	27.6	0.1	0.1	0.0	54.8	0.0	0.1

Intersection Summary		
HCM 6th Ctrl Delay		12.6
HCM 6th LOS		B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	19	846	192	32	2362	2	285	2	31	2	0	3
Future Volume (veh/h)	19	846	192	32	2362	2	285	2	31	2	0	3
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	21	920	133	35	2567	2	311	0	32	2	0	3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	36	5012	1117	36	5212	4	340	0	151	1	0	1
Arrive On Green	0.04	1.00	0.70	0.02	1.00	0.70	0.10	0.00	0.10	0.00	0.00	0.00
Sat Flow, veh/h	1781	7111	1585	1781	7394	6	3563	0	1585	1781	0	1585
Grp Volume(v), veh/h	21	920	133	35	1852	717	311	0	32	2	0	3
Grp Sat Flow(s),veh/h/ln	1781	1778	1585	1781	1778	2066	1781	0	1585	1781	0	1585
Q Serve(g_s), s	1.7	0.0	4.1	2.9	0.0	0.1	13.0	0.0	2.8	0.1	0.0	0.1
Cycle Q Clear(g_c), s	1.7	0.0	4.1	2.9	0.0	0.1	13.0	0.0	2.8	0.1	0.0	0.1
Prop In Lane	1.00		1.00	1.00		0.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	36	5012	1117	36	3759	1456	340	0	151	1	0	1
V/C Ratio(X)	0.59	0.18	0.12	0.98	0.49	0.49	0.91	0.00	0.21	1.68	0.00	2.84
Avail Cap(c_a), veh/h	119	5012	1117	119	3759	1456	665	0	296	95	0	85
HCM Platoon Ratio	2.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.97	0.97	0.97	0.47	0.47	0.47	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	71.4	0.0	7.1	73.5	0.0	0.0	67.2	0.0	62.6	75.0	0.0	75.0
Incr Delay (d2), s/veh	14.1	0.1	0.2	43.8	0.2	0.6	9.7	0.0	0.7	675.3	0.0	1214.5
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(95%),veh/ln	1.7	0.0	2.6	3.2	0.1	0.4	10.5	0.0	2.1	0.5	0.0	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	85.5	0.1	7.3	117.3	0.2	0.6	76.9	0.0	63.3	750.3	0.0	1289.5
LnGrp LOS	F	A	A	F	A	A	E	A	E	F	A	F
Approach Vol, veh/h		1074			2604			343			5	
Approach Delay, s/veh		2.6			1.9			75.6			1073.8	
Approach LOS		A			A			E			F	

Timer - Assigned Phs	1	2	4	5	6	8
Phs Duration (G+Y+Rc), s	10.0	112.7	5.9	10.0	112.7	21.3
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	12.0	78.0	10.0	12.0	78.0	30.0
Max Q Clear Time (g_c+I1), s	4.9	6.1	2.1	3.7	2.1	15.0
Green Ext Time (p_c), s	0.0	23.8	0.0	0.0	71.8	1.4

Intersection Summary	
HCM 6th Ctrl Delay	9.7
HCM 6th LOS	A

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	151	604	164	242	1836	398	524	400	170	141	211	173
Future Volume (veh/h)	151	604	164	242	1836	398	524	400	170	141	211	173
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	164	657	151	263	1996	297	570	435	183	153	229	106
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	366	2397	673	271	2095	589	572	467	195	157	253	113
Arrive On Green	0.07	0.85	0.42	0.15	0.74	0.37	0.17	0.19	0.19	0.05	0.07	0.07
Sat Flow, veh/h	1781	5644	1585	1781	5644	1585	3456	2445	1019	3456	3554	1585
Grp Volume(v), veh/h	164	657	151	263	1996	297	570	315	303	153	229	106
Grp Sat Flow(s),veh/h/ln	1781	1881	1585	1781	1881	1585	1728	1777	1687	1728	1777	1585
Q Serve(g_s), s	13.3	3.4	9.1	22.0	46.7	21.7	24.7	26.1	26.6	6.6	9.6	7.6
Cycle Q Clear(g_c), s	13.3	3.4	9.1	22.0	46.7	21.7	24.7	26.1	26.6	6.6	9.6	7.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.60	1.00		1.00
Lane Grp Cap(c), veh/h	366	2397	673	271	2095	589	572	340	322	157	253	113
V/C Ratio(X)	0.45	0.27	0.22	0.97	0.95	0.50	1.00	0.93	0.94	0.97	0.90	0.94
Avail Cap(c_a), veh/h	366	2397	673	404	2107	592	576	474	450	253	616	275
HCM Platoon Ratio	0.33	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.99	0.99	0.99	1.00	1.00	1.00	0.89	0.89	0.89	1.00	1.00	1.00
Uniform Delay (d), s/veh	61.7	6.8	27.4	63.3	18.1	36.5	62.6	59.6	59.8	71.5	69.2	40.5
Incr Delay (d2), s/veh	0.9	0.3	0.8	30.6	11.3	3.1	34.5	18.3	21.2	37.8	11.5	26.8
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(95%),veh/ln	10.7	2.4	6.6	17.9	17.0	13.9	19.3	19.2	18.9	6.8	8.4	7.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	62.6	7.0	28.2	93.8	29.4	39.6	97.0	78.0	81.0	109.3	80.6	67.3
LnGrp LOS	E	A	C	F	C	D	F	E	F	F	F	E
Approach Vol, veh/h		972			2556			1188			488	
Approach Delay, s/veh		19.7			37.2			87.9			86.7	
Approach LOS		B			D			F			F	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	13.8	35.7	37.8	62.7	31.8	17.7	29.8	70.7
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	13.0	42.0	17.0	58.0	27.0	28.0	36.0	39.0
Max Q Clear Time (g_c+I1), s	18.6	28.6	15.3	48.7	26.7	11.6	24.0	11.1
Green Ext Time (p_c), s	0.2	1.7	0.1	9.0	0.1	1.1	0.7	11.3

Intersection Summary		
HCM 6th Ctrl Delay		50.2
HCM 6th LOS		D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	212	426	148	231	1217	196	235	207	91	218	280	421
Future Volume (veh/h)	212	426	148	231	1217	196	235	207	91	218	280	421
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	230	463	107	251	1323	115	255	225	50	237	304	295
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	237	1339	540	261	1963	551	262	1515	470	247	1493	463
Arrive On Green	0.07	0.34	0.34	0.08	0.35	0.35	0.08	0.30	0.30	0.07	0.29	0.29
Sat Flow, veh/h	3456	3928	1585	3456	5644	1585	3456	5106	1585	3456	5106	1585
Grp Volume(v), veh/h	230	463	107	251	1323	115	255	225	50	237	304	295
Grp Sat Flow(s),veh/h/ln	1728	1964	1585	1728	1881	1585	1728	1702	1585	1728	1702	1585
Q Serve(g_s), s	8.6	11.4	6.2	9.4	26.0	6.6	9.6	4.2	3.0	8.9	5.8	21.0
Cycle Q Clear(g_c), s	8.6	11.4	6.2	9.4	26.0	6.6	9.6	4.2	3.0	8.9	5.8	21.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	237	1339	540	261	1963	551	262	1515	470	247	1493	463
V/C Ratio(X)	0.97	0.35	0.20	0.96	0.67	0.21	0.97	0.15	0.11	0.96	0.20	0.64
Avail Cap(c_a), veh/h	346	1339	540	399	1963	551	346	1515	470	399	1493	463
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	60.4	32.0	30.3	59.9	36.1	29.8	59.9	33.6	33.2	60.2	34.6	40.0
Incr Delay (d2), s/veh	33.3	0.7	0.8	27.8	1.9	0.9	36.6	0.2	0.5	26.0	0.3	6.5
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(95%),veh/ln	8.5	9.5	4.5	8.9	18.0	4.8	9.4	3.2	2.2	8.4	4.5	14.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	93.7	32.7	31.1	87.7	38.0	30.7	96.5	33.8	33.7	86.2	34.9	46.5
LnGrp LOS	F	C	C	F	D	C	F	C	C	F	C	D
Approach Vol, veh/h		800			1689			530			836	
Approach Delay, s/veh		50.0			44.9			64.0			53.6	
Approach LOS		D			D			E			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	16.8	51.3	16.9	45.0	15.9	52.2	16.3	45.6
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	17.0	38.0	15.0	40.0	15.0	40.0	17.0	38.0
Max Q Clear Time (g_c+I1), s	11.4	13.4	11.6	23.0	10.6	28.0	10.9	6.2
Green Ext Time (p_c), s	0.4	3.6	0.3	2.8	0.3	7.3	0.4	1.7

Intersection Summary	
HCM 6th Ctrl Delay	50.5
HCM 6th LOS	D

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	226	583	300	169	491	458
Future Volume (veh/h)	226	583	300	169	491	458
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	246	417	326	130	534	498
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	386	1017	457	179	757	2369
Arrive On Green	0.22	0.22	0.18	0.18	0.43	0.67
Sat Flow, veh/h	1781	1585	2589	976	1781	3647
Grp Volume(v), veh/h	246	417	230	226	534	498
Grp Sat Flow(s),veh/h/ln	1781	1585	1777	1695	1781	1777
Q Serve(g_s), s	15.1	15.4	14.6	15.1	29.5	6.5
Cycle Q Clear(g_c), s	15.1	15.4	14.6	15.1	29.5	6.5
Prop In Lane	1.00	1.00		0.58	1.00	
Lane Grp Cap(c), veh/h	386	1017	326	311	757	2369
V/C Ratio(X)	0.64	0.41	0.71	0.73	0.71	0.21
Avail Cap(c_a), veh/h	386	1017	326	311	757	2369
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	42.7	10.5	46.0	46.2	28.3	7.8
Incr Delay (d2), s/veh	3.5	0.3	12.2	13.8	3.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	11.4	9.1	11.8	11.8	18.3	4.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	46.2	10.7	58.2	60.0	31.3	8.0
LnGrp LOS	D	B	E	E	C	A
Approach Vol, veh/h	663		456			1032
Approach Delay, s/veh	23.9		59.1			20.0
Approach LOS	C		E			C

Timer - Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	48.1	38.9				87.0		28.6
Change Period (Y+Rc), s	5.0	5.0				5.0		5.0
Max Green Setting (Gmax), s	53.0	24.0				82.0		28.0
Max Q Clear Time (g_c+I1), s	31.5	17.1				8.5		17.4
Green Ext Time (p_c), s	1.6	1.4				3.3		1.9

Intersection Summary	
HCM 6th Ctrl Delay	29.5
HCM 6th LOS	C

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Volume (veh/h)	304	215	30	419	169	33
Future Volume (veh/h)	304	215	30	419	169	33
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	330	158	33	455	184	20
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	1066	476	148	1777	475	423
Arrive On Green	0.30	0.30	0.08	0.50	0.27	0.27
Sat Flow, veh/h	3647	1585	1781	3647	1781	1585
Grp Volume(v), veh/h	330	158	33	455	184	20
Grp Sat Flow(s),veh/h/ln	1777	1585	1781	1777	1781	1585
Q Serve(g_s), s	4.3	4.7	1.0	4.4	5.1	0.6
Cycle Q Clear(g_c), s	4.3	4.7	1.0	4.4	5.1	0.6
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	1066	476	148	1777	475	423
V/C Ratio(X)	0.31	0.33	0.22	0.26	0.39	0.05
Avail Cap(c_a), veh/h	1066	476	148	1777	475	423
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	16.2	16.3	25.7	8.6	18.0	16.3
Incr Delay (d2), s/veh	0.8	1.9	0.7	0.3	0.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	3.1	3.2	0.8	2.7	3.6	1.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	17.0	18.2	26.4	8.9	18.5	16.4
LnGrp LOS	B	B	C	A	B	B
Approach Vol, veh/h	488			488	204	
Approach Delay, s/veh	17.4			10.1	18.3	
Approach LOS	B			B	B	

Timer - Assigned Phs		2		4	5	6
Phs Duration (G+Y+Rc), s		37.0		17.6	9.6	27.4
Change Period (Y+Rc), s		5.0		5.0	5.0	5.0
Max Green Setting (Gmax), s		32.0		18.0	7.0	20.0
Max Q Clear Time (g_c+I1), s		6.4		7.1	3.0	6.7
Green Ext Time (p_c), s		3.2		0.4	0.0	2.2

Intersection Summary			
HCM 6th Ctrl Delay			14.5
HCM 6th LOS			B

Intersection	
Intersection Delay, s/veh	15.2
Intersection LOS	C

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	395	242	176	170	187	237
Future Vol, veh/h	395	242	176	170	187	237
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	429	263	191	185	203	258
Number of Lanes	2	1	2	0	1	2

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	3	2
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	2	0	3
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	3	3	0
HCM Control Delay	15.2	16	14.4
HCM LOS	C	C	B

Lane	NBLn1	NBLn2	WBLn1	WBLn2	WBLn3	SBLn1	SBLn2	SBLn3
Vol Left, %	0%	0%	100%	75%	0%	100%	0%	0%
Vol Thru, %	100%	26%	0%	0%	0%	0%	100%	100%
Vol Right, %	0%	74%	0%	25%	100%	0%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	117	229	263	175	198	187	119	119
LT Vol	0	0	263	131	0	187	0	0
Through Vol	117	59	0	0	0	0	119	119
RT Vol	0	170	0	44	198	0	0	0
Lane Flow Rate	128	249	286	190	216	203	129	129
Geometry Grp	8	8	7	7	7	8	8	8
Degree of Util (X)	0.277	0.503	0.595	0.38	0.27	0.461	0.274	0.21
Departure Headway (Hd)	7.82	7.288	7.482	7.18	4.513	8.158	7.648	5.877
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	459	495	487	505	800	441	470	611
Service Time	5.57	5.037	5.182	4.88	2.213	5.903	5.392	3.621
HCM Lane V/C Ratio	0.279	0.503	0.587	0.376	0.27	0.46	0.274	0.211
HCM Control Delay	13.6	17.2	20.6	14.2	8.9	17.7	13.3	10.2
HCM Lane LOS	B	C	C	B	A	C	B	B
HCM 95th-tile Q	1.1	2.8	3.8	1.8	1.1	2.4	1.1	0.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	187	106	87	466	1359	311
Future Volume (veh/h)	187	106	87	466	1359	311
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	203	82	95	507	1477	336
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	218	194	58	3361	2149	487
Arrive On Green	0.12	0.12	0.03	0.66	0.52	0.52
Sat Flow, veh/h	1781	1585	1781	5274	4330	943
Grp Volume(v), veh/h	203	82	95	507	1207	606
Grp Sat Flow(s),veh/h/ln	1781	1585	1781	1702	1702	1701
Q Serve(g_s), s	7.2	3.1	2.1	2.4	17.0	17.1
Cycle Q Clear(g_c), s	7.2	3.1	2.1	2.4	17.0	17.1
Prop In Lane	1.00	1.00	1.00			0.55
Lane Grp Cap(c), veh/h	218	194	58	3361	1757	878
V/C Ratio(X)	0.93	0.42	1.64	0.15	0.69	0.69
Avail Cap(c_a), veh/h	557	496	279	5274	2610	1304
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	27.8	25.9	30.9	4.1	11.6	11.6
Incr Delay (d2), s/veh	15.6	1.5	305.7	0.0	0.5	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	6.9	0.1	10.3	0.9	8.4	8.6
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	43.4	27.4	336.6	4.2	12.1	12.6
LnGrp LOS	D	C	F	A	B	B
Approach Vol, veh/h	285			602	1813	
Approach Delay, s/veh	38.8			56.6	12.2	
Approach LOS	D			E	B	

Timer - Assigned Phs		2		4	5	6
Phs Duration (G+Y+Rc), s		49.1		14.8	9.1	40.0
Change Period (Y+Rc), s		5.0		5.0	5.0	5.0
Max Green Setting (Gmax), s		68.0		22.0	12.0	51.0
Max Q Clear Time (g_c+I1), s		4.4		9.2	4.1	19.1
Green Ext Time (p_c), s		3.5		0.7	0.1	15.9

Intersection Summary			
HCM 6th Ctrl Delay			24.9
HCM 6th LOS			C

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	21	1057	150	88	1131	753	81	33	66	42	38	22
Future Volume (veh/h)	21	1057	150	88	1131	753	81	33	66	42	38	22
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	23	1149	109	96	1229	57	88	36	39	46	41	23
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	89	1451	647	178	1629	726	119	358	304	119	216	121
Arrive On Green	0.05	0.41	0.41	0.10	0.46	0.46	0.07	0.19	0.19	0.07	0.19	0.19
Sat Flow, veh/h	1781	3554	1585	1781	3554	1585	1781	1870	1585	1781	1125	631
Grp Volume(v), veh/h	23	1149	109	96	1229	57	88	36	39	46	0	64
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1777	1585	1781	1870	1585	1781	0	1757
Q Serve(g_s), s	1.5	33.9	5.2	6.2	34.4	2.4	5.8	1.9	2.4	3.0	0.0	3.7
Cycle Q Clear(g_c), s	1.5	33.9	5.2	6.2	34.4	2.4	5.8	1.9	2.4	3.0	0.0	3.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.36
Lane Grp Cap(c), veh/h	89	1451	647	178	1629	726	119	358	304	119	0	337
V/C Ratio(X)	0.26	0.79	0.17	0.54	0.75	0.08	0.74	0.10	0.13	0.39	0.00	0.19
Avail Cap(c_a), veh/h	89	1451	647	178	1629	726	119	358	304	119	0	337
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	0.98	0.98	0.98	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	54.9	31.0	22.6	51.4	26.9	18.3	55.0	40.0	40.2	53.7	0.0	40.7
Incr Delay (d2), s/veh	1.5	4.5	0.6	3.2	3.2	0.2	21.7	0.1	0.2	2.1	0.0	0.3
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(95%),veh/ln	1.2	20.9	3.6	5.1	20.5	1.6	6.0	1.6	1.7	2.5	0.0	2.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	56.4	35.5	23.1	54.5	30.1	18.5	76.7	40.1	40.4	55.7	0.0	41.0
LnGrp LOS	E	D	C	D	C	B	E	D	D	E	A	D
Approach Vol, veh/h		1281			1382			163			110	
Approach Delay, s/veh		34.9			31.4			59.9			47.1	
Approach LOS		C			C			E			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	16.4	68.5	12.4	22.7	10.3	74.6	14.2	20.9
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	14.0	51.0	10.0	25.0	8.0	57.0	10.0	25.0
Max Q Clear Time (g_c+I1), s	9.2	36.9	6.0	5.4	4.5	37.4	8.8	6.7
Green Ext Time (p_c), s	0.1	5.3	0.0	0.2	0.0	6.3	0.0	0.1

Intersection Summary	
HCM 6th Ctrl Delay	35.1
HCM 6th LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	214	1150	73	539	1020	407	192	393	609	366	356	117
Future Volume (veh/h)	214	1150	73	539	1020	407	192	393	609	366	356	117
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	233	1250	57	586	1109	279	209	427	553	398	387	84
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	745	1461	454	616	1270	394	237	784	632	421	973	434
Arrive On Green	0.22	0.57	0.29	0.18	0.50	0.25	0.07	0.22	0.22	0.12	0.27	0.27
Sat Flow, veh/h	3456	5106	1585	3456	5106	1585	3456	3554	1585	3456	3554	1585
Grp Volume(v), veh/h	233	1250	57	586	1109	279	209	427	553	398	387	84
Grp Sat Flow(s),veh/h/ln	1728	1702	1585	1728	1702	1585	1728	1777	1585	1728	1777	1585
Q Serve(g_s), s	8.2	29.7	3.9	24.3	28.0	17.4	8.7	15.4	32.0	16.6	12.9	3.6
Cycle Q Clear(g_c), s	8.2	29.7	3.9	24.3	28.0	17.4	8.7	15.4	32.0	16.6	12.9	3.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	745	1461	454	616	1270	394	237	784	632	421	973	434
V/C Ratio(X)	0.31	0.86	0.13	0.95	0.87	0.71	0.88	0.54	0.87	0.95	0.40	0.19
Avail Cap(c_a), veh/h	745	1461	454	643	1796	558	310	784	632	429	973	434
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.72	0.72	0.72	1.00	1.00	1.00	0.97	0.97	0.97	1.00	1.00	1.00
Uniform Delay (d), s/veh	47.8	28.5	38.3	59.0	34.4	27.6	66.9	50.0	40.2	63.2	42.9	14.9
Incr Delay (d2), s/veh	0.2	4.9	0.4	23.6	8.5	10.3	19.6	0.8	12.6	29.7	0.3	0.2
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(95%),veh/ln	6.2	13.5	2.8	18.3	15.0	12.3	7.9	11.2	27.4	13.9	9.6	4.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	48.0	33.4	38.7	82.6	42.9	37.9	86.6	50.8	52.9	92.9	43.2	15.1
LnGrp LOS	D	C	D	F	D	D	F	D	D	F	D	B
Approach Vol, veh/h		1540			1974			1189			869	
Approach Delay, s/veh		35.8			54.0			58.0			63.2	
Approach LOS		D			D			E			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	32.8	48.5	24.7	39.0	38.3	43.1	16.9	46.7
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	29.0	42.0	20.0	34.0	18.0	53.0	15.0	39.0
Max Q Clear Time (g_c+I1), s	27.3	32.7	19.6	35.0	11.2	31.0	11.7	15.9
Green Ext Time (p_c), s	0.5	4.4	0.1	0.0	0.5	7.1	0.3	2.1

Intersection Summary	
HCM 6th Ctrl Delay	51.3
HCM 6th LOS	D

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	1533	1092	0	648	871
Future Volume (veh/h)	0	1533	1092	0	648	871
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	0	1870	1870	0	1870	1870
Adj Flow Rate, veh/h	0	1666	1187	0	704	838
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	0	2	2
Cap, veh/h	0	2833	2833		1205	973
Arrive On Green	0.00	1.00	1.00	0.00	0.35	0.35
Sat Flow, veh/h	0	5443	5443	0	3456	2790
Grp Volume(v), veh/h	0	1666	1187	0	704	838
Grp Sat Flow(s),veh/h/ln	0	1702	1702	0	1728	1395
Q Serve(g_s), s	0.0	0.0	0.0	0.0	24.2	40.6
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	24.2	40.6
Prop In Lane	0.00			0.00	1.00	1.00
Lane Grp Cap(c), veh/h	0	2833	2833		1205	973
V/C Ratio(X)	0.00	0.59	0.42		0.58	0.86
Avail Cap(c_a), veh/h	0	2833	2833		1501	1212
HCM Platoon Ratio	1.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	38.6	44.0
Incr Delay (d2), s/veh	0.0	0.9	0.5	0.0	0.5	5.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.0	0.4	0.2	0.0	15.7	21.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.0	0.9	0.5	0.0	39.1	49.4
LnGrp LOS	A	A	A		D	D
Approach Vol, veh/h		1666	1187	A	1542	
Approach Delay, s/veh		0.9	0.5		44.7	
Approach LOS		A	A		D	

Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		87.4		57.6		87.4
Change Period (Y+Rc), s		5.0		5.0		5.0
Max Green Setting (Gmax), s		70.0		65.0		70.0
Max Q Clear Time (g_c+I1), s		3.0		43.6		3.0
Green Ext Time (p_c), s		12.0		9.0		6.9

Intersection Summary			
HCM 6th Ctrl Delay			16.2
HCM 6th LOS			B

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1459	0	0	1500	415	754
Future Volume (veh/h)	1459	0	0	1500	415	754
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	0	0	1870	1870	1870
Adj Flow Rate, veh/h	1586	0	0	1630	387	779
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	0	0	2	2	2
Cap, veh/h	3145	0	0	3962	512	912
Arrive On Green	1.00	0.00	0.00	1.00	0.29	0.29
Sat Flow, veh/h	5443	0	0	6958	1781	3170
Grp Volume(v), veh/h	1586	0	0	1630	387	779
Grp Sat Flow(s),veh/h/ln	1702	0	0	1609	1781	1585
Q Serve(g_s), s	0.0	0.0	0.0	0.0	28.7	33.7
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	28.7	33.7
Prop In Lane		0.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	3145	0	0	3962	512	912
V/C Ratio(X)	0.50	0.00	0.00	0.41	0.76	0.85
Avail Cap(c_a), veh/h	3145	0	0	3962	811	1443
HCM Platoon Ratio	2.00	1.00	1.00	2.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	47.0	48.8
Incr Delay (d2), s/veh	0.6	0.0	0.0	0.3	2.3	3.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.3	0.0	0.0	0.2	19.0	19.8
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.6	0.0	0.0	0.3	49.3	51.9
LnGrp LOS	A	A	A	A	D	D
Approach Vol, veh/h	1586			1630	1166	
Approach Delay, s/veh	0.6			0.3	51.0	
Approach LOS	A			A	D	

Timer - Assigned Phs	2	4	6
Phs Duration (G+Y+Rc), s	96.3	48.7	96.3
Change Period (Y+Rc), s	5.0	5.0	5.0
Max Green Setting (Gmax), s	67.0	68.0	67.0
Max Q Clear Time (g_c+I1), s	3.0	36.7	3.0
Green Ext Time (p_c), s	10.9	7.0	11.5

Intersection Summary	
HCM 6th Ctrl Delay	13.9
HCM 6th LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	403	1507	371	82	1528	54	426	138	185	126	91	380
Future Volume (veh/h)	403	1507	371	82	1528	54	426	138	185	126	91	380
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	438	1638	240	89	1661	57	463	150	199	137	99	304
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	490	1881	710	393	2830	97	539	277	247	246	258	443
Arrive On Green	0.14	0.58	0.29	0.22	0.74	0.37	0.16	0.16	0.16	0.14	0.14	0.14
Sat Flow, veh/h	3456	6434	1585	1781	7622	261	3456	1777	1585	1781	1870	1585
Grp Volume(v), veh/h	438	1638	240	89	1320	398	463	150	199	137	99	304
Grp Sat Flow(s),veh/h/ln	1728	1609	1585	1781	1515	1823	1728	1777	1585	1781	1870	1585
Q Serve(g_s), s	18.1	31.2	14.3	5.9	14.4	16.5	18.9	11.3	17.6	10.4	7.0	20.0
Cycle Q Clear(g_c), s	18.1	31.2	14.3	5.9	14.4	16.5	18.9	11.3	17.6	10.4	7.0	20.0
Prop In Lane	1.00		1.00	1.00		0.14	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	490	1881	710	393	2250	677	539	277	247	246	258	443
V/C Ratio(X)	0.89	0.87	0.34	0.23	0.59	0.59	0.86	0.54	0.81	0.56	0.38	0.69
Avail Cap(c_a), veh/h	715	2352	826	393	2250	677	691	355	317	246	258	443
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.70	0.70	0.70	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	61.1	27.8	26.0	46.3	13.6	16.7	59.7	56.4	59.1	58.4	56.9	46.5
Incr Delay (d2), s/veh	10.0	5.9	1.3	0.2	0.8	2.6	8.7	1.6	11.1	2.8	0.9	4.4
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(95%),veh/ln	18.3	14.1	11.8	4.8	5.9	8.5	13.9	9.0	12.4	8.5	6.1	15.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	71.2	33.7	27.3	46.5	14.4	19.3	68.3	58.1	70.2	61.2	57.8	50.9
LnGrp LOS	E	C	C	D	B	B	E	E	E	E	E	D
Approach Vol, veh/h		2316			1807			812			540	
Approach Delay, s/veh		40.1			17.0			66.9			54.8	
Approach LOS		D			B			E			D	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	39.0	49.4		27.0	27.6	60.8		29.6
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	17.0	55.0		22.0	32.0	40.0		31.0
Max Q Clear Time (g_c+I1), s	8.9	34.2		23.0	21.1	19.5		21.9
Green Ext Time (p_c), s	0.1	10.1		0.0	1.5	8.7		2.7

Intersection Summary		
HCM 6th Ctrl Delay		37.9
HCM 6th LOS		D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	71	1249	344	167	860	252	756	245	162	337	148	122
Future Volume (veh/h)	71	1249	344	167	860	252	756	245	162	337	148	122
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	77	1358	265	182	935	272	822	266	111	366	161	131
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	95	2531	1023	207	2133	609	870	441	374	408	196	149
Arrive On Green	0.03	0.79	0.39	0.06	0.85	0.43	0.25	0.24	0.24	0.12	0.10	0.10
Sat Flow, veh/h	3456	6434	1585	3456	5009	1429	3456	1870	1585	3456	1921	1463
Grp Volume(v), veh/h	77	1358	265	182	900	307	822	266	111	366	148	144
Grp Sat Flow(s),veh/h/ln	1728	1609	1585	1728	1609	1613	1728	1870	1585	1728	1777	1607
Q Serve(g_s), s	3.2	11.3	3.5	7.6	6.4	18.4	33.9	18.4	8.3	15.1	11.8	12.8
Cycle Q Clear(g_c), s	3.2	11.3	3.5	7.6	6.4	18.4	33.9	18.4	8.3	15.1	11.8	12.8
Prop In Lane	1.00		1.00	1.00		0.89	1.00		1.00	1.00		0.91
Lane Grp Cap(c), veh/h	95	2531	1023	207	2055	687	870	441	374	408	181	164
V/C Ratio(X)	0.81	0.54	0.26	0.88	0.44	0.45	0.94	0.60	0.30	0.90	0.82	0.88
Avail Cap(c_a), veh/h	167	2531	1023	238	2055	687	929	568	481	548	343	310
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.65	0.65	0.65	0.94	0.94	0.94	0.35	0.35	0.35	1.00	1.00	1.00
Uniform Delay (d), s/veh	70.1	10.6	3.6	67.7	6.7	26.7	53.3	49.4	45.5	63.1	63.8	64.2
Incr Delay (d2), s/veh	10.3	0.5	0.4	25.8	0.6	2.0	7.7	0.5	0.2	14.2	8.7	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(95%),veh/ln	2.8	5.0	2.7	7.3	3.1	11.4	19.3	11.5	5.1	12.0	9.8	9.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	80.4	11.1	4.0	93.4	7.3	28.7	61.0	49.8	45.7	77.2	72.5	77.9
LnGrp LOS	F	B	A	F	A	C	E	D	D	E	E	E
Approach Vol, veh/h		1700			1389			1199			658	
Approach Delay, s/veh		13.1			23.3			57.1			76.3	
Approach LOS		B			C			E			E	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	15.7	64.0	24.1	41.2	11.0	68.7	43.5	21.8				
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0				
Max Green Setting (Gmax), s	12.0	42.0	25.0	46.0	9.0	45.0	41.0	30.0				
Max Q Clear Time (g_c+I1), s	10.6	14.3	18.1	21.4	6.2	21.4	36.9	15.8				
Green Ext Time (p_c), s	0.1	9.4	1.0	1.5	0.0	6.0	1.6	1.0				
Intersection Summary												
HCM 6th Ctrl Delay			35.1									
HCM 6th LOS			D									

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1573	324	188	894	383	475
Future Volume (veh/h)	1573	324	188	894	383	475
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	1710	243	204	972	416	407
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	3187	989	237	3783	562	645
Arrive On Green	1.00	0.62	0.07	1.00	0.16	0.16
Sat Flow, veh/h	5274	1585	3456	5274	3456	2790
Grp Volume(v), veh/h	1710	243	204	972	416	407
Grp Sat Flow(s),veh/h/ln	1702	1585	1728	1702	1728	1395
Q Serve(g_s), s	0.0	9.9	8.5	0.0	16.6	19.0
Cycle Q Clear(g_c), s	0.0	9.9	8.5	0.0	16.6	19.0
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	3187	989	237	3783	562	645
V/C Ratio(X)	0.54	0.25	0.86	0.26	0.74	0.63
Avail Cap(c_a), veh/h	3187	989	405	3783	786	826
HCM Platoon Ratio	2.00	1.00	1.00	2.00	1.00	1.00
Upstream Filter(I)	0.99	0.99	0.29	0.29	1.00	1.00
Uniform Delay (d), s/veh	0.0	12.1	66.9	0.0	57.8	50.2
Incr Delay (d2), s/veh	0.6	0.6	2.9	0.0	2.3	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.3	6.4	5.5	0.0	12.0	11.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.6	12.7	69.8	0.0	60.1	51.2
LnGrp LOS	A	B	E	A	E	D
Approach Vol, veh/h	1953			1176	823	
Approach Delay, s/veh	2.1			12.1	55.7	
Approach LOS	A			B	E	

Timer - Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	16.9	97.5				114.4		30.6
Change Period (Y+Rc), s	5.0	5.0				5.0		5.0
Max Green Setting (Gmax), s	19.0	76.0				100.0		35.0
Max Q Clear Time (g_c+I1), s	11.5	12.9				3.0		22.0
Green Ext Time (p_c), s	0.5	15.2				5.3		3.5

Intersection Summary			
HCM 6th Ctrl Delay			16.3
HCM 6th LOS			B

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	942	287	584	496	220	730
Future Volume (veh/h)	942	287	584	496	220	730
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	1024	203	635	539	239	684
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	1214	542	778	2221	893	1348
Arrive On Green	0.34	0.34	0.22	0.63	0.26	0.26
Sat Flow, veh/h	3647	1585	3456	3647	3456	2790
Grp Volume(v), veh/h	1024	203	635	539	239	684
Grp Sat Flow(s),veh/h/ln	1777	1585	1728	1777	1728	1395
Q Serve(g_s), s	32.0	11.6	20.9	8.0	6.6	20.1
Cycle Q Clear(g_c), s	32.0	11.6	20.9	8.0	6.6	20.1
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	1214	542	778	2221	893	1348
V/C Ratio(X)	0.84	0.37	0.82	0.24	0.27	0.51
Avail Cap(c_a), veh/h	1214	542	778	2221	893	1348
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.83	0.83	0.99	0.99
Uniform Delay (d), s/veh	36.5	29.8	44.2	9.9	35.5	21.2
Incr Delay (d2), s/veh	7.2	2.0	5.7	0.2	0.2	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	20.6	8.1	13.8	5.2	4.9	10.2
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	43.8	31.8	49.9	10.2	35.6	21.5
LnGrp LOS	D	C	D	B	D	C
Approach Vol, veh/h	1227			1174	923	
Approach Delay, s/veh	41.8			31.6	25.2	
Approach LOS	D			C	C	

Timer - Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	32.2	53.1				85.3		34.7
Change Period (Y+Rc), s	5.0	5.0				5.0		5.0
Max Green Setting (Gmax), s	29.0	43.0				77.0		33.0
Max Q Clear Time (g_c+I1), s	22.9	35.0				11.0		23.1
Green Ext Time (p_c), s	1.4	3.6				2.5		3.3

Intersection Summary	
HCM 6th Ctrl Delay	33.6
HCM 6th LOS	C

Intersection	
Intersection Delay, s/veh	40.5
Intersection LOS	E

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	61	323	6	152	202	62	11	108	344	54	227	109
Future Vol, veh/h	61	323	6	152	202	62	11	108	344	54	227	109
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	66	351	7	165	220	67	12	117	374	59	247	118
Number of Lanes	1	2	0	1	2	0	0	1	1	0	1	1

Approach	SE	NW	NE	SW
Opposing Approach	NW	SE	SW	NE
Opposing Lanes	3	3	2	2
Conflicting Approach Left	SW	NE	SE	NW
Conflicting Lanes Left	2	2	3	3
Conflicting Approach Right	NE	SW	NW	SE
Conflicting Lanes Right	2	2	3	3
HCM Control Delay	27.9	22.5	61.2	47.6
HCM LOS	D	C	F	E

Lane	NELn1	NELn2	NWLn1	NWLn2	NWLn3	SELn1	SELn2	SELn3	SWLn1	SWLn2
Vol Left, %	9%	0%	100%	0%	0%	100%	0%	0%	19%	0%
Vol Thru, %	91%	0%	0%	100%	52%	0%	100%	95%	81%	0%
Vol Right, %	0%	100%	0%	0%	48%	0%	0%	5%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	119	344	152	135	129	61	215	114	281	109
LT Vol	11	0	152	0	0	61	0	0	54	0
Through Vol	108	0	0	135	67	0	215	108	227	0
RT Vol	0	344	0	0	62	0	0	6	0	109
Lane Flow Rate	129	374	165	146	141	66	234	124	305	118
Geometry Grp	8	8	8	8	8	8	8	8	8	8
Degree of Util (X)	0.371	0.991	0.516	0.436	0.404	0.208	0.7	0.368	0.896	0.32
Departure Headway (Hd)	10.312	9.545	11.239	10.711	10.357	11.296	10.768	10.729	10.555	9.737
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	349	381	321	335	347	318	335	335	342	368
Service Time	8.084	7.317	9.019	8.49	8.136	9.075	8.546	8.507	8.33	7.511
HCM Lane V/C Ratio	0.37	0.982	0.514	0.436	0.406	0.208	0.699	0.37	0.892	0.321
HCM Control Delay	19.1	75.8	25.5	21.6	20	17	35.3	19.7	59.5	17.1
HCM Lane LOS	C	F	D	C	C	C	E	C	F	C
HCM 95th-tile Q	1.7	11.6	2.8	2.1	1.9	0.8	5	1.6	8.7	1.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	62	208	82	398	439	662	74	361	154	349	434	44
Future Volume (veh/h)	62	208	82	398	439	662	74	361	154	349	434	44
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	67	226	46	433	477	557	80	392	113	379	472	47
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	96	793	354	452	791	671	164	683	305	399	703	70
Arrive On Green	0.05	0.22	0.22	0.25	0.42	0.42	0.09	0.19	0.19	0.12	0.22	0.22
Sat Flow, veh/h	1781	3554	1585	1781	1870	1585	1781	3554	1585	3456	3265	324
Grp Volume(v), veh/h	67	226	46	433	477	557	80	392	113	379	256	263
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1870	1585	1781	1777	1585	1728	1777	1812
Q Serve(g_s), s	4.8	6.9	3.0	31.2	25.7	40.6	5.5	13.0	8.1	14.2	17.2	17.3
Cycle Q Clear(g_c), s	4.8	6.9	3.0	31.2	25.7	40.6	5.5	13.0	8.1	14.2	17.2	17.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.18
Lane Grp Cap(c), veh/h	96	793	354	452	791	671	164	683	305	399	383	390
V/C Ratio(X)	0.70	0.29	0.13	0.96	0.60	0.83	0.49	0.57	0.37	0.95	0.67	0.67
Avail Cap(c_a), veh/h	96	793	354	452	791	671	164	683	305	399	383	390
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	60.5	41.9	40.4	47.8	29.0	33.4	56.1	47.7	45.7	57.1	46.8	46.8
Incr Delay (d2), s/veh	20.0	0.2	0.2	31.6	1.3	8.7	2.2	1.2	0.7	32.5	4.4	4.5
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(95%),veh/ln	4.9	5.5	2.2	24.3	17.0	23.6	4.7	9.8	5.8	12.6	12.7	13.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	80.4	42.1	40.6	79.4	30.3	42.0	58.3	48.8	46.4	89.6	51.2	51.3
LnGrp LOS	F	D	D	E	C	D	E	D	D	F	D	D
Approach Vol, veh/h		339			1467			585			898	
Approach Delay, s/veh		49.5			49.3			49.7			67.5	
Approach LOS		D			D			D			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	39.7	30.7	22.0	27.4	13.1	57.3	16.1	33.3
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	35.0	31.0	17.0	27.0	9.0	57.0	14.0	30.0
Max Q Clear Time (g_c+I1), s	14.2	9.9	17.2	16.0	7.8	43.6	8.5	20.3
Green Ext Time (p_c), s	0.2	1.1	0.0	1.7	0.0	4.1	0.1	1.5

Intersection Summary	
HCM 6th Ctrl Delay	54.3
HCM 6th LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑	↱		↰↑↱			↰↑	↱
Traffic Volume (veh/h)	14	428	267	48	899	24	537	4	79	33	8	82
Future Volume (veh/h)	14	428	267	48	899	24	537	4	79	33	8	82
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	15	465	247	52	977	15	584	4	85	36	9	88
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	59	1185	528	139	1343	599	593	23	493	349	80	564
Arrive On Green	0.03	0.33	0.33	0.08	0.38	0.38	0.36	0.36	0.36	0.36	0.36	0.36
Sat Flow, veh/h	1781	3554	1585	1781	3554	1585	1442	65	1387	780	224	1585
Grp Volume(v), veh/h	15	465	247	52	977	15	584	0	89	45	0	88
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1777	1585	1442	0	1452	1004	0	1585
Q Serve(g_s), s	0.7	9.0	11.1	2.5	21.2	0.5	29.0	0.0	3.8	1.6	0.0	3.4
Cycle Q Clear(g_c), s	0.7	9.0	11.1	2.5	21.2	0.5	32.0	0.0	3.8	11.1	0.0	3.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.96	0.80		1.00
Lane Grp Cap(c), veh/h	59	1185	528	139	1343	599	593	0	516	429	0	564
V/C Ratio(X)	0.25	0.39	0.47	0.38	0.73	0.03	0.99	0.00	0.17	0.10	0.00	0.16
Avail Cap(c_a), veh/h	59	1185	528	139	1343	599	593	0	516	429	0	564
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	42.4	23.0	23.7	39.4	24.0	17.6	30.6	0.0	19.9	23.6	0.0	19.8
Incr Delay (d2), s/veh	2.2	0.2	0.6	1.7	2.0	0.0	33.2	0.0	0.2	0.1	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.6	6.5	7.2	2.0	13.4	0.3	25.4	0.0	2.3	1.3	0.0	2.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	44.6	23.2	24.3	41.1	26.0	17.6	63.8	0.0	20.1	23.7	0.0	19.9
LnGrp LOS	D	C	C	D	C	B	E	A	C	C	A	B
Approach Vol, veh/h		727			1044			673			133	
Approach Delay, s/veh		24.0			26.7			58.0			21.2	
Approach LOS		C			C			E			C	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	11.5	33.8		39.0	8.3	37.0		39.0
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	9.0	32.0		34.0	5.0	36.0		34.0
Max Q Clear Time (g_c+I1), s	15.5	14.1		35.0	3.7	24.2		14.1
Green Ext Time (p_c), s	0.0	3.0		0.0	0.0	3.8		0.5

Intersection Summary		
HCM 6th Ctrl Delay		33.8
HCM 6th LOS		C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	135	329	65	54	361	213	237	680	145	181	418	174
Future Volume (veh/h)	135	329	65	54	361	213	237	680	145	181	418	174
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	147	358	70	59	392	230	258	739	93	197	454	187
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	214	802	155	125	477	276	303	817	365	267	517	211
Arrive On Green	0.12	0.27	0.27	0.07	0.22	0.22	0.17	0.23	0.23	0.15	0.21	0.21
Sat Flow, veh/h	1781	2969	575	1781	2167	1255	1781	3554	1585	1781	2461	1005
Grp Volume(v), veh/h	147	213	215	59	321	301	258	739	93	197	327	314
Grp Sat Flow(s),veh/h/ln	1781	1777	1767	1781	1777	1644	1781	1777	1585	1781	1777	1689
Q Serve(g_s), s	7.9	9.9	10.1	3.2	17.2	17.5	14.1	20.2	4.8	10.6	17.8	18.1
Cycle Q Clear(g_c), s	7.9	9.9	10.1	3.2	17.2	17.5	14.1	20.2	4.8	10.6	17.8	18.1
Prop In Lane	1.00		0.33	1.00		0.76	1.00		1.00	1.00		0.60
Lane Grp Cap(c), veh/h	214	480	477	125	391	362	303	817	365	267	373	355
V/C Ratio(X)	0.69	0.44	0.45	0.47	0.82	0.83	0.85	0.90	0.26	0.74	0.88	0.89
Avail Cap(c_a), veh/h	214	480	477	125	391	362	303	817	365	267	373	355
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	42.2	30.3	30.3	44.7	37.1	37.2	40.3	37.4	31.5	40.6	38.2	38.3
Incr Delay (d2), s/veh	8.9	0.6	0.7	2.8	13.0	15.2	20.2	13.5	0.4	10.2	20.1	22.5
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(95%),veh/ln	7.0	7.5	7.6	2.6	13.4	13.0	12.2	15.1	3.3	9.1	14.7	14.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	51.1	30.9	31.0	47.5	50.1	52.5	60.4	50.9	31.9	50.9	58.4	60.8
LnGrp LOS	D	C	C	D	D	D	E	D	C	D	E	E
Approach Vol, veh/h		575			681			1090			838	
Approach Delay, s/veh		36.1			50.9			51.5			57.5	
Approach LOS		D			D			D			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	12.0	33.1	20.4	30.1	17.4	27.7	23.1	27.3
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	9.0	29.0	17.0	25.0	14.0	24.0	19.0	23.0
Max Q Clear Time (g_c+I1), s	10.2	13.1	13.6	23.2	10.9	20.5	17.1	21.1
Green Ext Time (p_c), s	0.0	1.4	0.2	0.8	0.1	0.9	0.2	0.6

Intersection Summary	
HCM 6th Ctrl Delay	50.2
HCM 6th LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	327	38	263	42	55	111	162	360	22	63	390	115
Future Volume (veh/h)	327	38	263	42	55	111	162	360	22	63	390	115
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	355	41	0	46	60	78	176	391	23	68	424	92
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	484	585		126	456	387	251	907	53	125	693	531
Arrive On Green	0.14	0.31	0.00	0.07	0.24	0.24	0.14	0.27	0.27	0.07	0.19	0.19
Sat Flow, veh/h	3456	1870	1585	1781	1870	1585	1781	3411	200	1781	3554	1585
Grp Volume(v), veh/h	355	41	0	46	60	78	176	203	211	68	424	92
Grp Sat Flow(s),veh/h/ln	1728	1870	1585	1781	1870	1585	1781	1777	1834	1781	1777	1585
Q Serve(g_s), s	9.8	1.5	0.0	2.5	2.5	3.9	9.4	9.5	9.5	3.7	10.9	4.1
Cycle Q Clear(g_c), s	9.8	1.5	0.0	2.5	2.5	3.9	9.4	9.5	9.5	3.7	10.9	4.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.11	1.00		1.00
Lane Grp Cap(c), veh/h	484	585		126	456	387	251	473	488	125	693	531
V/C Ratio(X)	0.73	0.07		0.36	0.13	0.20	0.70	0.43	0.43	0.55	0.61	0.17
Avail Cap(c_a), veh/h	484	585		126	456	387	251	473	488	125	693	531
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	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	41.2	24.1	0.0	44.3	29.5	30.1	40.9	30.4	30.4	45.0	36.8	23.5
Incr Delay (d2), s/veh	5.7	0.1	0.0	1.7	0.1	0.3	8.4	0.6	0.6	4.9	1.6	0.2
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(95%),veh/ln	7.9	1.2	0.0	2.0	2.0	2.7	8.1	7.2	7.4	3.2	8.3	2.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	46.9	24.2	0.0	46.0	29.7	30.3	49.3	31.0	31.0	49.8	38.4	23.6
LnGrp LOS	D	C		D	C	C	D	C	C	D	D	C
Approach Vol, veh/h		396	A		184			590			584	
Approach Delay, s/veh		44.6			34.0			36.5			37.4	
Approach LOS		D			C			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	11.5	30.0	12.4	30.4	19.7	21.9	19.3	23.4
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	9.1	33.3	9.0	28.6	16.0	26.4	16.1	21.5
Max Q Clear Time (g_c+I1), s	11.5	4.5	6.7	12.5	12.8	6.9	12.4	13.9
Green Ext Time (p_c), s	0.0	0.1	0.0	1.4	0.5	0.4	0.2	1.4

Intersection Summary	
HCM 6th Ctrl Delay	38.4
HCM 6th LOS	D

Notes

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Intersection						
Int Delay, s/veh	7.7					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	89	170	198	9	154	159
Future Vol, veh/h	89	170	198	9	154	159
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	97	185	215	10	167	173

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	727	220	0	0	225	0
Stage 1	220	-	-	-	-	-
Stage 2	507	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	391	820	-	-	1344	-
Stage 1	817	-	-	-	-	-
Stage 2	605	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	337	820	-	-	1344	-
Mov Cap-2 Maneuver	337	-	-	-	-	-
Stage 1	817	-	-	-	-	-
Stage 2	522	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	18.3	0	4
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	549	1344	-
HCM Lane V/C Ratio	-	-	0.513	0.125	-
HCM Control Delay (s)	-	-	18.3	8.1	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	2.9	0.4	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	173	31	235	207	25	169	181	571	25	12	579	65
Future Volume (veh/h)	173	31	235	207	25	169	181	571	25	12	579	65
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	188	34	201	225	27	130	197	621	26	13	629	70
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	550	582	493	432	43	493	317	1467	61	59	896	100
Arrive On Green	0.31	0.31	0.31	0.31	0.31	0.31	0.18	0.42	0.42	0.03	0.28	0.28
Sat Flow, veh/h	1383	1870	1585	1144	137	1585	1781	3476	145	1781	3224	358
Grp Volume(v), veh/h	188	34	201	252	0	130	197	317	330	13	346	353
Grp Sat Flow(s),veh/h/ln	1383	1870	1585	1281	0	1585	1781	1777	1844	1781	1777	1806
Q Serve(g_s), s	0.0	1.1	9.0	14.0	0.0	5.5	9.2	11.3	11.3	0.6	15.7	15.8
Cycle Q Clear(g_c), s	7.9	1.1	9.0	16.7	0.0	5.5	9.2	11.3	11.3	0.6	15.7	15.8
Prop In Lane	1.00		1.00	0.89		1.00	1.00		0.08	1.00		0.20
Lane Grp Cap(c), veh/h	550	582	493	474	0	493	317	750	779	59	494	502
V/C Ratio(X)	0.34	0.06	0.41	0.53	0.00	0.26	0.62	0.42	0.42	0.22	0.70	0.70
Avail Cap(c_a), veh/h	550	582	493	474	0	493	317	750	779	59	494	502
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	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	24.1	21.8	24.5	28.3	0.0	23.3	34.2	18.3	18.3	42.4	29.2	29.2
Incr Delay (d2), s/veh	0.4	0.0	0.5	1.1	0.0	0.3	3.7	0.4	0.4	1.8	4.4	4.4
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(95%),veh/ln	5.6	0.9	6.1	8.4	0.0	3.7	7.4	7.8	8.0	0.5	11.3	11.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	24.4	21.8	25.0	29.4	0.0	23.5	37.9	18.7	18.7	44.2	33.6	33.6
LnGrp LOS	C	C	C	C	A	C	D	B	B	D	C	C
Approach Vol, veh/h		423			382			844			712	
Approach Delay, s/veh		24.5			27.4			23.2			33.8	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	8.2	40.9		30.4	20.2	28.8		30.4
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	5.0	40.0		30.0	18.0	27.0		30.0
Max Q Clear Time (g_c+I1), s	2.6	14.3		12.0	12.2	18.8		19.7
Green Ext Time (p_c), s	0.0	2.5		1.7	0.3	1.9		1.2

Intersection Summary	
HCM 6th Ctrl Delay	27.3
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	122	301	99	101	6	193	96	119	48	255	22
Future Volume (veh/h)	10	122	301	99	101	6	193	96	119	48	255	22
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	11	133	245	108	110	6	210	104	96	52	277	23
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	143	430	365	196	457	25	374	373	333	88	493	43
Arrive On Green	0.08	0.23	0.23	0.11	0.26	0.26	0.21	0.21	0.21	0.17	0.17	0.17
Sat Flow, veh/h	1781	1870	1585	1781	1757	96	1781	1777	1585	519	2900	251
Grp Volume(v), veh/h	11	133	245	108	0	116	210	104	96	185	0	167
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	0	1853	1781	1777	1585	1844	0	1825
Q Serve(g_s), s	0.6	5.9	14.1	5.7	0.0	4.9	10.6	4.9	5.1	9.2	0.0	8.4
Cycle Q Clear(g_c), s	0.6	5.9	14.1	5.7	0.0	4.9	10.6	4.9	5.1	9.2	0.0	8.4
Prop In Lane	1.00		1.00	1.00		0.05	1.00		1.00	0.28		0.14
Lane Grp Cap(c), veh/h	143	430	365	196	0	482	374	373	333	314	0	310
V/C Ratio(X)	0.08	0.31	0.67	0.55	0.00	0.24	0.56	0.28	0.29	0.59	0.00	0.54
Avail Cap(c_a), veh/h	143	430	365	196	0	482	374	373	333	314	0	310
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	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	42.6	31.9	35.1	42.2	0.0	29.2	35.4	33.1	33.2	38.3	0.0	37.9
Incr Delay (d2), s/veh	0.2	0.4	4.8	3.3	0.0	0.3	1.9	0.4	0.5	2.9	0.0	1.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.5	4.8	9.8	4.8	0.0	4.0	8.3	3.9	3.6	7.8	0.0	7.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	42.8	32.3	39.8	45.5	0.0	29.5	37.3	33.5	33.7	41.2	0.0	39.8
LnGrp LOS	D	C	D	D	A	C	D	C	C	D	A	D
Approach Vol, veh/h		389			224			410			352	
Approach Delay, s/veh		37.3			37.2			35.5			40.5	
Approach LOS		D			D			D			D	

Timer - Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		23.9	15.7	26.8		21.0	10.7	31.8
Change Period (Y+Rc), s		5.0	5.0	5.0		5.0	5.0	5.0
Max Green Setting (Gmax), s		23.0	13.0	25.0		19.0	10.0	28.0
Max Q Clear Time (g_c+I1), s		13.6	8.7	17.1		12.2	3.6	7.9
Green Ext Time (p_c), s		1.2	0.1	1.4		0.8	0.0	0.9

Intersection Summary			
HCM 6th Ctrl Delay			37.6
HCM 6th LOS			D

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	106	26	163	162	28	31	137	614	36	68	1156	161
Future Volume (veh/h)	106	26	163	162	28	31	137	614	36	68	1156	161
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	115	28	150	176	30	33	149	667	38	74	1257	173
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	386	505	428	409	220	242	178	1675	95	53	1319	181
Arrive On Green	0.27	0.27	0.27	0.27	0.27	0.27	0.10	0.49	0.49	0.03	0.42	0.42
Sat Flow, veh/h	1339	1870	1585	1382	814	895	1781	3418	195	1781	3140	430
Grp Volume(v), veh/h	115	28	150	176	0	63	149	347	358	74	708	722
Grp Sat Flow(s),veh/h/ln	1339	1870	1585	1382	0	1709	1781	1777	1835	1781	1777	1793
Q Serve(g_s), s	7.2	1.1	7.6	11.0	0.0	2.8	8.2	12.4	12.4	3.0	38.5	39.1
Cycle Q Clear(g_c), s	10.7	1.1	7.6	13.6	0.0	2.8	8.2	12.4	12.4	3.0	38.5	39.1
Prop In Lane	1.00		1.00	1.00		0.52	1.00		0.11	1.00		0.24
Lane Grp Cap(c), veh/h	386	505	428	409	0	461	178	871	899	53	746	753
V/C Ratio(X)	0.30	0.06	0.35	0.43	0.00	0.14	0.84	0.40	0.40	1.38	0.95	0.96
Avail Cap(c_a), veh/h	386	505	428	409	0	461	178	871	899	53	746	753
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	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	32.0	27.0	29.4	32.8	0.0	27.7	44.2	16.2	16.2	48.5	28.0	28.1
Incr Delay (d2), s/veh	0.4	0.0	0.5	0.7	0.0	0.1	27.9	0.3	0.3	255.3	21.4	23.0
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(95%),veh/ln	4.2	0.9	5.3	6.7	0.0	2.1	8.5	8.3	8.5	9.2	26.7	27.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	32.5	27.1	29.9	33.5	0.0	27.8	72.1	16.5	16.4	303.8	49.4	51.2
LnGrp LOS	C	C	C	C	A	C	E	B	B	F	D	D
Approach Vol, veh/h		293			239			854			1504	
Approach Delay, s/veh		30.7			32.0			26.2			62.8	
Approach LOS		C			C			C			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	10.0	55.4		28.2	16.5	48.9		28.2
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	5.0	51.0		29.0	12.0	44.0		29.0
Max Q Clear Time (g_c+I1), s	5.0	15.4		13.7	11.2	42.1		16.6
Green Ext Time (p_c), s	0.0	8.5		1.0	0.0	1.7		0.7

Intersection Summary		
HCM 6th Ctrl Delay		46.1
HCM 6th LOS		D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	54	8	329	59	0	22	341	298	112	34	587	61
Future Volume (veh/h)	54	8	329	59	0	22	341	298	112	34	587	61
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	59	9	276	64	0	23	371	324	120	37	638	65
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	299	46	305	665	0	305	505	1292	452	96	827	84
Arrive On Green	0.19	0.19	0.19	0.19	0.00	0.19	0.15	0.35	0.35	0.05	0.25	0.25
Sat Flow, veh/h	1555	237	1585	3456	0	1585	3456	3733	1306	1781	3256	331
Grp Volume(v), veh/h	68	0	276	64	0	23	371	294	150	37	348	355
Grp Sat Flow(s),veh/h/ln	1793	0	1585	1728	0	1585	1728	1702	1635	1781	1777	1811
Q Serve(g_s), s	4.1	0.0	22.1	2.0	0.0	1.5	13.4	8.0	8.6	2.6	23.6	23.7
Cycle Q Clear(g_c), s	4.1	0.0	22.1	2.0	0.0	1.5	13.4	8.0	8.6	2.6	23.6	23.7
Prop In Lane	0.87		1.00	1.00		1.00	1.00		0.80	1.00		0.18
Lane Grp Cap(c), veh/h	345	0	305	665	0	305	505	1178	566	96	451	460
V/C Ratio(X)	0.20	0.00	0.91	0.10	0.00	0.08	0.73	0.25	0.27	0.39	0.77	0.77
Avail Cap(c_a), veh/h	345	0	305	665	0	305	505	1178	566	96	451	460
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	44.1	0.0	51.3	43.2	0.0	43.0	53.1	30.4	30.6	59.4	45.0	45.0
Incr Delay (d2), s/veh	0.3	0.0	28.7	0.1	0.0	0.1	5.5	0.1	0.2	2.5	8.0	8.0
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(95%),veh/ln	3.4	0.0	16.8	1.6	0.0	1.1	10.3	6.1	6.3	2.3	17.1	17.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	44.4	0.0	80.1	43.3	0.0	43.1	58.6	30.5	30.8	61.9	53.0	53.0
LnGrp LOS	D	A	F	D	A	D	E	C	C	E	D	D
Approach Vol, veh/h		344			87			815			740	
Approach Delay, s/veh		73.0			43.2			43.4			53.4	
Approach LOS		E			D			D			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	11.6	49.4		31.2	24.1	36.9		21.0				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	9.0	47.0		27.0	21.0	35.0		27.0				
Max Q Clear Time (g_c+I1), s	15.6	11.6		25.1	16.4	26.7		5.0				
Green Ext Time (p_c), s	0.0	2.2		0.3	0.8	2.1		0.3				
Intersection Summary												
HCM 6th Ctrl Delay			52.2									
HCM 6th LOS			D									

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	15	532	223	767	540	198	123	356	293	358	525	19
Future Volume (veh/h)	15	532	223	767	540	198	123	356	293	358	525	19
Initial Q (Qb), veh	0	0	0	16	15	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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	16	578	133	834	587	0	134	387	209	389	571	20
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	59	782	349	945	1635		253	569	254	553	864	30
Arrive On Green	0.03	0.44	0.22	0.27	0.92	0.00	0.07	0.16	0.16	0.16	0.25	0.25
Sat Flow, veh/h	1781	3554	1585	3456	3554	1585	3456	3554	1585	3456	3503	123
Grp Volume(v), veh/h	16	578	133	834	587	0	134	387	209	389	289	302
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1728	1777	1585	1728	1777	1585	1728	1777	1848
Q Serve(g_s), s	1.3	20.2	10.7	34.7	3.0	0.0	5.6	15.4	19.1	16.0	22.0	22.0
Cycle Q Clear(g_c), s	1.3	20.2	10.7	34.7	3.0	0.0	5.6	15.4	19.1	16.0	22.0	22.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.07
Lane Grp Cap(c), veh/h	59	782	349	945	1635		253	569	254	553	438	456
V/C Ratio(X)	0.27	0.74	0.38	0.88	0.36		0.53	0.68	0.82	0.70	0.66	0.66
Avail Cap(c_a), veh/h	59	782	349	945	1635		253	569	254	553	438	456
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.99	0.99	0.99	0.09	0.09	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	70.7	38.4	49.8	53.5	3.5	0.0	67.0	59.4	61.0	59.6	50.8	50.9
Incr Delay (d2), s/veh	2.4	6.1	3.1	1.0	0.1	0.0	2.1	3.3	19.4	4.0	3.6	3.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	17.6	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	1.1	12.3	8.0	20.8	1.7	0.0	4.5	11.4	13.8	11.6	15.3	15.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	73.1	44.6	52.9	72.2	4.5	0.0	69.1	62.7	80.3	63.6	54.5	54.4
LnGrp LOS	E	D	D	E	A		E	E	F	E	D	D
Approach Vol, veh/h		727			1421	A		730			980	
Approach Delay, s/veh		46.7			44.2			68.9			58.1	
Approach LOS		D			D			E			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	46.3	45.9	28.0	29.8	9.7	82.5	15.9	41.9
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	43.0	35.0	26.0	26.0	7.0	71.0	13.0	39.0
Max Q Clear Time (g_c+I1), s	37.7	23.2	19.0	22.1	4.3	6.0	8.6	25.0
Green Ext Time (p_c), s	2.0	2.6	1.0	1.5	0.0	2.8	0.2	4.4

Intersection Summary	
HCM 6th Ctrl Delay	52.9
HCM 6th LOS	D

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1238	6	0	1201	1503	0	0	75	769	108	294
Future Volume (veh/h)	0	1238	6	0	1201	1503	0	0	75	769	108	294
Initial Q (Qb), veh	0	20	0	0	30	0	0	0	0	7	7	7
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	0	1870	1870	0	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	0	1346	7	0	1305	0	0	0	82	920	0	266
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	0	2	2	2	2	2	2	2	2
Cap, veh/h	0	3604	18	0	2764		0	0	85	950	0	841
Arrive On Green	0.00	1.00	1.00	0.00	1.00	0.00	0.00	0.00	0.05	0.27	0.00	0.27
Sat Flow, veh/h	0	6917	35	0	5443	0	0	0	1585	3563	0	3170
Grp Volume(v), veh/h	0	976	377	0	1305	0	0	0	82	920	0	266
Grp Sat Flow(s),veh/h/ln	0	1609	1864	0	1702	0	0	0	1585	1781	0	1585
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.7	38.4	0.0	10.1
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.7	38.4	0.0	10.1
Prop In Lane	0.00		0.02	0.00		0.00	0.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	0	2613	1009	0	2764		0	0	85	950	0	841
V/C Ratio(X)	0.00	0.37	0.37	0.00	0.47		0.00	0.00	0.97	0.97	0.00	0.32
Avail Cap(c_a), veh/h	0	2613	1009	0	2765		0	0	85	950	0	845
HCM Platoon Ratio	1.00	2.00	2.00	1.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	0.64	0.64	0.00	1.00	0.00	0.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	70.9	55.0	0.0	44.7
Incr Delay (d2), s/veh	0.0	0.3	0.7	0.0	0.6	0.0	0.0	0.0	87.6	21.9	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.4	0.3	0.0	1.6	0.0	0.0	0.0	0.0	12.5	0.0	0.7
%ile BackOfQ(95%),veh/ln	0.0	0.2	0.4	0.0	0.7	0.0	0.0	0.0	9.0	29.9	0.0	8.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	0.6	1.0	0.0	2.2	0.0	0.0	0.0	158.5	89.4	0.0	45.7
LnGrp LOS	A	A	A	A	A		A	A	F	F	A	D
Approach Vol, veh/h		1353			1305	A		82			1186	
Approach Delay, s/veh		0.7			2.2			158.5			79.6	
Approach LOS		A			A			F			E	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		88.2		46.8		88.2		15.0				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		83.0		42.0		83.0		10.0				
Max Q Clear Time (g_c+I1), s		3.0		41.4		3.0		10.7				
Green Ext Time (p_c), s		18.5		0.4		19.0		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			28.3									
HCM 6th LOS			C									

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1341	180	0	2372	751	418	0	1404	0	0	0
Future Volume (veh/h)	0	1341	180	0	2372	751	418	0	1404	0	0	0
Initial Q (Qb), veh	0	25	0	0	80	0	8	0	36			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	0	1870	1870	0	1870	1870	1870	0	1870			
Adj Flow Rate, veh/h	0	1458	0	0	2578	0	454	0	1309			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	0	2	2	0	2	2	2	0	2			
Cap, veh/h	0	2678		0	2880		682	0	1421			
Arrive On Green	0.00	1.00	0.00	0.00	1.00	0.00	0.38	0.00	0.38			
Sat Flow, veh/h	0	5274	1585	0	5611	1585	1781	0	3614			
Grp Volume(v), veh/h	0	1458	0	0	2578	0	454	0	1309			
Grp Sat Flow(s),veh/h/ln	0	1702	1585	0	1870	1585	1781	0	1205			
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	0.0	31.8	0.0	52.7			
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	0.0	0.0	31.8	0.0	52.7			
Prop In Lane	0.00		1.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	0	2678		0	2880		682	0	1421			
V/C Ratio(X)	0.00	0.54		0.00	0.90		0.67	0.00	0.92			
Avail Cap(c_a), veh/h	0	2683		0	2949		701	0	1421			
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.00	1.00	0.00	0.00	0.46	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	39.5	0.0	45.5			
Incr Delay (d2), s/veh	0.0	0.8	0.0	0.0	2.3	0.0	2.3	0.0	10.1			
Initial Q Delay(d3),s/veh	0.0	1.4	0.0	0.0	52.8	0.0	3.0	0.0	55.6			
%ile BackOfQ(95%),veh/ln	0.0	0.7	0.0	0.0	15.2	0.0	23.1	0.0	33.2			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	2.2	0.0	0.0	55.1	0.0	44.7	0.0	111.1			
LnGrp LOS	A	A		A	E		D	A	F			
Approach Vol, veh/h		1458	A		2578	A		1763				
Approach Delay, s/veh		2.2			55.1			94.0				
Approach LOS		A			E			F				

Timer - Assigned Phs		2				6		8				
Phs Duration (G+Y+Rc), s		85.8				85.8		64.2				
Change Period (Y+Rc), s		5.0				5.0		5.0				
Max Green Setting (Gmax), s		79.0				79.0		61.0				
Max Q Clear Time (g_c+I1), s		3.0				3.0		55.7				
Green Ext Time (p_c), s		40.5				71.7		3.5				

Intersection Summary			
HCM 6th Ctrl Delay			53.6
HCM 6th LOS			D

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	527	2134	22	4	1895	192	393	33	166	192	12	729
Future Volume (veh/h)	527	2134	22	4	1895	192	393	33	166	192	12	729
Initial Q (Qb), veh	16	30	0	0	60	0	10	10	0	0	0	16
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	573	2320	0	4	2060	144	453	0	126	218	0	792
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	599	3019		326	2276	563	562	0	336	261	0	782
Arrive On Green	0.17	0.84	0.00	0.17	0.84	0.42	0.15	0.00	0.15	0.07	0.00	0.07
Sat Flow, veh/h	3456	7111	1585	3456	7111	1585	3563	0	1585	3563	0	3170
Grp Volume(v), veh/h	573	2320	0	4	2060	144	453	0	126	218	0	792
Grp Sat Flow(s),veh/h/ln	1728	1778	1585	1728	1778	1585	1781	0	1585	1781	0	1585
Q Serve(g_s), s	24.7	22.0	0.0	0.1	16.6	8.7	18.6	0.0	11.0	9.1	0.0	11.0
Cycle Q Clear(g_c), s	24.7	22.0	0.0	0.1	16.6	8.7	18.6	0.0	11.0	9.1	0.0	11.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	599	3019		326	2276	563	562	0	336	261	0	782
V/C Ratio(X)	0.96	0.77		0.01	0.91	0.26	0.81	0.00	0.37	0.83	0.00	1.01
Avail Cap(c_a), veh/h	599	3129		587	2984	665	879	0	391	261	0	778
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.43	0.43	0.00	0.67	0.67	0.67	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	62.0	8.6	0.0	61.8	27.0	34.5	61.8	0.0	50.8	68.6	0.0	56.5
Incr Delay (d2), s/veh	15.0	0.8	0.0	0.0	4.6	0.7	3.1	0.0	0.7	20.2	0.0	35.4
Initial Q Delay(d3),s/veh	76.6	3.1	0.0	0.0	52.3	0.0	11.8	0.0	0.0	0.0	0.0	73.7
%ile BackOfQ(95%),veh/ln	22.7	6.5	0.0	0.1	27.1	6.5	15.5	0.0	7.5	8.5	0.0	34.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	153.6	12.5	0.0	61.8	83.9	35.2	76.6	0.0	51.4	88.8	0.0	165.6
LnGrp LOS	F	B		E	F	D	E	A	D	F	A	F
Approach Vol, veh/h		2893	A		2208			579			1010	
Approach Delay, s/veh		40.5			80.6			71.2			149.0	
Approach LOS		D			F			E			F	

Timer - Assigned Phs	1	2	4	5	6	8
Phs Duration (G+Y+Rc), s	32.5	70.3	29.3	32.8	69.9	18.0
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	10.0	68.0	39.0	28.0	50.0	13.0
Max Q Clear Time (g_c+I1), s	13.1	25.0	21.6	27.7	19.6	14.0
Green Ext Time (p_c), s	0.0	40.2	2.7	0.1	28.0	0.0

Intersection Summary	
HCM 6th Ctrl Delay	72.8
HCM 6th LOS	E

Notes

User approved volume balancing among the lanes for turning movement.

User approved changes to right turn type.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	342	2172	70	11	1028	313	280	76	32	557	36	798
Future Volume (veh/h)	342	2172	70	11	1028	313	280	76	32	557	36	798
Initial Q (Qb), veh	0	50	0	0	20	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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	372	2361	65	12	1117	258	304	83	30	605	0	784
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	415	3366	750	2	2509	559	317	98	83	1025	0	895
Arrive On Green	0.12	0.95	0.95	0.00	0.71	0.71	0.18	0.05	0.05	0.29	0.00	0.16
Sat Flow, veh/h	3456	7111	1585	3456	7111	1585	1781	1870	1585	3563	0	3170
Grp Volume(v), veh/h	372	2361	65	12	1117	258	304	83	30	605	0	784
Grp Sat Flow(s),veh/h/ln	1728	1778	1585	1728	1778	1585	1781	1870	1585	1781	0	1585
Q Serve(g_s), s	15.9	7.9	0.2	0.1	10.1	4.8	25.4	6.6	2.5	21.9	0.0	20.3
Cycle Q Clear(g_c), s	15.9	7.9	0.2	0.1	10.1	4.8	25.4	6.6	2.5	21.9	0.0	20.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	415	3366	750	2	2509	559	317	98	83	1025	0	895
V/C Ratio(X)	0.90	0.70	0.09	5.21	0.45	0.46	0.96	0.85	0.36	0.59	0.00	0.88
Avail Cap(c_a), veh/h	599	3366	750	184	2509	559	344	262	222	1025	0	1036
HCM Platoon Ratio	1.00	2.00	2.00	1.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.79	0.79	0.79	0.95	0.95	0.95	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	65.1	2.7	0.6	75.0	16.1	3.2	61.1	70.5	59.3	45.8	0.0	22.6
Incr Delay (d2), s/veh	9.8	1.0	0.2	2075.0	0.5	2.6	36.4	17.3	2.6	0.9	0.0	7.7
Initial Q Delay(d3),s/veh	0.0	5.3	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	11.5	3.9	0.3	1.3	7.0	5.9	21.0	6.6	2.1	14.8	0.0	12.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	74.9	9.0	0.8	2150.0	17.5	5.8	97.5	87.8	62.0	46.7	0.0	30.3
LnGrp LOS	E	A	A	F	B	A	F	F	E	D	A	C
Approach Vol, veh/h		2798			1387			417			1389	
Approach Delay, s/veh		17.5			33.8			93.0			37.5	
Approach LOS		B			C			F			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	7.0	78.0	50.2	14.9	25.0	59.9	33.7	31.3
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	10.0	56.0	41.0	23.0	28.0	38.0	31.0	33.0
Max Q Clear Time (g_c+I1), s	2.1	10.9	24.9	9.6	18.9	13.1	28.4	23.3
Green Ext Time (p_c), s	0.0	42.5	2.6	0.3	1.1	16.4	0.3	3.0

Intersection Summary	
HCM 6th Ctrl Delay	31.2
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	74	2517	45	12	1200	65	59	8	103	188	14	99
Future Volume (veh/h)	74	2517	45	12	1200	65	59	8	103	188	14	99
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	80	2736	49	13	1304	71	64	9	90	204	15	108
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	82	3984	71	36	4336	235	77	10	103	206	28	202
Arrive On Green	0.09	1.00	1.00	0.03	0.77	0.77	0.04	0.07	0.07	0.12	0.14	0.14
Sat Flow, veh/h	1781	6558	117	1781	7454	403	1781	146	1461	1781	197	1418
Grp Volume(v), veh/h	80	2012	773	13	1059	316	64	0	99	204	0	123
Grp Sat Flow(s),veh/h/ln	1781	1609	1849	1781	1515	1798	1781	0	1607	1781	0	1615
Q Serve(g_s), s	6.7	0.0	0.0	1.1	7.7	7.8	5.3	0.0	9.2	17.2	0.0	10.6
Cycle Q Clear(g_c), s	6.7	0.0	0.0	1.1	7.7	7.8	5.3	0.0	9.2	17.2	0.0	10.6
Prop In Lane	1.00		0.06	1.00		0.22	1.00		0.91	1.00		0.88
Lane Grp Cap(c), veh/h	82	2932	1123	36	3525	1046	77	0	113	206	0	230
V/C Ratio(X)	0.98	0.69	0.69	0.36	0.30	0.30	0.83	0.00	0.87	0.99	0.00	0.53
Avail Cap(c_a), veh/h	309	2932	1123	95	3525	1046	309	0	279	238	0	230
HCM Platoon Ratio	2.00	2.00	2.00	1.33	1.33	1.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.67	0.67	0.67	0.96	0.96	0.96	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	68.1	0.0	0.0	72.1	8.0	8.0	71.2	0.0	69.1	66.3	0.0	59.7
Incr Delay (d2), s/veh	33.3	0.9	2.3	5.9	0.2	0.7	19.4	0.0	18.2	53.5	0.0	2.4
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(95%),veh/ln	6.2	0.4	1.3	1.0	4.2	5.3	5.2	0.0	7.8	16.3	0.0	8.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	101.3	0.9	2.3	78.0	8.2	8.7	90.6	0.0	87.2	119.8	0.0	62.1
LnGrp LOS	F	A	A	E	A	A	F	A	F	F	A	E
Approach Vol, veh/h		2865			1388			163			327	
Approach Delay, s/veh		4.1			9.0			88.5			98.1	
Approach LOS		A			A			F			F	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	10.0	98.1	13.5	28.4	13.9	94.3	24.3	17.6
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	10.0	70.0	28.0	22.0	28.0	52.0	22.0	28.0
Max Q Clear Time (g_c+I1), s	14.1	3.0	8.3	12.6	8.7	10.7	19.2	12.2
Green Ext Time (p_c), s	0.0	64.0	0.2	0.4	0.2	27.9	0.2	0.4

Intersection Summary	
HCM 6th Ctrl Delay	14.9
HCM 6th LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	9	2354	496	61	979	2	283	0	164	12	3	15
Future Volume (veh/h)	9	2354	496	61	979	2	283	0	164	12	3	15
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	10	2559	376	66	1064	2	308	0	156	13	3	11
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	36	4160	1025	78	4477	8	406	0	181	13	3	15
Arrive On Green	0.04	1.00	1.00	0.09	1.00	1.00	0.11	0.00	0.11	0.01	0.01	0.01
Sat Flow, veh/h	1781	6434	1585	1781	6681	13	3563	0	1585	1460	337	1585
Grp Volume(v), veh/h	10	2559	376	66	768	298	308	0	156	16	0	11
Grp Sat Flow(s),veh/h/ln	1781	1609	1585	1781	1609	1868	1781	0	1585	1797	0	1585
Q Serve(g_s), s	0.8	0.0	0.0	5.5	0.0	0.0	12.6	0.0	14.5	1.3	0.0	1.0
Cycle Q Clear(g_c), s	0.8	0.0	0.0	5.5	0.0	0.0	12.6	0.0	14.5	1.3	0.0	1.0
Prop In Lane	1.00		1.00	1.00		0.01	1.00		1.00	0.81		1.00
Lane Grp Cap(c), veh/h	36	4160	1025	78	3234	1252	406	0	181	16	0	15
V/C Ratio(X)	0.28	0.62	0.37	0.85	0.24	0.24	0.76	0.00	0.86	0.97	0.00	0.76
Avail Cap(c_a), veh/h	95	4160	1025	143	3234	1252	618	0	275	96	0	85
HCM Platoon Ratio	2.00	2.00	2.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.65	0.65	0.65	0.94	0.94	0.94	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	71.0	0.0	0.0	68.0	0.0	0.0	64.4	0.0	65.3	74.3	0.0	74.1
Incr Delay (d2), s/veh	2.7	0.4	0.7	20.5	0.2	0.4	2.9	0.0	16.0	94.9	0.0	55.2
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(95%),veh/ln	0.7	0.2	0.3	5.1	0.1	0.3	9.9	0.0	10.9	1.9	0.0	1.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	73.7	0.4	0.7	88.4	0.2	0.4	67.4	0.0	81.3	169.2	0.0	129.3
LnGrp LOS	E	A	A	F	A	A	E	A	F	F	A	F
Approach Vol, veh/h		2945			1132			464			27	
Approach Delay, s/veh		0.7			5.4			72.0			152.9	
Approach LOS		A			A			E			F	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	13.5	104.0		8.4	10.0	107.5		24.1
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	14.0	78.0		10.0	10.0	82.0		28.0
Max Q Clear Time (g_c+I1), s	18.5	3.0		4.3	3.8	3.0		17.5
Green Ext Time (p_c), s	0.1	71.7		0.0	0.0	23.5		1.6

Intersection Summary	
HCM 6th Ctrl Delay	10.0
HCM 6th LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	117	1870	516	315	655	233	224	241	281	474	418	134
Future Volume (veh/h)	117	1870	516	315	655	233	224	241	281	474	418	134
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	2067	1870	1870	2067	1870
Adj Flow Rate, veh/h	127	2033	507	342	712	231	243	262	283	515	454	92
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	140	1844	518	333	2453	689	587	314	280	484	511	206
Arrive On Green	0.08	0.65	0.33	0.19	0.87	0.43	0.17	0.16	0.16	0.14	0.13	0.13
Sat Flow, veh/h	1781	5644	1585	1781	5644	1585	3456	1964	1752	3456	3928	1585
Grp Volume(v), veh/h	127	2033	507	342	712	231	243	262	283	515	454	92
Grp Sat Flow(s),veh/h/ln	1781	1881	1585	1781	1881	1585	1728	1964	1752	1728	1964	1585
Q Serve(g_s), s	10.6	49.0	47.5	28.0	3.3	8.4	9.4	19.4	24.0	21.0	17.1	5.7
Cycle Q Clear(g_c), s	10.6	49.0	47.5	28.0	3.3	8.4	9.4	19.4	24.0	21.0	17.1	5.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	140	1844	518	333	2453	689	587	314	280	484	511	206
V/C Ratio(X)	0.91	1.10	0.98	1.03	0.29	0.34	0.41	0.83	1.01	1.06	0.89	0.45
Avail Cap(c_a), veh/h	226	1844	518	333	2453	689	587	314	280	484	733	296
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.73	0.73	0.73	1.00	1.00	1.00	0.89	0.89	0.89	1.00	1.00	1.00
Uniform Delay (d), s/veh	68.5	26.0	50.0	61.0	5.8	9.5	55.6	61.1	63.0	64.5	64.2	30.3
Incr Delay (d2), s/veh	19.4	52.9	29.1	56.9	0.3	1.3	0.4	15.6	53.2	59.2	9.5	1.5
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(95%),veh/ln	8.8	31.4	29.3	25.0	2.2	5.5	7.3	16.1	20.8	19.7	14.1	5.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	87.9	78.9	79.1	117.9	6.1	10.8	56.0	76.7	116.2	123.7	73.6	31.8
LnGrp LOS	F	F	E	F	A	B	E	E	F	F	E	C
Approach Vol, veh/h		2667			1285			788			1061	
Approach Delay, s/veh		79.4			36.7			84.5			94.3	
Approach LOS		E			D			F			F	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	28.0	31.0	18.8	72.2	32.5	26.5	35.0	56.0
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	23.0	26.0	21.0	60.0	19.0	30.0	30.0	51.0
Max Q Clear Time (g_c+I1), s	24.0	27.0	13.6	11.4	12.4	20.1	31.0	52.0
Green Ext Time (p_c), s	0.0	0.0	0.2	14.0	0.5	1.5	0.0	0.0

Intersection Summary	
HCM 6th Ctrl Delay	73.3
HCM 6th LOS	E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	573	1014	266	134	569	157	194	279	128	262	206	224
Future Volume (veh/h)	573	1014	266	134	569	157	194	279	128	262	206	224
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	623	1102	180	146	618	106	211	303	85	285	224	167
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	684	1245	555	176	1038	322	241	1389	431	323	1510	469
Arrive On Green	0.20	0.35	0.35	0.05	0.20	0.20	0.07	0.27	0.27	0.09	0.30	0.30
Sat Flow, veh/h	3456	3554	1585	3456	5106	1585	3456	5106	1585	3456	5106	1585
Grp Volume(v), veh/h	623	1102	180	146	618	106	211	303	85	285	224	167
Grp Sat Flow(s),veh/h/ln	1728	1777	1585	1728	1702	1585	1728	1702	1585	1728	1702	1585
Q Serve(g_s), s	21.2	35.0	10.0	5.0	13.2	6.9	7.3	5.5	5.0	9.8	3.9	10.0
Cycle Q Clear(g_c), s	21.2	35.0	10.0	5.0	13.2	6.9	7.3	5.5	5.0	9.8	3.9	10.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	684	1245	555	176	1038	322	241	1389	431	323	1510	469
V/C Ratio(X)	0.91	0.88	0.32	0.83	0.60	0.33	0.88	0.22	0.20	0.88	0.15	0.36
Avail Cap(c_a), veh/h	893	1421	634	288	1149	357	288	1389	431	461	1510	469
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	47.1	36.7	28.6	56.4	43.3	40.8	55.3	33.8	33.6	53.7	31.1	33.3
Incr Delay (d2), s/veh	11.0	6.4	0.3	10.1	0.7	0.6	22.0	0.4	1.0	13.5	0.2	2.1
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(95%),veh/ln	15.0	22.0	6.7	4.3	9.3	4.8	6.8	4.0	3.6	8.3	2.8	7.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	58.1	43.1	28.9	66.6	44.0	41.4	77.3	34.2	34.6	67.2	31.3	35.4
LnGrp LOS	E	D	C	E	D	D	E	C	C	E	C	D
Approach Vol, veh/h		1905			870			599			676	
Approach Delay, s/veh		46.7			47.5			49.4			47.5	
Approach LOS		D			D			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	18.2	39.6	13.1	49.1	15.4	42.5	30.8	31.4
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	18.0	20.0	12.0	50.0	12.0	26.0	33.0	29.0
Max Q Clear Time (g_c+I1), s	12.8	8.5	8.0	38.0	10.3	13.0	24.2	16.2
Green Ext Time (p_c), s	0.4	1.5	0.1	6.0	0.1	1.5	1.6	3.4

Intersection Summary		
HCM 6th Ctrl Delay		47.4
HCM 6th LOS		D

Movement	WBL	WBR	NBT	NBR	SBL	SBT	
Lane Configurations							
Traffic Volume (veh/h)	115	239	409	188	674	908	
Future Volume (veh/h)	115	239	409	188	674	908	
Initial Q (Qb), veh	0	0	0	0	0	0	
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	
Work Zone On Approach	No		No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	
Adj Flow Rate, veh/h	125	151	445	202	733	987	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Percent Heavy Veh, %	2	2	2	2	2	2	
Cap, veh/h	277	933	424	191	772	2448	
Arrive On Green	0.16	0.16	0.18	0.18	0.43	0.69	
Sat Flow, veh/h	1781	1585	2476	1072	1781	3647	
Grp Volume(v), veh/h	125	151	331	316	733	987	
Grp Sat Flow(s),veh/h/ln	1781	1585	1777	1677	1781	1777	
Q Serve(g_s), s	5.7	3.9	16.0	16.0	35.7	10.8	
Cycle Q Clear(g_c), s	5.7	3.9	16.0	16.0	35.7	10.8	
Prop In Lane	1.00	1.00		0.64	1.00		
Lane Grp Cap(c), veh/h	277	933	316	298	772	2448	
V/C Ratio(X)	0.45	0.16	1.05	1.06	0.95	0.40	
Avail Cap(c_a), veh/h	277	933	316	298	772	2448	
HCM Platoon Ratio	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	
Uniform Delay (d), s/veh	34.5	8.4	37.0	37.0	24.6	6.0	
Incr Delay (d2), s/veh	1.1	0.1	63.6	68.8	21.0	0.1	
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	
%ile BackOfQ(95%),veh/ln	4.6	2.3	18.2	18.0	24.6	5.2	
Unsig. Movement Delay, s/veh							
LnGrp Delay(d),s/veh	35.7	8.5	100.6	105.8	45.6	6.1	
LnGrp LOS	D	A	F	F	D	A	
Approach Vol, veh/h	276		647			1720	
Approach Delay, s/veh	20.8		103.2			22.9	
Approach LOS	C		F			C	
Timer - Assigned Phs	1	2				6	8
Phs Duration (G+Y+Rc), s	45.2	23.0				68.2	17.6
Change Period (Y+Rc), s	5.0	5.0				5.0	5.0
Max Green Setting (Gmax), s	41.0	18.0				64.0	16.0
Max Q Clear Time (g_c+I1), s	37.7	19.0				13.8	8.7
Green Ext Time (p_c), s	0.7	0.0				7.9	0.5

Intersection Summary		
HCM 6th Ctrl Delay		42.4
HCM 6th LOS		D

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Volume (veh/h)	534	151	44	320	104	36
Future Volume (veh/h)	534	151	44	320	104	36
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	580	110	48	348	113	28
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	1125	502	178	1895	416	370
Arrive On Green	0.32	0.32	0.10	0.53	0.23	0.23
Sat Flow, veh/h	3647	1585	1781	3647	1781	1585
Grp Volume(v), veh/h	580	110	48	348	113	28
Grp Sat Flow(s),veh/h/ln	1777	1585	1781	1777	1781	1585
Q Serve(g_s), s	8.0	3.1	1.5	3.0	3.1	0.8
Cycle Q Clear(g_c), s	8.0	3.1	1.5	3.0	3.1	0.8
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	1125	502	178	1895	416	370
V/C Ratio(X)	0.52	0.22	0.27	0.18	0.27	0.08
Avail Cap(c_a), veh/h	1125	502	178	1895	416	370
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	16.7	15.1	25.0	7.2	18.8	18.0
Incr Delay (d2), s/veh	0.4	0.2	0.8	0.0	0.3	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	5.1	1.8	1.1	1.6	2.3	1.5
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	17.1	15.3	25.8	7.3	19.2	18.0
LnGrp LOS	B	B	C	A	B	B
Approach Vol, veh/h	690			396	141	
Approach Delay, s/veh	16.8			9.5	19.0	
Approach LOS	B			A	B	

Timer - Assigned Phs		2		4	5	6
Phs Duration (G+Y+Rc), s		32.8		15.9	10.4	22.4
Change Period (Y+Rc), s		5.0		5.0	5.0	5.0
Max Green Setting (Gmax), s		34.0		16.0	8.0	21.0
Max Q Clear Time (g_c+I1), s		6.0		6.1	4.5	11.0
Green Ext Time (p_c), s		2.2		0.2	0.0	2.9

Intersection Summary			
HCM 6th Ctrl Delay			14.7
HCM 6th LOS			B

Intersection	
Intersection Delay, s/veh	25
Intersection LOS	C

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	184	220	243	358	234	309
Future Vol, veh/h	184	220	243	358	234	309
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	200	239	264	389	254	336
Number of Lanes	2	1	2	0	1	2

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	3	2
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	2	0	3
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	3	3	0
HCM Control Delay	12.8	40.5	16.9
HCM LOS	B	E	C

Lane	NBLn1	NBLn2	WBLn1	WBLn2	WBLn3	SBLn1	SBLn2	SBLn3
Vol Left, %	0%	0%	100%	40%	0%	100%	0%	0%
Vol Thru, %	100%	18%	0%	0%	0%	0%	100%	100%
Vol Right, %	0%	82%	0%	60%	100%	0%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	162	439	123	154	128	234	155	155
LT Vol	0	0	123	61	0	234	0	0
Through Vol	162	81	0	0	0	0	155	155
RT Vol	0	358	0	93	128	0	0	0
Lane Flow Rate	176	477	133	167	139	254	168	168
Geometry Grp	8	8	7	7	7	8	8	8
Degree of Util (X)	0.371	0.927	0.305	0.348	0.202	0.584	0.362	0.279
Departure Headway (Hd)	7.577	6.995	8.243	7.506	5.247	8.266	7.754	5.98
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	475	520	436	480	682	437	463	600
Service Time	5.324	4.742	5.986	5.249	2.989	6.016	5.505	3.73
HCM Lane V/C Ratio	0.371	0.917	0.305	0.348	0.204	0.581	0.363	0.28
HCM Control Delay	14.8	50	14.6	14.2	9.3	22	14.9	11
HCM Lane LOS	B	E	B	B	A	C	B	B
HCM 95th-tile Q	1.7	11.2	1.3	1.5	0.8	3.6	1.6	1.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	309	139	147	1197	779	220
Future Volume (veh/h)	309	139	147	1197	779	220
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	336	97	160	1301	847	237
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	394	350	177	2747	1263	351
Arrive On Green	0.22	0.22	0.10	0.54	0.32	0.32
Sat Flow, veh/h	1781	1585	1781	5274	4139	1104
Grp Volume(v), veh/h	336	97	160	1301	725	359
Grp Sat Flow(s),veh/h/ln	1781	1585	1781	1702	1702	1672
Q Serve(g_s), s	10.5	2.9	5.2	9.2	10.7	10.8
Cycle Q Clear(g_c), s	10.5	2.9	5.2	9.2	10.7	10.8
Prop In Lane	1.00	1.00	1.00			0.66
Lane Grp Cap(c), veh/h	394	350	177	2747	1083	532
V/C Ratio(X)	0.85	0.28	0.90	0.47	0.67	0.67
Avail Cap(c_a), veh/h	1012	901	460	4661	1818	893
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	21.7	18.8	25.9	8.3	17.2	17.2
Incr Delay (d2), s/veh	5.3	0.4	15.3	0.1	0.7	1.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	8.1	5.1	4.8	4.1	6.3	6.5
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	27.1	19.2	41.2	8.4	17.9	18.7
LnGrp LOS	C	B	D	A	B	B
Approach Vol, veh/h	433			1461	1084	
Approach Delay, s/veh	25.3			12.0	18.2	
Approach LOS	C			B	B	

Timer - Assigned Phs		2		4	5	6
Phs Duration (G+Y+Rc), s		38.2		19.8	12.8	25.5
Change Period (Y+Rc), s		5.0		5.0	5.0	5.0
Max Green Setting (Gmax), s		55.0		35.0	17.0	33.0
Max Q Clear Time (g_c+I1), s		12.2		13.5	8.2	13.8
Green Ext Time (p_c), s		11.3		1.3	0.2	6.6

Intersection Summary			
HCM 6th Ctrl Delay			16.2
HCM 6th LOS			B

Notes

User approved volume balancing among the lanes for turning movement.

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	59	342	10	87	192	44	17	267	279	32	47	108
Future Volume (veh/h)	59	342	10	87	192	44	17	267	279	32	47	108
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	64	372	11	95	209	48	18	290	0	35	51	117
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	158	627	18	178	544	122	28	449		116	169	247
Arrive On Green	0.09	0.18	0.18	0.10	0.19	0.19	0.26	0.26	0.00	0.16	0.16	0.16
Sat Flow, veh/h	1781	3524	104	1781	2882	648	109	1756	1585	746	1087	1585
Grp Volume(v), veh/h	64	187	196	95	127	130	308	0	0	86	0	117
Grp Sat Flow(s),veh/h/ln	1781	1777	1852	1781	1777	1754	1865	0	1585	1833	0	1585
Q Serve(g_s), s	3.1	8.7	8.8	4.6	5.6	5.8	13.3	0.0	0.0	3.7	0.0	6.1
Cycle Q Clear(g_c), s	3.1	8.7	8.8	4.6	5.6	5.8	13.3	0.0	0.0	3.7	0.0	6.1
Prop In Lane	1.00		0.06	1.00		0.37	0.06		1.00	0.41		1.00
Lane Grp Cap(c), veh/h	158	316	329	178	336	331	477	0		285	0	247
V/C Ratio(X)	0.40	0.59	0.59	0.53	0.38	0.39	0.65	0.00		0.30	0.00	0.47
Avail Cap(c_a), veh/h	158	316	329	178	336	331	477	0		285	0	247
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	38.7	34.0	34.0	38.5	31.9	32.0	29.9	0.0	0.0	33.7	0.0	34.6
Incr Delay (d2), s/veh	1.7	2.9	2.9	3.1	0.7	0.8	3.0	0.0	0.0	0.6	0.0	1.4
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(95%),veh/ln	2.5	7.1	7.4	3.8	4.4	4.5	10.3	0.0	0.0	3.0	0.0	0.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	40.4	37.0	36.9	41.6	32.6	32.7	32.9	0.0	0.0	34.3	0.0	36.1
LnGrp LOS	D	D	D	D	C	C	C	A		C	A	D
Approach Vol, veh/h		447			352			308	A		203	
Approach Delay, s/veh		37.4			35.1			32.9			35.3	
Approach LOS		D			D			C			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	12.0	21.5		25.7	13.5	20.0		17.2				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	10.0	19.0		25.0	11.0	18.0		16.0				
Max Q Clear Time (g_c+I1), s	5.1	7.8		15.3	6.6	10.8		8.1				
Green Ext Time (p_c), s	0.0	1.0		1.2	0.1	1.3		0.5				

Intersection Summary			
HCM 6th Ctrl Delay			35.4
HCM 6th LOS			D

Notes

Unsignalized Delay for [NER] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	794	1967	524	165	2228	117	26	5	20	59	27	301
Future Volume (veh/h)	794	1967	524	165	2228	117	26	5	20	59	27	301
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	836	2071	0	174	2345	70	31	0	19	45	52	264
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	890	3512		865	3461	771	56	0	25	95	100	985
Arrive On Green	0.26	0.99	0.00	0.25	0.97	0.49	0.02	0.00	0.02	0.05	0.05	0.05
Sat Flow, veh/h	3456	7111	1585	3456	7111	1585	3563	0	1585	1781	1870	3170
Grp Volume(v), veh/h	836	2071	0	174	2345	70	31	0	19	45	52	264
Grp Sat Flow(s),veh/h/ln	1728	1778	1585	1728	1778	1585	1781	0	1585	1781	1870	1585
Q Serve(g_s), s	35.5	1.3	0.0	6.0	3.9	3.6	1.3	0.0	1.8	3.7	4.1	8.0
Cycle Q Clear(g_c), s	35.5	1.3	0.0	6.0	3.9	3.6	1.3	0.0	1.8	3.7	4.1	8.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	890	3512		865	3461	771	56	0	25	95	100	985
V/C Ratio(X)	0.94	0.59		0.20	0.68	0.09	0.55	0.00	0.76	0.47	0.52	0.27
Avail Cap(c_a), veh/h	1060	4409		865	3461	771	190	0	85	95	100	985
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.43	0.43	0.00	0.54	0.54	0.54	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	54.5	0.5	0.0	44.4	1.1	20.7	73.3	0.0	73.5	69.0	69.1	38.9
Incr Delay (d2), s/veh	7.2	0.3	0.0	0.1	0.6	0.1	8.1	0.0	36.1	3.6	4.8	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	20.4	0.5	0.0	4.5	1.3	2.4	1.2	0.0	1.8	3.2	3.8	6.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	61.7	0.8	0.0	44.5	1.7	20.8	81.3	0.0	109.7	72.6	73.9	39.0
LnGrp LOS	E	A		D	A	C	F	A	F	E	E	D
Approach Vol, veh/h		2907	A		2589			50			361	
Approach Delay, s/veh		18.3			5.1			92.1			48.2	
Approach LOS		B			A			F			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	44.5	81.1		9.4	45.6	80.0		15.0				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	15.0	95.0		10.0	48.0	62.0		10.0				
Max Q Clear Time (g_c+I1), s	8.0	3.3		3.8	37.5	5.9		10.0				
Green Ext Time (p_c), s	0.4	72.8		0.1	3.1	52.1		0.0				

Intersection Summary			
HCM 6th Ctrl Delay			15.0
HCM 6th LOS			B

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	151	604	164	242	1836	398	524	400	170	141	211	173
Future Volume (veh/h)	151	604	164	242	1836	398	524	400	170	141	211	173
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	164	657	151	263	1996	297	570	435	183	153	229	106
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	368	2373	667	271	2063	579	578	694	550	157	262	117
Arrive On Green	0.07	0.84	0.42	0.15	0.73	0.37	0.17	0.20	0.20	0.05	0.07	0.07
Sat Flow, veh/h	1781	5644	1585	1781	5644	1585	3456	3554	1585	3456	3554	1585
Grp Volume(v), veh/h	164	657	151	263	1996	297	570	435	183	153	229	106
Grp Sat Flow(s),veh/h/ln	1781	1881	1585	1781	1881	1585	1728	1777	1585	1728	1777	1585
Q Serve(g_s), s	13.3	3.6	5.5	22.0	48.7	18.1	24.7	16.8	12.8	6.6	9.6	10.0
Cycle Q Clear(g_c), s	13.3	3.6	5.5	22.0	48.7	18.1	24.7	16.8	12.8	6.6	9.6	10.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	368	2373	667	271	2063	579	578	694	550	157	262	117
V/C Ratio(X)	0.45	0.28	0.23	0.97	0.97	0.51	0.99	0.63	0.33	0.97	0.88	0.91
Avail Cap(c_a), veh/h	368	2373	667	404	2069	581	599	971	674	253	616	275
HCM Platoon Ratio	0.33	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.99	0.99	0.99	1.00	1.00	1.00	0.89	0.89	0.89	1.00	1.00	1.00
Uniform Delay (d), s/veh	61.6	7.2	9.9	63.3	19.3	25.2	62.3	55.3	36.1	71.5	68.8	69.0
Incr Delay (d2), s/veh	0.8	0.3	0.8	30.6	13.5	3.2	30.7	0.8	0.3	37.8	9.0	21.7
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(95%),veh/ln	10.6	2.5	6.4	17.9	18.8	11.9	19.0	12.0	8.6	6.8	8.3	8.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	62.4	7.5	10.7	93.8	32.8	28.4	93.0	56.2	36.4	109.3	77.8	90.7
LnGrp LOS	E	A	B	F	C	C	F	E	D	F	E	F
Approach Vol, veh/h		972			2556			1188			488	
Approach Delay, s/veh		17.3			38.6			70.8			90.5	
Approach LOS		B			D			E			F	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	13.8	36.3	38.0	61.8	32.1	18.0	29.8	70.1
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	13.0	43.0	17.0	57.0	28.0	28.0	36.0	38.0
Max Q Clear Time (g_c+I1), s	8.6	18.8	15.3	50.7	26.7	12.0	24.0	7.5
Green Ext Time (p_c), s	0.2	0.9	0.1	6.1	0.4	1.1	0.7	11.8

Intersection Summary	
HCM 6th Ctrl Delay	46.8
HCM 6th LOS	D

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	61	323	6	152	202	62	11	108	344	54	227	109
Future Volume (veh/h)	61	323	6	152	202	62	11	108	344	54	227	109
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1796	1870	1870	1796	1870	1870	1870	1870	1870	1796
Adj Flow Rate, veh/h	66	351	7	165	220	67	12	117	0	59	247	118
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	178	634	13	238	570	169	27	263		79	332	338
Arrive On Green	0.10	0.18	0.18	0.13	0.21	0.21	0.16	0.16	0.00	0.22	0.22	0.22
Sat Flow, veh/h	1781	3563	71	1781	2701	802	173	1689	1585	357	1495	1522
Grp Volume(v), veh/h	66	175	183	165	143	144	129	0	0	306	0	118
Grp Sat Flow(s),veh/h/ln	1781	1777	1858	1781	1777	1726	1862	0	1585	1853	0	1522
Q Serve(g_s), s	3.1	8.1	8.1	8.0	6.2	6.5	5.7	0.0	0.0	13.9	0.0	5.9
Cycle Q Clear(g_c), s	3.1	8.1	8.1	8.0	6.2	6.5	5.7	0.0	0.0	13.9	0.0	5.9
Prop In Lane	1.00		0.04	1.00		0.46	0.09		1.00	0.19		1.00
Lane Grp Cap(c), veh/h	178	316	330	238	375	364	290	0		412	0	338
V/C Ratio(X)	0.37	0.55	0.55	0.69	0.38	0.40	0.45	0.00		0.74	0.00	0.35
Avail Cap(c_a), veh/h	178	316	330	238	375	364	290	0		412	0	338
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	37.9	33.7	33.8	37.3	30.5	30.6	34.5	0.0	0.0	32.6	0.0	29.5
Incr Delay (d2), s/veh	1.3	2.1	2.0	8.5	0.6	0.7	1.1	0.0	0.0	7.1	0.0	0.6
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(95%),veh/ln	2.5	6.5	6.8	7.0	4.7	4.8	4.6	0.0	0.0	11.3	0.0	4.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	39.1	35.8	35.8	45.7	31.1	31.3	35.6	0.0	0.0	39.7	0.0	30.1
LnGrp LOS	D	D	D	D	C	C	D	A		D	A	C
Approach Vol, veh/h		424			452			129	A		424	
Approach Delay, s/veh		36.3			36.5			35.6			37.1	
Approach LOS		D			D			D			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	13.0	24.6		17.3	17.4	20.1		25.0				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	11.0	21.0		16.0	14.0	18.0		22.0				
Max Q Clear Time (g_c+I1), s	6.1	9.5		8.7	11.0	11.1		16.9				
Green Ext Time (p_c), s	0.0	1.1		0.3	0.1	1.1		1.1				

Intersection Summary			
HCM 6th Ctrl Delay			36.5
HCM 6th LOS			D

Notes

Unsignalized Delay for [NER] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	527	2134	22	4	1895	192	393	33	166	192	12	729
Future Volume (veh/h)	527	2134	22	4	1895	192	393	33	166	192	12	729
Initial Q (Qb), veh	16	30	0	0	30	0	10	10	0	0	0	16
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	573	2320	0	4	2060	144	453	0	126	218	0	792
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	599	3019		361	2590	577	562	0	322	261	0	782
Arrive On Green	0.17	0.84	0.00	0.17	0.84	0.42	0.15	0.00	0.15	0.07	0.00	0.07
Sat Flow, veh/h	3456	7111	1585	3456	7111	1585	3563	0	1585	3563	0	3170
Grp Volume(v), veh/h	573	2320	0	4	2060	144	453	0	126	218	0	792
Grp Sat Flow(s),veh/h/ln	1728	1778	1585	1728	1778	1585	1781	0	1585	1781	0	1585
Q Serve(g_s), s	24.7	22.0	0.0	0.1	16.6	8.7	18.6	0.0	11.0	9.1	0.0	11.0
Cycle Q Clear(g_c), s	24.7	22.0	0.0	0.1	16.6	8.7	18.6	0.0	11.0	9.1	0.0	11.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	599	3019		361	2590	577	562	0	322	261	0	782
V/C Ratio(X)	0.96	0.77		0.01	0.80	0.25	0.81	0.00	0.39	0.83	0.00	1.01
Avail Cap(c_a), veh/h	599	3129		587	2984	665	879	0	391	261	0	778
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.43	0.43	0.00	0.67	0.67	0.67	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	62.0	8.6	0.0	60.5	18.7	33.6	61.8	0.0	51.9	68.6	0.0	56.5
Incr Delay (d2), s/veh	15.0	0.8	0.0	0.0	1.8	0.7	3.1	0.0	0.8	20.2	0.0	35.4
Initial Q Delay(d3),s/veh	76.6	3.1	0.0	0.0	4.7	0.0	11.8	0.0	0.0	0.0	0.0	73.7
%ile BackOfQ(95%),veh/ln	22.7	6.5	0.0	0.1	14.0	6.4	15.5	0.0	7.6	8.5	0.0	34.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	153.6	12.5	0.0	60.5	25.2	34.3	76.6	0.0	52.7	88.8	0.0	165.6
LnGrp LOS	F	B		E	C	C	E	A	D	F	A	F
Approach Vol, veh/h		2893	A		2208			579			1010	
Approach Delay, s/veh		40.5			25.9			71.4			149.0	
Approach LOS		D			C			E			F	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	32.5	70.3		29.3	32.8	69.9		18.0				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	10.0	68.0		39.0	28.0	50.0		13.0				
Max Q Clear Time (g_c+I1), s	3.1	25.0		21.6	27.7	19.6		14.0				
Green Ext Time (p_c), s	0.0	40.2		2.7	0.1	28.0		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			54.7									
HCM 6th LOS			D									

Notes

User approved volume balancing among the lanes for turning movement.
User approved changes to right turn type.
Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	117	1870	516	315	655	233	224	241	281	474	418	134
Future Volume (veh/h)	117	1870	516	315	655	233	224	241	281	474	418	134
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	2067	1870	1870	2067	1870
Adj Flow Rate, veh/h	127	2033	507	342	712	231	243	262	283	515	454	92
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	140	1884	529	333	2493	700	562	600	538	484	511	206
Arrive On Green	0.08	0.67	0.33	0.19	0.88	0.44	0.16	0.15	0.15	0.14	0.13	0.13
Sat Flow, veh/h	1781	5644	1585	1781	5644	1585	3456	3928	1585	3456	3928	1585
Grp Volume(v), veh/h	127	2033	507	342	712	231	243	262	283	515	454	92
Grp Sat Flow(s),veh/h/ln	1781	1881	1585	1781	1881	1585	1728	1964	1585	1728	1964	1585
Q Serve(g_s), s	10.6	50.1	30.8	28.0	2.9	14.3	9.5	9.1	21.5	21.0	17.1	6.7
Cycle Q Clear(g_c), s	10.6	50.1	30.8	28.0	2.9	14.3	9.5	9.1	21.5	21.0	17.1	6.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	140	1884	529	333	2493	700	562	600	538	484	511	206
V/C Ratio(X)	0.91	1.08	0.96	1.03	0.29	0.33	0.43	0.44	0.53	1.06	0.89	0.45
Avail Cap(c_a), veh/h	226	1884	529	333	2493	700	562	628	549	484	733	296
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.73	0.73	0.73	1.00	1.00	1.00	0.89	0.89	0.89	1.00	1.00	1.00
Uniform Delay (d), s/veh	68.5	24.9	21.0	61.0	5.0	27.4	56.6	57.7	39.8	64.5	64.2	41.8
Incr Delay (d2), s/veh	19.4	43.3	24.6	56.9	0.3	1.3	0.5	0.4	0.8	59.2	9.5	1.5
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(95%),veh/ln	8.8	29.0	20.1	25.0	1.9	9.5	7.4	7.9	12.9	19.7	14.1	5.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	87.9	68.2	45.6	117.9	5.3	28.6	57.0	58.1	40.6	123.7	73.6	43.3
LnGrp LOS	F	F	D	F	A	C	E	E	D	F	E	D
Approach Vol, veh/h		2667			1285			788			1061	
Approach Delay, s/veh		64.9			39.5			51.5			95.3	
Approach LOS		E			D			D			F	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	28.0	29.9	18.8	73.3	31.4	26.5	35.0	57.1				
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0				
Max Green Setting (Gmax), s	23.0	26.0	21.0	60.0	19.0	30.0	30.0	51.0				
Max Q Clear Time (g_c+I1), s	24.0	24.5	13.6	17.3	12.5	20.1	31.0	53.1				
Green Ext Time (p_c), s	0.0	0.4	0.2	13.5	0.5	1.5	0.0	0.0				
Intersection Summary												
HCM 6th Ctrl Delay			63.0									
HCM 6th LOS			E									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	18	946	53	62	414	36	59	70	158	51	126	14
Future Volume (veh/h)	18	946	53	62	414	36	59	70	158	51	126	14
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	20	1028	31	67	450	22	64	76	107	55	137	15
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	81	1357	605	146	1486	663	130	391	331	130	346	38
Arrive On Green	0.05	0.38	0.38	0.08	0.42	0.42	0.07	0.21	0.21	0.07	0.21	0.21
Sat Flow, veh/h	1781	3554	1585	1781	3554	1585	1781	1870	1585	1781	1656	181
Grp Volume(v), veh/h	20	1028	31	67	450	22	64	76	107	55	0	152
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1777	1585	1781	1870	1585	1781	0	1838
Q Serve(g_s), s	1.2	27.7	1.4	3.9	9.3	0.9	3.8	3.7	6.3	3.2	0.0	7.8
Cycle Q Clear(g_c), s	1.2	27.7	1.4	3.9	9.3	0.9	3.8	3.7	6.3	3.2	0.0	7.8
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.10
Lane Grp Cap(c), veh/h	81	1357	605	146	1486	663	130	391	331	130	0	384
V/C Ratio(X)	0.25	0.76	0.05	0.46	0.30	0.03	0.49	0.19	0.32	0.42	0.00	0.40
Avail Cap(c_a), veh/h	81	1357	605	146	1486	663	130	391	331	130	0	384
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	0.98	0.98	0.98	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	50.7	29.6	21.4	48.2	21.3	18.9	49.1	35.9	36.9	48.8	0.0	37.5
Incr Delay (d2), s/veh	1.6	4.0	0.2	2.2	0.5	0.1	2.9	0.2	0.6	2.2	0.0	0.7
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(95%),veh/ln	1.0	17.7	0.9	3.3	6.9	0.6	3.2	3.1	4.4	2.7	0.0	6.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	52.3	33.6	21.6	50.4	21.8	19.0	51.9	36.1	37.5	51.0	0.0	38.2
LnGrp LOS	D	C	C	D	C	B	D	D	D	D	A	D
Approach Vol, veh/h		1079			539			247			207	
Approach Delay, s/veh		33.6			25.3			40.8			41.6	
Approach LOS		C			C			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	13.5	60.4	12.6	23.5	9.6	64.3	12.9	23.1
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	11.0	44.0	10.0	25.0	7.0	48.0	10.0	25.0
Max Q Clear Time (g_c+I1), s	6.9	30.7	6.2	9.3	4.2	12.3	6.8	10.8
Green Ext Time (p_c), s	0.0	4.4	0.0	0.6	0.0	2.1	0.0	0.4

Intersection Summary	
HCM 6th Ctrl Delay	33.1
HCM 6th LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	199	1126	92	511	802	287	104	250	494	420	255	67
Future Volume (veh/h)	199	1126	92	511	802	287	104	250	494	420	255	67
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	216	1224	70	555	872	219	113	272	376	457	277	51
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	900	1497	465	579	1022	317	138	736	594	481	1089	486
Arrive On Green	0.26	0.59	0.29	0.17	0.40	0.20	0.04	0.21	0.21	0.14	0.31	0.31
Sat Flow, veh/h	3456	5106	1585	3456	5106	1585	3456	3554	1585	3456	3554	1585
Grp Volume(v), veh/h	216	1224	70	555	872	219	113	272	376	457	277	51
Grp Sat Flow(s),veh/h/ln	1728	1702	1585	1728	1702	1585	1728	1777	1585	1728	1777	1585
Q Serve(g_s), s	7.1	27.6	4.7	23.1	22.6	13.8	4.7	9.5	28.2	19.0	8.5	1.8
Cycle Q Clear(g_c), s	7.1	27.6	4.7	23.1	22.6	13.8	4.7	9.5	28.2	19.0	8.5	1.8
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	900	1497	465	579	1022	317	138	736	594	481	1089	486
V/C Ratio(X)	0.24	0.82	0.15	0.96	0.85	0.69	0.82	0.37	0.63	0.95	0.25	0.10
Avail Cap(c_a), veh/h	900	1497	465	596	1726	536	214	784	615	500	1089	486
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.76	0.76	0.76	1.00	1.00	1.00	0.98	0.98	0.98	1.00	1.00	1.00
Uniform Delay (d), s/veh	42.3	26.9	37.9	59.9	41.5	29.4	69.1	49.4	37.2	61.9	37.8	9.9
Incr Delay (d2), s/veh	0.0	3.9	0.5	26.2	9.0	11.7	7.0	0.3	2.0	27.0	0.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	5.5	12.5	3.5	17.8	13.4	10.5	4.0	7.7	16.8	15.4	6.8	2.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	42.3	30.8	38.4	86.1	50.6	41.1	76.1	49.7	39.2	88.9	37.9	10.0
LnGrp LOS	D	C	D	F	D	D	E	D	D	F	D	B
Approach Vol, veh/h		1510			1646			761			785	
Approach Delay, s/veh		32.8			61.3			48.4			65.8	
Approach LOS		C			E			D			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	31.3	49.5	27.2	37.0	44.8	36.0	12.8	51.4
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	27.0	41.0	23.0	34.0	17.0	51.0	11.0	46.0
Max Q Clear Time (g_c+I1), s	26.1	30.6	22.0	31.2	10.1	25.6	7.7	11.5
Green Ext Time (p_c), s	0.2	4.7	0.2	0.8	0.3	5.5	0.1	1.5

Intersection Summary	
HCM 6th Ctrl Delay	50.8
HCM 6th LOS	D

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	1106	948	0	1149	932
Future Volume (veh/h)	0	1106	948	0	1149	932
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	0	1870	1870	0	1870	1870
Adj Flow Rate, veh/h	0	1202	1030	0	1249	1013
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	0	2	2
Cap, veh/h	0	2347	2347		1533	1238
Arrive On Green	0.00	0.92	0.92	0.00	0.44	0.44
Sat Flow, veh/h	0	5443	5443	0	3456	2790
Grp Volume(v), veh/h	0	1202	1030	0	1249	1013
Grp Sat Flow(s),veh/h/ln	0	1702	1702	0	1728	1395
Q Serve(g_s), s	0.0	5.2	4.0	0.0	45.7	46.0
Cycle Q Clear(g_c), s	0.0	5.2	4.0	0.0	45.7	46.0
Prop In Lane	0.00			0.00	1.00	1.00
Lane Grp Cap(c), veh/h	0	2347	2347		1533	1238
V/C Ratio(X)	0.00	0.51	0.44		0.81	0.82
Avail Cap(c_a), veh/h	0	2347	2347		1859	1501
HCM Platoon Ratio	1.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	3.4	3.3	0.0	35.1	35.2
Incr Delay (d2), s/veh	0.0	0.8	0.6	0.0	2.4	3.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.0	2.4	2.0	0.0	26.9	22.6
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.0	4.2	3.9	0.0	37.6	38.3
LnGrp LOS	A	A	A		D	D
Approach Vol, veh/h		1202	1030	A	2262	
Approach Delay, s/veh		4.2	3.9		37.9	
Approach LOS		A	A		D	

Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		73.7		71.3		73.7
Change Period (Y+Rc), s		5.0		5.0		5.0
Max Green Setting (Gmax), s		55.0		80.0		55.0
Max Q Clear Time (g_c+I1), s		8.2		49.0		7.0
Green Ext Time (p_c), s		7.0		17.4		5.6

Intersection Summary	
HCM 6th Ctrl Delay	21.1
HCM 6th LOS	C

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑			↑↑↑↑	↰↰	↱
Traffic Volume (veh/h)	1780	0	0	1085	606	759
Future Volume (veh/h)	1780	0	0	1085	606	759
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	0	0	1870	1870	1870
Adj Flow Rate, veh/h	1935	0	0	1179	495	1001
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	0	0	2	2	2
Cap, veh/h	2783	0	0	3507	638	1136
Arrive On Green	1.00	0.00	0.00	1.00	0.36	0.36
Sat Flow, veh/h	5443	0	0	6958	1781	3170
Grp Volume(v), veh/h	1935	0	0	1179	495	1001
Grp Sat Flow(s),veh/h/ln	1702	0	0	1609	1781	1585
Q Serve(g_s), s	0.0	0.0	0.0	0.0	35.8	42.9
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	35.8	42.9
Prop In Lane		0.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	2783	0	0	3507	638	1136
V/C Ratio(X)	0.70	0.00	0.00	0.34	0.78	0.88
Avail Cap(c_a), veh/h	2783	0	0	3507	762	1355
HCM Platoon Ratio	2.00	1.00	1.00	2.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	41.3	43.6
Incr Delay (d2), s/veh	1.5	0.0	0.0	0.3	4.2	6.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.7	0.0	0.0	0.1	23.2	24.7
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	1.5	0.0	0.0	0.3	45.5	49.8
LnGrp LOS	A	A	A	A	D	D
Approach Vol, veh/h	1935			1179	1496	
Approach Delay, s/veh	1.5			0.3	48.4	
Approach LOS	A			A	D	

Timer - Assigned Phs	2	4	6
Phs Duration (G+Y+Rc), s	86.0	59.0	86.0
Change Period (Y+Rc), s	5.0	5.0	5.0
Max Green Setting (Gmax), s	71.0	64.0	71.0
Max Q Clear Time (g_c+I1), s	3.0	45.9	3.0
Green Ext Time (p_c), s	16.1	8.0	6.8

Intersection Summary	
HCM 6th Ctrl Delay	16.4
HCM 6th LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	399	1756	435	94	1277	82	131	30	63	120	42	242
Future Volume (veh/h)	399	1756	435	94	1277	82	131	30	63	120	42	242
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	434	1909	473	102	1388	89	142	33	68	130	46	263
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	483	2266	645	466	3498	223	190	98	87	246	258	440
Arrive On Green	0.14	0.70	0.35	0.26	0.95	0.47	0.05	0.05	0.05	0.14	0.14	0.14
Sat Flow, veh/h	3456	6434	1585	1781	7375	470	3456	1777	1585	1781	1870	1585
Grp Volume(v), veh/h	434	1909	473	102	1139	338	142	33	68	130	46	263
Grp Sat Flow(s),veh/h/ln	1728	1609	1585	1781	1515	1786	1728	1777	1585	1781	1870	1585
Q Serve(g_s), s	17.9	31.3	36.6	6.5	2.2	7.2	5.9	2.6	6.1	9.8	3.2	20.0
Cycle Q Clear(g_c), s	17.9	31.3	36.6	6.5	2.2	7.2	5.9	2.6	6.1	9.8	3.2	20.0
Prop In Lane	1.00		1.00	1.00		0.26	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	483	2266	645	466	2874	847	190	98	87	246	258	440
V/C Ratio(X)	0.90	0.84	0.73	0.22	0.40	0.40	0.75	0.34	0.78	0.53	0.18	0.60
Avail Cap(c_a), veh/h	667	2618	732	466	2874	847	500	257	230	246	258	440
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.64	0.64	0.64	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	61.4	18.5	36.3	41.9	2.0	7.4	67.5	66.0	67.6	58.1	55.2	45.4
Incr Delay (d2), s/veh	11.9	4.0	7.2	0.1	0.3	0.9	5.8	2.0	13.9	2.1	0.3	2.2
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(95%),veh/ln	8.4	11.0	23.3	5.1	1.0	4.3	5.0	2.2	5.1	8.1	2.7	13.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	73.3	22.5	43.5	42.1	2.3	8.3	73.3	68.0	81.5	60.3	55.6	47.6
LnGrp LOS	E	C	D	D	A	A	E	E	F	E	E	D
Approach Vol, veh/h		2816			1579			243			439	
Approach Delay, s/veh		33.9			6.1			74.9			52.2	
Approach LOS		C			A			E			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	45.0	58.1		27.0	27.3	75.8		15.0				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	19.0	61.0		22.0	30.0	50.0		23.0				
Max Q Clear Time (g_c+I1), s	19.5	39.6		23.0	20.9	10.2		9.1				
Green Ext Time (p_c), s	0.2	13.5		0.0	1.3	8.5		0.8				
Intersection Summary												
HCM 6th Ctrl Delay			28.8									
HCM 6th LOS			C									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	140	1003	668	368	1580	214	119	162	58	171	157	59
Future Volume (veh/h)	140	1003	668	368	1580	214	119	162	58	171	157	59
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	152	1090	726	400	1717	233	129	176	63	186	171	64
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	167	3301	952	434	3407	462	302	198	168	215	207	75
Arrive On Green	0.05	1.00	0.51	0.13	1.00	0.59	0.09	0.11	0.11	0.06	0.08	0.08
Sat Flow, veh/h	3456	6434	1585	3456	5772	783	3456	1870	1585	3456	2558	923
Grp Volume(v), veh/h	152	1090	726	400	1436	514	129	176	63	186	117	118
Grp Sat Flow(s),veh/h/ln	1728	1609	1585	1728	1609	1729	1728	1870	1585	1728	1777	1704
Q Serve(g_s), s	6.3	0.0	27.8	16.6	0.0	13.6	5.1	13.5	5.4	7.7	9.4	9.9
Cycle Q Clear(g_c), s	6.3	0.0	27.8	16.6	0.0	13.6	5.1	13.5	5.4	7.7	9.4	9.9
Prop In Lane	1.00		1.00	1.00		0.45	1.00		1.00	1.00		0.54
Lane Grp Cap(c), veh/h	167	3301	952	434	2849	1021	302	198	168	215	144	138
V/C Ratio(X)	0.91	0.33	0.76	0.92	0.50	0.50	0.43	0.89	0.37	0.87	0.81	0.86
Avail Cap(c_a), veh/h	167	3301	952	500	2849	1021	810	632	536	310	343	329
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.78	0.78	0.78	0.95	0.95	0.95	0.90	0.90	0.90	1.00	1.00	1.00
Uniform Delay (d), s/veh	68.7	0.0	9.4	62.7	0.0	6.8	62.7	63.9	60.3	67.4	65.6	65.8
Incr Delay (d2), s/veh	38.1	0.2	4.5	20.3	0.6	1.7	0.9	11.3	1.2	16.0	10.5	14.0
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(95%),veh/ln	6.4	0.1	14.1	13.1	0.3	7.2	4.1	11.1	4.0	7.0	8.2	8.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	106.7	0.2	14.0	83.0	0.6	8.5	63.6	75.3	61.6	83.4	76.1	79.8
LnGrp LOS	F	A	B	F	A	A	E	E	E	F	E	E
Approach Vol, veh/h		1968			2350			368			421	
Approach Delay, s/veh		13.5			16.3			68.8			80.4	
Approach LOS		B			B			E			F	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	25.2	81.4	16.0	22.4	14.0	92.6	19.7	18.7
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	23.0	36.0	15.0	51.0	9.0	50.0	36.0	30.0
Max Q Clear Time (g_c+I1), s	19.6	30.8	10.7	16.5	9.3	16.6	8.1	12.9
Green Ext Time (p_c), s	0.6	3.7	0.3	0.9	0.0	12.6	0.5	0.8

Intersection Summary	
HCM 6th Ctrl Delay	24.3
HCM 6th LOS	C

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	701	460	556	1857	284	321
Future Volume (veh/h)	701	460	556	1857	284	321
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	762	500	604	2018	309	349
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	2733	849	672	3973	433	892
Arrive On Green	1.00	0.54	0.19	1.00	0.13	0.13
Sat Flow, veh/h	5274	1585	3456	5274	3456	2790
Grp Volume(v), veh/h	762	500	604	2018	309	349
Grp Sat Flow(s),veh/h/ln	1702	1585	1728	1702	1728	1395
Q Serve(g_s), s	0.0	31.0	24.7	0.0	12.5	14.1
Cycle Q Clear(g_c), s	0.0	31.0	24.7	0.0	12.5	14.1
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	2733	849	672	3973	433	892
V/C Ratio(X)	0.28	0.59	0.90	0.51	0.71	0.39
Avail Cap(c_a), veh/h	2733	849	953	3973	763	1158
HCM Platoon Ratio	2.00	1.00	1.00	2.00	1.00	1.00
Upstream Filter(I)	0.99	0.99	0.43	0.43	1.00	1.00
Uniform Delay (d), s/veh	0.0	22.9	57.0	0.0	60.9	38.3
Incr Delay (d2), s/veh	0.3	3.0	4.0	0.2	2.2	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.1	17.6	14.6	0.1	9.5	8.6
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.3	25.8	61.0	0.2	63.1	38.6
LnGrp LOS	A	C	E	A	E	D
Approach Vol, veh/h	1262			2622	658	
Approach Delay, s/veh	10.4			14.2	50.1	
Approach LOS	B			B	D	

Timer - Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	35.2	84.6				119.8		25.2
Change Period (Y+Rc), s	5.0	5.0				5.0		5.0
Max Green Setting (Gmax), s	42.0	54.0				101.0		34.0
Max Q Clear Time (g_c+I1), s	27.7	34.0				3.0		17.1
Green Ext Time (p_c), s	2.5	6.1				18.1		3.1

Intersection Summary	
HCM 6th Ctrl Delay	18.3
HCM 6th LOS	B

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	438	187	765	1033	438	716
Future Volume (veh/h)	438	187	765	1033	438	716
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	476	203	832	1123	476	778
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	929	415	1143	2296	851	1609
Arrive On Green	0.26	0.26	0.33	0.65	0.25	0.25
Sat Flow, veh/h	3647	1585	3456	3647	3456	2790
Grp Volume(v), veh/h	476	203	832	1123	476	778
Grp Sat Flow(s),veh/h/ln	1777	1585	1728	1777	1728	1395
Q Serve(g_s), s	14.8	14.1	27.6	21.3	15.7	21.3
Cycle Q Clear(g_c), s	14.8	14.1	27.6	21.3	15.7	21.3
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	929	415	1143	2296	851	1609
V/C Ratio(X)	0.51	0.49	0.73	0.49	0.56	0.48
Avail Cap(c_a), veh/h	929	415	1143	2296	851	1609
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.82	0.82	0.99	0.99
Uniform Delay (d), s/veh	40.9	40.7	38.3	11.9	42.8	16.1
Incr Delay (d2), s/veh	2.0	4.1	1.9	0.6	0.8	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	10.8	9.8	16.7	11.9	10.7	10.3
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	42.9	44.7	40.3	12.5	43.7	16.4
LnGrp LOS	D	D	D	B	D	B
Approach Vol, veh/h	679			1955	1254	
Approach Delay, s/veh	43.5			24.3	26.7	
Approach LOS	D			C	C	

Timer - Assigned Phs	1	2	6	8
Phs Duration (G+Y+Rc), s	44.5	49.1	93.7	36.3
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	45.0	36.0	86.0	34.0
Max Q Clear Time (g_c+I1), s	30.6	17.8	24.3	24.3
Green Ext Time (p_c), s	3.5	2.8	6.3	4.4

Intersection Summary	
HCM 6th Ctrl Delay	28.4
HCM 6th LOS	C

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	50	333	10	131	246	66	21	319	340	33	45	82
Future Volume (veh/h)	50	333	10	131	246	66	21	319	340	33	45	82
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1796	1870	1870	1796	1870	1870	1870	1870	1870	1796
Adj Flow Rate, veh/h	54	362	11	142	267	72	23	347	0	36	49	89
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	139	548	17	218	556	147	30	447		121	164	237
Arrive On Green	0.08	0.16	0.16	0.12	0.20	0.20	0.26	0.26	0.00	0.16	0.16	0.16
Sat Flow, veh/h	1781	3521	107	1781	2780	735	116	1749	1585	776	1056	1522
Grp Volume(v), veh/h	54	182	191	142	169	170	370	0	0	85	0	89
Grp Sat Flow(s),veh/h/ln	1781	1777	1851	1781	1777	1738	1865	0	1585	1832	0	1522
Q Serve(g_s), s	2.6	8.7	8.7	6.8	7.6	7.8	16.6	0.0	0.0	3.7	0.0	4.7
Cycle Q Clear(g_c), s	2.6	8.7	8.7	6.8	7.6	7.8	16.6	0.0	0.0	3.7	0.0	4.7
Prop In Lane	1.00		0.06	1.00		0.42	0.06		1.00	0.42		1.00
Lane Grp Cap(c), veh/h	139	276	288	218	355	348	476	0		285	0	237
V/C Ratio(X)	0.39	0.66	0.66	0.65	0.47	0.49	0.78	0.00		0.30	0.00	0.38
Avail Cap(c_a), veh/h	139	276	288	218	355	348	476	0		285	0	237
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	39.5	35.8	35.8	37.7	31.8	31.9	31.1	0.0	0.0	33.7	0.0	34.1
Incr Delay (d2), s/veh	1.8	5.7	5.6	6.8	1.0	1.1	7.9	0.0	0.0	0.6	0.0	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(95%),veh/ln	2.1	7.4	7.7	5.9	5.8	5.8	12.9	0.0	0.0	3.0	0.0	3.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	41.3	41.4	41.3	44.4	32.8	33.0	39.0	0.0	0.0	34.2	0.0	35.1
LnGrp LOS	D	D	D	D	C	C	D	A		C	A	D
Approach Vol, veh/h		427			481			370	A		174	
Approach Delay, s/veh		41.4			36.3			39.0			34.7	
Approach LOS		D			D			D			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	11.6	24.0		27.8	16.3	19.3		17.0				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	9.0	20.0		25.0	13.0	16.0		16.0				
Max Q Clear Time (g_c+I1), s	5.6	10.8		19.6	9.8	11.7		7.7				
Green Ext Time (p_c), s	0.0	1.2		1.0	0.1	0.8		0.4				

Intersection Summary		
HCM 6th Ctrl Delay		38.3
HCM 6th LOS		D

Notes

Unsignalized Delay for [NER] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	63	511	101	192	226	246	78	419	569	486	205	39
Future Volume (veh/h)	63	511	101	192	226	246	78	419	569	486	205	39
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	68	555	56	209	246	137	85	455	346	528	223	39
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	69	653	291	226	509	432	91	868	387	579	1093	188
Arrive On Green	0.04	0.18	0.18	0.13	0.27	0.27	0.05	0.24	0.24	0.17	0.36	0.36
Sat Flow, veh/h	1781	3554	1585	1781	1870	1585	1781	3554	1585	3456	3031	522
Grp Volume(v), veh/h	68	555	56	209	246	137	85	455	346	528	129	133
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1870	1585	1781	1777	1585	1728	1777	1776
Q Serve(g_s), s	3.9	15.2	3.0	11.7	11.1	6.9	4.8	11.2	21.3	15.2	5.1	5.2
Cycle Q Clear(g_c), s	3.9	15.2	3.0	11.7	11.1	6.9	4.8	11.2	21.3	15.2	5.1	5.2
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.29
Lane Grp Cap(c), veh/h	69	653	291	226	509	432	91	868	387	579	641	640
V/C Ratio(X)	0.99	0.85	0.19	0.92	0.48	0.32	0.93	0.52	0.89	0.91	0.20	0.21
Avail Cap(c_a), veh/h	176	986	440	265	611	518	212	1056	471	650	651	651
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	48.5	39.9	34.9	43.6	30.8	29.3	47.7	33.0	36.9	41.3	22.3	22.3
Incr Delay (d2), s/veh	48.4	4.6	0.3	32.8	0.7	0.4	29.6	0.5	16.8	16.2	0.2	0.2
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(95%),veh/ln	4.7	11.3	2.1	11.4	8.6	4.7	5.1	8.4	14.9	12.1	3.8	3.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	96.9	44.5	35.2	76.4	31.5	29.7	77.3	33.5	53.7	57.5	22.4	22.5
LnGrp LOS	F	D	D	E	C	C	E	C	D	E	C	C
Approach Vol, veh/h		679			592			886			790	
Approach Delay, s/veh		48.9			46.9			45.6			45.9	
Approach LOS		D			D			D			D	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	19.8	25.5	23.9	31.7	10.9	34.5	12.2	43.4				
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0				
Max Green Setting (Gmax), s	17.0	30.0	21.0	32.0	12.0	35.0	14.0	39.0				
Max Q Clear Time (g_c+I1), s	14.7	18.2	18.2	24.3	6.9	14.1	7.8	8.2				
Green Ext Time (p_c), s	0.2	2.3	0.7	2.4	0.1	1.4	0.1	1.0				
Intersection Summary												
HCM 6th Ctrl Delay			46.7									
HCM 6th LOS			D									
Notes												

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑	↱		↰↑↱			↰↑	↱
Traffic Volume (veh/h)	157	822	473	74	432	148	52	25	52	67	23	120
Future Volume (veh/h)	157	822	473	74	432	148	52	25	52	67	23	120
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	171	893	514	80	470	161	57	27	57	73	25	130
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	404	1415	631	47	703	314	254	96	185	232	50	203
Arrive On Green	0.23	0.40	0.40	0.03	0.20	0.20	0.13	0.13	0.13	0.13	0.13	0.13
Sat Flow, veh/h	1781	3554	1585	1781	3554	1585	981	749	1442	763	393	1585
Grp Volume(v), veh/h	171	893	514	80	470	161	84	0	57	98	0	130
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1777	1585	1730	0	1442	1156	0	1585
Q Serve(g_s), s	3.9	9.5	13.6	1.2	5.7	4.3	0.0	0.0	1.7	2.6	0.0	3.7
Cycle Q Clear(g_c), s	3.9	9.5	13.6	1.2	5.7	4.3	2.0	0.0	1.7	4.2	0.0	3.7
Prop In Lane	1.00		1.00	1.00		1.00	0.68		1.00	0.74		1.00
Lane Grp Cap(c), veh/h	404	1415	631	47	703	314	351	0	185	282	0	203
V/C Ratio(X)	0.42	0.63	0.81	1.70	0.67	0.51	0.24	0.00	0.31	0.35	0.00	0.64
Avail Cap(c_a), veh/h	404	1664	742	114	1589	709	897	0	706	826	0	810
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	15.5	11.4	12.6	22.9	17.4	16.8	18.7	0.0	18.6	20.0	0.0	19.4
Incr Delay (d2), s/veh	0.7	0.6	6.0	359.5	1.1	1.3	0.3	0.0	0.9	0.7	0.0	3.3
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(95%),veh/ln	2.6	5.5	8.4	9.3	3.9	2.6	1.4	0.0	1.0	1.8	0.0	2.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	16.2	12.0	18.6	382.4	18.5	18.1	19.0	0.0	19.5	20.8	0.0	22.8
LnGrp LOS	B	B	B	F	B	B	B	A	B	C	A	C
Approach Vol, veh/h		1578			711			141			228	
Approach Delay, s/veh		14.6			59.4			19.2			21.9	
Approach LOS		B			E			B			C	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	8.2	25.7		13.0	17.7	16.3		13.0
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	5.0	24.0		25.0	6.0	23.0		26.0
Max Q Clear Time (g_c+I1), s	4.2	16.6		5.0	6.9	8.7		7.2
Green Ext Time (p_c), s	0.0	4.1		0.5	0.0	2.6		0.8

Intersection Summary		
HCM 6th Ctrl Delay		27.4
HCM 6th LOS		C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	109	482	181	93	456	142	124	159	74	145	557	161
Future Volume (veh/h)	109	482	181	93	456	142	124	159	74	145	557	161
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	118	524	197	101	496	154	135	173	53	158	605	175
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	158	675	253	119	654	202	158	869	387	198	725	209
Arrive On Green	0.09	0.27	0.27	0.07	0.24	0.24	0.09	0.24	0.24	0.11	0.27	0.27
Sat Flow, veh/h	1781	2530	947	1781	2673	825	1781	3554	1585	1781	2720	785
Grp Volume(v), veh/h	118	367	354	101	329	321	135	173	53	158	395	385
Grp Sat Flow(s),veh/h/ln	1781	1777	1700	1781	1777	1722	1781	1777	1585	1781	1777	1729
Q Serve(g_s), s	5.8	17.2	17.3	5.0	15.4	15.6	6.7	3.5	2.4	7.8	18.9	18.9
Cycle Q Clear(g_c), s	5.8	17.2	17.3	5.0	15.4	15.6	6.7	3.5	2.4	7.8	18.9	18.9
Prop In Lane	1.00		0.56	1.00		0.48	1.00		1.00	1.00		0.45
Lane Grp Cap(c), veh/h	158	474	453	119	434	421	158	869	387	198	474	461
V/C Ratio(X)	0.75	0.78	0.78	0.85	0.76	0.76	0.85	0.20	0.14	0.80	0.83	0.84
Avail Cap(c_a), veh/h	158	474	453	119	434	421	158	869	387	198	474	461
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	40.0	30.5	30.6	41.6	31.5	31.6	40.4	27.0	26.6	39.0	31.1	31.1
Incr Delay (d2), s/veh	17.3	7.9	8.5	41.0	7.5	8.1	33.6	0.1	0.2	20.1	12.1	12.6
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(95%),veh/ln	5.8	12.6	12.3	6.3	11.6	11.4	7.7	2.6	1.6	7.8	14.2	14.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	57.4	38.4	39.1	82.6	39.0	39.7	74.0	27.1	26.7	59.2	43.2	43.7
LnGrp LOS	E	D	D	F	D	D	E	C	C	E	D	D
Approach Vol, veh/h		839			751			361			938	
Approach Delay, s/veh		41.3			45.1			44.6			46.1	
Approach LOS		D			D			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	12.7	29.0	16.3	28.0	14.2	27.5	14.7	29.6
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	8.0	26.0	12.0	24.0	10.0	24.0	10.0	26.0
Max Q Clear Time (g_c+I1), s	9.8	20.3	10.8	6.5	8.8	18.6	9.7	21.9
Green Ext Time (p_c), s	0.0	1.6	0.1	0.8	0.0	1.3	0.0	1.3

Intersection Summary		
HCM 6th Ctrl Delay		44.3
HCM 6th LOS		D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	157	67	372	13	38	57	335	364	77	175	411	215
Future Volume (veh/h)	157	67	372	13	38	57	335	364	77	175	411	215
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	171	73	0	14	41	51	364	396	82	190	447	125
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	264	508		58	427	362	470	726	149	345	630	402
Arrive On Green	0.08	0.27	0.00	0.03	0.23	0.23	0.26	0.25	0.25	0.19	0.18	0.18
Sat Flow, veh/h	3456	1870	1585	1781	1870	1585	1781	2936	602	1781	3554	1585
Grp Volume(v), veh/h	171	73	0	14	41	51	364	238	240	190	447	125
Grp Sat Flow(s),veh/h/ln	1728	1870	1585	1781	1870	1585	1781	1777	1762	1781	1777	1585
Q Serve(g_s), s	5.3	3.3	0.0	0.8	1.9	2.8	20.8	12.8	13.0	10.6	13.0	7.0
Cycle Q Clear(g_c), s	5.3	3.3	0.0	0.8	1.9	2.8	20.8	12.8	13.0	10.6	13.0	7.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.34	1.00		1.00
Lane Grp Cap(c), veh/h	264	508		58	427	362	470	439	436	345	630	402
V/C Ratio(X)	0.65	0.14		0.24	0.10	0.14	0.78	0.54	0.55	0.55	0.71	0.31
Avail Cap(c_a), veh/h	264	508		58	427	362	470	439	436	345	630	402
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	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	49.4	30.3	0.0	51.9	33.5	33.9	37.5	36.0	36.1	40.0	42.6	33.3
Incr Delay (d2), s/veh	5.4	0.1	0.0	2.1	0.1	0.2	7.9	1.4	1.5	1.9	3.7	0.4
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(95%),veh/ln	4.4	2.6	0.0	0.7	1.5	2.0	14.9	9.4	9.5	8.3	9.9	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	54.8	30.5	0.0	54.0	33.6	34.0	45.4	37.3	37.6	41.9	46.3	33.7
LnGrp LOS	D	C		D	C	C	D	D	D	D	D	C
Approach Vol, veh/h		244	A		106			842			762	
Approach Delay, s/veh		47.5			36.5			40.9			43.1	
Approach LOS		D			D			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.7	27.3	23.6	33.6	14.4	21.6	32.8	24.4
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	5.6	31.9	23.3	29.2	10.4	27.1	31.0	21.5
Max Q Clear Time (g_c+I1), s	13.8	6.3	13.6	16.0	8.3	5.8	23.8	16.0
Green Ext Time (p_c), s	0.0	0.2	0.4	1.5	0.1	0.3	0.9	1.3

Intersection Summary		
HCM 6th Ctrl Delay		42.4
HCM 6th LOS		D

Notes

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Intersection						
Int Delay, s/veh	4					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	16	46	92	130	232	162
Future Vol, veh/h	16	46	92	130	232	162
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	17	50	100	141	252	176

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	851	171	0	0	241	0
Stage 1	171	-	-	-	-	-
Stage 2	680	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	330	873	-	-	1326	-
Stage 1	859	-	-	-	-	-
Stage 2	503	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	260	873	-	-	1326	-
Mov Cap-2 Maneuver	260	-	-	-	-	-
Stage 1	859	-	-	-	-	-
Stage 2	397	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.6	0	4.9
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	543	1326	-
HCM Lane V/C Ratio	-	-	0.124	0.19	-
HCM Control Delay (s)	-	-	12.6	8.4	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.4	0.7	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	13	310	37	51	51	68	155	325	220	189	404	121
Future Volume (veh/h)	13	310	37	51	51	68	155	325	220	189	404	121
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	14	337	40	55	55	74	168	353	239	205	439	132
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	58	501	433	202	180	433	259	640	426	238	813	242
Arrive On Green	0.27	0.27	0.27	0.27	0.27	0.27	0.15	0.31	0.31	0.13	0.30	0.30
Sat Flow, veh/h	28	1831	1585	477	659	1585	1781	2043	1359	1781	2698	804
Grp Volume(v), veh/h	351	0	40	110	0	74	168	306	286	205	288	283
Grp Sat Flow(s),veh/h/ln	1859	0	1585	1136	0	1585	1781	1777	1626	1781	1777	1726
Q Serve(g_s), s	0.0	0.0	1.4	0.0	0.0	2.7	6.7	10.7	11.0	8.5	10.1	10.3
Cycle Q Clear(g_c), s	12.6	0.0	1.4	5.1	0.0	2.7	6.7	10.7	11.0	8.5	10.1	10.3
Prop In Lane	0.04		1.00	0.50		1.00	1.00		0.84	1.00		0.47
Lane Grp Cap(c), veh/h	558	0	433	382	0	433	259	557	509	238	535	520
V/C Ratio(X)	0.63	0.00	0.09	0.29	0.00	0.17	0.65	0.55	0.56	0.86	0.54	0.54
Avail Cap(c_a), veh/h	558	0	433	382	0	433	259	557	509	238	535	520
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	24.4	0.0	20.3	21.3	0.0	20.8	30.2	21.4	21.5	31.8	21.8	21.9
Incr Delay (d2), s/veh	2.3	0.0	0.1	0.4	0.0	0.2	5.6	1.2	1.4	26.3	1.1	1.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	9.5	0.0	0.9	2.7	0.0	1.7	5.5	7.6	7.2	8.9	7.2	7.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	26.6	0.0	20.4	21.7	0.0	21.0	35.8	22.5	22.9	58.1	22.9	23.1
LnGrp LOS	C	A	C	C	A	C	D	C	C	E	C	C
Approach Vol, veh/h		391			184			760			776	
Approach Delay, s/veh		26.0			21.4			25.6			32.3	
Approach LOS		C			C			C			C	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	16.7	25.7		24.5	16.2	26.2		24.5				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	12.0	25.5		22.5	12.9	24.6		22.5				
Max Q Clear Time (g_c+I1), s	11.5	14.0		15.6	9.7	13.3		8.1				
Green Ext Time (p_c), s	0.0	1.9		0.9	0.2	1.8		0.6				
Intersection Summary												
HCM 6th Ctrl Delay			27.8									
HCM 6th LOS			C									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	44	70	73	127	153	42	246	251	149	1	18	11
Future Volume (veh/h)	44	70	73	127	153	42	246	251	149	1	18	11
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	48	76	39	138	166	23	267	273	80	1	20	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	134	358	304	297	455	63	475	474	423	19	392	100
Arrive On Green	0.08	0.19	0.19	0.17	0.28	0.28	0.27	0.27	0.27	0.14	0.14	0.14
Sat Flow, veh/h	1781	1870	1585	1781	1608	223	1781	1777	1585	137	2765	705
Grp Volume(v), veh/h	48	76	39	138	0	189	267	273	80	14	0	12
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	0	1830	1781	1777	1585	1864	0	1743
Q Serve(g_s), s	3.1	4.1	2.4	8.4	0.0	9.9	15.5	16.0	4.7	0.8	0.0	0.7
Cycle Q Clear(g_c), s	3.1	4.1	2.4	8.4	0.0	9.9	15.5	16.0	4.7	0.8	0.0	0.7
Prop In Lane	1.00		1.00	1.00		0.12	1.00		1.00	0.07		0.40
Lane Grp Cap(c), veh/h	134	358	304	297	0	519	475	474	423	264	0	247
V/C Ratio(X)	0.36	0.21	0.13	0.46	0.00	0.36	0.56	0.58	0.19	0.05	0.00	0.05
Avail Cap(c_a), veh/h	134	358	304	297	0	519	475	474	423	264	0	247
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	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	52.8	40.9	40.2	45.2	0.0	34.4	38.0	38.1	34.0	44.5	0.0	44.5
Incr Delay (d2), s/veh	1.6	0.3	0.2	1.1	0.0	0.4	1.5	1.7	0.2	0.1	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	2.6	3.5	1.8	6.9	0.0	8.0	11.3	11.6	3.3	0.6	0.0	0.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	54.4	41.2	40.4	46.3	0.0	34.8	39.5	39.8	34.2	44.6	0.0	44.6
LnGrp LOS	D	D	D	D	A	C	D	D	C	D	A	D
Approach Vol, veh/h		163			327			620			26	
Approach Delay, s/veh		44.9			39.6			39.0			44.6	
Approach LOS		D			D			D			D	

Timer - Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		32.6	21.8	21.5		17.0	12.9	30.4
Change Period (Y+Rc), s		5.0	5.0	5.0		5.0	5.0	5.0
Max Green Setting (Gmax), s		34.0	22.0	25.0		19.0	11.0	36.0
Max Q Clear Time (g_c+I1), s		19.0	11.4	7.1		3.8	6.1	12.9
Green Ext Time (p_c), s		2.3	0.3	0.7		0.0	0.0	1.9

Intersection Summary			
HCM 6th Ctrl Delay			40.1
HCM 6th LOS			D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	136	16	34	7	2	0	143	1335	74	12	192	192
Future Volume (veh/h)	136	16	34	7	2	0	143	1335	74	12	192	192
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	148	17	37	8	2	0	155	1451	80	13	209	209
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	464	540	458	451	540	0	317	1522	84	59	533	476
Arrive On Green	0.29	0.29	0.29	0.29	0.29	0.00	0.18	0.44	0.44	0.03	0.30	0.30
Sat Flow, veh/h	1415	1870	1585	1396	1870	0	1781	3425	188	1781	1777	1585
Grp Volume(v), veh/h	148	17	37	8	2	0	155	751	780	13	209	209
Grp Sat Flow(s),veh/h/ln	1415	1870	1585	1396	1870	0	1781	1777	1836	1781	1777	1585
Q Serve(g_s), s	7.7	0.6	1.5	0.4	0.1	0.0	7.1	36.6	36.9	0.6	8.4	9.6
Cycle Q Clear(g_c), s	9.2	0.6	1.5	2.5	0.1	0.0	7.1	36.6	36.9	0.6	8.4	9.6
Prop In Lane	1.00		1.00	1.00		0.00	1.00		0.10	1.00		1.00
Lane Grp Cap(c), veh/h	464	540	458	451	540	0	317	790	816	59	533	476
V/C Ratio(X)	0.32	0.03	0.08	0.02	0.00	0.00	0.49	0.95	0.96	0.22	0.39	0.44
Avail Cap(c_a), veh/h	464	540	458	451	540	0	317	790	816	59	533	476
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	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	26.7	23.0	23.3	24.4	22.8	0.0	33.3	24.0	24.2	42.4	25.0	25.4
Incr Delay (d2), s/veh	0.4	0.0	0.1	0.0	0.0	0.0	1.2	20.8	21.5	1.8	0.5	0.6
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(95%),veh/ln	4.6	0.5	1.0	0.2	0.1	0.0	5.4	25.3	26.3	0.5	6.1	6.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	27.1	23.0	23.4	24.4	22.8	0.0	34.5	44.9	45.6	44.2	25.5	26.0
LnGrp LOS	C	C	C	C	C	A	C	D	D	D	C	C
Approach Vol, veh/h		202			10			1686			431	
Approach Delay, s/veh		26.0			24.1			44.3			26.3	
Approach LOS		C			C			D			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.2	46.9		25.4	19.1	36.0		25.4				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	5.0	42.0		28.0	18.0	29.0		28.0				
Max Q Clear Time (g_c+I1), s	3.6	39.9		12.2	10.1	12.6		5.5				
Green Ext Time (p_c), s	0.0	1.9		0.6	0.3	3.6		0.0				

Intersection Summary		
HCM 6th Ctrl Delay		39.3
HCM 6th LOS		D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	45	3	150	27	0	22	300	576	83	23	93	42
Future Volume (veh/h)	45	3	150	27	0	22	300	576	83	23	93	42
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	49	3	87	29	0	17	326	626	86	25	101	44
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	377	23	355	774	0	355	525	1273	173	86	431	178
Arrive On Green	0.22	0.22	0.22	0.22	0.00	0.22	0.15	0.28	0.28	0.05	0.18	0.18
Sat Flow, veh/h	1683	103	1585	3456	0	1585	3456	4546	617	1781	2451	1013
Grp Volume(v), veh/h	52	0	87	29	0	17	326	467	245	25	72	73
Grp Sat Flow(s),veh/h/ln	1786	0	1585	1728	0	1585	1728	1702	1759	1781	1777	1688
Q Serve(g_s), s	2.9	0.0	5.6	0.8	0.0	1.1	11.0	14.3	14.6	1.7	4.3	4.7
Cycle Q Clear(g_c), s	2.9	0.0	5.6	0.8	0.0	1.1	11.0	14.3	14.6	1.7	4.3	4.7
Prop In Lane	0.94		1.00	1.00		1.00	1.00		0.35	1.00		0.60
Lane Grp Cap(c), veh/h	400	0	355	774	0	355	525	953	493	86	313	297
V/C Ratio(X)	0.13	0.00	0.25	0.04	0.00	0.05	0.62	0.49	0.50	0.29	0.23	0.25
Avail Cap(c_a), veh/h	400	0	355	774	0	355	525	953	493	86	313	297
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	38.8	0.0	39.8	38.0	0.0	38.0	49.6	37.6	37.6	57.5	44.2	44.4
Incr Delay (d2), s/veh	0.1	0.0	0.4	0.0	0.0	0.1	2.2	0.4	0.8	1.9	0.4	0.4
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(95%),veh/ln	2.4	0.0	4.1	0.6	0.0	0.8	8.6	10.1	10.6	1.5	3.5	3.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	38.9	0.0	40.2	38.0	0.0	38.1	51.9	37.9	38.4	59.3	44.6	44.8
LnGrp LOS	D	A	D	D	A	D	D	D	D	E	D	D
Approach Vol, veh/h		139			46			1038			170	
Approach Delay, s/veh		39.7			38.0			42.4			46.8	
Approach LOS		D			D			D			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	10.5	33.9		24.5	23.0	21.4		22.0				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	8.0	37.0		30.0	21.0	24.0		30.0				
Max Q Clear Time (g_c+I1), s	4.7	17.6		8.6	14.0	7.7		4.1				
Green Ext Time (p_c), s	0.0	3.3		0.5	0.9	0.4		0.1				

Intersection Summary		
HCM 6th Ctrl Delay		42.6
HCM 6th LOS		D

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	34	522	306	339	293	398	299	473	699	298	477	36
Future Volume (veh/h)	34	522	306	339	293	398	299	473	699	298	477	36
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	37	567	170	368	318	0	325	514	488	324	518	27
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	71	733	296	415	1047		507	1421	634	369	1237	64
Arrive On Green	0.04	0.37	0.19	0.12	0.53	0.00	0.15	0.40	0.40	0.11	0.36	0.36
Sat Flow, veh/h	1781	3928	1585	3456	3928	1585	3456	3554	1585	3456	3436	179
Grp Volume(v), veh/h	37	567	170	368	318	0	325	514	488	324	267	278
Grp Sat Flow(s),veh/h/ln	1781	1964	1585	1728	1964	1585	1728	1777	1585	1728	1777	1838
Q Serve(g_s), s	3.1	19.1	14.7	15.7	6.8	0.0	13.3	15.2	40.0	13.9	17.0	17.1
Cycle Q Clear(g_c), s	3.1	19.1	14.7	15.7	6.8	0.0	13.3	15.2	40.0	13.9	17.0	17.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.10
Lane Grp Cap(c), veh/h	71	733	296	415	1047		507	1421	634	369	640	662
V/C Ratio(X)	0.52	0.77	0.57	0.89	0.30		0.64	0.36	0.77	0.88	0.42	0.42
Avail Cap(c_a), veh/h	71	733	296	415	1047		507	1421	634	369	640	662
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.99	0.99	0.99	0.92	0.92	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	70.6	44.2	55.6	65.0	27.2	0.0	60.3	31.6	39.0	66.0	36.2	36.2
Incr Delay (d2), s/veh	3.1	7.7	7.8	18.9	0.7	0.0	2.1	0.2	5.7	20.1	0.4	0.4
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(95%),veh/ln	2.6	13.3	10.6	12.4	5.4	0.0	9.9	10.6	22.7	11.4	11.8	12.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	73.7	51.9	63.4	83.9	27.9	0.0	62.4	31.7	44.8	86.2	36.6	36.6
LnGrp LOS	E	D	E	F	C		E	C	D	F	D	D
Approach Vol, veh/h		774			686	A		1327			869	
Approach Delay, s/veh		55.5			57.9			44.0			55.1	
Approach LOS		E			E			D			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	24.5	42.0	22.5	61.1	11.4	55.1	25.3	58.3
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	20.0	30.0	18.0	62.0	8.0	42.0	24.0	56.0
Max Q Clear Time (g_c+I1), s	18.7	22.1	16.9	43.0	6.1	9.8	16.3	20.1
Green Ext Time (p_c), s	0.2	2.1	0.1	7.1	0.0	1.4	0.3	5.9

Intersection Summary	
HCM 6th Ctrl Delay	51.7
HCM 6th LOS	D

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1433	12	0	672	0	0	0	49	1072	6	294
Future Volume (veh/h)	0	1433	12	0	672	0	0	0	49	1072	6	294
Initial Q (Qb), veh	0	20	0	0	15	0	0	0	0	7	7	7
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	0	2067	1870	0	2067	0	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	0	1558	13	0	730	0	0	0	53	1170	0	320
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	0	2	0	2	2	2	2	2	2
Cap, veh/h	0	3194	25	0	1706		0	0	54	1361	0	1202
Arrive On Green	0.00	0.90	0.45	0.00	0.90	0.00	0.00	0.00	0.03	0.38	0.00	0.38
Sat Flow, veh/h	0	7618	61	0	4134	0	0	0	1585	3563	0	3170
Grp Volume(v), veh/h	0	1134	437	0	730	0	0	0	53	1170	0	320
Grp Sat Flow(s),veh/h/ln	0	1778	2056	0	1964	0	0	0	1585	1781	0	1585
Q Serve(g_s), s	0.0	5.6	6.3	0.0	4.5	0.0	0.0	0.0	5.0	45.7	0.0	10.5
Cycle Q Clear(g_c), s	0.0	5.6	6.3	0.0	4.5	0.0	0.0	0.0	5.0	45.7	0.0	10.5
Prop In Lane	0.00		0.03	0.00		0.00	0.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	0	2323	900	0	1706		0	0	54	1361	0	1202
V/C Ratio(X)	0.00	0.49	0.49	0.00	0.43		0.00	0.00	0.97	0.86	0.00	0.27
Avail Cap(c_a), veh/h	0	2396	924	0	1765		0	0	85	1805	0	1606
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	0.31	0.31	0.00	1.00	0.00	0.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	6.9	7.1	0.0	7.0	0.0	0.0	0.0	72.4	43.1	0.0	32.5
Incr Delay (d2), s/veh	0.0	0.2	0.6	0.0	0.8	0.0	0.0	0.0	72.0	3.4	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.6	0.4	0.0	1.0	0.0	0.0	0.0	0.0	1.4	0.0	0.3
%ile BackOfQ(95%),veh/ln	0.0	4.3	5.0	0.0	5.7	0.0	0.0	0.0	5.6	29.1	0.0	8.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	7.7	8.1	0.0	8.8	0.0	0.0	0.0	144.4	47.9	0.0	33.0
LnGrp LOS	A	A	A	A	A		A	A	F	D	A	C
Approach Vol, veh/h		1571			730	A		53			1490	
Approach Delay, s/veh		7.8			8.8			144.4			44.7	
Approach LOS		A			A			F			D	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		74.4		63.5		74.4		12.1				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		47.0		78.0		47.0		10.0				
Max Q Clear Time (g_c+I1), s		9.3		48.7		7.5		8.0				
Green Ext Time (p_c), s		18.8		9.7		7.5		0.0				

Intersection Summary		
HCM 6th Ctrl Delay		24.2
HCM 6th LOS		C

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1500	444	0	358	717	339	0	1679	0	0	0
Future Volume (veh/h)	0	1500	444	0	358	717	339	0	1679	0	0	0
Initial Q (Qb), veh	0	25	0	0	10	0	8	0	21			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	0	2067	1870	0	2067	1870	1870	0	1870			
Adj Flow Rate, veh/h	0	1630	0	0	389	0	368	0	1277			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	0	2	2	0	2	2	2	0	2			
Cap, veh/h	0	2720		0	2096		668	0	1398			
Arrive On Green	0.00	1.00	0.00	0.00	1.00	0.00	0.36	0.00	0.36			
Sat Flow, veh/h	0	5830	1585	0	4031	1585	1781	0	3614			
Grp Volume(v), veh/h	0	1630	0	0	389	0	368	0	1277			
Grp Sat Flow(s),veh/h/ln	0	1881	1585	0	1964	1585	1781	0	1205			
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	0.0	24.8	0.0	52.1			
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	0.0	0.0	24.8	0.0	52.1			
Prop In Lane	0.00		1.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	0	2720		0	2096		668	0	1398			
V/C Ratio(X)	0.00	0.60		0.00	0.19		0.55	0.00	0.91			
Avail Cap(c_a), veh/h	0	3058		0	2128		998	0	2024			
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.00	1.00	0.00	0.00	0.67	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	0.0	7.0	0.0	0.0	0.9	0.0	37.9	0.0	45.2			
Incr Delay (d2), s/veh	0.0	1.0	0.0	0.0	0.1	0.0	0.3	0.0	4.0			
Initial Q Delay(d3),s/veh	0.0	1.5	0.0	0.0	0.2	0.0	2.3	0.0	18.8			
%ile BackOfQ(95%),veh/ln	0.0	8.0	0.0	0.0	1.1	0.0	18.4	0.0	26.1			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	9.5	0.0	0.0	1.3	0.0	40.4	0.0	68.0			
LnGrp LOS	A	A		A	A		D	A	E			
Approach Vol, veh/h		1630	A		389	A		1645				
Approach Delay, s/veh		9.5			1.3			61.8				
Approach LOS		A			A			E				

Timer - Assigned Phs		2				6		8				
Phs Duration (G+Y+Rc), s		88.3				88.3		61.7				
Change Period (Y+Rc), s		5.0				5.0		5.0				
Max Green Setting (Gmax), s		54.0				54.0		86.0				
Max Q Clear Time (g_c+I1), s		3.0				3.0		55.1				
Green Ext Time (p_c), s		36.5				6.2		1.7				

Intersection Summary		
HCM 6th Ctrl Delay		32.1
HCM 6th LOS		C

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	809	1888	610	184	1745	118	49	9	38	73	38	174
Future Volume (veh/h)	809	1888	610	184	1745	118	49	9	38	73	38	174
Initial Q (Qb), veh	16	20	0	0	10	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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	879	2052	0	200	1897	128	60	0	41	60	68	189
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	852	2801		1125	3419	762	123	0	55	92	96	945
Arrive On Green	0.25	0.78	0.00	0.34	0.96	0.48	0.03	0.00	0.03	0.05	0.05	0.05
Sat Flow, veh/h	3456	7111	1585	3456	7111	1585	3563	0	1585	1781	1870	3170
Grp Volume(v), veh/h	879	2052	0	200	1897	128	60	0	41	60	68	189
Grp Sat Flow(s),veh/h/ln	1728	1778	1585	1728	1778	1585	1781	0	1585	1781	1870	1585
Q Serve(g_s), s	37.0	22.2	0.0	6.1	3.3	6.8	2.5	0.0	3.8	5.0	5.4	6.7
Cycle Q Clear(g_c), s	37.0	22.2	0.0	6.1	3.3	6.8	2.5	0.0	3.8	5.0	5.4	6.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	852	2801		1125	3419	762	123	0	55	92	96	945
V/C Ratio(X)	1.03	0.73		0.18	0.55	0.17	0.49	0.00	0.75	0.65	0.71	0.20
Avail Cap(c_a), veh/h	852	2987		1161	3419	762	879	0	391	95	100	951
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.32	0.32	0.00	0.74	0.74	0.74	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	56.5	12.3	0.0	36.2	1.6	22.0	71.1	0.0	71.8	69.8	70.0	39.3
Incr Delay (d2), s/veh	26.1	0.6	0.0	0.1	0.5	0.4	3.0	0.0	18.5	14.3	19.6	0.1
Initial Q Delay(d3),s/veh	67.6	1.4	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	31.5	6.9	0.0	4.7	1.4	4.7	2.2	0.0	3.3	4.8	5.6	4.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	150.1	14.2	0.0	36.3	2.2	22.4	74.1	0.0	90.3	84.2	89.6	39.4
LnGrp LOS	F	B		D	A	C	E	A	F	F	F	D
Approach Vol, veh/h		2931	A		2225			101			317	
Approach Delay, s/veh		55.0			6.4			80.7			58.6	
Approach LOS		D			A			F			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	57.4	65.7		12.2	44.0	79.1		14.7
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	16.0	65.0		39.0	39.0	42.0		10.0
Max Q Clear Time (g_c+I1), s	19.1	25.2		6.8	40.0	9.8		9.7
Green Ext Time (p_c), s	0.4	35.5		0.4	0.0	28.4		0.1

Intersection Summary	
HCM 6th Ctrl Delay	36.3
HCM 6th LOS	D

Notes

User approved volume balancing among the lanes for turning movement.
User approved changes to right turn type.
Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	582	1006	470	110	1998	451	13	46	4	108	108	131
Future Volume (veh/h)	582	1006	470	110	1998	451	13	46	4	108	108	131
Initial Q (Qb), veh	0	50	0	0	10	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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	633	1093	358	120	2172	343	14	50	3	117	117	100
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	674	4956	1105	144	3865	862	2	64	54	145	137	425
Arrive On Green	0.19	1.00	0.70	0.04	1.00	0.54	0.00	0.03	0.03	0.04	0.07	0.07
Sat Flow, veh/h	3456	7111	1585	3456	7111	1585	1781	1870	1585	3563	1870	1585
Grp Volume(v), veh/h	633	1093	358	120	2172	343	14	50	3	117	117	100
Grp Sat Flow(s),veh/h/ln	1728	1778	1585	1728	1778	1585	1781	1870	1585	1781	1870	1585
Q Serve(g_s), s	27.1	0.0	10.3	5.2	0.0	14.5	0.2	4.0	0.2	4.9	9.3	6.1
Cycle Q Clear(g_c), s	27.1	0.0	10.3	5.2	0.0	14.5	0.2	4.0	0.2	4.9	9.3	6.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	674	4956	1105	144	3865	862	2	64	54	145	137	425
V/C Ratio(X)	0.94	0.22	0.32	0.83	0.56	0.40	5.62	0.78	0.06	0.81	0.85	0.24
Avail Cap(c_a), veh/h	737	4956	1105	230	3865	862	95	362	306	238	387	637
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.80	0.80	0.80	0.91	0.91	0.91	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	59.5	0.0	5.4	71.4	0.0	11.7	74.9	71.9	55.3	71.4	68.7	29.5
Incr Delay (d2), s/veh	16.2	0.1	0.6	12.3	0.5	1.3	2253.4	18.6	0.4	10.0	13.5	0.3
Initial Q Delay(d3),s/veh	0.0	0.9	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	18.6	0.4	5.7	4.5	0.3	8.8	3.0	4.0	0.2	4.3	8.5	4.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	75.7	1.0	6.0	83.6	0.7	12.9	2328.3	90.5	55.7	81.3	82.2	29.7
LnGrp LOS	E	A	A	F	A	B	F	F	E	F	F	C
Approach Vol, veh/h		2084			2635			67			334	
Approach Delay, s/veh		24.6			6.0			556.6			66.2	
Approach LOS		C			A			F			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	13.2	111.5	13.1	12.1	36.2	88.5	7.2	18.0
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	12.0	75.0	12.0	31.0	34.0	53.0	10.0	33.0
Max Q Clear Time (g_c+I1), s	18.2	13.3	7.9	7.0	30.1	17.5	3.2	12.3
Green Ext Time (p_c), s	0.1	27.8	0.1	0.1	1.2	33.4	0.0	0.7

Intersection Summary		
HCM 6th Ctrl Delay		24.7
HCM 6th LOS		C

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1125	49	0	2780	4	35
Future Volume (veh/h)	1125	49	0	2780	4	35
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	2067	1870	1870	2067	1870	1870
Adj Flow Rate, veh/h	1223	53	0	3022	4	38
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	6229	269	1	7406	39	35
Arrive On Green	1.00	0.88	0.00	1.00	0.02	0.02
Sat Flow, veh/h	7331	304	1781	8765	1781	1585
Grp Volume(v), veh/h	926	350	0	3022	4	38
Grp Sat Flow(s),veh/h/ln	1778	2012	1781	1674	1781	1585
Q Serve(g_s), s	0.0	0.6	0.0	0.0	0.3	3.3
Cycle Q Clear(g_c), s	0.0	0.6	0.0	0.0	0.3	3.3
Prop In Lane		0.15	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	4718	1780	1	7406	39	35
V/C Ratio(X)	0.20	0.20	0.00	0.41	0.10	1.09
Avail Cap(c_a), veh/h	4718	1780	95	7406	344	306
HCM Platoon Ratio	2.00	1.00	2.00	2.00	1.00	1.00
Upstream Filter(I)	0.97	0.97	0.00	0.79	1.00	1.00
Uniform Delay (d), s/veh	0.0	0.2	0.0	0.0	71.9	73.3
Incr Delay (d2), s/veh	0.1	0.2	0.0	0.1	1.1	95.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.1	0.4	0.0	0.1	0.3	4.1
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.1	0.4	0.0	0.1	73.0	168.7
LnGrp LOS	A	A	A	A	E	F
Approach Vol, veh/h	1276			3022	42	
Approach Delay, s/veh	0.2			0.1	159.6	
Approach LOS	A			A	F	

Timer - Assigned Phs	1	2	6	8
Phs Duration (G+Y+Rc), s	0.0	139.7	139.7	10.3
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	10.0	94.0	109.0	31.0
Max Q Clear Time (g_c+I1), s	0.0	3.6	3.0	6.3
Green Ext Time (p_c), s	0.0	32.9	104.7	0.1

Intersection Summary	
HCM 6th Ctrl Delay	1.7
HCM 6th LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	26	802	258	36	2456	2	327	2	36	6	0	9
Future Volume (veh/h)	26	802	258	36	2456	2	327	2	36	6	0	9
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	28	872	280	39	2670	2	356	0	39	7	0	10
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	40	4737	1056	51	4971	4	410	0	182	6	0	6
Arrive On Green	0.02	0.67	0.67	0.03	1.00	0.67	0.12	0.00	0.12	0.00	0.00	0.00
Sat Flow, veh/h	1781	7111	1585	1781	7394	6	3563	0	1585	1781	0	1585
Grp Volume(v), veh/h	28	872	280	39	1926	746	356	0	39	7	0	10
Grp Sat Flow(s),veh/h/ln	1781	1778	1585	1781	1778	2066	1781	0	1585	1781	0	1585
Q Serve(g_s), s	2.3	7.0	10.7	3.3	0.0	0.1	14.7	0.0	3.3	0.5	0.0	0.5
Cycle Q Clear(g_c), s	2.3	7.0	10.7	3.3	0.0	0.1	14.7	0.0	3.3	0.5	0.0	0.5
Prop In Lane	1.00		1.00	1.00		0.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	40	4737	1056	51	3586	1389	410	0	182	6	0	6
V/C Ratio(X)	0.70	0.18	0.27	0.77	0.54	0.54	0.87	0.00	0.21	1.10	0.00	1.76
Avail Cap(c_a), veh/h	95	4737	1056	107	3586	1389	689	0	306	95	0	85
HCM Platoon Ratio	1.00	1.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.98	0.98	0.98	0.25	0.25	0.25	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	72.8	9.5	10.2	72.4	0.0	0.0	65.3	0.0	60.2	74.7	0.0	74.7
Incr Delay (d2), s/veh	19.7	0.1	0.6	5.9	0.1	0.4	6.4	0.0	0.6	196.4	0.0	459.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	2.3	5.0	7.1	2.6	0.1	0.3	11.4	0.0	2.5	1.1	0.0	1.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	92.5	9.6	10.8	78.3	0.1	0.4	71.6	0.0	60.8	271.1	0.0	534.6
LnGrp LOS	F	A	B	E	A	A	E	A	E	F	A	F
Approach Vol, veh/h		1180			2711			395			17	
Approach Delay, s/veh		11.9			1.3			70.6			426.1	
Approach LOS		B			A			E			F	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	11.3	106.9		7.5	10.4	107.9		24.3				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	11.0	78.0		10.0	10.0	79.0		31.0				
Max Q Clear Time (g_c+I1), s	6.3	13.7		3.5	5.3	3.1		17.7				
Green Ext Time (p_c), s	0.0	22.9		0.0	0.0	72.7		1.5				
Intersection Summary												
HCM 6th Ctrl Delay			12.3									
HCM 6th LOS			B									
Notes												

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑↑	↱	↰	↑↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Traffic Volume (veh/h)	203	687	87	270	1953	443	523	467	199	150	225	180
Future Volume (veh/h)	203	687	87	270	1953	443	523	467	199	150	225	180
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	221	747	67	293	2123	337	568	508	151	163	245	137
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	214	2266	636	312	2576	723	553	647	289	189	273	122
Arrive On Green	0.12	0.80	0.40	0.17	0.91	0.46	0.16	0.18	0.18	0.05	0.08	0.08
Sat Flow, veh/h	1781	5644	1585	1781	5644	1585	3456	3554	1585	3456	3554	1585
Grp Volume(v), veh/h	221	747	67	293	2123	337	568	508	151	163	245	137
Grp Sat Flow(s),veh/h/ln	1781	1881	1585	1781	1881	1585	1728	1777	1585	1728	1777	1585
Q Serve(g_s), s	18.0	5.3	4.0	24.4	19.9	12.8	24.0	20.5	12.9	7.0	10.3	8.5
Cycle Q Clear(g_c), s	18.0	5.3	4.0	24.4	19.9	12.8	24.0	20.5	12.9	7.0	10.3	8.5
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	214	2266	636	312	2576	723	553	647	289	189	273	122
V/C Ratio(X)	1.03	0.33	0.11	0.94	0.82	0.47	1.03	0.78	0.52	0.86	0.90	1.12
Avail Cap(c_a), veh/h	214	2266	636	451	2576	723	553	900	402	276	616	275
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.99	0.99	0.99	1.00	1.00	1.00	0.91	0.91	0.91	1.00	1.00	1.00
Uniform Delay (d), s/veh	66.0	9.4	28.1	61.1	4.4	9.6	63.0	58.5	55.5	70.3	68.6	37.7
Incr Delay (d2), s/veh	70.4	0.4	0.3	22.3	3.2	2.2	43.7	1.8	0.5	16.5	4.2	64.8
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(95%),veh/ln	18.4	3.5	2.9	18.7	5.5	8.5	20.0	14.2	8.8	6.4	8.4	9.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	136.4	9.8	28.4	83.4	7.6	11.7	106.7	60.3	56.0	86.9	72.8	102.6
LnGrp LOS	F	A	C	F	A	B	F	E	E	F	E	F
Approach Vol, veh/h		1035			2753			1227			545	
Approach Delay, s/veh		38.0			16.2			81.2			84.5	
Approach LOS		D			B			F			F	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	15.2	34.3	25.0	75.5	31.0	18.5	33.2	67.2
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	14.0	40.0	20.0	56.0	26.0	28.0	40.0	36.0
Max Q Clear Time (g_c+I1), s	10.0	23.5	21.0	22.9	27.0	13.3	27.4	8.3
Green Ext Time (p_c), s	0.2	0.5	0.0	31.1	0.0	0.3	0.9	12.4

Intersection Summary		
HCM 6th Ctrl Delay		41.3
HCM 6th LOS		D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	320	595	138	268	1380	227	681	679	299	357	459	682
Future Volume (veh/h)	320	595	138	268	1380	227	681	679	299	357	459	682
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1969	1870	1870	1969	1870	1870	1969	1870	1870	1969	1870
Adj Flow Rate, veh/h	348	647	96	291	1500	138	740	738	189	388	499	469
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	292	919	389	321	1364	402	585	1728	510	431	1488	439
Arrive On Green	0.08	0.25	0.25	0.09	0.25	0.25	0.17	0.32	0.32	0.12	0.28	0.28
Sat Flow, veh/h	3456	3741	1585	3456	5375	1585	3456	5375	1585	3456	5375	1585
Grp Volume(v), veh/h	348	647	96	291	1500	138	740	738	189	388	499	469
Grp Sat Flow(s),veh/h/ln	1728	1870	1585	1728	1792	1585	1728	1792	1585	1728	1792	1585
Q Serve(g_s), s	11.0	20.5	6.3	10.8	33.0	9.3	22.0	14.0	11.9	14.4	9.6	36.0
Cycle Q Clear(g_c), s	11.0	20.5	6.3	10.8	33.0	9.3	22.0	14.0	11.9	14.4	9.6	36.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	292	919	389	321	1364	402	585	1728	510	431	1488	439
V/C Ratio(X)	1.19	0.70	0.25	0.91	1.10	0.34	1.27	0.43	0.37	0.90	0.34	1.07
Avail Cap(c_a), veh/h	292	919	389	372	1364	402	585	1728	510	585	1488	439
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	59.5	44.7	39.4	58.4	48.5	39.6	54.0	34.7	34.0	56.1	37.5	47.0
Incr Delay (d2), s/veh	114.4	4.5	1.5	23.2	56.3	2.3	132.6	0.2	0.4	13.8	0.1	62.4
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(95%),veh/ln	15.4	15.3	4.8	9.7	31.1	7.0	30.8	10.3	8.3	11.5	7.7	30.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	173.9	49.2	40.9	81.6	104.8	42.0	186.6	34.8	34.4	69.9	37.6	109.4
LnGrp LOS	F	D	D	F	F	D	F	C	C	E	D	F
Approach Vol, veh/h		1091			1929			1667			1356	
Approach Delay, s/veh		88.3			96.8			102.2			71.7	
Approach LOS		F			F			F			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	19.1	38.9	29.0	43.0	18.0	40.0	23.2	48.8
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	16.0	32.0	24.0	38.0	13.0	35.0	24.0	38.0
Max Q Clear Time (g_c+I1), s	13.8	23.5	25.0	39.0	14.0	36.0	17.4	17.0
Green Ext Time (p_c), s	0.2	3.0	0.0	0.0	0.0	0.0	0.8	5.9

Intersection Summary	
HCM 6th Ctrl Delay	91.1
HCM 6th LOS	F

Movement	WBL	WBR	NBT	NBR	SBL	SBT	
Lane Configurations							
Traffic Volume (veh/h)	228	589	537	322	570	467	
Future Volume (veh/h)	228	589	537	322	570	467	
Initial Q (Qb), veh	0	0	0	0	0	0	
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	
Work Zone On Approach	No		No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	
Adj Flow Rate, veh/h	248	448	584	245	620	508	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Percent Heavy Veh, %	2	2	2	2	2	2	
Cap, veh/h	277	810	624	261	633	2448	
Arrive On Green	0.16	0.16	0.26	0.26	0.36	0.69	
Sat Flow, veh/h	1781	1585	2534	1022	1781	3647	
Grp Volume(v), veh/h	248	448	425	404	620	508	
Grp Sat Flow(s),veh/h/ln	1781	1585	1777	1686	1781	1777	
Q Serve(g_s), s	12.3	14.0	21.1	21.1	31.0	4.7	
Cycle Q Clear(g_c), s	12.3	14.0	21.1	21.1	31.0	4.7	
Prop In Lane	1.00	1.00		0.61	1.00		
Lane Grp Cap(c), veh/h	277	810	454	431	633	2448	
V/C Ratio(X)	0.90	0.55	0.94	0.94	0.98	0.21	
Avail Cap(c_a), veh/h	277	810	454	431	633	2448	
HCM Platoon Ratio	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	
Uniform Delay (d), s/veh	37.3	15.0	32.8	32.8	28.7	5.1	
Incr Delay (d2), s/veh	28.8	0.8	26.9	28.3	30.4	0.0	
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	
%ile BackOfQ(95%),veh/ln	12.0	10.2	17.6	17.1	24.3	2.4	
Unsig. Movement Delay, s/veh							
LnGrp Delay(d),s/veh	66.0	15.8	59.7	61.1	59.0	5.1	
LnGrp LOS	E	B	E	E	E	A	
Approach Vol, veh/h	696		829			1128	
Approach Delay, s/veh	33.7		60.3			34.8	
Approach LOS	C		E			C	
Timer - Assigned Phs	1	2				6	8
Phs Duration (G+Y+Rc), s	39.0	29.8				68.8	21.0
Change Period (Y+Rc), s	5.0	5.0				5.0	5.0
Max Green Setting (Gmax), s	34.0	25.0				64.0	16.0
Max Q Clear Time (g_c+I1), s	14.0	24.1				7.7	17.0
Green Ext Time (p_c), s	0.0	0.5				3.6	0.0
Intersection Summary							
HCM 6th Ctrl Delay			42.5				
HCM 6th LOS			D				

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Volume (veh/h)	239	217	39	467	185	39
Future Volume (veh/h)	239	217	39	467	185	39
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	260	106	42	508	201	20
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	969	432	162	1745	453	403
Arrive On Green	0.27	0.27	0.09	0.49	0.25	0.25
Sat Flow, veh/h	3647	1585	1781	3647	1781	1585
Grp Volume(v), veh/h	260	106	42	508	201	20
Grp Sat Flow(s),veh/h/ln	1777	1585	1781	1777	1781	1585
Q Serve(g_s), s	3.2	2.9	1.2	4.7	5.2	0.5
Cycle Q Clear(g_c), s	3.2	2.9	1.2	4.7	5.2	0.5
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	969	432	162	1745	453	403
V/C Ratio(X)	0.27	0.25	0.26	0.29	0.44	0.05
Avail Cap(c_a), veh/h	969	432	162	1745	453	403
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	15.7	15.6	23.3	8.3	17.2	15.5
Incr Delay (d2), s/veh	0.1	0.3	0.8	0.1	0.7	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	2.0	1.7	0.9	2.4	3.7	1.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	15.8	15.9	24.1	8.4	17.9	15.5
LnGrp LOS	B	B	C	A	B	B
Approach Vol, veh/h	366			550	221	
Approach Delay, s/veh	15.9			9.6	17.7	
Approach LOS	B			A	B	

Timer - Assigned Phs		2		4	5	6
Phs Duration (G+Y+Rc), s		26.9		17.2	9.7	17.3
Change Period (Y+Rc), s		5.0		5.0	5.0	5.0
Max Green Setting (Gmax), s		29.0		16.0	7.0	17.0
Max Q Clear Time (g_c+I1), s		7.7		8.2	4.2	6.2
Green Ext Time (p_c), s		3.1		0.4	0.0	1.4

Intersection Summary			
HCM 6th Ctrl Delay			13.2
HCM 6th LOS			B

Notes

User approved pedestrian interval to be less than phase max green.

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	488	275	243	287	165	203
Future Volume (veh/h)	488	275	243	287	165	203
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	551	276	264	312	179	221
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	776	345	427	381	194	1754
Arrive On Green	0.22	0.22	0.24	0.24	0.11	0.49
Sat Flow, veh/h	3563	1585	1870	1585	1781	3647
Grp Volume(v), veh/h	551	276	264	312	179	221
Grp Sat Flow(s),veh/h/ln	1781	1585	1777	1585	1781	1777
Q Serve(g_s), s	6.9	8.0	6.4	9.0	4.8	1.6
Cycle Q Clear(g_c), s	6.9	8.0	6.4	9.0	4.8	1.6
Prop In Lane	1.00	1.00		1.00	1.00	
Lane Grp Cap(c), veh/h	776	345	427	381	194	1754
V/C Ratio(X)	0.71	0.80	0.62	0.82	0.92	0.13
Avail Cap(c_a), veh/h	1029	458	550	490	367	2346
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	17.5	18.0	16.4	17.4	21.4	6.6
Incr Delay (d2), s/veh	1.5	7.3	1.5	8.4	16.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	4.8	5.9	4.4	6.7	4.8	0.8
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	19.1	25.2	17.9	25.8	37.6	6.7
LnGrp LOS	B	C	B	C	D	A
Approach Vol, veh/h	827		576			400
Approach Delay, s/veh	21.1		22.2			20.5
Approach LOS	C		C			C

Timer - Assigned Phs	1	2	6	8
Phs Duration (G+Y+Rc), s	12.3	18.6	30.9	17.6
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	12.0	17.0	34.0	16.0
Max Q Clear Time (g_c+I1), s	7.8	12.0	4.6	11.0
Green Ext Time (p_c), s	0.2	1.6	1.4	1.6

Intersection Summary	
HCM 6th Ctrl Delay	21.3
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	228	84	123	775	1941	463
Future Volume (veh/h)	228	84	123	775	1941	463
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	248	91	134	842	2110	503
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	266	237	147	3715	2428	552
Arrive On Green	0.15	0.15	0.08	0.73	0.58	0.58
Sat Flow, veh/h	1781	1585	1781	5274	4327	945
Grp Volume(v), veh/h	248	91	134	842	1708	905
Grp Sat Flow(s),veh/h/ln	1781	1585	1781	1702	1702	1700
Q Serve(g_s), s	15.7	5.9	8.5	6.1	47.8	53.9
Cycle Q Clear(g_c), s	15.7	5.9	8.5	6.1	47.8	53.9
Prop In Lane	1.00	1.00	1.00			0.56
Lane Grp Cap(c), veh/h	266	237	147	3715	1987	993
V/C Ratio(X)	0.93	0.38	0.91	0.23	0.86	0.91
Avail Cap(c_a), veh/h	313	278	172	3855	2032	1015
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	47.9	43.7	51.9	5.1	19.8	21.1
Incr Delay (d2), s/veh	30.9	1.0	41.2	0.0	3.9	11.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	14.2	0.1	9.2	3.1	24.4	29.6
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	78.8	44.7	93.0	5.1	23.7	33.0
LnGrp LOS	E	D	F	A	C	C
Approach Vol, veh/h	339			976	2613	
Approach Delay, s/veh	69.6			17.2	26.9	
Approach LOS	E			B	C	

Timer - Assigned Phs		2		4	5	6
Phs Duration (G+Y+Rc), s		89.9		24.0	16.4	73.5
Change Period (Y+Rc), s		5.0		5.0	5.0	5.0
Max Green Setting (Gmax), s		88.0		22.0	13.0	70.0
Max Q Clear Time (g_c+I1), s		9.1		18.7	11.5	56.9
Green Ext Time (p_c), s		6.4		0.4	0.0	11.6

Intersection Summary		
HCM 6th Ctrl Delay		28.2
HCM 6th LOS		C

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	22	1010	105	91	1101	777	55	59	117	72	65	38
Future Volume (veh/h)	22	1010	105	91	1101	777	55	59	117	72	65	38
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	24	1098	60	99	1197	410	60	64	84	78	71	41
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	59	1436	641	163	1644	733	119	366	310	134	227	131
Arrive On Green	0.03	0.40	0.40	0.09	0.46	0.46	0.07	0.20	0.20	0.08	0.20	0.20
Sat Flow, veh/h	1781	3554	1585	1781	3554	1585	1781	1870	1585	1781	1112	642
Grp Volume(v), veh/h	24	1098	60	99	1197	410	60	64	84	78	0	112
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1777	1585	1781	1870	1585	1781	0	1755
Q Serve(g_s), s	1.6	32.0	2.8	6.4	32.8	22.5	3.9	3.4	5.4	5.1	0.0	6.5
Cycle Q Clear(g_c), s	1.6	32.0	2.8	6.4	32.8	22.5	3.9	3.4	5.4	5.1	0.0	6.5
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.37
Lane Grp Cap(c), veh/h	59	1436	641	163	1644	733	119	366	310	134	0	358
V/C Ratio(X)	0.40	0.76	0.09	0.61	0.73	0.56	0.51	0.17	0.27	0.58	0.00	0.31
Avail Cap(c_a), veh/h	59	1436	641	163	1644	733	119	366	310	134	0	358
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	0.82	0.82	0.82	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	56.8	30.8	22.1	52.4	26.1	23.4	54.1	40.2	41.0	53.7	0.0	40.6
Incr Delay (d2), s/veh	4.4	3.9	0.3	5.2	2.4	2.5	3.4	0.2	0.5	6.4	0.0	0.5
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(95%),veh/ln	1.4	19.8	1.9	5.5	18.9	12.9	3.4	2.9	3.8	4.5	0.0	5.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	61.2	34.7	22.4	57.6	28.5	25.9	57.5	40.4	41.4	60.0	0.0	41.1
LnGrp LOS	E	C	C	E	C	C	E	D	D	E	A	D
Approach Vol, veh/h		1182			1706			208			190	
Approach Delay, s/veh		34.7			29.6			45.8			48.9	
Approach LOS		C			C			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	16.1	67.5	14.3	22.2	9.4	74.2	13.0	23.4
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	13.0	50.5	11.0	25.5	6.0	57.5	10.0	26.5
Max Q Clear Time (g_c+I1), s	9.4	35.0	8.1	8.4	4.6	35.8	6.9	9.5
Green Ext Time (p_c), s	0.1	5.0	0.0	0.5	0.0	8.3	0.0	0.3

Intersection Summary	
HCM 6th Ctrl Delay	33.5
HCM 6th LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	226	1167	50	451	1131	444	163	410	651	434	327	141
Future Volume (veh/h)	226	1167	50	451	1131	444	163	410	651	434	327	141
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	246	1268	38	490	1229	338	177	446	496	472	355	107
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	609	1504	467	531	1390	431	206	784	593	477	1063	474
Arrive On Green	0.18	0.59	0.29	0.15	0.54	0.27	0.06	0.22	0.22	0.14	0.30	0.30
Sat Flow, veh/h	3456	5106	1585	3456	5106	1585	3456	3554	1585	3456	3554	1585
Grp Volume(v), veh/h	246	1268	38	490	1229	338	177	446	496	472	355	107
Grp Sat Flow(s),veh/h/ln	1728	1702	1585	1728	1702	1585	1728	1777	1585	1728	1777	1585
Q Serve(g_s), s	9.2	29.4	2.5	20.3	30.7	20.5	7.4	16.2	32.0	19.8	11.3	4.8
Cycle Q Clear(g_c), s	9.2	29.4	2.5	20.3	30.7	20.5	7.4	16.2	32.0	19.8	11.3	4.8
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	609	1504	467	531	1390	431	206	784	593	477	1063	474
V/C Ratio(X)	0.40	0.84	0.08	0.92	0.88	0.78	0.86	0.57	0.84	0.99	0.33	0.23
Avail Cap(c_a), veh/h	609	1504	467	620	1796	558	310	784	593	477	1063	474
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.76	0.76	0.76	1.00	1.00	1.00	0.95	0.95	0.95	1.00	1.00	1.00
Uniform Delay (d), s/veh	53.0	27.0	37.0	60.5	31.0	25.0	67.6	50.4	41.3	62.4	39.6	16.2
Incr Delay (d2), s/veh	0.3	4.6	0.3	18.0	8.5	13.3	13.8	0.9	9.7	38.6	0.2	0.2
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(95%),veh/ln	6.8	13.2	1.8	15.3	15.6	14.3	6.5	11.6	24.2	16.7	8.6	5.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	53.3	31.6	37.2	78.5	39.6	38.3	81.4	51.3	51.0	101.0	39.8	16.4
LnGrp LOS	D	C	D	E	D	D	F	D	D	F	D	B
Approach Vol, veh/h		1552			2057			1119			934	
Approach Delay, s/veh		35.2			48.6			55.9			68.0	
Approach LOS		D			D			E			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	29.3	49.7	27.0	39.0	32.5	46.5	15.6	50.4
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	28.0	41.0	22.0	34.0	16.0	53.0	15.0	41.0
Max Q Clear Time (g_c+I1), s	23.3	32.4	22.8	35.0	12.2	33.7	10.4	14.3
Green Ext Time (p_c), s	1.0	4.2	0.0	0.0	0.4	7.8	0.3	2.1

Intersection Summary	
HCM 6th Ctrl Delay	49.6
HCM 6th LOS	D

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	1598	1169	0	633	821
Future Volume (veh/h)	0	1598	1169	0	633	821
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	0	1870	1870	0	1870	1870
Adj Flow Rate, veh/h	0	1737	1271	0	688	892
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	0	2	2
Cap, veh/h	0	2754	2754		1258	1016
Arrive On Green	0.00	1.00	1.00	0.00	0.36	0.36
Sat Flow, veh/h	0	5443	5443	0	3456	2790
Grp Volume(v), veh/h	0	1737	1271	0	688	892
Grp Sat Flow(s),veh/h/ln	0	1702	1702	0	1728	1395
Q Serve(g_s), s	0.0	0.0	0.0	0.0	22.9	43.3
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	22.9	43.3
Prop In Lane	0.00			0.00	1.00	1.00
Lane Grp Cap(c), veh/h	0	2754	2754		1258	1016
V/C Ratio(X)	0.00	0.63	0.46		0.55	0.88
Avail Cap(c_a), veh/h	0	2754	2754		1478	1193
HCM Platoon Ratio	1.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	36.6	43.1
Incr Delay (d2), s/veh	0.0	1.1	0.6	0.0	0.4	6.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.0	0.5	0.3	0.0	15.0	22.4
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.0	1.1	0.6	0.0	37.0	50.0
LnGrp LOS	A	A	A		D	D
Approach Vol, veh/h		1737	1271	A	1580	
Approach Delay, s/veh		1.1	0.6		44.3	
Approach LOS		A	A		D	

Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		85.2		59.8		85.2
Change Period (Y+Rc), s		5.0		5.0		5.0
Max Green Setting (Gmax), s		71.0		64.0		71.0
Max Q Clear Time (g_c+I1), s		3.0		46.3		3.0
Green Ext Time (p_c), s		13.0		8.4		7.6

Intersection Summary			
HCM 6th Ctrl Delay			15.8
HCM 6th LOS			B

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1411	0	0	1571	490	890
Future Volume (veh/h)	1411	0	0	1571	490	890
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	0	0	1870	1870	1870
Adj Flow Rate, veh/h	1534	0	0	1708	500	1002
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	0	0	2	2	2
Cap, veh/h	2743	0	0	3456	652	1161
Arrive On Green	1.00	0.00	0.00	1.00	0.37	0.37
Sat Flow, veh/h	5443	0	0	6958	1781	3170
Grp Volume(v), veh/h	1534	0	0	1708	500	1002
Grp Sat Flow(s),veh/h/ln	1702	0	0	1609	1781	1585
Q Serve(g_s), s	0.0	0.0	0.0	0.0	35.9	42.5
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	35.9	42.5
Prop In Lane		0.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	2743	0	0	3456	652	1161
V/C Ratio(X)	0.56	0.00	0.00	0.49	0.77	0.86
Avail Cap(c_a), veh/h	2743	0	0	3456	872	1552
HCM Platoon Ratio	2.00	1.00	1.00	2.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	40.5	42.6
Incr Delay (d2), s/veh	0.8	0.0	0.0	0.5	2.9	4.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.4	0.0	0.0	0.2	22.9	24.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.8	0.0	0.0	0.5	43.4	46.6
LnGrp LOS	A	A	A	A	D	D
Approach Vol, veh/h	1534			1708	1502	
Approach Delay, s/veh	0.8			0.5	45.6	
Approach LOS	A			A	D	

Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		84.9		60.1		84.9
Change Period (Y+Rc), s		5.0		5.0		5.0
Max Green Setting (Gmax), s		62.0		73.0		62.0
Max Q Clear Time (g_c+I1), s		3.0		45.5		3.0
Green Ext Time (p_c), s		10.3		9.6		12.4

Intersection Summary			
HCM 6th Ctrl Delay			14.9
HCM 6th LOS			B

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	417	1425	384	110	1745	69	426	138	185	128	92	385
Future Volume (veh/h)	417	1425	384	110	1745	69	426	138	185	128	92	385
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	453	1549	417	120	1897	75	463	150	201	139	100	418
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	499	1846	698	444	2967	117	531	273	243	209	219	415
Arrive On Green	0.14	0.57	0.29	0.25	0.78	0.39	0.15	0.15	0.15	0.12	0.12	0.12
Sat Flow, veh/h	3456	6434	1585	1781	7577	299	3456	1777	1585	1781	1870	1585
Grp Volume(v), veh/h	453	1549	417	120	1517	455	463	150	201	139	100	418
Grp Sat Flow(s),veh/h/ln	1728	1609	1585	1781	1515	1816	1728	1777	1585	1781	1870	1585
Q Serve(g_s), s	18.7	28.7	29.0	7.9	15.8	18.9	19.0	11.3	17.8	10.8	7.2	17.0
Cycle Q Clear(g_c), s	18.7	28.7	29.0	7.9	15.8	18.9	19.0	11.3	17.8	10.8	7.2	17.0
Prop In Lane	1.00		1.00	1.00		0.16	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	499	1846	698	444	2373	711	531	273	243	209	219	415
V/C Ratio(X)	0.91	0.84	0.60	0.27	0.64	0.64	0.87	0.55	0.83	0.67	0.46	1.01
Avail Cap(c_a), veh/h	643	2440	845	444	2373	711	643	331	295	209	219	415
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.43	0.43	0.43	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	61.1	28.2	30.8	43.8	11.3	15.1	60.0	56.7	59.5	61.3	59.7	53.5
Incr Delay (d2), s/veh	14.1	4.8	3.7	0.1	0.6	1.9	10.9	1.7	14.8	7.8	1.5	46.1
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(95%),veh/ln	14.0	13.2	21.5	5.5	5.2	7.9	14.1	9.0	12.9	9.2	6.4	27.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	75.2	32.9	34.6	44.0	11.8	17.0	70.9	58.5	74.2	69.0	61.2	99.6
LnGrp LOS	E	C	C	D	B	B	E	E	E	E	E	F
Approach Vol, veh/h		2419			2092			814			657	
Approach Delay, s/veh		41.1			14.8			69.4			87.3	
Approach LOS		D			B			E			F	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	43.1	48.6		24.0	27.9	63.8		29.3
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	20.0	57.0		19.0	29.0	48.0		29.0
Max Q Clear Time (g_c+I1), s	20.9	32.0		20.0	21.7	21.9		22.0
Green Ext Time (p_c), s	0.2	11.6		0.0	1.2	11.5		2.3

Intersection Summary			
HCM 6th Ctrl Delay			40.8
HCM 6th LOS			D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	76	1342	262	185	1188	348	807	333	180	488	214	176
Future Volume (veh/h)	76	1342	262	185	1188	348	807	333	180	488	214	176
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	83	1459	285	201	1291	378	877	362	196	530	233	191
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	101	2129	951	224	1825	533	931	460	390	571	268	211
Arrive On Green	0.03	0.66	0.33	0.06	0.73	0.37	0.27	0.25	0.25	0.17	0.14	0.14
Sat Flow, veh/h	3456	6434	1585	3456	4980	1454	3456	1870	1585	3456	1894	1486
Grp Volume(v), veh/h	83	1459	285	201	1251	418	877	362	196	530	218	206
Grp Sat Flow(s),veh/h/ln	1728	1609	1585	1728	1609	1609	1728	1870	1585	1728	1777	1603
Q Serve(g_s), s	3.5	20.4	4.0	8.4	20.8	31.5	36.0	26.2	15.4	21.9	17.4	18.4
Cycle Q Clear(g_c), s	3.5	20.4	4.0	8.4	20.8	31.5	36.0	26.2	15.4	21.9	17.4	18.4
Prop In Lane	1.00		1.00	1.00		0.90	1.00		1.00	1.00		0.93
Lane Grp Cap(c), veh/h	101	2129	951	224	1769	590	931	460	390	571	252	227
V/C Ratio(X)	0.82	0.69	0.30	0.90	0.71	0.71	0.94	0.79	0.50	0.93	0.87	0.91
Avail Cap(c_a), veh/h	119	2129	951	238	1769	590	1001	555	470	643	343	310
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.63	0.63	0.63	0.95	0.95	0.95	0.09	0.09	0.09	1.00	1.00	1.00
Uniform Delay (d), s/veh	70.0	19.9	5.1	67.3	15.0	36.9	51.9	51.1	47.0	59.7	60.9	61.3
Incr Delay (d2), s/veh	21.2	1.2	0.5	30.0	2.3	6.7	2.1	0.6	0.1	18.7	15.7	23.5
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(95%),veh/ln	3.3	8.0	3.6	8.0	8.2	18.8	17.7	14.0	7.4	16.6	13.9	13.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	91.2	21.0	5.6	97.3	17.3	43.6	54.0	51.7	47.1	78.4	76.6	84.8
LnGrp LOS	F	C	A	F	B	D	D	D	D	E	E	F
Approach Vol, veh/h		1827			1870			1435			954	
Approach Delay, s/veh		21.8			31.8			52.5			79.4	
Approach LOS		C			C			D			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	16.4	55.0	31.0	42.7	11.2	60.2	46.1	27.5
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	12.0	39.0	29.0	45.0	7.0	44.0	44.0	30.0
Max Q Clear Time (g_c+I1), s	11.4	23.4	24.9	29.2	6.5	34.5	39.0	21.4
Green Ext Time (p_c), s	0.1	8.0	1.0	2.1	0.0	5.5	2.0	1.2

Intersection Summary	
HCM 6th Ctrl Delay	41.1
HCM 6th LOS	D

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1634	344	245	1234	566	685
Future Volume (veh/h)	1634	344	245	1234	566	685
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	1776	374	266	1341	615	745
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	2683	833	305	3381	834	920
Arrive On Green	1.00	0.53	0.09	1.00	0.24	0.24
Sat Flow, veh/h	5274	1585	3456	5274	3456	2790
Grp Volume(v), veh/h	1776	374	266	1341	615	745
Grp Sat Flow(s),veh/h/ln	1702	1585	1728	1702	1728	1395
Q Serve(g_s), s	0.0	21.2	11.0	0.0	23.8	35.0
Cycle Q Clear(g_c), s	0.0	21.2	11.0	0.0	23.8	35.0
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	2683	833	305	3381	834	920
V/C Ratio(X)	0.66	0.45	0.87	0.40	0.74	0.81
Avail Cap(c_a), veh/h	2683	833	524	3381	834	920
HCM Platoon Ratio	2.00	1.00	1.00	2.00	1.00	1.00
Upstream Filter(I)	0.99	0.99	0.43	0.43	1.00	1.00
Uniform Delay (d), s/veh	0.0	21.4	65.3	0.0	50.8	44.4
Incr Delay (d2), s/veh	1.3	1.7	3.7	0.2	3.5	5.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.6	12.8	7.4	0.1	16.1	18.9
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	1.3	23.1	69.0	0.2	54.2	50.0
LnGrp LOS	A	C	E	A	D	D
Approach Vol, veh/h	2150			1607	1360	
Approach Delay, s/veh	5.1			11.5	51.9	
Approach LOS	A			B	D	

Timer - Assigned Phs	1	2	6	8
Phs Duration (G+Y+Rc), s	19.8	83.2	103.0	42.0
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	24.0	69.0	98.0	37.0
Max Q Clear Time (g_c+I1), s	14.0	24.2	3.0	38.0
Green Ext Time (p_c), s	0.8	16.7	8.3	0.0

Intersection Summary	
HCM 6th Ctrl Delay	19.6
HCM 6th LOS	B

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1085	332	848	661	263	910
Future Volume (veh/h)	1085	332	848	661	263	910
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	1179	252	922	718	286	772
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	1175	524	904	2296	851	1416
Arrive On Green	0.33	0.33	0.26	0.65	0.25	0.25
Sat Flow, veh/h	3647	1585	3456	3647	3456	2790
Grp Volume(v), veh/h	1179	252	922	718	286	772
Grp Sat Flow(s),veh/h/ln	1777	1585	1728	1777	1728	1395
Q Serve(g_s), s	43.0	16.4	34.0	11.6	8.8	24.5
Cycle Q Clear(g_c), s	43.0	16.4	34.0	11.6	8.8	24.5
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	1175	524	904	2296	851	1416
V/C Ratio(X)	1.00	0.48	1.02	0.31	0.34	0.55
Avail Cap(c_a), veh/h	1175	524	904	2296	851	1416
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.82	0.82	0.99	0.99
Uniform Delay (d), s/veh	43.5	34.6	48.0	10.2	40.3	21.8
Incr Delay (d2), s/veh	27.0	3.1	32.3	0.3	0.2	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	30.3	10.8	24.8	7.3	6.6	12.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	70.5	37.8	80.3	10.5	40.5	22.2
LnGrp LOS	F	D	F	B	D	C
Approach Vol, veh/h	1431			1640	1058	
Approach Delay, s/veh	64.7			49.7	27.2	
Approach LOS	E			D	C	

Timer - Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	41.0	51.8				92.8		37.2
Change Period (Y+Rc), s	5.0	5.0				5.0		5.0
Max Green Setting (Gmax), s	36.0	45.0				86.0		34.0
Max Q Clear Time (g_c+I1), s	37.0	46.0				14.6		27.5
Green Ext Time (p_c), s	0.0	0.0				3.4		2.9

Intersection Summary	
HCM 6th Ctrl Delay	49.1
HCM 6th LOS	D

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰	↑↱		↰	↑↱			⇃	↱		⇃	↱
Traffic Volume (veh/h)	35	314	7	233	271	95	12	109	387	71	285	104
Future Volume (veh/h)	35	314	7	233	271	95	12	109	387	71	285	104
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1796	1870	1870	1796	1870	1870	1870	1870	1870	1796
Adj Flow Rate, veh/h	38	341	8	253	295	103	13	118	0	77	310	113
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	107	497	12	321	676	231	28	251		92	371	380
Arrive On Green	0.06	0.14	0.14	0.18	0.26	0.26	0.15	0.15	0.00	0.25	0.25	0.25
Sat Flow, veh/h	1781	3549	83	1781	2598	889	185	1676	1585	368	1483	1522
Grp Volume(v), veh/h	38	170	179	253	200	198	131	0	0	387	0	113
Grp Sat Flow(s),veh/h/ln	1781	1777	1855	1781	1777	1710	1861	0	1585	1852	0	1522
Q Serve(g_s), s	2.0	9.1	9.2	13.6	9.4	9.7	6.4	0.0	0.0	19.8	0.0	6.0
Cycle Q Clear(g_c), s	2.0	9.1	9.2	13.6	9.4	9.7	6.4	0.0	0.0	19.8	0.0	6.0
Prop In Lane	1.00		0.04	1.00		0.52	0.10		1.00	0.20		1.00
Lane Grp Cap(c), veh/h	107	249	260	321	462	445	279	0		463	0	380
V/C Ratio(X)	0.36	0.69	0.69	0.79	0.43	0.45	0.47	0.00		0.84	0.00	0.30
Avail Cap(c_a), veh/h	107	249	260	321	462	445	279	0		463	0	380
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	45.1	40.9	40.9	39.2	30.8	31.0	38.9	0.0	0.0	35.6	0.0	30.4
Incr Delay (d2), s/veh	2.0	7.6	7.4	12.4	0.6	0.7	1.2	0.0	0.0	12.6	0.0	0.4
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(95%),veh/ln	1.7	8.0	8.2	11.1	7.1	7.1	5.4	0.0	0.0	15.8	0.0	4.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	47.1	48.5	48.3	51.6	31.5	31.7	40.1	0.0	0.0	48.1	0.0	30.8
LnGrp LOS	D	D	D	D	C	C	D	A		D	A	C
Approach Vol, veh/h		387			651			131	A		500	
Approach Delay, s/veh		48.3			39.4			40.1			44.2	
Approach LOS		D			D			D			D	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	10.6	32.2		18.2	23.4	19.4		30.5
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	8.0	28.0		17.0	20.0	16.0		27.0
Max Q Clear Time (g_c+I1), s	5.0	12.7		9.4	16.6	12.2		22.8
Green Ext Time (p_c), s	0.0	1.9		0.3	0.2	0.7		1.1

Intersection Summary	
HCM 6th Ctrl Delay	42.9
HCM 6th LOS	D

Notes

Unsignalized Delay for [NER] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	80	196	106	583	587	842	100	486	185	197	479	50
Future Volume (veh/h)	80	196	106	583	587	842	100	486	185	197	479	50
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	87	213	61	634	638	589	109	528	136	214	521	52
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	93	327	146	677	785	666	120	624	278	253	593	59
Arrive On Green	0.05	0.09	0.09	0.38	0.42	0.42	0.07	0.18	0.18	0.07	0.18	0.18
Sat Flow, veh/h	1781	3554	1585	1781	1870	1585	1781	3554	1585	3456	3264	325
Grp Volume(v), veh/h	87	213	61	634	638	589	109	528	136	214	283	290
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1870	1585	1781	1777	1585	1728	1777	1812
Q Serve(g_s), s	4.9	5.8	3.6	34.4	30.1	34.4	6.1	14.4	7.8	6.1	15.5	15.6
Cycle Q Clear(g_c), s	4.9	5.8	3.6	34.4	30.1	34.4	6.1	14.4	7.8	6.1	15.5	15.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.18
Lane Grp Cap(c), veh/h	93	327	146	677	785	666	120	624	278	253	323	329
V/C Ratio(X)	0.94	0.65	0.42	0.94	0.81	0.88	0.91	0.85	0.49	0.85	0.88	0.88
Avail Cap(c_a), veh/h	142	992	442	959	1380	1169	178	886	395	345	443	452
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	47.4	44.0	43.0	29.9	25.6	26.9	46.5	40.0	37.3	45.9	39.9	40.0
Incr Delay (d2), s/veh	44.5	2.2	1.9	12.8	2.1	4.3	33.3	5.4	1.3	13.3	13.7	14.1
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(95%),veh/ln	5.9	4.7	2.7	22.7	18.8	18.9	6.8	10.8	5.5	5.5	12.5	12.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	91.8	46.1	44.9	42.7	27.7	31.1	79.7	45.4	38.6	59.2	53.7	54.1
LnGrp LOS	F	D	D	D	C	C	E	D	D	E	D	D
Approach Vol, veh/h		361			1861			773			787	
Approach Delay, s/veh		56.9			33.9			49.1			55.3	
Approach LOS		E			C			D			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	45.1	16.2	14.3	24.6	12.2	49.1	13.7	25.2
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	56.0	30.0	12.0	27.0	10.0	76.0	12.0	27.0
Max Q Clear Time (g_c+I1), s	37.4	8.8	9.1	17.4	7.9	37.4	9.1	18.6
Green Ext Time (p_c), s	2.7	1.1	0.2	2.2	0.0	6.7	0.1	1.5

Intersection Summary	
HCM 6th Ctrl Delay	43.7
HCM 6th LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	22	611	96	74	1295	37	596	5	102	34	8	83
Future Volume (veh/h)	22	611	96	74	1295	37	596	5	102	34	8	83
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	24	664	104	80	1408	40	648	5	111	37	9	90
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	14	1396	622	89	1545	689	642	26	579	444	103	660
Arrive On Green	0.01	0.39	0.39	0.05	0.43	0.43	0.42	0.42	0.42	0.42	0.42	0.42
Sat Flow, veh/h	1781	3554	1585	1781	3554	1585	1425	63	1389	961	249	1585
Grp Volume(v), veh/h	24	664	104	80	1408	40	648	0	116	46	0	90
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1777	1585	1425	0	1452	1210	0	1585
Q Serve(g_s), s	1.1	20.8	6.3	6.7	55.2	2.2	51.8	0.0	7.5	2.6	0.0	5.2
Cycle Q Clear(g_c), s	1.1	20.8	6.3	6.7	55.2	2.2	62.0	0.0	7.5	10.2	0.0	5.2
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.96	0.80		1.00
Lane Grp Cap(c), veh/h	14	1396	622	89	1545	689	642	0	605	547	0	660
V/C Ratio(X)	1.75	0.48	0.17	0.90	0.91	0.06	1.01	0.00	0.19	0.08	0.00	0.14
Avail Cap(c_a), veh/h	36	1647	735	203	1981	884	642	0	605	547	0	660
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	73.9	33.8	29.4	70.4	39.4	24.4	45.5	0.0	27.6	29.6	0.0	26.9
Incr Delay (d2), s/veh	447.9	0.3	0.1	25.4	5.7	0.0	38.0	0.0	0.2	0.1	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	4.0	13.9	4.4	6.5	32.7	1.5	41.0	0.0	4.9	2.0	0.0	3.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	521.7	34.0	29.5	95.8	45.1	24.4	83.5	0.0	27.7	29.7	0.0	27.0
LnGrp LOS	F	C	C	F	D	C	F	A	C	C	A	C
Approach Vol, veh/h		792			1528			764			136	
Approach Delay, s/veh		48.2			47.2			75.0			27.9	
Approach LOS		D			D			E			C	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	14.4	65.5		69.0	8.1	71.7		69.0				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	19.0	71.0		64.0	5.0	85.0		26.0				
Max Q Clear Time (g_c+I1), s	9.7	23.8		65.0	4.1	58.2		13.2				
Green Ext Time (p_c), s	0.1	3.7		0.0	0.0	8.5		0.4				
Intersection Summary												
HCM 6th Ctrl Delay			53.2									
HCM 6th LOS			D									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	163	396	42	76	595	351	294	806	219	289	402	277
Future Volume (veh/h)	163	396	42	76	595	351	294	806	219	289	402	277
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	177	430	43	83	647	377	320	876	129	314	437	296
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	178	909	91	165	587	342	344	914	408	305	479	322
Arrive On Green	0.10	0.28	0.28	0.09	0.27	0.27	0.19	0.26	0.26	0.17	0.24	0.24
Sat Flow, veh/h	1781	3264	325	1781	2161	1259	1781	3554	1585	1781	2033	1368
Grp Volume(v), veh/h	177	233	240	83	532	492	320	876	129	314	381	352
Grp Sat Flow(s),veh/h/ln	1781	1777	1812	1781	1777	1644	1781	1777	1585	1781	1777	1624
Q Serve(g_s), s	13.9	15.3	15.4	6.2	38.0	38.0	24.7	34.0	9.2	24.0	29.3	29.6
Cycle Q Clear(g_c), s	13.9	15.3	15.4	6.2	38.0	38.0	24.7	34.0	9.2	24.0	29.3	29.6
Prop In Lane	1.00		0.18	1.00		0.77	1.00		1.00	1.00		0.84
Lane Grp Cap(c), veh/h	178	495	505	165	482	446	344	914	408	305	419	383
V/C Ratio(X)	0.99	0.47	0.48	0.50	1.10	1.10	0.93	0.96	0.32	1.03	0.91	0.92
Avail Cap(c_a), veh/h	178	495	505	165	482	446	344	914	408	305	419	383
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	63.0	41.9	42.0	60.4	51.0	51.0	55.6	51.3	42.1	58.0	52.1	52.2
Incr Delay (d2), s/veh	65.5	0.7	0.7	2.4	72.0	73.6	31.5	20.4	0.4	59.0	23.7	26.7
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(95%),veh/ln	14.5	11.0	11.2	5.2	36.7	34.5	20.1	24.3	6.5	22.4	22.0	21.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	128.4	42.6	42.7	62.8	123.0	124.6	87.1	71.6	42.5	117.0	75.8	78.9
LnGrp LOS	F	D	D	E	F	F	F	E	D	F	E	E
Approach Vol, veh/h		650			1107			1325			1047	
Approach Delay, s/veh		66.0			119.2			72.5			89.2	
Approach LOS		E			F			E			F	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	17.0	49.0	31.0	42.8	21.0	45.0	33.5	40.3
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	15.0	41.0	26.0	38.0	16.0	40.0	29.0	35.0
Max Q Clear Time (g_c+I1), s	9.2	18.4	27.0	37.0	16.9	41.0	27.7	32.6
Green Ext Time (p_c), s	0.1	1.7	0.0	0.5	0.0	0.0	0.2	0.8

Intersection Summary		
HCM 6th Ctrl Delay		88.2
HCM 6th LOS		F

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	484	58	400	42	55	111	295	652	40	101	614	172
Future Volume (veh/h)	484	58	400	42	55	111	295	652	40	101	614	172
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	526	63	0	46	60	78	321	709	41	110	667	105
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	614	526		119	319	270	383	1113	64	211	816	646
Arrive On Green	0.18	0.28	0.00	0.07	0.17	0.17	0.21	0.33	0.33	0.12	0.23	0.23
Sat Flow, veh/h	3456	1870	1585	1781	1870	1585	1781	3414	197	1781	3554	1585
Grp Volume(v), veh/h	526	63	0	46	60	78	321	369	381	110	667	105
Grp Sat Flow(s),veh/h/ln	1728	1870	1585	1781	1870	1585	1781	1777	1835	1781	1777	1585
Q Serve(g_s), s	19.9	3.4	0.0	3.3	3.7	5.8	23.3	23.8	23.9	7.8	24.0	5.7
Cycle Q Clear(g_c), s	19.9	3.4	0.0	3.3	3.7	5.8	23.3	23.8	23.9	7.8	24.0	5.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.11	1.00		1.00
Lane Grp Cap(c), veh/h	614	526		119	319	270	383	579	598	211	816	646
V/C Ratio(X)	0.86	0.12		0.39	0.19	0.29	0.84	0.64	0.64	0.52	0.82	0.16
Avail Cap(c_a), veh/h	614	526		119	319	270	383	579	598	211	816	646
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	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	53.8	36.1	0.0	60.4	48.0	48.9	50.8	38.7	38.7	55.9	49.3	25.4
Incr Delay (d2), s/veh	11.5	0.1	0.0	2.1	0.3	0.6	15.1	2.3	2.3	2.3	6.5	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	14.6	2.8	0.0	2.9	3.2	4.3	17.5	15.9	16.3	6.5	16.7	4.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	65.3	36.2	0.0	62.4	48.3	49.4	65.9	41.0	41.0	58.2	55.8	25.5
LnGrp LOS	E	D		E	D	D	E	D	D	E	E	C
Approach Vol, veh/h		589	A		184			1071			882	
Approach Delay, s/veh		62.2			52.3			48.5			52.5	
Approach LOS		E			D			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	19.4	50.5	13.1	38.8	33.9	36.0	29.9	22.1
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	18.0	46.0	11.0	40.0	31.0	33.0	26.0	25.0
Max Q Clear Time (g_c+I1), s	10.8	26.9	6.3	6.4	26.3	27.0	22.9	8.8
Green Ext Time (p_c), s	0.2	2.9	0.0	0.2	0.5	1.9	0.8	0.4

Intersection Summary	
HCM 6th Ctrl Delay	53.0
HCM 6th LOS	D

Notes
Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Intersection						
Int Delay, s/veh	5.3					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	107	134	239	12	14	175
Future Vol, veh/h	107	134	239	12	14	175
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	116	146	260	13	15	190

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	487	267	0	0	273	0
Stage 1	267	-	-	-	-	-
Stage 2	220	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	540	772	-	-	1290	-
Stage 1	778	-	-	-	-	-
Stage 2	817	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	533	772	-	-	1290	-
Mov Cap-2 Maneuver	533	-	-	-	-	-
Stage 1	778	-	-	-	-	-
Stage 2	806	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.4	0	0.6
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	644	1290	-
HCM Lane V/C Ratio	-	-	0.407	0.012	-
HCM Control Delay (s)	-	-	14.4	7.8	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	2	0	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	93	56	280	207	25	169	26	828	45	20	710	17
Future Volume (veh/h)	93	56	280	207	25	169	26	828	45	20	710	17
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	101	61	250	225	27	151	28	900	47	22	772	17
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	371	206	476	477	46	476	102	1227	64	76	1219	27
Arrive On Green	0.30	0.30	0.30	0.30	0.30	0.30	0.06	0.36	0.36	0.04	0.34	0.34
Sat Flow, veh/h	958	686	1585	1266	152	1585	1781	3436	179	1781	3555	78
Grp Volume(v), veh/h	162	0	250	252	0	151	28	465	482	22	386	403
Grp Sat Flow(s),veh/h/ln	1644	0	1585	1418	0	1585	1781	1777	1838	1781	1777	1856
Q Serve(g_s), s	0.0	0.0	9.2	4.5	0.0	5.2	1.1	16.0	16.0	0.8	12.8	12.8
Cycle Q Clear(g_c), s	4.9	0.0	9.2	10.3	0.0	5.2	1.1	16.0	16.0	0.8	12.8	12.8
Prop In Lane	0.62		1.00	0.89		1.00	1.00		0.10	1.00		0.04
Lane Grp Cap(c), veh/h	577	0	476	523	0	476	102	635	656	76	609	636
V/C Ratio(X)	0.28	0.00	0.53	0.48	0.00	0.32	0.28	0.73	0.73	0.29	0.63	0.63
Avail Cap(c_a), veh/h	577	0	476	523	0	476	102	635	656	76	609	636
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	18.8	0.0	20.4	20.7	0.0	19.0	31.6	19.6	19.6	32.5	19.3	19.3
Incr Delay (d2), s/veh	0.3	0.0	1.1	0.7	0.0	0.4	1.4	4.4	4.2	2.0	2.1	2.1
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(95%),veh/ln	3.5	0.0	6.0	6.0	0.0	3.3	0.8	10.7	11.0	0.7	8.7	9.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	19.1	0.0	21.4	21.3	0.0	19.3	33.1	24.0	23.8	34.5	21.4	21.4
LnGrp LOS	B	A	C	C	A	B	C	C	C	C	C	C
Approach Vol, veh/h		412			403			975			811	
Approach Delay, s/veh		20.5			20.6			24.2			21.8	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.4	29.3		23.8	9.0	28.6		23.8				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	5.0	27.0		23.0	6.0	26.0		23.0				
Max Q Clear Time (g_c+I1), s	3.8	19.0		12.2	4.1	15.8		13.3				
Green Ext Time (p_c), s	0.0	2.6		1.3	0.0	2.4		1.2				

Intersection Summary		
HCM 6th Ctrl Delay		22.3
HCM 6th LOS		C

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	6	144	231	83	111	7	69	24	161	26	180	23
Future Volume (veh/h)	6	144	231	83	111	7	69	24	161	26	180	23
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	7	157	125	90	121	4	75	26	87	28	196	12
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	143	430	365	196	468	15	374	373	333	71	522	33
Arrive On Green	0.08	0.23	0.23	0.11	0.26	0.26	0.21	0.21	0.21	0.17	0.17	0.17
Sat Flow, veh/h	1781	1870	1585	1781	1800	60	1781	1777	1585	418	3070	196
Grp Volume(v), veh/h	7	157	125	90	0	125	75	26	87	124	0	112
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	0	1860	1781	1777	1585	1849	0	1835
Q Serve(g_s), s	0.4	7.1	6.6	4.7	0.0	5.3	3.5	1.2	4.6	6.0	0.0	5.4
Cycle Q Clear(g_c), s	0.4	7.1	6.6	4.7	0.0	5.3	3.5	1.2	4.6	6.0	0.0	5.4
Prop In Lane	1.00		1.00	1.00		0.03	1.00		1.00	0.23		0.11
Lane Grp Cap(c), veh/h	143	430	365	196	0	484	374	373	333	314	0	312
V/C Ratio(X)	0.05	0.36	0.34	0.46	0.00	0.26	0.20	0.07	0.26	0.39	0.00	0.36
Avail Cap(c_a), veh/h	143	430	365	196	0	484	374	373	333	314	0	312
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	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	42.5	32.4	32.2	41.7	0.0	29.4	32.6	31.7	33.0	36.9	0.0	36.7
Incr Delay (d2), s/veh	0.1	0.5	0.6	1.7	0.0	0.3	0.3	0.1	0.4	0.8	0.0	0.7
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(95%),veh/ln	0.3	5.8	4.6	3.9	0.0	4.3	2.8	0.9	3.2	5.0	0.0	4.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	42.6	32.9	32.7	43.4	0.0	29.6	32.8	31.7	33.4	37.7	0.0	37.4
LnGrp LOS	D	C	C	D	A	C	C	C	C	D	A	D
Approach Vol, veh/h		289			215			188			236	
Approach Delay, s/veh		33.1			35.4			33.0			37.6	
Approach LOS		C			D			C			D	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		20.6	15.1	23.4		19.3	10.4	28.0				
Change Period (Y+Rc), s		5.0	5.0	5.0		5.0	5.0	5.0				
Max Green Setting (Gmax), s		23.0	13.0	25.0		19.0	10.0	28.0				
Max Q Clear Time (g_c+I1), s		7.6	7.7	10.1		9.0	3.4	8.3				
Green Ext Time (p_c), s		0.6	0.1	1.7		0.6	0.0	1.0				

Intersection Summary			
HCM 6th Ctrl Delay			34.7
HCM 6th LOS			C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	183	0	216	280	10	9	246	448	1	1	1115	226
Future Volume (veh/h)	183	0	216	280	10	9	246	448	1	1	1115	226
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	199	0	202	304	11	10	267	487	1	1	1212	246
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	346	421	357	361	203	185	282	2092	4	45	1302	262
Arrive On Green	0.22	0.00	0.22	0.22	0.22	0.22	0.16	0.57	0.57	0.03	0.44	0.44
Sat Flow, veh/h	1391	1870	1585	1418	902	820	1781	3638	7	1781	2947	593
Grp Volume(v), veh/h	199	0	202	304	0	21	267	238	250	1	727	731
Grp Sat Flow(s),veh/h/ln	1391	1870	1585	1418	0	1723	1781	1777	1869	1781	1777	1764
Q Serve(g_s), s	15.9	0.0	13.6	25.5	0.0	1.1	17.8	7.9	7.9	0.1	46.3	47.5
Cycle Q Clear(g_c), s	18.3	0.0	13.6	27.0	0.0	1.1	17.8	7.9	7.9	0.1	46.3	47.5
Prop In Lane	1.00		1.00	1.00		0.48	1.00		0.00	1.00		0.34
Lane Grp Cap(c), veh/h	346	421	357	361	0	388	282	1022	1075	45	785	779
V/C Ratio(X)	0.58	0.00	0.57	0.84	0.00	0.05	0.95	0.23	0.23	0.02	0.93	0.94
Avail Cap(c_a), veh/h	346	421	357	361	0	388	282	1022	1075	45	785	779
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	44.2	0.0	41.3	47.4	0.0	36.5	50.0	12.5	12.5	57.1	31.6	32.0
Incr Delay (d2), s/veh	2.3	0.0	2.1	16.2	0.0	0.1	39.3	0.1	0.1	0.2	16.8	19.0
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(95%),veh/ln	9.6	0.0	9.4	16.0	0.0	0.9	16.2	5.4	5.7	0.1	30.2	31.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	46.5	0.0	43.4	63.6	0.0	36.5	89.3	12.6	12.6	57.3	48.5	51.0
LnGrp LOS	D	A	D	E	A	D	F	B	B	E	D	D
Approach Vol, veh/h		401			325			755			1459	
Approach Delay, s/veh		45.0			61.8			39.8			49.7	
Approach LOS		D			E			D			D	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	7.6	78.0		34.0	25.9	59.7		34.0
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	5.0	71.0		29.0	21.0	55.0		29.0
Max Q Clear Time (g_c+I1), s	3.1	10.9		21.3	20.8	50.5		30.0
Green Ext Time (p_c), s	0.0	5.8		1.1	0.0	4.0		0.0

Intersection Summary			
HCM 6th Ctrl Delay			47.9
HCM 6th LOS			D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	53	8	329	59	0	18	368	124	121	31	448	60
Future Volume (veh/h)	53	8	329	59	0	18	368	124	121	31	448	60
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	58	9	222	64	0	10	400	135	130	34	487	63
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	322	50	329	717	0	329	563	1109	517	92	680	88
Arrive On Green	0.21	0.21	0.21	0.21	0.00	0.21	0.16	0.33	0.33	0.05	0.21	0.21
Sat Flow, veh/h	1552	241	1585	3456	0	1585	3456	3404	1585	1781	3166	408
Grp Volume(v), veh/h	67	0	222	64	0	10	400	135	130	34	272	278
Grp Sat Flow(s),veh/h/ln	1793	0	1585	1728	0	1585	1728	1702	1585	1781	1777	1797
Q Serve(g_s), s	4.2	0.0	17.4	2.0	0.0	0.7	14.8	3.8	8.1	2.5	19.2	19.4
Cycle Q Clear(g_c), s	4.2	0.0	17.4	2.0	0.0	0.7	14.8	3.8	8.1	2.5	19.2	19.4
Prop In Lane	0.87		1.00	1.00		1.00	1.00		1.00	1.00		0.23
Lane Grp Cap(c), veh/h	372	0	329	717	0	329	563	1109	517	92	382	386
V/C Ratio(X)	0.18	0.00	0.68	0.09	0.00	0.03	0.71	0.12	0.25	0.37	0.71	0.72
Avail Cap(c_a), veh/h	372	0	329	717	0	329	563	1109	517	92	382	386
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	44.1	0.0	49.3	43.2	0.0	42.7	53.5	31.9	33.4	61.9	49.2	49.2
Incr Delay (d2), s/veh	0.2	0.0	5.4	0.1	0.0	0.0	4.1	0.0	0.3	2.4	6.2	6.4
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(95%),veh/ln	3.4	0.0	12.0	1.6	0.0	0.5	11.1	2.9	5.8	2.2	14.3	14.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	44.3	0.0	54.7	43.3	0.0	42.7	57.6	32.0	33.7	64.3	55.3	55.6
LnGrp LOS	D	A	D	D	A	D	E	C	C	E	E	E
Approach Vol, veh/h		289			74			665			584	
Approach Delay, s/veh		52.3			43.2			47.7			56.0	
Approach LOS		D			D			D			E	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	11.5	47.4		30.6	26.4	32.5		22.5				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	9.0	46.0		30.0	24.0	31.0		30.0				
Max Q Clear Time (g_c+I1), s	15.5	11.1		20.4	17.8	22.4		5.0				
Green Ext Time (p_c), s	0.0	1.2		0.9	1.0	1.6		0.3				

Intersection Summary		
HCM 6th Ctrl Delay		51.3
HCM 6th LOS		D

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	18	555	272	786	518	212	174	479	366	528	792	29
Future Volume (veh/h)	18	555	272	786	518	212	174	479	366	528	792	29
Initial Q (Qb), veh	0	0	0	14	5	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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	20	603	133	854	563	0	189	521	235	574	861	30
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	71	759	306	945	1676		207	569	254	645	1004	35
Arrive On Green	0.04	0.39	0.19	0.27	0.85	0.00	0.06	0.16	0.16	0.19	0.29	0.29
Sat Flow, veh/h	1781	3928	1585	3456	3928	1585	3456	3554	1585	3456	3503	122
Grp Volume(v), veh/h	20	603	133	854	563	0	189	521	235	574	437	454
Grp Sat Flow(s),veh/h/ln	1781	1964	1585	1728	1964	1585	1728	1777	1585	1728	1777	1848
Q Serve(g_s), s	1.6	20.4	11.1	35.8	4.4	0.0	8.2	21.6	21.9	24.3	34.9	34.9
Cycle Q Clear(g_c), s	1.6	20.4	11.1	35.8	4.4	0.0	8.2	21.6	21.9	24.3	34.9	34.9
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.07
Lane Grp Cap(c), veh/h	71	759	306	945	1676		207	569	254	645	509	530
V/C Ratio(X)	0.28	0.79	0.43	0.90	0.34		0.91	0.92	0.93	0.89	0.86	0.86
Avail Cap(c_a), veh/h	71	759	306	945	1676		207	569	254	645	509	530
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.99	0.99	0.99	0.71	0.71	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	69.9	43.4	53.3	53.8	6.7	0.0	70.1	62.0	62.1	59.5	50.6	50.6
Incr Delay (d2), s/veh	2.1	8.3	4.4	9.0	0.4	0.0	38.9	19.8	37.3	14.4	13.6	13.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	16.5	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	1.4	14.0	8.3	25.8	3.1	0.0	8.2	16.6	16.8	17.3	23.8	24.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	72.0	51.7	57.7	79.2	7.2	0.0	109.0	81.8	99.4	73.9	64.2	63.8
LnGrp LOS	E	D	E	E	A		F	F	F	E	E	E
Approach Vol, veh/h		756			1417	A		945			1465	
Approach Delay, s/veh		53.3			50.6			91.6			67.9	
Approach LOS		D			D			F			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	46.7	38.5	34.0	30.8	10.4	74.8	16.0	48.8
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	43.0	31.0	30.0	26.0	8.0	66.0	11.0	45.0
Max Q Clear Time (g_c+I1), s	38.8	23.4	27.3	24.9	4.6	7.4	11.2	37.9
Green Ext Time (p_c), s	1.7	2.1	0.8	0.6	0.0	2.7	0.0	4.2

Intersection Summary		
HCM 6th Ctrl Delay		65.0
HCM 6th LOS		E

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1387	7	0	1146	0	0	0	75	804	151	411
Future Volume (veh/h)	0	1387	7	0	1146	0	0	0	75	804	151	411
Initial Q (Qb), veh	0	20	0	0	15	0	0	0	0	7	7	7
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	0	2067	1870	0	2067	0	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	0	1508	8	0	1246	0	0	0	82	991	0	447
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	0	2	0	2	2	2	2	2	2
Cap, veh/h	0	3419	17	0	1454		0	0	89	1187	0	1050
Arrive On Green	0.00	0.95	0.48	0.00	0.95	0.00	0.00	0.00	0.06	0.33	0.00	0.33
Sat Flow, veh/h	0	7644	39	0	4134	0	0	0	1585	3563	0	3170
Grp Volume(v), veh/h	0	1094	422	0	1246	0	0	0	82	991	0	447
Grp Sat Flow(s),veh/h/ln	0	1778	2060	0	1964	0	0	0	1585	1781	0	1585
Q Serve(g_s), s	0.0	2.4	2.9	0.0	6.1	0.0	0.0	0.0	7.7	38.9	0.0	16.6
Cycle Q Clear(g_c), s	0.0	2.4	2.9	0.0	6.1	0.0	0.0	0.0	7.7	38.9	0.0	16.6
Prop In Lane	0.00		0.02	0.00		0.00	0.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	0	2479	961	0	1454		0	0	89	1187	0	1050
V/C Ratio(X)	0.00	0.44	0.44	0.00	0.86		0.00	0.00	0.92	0.84	0.00	0.43
Avail Cap(c_a), veh/h	0	2542	982	0	1872		0	0	116	1663	0	1479
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	0.37	0.37	0.00	1.00	0.00	0.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	3.8	3.9	0.0	19.1	0.0	0.0	0.0	70.5	46.7	0.0	39.5
Incr Delay (d2), s/veh	0.0	0.2	0.5	0.0	6.7	0.0	0.0	0.0	52.0	2.7	0.0	0.3
Initial Q Delay(d3),s/veh	0.0	0.5	0.3	0.0	5.4	0.0	0.0	0.0	0.0	1.5	0.0	0.6
%ile BackOfQ(95%),veh/ln	0.0	3.1	3.5	0.0	19.2	0.0	0.0	0.0	7.9	25.5	0.0	11.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	4.5	4.8	0.0	31.2	0.0	0.0	0.0	122.4	51.0	0.0	40.4
LnGrp LOS	A	A	A	A	C		A	A	F	D	A	D
Approach Vol, veh/h		1516			1246	A		82			1438	
Approach Delay, s/veh		4.6			31.2			122.4			47.7	
Approach LOS		A			C			F			D	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		78.5		56.1		78.5		15.4				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		50.0		72.0		50.0		13.0				
Max Q Clear Time (g_c+I1), s		5.9		41.9		9.1		10.7				
Green Ext Time (p_c), s		19.2		9.2		15.9		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			29.0									
HCM 6th LOS			C									

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↱		↑↑	↱	↰		↱↱↱			
Traffic Volume (veh/h)	0	1284	227	0	815	655	433	0	1025	0	0	0
Future Volume (veh/h)	0	1284	227	0	815	655	433	0	1025	0	0	0
Initial Q (Qb), veh	0	25	0	0	40	0	8	0	36			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	0	2067	1870	0	2067	1870	1870	0	1870			
Adj Flow Rate, veh/h	0	1396	0	0	886	0	471	0	779			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	0	2	2	0	2	2	2	0	2			
Cap, veh/h	0	3436		0	2297		519	0	1105			
Arrive On Green	0.00	1.00	0.00	0.00	1.00	0.00	0.27	0.00	0.27			
Sat Flow, veh/h	0	5830	1585	0	4031	1585	1781	0	3614			
Grp Volume(v), veh/h	0	1396	0	0	886	0	471	0	779			
Grp Sat Flow(s),veh/h/ln	0	1881	1585	0	1964	1585	1781	0	1205			
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	0.0	39.1	0.0	29.9			
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	0.0	0.0	39.1	0.0	29.9			
Prop In Lane	0.00		1.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	0	3436		0	2297		519	0	1105			
V/C Ratio(X)	0.00	0.41		0.00	0.39		0.91	0.00	0.70			
Avail Cap(c_a), veh/h	0	3568		0	2483		879	0	1783			
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.00	1.00	0.00	0.00	0.62	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	0.0	1.4	0.0	0.0	2.8	0.0	52.4	0.0	48.6			
Incr Delay (d2), s/veh	0.0	0.4	0.0	0.0	0.3	0.0	4.4	0.0	0.3			
Initial Q Delay(d3),s/veh	0.0	0.6	0.0	0.0	3.6	0.0	18.3	0.0	25.9			
%ile BackOfQ(95%),veh/ln	0.0	1.5	0.0	0.0	3.6	0.0	29.1	0.0	18.9			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	2.4	0.0	0.0	6.7	0.0	75.2	0.0	74.7			
LnGrp LOS	A	A		A	A		E	A	E			
Approach Vol, veh/h		1396	A		886	A		1250				
Approach Delay, s/veh		2.4			6.7			74.9				
Approach LOS		A			A			E				
Timer - Assigned Phs		2				6		8				
Phs Duration (G+Y+Rc), s		101.8				101.8		48.2				
Change Period (Y+Rc), s		5.0				5.0		5.0				
Max Green Setting (Gmax), s		64.0				64.0		76.0				
Max Q Clear Time (g_c+I1), s		3.0				3.0		42.1				
Green Ext Time (p_c), s		34.0				18.4		1.0				

Intersection Summary			
HCM 6th Ctrl Delay			29.1
HCM 6th LOS			C

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	373	1729	25	5	1620	185	394	33	167	171	12	611
Future Volume (veh/h)	373	1729	25	5	1620	185	394	33	167	171	12	611
Initial Q (Qb), veh	16	30	0	0	30	0	10	10	0	0	0	16
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	405	1879	0	5	1761	201	454	0	182	195	0	664
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	495	2712		545	2861	645	568	0	277	333	0	753
Arrive On Green	0.13	0.75	0.00	0.19	0.88	0.44	0.15	0.00	0.15	0.09	0.00	0.09
Sat Flow, veh/h	3456	7111	1585	3456	7111	1585	3563	0	1585	3563	0	3170
Grp Volume(v), veh/h	405	1879	0	5	1761	201	454	0	182	195	0	664
Grp Sat Flow(s),veh/h/ln	1728	1778	1585	1728	1778	1585	1781	0	1585	1781	0	1585
Q Serve(g_s), s	17.3	20.7	0.0	0.2	8.7	12.2	18.6	0.0	16.5	7.9	0.0	14.0
Cycle Q Clear(g_c), s	17.3	20.7	0.0	0.2	8.7	12.2	18.6	0.0	16.5	7.9	0.0	14.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	495	2712		545	2861	645	568	0	277	333	0	753
V/C Ratio(X)	0.82	0.69		0.01	0.62	0.31	0.80	0.00	0.66	0.59	0.00	0.88
Avail Cap(c_a), veh/h	576	2987		667	3133	698	879	0	391	333	0	705
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.71	0.71	0.00	0.62	0.62	0.62	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	63.7	13.9	0.0	53.6	12.2	30.5	61.5	0.0	57.9	65.2	0.0	56.6
Incr Delay (d2), s/veh	5.8	1.1	0.0	0.0	0.6	0.8	3.0	0.0	2.6	2.7	0.0	13.1
Initial Q Delay(d3),s/veh	41.6	2.9	0.0	0.0	2.1	0.0	11.1	0.0	0.0	0.0	0.0	27.6
%ile BackOfQ(95%),veh/ln	16.2	8.5	0.0	0.1	8.7	8.0	15.5	0.0	11.0	6.7	0.0	24.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	111.1	17.8	0.0	53.6	14.9	31.3	75.6	0.0	60.5	67.9	0.0	97.3
LnGrp LOS	F	B		D	B	C	E	A	E	E	A	F
Approach Vol, veh/h		2284	A		1967			636			859	
Approach Delay, s/veh		34.3			16.7			71.3			90.6	
Approach LOS		C			B			E			F	

Timer - Assigned Phs	1	2	4	5	6	8
Phs Duration (G+Y+Rc), s	35.9	63.5	29.6	26.4	73.1	21.0
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	10.0	65.0	39.0	27.0	48.0	16.0
Max Q Clear Time (g_c+I1), s	13.2	23.7	21.6	20.3	15.2	17.0
Green Ext Time (p_c), s	0.0	34.8	2.9	1.0	28.0	0.0

Intersection Summary	
HCM 6th Ctrl Delay	40.8
HCM 6th LOS	D

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	91	2044	23	7	983	196	323	72	34	845	10	861
Future Volume (veh/h)	91	2044	23	7	983	196	323	72	34	845	10	861
Initial Q (Qb), veh	0	50	0	0	10	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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	99	2222	17	8	1068	149	351	78	26	918	0	663
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	126	3120	695	2	2834	632	363	92	78	1172	0	669
Arrive On Green	0.04	0.88	0.44	0.00	0.80	0.40	0.20	0.05	0.05	0.33	0.00	0.17
Sat Flow, veh/h	3456	7111	1585	3456	7111	1585	1781	1870	1585	3563	0	3170
Grp Volume(v), veh/h	99	2222	17	8	1068	149	351	78	26	918	0	663
Grp Sat Flow(s),veh/h/ln	1728	1778	1585	1728	1778	1585	1781	1870	1585	1781	0	1585
Q Serve(g_s), s	4.3	15.3	0.5	0.1	6.5	3.2	29.3	6.2	2.2	34.9	0.0	23.2
Cycle Q Clear(g_c), s	4.3	15.3	0.5	0.1	6.5	3.2	29.3	6.2	2.2	34.9	0.0	23.2
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	126	3120	695	2	2834	632	363	92	78	1172	0	669
V/C Ratio(X)	0.79	0.71	0.02	3.47	0.38	0.24	0.97	0.84	0.33	0.78	0.00	0.99
Avail Cap(c_a), veh/h	576	3120	695	184	2834	632	380	212	180	1172	0	770
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.87	0.87	0.87	0.99	0.99	0.99	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	71.7	6.8	6.4	75.0	9.9	3.5	59.2	70.7	60.1	45.5	0.0	37.5
Incr Delay (d2), s/veh	9.1	1.2	0.1	1311.7	0.4	0.9	36.7	18.2	2.5	3.5	0.0	28.7
Initial Q Delay(d3),s/veh	0.0	6.4	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	8.7	7.0	0.6	0.8	4.0	6.2	23.7	6.2	1.8	22.3	0.0	17.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	80.8	14.4	6.5	1386.7	10.5	4.4	95.9	88.9	62.6	49.0	0.0	66.3
LnGrp LOS	F	B	A	F	B	A	F	F	E	D	A	E
Approach Vol, veh/h		2338			1225			455			1581	
Approach Delay, s/veh		17.2			18.7			92.8			56.2	
Approach LOS		B			B			F			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	6.4	72.8	56.4	14.4	12.5	66.8	37.6	33.2
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	10.0	53.0	48.0	19.0	27.0	36.0	34.0	33.0
Max Q Clear Time (g_c+I1), s	13.1	18.3	37.9	9.2	7.3	9.5	32.3	26.2
Green Ext Time (p_c), s	0.0	32.4	3.3	0.2	0.3	16.0	0.3	2.0

Intersection Summary	
HCM 6th Ctrl Delay	34.7
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	2541	3	0	1174	36	109
Future Volume (veh/h)	2541	3	0	1174	36	109
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	2067	1870	1870	2067	1870	1870
Adj Flow Rate, veh/h	2762	3	0	1276	39	118
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	6082	7	1	6889	149	133
Arrive On Green	1.00	0.82	0.00	1.00	0.08	0.08
Sat Flow, veh/h	7681	8	1781	8765	1781	1585
Grp Volume(v), veh/h	1993	772	0	1276	39	118
Grp Sat Flow(s),veh/h/ln	1778	2066	1781	1674	1781	1585
Q Serve(g_s), s	0.0	0.1	0.0	0.0	3.1	11.1
Cycle Q Clear(g_c), s	0.0	0.1	0.0	0.0	3.1	11.1
Prop In Lane		0.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	4389	1700	1	6889	149	133
V/C Ratio(X)	0.45	0.45	0.00	0.19	0.26	0.89
Avail Cap(c_a), veh/h	4389	1700	95	6889	344	306
HCM Platoon Ratio	2.00	1.00	2.00	2.00	1.00	1.00
Upstream Filter(I)	0.59	0.59	0.00	0.97	1.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	64.4	68.0
Incr Delay (d2), s/veh	0.2	0.5	0.0	0.1	0.9	17.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.1	0.5	0.0	0.0	2.6	8.9
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.2	0.5	0.0	0.1	65.3	85.3
LnGrp LOS	A	A	A	A	E	F
Approach Vol, veh/h	2765			1276	157	
Approach Delay, s/veh	0.3			0.1	80.3	
Approach LOS	A			A	F	

Timer - Assigned Phs	1	2	6	8
Phs Duration (G+Y+Rc), s	0.0	130.4	130.4	19.6
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	10.0	94.0	109.0	31.0
Max Q Clear Time (g_c+I1), s	0.0	3.1	3.0	14.1
Green Ext Time (p_c), s	0.0	85.3	36.5	0.5

Intersection Summary	
HCM 6th Ctrl Delay	3.2
HCM 6th LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	2191	522	82	839	3	295	0	172	12	3	15
Future Volume (veh/h)	10	2191	522	82	839	3	295	0	172	12	3	15
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	11	2382	567	89	912	3	321	0	187	13	3	16
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	36	4360	972	102	4793	16	470	0	209	16	4	18
Arrive On Green	0.02	0.82	0.61	0.06	1.00	0.65	0.13	0.00	0.13	0.01	0.01	0.01
Sat Flow, veh/h	1781	7111	1585	1781	7372	24	3563	0	1585	1460	337	1585
Grp Volume(v), veh/h	11	2382	567	89	660	255	321	0	187	16	0	16
Grp Sat Flow(s),veh/h/ln	1781	1778	1585	1781	1778	2063	1781	0	1585	1797	0	1585
Q Serve(g_s), s	0.9	16.7	32.3	7.4	0.0	0.1	12.9	0.0	17.4	1.3	0.0	1.5
Cycle Q Clear(g_c), s	0.9	16.7	32.3	7.4	0.0	0.1	12.9	0.0	17.4	1.3	0.0	1.5
Prop In Lane	1.00		1.00	1.00		0.01	1.00		1.00	0.81		1.00
Lane Grp Cap(c), veh/h	36	4360	972	102	3467	1341	470	0	209	20	0	18
V/C Ratio(X)	0.31	0.55	0.58	0.88	0.19	0.19	0.68	0.00	0.89	0.79	0.00	0.90
Avail Cap(c_a), veh/h	95	4360	972	178	3467	1341	594	0	264	96	0	85
HCM Platoon Ratio	1.00	1.33	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.87	0.87	0.87	0.94	0.94	0.94	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	72.5	6.9	17.5	70.2	0.0	0.1	62.1	0.0	64.1	74.0	0.0	74.1
Incr Delay (d2), s/veh	4.2	0.4	2.2	19.1	0.1	0.3	2.3	0.0	25.6	48.7	0.0	74.3
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(95%),veh/ln	0.8	7.7	17.2	7.0	0.1	0.3	10.1	0.0	13.4	1.6	0.0	1.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	76.7	7.3	19.7	89.3	0.1	0.4	64.4	0.0	89.6	122.7	0.0	148.4
LnGrp LOS	E	A	B	F	A	A	E	A	F	F	A	F
Approach Vol, veh/h		2960			1004			508			32	
Approach Delay, s/veh		10.0			8.1			73.7			135.6	
Approach LOS		A			A			E			F	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	15.5	99.0		8.7	10.0	104.5		26.8
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	17.0	76.0		10.0	10.0	83.0		27.0
Max Q Clear Time (g_c+I1), s	10.4	35.3		4.5	3.9	3.1		20.4
Green Ext Time (p_c), s	0.1	39.4		0.0	0.0	18.6		1.4

Intersection Summary	
HCM 6th Ctrl Delay	17.6
HCM 6th LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	125	1844	445	409	609	302	132	312	363	649	572	172
Future Volume (veh/h)	125	1844	445	409	609	302	132	312	363	649	572	172
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	136	2004	267	445	662	219	143	339	232	705	622	122
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	150	1802	506	333	2381	669	399	547	244	530	681	304
Arrive On Green	0.08	0.64	0.32	0.19	0.84	0.42	0.12	0.15	0.15	0.15	0.19	0.19
Sat Flow, veh/h	1781	5644	1585	1781	5644	1585	3456	3554	1585	3456	3554	1585
Grp Volume(v), veh/h	136	2004	267	445	662	219	143	339	232	705	622	122
Grp Sat Flow(s),veh/h/ln	1781	1881	1585	1781	1881	1585	1728	1777	1585	1728	1777	1585
Q Serve(g_s), s	11.4	47.9	20.7	28.0	3.6	9.5	5.7	13.4	21.8	23.0	25.7	6.9
Cycle Q Clear(g_c), s	11.4	47.9	20.7	28.0	3.6	9.5	5.7	13.4	21.8	23.0	25.7	6.9
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	150	1802	506	333	2381	669	399	547	244	530	681	304
V/C Ratio(X)	0.91	1.11	0.53	1.34	0.28	0.33	0.36	0.62	0.95	1.33	0.91	0.40
Avail Cap(c_a), veh/h	249	1802	506	333	2381	669	399	569	254	530	853	380
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.80	0.80	0.80	1.00	1.00	1.00	0.91	0.91	0.91	1.00	1.00	1.00
Uniform Delay (d), s/veh	68.1	27.1	41.8	61.0	7.0	13.6	61.2	59.3	62.9	63.5	59.4	25.0
Incr Delay (d2), s/veh	18.8	57.3	3.1	171.3	0.3	1.3	0.5	1.8	40.0	161.3	12.2	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	9.5	32.8	12.7	42.4	2.4	6.4	4.6	10.0	16.7	33.5	18.5	7.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	86.9	84.4	44.9	232.3	7.3	14.9	61.7	61.1	102.9	224.8	71.6	25.9
LnGrp LOS	F	F	D	F	A	B	E	E	F	F	E	C
Approach Vol, veh/h		2407			1326			714			1449	
Approach Delay, s/veh		80.2			84.1			74.8			142.3	
Approach LOS		F			F			E			F	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	30.0	30.1	19.6	70.3	24.3	35.8	35.0	54.9
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	25.0	26.0	23.0	56.0	13.0	38.0	30.0	49.0
Max Q Clear Time (g_c+I1), s	26.0	24.8	14.4	12.5	8.7	28.7	31.0	50.9
Green Ext Time (p_c), s	0.0	0.3	0.3	12.4	0.2	2.0	0.0	0.0

Intersection Summary	
HCM 6th Ctrl Delay	95.7
HCM 6th LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	688	1199	239	138	539	162	517	1090	500	551	433	443
Future Volume (veh/h)	688	1199	239	138	539	162	517	1090	500	551	433	443
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	748	1303	182	150	586	123	562	1185	380	599	471	337
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	782	1155	515	115	675	210	591	1319	409	518	1212	376
Arrive On Green	0.23	0.32	0.32	0.03	0.13	0.13	0.17	0.26	0.26	0.15	0.24	0.24
Sat Flow, veh/h	3456	3554	1585	3456	5106	1585	3456	5106	1585	3456	5106	1585
Grp Volume(v), veh/h	748	1303	182	150	586	123	562	1185	380	599	471	337
Grp Sat Flow(s),veh/h/ln	1728	1777	1585	1728	1702	1585	1728	1702	1585	1728	1702	1585
Q Serve(g_s), s	25.7	39.0	10.5	4.0	13.5	8.8	19.3	26.9	28.1	18.0	9.3	24.7
Cycle Q Clear(g_c), s	25.7	39.0	10.5	4.0	13.5	8.8	19.3	26.9	28.1	18.0	9.3	24.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	782	1155	515	115	675	210	591	1319	409	518	1212	376
V/C Ratio(X)	0.96	1.13	0.35	1.30	0.87	0.59	0.95	0.90	0.93	1.16	0.39	0.90
Avail Cap(c_a), veh/h	806	1155	515	115	675	210	605	1319	409	518	1212	376
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	45.9	40.5	30.9	58.0	51.0	49.0	49.3	43.0	43.4	51.0	38.4	44.3
Incr Delay (d2), s/veh	21.5	69.1	0.4	185.4	11.7	4.2	24.9	9.9	29.6	90.1	0.9	26.3
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(95%),veh/ln	19.2	39.4	7.4	8.5	10.6	6.7	15.6	18.2	20.5	21.8	7.2	18.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	67.4	109.6	31.3	243.4	62.7	53.2	74.1	52.9	73.0	141.1	39.4	70.6
LnGrp LOS	E	F	C	F	E	D	E	D	E	F	D	E
Approach Vol, veh/h		2233			859			2127			1407	
Approach Delay, s/veh		89.1			92.9			62.1			90.1	
Approach LOS		F			F			E			F	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	25.0	38.0	11.0	46.0	27.5	35.5	34.1	22.9
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	20.0	33.0	6.0	41.0	23.0	30.0	30.0	17.0
Max Q Clear Time (g_c+I1), s	21.0	31.1	7.0	42.0	22.3	27.7	28.7	16.5
Green Ext Time (p_c), s	0.0	1.5	0.0	0.0	0.2	1.0	0.5	0.2

Intersection Summary	
HCM 6th Ctrl Delay	81.1
HCM 6th LOS	F

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	134	278	528	277	829	1070
Future Volume (veh/h)	134	278	528	277	829	1070
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	146	193	574	211	901	1163
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	166	962	645	237	914	2890
Arrive On Green	0.09	0.09	0.25	0.25	0.51	0.81
Sat Flow, veh/h	1781	1585	2639	934	1781	3647
Grp Volume(v), veh/h	146	193	400	385	901	1163
Grp Sat Flow(s),veh/h/ln	1781	1585	1777	1702	1781	1777
Q Serve(g_s), s	12.1	8.2	32.6	32.7	74.7	13.6
Cycle Q Clear(g_c), s	12.1	8.2	32.6	32.7	74.7	13.6
Prop In Lane	1.00	1.00		0.55	1.00	
Lane Grp Cap(c), veh/h	166	962	450	431	914	2890
V/C Ratio(X)	0.88	0.20	0.89	0.89	0.99	0.40
Avail Cap(c_a), veh/h	166	962	450	431	914	2890
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	67.2	13.2	54.0	54.0	35.9	3.9
Incr Delay (d2), s/veh	37.5	0.1	19.2	20.2	26.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	11.7	5.5	23.3	22.7	47.1	6.6
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	104.7	13.3	73.1	74.3	62.0	4.0
LnGrp LOS	F	B	E	E	E	A
Approach Vol, veh/h	339		785			2064
Approach Delay, s/veh	52.7		73.7			29.3
Approach LOS	D		E			C

Timer - Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	83.6	43.7				127.4		20.6
Change Period (Y+Rc), s	5.0	5.0				5.0		5.0
Max Green Setting (Gmax), s	79.0	40.0				124.0		16.0
Max Q Clear Time (g_c+I1), s	76.7	35.7				16.6		15.1
Green Ext Time (p_c), s	0.6	1.8				10.4		0.1

Intersection Summary	
HCM 6th Ctrl Delay	42.7
HCM 6th LOS	D

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Volume (veh/h)	477	137	66	293	115	55
Future Volume (veh/h)	477	137	66	293	115	55
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	518	95	72	318	125	38
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	995	444	214	1919	321	285
Arrive On Green	0.28	0.28	0.12	0.54	0.18	0.18
Sat Flow, veh/h	3647	1585	1781	3647	1781	1585
Grp Volume(v), veh/h	518	95	72	318	125	38
Grp Sat Flow(s),veh/h/ln	1777	1585	1781	1777	1781	1585
Q Serve(g_s), s	6.1	2.3	1.9	2.3	3.1	1.0
Cycle Q Clear(g_c), s	6.1	2.3	1.9	2.3	3.1	1.0
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	995	444	214	1919	321	285
V/C Ratio(X)	0.52	0.21	0.34	0.17	0.39	0.13
Avail Cap(c_a), veh/h	995	444	214	1919	321	285
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	15.2	13.8	20.2	5.8	18.1	17.2
Incr Delay (d2), s/veh	0.5	0.2	0.9	0.0	0.8	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	3.7	1.3	1.3	1.0	2.2	1.8
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	15.7	14.0	21.1	5.9	18.9	17.4
LnGrp LOS	B	B	C	A	B	B
Approach Vol, veh/h	613			390	163	
Approach Delay, s/veh	15.4			8.7	18.5	
Approach LOS	B			A	B	
Timer - Assigned Phs		2		4	5	6
Phs Duration (G+Y+Rc), s		29.1		13.3	10.6	18.6
Change Period (Y+Rc), s		5.0		5.0	5.0	5.0
Max Green Setting (Gmax), s		29.0		11.0	8.0	16.0
Max Q Clear Time (g_c+I1), s		5.3		6.1	4.9	9.1
Green Ext Time (p_c), s		1.9		0.2	0.0	2.0
Intersection Summary						
HCM 6th Ctrl Delay			13.6			
HCM 6th LOS			B			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	232	219	271	548	214	278
Future Volume (veh/h)	232	219	271	548	214	278
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	254	127	295	585	233	302
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	386	172	733	654	266	2387
Arrive On Green	0.11	0.11	0.41	0.41	0.15	0.67
Sat Flow, veh/h	3563	1585	1870	1585	1781	3647
Grp Volume(v), veh/h	254	127	295	585	233	302
Grp Sat Flow(s),veh/h/ln	1781	1585	1777	1585	1781	1777
Q Serve(g_s), s	4.4	4.9	7.4	21.9	8.2	1.9
Cycle Q Clear(g_c), s	4.4	4.9	7.4	21.9	8.2	1.9
Prop In Lane	1.00	1.00		1.00	1.00	
Lane Grp Cap(c), veh/h	386	172	733	654	266	2387
V/C Ratio(X)	0.66	0.74	0.40	0.89	0.88	0.13
Avail Cap(c_a), veh/h	895	398	837	747	643	3348
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	27.3	27.5	13.2	17.4	26.5	3.8
Incr Delay (d2), s/veh	1.9	6.1	0.4	12.3	8.9	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	3.4	3.7	4.9	14.2	7.0	0.9
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	29.2	33.6	13.5	29.7	35.4	3.8
LnGrp LOS	C	C	B	C	D	A
Approach Vol, veh/h	381		880			535
Approach Delay, s/veh	30.6		24.3			17.5
Approach LOS	C		C			B

Timer - Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	16.5	33.3				49.8		13.9
Change Period (Y+Rc), s	5.0	5.0				5.0		5.0
Max Green Setting (Gmax), s	25.0	32.0				62.0		18.0
Max Q Clear Time (g_c+I1), s	11.2	24.9				4.9		7.9
Green Ext Time (p_c), s	0.5	3.4				2.2		1.0

Intersection Summary		
HCM 6th Ctrl Delay		23.6
HCM 6th LOS		C

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	309	119	170	1839	1200	362
Future Volume (veh/h)	309	119	170	1839	1200	362
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	336	107	185	1999	1304	393
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	370	329	205	3179	1646	495
Arrive On Green	0.21	0.21	0.11	0.62	0.42	0.42
Sat Flow, veh/h	1781	1585	1781	5274	4062	1170
Grp Volume(v), veh/h	336	107	185	1999	1140	557
Grp Sat Flow(s),veh/h/ln	1781	1585	1781	1702	1702	1660
Q Serve(g_s), s	15.2	4.7	8.5	20.0	24.0	24.1
Cycle Q Clear(g_c), s	15.2	4.7	8.5	20.0	24.0	24.1
Prop In Lane	1.00	1.00	1.00			0.71
Lane Grp Cap(c), veh/h	370	329	205	3179	1439	702
V/C Ratio(X)	0.91	0.33	0.90	0.63	0.79	0.79
Avail Cap(c_a), veh/h	518	461	302	3839	1692	825
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	31.9	27.8	36.0	9.6	20.6	20.7
Incr Delay (d2), s/veh	15.7	0.6	21.6	0.2	2.3	4.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	12.6	7.9	8.2	9.6	13.6	13.9
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	47.6	28.3	57.6	9.9	22.9	25.3
LnGrp LOS	D	C	E	A	C	C
Approach Vol, veh/h	443			2184	1697	
Approach Delay, s/veh	43.0			13.9	23.7	
Approach LOS	D			B	C	

Timer - Assigned Phs		2		4	5	6
Phs Duration (G+Y+Rc), s		58.4		24.1	16.5	41.9
Change Period (Y+Rc), s		5.0		5.0	5.0	5.0
Max Green Setting (Gmax), s		64.0		26.0	16.0	43.0
Max Q Clear Time (g_c+I1), s		23.0		18.2	11.5	27.1
Green Ext Time (p_c), s		21.6		0.9	0.2	9.8

Intersection Summary			
HCM 6th Ctrl Delay			20.7
HCM 6th LOS			C

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	18	964	73	62	461	36	102	70	158	51	126	14
Future Volume (veh/h)	18	964	73	62	461	36	102	70	158	51	126	14
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	20	1048	52	67	501	22	111	76	107	55	137	15
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	81	1357	605	113	1421	634	162	408	346	146	346	38
Arrive On Green	0.05	0.38	0.38	0.06	0.40	0.40	0.09	0.22	0.22	0.08	0.21	0.21
Sat Flow, veh/h	1781	3554	1585	1781	3554	1585	1781	1870	1585	1781	1656	181
Grp Volume(v), veh/h	20	1048	52	67	501	22	111	76	107	55	0	152
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1777	1585	1781	1870	1585	1781	0	1838
Q Serve(g_s), s	1.2	28.4	2.3	4.0	10.8	0.9	6.6	3.6	6.2	3.2	0.0	7.8
Cycle Q Clear(g_c), s	1.2	28.4	2.3	4.0	10.8	0.9	6.6	3.6	6.2	3.2	0.0	7.8
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.10
Lane Grp Cap(c), veh/h	81	1357	605	113	1421	634	162	408	346	146	0	384
V/C Ratio(X)	0.25	0.77	0.09	0.59	0.35	0.03	0.69	0.19	0.31	0.38	0.00	0.40
Avail Cap(c_a), veh/h	81	1357	605	113	1421	634	162	408	346	146	0	384
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	0.98	0.98	0.98	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	50.7	29.8	21.7	50.1	23.0	20.1	48.5	35.0	36.1	47.8	0.0	37.5
Incr Delay (d2), s/veh	1.6	4.3	0.3	7.7	0.7	0.1	11.4	0.2	0.5	1.6	0.0	0.7
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(95%),veh/ln	1.0	18.1	1.6	3.6	7.9	0.6	6.2	3.0	4.3	2.6	0.0	6.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	52.3	34.1	22.0	57.9	23.7	20.2	59.8	35.3	36.6	49.5	0.0	38.2
LnGrp LOS	D	C	C	E	C	C	E	D	D	D	A	D
Approach Vol, veh/h		1120			590			294			207	
Approach Delay, s/veh		33.9			27.5			45.0			41.2	
Approach LOS		C			C			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	12.6	58.6	13.0	25.8	9.6	61.5	15.7	23.1
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	9.0	44.0	11.0	26.0	7.0	46.0	12.0	25.0
Max Q Clear Time (g_c+I1), s	7.0	31.4	6.2	9.2	4.2	13.8	9.6	10.8
Green Ext Time (p_c), s	0.0	4.4	0.0	0.6	0.0	2.4	0.1	0.4

Intersection Summary	
HCM 6th Ctrl Delay	34.3
HCM 6th LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	199	1136	100	544	809	292	144	266	512	422	272	67
Future Volume (veh/h)	199	1136	100	544	809	292	144	266	512	422	272	67
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	216	1235	79	591	879	224	157	289	396	459	296	51
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	871	1411	438	613	1030	320	183	759	619	483	1067	476
Arrive On Green	0.25	0.55	0.28	0.18	0.40	0.20	0.05	0.21	0.21	0.14	0.30	0.30
Sat Flow, veh/h	3456	5106	1585	3456	5106	1585	3456	3554	1585	3456	3554	1585
Grp Volume(v), veh/h	216	1235	79	591	879	224	157	289	396	459	296	51
Grp Sat Flow(s),veh/h/ln	1728	1702	1585	1728	1702	1585	1728	1777	1585	1728	1777	1585
Q Serve(g_s), s	7.2	30.4	5.5	24.6	22.7	14.1	6.5	10.1	29.4	19.1	9.2	1.8
Cycle Q Clear(g_c), s	7.2	30.4	5.5	24.6	22.7	14.1	6.5	10.1	29.4	19.1	9.2	1.8
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	871	1411	438	613	1030	320	183	759	619	483	1067	476
V/C Ratio(X)	0.25	0.87	0.18	0.96	0.85	0.70	0.86	0.38	0.64	0.95	0.28	0.11
Avail Cap(c_a), veh/h	871	1411	438	620	1726	536	286	784	631	500	1067	476
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.76	0.76	0.76	1.00	1.00	1.00	0.98	0.98	0.98	1.00	1.00	1.00
Uniform Delay (d), s/veh	43.3	30.2	39.9	59.2	41.3	29.4	68.1	48.8	35.9	61.9	38.7	10.7
Incr Delay (d2), s/veh	0.0	6.1	0.7	27.1	9.0	12.1	8.7	0.3	2.1	27.3	0.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	5.6	14.3	4.1	18.8	13.4	10.7	5.6	8.0	17.4	15.5	7.4	2.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	43.3	36.4	40.6	86.3	50.3	41.4	76.8	49.1	38.0	89.1	38.9	10.8
LnGrp LOS	D	D	D	F	D	D	E	D	D	F	D	B
Approach Vol, veh/h		1530			1694			842			806	
Approach Delay, s/veh		37.6			61.7			49.0			65.7	
Approach LOS		D			E			D			E	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	32.7	47.1	27.3	38.0	43.5	36.2	14.7	50.5				
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0				
Max Green Setting (Gmax), s	28.0	40.0	23.0	34.0	17.0	51.0	14.0	43.0				
Max Q Clear Time (g_c+I1), s	27.6	33.4	22.1	32.4	10.2	25.7	9.5	12.2				
Green Ext Time (p_c), s	0.1	3.5	0.2	0.5	0.3	5.5	0.1	1.6				
Intersection Summary												
HCM 6th Ctrl Delay			52.6									
HCM 6th LOS			D									

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	1136	959	0	1170	965
Future Volume (veh/h)	0	1136	959	0	1170	965
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	0	1870	1870	0	1870	1870
Adj Flow Rate, veh/h	0	1235	1042	0	1272	1049
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	0	2	2
Cap, veh/h	0	2289	2289		1573	1270
Arrive On Green	0.00	0.90	0.90	0.00	0.46	0.46
Sat Flow, veh/h	0	5443	5443	0	3456	2790
Grp Volume(v), veh/h	0	1235	1042	0	1272	1049
Grp Sat Flow(s),veh/h/ln	0	1702	1702	0	1728	1395
Q Serve(g_s), s	0.0	7.0	5.2	0.0	46.0	47.6
Cycle Q Clear(g_c), s	0.0	7.0	5.2	0.0	46.0	47.6
Prop In Lane	0.00			0.00	1.00	1.00
Lane Grp Cap(c), veh/h	0	2289	2289		1573	1270
V/C Ratio(X)	0.00	0.54	0.46		0.81	0.83
Avail Cap(c_a), veh/h	0	2289	2289		1859	1501
HCM Platoon Ratio	1.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	4.5	4.4	0.0	34.1	34.5
Incr Delay (d2), s/veh	0.0	0.9	0.7	0.0	2.4	3.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.0	3.1	2.6	0.0	27.0	23.3
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.0	5.4	5.1	0.0	36.4	37.9
LnGrp LOS	A	A	A		D	D
Approach Vol, veh/h		1235	1042	A	2321	
Approach Delay, s/veh		5.4	5.1		37.1	
Approach LOS		A	A		D	

Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		72.0		73.0		72.0
Change Period (Y+Rc), s		5.0		5.0		5.0
Max Green Setting (Gmax), s		55.0		80.0		55.0
Max Q Clear Time (g_c+I1), s		10.0		50.6		8.2
Green Ext Time (p_c), s		7.2		17.4		5.7

Intersection Summary	
HCM 6th Ctrl Delay	21.3
HCM 6th LOS	C

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1813	0	0	1096	606	759
Future Volume (veh/h)	1813	0	0	1096	606	759
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	0	0	1870	1870	1870
Adj Flow Rate, veh/h	1971	0	0	1191	495	1001
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	0	0	2	2	2
Cap, veh/h	2783	0	0	3507	638	1136
Arrive On Green	1.00	0.00	0.00	1.00	0.36	0.36
Sat Flow, veh/h	5443	0	0	6958	1781	3170
Grp Volume(v), veh/h	1971	0	0	1191	495	1001
Grp Sat Flow(s),veh/h/ln	1702	0	0	1609	1781	1585
Q Serve(g_s), s	0.0	0.0	0.0	0.0	35.8	42.9
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	35.8	42.9
Prop In Lane		0.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	2783	0	0	3507	638	1136
V/C Ratio(X)	0.71	0.00	0.00	0.34	0.78	0.88
Avail Cap(c_a), veh/h	2783	0	0	3507	762	1355
HCM Platoon Ratio	2.00	1.00	1.00	2.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	41.3	43.6
Incr Delay (d2), s/veh	1.6	0.0	0.0	0.3	4.2	6.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.7	0.0	0.0	0.1	23.2	24.7
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	1.6	0.0	0.0	0.3	45.5	49.8
LnGrp LOS	A	A	A	A	D	D
Approach Vol, veh/h	1971			1191	1496	
Approach Delay, s/veh	1.6			0.3	48.4	
Approach LOS	A			A	D	
Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		86.0		59.0		86.0
Change Period (Y+Rc), s		5.0		5.0		5.0
Max Green Setting (Gmax), s		71.0		64.0		71.0
Max Q Clear Time (g_c+I1), s		3.0		45.9		3.0
Green Ext Time (p_c), s		16.7		8.0		6.9
Intersection Summary						
HCM 6th Ctrl Delay			16.3			
HCM 6th LOS			B			

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	399	1789	435	94	1418	82	131	30	63	120	42	242
Future Volume (veh/h)	399	1789	435	94	1418	82	131	30	63	120	42	242
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	434	1945	473	102	1541	89	142	33	68	130	46	263
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	444	2317	659	200	2555	147	193	99	89	127	134	317
Arrive On Green	0.13	0.72	0.36	0.11	0.69	0.34	0.06	0.06	0.06	0.07	0.07	0.07
Sat Flow, veh/h	3456	6434	1585	1781	7426	427	3456	1777	1585	1781	1870	1585
Grp Volume(v), veh/h	434	1945	473	102	1256	374	142	33	68	130	46	263
Grp Sat Flow(s),veh/h/ln	1728	1609	1585	1781	1515	1793	1728	1777	1585	1781	1870	1585
Q Serve(g_s), s	8.8	15.0	17.4	3.8	7.7	9.1	2.8	1.3	3.0	5.0	1.6	5.0
Cycle Q Clear(g_c), s	8.8	15.0	17.4	3.8	7.7	9.1	2.8	1.3	3.0	5.0	1.6	5.0
Prop In Lane	1.00		1.00	1.00		0.24	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	444	2317	659	200	2085	617	193	99	89	127	134	317
V/C Ratio(X)	0.98	0.84	0.72	0.51	0.60	0.61	0.74	0.33	0.77	1.02	0.34	0.83
Avail Cap(c_a), veh/h	444	2482	700	200	2085	617	197	102	91	127	134	317
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.63	0.63	0.63	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	30.4	8.4	17.0	29.2	8.4	10.8	32.5	31.8	32.6	32.5	30.9	26.9
Incr Delay (d2), s/veh	36.5	3.9	6.6	1.3	0.8	2.8	13.0	1.9	31.4	85.7	1.5	16.6
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(95%),veh/ln	9.5	5.1	11.8	2.8	3.0	5.1	2.7	1.0	3.4	8.9	1.4	9.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	66.9	12.2	23.6	30.6	9.2	13.6	45.6	33.7	64.0	118.2	32.5	43.5
LnGrp LOS	E	B	C	C	A	B	D	C	E	F	C	D
Approach Vol, veh/h		2852			1732			243			439	
Approach Delay, s/veh		22.4			11.4			49.1			64.5	
Approach LOS		C			B			D			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	14.9	32.2		12.0	16.0	31.1		10.9
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	8.0	29.0		7.0	11.0	26.0		6.0
Max Q Clear Time (g_c+I1), s	10.8	20.4		8.0	11.8	12.1		6.0
Green Ext Time (p_c), s	0.0	6.8		0.0	0.0	6.7		0.0

Intersection Summary	
HCM 6th Ctrl Delay	23.5
HCM 6th LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	140	1003	701	377	1580	214	260	162	77	171	157	59
Future Volume (veh/h)	140	1003	701	377	1580	214	260	162	77	171	157	59
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	152	1090	762	410	1717	233	283	176	84	186	171	64
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	167	3238	950	439	3359	456	331	214	181	215	207	75
Arrive On Green	0.05	1.00	0.50	0.13	1.00	0.58	0.10	0.11	0.11	0.06	0.08	0.08
Sat Flow, veh/h	3456	6434	1585	3456	5772	783	3456	1870	1585	3456	2558	923
Grp Volume(v), veh/h	152	1090	762	410	1436	514	283	176	84	186	117	118
Grp Sat Flow(s),veh/h/ln	1728	1609	1585	1728	1609	1729	1728	1870	1585	1728	1777	1704
Q Serve(g_s), s	6.3	0.0	30.7	17.0	0.0	13.9	11.7	13.3	7.2	7.7	9.4	9.9
Cycle Q Clear(g_c), s	6.3	0.0	30.7	17.0	0.0	13.9	11.7	13.3	7.2	7.7	9.4	9.9
Prop In Lane	1.00		1.00	1.00		0.45	1.00		1.00	1.00		0.54
Lane Grp Cap(c), veh/h	167	3238	950	439	2809	1007	331	214	181	215	144	138
V/C Ratio(X)	0.91	0.34	0.80	0.93	0.51	0.51	0.85	0.82	0.46	0.87	0.81	0.86
Avail Cap(c_a), veh/h	167	3238	950	477	2809	1007	810	632	536	310	343	329
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.56	0.56	0.56	0.95	0.95	0.95	0.86	0.86	0.86	1.00	1.00	1.00
Uniform Delay (d), s/veh	68.7	0.0	9.9	62.7	0.0	7.1	64.6	62.8	60.0	67.4	65.6	65.8
Incr Delay (d2), s/veh	30.3	0.2	4.1	23.8	0.6	1.8	5.5	6.7	1.6	16.0	10.5	14.0
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(95%),veh/ln	5.8	0.1	14.3	13.6	0.3	7.4	8.9	10.7	5.4	7.0	8.2	8.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	99.0	0.2	14.0	86.5	0.6	8.8	70.0	69.4	61.6	83.4	76.1	79.8
LnGrp LOS	F	A	B	F	A	A	E	E	E	F	E	E
Approach Vol, veh/h		2004			2360			543			421	
Approach Delay, s/veh		12.9			17.3			68.5			80.4	
Approach LOS		B			B			E			F	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	25.4	80.0	16.0	23.6	14.0	91.4	20.9	18.7
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	22.0	37.0	15.0	51.0	9.0	50.0	36.0	30.0
Max Q Clear Time (g_c+I1), s	20.0	33.7	10.7	16.3	9.3	16.9	14.7	12.9
Green Ext Time (p_c), s	0.4	2.5	0.3	1.0	0.0	12.5	1.2	0.8

Intersection Summary	
HCM 6th Ctrl Delay	25.9
HCM 6th LOS	C

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	720	460	560	1866	284	325
Future Volume (veh/h)	720	460	560	1866	284	325
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	783	500	609	2028	309	353
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	2721	845	677	3967	437	899
Arrive On Green	1.00	0.53	0.20	1.00	0.13	0.13
Sat Flow, veh/h	5274	1585	3456	5274	3456	2790
Grp Volume(v), veh/h	783	500	609	2028	309	353
Grp Sat Flow(s),veh/h/ln	1702	1585	1728	1702	1728	1395
Q Serve(g_s), s	0.0	31.2	24.9	0.0	12.4	14.2
Cycle Q Clear(g_c), s	0.0	31.2	24.9	0.0	12.4	14.2
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	2721	845	677	3967	437	899
V/C Ratio(X)	0.29	0.59	0.90	0.51	0.71	0.39
Avail Cap(c_a), veh/h	2721	845	953	3967	763	1162
HCM Platoon Ratio	2.00	1.00	1.00	2.00	1.00	1.00
Upstream Filter(I)	0.99	0.99	0.43	0.43	1.00	1.00
Uniform Delay (d), s/veh	0.0	23.1	56.9	0.0	60.8	38.1
Incr Delay (d2), s/veh	0.3	3.0	4.1	0.2	2.1	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.1	17.7	14.7	0.1	9.5	8.6
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.3	26.1	61.0	0.2	62.9	38.4
LnGrp LOS	A	C	E	A	E	D
Approach Vol, veh/h	1283			2637	662	
Approach Delay, s/veh	10.3			14.2	49.8	
Approach LOS	B			B	D	

Timer - Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	35.4	84.3				119.7		25.3
Change Period (Y+Rc), s	5.0	5.0				5.0		5.0
Max Green Setting (Gmax), s	42.0	54.0				101.0		34.0
Max Q Clear Time (g_c+I1), s	27.9	34.2				3.0		17.2
Green Ext Time (p_c), s	2.5	6.2				18.3		3.1

Intersection Summary		
HCM 6th Ctrl Delay		18.3
HCM 6th LOS		B

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	459	188	765	1044	440	716
Future Volume (veh/h)	459	188	765	1044	440	716
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	499	204	832	1135	478	778
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	929	415	1143	2296	851	1609
Arrive On Green	0.26	0.26	0.33	0.65	0.25	0.25
Sat Flow, veh/h	3647	1585	3456	3647	3456	2790
Grp Volume(v), veh/h	499	204	832	1135	478	778
Grp Sat Flow(s),veh/h/ln	1777	1585	1728	1777	1728	1395
Q Serve(g_s), s	15.7	14.2	27.6	21.6	15.7	21.3
Cycle Q Clear(g_c), s	15.7	14.2	27.6	21.6	15.7	21.3
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	929	415	1143	2296	851	1609
V/C Ratio(X)	0.54	0.49	0.73	0.49	0.56	0.48
Avail Cap(c_a), veh/h	929	415	1143	2296	851	1609
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.82	0.82	0.99	0.99
Uniform Delay (d), s/veh	41.2	40.7	38.3	12.0	42.9	16.1
Incr Delay (d2), s/veh	2.2	4.1	1.9	0.6	0.8	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	11.3	9.9	16.7	12.0	10.8	10.3
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	43.5	44.8	40.3	12.6	43.7	16.4
LnGrp LOS	D	D	D	B	D	B
Approach Vol, veh/h	703			1967	1256	
Approach Delay, s/veh	43.9			24.3	26.8	
Approach LOS	D			C	C	

Timer - Assigned Phs	1	2	6	8
Phs Duration (G+Y+Rc), s	44.5	49.1	93.7	36.3
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	45.0	36.0	86.0	34.0
Max Q Clear Time (g_c+I1), s	30.6	18.7	24.6	24.3
Green Ext Time (p_c), s	3.5	2.8	6.4	4.4

Intersection Summary	
HCM 6th Ctrl Delay	28.6
HCM 6th LOS	C

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	59	343	10	131	263	66	21	322	340	33	47	108
Future Volume (veh/h)	59	343	10	131	263	66	21	322	340	33	47	108
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1796	1870	1870	1796	1870	1870	1870	1870	1870	1796
Adj Flow Rate, veh/h	64	373	11	142	286	72	23	350	0	36	51	117
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	160	599	18	232	593	147	32	490		106	150	213
Arrive On Green	0.09	0.17	0.17	0.13	0.21	0.21	0.28	0.28	0.00	0.14	0.14	0.14
Sat Flow, veh/h	1781	3525	104	1781	2823	699	115	1750	1585	758	1074	1522
Grp Volume(v), veh/h	64	188	196	142	178	180	373	0	0	87	0	117
Grp Sat Flow(s),veh/h/ln	1781	1777	1852	1781	1777	1745	1865	0	1585	1832	0	1522
Q Serve(g_s), s	3.4	9.8	9.8	7.5	8.8	9.1	18.0	0.0	0.0	4.3	0.0	7.2
Cycle Q Clear(g_c), s	3.4	9.8	9.8	7.5	8.8	9.1	18.0	0.0	0.0	4.3	0.0	7.2
Prop In Lane	1.00		0.06	1.00		0.40	0.06		1.00	0.41		1.00
Lane Grp Cap(c), veh/h	160	302	315	232	373	366	522	0		257	0	213
V/C Ratio(X)	0.40	0.62	0.62	0.61	0.48	0.49	0.71	0.00		0.34	0.00	0.55
Avail Cap(c_a), veh/h	160	302	315	232	373	366	522	0		257	0	213
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	42.9	38.5	38.5	41.1	34.7	34.8	32.4	0.0	0.0	38.8	0.0	40.1
Incr Delay (d2), s/veh	1.6	3.9	3.8	4.7	0.9	1.0	4.6	0.0	0.0	0.8	0.0	3.0
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(95%),veh/ln	2.8	8.1	8.3	6.3	6.8	6.9	13.3	0.0	0.0	3.6	0.0	5.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	44.6	42.4	42.3	45.8	35.6	35.8	37.0	0.0	0.0	39.6	0.0	43.0
LnGrp LOS	D	D	D	D	D	D	D	A		D	A	D
Approach Vol, veh/h		448			500			373	A		204	
Approach Delay, s/veh		42.7			38.6			37.0			41.6	
Approach LOS		D			D			D			D	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	13.2	26.0		31.2	17.7	21.5		18.3
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	11.0	23.0		30.0	15.0	19.0		16.0
Max Q Clear Time (g_c+I1), s	5.4	12.1		21.0	10.5	12.8		10.2
Green Ext Time (p_c), s	0.0	1.4		1.4	0.1	1.1		0.4

Intersection Summary	
HCM 6th Ctrl Delay	39.8
HCM 6th LOS	D

Notes

Unsignalized Delay for [NER] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	63	523	101	192	254	318	78	422	573	542	207	39
Future Volume (veh/h)	63	523	101	192	254	318	78	422	573	542	207	39
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	68	568	56	209	276	216	85	459	351	589	225	39
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	70	659	294	224	509	431	92	867	387	626	1134	193
Arrive On Green	0.04	0.19	0.19	0.13	0.27	0.27	0.05	0.24	0.24	0.18	0.37	0.37
Sat Flow, veh/h	1781	3554	1585	1781	1870	1585	1781	3554	1585	3456	3036	518
Grp Volume(v), veh/h	68	568	56	209	276	216	85	459	351	589	130	134
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1870	1585	1781	1777	1585	1728	1777	1777
Q Serve(g_s), s	4.0	16.5	3.2	12.3	13.4	12.2	5.0	11.9	22.8	17.9	5.3	5.4
Cycle Q Clear(g_c), s	4.0	16.5	3.2	12.3	13.4	12.2	5.0	11.9	22.8	17.9	5.3	5.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.29
Lane Grp Cap(c), veh/h	70	659	294	224	509	431	92	867	387	626	664	664
V/C Ratio(X)	0.98	0.86	0.19	0.93	0.54	0.50	0.92	0.53	0.91	0.94	0.20	0.20
Avail Cap(c_a), veh/h	168	937	418	235	564	478	201	1004	448	651	664	664
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	51.0	41.9	36.5	46.0	33.0	32.6	50.1	34.8	39.0	42.9	22.5	22.5
Incr Delay (d2), s/veh	44.4	6.0	0.3	39.8	0.9	0.9	28.3	0.5	20.3	21.5	0.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	4.8	12.2	2.2	12.4	10.0	8.3	5.3	8.8	16.2	14.4	3.9	4.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	95.4	47.9	36.8	85.8	33.9	33.5	78.4	35.3	59.3	64.4	22.6	22.7
LnGrp LOS	F	D	D	F	C	C	E	D	E	E	C	C
Approach Vol, veh/h		692			701			895			853	
Approach Delay, s/veh		51.7			49.2			48.8			51.5	
Approach LOS		D			D			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	20.4	26.7	26.2	32.9	11.2	35.9	12.5	46.7
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	16.0	30.0	22.0	32.0	12.0	34.0	14.0	40.0
Max Q Clear Time (g_c+I1), s	15.3	19.5	20.9	25.8	7.0	16.4	8.0	8.4
Green Ext Time (p_c), s	0.0	2.2	0.4	2.1	0.1	1.8	0.1	1.0

Intersection Summary	
HCM 6th Ctrl Delay	50.3
HCM 6th LOS	D

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	157	831	536	74	465	148	119	25	52	67	23	120
Future Volume (veh/h)	157	831	536	74	465	148	119	25	52	67	23	120
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	171	903	583	80	505	161	129	27	57	73	25	130
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	422	1474	658	48	729	325	349	65	147	219	54	214
Arrive On Green	0.24	0.41	0.41	0.03	0.21	0.21	0.14	0.14	0.14	0.14	0.14	0.14
Sat Flow, veh/h	1781	3554	1585	1781	3554	1585	1527	478	1089	685	399	1585
Grp Volume(v), veh/h	171	903	583	80	505	161	134	0	79	98	0	130
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1777	1585	1589	0	1506	1084	0	1585
Q Serve(g_s), s	4.0	9.9	16.9	1.3	6.5	4.5	0.0	0.0	2.4	2.5	0.0	3.8
Cycle Q Clear(g_c), s	4.0	9.9	16.9	1.3	6.5	4.5	3.8	0.0	2.4	4.9	0.0	3.8
Prop In Lane	1.00		1.00	1.00		1.00	0.96		0.72	0.74		1.00
Lane Grp Cap(c), veh/h	422	1474	658	48	729	325	357	0	204	273	0	214
V/C Ratio(X)	0.41	0.61	0.89	1.66	0.69	0.49	0.38	0.00	0.39	0.36	0.00	0.61
Avail Cap(c_a), veh/h	422	1575	702	108	1503	670	816	0	698	768	0	766
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	16.0	11.4	13.4	24.2	18.3	17.5	20.2	0.0	19.6	21.1	0.0	20.2
Incr Delay (d2), s/veh	0.6	0.6	12.6	346.4	1.2	1.2	0.7	0.0	1.2	0.8	0.0	2.8
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(95%),veh/ln	2.7	5.9	11.4	9.3	4.5	2.8	2.5	0.0	1.5	1.9	0.0	2.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	16.6	12.0	26.0	370.6	19.5	18.6	20.9	0.0	20.8	21.9	0.0	23.0
LnGrp LOS	B	B	C	F	B	B	C	A	C	C	A	C
Approach Vol, veh/h		1657			746			213			228	
Approach Delay, s/veh		17.4			56.9			20.8			22.5	
Approach LOS		B			E			C			C	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	8.3	27.6		13.7	18.7	17.2		13.7
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	5.0	24.0		25.0	6.0	23.0		26.0
Max Q Clear Time (g_c+I1), s	4.3	19.9		6.8	7.0	9.5		7.9
Green Ext Time (p_c), s	0.0	2.7		0.7	0.0	2.7		0.8

Intersection Summary			
HCM 6th Ctrl Delay			28.5
HCM 6th LOS			C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	109	482	190	95	456	142	157	319	75	145	598	161
Future Volume (veh/h)	109	482	190	95	456	142	157	319	75	145	598	161
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	118	524	207	103	496	154	171	347	55	158	650	175
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	158	664	261	119	654	202	198	869	387	198	677	182
Arrive On Green	0.09	0.27	0.27	0.07	0.24	0.24	0.11	0.24	0.24	0.11	0.24	0.24
Sat Flow, veh/h	1781	2491	980	1781	2673	825	1781	3554	1585	1781	2769	745
Grp Volume(v), veh/h	118	373	358	103	329	321	171	347	55	158	417	408
Grp Sat Flow(s),veh/h/ln	1781	1777	1694	1781	1777	1722	1781	1777	1585	1781	1777	1736
Q Serve(g_s), s	5.8	17.5	17.7	5.2	15.4	15.6	8.5	7.4	2.4	7.8	20.8	20.9
Cycle Q Clear(g_c), s	5.8	17.5	17.7	5.2	15.4	15.6	8.5	7.4	2.4	7.8	20.8	20.9
Prop In Lane	1.00		0.58	1.00		0.48	1.00		1.00	1.00		0.43
Lane Grp Cap(c), veh/h	158	474	452	119	434	421	198	869	387	198	434	424
V/C Ratio(X)	0.75	0.79	0.79	0.87	0.76	0.76	0.86	0.40	0.14	0.80	0.96	0.96
Avail Cap(c_a), veh/h	158	474	452	119	434	421	198	869	387	198	434	424
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	40.0	30.6	30.7	41.6	31.5	31.6	39.3	28.5	26.6	39.0	33.6	33.6
Incr Delay (d2), s/veh	17.3	8.6	9.3	44.8	7.5	8.1	30.4	0.3	0.2	20.1	32.9	33.7
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(95%),veh/ln	5.8	12.9	12.6	6.6	11.6	11.4	9.0	5.4	1.6	7.8	18.2	18.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	57.4	39.2	40.0	86.4	39.0	39.7	69.7	28.8	26.8	59.2	66.5	67.3
LnGrp LOS	E	D	D	F	D	D	E	C	C	E	E	E
Approach Vol, veh/h		849			753			573			983	
Approach Delay, s/veh		42.1			45.8			40.8			65.7	
Approach LOS		D			D			D			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	12.8	29.1	16.3	29.3	14.2	27.7	16.7	29.0
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	8.0	26.0	12.0	24.0	10.0	24.0	12.0	24.0
Max Q Clear Time (g_c+I1), s	9.2	20.7	10.8	10.4	8.8	18.6	11.5	23.9
Green Ext Time (p_c), s	0.0	1.5	0.1	1.4	0.0	1.3	0.0	0.0

Intersection Summary		
HCM 6th Ctrl Delay		50.1
HCM 6th LOS		D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	158	67	372	13	38	57	335	367	77	175	413	217
Future Volume (veh/h)	158	67	372	13	38	57	335	367	77	175	413	217
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	172	73	0	14	41	51	364	399	82	190	449	127
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	264	508		58	427	362	470	727	148	345	630	402
Arrive On Green	0.08	0.27	0.00	0.03	0.23	0.23	0.26	0.25	0.25	0.19	0.18	0.18
Sat Flow, veh/h	3456	1870	1585	1781	1870	1585	1781	2940	599	1781	3554	1585
Grp Volume(v), veh/h	172	73	0	14	41	51	364	240	241	190	449	127
Grp Sat Flow(s),veh/h/ln	1728	1870	1585	1781	1870	1585	1781	1777	1763	1781	1777	1585
Q Serve(g_s), s	5.3	3.3	0.0	0.8	1.9	2.8	20.8	12.9	13.1	10.6	13.1	7.2
Cycle Q Clear(g_c), s	5.3	3.3	0.0	0.8	1.9	2.8	20.8	12.9	13.1	10.6	13.1	7.2
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.34	1.00		1.00
Lane Grp Cap(c), veh/h	264	508		58	427	362	470	439	436	345	630	402
V/C Ratio(X)	0.65	0.14		0.24	0.10	0.14	0.78	0.55	0.55	0.55	0.71	0.32
Avail Cap(c_a), veh/h	264	508		58	427	362	470	439	436	345	630	402
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	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	49.4	30.3	0.0	51.9	33.5	33.9	37.5	36.0	36.1	40.0	42.6	33.3
Incr Delay (d2), s/veh	5.6	0.1	0.0	2.1	0.1	0.2	7.9	1.4	1.5	1.9	3.8	0.4
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(95%),veh/ln	4.4	2.6	0.0	0.7	1.5	2.0	14.9	9.5	9.6	8.3	9.9	4.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	55.0	30.5	0.0	54.0	33.6	34.0	45.4	37.4	37.6	41.9	46.4	33.8
LnGrp LOS	D	C		D	C	C	D	D	D	D	D	C
Approach Vol, veh/h		245	A		106			845			766	
Approach Delay, s/veh		47.7			36.5			40.9			43.2	
Approach LOS		D			D			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.7	27.3	23.6	33.6	14.4	21.6	32.8	24.4
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	5.6	31.9	23.3	29.2	10.4	27.1	31.0	21.5
Max Q Clear Time (g_c+I1), s	3.8	6.3	13.6	16.1	8.3	5.8	23.8	16.1
Green Ext Time (p_c), s	0.0	0.2	0.4	1.5	0.1	0.3	0.9	1.3

Intersection Summary	
HCM 6th Ctrl Delay	42.4
HCM 6th LOS	D

Notes

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	4.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	16	104	101	130	284	174
Future Vol, veh/h	16	104	101	130	284	174
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	17	113	110	141	309	189

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	988	181	0	0	251	0
Stage 1	181	-	-	-	-	-
Stage 2	807	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	274	862	-	-	1314	-
Stage 1	850	-	-	-	-	-
Stage 2	439	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	202	862	-	-	1314	-
Mov Cap-2 Maneuver	202	-	-	-	-	-
Stage 1	850	-	-	-	-	-
Stage 2	324	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.7	0	5.3
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	600	1314	-
HCM Lane V/C Ratio	-	-	0.217	0.235	-
HCM Control Delay (s)	-	-	12.7	8.6	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.8	0.9	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	135	310	115	51	51	68	213	401	220	189	443	134
Future Volume (veh/h)	135	310	115	51	51	68	213	401	220	189	443	134
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	147	337	125	55	55	74	232	436	239	205	482	146
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	506	549	465	151	129	465	242	679	369	216	782	235
Arrive On Green	0.29	0.29	0.29	0.29	0.29	0.29	0.14	0.31	0.31	0.12	0.29	0.29
Sat Flow, veh/h	1349	1870	1585	269	439	1585	1781	2222	1208	1781	2691	810
Grp Volume(v), veh/h	147	337	125	110	0	74	232	348	327	205	317	311
Grp Sat Flow(s),veh/h/ln	1349	1870	1585	709	0	1585	1781	1777	1653	1781	1777	1725
Q Serve(g_s), s	0.9	11.6	4.5	2.9	0.0	2.6	9.7	12.7	12.9	8.6	11.6	11.7
Cycle Q Clear(g_c), s	5.6	11.6	4.5	16.0	0.0	2.6	9.7	12.7	12.9	8.6	11.6	11.7
Prop In Lane	1.00		1.00	0.50		1.00	1.00		0.73	1.00		0.47
Lane Grp Cap(c), veh/h	506	549	465	280	0	465	242	543	505	216	516	501
V/C Ratio(X)	0.29	0.61	0.27	0.39	0.00	0.16	0.96	0.64	0.65	0.95	0.61	0.62
Avail Cap(c_a), veh/h	506	549	465	280	0	465	242	543	505	216	516	501
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	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.7	22.8	20.3	24.3	0.0	19.6	32.2	22.5	22.6	32.7	23.0	23.0
Incr Delay (d2), s/veh	0.3	2.0	0.3	0.9	0.0	0.2	46.0	2.6	2.9	46.7	2.2	2.3
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(95%),veh/ln	3.5	8.9	3.0	3.3	0.0	1.7	11.3	8.9	8.6	10.4	8.3	8.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	21.0	24.9	20.6	25.2	0.0	19.8	78.2	25.1	25.5	79.5	25.1	25.4
LnGrp LOS	C	C	C	C	A	B	E	C	C	E	C	C
Approach Vol, veh/h		609			184			907			833	
Approach Delay, s/veh		23.1			23.0			38.8			38.6	
Approach LOS		C			C			D			D	

Timer - Assigned Phs	1	2	4	5	6	8
Phs Duration (G+Y+Rc), s	16.1	26.4	26.7	17.2	25.3	26.7
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	11.1	24.9	24.0	12.2	23.8	24.0
Max Q Clear Time (g_c+I1), s	11.6	15.9	14.6	12.7	14.7	19.0
Green Ext Time (p_c), s	0.0	2.0	1.9	0.0	1.8	0.3

Intersection Summary	
HCM 6th Ctrl Delay	33.8
HCM 6th LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	45	74	184	136	154	42	291	271	149	6	33	11
Future Volume (veh/h)	45	74	184	136	154	42	291	271	149	6	33	11
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	49	80	160	148	167	23	316	295	80	7	36	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	134	358	304	267	429	59	505	503	449	73	388	56
Arrive On Green	0.08	0.19	0.19	0.15	0.27	0.27	0.28	0.28	0.28	0.14	0.14	0.14
Sat Flow, veh/h	1781	1870	1585	1781	1609	222	1781	1777	1585	513	2737	394
Grp Volume(v), veh/h	49	80	160	148	0	190	316	295	80	25	0	23
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	0	1830	1781	1777	1585	1845	0	1799
Q Serve(g_s), s	3.1	4.3	10.9	9.2	0.0	10.2	18.5	17.1	4.6	1.4	0.0	1.3
Cycle Q Clear(g_c), s	3.1	4.3	10.9	9.2	0.0	10.2	18.5	17.1	4.6	1.4	0.0	1.3
Prop In Lane	1.00		1.00	1.00		0.12	1.00		1.00	0.28		0.22
Lane Grp Cap(c), veh/h	134	358	304	267	0	488	505	503	449	261	0	255
V/C Ratio(X)	0.37	0.22	0.53	0.55	0.00	0.39	0.63	0.59	0.18	0.10	0.00	0.09
Avail Cap(c_a), veh/h	134	358	304	267	0	488	505	503	449	261	0	255
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	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	52.8	41.0	43.6	47.3	0.0	36.0	37.5	37.0	32.5	44.8	0.0	44.8
Incr Delay (d2), s/veh	1.7	0.3	1.7	2.5	0.0	0.5	2.4	1.8	0.2	0.2	0.0	0.2
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(95%),veh/ln	2.6	3.7	7.9	7.7	0.0	8.2	13.2	12.2	3.2	1.2	0.0	1.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	54.5	41.3	45.3	49.8	0.0	36.5	39.9	38.7	32.6	45.0	0.0	44.9
LnGrp LOS	D	D	D	D	A	D	D	D	C	D	A	D
Approach Vol, veh/h		289			338			691			48	
Approach Delay, s/veh		45.7			42.3			38.6			44.9	
Approach LOS		D			D			D			D	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		35.1	21.2	24.9		17.0	13.0	33.2				
Change Period (Y+Rc), s		5.0	5.0	5.0		5.0	5.0	5.0				
Max Green Setting (Gmax), s		36.0	20.0	25.0		19.0	11.0	34.0				
Max Q Clear Time (g_c+I1), s		21.5	12.2	13.9		4.4	6.1	13.2				
Green Ext Time (p_c), s		2.6	0.3	1.0		0.1	0.0	1.8				

Intersection Summary			
HCM 6th Ctrl Delay			41.2
HCM 6th LOS			D

HCM 6th Signalized Intersection Summary
17: Camino Ramon & Bishop Dr 03/16/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	136	17	42	16	12	8	151	1488	115	25	525	192
Future Volume (veh/h)	136	17	42	16	12	8	151	1488	115	25	525	192
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	148	18	46	17	13	9	164	1617	125	27	571	209
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	402	486	412	404	268	185	321	1672	128	53	892	326
Arrive On Green	0.26	0.26	0.26	0.26	0.26	0.26	0.18	0.50	0.50	0.03	0.35	0.35
Sat Flow, veh/h	1390	1870	1585	1395	1029	713	1781	3345	256	1781	2549	931
Grp Volume(v), veh/h	148	18	46	17	0	22	164	853	889	27	398	382
Grp Sat Flow(s),veh/h/ln	1390	1870	1585	1395	0	1742	1781	1777	1824	1781	1777	1703
Q Serve(g_s), s	9.1	0.7	2.2	0.9	0.0	0.9	8.3	46.1	47.6	1.5	18.7	18.8
Cycle Q Clear(g_c), s	11.3	0.7	2.2	3.2	0.0	0.9	8.3	46.1	47.6	1.5	18.7	18.8
Prop In Lane	1.00		1.00	1.00		0.41	1.00		0.14	1.00		0.55
Lane Grp Cap(c), veh/h	402	486	412	404	0	453	321	888	912	53	622	596
V/C Ratio(X)	0.37	0.04	0.11	0.04	0.00	0.05	0.51	0.96	0.97	0.51	0.64	0.64
Avail Cap(c_a), veh/h	402	486	412	404	0	453	321	888	912	53	622	596
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	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	32.5	27.6	28.2	29.4	0.0	27.7	37.0	24.0	24.4	47.8	27.2	27.2
Incr Delay (d2), s/veh	0.6	0.0	0.1	0.0	0.0	0.0	1.4	21.0	23.7	7.5	2.2	2.3
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(95%),veh/ln	5.6	0.6	1.5	0.6	0.0	0.7	6.5	30.2	32.4	1.4	12.5	12.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	33.1	27.7	28.3	29.4	0.0	27.8	38.4	45.0	48.1	55.2	29.4	29.6
LnGrp LOS	C	C	C	C	A	C	D	D	D	E	C	C
Approach Vol, veh/h		212			39			1906			807	
Approach Delay, s/veh		31.6			28.5			45.9			30.4	
Approach LOS		C			C			D			C	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	8.8	57.0		26.5	20.8	45.0		26.5
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	5.0	52.0		28.0	20.0	37.0		28.0
Max Q Clear Time (g_c+I1), s	4.5	50.6		14.3	11.3	21.8		6.2
Green Ext Time (p_c), s	0.0	1.4		0.6	0.3	6.7		0.1

Intersection Summary	
HCM 6th Ctrl Delay	40.4
HCM 6th LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	45	3	150	27	0	22	300	635	83	23	224	42
Future Volume (veh/h)	45	3	150	27	0	22	300	635	83	23	224	42
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	49	3	87	29	0	17	326	690	86	25	243	44
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	377	23	355	774	0	355	525	1289	159	86	530	95
Arrive On Green	0.22	0.22	0.22	0.22	0.00	0.22	0.15	0.28	0.28	0.05	0.18	0.18
Sat Flow, veh/h	1683	103	1585	3456	0	1585	3456	4603	569	1781	3013	537
Grp Volume(v), veh/h	52	0	87	29	0	17	326	509	267	25	142	145
Grp Sat Flow(s),veh/h/ln	1786	0	1585	1728	0	1585	1728	1702	1768	1781	1777	1774
Q Serve(g_s), s	2.9	0.0	5.6	0.8	0.0	1.1	11.0	15.8	16.0	1.7	8.9	9.2
Cycle Q Clear(g_c), s	2.9	0.0	5.6	0.8	0.0	1.1	11.0	15.8	16.0	1.7	8.9	9.2
Prop In Lane	0.94		1.00	1.00		1.00	1.00		0.32	1.00		0.30
Lane Grp Cap(c), veh/h	400	0	355	774	0	355	525	953	495	86	313	312
V/C Ratio(X)	0.13	0.00	0.25	0.04	0.00	0.05	0.62	0.53	0.54	0.29	0.45	0.47
Avail Cap(c_a), veh/h	400	0	355	774	0	355	525	953	495	86	313	312
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	38.8	0.0	39.8	38.0	0.0	38.0	49.6	38.1	38.2	57.5	46.1	46.2
Incr Delay (d2), s/veh	0.1	0.0	0.4	0.0	0.0	0.1	2.2	0.6	1.2	1.9	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(95%),veh/ln	2.4	0.0	4.1	0.6	0.0	0.8	8.6	11.0	11.6	1.5	7.3	7.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	38.9	0.0	40.2	38.0	0.0	38.1	51.9	38.7	39.4	59.3	47.1	47.3
LnGrp LOS	D	A	D	D	A	D	D	D	D	E	D	D
Approach Vol, veh/h		139			46			1102			312	
Approach Delay, s/veh		39.7			38.0			42.7			48.2	
Approach LOS		D			D			D			D	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	10.5	36.0		24.5	23.0	23.5		22.0
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	8.0	37.0		30.0	21.0	24.0		30.0
Max Q Clear Time (g_c+I1), s	4.7	19.0		8.6	14.0	12.2		4.1
Green Ext Time (p_c), s	0.0	3.5		0.5	0.9	0.9		0.1

Intersection Summary			
HCM 6th Ctrl Delay			43.4
HCM 6th LOS			D

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	34	542	306	369	331	401	299	477	707	300	477	36
Future Volume (veh/h)	34	542	306	369	331	401	299	477	707	300	477	36
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	37	589	170	401	360	0	325	518	496	326	518	27
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	71	759	306	438	1100		507	1398	623	346	1191	62
Arrive On Green	0.04	0.39	0.19	0.13	0.56	0.00	0.15	0.39	0.39	0.10	0.35	0.35
Sat Flow, veh/h	1781	3928	1585	3456	3928	1585	3456	3554	1585	3456	3436	179
Grp Volume(v), veh/h	37	589	170	401	360	0	325	518	496	326	267	278
Grp Sat Flow(s),veh/h/ln	1781	1964	1585	1728	1964	1585	1728	1777	1585	1728	1777	1838
Q Serve(g_s), s	3.1	19.7	14.5	17.2	7.4	0.0	13.3	15.5	41.4	14.1	17.4	17.4
Cycle Q Clear(g_c), s	3.1	19.7	14.5	17.2	7.4	0.0	13.3	15.5	41.4	14.1	17.4	17.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.10
Lane Grp Cap(c), veh/h	71	759	306	438	1100		507	1398	623	346	616	637
V/C Ratio(X)	0.52	0.78	0.55	0.92	0.33		0.64	0.37	0.80	0.94	0.43	0.44
Avail Cap(c_a), veh/h	71	759	306	438	1100		507	1398	623	346	616	637
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.99	0.99	0.99	0.89	0.89	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	70.6	43.1	54.7	64.7	25.4	0.0	60.3	32.3	40.2	67.1	37.7	37.7
Incr Delay (d2), s/veh	3.1	7.5	7.0	21.9	0.7	0.0	2.1	0.2	7.1	33.6	0.5	0.5
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(95%),veh/ln	2.6	13.5	10.4	13.4	5.8	0.0	9.9	10.8	23.6	12.3	12.0	12.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	73.7	50.7	61.7	86.7	26.1	0.0	62.4	32.5	47.3	100.6	38.2	38.2
LnGrp LOS	E	D	E	F	C		E	C	D	F	D	D
Approach Vol, veh/h		796			761	A		1339			871	
Approach Delay, s/veh		54.1			58.0			45.2			61.5	
Approach LOS		D			E			D			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	25.7	41.2	22.0	61.1	11.4	55.5	25.3	57.8
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	21.0	31.0	17.0	61.0	8.0	44.0	24.0	54.0
Max Q Clear Time (g_c+I1), s	20.2	22.7	17.1	44.4	6.1	10.4	16.3	20.4
Green Ext Time (p_c), s	0.2	2.3	0.0	6.7	0.0	1.6	0.3	5.8

Intersection Summary		
HCM 6th Ctrl Delay		53.5
HCM 6th LOS		D

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1464	12	0	742	0	0	0	49	1125	6	294
Future Volume (veh/h)	0	1464	12	0	742	0	0	0	49	1125	6	294
Initial Q (Qb), veh	0	20	0	0	15	0	0	0	0	7	7	7
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	0	2067	1870	0	2067	0	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	0	1591	13	0	807	0	0	0	53	1228	0	320
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	0	2	0	2	2	2	2	2	2
Cap, veh/h	0	3067	24	0	1631		0	0	54	1421	0	1255
Arrive On Green	0.00	0.86	0.43	0.00	0.86	0.00	0.00	0.00	0.03	0.39	0.00	0.39
Sat Flow, veh/h	0	7619	60	0	4134	0	0	0	1585	3563	0	3170
Grp Volume(v), veh/h	0	1158	446	0	807	0	0	0	53	1228	0	320
Grp Sat Flow(s),veh/h/ln	0	1778	2056	0	1964	0	0	0	1585	1781	0	1585
Q Serve(g_s), s	0.0	7.8	8.4	0.0	7.1	0.0	0.0	0.0	5.0	47.9	0.0	10.2
Cycle Q Clear(g_c), s	0.0	7.8	8.4	0.0	7.1	0.0	0.0	0.0	5.0	47.9	0.0	10.2
Prop In Lane	0.00		0.03	0.00		0.00	0.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	0	2230	865	0	1631		0	0	54	1421	0	1255
V/C Ratio(X)	0.00	0.52	0.52	0.00	0.49		0.00	0.00	0.97	0.86	0.00	0.25
Avail Cap(c_a), veh/h	0	2306	889	0	1698		0	0	85	1829	0	1627
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	0.26	0.26	0.00	1.00	0.00	0.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	8.9	9.1	0.0	9.4	0.0	0.0	0.0	72.4	41.9	0.0	30.8
Incr Delay (d2), s/veh	0.0	0.2	0.6	0.0	1.1	0.0	0.0	0.0	72.0	3.7	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.7	0.5	0.0	1.2	0.0	0.0	0.0	0.0	1.3	0.0	0.3
%ile BackOfQ(95%),veh/ln	0.0	5.0	5.7	0.0	7.6	0.0	0.0	0.0	5.6	30.3	0.0	8.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	9.8	10.1	0.0	11.7	0.0	0.0	0.0	144.4	46.8	0.0	31.2
LnGrp LOS	A	A	B	A	B		A	A	F	D	A	C
Approach Vol, veh/h		1604			807	A		53			1548	
Approach Delay, s/veh		9.9			11.7			144.4			43.6	
Approach LOS		A			B			F			D	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		71.9		66.0		71.9		12.1				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		46.0		79.0		46.0		10.0				
Max Q Clear Time (g_c+I1), s		11.4		50.9		10.1		8.0				
Green Ext Time (p_c), s		18.5		10.1		8.4		0.0				

Intersection Summary		
HCM 6th Ctrl Delay		25.0
HCM 6th LOS		C

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1583	444	0	428	863	339	0	1834	0	0	0
Future Volume (veh/h)	0	1583	444	0	428	863	339	0	1834	0	0	0
Initial Q (Qb), veh	0	25	0	0	10	0	8	0	21			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	0	2067	1870	0	2067	1870	1870	0	1870			
Adj Flow Rate, veh/h	0	1721	0	0	465	0	368	0	1445			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	0	2	2	0	2	2	2	0	2			
Cap, veh/h	0	2352		0	1917		747	0	1566			
Arrive On Green	0.00	0.99	0.00	0.00	0.99	0.00	0.41	0.00	0.41			
Sat Flow, veh/h	0	5830	1585	0	4031	1585	1781	0	3614			
Grp Volume(v), veh/h	0	1721	0	0	465	0	368	0	1445			
Grp Sat Flow(s),veh/h/ln	0	1881	1585	0	1964	1585	1781	0	1205			
Q Serve(g_s), s	0.0	1.2	0.0	0.0	0.2	0.0	23.0	0.0	58.8			
Cycle Q Clear(g_c), s	0.0	1.2	0.0	0.0	0.2	0.0	23.0	0.0	58.8			
Prop In Lane	0.00		1.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	0	2352		0	1917		747	0	1566			
V/C Ratio(X)	0.00	0.73		0.00	0.24		0.49	0.00	0.92			
Avail Cap(c_a), veh/h	0	2794		0	1945		1009	0	2048			
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.00	1.00	0.00	0.00	0.47	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	0.0	12.3	0.0	0.0	1.5	0.0	32.7	0.0	41.8			
Incr Delay (d2), s/veh	0.0	2.1	0.0	0.0	0.1	0.0	0.2	0.0	5.5			
Initial Q Delay(d3),s/veh	0.0	3.0	0.0	0.0	0.3	0.0	1.6	0.0	16.8			
%ile BackOfQ(95%),veh/ln	0.0	12.4	0.0	0.0	1.4	0.0	17.2	0.0	28.7			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	17.4	0.0	0.0	1.9	0.0	34.5	0.0	64.1			
LnGrp LOS	A	B		A	A		C	A	E			
Approach Vol, veh/h		1721	A		465	A		1813				
Approach Delay, s/veh		17.4			1.9			58.1				
Approach LOS		B			A			E				

Timer - Assigned Phs		2				6		8				
Phs Duration (G+Y+Rc), s		81.3				81.3		68.7				
Change Period (Y+Rc), s		5.0				5.0		5.0				
Max Green Setting (Gmax), s		53.0				53.0		87.0				
Max Q Clear Time (g_c+I1), s		4.2				3.2		61.8				
Green Ext Time (p_c), s		37.2				7.6		1.9				

Intersection Summary		
HCM 6th Ctrl Delay		34.0
HCM 6th LOS		C

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	862	2073	610	184	2228	124	49	9	38	77	38	301
Future Volume (veh/h)	862	2073	610	184	2228	124	49	9	38	77	38	301
Initial Q (Qb), veh	16	20	0	0	10	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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	937	2253	0	200	2422	135	60	0	41	62	71	327
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	760	2884		1091	3595	801	123	0	55	95	100	866
Arrive On Green	0.22	0.81	0.00	0.32	1.00	0.51	0.03	0.00	0.03	0.05	0.05	0.05
Sat Flow, veh/h	3456	7111	1585	3456	7111	1585	3563	0	1585	1781	1870	3170
Grp Volume(v), veh/h	937	2253	0	200	2422	135	60	0	41	62	71	327
Grp Sat Flow(s),veh/h/ln	1728	1778	1585	1728	1778	1585	1781	0	1585	1781	1870	1585
Q Serve(g_s), s	33.0	24.9	0.0	6.2	0.0	6.9	2.5	0.0	3.8	5.1	5.6	8.0
Cycle Q Clear(g_c), s	33.0	24.9	0.0	6.2	0.0	6.9	2.5	0.0	3.8	5.1	5.6	8.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	760	2884		1091	3595	801	123	0	55	95	100	866
V/C Ratio(X)	1.23	0.78		0.18	0.67	0.17	0.49	0.00	0.75	0.65	0.71	0.38
Avail Cap(c_a), veh/h	760	2987		1112	3595	801	879	0	391	95	100	866
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.16	0.16	0.00	0.34	0.34	0.34	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	58.5	11.1	0.0	37.3	0.0	20.0	71.1	0.0	71.8	69.6	69.9	44.2
Incr Delay (d2), s/veh	106.6	0.4	0.0	0.0	0.4	0.2	3.0	0.0	18.5	14.8	21.0	0.3
Initial Q Delay(d3),s/veh	75.8	1.6	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	40.6	6.2	0.0	4.2	0.2	4.1	2.2	0.0	3.3	5.0	5.9	8.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	240.9	13.0	0.0	37.3	0.5	20.2	74.1	0.0	90.3	84.4	90.9	44.4
LnGrp LOS	F	B		D	A	C	E	A	F	F	F	D
Approach Vol, veh/h		3190	A		2757			101			460	
Approach Delay, s/veh		80.0			4.2			80.7			57.0	
Approach LOS		E			A			F			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	55.3	67.6		12.2	40.0	82.8		15.0
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	16.0	65.0		39.0	35.0	46.0		10.0
Max Q Clear Time (g_c+I1), s	19.2	27.9		6.8	36.0	9.9		11.0
Green Ext Time (p_c), s	0.4	34.6		0.4	0.0	34.7		0.0

Intersection Summary			
HCM 6th Ctrl Delay			46.2
HCM 6th LOS			D

Notes

User approved volume balancing among the lanes for turning movement.
User approved changes to right turn type.
Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	699	1057	491	116	2166	512	81	55	14	200	110	384
Future Volume (veh/h)	699	1057	491	116	2166	512	81	55	14	200	110	384
Initial Q (Qb), veh	0	50	0	0	10	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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	760	1149	381	126	2354	410	88	60	14	217	311	247
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	760	3828	853	150	2572	573	95	74	63	684	333	631
Arrive On Green	0.22	1.00	0.54	0.04	0.72	0.36	0.05	0.04	0.04	0.19	0.18	0.18
Sat Flow, veh/h	3456	7111	1585	3456	7111	1585	1781	1870	1585	3563	1870	1585
Grp Volume(v), veh/h	760	1149	381	126	2354	410	88	60	14	217	311	247
Grp Sat Flow(s),veh/h/ln	1728	1778	1585	1728	1778	1585	1781	1870	1585	1781	1870	1585
Q Serve(g_s), s	33.0	0.0	16.2	5.4	40.6	19.9	7.4	4.8	1.1	7.9	24.6	11.7
Cycle Q Clear(g_c), s	33.0	0.0	16.2	5.4	40.6	19.9	7.4	4.8	1.1	7.9	24.6	11.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	760	3828	853	150	2572	573	95	74	63	684	333	631
V/C Ratio(X)	1.00	0.30	0.45	0.84	0.92	0.72	0.93	0.81	0.22	0.32	0.93	0.39
Avail Cap(c_a), veh/h	760	3828	853	230	2572	573	95	287	243	684	387	676
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.75	0.75	0.75	0.80	0.80	0.80	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	58.5	0.0	11.5	71.2	19.2	14.6	70.7	71.5	54.7	52.1	60.7	16.9
Incr Delay (d2), s/veh	28.2	0.2	1.3	12.4	5.3	6.0	68.6	18.3	1.8	0.3	27.3	0.4
Initial Q Delay(d3),s/veh	0.0	1.8	0.0	0.0	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	28.1	0.5	9.2	4.8	14.8	12.0	8.9	4.8	1.0	6.3	20.2	7.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	86.7	1.9	12.8	83.7	25.8	20.6	139.3	89.7	56.5	52.4	88.0	17.3
LnGrp LOS	F	A	B	F	C	C	F	F	E	D	F	B
Approach Vol, veh/h		2290			2890			162			775	
Approach Delay, s/veh		31.9			27.6			113.8			55.5	
Approach LOS		C			C			F			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	13.5	87.7	35.8	13.0	40.0	61.3	15.0	33.7
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	12.0	75.0	18.0	25.0	35.0	52.0	10.0	33.0
Max Q Clear Time (g_c+I1), s	8.4	19.2	10.9	7.8	36.0	43.6	10.4	27.6
Green Ext Time (p_c), s	0.1	28.7	0.5	0.2	0.0	8.3	0.0	1.2

Intersection Summary		
HCM 6th Ctrl Delay		35.0
HCM 6th LOS		D

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	30	1235	68	0	2851	25	48	2	45	30	1	126
Future Volume (veh/h)	30	1235	68	0	2851	25	48	2	45	30	1	126
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	0	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	33	1342	74	0	3099	27	52	2	49	33	1	137
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	0	2	2	2	2	2	2	2	2
Cap, veh/h	21	5132	282	0	5902	51	54	6	155	36	1	143
Arrive On Green	0.02	1.00	0.74	0.00	1.00	1.00	0.03	0.10	0.10	0.02	0.09	0.09
Sat Flow, veh/h	1781	6949	382	0	9069	76	1781	63	1532	1781	11	1575
Grp Volume(v), veh/h	33	1029	387	0	2392	734	52	0	51	33	0	138
Grp Sat Flow(s),veh/h/ln	1781	1778	1998	0	1674	2054	1781	0	1595	1781	0	1587
Q Serve(g_s), s	1.7	0.0	1.9	0.0	0.0	0.0	4.4	0.0	4.5	2.8	0.0	13.0
Cycle Q Clear(g_c), s	1.7	0.0	1.9	0.0	0.0	0.0	4.4	0.0	4.5	2.8	0.0	13.0
Prop In Lane	1.00		0.19	0.00		0.04	1.00		0.96	1.00		0.99
Lane Grp Cap(c), veh/h	21	3939	1476	0	4557	1397	54	0	162	36	0	144
V/C Ratio(X)	1.60	0.26	0.26	0.00	0.52	0.53	0.96	0.00	0.32	0.93	0.00	0.96
Avail Cap(c_a), veh/h	59	3939	1476	0	4557	1397	119	0	276	166	0	317
HCM Platoon Ratio	2.00	2.00	1.00	1.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.96	0.96	0.96	0.00	0.77	0.77	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	73.3	0.0	1.0	0.0	0.0	0.0	72.6	0.0	62.6	73.4	0.0	67.9
Incr Delay (d2), s/veh	326.5	0.2	0.4	0.0	0.3	1.1	47.4	0.0	1.1	52.9	0.0	25.4
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(95%),veh/ln	4.8	0.1	1.3	0.0	0.2	0.8	4.9	0.0	3.4	3.2	0.0	10.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	399.8	0.2	1.4	0.0	0.3	1.1	120.0	0.0	63.7	126.3	0.0	93.3
LnGrp LOS	F	A	A	A	A	A	F	A	E	F	A	F
Approach Vol, veh/h		1449			3126			103			171	
Approach Delay, s/veh		9.6			0.5			92.1			99.6	
Approach LOS		A			A			F			F	

Timer - Assigned Phs	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	117.8	11.6	20.7	8.7	109.0	10.0	22.2
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	91.0	12.0	32.0	7.0	79.0	16.0	28.0
Max Q Clear Time (g_c+I1), s	4.9	7.4	15.0	3.7	3.0	4.8	7.5
Green Ext Time (p_c), s	38.6	0.0	0.7	0.0	75.0	0.0	0.2

Intersection Summary	
HCM 6th Ctrl Delay	8.7
HCM 6th LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	26	945	258	36	2543	2	328	2	36	6	0	9
Future Volume (veh/h)	26	945	258	36	2543	2	328	2	36	6	0	9
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	28	1027	280	39	2764	2	358	0	39	7	0	10
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	40	4733	1055	51	4967	4	412	0	183	6	0	6
Arrive On Green	0.02	1.00	0.67	0.03	1.00	0.67	0.12	0.00	0.12	0.00	0.00	0.00
Sat Flow, veh/h	1781	7111	1585	1781	7394	5	3563	0	1585	1781	0	1585
Grp Volume(v), veh/h	28	1027	280	39	1994	772	358	0	39	7	0	10
Grp Sat Flow(s),veh/h/ln	1781	1778	1585	1781	1778	2066	1781	0	1585	1781	0	1585
Q Serve(g_s), s	2.3	0.0	10.8	3.3	0.0	0.1	14.8	0.0	3.3	0.5	0.0	0.5
Cycle Q Clear(g_c), s	2.3	0.0	10.8	3.3	0.0	0.1	14.8	0.0	3.3	0.5	0.0	0.5
Prop In Lane	1.00		1.00	1.00		0.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	40	4733	1055	51	3583	1388	412	0	183	6	0	6
V/C Ratio(X)	0.70	0.22	0.27	0.77	0.56	0.56	0.87	0.00	0.21	1.10	0.00	1.76
Avail Cap(c_a), veh/h	95	4733	1055	107	3583	1388	689	0	306	95	0	85
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.97	0.97	0.97	0.22	0.22	0.22	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	72.8	0.0	10.2	72.4	0.0	0.0	65.2	0.0	60.1	74.7	0.0	74.7
Incr Delay (d2), s/veh	19.5	0.1	0.6	5.3	0.1	0.4	6.5	0.0	0.6	196.4	0.0	459.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	2.3	0.1	7.1	2.5	0.1	0.3	11.5	0.0	2.5	1.1	0.0	1.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	92.4	0.1	10.8	77.6	0.1	0.4	71.7	0.0	60.7	271.1	0.0	534.6
LnGrp LOS	F	A	B	E	A	A	E	A	E	F	A	F
Approach Vol, veh/h		1335			2805			397			17	
Approach Delay, s/veh		4.3			1.3			70.6			426.1	
Approach LOS		A			A			E			F	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	11.3	106.8		7.5	10.4	107.8		24.3
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	11.0	78.0		10.0	10.0	79.0		31.0
Max Q Clear Time (g_c+I1), s	16.3	13.8		3.5	5.3	3.1		17.8
Green Ext Time (p_c), s	0.0	28.6		0.0	0.0	73.4		1.5

Intersection Summary	
HCM 6th Ctrl Delay	9.8
HCM 6th LOS	A

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	206	751	164	270	1997	443	564	467	199	150	225	182
Future Volume (veh/h)	206	751	164	270	1997	443	564	467	199	150	225	182
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	224	816	150	293	2171	337	613	508	151	163	245	139
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	190	2265	636	312	2651	745	553	647	289	189	273	122
Arrive On Green	0.11	0.80	0.40	0.17	0.94	0.47	0.16	0.18	0.18	0.05	0.08	0.08
Sat Flow, veh/h	1781	5644	1585	1781	5644	1585	3456	3554	1585	3456	3554	1585
Grp Volume(v), veh/h	224	816	150	293	2171	337	613	508	151	163	245	139
Grp Sat Flow(s),veh/h/ln	1781	1881	1585	1781	1881	1585	1728	1777	1585	1728	1777	1585
Q Serve(g_s), s	16.0	6.0	9.4	24.4	15.1	12.3	24.0	20.5	12.9	7.0	10.3	8.5
Cycle Q Clear(g_c), s	16.0	6.0	9.4	24.4	15.1	12.3	24.0	20.5	12.9	7.0	10.3	8.5
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	190	2265	636	312	2651	745	553	647	289	189	273	122
V/C Ratio(X)	1.18	0.36	0.24	0.94	0.82	0.45	1.11	0.78	0.52	0.86	0.90	1.14
Avail Cap(c_a), veh/h	190	2265	636	451	2651	745	553	900	402	276	616	275
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.98	0.98	0.98	1.00	1.00	1.00	0.91	0.91	0.91	1.00	1.00	1.00
Uniform Delay (d), s/veh	67.0	9.4	29.7	61.1	2.9	8.8	63.0	58.5	55.5	70.3	68.6	37.7
Incr Delay (d2), s/veh	121.2	0.4	0.9	22.3	3.0	2.0	70.0	1.8	0.5	16.5	4.2	72.4
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(95%),veh/ln	21.0	3.9	6.8	18.7	4.2	8.1	23.3	14.2	8.8	6.4	8.4	10.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	188.2	9.9	30.5	83.4	5.8	10.8	133.0	60.3	55.9	86.9	72.8	110.1
LnGrp LOS	F	A	C	F	A	B	F	E	E	F	E	F
Approach Vol, veh/h		1190			2801			1272			547	
Approach Delay, s/veh		46.0			14.5			94.8			86.5	
Approach LOS		D			B			F			F	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	15.2	34.3	23.0	77.5	31.0	18.5	33.2	67.2
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	14.0	40.0	18.0	58.0	26.0	28.0	40.0	36.0
Max Q Clear Time (g_c+I1), s	10.0	23.5	19.0	18.1	27.0	13.3	27.4	12.4
Green Ext Time (p_c), s	0.2	0.5	0.0	37.2	0.0	0.3	0.9	12.7

Intersection Summary	
HCM 6th Ctrl Delay	45.3
HCM 6th LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	322	618	173	268	1394	227	702	679	299	357	459	685
Future Volume (veh/h)	322	618	173	268	1394	227	702	679	299	357	459	685
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1969	1870	1870	1969	1870	1870	1969	1870	1870	1969	1870
Adj Flow Rate, veh/h	350	672	134	291	1515	138	763	738	189	388	499	473
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	292	950	403	318	1406	415	585	1687	498	431	1447	427
Arrive On Green	0.08	0.25	0.25	0.09	0.26	0.26	0.17	0.31	0.31	0.12	0.27	0.27
Sat Flow, veh/h	3456	3741	1585	3456	5375	1585	3456	5375	1585	3456	5375	1585
Grp Volume(v), veh/h	350	672	134	291	1515	138	763	738	189	388	499	473
Grp Sat Flow(s),veh/h/ln	1728	1870	1585	1728	1792	1585	1728	1792	1585	1728	1792	1585
Q Serve(g_s), s	11.0	21.2	9.0	10.9	34.0	9.2	22.0	14.2	12.1	14.4	9.7	35.0
Cycle Q Clear(g_c), s	11.0	21.2	9.0	10.9	34.0	9.2	22.0	14.2	12.1	14.4	9.7	35.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	292	950	403	318	1406	415	585	1687	498	431	1447	427
V/C Ratio(X)	1.20	0.71	0.33	0.91	1.08	0.33	1.30	0.44	0.38	0.90	0.34	1.11
Avail Cap(c_a), veh/h	292	950	403	346	1406	415	585	1687	498	585	1447	427
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	59.5	44.1	39.5	58.5	48.0	38.8	54.0	35.5	34.7	56.1	38.3	47.5
Incr Delay (d2), s/veh	117.0	4.4	2.2	26.7	47.9	2.2	149.2	0.2	0.5	13.8	0.1	76.3
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(95%),veh/ln	15.6	15.7	6.8	9.9	30.2	6.9	33.0	10.4	8.3	11.5	7.7	32.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	176.5	48.5	41.7	85.2	95.9	41.0	203.2	35.6	35.2	69.9	38.4	123.8
LnGrp LOS	F	D	D	F	F	D	F	D	D	E	D	F
Approach Vol, veh/h		1156			1944			1690			1360	
Approach Delay, s/veh		86.5			90.4			111.3			77.1	
Approach LOS		F			F			F			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	19.0	40.0	29.0	42.0	18.0	41.0	23.2	47.8
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	15.0	34.0	24.0	37.0	13.0	36.0	24.0	37.0
Max Q Clear Time (g_c+I1), s	13.9	24.2	25.0	38.0	14.0	37.0	17.4	17.2
Green Ext Time (p_c), s	0.1	3.5	0.0	0.0	0.0	0.0	0.8	5.8

Intersection Summary	
HCM 6th Ctrl Delay	92.5
HCM 6th LOS	F

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	228	589	549	322	570	497
Future Volume (veh/h)	228	589	549	322	570	497
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	248	448	597	245	620	540
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	277	810	628	257	633	2448
Arrive On Green	0.16	0.16	0.26	0.26	0.36	0.69
Sat Flow, veh/h	1781	1585	2552	1008	1781	3647
Grp Volume(v), veh/h	248	448	431	411	620	540
Grp Sat Flow(s),veh/h/ln	1781	1585	1777	1689	1781	1777
Q Serve(g_s), s	12.3	14.0	21.5	21.5	31.0	5.0
Cycle Q Clear(g_c), s	12.3	14.0	21.5	21.5	31.0	5.0
Prop In Lane	1.00	1.00		0.60	1.00	
Lane Grp Cap(c), veh/h	277	810	454	432	633	2448
V/C Ratio(X)	0.90	0.55	0.95	0.95	0.98	0.22
Avail Cap(c_a), veh/h	277	810	454	432	633	2448
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	37.3	15.0	32.9	33.0	28.7	5.1
Incr Delay (d2), s/veh	28.8	0.8	29.8	31.1	30.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	12.0	10.2	18.2	17.7	24.3	2.6
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	66.0	15.8	62.7	64.1	59.0	5.2
LnGrp LOS	E	B	E	E	E	A
Approach Vol, veh/h	696		842			1160
Approach Delay, s/veh	33.7		63.4			34.0
Approach LOS	C		E			C

Timer - Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	39.0	29.9				68.9		21.0
Change Period (Y+Rc), s	5.0	5.0				5.0		5.0
Max Green Setting (Gmax), s	34.0	25.0				64.0		16.0
Max Q Clear Time (g_c+I1), s	14.0	24.5				8.0		17.0
Green Ext Time (p_c), s	0.0	0.3				3.8		0.0

Intersection Summary		
HCM 6th Ctrl Delay		43.1
HCM 6th LOS		D

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Volume (veh/h)	304	228	39	502	191	39
Future Volume (veh/h)	304	228	39	502	191	39
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	330	118	42	546	208	20
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	969	432	162	1745	453	403
Arrive On Green	0.27	0.27	0.09	0.49	0.25	0.25
Sat Flow, veh/h	3647	1585	1781	3647	1781	1585
Grp Volume(v), veh/h	330	118	42	546	208	20
Grp Sat Flow(s),veh/h/ln	1777	1585	1781	1777	1781	1585
Q Serve(g_s), s	4.1	3.2	1.2	5.1	5.4	0.5
Cycle Q Clear(g_c), s	4.1	3.2	1.2	5.1	5.4	0.5
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	969	432	162	1745	453	403
V/C Ratio(X)	0.34	0.27	0.26	0.31	0.46	0.05
Avail Cap(c_a), veh/h	969	432	162	1745	453	403
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	16.0	15.7	23.3	8.4	17.3	15.5
Incr Delay (d2), s/veh	0.2	0.3	0.8	0.1	0.7	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	2.6	1.9	0.9	2.6	3.9	1.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	16.2	16.1	24.1	8.5	18.0	15.5
LnGrp LOS	B	B	C	A	B	B
Approach Vol, veh/h	448			588	228	
Approach Delay, s/veh	16.2			9.6	17.8	
Approach LOS	B			A	B	

Timer - Assigned Phs		2		4	5	6
Phs Duration (G+Y+Rc), s		27.6		17.3	9.7	17.9
Change Period (Y+Rc), s		5.0		5.0	5.0	5.0
Max Green Setting (Gmax), s		29.0		16.0	7.0	17.0
Max Q Clear Time (g_c+I1), s		8.1		8.4	4.2	7.1
Green Ext Time (p_c), s		3.4		0.4	0.0	1.7

Intersection Summary			
HCM 6th Ctrl Delay			13.4
HCM 6th LOS			B

Notes

User approved pedestrian interval to be less than phase max green.

Movement	WBL	WBR	NBT	NBR	SBL	SBT		
Lane Configurations								
Traffic Volume (veh/h)	488	286	263	287	187	237		
Future Volume (veh/h)	488	286	263	287	187	237		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Work Zone On Approach	No		No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870		
Adj Flow Rate, veh/h	559	280	286	312	203	258		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92		
Percent Heavy Veh, %	2	2	2	2	2	2		
Cap, veh/h	775	345	423	378	224	1789		
Arrive On Green	0.22	0.22	0.24	0.24	0.13	0.50		
Sat Flow, veh/h	3563	1585	1870	1585	1781	3647		
Grp Volume(v), veh/h	559	280	286	312	203	258		
Grp Sat Flow(s),veh/h/ln	1781	1585	1777	1585	1781	1777		
Q Serve(g_s), s	7.3	8.4	7.3	9.4	5.6	1.9		
Cycle Q Clear(g_c), s	7.3	8.4	7.3	9.4	5.6	1.9		
Prop In Lane	1.00	1.00		1.00	1.00			
Lane Grp Cap(c), veh/h	775	345	423	378	224	1789		
V/C Ratio(X)	0.72	0.81	0.68	0.83	0.91	0.14		
Avail Cap(c_a), veh/h	995	442	531	474	355	2267		
HCM Platoon Ratio	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		
Uniform Delay (d), s/veh	18.2	18.7	17.3	18.1	21.6	6.7		
Incr Delay (d2), s/veh	1.9	8.7	2.4	9.4	18.1	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(95%),veh/ln	5.1	6.4	5.3	7.2	5.9	1.0		
Unsig. Movement Delay, s/veh								
LnGrp Delay(d),s/veh	20.1	27.3	19.7	27.5	39.8	6.7		
LnGrp LOS	C	C	B	C	D	A		
Approach Vol, veh/h	839		598			461		
Approach Delay, s/veh	22.5		23.8			21.3		
Approach LOS	C		C			C		
Timer - Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	13.3	19.0				32.2		17.9
Change Period (Y+Rc), s	5.0	5.0				5.0		5.0
Max Green Setting (Gmax), s	12.0	17.0				34.0		16.0
Max Q Clear Time (g_c+I1), s	8.6	12.4				4.9		11.4
Green Ext Time (p_c), s	0.2	1.6				1.7		1.5
Intersection Summary								
HCM 6th Ctrl Delay			22.6					
HCM 6th LOS			C					

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	228	106	134	793	1974	463
Future Volume (veh/h)	228	106	134	793	1974	463
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	248	115	146	862	2146	503
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	264	235	159	3736	2432	542
Arrive On Green	0.15	0.15	0.09	0.73	0.58	0.58
Sat Flow, veh/h	1781	1585	1781	5274	4344	931
Grp Volume(v), veh/h	248	115	146	862	1729	920
Grp Sat Flow(s),veh/h/ln	1781	1585	1781	1702	1702	1703
Q Serve(g_s), s	16.1	7.8	9.5	6.4	50.3	57.2
Cycle Q Clear(g_c), s	16.1	7.8	9.5	6.4	50.3	57.2
Prop In Lane	1.00	1.00	1.00			0.55
Lane Grp Cap(c), veh/h	264	235	159	3736	1983	992
V/C Ratio(X)	0.94	0.49	0.92	0.23	0.87	0.93
Avail Cap(c_a), veh/h	290	258	168	3807	2013	1007
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	49.2	45.6	52.7	5.1	20.7	22.1
Incr Delay (d2), s/veh	35.2	1.6	45.7	0.0	4.5	14.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	14.8	11.3	10.2	3.2	25.9	31.8
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	84.3	47.2	98.4	5.1	25.1	36.1
LnGrp LOS	F	D	F	A	C	D
Approach Vol, veh/h	363			1008	2649	
Approach Delay, s/veh	72.6			18.6	29.0	
Approach LOS	E			B	C	

Timer - Assigned Phs		2		4	5	6
Phs Duration (G+Y+Rc), s		92.4		24.3	17.4	75.0
Change Period (Y+Rc), s		5.0		5.0	5.0	5.0
Max Green Setting (Gmax), s		89.0		21.0	13.0	71.0
Max Q Clear Time (g_c+I1), s		9.4		19.1	12.5	60.2
Green Ext Time (p_c), s		6.6		0.2	0.0	9.7

Intersection Summary		
HCM 6th Ctrl Delay		30.3
HCM 6th LOS		C

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	22	1057	150	91	1134	777	87	59	117	72	65	38
Future Volume (veh/h)	22	1057	150	91	1134	777	87	59	117	72	65	38
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	24	1149	109	99	1233	410	95	64	84	78	71	41
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	59	1436	641	163	1644	733	134	382	324	119	218	126
Arrive On Green	0.03	0.40	0.40	0.09	0.46	0.46	0.08	0.20	0.20	0.07	0.20	0.20
Sat Flow, veh/h	1781	3554	1585	1781	3554	1585	1781	1870	1585	1781	1112	642
Grp Volume(v), veh/h	24	1149	109	99	1233	410	95	64	84	78	0	112
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1777	1585	1781	1870	1585	1781	0	1755
Q Serve(g_s), s	1.6	34.2	5.3	6.4	34.3	22.5	6.3	3.4	5.3	5.1	0.0	6.6
Cycle Q Clear(g_c), s	1.6	34.2	5.3	6.4	34.3	22.5	6.3	3.4	5.3	5.1	0.0	6.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.37
Lane Grp Cap(c), veh/h	59	1436	641	163	1644	733	134	382	324	119	0	344
V/C Ratio(X)	0.40	0.80	0.17	0.61	0.75	0.56	0.71	0.17	0.26	0.66	0.00	0.33
Avail Cap(c_a), veh/h	59	1436	641	163	1644	733	134	382	324	119	0	344
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	0.82	0.82	0.82	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	56.8	31.5	22.9	52.4	26.5	23.4	54.2	39.3	40.1	54.7	0.0	41.4
Incr Delay (d2), s/veh	4.4	4.8	0.6	5.2	2.6	2.5	16.1	0.2	0.4	12.4	0.0	0.5
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(95%),veh/ln	1.4	21.1	3.7	5.5	19.7	12.9	6.1	2.9	3.8	4.8	0.0	5.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	61.2	36.2	23.4	57.6	29.2	25.9	70.4	39.6	40.5	67.1	0.0	42.0
LnGrp LOS	E	D	C	E	C	C	E	D	D	E	A	D
Approach Vol, veh/h		1282			1742			243			190	
Approach Delay, s/veh		35.6			30.0			51.9			52.3	
Approach LOS		D			C			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	16.1	66.3	13.8	23.9	9.4	73.0	15.0	22.7
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	13.0	50.5	10.0	26.5	6.0	57.5	11.0	25.5
Max Q Clear Time (g_c+I1), s	9.4	37.2	8.1	8.3	4.6	37.3	9.3	9.6
Green Ext Time (p_c), s	0.1	5.1	0.0	0.5	0.0	8.3	0.0	0.3

Intersection Summary	
HCM 6th Ctrl Delay	34.9
HCM 6th LOS	C

HCM 6th Signalized Intersection Summary
2: San Ramon Valley Blvd & Crow Canyon Rd

03/16/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	226	1191	73	539	1135	449	192	422	662	437	373	141
Future Volume (veh/h)	226	1191	73	539	1135	449	192	422	662	437	373	141
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	246	1295	63	586	1234	343	209	459	508	475	405	107
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	603	1388	431	610	1398	434	240	784	629	477	1028	458
Arrive On Green	0.17	0.54	0.27	0.18	0.55	0.27	0.07	0.22	0.22	0.14	0.29	0.29
Sat Flow, veh/h	3456	5106	1585	3456	5106	1585	3456	3554	1585	3456	3554	1585
Grp Volume(v), veh/h	246	1295	63	586	1234	343	209	459	508	475	405	107
Grp Sat Flow(s),veh/h/ln	1728	1702	1585	1728	1702	1585	1728	1777	1585	1728	1777	1585
Q Serve(g_s), s	9.2	34.1	4.4	24.4	30.7	20.8	8.7	16.8	32.0	19.9	13.3	4.9
Cycle Q Clear(g_c), s	9.2	34.1	4.4	24.4	30.7	20.8	8.7	16.8	32.0	19.9	13.3	4.9
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	603	1388	431	610	1398	434	240	784	629	477	1028	458
V/C Ratio(X)	0.41	0.93	0.15	0.96	0.88	0.79	0.87	0.59	0.81	1.00	0.39	0.23
Avail Cap(c_a), veh/h	603	1388	431	620	1831	568	357	784	629	477	1028	458
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.76	0.76	0.76	1.00	1.00	1.00	0.95	0.95	0.95	1.00	1.00	1.00
Uniform Delay (d), s/veh	53.2	31.9	40.0	59.2	30.8	24.9	66.8	50.6	38.8	62.5	41.3	17.0
Incr Delay (d2), s/veh	0.3	10.2	0.5	26.5	8.4	13.7	13.7	1.1	7.3	40.3	0.2	0.3
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(95%),veh/ln	6.8	16.4	3.2	18.6	15.5	14.5	7.6	12.0	23.7	16.9	9.8	5.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	53.5	42.1	40.6	85.7	39.1	38.6	80.5	51.6	46.1	102.7	41.6	17.2
LnGrp LOS	D	D	D	F	D	D	F	D	D	F	D	B
Approach Vol, veh/h		1604			2163			1176			987	
Approach Delay, s/veh		43.8			51.7			54.4			68.4	
Approach LOS		D			D			D			E	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	32.6	46.4	27.0	39.0	32.3	46.7	17.1	48.9				
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0				
Max Green Setting (Gmax), s	28.0	41.0	22.0	34.0	15.0	54.0	17.0	39.0				
Max Q Clear Time (g_c+I1), s	27.4	37.1	22.9	35.0	12.2	33.7	11.7	16.3				
Green Ext Time (p_c), s	0.2	2.4	0.0	0.0	0.3	8.0	0.4	2.2				
Intersection Summary												
HCM 6th Ctrl Delay			52.9									
HCM 6th LOS			D									

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	1636	1178	0	688	909
Future Volume (veh/h)	0	1636	1178	0	688	909
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	0	1870	1870	0	1870	1870
Adj Flow Rate, veh/h	0	1778	1280	0	748	988
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	0	2	2
Cap, veh/h	0	2572	2572		1381	1115
Arrive On Green	0.00	1.00	1.00	0.00	0.40	0.40
Sat Flow, veh/h	0	5443	5443	0	3456	2790
Grp Volume(v), veh/h	0	1778	1280	0	748	988
Grp Sat Flow(s),veh/h/ln	0	1702	1702	0	1728	1395
Q Serve(g_s), s	0.0	0.0	0.0	0.0	24.0	47.7
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	24.0	47.7
Prop In Lane	0.00			0.00	1.00	1.00
Lane Grp Cap(c), veh/h	0	2572	2572		1381	1115
V/C Ratio(X)	0.00	0.69	0.50		0.54	0.89
Avail Cap(c_a), veh/h	0	2572	2572		1573	1270
HCM Platoon Ratio	1.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	33.3	40.4
Incr Delay (d2), s/veh	0.0	1.6	0.7	0.0	0.3	7.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.0	0.7	0.3	0.0	15.5	24.2
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.0	1.6	0.7	0.0	33.7	47.6
LnGrp LOS	A	A	A		C	D
Approach Vol, veh/h		1778	1280	A	1736	
Approach Delay, s/veh		1.6	0.7		41.6	
Approach LOS		A	A		D	

Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		80.0		65.0		80.0
Change Period (Y+Rc), s		5.0		5.0		5.0
Max Green Setting (Gmax), s		67.0		68.0		67.0
Max Q Clear Time (g_c+I1), s		3.0		50.7		3.0
Green Ext Time (p_c), s		13.5		9.2		7.7

Intersection Summary	
HCM 6th Ctrl Delay	15.8
HCM 6th LOS	B

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1493	0	0	1580	490	890
Future Volume (veh/h)	1493	0	0	1580	490	890
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	0	0	1870	1870	1870
Adj Flow Rate, veh/h	1623	0	0	1717	500	1002
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	0	0	2	2	2
Cap, veh/h	2749	0	0	3464	650	1157
Arrive On Green	1.00	0.00	0.00	1.00	0.37	0.37
Sat Flow, veh/h	5443	0	0	6958	1781	3170
Grp Volume(v), veh/h	1623	0	0	1717	500	1002
Grp Sat Flow(s),veh/h/ln	1702	0	0	1609	1781	1585
Q Serve(g_s), s	0.0	0.0	0.0	0.0	35.9	42.5
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	35.9	42.5
Prop In Lane		0.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	2749	0	0	3464	650	1157
V/C Ratio(X)	0.59	0.00	0.00	0.50	0.77	0.87
Avail Cap(c_a), veh/h	2749	0	0	3464	848	1509
HCM Platoon Ratio	2.00	1.00	1.00	2.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	40.6	42.7
Incr Delay (d2), s/veh	0.9	0.0	0.0	0.5	3.2	4.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.4	0.0	0.0	0.2	23.0	24.2
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.9	0.0	0.0	0.5	43.8	47.2
LnGrp LOS	A	A	A	A	D	D
Approach Vol, veh/h	1623			1717	1502	
Approach Delay, s/veh	0.9			0.5	46.1	
Approach LOS	A			A	D	
Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		85.1		59.9		85.1
Change Period (Y+Rc), s		5.0		5.0		5.0
Max Green Setting (Gmax), s		64.0		71.0		64.0
Max Q Clear Time (g_c+I1), s		3.0		45.5		3.0
Green Ext Time (p_c), s		11.4		9.4		12.6
Intersection Summary						
HCM 6th Ctrl Delay			14.8			
HCM 6th LOS			B			

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	417	1507	384	110	1838	69	426	138	185	128	92	385
Future Volume (veh/h)	417	1507	384	110	1838	69	426	138	185	128	92	385
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	453	1638	417	120	1998	75	463	150	201	139	100	418
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	497	1927	716	424	2990	112	526	270	241	209	219	414
Arrive On Green	0.14	0.60	0.30	0.24	0.79	0.39	0.15	0.15	0.15	0.12	0.12	0.12
Sat Flow, veh/h	3456	6434	1585	1781	7594	285	3456	1777	1585	1781	1870	1585
Grp Volume(v), veh/h	453	1638	417	120	1594	479	463	150	201	139	100	418
Grp Sat Flow(s),veh/h/ln	1728	1609	1585	1781	1515	1819	1728	1777	1585	1781	1870	1585
Q Serve(g_s), s	18.7	30.1	28.4	8.0	17.1	20.3	19.0	11.3	17.9	10.8	7.2	17.0
Cycle Q Clear(g_c), s	18.7	30.1	28.4	8.0	17.1	20.3	19.0	11.3	17.9	10.8	7.2	17.0
Prop In Lane	1.00		1.00	1.00		0.16	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	497	1927	716	424	2386	716	526	270	241	209	219	414
V/C Ratio(X)	0.91	0.85	0.58	0.28	0.67	0.67	0.88	0.55	0.83	0.67	0.46	1.01
Avail Cap(c_a), veh/h	620	2485	853	424	2386	716	620	319	284	209	219	414
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.35	0.35	0.35	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	61.2	26.4	29.6	45.1	11.2	14.8	60.2	56.9	59.7	61.3	59.7	53.6
Incr Delay (d2), s/veh	15.6	4.9	3.4	0.1	0.5	1.8	12.4	1.8	16.5	7.8	1.5	46.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	14.2	13.4	21.0	5.4	5.1	7.8	14.3	9.0	13.0	9.2	6.4	28.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	76.7	31.3	33.0	45.3	11.7	16.6	72.6	58.7	76.2	69.0	61.2	100.4
LnGrp LOS	E	C	C	D	B	B	E	E	E	E	E	F
Approach Vol, veh/h		2508			2193			814			657	
Approach Delay, s/veh		39.8			14.6			70.9			87.8	
Approach LOS		D			B			E			F	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	41.5	50.4		24.0	27.8	64.1		29.1
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	20.0	58.0		19.0	28.0	50.0		28.0
Max Q Clear Time (g_c+I1), s	11.0	33.1		20.0	21.7	23.3		22.0
Green Ext Time (p_c), s	0.2	12.3		0.0	1.1	12.5		2.0

Intersection Summary	
HCM 6th Ctrl Delay	40.1
HCM 6th LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	76	1342	344	204	1188	348	900	333	197	488	214	176
Future Volume (veh/h)	76	1342	344	204	1188	348	900	333	197	488	214	176
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	83	1459	374	222	1291	378	978	362	214	530	233	191
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	95	1958	945	238	1722	503	1009	502	425	571	268	211
Arrive On Green	0.03	0.61	0.30	0.07	0.69	0.35	0.29	0.27	0.27	0.17	0.14	0.14
Sat Flow, veh/h	3456	6434	1585	3456	4980	1454	3456	1870	1585	3456	1894	1486
Grp Volume(v), veh/h	83	1459	374	222	1251	418	978	362	214	530	218	206
Grp Sat Flow(s),veh/h/ln	1728	1609	1585	1728	1609	1609	1728	1870	1585	1728	1777	1603
Q Serve(g_s), s	3.5	23.5	5.9	9.3	24.1	32.7	40.5	25.5	16.6	21.9	17.4	18.4
Cycle Q Clear(g_c), s	3.5	23.5	5.9	9.3	24.1	32.7	40.5	25.5	16.6	21.9	17.4	18.4
Prop In Lane	1.00		1.00	1.00		0.90	1.00		1.00	1.00		0.93
Lane Grp Cap(c), veh/h	95	1958	945	238	1668	556	1009	502	425	571	252	227
V/C Ratio(X)	0.87	0.74	0.40	0.93	0.75	0.75	0.97	0.72	0.50	0.93	0.87	0.91
Avail Cap(c_a), veh/h	95	1958	945	238	1668	556	1025	568	481	643	343	310
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.61	0.61	0.61	0.95	0.95	0.95	0.09	0.09	0.09	1.00	1.00	1.00
Uniform Delay (d), s/veh	70.2	24.3	5.6	67.2	18.3	39.6	50.7	48.1	44.9	59.7	60.9	61.3
Incr Delay (d2), s/veh	37.6	1.6	0.8	38.6	3.0	8.6	3.7	0.4	0.1	18.7	15.7	23.5
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(95%),veh/ln	3.6	9.5	4.9	9.0	9.4	19.8	19.9	13.6	7.8	16.6	13.9	13.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	107.8	26.0	6.3	105.8	21.3	48.3	54.5	48.5	44.9	78.4	76.6	84.8
LnGrp LOS	F	C	A	F	C	D	D	D	D	E	E	F
Approach Vol, veh/h		1916			1891			1554			954	
Approach Delay, s/veh		25.7			37.2			51.8			79.4	
Approach LOS		C			D			D			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	17.0	51.1	31.0	45.9	11.0	57.1	49.3	27.5
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	12.0	38.0	29.0	46.0	6.0	44.0	45.0	30.0
Max Q Clear Time (g_c+I1), s	11.3	26.5	24.9	28.5	6.5	35.7	43.5	21.4
Green Ext Time (p_c), s	0.0	6.8	1.0	2.2	0.0	5.0	0.8	1.2

Intersection Summary	
HCM 6th Ctrl Delay	43.7
HCM 6th LOS	D

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1651	344	255	1253	566	692
Future Volume (veh/h)	1651	344	255	1253	566	692
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	1795	374	277	1362	615	752
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	2667	828	316	3381	834	929
Arrive On Green	1.00	0.52	0.09	1.00	0.24	0.24
Sat Flow, veh/h	5274	1585	3456	5274	3456	2790
Grp Volume(v), veh/h	1795	374	277	1362	615	752
Grp Sat Flow(s),veh/h/ln	1702	1585	1728	1702	1728	1395
Q Serve(g_s), s	0.0	21.4	11.5	0.0	23.8	35.0
Cycle Q Clear(g_c), s	0.0	21.4	11.5	0.0	23.8	35.0
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	2667	828	316	3381	834	929
V/C Ratio(X)	0.67	0.45	0.88	0.40	0.74	0.81
Avail Cap(c_a), veh/h	2667	828	524	3381	834	929
HCM Platoon Ratio	2.00	1.00	1.00	2.00	1.00	1.00
Upstream Filter(I)	0.99	0.99	0.43	0.43	1.00	1.00
Uniform Delay (d), s/veh	0.0	21.7	65.0	0.0	50.8	44.2
Incr Delay (d2), s/veh	1.4	1.8	4.2	0.2	3.5	5.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.6	12.9	7.6	0.1	16.1	19.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	1.4	23.4	69.2	0.2	54.2	49.6
LnGrp LOS	A	C	E	A	D	D
Approach Vol, veh/h	2169			1639	1367	
Approach Delay, s/veh	5.2			11.8	51.7	
Approach LOS	A			B	D	

Timer - Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	20.3	82.7				103.0		42.0
Change Period (Y+Rc), s	5.0	5.0				5.0		5.0
Max Green Setting (Gmax), s	24.0	69.0				98.0		37.0
Max Q Clear Time (g_c+I1), s	14.5	24.4				3.0		38.0
Green Ext Time (p_c), s	0.8	16.9				8.5		0.0

Intersection Summary			
HCM 6th Ctrl Delay			19.6
HCM 6th LOS			B

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1103	337	848	685	268	910
Future Volume (veh/h)	1103	337	848	685	268	910
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	1199	257	922	745	291	772
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	1175	524	904	2296	851	1416
Arrive On Green	0.33	0.33	0.26	0.65	0.25	0.25
Sat Flow, veh/h	3647	1585	3456	3647	3456	2790
Grp Volume(v), veh/h	1199	257	922	745	291	772
Grp Sat Flow(s),veh/h/ln	1777	1585	1728	1777	1728	1395
Q Serve(g_s), s	43.0	16.8	34.0	12.2	9.0	24.5
Cycle Q Clear(g_c), s	43.0	16.8	34.0	12.2	9.0	24.5
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	1175	524	904	2296	851	1416
V/C Ratio(X)	1.02	0.49	1.02	0.32	0.34	0.55
Avail Cap(c_a), veh/h	1175	524	904	2296	851	1416
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.82	0.82	0.99	0.99
Uniform Delay (d), s/veh	43.5	34.7	48.0	10.3	40.3	21.8
Incr Delay (d2), s/veh	31.4	3.3	32.3	0.3	0.2	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	31.5	11.1	24.8	7.6	6.8	12.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	74.9	38.0	80.3	10.6	40.6	22.2
LnGrp LOS	F	D	F	B	D	C
Approach Vol, veh/h	1456			1667	1063	
Approach Delay, s/veh	68.4			49.1	27.2	
Approach LOS	E			D	C	

Timer - Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	41.0	51.8				92.8		37.2
Change Period (Y+Rc), s	5.0	5.0				5.0		5.0
Max Green Setting (Gmax), s	36.0	45.0				86.0		34.0
Max Q Clear Time (g_c+I1), s	37.0	46.0				15.2		27.5
Green Ext Time (p_c), s	0.0	0.0				3.6		2.9

Intersection Summary	
HCM 6th Ctrl Delay	50.3
HCM 6th LOS	D

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	61	333	7	233	286	95	12	115	387	71	291	121
Future Volume (veh/h)	61	333	7	233	286	95	12	115	387	71	291	121
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1796	1870	1870	1796	1870	1870	1870	1870	1870	1796
Adj Flow Rate, veh/h	66	362	8	253	311	103	13	125	0	77	316	132
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	160	569	13	303	633	206	25	236		91	372	380
Arrive On Green	0.09	0.16	0.16	0.17	0.24	0.24	0.14	0.14	0.00	0.25	0.25	0.25
Sat Flow, veh/h	1781	3555	78	1781	2636	857	175	1686	1585	363	1489	1522
Grp Volume(v), veh/h	66	181	189	253	208	206	138	0	0	393	0	132
Grp Sat Flow(s),veh/h/ln	1781	1777	1856	1781	1777	1716	1862	0	1585	1852	0	1522
Q Serve(g_s), s	3.5	9.5	9.5	13.7	10.1	10.4	6.9	0.0	0.0	20.2	0.0	7.1
Cycle Q Clear(g_c), s	3.5	9.5	9.5	13.7	10.1	10.4	6.9	0.0	0.0	20.2	0.0	7.1
Prop In Lane	1.00		0.04	1.00		0.50	0.09		1.00	0.20		1.00
Lane Grp Cap(c), veh/h	160	284	297	303	426	412	261	0		463	0	380
V/C Ratio(X)	0.41	0.64	0.64	0.84	0.49	0.50	0.53	0.00		0.85	0.00	0.35
Avail Cap(c_a), veh/h	160	284	297	303	426	412	261	0		463	0	380
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	43.0	39.3	39.3	40.1	32.7	32.8	39.9	0.0	0.0	35.7	0.0	30.8
Incr Delay (d2), s/veh	1.7	4.6	4.5	18.0	0.9	0.9	2.0	0.0	0.0	13.8	0.0	0.5
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(95%),veh/ln	2.9	7.9	8.2	11.8	7.7	7.7	5.8	0.0	0.0	16.2	0.0	4.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	44.7	43.9	43.8	58.2	33.6	33.8	42.0	0.0	0.0	49.5	0.0	31.3
LnGrp LOS	D	D	D	E	C	C	D	A		D	A	C
Approach Vol, veh/h		436			667			138	A		525	
Approach Delay, s/veh		43.9			43.0			42.0			45.0	
Approach LOS		D			D			D			D	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	13.2	30.5		18.0	22.9	20.8		30.6
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	11.0	26.0		16.0	19.0	18.0		27.0
Max Q Clear Time (g_c+I1), s	5.5	13.4		9.9	16.7	12.5		23.2
Green Ext Time (p_c), s	0.0	1.8		0.3	0.2	1.0		1.1

Intersection Summary	
HCM 6th Ctrl Delay	43.7
HCM 6th LOS	D

Notes

Unsignalized Delay for [NER] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	80	228	106	583	610	894	100	487	195	349	484	50
Future Volume (veh/h)	80	228	106	583	610	894	100	487	195	349	484	50
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	87	248	61	634	663	646	109	529	147	379	526	52
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	95	443	197	667	834	707	120	590	263	417	716	71
Arrive On Green	0.05	0.12	0.12	0.37	0.45	0.45	0.07	0.17	0.17	0.12	0.22	0.22
Sat Flow, veh/h	1781	3554	1585	1781	1870	1585	1781	3554	1585	3456	3267	322
Grp Volume(v), veh/h	87	248	61	634	663	646	109	529	147	379	285	293
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1870	1585	1781	1777	1585	1728	1777	1812
Q Serve(g_s), s	6.4	8.6	4.6	45.2	39.8	49.9	8.0	19.1	11.2	14.2	19.6	19.7
Cycle Q Clear(g_c), s	6.4	8.6	4.6	45.2	39.8	49.9	8.0	19.1	11.2	14.2	19.6	19.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.18
Lane Grp Cap(c), veh/h	95	443	197	667	834	707	120	590	263	417	390	397
V/C Ratio(X)	0.91	0.56	0.31	0.95	0.80	0.91	0.91	0.90	0.56	0.91	0.73	0.74
Avail Cap(c_a), veh/h	122	814	363	912	1257	1066	177	706	315	502	434	443
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	61.6	53.9	52.2	39.7	31.1	33.9	60.6	53.5	50.2	56.8	47.5	47.6
Incr Delay (d2), s/veh	48.5	1.1	0.9	15.8	2.1	8.5	32.3	12.6	1.9	18.2	5.6	5.6
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(95%),veh/ln	7.5	7.1	3.4	29.7	24.7	27.6	8.2	14.5	8.0	11.6	14.2	14.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	110.2	55.0	53.0	55.5	33.3	42.5	93.0	66.1	52.0	75.1	53.1	53.2
LnGrp LOS	F	E	D	E	C	D	F	E	D	E	D	D
Approach Vol, veh/h		396			1943			785			957	
Approach Delay, s/veh		66.8			43.6			67.2			61.8	
Approach LOS		E			D			E			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	56.0	23.3	22.8	28.7	14.0	65.3	15.8	35.7
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	60.0	32.0	21.0	28.0	11.0	90.0	15.0	34.0
Max Q Clear Time (g_c+I1), s	48.2	11.6	17.2	22.1	9.4	52.9	11.0	22.7
Green Ext Time (p_c), s	2.8	1.3	0.6	1.7	0.0	7.4	0.1	1.8

Intersection Summary	
HCM 6th Ctrl Delay	54.7
HCM 6th LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	22	634	267	74	1328	37	638	5	102	34	8	83
Future Volume (veh/h)	22	634	267	74	1328	37	638	5	102	34	8	83
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	24	689	290	80	1443	40	693	5	111	37	9	90
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	12	1425	636	88	1577	703	601	24	528	409	94	602
Arrive On Green	0.01	0.40	0.40	0.05	0.44	0.44	0.38	0.38	0.38	0.38	0.38	0.38
Sat Flow, veh/h	1781	3554	1585	1781	3554	1585	1430	63	1389	939	248	1585
Grp Volume(v), veh/h	24	689	290	80	1443	40	693	0	116	46	0	90
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1777	1585	1430	0	1452	1187	0	1585
Q Serve(g_s), s	0.8	17.8	16.6	5.5	47.0	1.8	38.1	0.0	6.7	2.2	0.0	4.6
Cycle Q Clear(g_c), s	0.8	17.8	16.6	5.5	47.0	1.8	47.0	0.0	6.7	8.9	0.0	4.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.96	0.80		1.00
Lane Grp Cap(c), veh/h	12	1425	636	88	1577	703	601	0	552	504	0	602
V/C Ratio(X)	2.06	0.48	0.46	0.91	0.91	0.06	1.15	0.00	0.21	0.09	0.00	0.15
Avail Cap(c_a), veh/h	43	1465	653	216	1810	807	601	0	552	504	0	602
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	61.5	27.5	27.2	58.5	32.2	19.6	40.3	0.0	25.9	27.6	0.0	25.2
Incr Delay (d2), s/veh	556.2	0.3	0.5	27.2	7.1	0.0	86.5	0.0	0.2	0.1	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	3.9	11.9	10.3	5.6	28.2	1.2	47.2	0.0	4.2	1.8	0.0	3.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	617.7	27.8	27.7	85.8	39.3	19.7	126.8	0.0	26.0	27.7	0.0	25.3
LnGrp LOS	F	C	C	F	D	B	F	A	C	C	A	C
Approach Vol, veh/h		1003			1563			809			136	
Approach Delay, s/veh		41.9			41.2			112.4			26.1	
Approach LOS		D			D			F			C	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	13.1	56.6		54.0	7.8	61.9		54.0				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	17.0	53.0		49.0	5.0	65.0		26.0				
Max Q Clear Time (g_c+I1), s	18.5	20.8		50.0	3.8	50.0		11.9				
Green Ext Time (p_c), s	0.1	4.9		0.0	0.0	6.9		0.4				

Intersection Summary			
HCM 6th Ctrl Delay			57.2
HCM 6th LOS			E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	163	396	65	81	595	351	327	915	224	289	504	277
Future Volume (veh/h)	163	396	65	81	595	351	327	915	224	289	504	277
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	177	430	68	88	647	377	355	995	134	314	548	296
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	173	839	132	173	589	343	356	1034	461	302	581	313
Arrive On Green	0.10	0.27	0.27	0.10	0.27	0.27	0.20	0.29	0.29	0.17	0.26	0.26
Sat Flow, veh/h	1781	3077	483	1781	2161	1259	1781	3554	1585	1781	2229	1202
Grp Volume(v), veh/h	177	247	251	88	532	492	355	995	134	314	437	407
Grp Sat Flow(s),veh/h/ln	1781	1777	1783	1781	1777	1644	1781	1777	1585	1781	1777	1654
Q Serve(g_s), s	16.0	19.4	19.6	7.7	45.0	45.0	32.9	45.5	10.8	28.0	39.8	39.9
Cycle Q Clear(g_c), s	16.0	19.4	19.6	7.7	45.0	45.0	32.9	45.5	10.8	28.0	39.8	39.9
Prop In Lane	1.00		0.27	1.00		0.77	1.00		1.00	1.00		0.73
Lane Grp Cap(c), veh/h	173	485	486	173	485	448	356	1034	461	302	463	431
V/C Ratio(X)	1.02	0.51	0.52	0.51	1.10	1.10	1.00	0.96	0.29	1.04	0.94	0.94
Avail Cap(c_a), veh/h	173	485	486	173	485	448	356	1034	461	302	463	431
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	74.5	50.7	50.8	70.8	60.0	60.0	65.9	57.6	45.3	68.5	59.8	59.8
Incr Delay (d2), s/veh	75.1	0.9	0.9	2.5	70.1	71.7	46.7	19.5	0.3	62.2	28.0	29.8
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(95%),veh/ln	16.5	13.6	13.8	6.6	40.6	38.2	26.6	30.8	7.7	25.3	28.9	27.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	149.6	51.6	51.7	73.2	130.1	131.7	112.6	77.1	45.7	130.7	87.8	89.6
LnGrp LOS	F	D	D	E	F	F	F	E	D	F	F	F
Approach Vol, veh/h		675			1112			1484			1158	
Approach Delay, s/veh		77.3			126.3			82.8			100.1	
Approach LOS		E			F			F			F	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	19.3	55.7	35.0	54.7	23.0	52.0	40.0	49.7
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	18.0	47.0	30.0	50.0	18.0	47.0	35.0	45.0
Max Q Clear Time (g_c+I1), s	10.7	22.6	31.0	48.5	19.0	48.0	35.9	42.9
Green Ext Time (p_c), s	0.1	1.9	0.0	0.9	0.0	0.0	0.0	0.9

Intersection Summary	
HCM 6th Ctrl Delay	97.4
HCM 6th LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	489	58	400	42	55	111	295	653	40	101	619	177
Future Volume (veh/h)	489	58	400	42	55	111	295	653	40	101	619	177
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	532	63	0	46	60	78	321	710	41	110	673	110
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	614	526		119	319	270	383	1113	64	211	816	646
Arrive On Green	0.18	0.28	0.00	0.07	0.17	0.17	0.21	0.33	0.33	0.12	0.23	0.23
Sat Flow, veh/h	3456	1870	1585	1781	1870	1585	1781	3415	197	1781	3554	1585
Grp Volume(v), veh/h	532	63	0	46	60	78	321	369	382	110	673	110
Grp Sat Flow(s),veh/h/ln	1728	1870	1585	1781	1870	1585	1781	1777	1835	1781	1777	1585
Q Serve(g_s), s	20.2	3.4	0.0	3.3	3.7	5.8	23.3	23.9	23.9	7.8	24.3	6.0
Cycle Q Clear(g_c), s	20.2	3.4	0.0	3.3	3.7	5.8	23.3	23.9	23.9	7.8	24.3	6.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.11	1.00		1.00
Lane Grp Cap(c), veh/h	614	526		119	319	270	383	579	598	211	816	646
V/C Ratio(X)	0.87	0.12		0.39	0.19	0.29	0.84	0.64	0.64	0.52	0.82	0.17
Avail Cap(c_a), veh/h	614	526		119	319	270	383	579	598	211	816	646
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	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	53.9	36.1	0.0	60.4	48.0	48.9	50.8	38.7	38.7	55.9	49.4	25.5
Incr Delay (d2), s/veh	12.4	0.1	0.0	2.1	0.3	0.6	15.1	2.3	2.3	2.3	6.9	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	14.8	2.8	0.0	2.9	3.2	4.3	17.5	15.9	16.4	6.5	16.9	4.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	66.3	36.2	0.0	62.4	48.3	49.4	65.9	41.0	41.0	58.2	56.3	25.6
LnGrp LOS	E	D		E	D	D	E	D	D	E	E	C
Approach Vol, veh/h		595	A		184			1072			893	
Approach Delay, s/veh		63.1			52.3			48.5			52.8	
Approach LOS		E			D			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	19.4	50.6	13.1	39.0	33.9	36.1	30.0	22.1
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	18.0	46.0	11.0	40.0	31.0	33.0	26.0	25.0
Max Q Clear Time (g_c+I1), s	10.8	26.9	6.3	6.4	26.3	27.3	23.2	8.8
Green Ext Time (p_c), s	0.2	2.9	0.0	0.2	0.5	1.9	0.7	0.4

Intersection Summary	
HCM 6th Ctrl Delay	53.3
HCM 6th LOS	D

Notes

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Intersection						
Int Delay, s/veh	9.4					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	107	170	247	12	154	208
Future Vol, veh/h	107	170	247	12	154	208
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	116	185	268	13	167	226

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	835	275	0	0	281	0
Stage 1	275	-	-	-	-	-
Stage 2	560	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	338	764	-	-	1282	-
Stage 1	771	-	-	-	-	-
Stage 2	572	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	288	764	-	-	1282	-
Mov Cap-2 Maneuver	288	-	-	-	-	-
Stage 1	771	-	-	-	-	-
Stage 2	487	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	25.8	0	3.5
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	466	1282	-
HCM Lane V/C Ratio	-	-	0.646	0.131	-
HCM Control Delay (s)	-	-	25.8	8.2	0
HCM Lane LOS	-	-	D	A	A
HCM 95th %tile Q(veh)	-	-	4.5	0.4	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	173	56	332	207	25	169	181	902	45	20	805	65
Future Volume (veh/h)	173	56	332	207	25	169	181	902	45	20	805	65
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	188	61	307	225	27	151	197	980	47	22	875	70
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	541	534	453	394	36	453	204	1282	61	76	1000	80
Arrive On Green	0.29	0.29	0.29	0.29	0.29	0.29	0.11	0.37	0.37	0.04	0.30	0.30
Sat Flow, veh/h	1383	1870	1585	1038	125	1585	1781	3452	166	1781	3333	267
Grp Volume(v), veh/h	188	61	307	252	0	151	197	504	523	22	467	478
Grp Sat Flow(s),veh/h/ln	1383	1870	1585	1163	0	1585	1781	1777	1841	1781	1777	1822
Q Serve(g_s), s	0.0	1.7	12.0	11.8	0.0	5.3	7.7	17.4	17.4	0.8	17.4	17.4
Cycle Q Clear(g_c), s	6.3	1.7	12.0	15.0	0.0	5.3	7.7	17.4	17.4	0.8	17.4	17.4
Prop In Lane	1.00		1.00	0.89		1.00	1.00		0.09	1.00		0.15
Lane Grp Cap(c), veh/h	541	534	453	430	0	453	204	660	684	76	533	547
V/C Ratio(X)	0.35	0.11	0.68	0.59	0.00	0.33	0.97	0.76	0.76	0.29	0.88	0.88
Avail Cap(c_a), veh/h	541	534	453	430	0	453	204	660	684	76	533	547
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	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.1	18.5	22.1	24.7	0.0	19.7	30.9	19.3	19.3	32.5	23.3	23.3
Incr Delay (d2), s/veh	0.4	0.1	4.0	2.1	0.0	0.4	53.6	5.3	5.1	2.0	15.0	14.7
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(95%),veh/ln	4.3	1.3	8.2	7.0	0.0	3.4	10.2	11.6	11.9	0.7	13.6	13.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.5	18.6	26.2	26.8	0.0	20.2	84.5	24.6	24.4	34.5	38.3	38.0
LnGrp LOS	C	B	C	C	A	C	F	C	C	C	D	D
Approach Vol, veh/h		556			403			1224			967	
Approach Delay, s/veh		23.4			24.3			34.2			38.0	
Approach LOS		C			C			C			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.4	33.9		25.3	15.0	27.3		25.3				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	5.0	28.0		22.0	10.0	23.0		22.0				
Max Q Clear Time (g_c+I1), s	2.8	20.4		15.0	10.7	20.4		18.0				
Green Ext Time (p_c), s	0.0	2.8		1.5	0.0	1.1		0.7				

Intersection Summary		
HCM 6th Ctrl Delay		32.2
HCM 6th LOS		C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	147	301	99	115	7	193	96	161	48	255	24
Future Volume (veh/h)	10	147	301	99	115	7	193	96	161	48	255	24
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	11	160	201	108	125	4	210	104	87	52	277	13
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	143	430	365	196	469	15	374	373	333	91	511	25
Arrive On Green	0.08	0.23	0.23	0.11	0.26	0.26	0.21	0.21	0.21	0.17	0.17	0.17
Sat Flow, veh/h	1781	1870	1585	1781	1802	58	1781	1777	1585	535	3005	147
Grp Volume(v), veh/h	11	160	201	108	0	129	210	104	87	179	0	163
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	0	1860	1781	1777	1585	1844	0	1844
Q Serve(g_s), s	0.6	7.2	11.2	5.7	0.0	5.5	10.6	4.9	4.6	8.9	0.0	8.0
Cycle Q Clear(g_c), s	0.6	7.2	11.2	5.7	0.0	5.5	10.6	4.9	4.6	8.9	0.0	8.0
Prop In Lane	1.00		1.00	1.00		0.03	1.00		1.00	0.29		0.08
Lane Grp Cap(c), veh/h	143	430	365	196	0	484	374	373	333	313	0	313
V/C Ratio(X)	0.08	0.37	0.55	0.55	0.00	0.27	0.56	0.28	0.26	0.57	0.00	0.52
Avail Cap(c_a), veh/h	143	430	365	196	0	484	374	373	333	313	0	313
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	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	42.6	32.4	34.0	42.2	0.0	29.4	35.4	33.1	33.0	38.2	0.0	37.8
Incr Delay (d2), s/veh	0.2	0.5	1.8	3.3	0.0	0.3	1.9	0.4	0.4	2.5	0.0	1.5
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(95%),veh/ln	0.5	5.9	7.9	4.8	0.0	4.5	8.4	3.9	3.2	7.6	0.0	6.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	42.8	33.0	35.7	45.5	0.0	29.7	37.3	33.5	33.4	40.6	0.0	39.3
LnGrp LOS	D	C	D	D	A	C	D	C	C	D	A	D
Approach Vol, veh/h		372			237			401			342	
Approach Delay, s/veh		34.7			36.9			35.5			40.0	
Approach LOS		C			D			D			D	

Timer - Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		23.9	15.7	25.5		20.9	10.7	30.5
Change Period (Y+Rc), s		5.0	5.0	5.0		5.0	5.0	5.0
Max Green Setting (Gmax), s		23.0	13.0	25.0		19.0	10.0	28.0
Max Q Clear Time (g_c+I1), s		13.6	8.7	14.2		11.9	3.6	8.5
Green Ext Time (p_c), s		1.2	0.1	1.8		0.8	0.0	1.1

Intersection Summary			
HCM 6th Ctrl Delay			36.7
HCM 6th LOS			D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	183	26	240	162	28	31	277	768	36	68	1326	226
Future Volume (veh/h)	183	26	240	162	28	31	277	768	36	68	1326	226
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	199	28	228	176	30	34	301	835	39	74	1441	246
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	254	347	294	276	149	168	318	2000	93	153	1478	248
Arrive On Green	0.19	0.19	0.19	0.19	0.19	0.19	0.18	0.58	0.58	0.09	0.49	0.49
Sat Flow, veh/h	1338	1870	1585	1382	800	907	1781	3457	161	1781	3044	512
Grp Volume(v), veh/h	199	28	228	176	0	64	301	429	445	74	832	855
Grp Sat Flow(s),veh/h/ln	1338	1870	1585	1382	0	1707	1781	1777	1841	1781	1777	1778
Q Serve(g_s), s	20.8	1.7	19.2	17.1	0.0	4.4	23.4	18.8	18.8	5.5	63.4	66.7
Cycle Q Clear(g_c), s	25.5	1.7	19.2	20.3	0.0	4.4	23.4	18.8	18.8	5.5	63.4	66.7
Prop In Lane	1.00		1.00	1.00		0.53	1.00		0.09	1.00		0.29
Lane Grp Cap(c), veh/h	254	347	294	276	0	317	318	1028	1065	153	863	864
V/C Ratio(X)	0.78	0.08	0.77	0.64	0.00	0.20	0.95	0.42	0.42	0.48	0.96	0.99
Avail Cap(c_a), veh/h	254	347	294	276	0	317	318	1028	1065	153	863	864
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	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	59.2	47.1	54.2	56.2	0.0	48.2	56.8	16.4	16.4	61.1	34.8	35.7
Incr Delay (d2), s/veh	14.6	0.1	12.1	4.8	0.0	0.3	36.4	0.3	0.3	2.4	22.2	28.1
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(95%),veh/ln	12.7	1.5	13.5	10.5	0.0	3.5	19.6	11.9	12.3	4.7	40.5	43.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	73.7	47.2	66.3	61.0	0.0	48.5	93.3	16.7	16.7	63.4	57.0	63.8
LnGrp LOS	E	D	E	E	A	D	F	B	B	E	E	E
Approach Vol, veh/h		455			240			1175			1761	
Approach Delay, s/veh		68.4			57.7			36.3			60.5	
Approach LOS		E			E			D			E	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	16.1	90.7		33.0	31.7	75.0		33.0				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	14.0	83.0		28.0	27.0	70.0		28.0				
Max Q Clear Time (g_c+I1), s	7.5	21.8		28.5	26.4	69.7		23.3				
Green Ext Time (p_c), s	0.1	12.7		0.0	0.1	0.3		0.4				
Intersection Summary												
HCM 6th Ctrl Delay			53.5									
HCM 6th LOS			D									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	54	8	329	59	0	22	368	298	121	34	587	61
Future Volume (veh/h)	54	8	329	59	0	22	368	298	121	34	587	61
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	59	9	222	64	0	14	400	324	130	37	638	64
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	323	49	329	717	0	329	509	1189	449	92	751	75
Arrive On Green	0.21	0.21	0.21	0.21	0.00	0.21	0.15	0.33	0.33	0.05	0.23	0.23
Sat Flow, veh/h	1555	237	1585	3456	0	1585	3456	3648	1378	1781	3262	327
Grp Volume(v), veh/h	68	0	222	64	0	14	400	301	153	37	347	355
Grp Sat Flow(s),veh/h/ln	1793	0	1585	1728	0	1585	1728	1702	1622	1781	1777	1812
Q Serve(g_s), s	4.2	0.0	17.4	2.0	0.0	1.0	15.1	8.8	9.5	2.7	25.2	25.3
Cycle Q Clear(g_c), s	4.2	0.0	17.4	2.0	0.0	1.0	15.1	8.8	9.5	2.7	25.2	25.3
Prop In Lane	0.87		1.00	1.00		1.00	1.00		0.85	1.00		0.18
Lane Grp Cap(c), veh/h	372	0	329	717	0	329	509	1109	529	92	409	417
V/C Ratio(X)	0.18	0.00	0.68	0.09	0.00	0.04	0.79	0.27	0.29	0.40	0.85	0.85
Avail Cap(c_a), veh/h	372	0	329	717	0	329	509	1109	529	92	409	417
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	44.1	0.0	49.3	43.2	0.0	42.8	55.5	33.6	33.9	62.0	49.7	49.7
Incr Delay (d2), s/veh	0.2	0.0	5.4	0.1	0.0	0.1	7.9	0.1	0.3	2.8	15.3	15.3
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(95%),veh/ln	3.5	0.0	12.0	1.6	0.0	0.7	11.6	6.7	7.0	2.4	19.0	19.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	44.3	0.0	54.7	43.3	0.0	42.8	63.4	33.8	34.2	64.8	65.0	65.0
LnGrp LOS	D	A	D	D	A	D	E	C	C	E	E	E
Approach Vol, veh/h		290			78			854			739	
Approach Delay, s/veh		52.3			43.2			47.7			65.0	
Approach LOS		D			D			D			E	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	11.7	50.1		30.6	25.3	36.4		22.5				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	9.0	46.0		30.0	21.9	33.1		30.0				
Max Q Clear Time (g_c+I1), s	15.7	12.5		20.4	18.1	28.3		5.0				
Green Ext Time (p_c), s	0.0	2.2		0.9	0.7	1.4		0.3				
Intersection Summary												
HCM 6th Ctrl Delay			54.7									
HCM 6th LOS			D									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	18	597	272	807	550	213	174	489	386	533	792	29
Future Volume (veh/h)	18	597	272	807	550	213	174	489	386	533	792	29
Initial Q (Qb), veh	0	0	0	14	5	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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	20	649	133	877	598	0	189	532	257	579	861	30
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	71	733	296	945	1650		230	592	264	645	1004	35
Arrive On Green	0.04	0.37	0.19	0.27	0.84	0.00	0.07	0.17	0.17	0.19	0.29	0.29
Sat Flow, veh/h	1781	3928	1585	3456	3928	1585	3456	3554	1585	3456	3503	122
Grp Volume(v), veh/h	20	649	133	877	598	0	189	532	257	579	437	454
Grp Sat Flow(s),veh/h/ln	1781	1964	1585	1728	1964	1585	1728	1777	1585	1728	1777	1848
Q Serve(g_s), s	1.6	23.2	11.2	37.1	5.3	0.0	8.1	22.0	24.2	24.6	34.9	34.9
Cycle Q Clear(g_c), s	1.6	23.2	11.2	37.1	5.3	0.0	8.1	22.0	24.2	24.6	34.9	34.9
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.07
Lane Grp Cap(c), veh/h	71	733	296	945	1650		230	592	264	645	509	530
V/C Ratio(X)	0.28	0.89	0.45	0.93	0.36		0.82	0.90	0.97	0.90	0.86	0.86
Avail Cap(c_a), veh/h	71	733	296	945	1650		230	592	264	645	509	530
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.99	0.99	0.99	0.61	0.61	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	69.9	45.5	54.2	54.3	7.5	0.0	69.1	61.3	62.2	59.6	50.6	50.6
Incr Delay (d2), s/veh	2.1	14.6	4.8	10.2	0.4	0.0	20.5	16.6	47.7	15.4	13.6	13.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	22.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	1.4	16.3	8.4	27.0	3.5	0.0	7.5	16.6	19.0	17.6	23.8	24.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	72.0	60.1	59.0	86.5	7.9	0.0	89.6	77.8	109.8	75.0	64.2	63.8
LnGrp LOS	E	E	E	F	A		F	E	F	E	E	E
Approach Vol, veh/h		802			1475	A		978			1470	
Approach Delay, s/veh		60.2			54.7			88.5			68.3	
Approach LOS		E			D			F			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	47.2	36.7	34.1	32.0	10.4	73.5	16.6	49.5
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	43.0	30.0	30.0	27.0	8.0	65.0	12.0	45.0
Max Q Clear Time (g_c+I1), s	10.1	26.2	27.6	27.2	4.6	8.3	11.1	37.9
Green Ext Time (p_c), s	1.3	1.4	0.7	0.0	0.0	2.9	0.1	4.2

Intersection Summary	
HCM 6th Ctrl Delay	66.9
HCM 6th LOS	E

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1454	7	0	1201	0	0	0	75	917	151	411
Future Volume (veh/h)	0	1454	7	0	1201	0	0	0	75	917	151	411
Initial Q (Qb), veh	0	20	0	0	15	0	0	0	0	7	7	7
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	0	2067	1870	0	2067	0	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	0	1580	8	0	1305	0	0	0	82	1114	0	447
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	0	2	0	2	2	2	2	2	2
Cap, veh/h	0	3140	15	0	1246		0	0	89	1316	0	1164
Arrive On Green	0.00	0.88	0.44	0.00	0.88	0.00	0.00	0.00	0.06	0.36	0.00	0.36
Sat Flow, veh/h	0	7646	37	0	4134	0	0	0	1585	3563	0	3170
Grp Volume(v), veh/h	0	1145	443	0	1305	0	0	0	82	1114	0	447
Grp Sat Flow(s),veh/h/ln	0	1778	2061	0	1964	0	0	0	1585	1781	0	1585
Q Serve(g_s), s	0.0	6.8	7.2	0.0	17.8	0.0	0.0	0.0	7.7	43.4	0.0	15.7
Cycle Q Clear(g_c), s	0.0	6.8	7.2	0.0	17.8	0.0	0.0	0.0	7.7	43.4	0.0	15.7
Prop In Lane	0.00		0.02	0.00		0.00	0.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	0	2276	883	0	1246		0	0	89	1316	0	1164
V/C Ratio(X)	0.00	0.50	0.50	0.00	1.05		0.00	0.00	0.92	0.85	0.00	0.38
Avail Cap(c_a), veh/h	0	2347	907	0	1729		0	0	106	1734	0	1543
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	0.29	0.29	0.00	1.00	0.00	0.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	7.8	7.9	0.0	27.4	0.0	0.0	0.0	70.5	43.9	0.0	35.4
Incr Delay (d2), s/veh	0.0	0.2	0.6	0.0	38.7	0.0	0.0	0.0	58.8	3.2	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.6	0.5	0.0	43.3	0.0	0.0	0.0	0.0	1.3	0.0	0.4
%ile BackOfQ(95%),veh/ln	0.0	4.7	5.3	0.0	37.3	0.0	0.0	0.0	8.1	27.9	0.0	11.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	8.7	8.9	0.0	109.4	0.0	0.0	0.0	129.3	48.4	0.0	36.0
LnGrp LOS	A	A	A	A	F		A	A	F	D	A	D
Approach Vol, veh/h		1588			1305	A		82			1561	
Approach Delay, s/veh		8.8			109.4			129.3			44.9	
Approach LOS		A			F			F			D	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		73.0		61.6		73.0		15.4				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		48.0		75.0		48.0		12.0				
Max Q Clear Time (g_c+I1), s		10.2		46.4		20.8		10.7				
Green Ext Time (p_c), s		19.1		10.2		14.0		0.0				

Intersection Summary			
HCM 6th Ctrl Delay			52.3
HCM 6th LOS			D

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↱		↑↑	↱	↰		↱↱↱			
Traffic Volume (veh/h)	0	1464	227	0	869	751	433	0	1404	0	0	0
Future Volume (veh/h)	0	1464	227	0	869	751	433	0	1404	0	0	0
Initial Q (Qb), veh	0	25	0	0	40	0	8	0	36			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	0	2067	1870	0	2067	1870	1870	0	1870			
Adj Flow Rate, veh/h	0	1591	0	0	945	0	471	0	1191			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	0	2	2	0	2	2	2	0	2			
Cap, veh/h	0	2267		0	1541		647	0	1393			
Arrive On Green	0.00	0.86	0.00	0.00	0.86	0.00	0.35	0.00	0.35			
Sat Flow, veh/h	0	5830	1585	0	4031	1585	1781	0	3614			
Grp Volume(v), veh/h	0	1591	0	0	945	0	471	0	1191			
Grp Sat Flow(s),veh/h/ln	0	1881	1585	0	1964	1585	1781	0	1205			
Q Serve(g_s), s	0.0	5.8	0.0	0.0	4.2	0.0	15.1	0.0	20.6			
Cycle Q Clear(g_c), s	0.0	5.8	0.0	0.0	4.2	0.0	15.1	0.0	20.6			
Prop In Lane	0.00		1.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	0	2267		0	1541		647	0	1393			
V/C Ratio(X)	0.00	0.70		0.00	0.61		0.73	0.00	0.85			
Avail Cap(c_a), veh/h	0	2430		0	1691		795	0	1612			
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.00	1.00	0.00	0.00	0.42	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	0.0	5.3	0.0	0.0	6.0	0.0	18.4	0.0	19.5			
Incr Delay (d2), s/veh	0.0	1.8	0.0	0.0	0.8	0.0	1.8	0.0	3.7			
Initial Q Delay(d3),s/veh	0.0	2.9	0.0	0.0	12.6	0.0	4.1	0.0	33.1			
%ile BackOfQ(95%),veh/ln	0.0	4.3	0.0	0.0	6.3	0.0	11.3	0.0	14.6			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	10.1	0.0	0.0	19.4	0.0	24.3	0.0	56.4			
LnGrp LOS	A	B		A	B		C	A	E			
Approach Vol, veh/h		1591	A		945	A		1662				
Approach Delay, s/veh		10.1			19.4			47.3				
Approach LOS		B			B			D				

Timer - Assigned Phs		2				6		8				
Phs Duration (G+Y+Rc), s		35.0				35.0		30.0				
Change Period (Y+Rc), s		5.0				5.0		5.0				
Max Green Setting (Gmax), s		24.0				24.0		31.0				
Max Q Clear Time (g_c+I1), s		8.8				7.2		23.6				
Green Ext Time (p_c), s		13.2				10.3		1.4				

Intersection Summary			
HCM 6th Ctrl Delay			26.9
HCM 6th LOS			C

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	527	2134	25	5	1911	205	394	33	167	192	12	729
Future Volume (veh/h)	527	2134	25	5	1911	205	394	33	167	192	12	729
Initial Q (Qb), veh	16	30	0	0	30	0	10	10	0	0	0	16
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	573	2320	0	5	2077	223	454	0	182	218	0	792
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	599	3019		355	2551	574	568	0	325	261	0	782
Arrive On Green	0.17	0.84	0.00	0.17	0.84	0.42	0.15	0.00	0.15	0.07	0.00	0.07
Sat Flow, veh/h	3456	7111	1585	3456	7111	1585	3563	0	1585	3563	0	3170
Grp Volume(v), veh/h	573	2320	0	5	2077	223	454	0	182	218	0	792
Grp Sat Flow(s),veh/h/ln	1728	1778	1585	1728	1778	1585	1781	0	1585	1781	0	1585
Q Serve(g_s), s	24.7	22.0	0.0	0.2	17.3	14.3	18.6	0.0	16.5	9.1	0.0	11.0
Cycle Q Clear(g_c), s	24.7	22.0	0.0	0.2	17.3	14.3	18.6	0.0	16.5	9.1	0.0	11.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	599	3019		355	2551	574	568	0	325	261	0	782
V/C Ratio(X)	0.96	0.77		0.01	0.81	0.39	0.80	0.00	0.56	0.83	0.00	1.01
Avail Cap(c_a), veh/h	599	3129		580	2970	662	879	0	391	261	0	778
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.28	0.28	0.00	0.31	0.31	0.31	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	62.0	8.6	0.0	60.7	19.7	35.7	61.5	0.0	53.7	68.6	0.0	56.5
Incr Delay (d2), s/veh	11.0	0.6	0.0	0.0	0.9	0.6	3.0	0.0	1.5	20.2	0.0	35.4
Initial Q Delay(d3),s/veh	76.6	3.1	0.0	0.0	5.4	0.0	11.1	0.0	0.0	0.0	0.0	73.7
%ile BackOfQ(95%),veh/ln	21.6	6.0	0.0	0.2	13.2	8.4	15.5	0.0	10.5	8.5	0.0	34.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	149.7	12.2	0.0	60.7	26.0	36.3	75.6	0.0	55.2	88.8	0.0	165.6
LnGrp LOS	F	B		E	C	D	E	A	E	F	A	F
Approach Vol, veh/h		2893	A		2305			636			1010	
Approach Delay, s/veh		39.4			27.1			69.8			149.0	
Approach LOS		D			C			E			F	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	32.2	70.3		29.6	32.8	69.7		18.0				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	10.0	68.0		39.0	28.0	50.0		13.0				
Max Q Clear Time (g_c+I1), s	13.2	25.0		21.6	27.7	20.3		14.0				
Green Ext Time (p_c), s	0.0	40.2		2.9	0.1	27.6		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			54.3									
HCM 6th LOS			D									

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	342	2172	70	23	1112	313	358	88	39	800	36	1009
Future Volume (veh/h)	342	2172	70	23	1112	313	358	88	39	800	36	1009
Initial Q (Qb), veh	0	50	0	0	10	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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	372	2361	68	25	1209	276	389	96	31	870	0	843
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	415	3004	669	28	2207	492	392	110	93	1154	0	897
Arrive On Green	0.12	0.84	0.42	0.01	0.62	0.31	0.22	0.06	0.06	0.32	0.00	0.16
Sat Flow, veh/h	3456	7111	1585	3456	7111	1585	1781	1870	1585	3563	0	3170
Grp Volume(v), veh/h	372	2361	68	25	1209	276	389	96	31	870	0	843
Grp Sat Flow(s),veh/h/ln	1728	1778	1585	1728	1778	1585	1781	1870	1585	1781	0	1585
Q Serve(g_s), s	15.9	23.0	2.0	1.1	14.7	9.5	32.7	7.6	2.6	32.8	0.0	20.1
Cycle Q Clear(g_c), s	15.9	23.0	2.0	1.1	14.7	9.5	32.7	7.6	2.6	32.8	0.0	20.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	415	3004	669	28	2207	492	392	110	93	1154	0	897
V/C Ratio(X)	0.90	0.79	0.10	0.88	0.55	0.56	0.99	0.87	0.33	0.75	0.00	0.94
Avail Cap(c_a), veh/h	599	3004	669	184	2207	492	392	187	159	1164	0	1036
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.78	0.78	0.78	0.94	0.94	0.94	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	65.1	9.5	6.6	74.3	22.6	8.1	58.4	70.0	57.4	45.4	0.0	22.0
Incr Delay (d2), s/veh	9.7	1.7	0.2	48.9	0.9	4.3	43.4	19.7	2.1	2.8	0.0	14.5
Initial Q Delay(d3),s/veh	0.0	9.3	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	11.5	9.3	2.7	1.2	8.8	6.5	26.7	7.7	2.1	21.0	0.0	13.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	74.8	20.5	6.9	123.2	23.9	12.4	101.8	89.7	59.5	48.2	0.0	36.5
LnGrp LOS	E	C	A	F	C	B	F	F	E	D	A	D
Approach Vol, veh/h		2801			1510			516			1713	
Approach Delay, s/veh		27.4			23.4			97.0			42.4	
Approach LOS		C			C			F			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.2	70.4	55.6	15.8	25.0	53.6	40.0	31.4
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	10.0	52.0	51.0	17.0	28.0	34.0	35.0	33.0
Max Q Clear Time (g_c+I1), s	4.1	26.0	35.8	10.6	18.9	17.7	35.7	23.1
Green Ext Time (p_c), s	0.0	25.1	3.8	0.2	1.1	12.6	0.0	3.3

Intersection Summary	
HCM 6th Ctrl Delay	35.9
HCM 6th LOS	D

Notes
User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	68	2538	45	0	1339	65	59	8	114	188	14	99
Future Volume (veh/h)	68	2538	45	0	1339	65	59	8	114	188	14	99
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	0	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	74	2759	49	0	1455	71	64	9	124	204	15	108
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	0	2	2	2	2	2	2	2	2
Cap, veh/h	35	4715	84	0	4842	235	77	10	138	208	33	236
Arrive On Green	0.04	1.00	0.65	0.00	1.00	1.00	0.04	0.09	0.09	0.12	0.17	0.17
Sat Flow, veh/h	1781	7249	129	0	8682	403	1781	108	1493	1781	197	1418
Grp Volume(v), veh/h	74	2029	779	0	1175	351	64	0	133	204	0	123
Grp Sat Flow(s),veh/h/ln	1781	1778	2044	0	1674	1995	1781	0	1602	1781	0	1615
Q Serve(g_s), s	3.0	0.0	2.9	0.0	0.0	0.0	5.3	0.0	12.3	17.1	0.0	10.3
Cycle Q Clear(g_c), s	3.0	0.0	2.9	0.0	0.0	0.0	5.3	0.0	12.3	17.1	0.0	10.3
Prop In Lane	1.00		0.06	0.00		0.20	1.00		0.93	1.00		0.88
Lane Grp Cap(c), veh/h	35	3469	1329	0	3912	1165	77	0	148	208	0	268
V/C Ratio(X)	2.11	0.58	0.59	0.00	0.30	0.30	0.83	0.00	0.90	0.98	0.00	0.46
Avail Cap(c_a), veh/h	154	3469	1329	0	3912	1165	309	0	278	344	0	312
HCM Platoon Ratio	2.00	2.00	1.00	1.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.42	0.42	0.42	0.00	0.96	0.96	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	72.0	0.0	0.6	0.0	0.0	0.0	71.2	0.0	67.3	66.0	0.0	56.4
Incr Delay (d2), s/veh	508.8	0.3	0.8	0.0	0.2	0.6	19.3	0.0	16.8	32.5	0.0	1.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	10.0	0.2	1.5	0.0	0.1	0.4	5.2	0.0	9.7	14.8	0.0	7.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	580.9	0.3	1.4	0.0	0.2	0.6	90.5	0.0	84.1	98.6	0.0	57.7
LnGrp LOS	F	A	A	A	A	A	F	A	F	F	A	E
Approach Vol, veh/h		2882			1526			197			327	
Approach Delay, s/veh		15.5			0.3			86.2			83.2	
Approach LOS		B			A			F			F	

Timer - Assigned Phs	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	104.6	13.5	31.9	9.9	94.7	24.6	20.9
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	76.0	28.0	31.0	15.0	56.0	31.0	28.0
Max Q Clear Time (g_c+I1), s	5.9	8.3	12.3	5.0	3.0	19.1	15.3
Green Ext Time (p_c), s	66.9	0.2	0.6	0.1	33.5	0.4	0.6

Intersection Summary	
HCM 6th Ctrl Delay	18.1
HCM 6th LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	2354	523	82	1041	3	296	0	172	12	3	15
Future Volume (veh/h)	10	2354	523	82	1041	3	296	0	172	12	3	15
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	11	2559	568	89	1132	3	322	0	187	13	3	16
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	36	4360	972	102	4796	13	470	0	209	16	4	18
Arrive On Green	0.02	1.00	0.61	0.06	1.00	0.65	0.13	0.00	0.13	0.01	0.01	0.01
Sat Flow, veh/h	1781	7111	1585	1781	7378	20	3563	0	1585	1460	337	1585
Grp Volume(v), veh/h	11	2559	568	89	818	317	322	0	187	16	0	16
Grp Sat Flow(s),veh/h/ln	1781	1778	1585	1781	1778	2064	1781	0	1585	1797	0	1585
Q Serve(g_s), s	0.9	0.0	32.4	7.4	0.0	0.1	12.9	0.0	17.4	1.3	0.0	1.5
Cycle Q Clear(g_c), s	0.9	0.0	32.4	7.4	0.0	0.1	12.9	0.0	17.4	1.3	0.0	1.5
Prop In Lane	1.00		1.00	1.00		0.01	1.00		1.00	0.81		1.00
Lane Grp Cap(c), veh/h	36	4360	972	102	3467	1342	470	0	209	20	0	18
V/C Ratio(X)	0.31	0.59	0.58	0.88	0.24	0.24	0.68	0.00	0.89	0.79	0.00	0.90
Avail Cap(c_a), veh/h	95	4360	972	178	3467	1342	594	0	264	96	0	85
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.71	0.71	0.71	0.89	0.89	0.89	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	72.5	0.0	17.5	70.2	0.0	0.1	62.1	0.0	64.1	74.0	0.0	74.1
Incr Delay (d2), s/veh	3.4	0.4	1.8	18.2	0.1	0.4	2.3	0.0	25.5	48.7	0.0	74.3
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(95%),veh/ln	0.8	0.2	16.6	6.9	0.1	0.3	10.1	0.0	13.4	1.6	0.0	1.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	75.9	0.4	19.3	88.4	0.1	0.5	64.4	0.0	89.6	122.7	0.0	148.4
LnGrp LOS	E	A	B	F	A	A	E	A	F	F	A	F
Approach Vol, veh/h		3138			1224			509			32	
Approach Delay, s/veh		4.1			6.6			73.7			135.6	
Approach LOS		A			A			E			F	

Timer - Assigned Phs	1	2	4	5	6	8
Phs Duration (G+Y+Rc), s	15.5	99.0	8.7	10.0	104.5	26.8
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	17.0	76.0	10.0	10.0	83.0	27.0
Max Q Clear Time (g_c+I1), s	10.4	35.4	4.5	3.9	3.1	20.4
Green Ext Time (p_c), s	0.1	39.8	0.0	0.0	26.1	1.4

Intersection Summary	
HCM 6th Ctrl Delay	12.8
HCM 6th LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	126	1934	516	409	714	302	224	312	363	649	572	177
Future Volume (veh/h)	126	1934	516	409	714	302	224	312	363	649	572	177
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	137	2102	344	445	776	219	243	339	232	705	622	127
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	151	1802	506	333	2378	668	407	547	244	530	673	300
Arrive On Green	0.08	0.64	0.32	0.19	0.84	0.42	0.12	0.15	0.15	0.15	0.19	0.19
Sat Flow, veh/h	1781	5644	1585	1781	5644	1585	3456	3554	1585	3456	3554	1585
Grp Volume(v), veh/h	137	2102	344	445	776	219	243	339	232	705	622	127
Grp Sat Flow(s),veh/h/ln	1781	1881	1585	1781	1881	1585	1728	1777	1585	1728	1777	1585
Q Serve(g_s), s	11.4	47.9	28.3	28.0	4.5	9.5	10.0	13.4	21.8	23.0	25.8	7.3
Cycle Q Clear(g_c), s	11.4	47.9	28.3	28.0	4.5	9.5	10.0	13.4	21.8	23.0	25.8	7.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	151	1802	506	333	2378	668	407	547	244	530	673	300
V/C Ratio(X)	0.91	1.17	0.68	1.34	0.33	0.33	0.60	0.62	0.95	1.33	0.92	0.42
Avail Cap(c_a), veh/h	249	1802	506	333	2378	668	407	569	254	530	782	349
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.76	0.76	0.76	1.00	1.00	1.00	0.91	0.91	0.91	1.00	1.00	1.00
Uniform Delay (d), s/veh	68.1	27.1	44.4	61.0	7.2	13.5	62.8	59.3	62.9	63.5	59.7	25.3
Incr Delay (d2), s/veh	18.3	79.8	5.5	171.3	0.4	1.3	2.2	1.8	40.0	161.3	15.3	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	9.4	38.3	16.7	42.4	2.9	6.4	7.8	10.0	16.7	33.5	18.9	5.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	86.4	106.9	49.9	232.3	7.5	14.8	64.9	61.1	102.9	224.8	75.0	26.3
LnGrp LOS	F	F	D	F	A	B	E	E	F	F	E	C
Approach Vol, veh/h		2583			1440			814			1454	
Approach Delay, s/veh		98.2			78.1			74.2			143.4	
Approach LOS		F			E			E			F	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	30.0	30.1	19.7	70.2	24.7	35.4	35.0	54.9
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	25.0	26.0	23.0	56.0	16.0	35.0	30.0	49.0
Max Q Clear Time (g_c+I1), s	26.0	24.8	14.4	12.5	13.0	28.8	31.0	50.9
Green Ext Time (p_c), s	0.0	0.3	0.3	14.9	0.3	1.6	0.0	0.0

Intersection Summary	
HCM 6th Ctrl Delay	100.9
HCM 6th LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	697	1223	279	138	569	162	566	1090	500	551	433	452
Future Volume (veh/h)	697	1223	279	138	569	162	566	1090	500	551	433	452
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	758	1329	225	150	618	123	615	1185	380	599	471	346
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	778	1155	515	115	681	211	645	1319	409	518	1132	351
Arrive On Green	0.22	0.32	0.32	0.03	0.13	0.13	0.19	0.26	0.26	0.15	0.22	0.22
Sat Flow, veh/h	3456	3554	1585	3456	5106	1585	3456	5106	1585	3456	5106	1585
Grp Volume(v), veh/h	758	1329	225	150	618	123	615	1185	380	599	471	346
Grp Sat Flow(s),veh/h/ln	1728	1777	1585	1728	1702	1585	1728	1702	1585	1728	1702	1585
Q Serve(g_s), s	26.1	39.0	13.4	4.0	14.3	8.7	21.1	26.9	28.1	18.0	9.5	26.1
Cycle Q Clear(g_c), s	26.1	39.0	13.4	4.0	14.3	8.7	21.1	26.9	28.1	18.0	9.5	26.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	778	1155	515	115	681	211	645	1319	409	518	1132	351
V/C Ratio(X)	0.97	1.15	0.44	1.30	0.91	0.58	0.95	0.90	0.93	1.16	0.42	0.98
Avail Cap(c_a), veh/h	778	1155	515	115	681	211	662	1319	409	518	1132	351
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	46.2	40.5	31.9	58.0	51.3	48.9	48.3	43.0	43.4	51.0	40.0	46.5
Incr Delay (d2), s/veh	26.1	78.1	0.6	185.4	16.0	4.0	23.8	9.9	29.6	90.1	1.1	44.3
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(95%),veh/ln	20.1	41.7	9.0	8.5	11.5	6.7	16.7	18.2	20.5	21.8	7.4	20.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	72.3	118.6	32.4	243.4	67.3	52.9	72.1	52.9	73.0	141.1	41.2	90.7
LnGrp LOS	E	F	C	F	E	D	E	D	E	F	D	F
Approach Vol, veh/h		2312			891			2180			1416	
Approach Delay, s/veh		95.0			95.0			61.8			95.5	
Approach LOS		F			F			E			F	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	25.0	38.0	11.0	46.0	29.4	33.6	34.0	23.0
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	20.0	33.0	6.0	41.0	25.0	28.0	29.0	18.0
Max Q Clear Time (g_c+I1), s	20.0	31.1	7.0	42.0	24.1	29.1	29.1	17.3
Green Ext Time (p_c), s	0.0	1.5	0.0	0.0	0.3	0.0	0.0	0.3

Intersection Summary	
HCM 6th Ctrl Delay	84.5
HCM 6th LOS	F

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	134	278	558	277	829	1091
Future Volume (veh/h)	134	278	558	277	829	1091
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	146	193	607	211	901	1186
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	166	951	673	234	903	2890
Arrive On Green	0.09	0.09	0.26	0.26	0.51	0.81
Sat Flow, veh/h	1781	1585	2681	898	1781	3647
Grp Volume(v), veh/h	146	193	417	401	901	1186
Grp Sat Flow(s),veh/h/ln	1781	1585	1777	1709	1781	1777
Q Serve(g_s), s	12.1	8.3	34.0	34.1	75.7	14.0
Cycle Q Clear(g_c), s	12.1	8.3	34.0	34.1	75.7	14.0
Prop In Lane	1.00	1.00		0.53	1.00	
Lane Grp Cap(c), veh/h	166	951	462	444	903	2890
V/C Ratio(X)	0.88	0.20	0.90	0.90	1.00	0.41
Avail Cap(c_a), veh/h	166	951	462	444	903	2890
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	67.2	13.7	53.6	53.7	36.9	3.9
Incr Delay (d2), s/veh	37.5	0.1	20.6	21.5	29.5	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	11.7	5.6	24.3	23.7	48.5	6.8
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	104.7	13.8	74.3	75.2	66.5	4.0
LnGrp LOS	F	B	E	E	E	A
Approach Vol, veh/h	339		818			2087
Approach Delay, s/veh	52.9		74.7			31.0
Approach LOS	D		E			C

Timer - Assigned Phs	1	2				6	8
Phs Duration (G+Y+Rc), s	83.0	44.9				127.9	20.6
Change Period (Y+Rc), s	5.0	5.0				5.0	5.0
Max Green Setting (Gmax), s	78.0	41.0				124.0	16.0
Max Q Clear Time (g_c+I1), s	77.7	37.1				17.0	15.1
Green Ext Time (p_c), s	0.0	1.7				10.8	0.1

Intersection Summary	
HCM 6th Ctrl Delay	44.3
HCM 6th LOS	D

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Volume (veh/h)	534	151	66	367	132	55
Future Volume (veh/h)	534	151	66	367	132	55
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	580	110	72	399	143	38
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	995	444	214	1919	321	285
Arrive On Green	0.28	0.28	0.12	0.54	0.18	0.18
Sat Flow, veh/h	3647	1585	1781	3647	1781	1585
Grp Volume(v), veh/h	580	110	72	399	143	38
Grp Sat Flow(s),veh/h/ln	1777	1585	1781	1777	1781	1585
Q Serve(g_s), s	7.0	2.7	1.9	2.9	3.6	1.0
Cycle Q Clear(g_c), s	7.0	2.7	1.9	2.9	3.6	1.0
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	995	444	214	1919	321	285
V/C Ratio(X)	0.58	0.25	0.34	0.21	0.45	0.13
Avail Cap(c_a), veh/h	995	444	214	1919	321	285
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	15.5	13.9	20.2	6.0	18.3	17.2
Incr Delay (d2), s/veh	0.9	0.3	0.9	0.1	1.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	4.3	1.5	1.3	1.2	2.6	1.8
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	16.4	14.2	21.1	6.0	19.2	17.4
LnGrp LOS	B	B	C	A	B	B
Approach Vol, veh/h	690			471	181	
Approach Delay, s/veh	16.0			8.3	18.9	
Approach LOS	B			A	B	

Timer - Assigned Phs		2		4	5	6
Phs Duration (G+Y+Rc), s		29.6		13.6	10.6	19.0
Change Period (Y+Rc), s		5.0		5.0	5.0	5.0
Max Green Setting (Gmax), s		29.0		11.0	8.0	16.0
Max Q Clear Time (g_c+I1), s		5.9		6.6	4.9	10.0
Green Ext Time (p_c), s		2.4		0.2	0.0	2.0

Intersection Summary		
HCM 6th Ctrl Delay		13.7
HCM 6th LOS		B

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	232	245	311	548	234	309
Future Volume (veh/h)	232	245	311	548	234	309
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	271	136	338	585	254	336
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	400	178	736	657	287	2415
Arrive On Green	0.11	0.11	0.41	0.41	0.16	0.68
Sat Flow, veh/h	3563	1585	1870	1585	1781	3647
Grp Volume(v), veh/h	271	136	338	585	254	336
Grp Sat Flow(s),veh/h/ln	1781	1585	1777	1585	1781	1777
Q Serve(g_s), s	4.9	5.6	9.3	23.0	9.4	2.3
Cycle Q Clear(g_c), s	4.9	5.6	9.3	23.0	9.4	2.3
Prop In Lane	1.00	1.00		1.00	1.00	
Lane Grp Cap(c), veh/h	400	178	736	657	287	2415
V/C Ratio(X)	0.68	0.76	0.46	0.89	0.89	0.14
Avail Cap(c_a), veh/h	795	354	845	754	583	3223
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	28.7	29.0	14.2	18.3	27.6	3.8
Incr Delay (d2), s/veh	2.0	6.7	0.4	11.7	8.9	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	3.8	4.3	6.2	14.7	8.0	1.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	30.7	35.6	14.7	30.0	36.5	3.8
LnGrp LOS	C	D	B	C	D	A
Approach Vol, veh/h	407		923			590
Approach Delay, s/veh	32.3		24.4			17.9
Approach LOS	C		C			B

Timer - Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	17.8	34.9				52.7		14.6
Change Period (Y+Rc), s	5.0	5.0				5.0		5.0
Max Green Setting (Gmax), s	24.0	34.0				63.0		17.0
Max Q Clear Time (g_c+I1), s	11.4	26.0				5.3		8.6
Green Ext Time (p_c), s	0.6	3.8				2.5		1.0

Intersection Summary	
HCM 6th Ctrl Delay	24.1
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	309	139	196	1879	1231	362
Future Volume (veh/h)	309	139	196	1879	1231	362
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	336	129	213	2042	1338	393
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	369	329	234	3205	1621	475
Arrive On Green	0.21	0.21	0.13	0.63	0.41	0.41
Sat Flow, veh/h	1781	1585	1781	5274	4089	1148
Grp Volume(v), veh/h	336	129	213	2042	1161	570
Grp Sat Flow(s),veh/h/ln	1781	1585	1781	1702	1702	1664
Q Serve(g_s), s	15.6	6.0	10.0	21.1	25.8	25.9
Cycle Q Clear(g_c), s	15.6	6.0	10.0	21.1	25.8	25.9
Prop In Lane	1.00	1.00	1.00			0.69
Lane Grp Cap(c), veh/h	369	329	234	3205	1408	688
V/C Ratio(X)	0.91	0.39	0.91	0.64	0.82	0.83
Avail Cap(c_a), veh/h	504	448	336	3731	1565	765
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	32.9	29.0	36.3	9.8	22.1	22.2
Incr Delay (d2), s/veh	16.7	0.8	21.4	0.3	3.4	6.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	13.0	0.1	9.3	10.0	14.8	15.4
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	49.5	29.8	57.8	10.1	25.6	29.1
LnGrp LOS	D	C	E	B	C	C
Approach Vol, veh/h	465			2255	1731	
Approach Delay, s/veh	44.0			14.6	26.7	
Approach LOS	D			B	C	

Timer - Assigned Phs		2		4	5	6
Phs Duration (G+Y+Rc), s		60.3		24.6	18.2	42.1
Change Period (Y+Rc), s		5.0		5.0	5.0	5.0
Max Green Setting (Gmax), s		64.0		26.0	18.0	41.0
Max Q Clear Time (g_c+I1), s		24.1		18.6	13.0	28.9
Green Ext Time (p_c), s		22.0		1.0	0.2	8.2

Intersection Summary			
HCM 6th Ctrl Delay			22.4
HCM 6th LOS			C

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	157	831	536	74	465	148	119	25	52	67	23	120
Future Volume (veh/h)	157	831	536	74	465	148	119	25	52	67	23	120
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	171	903	583	80	505	161	106	58	57	73	25	130
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	323	1213	541	50	669	298	161	78	77	142	49	168
Arrive On Green	0.18	0.34	0.34	0.03	0.19	0.19	0.09	0.09	0.09	0.11	0.11	0.11
Sat Flow, veh/h	1781	3554	1585	1781	3554	1585	1781	866	851	1343	460	1585
Grp Volume(v), veh/h	171	903	583	80	505	161	106	0	115	98	0	130
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1777	1585	1781	0	1717	1803	0	1585
Q Serve(g_s), s	5.6	14.5	22.0	1.8	8.7	5.9	3.7	0.0	4.2	3.3	0.0	5.1
Cycle Q Clear(g_c), s	5.6	14.5	22.0	1.8	8.7	5.9	3.7	0.0	4.2	3.3	0.0	5.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.50	0.74		1.00
Lane Grp Cap(c), veh/h	323	1213	541	50	669	298	161	0	155	191	0	168
V/C Ratio(X)	0.53	0.74	1.08	1.60	0.76	0.54	0.66	0.00	0.74	0.51	0.00	0.78
Avail Cap(c_a), veh/h	323	1213	541	83	1158	517	636	0	613	672	0	590
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	23.9	18.7	21.2	31.3	24.8	23.6	28.4	0.0	28.6	27.2	0.0	28.1
Incr Delay (d2), s/veh	1.6	2.5	61.1	342.8	1.8	1.5	4.6	0.0	6.8	2.1	0.0	7.4
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(95%),veh/ln	4.3	9.8	24.3	9.9	6.5	4.0	3.1	0.0	3.5	2.7	0.0	4.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	25.5	21.3	82.4	374.1	26.5	25.2	32.9	0.0	35.4	29.4	0.0	35.5
LnGrp LOS	C	C	F	F	C	C	C	A	D	C	A	D
Approach Vol, veh/h		1657			746			221			228	
Approach Delay, s/veh		43.2			63.5			34.2			32.9	
Approach LOS		D			E			C			C	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.8	29.0		12.8	18.7	19.1		13.8				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	5.0	24.0		25.0	6.0	23.0		26.0				
Max Q Clear Time (g_c+I1), s	4.8	25.0		7.2	8.6	11.7		8.1				
Green Ext Time (p_c), s	0.0	0.0		0.8	0.0	2.5		0.8				
Intersection Summary												
HCM 6th Ctrl Delay			47.0									
HCM 6th LOS			D									

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↑	↱	↰	↑↑	↱	↰	↑↱	
Traffic Volume (veh/h)	109	482	190	95	456	142	157	319	75	145	598	161
Future Volume (veh/h)	109	482	190	95	456	142	157	319	75	145	598	161
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	118	524	207	103	496	154	171	347	55	158	650	175
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	158	664	261	119	869	387	198	869	387	198	677	182
Arrive On Green	0.09	0.27	0.27	0.07	0.24	0.24	0.11	0.24	0.24	0.11	0.24	0.24
Sat Flow, veh/h	1781	2491	980	1781	3554	1585	1781	3554	1585	1781	2769	745
Grp Volume(v), veh/h	118	373	358	103	496	154	171	347	55	158	417	408
Grp Sat Flow(s),veh/h/ln	1781	1777	1694	1781	1777	1585	1781	1777	1585	1781	1777	1736
Q Serve(g_s), s	5.8	17.5	17.7	5.2	11.0	7.3	8.5	7.4	2.4	7.8	20.8	20.9
Cycle Q Clear(g_c), s	5.8	17.5	17.7	5.2	11.0	7.3	8.5	7.4	2.4	7.8	20.8	20.9
Prop In Lane	1.00		0.58	1.00		1.00	1.00		1.00	1.00		0.43
Lane Grp Cap(c), veh/h	158	474	452	119	869	387	198	869	387	198	434	424
V/C Ratio(X)	0.75	0.79	0.79	0.87	0.57	0.40	0.86	0.40	0.14	0.80	0.96	0.96
Avail Cap(c_a), veh/h	158	474	452	119	869	387	198	869	387	198	434	424
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	40.0	30.6	30.7	41.6	29.9	28.5	39.3	28.5	26.6	39.0	33.6	33.6
Incr Delay (d2), s/veh	17.3	8.6	9.3	44.8	0.9	0.7	30.4	0.3	0.2	20.1	32.9	33.7
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(95%),veh/ln	5.8	12.9	12.6	6.6	8.1	0.1	9.0	5.4	1.6	7.8	18.2	18.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	57.4	39.2	40.0	86.4	30.8	29.1	69.7	28.8	26.8	59.2	66.5	67.3
LnGrp LOS	E	D	D	F	C	C	E	C	C	E	E	E
Approach Vol, veh/h		849			753			573			983	
Approach Delay, s/veh		42.1			38.0			40.8			65.7	
Approach LOS		D			D			D			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	12.8	29.1	16.3	29.3	14.2	27.7	16.7	29.0
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	8.0	26.0	12.0	24.0	10.0	24.0	12.0	24.0
Max Q Clear Time (g_c+I1), s	8.2	20.7	10.8	10.4	8.8	14.0	11.5	23.9
Green Ext Time (p_c), s	0.0	1.5	0.1	1.4	0.0	2.1	0.0	0.0

Intersection Summary	
HCM 6th Ctrl Delay	48.2
HCM 6th LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	206	751	164	270	1997	443	564	467	199	150	225	182
Future Volume (veh/h)	206	751	164	270	1997	443	564	467	199	150	225	182
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	224	816	150	293	2171	337	613	508	151	163	245	139
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	190	2265	636	312	2651	745	553	647	566	189	273	122
Arrive On Green	0.11	0.80	0.40	0.17	0.94	0.47	0.16	0.18	0.18	0.05	0.08	0.08
Sat Flow, veh/h	1781	5644	1585	1781	5644	1585	3456	3554	1585	3456	3554	1585
Grp Volume(v), veh/h	224	816	150	293	2171	337	613	508	151	163	245	139
Grp Sat Flow(s),veh/h/ln	1781	1881	1585	1781	1881	1585	1728	1777	1585	1728	1777	1585
Q Serve(g_s), s	16.0	6.0	5.8	24.4	15.1	21.5	24.0	20.5	10.2	7.0	10.3	9.4
Cycle Q Clear(g_c), s	16.0	6.0	5.8	24.4	15.1	21.5	24.0	20.5	10.2	7.0	10.3	9.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	190	2265	636	312	2651	745	553	647	566	189	273	122
V/C Ratio(X)	1.18	0.36	0.24	0.94	0.82	0.45	1.11	0.78	0.27	0.86	0.90	1.14
Avail Cap(c_a), veh/h	190	2265	636	451	2651	745	553	900	679	276	616	275
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.98	0.98	0.98	1.00	1.00	1.00	0.91	0.91	0.91	1.00	1.00	1.00
Uniform Delay (d), s/veh	67.0	9.4	11.5	61.1	2.9	26.8	63.0	58.5	34.3	70.3	68.6	45.7
Incr Delay (d2), s/veh	121.2	0.4	0.9	22.3	3.0	2.0	70.0	1.8	0.1	16.5	4.2	72.4
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(95%),veh/ln	21.0	3.9	6.6	18.7	4.2	13.4	23.3	14.2	7.1	6.4	8.4	10.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	188.2	9.9	12.3	83.4	5.8	28.8	133.0	60.3	34.3	86.9	72.8	118.1
LnGrp LOS	F	A	B	F	A	C	F	E	C	F	E	F
Approach Vol, veh/h		1190			2801			1272			547	
Approach Delay, s/veh		43.7			16.7			92.3			88.5	
Approach LOS		D			B			F			F	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	15.2	34.3	23.0	77.5	31.0	18.5	33.2	67.2
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	14.0	40.0	18.0	58.0	26.0	28.0	40.0	36.0
Max Q Clear Time (g_c+I1), s	10.0	23.5	19.0	24.5	27.0	13.3	27.4	9.0
Green Ext Time (p_c), s	0.2	0.5	0.0	31.6	0.0	0.3	0.9	13.8

Intersection Summary			
HCM 6th Ctrl Delay			45.5
HCM 6th LOS			D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	22	634	267	74	1328	37	638	5	102	34	8	83
Future Volume (veh/h)	22	634	267	74	1328	37	638	5	102	34	8	83
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	24	689	290	80	1443	40	800	0	0	37	9	90
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	12	1440	642	88	1591	710	895	470	0	97	24	106
Arrive On Green	0.01	0.41	0.41	0.05	0.45	0.45	0.25	0.00	0.00	0.07	0.07	0.07
Sat Flow, veh/h	1781	3554	1585	1781	3554	1585	3563	1870	0	1446	352	1585
Grp Volume(v), veh/h	24	689	290	80	1443	40	800	0	0	46	0	90
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1777	1585	1781	1870	0	1798	0	1585
Q Serve(g_s), s	0.8	17.6	16.4	5.5	46.4	1.8	26.7	0.0	0.0	3.0	0.0	6.9
Cycle Q Clear(g_c), s	0.8	17.6	16.4	5.5	46.4	1.8	26.7	0.0	0.0	3.0	0.0	6.9
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.00	0.80		1.00
Lane Grp Cap(c), veh/h	12	1440	642	88	1591	710	895	470	0	120	0	106
V/C Ratio(X)	2.08	0.48	0.45	0.91	0.91	0.06	0.89	0.00	0.00	0.38	0.00	0.85
Avail Cap(c_a), veh/h	43	1560	696	217	1906	850	1129	593	0	351	0	309
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	61.1	27.0	26.6	58.2	31.6	19.2	44.5	0.0	0.0	55.0	0.0	56.8
Incr Delay (d2), s/veh	561.6	0.2	0.5	27.3	6.0	0.0	7.9	0.0	0.0	2.0	0.0	16.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	3.9	11.7	10.2	5.6	27.5	1.2	18.5	0.0	0.0	2.6	0.0	5.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	622.7	27.3	27.1	85.5	37.5	19.3	52.4	0.0	0.0	56.9	0.0	73.2
LnGrp LOS	F	C	C	F	D	B	D	A	A	E	A	E
Approach Vol, veh/h		1003			1563			800			136	
Approach Delay, s/veh		41.5			39.5			52.4			67.7	
Approach LOS		D			D			D			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	13.1	56.8		37.9	7.8	62.1		15.2
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	17.0	56.0		41.0	5.0	68.0		26.0
Max Q Clear Time (g_c+I1), s	8.5	20.6		29.7	3.8	49.4		9.9
Green Ext Time (p_c), s	0.1	4.9		3.2	0.0	7.7		0.4

Intersection Summary			
HCM 6th Ctrl Delay			44.1
HCM 6th LOS			D

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	163	396	65	81	595	351	327	915	224	289	504	277
Future Volume (veh/h)	163	396	65	81	595	351	327	915	224	289	504	277
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	177	430	68	88	647	377	355	995	134	314	548	296
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	178	699	110	130	711	317	372	969	432	308	527	284
Arrive On Green	0.10	0.23	0.23	0.07	0.20	0.20	0.21	0.27	0.27	0.17	0.24	0.24
Sat Flow, veh/h	1781	3077	483	1781	3554	1585	1781	3554	1585	1781	2229	1202
Grp Volume(v), veh/h	177	247	251	88	647	377	355	995	134	314	437	407
Grp Sat Flow(s),veh/h/ln	1781	1777	1783	1781	1777	1585	1781	1777	1585	1781	1777	1654
Q Serve(g_s), s	10.9	13.7	13.9	5.3	19.6	22.0	21.7	30.0	7.4	19.0	26.0	26.0
Cycle Q Clear(g_c), s	10.9	13.7	13.9	5.3	19.6	22.0	21.7	30.0	7.4	19.0	26.0	26.0
Prop In Lane	1.00		0.27	1.00		1.00	1.00		1.00	1.00		0.73
Lane Grp Cap(c), veh/h	178	404	405	130	711	317	372	969	432	308	420	391
V/C Ratio(X)	0.99	0.61	0.62	0.68	0.91	1.19	0.95	1.03	0.31	1.02	1.04	1.04
Avail Cap(c_a), veh/h	178	404	405	130	711	317	372	969	432	308	420	391
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	49.5	38.1	38.2	49.7	43.0	44.0	43.0	40.0	31.8	45.5	42.0	42.0
Incr Delay (d2), s/veh	65.5	2.7	2.9	13.4	15.9	112.2	34.5	35.9	0.4	56.7	54.6	56.8
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(95%),veh/ln	12.6	10.2	10.3	5.0	15.1	27.5	18.7	24.7	5.1	19.1	24.8	23.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	114.9	40.9	41.1	63.1	58.9	156.2	77.5	75.9	32.2	102.2	96.6	98.8
LnGrp LOS	F	D	D	E	E	F	E	F	C	F	F	F
Approach Vol, veh/h		675			1112			1484			1158	
Approach Delay, s/veh		60.4			92.2			72.3			98.9	
Approach LOS		E			F			E			F	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	13.9	33.1	26.0	37.0	18.0	29.0	29.9	33.1
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	10.0	27.0	21.0	32.0	13.0	24.0	25.0	28.0
Max Q Clear Time (g_c+I1), s	8.3	16.9	22.0	33.0	13.9	25.0	24.7	29.0
Green Ext Time (p_c), s	0.0	1.4	0.0	0.0	0.0	0.0	0.1	0.0

Intersection Summary	
HCM 6th Ctrl Delay	82.4
HCM 6th LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	126	1934	516	409	714	302	224	312	363	649	572	177
Future Volume (veh/h)	126	1934	516	409	714	302	224	312	363	649	572	177
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	137	2102	344	445	776	219	243	339	232	705	622	127
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	151	1931	542	333	2506	704	329	466	504	530	673	300
Arrive On Green	0.08	0.68	0.34	0.19	0.89	0.44	0.10	0.13	0.13	0.15	0.19	0.19
Sat Flow, veh/h	1781	5644	1585	1781	5644	1585	3456	3554	1585	3456	3554	1585
Grp Volume(v), veh/h	137	2102	344	445	776	219	243	339	232	705	622	127
Grp Sat Flow(s),veh/h/ln	1781	1881	1585	1781	1881	1585	1728	1777	1585	1728	1777	1585
Q Serve(g_s), s	11.4	51.3	20.6	28.0	3.2	13.4	10.3	13.7	17.5	23.0	25.8	8.6
Cycle Q Clear(g_c), s	11.4	51.3	20.6	28.0	3.2	13.4	10.3	13.7	17.5	23.0	25.8	8.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	151	1931	542	333	2506	704	329	466	504	530	673	300
V/C Ratio(X)	0.91	1.09	0.63	1.34	0.31	0.31	0.74	0.73	0.46	1.33	0.92	0.42
Avail Cap(c_a), veh/h	249	1931	542	333	2506	704	329	569	549	530	782	349
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.76	0.76	0.76	1.00	1.00	1.00	0.91	0.91	0.91	1.00	1.00	1.00
Uniform Delay (d), s/veh	68.1	23.7	23.6	61.0	4.8	26.9	66.1	62.6	40.9	63.5	59.7	35.4
Incr Delay (d2), s/veh	18.3	47.3	4.3	171.3	0.3	1.2	7.8	3.3	0.6	161.3	15.3	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	9.4	30.0	12.4	42.4	2.0	9.0	8.3	10.4	11.0	33.5	18.9	6.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	86.4	71.0	27.8	232.3	5.2	28.0	73.9	65.9	41.5	224.8	75.0	36.4
LnGrp LOS	F	F	C	F	A	C	E	E	D	F	E	D
Approach Vol, veh/h		2583			1440			814			1454	
Approach Delay, s/veh		66.1			78.8			61.3			144.3	
Approach LOS		E			E			E			F	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	30.0	26.7	19.7	73.6	21.3	35.4	35.0	58.3
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	25.0	26.0	23.0	56.0	16.0	35.0	30.0	49.0
Max Q Clear Time (g_c+I1), s	26.0	20.5	14.4	16.4	13.3	28.8	31.0	54.3
Green Ext Time (p_c), s	0.0	1.1	0.3	14.5	0.3	1.6	0.0	0.0

Intersection Summary	
HCM 6th Ctrl Delay	86.4
HCM 6th LOS	F

Appendix E

Caltrans Interim Guidance

LOCAL DEVELOPMENT – INTERGOVERNMENTAL REVIEW PROGRAM INTERIM GUIDANCE

APPROVED – SEPTEMBER 2, 2016

Implementing Caltrans Strategic Management Plan 2015-2020
Consistent with SB 743 (Steinberg, 2013)

Table of Contents

I. Introduction and Background

Caltrans' Local Development-Intergovernmental Review (LD-IGR) program reviews land use and infrastructure plans and projects across the state for potential impacts and enhancements to the State's environment, natural resources and multimodal transportation system for the California public. Through the LD-IGR process, Caltrans advises Lead Agencies on what these impacts might be and ways to avoid, minimize, and/or mitigate adverse impacts. Caltrans also identifies land use and design strategies that may enhance connectivity and access to destinations. As required through a host of state and federal planning requirements, the LD-IGR program has historically supported smart growth policies designed to create vibrant communities with a sustainable multimodal transportation system. For example, the program's 2005 Deputy Directive 25-R1 states:

> *"The Department works to ensure that local land use planning and development decisions include the provision of transportation choices, including transit, intercity rail passenger service, air service, walking, and biking, when appropriate. The Department advocates community design (e.g., urban infill, mixed use, transit oriented development) that promotes an efficient transportation system and healthy communities."*

With the enactment of legislation such as AB 32 (2006), SB 375 (2008), SB 226 (2011), SB 743 (2013), etc. and the development of planning guidance such as the Smart Mobility Framework, Complete Streets Implementation Action Plan, the California Transportation Plan 2040, as well as Caltrans' adoption of its new mission, vision, goals and the Strategic Management Plan 2015 – 2020 (SMP), the LD-IGR program is strengthening its focus on transportation infrastructure that supports smart growth and efficient development. This is intended to help ensure that greenhouse gas (GHG) emissions reduction, good community design, improved proximity to key destinations, and a safe, multimodal transportation system are all integral parts of land use decision making throughout the state. Past LD-IGR practices primarily utilized Level of Service to identify various impacts to the State Highway System (SHS), and often limited its recommended mitigation to traditional road improvements. Although Caltrans recognized that Lead Agencies could implement other measures, such as improvements to other modes of transportation or incentive programs to encourage use of other modes, the Lead Agencies often rely on Caltrans' recommended measures. Going forward, efforts to fulfill our LD-IGR obligation should consider multimodal solutions to not only improve access to destinations for all system users (motorists, transit riders, bicyclists, pedestrians), but also encourage efficient land use that helps achieve the multitude of goals sought, including quality of life, economic prosperity, the development of multimodal networks, and GHG emissions reduction.

The LD-IGR program provides an important opportunity to encourage Lead Agencies to implement the goals and targets of the Caltrans Strategic Management Plan. By year 2020, the SMP calls for several specific targets related to the LD-IGR program:

- a doubling of walking and transit, and tripling of bicycle trips as a percentage of overall trips
- a reduction of per capita vehicle miles traveled (VMT) by 15%
- a reduction of the number of fatalities in each travel mode by 10% a year
- a reduction of GHG and other pollutants consistent with the Air Resources Board's AB 32 Scoping Plan and State Implementation Plan
- an increase of freight system efficiency by 10 %

- a reduction to an 8% rate of growth in Daily Vehicle Hours of Delay (DVHD) under 35 miles per hour on urban State highways

The SMP also contains several strategic objectives related to the LD-IGR program, including:

- reduce user fatalities and injuries by adopting a "Toward Zero Deaths" practice
- promote community health through active transportation and reduced pollution in communities
- effectively manage taxpayer funds and maximize the use of available financial resources
- improve the quality of life for all Californians by providing mobility choice, increasing accessibility to all modes of transportation and creating transportation corridors not only for conveyance of people, goods, and services, but also as livable public spaces
- reduce environmental impacts from the transportation system with emphasis on supporting a statewide reduction of greenhouse gas emissions to achieve 80% below 1990 levels by 2050
- improve economic prosperity of the State and local communities through a resilient and integrated transportation system
- improve travel time reliability for all modes
- reduce peak period travel times and delay for all modes through intelligent transportation systems, operational strategies, demand management, and land use/ transportation integration
- increase the number of Complete Streets features on State highways that are also local streets in urban, suburban, and small town settings
- improve collaborative partnerships with agencies, industries, municipalities and tribal governments and advance national engagement with the transportation research and policy committees

As highlighted in the guidance below, the LD-IGR program's revised approach to commenting on plans and projects will help meet the goals and targets of the Strategic Management Plan. One important component to help achieve these goals is Caltrans' current process of creating a statewide Transportation Analysis Guide (TAG) and completing a comprehensive update of our Transportation Impact Study Guide (TISG). The TAG-TISG will better inform transportation infrastructure investment and land use and infrastructure project impact analysis, bring Caltrans practices in line with state policy (including those policies named above), and bring Caltrans analysis practices up to state of the practice by providing a suite of methodologies, tools, and best practices. It will help public and private sector practitioners across the state perform the various types of analysis needed to identify multimodal transportation impacts from new land use, transportation, and infrastructure plans and projects.

In the interim, this Interim Guidance document intends to ensure that all Caltrans LD-IGR comments on growth plans, development projects, and infrastructure investments align with state policies through the use of efficient development patterns, innovative demand reduction mitigation strategies, and necessary multimodal roadway improvements. This is in addition to Caltrans' long-standing commitment to maintain a safe, multimodal transportation system that provides access to destinations for all users. We also continue to recognize that under the California Environmental Quality Act (CEQA), it is ultimately the Lead Agency's responsibility to perform a CEQA analysis, set local thresholds of significance, analyze potential impacts, determine significance, and identify, implement, and monitor any required mitigations.

This guidance supersedes the 2002 Caltrans Guide for the Preparation of Traffic Impact Studies in comments to local agencies. Instead of referencing the 2002 guide, Districts should make specific analysis requests of the Lead Agency when additional information is needed. The District can offer to provide the Lead Agency assistance in developing the scope of any analysis and answering questions. Headquarters

LD-IGR staff is also able to assist with scoping required analysis and developing recommended solutions for the Districts' and Caltrans' local and regional partners to consider.

In order to ensure alignment of Caltrans comments with state goals described above, LD-IGR comments henceforth should take into consideration whether the project exhibits low or high VMT (by place type e.g., urban, suburban, and rural areas) and should focus recommendations on smart land use, multimodal access, safety for all users, and reducing single occupant vehicle trips. Well planned urban infill projects which are located close to transit, bike and pedestrian facilities (see Appendix A: Project Type 1), which also have proximity benefits to employment centers, services and goods – will reduce travel demand on the entire transportation system and will therefore require significantly less review and mitigation than rural fringe projects (Project Type 5), which generate proportionately higher number of trips and vehicle miles traveled.

Senate Bill 743 (2013) mandated that CEQA review of transportation impacts of proposed development be modified by eliminating consideration of delay- and capacity- based metrics such as level of service (LOS) and instead focusing analysis on another metric of impact. The Governor's Office of Planning and Research (OPR) is currently updating its CEQA Guidelines to implement SB 743 and is proposing that vehicle miles traveled be the primary metric used in identifying transportation impacts. OPR has released a separate "Technical Advisory" outlining recommended techniques for measuring impacts with this new metric, which applies statewide. The General Plan Guidelines are also concurrently being updated to align with state policy, including SB 743.

The need to evolve LD-IGR comments on local development transportation analysis and local development mitigation responses was articulated in a California State Transportation Agency (CalSTA) commissioned review of Caltrans practices in the State Smart Transportation Initiative (SSTI). Their January 2014 report stated that *"SB 743 could do more to advance state planning goals than anything else Caltrans has done", and "would put California and Caltrans back at the leading edge of modern transportation practice ….. It would begin to make Caltrans a real contributor to the success of modern policy in the state, and it would provide a model for how the staff could help implement a challenging new charge."* A December 2014 report titled *A Follow-Up to The California Department of Transportation: SSTI Assessment and Recommendations* noted that OPR, CalSTA and Caltrans have been collaborating closely on remaining CEQA rulemaking issues, such as "*to manage operational challenges, namely where congested exit ramps may back up onto freeways, in a way that is not simply level of service by another name, failing to deliver the relief to infill development as the law directs. The draft rulemaking would also base mitigation on a development's total vehicle-miles generated."*

The TAG-TISG will also help implement Caltrans Strategic Management Plan 2015-2020 objectives consistent with SB 743 changes to CEQA. The TAG-TISG focuses transportation analysis on VMT impacts, assessing impacts from growth plans and development projects on the multimodal transportation network, and quantifying VMT and GHG reductions achieved through smart mobility principles and Transportation Demand Management (TDM) strategies. Until the TAG-TISG is complete, the Interim Guidance provided herein is intended to help ensure that District LD-IGR comment letters evolve to carry out state law, reflect the State's strategic safety goals and planning priorities, and align with California's climate change goals.

Purpose of this Interim Guidance

With the Strategic Management Plan objectives and SB 743's changes to CEQA, LD-IGR coordinators and functional reviewers will transition away from using delay based analysis, such as LOS or similar measures of vehicular capacity or traffic congestion, to determine the impacts of land use and infrastructure plans and projects. Instead, they will identify opportunities for reduced VMT generation, advise Lead Agencies on maintaining safe operations, and provide recommendations on developing location-efficient (e.g., centrally located, infill) and travel-efficient (e.g., inclusion of TDM measures) land use.

This Interim Guidance will remain in effect until superseded by Caltrans Transportation Impact Study Guidelines (TISG), currently under development.

Henceforth, LD-IGR comment letters should reflect the "top six" elements discussed below, as well as the more detailed guidance in the accompanying appendices. It is important to note that this Interim Guidance is intended to be the overarching policy and guidance of the LD-IGR program, aside from any Director's Policies or Deputy Directives. The Headquarters LD-IGR program will be updating guidance and training to be aligned with the Strategic Management Plan 2015-2020 lens over the upcoming months. If reviewers notice any discrepancies in policy and direction between the existing guidance on the Caltrans intranet and this Interim Guidance, please notify the LD-IGR program manager for further direction. Similarly, if reviewers experience any difficulties in applying this Interim Guidance to individual development-related plans, programs, or projects, they are encouraged to contact Alyssa Begley, SB 743 Program Implementation Manager, for assistance on a statewide perspective, and suggested solutions that might be useful.

Active participation by the Districts in regularly scheduled LD-IGR Teleforum meetings with Headquarters will also help District staff keep abreast of emerging methodologies, relevant examples, and current events that may further inform this Interim Guidance while OPR's CEQA Guidelines Update and Caltrans' TAG-TISG Update are in progress.

The existing LD-IGR program's intranet guidance and the technical resources are found at:
http://transplanning.onramp.dot.ca.gov/local-development-intergovernmental-review-ld-igr-branch

II. Key Elements to Include in LD-IGR Letters

This section summarizes the "top six" elements to emphasize when reviewing development plans and project proposals for transportation impacts and when drafting LD-IGR comment letters. The following appendices provide explicit guidance, technical considerations, and template language for District LD-IGR coordinators and functional reviewers to incorporate as needed.

A. Comment on Vehicle Miles Traveled associated with the project.

Reviewers should comment on vehicle miles traveled resulting from the land use project, applying local agency thresholds or absent those, thresholds recommended by the most recent draft of OPR's CEQA Guidelines and Technical Advisory. If an assessment of VMT is not presented, Caltrans should request it be presented. Though SB 743 clarifies requirements for transportation analysis, a VMT analysis is already needed to meet other CEQA requirements.[1] Methods for assessing VMT should be compared to the methods recommended in the OPR Technical Advisory. Where methods are not consistent with the recommendations in the Technical Advisory, Caltrans should comment on those methods. Where the project exhibits less than threshold VMT, Caltrans comments should acknowledge the project's transportation efficiency. Where the project exhibits greater than threshold VMT, Caltrans should request mitigation. Examples of mitigation measures are included in the OPR Technical Advisory. Contact the SB 743 Program Implementation Manager, Alyssa Begley, for assistance with VMT calculation.

B. Rather than providing recommendations that primarily accommodate motor vehicle travel, provide recommendations that strive to reduce VMT generation; improve pedestrian, bike, and transit service and infrastructure; and which don't induce additional VMT.

As demonstrated by the template language provided in Appendix C of this Interim Guidance, it is important that Caltrans comment letters express the intent and purpose of the LD-IGR program and Caltrans' review of land use and infrastructure plans and projects through the new lens of the Caltrans Strategic Management Plan 2015-2020. In other words, providing recommendations for solutions that reduce automobile travel rather than recommendations that accommodate more of it. For example, consider the following sample paragraph intended for letter introductions:

> *"The mission of Caltrans is to provide a safe, sustainable, integrated, and efficient transportation system to enhance California's economy and livability. The Local Development-Intergovernmental Review (LD-IGR) Program reviews land use and infrastructure plans and projects through the lenses of our mission, vision, and goals as guided by the State's planning priorities of prioritizing infill, conservation, and efficient development."*

Consider also the following paragraph intended to discuss demand reduction and mitigation strategies:

> *"Caltrans seeks to reduce vehicle trips and new vehicle miles traveled associated with development and recommends appropriate measures to avoid, minimize, or mitigate transportation impacts through smart mobility community design and innovative multimodal demand reduction strategies."*

C. Focus on travel efficiency

Coordinators and reviewers should use the terms *"transportation impact study"* rather than *"traffic impact study"* and note that the study should analyze all modes. Such terminology helps developers, decision makers, and the public better understand that Caltrans seeks a holistic perspective on the infrastructure (roadways, bicycle facilities, sidewalks, transit stations, etc.), the service (e.g. transit, rail, etc.) needs, opportunities for closer proximity to key destinations, and other factors that may be created by growth plans and development projects under review. This language acknowledges and builds upon the multimodal perspective taken by the LD-IGR program since its inception, but not always followed in practice. This approach will also help shape the analysis techniques applied to the review so that the right kinds of data and analyses are provided for consideration. For example, Districts should help the Lead Agency contextualize the project by describing not just what and where it is, but also

[1] See CEQA Guidelines §15064.4 (analysis of greenhouse gas emissions) and Appendix F (requiring analysis of "the project's projected transportation energy use requirements and its overall use of efficient transportation alternatives". See also California Clean Energy Committee v. City of Woodland (2014) 225 Cal. App. 4th 173, 210.

how those factors relate to both the multimodal transportation system and parallel objectives such as job creation, resource and open space conservation, or housing affordability—especially for projects and plans that generate high VMT. If the project is on the suburban edge of a region or far from transit, it is likely to induce more VMT than an infill project. In assessing how the project might be able to reduce its VMT generation, it is also critical to understand how the project can enhance a multimodal transportation network, how the project may increase access to key destinations (by foot or bicycle), and what aspects of the system can be utilized as feasible TDM mitigation measures. See Appendix D for additional information.

Districts should be cognizant of land use economics when reviewing local development projects in order to be mindful of all factors that lead to viability of individual project, more specifically, for projects that generate less overall vehicle miles traveled.

Districts are strongly encouraged to work with Lead Agencies to address transportation deficiencies and enhancements through policies at the planning level and through mitigation fee programs. Districts should still encourage Lead Agencies to share plans and projects for review that directly abut the SHS, are in vicinity of a State Highway, or projects for which Caltrans must approve and issue an encroachment permit.

Headquarters LD-IGR staff recognizes that this type of analysis will be a dramatic shift in process for Caltrans, and that Headquarters programs, District coordinators, and functional reviewers will need extensive training to adapt to the new analysis methods. Headquarters LD-IGR staff will coordinate with the Districts to ensure additional training and tools are provided throughout the Department. If Districts have training requests or concerns, please contact their Headquarters LD-IGR coordinator.

D. Remain neutral on project purpose while framing recommendations for mitigation of the project's impacts within statewide policy.

Commenting on local development can be controversial and should be written in a tone that promotes partnership, promotes collaboration, focuses on technical aspects of plans and projects, and is deferential to the Lead Agency's discretionary authority. However, Caltrans has a responsibility to advance the state's legislative priorities and carry out its role as a Responsible or Commenting Agency under CEQA. In order to strike this balance, our response letters should convey Caltrans' desire to be an active partner in Lead Agencies understand the transportation implications of development and to assist Lead Agencies in shaping projects to make more efficient use of our transportation system. Districts may choose to, for example:

- State whether the project is location-efficient (e.g. transit-oriented infill), with safe and adequate access to a multimodal transportation system and key destinations, that will help the state meet its GHG reduction targets under AB 32; or if it is sprawl that will increase VMT and regional emissions. As described in Section A above, ascertain VMT per OPR's guidance. Residential development should be assessed on a per capita basis. Office development VMT should be assessed on a per employee basis. Retail project VMT should be assessed on an absolute basis, but need not be calculated for local-serving retail (which generally reduces VMT). Land use project VMT should be compared to thresholds created by the local agency. In the absence of local agency thresholds, use recommendations in OPR's Technical Advisory, i.e., 15 percent below overall regional or city VMT per capita for residential projects, 15 percent below regional VMT per employee for office projects, and any increase in overall VMT for retail (further details can be found in the Technical Advisory). For residential and office development, VMT Maps produced by either regional travel demand models, or the California Statewide Travel Demand Model may be used as a shortcut to estimating VMT. VMT Calculation training will be made available to District staff. Sample language is provided in Appendix C.

- Note if the project is consistent or inconsistent with the growth patterns and future infrastructure features identified in the General Plan or Master-Specific Plans, as well as Regional Transportation Plans (RTP) or Sustainable Community Strategies (SCSs).
- Note if the project is consistent or inconsistent with State planning priorities of infill, conservation, and efficient development. For more information on the State's planning priorities, see the text from AB 857 (2002) and SB 226 (2011).

While it is not necessary to "take a stand" by commenting on a Lead Agency's actual decision to adopt a plan or approve-deny a project, comment letters should express findings of consistency or concern related to the implications and impacts, particularly VMT impacts, of development projects. And remember, Caltrans can recommend plan changes or project re-design where impact avoidance or minimization could be achieved. For example, a high-VMT-inducing edge development may consider walking or biking connectivity around a new major transit station with high-quality transit service (see SB 375), or if such a transit station is not present or planned, then around a neighborhood town center. Similarly, a jurisdiction or developer might be able to take advantage of reduced parking requirements or affordability density-bonus credits for projects located in infill areas to achieve a more efficient growth pattern. Such suggestions can point to a "win-win" by substantially reducing the plan's or project's VMT generation while still meeting the developer and Lead Agency's overarching economic and community development objectives. Our comment letters should note when Caltrans has had discussions in person with Lead Agency staff.

E. Be collaborative – Create paths for workable solutions and overcome roadblocks.

Cities, counties, and developers, as well as Regional Transportation Planning Agencies (RTPAs), Metropolitan Planning Organizations (MPOs), transit and inner-city rail operators, and a wide array of employers and service providers across the State face increasing pressures to accommodate California's population growth with limited funding, while also facing environmental and community-acceptance constraints. Caltrans, through our LD-IGR role, can work collaboratively to assist these agencies. Comment letters should not just identify potential concerns or problems, but offer suggested solutions that could be taken toward their resolution.

District staff should proactively establish early consultation in the planning and development project process. For example, request face-to-face meetings with Lead Agencies and project proponents to discuss how state law and the multimodal policies in city/county General Plans and RTPA/MPO RTPs and SCSs apply to the development project being reviewed or plan amendments being considered. This would allow both plan-level and project-specific technical concerns to be conveyed and, if possible, resolved with Lead Agencies as part of on-going information sharing. Such meetings can be used to link "early" and "late" steps in the development approval process by identifying potential planning policies and avoidance or minimization strategies, and developing mitigation implementation programs that help achieve Caltrans Strategic Management Plan 2015-2020 objectives and other state goals. Specifically, Districts should perform robust review of the land use and transportation analysis contained in the transportation impact studies for the environmental impact reports performed on General Plans, Specific/Master/Community plans, Regional Transportation Plans, Sustainable Community Strategies, etc.. This affords District staff a better understanding of how individual "streamlined" developments and infrastructure investments "tier" off of the analysis in plan- or program-level EIRs and provides opportunities for Caltrans to encourage and help shape new VMT-based impact fees.

F. Comments related to impacts to the State Highway System (SHS) will be focused on VMT impacts not delay or effects on road capacity.

Transportation analysis under CEQA is evolving, in part because of SB 743, to measure impacts using vehicle miles traveled. Similarly, Caltrans has adopted Strategic Management Plan goals related to reducing VMT per capita and increasing use of non-auto modes. Therefore, in reviewing project proposals and related CEQA documents, LD-IGR will focus its comments on reducing demand on the SHS as measured with VMT. Caltrans continues to be responsible for ensuring that encroachments on or changes to the SHS are designed to provide for safe operations.

The use of LOS as a CEQA threshold of significance will soon be disallowed and replaced with vehicle miles traveled. SB 743 did not alter a Lead Agency's responsibility to "analyze a project's potentially significant transportation impacts related to air quality, noise, safety, or any other impact associated with transportation."[2] Any information requests should be consistent with the guidance found in Appendices A and B.

This section will not address specifics of how to conduct an operational impacts analysis for all modes of transportation. This section is focused on the general policy, tone, and approach.

Improvements on conventional roadways should, as appropriate to the context, emphasize a complete streets approach to improvements (improvements such as lane width reduction, landscaped medians, pedestrian bulb outs, etc.) and should avoid increasing automobile capacity and/or other measures that would significantly increase VMT.

Suggested improvements to address operational impacts should not result in increased speeds that are not suitable for vulnerable users on the conventional facility. Operational impact improvements should be appropriate to the context and consistent with complete streets principles wherever feasible. Capacity improvements to freeway ramps and freeway mainlines to address operational impacts should be a last resort. Improved crosswalk signal timing, intelligent transportation systems improvements, enhanced signage, roadway designs that result in reduced speed limits, and other effective methods that do not significantly increase VMT should first be explored as potential solutions.

[2] A safety-related transportation impact under CEQA is not the same as, and does not establish, an unsafe condition. Instead, the CEQA determinations are based on modeling and projections of potential future conditions and any mitigation is focused on making conditions safer.

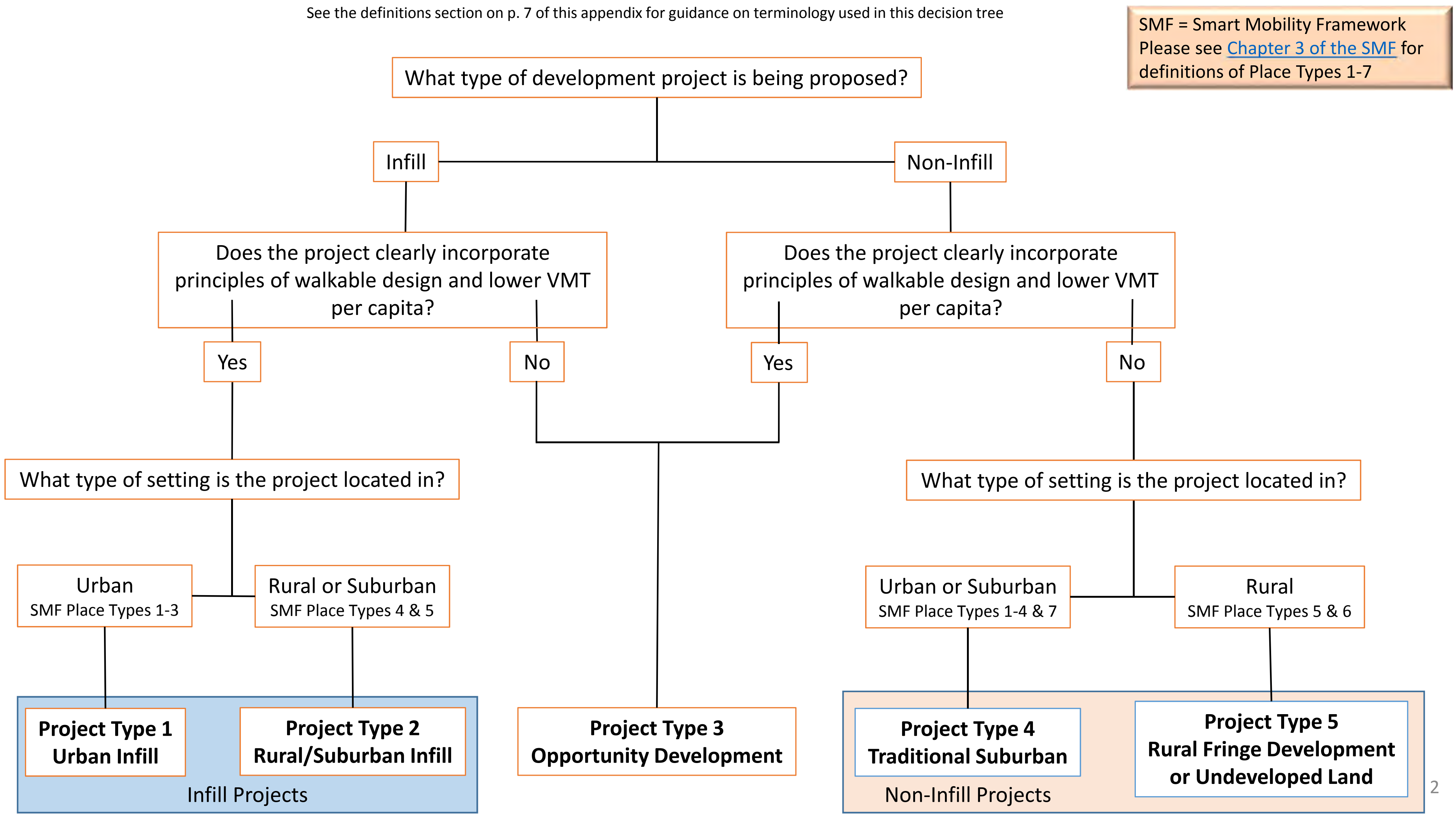
Appendix A: Recommended Guidance for Site-Specific Development Project Review

Please use this flow chart and the guidance following it to determine whether to comment on site-specific projects and what types of comments to make based on the type of project and its location. Reviewers should first consider the project's geographic setting and whether projects are located in an infill location, have a walkable project design, and assess VMT generation (definitions of key terms are at the end of this appendix). Projects may not fall perfectly into the place type categories below, so please use your best judgment on types of comments to make. We recognize every project is different.

Before sending a comment letter, the District LD-IGR coordinator should consider what the main objective of sending a letter is, what point of the process the project is in, and if it is necessary to even make comments. A request for additional analysis should be followed by an explanation of why that analysis is needed. If we request a Lead Agency to provide additional analysis on how a project impacts the SHS, we should articulate our concerns. Districts should not just ask for studies or analysis for projects just to have the information. For high-VMT projects, comments should have a primary focus on helping a project reduce VMT loaded onto roadway networks, including the State Highway System.

LD-IGR Site-Specific Development Project Review Decision Tree

See the definitions section on p. 7 of this appendix for guidance on terminology used in this decision tree



Guidance for Site-Specific Development Project Review by Place Type

	Urban Infill Project Type 1	Rural/Suburban Infill Project Type 2	Opportunity Development Project Type 3	Traditional Suburban Project Type 4	Rural Fringe/ Undeveloped Land Project Type 5
a. General Review Approach	• Generally Districts should have minimal comments (or no comments) on Type 1-2 because they are well planned infill projects which are located close to transit, bike and pedestrian facilities which also have proximity benefits to employment centers, services, and goods will reduce travel demand on the entire transportation system and will therefore require significantly less review and mitigation than rural fringe projects (Project Type 5) which generate proportionally higher number of trips and vehicle miles traveled. Districts should coordinate with SB 743 Program Implementation Manager when developing letters for Type 1 land use projects. • Consistent with the new Caltrans mission, vision, and goals, and other statewide laws and policy, projects meeting Type 1-2 criteria typically minimize the overall demand on the SHS compared to what would be built in their place to accommodate demand. • Infill projects have the benefit of proximity to employment, services, and retail that helps reduce trip length and increase accessibility for all modes. • While in some cases, projects with a walk and bike friendly design may actually increase regional VMT in rural areas, projects in town centers that incorporate pedestrian friendly designs could encourage more trips by walking, biking, and transit for local residents. Districts may still encourage project construction traffic to avoid peak hours when specific non-delay operational concerns arise.		• Opportunity development projects are similar to those in Type 1 and Type 2, but they are typically designed in such a way that is traditional suburban type development that happens to reduce VMT due to its location. Or they are projects on the fringe of urban areas designed in a way that minimizes VMT impacts. • Districts may encourage the Lead Agency to improve pedestrian connectivity both within the project and its connections to surrounding areas. The Districts may also encourage a reduction in parking spaces (when warranted), and potentially reorienting the development so that parking lots are not located between buildings and the streets. • If some of the individual components of the project exceed VMT thresholds on page 6 of this appendix (when accounting for mixed-use trip reduction), then Districts can encourage transportation demand management (TDM) measures. See the Appendix D section on Demand Management for suggestions on TDM. • Other projects that typically do not generate permanent traffic (such as levee repairs, signs, pipelines, solar farms, etc.) should follow existing LD-IGR guidance. Comments related to these types of projects should not focus on congestion.	• Type 4 and 5 projects generally are considered traditional suburban or rural fringe development that generate higher VMT, and do not encourage walking or biking by their project design. • Districts should make comments on ways projects can minimize VMT generation to meet VMT reduction goals from SB 743 and assist the State in meeting GHG reduction targets. Caltrans should press for significant connections to existing pedestrian, bicycle, and transit infrastructure to avoid a development relying solely on the existing local roadway system or State Highway System. • Districts are also encouraged to use the Smart Growth Principles language suggested in the Appendix C: Recommended Language that identifies whether or not a project incorporates smart growth principles. • Districts should make comments on ways the projects can improve internal circulation for all modes, better integrate with other nearby land uses, and provide a network of complete streets that benefits all users of the transportation system.	

Guidance for Site-Specific Development Project Review by Place Type

<table>
<tr><th></th><th>Urban Infill

Project Type 1</th><th>Rural/ Suburban Infill
Project Type 2</th><th>Opportunity Development
Project Type 3</th><th>Traditional Suburban
Project Type 4</th><th>Rural Fringe/ Undeveloped Land
Project Type 5</th></tr>
<tr><td>b. Multimodal Operational Impacts Analysis</td><td>• For purposes of this Interim Guidance, projects in Urban Infill areas are presumed to have multiple community benefits that include multimodal mobility, increased access, and safety for all users. Urban Infill projects also tend to increase pedestrian and bicycling travel, which promotes livable and healthy communities. This is important to note, because an important goal of this guidance is to help implement statewide objectives to minimize VMT generation and reduce GHGs--which research suggests infill development helps accomplish.
• Well planned infill projects which are located close to transit, bike and pedestrian facilities which also have proximity benefits to employment centers, services, and goods will reduce travel demand on the entire transportation system and will therefore require significantly less review and mitigation than rural fringe projects (Project Type 5) which generate proportionally higher number of trips and vehicle miles traveled.
• In cases where the Districts have specific substantial evidence that operational impacts or safety concerns exist, the Districts should work with the Lead Agency to identify the appropriate analysis needed, ways it can be provided, and how the operational impacts can be addressed.
• Districts are encouraged to work with Lead Agencies to proactively address relevant transportation concerns at the plan-level or corridor-level; this helps ensure that the Department is able to carry out its responsibilities as owner/operator of the SHS without having to ask for additional project-level analysis when individual Urban Infill developments move forward to approval, if it is not needed.
• Consideration should be given to the context of the area in relation to the SHS. Comments related to operational impacts should not be used as a mechanism to increase capacity of the roadway--they should only be made to address specific operational impacts as defined above. Districts should coordinate with SB 743 Program Implementation Manager when developing letters for Type 1 land use projects.</td><td colspan="4">• While an important overall goal of this guidance is to minimize VMT generation, many new development projects will increase traffic in a localized area and could create or exacerbate operational concerns that may increase the potential for future collisions (operational impacts).
• When necessary, the Districts should still analyze a project’s potential operational impacts and impact of significant increases of VMT on walkers, bikers, and drivers using the SHS.
• Well planned infill projects which are located close to transit, bike and pedestrian facilities (see Appendix A: Project Type 1), which also have proximity benefits to employment centers, services and goods – will reduce travel demand on the entire transportation system and will therefore require significantly less review and mitigation than traditional suburban projects (Project Type 4), and rural fringe projects (Project Type 5), which generate proportionately higher number of trips and vehicle miles traveled. Caltrans should press for significant and safe connections to existing pedestrian, bicycle, and transit infrastructure to avoid a Project Type 2-5 relying solely on the existing local roadway system or State Highway System.
• In cases where multimodal operational impact analysis is needed, but it is not provided, the Districts should work with the Lead Agency to identify the appropriate analysis needed and ways it can be provided. To date, no state law has exempted project proponents from performing a safety analysis for all transportation modes. That does not mean that project proponents necessarily need to perform an analysis. Consideration should be given to the context of the area in relation to the SHS.
• The Districts can also ask for construction traffic management plans. See Appendix C for sample language.</td></tr>
</table>

Guidance for Site-Specific Development Project Review by Place Type

	Urban Infill Project Type 1	Rural/Suburban Infill Project Type 2	Opportunity Development Project Type 3	Traditional Suburban Project Type 4	Rural Fringe/ Undeveloped Land Project Type 5
c. Pedestrian, Bicycle, and Transit Facilities	For projects that directly abut the SHS, agreements may be required for maintenance of pedestrian facilities. The Districts are strongly encouraged to advocate in comment letters for completing a network of pedestrian walkways along the SHS where feasible and appropriate to the context. The Districts should make efforts to familiarize themselves with local agencies' policies and design standards and work with project proponents early to resolve any design or safety-related issues for the walkways. Bicycle and transit facilities within the Caltrans ROW should also be considered and encouraged on a case-by-case basis. Agreements with other agencies may be necessary.				
d. Fee Programs	The Districts can request that projects pay into established fee programs (mandatory or voluntary programs are ok). Districts are encouraged to promote projects or improvements within the fee programs that help reduce VMT and enhance efficient access to destinations when feasible. Programmatic fee programs to address operational impacts are also encouraged to help avoid individual development projects avoid triggering direct operational impacts; this is especially important for Project Type 1-2.				
e. Level of Service (LOS) Related Comments Aimed at Reducing VMT	Not applicable		Some jurisdictions have set LOS thresholds for the SHS either through plans or by ballot measures and will provide this analysis during project review. Until the TAG-TISG is completed, Districts can make technical comments about a Lead Agency's deficiencies in LOS analysis of the SHS when a project is inconsistent with smart growth principles ("sprawl"). In this circumstance, the District can also point out LOS deficiencies on the SHS and request mitigation that minimizes new VMT on the SHS. Please note that the District should suggest capacity increasing improvements sparingly. Comments can focus on operational impacts and should be consistent with complete streets principles. Particularly for Project Type 3-5, Districts should assist the Lead Agency in identifying appropriate demand reduction measures by listing specific programs (see Appendix D – Section A "Demand Management")		
f. ROW Preservation	In areas where Caltrans system planning documents are aligned with local plans that call for the eventual widening of the SHS, Caltrans may find it necessary to make comments about preserving that ROW. The context of the situation is critical. District staff should consult with System Planning to maintain consistency with any existing local plans to enhance the livability and neighborhood connectivity of a State Highway segment, and determine whether Caltrans is working with a local agency to relinquish that portion of the State Highway.				
g. Responsible Agency	Caltrans is a Responsible Agency under CEQA when we have to approve and issue an Encroachment Permit for a local development project. We are a Commenting Agency when the local development project does not require an Encroachment Permit. Districts should inform the Lead Agency when an Encroachment Permit is required as early as possible in the local development project's process. District Planning should coordinate with District Encroachment Permits regarding which local development projects are not required to provide a transportation analysis. The Encroachment Permit process still requires some level of transportation analysis. Particularly for infill, the level of analysis required should balance the engineer's need for information with monetary costs incurred by the project. Time and money will be saved if Caltrans and the Lead Agency discuss the analysis needs for the Encroachment Permit as early as possible. See the "Encroachment Permits" section in Appendix C for language that should be included in a comment letter.				

Guidance for Site-Specific Development Project Review by Place Type

	Urban Infill Project Type 1	Rural/Suburban Infill Project Type 2	Opportunity Development Project Type 3	Traditional Suburban Project Type 4	Rural Fringe/ Undeveloped Land Project Type 5
h. Projects in Close Proximity to the SHS	The Districts should consider commenting on projects that border or are within a few hundred feet of Caltrans ROW. Some specific examples include projects that may have hydraulic impacts to the SHS, ROW Engineering concerns, sound wall placement along freeways, and other cases. For projects that border or plan any work within the state highway system ROW, Districts should comment about the potential need for an encroachment permit. The Lead Agency and developers appreciate being made aware of issues that could affect the cost, scope, or schedule of the project. We recommend working with Lead Agencies as early in the process as possible to resolve issues before CEQA-stage documents are released for public review and comment. The tone in the letters should be of a cooperative approach.				
i. Parking	If District staff notice an excessive number of parking spaces, greater than required by local zoning, associated with a development related to its context (i.e., in places with excessive amounts of underutilized parking nearby, in places with very high transit connectivity, etc.) the District may choose to comment that a reduction in parking may help reduce VMT and development project costs. Note that AB 744 (2015) identifies maximum parking ratios for affordable housing projects located within one-half mile of a major transit stop, and affordable housing projects outside of those locations.				

Questions to Consider for VMT Impacts

Questions to consider for VMT impacts:
Reviewers should comment on vehicle miles traveled resulting from the land use project, applying local agency thresholds. Or absent those, apply thresholds recommended by the most recent draft of OPR's CEQA Guidelines and Technical Advisory.

a) Will residential components of the project lower both the citywide (or countywide) and the regionwide existing VMT per capita by at least 15%?
b) Will office components of the project lower existing VMT per employee across the region by at least 15%?
c) Will retail components of the project decrease total VMT (note: can presume local serving retail will)?
Note: These questions are consistent with the most recent draft of the OPR Technical Advisory Implementing SB 743.

If the answer is no to any of the above questions (when accounting for internal trip capture for mixed use projects), then it may be appropriate to request the Lead Agency to minimize VMT generated by a project. See Appendix D for Transportation Demand Management suggestions.

Definitions of Key Terms

Infill Site: According California Public Resources Code Section 21061.3, an infill site is defined as "a site in an urbanized area that meets either of the following criteria: (a) The site has not been previously developed for urban uses and both of the following apply: (1) The site is immediately adjacent to parcels that are developed with qualified urban uses, or at least 75 percent of the perimeter of the site adjoins parcels that are developed with qualified urban uses, and the remaining 25 percent of the site adjoins parcels that have previously been developed for qualified urban uses. (2) No parcel within the site has been created within the past 10 years unless the parcel was created as a result of the plan of a redevelopment agency. (b) The site has been previously developed for qualified urban uses." For purposes of LD-IGR evaluation, whether or not a project is considered infill should also be considered with its effects on VMT. If it is unclear whether a project is infill or not, if a project induces high-VMT, the District should treat the project as a Type 3 Opportunity Development. Taking projects through the project place type decision tree above may help in determining the types of comments to make on the project.

***Walkable Project Design*:** There is no perfect definition of what comprises a project with good walkable design. However, there are resources that help define some of the principles of walkable design. The San Francisco Planning and Urban Research Association (SPUR) has developed seven principles of walkable urban districts that may be useful to District staff to help understand what walkable design incorporates: create fine-grained pedestrian circulation; orient buildings to street and open spaces; organize uses to support public activity; place parking behind or below buildings; address the human scale with building and landscape details; provide clear, continuous pedestrian access; and build complete streets. A project does not necessarily have to incorporate all of these principles to be considered having walkable design, but it should incorporate almost all of them.

Operational Impacts: When new development may create or exacerbate operational concerns that may increase the potential for future collisions. A safety-related transportation impact under CEQA is not the same as, and does not establish, an unsafe condition. Instead, the CEQA determinations are based on modeling and projections of potential future conditions and any mitigation is focused on making conditions safer.

***Place Types*:** Districts should not be too concerned with whether or not a project is considered rural, urban, or suburban to navigate the decision tree. What matters more is the project design and the VMT generated by the project (i.e., which project type box is selected). The Districts can also use the Smart Mobility Framework (SMF) Place Types to help navigate the decision tree. The SMF Place Type descriptions are located in Chapter 3 of the SMF. The SMF Place Type numbers on the decision tree correspond to the numbers in Chapter 3.

Appendix B: Recommended Guidance for Plans and Programs Review

There are many different types of plans (General, Specific, Community, Regional Transportation, Watershed, Air Quality to name a few) and programs that LD-IGR reviewers receive. To cover all the different types of them would defeat the purpose of keeping this guidance brief and just providing an overall policy framework.

OPR's Technical Advisory provides guidance on VMT-based impact analysis and mitigation. An array of research is available on this topic, much of which is summarized and packaged for deployment in the California Air Pollution Control Officers Association (CAPCOA) Quantifying Greenhouse Gas Mitigation Measures document (which focuses also on VMT). Further, HQ will post Technical Bulletins on Onramp as further information becomes available. In the meantime, HQ will provide the Districts with an SB 743 notification letter template for transmittal to Lead Agencies explaining what SB 743 requires them to consider, noting how Caltrans can assist, and stating that OPR is drafting an update of its CEQA Guidelines in order to spell out the new requirements in more detail.

It is important to note that one of the likely outcomes of SB 743 implementation will be the closer alignment of project-specific impact analysis and mitigation with the regional growth and program-level management strategies identified through the regional and systems planning process. Through regional and system planning efforts, the existing transportation system is analyzed and future improvements are planned to improve human mobility and system operations based on the regional population growth and mobility needs identified through city and county General Plans, RTPs/MTPs, etc. For example, when District system planners update Transportation Concept Reports (TCR), District System Management Plans (DSMPs), and Corridor System Management Plans (CSMP), coordination with LD-IGR is an opportunity to reflect long range growth plans, development projects, and regional improvement plans identified in regional planning documents. Similarly, when LD-IGR coordinators are reviewing development plans and projects, coordination with regional and system planning can be used to identify ultimate ROW setbacks, access management restrictions, planned frontage improvements, and facility improvements identified in system planning documents that should be factored into a project's site plan and mitigation measures.

Particularly at a project level, we want to avoid disadvantaging the last-in development. Caltrans (as well as other agencies) is sometimes criticized for being a barrier to local infill development by asking for costly studies or mitigation. In order to achieve equity in transportation financing and not place unreasonable burdens on site-specific development projects that advance state goals of smart growth and reduced greenhouse gas emissions, Caltrans should work with Lead Agencies to address impacts to the SHS at the plan level and in fee programs. In general, plans and programs can be an extremely important and efficient mechanism to identify and mitigate issues at a macro level and thus avoid issues with the site-specific project analysis. VMT reduction can have substantial safety benefits, so Districts should emphasize VMT reduction in their comments on lead agency plans or programs.

One way Districts can work with their partners to address mitigation issues is to proactively and directly participate in the development of comprehensive plans (e.g. General Plans, Master Plans, Specific Plans, etc.) and mitigation implementation programs (regional advance mitigation programs, impact fee nexus plans and capital improvement plans, etc.). For instance, a local agency could forecast expected development, identify needed transportation improvements that provides safe access for all modes (like lowering speeds at interchanges, mid-block crossings for pedestrians, cycle tracks for bicyclists, bus bays, added transit capacity, etc.), create cost estimates for those improvements, and create a financing program that development projects pay into to implement those improvements. Then local development projects would simply pay their fair share toward those improvements. There are many examples around the state where local agencies have established fee programs to pay for improvements. One example of a plan and fee program that does comprehensively address transportation needs (including safety and multimodal improvements) based on projected development is the Martell Triangle Plan in Amador County.

This process may also be beneficial for Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) and CEQA streamlining. The District should work with the MPO to address potential safety issues and needed mitigation in the RTP/SCS, in an effort to establish a corresponding fee program is established to pay for those improvements; then local development projects could simply pay fair share toward those improvements based upon their proportional impact and therefore would not need to perform any additional analysis of the SHS during the environmental review process if they met the CEQA streamlining provisions of the RTP/SCS. Please contact the HQ LD-IGR program manager for assistance with individual development projects tiering from programmatic-level CEQA documents.

LD-IGR coordinators should be proactively engaged in the regional and system planning processes and provide comments on the development of General Plans, Specific Plans/Master Plans, RTPs, and SCSs or Alternative Planning Strategies that integrate policies, priorities, and projects identified in TCRs, DSMPs, and CSMPs. Reviewers should advise lead agencies of any regional or system planning implications related to their travel demand models and RTP/SCSs-General Plans. Specifically, coordinators should also ask lead agencies if their regional models and Transportation Impact Mitigation (TIM) fee programs reflect long-range multimodal system improvements. In coordinating these efforts with System Planning, coordinators should be focused on helping lead agencies integrate their plan's or project's mitigation measures with corridor and system level management strategies and planned multimodal improvements on specific facilities. The Districts may also need to work with lead agencies on preserving ROW in some SHS corridors for future improvements and ensure consistency with Caltrans system planning documents.

Similarly, when evaluating proposed mitigation measures, reviewers should analyze the potential effects of induced travel (both VMT and GHG increases) resulting from any roadway capacity expansion improvements intended to reduce congestion. Reviewers should also evaluate the potential for connectivity improvements, such as internal circulation within a development or local roadway extensions-connections, to reduce VMT and GHG emissions by providing more efficient land use and direct routes between locations.

The intention for this integration should be conveyed to cities and counties through on-going communication and specifically requested at the Initial Study stage for growth plans, financing programs, and development projects. In order acquire the necessary data, to provide peer review, and in cases where District staff may need to assist lead agencies in performing these evaluations, LD-IGR coordinators should ask the regions to share their model platforms through a Model Users Agreement (contact HQ for examples) and Caltrans should share the California State Transportation Demand Model. Coordinators should also request copies of any sub-area models that might be developed for Traffic Operations Reports required in the capital project delivery process as these may include additional levels of refinement not available in regional models. Depending on the answers received, coordinators should recommend changes to ensure that planned plan-level and project-specific mitigation measures are consistent with adopted regional and system plans. If needed, coordinators should recommend changes to ensure that local and regional TIM programs include multimodal improvement intended to <u>reduce</u>, rather than <u>induce</u> VMT. Districts should create an electronic archive of the models they ask for and receive from local partners.

Districts should, when appropriate, request that local agencies provide a multimodal transportation demand and impact analysis for plans and programs. The Districts should note that this plan/program level analysis may also be useful for the evaluation of individual development projects that are utilizing CEQA streamlining provisions. Appendix C contains sample language for use in comment letters on plans and programs.

For certain projects and plans, District staff should coordinate with transit operators so information can be jointly shared for the purpose of service coordination and long-range transit planning.

Level of Service (LOS) Related Comments Aimed at Reducing VMT

Some jurisdictions have set LOS thresholds for the SHS either through plans or by ballot measures and will provide this analysis during plan review. LOS can still be used as a transportation analysis tool, however, for CEQA purposes District comments should address VMT.

Until the TAG-TISG guidance is provided, Districts can make technical comments about a lead agency's deficiencies in LOS analysis of the SHS when a plan is inconsistent with smart growth principles ("sprawl"). In this circumstance, the District can also point out LOS deficiencies on the SHS and request mitigation that minimizes new VMT on the SHS. Please note that the District should suggest roadway capacity improvements sparingly. Comments should focus on operational impacts and should be consistent with complete streets principles. Particularly for Project Types 3-5, Districts should assist the lead agency in identifying appropriate transportation demand reduction measures by listing specific programs (see Appendix D).

Appendix C: Recommended Language for LD-IGR Comment Letters

The template language below is provided for District LD-IGR coordinators to adapt as needed in order to reflect the key terms and general guidance outlined above. Please note that LD-IGR letters should be tailored to reflect the context surrounding the different types of plans and projects under review, what stage they are at in the review and approval process, and relevant background information such their scope and relationship to the multimodal transportation system.

All letters should contain introductory language that references the Department's new vision, mission, and goals, as well as versions of the general language below where appropriate in the standard LD-IGR letter format.

A. Caltrans New Mission

"Thank you for including the California Department of Transportation (Caltrans) in the environmental review process for the project referenced above. The mission of Caltrans is to provide a safe, sustainable, integrated and efficient transportation system to enhance California's economy and livability. The Local Development-Intergovernmental Review (LD-IGR) Program reviews land use projects and plans through the lenses of our mission and state planning priorities of infill, conservation, and travel-efficient development. To ensure a safe and efficient transportation system, we encourage early consultation and coordination with local jurisdictions and project proponents on all development projects that utilize the multimodal transportation network. We provide these comments consistent with the State's smart mobility goals that support a vibrant economy, and build communities, not sprawl. The following comments are based on the (insert type of document)*."*

"Caltrans new mission supports safety and sustainability in its call to "provide a safe, sustainable, integrated and efficient transportation system to enhance California's economy and livability". Caltrans Sustainability, Livability, and Economy goal states we will "make long-lasting, smart mobility decisions that improve the environment, support a vibrant economy, and build communities, not sprawl."

"Caltrans supports six smart mobility principles of location efficiency, reliable mobility, health and safety, environmental stewardship, social equity, and robust economy. The California Transportation Plan 2040 further encourages infill development and conservation opportunities as a way to reduce urban sprawl, allow for better transit and to be consistent with SB 375."

"The following comments are based on the (insert type of document)*. We provide these comments consistent with the State's smart mobility goals that support a vibrant economy and sustainable communities."*

B. Plan Development, Project Design and Mitigation Strategies

*"In (*developing this plan/designing this project*) we encourage the (*City/County/Developer*) to integrate transportation and land use in a way that reduces Vehicle Miles Traveled (VMT) and Greenhouse Gas (GHG) emissions by facilitating the provision of more proximate goods and services to shorten trip lengths, and achieve a high level of non-motorized travel and transit use. As such, we encourage the (*City/County/Developer*) evaluate the potential of Transportation Demand Management (TDM) strategies and Intelligent Transportation System (ITS) applications in order to better manage the transportation network, as well as transit service and bicycle or pedestrian connectivity improvements. The Department also seeks to reduce serious injuries and fatalities, as well as provide equitable mobility options for people*

*who are economically, socially, or physically disadvantaged. Therefore, we ask the (*City/County/Developer*) to evaluate the (*plan/project site*) for access problems, VMT and service needs that may need to be addressed.*

*For example, we recommend that the (*City/County/Developer*) analyze the following issues related to the (*plan/project*):"* (identify the scope of what we are asking for)

C. Multimodal Transportation Impact Study

Well planned infill projects which are located close to transit, bike and pedestrian facilities (see Appendix A: Project Type 1) which also have proximity benefits to employment centers, services and goods – will reduce travel demand on the entire transportation system and will therefore require significantly less review and mitigation than rural fringe projects (Project Type 5) which generate proportionately higher number of trips and vehicle miles traveled.

Districts should coordinate with SB 743 Program Implementation Manager when developing letters for Type 1 land use projects.

Below is suggested language for consideration and is generally targeted for Type 4 and 5 projects from Appendix A and some plans.

> *"The environmental document should include an analysis of the multimodal travel demand expected from the proposed project. This analysis should also identify potentially significant adverse impacts from such demands and avoidance, minimization, and mitigation measures needed to address them.*
>
> *Early collaboration, such as sharing the analysis for review and comment prior to the environmental document, leads to better outcomes for all stakeholders.*
>
> *Given that Caltrans current guidelines are in the process of being updated, a transportation impact study scoping meeting with District staff could be used to discuss the most appropriate methodology for this analysis. At a minimum, the analysis should provide the following:*
>
> 1. *Vicinity maps, regional location map, and a site plan clearly showing project access in relation to nearby roadways and key destinations. Ingress and egress for all project components should be clearly identified. Clearly identify the State right-of-way (ROW). Project driveways, the State Highway System and local roads, intersections and interchanges, pedestrian and bicycle routes, car/bike parking, and transit routes and facilities should be mapped.*
> 2. *Project-related VMT should be calculated factoring in per capita use of transit, rideshare or active transportation modes and VMT reduction factors. The assumptions and methodologies used to develop this information should be detailed in the study, should utilize the latest place based research, and should be supported with appropriate documentation. Mitigation for any roadway section or intersection with increasing VMT should be identified and mitigated in a manner that does not further raise VMT.*
> 3. *Schematic illustrations of walking, biking and auto traffic conditions at the project site and study area roadways, trip distribution percentages and volumes as well as intersection geometrics, i.e., lane configurations, for AM and PM peak periods. Operational concerns for*

all road users that may increase the potential for future collisions should be identified and fully mitigated in a manner that does not further raise VMT.

D. Encroachment Permits

*"Please be advised that any ingress-egress, work (e.g. construction, vegetation management, drainage improvement, etc.), or traffic control that is conducted within or adjacent to or encroaches upon the State Right of Way (ROW) requires an encroachment permit that is issued by Caltrans. Where construction related traffic restrictions and detour affect State highways, a Transportation Management Plan or construction traffic impact study may be required. Traffic-related mitigation measures should be incorporated into the construction plans prior to the encroachment permit process. To apply, a completed encroachment permit application, environmental documentation, and six (6) sets of plans clearly indicating State ROW as well as any applicable specifications, calculations, maps, etc. must be submitted to the following address: (*insert District Permits contact and address*). It is important to note that, in order to uphold the Department's statutory responsibility to protect the safety of the traveling public, if this information is not adequately provided, then a permit will not be issued for said encroachments. See the following website for more information:*
http://www.dot.ca.gov/hq/traffops/developserv/permits"

A note about encroachment permits: compliance with CEQA must be completely addressed before an encroachment permit application is submitted to the District Encroachment Permits Office. Before an encroachment permit application package can be deemed as complete, all applicable Federal and State statutory requirements including but not limited to Storm Water, Americans with Disabilities Act (ADA), and CEQA must be complied with. Therefore it is critical that all issues have been ironed out prior to the applicant submitting an application package to the District Encroachment Permits Office. This is also critical to provide documentation for District Encroachment Permit Engineers' consideration when issuing subsequent encroachments or when processing developer-built mitigation measures within State right-of-way. Comment letters should remind the reader that such analysis is required during the permit review process and a development's needed improvements, even opening day access, may be delayed if adequate detail is not provided during the environmental process upfront. This should be explained in such a way to convey that Caltrans is also trying to help save time and money for all those concerned.

E. Smart Growth Principles

"Support for infill and smart growth development is found in our new Mission, Vision, and Goals, the California Transportation Plan 2040, Smart Mobility Framework, Strategic Management Plan, and related guidance documents.

*Based on its place-type, VMT, design characteristics, potential impacts, and proposed mitigations, the Department feels that this (*plan/project*) (*is/is not*) representative of the smart growth principles and* (assists/does not assist) *in meeting the state's goals."*

Note: If the plan/project is *not* representative of smart growth principles, assist the lead agency by recommending specific changes that could help it move in a different direction. This should be done at the earliest point in the planning process possible.

F. Transportation Impact Fees

*"We request that an analysis of the (*plans/project's*) impacts and mitigation include information regarding the (*city/county's*) local and/or regional impact fee program. The analysis should identify if those*

programs include improvements to pedestrian, bicycle and transit infrastructure or that could be considered representative of the project's likely TDM mitigation measures. If no such fee exists, we would appreciate exploring with you the establishment of (local or regional) *VMT-based transportation impact fee programs."*

Two jurisdictions are currently using VMT-based thresholds: City of Pasadena, and City of San Francisco. City of Pasadena is updating a nexus study for its fee program that includes bicycle, pedestrian, and VMT metrics. City of San Francisco legislated a fee program based upon square footage of new development.

G. Responsiveness of the Lead Agency to Caltrans Comments

Generally, the second introductory paragraph of comment letters should reiterate the project description, reference previous comment letters, summarize the results of interagency coordination and outcome of previous comments, clarify where the project is currently at in the process, and identify key decision points.

Specifically, it is important to compare issues raised in the NOP stage with those addressed in the Draft TIS and EIR, as well as those between the Draft and Final EIRs, so that decision makers and the public know what concerns were addressed/resolved or remain a concern. If all of Caltrans concerns have been resolved, that would be valuable information for the public and decision makers to know. A brief summary paragraph should be adequate to summarize relevant points related to key concerns and convey a conclusion to the reader.

In the event that substantive concerns were brought up in the NOP stage and commented on in the Draft TIS-EIR stage, but not sufficiently resolved by the Final EIR stage, then IGR coordinators should consider making a statement related to adequacy of the FEIR based on either CEQA's public disclosure or reasonable argument provisions and recommend to the lead agency how it could be corrected prior to certification. Any comments on adequacy of an FEIR should consider the policies outlined earlier in this document.

No template language is provided because this information is specific to the nature and history of each plan/project and District staff would be best suited to summarize the relevant issues for the public record.

Appendix D: Additional Technical Considerations

Note that any considerations below must fall into the policy framework of the main guidance.

A. Transportation Demand Management

Transportation Demand Management is a set of tools that increases the efficiency of the transportation system by providing options for users other than driving alone, or by shifting travel away from peak periods. In direct support of SB 743, reviewers should always evaluate opportunities for TDM measures that could be deployed to reduce VMT and increase walking, biking, and transit use. Evidence of VMT reduction benefits resulting from the project's design, siting, and TDM mitigation measures should provide a clear nexus in the VMT analysis. This analysis should be place-based and utilize the latest trip-generation research available to describe influencing factors such as mode-shift due to transit availability and internal capture attributable to mixed use developments (see the Caltrans research on new trip generation rates for infill development). District and Headquarters staff can help recommend emerging methodologies that could be used to better estimate mixed use infill trip generation rates or quantify VMT reduction from TDM mitigation measures. Similarly, rather than making a vague reference that a lead agency should use VMT-based impact fees to mitigate the effects of its cumulative development, provide sample language for an actual Condition of Approval or Mitigation Measure to that effect and offer to participate in its creation. If there were questions about the project or assumptions about the analysis that were resolved or agreed to, comment letters should reflect those outcomes for the record and state that Caltrans' concerns were adequately addressed.

Reviewers should request that Lead Agencies include in their transportation impact studies (TIS) a project vicinity map and site-design layout plan that identifies all of the priority pedestrian and bicycle routes and transit routes/stops serving the site (based on relevant bike-pedestrian and transit service-development plans). It would be helpful for the lead agency if reviewers included a brief summary of what the District thinks the potential impacts of concern are likely to be based on the project and its location. This will help them focus the emphasis of their TIS. One repository for TDM strategies is found in the CAPCOA Quantifying Greenhouse Gas Mitigation Measures document (which focuses also on VMT). Also consider the following as a non-exhaustive list of potential TDM strategies:

1. Parking Management:
   a) In urban settings, recommend eliminating parking where transit is adjacent, significantly reduce parking where transit is within ¼ mile. See AB 744 (2015), which identifies maximum parking ratios for affordable housing projects located within one-half mile of a major transit stop, and affordable housing projects outside of those locations.
   b) In rural resort and special event settings, ensure an adequate balance between on-site parking and availability of off-site parking coupled with shuttle service for peak demand dates/times.
   c) Raise the cost of parking in general parking zones.
   d) Give preferential parking for carpools, vanpools, carshare, and rideshare programs.
   e) Create park and ride lots adjacent to transit commuter facilities or near HOV entrances.
   f) Establish maximum parking units per dwelling unit equivalent (d.u.e.) and thousand square foot (k.s.f.) ratios.
   g) Provide preferred and/or restricted parking stalls for Transportation Network Companies at select locations.

2. Additional non-auto centric measures

a) Add or extend transit routes or increase transit frequency.
b) Issue transit passes or subsidies to employees.
c) Issue housing-based transit passes.
d) Promote telecommuting and flexible work schedules.
e) Provide shelter and lighting for pedestrians as well as quality street furniture.
f) Compliment bicycle routes with secure bicycle parking facilities and showers at strategic locations.
g) Establish bike share programs or systems.
h) Establish safe routes to school programs (for example: a walking school bus program)
i) Complete sidewalk systems and mixed-use pathways for non-motorized travel.
j) Implement bus rapid transit (BRT) systems along key corridors.
k) Encourage light rail stations and complimentary adjacent TOD.
l) Develop toll-funded TOD redevelopment incentive programs for high density residential corridors.
m) Integrate solar-power shade structures and electric vehicle charging stations with rideshare parking lots and transit-rail station planning.

It may also be useful for Districts to provide lead agencies with links to local/regional TDM program resources that serve those jurisdictions.

B. Safety Considerations

Generally, Districts should have minimal comments (or no comments) on Project Type 1-2 (Appendix A) because well-planned, well-located infill projects are presumed to have multiple community benefits that include increased access and safety for all users. Urban infill projects also tend to increase pedestrian and bicycling travel, which promotes livable and healthy communities. In cases where the Districts have specific substantial evidence that safety concerns exist, the Districts should work with the Lead Agency to identify the appropriate analysis needed, ways it can be provided, and how the safety concerns can be addressed. Appropriate multimodal mitigation can be suggested that advances safety for bicyclists, pedestrians, transit users, and motorists. Districts should coordinate with the SB 743 Program Implementation Manager when developing letters for Type 1 land use projects.

Districts should analyze how increased VMT from either planned development (particularly project types 3-5) or proposed infrastructure investments may cause traffic operational dynamics that exacerbate modal conflict in the transportation system. For example, increased traffic volumes from high-VMT development and/or high speeds can exacerbate safety concerns related to inadequate acceleration-deceleration lengths, sight-distance, and reaction-time that may affect adjacent pedestrian facilities. Similarly, increasing traffic volumes at uncontrolled turn-movement points or in locations without adequate modal separation/refuge can increase the vulnerability for all modes, especially pedestrians and bicyclists.

Highway intersections and interchanges are often a challenge for motorists, bicyclists, and pedestrians. This is due to higher volumes, variable speeds, complex or unique designs, numerous conflict points, a mix of vehicle types, and changes in land uses. Care must be employed to assure all system users perceive the design, operating conditions, and speed limits allow them to act and react in a safe manner.

This transition zone between free flow and metered flow is considered a "critical transition area". Traffic design speeds near intersections and interchanges should be appropriate to the context. Where pedestrians and bicyclists are present, design speeds should be slower to help ensure the safety of all road users. For more guidance on intersections and interchanges, please see Caltrans Complete Intersections: A Guide to Reconstructing Intersections and Interchanges for Bicyclists and Pedestrians, 2010. Page 15 of the document states:

> *Any reduction in vehicle speed benefits pedestrian and bicyclist safety, since there is a direct link between impact speeds and the likelihood of fatality. Methods to reduce pedestrian and bicyclist exposure to vehicles improve safety by lessening the time that the user is in the likely path of a motor vehicle. These methods include the construction of physically separated facilities such as sidewalks, raised medians, refuge islands, and off-road paths and trails, or reductions in crossing distances through roadway narrowing.*
>
> *Pedestrian and bicyclist warning signage, flashing beacons, crosswalks, and other signage and striping should be used to indicate to motorists that they should expect to see and yield to pedestrians and bicyclists. Formal information from traffic control devices should be reinforced by informal sources of information such as lane widths, landscaping, street furniture, and other road design features.*

Other documents that should be referenced include the Caltrans Class IV Bikeway (Separated Bikeways/Cycletracks) Guidance, 2015 and the Highway Design Manual.

All discussions or comments should keep in mind Caltrans Strategic Management Plan goals, including to increase walking, biking, and transit use, and reduce per capita vehicle miles traveled. Suggested Operational Impact improvements must consider the most vulnerable roadway users (i.e., children and elderly pedestrians, children bicyclists, etc.).

Caltrans staff should be ready to provide a list of potential multimodal mitigation measures for specific concerns that might be raised. Listed below are a few resources to reference when making Operational Impact determinations for development projects and plans:

The American Association of State Highway and Transportation Officials (AASHTO) Highway Safety Manual (2010) can be found here.

The Caltrans Highway Design Manual (HDM) can be found at:
http://www.dot.ca.gov/hq/oppd/hdm/hdmtoc.htm

Topics contained within the California Manual on Uniform Traffic Control Devices (California MUTCD), such as pedestrian hybrid beacons, can be found at:
http://www.dot.ca.gov/hq/traffops/engineering/mutcd/ca_mutcd2014.htm

The Caltrans-endorsed National Association of City Transportation Officials (NACTO) guides on Urban Street Design and Urban Bikeways provide best practices and standards for pedestrian, bicycle, and transit features. The guides can be found in the Caltrans Library. More information about the guides can be found here: http://nacto.org/

More Caltrans resources related to Complete Streets and Smart Mobility can be found at: http://www.dot.ca.gov/hq/tpp/offices/ocp/smbr.html

C. Access Management

Access management is a particular concern at the interface between vehicular and bicycle-pedestrian use of roadways, shoulders, bike lanes, and sidewalks and the ingress-egress points for land use destinations. Avoiding operational impacts that may increase the likelihood of collisions is an integral and important part of multimodal access management. Significant speed differentials and travel volumes can result in a need for access management mitigation measures. These include efforts to limit modal conflicts and increase accessibility for vulnerable road users, reduce speed differentials between vehicles, modulate flow volumes for specific directions, control specific turning movements, and provide adequate stopping sight distance and decision site distance. These issues are amplified where large buses or trucks are involved. Where design features are recommended to mitigate pedestrian and/or bicycle safety concerns, various issues should be considered such as topography, ADA accessibility, maintenance, and seasonal factors (e.g. snow removal and/or storage, etc.). Access management efforts must also take into consideration of other state goals such as designing for motor vehicle speeds appropriate to the place setting, protection of vulnerable road users, reduction in motor vehicle travel, and adding features that increase driver attention.

Reviewers may also highlight the benefits of roundabouts because they facilitate road diets, produce narrower pedestrian crossing widths compared to signalized and stop-controlled intersections, and produce lower speeds and speed differential at and near pedestrian and bike conflict areas. Roundabouts may not be appropriate at some intersection contexts and locations. See the Intersection Control Evaluation guidance for more information.

Appendix F

Caltrans Analysis Worksheets

EXISTING CONDITIONS (YEAR 2019)

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

1 I-680 Northbound

north of Crow Canyon Road ***AM Peak Hour***

GEOMETRIC DATA INPUTS			DEMAND INPUTS		
Measured Free Flow Speed (BFFS):	55.0	mi/h	Hourly Demand Volume (V):	5,672	veh/h
Mainline Lanes (N):	5	lanes	Heavy Vehicle Percentage (P_T):	4.04	%
Lane Widths:	12	ft	Peak Hour Factor (PHF):	0.940	
Right-Side Lateral Clearance:	10	ft	Capacity Adj. Factor (CAF):	1.00	
Total Ramp Density (TRD):	2.8	ramps/mi	Speed Adj. Factor (SAF):	1.00	
Terrain Type:	Level		Density at Capacity (D_c):	45.0	pc/mi/ln
			Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	$\frac{V}{(PHF \times N \times f_{HV})}$ *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	1,256	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity ($v_p > c_{adj}$)? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): If $v_p \le BP$: FFS_{adj} *(Eq. 12-1)*

If $BP < v_p \le c$: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP) ^ a]}{(c_{adj} - BP) ^ a}$

S: **55.0** mi/h

Density (D): D = v_p / S *(Eq. 12-11)* D: **22.8** pc/mi/ln

Level of Service (LOS): LOS: **C**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

1 I-680 Southbound

north of Crow Canyon Road — ***AM Peak Hour***

GEOMETRIC DATA INPUTS			DEMAND INPUTS		
Measured Free Flow Speed (BFFS):	55.0	mi/h	Hourly Demand Volume (V):	7,961	veh/h
Mainline Lanes (N):	5	lanes	Heavy Vehicle Percentage (P_T):	4.04	%
Lane Widths:	12	ft	Peak Hour Factor (PHF):	0.940	
Right-Side Lateral Clearance:	12	ft	Capacity Adj. Factor (CAF):	1.00	
Total Ramp Density (TRD):	2.8	ramps/mi	Speed Adj. Factor (SAF):	1.00	
Terrain Type:	Level		Density at Capacity (D_c):	45.0	pc/mi/ln
			Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	V / (PHF x N x f_{HV}) *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	1,763	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity (v_p > c_{adj})? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): If $v_p \le$ BP: FFS_{adj} *(Eq. 12-1)*

If BP < $v_p \le$ c: $$FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP) ^ a]}{(c_{adj} - BP) ^ a}$$

S: **55.0** mi/h

Density (D): D = v_p / S *(Eq. 12-11)* D: **32.0** pc/mi/ln

Level of Service (LOS): LOS: **D**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

1 I-680 Northbound

north of Crow Canyon Road ***PM Peak Hour***

GEOMETRIC DATA INPUTS			DEMAND INPUTS		
Measured Free Flow Speed (BFFS):	55.0	mi/h	Hourly Demand Volume (V):	7,681	veh/h
Mainline Lanes (N):	5	lanes	Heavy Vehicle Percentage (P_T):	4.04	%
Lane Widths:	12	ft	Peak Hour Factor (PHF):	0.940	
Right-Side Lateral Clearance:	10	ft	Capacity Adj. Factor (CAF):	1.00	
Total Ramp Density (TRD):	2.8	ramps/mi	Speed Adj. Factor (SAF):	1.00	
Terrain Type:	Level		Density at Capacity (D_c):	45.0	pc/mi/ln
			Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	$\frac{V}{(PHF \times N \times f_{HV})}$ *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	1,701	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity ($v_p > c_{adj}$)? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): If $v_p \leq BP$: FFS_{adj} *(Eq. 12-1)*

If $BP < v_p \leq c$: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP)^a]}{(c_{adj} - BP)^a}$

S: **55.0** mi/h

Density (D): $D = v_p / S$ *(Eq. 12-11)* D: **30.9** pc/mi/ln

Level of Service (LOS): LOS: **D**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

EXISTING CONDITIONS (YEAR 2019)

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

1 I-680 Southbound

north of Crow Canyon Road — ***PM Peak Hour***

GEOMETRIC DATA INPUTS			DEMAND INPUTS		
Measured Free Flow Speed (BFFS):	55.0	mi/h	Hourly Demand Volume (V):	6,732	veh/h
Mainline Lanes (N):	5	lanes	Heavy Vehicle Percentage (P_T):	4.04	%
Lane Widths:	12	ft	Peak Hour Factor (PHF):	0.940	
Right-Side Lateral Clearance:	12	ft	Capacity Adj. Factor (CAF):	1.00	
Total Ramp Density (TRD):	2.8	ramps/mi	Speed Adj. Factor (SAF):	1.00	
Terrain Type:	Level		Density at Capacity (D_c):	45.0	pc/mi/ln
			Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	$\frac{V}{(PHF \times N \times f_{HV})}$ *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	1,490	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity ($v_p > c_{adj}$)? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): If $v_p \le BP$: FFS_{adj} *(Eq. 12-1)*

If $BP < v_p \le c$: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP) ^ a]}{(c_{adj} - BP) ^ a}$

S: **55.0** mi/h

Density (D): $D = v_p / S$ *(Eq. 12-11)* D: **27.1** pc/mi/ln

Level of Service (LOS): LOS: **D**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

2 I-680 Northbound

between Crow Canyon Road & Bollinger Canyon Road | ***AM Peak Hour***

GEOMETRIC DATA INPUTS			DEMAND INPUTS		
Measured Free Flow Speed (BFFS):	55.0	mi/h	Hourly Demand Volume (V):	5,520	veh/h
Mainline Lanes (N):	5	lanes	Heavy Vehicle Percentage (P_T):	4.04	%
Lane Widths:	12	ft	Peak Hour Factor (PHF):	0.940	
Right-Side Lateral Clearance:	9	ft	Capacity Adj. Factor (CAF):	1.00	
Total Ramp Density (TRD):	2.0	ramps/mi	Speed Adj. Factor (SAF):	1.00	
Terrain Type:	Level		Density at Capacity (D_c):	45.0	pc/mi/ln
			Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	$\frac{V}{(PHF \times N \times f_{HV})}$ *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	1,222	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity ($v_p > c_{adj}$)? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): If $v_p \le BP$: FFS_{adj} *(Eq. 12-1)*

If $BP < v_p \le c$: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP) ^ a]}{(c_{adj} - BP) ^ a}$

S: **55.0** mi/h

Density (D): $D = v_p / S$ *(Eq. 12-11)* D: **22.2** pc/mi/ln

Level of Service (LOS): LOS: **C**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

2 I-680 Southbound

between Crow Canyon Road & Bollinger Canyon Road ***AM Peak Hour***

GEOMETRIC DATA INPUTS			DEMAND INPUTS		
Measured Free Flow Speed (BFFS):	55.0	mi/h	Hourly Demand Volume (V):	7,993	veh/h
Mainline Lanes (N):	5	lanes	Heavy Vehicle Percentage (P_T):	4.04	%
Lane Widths:	12	ft	Peak Hour Factor (PHF):	0.940	
Right-Side Lateral Clearance:	11	ft	Capacity Adj. Factor (CAF):	1.00	
Total Ramp Density (TRD):	2.0	ramps/mi	Speed Adj. Factor (SAF):	1.00	
Terrain Type:	Level		Density at Capacity (D_c):	45.0	pc/mi/ln
			Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	$\frac{V}{(PHF \times N \times f_{HV})}$ *(Eq. 12-9)*	[f_{HV}:	0.961	]
		v_p:	1,770	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity ($v_p > c_{adj}$)? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): If $v_p \le BP$: FFS_{adj} *(Eq. 12-1)*

If $BP < v_p \le c$: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP) ^ a]}{(c_{adj} - BP) ^ a}$

S: **55.0** mi/h

Density (D): $D = v_p / S$ *(Eq. 12-11)* D: **32.2** pc/mi/ln

Level of Service (LOS): LOS: **D**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

2 I-680 Northbound

between Crow Canyon Road & Bollinger Canyon Road ***PM Peak Hour***

GEOMETRIC DATA INPUTS			DEMAND INPUTS		
Measured Free Flow Speed (BFFS):	55.0	mi/h	Hourly Demand Volume (V):	7,009	veh/h
Mainline Lanes (N):	5	lanes	Heavy Vehicle Percentage (P_T):	4.04	%
Lane Widths:	12	ft	Peak Hour Factor (PHF):	0.940	
Right-Side Lateral Clearance:	9	ft	Capacity Adj. Factor (CAF):	1.00	
Total Ramp Density (TRD):	2.0	ramps/mi	Speed Adj. Factor (SAF):	1.00	
Terrain Type:	Level		Density at Capacity (D_c):	45.0	pc/mi/ln
			Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	$\frac{V}{(PHF \times N \times f_{HV})}$ *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	1,552	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity (v_p > c_{adj})? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): If $v_p \le BP$: FFS_{adj} *(Eq. 12-1)*

If $BP < v_p \le c$: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP) ^ a]}{(c_{adj} - BP) ^ a}$

S: **55.0** mi/h

Density (D): D = v_p / S *(Eq. 12-11)* D: **28.2** pc/mi/ln

Level of Service (LOS): LOS: **D**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

EXISTING CONDITIONS (YEAR 2019)

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

2 I-680 Southbound

between Crow Canyon Road & Bollinger Canyon Road — ***PM Peak Hour***

GEOMETRIC DATA INPUTS			DEMAND INPUTS		
Measured Free Flow Speed (BFFS):	55.0	mi/h	Hourly Demand Volume (V):	6,640	veh/h
Mainline Lanes (N):	5	lanes	Heavy Vehicle Percentage (P_T):	4.04	%
Lane Widths:	12	ft	Peak Hour Factor (PHF):	0.940	
Right-Side Lateral Clearance:	11	ft	Capacity Adj. Factor (CAF):	1.00	
Total Ramp Density (TRD):	2.0	ramps/mi	Speed Adj. Factor (SAF):	1.00	
Terrain Type:	Level		Density at Capacity (D_c):	45.0	pc/mi/ln
			Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	$\frac{V}{(PHF \times N \times f_{HV})}$ *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	1,470	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity ($v_p > c_{adj}$)? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): If $v_p \leq BP$: FFS_{adj} *(Eq. 12-1)*

If $BP < v_p \leq c$: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP) ^ a]}{(c_{adj} - BP) ^ a}$

S: **55.0** mi/h

Density (D): D = v_p / S *(Eq. 12-11)* — D: **26.7** pc/mi/ln

Level of Service (LOS): — LOS: **D**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

3 I-680 Northbound

south of Bollinger Canyon Road — ***AM Peak Hour***

GEOMETRIC DATA INPUTS			DEMAND INPUTS		
Measured Free Flow Speed (BFFS):	55.0	mi/h	Hourly Demand Volume (V):	5,638	veh/h
Mainline Lanes (N):	4	lanes	Heavy Vehicle Percentage (P_T):	4.04	%
Lane Widths:	12	ft	Peak Hour Factor (PHF):	0.940	
Right-Side Lateral Clearance:	10	ft	Capacity Adj. Factor (CAF):	1.00	
Total Ramp Density (TRD):	2.8	ramps/mi	Speed Adj. Factor (SAF):	1.00	
Terrain Type:	Level		Density at Capacity (D_c):	45.0	pc/mi/ln
			Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	$\frac{V}{(PHF \times N \times f_{HV})}$ *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	1,560	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity (v_p > c_{adj})? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): If $v_p \le BP$: FFS_{adj} *(Eq. 12-1)*

If $BP < v_p \le c$: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP)^a]}{(c_{adj} - BP)^a}$

S: **55.0** mi/h

Density (D): D = v_p / S *(Eq. 12-11)* — D: **28.4** pc/mi/ln

Level of Service (LOS): — LOS: **D**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

3 I-680 Southbound

south of Bollinger Canyon Road — ***AM Peak Hour***

GEOMETRIC DATA INPUTS

Measured Free Flow Speed (BFFS):	55.0	mi/h
Mainline Lanes (N):	4	lanes
Lane Widths:	12	ft
Right-Side Lateral Clearance:	11	ft
Total Ramp Density (TRD):	2.8	ramps/mi
Terrain Type:	Level	

DEMAND INPUTS

Hourly Demand Volume (V):	7,191	veh/h
Heavy Vehicle Percentage (P_T):	4.04	%
Peak Hour Factor (PHF):	0.940	
Capacity Adj. Factor (CAF):	1.00	
Speed Adj. Factor (SAF):	1.00	
Density at Capacity (D_c):	45.0	pc/mi/ln
Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	$\frac{V}{(PHF \times N \times f_{HV})}$ *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	1,990	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity ($v_p > c_{adj}$)? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): *(Eq. 12-1)*

If $v_p \le BP$: FFS_{adj}

If $BP < v_p \le c$: $$FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP) ^ a]}{(c_{adj} - BP) ^ a}$$

S: **54.1** mi/h

Density (D): $D = v_p / S$ *(Eq. 12-11)* D: **36.8** pc/mi/ln

Level of Service (LOS): LOS: **E**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

3 I-680 Northbound

south of Bollinger Canyon Road — ***PM Peak Hour***

GEOMETRIC DATA INPUTS			DEMAND INPUTS		
Measured Free Flow Speed (BFFS):	55.0	mi/h	Hourly Demand Volume (V):	6,708	veh/h
Mainline Lanes (N):	4	lanes	Heavy Vehicle Percentage (P_T):	4.04	%
Lane Widths:	12	ft	Peak Hour Factor (PHF):	0.940	
Right-Side Lateral Clearance:	10	ft	Capacity Adj. Factor (CAF):	1.00	
Total Ramp Density (TRD):	2.8	ramps/mi	Speed Adj. Factor (SAF):	1.00	
Terrain Type:	Level		Density at Capacity (D_c):	45.0	pc/mi/ln
			Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	$\frac{V}{(PHF \times N \times f_{HV})}$ *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	1,856	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity ($v_p > c_{adj}$)? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): *(Eq. 12-1)*

If $v_p \le BP$: FFS_{adj}

If $BP < v_p \le c$: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP)^a]}{(c_{adj} - BP)^a}$

S: **54.9** mi/h

Density (D): $D = v_p / S$ *(Eq. 12-11)* — D: **33.8** pc/mi/ln

Level of Service (LOS): — LOS: **D**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

EXISTING CONDITIONS (YEAR 2019)

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

3 I-680 Southbound

south of Bollinger Canyon Road — ***PM Peak Hour***

GEOMETRIC DATA INPUTS

Measured Free Flow Speed (BFFS):	55.0	mi/h
Mainline Lanes (N):	4	lanes
Lane Widths:	12	ft
Right-Side Lateral Clearance:	11	ft
Total Ramp Density (TRD):	2.8	ramps/mi
Terrain Type:	Level	

DEMAND INPUTS

Hourly Demand Volume (V):	6,175	veh/h
Heavy Vehicle Percentage (P_T):	4.04	%
Peak Hour Factor (PHF):	0.940	
Capacity Adj. Factor (CAF):	1.00	
Speed Adj. Factor (SAF):	1.00	
Density at Capacity (D_c):	45.0	pc/mi/ln
Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	$\frac{V}{(PHF \times N \times f_{HV})}$ *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	1,709	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity (v_p > c_{adj})? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S):

If $v_p \leq BP$: FFS_{adj} *(Eq. 12-1)*

If $BP < v_p \leq c$: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP) ^ a]}{(c_{adj} - BP) ^ a}$

S: **55.0** mi/h

Density (D): D = v_p / S *(Eq. 12-11)* — D: **31.1** pc/mi/ln

Level of Service (LOS): — LOS: **D**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

1 I-680 Northbound

north of Crow Canyon Road — ***AM Peak Hour***

GEOMETRIC DATA INPUTS			DEMAND INPUTS		
Measured Free Flow Speed (BFFS):	55.0	mi/h	Hourly Demand Volume (V):	5,966	veh/h
Mainline Lanes (N):	5	lanes	Heavy Vehicle Percentage (P_T):	4.04	%
Lane Widths:	12	ft	Peak Hour Factor (PHF):	0.940	
Right-Side Lateral Clearance:	10	ft	Capacity Adj. Factor (CAF):	1.00	
Total Ramp Density (TRD):	2.8	ramps/mi	Speed Adj. Factor (SAF):	1.00	
Terrain Type:	Level		Density at Capacity (D_c):	45.0	pc/mi/ln
			Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	$\frac{V}{(PHF \times N \times f_{HV})}$ *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	1,321	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity ($v_p > c_{adj}$)? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): If $v_p \le BP$: FFS_{adj} *(Eq. 12-1)*

If $BP < v_p \le c$: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP) ^ a]}{(c_{adj} - BP) ^ a}$

S: **55.0** mi/h

Density (D): D = v_p / S *(Eq. 12-11)* D: **24.0** pc/mi/ln

Level of Service (LOS): LOS: **C**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

EXISTING WITH PROJECT CONDITIONS (YEAR 2019)

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

1 I-680 Southbound

north of Crow Canyon Road ***AM Peak Hour***

GEOMETRIC DATA INPUTS			DEMAND INPUTS		
Measured Free Flow Speed (BFFS):	55.0	mi/h	Hourly Demand Volume (V):	8,067	veh/h
Mainline Lanes (N):	5	lanes	Heavy Vehicle Percentage (P_T):	4.04	%
Lane Widths:	12	ft	Peak Hour Factor (PHF):	0.940	
Right-Side Lateral Clearance:	12	ft	Capacity Adj. Factor (CAF):	1.00	
Total Ramp Density (TRD):	2.8	ramps/mi	Speed Adj. Factor (SAF):	1.00	
Terrain Type:	Level		Density at Capacity (D_c):	45.0	pc/mi/ln
			Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	$\frac{V}{(PHF \times N \times f_{HV})}$ *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	1,786	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity (v_p > c_{adj})? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): If $v_p \le BP$: FFS_{adj} *(Eq. 12-1)*

If $BP < v_p \le c$: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP) ^ a]}{(c_{adj} - BP) ^ a}$

S: **55.0** mi/h

Density (D): D = v_p / S *(Eq. 12-11)* D: **32.5** pc/mi/ln

Level of Service (LOS): LOS: **D**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

1 I-680 Northbound

north of Crow Canyon Road — ***PM Peak Hour***

GEOMETRIC DATA INPUTS			DEMAND INPUTS		
Measured Free Flow Speed (BFFS):	55.0	mi/h	Hourly Demand Volume (V):	7,872	veh/h
Mainline Lanes (N):	5	lanes	Heavy Vehicle Percentage (P_T):	4.04	%
Lane Widths:	12	ft	Peak Hour Factor (PHF):	0.940	
Right-Side Lateral Clearance:	10	ft	Capacity Adj. Factor (CAF):	1.00	
Total Ramp Density (TRD):	2.8	ramps/mi	Speed Adj. Factor (SAF):	1.00	
Terrain Type:	Level		Density at Capacity (D_c):	45.0	pc/mi/ln
			Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	$\frac{V}{(PHF \times N \times f_{HV})}$ *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	1,743	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity ($v_p > c_{adj}$)? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): If $v_p \le BP$: FFS_{adj} *(Eq. 12-1)*

If $BP < v_p \le c$: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP) ^ a]}{(c_{adj} - BP) ^ a}$

S: **55.0** mi/h

Density (D): D = v_p / S *(Eq. 12-11)* D: **31.7** pc/mi/ln

Level of Service (LOS): LOS: **D**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

1 I-680 Southbound

north of Crow Canyon Road ***PM Peak Hour***

GEOMETRIC DATA INPUTS			**DEMAND INPUTS**		
Measured Free Flow Speed (BFFS):	55.0	mi/h	Hourly Demand Volume (V):	6,988	veh/h
Mainline Lanes (N):	5	lanes	Heavy Vehicle Percentage (P_T):	4.04	%
Lane Widths:	12	ft	Peak Hour Factor (PHF):	0.940	
Right-Side Lateral Clearance:	12	ft	Capacity Adj. Factor (CAF):	1.00	
Total Ramp Density (TRD):	2.8	ramps/mi	Speed Adj. Factor (SAF):	1.00	
Terrain Type:	Level		Density at Capacity (D_c):	45.0	pc/mi/ln
			Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	$\frac{V}{(PHF \times N \times f_{HV})}$ *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	1,547	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity (v_p > c_{adj})? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): If $v_p \le BP$: FFS_{adj} *(Eq. 12-1)*

If $BP < v_p \le c$: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP) ^ a]}{(c_{adj} - BP) ^ a}$

S: **55.0** mi/h

Density (D): D = v_p / S *(Eq. 12-11)* D: **28.1** pc/mi/ln

Level of Service (LOS): LOS: **D**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

EXISTING WITH PROJECT CONDITIONS (YEAR 2019)

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

2 I-680 Northbound

between Crow Canyon Road & Bollinger Canyon Road — ***AM Peak Hour***

GEOMETRIC DATA INPUTS			DEMAND INPUTS		
Measured Free Flow Speed (BFFS):	55.0	mi/h	Hourly Demand Volume (V):	5,666	veh/h
Mainline Lanes (N):	5	lanes	Heavy Vehicle Percentage (P_T):	4.04	%
Lane Widths:	12	ft	Peak Hour Factor (PHF):	0.940	
Right-Side Lateral Clearance:	9	ft	Capacity Adj. Factor (CAF):	1.00	
Total Ramp Density (TRD):	2.0	ramps/mi	Speed Adj. Factor (SAF):	1.00	
Terrain Type:	Level		Density at Capacity (D_c):	45.0	pc/mi/ln
			Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	$\frac{V}{(PHF \times N \times f_{HV})}$ *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	1,254	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity ($v_p > c_{adj}$)? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): If $v_p \le BP$: FFS_{adj} *(Eq. 12-1)*

If $BP < v_p \le c$: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP) ^ a]}{(c_{adj} - BP) ^ a}$

S: **55.0** mi/h

Density (D): $D = v_p / S$ *(Eq. 12-11)* D: **22.8** pc/mi/ln

Level of Service (LOS): LOS: **C**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

2 I-680 Southbound

between Crow Canyon Road & Bollinger Canyon Road ***AM Peak Hour***

GEOMETRIC DATA INPUTS			DEMAND INPUTS		
Measured Free Flow Speed (BFFS):	55.0	mi/h	Hourly Demand Volume (V):	8,046	veh/h
Mainline Lanes (N):	5	lanes	Heavy Vehicle Percentage (P_T):	4.04	%
Lane Widths:	12	ft	Peak Hour Factor (PHF):	0.940	
Right-Side Lateral Clearance:	11	ft	Capacity Adj. Factor (CAF):	1.00	
Total Ramp Density (TRD):	2.0	ramps/mi	Speed Adj. Factor (SAF):	1.00	
Terrain Type:	Level		Density at Capacity (D_c):	45.0	pc/mi/ln
			Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	$\frac{V}{(PHF \times N \times f_{HV})}$ *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	1,781	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity ($v_p > c_{adj}$)? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): If $v_p \le BP$: FFS_{adj} *(Eq. 12-1)*

If $BP < v_p \le c$: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP) ^ a]}{(c_{adj} - BP) ^ a}$

S: **55.0** mi/h

Density (D): D = v_p / S *(Eq. 12-11)* D: **32.4** pc/mi/ln

Level of Service (LOS): LOS: **D**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

EXISTING WITH PROJECT CONDITIONS (YEAR 2019)

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

2 I-680 Northbound

between Crow Canyon Road & Bollinger Canyon Road ***PM Peak Hour***

GEOMETRIC DATA INPUTS			DEMAND INPUTS		
Measured Free Flow Speed (BFFS):	55.0	mi/h	Hourly Demand Volume (V):	7,105	veh/h
Mainline Lanes (N):	5	lanes	Heavy Vehicle Percentage (P_T):	4.04	%
Lane Widths:	12	ft	Peak Hour Factor (PHF):	0.940	
Right-Side Lateral Clearance:	9	ft	Capacity Adj. Factor (CAF):	1.00	
Total Ramp Density (TRD):	2.0	ramps/mi	Speed Adj. Factor (SAF):	1.00	
Terrain Type:	Level		Density at Capacity (D_c):	45.0	pc/mi/ln
			Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	$\frac{V}{(PHF \times N \times f_{HV})}$ *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	1,573	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity ($v_p > c_{adj}$)? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): If $v_p \le BP$: FFS_{adj} *(Eq. 12-1)*

If $BP < v_p \le c$: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP) ^ a]}{(c_{adj} - BP) ^ a}$

S: **55.0** mi/h

Density (D): $D = v_p / S$ *(Eq. 12-11)* D: **28.6** pc/mi/ln

Level of Service (LOS): LOS: **D**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

2 I-680 Southbound

between Crow Canyon Road & Bollinger Canyon Road — ***PM Peak Hour***

GEOMETRIC DATA INPUTS			DEMAND INPUTS		
Measured Free Flow Speed (BFFS):	55.0	mi/h	Hourly Demand Volume (V):	6,753	veh/h
Mainline Lanes (N):	5	lanes	Heavy Vehicle Percentage (P_T):	4.04	%
Lane Widths:	12	ft	Peak Hour Factor (PHF):	0.940	
Right-Side Lateral Clearance:	11	ft	Capacity Adj. Factor (CAF):	1.00	
Total Ramp Density (TRD):	2.0	ramps/mi	Speed Adj. Factor (SAF):	1.00	
Terrain Type:	Level		Density at Capacity (D_c):	45.0	pc/mi/ln
			Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	$\frac{V}{(PHF \times N \times f_{HV})}$ *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	1,495	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity ($v_p > c_{adj}$)? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): If $v_p \le BP$: FFS_{adj} *(Eq. 12-1)*

If $BP < v_p \le c$: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP) ^ a]}{(c_{adj} - BP) ^ a}$

S: **55.0** mi/h

Density (D): D = v_p / S *(Eq. 12-11)* — D: **27.2** pc/mi/ln

Level of Service (LOS): — LOS: **D**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

3 I-680 Northbound

south of Bollinger Canyon Road — ***AM Peak Hour***

GEOMETRIC DATA INPUTS

Measured Free Flow Speed (BFFS):	55.0	mi/h
Mainline Lanes (N):	4	lanes
Lane Widths:	12	ft
Right-Side Lateral Clearance:	10	ft
Total Ramp Density (TRD):	2.8	ramps/mi
Terrain Type:	Level	

DEMAND INPUTS

Hourly Demand Volume (V):	5,793	veh/h
Heavy Vehicle Percentage (P_T):	4.04	%
Peak Hour Factor (PHF):	0.940	
Capacity Adj. Factor (CAF):	1.00	
Speed Adj. Factor (SAF):	1.00	
Density at Capacity (D_c):	45.0	pc/mi/ln
Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	$\frac{V}{(PHF \times N \times f_{HV})}$ *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	1,603	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity ($v_p > c_{adj}$)? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): If $v_p \le BP$: FFS_{adj} *(Eq. 12-1)*

If $BP < v_p \le c$: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP) ^ a]}{(c_{adj} - BP) ^ a}$

S: **55.0** mi/h

Density (D): $D = v_p / S$ *(Eq. 12-11)* — D: **29.1** pc/mi/ln

Level of Service (LOS): — LOS: **D**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

3 I-680 Southbound

south of Bollinger Canyon Road — ***AM Peak Hour***

GEOMETRIC DATA INPUTS

Measured Free Flow Speed (BFFS):	55.0	mi/h
Mainline Lanes (N):	4	lanes
Lane Widths:	12	ft
Right-Side Lateral Clearance:	11	ft
Total Ramp Density (TRD):	2.8	ramps/mi
Terrain Type:	Level	

DEMAND INPUTS

Hourly Demand Volume (V):	7,584	veh/h
Heavy Vehicle Percentage (P_T):	4.04	%
Peak Hour Factor (PHF):	0.940	
Capacity Adj. Factor (CAF):	1.00	
Speed Adj. Factor (SAF):	1.00	
Density at Capacity (D_c):	45.0	pc/mi/ln
Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	V / (PHF x N x f_{HV}) *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	2,099	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity ($v_p > c_{adj}$)? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): If $v_p \le BP$: FFS_{adj} *(Eq. 12-1)*

If $BP < v_p \le c$: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP)^a]}{(c_{adj} - BP)^a}$

S: **52.8** mi/h

Density (D): D = v_p / S *(Eq. 12-11)* — D: **39.8** pc/mi/ln

Level of Service (LOS): — LOS: **E**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

3 I-680 Northbound

south of Bollinger Canyon Road — ***PM Peak Hour***

GEOMETRIC DATA INPUTS			DEMAND INPUTS		
Measured Free Flow Speed (BFFS):	55.0	mi/h	Hourly Demand Volume (V):	7,087	veh/h
Mainline Lanes (N):	4	lanes	Heavy Vehicle Percentage (P_T):	4.04	%
Lane Widths:	12	ft	Peak Hour Factor (PHF):	0.940	
Right-Side Lateral Clearance:	10	ft	Capacity Adj. Factor (CAF):	1.00	
Total Ramp Density (TRD):	2.8	ramps/mi	Speed Adj. Factor (SAF):	1.00	
Terrain Type:	Level		Density at Capacity (D_c):	45.0	pc/mi/ln
			Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Item	Equation	Symbol	Value	Units
Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	$\frac{V}{(PHF \times N \times f_{HV})}$ *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	1,961	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity ($v_p > c_{adj}$)? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): If $v_p \leq BP$: FFS_{adj} *(Eq. 12-1)*

If $BP < v_p \leq c$: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP) ^ a]}{(c_{adj} - BP) ^ a}$

S: **54.4** mi/h

Density (D): $D = v_p / S$ *(Eq. 12-11)* D: **36.1** pc/mi/ln

Level of Service (LOS): LOS: **E**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

3 I-680 Southbound

south of Bollinger Canyon Road — ***PM Peak Hour***

GEOMETRIC DATA INPUTS			DEMAND INPUTS		
Measured Free Flow Speed (BFFS):	55.0	mi/h	Hourly Demand Volume (V):	6,434	veh/h
Mainline Lanes (N):	4	lanes	Heavy Vehicle Percentage (P_T):	4.04	%
Lane Widths:	12	ft	Peak Hour Factor (PHF):	0.940	
Right-Side Lateral Clearance:	11	ft	Capacity Adj. Factor (CAF):	1.00	
Total Ramp Density (TRD):	2.8	ramps/mi	Speed Adj. Factor (SAF):	1.00	
Terrain Type:	Level		Density at Capacity (D_c):	45.0	pc/mi/ln
			Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

	Formula		Value	Units
Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	$\frac{V}{PHF \times N \times f_{HV}}$ *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	1,781	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity ($v_p > c_{adj}$)? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): If $v_p \le BP$: FFS_{adj} *(Eq. 12-1)*

If $BP < v_p \le c$: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP)^a]}{(c_{adj} - BP)^a}$

S: **55.0** mi/h

Density (D): $D = v_p / S$ *(Eq. 12-11)* — D: **32.4** pc/mi/ln

Level of Service (LOS): — LOS: **D**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

1 I-680 Northbound

north of Crow Canyon Road ***AM Peak Hour***

GEOMETRIC DATA INPUTS			DEMAND INPUTS		
Measured Free Flow Speed (BFFS):	55.0	mi/h	Hourly Demand Volume (V):	6,596	veh/h
Mainline Lanes (N):	5	lanes	Heavy Vehicle Percentage (P_T):	4.04	%
Lane Widths:	12	ft	Peak Hour Factor (PHF):	0.940	
Right-Side Lateral Clearance:	10	ft	Capacity Adj. Factor (CAF):	1.00	
Total Ramp Density (TRD):	2.8	ramps/mi	Speed Adj. Factor (SAF):	1.00	
Terrain Type:	Level		Density at Capacity (D_c):	45.0	pc/mi/ln
			Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	$\frac{V}{(PHF \times N \times f_{HV})}$ *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	1,460	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity (v_p > c_{adj})? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): If $v_p \le BP$: FFS_{adj} *(Eq. 12-1)*

If $BP < v_p \le c$: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP) ^ a]}{(c_{adj} - BP) ^ a}$

S: **55.0** mi/h

Density (D): D = v_p / S *(Eq. 12-11)* D: **26.6** pc/mi/ln

Level of Service (LOS): LOS: **D**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

1 I-680 Southbound

north of Crow Canyon Road ***AM Peak Hour***

GEOMETRIC DATA INPUTS			DEMAND INPUTS		
Measured Free Flow Speed (BFFS):	55.0	mi/h	Hourly Demand Volume (V):	7,955	veh/h
Mainline Lanes (N):	5	lanes	Heavy Vehicle Percentage (P_T):	4.04	%
Lane Widths:	12	ft	Peak Hour Factor (PHF):	0.940	
Right-Side Lateral Clearance:	12	ft	Capacity Adj. Factor (CAF):	1.00	
Total Ramp Density (TRD):	2.8	ramps/mi	Speed Adj. Factor (SAF):	1.00	
Terrain Type:	Level		Density at Capacity (D_c):	45.0	pc/mi/ln
			Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	$\frac{V}{(PHF \times N \times f_{HV})}$ *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	1,761	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity ($v_p > c_{adj}$)? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): If $v_p \leq BP$: FFS_{adj} *(Eq. 12-1)*

If $BP < v_p \leq c$: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP) ^ a]}{(c_{adj} - BP) ^ a}$

S: **55.0** mi/h

Density (D): $D = v_p / S$ *(Eq. 12-11)* D: **32.0** pc/mi/ln

Level of Service (LOS): LOS: **D**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

1 I-680 Northbound

north of Crow Canyon Road ***PM Peak Hour***

GEOMETRIC DATA INPUTS			DEMAND INPUTS		
Measured Free Flow Speed (BFFS):	55.0	mi/h	Hourly Demand Volume (V):	8,728	veh/h
Mainline Lanes (N):	5	lanes	Heavy Vehicle Percentage (P_T):	4.04	%
Lane Widths:	12	ft	Peak Hour Factor (PHF):	0.940	
Right-Side Lateral Clearance:	10	ft	Capacity Adj. Factor (CAF):	1.00	
Total Ramp Density (TRD):	2.8	ramps/mi	Speed Adj. Factor (SAF):	1.00	
Terrain Type:	Level		Density at Capacity (D_c):	45.0	pc/mi/ln
			Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	V / (PHF x N x f_{HV}) *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	1,932	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity ($v_p > c_{adj}$)? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): If $v_p \le BP$: FFS_{adj} *(Eq. 12-1)*

If $BP < v_p \le c$: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP) ^ a]}{(c_{adj} - BP) ^ a}$

S: **54.6** mi/h

Density (D): D = v_p / S *(Eq. 12-11)* D: **35.4** pc/mi/ln

Level of Service (LOS): LOS: **E**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

1 I-680 Southbound

north of Crow Canyon Road — ***PM Peak Hour***

GEOMETRIC DATA INPUTS			DEMAND INPUTS		
Measured Free Flow Speed (BFFS):	55.0	mi/h	Hourly Demand Volume (V):	7,903	veh/h
Mainline Lanes (N):	5	lanes	Heavy Vehicle Percentage (P_T):	4.04	%
Lane Widths:	12	ft	Peak Hour Factor (PHF):	0.940	
Right-Side Lateral Clearance:	12	ft	Capacity Adj. Factor (CAF):	1.00	
Total Ramp Density (TRD):	2.8	ramps/mi	Speed Adj. Factor (SAF):	1.00	
Terrain Type:	Level		Density at Capacity (D_c):	45.0	pc/mi/ln
			Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	$\frac{V}{(PHF \times N \times f_{HV})}$ *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	1,750	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity (v_p > c_{adj})? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): If $v_p \le BP$: FFS_{adj} *(Eq. 12-1)*

If $BP < v_p \le c$: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP) ^ a]}{(c_{adj} - BP) ^ a}$

S: **55.0** mi/h

Density (D): D = v_p / S *(Eq. 12-11)* — D: **31.8** pc/mi/ln

Level of Service (LOS): — LOS: **D**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

2 I-680 Northbound

between Crow Canyon Road & Bollinger Canyon Road — ***AM Peak Hour***

GEOMETRIC DATA INPUTS			DEMAND INPUTS		
Measured Free Flow Speed (BFFS):	55.0	mi/h	Hourly Demand Volume (V):	6,405	veh/h
Mainline Lanes (N):	5	lanes	Heavy Vehicle Percentage (P_T):	4.04	%
Lane Widths:	12	ft	Peak Hour Factor (PHF):	0.940	
Right-Side Lateral Clearance:	9	ft	Capacity Adj. Factor (CAF):	1.00	
Total Ramp Density (TRD):	2.0	ramps/mi	Speed Adj. Factor (SAF):	1.00	
Terrain Type:	Level		Density at Capacity (D_c):	45.0	pc/mi/ln
			Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	$\frac{V}{(PHF \times N \times f_{HV})}$ *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	1,418	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity ($v_p > c_{adj}$)? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): If $v_p \le BP$: FFS_{adj} *(Eq. 12-1)*

If $BP < v_p \le c$: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP) ^ a]}{(c_{adj} - BP) ^ a}$

S: **55.0** mi/h

Density (D): D = v_p / S *(Eq. 12-11)* — D: **25.8** pc/mi/ln

Level of Service (LOS): — LOS: **C**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

FUTURE WITHOUT PROJECT CONDITIONS (YEAR 2040)

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

2 I-680 Southbound

between Crow Canyon Road & Bollinger Canyon Road ***AM Peak Hour***

GEOMETRIC DATA INPUTS			DEMAND INPUTS		
Measured Free Flow Speed (BFFS):	55.0	mi/h	Hourly Demand Volume (V):	7,914	veh/h
Mainline Lanes (N):	5	lanes	Heavy Vehicle Percentage (P_T):	4.04	%
Lane Widths:	12	ft	Peak Hour Factor (PHF):	0.940	
Right-Side Lateral Clearance:	11	ft	Capacity Adj. Factor (CAF):	1.00	
Total Ramp Density (TRD):	2.0	ramps/mi	Speed Adj. Factor (SAF):	1.00	
Terrain Type:	Level		Density at Capacity (D_c):	45.0	pc/mi/ln
			Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	$\frac{V}{(PHF \times N \times f_{HV})}$ *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	1,752	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity ($v_p > c_{adj}$)? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): If $v_p \le BP$: FFS_{adj} *(Eq. 12-1)*

If $BP < v_p \le c$: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP) ^ a]}{(c_{adj} - BP) ^ a}$

S: **55.0** mi/h

Density (D): $D = v_p / S$ *(Eq. 12-11)* D: **31.9** pc/mi/ln

Level of Service (LOS): LOS: **D**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

2 I-680 Northbound

between Crow Canyon Road & Bollinger Canyon Road — ***PM Peak Hour***

GEOMETRIC DATA INPUTS			DEMAND INPUTS		
Measured Free Flow Speed (BFFS):	55.0	mi/h	Hourly Demand Volume (V):	7,728	veh/h
Mainline Lanes (N):	5	lanes	Heavy Vehicle Percentage (P_T):	4.04	%
Lane Widths:	12	ft	Peak Hour Factor (PHF):	0.940	
Right-Side Lateral Clearance:	9	ft	Capacity Adj. Factor (CAF):	1.00	
Total Ramp Density (TRD):	2.0	ramps/mi	Speed Adj. Factor (SAF):	1.00	
Terrain Type:	Level		Density at Capacity (D_c):	45.0	pc/mi/ln
			Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	V / (PHF x N x f_{HV}) *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	1,711	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity ($v_p > c_{adj}$)? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): If $v_p \le BP$: FFS_{adj} *(Eq. 12-1)*

If $BP < v_p \le c$: $$FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP) ^ a]}{(c_{adj} - BP) ^ a}$$

S: **55.0** mi/h

Density (D): $D = v_p / S$ *(Eq. 12-11)* — D: **31.1** pc/mi/ln

Level of Service (LOS): — LOS: **D**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

2 I-680 Southbound

between Crow Canyon Road & Bollinger Canyon Road ***PM Peak Hour***

GEOMETRIC DATA INPUTS			DEMAND INPUTS		
Measured Free Flow Speed (BFFS):	55.0	mi/h	Hourly Demand Volume (V):	7,762	veh/h
Mainline Lanes (N):	5	lanes	Heavy Vehicle Percentage (P_T):	4.04	%
Lane Widths:	12	ft	Peak Hour Factor (PHF):	0.940	
Right-Side Lateral Clearance:	11	ft	Capacity Adj. Factor (CAF):	1.00	
Total Ramp Density (TRD):	2.0	ramps/mi	Speed Adj. Factor (SAF):	1.00	
Terrain Type:	Level		Density at Capacity (D_c):	45.0	pc/mi/ln
			Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	$\frac{V}{(PHF \times N \times f_{HV})}$ *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	1,719	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity (v_p > c_{adj})? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): If $v_p \leq BP$: FFS_{adj} *(Eq. 12-1)*

If $BP < v_p \leq c$: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP) ^ a]}{(c_{adj} - BP) ^ a}$

S: **55.0** mi/h

Density (D): $D = v_p / S$ *(Eq. 12-11)* D: **31.2** pc/mi/ln

Level of Service (LOS): LOS: **D**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

3 I-680 Northbound

south of Bollinger Canyon Road — ***AM Peak Hour***

GEOMETRIC DATA INPUTS			DEMAND INPUTS		
Measured Free Flow Speed (BFFS):	55.0	mi/h	Hourly Demand Volume (V):	6,306	veh/h
Mainline Lanes (N):	4	lanes	Heavy Vehicle Percentage (P_T):	4.04	%
Lane Widths:	12	ft	Peak Hour Factor (PHF):	0.940	
Right-Side Lateral Clearance:	10	ft	Capacity Adj. Factor (CAF):	1.00	
Total Ramp Density (TRD):	2.8	ramps/mi	Speed Adj. Factor (SAF):	1.00	
Terrain Type:	Level		Density at Capacity (D_c):	45.0	pc/mi/ln
			Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	$\frac{V}{(PHF \times N \times f_{HV})}$ *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	1,745	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity ($v_p > c_{adj}$)? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): If $v_p \le BP$: FFS_{adj} *(Eq. 12-1)*

If $BP < v_p \le c$: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP) ^ a]}{(c_{adj} - BP) ^ a}$

S: **55.0** mi/h

Density (D): D = v_p / S *(Eq. 12-11)* — D: **31.7** pc/mi/ln

Level of Service (LOS): — LOS: **D**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

3 I-680 Southbound

south of Bollinger Canyon Road ***AM Peak Hour***

GEOMETRIC DATA INPUTS			DEMAND INPUTS		
Measured Free Flow Speed (BFFS):	55.0	mi/h	Hourly Demand Volume (V):	7,120	veh/h
Mainline Lanes (N):	4	lanes	Heavy Vehicle Percentage (P_T):	4.04	%
Lane Widths:	12	ft	Peak Hour Factor (PHF):	0.940	
Right-Side Lateral Clearance:	11	ft	Capacity Adj. Factor (CAF):	1.00	
Total Ramp Density (TRD):	2.8	ramps/mi	Speed Adj. Factor (SAF):	1.00	
Terrain Type:	Level		Density at Capacity (D_c):	45.0	pc/mi/ln
			Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	$\frac{V}{(PHF \times N \times f_{HV})}$ *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	1,970	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity (v_p > c_{adj})? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S):

If $v_p \le BP$: FFS_{adj} *(Eq. 12-1)*

If $BP < v_p \le c$: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP) ^ a]}{(c_{adj} - BP) ^ a}$

S: **54.3** mi/h

Density (D): D = v_p / S *(Eq. 12-11)* D: **36.3** pc/mi/ln

Level of Service (LOS): LOS: **E**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

3 I-680 Northbound

south of Bollinger Canyon Road ***PM Peak Hour***

GEOMETRIC DATA INPUTS			**DEMAND INPUTS**		
Measured Free Flow Speed (BFFS):	55.0	mi/h	Hourly Demand Volume (V):	6,860	veh/h
Mainline Lanes (N):	4	lanes	Heavy Vehicle Percentage (P_T):	4.04	%
Lane Widths:	12	ft	Peak Hour Factor (PHF):	0.940	
Right-Side Lateral Clearance:	10	ft	Capacity Adj. Factor (CAF):	1.00	
Total Ramp Density (TRD):	2.8	ramps/mi	Speed Adj. Factor (SAF):	1.00	
Terrain Type:	Level		Density at Capacity (D_c):	45.0	pc/mi/ln
			Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	$\frac{V}{(PHF \times N \times f_{HV})}$ *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	1,899	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity (v_p > c_{adj})? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): If $v_p \leq BP$: FFS_{adj} *(Eq. 12-1)*

If $BP < v_p \leq c$: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP) ^ a]}{(c_{adj} - BP) ^ a}$

S: **54.8** mi/h

Density (D): $D = v_p / S$ *(Eq. 12-11)* D: **34.6** pc/mi/ln

Level of Service (LOS): LOS: **D**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

3 I-680 Southbound

south of Bollinger Canyon Road — ***PM Peak Hour***

GEOMETRIC DATA INPUTS / DEMAND INPUTS

Measured Free Flow Speed (BFFS):	55.0	mi/h	Hourly Demand Volume (V):	6,853	veh/h
Mainline Lanes (N):	4	lanes	Heavy Vehicle Percentage (P_T):	4.04	%
Lane Widths:	12	ft	Peak Hour Factor (PHF):	0.940	
Right-Side Lateral Clearance:	11	ft	Capacity Adj. Factor (CAF):	1.00	
Total Ramp Density (TRD):	2.8	ramps/mi	Speed Adj. Factor (SAF):	1.00	
Terrain Type:	Level		Density at Capacity (D_c):	45.0	pc/mi/ln
			Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	$\frac{V}{(PHF \times N \times f_{HV})}$ *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	1,897	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity ($v_p > c_{adj}$)? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): If $v_p \le BP$: FFS_{adj} *(Eq. 12-1)*

If $BP < v_p \le c$: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP) ^ a]}{(c_{adj} - BP) ^ a}$

S: **54.8** mi/h

Density (D): $D = v_p / S$ *(Eq. 12-11)* D: **34.6** pc/mi/ln

Level of Service (LOS): LOS: **D**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

1 I-680 Northbound

north of Crow Canyon Road — ***AM Peak Hour***

GEOMETRIC DATA INPUTS			DEMAND INPUTS		
Measured Free Flow Speed (BFFS):	55.0	mi/h	Hourly Demand Volume (V):	6,890	veh/h
Mainline Lanes (N):	5	lanes	Heavy Vehicle Percentage (P_T):	4.04	%
Lane Widths:	12	ft	Peak Hour Factor (PHF):	0.940	
Right-Side Lateral Clearance:	10	ft	Capacity Adj. Factor (CAF):	1.00	
Total Ramp Density (TRD):	2.8	ramps/mi	Speed Adj. Factor (SAF):	1.00	
Terrain Type:	Level		Density at Capacity (D_c):	45.0	pc/mi/ln
			Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	V / (PHF x N x f_{HV}) *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	1,525	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity ($v_p > c_{adj}$)? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): If $v_p \le BP$: FFS_{adj} *(Eq. 12-1)*

If $BP < v_p \le c$: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP)^a]}{(c_{adj} - BP)^a}$

S: **55.0** mi/h

Density (D): $D = v_p / S$ *(Eq. 12-11)* — D: **27.7** pc/mi/ln

Level of Service (LOS): — LOS: **D**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

1 I-680 Southbound

north of Crow Canyon Road — ***AM Peak Hour***

GEOMETRIC DATA INPUTS			DEMAND INPUTS		
Measured Free Flow Speed (BFFS):	55.0	mi/h	Hourly Demand Volume (V):	8,061	veh/h
Mainline Lanes (N):	5	lanes	Heavy Vehicle Percentage (P_T):	4.04	%
Lane Widths:	12	ft	Peak Hour Factor (PHF):	0.940	
Right-Side Lateral Clearance:	12	ft	Capacity Adj. Factor (CAF):	1.00	
Total Ramp Density (TRD):	2.8	ramps/mi	Speed Adj. Factor (SAF):	1.00	
Terrain Type:	Level		Density at Capacity (D_c):	45.0	pc/mi/ln
			Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Item	Formula		Value	Units
Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
		[f_{HV}:	0.961]	
Flow Rate (v_p):	V / (PHF x N x f_{HV}) *(Eq. 12-9)*	v_p:	1,785	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity (v_p > c_{adj})? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): If $v_p \le$ BP: FFS_{adj} *(Eq. 12-1)*

If BP < $v_p \le$ c: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP)^a]}{(c_{adj} - BP)^a}$

S: **55.0** mi/h

Density (D): D = v_p / S *(Eq. 12-11)* D: **32.4** pc/mi/ln

Level of Service (LOS): LOS: **D**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

1 I-680 Northbound

north of Crow Canyon Road — ***PM Peak Hour***

GEOMETRIC DATA INPUTS			DEMAND INPUTS		
Measured Free Flow Speed (BFFS):	55.0	mi/h	Hourly Demand Volume (V):	8,919	veh/h
Mainline Lanes (N):	5	lanes	Heavy Vehicle Percentage (P_T):	4.04	%
Lane Widths:	12	ft	Peak Hour Factor (PHF):	0.940	
Right-Side Lateral Clearance:	10	ft	Capacity Adj. Factor (CAF):	1.00	
Total Ramp Density (TRD):	2.8	ramps/mi	Speed Adj. Factor (SAF):	1.00	
Terrain Type:	Level		Density at Capacity (D_c):	45.0	pc/mi/ln
			Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	$\frac{V}{(PHF \times N \times f_{HV})}$ *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	1,975	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity ($v_p > c_{adj}$)? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): If $v_p \le BP$: FFS_{adj} *(Eq. 12-1)*

If $BP < v_p \le c$: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP) ^ a]}{(c_{adj} - BP) ^ a}$

S: **54.2** mi/h

Density (D): D = v_p / S *(Eq. 12-11)* D: **36.4** pc/mi/ln

Level of Service (LOS): LOS: **E**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

1 I-680 Southbound

north of Crow Canyon Road — ***PM Peak Hour***

GEOMETRIC DATA INPUTS

Measured Free Flow Speed (BFFS):	55.0	mi/h
Mainline Lanes (N):	5	lanes
Lane Widths:	12	ft
Right-Side Lateral Clearance:	12	ft
Total Ramp Density (TRD):	2.8	ramps/mi
Terrain Type:	Level	

DEMAND INPUTS

Hourly Demand Volume (V):	8,159	veh/h
Heavy Vehicle Percentage (P_T):	4.04	%
Peak Hour Factor (PHF):	0.940	
Capacity Adj. Factor (CAF):	1.00	
Speed Adj. Factor (SAF):	1.00	
Density at Capacity (D_c):	45.0	pc/mi/ln
Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	$\frac{V}{(PHF \times N \times f_{HV})}$ *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	1,806	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity (v_p > c_{adj})? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): If $v_p \le BP$: FFS_{adj} *(Eq. 12-1)*

If $BP < v_p \le c$: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP)^a]}{(c_{adj} - BP)^a}$

S: **55.0** mi/h

Density (D): $D = v_p / S$ *(Eq. 12-11)* — D: **32.8** pc/mi/ln

Level of Service (LOS): — LOS: **D**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

FUTURE WITH PROJECT CONDITIONS (YEAR 2040)

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

2 I-680 Northbound

between Crow Canyon Road & Bollinger Canyon Road ***AM Peak Hour***

GEOMETRIC DATA INPUTS			DEMAND INPUTS		
Measured Free Flow Speed (BFFS):	55.0	mi/h	Hourly Demand Volume (V):	6,551	veh/h
Mainline Lanes (N):	5	lanes	Heavy Vehicle Percentage (P_T):	4.04	%
Lane Widths:	12	ft	Peak Hour Factor (PHF):	0.940	
Right-Side Lateral Clearance:	9	ft	Capacity Adj. Factor (CAF):	1.00	
Total Ramp Density (TRD):	2.0	ramps/mi	Speed Adj. Factor (SAF):	1.00	
Terrain Type:	Level		Density at Capacity (D_c):	45.0	pc/mi/ln
			Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	$\frac{V}{(PHF \times N \times f_{HV})}$ *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	1,450	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity (v_p > c_{adj})? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S):
If $v_p \leq BP$: FFS_{adj} *(Eq. 12-1)*
If $BP < v_p \leq c$: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP)^a]}{(c_{adj} - BP)^a}$

S: **55.0** mi/h

Density (D): D = v_p / S *(Eq. 12-11)* D: **26.4** pc/mi/ln

Level of Service (LOS): LOS: **D**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

2 I-680 Southbound

between Crow Canyon Road & Bollinger Canyon Road — ***AM Peak Hour***

GEOMETRIC DATA INPUTS			DEMAND INPUTS		
Measured Free Flow Speed (BFFS):	55.0	mi/h	Hourly Demand Volume (V):	7,967	veh/h
Mainline Lanes (N):	5	lanes	Heavy Vehicle Percentage (P_T):	4.04	%
Lane Widths:	12	ft	Peak Hour Factor (PHF):	0.940	
Right-Side Lateral Clearance:	11	ft	Capacity Adj. Factor (CAF):	1.00	
Total Ramp Density (TRD):	2.0	ramps/mi	Speed Adj. Factor (SAF):	1.00	
Terrain Type:	Level		Density at Capacity (D_c):	45.0	pc/mi/ln
			Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	$\frac{V}{(PHF \times N \times f_{HV})}$ *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	1,764	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity ($v_p > c_{adj}$)? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): If $v_p \leq BP$: FFS_{adj} *(Eq. 12-1)*

If $BP < v_p \leq c$: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP) ^ a]}{(c_{adj} - BP) ^ a}$

S: **55.0** mi/h

Density (D): $D = v_p / S$ *(Eq. 12-11)* D: **32.1** pc/mi/ln

Level of Service (LOS): LOS: **D**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

2 I-680 Northbound

between Crow Canyon Road & Bollinger Canyon Road — ***PM Peak Hour***

GEOMETRIC DATA INPUTS			DEMAND INPUTS		
Measured Free Flow Speed (BFFS):	55.0	mi/h	Hourly Demand Volume (V):	7,824	veh/h
Mainline Lanes (N):	5	lanes	Heavy Vehicle Percentage (P_T):	4.04	%
Lane Widths:	12	ft	Peak Hour Factor (PHF):	0.940	
Right-Side Lateral Clearance:	9	ft	Capacity Adj. Factor (CAF):	1.00	
Total Ramp Density (TRD):	2.0	ramps/mi	Speed Adj. Factor (SAF):	1.00	
Terrain Type:	Level		Density at Capacity (D_c):	45.0	pc/mi/ln
			Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	$\frac{V}{(PHF \times N \times f_{HV})}$ *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	1,732	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity ($v_p > c_{adj}$)? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): If $v_p \le BP$: FFS_{adj} *(Eq. 12-1)*

If $BP < v_p \le c$: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP) ^ a]}{(c_{adj} - BP) ^ a}$

S: **55.0** mi/h

Density (D): $D = v_p / S$ *(Eq. 12-11)* D: **31.5** pc/mi/ln

Level of Service (LOS): LOS: **D**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

2 I-680 Southbound

between Crow Canyon Road & Bollinger Canyon Road ***PM Peak Hour***

GEOMETRIC DATA INPUTS			DEMAND INPUTS		
Measured Free Flow Speed (BFFS):	55.0	mi/h	Hourly Demand Volume (V):	7,875	veh/h
Mainline Lanes (N):	5	lanes	Heavy Vehicle Percentage (P_T):	4.04	%
Lane Widths:	12	ft	Peak Hour Factor (PHF):	0.940	
Right-Side Lateral Clearance:	11	ft	Capacity Adj. Factor (CAF):	1.00	
Total Ramp Density (TRD):	2.0	ramps/mi	Speed Adj. Factor (SAF):	1.00	
Terrain Type:	Level		Density at Capacity (D_c):	45.0	pc/mi/ln
			Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	$\frac{V}{(PHF \times N \times f_{HV})}$ *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	1,744	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity (v_p > c_{adj})? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): If $v_p \le BP$: FFS_{adj} *(Eq. 12-1)*

If $BP < v_p \le c$: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP) ^ a]}{(c_{adj} - BP) ^ a}$

S: **55.0** mi/h

Density (D): D = v_p / S *(Eq. 12-11)* D: **31.7** pc/mi/ln

Level of Service (LOS): LOS: **D**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

3 I-680 Northbound

south of Bollinger Canyon Road — ***AM Peak Hour***

GEOMETRIC DATA INPUTS			DEMAND INPUTS		
Measured Free Flow Speed (BFFS):	55.0	mi/h	Hourly Demand Volume (V):	6,461	veh/h
Mainline Lanes (N):	4	lanes	Heavy Vehicle Percentage (P_T):	4.04	%
Lane Widths:	12	ft	Peak Hour Factor (PHF):	0.940	
Right-Side Lateral Clearance:	10	ft	Capacity Adj. Factor (CAF):	1.00	
Total Ramp Density (TRD):	2.8	ramps/mi	Speed Adj. Factor (SAF):	1.00	
Terrain Type:	Level		Density at Capacity (D_c):	45.0	pc/mi/ln
			Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	$\frac{V}{(PHF \times N \times f_{HV})}$ *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	1,788	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity (v_p > c_{adj})? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): If $v_p \le BP$: FFS_{adj} *(Eq. 12-1)*

If $BP < v_p \le c$: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP) ^ a]}{(c_{adj} - BP) ^ a}$

S: **55.0** mi/h

Density (D): D = v_p / S *(Eq. 12-11)* D: **32.5** pc/mi/ln

Level of Service (LOS): LOS: **D**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

FUTURE WITH PROJECT CONDITIONS (YEAR 2040)

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

3 I-680 Southbound

south of Bollinger Canyon Road — ***AM Peak Hour***

GEOMETRIC DATA INPUTS			DEMAND INPUTS		
Measured Free Flow Speed (BFFS):	55.0	mi/h	Hourly Demand Volume (V):	7,513	veh/h
Mainline Lanes (N):	4	lanes	Heavy Vehicle Percentage (P_T):	4.04	%
Lane Widths:	12	ft	Peak Hour Factor (PHF):	0.940	
Right-Side Lateral Clearance:	11	ft	Capacity Adj. Factor (CAF):	1.00	
Total Ramp Density (TRD):	2.8	ramps/mi	Speed Adj. Factor (SAF):	1.00	
Terrain Type:	Level		Density at Capacity (D_c):	45.0	pc/mi/ln
			Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	V / (PHF x N x f_{HV}) *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	2,079	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity ($v_p > c_{adj}$)? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): If $v_p \le BP$: FFS_{adj} *(Eq. 12-1)*

If $BP < v_p \le c$: $$FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP) ^ a]}{(c_{adj} - BP) ^ a}$$

S: **53.1** mi/h

Density (D): D = v_p / S *(Eq. 12-11)* — D: **39.2** pc/mi/ln

Level of Service (LOS): — LOS: **E**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

3 I-680 Northbound

south of Bollinger Canyon Road — ***PM Peak Hour***

GEOMETRIC DATA INPUTS

Measured Free Flow Speed (BFFS):	55.0	mi/h
Mainline Lanes (N):	4	lanes
Lane Widths:	12	ft
Right-Side Lateral Clearance:	10	ft
Total Ramp Density (TRD):	2.8	ramps/mi
Terrain Type:	Level	

DEMAND INPUTS

Hourly Demand Volume (V):	7,239	veh/h
Heavy Vehicle Percentage (P_T):	4.04	%
Peak Hour Factor (PHF):	0.940	
Capacity Adj. Factor (CAF):	1.00	
Speed Adj. Factor (SAF):	1.00	
Density at Capacity (D_c):	45.0	pc/mi/ln
Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	$\frac{V}{(PHF \times N \times f_{HV})}$ *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	2,003	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity ($v_p > c_{adj}$)? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): If $v_p \le BP$: FFS_{adj} *(Eq. 12-1)*

If $BP < v_p \le c$: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP) ^ a]}{(c_{adj} - BP) ^ a}$

S: **54.0** mi/h

Density (D): $D = v_p / S$ *(Eq. 12-11)* — D: **37.1** pc/mi/ln

Level of Service (LOS): — LOS: **E**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

CityWalk Master Plan Project

Highway Capacity Manual 6th Edition - Basic Freeway Segments Worksheet

3 I-680 Southbound

south of Bollinger Canyon Road ***PM Peak Hour***

GEOMETRIC DATA INPUTS			DEMAND INPUTS		
Measured Free Flow Speed (BFFS):	55.0	mi/h	Hourly Demand Volume (V):	7,112	veh/h
Mainline Lanes (N):	4	lanes	Heavy Vehicle Percentage (P_T):	4.04	%
Lane Widths:	12	ft	Peak Hour Factor (PHF):	0.940	
Right-Side Lateral Clearance:	11	ft	Capacity Adj. Factor (CAF):	1.00	
Total Ramp Density (TRD):	2.8	ramps/mi	Speed Adj. Factor (SAF):	1.00	
Terrain Type:	Level		Density at Capacity (D_c):	45.0	pc/mi/ln
			Exponent Calibration Parameter (a):	2.00	

FREE FLOW SPEED, CAPACITY, & FLOW CALCULATIONS

Adjusted Free Flow Speed (FFS_{adj}):	FFS x SAF *(Eq. 12-5)*	FFS_{adj}:	55.0	mi/h
Basic Freeway Seg. Capacity (c):	2,200 + 10 x (FFS_{adj} - 50) *(Eq. 12-6)*	c:	2,250	pc/h/ln
Adj. Freeway Seg. Capacity (c_{adj}):	c x CAF *(Eq. 12-8)*	c_{adj}:	2,250	pc/h/ln
Breakpoint (BP):	[1,000 + 40 x (75 - FFS_{adj})] x CAF ^ 2 *(Ex. 12-6)*	BP:	1,800	pc/h/ln
Flow Rate (v_p):	$\frac{V}{(PHF \times N \times f_{HV})}$ *(Eq. 12-9)*	[f_{HV}:	0.961]	
		v_p:	1,968	pc/h/ln

Flow Rate > Adjusted Freeway Segment Capacity ($v_p > c_{adj}$)? NO

SPEED, DENSITY, & LEVEL OF SERVICE

Mean Speed (S): If $v_p \le BP$: FFS_{adj} *(Eq. 12-1)*

If $BP < v_p \le c$: $FFS_{adj} - \frac{[(FFS_{adj} - c_{adj} / D_c) \times (v_p - BP) ^ a]}{(c_{adj} - BP) ^ a}$

S: **54.3** mi/h

Density (D): $D = v_p / S$ *(Eq. 12-11)* D: **36.2** pc/mi/ln

Level of Service (LOS): LOS: **E**

Notes: Methodology from *Highway Capacity Manual 6th Edition* , Transportation Research Board, 2016.

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	1106	896	0	1025	845
Future Volume (veh/h)	0	1106	896	0	1025	845
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	0	1870	1870	0	1870	1870
Adj Flow Rate, veh/h	0	1140	924	0	1057	665
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	2	2	0	2	2
Cap, veh/h	0	2773	2773		1257	1015
Arrive On Green	0.00	1.00	1.00	0.00	0.36	0.36
Sat Flow, veh/h	0	5443	5443	0	3456	2790
Grp Volume(v), veh/h	0	1140	924	0	1057	665
Grp Sat Flow(s),veh/h/ln	0	1702	1702	0	1728	1395
Q Serve(g_s), s	0.0	0.0	0.0	0.0	42.1	29.9
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	42.1	29.9
Prop In Lane	0.00			0.00	1.00	1.00
Lane Grp Cap(c), veh/h	0	2773	2773		1257	1015
V/C Ratio(X)	0.00	0.41	0.33		0.84	0.66
Avail Cap(c_a), veh/h	0	2773	2773		1797	1451
HCM Platoon Ratio	1.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	43.7	39.9
Incr Delay (d2), s/veh	0.0	0.5	0.3	0.0	2.6	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.0	0.2	0.1	0.0	25.5	15.7
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.0	0.5	0.3	0.0	46.3	40.6
LnGrp LOS	A	A	A		D	D
Approach Vol, veh/h		1140	924	A	1722	
Approach Delay, s/veh		0.5	0.3		44.1	
Approach LOS		A	A		D	
Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		88.4		61.6		88.4
Change Period (Y+Rc), s		5.0		5.0		5.0
Max Green Setting (Gmax), s		60.0		80.0		60.0
Max Q Clear Time (g_c+I1), s		2.0		44.1		2.0
Green Ext Time (p_c), s		6.5		12.5		4.9
Intersection Summary						
HCM 6th Ctrl Delay			20.3			
HCM 6th LOS			C			

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1511	0	0	998	517	648
Future Volume (veh/h)	1511	0	0	998	517	648
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	0	0	1870	1870	1870
Adj Flow Rate, veh/h	1591	0	0	1051	701	356
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	0	0	2	2	2
Cap, veh/h	3325	0	0	4190	910	405
Arrive On Green	1.00	0.00	0.00	1.00	0.26	0.26
Sat Flow, veh/h	5443	0	0	6958	3563	1585
Grp Volume(v), veh/h	1591	0	0	1051	701	356
Grp Sat Flow(s),veh/h/ln	1702	0	0	1609	1781	1585
Q Serve(g_s), s	0.0	0.0	0.0	0.0	27.4	32.3
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	27.4	32.3
Prop In Lane		0.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	3325	0	0	4190	910	405
V/C Ratio(X)	0.48	0.00	0.00	0.25	0.77	0.88
Avail Cap(c_a), veh/h	3325	0	0	4190	1544	687
HCM Platoon Ratio	2.00	1.00	1.00	2.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	51.8	53.6
Incr Delay (d2), s/veh	0.5	0.0	0.0	0.1	1.4	7.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.3	0.0	0.0	0.1	18.2	19.8
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.5	0.0	0.0	0.1	53.2	60.6
LnGrp LOS	A	A	A	A	D	E
Approach Vol, veh/h	1591			1051	1057	
Approach Delay, s/veh	0.5			0.1	55.7	
Approach LOS	A			A	E	

Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		104.7		45.3		104.7
Change Period (Y+Rc), s		5.0		5.0		5.0
Max Green Setting (Gmax), s		73.0		67.0		73.0
Max Q Clear Time (g_c+I1), s		2.0		34.3		2.0
Green Ext Time (p_c), s		11.0		6.0		5.8

Intersection Summary			
HCM 6th Ctrl Delay			16.2
HCM 6th LOS			B

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1127	9	0	672	908	0	0	49	892	5	233
Future Volume (veh/h)	0	1127	9	0	672	908	0	0	49	892	5	233
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	0	2067	1870	0	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	0	1162	9	0	693	0	0	0	51	924	0	137
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	2	2	0	2	2	2	2	2	2	2	2
Cap, veh/h	0	4079	32	0	3139		0	0	25	1025	0	912
Arrive On Green	0.00	1.00	0.56	0.00	1.00	0.00	0.00	0.00	0.02	0.29	0.00	0.29
Sat Flow, veh/h	0	7623	57	0	6016	0	0	0	1585	3563	0	3170
Grp Volume(v), veh/h	0	845	326	0	693	0	0	0	51	924	0	137
Grp Sat Flow(s),veh/h/ln	0	1778	2057	0	1881	0	0	0	1585	1781	0	1585
Q Serve(g_s), s	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	2.4	37.4	0.0	4.8
Cycle Q Clear(g_c), s	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	2.4	37.4	0.0	4.8
Prop In Lane	0.00		0.03	0.00		0.00	0.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	0	2967	1144	0	3139		0	0	25	1025	0	912
V/C Ratio(X)	0.00	0.28	0.29	0.00	0.22		0.00	0.00	2.01	0.90	0.00	0.15
Avail Cap(c_a), veh/h	0	2967	1144	0	3139		0	0	85	1401	0	1247
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.67	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	0.74	0.74	0.00	1.00	0.00	0.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	73.8	51.4	0.0	39.8
Incr Delay (d2), s/veh	0.0	0.2	0.5	0.0	0.2	0.0	0.0	0.0	502.1	6.5	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.0	0.1	0.5	0.0	0.1	0.0	0.0	0.0	8.1	24.5	0.0	3.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	0.2	0.9	0.0	0.2	0.0	0.0	0.0	575.9	57.9	0.0	39.8
LnGrp LOS	A	A	A	A	A		A	A	F	E	A	D
Approach Vol, veh/h		1171			693	A		51			1061	
Approach Delay, s/veh		0.4			0.2			575.9			55.6	
Approach LOS		A			A			F			E	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		90.4		50.2		90.4		9.4				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		64.0		61.0		64.0		10.0				
Max Q Clear Time (g_c+I1), s		2.4		39.4		2.0		4.4				
Green Ext Time (p_c), s		14.2		5.8		7.3		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			29.9									
HCM 6th LOS			C									

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1283	360	0	1266	717	332	0	1679	0	0	0
Future Volume (veh/h)	0	1283	360	0	1266	717	332	0	1679	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	0	2067	1870	0	2067	1870	1870	0	1870			
Adj Flow Rate, veh/h	0	1309	0	0	1631	0	339	0	1407			
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98			
Percent Heavy Veh, %	0	2	2	0	2	2	2	0	2			
Cap, veh/h	0	2719		0	2988		757	0	1536			
Arrive On Green	0.00	0.96	0.00	0.00	0.96	0.00	0.42	0.00	0.42			
Sat Flow, veh/h	0	5830	1585	0	6202	1585	1781	0	3614			
Grp Volume(v), veh/h	0	1309	0	0	1631	0	339	0	1407			
Grp Sat Flow(s),veh/h/ln	0	1881	1585	0	2067	1585	1781	0	1205			
Q Serve(g_s), s	0.0	2.4	0.0	0.0	3.0	0.0	20.3	0.0	55.0			
Cycle Q Clear(g_c), s	0.0	2.4	0.0	0.0	3.0	0.0	20.3	0.0	55.0			
Prop In Lane	0.00		1.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	0	2719		0	2988		757	0	1536			
V/C Ratio(X)	0.00	0.48		0.00	0.55		0.45	0.00	0.92			
Avail Cap(c_a), veh/h	0	2719		0	2988		926	0	1879			
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.00	1.00	0.00	0.00	0.85	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	0.0	1.5	0.0	0.0	1.5	0.0	30.6	0.0	40.6			
Incr Delay (d2), s/veh	0.0	0.6	0.0	0.0	0.6	0.0	0.4	0.0	6.6			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(95%),veh/ln	0.0	1.3	0.0	0.0	1.6	0.0	13.8	0.0	23.9			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	2.1	0.0	0.0	2.1	0.0	31.1	0.0	47.2			
LnGrp LOS	A	A		A	A		C	A	D			
Approach Vol, veh/h		1309	A		1631	A		1746				
Approach Delay, s/veh		2.1			2.1			44.1				
Approach LOS		A			A			D				

Timer - Assigned Phs	2	6	8
Phs Duration (G+Y+Rc), s	79.3	79.3	70.7
Change Period (Y+Rc), s	5.0	5.0	5.0
Max Green Setting (Gmax), s	60.0	60.0	80.0
Max Q Clear Time (g_c+I1), s	4.4	5.0	57.0
Green Ext Time (p_c), s	29.7	38.5	8.7

Intersection Summary	
HCM 6th Ctrl Delay	17.7
HCM 6th LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	1495	1083	0	593	783
Future Volume (veh/h)	0	1495	1083	0	593	783
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	0	1870	1870	0	1870	1870
Adj Flow Rate, veh/h	0	1625	1177	0	645	742
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	0	2	2
Cap, veh/h	0	3010	3010		1085	876
Arrive On Green	0.00	1.00	1.00	0.00	0.31	0.31
Sat Flow, veh/h	0	5443	5443	0	3456	2790
Grp Volume(v), veh/h	0	1625	1177	0	645	742
Grp Sat Flow(s),veh/h/ln	0	1702	1702	0	1728	1395
Q Serve(g_s), s	0.0	0.0	0.0	0.0	22.8	36.0
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	22.8	36.0
Prop In Lane	0.00			0.00	1.00	1.00
Lane Grp Cap(c), veh/h	0	3010	3010		1085	876
V/C Ratio(X)	0.00	0.54	0.39		0.59	0.85
Avail Cap(c_a), veh/h	0	3010	3010		1501	1212
HCM Platoon Ratio	1.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	42.0	46.5
Incr Delay (d2), s/veh	0.0	0.7	0.4	0.0	0.5	4.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.0	0.4	0.2	0.0	15.0	18.9
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.0	0.7	0.4	0.0	42.5	50.7
LnGrp LOS	A	A	A		D	D
Approach Vol, veh/h		1625	1177	A	1387	
Approach Delay, s/veh		0.7	0.4		46.9	
Approach LOS		A	A		D	
Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		92.5		52.5		92.5
Change Period (Y+Rc), s		5.0		5.0		5.0
Max Green Setting (Gmax), s		70.0		65.0		70.0
Max Q Clear Time (g_c+I1), s		3.0		39.0		3.0
Green Ext Time (p_c), s		11.4		8.5		6.8
Intersection Summary						
HCM 6th Ctrl Delay			15.9			
HCM 6th LOS			B			

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1377	0	0	1491	415	754
Future Volume (veh/h)	1377	0	0	1491	415	754
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	0	0	1870	1870	1870
Adj Flow Rate, veh/h	1497	0	0	1621	387	779
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	0	0	2	2	2
Cap, veh/h	3145	0	0	3962	512	912
Arrive On Green	1.00	0.00	0.00	1.00	0.29	0.29
Sat Flow, veh/h	5443	0	0	6958	1781	3170
Grp Volume(v), veh/h	1497	0	0	1621	387	779
Grp Sat Flow(s),veh/h/ln	1702	0	0	1609	1781	1585
Q Serve(g_s), s	0.0	0.0	0.0	0.0	28.7	33.7
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	28.7	33.7
Prop In Lane		0.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	3145	0	0	3962	512	912
V/C Ratio(X)	0.48	0.00	0.00	0.41	0.76	0.85
Avail Cap(c_a), veh/h	3145	0	0	3962	811	1443
HCM Platoon Ratio	2.00	1.00	1.00	2.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	47.0	48.8
Incr Delay (d2), s/veh	0.5	0.0	0.0	0.3	2.3	3.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.3	0.0	0.0	0.2	19.0	19.8
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.5	0.0	0.0	0.3	49.3	51.9
LnGrp LOS	A	A	A	A	D	D
Approach Vol, veh/h	1497			1621	1166	
Approach Delay, s/veh	0.5			0.3	51.0	
Approach LOS	A			A	D	

Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		96.3		48.7		96.3
Change Period (Y+Rc), s		5.0		5.0		5.0
Max Green Setting (Gmax), s		67.0		68.0		67.0
Max Q Clear Time (g_c+I1), s		3.0		36.7		3.0
Green Ext Time (p_c), s		9.9		7.0		11.4

Intersection Summary			
HCM 6th Ctrl Delay			14.2
HCM 6th LOS			B

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1171	6	0	1146	1244	0	0	75	656	108	294
Future Volume (veh/h)	0	1171	6	0	1146	1244	0	0	75	656	108	294
Initial Q (Qb), veh	0	20	0	0	30	0	0	0	0	7	7	7
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	0	1870	1870	0	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	0	1273	7	0	1246	0	0	0	82	797	0	266
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	0	2	2	2	2	2	2	2	2
Cap, veh/h	0	3738	20	0	2863		0	0	85	884	0	777
Arrive On Green	0.00	1.00	1.00	0.00	1.00	0.00	0.00	0.00	0.05	0.24	0.00	0.24
Sat Flow, veh/h	0	6915	37	0	5443	0	0	0	1585	3563	0	3170
Grp Volume(v), veh/h	0	923	357	0	1246	0	0	0	82	797	0	266
Grp Sat Flow(s),veh/h/ln	0	1609	1864	0	1702	0	0	0	1585	1781	0	1585
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.7	32.7	0.0	10.4
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.7	32.7	0.0	10.4
Prop In Lane	0.00		0.02	0.00		0.00	0.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	0	2711	1047	0	2863		0	0	85	884	0	777
V/C Ratio(X)	0.00	0.34	0.34	0.00	0.44		0.00	0.00	0.97	0.90	0.00	0.34
Avail Cap(c_a), veh/h	0	2715	1048	0	2872		0	0	85	950	0	845
HCM Platoon Ratio	1.00	2.00	2.00	1.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	0.67	0.67	0.00	1.00	0.00	0.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	70.9	55.2	0.0	47.2
Incr Delay (d2), s/veh	0.0	0.2	0.6	0.0	0.5	0.0	0.0	0.0	87.6	11.1	0.0	0.3
Initial Q Delay(d3),s/veh	0.0	0.3	0.2	0.0	1.4	0.0	0.0	0.0	0.0	4.6	0.0	0.9
%ile BackOfQ(95%),veh/ln	0.0	0.2	0.4	0.0	0.6	0.0	0.0	0.0	9.0	23.9	0.0	8.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	0.6	0.8	0.0	1.9	0.0	0.0	0.0	158.5	70.8	0.0	48.3
LnGrp LOS	A	A	A	A	A		A	A	F	E	A	D
Approach Vol, veh/h		1280			1246	A		82			1063	
Approach Delay, s/veh		0.6			1.9			158.5			65.2	
Approach LOS		A			A			F			E	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		91.4		43.6		91.4		15.0				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		83.0		42.0		83.0		10.0				
Max Q Clear Time (g_c+I1), s		3.0		35.7		3.0		10.7				
Green Ext Time (p_c), s		16.8		2.9		17.5		0.0				

Intersection Summary			
HCM 6th Ctrl Delay			23.3
HCM 6th LOS			C

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↱		↑↑↑↱	↱	↰		↱↱↱			
Traffic Volume (veh/h)	0	1161	180	0	2059	655	418	0	1025	0	0	0
Future Volume (veh/h)	0	1161	180	0	2059	655	418	0	1025	0	0	0
Initial Q (Qb), veh	0	25	0	0	80	0	8	0	36			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	0	1870	1870	0	1870	1870	1870	0	1870			
Adj Flow Rate, veh/h	0	1262	0	0	2238	0	454	0	897			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	0	2	2	0	2	2	2	0	2			
Cap, veh/h	0	3142		0	3321		533	0	1130			
Arrive On Green	0.00	1.00	0.00	0.00	1.00	0.00	0.29	0.00	0.29			
Sat Flow, veh/h	0	5274	1585	0	5611	1585	1781	0	3614			
Grp Volume(v), veh/h	0	1262	0	0	2238	0	454	0	897			
Grp Sat Flow(s),veh/h/ln	0	1702	1585	0	1870	1585	1781	0	1205			
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	0.0	36.6	0.0	35.3			
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	0.0	0.0	36.6	0.0	35.3			
Prop In Lane	0.00		1.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	0	3142		0	3321		533	0	1130			
V/C Ratio(X)	0.00	0.40		0.00	0.67		0.85	0.00	0.79			
Avail Cap(c_a), veh/h	0	3167		0	3480		641	0	1301			
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.00	1.00	0.00	0.00	0.64	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	50.7	0.0	49.8			
Incr Delay (d2), s/veh	0.0	0.4	0.0	0.0	0.7	0.0	9.3	0.0	3.0			
Initial Q Delay(d3),s/veh	0.0	0.8	0.0	0.0	12.8	0.0	11.0	0.0	35.4			
%ile BackOfQ(95%),veh/ln	0.0	0.4	0.0	0.0	4.3	0.0	27.8	0.0	22.5			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	1.1	0.0	0.0	13.5	0.0	70.9	0.0	88.3			
LnGrp LOS	A	A		A	B		E	A	F			
Approach Vol, veh/h		1262	A		2238	A		1351				
Approach Delay, s/veh		1.1			13.5			82.4				
Approach LOS		A			B			F				
Timer - Assigned Phs		2				6		8				
Phs Duration (G+Y+Rc), s		100.0				100.0		50.0				
Change Period (Y+Rc), s		5.0				5.0		5.0				
Max Green Setting (Gmax), s		84.0				84.0		56.0				
Max Q Clear Time (g_c+I1), s		3.0				3.0		39.6				
Green Ext Time (p_c), s		33.1				70.3		5.4				

Intersection Summary			
HCM 6th Ctrl Delay			29.5
HCM 6th LOS			C

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	1136	907	0	1046	878
Future Volume (veh/h)	0	1136	907	0	1046	878
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	0	1870	1870	0	1870	1870
Adj Flow Rate, veh/h	0	1171	935	0	1078	699
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	2	2	0	2	2
Cap, veh/h	0	2732	2732		1284	1037
Arrive On Green	0.00	1.00	1.00	0.00	0.37	0.37
Sat Flow, veh/h	0	5443	5443	0	3456	2790
Grp Volume(v), veh/h	0	1171	935	0	1078	699
Grp Sat Flow(s),veh/h/ln	0	1702	1702	0	1728	1395
Q Serve(g_s), s	0.0	0.0	0.0	0.0	42.7	31.5
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	42.7	31.5
Prop In Lane	0.00			0.00	1.00	1.00
Lane Grp Cap(c), veh/h	0	2732	2732		1284	1037
V/C Ratio(X)	0.00	0.43	0.34		0.84	0.67
Avail Cap(c_a), veh/h	0	2732	2732		1797	1451
HCM Platoon Ratio	1.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	43.0	39.5
Incr Delay (d2), s/veh	0.0	0.5	0.3	0.0	2.6	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.0	0.2	0.2	0.0	25.8	16.4
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.0	0.5	0.3	0.0	45.7	40.3
LnGrp LOS	A	A	A		D	D
Approach Vol, veh/h		1171	935	A	1777	
Approach Delay, s/veh		0.5	0.3		43.5	
Approach LOS		A	A		D	
Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		87.3		62.7		87.3
Change Period (Y+Rc), s		5.0		5.0		5.0
Max Green Setting (Gmax), s		60.0		80.0		60.0
Max Q Clear Time (g_c+I1), s		2.0		44.7		2.0
Green Ext Time (p_c), s		6.8		13.0		5.0
Intersection Summary						
HCM 6th Ctrl Delay			20.2			
HCM 6th LOS			C			

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1544	0	0	1009	517	648
Future Volume (veh/h)	1544	0	0	1009	517	648
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	0	0	1870	1870	1870
Adj Flow Rate, veh/h	1625	0	0	1062	701	356
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	0	0	2	2	2
Cap, veh/h	3325	0	0	4190	910	405
Arrive On Green	1.00	0.00	0.00	1.00	0.26	0.26
Sat Flow, veh/h	5443	0	0	6958	3563	1585
Grp Volume(v), veh/h	1625	0	0	1062	701	356
Grp Sat Flow(s),veh/h/ln	1702	0	0	1609	1781	1585
Q Serve(g_s), s	0.0	0.0	0.0	0.0	27.4	32.3
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	27.4	32.3
Prop In Lane		0.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	3325	0	0	4190	910	405
V/C Ratio(X)	0.49	0.00	0.00	0.25	0.77	0.88
Avail Cap(c_a), veh/h	3325	0	0	4190	1544	687
HCM Platoon Ratio	2.00	1.00	1.00	2.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	51.8	53.6
Incr Delay (d2), s/veh	0.5	0.0	0.0	0.1	1.4	7.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.3	0.0	0.0	0.1	18.2	19.8
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.5	0.0	0.0	0.1	53.2	60.6
LnGrp LOS	A	A	A	A	D	E
Approach Vol, veh/h	1625			1062	1057	
Approach Delay, s/veh	0.5			0.1	55.7	
Approach LOS	A			A	E	

Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		104.7		45.3		104.7
Change Period (Y+Rc), s		5.0		5.0		5.0
Max Green Setting (Gmax), s		73.0		67.0		73.0
Max Q Clear Time (g_c+I1), s		2.0		34.3		2.0
Green Ext Time (p_c), s		11.5		6.0		5.9

Intersection Summary	
HCM 6th Ctrl Delay	16.0
HCM 6th LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1158	9	0	742	1301	0	0	49	945	5	233
Future Volume (veh/h)	0	1158	9	0	742	1301	0	0	49	945	5	233
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	0	2067	1870	0	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	0	1194	9	0	765	0	0	0	51	978	0	137
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	2	2	0	2	2	2	2	2	2	2	2
Cap, veh/h	0	3968	30	0	3053		0	0	25	1080	0	961
Arrive On Green	0.00	1.00	0.54	0.00	1.00	0.00	0.00	0.00	0.02	0.30	0.00	0.30
Sat Flow, veh/h	0	7625	55	0	6016	0	0	0	1585	3563	0	3170
Grp Volume(v), veh/h	0	868	335	0	765	0	0	0	51	978	0	137
Grp Sat Flow(s),veh/h/ln	0	1778	2057	0	1881	0	0	0	1585	1781	0	1585
Q Serve(g_s), s	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	2.4	39.6	0.0	4.7
Cycle Q Clear(g_c), s	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	2.4	39.6	0.0	4.7
Prop In Lane	0.00		0.03	0.00		0.00	0.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	0	2885	1113	0	3053		0	0	25	1080	0	961
V/C Ratio(X)	0.00	0.30	0.30	0.00	0.25		0.00	0.00	2.01	0.91	0.00	0.14
Avail Cap(c_a), veh/h	0	2885	1113	0	3053		0	0	85	1401	0	1247
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.67	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	0.72	0.72	0.00	1.00	0.00	0.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	73.8	50.2	0.0	38.1
Incr Delay (d2), s/veh	0.0	0.2	0.5	0.0	0.2	0.0	0.0	0.0	502.1	7.2	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.0	0.1	0.5	0.0	0.1	0.0	0.0	0.0	8.1	25.8	0.0	3.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	0.2	0.9	0.0	0.2	0.0	0.0	0.0	575.9	57.4	0.0	38.1
LnGrp LOS	A	A	A	A	A		A	A	F	E	A	D
Approach Vol, veh/h		1203			765	A		51			1115	
Approach Delay, s/veh		0.4			0.2			575.9			55.1	
Approach LOS		A			A			F			E	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		88.1		52.5		88.1		9.4				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		64.0		61.0		64.0		10.0				
Max Q Clear Time (g_c+I1), s		2.4		41.6		2.0		4.4				
Green Ext Time (p_c), s		14.8		5.9		8.3		0.0				

Intersection Summary	
HCM 6th Ctrl Delay	29.2
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1366	360	0	1729	863	332	0	1834	0	0	0
Future Volume (veh/h)	0	1366	360	0	1729	863	332	0	1834	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	0	2067	1870	0	2067	1870	1870	0	1870			
Adj Flow Rate, veh/h	0	1394	0	0	2094	0	339	0	1565			
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98			
Percent Heavy Veh, %	0	2	2	0	2	2	2	0	2			
Cap, veh/h	0	2493		0	2740		828	0	1680			
Arrive On Green	0.00	0.88	0.00	0.00	0.88	0.00	0.46	0.00	0.46			
Sat Flow, veh/h	0	5830	1585	0	6202	1585	1781	0	3614			
Grp Volume(v), veh/h	0	1394	0	0	2094	0	339	0	1565			
Grp Sat Flow(s),veh/h/ln	0	1881	1585	0	2067	1585	1781	0	1205			
Q Serve(g_s), s	0.0	8.5	0.0	0.0	18.2	0.0	18.9	0.0	61.3			
Cycle Q Clear(g_c), s	0.0	8.5	0.0	0.0	18.2	0.0	18.9	0.0	61.3			
Prop In Lane	0.00		1.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	0	2493		0	2740		828	0	1680			
V/C Ratio(X)	0.00	0.56		0.00	0.76		0.41	0.00	0.93			
Avail Cap(c_a), veh/h	0	2493		0	2740		926	0	1879			
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.00	1.00	0.00	0.00	0.68	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	0.0	5.4	0.0	0.0	5.9	0.0	26.5	0.0	37.9			
Incr Delay (d2), s/veh	0.0	0.9	0.0	0.0	1.4	0.0	0.3	0.0	8.4			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(95%),veh/ln	0.0	4.0	0.0	0.0	6.0	0.0	12.9	0.0	26.3			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	6.3	0.0	0.0	7.4	0.0	26.8	0.0	46.3			
LnGrp LOS	A	A		A	A		C	A	D			
Approach Vol, veh/h		1394	A		2094	A		1904				
Approach Delay, s/veh		6.3			7.4			42.8				
Approach LOS		A			A			D				
Timer - Assigned Phs		2				6		8				
Phs Duration (G+Y+Rc), s		73.3				73.3		76.7				
Change Period (Y+Rc), s		5.0				5.0		5.0				
Max Green Setting (Gmax), s		60.0				60.0		80.0				
Max Q Clear Time (g_c+I1), s		10.5				20.2		63.3				
Green Ext Time (p_c), s		30.1				35.9		8.4				
Intersection Summary												
HCM 6th Ctrl Delay			19.6									
HCM 6th LOS			B									

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	1533	1092	0	648	871
Future Volume (veh/h)	0	1533	1092	0	648	871
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	0	1870	1870	0	1870	1870
Adj Flow Rate, veh/h	0	1666	1187	0	704	838
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	0	2	2
Cap, veh/h	0	2833	2833		1205	973
Arrive On Green	0.00	1.00	1.00	0.00	0.35	0.35
Sat Flow, veh/h	0	5443	5443	0	3456	2790
Grp Volume(v), veh/h	0	1666	1187	0	704	838
Grp Sat Flow(s),veh/h/ln	0	1702	1702	0	1728	1395
Q Serve(g_s), s	0.0	0.0	0.0	0.0	24.2	40.6
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	24.2	40.6
Prop In Lane	0.00			0.00	1.00	1.00
Lane Grp Cap(c), veh/h	0	2833	2833		1205	973
V/C Ratio(X)	0.00	0.59	0.42		0.58	0.86
Avail Cap(c_a), veh/h	0	2833	2833		1501	1212
HCM Platoon Ratio	1.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	38.6	44.0
Incr Delay (d2), s/veh	0.0	0.9	0.5	0.0	0.5	5.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.0	0.4	0.2	0.0	15.7	21.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.0	0.9	0.5	0.0	39.1	49.4
LnGrp LOS	A	A	A		D	D
Approach Vol, veh/h		1666	1187	A	1542	
Approach Delay, s/veh		0.9	0.5		44.7	
Approach LOS		A	A		D	

Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		87.4		57.6		87.4
Change Period (Y+Rc), s		5.0		5.0		5.0
Max Green Setting (Gmax), s		70.0		65.0		70.0
Max Q Clear Time (g_c+I1), s		3.0		43.6		3.0
Green Ext Time (p_c), s		12.0		9.0		6.9

Intersection Summary			
HCM 6th Ctrl Delay			16.2
HCM 6th LOS			B

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1459	0	0	1500	415	754
Future Volume (veh/h)	1459	0	0	1500	415	754
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	0	0	1870	1870	1870
Adj Flow Rate, veh/h	1586	0	0	1630	387	779
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	0	0	2	2	2
Cap, veh/h	3145	0	0	3962	512	912
Arrive On Green	1.00	0.00	0.00	1.00	0.29	0.29
Sat Flow, veh/h	5443	0	0	6958	1781	3170
Grp Volume(v), veh/h	1586	0	0	1630	387	779
Grp Sat Flow(s),veh/h/ln	1702	0	0	1609	1781	1585
Q Serve(g_s), s	0.0	0.0	0.0	0.0	28.7	33.7
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	28.7	33.7
Prop In Lane		0.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	3145	0	0	3962	512	912
V/C Ratio(X)	0.50	0.00	0.00	0.41	0.76	0.85
Avail Cap(c_a), veh/h	3145	0	0	3962	811	1443
HCM Platoon Ratio	2.00	1.00	1.00	2.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	47.0	48.8
Incr Delay (d2), s/veh	0.6	0.0	0.0	0.3	2.3	3.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.3	0.0	0.0	0.2	19.0	19.8
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.6	0.0	0.0	0.3	49.3	51.9
LnGrp LOS	A	A	A	A	D	D
Approach Vol, veh/h	1586			1630	1166	
Approach Delay, s/veh	0.6			0.3	51.0	
Approach LOS	A			A	D	

Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		96.3		48.7		96.3
Change Period (Y+Rc), s		5.0		5.0		5.0
Max Green Setting (Gmax), s		67.0		68.0		67.0
Max Q Clear Time (g_c+I1), s		3.0		36.7		3.0
Green Ext Time (p_c), s		10.9		7.0		11.5

Intersection Summary						
HCM 6th Ctrl Delay			13.9			
HCM 6th LOS			B			

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1238	6	0	1201	1503	0	0	75	769	108	294
Future Volume (veh/h)	0	1238	6	0	1201	1503	0	0	75	769	108	294
Initial Q (Qb), veh	0	20	0	0	30	0	0	0	0	7	7	7
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	0	1870	1870	0	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	0	1346	7	0	1305	0	0	0	82	920	0	266
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	0	2	2	2	2	2	2	2	2
Cap, veh/h	0	3604	18	0	2764		0	0	85	950	0	841
Arrive On Green	0.00	1.00	1.00	0.00	1.00	0.00	0.00	0.00	0.05	0.27	0.00	0.27
Sat Flow, veh/h	0	6917	35	0	5443	0	0	0	1585	3563	0	3170
Grp Volume(v), veh/h	0	976	377	0	1305	0	0	0	82	920	0	266
Grp Sat Flow(s),veh/h/ln	0	1609	1864	0	1702	0	0	0	1585	1781	0	1585
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.7	38.4	0.0	10.1
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.7	38.4	0.0	10.1
Prop In Lane	0.00		0.02	0.00		0.00	0.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	0	2613	1009	0	2764		0	0	85	950	0	841
V/C Ratio(X)	0.00	0.37	0.37	0.00	0.47		0.00	0.00	0.97	0.97	0.00	0.32
Avail Cap(c_a), veh/h	0	2613	1009	0	2765		0	0	85	950	0	845
HCM Platoon Ratio	1.00	2.00	2.00	1.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	0.64	0.64	0.00	1.00	0.00	0.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	70.9	55.0	0.0	44.7
Incr Delay (d2), s/veh	0.0	0.3	0.7	0.0	0.6	0.0	0.0	0.0	87.6	21.9	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.4	0.3	0.0	1.6	0.0	0.0	0.0	0.0	12.5	0.0	0.7
%ile BackOfQ(95%),veh/ln	0.0	0.2	0.4	0.0	0.7	0.0	0.0	0.0	9.0	29.9	0.0	8.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	0.6	1.0	0.0	2.2	0.0	0.0	0.0	158.5	89.4	0.0	45.7
LnGrp LOS	A	A	A	A	A		A	A	F	F	A	D
Approach Vol, veh/h		1353			1305	A		82			1186	
Approach Delay, s/veh		0.7			2.2			158.5			79.6	
Approach LOS		A			A			F			E	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		88.2		46.8		88.2		15.0				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		83.0		42.0		83.0		10.0				
Max Q Clear Time (g_c+I1), s		3.0		41.4		3.0		10.7				
Green Ext Time (p_c), s		18.5		0.4		19.0		0.0				

Intersection Summary		
HCM 6th Ctrl Delay		28.3
HCM 6th LOS		C

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1341	180	0	2372	751	418	0	1404	0	0	0
Future Volume (veh/h)	0	1341	180	0	2372	751	418	0	1404	0	0	0
Initial Q (Qb), veh	0	25	0	0	80	0	8	0	36			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	0	1870	1870	0	1870	1870	1870	0	1870			
Adj Flow Rate, veh/h	0	1458	0	0	2578	0	454	0	1309			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	0	2	2	0	2	2	2	0	2			
Cap, veh/h	0	2678		0	2880		682	0	1421			
Arrive On Green	0.00	1.00	0.00	0.00	1.00	0.00	0.38	0.00	0.38			
Sat Flow, veh/h	0	5274	1585	0	5611	1585	1781	0	3614			
Grp Volume(v), veh/h	0	1458	0	0	2578	0	454	0	1309			
Grp Sat Flow(s),veh/h/ln	0	1702	1585	0	1870	1585	1781	0	1205			
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	0.0	31.8	0.0	52.7			
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	0.0	0.0	31.8	0.0	52.7			
Prop In Lane	0.00		1.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	0	2678		0	2880		682	0	1421			
V/C Ratio(X)	0.00	0.54		0.00	0.90		0.67	0.00	0.92			
Avail Cap(c_a), veh/h	0	2683		0	2949		701	0	1421			
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.00	1.00	0.00	0.00	0.46	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	39.5	0.0	45.5			
Incr Delay (d2), s/veh	0.0	0.8	0.0	0.0	2.3	0.0	2.3	0.0	10.1			
Initial Q Delay(d3),s/veh	0.0	1.4	0.0	0.0	52.8	0.0	3.0	0.0	55.6			
%ile BackOfQ(95%),veh/ln	0.0	0.7	0.0	0.0	15.2	0.0	23.1	0.0	33.2			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	2.2	0.0	0.0	55.1	0.0	44.7	0.0	111.1			
LnGrp LOS	A	A		A	E		D	A	F			
Approach Vol, veh/h		1458	A		2578	A		1763				
Approach Delay, s/veh		2.2			55.1			94.0				
Approach LOS		A			E			F				
Timer - Assigned Phs		2				6		8				
Phs Duration (G+Y+Rc), s		85.8				85.8		64.2				
Change Period (Y+Rc), s		5.0				5.0		5.0				
Max Green Setting (Gmax), s		79.0				79.0		61.0				
Max Q Clear Time (g_c+I1), s		3.0				3.0		55.7				
Green Ext Time (p_c), s		40.5				71.7		3.5				

Intersection Summary			
HCM 6th Ctrl Delay			53.6
HCM 6th LOS			D

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	1106	948	0	1149	932
Future Volume (veh/h)	0	1106	948	0	1149	932
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	0	1870	1870	0	1870	1870
Adj Flow Rate, veh/h	0	1202	1030	0	1249	1013
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	0	2	2
Cap, veh/h	0	2347	2347		1533	1238
Arrive On Green	0.00	0.92	0.92	0.00	0.44	0.44
Sat Flow, veh/h	0	5443	5443	0	3456	2790
Grp Volume(v), veh/h	0	1202	1030	0	1249	1013
Grp Sat Flow(s),veh/h/ln	0	1702	1702	0	1728	1395
Q Serve(g_s), s	0.0	5.2	4.0	0.0	45.7	46.0
Cycle Q Clear(g_c), s	0.0	5.2	4.0	0.0	45.7	46.0
Prop In Lane	0.00			0.00	1.00	1.00
Lane Grp Cap(c), veh/h	0	2347	2347		1533	1238
V/C Ratio(X)	0.00	0.51	0.44		0.81	0.82
Avail Cap(c_a), veh/h	0	2347	2347		1859	1501
HCM Platoon Ratio	1.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	3.4	3.3	0.0	35.1	35.2
Incr Delay (d2), s/veh	0.0	0.8	0.6	0.0	2.4	3.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.0	2.4	2.0	0.0	26.9	22.6
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.0	4.2	3.9	0.0	37.6	38.3
LnGrp LOS	A	A	A		D	D
Approach Vol, veh/h		1202	1030	A	2262	
Approach Delay, s/veh		4.2	3.9		37.9	
Approach LOS		A	A		D	

Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		73.7		71.3		73.7
Change Period (Y+Rc), s		5.0		5.0		5.0
Max Green Setting (Gmax), s		55.0		80.0		55.0
Max Q Clear Time (g_c+I1), s		8.2		49.0		7.0
Green Ext Time (p_c), s		7.0		17.4		5.6

Intersection Summary						
HCM 6th Ctrl Delay			21.1			
HCM 6th LOS			C			

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary
4: 680NB Off-Ramp & Crow Canyon Rd

03/16/2020

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1780	0	0	1085	606	759
Future Volume (veh/h)	1780	0	0	1085	606	759
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	0	0	1870	1870	1870
Adj Flow Rate, veh/h	1935	0	0	1179	495	1001
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	0	0	2	2	2
Cap, veh/h	2783	0	0	3507	638	1136
Arrive On Green	1.00	0.00	0.00	1.00	0.36	0.36
Sat Flow, veh/h	5443	0	0	6958	1781	3170
Grp Volume(v), veh/h	1935	0	0	1179	495	1001
Grp Sat Flow(s),veh/h/ln	1702	0	0	1609	1781	1585
Q Serve(g_s), s	0.0	0.0	0.0	0.0	35.8	42.9
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	35.8	42.9
Prop In Lane		0.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	2783	0	0	3507	638	1136
V/C Ratio(X)	0.70	0.00	0.00	0.34	0.78	0.88
Avail Cap(c_a), veh/h	2783	0	0	3507	762	1355
HCM Platoon Ratio	2.00	1.00	1.00	2.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	41.3	43.6
Incr Delay (d2), s/veh	1.5	0.0	0.0	0.3	4.2	6.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.7	0.0	0.0	0.1	23.2	24.7
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	1.5	0.0	0.0	0.3	45.5	49.8
LnGrp LOS	A	A	A	A	D	D
Approach Vol, veh/h	1935			1179	1496	
Approach Delay, s/veh	1.5			0.3	48.4	
Approach LOS	A			A	D	

Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		86.0		59.0		86.0
Change Period (Y+Rc), s		5.0		5.0		5.0
Max Green Setting (Gmax), s		71.0		64.0		71.0
Max Q Clear Time (g_c+I1), s		3.0		45.9		3.0
Green Ext Time (p_c), s		16.1		8.0		6.8

Intersection Summary			
HCM 6th Ctrl Delay			16.4
HCM 6th LOS			B

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1433	12	0	672	0	0	0	49	1072	6	294
Future Volume (veh/h)	0	1433	12	0	672	0	0	0	49	1072	6	294
Initial Q (Qb), veh	0	20	0	0	15	0	0	0	0	7	7	7
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	0	2067	1870	0	2067	0	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	0	1558	13	0	730	0	0	0	53	1170	0	320
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	0	2	0	2	2	2	2	2	2
Cap, veh/h	0	3194	25	0	1706		0	0	54	1361	0	1202
Arrive On Green	0.00	0.90	0.45	0.00	0.90	0.00	0.00	0.00	0.03	0.38	0.00	0.38
Sat Flow, veh/h	0	7618	61	0	4134	0	0	0	1585	3563	0	3170
Grp Volume(v), veh/h	0	1134	437	0	730	0	0	0	53	1170	0	320
Grp Sat Flow(s),veh/h/ln	0	1778	2056	0	1964	0	0	0	1585	1781	0	1585
Q Serve(g_s), s	0.0	5.6	6.3	0.0	4.5	0.0	0.0	0.0	5.0	45.7	0.0	10.5
Cycle Q Clear(g_c), s	0.0	5.6	6.3	0.0	4.5	0.0	0.0	0.0	5.0	45.7	0.0	10.5
Prop In Lane	0.00		0.03	0.00		0.00	0.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	0	2323	900	0	1706		0	0	54	1361	0	1202
V/C Ratio(X)	0.00	0.49	0.49	0.00	0.43		0.00	0.00	0.97	0.86	0.00	0.27
Avail Cap(c_a), veh/h	0	2396	924	0	1765		0	0	85	1805	0	1606
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	0.31	0.31	0.00	1.00	0.00	0.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	6.9	7.1	0.0	7.0	0.0	0.0	0.0	72.4	43.1	0.0	32.5
Incr Delay (d2), s/veh	0.0	0.2	0.6	0.0	0.8	0.0	0.0	0.0	72.0	3.4	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.6	0.4	0.0	1.0	0.0	0.0	0.0	0.0	1.4	0.0	0.3
%ile BackOfQ(95%),veh/ln	0.0	4.3	5.0	0.0	5.7	0.0	0.0	0.0	5.6	29.1	0.0	8.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	7.7	8.1	0.0	8.8	0.0	0.0	0.0	144.4	47.9	0.0	33.0
LnGrp LOS	A	A	A	A	A		A	A	F	D	A	C
Approach Vol, veh/h		1571			730	A		53			1490	
Approach Delay, s/veh		7.8			8.8			144.4			44.7	
Approach LOS		A			A			F			D	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		74.4		63.5		74.4		12.1				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		47.0		78.0		47.0		10.0				
Max Q Clear Time (g_c+I1), s		9.3		48.7		7.5		8.0				
Green Ext Time (p_c), s		18.8		9.7		7.5		0.0				

Intersection Summary			
HCM 6th Ctrl Delay			24.2
HCM 6th LOS			C

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1500	444	0	358	717	339	0	1679	0	0	0
Future Volume (veh/h)	0	1500	444	0	358	717	339	0	1679	0	0	0
Initial Q (Qb), veh	0	25	0	0	10	0	8	0	21			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	0	2067	1870	0	2067	1870	1870	0	1870			
Adj Flow Rate, veh/h	0	1630	0	0	389	0	368	0	1277			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	0	2	2	0	2	2	2	0	2			
Cap, veh/h	0	2720		0	2096		668	0	1398			
Arrive On Green	0.00	1.00	0.00	0.00	1.00	0.00	0.36	0.00	0.36			
Sat Flow, veh/h	0	5830	1585	0	4031	1585	1781	0	3614			
Grp Volume(v), veh/h	0	1630	0	0	389	0	368	0	1277			
Grp Sat Flow(s),veh/h/ln	0	1881	1585	0	1964	1585	1781	0	1205			
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	0.0	24.8	0.0	52.1			
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	0.0	0.0	24.8	0.0	52.1			
Prop In Lane	0.00		1.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	0	2720		0	2096		668	0	1398			
V/C Ratio(X)	0.00	0.60		0.00	0.19		0.55	0.00	0.91			
Avail Cap(c_a), veh/h	0	3058		0	2128		998	0	2024			
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.00	1.00	0.00	0.00	0.67	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	0.0	7.0	0.0	0.0	0.9	0.0	37.9	0.0	45.2			
Incr Delay (d2), s/veh	0.0	1.0	0.0	0.0	0.1	0.0	0.3	0.0	4.0			
Initial Q Delay(d3),s/veh	0.0	1.5	0.0	0.0	0.2	0.0	2.3	0.0	18.8			
%ile BackOfQ(95%),veh/ln	0.0	8.0	0.0	0.0	1.1	0.0	18.4	0.0	26.1			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	9.5	0.0	0.0	1.3	0.0	40.4	0.0	68.0			
LnGrp LOS	A	A		A	A		D	A	E			
Approach Vol, veh/h		1630	A		389	A		1645				
Approach Delay, s/veh		9.5			1.3			61.8				
Approach LOS		A			A			E				

Timer - Assigned Phs	2	6	8
Phs Duration (G+Y+Rc), s	88.3	88.3	61.7
Change Period (Y+Rc), s	5.0	5.0	5.0
Max Green Setting (Gmax), s	54.0	54.0	86.0
Max Q Clear Time (g_c+I1), s	3.0	3.0	55.1
Green Ext Time (p_c), s	36.5	6.2	1.7

Intersection Summary	
HCM 6th Ctrl Delay	32.1
HCM 6th LOS	C

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	1598	1169	0	633	821
Future Volume (veh/h)	0	1598	1169	0	633	821
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	0	1870	1870	0	1870	1870
Adj Flow Rate, veh/h	0	1737	1271	0	688	892
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	0	2	2
Cap, veh/h	0	2754	2754		1258	1016
Arrive On Green	0.00	1.00	1.00	0.00	0.36	0.36
Sat Flow, veh/h	0	5443	5443	0	3456	2790
Grp Volume(v), veh/h	0	1737	1271	0	688	892
Grp Sat Flow(s),veh/h/ln	0	1702	1702	0	1728	1395
Q Serve(g_s), s	0.0	0.0	0.0	0.0	22.9	43.3
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	22.9	43.3
Prop In Lane	0.00			0.00	1.00	1.00
Lane Grp Cap(c), veh/h	0	2754	2754		1258	1016
V/C Ratio(X)	0.00	0.63	0.46		0.55	0.88
Avail Cap(c_a), veh/h	0	2754	2754		1478	1193
HCM Platoon Ratio	1.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	36.6	43.1
Incr Delay (d2), s/veh	0.0	1.1	0.6	0.0	0.4	6.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.0	0.5	0.3	0.0	15.0	22.4
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.0	1.1	0.6	0.0	37.0	50.0
LnGrp LOS	A	A	A		D	D
Approach Vol, veh/h		1737	1271	A	1580	
Approach Delay, s/veh		1.1	0.6		44.3	
Approach LOS		A	A		D	
Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		85.2		59.8		85.2
Change Period (Y+Rc), s		5.0		5.0		5.0
Max Green Setting (Gmax), s		71.0		64.0		71.0
Max Q Clear Time (g_c+I1), s		3.0		46.3		3.0
Green Ext Time (p_c), s		13.0		8.4		7.6
Intersection Summary						
HCM 6th Ctrl Delay			15.8			
HCM 6th LOS			B			

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1411	0	0	1571	490	890
Future Volume (veh/h)	1411	0	0	1571	490	890
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	0	0	1870	1870	1870
Adj Flow Rate, veh/h	1534	0	0	1708	500	1002
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	0	0	2	2	2
Cap, veh/h	2743	0	0	3456	652	1161
Arrive On Green	1.00	0.00	0.00	1.00	0.37	0.37
Sat Flow, veh/h	5443	0	0	6958	1781	3170
Grp Volume(v), veh/h	1534	0	0	1708	500	1002
Grp Sat Flow(s),veh/h/ln	1702	0	0	1609	1781	1585
Q Serve(g_s), s	0.0	0.0	0.0	0.0	35.9	42.5
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	35.9	42.5
Prop In Lane		0.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	2743	0	0	3456	652	1161
V/C Ratio(X)	0.56	0.00	0.00	0.49	0.77	0.86
Avail Cap(c_a), veh/h	2743	0	0	3456	872	1552
HCM Platoon Ratio	2.00	1.00	1.00	2.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	40.5	42.6
Incr Delay (d2), s/veh	0.8	0.0	0.0	0.5	2.9	4.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.4	0.0	0.0	0.2	22.9	24.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.8	0.0	0.0	0.5	43.4	46.6
LnGrp LOS	A	A	A	A	D	D
Approach Vol, veh/h	1534			1708	1502	
Approach Delay, s/veh	0.8			0.5	45.6	
Approach LOS	A			A	D	
Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		84.9		60.1		84.9
Change Period (Y+Rc), s		5.0		5.0		5.0
Max Green Setting (Gmax), s		62.0		73.0		62.0
Max Q Clear Time (g_c+I1), s		3.0		45.5		3.0
Green Ext Time (p_c), s		10.3		9.6		12.4
Intersection Summary						
HCM 6th Ctrl Delay			14.9			
HCM 6th LOS			B			

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1387	7	0	1146	0	0	0	75	804	151	411
Future Volume (veh/h)	0	1387	7	0	1146	0	0	0	75	804	151	411
Initial Q (Qb), veh	0	20	0	0	15	0	0	0	0	7	7	7
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	0	2067	1870	0	2067	0	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	0	1508	8	0	1246	0	0	0	82	991	0	447
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	0	2	0	2	2	2	2	2	2
Cap, veh/h	0	3419	17	0	1454		0	0	89	1187	0	1050
Arrive On Green	0.00	0.95	0.48	0.00	0.95	0.00	0.00	0.00	0.06	0.33	0.00	0.33
Sat Flow, veh/h	0	7644	39	0	4134	0	0	0	1585	3563	0	3170
Grp Volume(v), veh/h	0	1094	422	0	1246	0	0	0	82	991	0	447
Grp Sat Flow(s),veh/h/ln	0	1778	2060	0	1964	0	0	0	1585	1781	0	1585
Q Serve(g_s), s	0.0	2.4	2.9	0.0	6.1	0.0	0.0	0.0	7.7	38.9	0.0	16.6
Cycle Q Clear(g_c), s	0.0	2.4	2.9	0.0	6.1	0.0	0.0	0.0	7.7	38.9	0.0	16.6
Prop In Lane	0.00		0.02	0.00		0.00	0.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	0	2479	961	0	1454		0	0	89	1187	0	1050
V/C Ratio(X)	0.00	0.44	0.44	0.00	0.86		0.00	0.00	0.92	0.84	0.00	0.43
Avail Cap(c_a), veh/h	0	2542	982	0	1872		0	0	116	1663	0	1479
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	0.37	0.37	0.00	1.00	0.00	0.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	3.8	3.9	0.0	19.1	0.0	0.0	0.0	70.5	46.7	0.0	39.5
Incr Delay (d2), s/veh	0.0	0.2	0.5	0.0	6.7	0.0	0.0	0.0	52.0	2.7	0.0	0.3
Initial Q Delay(d3),s/veh	0.0	0.5	0.3	0.0	5.4	0.0	0.0	0.0	0.0	1.5	0.0	0.6
%ile BackOfQ(95%),veh/ln	0.0	3.1	3.5	0.0	19.2	0.0	0.0	0.0	7.9	25.5	0.0	11.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	4.5	4.8	0.0	31.2	0.0	0.0	0.0	122.4	51.0	0.0	40.4
LnGrp LOS	A	A	A	A	C		A	A	F	D	A	D
Approach Vol, veh/h		1516			1246	A		82			1438	
Approach Delay, s/veh		4.6			31.2			122.4			47.7	
Approach LOS		A			C			F			D	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		78.5		56.1		78.5		15.4				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		50.0		72.0		50.0		13.0				
Max Q Clear Time (g_c+I1), s		5.9		41.9		9.1		10.7				
Green Ext Time (p_c), s		19.2		9.2		15.9		0.0				

Intersection Summary			
HCM 6th Ctrl Delay			29.0
HCM 6th LOS			C

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1284	227	0	815	655	433	0	1025	0	0	0
Future Volume (veh/h)	0	1284	227	0	815	655	433	0	1025	0	0	0
Initial Q (Qb), veh	0	25	0	0	40	0	8	0	36			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	0	2067	1870	0	2067	1870	1870	0	1870			
Adj Flow Rate, veh/h	0	1396	0	0	886	0	471	0	779			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	0	2	2	0	2	2	2	0	2			
Cap, veh/h	0	3436		0	2297		519	0	1105			
Arrive On Green	0.00	1.00	0.00	0.00	1.00	0.00	0.27	0.00	0.27			
Sat Flow, veh/h	0	5830	1585	0	4031	1585	1781	0	3614			
Grp Volume(v), veh/h	0	1396	0	0	886	0	471	0	779			
Grp Sat Flow(s),veh/h/ln	0	1881	1585	0	1964	1585	1781	0	1205			
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	0.0	39.1	0.0	29.9			
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	0.0	0.0	39.1	0.0	29.9			
Prop In Lane	0.00		1.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	0	3436		0	2297		519	0	1105			
V/C Ratio(X)	0.00	0.41		0.00	0.39		0.91	0.00	0.70			
Avail Cap(c_a), veh/h	0	3568		0	2483		879	0	1783			
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.00	1.00	0.00	0.00	0.62	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	0.0	1.4	0.0	0.0	2.8	0.0	52.4	0.0	48.6			
Incr Delay (d2), s/veh	0.0	0.4	0.0	0.0	0.3	0.0	4.4	0.0	0.3			
Initial Q Delay(d3),s/veh	0.0	0.6	0.0	0.0	3.6	0.0	18.3	0.0	25.9			
%ile BackOfQ(95%),veh/ln	0.0	1.5	0.0	0.0	3.6	0.0	29.1	0.0	18.9			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	2.4	0.0	0.0	6.7	0.0	75.2	0.0	74.7			
LnGrp LOS	A	A		A	A		E	A	E			
Approach Vol, veh/h		1396	A		886	A		1250				
Approach Delay, s/veh		2.4			6.7			74.9				
Approach LOS		A			A			E				
Timer - Assigned Phs		2				6		8				
Phs Duration (G+Y+Rc), s		101.8				101.8		48.2				
Change Period (Y+Rc), s		5.0				5.0		5.0				
Max Green Setting (Gmax), s		64.0				64.0		76.0				
Max Q Clear Time (g_c+I1), s		3.0				3.0		42.1				
Green Ext Time (p_c), s		34.0				18.4		1.0				
Intersection Summary												
HCM 6th Ctrl Delay			29.1									
HCM 6th LOS			C									

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	1136	959	0	1170	965
Future Volume (veh/h)	0	1136	959	0	1170	965
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	0	1870	1870	0	1870	1870
Adj Flow Rate, veh/h	0	1235	1042	0	1272	1049
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	0	2	2
Cap, veh/h	0	2289	2289		1573	1270
Arrive On Green	0.00	0.90	0.90	0.00	0.46	0.46
Sat Flow, veh/h	0	5443	5443	0	3456	2790
Grp Volume(v), veh/h	0	1235	1042	0	1272	1049
Grp Sat Flow(s),veh/h/ln	0	1702	1702	0	1728	1395
Q Serve(g_s), s	0.0	7.0	5.2	0.0	46.0	47.6
Cycle Q Clear(g_c), s	0.0	7.0	5.2	0.0	46.0	47.6
Prop In Lane	0.00			0.00	1.00	1.00
Lane Grp Cap(c), veh/h	0	2289	2289		1573	1270
V/C Ratio(X)	0.00	0.54	0.46		0.81	0.83
Avail Cap(c_a), veh/h	0	2289	2289		1859	1501
HCM Platoon Ratio	1.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	4.5	4.4	0.0	34.1	34.5
Incr Delay (d2), s/veh	0.0	0.9	0.7	0.0	2.4	3.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.0	3.1	2.6	0.0	27.0	23.3
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.0	5.4	5.1	0.0	36.4	37.9
LnGrp LOS	A	A	A		D	D
Approach Vol, veh/h		1235	1042	A	2321	
Approach Delay, s/veh		5.4	5.1		37.1	
Approach LOS		A	A		D	

Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		72.0		73.0		72.0
Change Period (Y+Rc), s		5.0		5.0		5.0
Max Green Setting (Gmax), s		55.0		80.0		55.0
Max Q Clear Time (g_c+I1), s		10.0		50.6		8.2
Green Ext Time (p_c), s		7.2		17.4		5.7

Intersection Summary	
HCM 6th Ctrl Delay	21.3
HCM 6th LOS	C

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑			↑↑↑↑	↰↰	↱
Traffic Volume (veh/h)	1813	0	0	1096	606	759
Future Volume (veh/h)	1813	0	0	1096	606	759
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	0	0	1870	1870	1870
Adj Flow Rate, veh/h	1971	0	0	1191	495	1001
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	0	0	2	2	2
Cap, veh/h	2783	0	0	3507	638	1136
Arrive On Green	1.00	0.00	0.00	1.00	0.36	0.36
Sat Flow, veh/h	5443	0	0	6958	1781	3170
Grp Volume(v), veh/h	1971	0	0	1191	495	1001
Grp Sat Flow(s),veh/h/ln	1702	0	0	1609	1781	1585
Q Serve(g_s), s	0.0	0.0	0.0	0.0	35.8	42.9
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	35.8	42.9
Prop In Lane		0.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	2783	0	0	3507	638	1136
V/C Ratio(X)	0.71	0.00	0.00	0.34	0.78	0.88
Avail Cap(c_a), veh/h	2783	0	0	3507	762	1355
HCM Platoon Ratio	2.00	1.00	1.00	2.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	41.3	43.6
Incr Delay (d2), s/veh	1.6	0.0	0.0	0.3	4.2	6.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.7	0.0	0.0	0.1	23.2	24.7
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	1.6	0.0	0.0	0.3	45.5	49.8
LnGrp LOS	A	A	A	A	D	D
Approach Vol, veh/h	1971			1191	1496	
Approach Delay, s/veh	1.6			0.3	48.4	
Approach LOS	A			A	D	

Timer - Assigned Phs	2	4	6
Phs Duration (G+Y+Rc), s	86.0	59.0	86.0
Change Period (Y+Rc), s	5.0	5.0	5.0
Max Green Setting (Gmax), s	71.0	64.0	71.0
Max Q Clear Time (g_c+I1), s	3.0	45.9	3.0
Green Ext Time (p_c), s	16.7	8.0	6.9

Intersection Summary	
HCM 6th Ctrl Delay	16.3
HCM 6th LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1464	12	0	742	0	0	0	49	1125	6	294
Future Volume (veh/h)	0	1464	12	0	742	0	0	0	49	1125	6	294
Initial Q (Qb), veh	0	20	0	0	15	0	0	0	0	7	7	7
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	0	2067	1870	0	2067	0	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	0	1591	13	0	807	0	0	0	53	1228	0	320
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	0	2	0	2	2	2	2	2	2
Cap, veh/h	0	3067	24	0	1631		0	0	54	1421	0	1255
Arrive On Green	0.00	0.86	0.43	0.00	0.86	0.00	0.00	0.00	0.03	0.39	0.00	0.39
Sat Flow, veh/h	0	7619	60	0	4134	0	0	0	1585	3563	0	3170
Grp Volume(v), veh/h	0	1158	446	0	807	0	0	0	53	1228	0	320
Grp Sat Flow(s),veh/h/ln	0	1778	2056	0	1964	0	0	0	1585	1781	0	1585
Q Serve(g_s), s	0.0	7.8	8.4	0.0	7.1	0.0	0.0	0.0	5.0	47.9	0.0	10.2
Cycle Q Clear(g_c), s	0.0	7.8	8.4	0.0	7.1	0.0	0.0	0.0	5.0	47.9	0.0	10.2
Prop In Lane	0.00		0.03	0.00		0.00	0.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	0	2230	865	0	1631		0	0	54	1421	0	1255
V/C Ratio(X)	0.00	0.52	0.52	0.00	0.49		0.00	0.00	0.97	0.86	0.00	0.25
Avail Cap(c_a), veh/h	0	2306	889	0	1698		0	0	85	1829	0	1627
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	0.26	0.26	0.00	1.00	0.00	0.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	8.9	9.1	0.0	9.4	0.0	0.0	0.0	72.4	41.9	0.0	30.8
Incr Delay (d2), s/veh	0.0	0.2	0.6	0.0	1.1	0.0	0.0	0.0	72.0	3.7	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.7	0.5	0.0	1.2	0.0	0.0	0.0	0.0	1.3	0.0	0.3
%ile BackOfQ(95%),veh/ln	0.0	5.0	5.7	0.0	7.6	0.0	0.0	0.0	5.6	30.3	0.0	8.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	9.8	10.1	0.0	11.7	0.0	0.0	0.0	144.4	46.8	0.0	31.2
LnGrp LOS	A	A	B	A	B		A	A	F	D	A	C
Approach Vol, veh/h		1604			807	A		53			1548	
Approach Delay, s/veh		9.9			11.7			144.4			43.6	
Approach LOS		A			B			F			D	

Timer - Assigned Phs	2	4	6	8
Phs Duration (G+Y+Rc), s	71.9	66.0	71.9	12.1
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	46.0	79.0	46.0	10.0
Max Q Clear Time (g_c+I1), s	11.4	50.9	10.1	8.0
Green Ext Time (p_c), s	18.5	10.1	8.4	0.0

Intersection Summary	
HCM 6th Ctrl Delay	25.0
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1583	444	0	428	863	339	0	1834	0	0	0
Future Volume (veh/h)	0	1583	444	0	428	863	339	0	1834	0	0	0
Initial Q (Qb), veh	0	25	0	0	10	0	8	0	21			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	0	2067	1870	0	2067	1870	1870	0	1870			
Adj Flow Rate, veh/h	0	1721	0	0	465	0	368	0	1445			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	0	2	2	0	2	2	2	0	2			
Cap, veh/h	0	2352		0	1917		747	0	1566			
Arrive On Green	0.00	0.99	0.00	0.00	0.99	0.00	0.41	0.00	0.41			
Sat Flow, veh/h	0	5830	1585	0	4031	1585	1781	0	3614			
Grp Volume(v), veh/h	0	1721	0	0	465	0	368	0	1445			
Grp Sat Flow(s),veh/h/ln	0	1881	1585	0	1964	1585	1781	0	1205			
Q Serve(g_s), s	0.0	1.2	0.0	0.0	0.2	0.0	23.0	0.0	58.8			
Cycle Q Clear(g_c), s	0.0	1.2	0.0	0.0	0.2	0.0	23.0	0.0	58.8			
Prop In Lane	0.00		1.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	0	2352		0	1917		747	0	1566			
V/C Ratio(X)	0.00	0.73		0.00	0.24		0.49	0.00	0.92			
Avail Cap(c_a), veh/h	0	2794		0	1945		1009	0	2048			
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.00	1.00	0.00	0.00	0.47	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	0.0	12.3	0.0	0.0	1.5	0.0	32.7	0.0	41.8			
Incr Delay (d2), s/veh	0.0	2.1	0.0	0.0	0.1	0.0	0.2	0.0	5.5			
Initial Q Delay(d3),s/veh	0.0	3.0	0.0	0.0	0.3	0.0	1.6	0.0	16.8			
%ile BackOfQ(95%),veh/ln	0.0	12.4	0.0	0.0	1.4	0.0	17.2	0.0	28.7			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	17.4	0.0	0.0	1.9	0.0	34.5	0.0	64.1			
LnGrp LOS	A	B		A	A		C	A	E			
Approach Vol, veh/h		1721	A		465	A		1813				
Approach Delay, s/veh		17.4			1.9			58.1				
Approach LOS		B			A			E				
Timer - Assigned Phs		2				6		8				
Phs Duration (G+Y+Rc), s		81.3				81.3		68.7				
Change Period (Y+Rc), s		5.0				5.0		5.0				
Max Green Setting (Gmax), s		53.0				53.0		87.0				
Max Q Clear Time (g_c+I1), s		4.2				3.2		61.8				
Green Ext Time (p_c), s		37.2				7.6		1.9				

Intersection Summary			
HCM 6th Ctrl Delay			34.0
HCM 6th LOS			C

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	1636	1178	0	688	909
Future Volume (veh/h)	0	1636	1178	0	688	909
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	0	1870	1870	0	1870	1870
Adj Flow Rate, veh/h	0	1778	1280	0	748	988
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	0	2	2
Cap, veh/h	0	2572	2572		1381	1115
Arrive On Green	0.00	1.00	1.00	0.00	0.40	0.40
Sat Flow, veh/h	0	5443	5443	0	3456	2790
Grp Volume(v), veh/h	0	1778	1280	0	748	988
Grp Sat Flow(s),veh/h/ln	0	1702	1702	0	1728	1395
Q Serve(g_s), s	0.0	0.0	0.0	0.0	24.0	47.7
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	24.0	47.7
Prop In Lane	0.00			0.00	1.00	1.00
Lane Grp Cap(c), veh/h	0	2572	2572		1381	1115
V/C Ratio(X)	0.00	0.69	0.50		0.54	0.89
Avail Cap(c_a), veh/h	0	2572	2572		1573	1270
HCM Platoon Ratio	1.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	33.3	40.4
Incr Delay (d2), s/veh	0.0	1.6	0.7	0.0	0.3	7.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.0	0.7	0.3	0.0	15.5	24.2
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.0	1.6	0.7	0.0	33.7	47.6
LnGrp LOS	A	A	A		C	D
Approach Vol, veh/h		1778	1280	A	1736	
Approach Delay, s/veh		1.6	0.7		41.6	
Approach LOS		A	A		D	

Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		80.0		65.0		80.0
Change Period (Y+Rc), s		5.0		5.0		5.0
Max Green Setting (Gmax), s		67.0		68.0		67.0
Max Q Clear Time (g_c+I1), s		3.0		50.7		3.0
Green Ext Time (p_c), s		13.5		9.2		7.7

Intersection Summary			
HCM 6th Ctrl Delay			15.8
HCM 6th LOS			B

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1493	0	0	1580	490	890
Future Volume (veh/h)	1493	0	0	1580	490	890
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	0	0	1870	1870	1870
Adj Flow Rate, veh/h	1623	0	0	1717	500	1002
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	0	0	2	2	2
Cap, veh/h	2749	0	0	3464	650	1157
Arrive On Green	1.00	0.00	0.00	1.00	0.37	0.37
Sat Flow, veh/h	5443	0	0	6958	1781	3170
Grp Volume(v), veh/h	1623	0	0	1717	500	1002
Grp Sat Flow(s),veh/h/ln	1702	0	0	1609	1781	1585
Q Serve(g_s), s	0.0	0.0	0.0	0.0	35.9	42.5
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	35.9	42.5
Prop In Lane		0.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	2749	0	0	3464	650	1157
V/C Ratio(X)	0.59	0.00	0.00	0.50	0.77	0.87
Avail Cap(c_a), veh/h	2749	0	0	3464	848	1509
HCM Platoon Ratio	2.00	1.00	1.00	2.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	40.6	42.7
Incr Delay (d2), s/veh	0.9	0.0	0.0	0.5	3.2	4.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.4	0.0	0.0	0.2	23.0	24.2
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.9	0.0	0.0	0.5	43.8	47.2
LnGrp LOS	A	A	A	A	D	D
Approach Vol, veh/h	1623			1717	1502	
Approach Delay, s/veh	0.9			0.5	46.1	
Approach LOS	A			A	D	
Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		85.1		59.9		85.1
Change Period (Y+Rc), s		5.0		5.0		5.0
Max Green Setting (Gmax), s		64.0		71.0		64.0
Max Q Clear Time (g_c+I1), s		3.0		45.5		3.0
Green Ext Time (p_c), s		11.4		9.4		12.6
Intersection Summary						
HCM 6th Ctrl Delay			14.8			
HCM 6th LOS			B			

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1454	7	0	1201	0	0	0	75	917	151	411
Future Volume (veh/h)	0	1454	7	0	1201	0	0	0	75	917	151	411
Initial Q (Qb), veh	0	20	0	0	15	0	0	0	0	7	7	7
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	0	2067	1870	0	2067	0	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	0	1580	8	0	1305	0	0	0	82	1114	0	447
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	0	2	0	2	2	2	2	2	2
Cap, veh/h	0	3140	15	0	1246		0	0	89	1316	0	1164
Arrive On Green	0.00	0.88	0.44	0.00	0.88	0.00	0.00	0.00	0.06	0.36	0.00	0.36
Sat Flow, veh/h	0	7646	37	0	4134	0	0	0	1585	3563	0	3170
Grp Volume(v), veh/h	0	1145	443	0	1305	0	0	0	82	1114	0	447
Grp Sat Flow(s),veh/h/ln	0	1778	2061	0	1964	0	0	0	1585	1781	0	1585
Q Serve(g_s), s	0.0	6.8	7.2	0.0	17.8	0.0	0.0	0.0	7.7	43.4	0.0	15.7
Cycle Q Clear(g_c), s	0.0	6.8	7.2	0.0	17.8	0.0	0.0	0.0	7.7	43.4	0.0	15.7
Prop In Lane	0.00		0.02	0.00		0.00	0.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	0	2276	883	0	1246		0	0	89	1316	0	1164
V/C Ratio(X)	0.00	0.50	0.50	0.00	1.05		0.00	0.00	0.92	0.85	0.00	0.38
Avail Cap(c_a), veh/h	0	2347	907	0	1729		0	0	106	1734	0	1543
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	0.29	0.29	0.00	1.00	0.00	0.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	7.8	7.9	0.0	27.4	0.0	0.0	0.0	70.5	43.9	0.0	35.4
Incr Delay (d2), s/veh	0.0	0.2	0.6	0.0	38.7	0.0	0.0	0.0	58.8	3.2	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.6	0.5	0.0	43.3	0.0	0.0	0.0	0.0	1.3	0.0	0.4
%ile BackOfQ(95%),veh/ln	0.0	4.7	5.3	0.0	37.3	0.0	0.0	0.0	8.1	27.9	0.0	11.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	8.7	8.9	0.0	109.4	0.0	0.0	0.0	129.3	48.4	0.0	36.0
LnGrp LOS	A	A	A	A	F		A	A	F	D	A	D
Approach Vol, veh/h		1588			1305	A		82			1561	
Approach Delay, s/veh		8.8			109.4			129.3			44.9	
Approach LOS		A			F			F			D	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		73.0		61.6		73.0		15.4				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		48.0		75.0		48.0		12.0				
Max Q Clear Time (g_c+I1), s		10.2		46.4		20.8		10.7				
Green Ext Time (p_c), s		19.1		10.2		14.0		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			52.3									
HCM 6th LOS			D									

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1464	227	0	869	751	433	0	1404	0	0	0
Future Volume (veh/h)	0	1464	227	0	869	751	433	0	1404	0	0	0
Initial Q (Qb), veh	0	25	0	0	40	0	8	0	36			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	0	2067	1870	0	2067	1870	1870	0	1870			
Adj Flow Rate, veh/h	0	1591	0	0	945	0	471	0	1191			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	0	2	2	0	2	2	2	0	2			
Cap, veh/h	0	2267		0	1541		647	0	1393			
Arrive On Green	0.00	0.86	0.00	0.00	0.86	0.00	0.35	0.00	0.35			
Sat Flow, veh/h	0	5830	1585	0	4031	1585	1781	0	3614			
Grp Volume(v), veh/h	0	1591	0	0	945	0	471	0	1191			
Grp Sat Flow(s),veh/h/ln	0	1881	1585	0	1964	1585	1781	0	1205			
Q Serve(g_s), s	0.0	5.8	0.0	0.0	4.2	0.0	15.1	0.0	20.6			
Cycle Q Clear(g_c), s	0.0	5.8	0.0	0.0	4.2	0.0	15.1	0.0	20.6			
Prop In Lane	0.00		1.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	0	2267		0	1541		647	0	1393			
V/C Ratio(X)	0.00	0.70		0.00	0.61		0.73	0.00	0.85			
Avail Cap(c_a), veh/h	0	2430		0	1691		795	0	1612			
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.00	1.00	0.00	0.00	0.42	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	0.0	5.3	0.0	0.0	6.0	0.0	18.4	0.0	19.5			
Incr Delay (d2), s/veh	0.0	1.8	0.0	0.0	0.8	0.0	1.8	0.0	3.7			
Initial Q Delay(d3),s/veh	0.0	2.9	0.0	0.0	12.6	0.0	4.1	0.0	33.1			
%ile BackOfQ(95%),veh/ln	0.0	4.3	0.0	0.0	6.3	0.0	11.3	0.0	14.6			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	10.1	0.0	0.0	19.4	0.0	24.3	0.0	56.4			
LnGrp LOS	A	B		A	B		C	A	E			
Approach Vol, veh/h		1591	A		945	A		1662				
Approach Delay, s/veh		10.1			19.4			47.3				
Approach LOS		B			B			D				

Timer - Assigned Phs	2	6	8
Phs Duration (G+Y+Rc), s	35.0	35.0	30.0
Change Period (Y+Rc), s	5.0	5.0	5.0
Max Green Setting (Gmax), s	24.0	24.0	31.0
Max Q Clear Time (g_c+I1), s	8.8	7.2	23.6
Green Ext Time (p_c), s	13.2	10.3	1.4

Intersection Summary	
HCM 6th Ctrl Delay	26.9
HCM 6th LOS	C

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Appendix G

VMT Analysis

2150 Trade Zone Blvd
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Memorandum

Date: January 31, 2020

To: Pat Gibson, Gibson Transportation Consultants

From: Jill Hough

Re: Bishop Ranch City Center Project - VMT Analysis (FINAL)

1.0 Background

CHS prepared an analysis of vehicle miles travelled (VMT) for The Bishop Ranch City Center Project. Since the City of San Ramon does not have an adopted Traffic Impact Analysis framework that incorporates VMT as a metric, this analysis is provided for information only. Discussed within this memorandum is the VMT analysis approach and assumptions, followed by the results. The VMT is the total miles of travel by the motorized vehicles that a project is expected to generate on a daily basis, and includes the entire distance of these vehicle trips. The motorized vehicle trips that are included within the VMT are those with one trip 'end' in the project.

2.0 Approach to Evaluating VMT

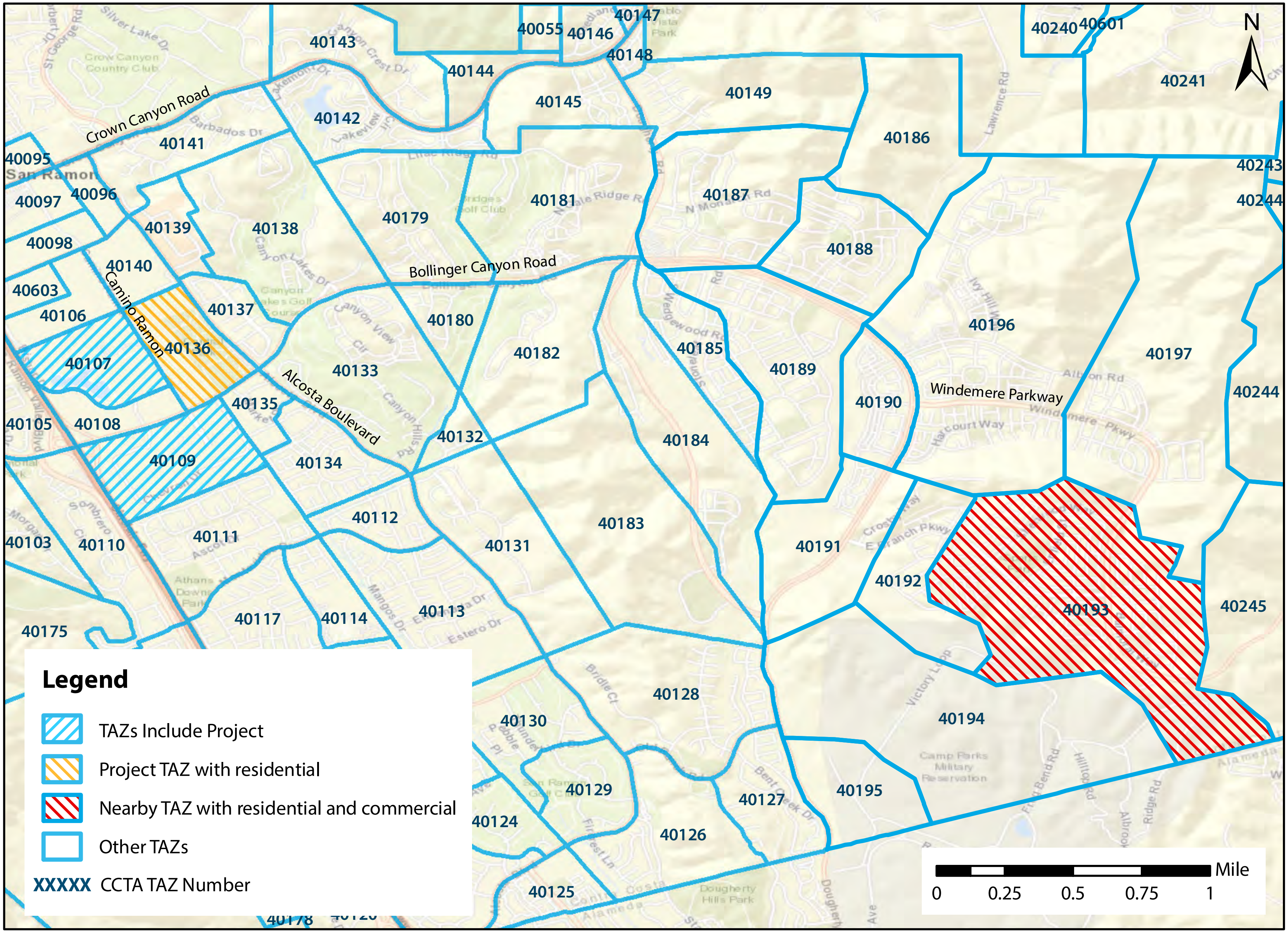
The approach CHS used for estimating the effects of the Project on per capita VMT consisted of using travel demand model information that was readily available. CHS obtained 2040 modeled trip tables from the Contra Costa Transportation Authority (CCTA) and used these to calculate residential per Capita VMT.

For Project VMT, since the Project was not modeled directly (i.e., it was not incorporated into the model land use in order to estimate trip generation, distribution and mode choice trip tables for the Project), CHS calculated VMT information for a Bishop Ranch zone in which CCTA had included future residential development. (There is no existing residential development in Bishop Ranch City Center; consequently CHS did not perform a VMT analysis for existing land uses.) In addition, CHS looked at a different zone in the San Ramon area that had a similar development profile as the Project for purposes of developing a more accurate VMT estimate.

The CCTA model results are fairly high level and do not incorporate refined detailed transit-access and zonal-access coding for either existing Bishop Ranch or future Project uses. Therefore, CHS made adjustments to the aforementioned per capita Project VMT result that was calculated from the CCTA model trip tables. Specifically taken into account was the larger number of residential units for the Project (compared with the Bishop Ranch TAZ that includes future residential development); and the average trip length, which would change if the entire CCTA model was re-run to include the Project. Making adjustments for both of these factors, CHS completed an evaluation showing the estimated Project per capita VMT relative to the average per capita VMT for Contra Costa County.

3.0 VMT of Future Baseline Project Land Uses

CHS utilized person trip tables by trip purpose from the CCTA Travel Demand Model (hereafter referred to as the Model) for the VMT analysis. The Project is located in three Model Traffic Analysis Zone (TAZs), as shown on Figure 1. The Model assumed future residential development for the Bishop Ranch TAZ that is south of Executive Parkway and east of Camino Ramon – TAZ 40136. This is also shown on Figure 1.



Bishop Ranch VMT Analysis

Figure 1

Bishop Ranch TAZs in the Contra Costa County Transportation Authority Model

Consulting Group

The Model did not assume future residential development for the Bishop Ranch TAZs of 40107 and 40109, also shown on Figure 1. The Project locations reside in large Model TAZs, and the ability to model the attractiveness of transit service relative to the Project within large TAZs is very limited. The access and proximity to good transit services for TAZ 40136 (a large TAZ) is not as good from the Model perspective as the actual proposed Project locations. There are several reasons for this, two of which are that the Project would incorporate much higher density which is better served by transit – and this higher density is not translated into the Model data; and the large size of TAZ 40136 makes it difficult to effectively model transit-oriented development. No adjustment or reduction was made to factor in the better transit access associated with the Project.

The scale of vehicle trips that would be generated by the Project would also be very different than the vehicle trips for TAZ 40136, given that TAZ 40136 has 900 future residential units compared to the 4,500 multi-family units associated with the Project and also has a substantial amount of commercial square footage (i.e., employment). To estimate more realistic vehicle trips (home-based) for the Project, a comparison was made to a peer zone in Dougherty Valley (DV), TAZ 40193, also shown on Figure 1. The vehicle trips for the Project were scaled up in proportion to the relative difference in residential units.

Another important factor that was taken into account for this analysis is the average trip length for the Project. The average trip length associated with TAZ 40136 would likely change with the Project. This could be calculated by performing detailed modeling of the Project with the complete CCTA model set, which would have required significant model calibration and validation. However, this was not done because the City does not have an adopted VMT policy and this VMT analysis is being prepared for information purposes. Therefore, to account for changes in average trip length, we conservatively assumed that the average trip length for the Project TAZ could increase by 50 percent. The result of this adjusted average trip length is 31.8 miles, which is slightly higher than that for the DV zone, according to the CCTA model. However, it is possible that the average trip length for the Project could be lower than that of the DV TAZ, given that it is several miles closer to I-680 and to regional transit. Therefore, the increased average trip length of 31.8 miles is considered conservative.

Based on the above estimates of vehicle trips and average trip length, year 2040 VMT was calculated for the Project and the estimated per capita VMT is 18.0. This compares with countywide VMT per capita of 20.1. This information is presented in Table 1.

As previously mentioned, the City of San Ramon does not have an adopted transportation policy that identifies a VMT impact threshold or methodology. Guidance from the California Governor's Office of Planning and Research (OPR) related to State Bill 743, which establishes VMT as a metric for CEQA Traffic Impact Analysis, has suggested consideration of VMT thresholds of below or at a 15 percent reduction in the Countywide per capita VMT (or alternatively, per capita VMT below or at a 15 percent reduction in regional VMT). Using this guidance relative to Countywide VMT would suggest an impact threshold of 15 percent below the countywide average per capita VMT of 20.1, which yields 17.1. Using this hypothetical scenario, the proposed Project would potentially result in a significant impact because it results in VMT per capita of 18.0 which exceeds 17.1. This information is also presented in Table 1. While the Project TAZ described above has forecast adjusted VMT per capita which is greater than the 15 percent reduction in countywide VMT, it reflects a per capita VMT reduction of approximately 10% compared to the countywide average. It should be noted that the adjustments made to home-based vehicle trips and average trip length effectively increased the resulting per capita VMT. Moreover, it is important to note that OPR does not mandate thresholds of 15 percent reductions of per capita VMT.

Table 1

Zonal VMT Compared to Contra Costa Countywide Average (2040) - Post Processed

Geographic Level	VMT (Home-Based)	Population	Residential VMT Per Capita	Residential VMT Per Capita Threshold	Threshold Met?
Countywide	27,803,110	1,381,643	20.1	17.1	n/a
Project/CCTA TAZ "40136" [1]	222,290	12,375	18.0	n/a	no

Note: 1 The VMT for the Project zone reflects a) proportional scaling of home-based vehicle trips for TAZ 40193 in Dougherty Valley by a factor of 3.1 and b) a conservative assumption that average trip length would increase by 50 percent. The population for the Project was based on an assumed 2.75 persons per residential unit

There are aspects of the Project description that are associated with potential per capita VMT reductions, which are likely to reduce the per capita VMT to within or below 17.1, as follows:.

As mentioned, the Project would have measurably better access to transit compared to the large Model TAZ 40136. Beyond this, the Project will have several additional distinctive features:

- The Bishop Ranch development has and will continue to have a strong TDM program, and a planned expansion of the TDM program to provide each resident with a transit pass;

- The existing shuttle service for Bishop Ranch will be extended to serve the Project residences and will have more frequent service; and

- The residential population per unit assumption for the Project was 2.75, which is lower than the population per unit assumption of 3.3 for the DV TAZ. Also, the proportion of multi-family dwelling units for the DV TAZ is only 3 percent and for the Project is 100 percent. Multi-family dwelling units have higher residential density, are easier to serve with transit, and typically have lower motorized vehicle ownership rates than single-family households, resulting in lower per capita VMT.

The features described above are not taken into account within the readily-available CCTA model results. The effect on VMT reduction of higher density for the Project than that reflected in TAZ 40136 is difficult to estimate without modeling the Project and would require extensive additional analysis. The recent VMT sketch planning tool in City of San Jose includes a proportional reduction in per capita VMT in response to transit fare subsidies, where a 100 percent fare subsidy would result in a per capita VMT reduction of 26 percent. However, the tool also conservatively caps the overall reduction in per capita VMT at 20 percent for combinations of various TDM programs in which the cumulative effects add up to more than 20 percent. Based on the strong relationships between subsidized transit passes coupled with free shuttle service, higher residential densities and the resulting reductions in VMT, the per capita VMT for the Project would be expected to go down by 20 percent to approximately 14.4. This would result in per capita VMT for the Project to a level below a 15% reduction in per capita VMT relative to the countywide average. This is shown in Table 2.

Table 2

Zonal VMT Estimate With Effects of TDM (2040)

Geographic Level	VMT (Home-Based)[1]	Population	Residential VMT Per Capita	Residential VMT Per Capita Threshold	Threshold Met?
Countywide	27,803,110	1,381,643	20.1	17.1	n/a
CCTA TAZ "40136"	177,832	12,375	14.4	n/a	yes

Note

1 The VMT (home-based) for CCTA TAZ 40136 assumes a 20% reduction due to free transit passes and free shuttle service for residents. SOURCE: Handy, Lovejoy, Boarnet, Spears. 2013. "Impacts of Transit Service Strategies on Passenger Vehicle Use and Greenhouse Gas Emissions."
http://www.arb.ca.gov/cc/sb375/policies/transitservice/transit_brief.pdf

4.0 Conclusion

The above analysis provides per capita VMT results for the Project in an informational context, given that the City of San Ramon does not have an adopted transportation impact policy that incorporates a VMT metric and VMT thresholds. The VMT analysis presented in this memorandum shows that per capita VMT estimated from the CCTA travel demand model and adjusted using reasonable and regionally accepted factors to reflect feasible TDM measures, for the Project is highly likely to result in per capita VMT at a level below a 15 percent reduction in Countywide average per capita VMT.

Appendix H

Existing TDM Program Elements

Bishop Ranch Business Park- Transportation Demand Management (TDM) Plan

Purpose:
This plan outlines efforts to be taken by Sunset Development to promote Transportation Demand Management (TDM) program strategies among tenants located in leased spaces throughout Bishop Ranch Business Park. Tenants of Bishop Ranch have access to programs, tools, and discounts available to all employers covered by the Bishop Ranch TMA facilitated by the Bishop Ranch Transportation Center (BRTC). These strategies are designed to reduce the air quality and congestion impacts of employee, customer & supplier vehicle trips to, from and within Bishop Ranch during daily operation.

TDM Commuter Incentive Programs:
Bishop Ranch TMA Transportation Coordinator: Bishop Ranch TMA will provide the services of two full-time employees manning the Bishop Ranch Transportation Center (BRTC) 2600 Camino Ramon, Suite 201. BRTC staff are available between 8am & 5pm at (925)830-0101 or brtc@bishopranch.com

Tenant ETC's/ Transportation Contact: An Employee Transportation Coordinator (ETC) will be identified for each tenant who will receive, format and forward, or post (for employees without email) important transportation communications to employees and customers from the BRTC.

Access to Bishop Ranch Bus Pass: The BRTC will issue all interested tenant employees BRECO Clipper Cards. These special Clipper cards allow free unlimited rides on all County Connection buses as well as all other benefits tied to the pass.

Access to Bishop Ranch SF Express Bus: The BRTC will allow all tenant employees access, at the going rate ($7.50 per direction 03/01/2019) to the Bishop Ranch San Francisco Express bus for daily direct commute from San Francisco. The deadheads of this run will be open to the public at some point soon for a similar fee.

Access to Carpool Trip Match Assistance & Subsidy: The BRTC will provide for the promotion of subsidized Carpool Matching program to Bishop Ranch tenant employees. Employees who download the Waze carpooling app to find people to share their commutes with will be automatically included in any Bishop Ranch incentives or promotions when available. Registered carpools can apply for preferential parking stalls reserved for Carpoolers.

Access to Secure Bike Parking & Showers: The BRTC will make sure that secure bike parking is available near building entrances and where possible inside a secure bike facility. Showers will be made conveniently available within walking distance of secure bike parking. BRTC will make regional eLocker access cards available for eLock facilities at BART stations and Bike Stations throughout the country.

Access to Shared Bike Program: The BRTC will provide tenant employees access to the BRiteBikes bike share program for employees to use free of charge for work-day local trips within Bishop Ranch to reduce tenant vehicle trips. Once a part of the program members can use BRiteBikes to commute with approval of BRiteBikes staff.

Access to Booster Onsite Vehicle Fueling: The BRTC will provide tenant employees parked in designated areas, access to on site vehicle fueling program. This program will eliminate trips construction vehicles take within and outside San Ramon to fuel vehicles.

FasTrak Flex Vending: The BRTC will help facilitate tenant employees' access to the FasTrak Flex transponder for use in new HOT/Express lanes on I680 & I580 through the BRTC.

Digital Notification: Tenants and tenant employees may join the weekly eblast to stay informed of weekly transportation initiatives. We also have a Text Alert system for breaking transportation announcements.

a. TDM Public Outreach Campaigns – City of San Ramon, 511 Contra Costa :

Alternative Transportation Event Participation and Promotion: The BRTC will communicate such events (i.e. Bike to Work Day, Spare the Air) to Bishop Ranch tenant employers as they occur.

511 Contra Costa Drive-less Incentive Program: The BRTC will provide information to tenants that are interested in making the change from driving alone to carpooling, vanpooling, taking transit, bicycling or walking. Eligible participants could receive $25 from 511 Contra Costa.

511 Contra Costa Guaranteed Ride Home (GRH) Program: The BRTC will help Bishop Ranch tenant employees to sign up for the GRH program run by 511 Contra Costa.

511 Contra Costa Vanpool Incentive Program – The BRTC will promote the 511 Contra Costa Vanpool Passenger Incentive and Vanpool Driver Programs to Bishop Ranch tenant employees. These programs are administered by 511 Contra Costa.

Attendance at Meetings to Promote TDM: The BRTC will attend new employee orientation meetings to communicate TDM opportunities to tenant employees on request.

TDM Advisory Committee Updates: The BRTC will provide updates to the City of San Ramon TDM Advisory Committee on program participation. Meetings are held bi-monthly.

b. Bay Area Commuter Benefit Program (SB1339)~ Reg 14:

Exemption Due To Free Express Bus Program Access: Bay Area employers with 50 or more full-time employees within the Bay Area Air Quality Management District (Air District) geographic boundaries are required to register and offer commuter benefits to their employees in order to comply with Air District Regulation 14, Rule 1, also known as the Bay Area Commuter Benefits Program. Employers must still register when contacted but should select Commuter Benefit option 3 "Employer Subsidized Transit" Bishop Ranch tenants will be in compliance with SB1339 (AKA Reg 14) by participation in the Bishop Ranch TMA through which their employees will have access to a free express shuttle system and unlimited County Connection bus pass.

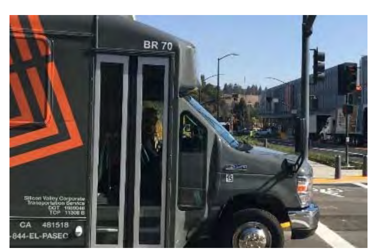
The BRTC will collect Home Zip Code Lists from all tenants: Bishop Ranch tenants will at minimum, annually, provide the home zip codes of all tenant employees. Example: Employees currently reside in the following zip codes: (94115 - 1 Employee, 94123 - 5 employees, 94131-1 Employee, = 7 Total zip codes should represent all Bay Area zips.

BR transportation

Bishop Ranch is easily accessible for commuters, customers, and visitors

Quick freeway access with close proximity to the 680 diamond lane combined with free and plentiful parking helps make transportation to Bishop Ranch simple by car or transit. We actively support a regional and local commuter bus fleet, carpools and vanpools by providing Bishop Ranch focused ride match tools and a preferential proximal parking program for carpools and vanpools. We also offer electric vehicle charging infrastructure for all kinds of electric vehicles. Express transit service runs as frequently as every 10 minutes during commute times. Connections to regional transit are easy and free using the BR/ECO Bus/Clipper Pass with routing and schedule information and updates provided by our staffed transportation center. Pass holders can ride all County Connection buses for free as well as connections to local BART stations. All buses provide real time next bus arrival notifications and free Wi-Fi. Express buses to local train stations with easy transfers to regional BART trains and ACE trains make regional transit another viable alternative. Regional luxury direct busing is also available between San Francisco and Bishop Ranch. A bike sharing fleet of 100 comfortable, GPS tracked, park-anywhere bikes are available on site providing an ideal way to enjoy the park like setting. The Iron Horse Regional Trail provides a paved, direct, car-free, bicycle route to Bishop Ranch from regional BART stations. Bishop Ranch is transit oriented, bicycle friendly, and automobile convenient site. For more information, please visit us at: www.bishopranch.com/transporation.

San Francisco Express Bus

BR transportation

Service Summary
The Bishop Ranch Transportation Center is your "one-stop-shop" for transportation information and assistance exclusively for Bishop Ranch employers and employees. All of our services are provided free. Call 925.830.0101 or brtc@bishopranch.com.

Free Commuter Assistance Services
The 96X and 97X are the primary busses used by Bishop Ranch tenants since they provide express connections to BART. Bishop Ranch bus passes can be used for free rides on all County Connection routes using our BRECO Clipper Card. Check Bishopranch.com for schedules serving San Ramon. www.cccta.org

- One-on-one commute trip planning assistance to fit your lifestyle and circumstances https://www.surveymonkey.com/r/?sm=sou3DS%2fWJNHLin1nrGUJdg%3d%3d
- **We will give your employees $25** to try one of the commute modes listed below. Take the pledge at www.511contracosta.org/commuterprogram/ and we will send them a $25 check.
- Free Bishop Ranch BR/ECO Bus Pass & Clipper Card for employees:
    - Easy online pass requests & renewals: www.bishopranch.com/transportation
    - Schedules: http://cccta.org/maps-schedules/
    - Express routes to Walnut Creek (96X, 95X) and Dublin (97X) BART stations
    - Express route to ACE Train station in Pleasanton (92X)
    - Express route to Mitchell Park &Ride in Walnut Creek (92X, 93X)
    - Three local routes serving Bishop Ranch and nearby cities (21, 35, 36)
    - Weekend bus routes available to/from Walnut Creek BART (321)
- Regional Direct Luxury Express Bus Service
    - Express Bus San Francisco: http://www.bishopranch.com/customer-resources/transportation/buses/regional-express-buses/
    - Movie: http://vimeo.com/77178153#at=0
- Free Circulator Bus to City Center entertainment and shops
    - Every 15 minutes from all Bishop Ranch Buildings between 10am and 6pm
        - https://www.bishopranch.com/customer-resources/transportation/buses/
- New Waze Carpool Promotion
    - Bishop Ranch helps form carpools with the Bishop Ranch Carpool Group
        - bit.ly/BishopRanchCarpool.
- BRiteBikes,100 Bicycle One Way Bike Share System Using Social Bicycles
    - BRiteBikes website: http://britebikes.socialbicycles.com/
- Bishop Ranch Carpool/Vanpool Ride-matching Assistance
    - Bishop Ranch 511 Regional Ridematch Tool https://www.ridematch.511.org/?client=bishopranch
    - Bishop Ranch Enterprise Vanpool Partner Page https://www.enterpriserideshare.com/content/vanpool/en/StartVanpooling.html
- Guaranteed Ride Home Program: Uber, Lyft, Taxi free in an emergency
    - http://511contracosta.org/guaranteed-ride-home/
- Preferential Carpool and Electric/Hybrid Vehicle Parking Programs
    - http://www.bishopranch.com/assets/pdfs/CarpoolVanpool-Parking-Application.pdf
- Vanpool Incentives
    - https://www.bishopranch.com/customer-resources/transportation/cars/vanpool/
- Delivery of NEW FasTrak Flex Card
    - http://www.bishopranch.com/customer-resources/transportation/cars/
- Fuel you hydrogen car on site at the Bishop Ranch Hydrogen Station
    - https://cafcp.org/stationmap
- Electric Vehicle Charging Infrastructure – Chargepoint, Blink, Level 1, 2 & 3
    - https://www.google.com/maps/d/edit?mid=z66EBkjFGJkQ.kpoBbvxHx5QQ
- Gasoline Delivery While You Are at Work – Booster Fuels
    - https://www.bishopranch.com/customer-resources/transportation/cars/booster/
- Traffic & Transportation Text Alert
    - To sign up, text "bishopranch" to 94502

BR transportation

Projects for 2019

The Bishop Ranch Transportation Center has many exciting plans for new transportation amenities rolling out in the coming months. Here are a few examples:

1. 200 New Level 2 EV Charging Heads
   - Bishop Ranch based companies enjoy easy EV charging in every building.

2. Waze Carpool Subsidy Program

3. Autonomous Shuttle Pilot
   - Testing the first autonomous shuttles in the USA in Bishop Ranch

4. Hydrogen Fueling Station at Bishop Ranch
   - http://bloom.bg/R88IvO
   - Norris @ Bishop

5. Bike Shop and Storage at 2600
   - Indoor parking for bicycles
   - Repair services
   - Lockers

6. Bishop Ranch Transportation Association is a TMA. All tenants in Bishop Ranch buildings are covered by TMA funded transportation programs and are in compliance with Regulation 14 Rule 1 mandated employee transportation program provisions for employers with over 50 employees.
   - Program info page: https://commuterbenefits.511.org/

7. Green Bike Lanes
   - Hi-visibility hi-traction painted bike lanes

8. Bus in Shoulder Planning for I680

9. More Bike Racks at your building
   - Want a bike rack? brtc@bishopranch.com

1 Level 2 EV Charging

2 Subsidized Waze Carpool program

3 EasyMile Autonomous Bus

4 Hydrogen Fueling Station

7 Green Bike Lanes

8 Bus in shoulder long range planning

The following tables are excerpts from 511 Contra Costa 2018 Employee Survey – Bishop Ranch Specific Report.

Table 5: Commute Mode Average - Monday through Friday; N=2,255

Mode	Percentage
Altamont Commuter Express (ACE)	1%
BART	1%
Bicycle	1%
Bus	6%
Carpool	8%
Drive Alone	71%
Electric Bike or Scooter	<1%
Motorcycle or Moped	<1%
Telecommute	3%
TNC	<1%
TNC on Pool Mode	<1%
Vanpool	3%
Walk	0%
Non-working Day	1%

Table 6: Daily Commute Mode Percentages; N=2,255

	Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday	
	% incl. NWD*	% without NWD	% incl. NWD*	% without NWD	% incl. NWD*	% without NWD	% incl. NWD*	% without NWD	% incl. NWD*	% without NWD	% incl. NWD*	% without NWD	% incl. NWD*	% without NWD
Altamont Commuter Express	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	0%	1%	0%	1%
BART	5%	5%	6%	6%	6%	6%	6%	6%	5%	6%	1%	5%	1%	7%
Bicycle	1%	1%	2%	2%	1%	1%	2%	2%	2%	2%	0%	1%	0%	0%
Bus	6%	7%	7%	7%	7%	7%	7%	7%	6%	6%	1%	4%	1%	5%
Carpool	8%	8%	8%	8%	8%	8%	8%	8%	6%	7%	1%	8%	1%	7%
Do not work/Non-working Day (NWD)	1%	N/A	0%	N/A	0%	N/A	0%	N/A	3%	N/A	85%	N/A	87%	N/A
Drive Alone	70%	71%	69%	70%	69%	69%	69%	69%	66%	68%	11%	75%	10%	75%
Electric Bike or Scooter	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Motorcycle or Moped	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	0%	0%	0%	0%
Telecommute	3%	3%	1%	1%	2%	2%	2%	2%	7%	7%	1%	3%	0%	1%
TNC	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
TNC on Pool Mode	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%
Vanpool	3%	3%	3%	3%	3%	3%	3%	3%	2%	2%	0%	0%	0%	0%
Walk	0%	0%	1%	1%	0%	0%	1%	1%	1%	1%	0%	0%	0%	1%

Appendix I

CCTA Model Traffic Forecast Methodology

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Suite 105-A
San José, CA 95131
(408) 477-2131 **P**
www.chsconsulting.net

Memorandum

Date:	December 19, 2019
To:	Deborah Fehr, City of San Ramon
Copy To:	Pat Gibson, Gibson Transportation Consultants
From:	Jill Hough
Re:	**Bishop Ranch Master Plan Update Travel Forecast Methodology**

1.0 Background

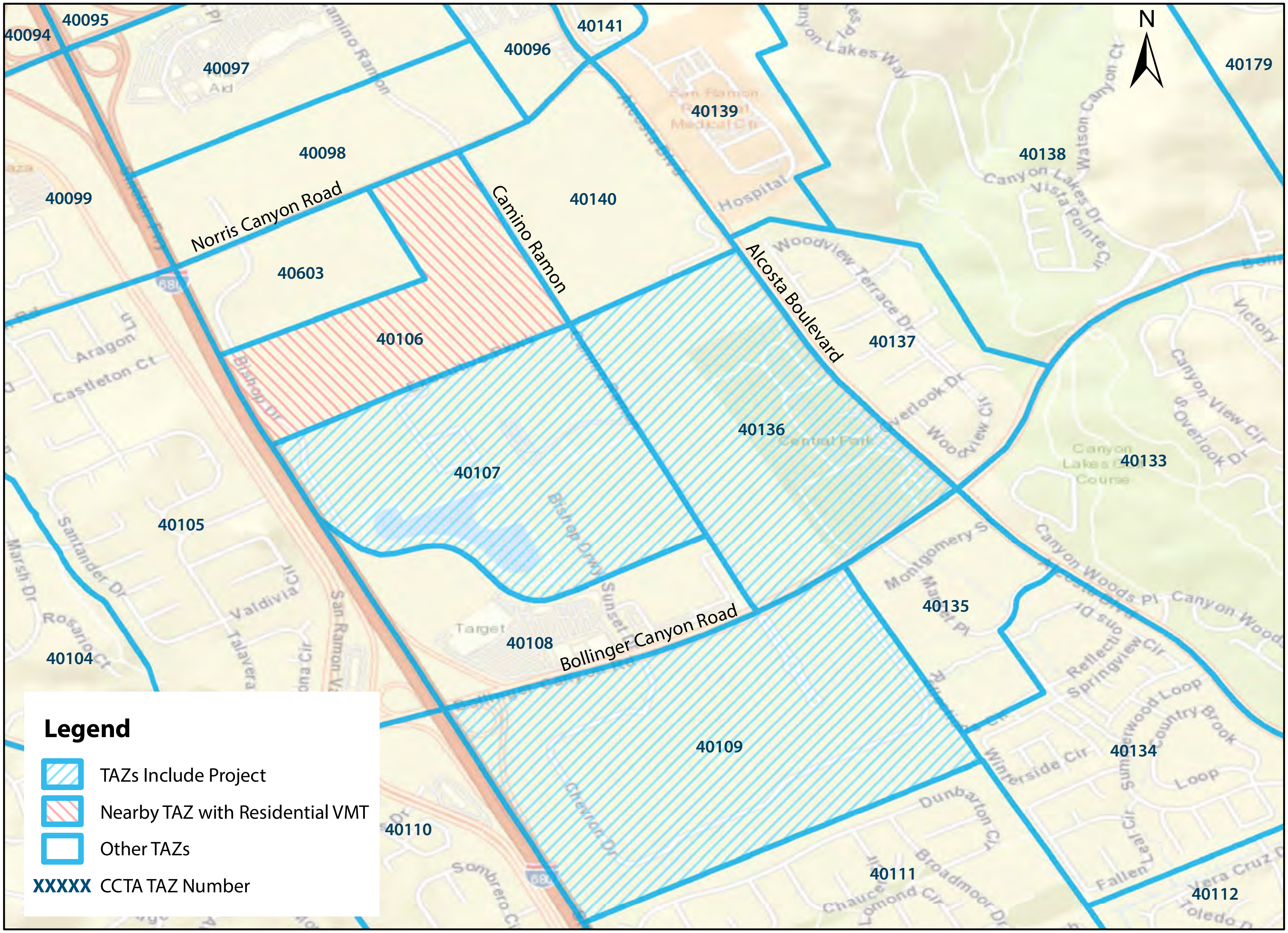
CHS prepared traffic forecasts for the Bishop Ranch Master Plan Update (BRMPU). CHS coordinated with staff from Contra Costa Transportation Authority (CCTA) to obtain model data files; and used the data files to create a model based in the CUBE transportation planning software, which were used to generate forecasts both with and without the BRMPU project. The purpose of this memorandum is to describe how this work was performed and to provide some information on how the forecasts from the CUBE version of the model compare to the CCTA-Transcad model.

2.0 Approach to Developing Forecast Volumes

As mentioned, CHS met with CCTA staff on several occasions, and initially to discuss an approach to using the CCTA model for the BRMPU forecasting work. An approach was agreed to in which CHS would obtain transportation networks (by time period) and vehicular trip tables by time periods and vehicular mode; as well as key modeling assumptions and extensive model documentation. The approach also included CHS converting the networks to CUBE formats; converting the trip tables to CUBE formats; and implementing scripted procedures to create traffic assignments in CUBE, which utilize the same parameters and assumptions as the CCTA Transcad assignment procedures. For purposes of establishing consistency between the two models, CHS prepared assignments with the above-outlined process and compared the results to assignment results that were obtained from CCTA directly from the Transcad model (The CCTA forecast results were from mid-July 2019). Model plots showing the 2040 AM and PM peak hour volumes generated from the CUBE model are included as an appendix to this memorandum.

3.0 Trip Generation and Trip Distribution

The trip generation for the BRMPU project was provided by Gibson Transportation Consultants and was based on ITE trip generation rates (documented in traffic report from Gibson Transportation Consultants). These trip generation estimates for the project were used instead of modifying 2040 model land use and running the trip generation model. An important part of the modeling methodology was to assume the same distribution for the BRMPU project as the CCTA model trip distribution for the year 2040. This was done by identifying the CCTA Traffic Analysis Zones (TAZs) in which the BRMPU project components resided. The TAZ map in the vicinity of the BRMPU project is presented on Figure 1 (and is essentially the same TAZ structure as the CCTA model). The BRMPU project components reside within three (3) CCTA TAZs, as shown in Table 1.



Bishop Ranch VMT Analysis

Figure 1

Bishop Ranch TAZs in the Contra Costa County Transportation Authority Model

chs Consulting Group

Table 1
Correspondence of Bishop Ranch Master Plan Project Elements to CCTA TAZs

Bishop Ranch Project Element	CCTA Traffic Analysis Zone
2600 NW	40107
2600 NE	40107
2600 SE	40107
3A	40136
1A	40109

The distribution of vehicle trips for each of the zones 40107, 40136, and 40109 was applied to the ITE trip generation estimates for the appropriate BRMPU project portions. The project trip tables were added to the 2040 vehicular trip tables to yield the 2040 With Project scenario trip tables. In addition, the 2040 CCTA vehicular trip tables had reflected some growth in trips to and from Bishop Ranch zones. This growth was associated with CCTA's assumptions about allocating land use growth throughout Contra Costa County by the year 2040 (as compared with 2018). CHS subtracted the previously-assumed growth in vehicle trips for the Bishop Ranch zones from the 2040 With Project trip tables, in order to avoid double-counting the project trips. Lastly, for purposes of developing a 2040 Without Project scenario, CHS subtracted the growth in vehicle trips for the Bishop Ranch zones from the CCTA 2040 vehicular trip tables. Discussions with Matt Kelley and Martin Engelmann indicated that this approach was reasonable.

Traffic assignments of the 2040 Without Project scenario and 2040 With Project Scenario were completed; as well as traffic assignments of the 2018 base year; for both the AM and PM peak hours. For purposes of reporting link volumes entering and exiting each study intersection approach, CHS developed adjusted forecast volumes that were based on actual counted traffic on each link, as well as model-estimated growth for each link (where the model-estimated growth of each link was the ratio of the forecast link volume to the 2018 base-year link volume). Adjusted forecast volumes for roadway links were developed in this manner, for both the 2040 Without Project scenario and 2040 With Project scenario.

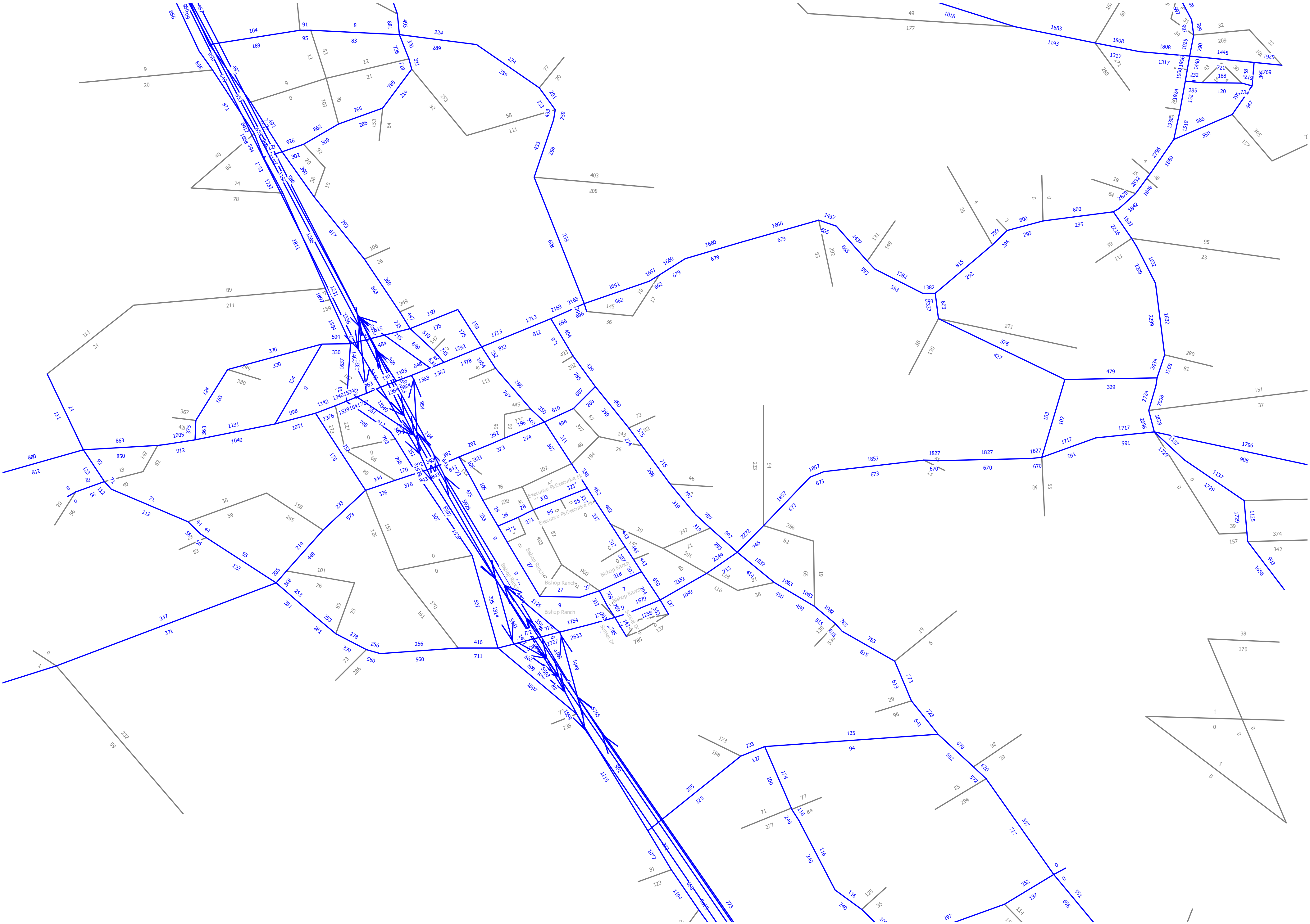
4.0 Conclusion

The above methodology resulted in a straight-forward way of using the same TAZ structure and assumptions about trip distribution and traffic assignment that were consistent with the CCTA modeling procedures. While the trip generation estimates were based on ITE rather than the CCTA model estimates of trip generation, the latter tend to be lower overall than those from ITE. Prior to implementing the methodology for developing forecasts with and without the BRMPU project, a comparison was made of the CUBE 2040 traffic assignment of the converted CCTA trip table with the converted 2040 CCTA network to the 2040 assignment result obtained from CCTA. The comparison showed that overall, the assignment from CUBE compared reasonably closely with the assignment result from Transcad.

Appendix

2040 AM & PM Peak Hour Assignment Result (CCTA Trip Table)

CCTA-BRMP Model Forecast Volumes on Roadway Links - AM Peak 1 Hour
2040 No Project



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cube

Bishop Ranch 07/26/2019

BRMP 1 hr vols [blue]

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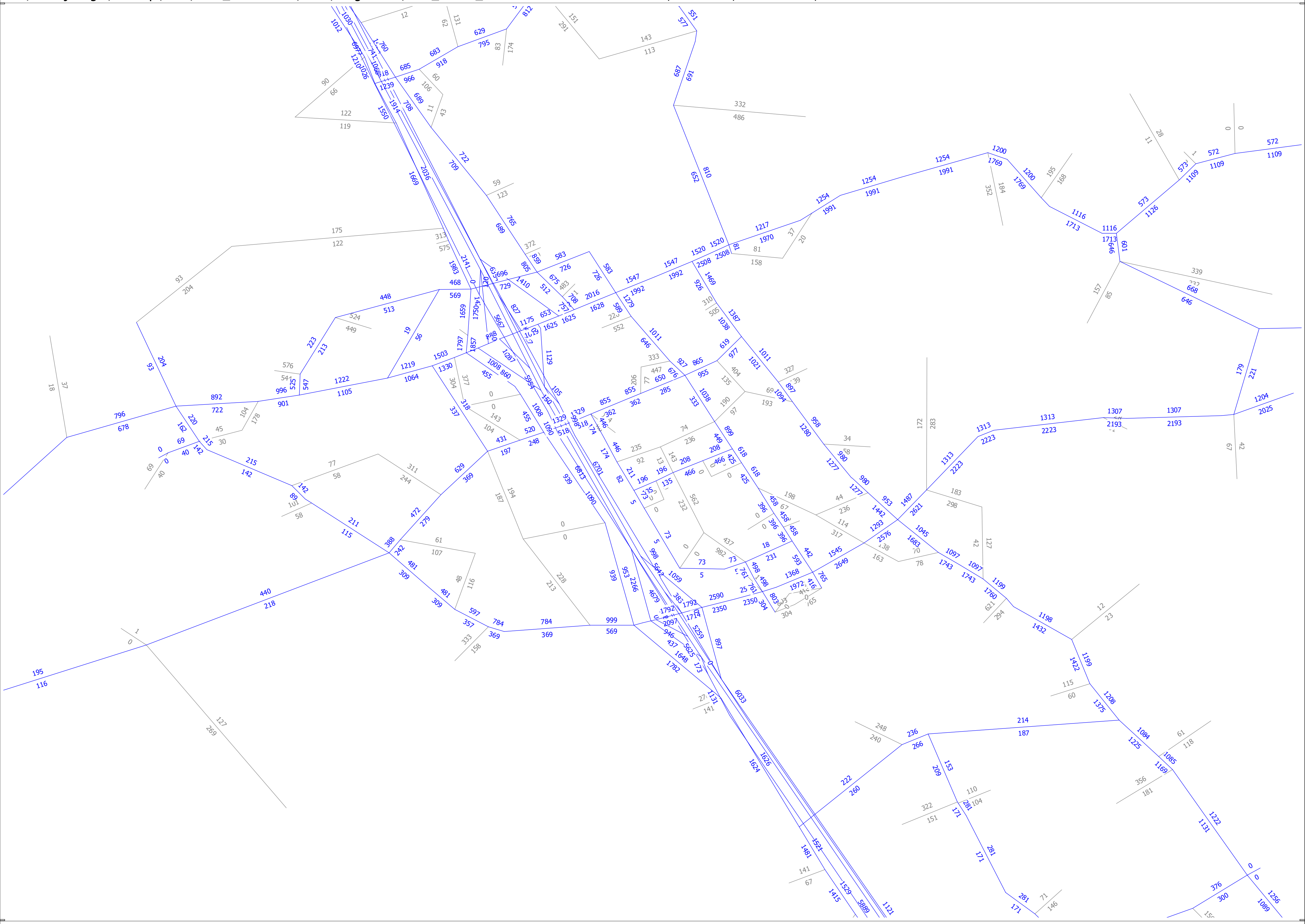

Appendix J

Future without Project without CIP Analysis

Intersection	
Intersection Delay, s/veh	32.7
Intersection LOS	D

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	50	333	10	131	246	66	21	319	340	33	45	82
Future Vol, veh/h	50	333	10	131	246	66	21	319	340	33	45	82
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	54	362	11	142	267	72	23	347	370	36	49	89
Number of Lanes	1	2	0	1	2	0	0	1	1	0	1	1

Approach	SE	NW	NE	SW
Opposing Approach	NW	SE	SW	NE
Opposing Lanes	3	3	2	2
Conflicting Approach Left	SW	NE	SE	NW
Conflicting Lanes Left	2	2	3	3
Conflicting Approach Right	NE	SW	NW	SE
Conflicting Lanes Right	2	2	3	3
HCM Control Delay	24.1	19.8	49.8	16.5
HCM LOS	C	C	E	C

Lane	NELn1	NELn2	NWLn1	NWLn2	NWLn3	SELn1	SELn2	SELn3	SWLn1	SWLn2
Vol Left, %	6%	0%	100%	0%	0%	100%	0%	0%	42%	0%
Vol Thru, %	94%	0%	0%	100%	55%	0%	100%	92%	58%	0%
Vol Right, %	0%	100%	0%	0%	45%	0%	0%	8%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	340	340	131	164	148	50	222	121	78	82
LT Vol	21	0	131	0	0	50	0	0	33	0
Through Vol	319	0	0	164	82	0	222	111	45	0
RT Vol	0	340	0	0	66	0	0	10	0	82
Lane Flow Rate	370	370	142	178	161	54	241	132	85	89
Geometry Grp	8	8	8	8	8	8	8	8	8	8
Degree of Util (X)	0.92	0.844	0.403	0.478	0.417	0.156	0.657	0.356	0.254	0.244
Departure Headway (Hd)	8.962	8.22	10.182	9.661	9.336	10.33	9.809	9.749	10.79	9.854
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	403	440	353	373	384	347	367	368	332	364
Service Time	6.73	5.988	7.957	7.436	7.111	8.109	7.588	7.528	8.579	7.643
HCM Lane V/C Ratio	0.918	0.841	0.402	0.477	0.419	0.156	0.657	0.359	0.256	0.245
HCM Control Delay	57.5	42.1	19.7	21	18.7	15	29.6	17.9	17.2	15.8
HCM Lane LOS	F	E	C	C	C	B	D	C	C	C
HCM 95th-tile Q	9.9	8.2	1.9	2.5	2	0.5	4.5	1.6	1	0.9

Intersection	
Intersection Delay, s/veh	76.1
Intersection LOS	F

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	35	314	7	233	271	95	12	109	387	71	285	104
Future Vol, veh/h	35	314	7	233	271	95	12	109	387	71	285	104
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	38	341	8	253	295	103	13	118	421	77	310	113
Number of Lanes	1	2	0	1	2	0	0	1	1	0	1	1

Approach	SE	NW	NE	SW
Opposing Approach	NW	SE	SW	NE
Opposing Lanes	3	3	2	2
Conflicting Approach Left	SW	NE	SE	NW
Conflicting Lanes Left	2	2	3	3
Conflicting Approach Right	NE	SW	NW	SE
Conflicting Lanes Right	2	2	3	3
HCM Control Delay	32.9	35.8	115.5	118.3
HCM LOS	D	E	F	F

Lane	NELn1	NELn2	NWLn1	NWLn2	NWLn3	SELn1	SELn2	SELn3	SWLn1	SWLn2
Vol Left, %	10%	0%	100%	0%	0%	100%	0%	0%	20%	0%
Vol Thru, %	90%	0%	0%	100%	49%	0%	100%	94%	80%	0%
Vol Right, %	0%	100%	0%	0%	51%	0%	0%	6%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	121	387	233	181	185	35	209	112	356	104
LT Vol	12	0	233	0	0	35	0	0	71	0
Through Vol	109	0	0	181	90	0	209	105	285	0
RT Vol	0	387	0	0	95	0	0	7	0	104
Lane Flow Rate	132	421	253	196	201	38	228	121	387	113
Geometry Grp	8	8	8	8	8	8	8	8	8	8
Degree of Util (X)	0.401	1.195	0.781	0.576	0.57	0.125	0.715	0.383	1.192	0.323
Departure Headway (Hd)	11.473	10.697	12.133	11.6	11.218	12.926	12.391	12.344	11.592	10.765
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	316	345	301	314	324	279	294	294	317	336
Service Time	9.173	8.397	9.833	9.3	8.918	10.626	10.091	10.044	9.292	8.465
HCM Lane V/C Ratio	0.418	1.22	0.841	0.624	0.62	0.136	0.776	0.412	1.221	0.336
HCM Control Delay	21.6	144.9	47.4	28.9	27.8	17.5	41	22.5	147.4	18.5
HCM Lane LOS	C	F	E	D	D	C	E	C	F	C
HCM 95th-tile Q	1.9	17	6.1	3.4	3.3	0.4	5.1	1.7	16.1	1.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	203	687	87	270	1953	443	523	467	199	150	225	180
Future Volume (veh/h)	203	687	87	270	1953	443	523	467	199	150	225	180
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	221	747	67	293	2123	337	568	508	151	163	245	137
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	214	2189	615	312	2499	702	600	529	156	189	273	122
Arrive On Green	0.12	0.78	0.39	0.17	0.89	0.44	0.17	0.20	0.20	0.05	0.08	0.08
Sat Flow, veh/h	1781	5644	1585	1781	5644	1585	3456	2704	799	3456	3554	1585
Grp Volume(v), veh/h	221	747	67	293	2123	337	568	333	326	163	245	137
Grp Sat Flow(s),veh/h/ln	1781	1881	1585	1781	1881	1585	1728	1777	1726	1728	1777	1585
Q Serve(g_s), s	18.0	6.1	4.1	24.4	26.0	12.8	24.4	27.8	28.1	7.0	10.3	8.5
Cycle Q Clear(g_c), s	18.0	6.1	4.1	24.4	26.0	12.8	24.4	27.8	28.1	7.0	10.3	8.5
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.46	1.00		1.00
Lane Grp Cap(c), veh/h	214	2189	615	312	2499	702	600	348	338	189	273	122
V/C Ratio(X)	1.03	0.34	0.11	0.94	0.85	0.48	0.95	0.96	0.97	0.86	0.90	1.12
Avail Cap(c_a), veh/h	214	2189	615	451	2499	702	600	450	437	276	616	275
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.99	0.99	0.99	1.00	1.00	1.00	0.91	0.91	0.91	1.00	1.00	1.00
Uniform Delay (d), s/veh	66.0	11.0	29.3	61.1	6.3	9.6	61.3	59.7	59.8	70.3	68.6	37.7
Incr Delay (d2), s/veh	70.4	0.4	0.4	22.3	3.8	2.3	22.9	24.4	26.6	16.5	4.2	64.8
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(95%),veh/ln	18.4	4.1	3.0	18.7	7.2	8.5	18.2	20.9	20.8	6.4	8.4	9.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	136.4	11.4	29.7	83.4	10.1	11.9	84.2	84.1	86.4	86.9	72.8	102.6
LnGrp LOS	F	B	C	F	B	B	F	F	F	F	E	F
Approach Vol, veh/h		1035			2753			1227			545	
Approach Delay, s/veh		39.3			18.1			84.8			84.5	
Approach LOS		D			B			F			F	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	15.2	36.3	25.0	73.4	33.0	18.5	33.2	65.2				
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0				
Max Green Setting (Gmax), s	14.0	40.0	20.0	56.0	26.0	28.0	40.0	36.0				
Max Q Clear Time (g_c+I1), s	10.0	31.1	21.0	29.0	27.4	13.3	27.4	9.1				
Green Ext Time (p_c), s	0.2	0.3	0.0	25.6	0.0	0.3	0.9	12.2				
Intersection Summary												
HCM 6th Ctrl Delay			43.3									
HCM 6th LOS			D									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	125	1844	445	409	609	302	132	312	363	649	572	172
Future Volume (veh/h)	125	1844	445	409	609	302	132	312	363	649	572	172
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	2067	1870	1870	2067	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	136	2004	267	445	662	219	143	339	232	705	622	122
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	150	1768	497	333	2347	659	420	326	219	530	681	304
Arrive On Green	0.08	0.63	0.31	0.19	0.83	0.42	0.12	0.16	0.16	0.15	0.19	0.19
Sat Flow, veh/h	1781	5644	1585	1781	5644	1585	3456	2036	1366	3456	3554	1585
Grp Volume(v), veh/h	136	2004	267	445	662	219	143	295	276	705	622	122
Grp Sat Flow(s),veh/h/ln	1781	1881	1585	1781	1881	1585	1728	1777	1625	1728	1777	1585
Q Serve(g_s), s	11.4	47.0	20.9	28.0	3.9	9.5	5.7	24.0	24.0	23.0	25.7	6.9
Cycle Q Clear(g_c), s	11.4	47.0	20.9	28.0	3.9	9.5	5.7	24.0	24.0	23.0	25.7	6.9
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.84	1.00		1.00
Lane Grp Cap(c), veh/h	150	1768	497	333	2347	659	420	284	260	530	681	304
V/C Ratio(X)	0.91	1.13	0.54	1.34	0.28	0.33	0.34	1.04	1.06	1.33	0.91	0.40
Avail Cap(c_a), veh/h	249	1768	497	333	2347	659	420	284	260	530	853	380
HCM Platoon Ratio	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.80	0.80	0.80	1.00	1.00	1.00	0.91	0.91	0.91	1.00	1.00	1.00
Uniform Delay (d), s/veh	68.1	28.0	42.5	61.0	7.7	13.6	60.4	63.0	63.0	63.5	59.4	25.0
Incr Delay (d2), s/veh	18.8	66.2	3.3	171.3	0.3	1.4	0.4	61.1	70.5	161.3	12.2	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	9.5	34.9	12.9	42.4	2.6	6.5	4.5	22.2	21.6	33.5	18.5	7.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	86.9	94.2	45.8	232.3	8.0	15.0	60.8	124.1	133.5	224.8	71.6	25.9
LnGrp LOS	F	F	D	F	A	B	E	F	F	F	E	C
Approach Vol, veh/h		2407			1326			714			1449	
Approach Delay, s/veh		88.5			84.4			115.0			142.3	
Approach LOS		F			F			F			F	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	30.0	31.0	19.6	69.4	25.2	35.8	35.0	54.0
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	25.0	26.0	23.0	56.0	13.0	38.0	30.0	49.0
Max Q Clear Time (g_c+I1), s	26.0	27.0	14.4	12.5	8.7	28.7	31.0	50.0
Green Ext Time (p_c), s	0.0	0.0	0.3	12.4	0.2	2.0	0.0	0.0

Intersection Summary	
HCM 6th Ctrl Delay	104.0
HCM 6th LOS	F

Intersection	
Intersection Delay, s/veh	24.4
Intersection LOS	C

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	488	275	243	287	165	203
Future Vol, veh/h	488	275	243	287	165	203
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	530	299	264	312	179	221
Number of Lanes	2	1	2	0	1	2

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	3	2
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	2	0	3
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	3	3	0
HCM Control Delay	22	33.6	16
HCM LOS	C	D	C

Lane	NBLn1	NBLn2	WBLn1	WBLn2	WBLn3	SBLn1	SBLn2	SBLn3
Vol Left, %	0%	0%	100%	81%	0%	100%	0%	0%
Vol Thru, %	100%	22%	0%	0%	0%	0%	100%	100%
Vol Right, %	0%	78%	0%	19%	100%	0%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	162	368	325	201	237	165	102	102
LT Vol	0	0	325	163	0	165	0	0
Through Vol	162	81	0	0	0	0	102	102
RT Vol	0	287	0	38	237	0	0	0
Lane Flow Rate	176	400	354	219	257	179	110	110
Geometry Grp	8	8	7	7	7	8	8	8
Degree of Util (X)	0.403	0.853	0.779	0.468	0.353	0.459	0.266	0.212
Departure Headway (Hd)	8.241	7.681	7.934	7.7	4.95	9.208	8.693	6.907
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	437	472	456	468	725	391	413	517
Service Time	6.002	5.442	5.68	5.447	2.695	6.978	6.462	4.675
HCM Lane V/C Ratio	0.403	0.847	0.776	0.468	0.354	0.458	0.266	0.213
HCM Control Delay	16.5	41.1	33.5	17.1	10.4	19.6	14.6	11.5
HCM Lane LOS	C	E	D	C	B	C	B	B
HCM 95th-tile Q	1.9	8.7	6.8	2.4	1.6	2.3	1.1	0.8

Intersection	
Intersection Delay, s/veh	78.7
Intersection LOS	F

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	232	219	271	548	214	278
Future Vol, veh/h	232	219	271	548	214	278
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	252	238	295	596	233	302
Number of Lanes	2	1	2	0	1	2

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	3	2
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	2	0	3
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	3	3	0
HCM Control Delay	14	151.3	17.3
HCM LOS	B	F	C

Lane	NBLn1	NBLn2	WBLn1	WBLn2	WBLn3	SBLn1	SBLn2	SBLn3
Vol Left, %	0%	0%	100%	50%	0%	100%	0%	0%
Vol Thru, %	100%	14%	0%	0%	0%	0%	100%	100%
Vol Right, %	0%	86%	0%	50%	100%	0%	0%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	181	638	155	154	142	214	139	139
LT Vol	0	0	155	77	0	214	0	0
Through Vol	181	90	0	0	0	0	139	139
RT Vol	0	548	0	77	142	0	0	0
Lane Flow Rate	196	694	168	167	155	233	151	151
Geometry Grp	8	8	7	7	7	8	8	8
Degree of Util (X)	0.415	1.347	0.381	0.351	0.225	0.543	0.332	0.259
Departure Headway (Hd)	7.603	6.99	8.676	8.063	5.664	9.036	8.521	6.736
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	471	520	417	449	637	402	425	536
Service Time	5.379	4.765	6.376	5.763	3.364	6.736	6.221	4.436
HCM Lane V/C Ratio	0.416	1.335	0.403	0.372	0.243	0.58	0.355	0.282
HCM Control Delay	15.7	189.7	16.6	15.1	10	22	15.4	11.8
HCM Lane LOS	C	F	C	C	A	C	C	B
HCM 95th-tile Q	2	30.5	1.8	1.6	0.9	3.1	1.4	1

Appendix K

Mixed-Use Internal Capture Worksheets and Trip Generation References

NCHRP 8-51 Internal Trip Capture Estimation Tool			
Project Name:	J1705 - Bishop Ranch	**Organization:**	Gibson Transportation
Project Location:	San Ramon, CA	**Performed By:**	
Scenario Description:	BR 2600 NW	**Date:**	
Analysis Year:	2019	**Checked By:**	
Analysis Period:	**AM Street Peak Hour**	**Date:**	

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)			Estimated Vehicle-Trips		
	ITE LUCs[1]	Quantity	Units	Total	Entering	Exiting
Office	710	2,148	ksf	2046	1760	286
Retail				0		
Restaurant				0		
Cinema/Entertainment				0		
Residential	221	1,372	du	446	116	330
Hotel				0		
All Other Land Uses[2]				0		
Total				2492	1876	616

Table 2-A: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00			1.00		
Retail	1.00			1.00		
Restaurant	1.00			1.00		
Cinema/Entertainment	1.00			1.00		
Residential	1.00			1.00		
Hotel	1.00			1.00		
All Other Land Uses[2]	1.00			1.00		

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-A: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	0	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	7	0	0	0		0
Hotel	0	0	0	0	0	

Table 5-A: Computations Summary

	Total	Entering	Exiting
All Person-Trips	2,492	1,876	616
Internal Capture Percentage	1%	0%	1%
External Vehicle-Trips[3]	2,478	1,869	609
External Transit-Trips[4]	0	0	0
External Non-Motorized Trips[4]	0	0	0

Table 6-A: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	0%	0%
Retail	N/A	N/A
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	0%	2%
Hotel	N/A	N/A

[1]Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.
[2]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator
[3]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A
[4]Person-Trips
*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	J1705 - Bishop Ranch
Analysis Period:	**AM Street Peak Hour**

Table 7-A: Conversion of Vehicle-Trip Ends to Person-Trip Ends

Land Use	Table 7-A (D): Entering Trips			Table 7-A (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	1760	1760	1.00	286	286
Retail	1.00	0	0	1.00	0	0
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	116	116	1.00	330	330
Hotel	1.00	0	0	1.00	0	0

Table 8-A (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		80	180	0	3	0
Retail	0		0	0	0	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	7	3	66	0		0
Hotel	0	0	0	0	0	

Table 8-A (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	70		0	0	2	0
Restaurant	246	0		0	6	0
Cinema/Entertainment	0	0	0		0	0
Residential	53	0	0	0		0
Hotel	53	0	0	0	0	

Table 9-A (D): Internal and External Trips Summary (Entering Trips)

Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	7	1753	1760	1753	0	0
Retail	0	0	0	0	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	116	116	116	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses[3]	0	0	0	0	0	0

Table 9-A (O): Internal and External Trips Summary (Exiting Trips)

Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	0	286	286	286	0	0
Retail	0	0	0	0	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	7	323	330	323	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses[3]	0	0	0	0	0	0

[1]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A
[2]Person-Trips
[3]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator
*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal Trip Capture Estimation Tool			
Project Name:	J1705 - Bishop Ranch	**Organization:**	Gibson Transportation
Project Location:	San Ramon, CA	**Performed By:**	
Scenario Description:	BR 2600 NW	**Date:**	
Analysis Year:	2019	**Checked By:**	
Analysis Period:	**PM Street Peak Hour**	**Date:**	

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)			Estimated Vehicle-Trips		
	ITE LUCs[1]	Quantity	Units	Total	Entering	Exiting
Office	710	2,148	ksf	2098	336	1762
Retail				0		
Restaurant				0		
Cinema/Entertainment				0		
Residential	221	1,372	du	547	334	213
Hotel				0		
All Other Land Uses[2]				0		
Total				2645	670	1975

Table 2-P: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00			1.00		
Retail	1.00			1.00		
Restaurant	1.00			1.00		
Cinema/Entertainment	1.00			1.00		
Residential	1.00			1.00		
Hotel	1.00			1.00		
All Other Land Uses[2]	1.00			1.00		

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	13	0
Retail	0		0	0	0	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	9	0	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary

	Total	Entering	Exiting
All Person-Trips	2,645	670	1,975
Internal Capture Percentage	2%	3%	1%
External Vehicle-Trips[3]	2,601	648	1,953
External Transit-Trips[4]	0	0	0
External Non-Motorized Trips[4]	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	3%	1%
Retail	N/A	N/A
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	4%	4%
Hotel	N/A	N/A

[1]Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.
[2]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator
[3]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P
[4]Person-Trips
*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	J1705 - Bishop Ranch
Analysis Period:	**PM Street Peak Hour**

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends

Land Use	Table 7-P (D): Entering Trips				Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*		Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	336	336		1.00	1762	1762
Retail	1.00	0	0		1.00	0	0
Restaurant	1.00	0	0		1.00	0	0
Cinema/Entertainment	1.00	0	0		1.00	0	0
Residential	1.00	334	334		1.00	213	213
Hotel	1.00	0	0		1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		352	70	0	35	0
Retail	0		0	0	0	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	9	89	45	0		6
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	13	0
Retail	104		0	0	154	0
Restaurant	101	0		0	53	0
Cinema/Entertainment	20	0	0		13	0
Residential	192	0	0	0		0
Hotel	0	0	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)

Destination Land Use	Person-Trip Estimates				External Trips by Mode*		
	Internal	External	Total		Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	9	327	336		327	0	0
Retail	0	0	0		0	0	0
Restaurant	0	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0	0
Residential	13	321	334		321	0	0
Hotel	0	0	0		0	0	0
All Other Land Uses[3]	0	0	0		0	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)

Origin Land Use	Person-Trip Estimates				External Trips by Mode*		
	Internal	External	Total		Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	13	1749	1762		1749	0	0
Retail	0	0	0		0	0	0
Restaurant	0	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0	0
Residential	9	204	213		204	0	0
Hotel	0	0	0		0	0	0
All Other Land Uses[3]	0	0	0		0	0	0

[1]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

[2]Person-Trips

[3]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal Trip Capture Estimation Tool				
Project Name:	J1705 - Bishop Ranch		**Organization:**	Gibson Transportation
Project Location:	San Ramon, CA		**Performed By:**	
Scenario Description:	BR 2600 NE		**Date:**	
Analysis Year:	2019		**Checked By:**	
Analysis Period:	**AM Street Peak Hour**		**Date:**	

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)			Estimated Vehicle-Trips		
	ITE LUCs[1]	Quantity	Units	Total	Entering	Exiting
Office	710	5,321	ksf	5028	4324	704
Retail	820	97	ksf	91	56	35
Restaurant				0		
Cinema/Entertainment				0		
Residential	221	3,058	du	978	254	724
Hotel				0		
All Other Land Uses[2]				0		
Total				6097	4634	1463

Table 2-A: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00			1.00		
Retail	1.00			1.00		
Restaurant	1.00			1.00		
Cinema/Entertainment	1.00			1.00		
Residential	1.00			1.00		
Hotel	1.00			1.00		
All Other Land Uses[2]	1.00			1.00		

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-A: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		18	0	0	0	0
Retail	10		0	0	5	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	14	7	0	0		0
Hotel	0	0	0	0	0	

Table 5-A: Computations Summary

	Total	Entering	Exiting
All Person-Trips	6,097	4,634	1,463
Internal Capture Percentage	2%	1%	4%
External Vehicle-Trips[3]	5,989	4,580	1,409
External Transit-Trips[4]	0	0	0
External Non-Motorized Trips[4]	0	0	0

Table 6-A: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	1%	3%
Retail	45%	43%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	2%	3%
Hotel	N/A	N/A

[1]Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

[2]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

[3]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A

[4]Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	J1705 - Bishop Ranch
Analysis Period:	**AM Street Peak Hour**

Table 7-A: Conversion of Vehicle-Trip Ends to Person-Trip Ends

Land Use	Table 7-A (D): Entering Trips				Table 7-A (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*		Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	4324	4324		1.00	704	704
Retail	1.00	56	56		1.00	35	35
Restaurant	1.00	0	0		1.00	0	0
Cinema/Entertainment	1.00	0	0		1.00	0	0
Residential	1.00	254	254		1.00	724	724
Hotel	1.00	0	0		1.00	0	0

Table 8-A (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		197	444	0	7	0
Retail	10		5	0	5	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	14	7	145	0		0
Hotel	0	0	0	0	0	

Table 8-A (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		18	0	0	0	0
Retail	173		0	0	5	0
Restaurant	605	4		0	13	0
Cinema/Entertainment	0	0	0		0	0
Residential	130	10	0	0		0
Hotel	130	2	0	0	0	

Table 9-A (D): Internal and External Trips Summary (Entering Trips)

Destination Land Use	Person-Trip Estimates				External Trips by Mode*		
	Internal	External	Total		Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	24	4300	4324		4300	0	0
Retail	25	31	56		31	0	0
Restaurant	0	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0	0
Residential	5	249	254		249	0	0
Hotel	0	0	0		0	0	0
All Other Land Uses[3]	0	0	0		0	0	0

Table 9-A (O): Internal and External Trips Summary (Exiting Trips)

Origin Land Use	Person-Trip Estimates				External Trips by Mode*		
	Internal	External	Total		Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	18	686	704		686	0	0
Retail	15	20	35		20	0	0
Restaurant	0	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0	0
Residential	21	703	724		703	0	0
Hotel	0	0	0		0	0	0
All Other Land Uses[3]	0	0	0		0	0	0

[1]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A
[2]Person-Trips
[3]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator
*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal Trip Capture Estimation Tool			
Project Name:	J1705 - Bishop Ranch	**Organization:**	
Project Location:	San Ramon, CA	**Performed By:**	
Scenario Description:	BR 2600 NE	**Date:**	
Analysis Year:	2019	**Checked By:**	
Analysis Period:	**PM Street Peak Hour**	**Date:**	

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)			Estimated Vehicle-Trips		
	ITE LUCs[1]	Quantity	Units	Total	Entering	Exiting
Office	710	5,321	ksf	4966	795	4171
Retail	820	97	ksf	368	177	191
Restaurant				0		
Cinema/Entertainment				0		
Residential	221	3,058	du	1181	720	461
Hotel				0		
All Other Land Uses[2]				0		
Total				6515	1692	4823

Table 2-P: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00			1.00		
Retail	1.00			1.00		
Restaurant	1.00			1.00		
Cinema/Entertainment	1.00			1.00		
Residential	1.00			1.00		
Hotel	1.00			1.00		
All Other Land Uses[2]	1.00			1.00		

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		14	0	0	29	0
Retail	4		0	0	50	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	18	18	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary

	Total	Entering	Exiting
All Person-Trips	6,515	1,692	4,823
Internal Capture Percentage	4%	8%	3%
External Vehicle-Trips[3]	6,249	1,559	4,690
External Transit-Trips[4]	0	0	0
External Non-Motorized Trips[4]	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	3%	1%
Retail	18%	28%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	11%	8%
Hotel	N/A	N/A

[1]Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.
[2]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator
[3]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P
[4]Person-Trips
*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	J1705 - Bishop Ranch
Analysis Period:	**PM Street Peak Hour**

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends

Land Use	Table 7-P (D): Entering Trips				Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*		Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	795	795		1.00	4171	4171
Retail	1.00	177	177		1.00	191	191
Restaurant	1.00	0	0		1.00	0	0
Cinema/Entertainment	1.00	0	0		1.00	0	0
Residential	1.00	720	720		1.00	461	461
Hotel	1.00	0	0		1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		834	167	0	83	0
Retail	4		55	8	50	10
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	18	194	97	0		14
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		14	0	0	29	0
Retail	246		0	0	331	0
Restaurant	239	89		0	115	0
Cinema/Entertainment	48	7	0		29	0
Residential	453	18	0	0		0
Hotel	0	4	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)

Destination Land Use	Person-Trip Estimates				External Trips by Mode*		
	Internal	External	Total		Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	22	773	795		773	0	0
Retail	32	145	177		145	0	0
Restaurant	0	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0	0
Residential	79	641	720		641	0	0
Hotel	0	0	0		0	0	0
All Other Land Uses[3]	0	0	0		0	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)

Origin Land Use	Person-Trip Estimates				External Trips by Mode*		
	Internal	External	Total		Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	43	4128	4171		4128	0	0
Retail	54	137	191		137	0	0
Restaurant	0	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0	0
Residential	36	425	461		425	0	0
Hotel	0	0	0		0	0	0
All Other Land Uses[3]	0	0	0		0	0	0

[1]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P
[2]Person-Trips
[3]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator
*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal Trip Capture Estimation Tool				
Project Name:	J1705 - Bishop Ranch		**Organization:**	Gibson Transportation
Project Location:	San Ramon, CA		**Performed By:**	
Scenario Description:	BR 2600 SE		**Date:**	
Analysis Year:	2019		**Checked By:**	
Analysis Period:	**AM Street Peak Hour**		**Date:**	

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)				Estimated Vehicle-Trips		
	ITE LUCs[1]	Quantity	Units		Total	Entering	Exiting
Office	710	2,162	ksf		2059	1771	288
Retail	820 / 850	551	ksf		802	490	312
Restaurant					0		
Cinema/Entertainment					0		
Residential	221	2,477	du		795	207	588
Hotel	310	169	rms		79	47	32
All Other Land Uses[2]					0		
Total					3735	2515	1220

Table 2-A: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips				Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized		Veh. Occ.	% Transit	% Non-Motorized
Office	1.00				1.00		
Retail	1.00				1.00		
Restaurant	1.00				1.00		
Cinema/Entertainment	1.00				1.00		
Residential	1.00				1.00		
Hotel	1.00				1.00		
All Other Land Uses[2]	1.00				1.00		

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-A: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		81	0	0	0	0
Retail	71		0	0	4	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	12	6	0	0		0
Hotel	24	4	0	0	0	

Table 5-A: Computations Summary

	Total	Entering	Exiting
All Person-Trips	3,735	2,515	1,220
Internal Capture Percentage	11%	8%	17%
External Vehicle-Trips[3]	3,331	2,313	1,018
External Transit-Trips[4]	0	0	0
External Non-Motorized Trips[4]	0	0	0

Table 6-A: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	6%	28%
Retail	19%	24%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	2%	3%
Hotel	0%	88%

[1]Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

[2]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

[3]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A

[4]Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	J1705 - Bishop Ranch
Analysis Period:	**AM Street Peak Hour**

Table 7-A: Conversion of Vehicle-Trip Ends to Person-Trip Ends

Land Use	Table 7-A (D): Entering Trips				Table 7-A (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*		Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	1771	1771		1.00	288	288
Retail	1.00	490	490		1.00	312	312
Restaurant	1.00	0	0		1.00	0	0
Cinema/Entertainment	1.00	0	0		1.00	0	0
Residential	1.00	207	207		1.00	588	588
Hotel	1.00	47	47		1.00	32	32

Table 8-A (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		81	181	0	3	0
Retail	90		41	0	44	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	12	6	118	0		0
Hotel	24	4	3	0	0	

Table 8-A (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		157	0	0	0	0
Retail	71		0	0	4	0
Restaurant	248	39		0	10	2
Cinema/Entertainment	0	0	0		0	0
Residential	53	83	0	0		0
Hotel	53	20	0	0	0	

Table 9-A (D): Internal and External Trips Summary (Entering Trips)

Destination Land Use	Person-Trip Estimates				External Trips by Mode*		
	Internal	External	Total		Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	107	1664	1771		1664	0	0
Retail	91	399	490		399	0	0
Restaurant	0	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0	0
Residential	4	203	207		203	0	0
Hotel	0	47	47		47	0	0
All Other Land Uses[3]	0	0	0		0	0	0

Table 9-A (O): Internal and External Trips Summary (Exiting Trips)

Origin Land Use	Person-Trip Estimates				External Trips by Mode*		
	Internal	External	Total		Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	81	207	288		207	0	0
Retail	75	237	312		237	0	0
Restaurant	0	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0	0
Residential	18	570	588		570	0	0
Hotel	28	4	32		4	0	0
All Other Land Uses[3]	0	0	0		0	0	0

[1]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A

[2]Person-Trips

[3]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal Trip Capture Estimation Tool

Project Name:	J1705 - Bishop Ranch	**Organization:**	Gibson Transportation
Project Location:	San Ramon, CA	**Performed By:**	
Scenario Description:	BR 2600 SE	**Date:**	
Analysis Year:	2019	**Checked By:**	
Analysis Period:	**PM Street Peak Hour**	**Date:**	

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)			Estimated Vehicle-Trips		
	ITE LUCs[1]	Quantity	Units	Total	Entering	Exiting
Office	710	2,162	ksf	2111	338	1773
Retail	820 / 850	551	ksf	2635	1292	1343
Restaurant				0		
Cinema/Entertainment				0		
Residential	221	2,477	du	965	589	376
Hotel	310	169	rms	101	52	49
All Other Land Uses[2]				0		
Total				5812	2271	3541

Table 2-P: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00			1.00		
Retail	1.00			1.00		
Restaurant	1.00			1.00		
Cinema/Entertainment	1.00			1.00		
Residential	1.00			1.00		
Hotel	1.00			1.00		
All Other Land Uses[2]	1.00			1.00		

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		103	0	0	24	0
Retail	27		0	0	271	9
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	15	129	0	0		6
Hotel	0	8	0	0	0	

Table 5-P: Computations Summary

	Total	Entering	Exiting
All Person-Trips	5,812	2,271	3,541
Internal Capture Percentage	20%	26%	17%
External Vehicle-Trips[3]	4,628	1,679	2,949
External Transit-Trips[4]	0	0	0
External Non-Motorized Trips[4]	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	12%	7%
Retail	19%	23%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	50%	40%
Hotel	29%	16%

[1]Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.
[2]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator
[3]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P
[4]Person-Trips
*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	J1705 - Bishop Ranch
Analysis Period:	**PM Street Peak Hour**

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends

Land Use	Table 7-P (D): Entering Trips				Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*		Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	338	338		1.00	1773	1773
Retail	1.00	1292	1292		1.00	1343	1343
Restaurant	1.00	0	0		1.00	0	0
Cinema/Entertainment	1.00	0	0		1.00	0	0
Residential	1.00	589	589		1.00	376	376
Hotel	1.00	52	52		1.00	49	49

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		355	71	0	35	0
Retail	27		389	54	349	67
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	15	158	79	0		11
Hotel	0	8	33	0	1	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		103	0	0	24	0
Retail	105		0	0	271	9
Restaurant	101	646		0	94	37
Cinema/Entertainment	20	52	0		24	1
Residential	193	129	0	0		6
Hotel	0	26	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)

Destination Land Use	Person-Trip Estimates				External Trips by Mode*		
	Internal	External	Total		Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	42	296	338		296	0	0
Retail	240	1052	1292		1052	0	0
Restaurant	0	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0	0
Residential	295	294	589		294	0	0
Hotel	15	37	52		37	0	0
All Other Land Uses[3]	0	0	0		0	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)

Origin Land Use	Person-Trip Estimates				External Trips by Mode*		
	Internal	External	Total		Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	127	1646	1773		1646	0	0
Retail	307	1036	1343		1036	0	0
Restaurant	0	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0	0
Residential	150	226	376		226	0	0
Hotel	8	41	49		41	0	0
All Other Land Uses[3]	0	0	0		0	0	0

[1]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

[2]Person-Trips

[3]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal Trip Capture Estimation Tool			
Project Name:	J1705 - Bishop Ranch	**Organization:**	Gibson Transportation
Project Location:	San Ramon, CA	**Performed By:**	
Scenario Description:	BR 3A	**Date:**	
Analysis Year:	2019	**Checked By:**	
Analysis Period:	**AM Street Peak Hour**	**Date:**	

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)			Estimated Vehicle-Trips		
	ITE LUCs[1]	Quantity	Units	Total	Entering	Exiting
Office	710	242	ksf	253	218	35
Retail	820	452	ksf	425	264	161
Restaurant				0		
Cinema/Entertainment				0		
Residential	221	2,000	du	645	168	477
Hotel	310	169	rms	79	47	32
All Other Land Uses[2]	730	45	ksf	150	113	37
Total				1552	810	742

Table 2-A: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00			1.00		
Retail	1.00			1.00		
Restaurant	1.00			1.00		
Cinema/Entertainment	1.00			1.00		
Residential	1.00			1.00		
Hotel	1.00			1.00		
All Other Land Uses[2]	1.00			1.00		

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-A: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		10	0	0	0	0
Retail	9		0	0	3	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	7	5	0	0		0
Hotel	7	4	0	0	0	

Table 5-A: Computations Summary

	Total	Entering	Exiting
All Person-Trips	1,552	810	742
Internal Capture Percentage	6%	6%	6%
External Vehicle-Trips[3]	1,462	765	697
External Transit-Trips[4]	0	0	0
External Non-Motorized Trips[4]	0	0	0

Table 6-A: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	11%	29%
Retail	7%	7%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	2%	3%
Hotel	0%	34%

[1]Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

[2]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

[3]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A

[4]Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	J1705 - Bishop Ranch
Analysis Period:	**AM Street Peak Hour**

Table 7-A: Conversion of Vehicle-Trip Ends to Person-Trip Ends

Land Use	Table 7-A (D): Entering Trips				Table 7-A (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*		Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	218	218		1.00	35	35
Retail	1.00	264	264		1.00	161	161
Restaurant	1.00	0	0		1.00	0	0
Cinema/Entertainment	1.00	0	0		1.00	0	0
Residential	1.00	168	168		1.00	477	477
Hotel	1.00	47	47		1.00	32	32

Table 8-A (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		10	22	0	0	0
Retail	47		21	0	23	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	10	5	95	0		0
Hotel	24	4	3	0	0	

Table 8-A (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		84	0	0	0	0
Retail	9		0	0	3	0
Restaurant	31	21		0	8	2
Cinema/Entertainment	0	0	0		0	0
Residential	7	45	0	0		0
Hotel	7	11	0	0	0	

Table 9-A (D): Internal and External Trips Summary (Entering Trips)

Destination Land Use	Person-Trip Estimates				External Trips by Mode*		
	Internal	External	Total		Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	23	195	218		195	0	0
Retail	19	245	264		245	0	0
Restaurant	0	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0	0
Residential	3	165	168		165	0	0
Hotel	0	47	47		47	0	0
All Other Land Uses[3]	0	113	113		113	0	0

Table 9-A (O): Internal and External Trips Summary (Exiting Trips)

Origin Land Use	Person-Trip Estimates				External Trips by Mode*		
	Internal	External	Total		Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	10	25	35		25	0	0
Retail	12	149	161		149	0	0
Restaurant	0	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0	0
Residential	12	465	477		465	0	0
Hotel	11	21	32		21	0	0
All Other Land Uses[3]	0	37	37		37	0	0

[1]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A
[2]Person-Trips
[3]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator
*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal Trip Capture Estimation Tool			
Project Name:	J1705 - Bishop Ranch	**Organization:**	Gibson Transportation
Project Location:	San Ramon, CA	**Performed By:**	
Scenario Description:	BR 3A	**Date:**	
Analysis Year:	2019	**Checked By:**	
Analysis Period:	**PM Street Peak Hour**	**Date:**	

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)			Estimated Vehicle-Trips		
	ITE LUCs[1]	Quantity	Units	Total	Entering	Exiting
Office	710	242	ksf	263	42	221
Retail	820	452	ksf	1723	827	896
Restaurant				0		
Cinema/Entertainment				0		
Residential	221	2,000	du	786	479	307
Hotel	310	169	rms	101	52	49
All Other Land Uses[2]	730	45	ksf	77	19	58
Total				2950	1419	1531

Table 2-P: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00			1.00		
Retail	1.00			1.00		
Restaurant	1.00			1.00		
Cinema/Entertainment	1.00			1.00		
Residential	1.00			1.00		
Hotel	1.00			1.00		
All Other Land Uses[2]	1.00			1.00		

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		44	0	0	4	0
Retail	13		0	0	220	9
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	12	83	0	0		6
Hotel	0	8	0	0	0	

Table 5-P: Computations Summary

	Total	Entering	Exiting
All Person-Trips	2,950	1,419	1,531
Internal Capture Percentage	27%	28%	26%
External Vehicle-Trips[3]	2,152	1,020	1,132
External Transit-Trips[4]	0	0	0
External Non-Motorized Trips[4]	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	60%	22%
Retail	16%	27%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	47%	33%
Hotel	29%	16%

[1]Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.
[2]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator
[3]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P
[4]Person-Trips
*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	J1705 - Bishop Ranch
Analysis Period:	**PM Street Peak Hour**

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends

Land Use	Table 7-P (D): Entering Trips				Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*		Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	42	42		1.00	221	221
Retail	1.00	827	827		1.00	896	896
Restaurant	1.00	0	0		1.00	0	0
Cinema/Entertainment	1.00	0	0		1.00	0	0
Residential	1.00	479	479		1.00	307	307
Hotel	1.00	52	52		1.00	49	49

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		44	9	0	4	0
Retail	18		260	36	233	45
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	12	129	64	0		9
Hotel	0	8	33	0	1	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		66	0	0	19	0
Retail	13		0	0	220	9
Restaurant	13	414		0	77	37
Cinema/Entertainment	3	33	0		19	1
Residential	24	83	0	0		6
Hotel	0	17	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)

Destination Land Use	Person-Trip Estimates				External Trips by Mode*		
	Internal	External	Total		Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	25	17	42		17	0	0
Retail	135	692	827		692	0	0
Restaurant	0	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0	0
Residential	224	255	479		255	0	0
Hotel	15	37	52		37	0	0
All Other Land Uses[3]	0	19	19		19	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)

Origin Land Use	Person-Trip Estimates				External Trips by Mode*		
	Internal	External	Total		Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	48	173	221		173	0	0
Retail	242	654	896		654	0	0
Restaurant	0	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0	0
Residential	101	206	307		206	0	0
Hotel	8	41	49		41	0	0
All Other Land Uses[3]	0	58	58		58	0	0

[1]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P
[2]Person-Trips
[3]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator
*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal Trip Capture Estimation Tool			
Project Name:	J1705 - Bishop Ranch	**Organization:**	Gibson Transportation
Project Location:	San Ramon, CA	**Performed By:**	
Scenario Description:	BR 1A	**Date:**	
Analysis Year:	2019	**Checked By:**	
Analysis Period:	**AM Street Peak Hour**	**Date:**	

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)			Estimated Vehicle-Trips		
	ITE LUCs[1]	Quantity	Units	Total	Entering	Exiting
Office	710	243	ksf	255	219	36
Retail	820	356	ksf	334	207	127
Restaurant				0		
Cinema/Entertainment				0		
Residential	221	1,442	du	468	122	346
Hotel	310	169	rms	79	47	32
All Other Land Uses[2]	730	45	ksf	150	113	37
Total				1286	708	578

Table 2-A: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00			1.00		
Retail	1.00			1.00		
Restaurant	1.00			1.00		
Cinema/Entertainment	1.00			1.00		
Residential	1.00			1.00		
Hotel	1.00			1.00		
All Other Land Uses[2]	1.00			1.00		

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-A: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		10	0	0	0	0
Retail	9		0	0	2	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	7	3	0	0		0
Hotel	7	4	0	0	0	

Table 5-A: Computations Summary

	Total	Entering	Exiting
All Person-Trips	1,286	708	578
Internal Capture Percentage	7%	6%	7%
External Vehicle-Trips[3]	1,202	666	536
External Transit-Trips[4]	0	0	0
External Non-Motorized Trips[4]	0	0	0

Table 6-A: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	11%	28%
Retail	8%	9%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	2%	3%
Hotel	0%	34%

[1]Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

[2]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

[3]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A

[4]Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	J1705 - Bishop Ranch
Analysis Period:	**AM Street Peak Hour**

Table 7-A: Conversion of Vehicle-Trip Ends to Person-Trip Ends

Land Use	Table 7-A (D): Entering Trips				Table 7-A (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*		Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	219	219		1.00	36	36
Retail	1.00	207	207		1.00	127	127
Restaurant	1.00	0	0		1.00	0	0
Cinema/Entertainment	1.00	0	0		1.00	0	0
Residential	1.00	122	122		1.00	346	346
Hotel	1.00	47	47		1.00	32	32

Table 8-A (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		10	23	0	0	0
Retail	37		17	0	18	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	7	3	69	0		0
Hotel	24	4	3	0	0	

Table 8-A (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		66	0	0	0	0
Retail	9		0	0	2	0
Restaurant	31	17		0	6	2
Cinema/Entertainment	0	0	0		0	0
Residential	7	35	0	0		0
Hotel	7	8	0	0	0	

Table 9-A (D): Internal and External Trips Summary (Entering Trips)

Destination Land Use	Person-Trip Estimates				External Trips by Mode*		
	Internal	External	Total		Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	23	196	219		196	0	0
Retail	17	190	207		190	0	0
Restaurant	0	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0	0
Residential	2	120	122		120	0	0
Hotel	0	47	47		47	0	0
All Other Land Uses[3]	0	113	113		113	0	0

Table 9-A (O): Internal and External Trips Summary (Exiting Trips)

Origin Land Use	Person-Trip Estimates				External Trips by Mode*		
	Internal	External	Total		Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	10	26	36		26	0	0
Retail	11	116	127		116	0	0
Restaurant	0	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0	0
Residential	10	336	346		336	0	0
Hotel	11	21	32		21	0	0
All Other Land Uses[3]	0	37	37		37	0	0

[1]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A
[2]Person-Trips
[3]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator
*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal Trip Capture Estimation Tool			
Project Name:	J1705 - Bishop Ranch	**Organization:**	Gibson Transportation
Project Location:	San Ramon, CA	**Performed By:**	
Scenario Description:	BR 1A	**Date:**	
Analysis Year:	2019	**Checked By:**	
Analysis Period:	**PM Street Peak Hour**	**Date:**	

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)			Estimated Vehicle-Trips		
	ITE LUCs[1]	Quantity	Units	Total	Entering	Exiting
Office	710	243	ksf	264	42	222
Retail	820	356	ksf	1355	650	705
Restaurant				0		
Cinema/Entertainment				0		
Residential	221	1,442	du	574	350	224
Hotel	310	169	rms	101	52	49
All Other Land Uses[2]	730	45	ksf	77	19	58
Total				2371	1113	1258

Table 2-P: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00			1.00		
Retail	1.00			1.00		
Restaurant	1.00			1.00		
Cinema/Entertainment	1.00			1.00		
Residential	1.00			1.00		
Hotel	1.00			1.00		
All Other Land Uses[2]	1.00			1.00		

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		44	0	0	4	0
Retail	13		0	0	161	9
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	9	65	0	0		6
Hotel	0	8	0	0	0	

Table 5-P: Computations Summary

	Total	Entering	Exiting
All Person-Trips	2,371	1,113	1,258
Internal Capture Percentage	27%	29%	25%
External Vehicle-Trips[3]	1,733	794	939
External Transit-Trips[4]	0	0	0
External Non-Motorized Trips[4]	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	52%	22%
Retail	18%	26%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	47%	36%
Hotel	29%	16%

[1]Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.
[2]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator
[3]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P
[4]Person-Trips
*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	J1705 - Bishop Ranch
Analysis Period:	**PM Street Peak Hour**

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends

Land Use	Table 7-P (D): Entering Trips				Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*		Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	42	42		1.00	222	222
Retail	1.00	650	650		1.00	705	705
Restaurant	1.00	0	0		1.00	0	0
Cinema/Entertainment	1.00	0	0		1.00	0	0
Residential	1.00	350	350		1.00	224	224
Hotel	1.00	52	52		1.00	49	49

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		44	9	0	4	0
Retail	14		204	28	183	35
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	9	94	47	0		7
Hotel	0	8	33	0	1	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		52	0	0	14	0
Retail	13		0	0	161	9
Restaurant	13	325		0	56	37
Cinema/Entertainment	3	26	0		14	1
Residential	24	65	0	0		6
Hotel	0	13	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)

Destination Land Use	Person-Trip Estimates				External Trips by Mode*		
	Internal	External	Total		Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	22	20	42		20	0	0
Retail	117	533	650		533	0	0
Restaurant	0	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0	0
Residential	165	185	350		185	0	0
Hotel	15	37	52		37	0	0
All Other Land Uses[3]	0	19	19		19	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)

Origin Land Use	Person-Trip Estimates				External Trips by Mode*		
	Internal	External	Total		Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	48	174	222		174	0	0
Retail	183	522	705		522	0	0
Restaurant	0	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0	0
Residential	80	144	224		144	0	0
Hotel	8	41	49		41	0	0
All Other Land Uses[3]	0	58	58		58	0	0

[1]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

[2]Person-Trips

[3]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

TRAFFIC & PARKING STUDY

SHATTUCK & UNIVERSITY MIXED USE PROJECT

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MARCH 1, 2012

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Shattuck and University Mixed Use Project

Traffic and Parking Study

1. INTRODUCTION

This report presents the results of a traffic impact study and parking analysis of the proposed University-Shattuck development also referred to as "Acheson Commons." The proposed project will consist of a mixed-use development that will be contained within the block bounded by Shattuck Avenue, University Avenue, Walnut Street and Berkeley Way in Downtown Berkeley near the University of California.

Project Description

Four new buildings will be constructed as illustrated on **Figure 1**, which is the proposed site plan for the project. The project is planned to consist of 202 residential rental units, 3 live-work units, and 33,252 square feet of commercial space. The commercial space consists of 9,730 square feet of restaurant uses and 23,522 square feet of retail uses which equates to a net reduction of 6,600 square feet of commercial space when compared to the existing retail and restaurant uses. The project is proposing to provide a total of 50 on-site parking spaces, all of which would be reserved for tenants. Vehicular access to the project will be at a driveway on Berkeley Way near the corner of Walnut Street, which will replace the existing driveway. All other curb cuts on the project frontage on Walnut Street will be closed. The location of the proposed project in relation to surrounding streets can be seen on **Figure 2**.

2. INTERSECTION ANALYSIS METHODOLOGY

Study Intersections and Scenarios

Six intersections were selected for the study analysis in consultation with City of Berkeley staff. The intersections and their traffic control types are as follows:

1. Berkeley Way and Oxford Street (Signal)
2. Berkeley Way and Shattuck Avenue (Stop signs on Berkeley Way)
3. Shattuck Avenue and University Avenue (Signal)
4. University Avenue and Martin Luther King Jr Way (Signal)
5. Shattuck Avenue and Center Street (Signal)
6. Shattuck Avenue and Dwight Way (Signal)

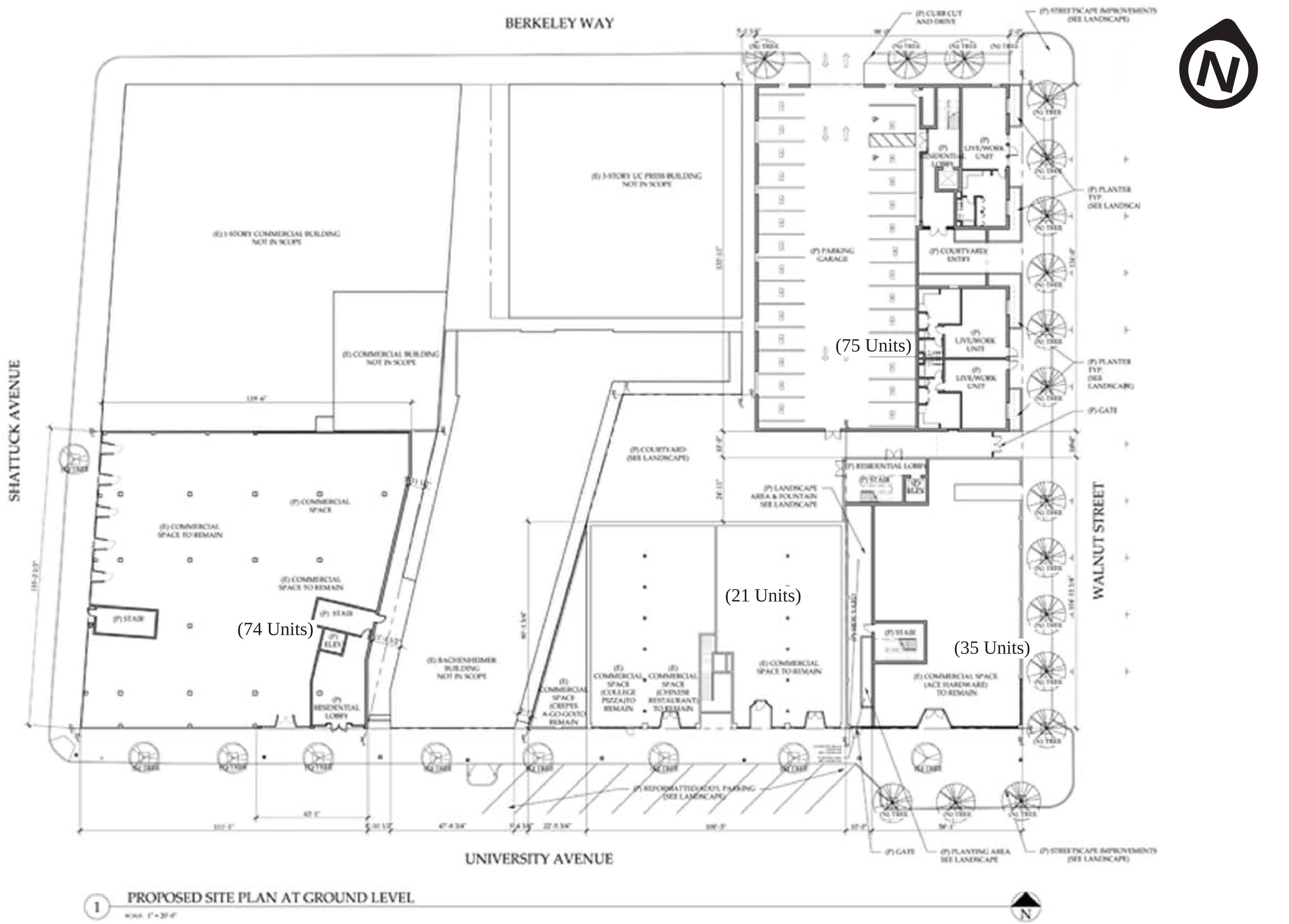

FIGURE 1

SITE PLAN

TRAFFIC IMPACT STUDY
Acheson Commons
City of Berkeley

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FIGURE 2

PROJECT LOCATION AND STUDY INTERSECTIONS

TRAFFIC IMPACT STUDY
Acheson Commons
City of Berkeley

Abrams Associates
TRAFFIC ENGINEERING, INC.

This study evaluated morning and evening peak hour traffic conditions on a typical weekday for the following six scenarios:

1. **Existing Conditions** – Current (Year 2010) traffic volumes and roadway conditions.
2. **Existing plus Project Conditions** –Existing Conditions with traffic added from the proposed Acheson Commons project.
3. **Existing plus Approved Projects Conditions** – Identical to Existing Conditions, but with traffic added from approved/pending projects in the project's vicinity.
4. **Existing plus Approved plus Project Conditions** – Identical to Existing plus Approved Project Conditions, but with traffic added from the proposed Acheson Commons project.
5. **Year 2035 Conditions** – This scenario is based on projections from the latest Alameda County Congestion Management Agency (CMA) travel demand model. Twenty-five-year incremental traffic growth was added to existing volumes to estimate 2035 traffic conditions.
6. **Year 2035 plus Project Conditions** – This scenario is identical to Year 2035 Conditions, but with the addition of proposed project traffic.

Level of Service Analysis Methodology

Level of service (LOS) is a qualitative description of intersection operations and is reported using an A through F letter rating system to describe travel delay and congestion. LOS A indicates free flow conditions with little or no delay, while LOS F indicates jammed conditions with excessive delays and long back-ups. The LOS methodology is detailed in the Appendix. Operating conditions at the study intersections were evaluated using the 2000 Highway Capacity Manual (HCM) Operations methodology contained in Synchro software. Peak hour intersection conditions for signalized intersections are reported in terms of the average control delay in seconds per vehicle with corresponding levels of service. For unsignalized intersections, results from the 2000 HCM Operations methodology include average control delay in seconds per vehicle for the overall intersection as well as the critical minor turning movement, along with corresponding levels of service.

Impact Criteria

The City's level of service standard states that an impact is significant when the criteria are reduced from LOS A, B, C, or D to LOS E (with the addition of two (2) seconds of average delay) for signalized intersections. Intersections that exceed this service level threshold are considered to be impacted and should be considered for mitigation. Exceptions to the LOS D standard arise when the project is not expected to add more than three seconds of delay at an intersection that is already operating at LOS E, or increase the V/C ratio by more than 0.01 at an intersection that is already operating at LOS F.

For unsignalized intersections, additional considerations are involved, including the number of vehicles on the critical approach, vehicles contributed by the proposed project, and signal warrant analysis. At an unsignalized intersection, mitigation is required if a movement is LOS F, the peak hour signal warrant is met and a minimum of 10 vehicles is added to the critical movement.

3. EXISTING TRAFFIC CONDITIONS

Abrams Associates conducted weekday morning (7:00 AM - 9:00 AM) and evening (4:00 PM - 6:00 PM) turning movement counts at each of the six (6) study intersections during September 2010 when schools were in session. At many of the intersections along Shattuck Avenue, traffic counts were also available from previous traffic studies. In a few cases where the earlier turning movements were higher than the current data, adjustments were made to the count data to reflect these changes. Adjustments were also made to account for the changes on links between adjacent intersections. The intersection with the greatest variability in traffic volumes was at University and MLK Jr. Way, where the higher count was used.

Based on these counts, it is evident that there has been a slight overall reduction (about 5%) compared to the older traffic volume data. It should also be noted that there were some off-and-on minor construction activities on University Avenue during the period of the traffic counts. Additional traffic counts at University Avenue and Shattuck Avenue were required because it was noted that there was construction occurring west of the intersection near the vicinity of University Avenue and Bonita Ave. This construction caused some delay and occasionally caused cars to back up into the study intersection.

Figure 3 illustrates the existing AM and PM peak hour turning movement volumes at the six study intersections. **Figure 4** shows the lane geometry and the type of traffic control at each intersection. Traffic signals are in place at all intersections except at Shattuck Avenue and Berkeley Way.

Existing Conditions – Level of Service Analysis

Table 1 summarizes the results of the weekday peak hour intersection analysis for the Existing Conditions. Detailed LOS calculations are provided in the Appendix.

Table 1: Intersection Level of Service - Existing Conditions

ID	Intersection	Traffic Control Method	Existing Conditions					
			AM Peak Hour			PM Peak Hour		
			Delay	V/C	LOS	Delay	V/C	LOS
1	Berkeley Way and Oxford St	Signal	13.6	0.32	B	13.4	0.34	B
2	Shattuck Ave and Berkeley Way	Side Street Stop	36.9	N/A	E	26.3	N/A	D
3	Shattuck Ave and University Ave	Signal	14.4	0.46	B	13.8	0.45	B
4	University Way and MLK, Jr. Way	Signal	15.3	0.47	B	18.3	0.55	B
5	Shattuck Avenue and Center St	Signal (Offset)	16.0	0.49	B	17.1	0.57	B
6	Shattuck Avenue and Dwight Way	Signal	17.7	0.65	B	20.1	0.76	B

Notes: For unsignalized intersections, the delay values are for the critical minor approach. For signals, the delay values are the overall delay. Delay is expressed in seconds per vehicle. LOS = Level of Service.

Under Existing Conditions, all signalized study intersections operate at acceptable service levels (LOS D or better).

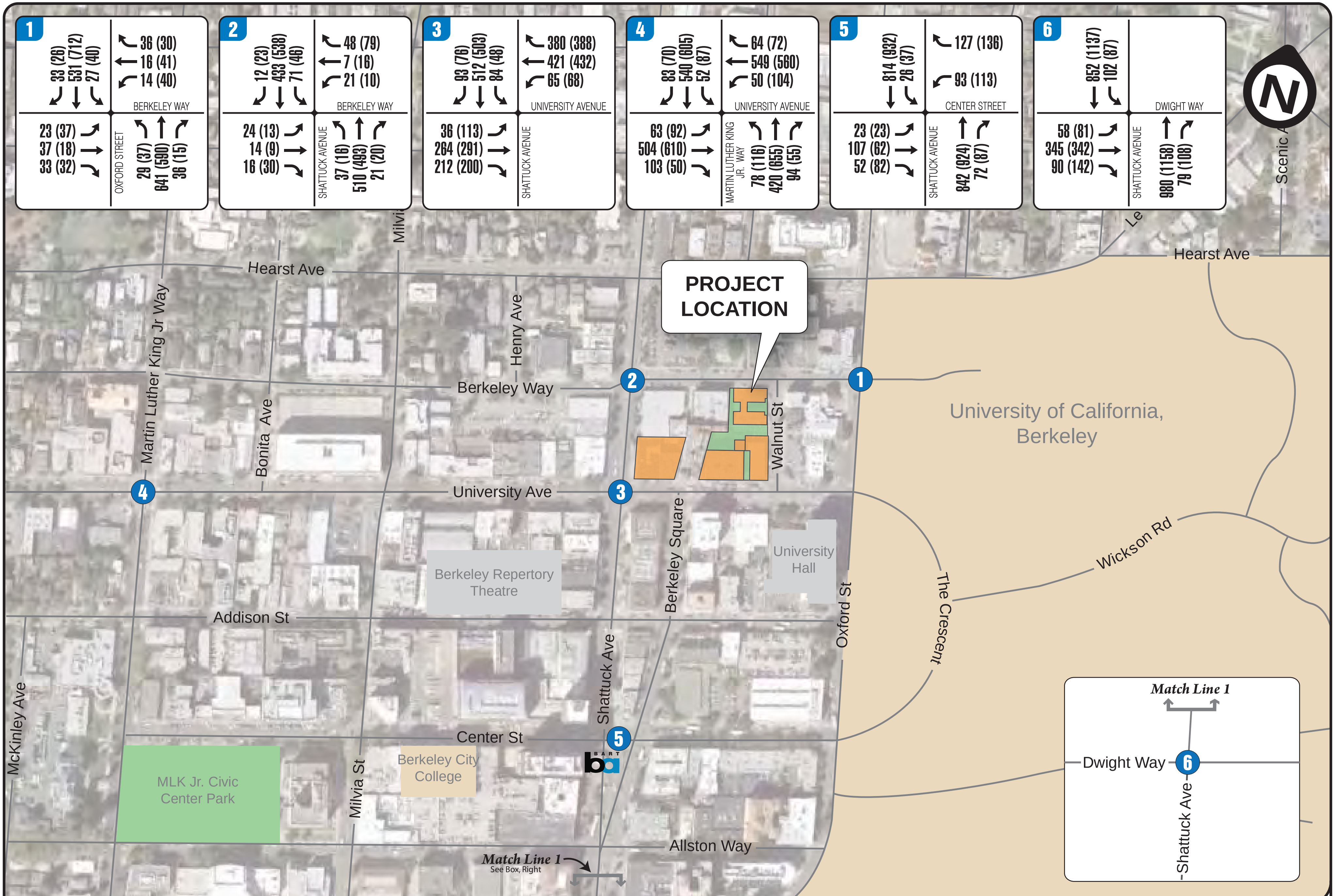

FIGURE 3

EXISTING TRAFFIC VOLUMES
AM (PM) PEAK HOUR

TRAFFIC IMPACT STUDY
Acheson Commons
City of Berkeley

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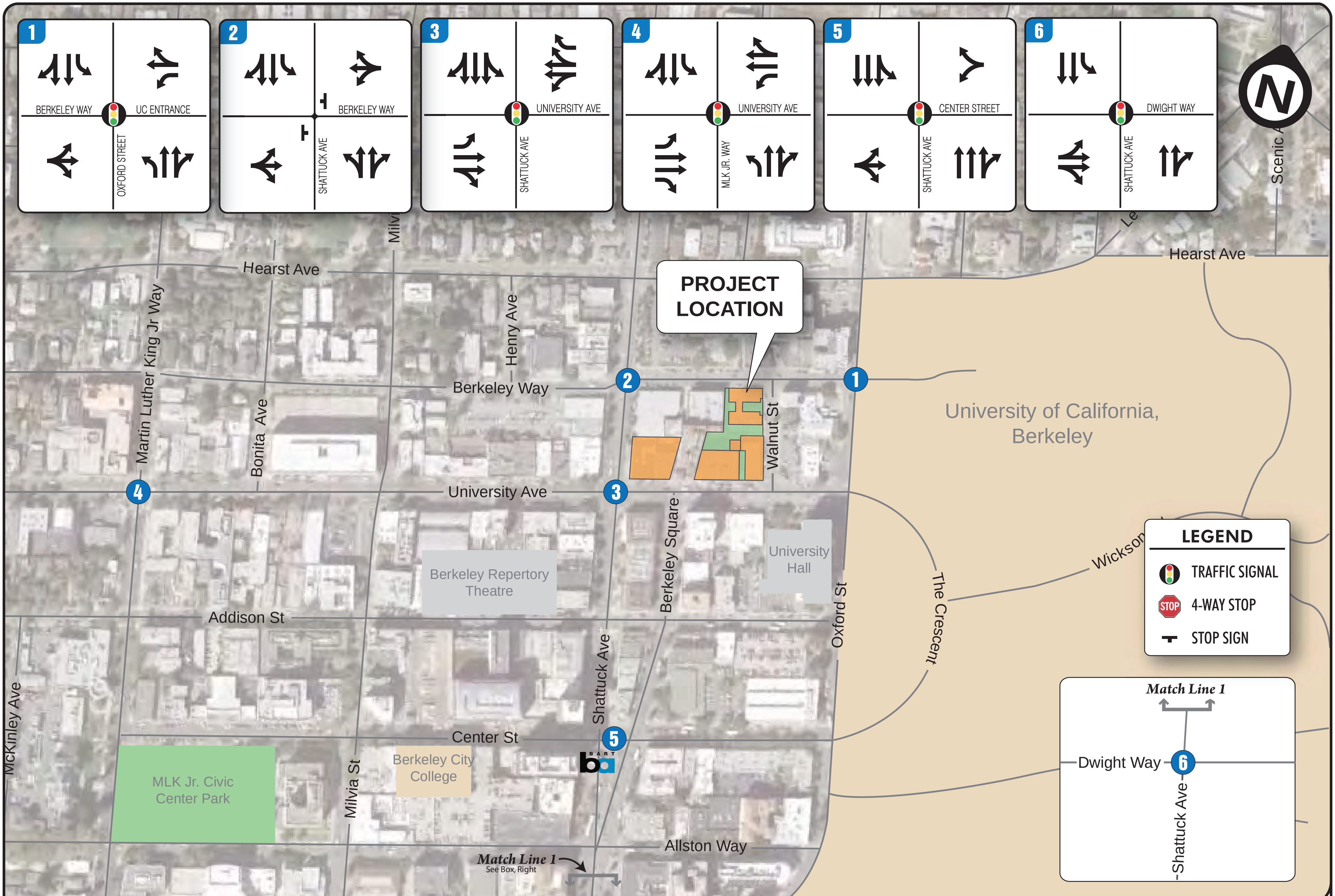

FIGURE 4

LANE CONFIGURATIONS AND TRAFFIC CONTROLS

TRAFFIC IMPACT STUDY
Acheson Commons
City of Berkeley

Abrams Associates
TRAFFIC ENGINEERING, INC.

Peak Hour Traffic Signal Warrants

To assess the need for signalization of a stop controlled intersection, the *California Manual on Uniform Traffic Control Devices (CAMUTCD) [1]* presents nine (9) signal warrants. Satisfying one or more of the signal warrants could justify signalization of an intersection; however, the full set of warrants should be considered as part of an evaluation and an engineering study should be conducted before the decision to install a signal is made. In addition, satisfaction of one or more signal warrants does not in itself require an installation of a traffic signal. The peak hour volume warrant (Warrant 3) analysis for urban conditions was conducted for the unsignalized study intersection of University Avenue and Berkeley Way, which is the only study intersection that is a candidate for signalization.

Figure 5 shows the Caltrans signal warrant results for the intersection of Berkeley Way and Shattuck Avenue. This issue is discussed in each of the analysis scenarios. In summary, the data points that are shown do not meet the warrants under Existing Conditions but are very close to meeting the standards under Cumulative conditions (but do not exceed the warrants). Based on a review of all the numerous factors that need to be considered, it is our recommendation that a traffic signal not be installed at this location.

Trip Generation and Trip Assignment for Approved Projects

Trip generation and trip assignment assumptions for the approved projects were based on the traffic study reports prepared for each project, where available. The trip assignments are accounting for projects that could be completed within the next few years. Approved projects include developments that are either under construction, built but not fully occupied, or not built but have final development approval from the City. A review of the City planning records shows that there are three (3) approved projects in the vicinity that could be expected to add traffic to the study intersections. Trips from the developments listed below were added to the existing intersection turning movement counts to account for a portion of the Approved Projects Condition.

1. 3132 Martin Luther King Jr. Boulevard Project
2. 2701Shattuck Avenue Project
3. 2489 Martin Luther King Jr. Boulevard Project

In addition to the above projects, the analysis also accounts for projects at the University of California under construction along Oxford Street and also along Berkeley Way in the immediate vicinity of the project. These buildings will primarily house existing activities that are already occurring on the UC campus. However there will be some shifts in traffic in the vicinity of the campus. To account for these shifts in traffic, it was determined in coordination with City staff that the traffic volumes at several intersections should be increased. As a result, the through movements and major turning movements at Intersections 1, 2 and 3 were increased by 5%.

Therefore the Approved Project condition has been estimated based on a combination of the traffic from the three projects above, plus a growth factor that was applied to intersections 1, 2, and 3. The resulting turning movement volumes for this scenario with the addition of existing traffic are illustrated in **Figure 6**.

PM Peak Hour Traffic

Scenario	Major Street (Both Approaches)	Minor Street (Higher Volume Approach)
Existing	1,136	105
Existing Plus Project	1,197	111
Existing Plus Approved	1,185	127
Existing Plus Approved Plus Project	1,246	146
Cumulative	1,327	142
Cumulative Plus Project	1,388	161
Existing Saturday	1,241	54
Cumulative Plus Project Saturday	1,433	91

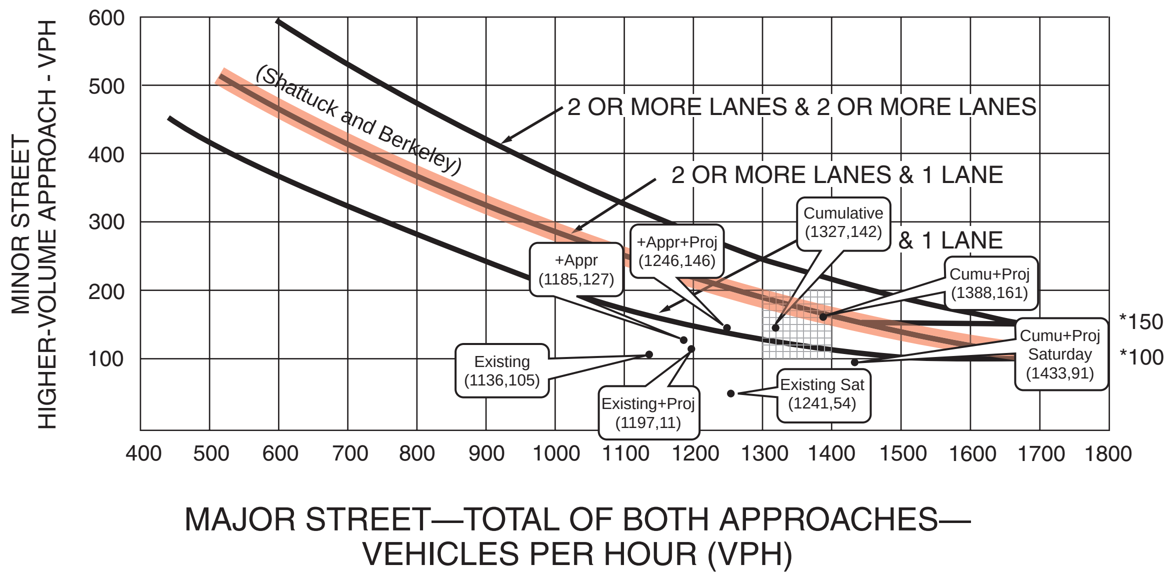

FIGURE 5

TRAFFIC SIGNAL WARRANTS
SHATTUCK AVENUE AND BERKELEY WAY

TRAFFIC IMPACT STUDY
Acheson Commons
City of Berkeley

Abrams Associates
TRAFFIC ENGINEERING, INC.

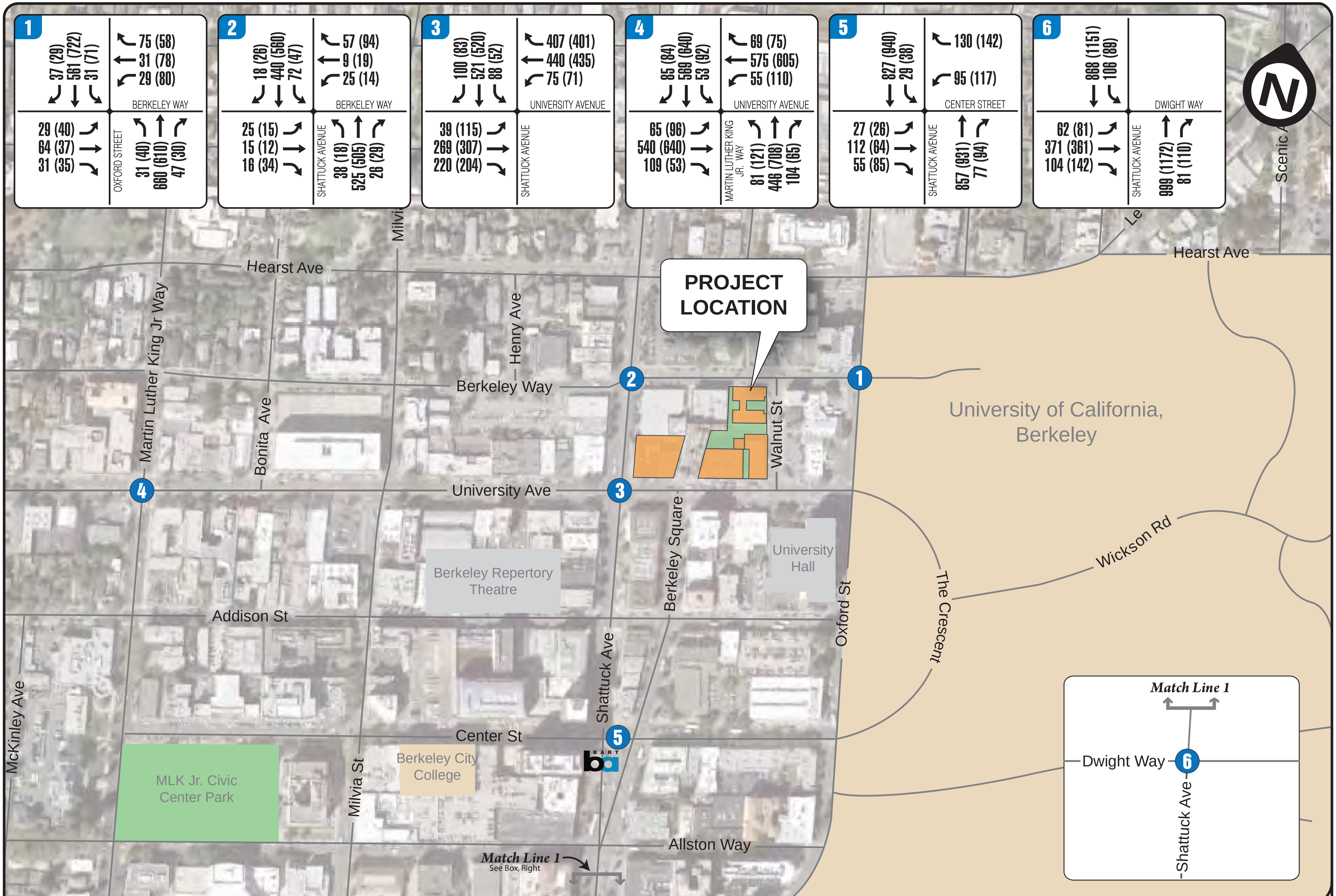

FIGURE 6

EXISTING PLUS APPROVED PROJECTS (2014) TRAFFIC VOLUMES
AM (PM) PEAK HOUR

TRAFFIC IMPACT STUDY
Acheson Commons
City of Berkeley

Abrams Associates
TRAFFIC ENGINEERING, INC.

Existing Plus Approved Projects Conditions – Level of Service Analysis

Intersection LOS analysis results for Existing plus Approved Projects Conditions are shown in **Table 2**. Detailed calculations and queuing analyses are included in the Appendix.

With the addition of traffic from the approved developments and the university changes, service levels for the weekday peak periods at all of the signalized study intersections are expected to remain unchanged, with a few minor increases in average delay. The side street movements at the intersection of Shattuck Avenue and Berkeley Way are at LOS D during the PM peak hour and LOS E during the AM peak. At an unsignalized intersection, mitigation is required if a movement is LOS F, the peak hour signal warrant is met and a minimum of 10 vehicles is added to the critical movement. The intersection does not meet peak hour signal warrant criteria. The traffic volumes for the Existing Plus Approved Projects conditions are shown on **Figure 6**.

Table 2: Intersection Level of Service - Existing Plus Approved

ID	Intersection	Traffic Control Method	Existing + Approved Conditions					
			AM Peak Hour			PM Peak Hour		
			Delay	V/C	LOS	Delay	V/C	LOS
1	Berkeley Way and Oxford St	Signal	14.1	0.36	B	14.1	0.37	B
2	Shattuck Ave and Berkeley Way	Side Street Stop	42.2	N/A	E	32.4	N/A	D
3	Shattuck Ave and University Ave	Signal	14.6	0.48	B	14.0	0.46	B
4	University Way and MLK, Jr. Way	Signal	15.9	0.49	B	20.1	0.63	C
5	Shattuck Avenue and Center St	Signal (Offset)	16.3	0.50	B	17.6	0.59	B
6	Shattuck Avenue and Dwight Way	Signal	19.0	0.68	B	20.8	0.77	C

Notes: For unsignalized intersections, the delay values are for the critical minor approach. For signals, the delay values are the overall delay. Delay is expressed in seconds per vehicle. LOS = Level of Service.

Year 2020 Conditions – Level of Service Analysis

In response to a request from the Alameda County Transportation Commission a separate analysis scenario was prepared to evaluate the project's potential impacts on Year 2020 traffic conditions. The Year 2020 forecasts were developed by utilizing the latest ACCMA traffic and land use projections. The Intersection LOS analysis results this scenario are shown in **Table 3** and figures presenting the volumes used in the calculations are included with the detailed LOS calculations in the appendix to this report.

Under 2020 conditions all of the signalized intersections will continue to operate at Level of Service C or better and none of the intersections will violate the City's intersection capacity standards. At an unsignalized intersection, mitigation is required if a movement is LOS F, the peak hour signal warrant is met, and a minimum of 10 vehicles is added to the critical movement. The side street movements at the intersection of Shattuck Avenue and Berkeley Way are at LOS F however the intersection does not meet peak hour signal warrant criteria.

Table 3: Intersection Level of Service – Year 2020 Conditions

ID	Intersection	Traffic Control Method	Year 2020 Conditions					
			AM Peak Hour			PM Peak Hour		
			Delay	V/C	LOS	Delay	V/C	LOS
1	Berkeley Way and Oxford St	Signal	14.1	0.42	B	14.0	0.39	B
2	Shattuck Ave and Berkeley Way	Side Street Stop	>50	N/A	F	38.0	N/A	E
3	Shattuck Ave and University Ave	Signal	15.6	0.57	B	14.0	0.48	B
4	University Way and MLK, Jr. Way	Signal	18.4	0.61	B	21.8	0.68	C
5	Shattuck Avenue and Center St	Signal (Offset)	17.6	0.61	B	17.6	0.62	B
6	Shattuck Avenue and Dwight Way	Signal	23.4	0.79	C	21.9	0.80	C

Notes: For unsignalized intersections, the delay values are for the critical minor approach. For signals, the delay values are the overall delay. Delay is expressed in seconds per vehicle. LOS = Level of Service.

4. PROJECT TRIP GENERATION

The project is planned to consist of 202 residential rental units, 3 live-work units, and 33,252 square feet of commercial space (i.e., 9,730 square feet of restaurant uses, and 23,520 square feet of retail). The currently occupied space on the site includes 8 residential units, 18,063 square feet of retail, 4,339 square feet of restaurant uses, 6,527 square feet of offices.

The vehicle trip generation for the Acheson Commons project is shown in **Table 4**. The trip generation rates are based on the ITE rates for Apartments (Category 220), Retail (Category 820) and restaurants (Category 932). The trip rates have been taken from the *8th Edition of the* Institute of Transportation Engineers (ITE) *Trip Generation Manual*, and have been adjusted (as described below) to account for traffic conditions in this part of downtown Berkeley.

Downtown Berkeley Residential Trip Generation. Since the project is located downtown in an area with BART access and numerous bus connections, and within walking distance of the UC campus, the vehicle trip rate per unit is much less than would be generated by a typical apartment. Since the amount of parking planned for the project is lower than normal, this will further limit the number of vehicle trips generated. For this project, a trip reduction of 40% has been applied to the unfiltered trip generation rate. The ITE trip generation rates are based on surveys of primarily suburban locations and this reduction intended to account for walk, bicycle, and transit trips as well as shared trips with the residential component of the project. The 40% reduction was based on data from the Alameda County Transportation Commission's Travel Demand Model, trip generation surveys compiled by ITE and the San Diego Association of Governments (SANDAG), and census data on vehicle ownership and travel patterns provided by the City of Berkeley. As a result, the proposed residential portion project is expected to generate 63 net new total trips during the AM peak hour and 76 net new total trips during the PM peak hour (if there is no credit given for the existing residential uses).

Table 4: Project Vehicle Trip Generation

Land Use	ITE Code	Size	ADT	AM Peak Hour			PM Peak Hour		
				In	Out	Total	In	Out	Total
Trip Generation for the Proposed Project									
ITE Apartment Rates - Trips per Unit	220		6.65	0.10	0.41	0.51	0.40	0.22	0.62
Apartment Trip Generation		205 Units	1,363	21	84	105	83	44	127
Reduction for Non-Auto Trips (40%)			545	8	33	42	33	18	51
Subtotal - Residential			*818*	*13*	*50*	*63*	*50*	*27*	*76*
ITE Retail Trip Rates (per 1,000 sq. ft.)	820		42.94	0.61	0.39	1.00	1.83	1.90	3.73
Retail Trip Generation		23,522 sq. ft.	1,010	14	9	24	43	45	88
Reduction for Pass By/Non-Auto Trips (34%)			343	5	3	8	15	15	30
Subtotal – Retail			*667*	*9*	*6*	*16*	*28*	*30*	*58*
ITE Restaurant Rates (per 1,000 sq. ft.)	932		127.15	5.99	5.53	11.52	6.58	4.57	11.15
Restaurant Trip Generation		9,730 sq. ft.	1,237	58	54	112	64	44	108
Reduction for Pass By/Non-Auto Trips (43%)			532	25	23	48	28	19	47
Subtotal - Restaurants			*705*	*33*	*31*	*64*	*36*	*25*	*62*
Subtotal – Trip Generation from New Uses			*2,202*	*55*	*88*	*143*	*115*	*82*	*197*
Trip Generation Calculations for Currently Occupied Space Being Replaced by the Proposed Project *(Note: There are 8 existing residential units that were unoccupied at the time of the traffic counts so no credit was given for these units.)*									
ITE Retail Trip Rates (Per 1,000 Sq. ft.)	820		42.94	0.61	0.39	1.00	1.83	1.90	3.73
Retail Trip Generation		18,063 sq. ft.	776	11	7	18	33	34	67
Reduction for Pass By/Non-Auto Trips (34%)			264	4	2	6	11	12	23
Subtotal - Retail			*512*	*7*	*5*	*12*	*22*	*23*	*44*
ITE Restaurant Rates (per 1,000 sq. ft.)	932		127.15	5.99	5.53	11.52	6.58	4.57	11.15
Restaurant Trip Generation		4,399 sq. ft.	559	26	24	51	29	20	49
Reduction for Pass By/Non-Auto Trips (43%)			241	11	10	22	12	9	21
Subtotal – Restaurants			*319*	*15*	*14*	*29*	*16*	*11*	*28*
ITE Office Trip Rates (per 1,000 sq. ft.)	710		11.01	1.36	0.19	1.55	0.25	1.24	1.49
Office Trip Generation		6,527 sq. ft.	72	9	1	10	2	8	10
Subtotal – Offices			*72*	*9*	*1*	*10*	*2*	*8*	*10*
Subtotal – Trip Generation from Existing Uses			*903*	*31*	*20*	*51*	*40*	*42*	*82*
Net New Trip Generation for the Project			**1,299**	**24**	**68**	**92**	**75**	**40**	**115**

Retail Trip Generation. Individual land uses within a mixed-use development typically generate fewer peak hour vehicle trips than those generated by comparable single-use developments, in this case due to internal trip matching between residential and retail uses. Furthermore, the project site is located on a transit-rich corridor that includes the AC Transit bus lines on Shattuck Avenue and BART. The percentage reduction in vehicle trips to account for walking, bicycle and transit trips was based on *The ITE Trip Generation Manual* and the resulting rates are consistent with those used in the ACCMA traffic model.

As noted in **Table 4**, the amount of retail and restaurants is relatively small, and the number of vehicle traffic rips by the new retail space will be limited by existing access and parking constraints in the downtown area. The ITE trip generation rates for retail and restaurants have been reduced by 34% and 42%, respectively, to reflect the pedestrian-oriented nature of the businesses and the number of linked trips that occur in a downtown area. These reductions were taken from the Second Edition of the ITE Trip Generation Handbook which provides specific rates for pass-by trips for each individual land use based on surveys collected by ITE. With these reductions the proposed retail and restaurant portions of the proposed project are expected to generate 39 net new trips during the AM peak hour and 48 net new trips during the PM peak hour. This assumes credit for removal of the currently occupied areas as shown in Table 3.

Summary. The proposed mixed-use development is conservatively estimated to generate approximately 92 net new trips during the weekday AM peak hour and 115 net new trips during the weekday PM peak hour. These values have been used in the subsequent intersection capacity analyses.

Proposed Access and Circulation

The proposed project's access will consist of one full access driveway on Berkeley Way. The driveway will be located approximately 90 feet west of Walnut Street, providing access to ground floor level parking spaces. The existing driveway to the site is located just to the west and will be replaced by the proposed new driveway. There will not be any new curb cuts on Berkeley Way, but several curb cuts on Walnut Street will be closed, which could result in the addition of up to 5 new parking spaces. "STOP" signs should also be installed facing exiting vehicles at the project driveway. In addition to the signs, a street-level audible signal and flashing light system that alerts pedestrians of exiting vehicles will be installed at the project driveways.

The driveway is safely located in terms of sight distance and the spacing to the nearest streets. There are a number of driveways for the existing property that will be closed as a result of the Acheson Commons project. This will permit the addition of new on-street parking where it is currently prohibited. The access to the project is consistent with other blocks in downtown Berkeley. No unusual situations would be expected to develop.

Bicycle Parking. The applicant intends to meet the City's zoning standards for the number of bicycle spaces to be provided. The City's Zoning Code one bicycle parking space per 2,000 square feet of gross commercial floor area which would equate to 17 bicycle parking spaces which are currently proposed to be located in a locked area accessed off of the building courtyard where the residential bike parking is also proposed to be located (separate from the employee bicycle parking). Parking for the retail component will be determined later in conjunction with City of Berkeley staff. The proposed project to narrow University Avenue and widen the sidewalks presents an opportunity for bicycle parking, either along the building frontage or at the curb perhaps with bicycle kiosks. This plan will be identified later once plans for reconfiguring University Avenue adjacent to the site are finalized.

Existing Truck Loading Zones. The existing truck loading operations are as follows:

University Avenue – None. Trucks are frequently observed using the curb lane during the morning hours between 7 AM and 10 AM.
Shattuck Avenue – None.
Walnut Street – An on-street area is currently available for truck loading for properties that front on Walnut Street.
Berkeley Way – Red curb area marked.

Proposed Truck Loading Zone. The proposed truck loading operations would be focused on Walnut Street. The existing on-street loading area will be reconfigured to serve the proposed project and signed with specific hours for loading in coordination with the City.

Transit Accessibility. The downtown Berkeley BART station is located on Shattuck Avenue at Center Street, which is just two blocks from the project. This station connects to destinations within the East Bay and San Francisco. There is extensive bus transit service provided by Alameda-Contra Costa County (AC) Transit at the BART Station. The following lines serve the station:

Local Bus Transit Lines
1: Berkeley BART to Bay Fair BART via Telegraph Ave, International Blvd, and E 14th Street.
1R: International Rapid – UC Berkeley Campus to Bay Fair BART via Berkeley BART, Telegraph Ave, International Blvd, and E 14th Street.
7: El Cerrito Del Norte BART to Berkeley BART via Arlington Dr and Shattuck Ave.
18: University Village, Albany, to Montclair via Solano Ave, Shattuck Ave, Children's Hospital, Martin Luther King Jr. Way, downtown Oakland, and Park Blvd.
25: Two-way Loop – El Cerrito Plaza BART, Central Ave, Pierce St, University Village, Gilman St, Hopkins St, MLK Jr. Way, Berkeley BART, MLK Jr. Way, Solano Ave, Colusa Ave, Fairmount Ave.
49: Two-way loop: Rockridge BART, College Ave, Ashby Ave, 7th St, Dwight Way, Shattuck Ave, Berkeley BART, Bancroft Wy/ Durant Ave, Piedmont Ave, Warring St, Derby St, Claremont Blvd, Claremont Ave and College Ave.
51B: Rockridge BART to Berkeley Amtrak or Berkeley Marina via College Ave, Bancroft Way / Durant Ave, Shattuck Ave, Berkeley BART, and University Ave.
52: University Village to UC Campus via University Village, Cedar St, Sacramento St, and University Ave, looping the UC Campus via Hearst Ave, Gayley St, Bancroft Way, and Shattuck Ave (Berkeley BART).
65: Berkeley BART to Lawrence Hall of Science or Senior Ave and Grizzly Peak Blvd via Hearst Ave, Euclid Ave and Grizzly Peak Blvd.
67: Berkeley BART to Grizzly Peak Blvd and Spruce St via Oxford St and Spruce St Weekends serves Tilden Park.
88: From Berkeley BART to Lake Merritt BART via University Ave, Sacramento St, Market St. and downtown Oakland

All-Nighter Bus Transit Lines
800: All Nighter. Richmond BART to Market St. and Van Ness Ave, S.F., via Macdonald Ave, San Pablo Ave, University Ave, Telegraph Ave and downtown Oakland. Returns via Market St. and West Oakland BART.
851: All Nighter. Downtown Berkeley to Park St & Santa Clara Ave, Alameda, via UC Campus South, College Ave, Broadway, downtown Oakland and Santa Clara Ave.

Transbay Bus Transit
F: UC Campus to Transbay Temporary Terminal, San Francisco via Shattuck Ave, Adeline St and 40th St.

Routes F, 18, and 800 along Shattuck Avenue would serve the proposed development. The bus stops for these lines are located on Shattuck Avenue, south of University Avenue.

Project Trip Distribution and Assignment

Trip distribution assumptions for the proposed project were developed based on existing travel patterns, knowledge of the study area, and the proposed access of the project, mentioned above. The distribution assumptions are listed below:

- Nineteen (19) percent to/from north via Shattuck Avenue
- Eight (8) percent to/from north via Oxford Street
- Ten (10) percent to/from south via Oxford Street
- Thirty-five (35) percent to/from west via University Avenue
- Twenty-eight (28) percent to/from south via Shattuck Avenue

The trip distribution assumptions for the local roadway network are illustrated in **Figure 7**. The project will add the majority of its trips to the intersection of Shattuck Avenue and Berkeley Way. The resulting LOS results for the Existing Plus Project conditions are shown in **Table 5**.

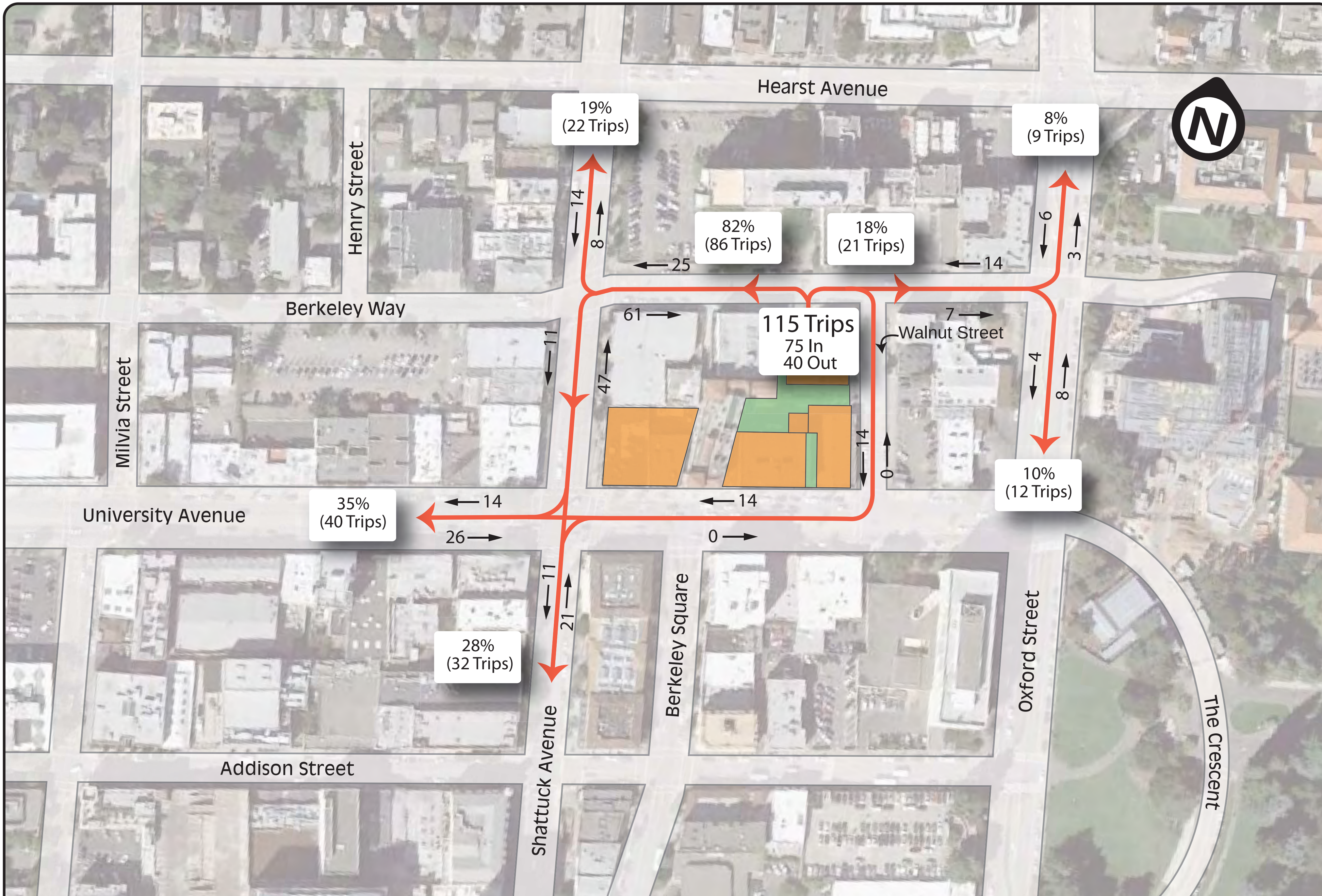

FIGURE 7

PROJECT TRIP DISTRIBUTION

TRAFFIC IMPACT STUDY
Acheson Commons
City of Berkeley

Abrams Associates
TRAFFIC ENGINEERING, INC.

Existing Plus Project Conditions – Level of Service Analysis

The first step in the analysis is to evaluate an "Existing plus Project" condition. This scenario is the number of project trips (Figure 5) added to the existing traffic volumes. The resulting LOS results for the Existing Plus Project conditions are shown in **Table 5**. The traffic volumes assumed for this scenario are shown in **Figure 8**. Detailed calculations and queuing analyses are included in the Appendix. With the addition of project trips on top of the existing traffic volumes the service levels for the weekday peak periods at all of the signalized study intersections are expected to remain unchanged, with a few minor increases in average delay.

Table 5: Intersection Level of Service - Existing Plus Project

ID	Intersection	Traffic Control Method	Existing + Project Conditions					
			AM Peak Hour			PM Peak Hour		
			Delay	V/C	LOS	Delay	V/C	LOS
1	Berkeley Way and Oxford St	Signal	13.6	0.32	B	13.4	0.34	B
2	Shattuck Ave and Berkeley Way	Side Street Stop	39.9	N/A	E	29.3	N/A	D
3	Shattuck Ave and University Ave	Signal	14.6	0.47	B	14.1	0.46	B
4	University Way and MLK, Jr. Way	Signal	15.4	0.48	B	18.4	0.56	B
5	Shattuck Avenue and Center St	Signal (Offset)	16.1	0.49	B	17.1	0.58	B
6	Shattuck Avenue and Dwight Way	Signal	17.7	0.65	B	20.1	0.76	C

Notes: For unsignalized intersections, the delay values are for the critical minor approach. For signals, the delay values are the overall delay. Delay is expressed in seconds per vehicle. LOS = Level of Service.

Existing Plus Approved Plus Project Conditions – Level of Service Analysis

Intersection LOS analysis results for Existing plus Approved plus Projects Conditions are shown in **Table 6** and the volumes are shown on **Figure 9**. Detailed calculations and queuing analyses are included in the Appendix. With the addition of project trips on top of the traffic from the approved developments and the university changes, service levels for the weekday peak periods at all of the signalized study intersections are expected to remain unchanged, with a few minor increases in average delay. At an unsignalized intersection, mitigation is required if a movement is LOS F, the peak hour signal warrant is met and a minimum of 10 vehicles is added to the critical movement. The side street movements at the intersection of Shattuck Avenue and Berkeley Way are at LOS E, however the intersection does not meet peak hour signal warrant criteria. See Figure 5 for the results of the signal warrant analysis.

The changes that result from the addition of project trips are very small. All of the signalized intersections will continue to operate at Level of Service B with the exception of Shattuck Avenue and Dwight Way, which will operate at LOS C during the PM peak period. None of the intersections will violate the City's intersection capacity standards.

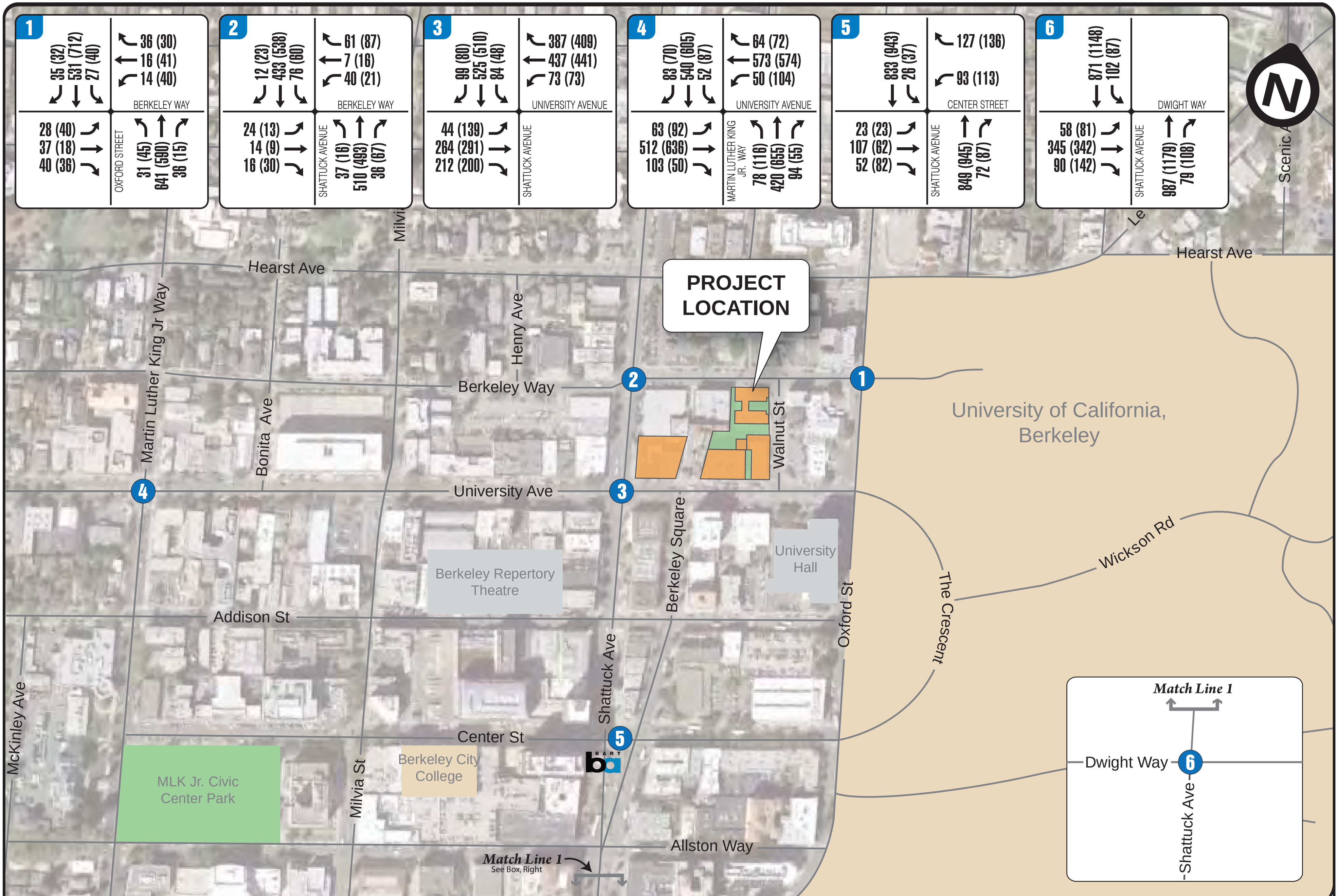

FIGURE 8

EXISTING PLUS PROJECT (2014) TRAFFIC VOLUMES
AM (PM) PEAK HOUR

TRAFFIC IMPACT STUDY
Acheson Commons
City of Berkeley

Abrams Associates
TRAFFIC ENGINEERING, INC.

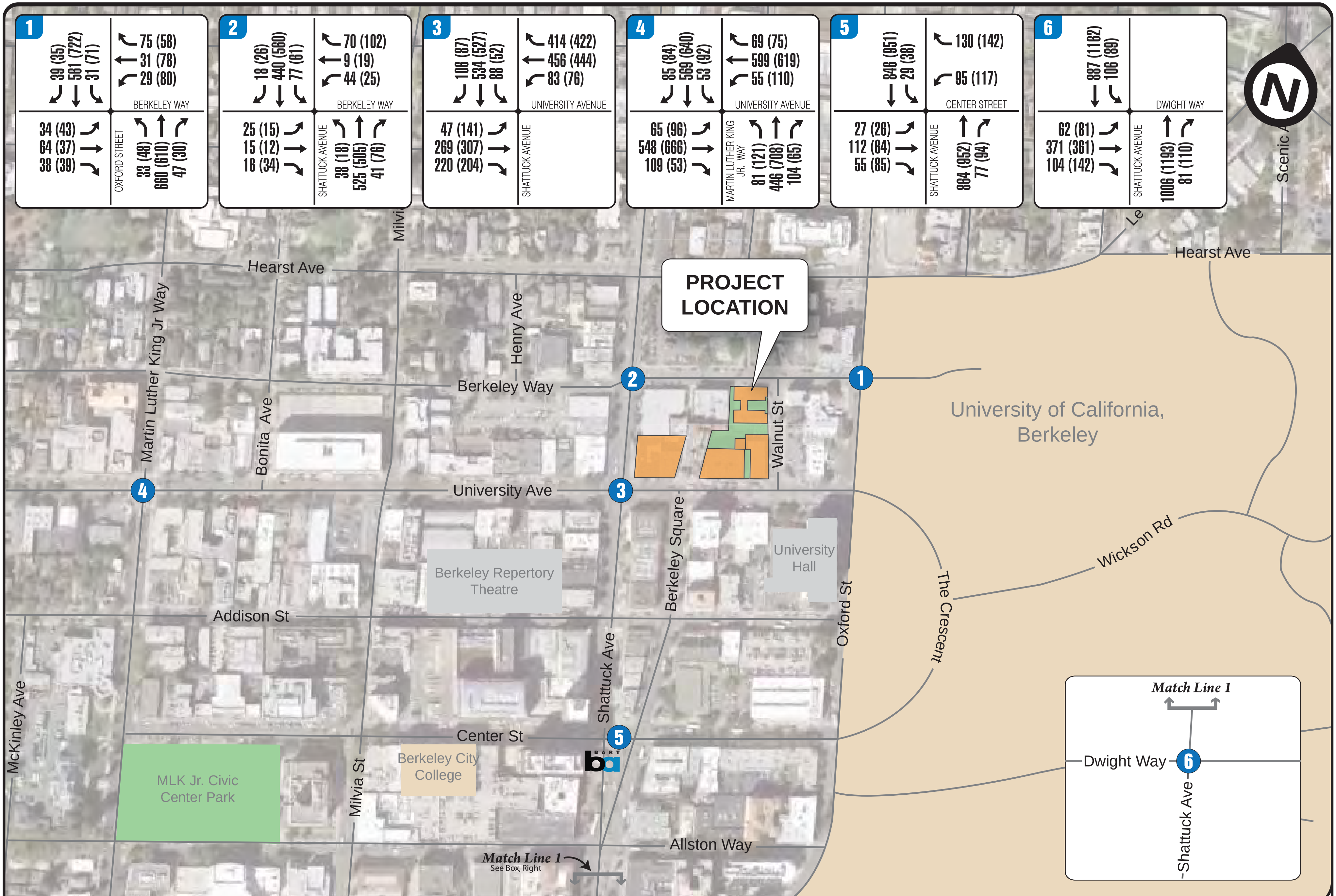

FIGURE 9

EXISTING PLUS APROVED PLUS PROJECT (2014) TRAFFIC VOLUMES

AM (PM) PEAK HOUR

TRAFFIC IMPACT STUDY

Acheson Commons

City of Berkeley

Abrams Associates
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Table 6: Intersection Level of Service - Existing Plus Approved Plus Project

ID	Intersection	Traffic Control Method	Existing + Approved + Proj. Conditions					
			AM Peak Hour			PM Peak Hour		
			Delay	V/C	LOS	Delay	V/C	LOS
1	Berkeley Way and Oxford St	Signal	14.1	0.37	B	14.1	0.37	B
2	Shattuck Ave and Berkeley Way	Side Street Stop	46.1	N/A	E	37.0	N/A	E
3	Shattuck Ave and University Ave	Signal	14.8	0.50	B	13.8	0.48	B
4	University Way and MLK, Jr. Way	Signal	16.0	0.50	B	21.1	0.64	C
5	Shattuck Avenue and Center St	Signal (Offset)	16.4	0.51	B	17.0	0.59	B
6	Shattuck Avenue and Dwight Way	Signal	19.0	0.68	B	20.9	0.78	C

Notes: For unsignalized intersections, the delay values are for the critical minor approach. For signals, the delay values are the overall delay. Delay is expressed in seconds per vehicle. LOS = Level of Service.

Year 2020 Plus Project Conditions – Level of Service Analysis

In response to a request from the Alameda County Transportation Commission a separate analysis scenario was prepared to evaluate the project's potential impacts on Year 2020 traffic conditions, The Year 2020 forecasts were developed by utilizing the latest ACCMA traffic and land use projections. The Intersection LOS analysis results for this scenario are shown in **Table 7** and figures presenting the volumes used in the calculations are included with the detailed LOS calculations in the appendix to this report. With the addition of project trips service levels for the weekday peak periods at all of the signalized study intersections are expected to remain unchanged, with a few minor increases in average delay. At an unsignalized intersection, mitigation is required if a movement is LOS F, the peak hour signal warrant is met, and a minimum of 10 vehicles is added to the critical movement. The side street movements at the intersection of Shattuck Avenue and Berkeley Way are at LOS F, however the intersection does not meet peak hour signal warrant criteria.

The changes that result from the addition of project trips are very small. All of the signalized intersections will continue to operate at Level of Service C or better. None of the intersections will violate the City's intersection capacity standards.

Table 7: Intersection Level of Service – Year 2020 Plus Project

ID	Intersection	Traffic Control Method	Year 2020 + Project Conditions					
			AM Peak Hour			PM Peak Hour		
			Delay	V/C	LOS	Delay	V/C	LOS
1	Berkeley Way and Oxford St	Signal	14.1	0.43	B	13.9	0.39	B
2	Shattuck Ave and Berkeley Way	Side Street Stop	>50	N/A	F	45.1	N/A	E
3	Shattuck Ave and University Ave	Signal	15.8	0.58	B	13.9	0.50	B
4	University Way and MLK, Jr. Way	Signal	18.9	0.63	B	23.2	0.70	C
5	Shattuck Avenue and Center St	Signal (Offset)	17.2	0.61	B	16.9	0.62	B
6	Shattuck Avenue and Dwight Way	Signal	23.4	0.80	C	22.1	0.81	C

Notes: For unsignalized intersections, the delay values are for the critical minor approach. For signals, the delay values are the overall delay. Delay is expressed in seconds per vehicle. LOS = Level of Service.

5. CUMULATIVE (2035) TRAFFIC CONDITIONS

Cumulative (2035) Conditions – Level of Service Analysis

Abrams Associates developed the 2035 traffic forecast by utilizing the latest ACCMA traffic and land use projections. The model data was used to estimate a growth increment to 2035. This increment was added to existing turning movement volumes proportionately based on existing left, through, and right turn volumes at the study intersections. The individual turning movements were summed and compared to the model link volumes to calibrate the results.

Figure 10 shows the resulting 2035 turning movement volumes at each of the six (6) study intersections. Intersection capacity results were calculated for each intersection, and are shown in **Table 8**.

Table 8: Intersection Level of Service – Cumulative (2035)

ID	Intersection	Traffic Control Method	Cumulative Conditions					
			AM Peak Hour			PM Peak Hour		
			Delay	V/C	LOS	Delay	V/C	LOS
1	Berkeley Way and Oxford St	Signal	14.5	0.45	B	14.4	0.41	B
2	Shattuck Ave and Berkeley Way	Side Street Stop	>50.0	N/A	F	49.9	N/A	E
3	Shattuck Ave and University Ave	Signal	16.2	0.61	B	14.4	0.52	B
4	University Way and MLK, Jr. Way	Signal	20.3	0.71	C	26.7	0.81	C
5	Shattuck Avenue and Center St	Signal (Offset)	18.6	0.67	B	18.7	0.68	B
6	Shattuck Avenue and Dwight Way	Signal	26.8	0.86	C	25.6	0.87	C

Notes: For unsignalized intersections, the delay values are for the critical minor approach. For signals, the delay values are the overall delay. Delay is expressed in seconds per vehicle. LOS = Level of Service.

The intersection capacity results shown in Table 6 indicate that each of the five signalized intersections that have been studied will operate at Level of Service B or C under cumulative traffic conditions. None of the intersections were shown to exhibit any significant or unusual intersection delay. At an unsignalized intersection, mitigation is required if a movement is LOS F, the peak hour signal warrant is met and a minimum of 10 vehicles is added to the critical movement. The results indicate the unsignalized intersection at Berkeley Way and Shattuck Avenue will not meet the peak hour warrants for consideration of a traffic signal. It should also be noted that other options, such as restricting side streets to right turns only, are certainly possible at this location.

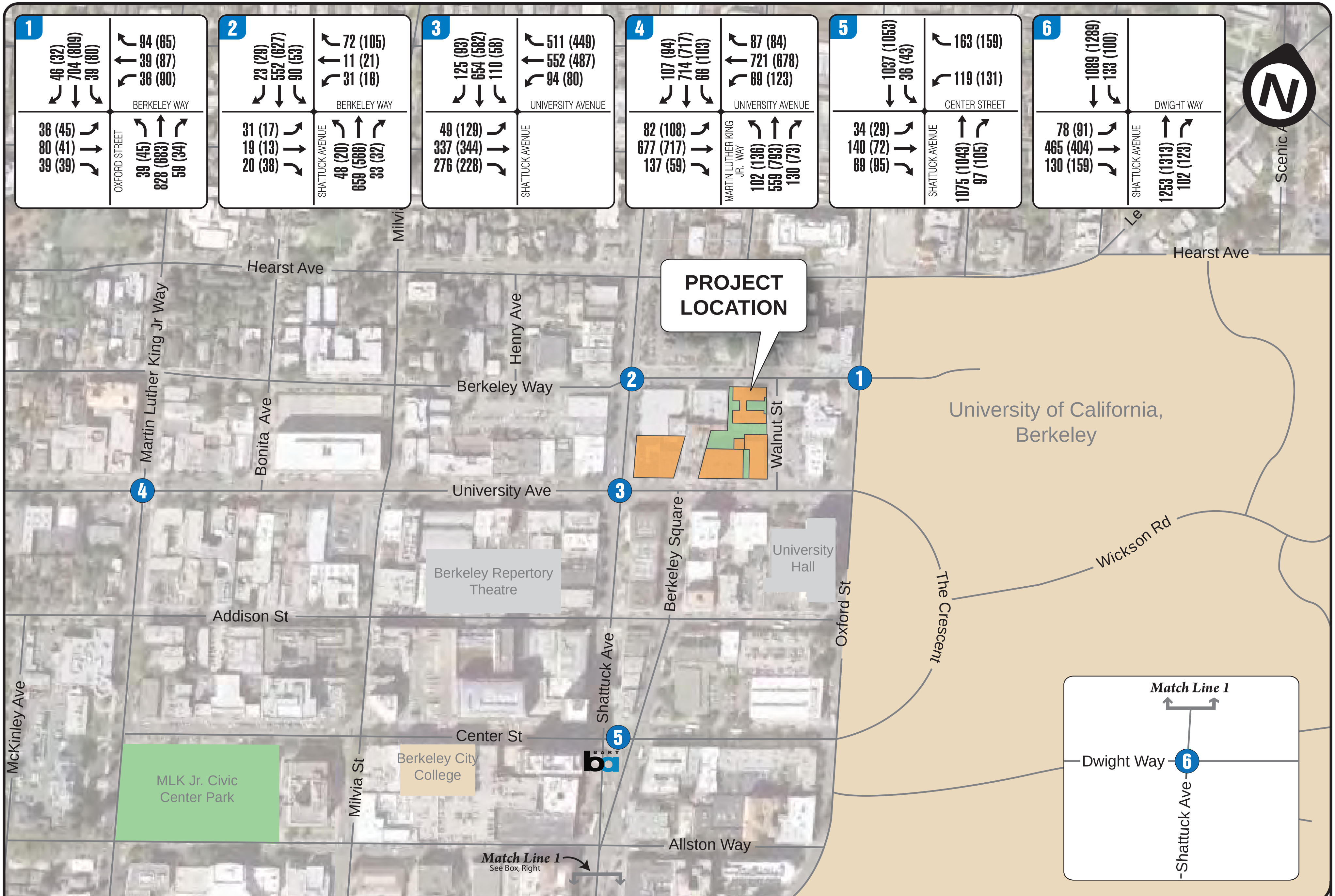

FIGURE 10

TRAFFIC IMPACT STUDY

Acheson Commons

City of Berkeley

CUMULATIVE (2035) TRAFFIC VOLUMES

AM (PM) PEAK HOUR

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Fair Share Cost Allocation

The cost of installing a traffic signal at this location may be included as a part of the Traffic Impact Fee (TIF). If not, the applicant may be asked to contribute its fair share to this new signal installation. The changes that result from the addition of project trips are very small. All of the intersections will continue to operate at Level of Service B with the exception of Shattuck Avenue and Dwight Way, which will operate at LOS C during the PM peak period. None of the intersections will violate the City's intersection capacity standards.

Cumulative (2035) Plus Project Conditions – Level of Service Analysis

This scenario is identical to 2035 Conditions, but with the addition of traffic from the proposed Acheson Commons project.

Figure 11 shows the intersection turning movement volumes resulting from project trip assignment under Cumulative (2035) plus Project Conditions. Intersection LOS analysis results for 2035 plus Project Conditions are shown in **Table 9** for the weekday peak periods. Detailed calculations and queuing analyses are included in the Appendix.

Table 9: Intersection Level of Service – Cumulative (2035) Plus Project

ID	Intersection	Traffic Control Method	Cumulative + Project Conditions					
			AM Peak Hour			PM Peak Hour		
			Delay	V/C	LOS	Delay	V/C	LOS
1	Berkeley Way and Oxford St	Signal	14.5	0.46	B	14.4	0.42	B
2	Shattuck Ave and Berkeley Way	Side Street Stop	> 50.0	N/A	F	> 50.0	N/A	F
3	Shattuck Ave and University Ave	Signal	16.5	0.63	B	14.4	0.54	B
4	University Way and MLK, Jr. Way	Signal	21.2	0.74	C	29.0	0.84	C
5	Shattuck Avenue and Center St	Signal (Offset)	18.1	0.67	B	17.8	0.69	B
6	Shattuck Avenue and Dwight Way	Signal	27.0	0.86	C	26.0	0.88	C

Notes: For unsignalized intersections, the delay values are for the critical minor approach. For signals, the delay values are the overall delay. Delay is expressed in seconds per vehicle. LOS = Level of Service.

The intersection capacity results show that each of the five signalized intersections will continue to operate at Level of Service B and C. The addition of project traffic is very minor at all locations. None of the intersections should experience any significant or unusual intersection delay. The difference in the average delay is no more than 0.5 seconds at any location. The change in the v/c ratio is at most 0.01, which is not within the statistical accuracy of the methodology.

At an unsignalized intersection, mitigation is required if a movement is LOS F, the peak hour signal warrant is met and a minimum of 10 vehicles are added to the critical movement. The addition of the project traffic will increase the side street delay at Berkeley Way and Shattuck

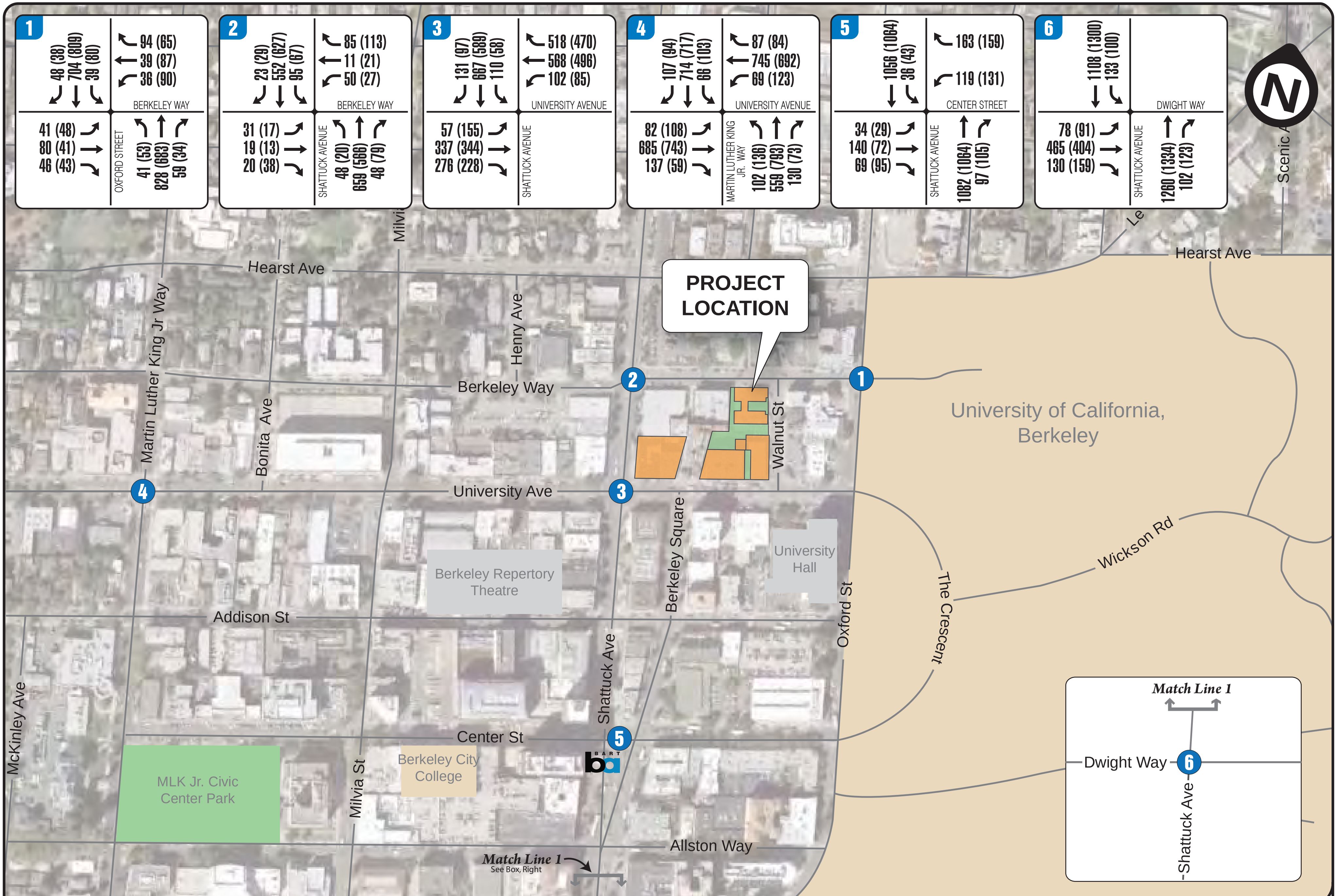

FIGURE 11

CUMULATIVE PLUS PROJECT (2035) TRAFFIC VOLUMES

AM (PM) PEAK HOUR

TRAFFIC IMPACT STUDY

Acheson Commons

City of Berkeley

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Avenue. The traffic from the project represents a 30% increase in the left turn volume from Berkeley Way onto Shattuck Avenue during the PM peak period. However, the project represents about a 2% change to the overall intersection volumes and the traffic signal warrant (and the impact criteria) are not met at this intersection under Cumulative plus Project conditions. It is important to note that the project is not expected to result in any noticeable changes to traffic operations or delay on Shattuck Avenue.

6. PARKING

This section describes the current parking conditions in downtown Berkeley. The existing parking conditions have three components: 1.) on-street parking (generally metered), 2.) public parking lots, and 3.) private off-street parking lots. It also discusses the City of Berkeley's zoning and parking standards and the specific parking conditions in the vicinity of the project. The Acheson Commons project plans to provide 50 off-street spaces within the project. This amount of parking is sufficient to accommodate the parking needs of Acheson Commons.

Existing Conditions

On-Street Parking Conditions Near the Project Site

On-street parking occupancy surveys were conducted on both weekdays and weekends in September and October of 2010 when schools were in session. A total of 21 block faces in the vicinity of the project site were surveyed. Where the street parking is not marked, the number of parking spaces was estimated by measuring block lengths and assuming approximately 25 feet per space. The survey results are shown in **Table 10**.

The on-street parking occupancy surveys show that there are 294 parking spaces within a two-block radius of the project. The project area parking, within this two-block radius, is approximately 70% full during the weekday morning peak period between 10:30 AM and 11:30 AM, leaving approximately 87 of the on-street parking spaces available for parking during this peak period. However, during the evening peak period, after 7:00 PM, the project area has approximately 53 on-street parking spaces available and is approximately 82% full. Overall, by combining this surplus of on-street parking with the on-site parking supply, the project is expected to have enough short-term and long-term parking available between 9:00 AM to 7:00 PM.

The project is partially located in the Residential Permit Parking Area (Area E), which limits parking to 2-hours only, unless a residential permit parking or visitor permit is properly displayed in the vehicle. The Area E parking area is restricted to 2-hour parking between 8:00 AM and 7:00 PM. Some limited, unrestricted on-street parking is available after 7 PM. for the residents of the proposed project. Therefore, the project is expected to have enough long-term parking available after 7:00 PM. Traffic engineers typically consider an occupancy rate of 90 % or more to be "full". This shows that on-street parking is 82% occupied during the morning peak period in the vicinity of the proposed project. However, ample parking spaces are available during the evening peak period after 7:00 PM. After 7:00 PM, the surveys show that there will be approximately 55 unrestricted street spaces for the residents of the proposed project to park in. It would most likely be the visitors that will be utilizing the on-street parking. **Figure 12** depicts a sample of our on-street and off-street parking study results. This figure in particular shows the results of our Thursday, August 31 count taken between 11 AM and noon, which is fairly representative of the parking conditions.

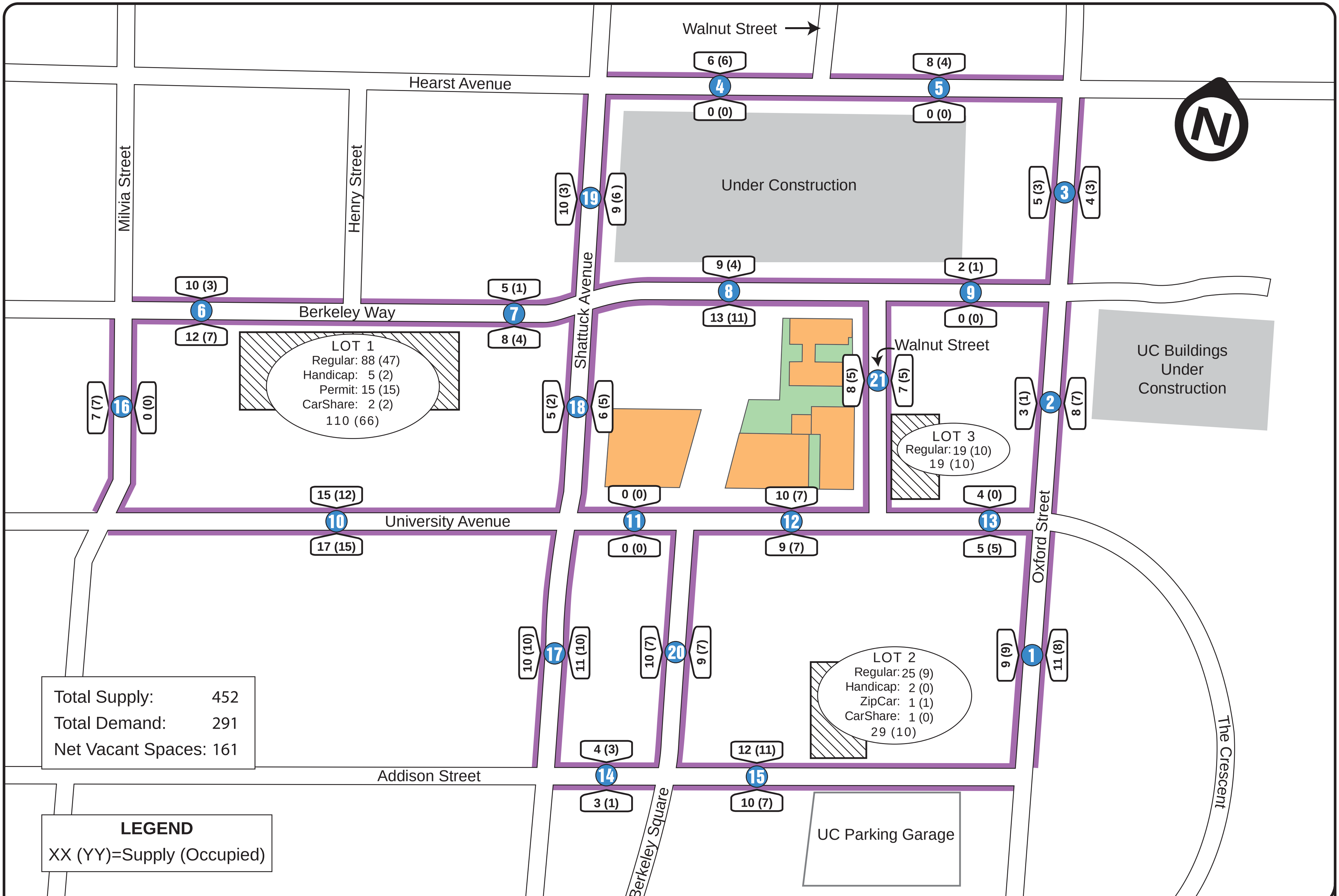

FIGURE 12

SAMPLE OF ON-STREET AND OFF-STREET PARKING DATA

TUESDAY, 8/31 11AM-NOON

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Table 10: On-Street Parking Survey Summary

Street	Side of Block	Parking Capacity	Number of Occupied Spaces						
			Thurs. 8/26/10 3:30-4:30 PM	Tue. 8/31/10 11:00 AM-Noon	Tue. 9/9/10 8:00-9:00 PM	Tue. 9/16/10 2:30-3:30 PM	Wed. 9/22/10 9:00-10:00 PM	Sat. 10/2/10 2:00-3:00 PM	Sat. 10/16/10 2:00-3:00 PM
Oxford St	1 West	**9**	9	9	9	9	5	5	7
	1 East	**11**	6	8	11	11	8	8	6
	2 West	**3**	2	1	3	3	3	2	3
	2 East	**8**	5	7	8	5	4	4	1
	3 West	**5**	3	3	5	2	1	2	1
	3 East	**4**	4	3	4	3	4	3	2
Hearst Ave	4 North	**6**	5	6	6	6	5	5	6
	4 South	**0**	0	0	0	0	0	0	0
	5 North	**8**	1	4	4	5	4	3	2
	5 South	**0**	0	0	0	0	0	0	0
Berkeley Way	6 North	**10**	9	3	9	8	6	4	8
	6 South	**12**	11	7	12	8	9	8	8
	7 North	**5**	3	1	4	2	4	4	1
	7 South	**8**	5	4	6	6	5	3	3
	8 North	**9**	4	4	9	3	6	4	5
	8 South	**13**	9	11	13	8	11	10	12
	9 North	**2**	2	1	2	0	2	2	1
	9 South	**0**	0	0	0	0	0	0	0
University Ave	10 North	**15**	7	12	13	4	14	13	10
	10 South	**17**	12	15	18	12	15	16	14
	11 North	**0**	0	0	0	0	0	0	0
	11 South	**0**	0	0	0	0	0	0	0
	12 North	**10**	2	7	10	3	8	9	8
	12 South	**9**	6	7	8	1	6	8	6
	13 North	**4**	0	0	3	0	3	3	3
	13 South	**5**	4	5	4	3	3	4	5
Addison St	14 North	**4**	2	3	3	4	3	4	3
	14 South	**3**	0	1	3	1	0	3	2
	15 North	**12**	10	11	12	9	9	10	10
	15 South	**10**	7	7	8	3	4	6	9
Milvia St	16 West	**7**	7	7	7	6	6	6	6
	16 East	**0**	0	0	0	0	0	0	0
Shattuck Ave	17 West	**10**	10	10	9	10	9	10	8
	17 East	**11**	11	10	10	7	8	9	9
	18 West	**5**	3	2	4	5	5	5	4
	18 East	**6**	4	5	5	3	4	5	5
	19 West	**10**	3	3	9	7	7	9	9
	19 East	**9**	2	6	9	3	7	8	9
Berkeley Sq	20 West	**10**	7	7	10	8	4	8	8
	20 East	**9**	7	7	9	6	7	7	7
Walnut St	21 West	**8**	6	5	8	3	4	3	6
	21 East	**7**	2	5	8	2	5	3	6
Off-Street Parking	**Subtotal:**	**294**	**190**	**207**	**275**	**179**	**208**	**216**	**213**
	Parking Lot 1	**110**	52	60	90	78	26	81	63
	Parking Lot 2	**29**	17	14	5	11	5	18	13
	Parking Lot 3	**19**	14	10	7	10	4	10	17
	Total:	**452**	**273**	**291**	**377**	**278**	**243**	**325**	**306**

Off-Street Parking – Private Parking Areas

Mike's Bikes (Private Parking). This parking lot is located at the corner of University Avenue and Walnut Street and is designated for Mike's Bike's, a retail bike shop. The parking lot has a total of 19 parking spaces and the hours posted for use by Mike's Bike's customers only are between the hours of 6 AM and 7 PM on weekdays and 6 AM and 6 PM on weekends.

Other Equity Properties. Equity Properties manages and controls a number of properties within a short walk of the proposed project. **Figure 13** shows the location of these properties, the number of spaces that are generally available at other Equity holdings. Please note that two Equity apartment complexes within the vicinity are not shown on the figure. These include the Acton apartments, located at 1370 University Ave., which generally have 63 spots available, and the Fine Arts apartments located at 2110 Haste Street, which were found to have about 60 spots available.

Off-Street Parking - Public Parking Areas

There are two off-street parking lots that are in the vicinity of the Acheson Project. These are:

Berkeley Way Public Parking Lot – This lot is located one block west of the site on Berkeley Way. This parking lot consists of 110 spaces, of which 88 are metered public parking, 5 are handicap, 15 are for Berkeley Way Permits, and 2 are City CarShare. The lot is metered between the hours of 7 AM and 10 PM and the Berkeley Way parking permits permits are valid between 6 AM and 6 PM. This lot could provide overnight parking for visitors to Acheson Commons.

Addison Public Parking Lot – Another parking lot within the vicinity of the project is on Addison Way between Shattuck Avenue and Oxford Street. This parking lot contains a total of 29 spaces, 2 of which are handicap, 1 for Zipcars, 1 for City CarShare, and the remaining 25 are regular spaces. The lot is metered but parkers can only be charged a maximum of $7.00 on weeknights and weekends and a maximum of $15.00 during weekdays.

Occupancy studies of these off-street parking lots in the area were also conducted. The projected parking conditions during different times of day are shown in **Table 11**.

FIGURE 13

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City of Berkeley

OTHER EQUITY APARTMENTS
WITHIN THE VICINITY OF THE PROJECT

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Table 11: Average Available Spaces Within the Project Vicinity

Time Period	On-Street Parking Spaces Available	Off-Street Parking Available (Public Parking)	Total Available Parking (Including 50 From Acheson)
Weekday Morning	87	62	199
Weekday Afternoon	110	59	219
Weekday Evening	53	76	179
Saturday-Sunday	78	58	186

Characteristics of Downtown Berkeley

The parking demand for a mixed-use residential project such as this would be generated primarily by the apartment tenants and their guests/visitors.

For this location in a central business district with excellent transit access (and located next to a major university), the parking demand will be much less than the typical ITE rate in the Parking Generation Manual. This is based on many of the same characteristics that are discussed in the trip generation section. The availability of transit, the use of bicycles, and the attractiveness of walking in the mixed-use university/downtown environment clearly results in reduced vehicle trip generation and an associated reduction in the need for parking.

Since Berkeley has numerous opportunities for public transportation and the apartment residents are not all expected to have personal vehicles, it is anticipated that a substantial portion of all travel will occur by walking, bicycling, and through the use of public transit. Despite this, however, it is expected that some vehicles would park off-site, including both on-street metered parking, and parking lots and garages, where available.

City of Berkeley Parking Practices. It has been a general practice in Berkeley to reduce the parking requirement for downtown residential projects in order to account for the extensive public bus transit system and the proximity of the nearby BART station. The actual experience of other multi-story, downtown Berkeley projects also needs to be evaluated because the area also has other unique characteristics. In this case, the proximity to the University campus and the number of school related units also needs to be considered. There is also a great deal of on-street parking in the vicinity of the project and there are several parking structures available in the area, which are open to the public. If a problem is identified then nearby off-street parking at other private properties may also be utilized. In summary, the main factors that should be considered are listed below:

- Proximity to bus transit and BART
- Proximity to a major university and various other learning institutions
- Location in a pedestrian friendly central business/commercial district
- Availability of on-street parking (due to strict enforcement of time restrictions)
- Availability of off-street public parking
- Potential for arrangements with off-street private parking lots

Parking Occupancy at Downtown Berkeley Projects. The Project Sponsor gathered parking data for comparable developments during evening peak periods when parking demand of residential use is expected to peak. Based on the data in **Table 12**, the average project had a parking ratio of 0.54 spaces per unit. One of the projects, the Gaia, had a parking ratio of 0.42 spaces per unit. The overall parking occupancy for the projects was about 75%, and most of the parking ratios were in the range of 50% to 80%. If it is assumed that 67% percent of the residential units at each project were occupied at the time of the surveys then the average occupancy comes out to be 0.52 spaces per unit.

As the number of units increase, the parking demand per unit tends to decline. Given the more favorable location with respect to transit and the proximity to UC Berkeley, it is our conclusion that the off-street parking proposal for Acheson Commons is reasonable and appropriate for downtown Berkeley.

Table 12: Parking Occupancy at Downtown Berkeley Projects

Project Title	Location	No. of Units	On-site Parking	Number Occupied
Acton Courtyard	1370 University Ave	71	63	34
ARTech	2002 Addison St	21	8	8
Bachenheimer	2119 University Ave	55	30	16
Berkeleyan	1910 Oxford St	56	25	15
Fine Arts	2110 Haste St	100	60	40
Gaia	2116 Allston Way	91	39	32
Touriel	2004 University Ave	35	5	5

Notes: The parking occupancy counts were taken during the week from Wednesday, 8/31/10 through Tuesday, 9/6/10.

Parking Conditions at Other Equity Residential Properties. Data has been compiled at several other Equity properties in downtown Berkeley. At each of these projects, there is a reduced parking supply from the City's zoning code. Equity has a number of similar projects where the amount of parking provided does not comply with the City's zoning code. A survey of these parking areas suggests that these counts are indicative of a time period where there is above average occupancy. At all sites, with the exception of the very small ones, the number of occupied spaces were substantially less than the capacity.

Analysis of Project Parking

The parking zoning regulations and standards in Berkeley that could be applied to the Acheson Commons project are the following:

Residential	one (1) space per 1,000 square feet
Office	two (2) spaces per 1,000 square feet
Food Services	one (1) space per 300 square feet (3.3 spaces per 1,000 sf)
Retail	two (2) spaces per 1,000 square feet

Currently the project site supports approximately 64,500 square feet of space with only 15 parking spaces. The following is a breakdown of the potential zoning requirements for the existing site: 6,000 square feet is devoted to residential uses (requires 6 spaces), 18,664 is office (requires 37 spaces), 15,832 is food service (requires 53 parking spaces), and 24,022 is retail (requires 48 spaces). These features are also listed below.

Existing Conditions

Land Use	Parking Standard
6,000 sf of residential	6 spaces
18,664 sf of office	37 spaces
15,832 sf of food service	53 spaces
24,022 sf of retail	48 spaces
Total	144 parking spaces

Using the same standards, a calculation of the parking requirement for the proposed Acheson Commons project is shown below.

Proposed Project

Land Use	Parking Standard
140,000 sf of residential	140 spaces
9,730 sf of food service	32 spaces
23,522 sf of retail	47 spaces
Total	219 parking spaces

Section 23E.36.080 specifies that "*The number of off-street Parking Spaces required for the commercial portion of Mixed Use projects, which combine Retail Products Stores and/or Personal Household Services, and Multi-family Residential Uses within the same building or located on the same lot (or contiguous lots as part of the same project) may be modified or waived by the Board by approval of a Use Permit, in lots on blocks adjacent to University Avenue*". In this case the applicant is requesting credit for existing uses on the site that would be displaced. If this credit were approved and applied for existing uses the resulting requirement would be for 75 parking spaces.

The ITE Parking Generation Manual[1] contains parking statistics for a wide range of land uses. However, there are no studies of downtown, mixed use projects such as Acheson Commons. If this project were located in a suburban, auto-oriented area with no shared parking the ITE average peak parking demand rate would be 1.23 spaces per unit for apartments and 3.76 spaces per 1,000 square feet of commercial space based on surveys of mostly (87%) suburban commercial sites contained. The ULI and other references recommend that parking supply be determined on a case-by-case basis. For this reason, the following analysis has been developed:

Changes in Land Use and Floor Areas. The existing buildings are legal non-conforming in that they do not provide the parking required by the current zoning ordinance. Pursuant to the zoning ordinance, the parking requirements for Acheson Commons are based on the new floor area plus any changes of use that involve higher parking requirements. Based on this

[1] *Parking Generation – An Informational Report*, 3rd Edition, Institute of Transportation Engineers, Washington D.C., 2004.

methodology, the current property, which includes residential, office, food service and retail land uses, would require 144 off-street parking spaces. With the requirement of 219 spaces for the new land use, and a credit of 144 spaces for the legal non-conforming aspects of the previous land uses, the net new parking requirement would be 75 spaces.

The proposed project will reduce the food service floor area from 15,832 square feet to less than 10,000 square feet. The total retail will be reduced by 500 square feet from 24,022 square feet to 23,522 square feet. The office use will be eliminated entirely and replaced with a residential floor.

Findings

Based on our review of available data and City of Berkeley standards the proposed off-street parking supply (50 spaces) would be sufficient to ensure there are no significant impacts on the surrounding streets. **Table 13** presents the unadjusted parking requirements as specified by the City of Berkeley Municipal Code and Zoning Ordinance and Tables 14 through 16 provide detailed parking demand calculations using three additional methodologies. Please note that the calculations of the zoning requirements in Table 13 are preliminary and have not yet been approved by the City.

Table 13
Off-Street Parking Calculations Using City of Berkeley Zoning Requirements

No.	Scenario	Data Source	Land Use	Size		Parking Ratio	Required Spaces
1	Existing Conditions	City of Berkeley	Apartments	6,000	sq. ft.	1.00	6
		Zoning Requirements	Office	18,664	sq. ft.	2.00	37
			Restaurants	15,832	sq. ft.	3.33	53
			Retail	24,022	sq. ft.	2.00	48
	Subtotal of Existing Land Uses			*64,518*	*sq. ft.*		*144*
2	Proposed Project	City of Berkeley	Apartments	140,000	sq. ft.	1.00	140
		Zoning Requirements	Restaurants	9,730	sq. ft.	3.33	32
			Retail	23,522	sq. ft.	2.00	47
	Subtotal of Proposed Land Uses			*173,252*	*sq. ft.*		*219*
3	Net Change	City of Berkeley	Apartments	134,000	sq. ft.	1.00	134
	(Proposed minus Existing)	Zoning Requirements	Office	-18,664	sq. ft.	2.00	-37
			Restaurants	-6,102	sq. ft.	3.33	-20
			Retail	-500	sq. ft.	2.00	-1
	Subtotal – Net Change			***108,734***	***sq. ft.***		***75***

Section 23E.28.130 of the City of Berkeley Municipal Code allows the Zoning Officer or Zoning Adjustments Board to approve a reduction in parking within a C-1 district (in which the project is located) but it requires findings that the reduction will not substantially reduce the availability of on-street parking in the vicinity of the use. The Zoning Officer or Board must also find that at least one of each of the two groups of conditions below apply:

1. a. The use is located one-third of a mile or less from a Bay Area Rapid Transit (BART) station, intercity rail station or rapid bus transit stops; or

b. The use is located one-quarter of a mile or less from a publicly accessible parking facility, the use of which is not limited to a specific business or activity during the use's peak parking demand; or

c. A parking survey conducted under procedures set forth by the Planning Department finds that within 500 feet or less of the use, on non-residential streets, at least two times the number of spaces requested for reduction are available through on-street parking spaces for at least two of the four hours of the use's peak parking demand; or

d. The use includes one of the following neighborhood-serving uses: Retail Products Store(s), Food Service Establishments, and/or Personal/Household Service(s). These uses include, but are not limited to: Dry Cleaning and Laundry Agents, Drug Stores, Food Products Stores, Household Items Repair Shops, and/or Laundromats; and

2. a. The parking requirement modification will meet the purposes of the district related to improvement and support for alternative transportation, pedestrian improvements and activity, or similar policies; or

b. There are other factors, such as alternative transportation demand management strategies or policies in place that will reduce the parking demand generated by the use

Although the project only needs to meet just one condition in each group our review indicates the proposed project would meet all six conditions in both groups (subject to verification by the City). The project is clearly within a quarter mile of both BART and public parking lots and a parking survey has been conducted with findings indicating that more than twice the reduction in parking spaces requested (25 spaces) are typically available on street within two blocks of the site. In addition, this project also includes the specified neighborhood serving uses. But most importantly, this project is proposing to provide significant Transportation Demand Management (TDM) measures that would substantially reduce the parking demand and also satisfy the final two conditions related to alternative transportation.

Proposed Transportation Demand Management (TDM) Measures. As part of the proposal for the project the applicant has agreed to provide one transit pass for each residential unit (205 passes) which would be provided for project residents in perpetuity as a condition of project approval. In addition, another TDM measure the applicant has agreed to is a provision for a minimum of 100 secure off-street bicycle parking spaces. As per direction provided by the City, the bicycle parking would be conveniently located in a secure room accessed off of the main courtyard on the ground floor.

In addition to the planned TDM measures there are several factors that would support findings for a reduced parking requirement at this location. In addition to excellent transit access the project site is located in a downtown area with excellent walkability and numerous nearby destinations that would encourage non-auto travel. The project site is also very close to major employment centers (both existing and under construction) and is near several major educational institutions, the most significant being UC Berkeley. To account for these factors and the proposed TDM measures a 20% reduction has been applied to the residential parking requirements in **Table 14**. As seen in Table 14, with a 20% reduction to the residential parking ratio the project's proposed off-street parking (50 parking spaces) would exceed the reduced parking requirement (47 parking spaces).

Table 14
Off-Street Parking Calculations With TDM Reduction Using City of Berkeley Zoning Requirements

No.	Scenario	Data Source	Category	Size		Parking Ratio	Required Spaces
1	Existing Conditions	City of Berkeley	Apartments	6,000	sq. ft.	1.00	6
		Zoning Requirements	Office	18,664	sq. ft.	2.00	37
			Restaurants	15,832	sq. ft.	3.33	53
			Retail	24,022	sq. ft.	2.00	48
	Subtotal of Existing Land Uses			*64,518*	*sq. ft.*		*144*
2	Proposed Project	City of Berkeley	Apartments	140,000	sq. ft.	1.00	140
		Zoning Requirements	TDM Reduction	20%		-0.20	-28
			Restaurants	9,730	sq. ft.	3.33	32
			Retail	23,522	sq. ft.	2.00	47
	Subtotal of Proposed Land Uses			*173,252*	*sq. ft.*		*191*
3	Net Change	City of Berkeley	Apartments	134,000	sq. ft.	1.00	106
	(Proposed minus Existing)	Zoning Requirements	Office	-18,664	sq. ft.	2.00	-37
			Restaurants	-6,102	sq. ft.	3.33	-21
			Retail	-500	sq. ft.	2.00	-1
	Subtotal - Net Project Increase			***108,734***	***sq. ft.***		***47***

To provide additional supporting data on the estimated parking demand, the results using two other calculation methodologies have been provided. **Table 15** presents the results based on parking rates developed from surveys of other residential projects in downtown area. The results of surveys of parking occupancy at other downtown residential projects (shown in Table 10) indicate the average of the maximum occupancy recorded at each site surveyed resulted in an average occupancy rate of 0.35 spaces per unit. If it were assumed that 67% percent of the residential units at each project were occupied at the time of the surveys then the average occupancy would be 0.52 spaces per occupied unit. However, it is important to note the proposed project would be expected to have occupancy rates similar to the projects that were surveyed. As seen in Table 15, if the standard zoning requirement for residential parking is recalculated based on the average parking occupancy recorded at other downtown projects then the resulting project demand is 44 parking spaces. Please note that the standard requirements for restaurant and retail uses remain unchanged in these calculations.

To provide additional verification for the parking demand analysis, **Table 16** provides a summary of the parking demand results using standard ITE parking generation rates taken from the 4th Edition of the *ITE Parking Generation Manual*. The average peak parking demand for apartments in an urban area (1.20 vehicles per dwelling unit) was taken from page 54 of the 4th Edition of the ITE Parking Generation Manual. This rate was then reduced by 40 percent based on US Census data on vehicle ownership for a resulting rate of 0.72 vehicles per dwelling unit. Please note that ITE's Parking Generation makes it clear that the parking demand recorded at urban CND (central city) sites differed from the rates recorded at CBD (central business district) sites like the one the proposed project is located in. As shown in Tables 14 and 15, the overall increase in parking demand generated by the project (over the currently existing demand) according using ITE data is expected to be about 61 parking spaces. Based on these studies, the City of Berkeley should be able to make the findings that the proposed 50-space on-site parking lot for the Acheson Commons project is appropriate for this project.

Table 15
Off-Street Parking Calculations Using Parking Data from Downtown Residential Projects

No.	Scenario	Data Source	Land Use	Size		Parking Ratio	Required Spaces
1	Existing Conditions	Parking Data from Existing	Apartments	8	units	0.52	4
		Downtown Projects	Office	18,664	sq. ft.	2.00	37
			Restaurants	15,832	sq. ft.	3.33	53
			Retail	24,022	sq. ft.	2.00	48
	Subtotal of Existing Land Uses			*64,518*	*sq. ft.*		*142*
2	Proposed Project	Parking Data from Existing	Apartments	205	units	0.52	107
		Downtown Projects	Restaurants	9,730	sq. ft.	3.33	32
			Retail	23,522	sq. ft.	2.00	47
	Subtotal of Proposed Land Uses			*173,252*	*sq. ft.*		*186*
3	Net Change	Parking Data from Existing	Apartments	199	units	0.52	102
	(Proposed minus Existing)	Downtown Projects	Office	-18,664	sq. ft.	2.00	-37
			Restaurants	-6,102	sq. ft.	3.33	-21
			Retail	-500	sq. ft.	2.00	-1
	Subtotal - Net Project Increase			***108,734***	***sq. ft.***		***44***

If there is a need, it is important to note that the project has several options to accommodate additional parking. These would include:

On-Street Parking. There are 294 on-street parking spaces within two blocks of the project. Studies show that during the day, there are at least 94 spaces that are vacant and are available. During the evening and overnight, when the need for residential parking peaks, there are 53 spaces available on the street.

Public Parking Lots. There are two public parking areas operated by the City of Berkeley that are very conveniently located for use by Acheson Commons residents. These are the Berkeley Way Public Parking Lot and the Addison Public Parking Lot. Both of these are available to Acheson Commons. They provide hourly parking during the day and overnight parking where needed.

Table 16
Off-Street Parking Calculations Using ITE Parking Generation Rates

No.	Scenario	Data Source	Land Use	Size		Parking Ratio	Required Spaces
1	Existing Conditions	ITE Parking Demand Rates[2]	Apartments	8	units	0.72	6
			Office	18,664	sq. ft.	2.47	46
			Restaurants	15,832	sq. ft.	5.55	88
			Retail	24,022	sq. ft.	2.55	61
	Subtotal of Existing Land Uses			*64,518*	*sq. ft.*		*201*
2	Proposed Project	ITE Parking Demand Rates	Apartments	205	units	0.72	148
			Restaurants	9,730	sq. ft.	5.55	54
			Retail	23,522	sq. ft.	2.55	60
	Subtotal of Proposed Land Uses			*173,252*	*sq. ft.*		*262*
3	Net Change	ITE Parking Demand Rates	Apartments	197	units	0.72	142
	(Proposed minus Existing)		Office	-18,664	sq. ft.	2.47	-46
			Restaurants	-6,102	sq. ft.	5.55	-34
			Retail	-500	sq. ft.	2.55	-1
	Subtotal - Net Project Increase			***108,734***	***sq. ft.***		***61***

It is important to note that the provision of excess off-street parking is counter to many of the City policies. These include the desire to increase use of public transit, the desire to limit increases in vehicular traffic, the need to improve air quality and limit fuel consumption, and the desire to improve conditions for pedestrians in the area. Each of these factors, goals, objectives is described in one form or another in the City's General Plan. These policies provide additional support for making the findings to approve the Acheson Commons project as proposed.

7. WEEKEND TRAFFIC AND PARKING CONDITIONS

For the weekend analysis, traffic counts were taken at each of the six (6) study intersections on a Saturday afternoon between 12:00 PM and 3:00 PM. The Saturday afternoon conditions are considered to be representative of the traffic conditions in downtown Berkeley. **Figure 14** shows the existing intersection turning movements for the weekend period. The lane configurations are the same as has been identified for the other scenarios.

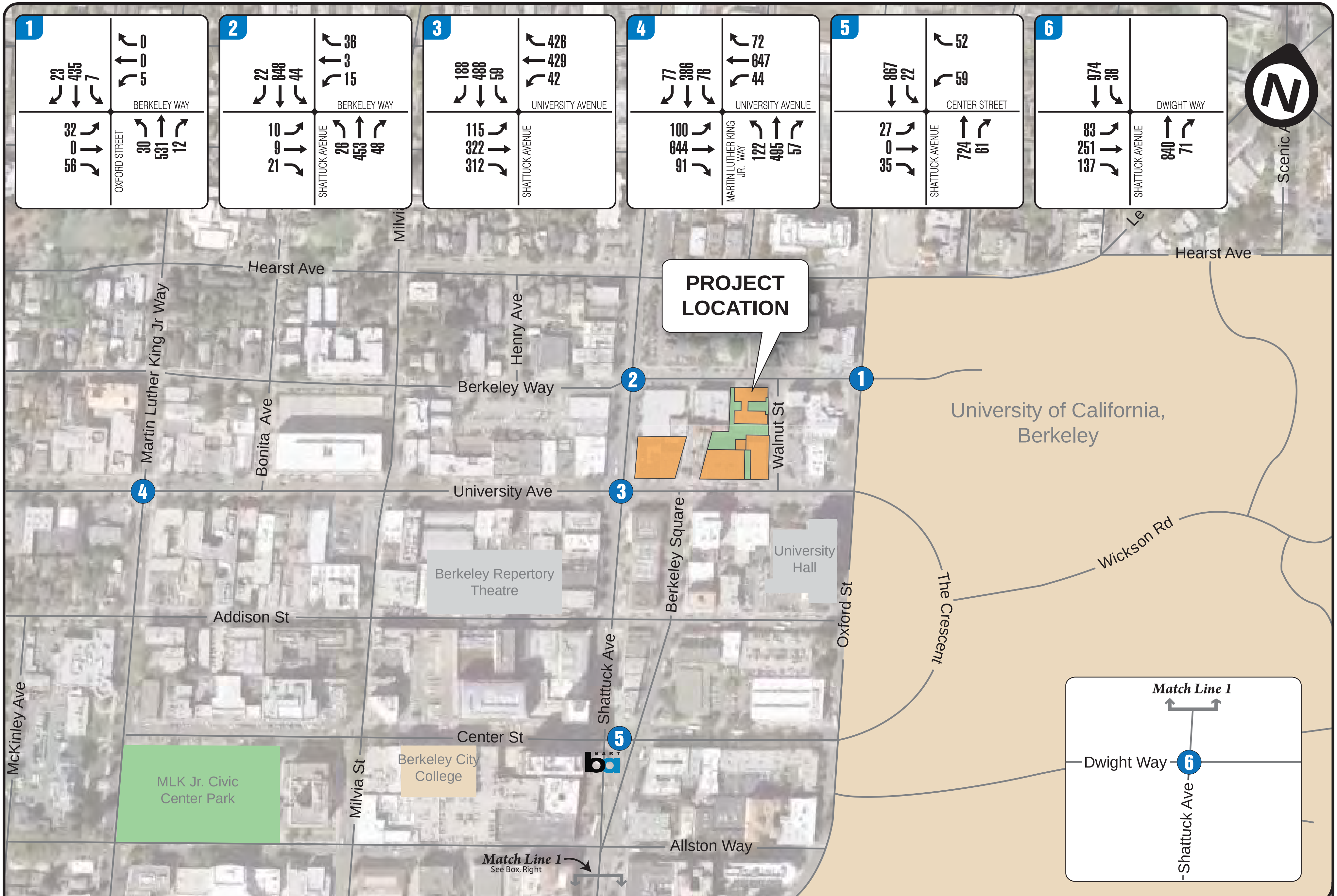

FIGURE 14

TRAFFIC IMPACT STUDY
Acheson Commons
City of Berkeley

EXISTING TRAFFIC VOLUMES
SATURDAY PEAK HOUR

Abrams Associates
TRAFFIC ENGINEERING, INC.

Existing Weekend Conditions – Level of Service Analysis

Table 17 shows the intersection capacity results that are estimated to occur during a peak hour of activity on a Saturday. Detailed calculations and queuing analyses for weekend conditions are included in the Appendix. The side street movements at Shattuck Avenue and Berkeley Way are at LOS D and the intersection doesn't meet peak hour signal warrant criteria. None of the intersections experienced any significant or unusual intersection delay during the traffic counts. At the intersections on University Avenue at Shattuck Avenue and at MLK Jr. Way, there were a number of signal cycles where a queue of up to five vehicles would occur when the green cycle was completed. In each case, the delay could be attributed to the very heavy pedestrian volumes, and conflicts with the right-turning vehicles.

Table 17: Intersection Level of Service – Existing Weekend Conditions

ID	Intersection	Traffic Control Method	Weekend Conditions		
			Existing Conditions		
			Delay	V/C	LOS
1	Berkeley Way and Oxford St	Signal	14.0	0.25	B
2	Shattuck Ave and Berkeley Way	Side Street Stop	28.2	N/A	D
3	Shattuck Ave and University Ave	Signal	13.4	0.47	B
4	University Way and MLK, Jr. Way	Signal	16.3	0.49	B
5	Shattuck Avenue and Center St	Signal (Offset)	12.5	0.34	B
6	Shattuck Avenue and Dwight Way	Signal	15.3	0.56	B

Notes: For unsignalized intersections, the delay values are for the critical minor approach. For signals, the delay values are the overall delay. Delay is expressed in seconds per vehicle. LOS = Level of Service.

Weekend Project Trip Generation

Table 18 shows the trip generation characteristics that are estimated to occur during the weekend peak hour which is typically from 2:00 to 3:00 PM on Saturday.

Existing Plus Project Weekend Conditions

This scenario is based on the number of project trips (calculated as per ITE guidelines) added to the existing weekend traffic volumes. The results are shown in **Table 19**. Detailed calculations and queuing analyses are included in the Appendix. With the addition of project trips on top of the traffic from the approved developments and the university, there are no significant impacts.

**Table 18: Weekend Vehicle Trip Generation
(Saturday, 2:00 to 3:00 PM)**

Land Use	Size	Sat Peak Hour		
		In	Out	Total
ITE Apartment Rates (Code 230)		0.26	0.26	0.52
Proposed Apartments	205 Units	70	37	107
Reduction for Non-Auto Trips (40%)		28	15	43
Subtotal		*42*	*22*	*64*
ITE Retail Rates (Code 820)		2.54	2.35	4.89
Proposed Retail Space	23,522 Sq. Ft	60	55	115
Reduction for Pass-By/Non-Auto Trips (34%)		21	19	40
Subtotal		*39*	*36*	*75*
ITE Restaurant Rates (Code 932)		7.46	6.61	14.07
Proposed Restaurant Space	9,730 Sq. Ft	73	64	137
Reduction for Pass-By/Non-Auto Trips (43%)		31	28	59
Subtotal		*42*	*36*	*78*
Total		**123**	**94**	**217**

Table 19: Intersection Level of Service – Existing Plus Project Weekend Conditions

ID	Intersection	Traffic Control Method	Existing Weekend Conditions			Existing +Project Weekend Conditions		
			Delay	V/C	LOS	Delay	V/C	LOS
1	Berkeley Way and Oxford St	Signal	14.0	0.25	B	13.8	0.26	B
2	Shattuck Ave and Berkeley Way	Side Street Stop	28.2	N/A	D	33.9	N/A	D
3	Shattuck Ave and University Ave	Signal	13.4	0.47	B	13.9	0.54	B
4	University Way and MLK, Jr. Way	Signal	16.3	0.49	B	16.5	0.50	B
5	Shattuck Avenue and Center St	Signal (Offset)	12.5	0.34	B	12.6	0.35	B
6	Shattuck Avenue and Dwight Way	Signal	15.3	0.56	B	15.2	0.58	B

Notes: For unsignalized intersections, the delay values are for the critical minor approach. For signals, the delay values are the overall delay. Delay is expressed in seconds per vehicle. LOS = Level of Service.

Existing Plus Approved Plus Project Weekend Conditions – Level of Service Analysis

The intersection capacity results show that each of the five signalized intersections will operate no worse than Level of Service B at any time during the weekend. The addition of project traffic is very minor at all locations. None of the intersections should experience any significant or unusual intersection delay as a result of the project. The difference in the average delay by adding the project is no more than 0.8 seconds at any location. The change in the v/c ratio is at most 0.02, which is very minor change within the statistical variability of the calculations.

The traffic from the project represents about a 30% increase in the left turn volume from Berkeley Way onto Shattuck Avenue during the PM peak period. However, the project represents about a 2% change to the overall intersection volumes and would not be expected to result in any noticeable changes to traffic operations or delay on Shattuck Avenue. **Figure 15** shows the intersection turning movement volumes resulting from Weekend Existing plus Approved plus Project Conditions and **Table 20** shows the LOS results for this same scenario.

Table 20: Intersection Level of Service – Existing Plus Approved Plus Project Weekend Conditions

ID	Intersection	Traffic Control Method	Existing+Approved Conditions			Existing+Approved +Project Conditions		
			Delay	V/C	LOS	Delay	V/C	LOS
1	Berkeley Way and Oxford St	Signal	14.0	0.26	B	13.8	0.27	B
2	Shattuck Ave and Berkeley Way	Side Street Stop	28.9	N/A	D	34.9	N/A	D
3	Shattuck Ave and University Ave	Signal	13.5	0.47	B	14.0	0.55	B
4	University Way and MLK, Jr. Way	Signal	16.4	0.50	B	16.6	0.51	B
5	Shattuck Avenue and Center St	Signal (Offset)	12.5	0.35	B	12.7	0.35	B
6	Shattuck Avenue and Dwight Way	Signal	15.4	0.57	B	15.4	0.59	B

Notes: For unsignalized intersections, the delay values are for the critical minor approach. For signals, the delay values are the overall delay. Delay is expressed in seconds per vehicle. LOS = Level of Service.

Year 2020 Plus Project Weekend Conditions – Level of Service Analysis

In response to a request from the Alameda County Transportation Commission a separate analysis scenario was prepared to evaluate the project's potential impacts on Year 2020 traffic conditions, The Year 2020 forecasts were developed by utilizing the latest ACCMA traffic and land use projections. The Intersection LOS analysis results for this scenario are shown in **Table 21** and figures presenting the volumes used in the calculations are included with the detailed LOS calculations in the appendix to this report. With the addition of project trips service levels for the weekday peak periods at all of the signalized study intersections are expected to remain unchanged, with a few minor increases in average delay. At an unsignalized intersection, mitigation is required if a movement is LOS F, the peak hour signal warrant is met, and a minimum of 10 vehicles is added to the critical movement. The side street movements at the intersection of Shattuck Avenue and Berkeley Way are at LOS E, however the intersection does not meet peak hour signal warrant criteria.

The changes that result from the addition of project trips are very small. All of the signalized intersections will continue to operate at Level of Service B or better and none of the intersections will violate the City's intersection capacity standards.

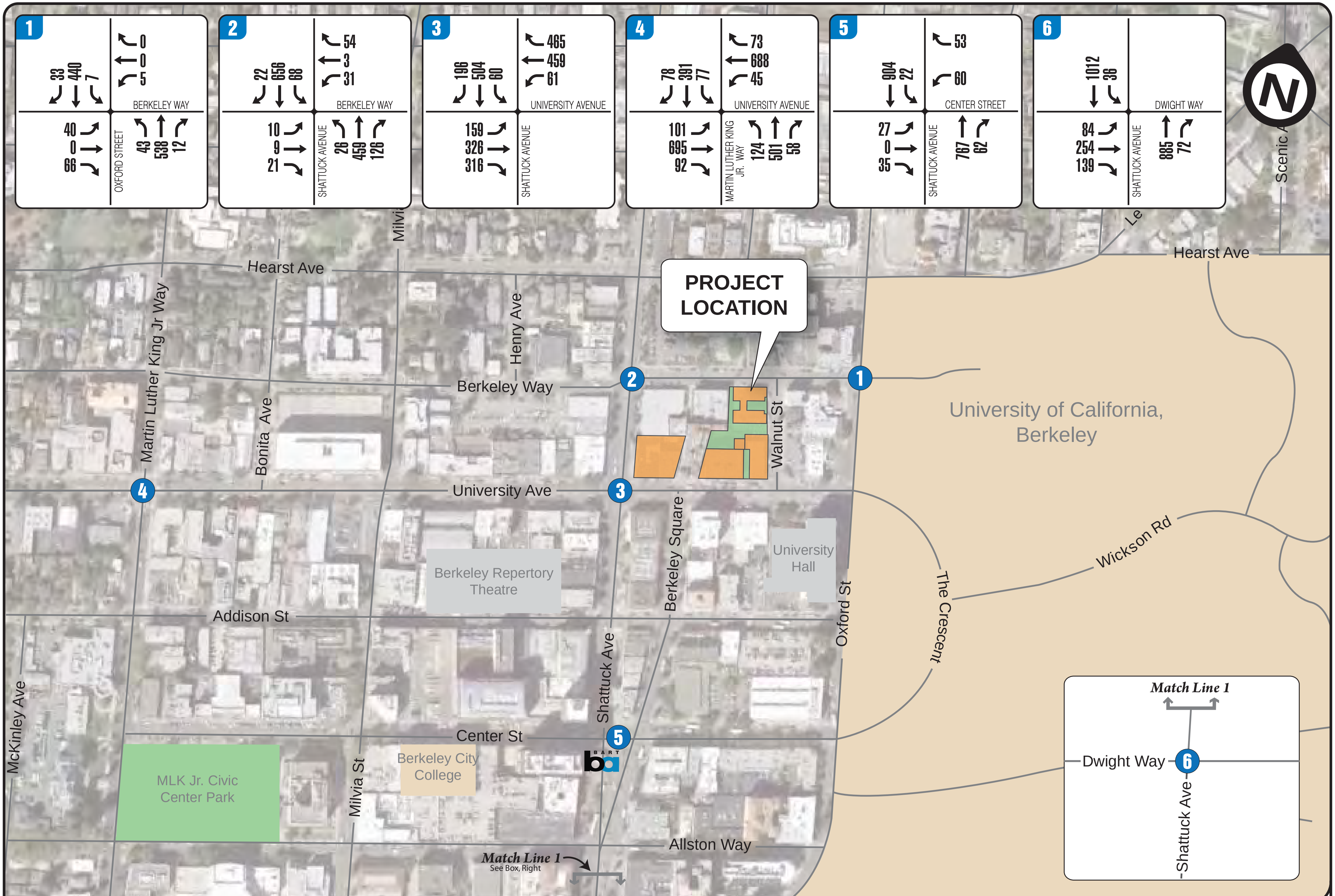

FIGURE 15

EXISTING PLUS APPROVED PLUS PROJECT TRAFFIC VOLUMES
SATURDAY PEAK HOUR

TRAFFIC IMPACT STUDY
Acheson Commons
City of Berkeley

Abrams Associates
TRAFFIC ENGINEERING, INC.

Table 21: Intersection Level of Service – Year 2020 Plus Project Weekend Conditions

ID	Intersection	Traffic Control Method	Year 2020 Weekend Conditions			Year 2020 +Project Weekend Conditions		
			Delay	V/C	LOS	Delay	V/C	LOS
1	Berkeley Way and Oxford St	Signal	12.9	0.25	B	12.9	0.26	B
2	Shattuck Ave and Berkeley Way	Side Street Stop	29.1	N/A	D	35.2	N/A	E
3	Shattuck Ave and University Ave	Signal	13.3	0.47	B	13.6	0.53	B
4	University Way and MLK, Jr. Way	Signal	16.3	0.49	B	16.4	0.51	B
5	Shattuck Avenue and Center St	Signal (Offset)	12.0	0.34	B	12.1	0.35	B
6	Shattuck Avenue and Dwight Way	Signal	15.1	0.57	B	15.2	0.58	B

Notes: For unsignalized intersections, the delay values are for the critical minor approach. For signals, the delay values are the overall delay. Delay is expressed in seconds per vehicle. LOS = Level of Service.

Cumulative (2035) Weekend Conditions – Level of Service Analysis

Abrams Associates developed the 2035 traffic forecast by utilizing the latest ACCMA traffic and land use projections. The model data was used to estimate a growth increment to 2035. This increment was added to existing turning movement volumes proportionately based on existing left, through, and right turn volumes at the study intersections. The individual turning movements were summed and compared to the model link volumes for calibration.

Figure 16 illustrates the resulting Cumulative 2035 turning movement volumes at each of the six (6) study intersections and **Figure 17** shows the Cumulative plus Project turning movement volumes. Intersection capacity results were calculated for each intersection, and the results are shown in **Table 22** for both Cumulative and Cumulative plus Project scenarios.

Table 22: Intersection Level of Service – Cumulative (2035) Weekend Conditions

ID	Intersection	Traffic Control Method	Cumulative Conditions			Cumulative + Project Conditions		
			Delay	V/C	LOS	Delay	V/C	LOS
1	Berkeley Way and Oxford St	Signal	13.2	0.27	B	13.1	0.28	B
2	Shattuck Ave and Berkeley Way	Side Street Stop	35.2	N/A	E	43.8	N/A	E
3	Shattuck Ave and University Ave	Signal	13.8	0.51	B	14.2	0.58	B
4	University Way and MLK, Jr. Way	Signal	16.9	0.54	B	17.0	0.56	B
5	Shattuck Avenue and Center St	Signal (Offset)	12.2	0.37	B	12.3	0.38	B
6	Shattuck Avenue and Dwight Way	Signal	16.1	0.61	B	16.2	0.62	B

Notes: For unsignalized intersections, the delay values are for the critical minor approach. For signals, the delay values are the overall delay. Delay is expressed in seconds per vehicle. LOS = Level of Service.

The intersection capacity results shown in **Table 22** indicate that each of the five signalized intersections that have been studied will operate at Level of Service B under weekend cumulative traffic conditions. None of the intersections were shown to exhibit any significant or

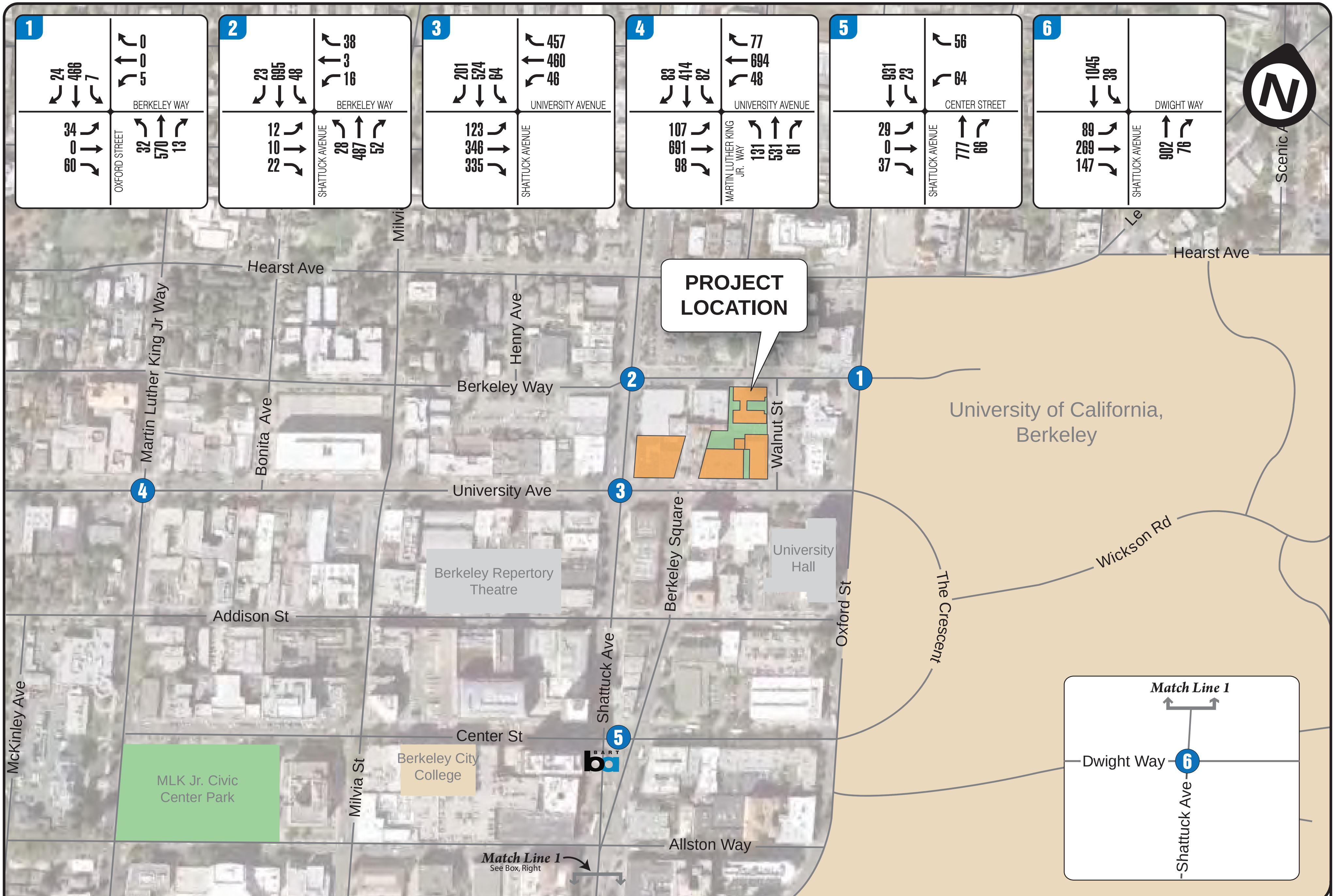

FIGURE 16

CUMULATIVE TRAFFIC VOLUMES
SATURDAY PEAK HOUR

TRAFFIC IMPACT STUDY
Acheson Commons
City of Berkeley

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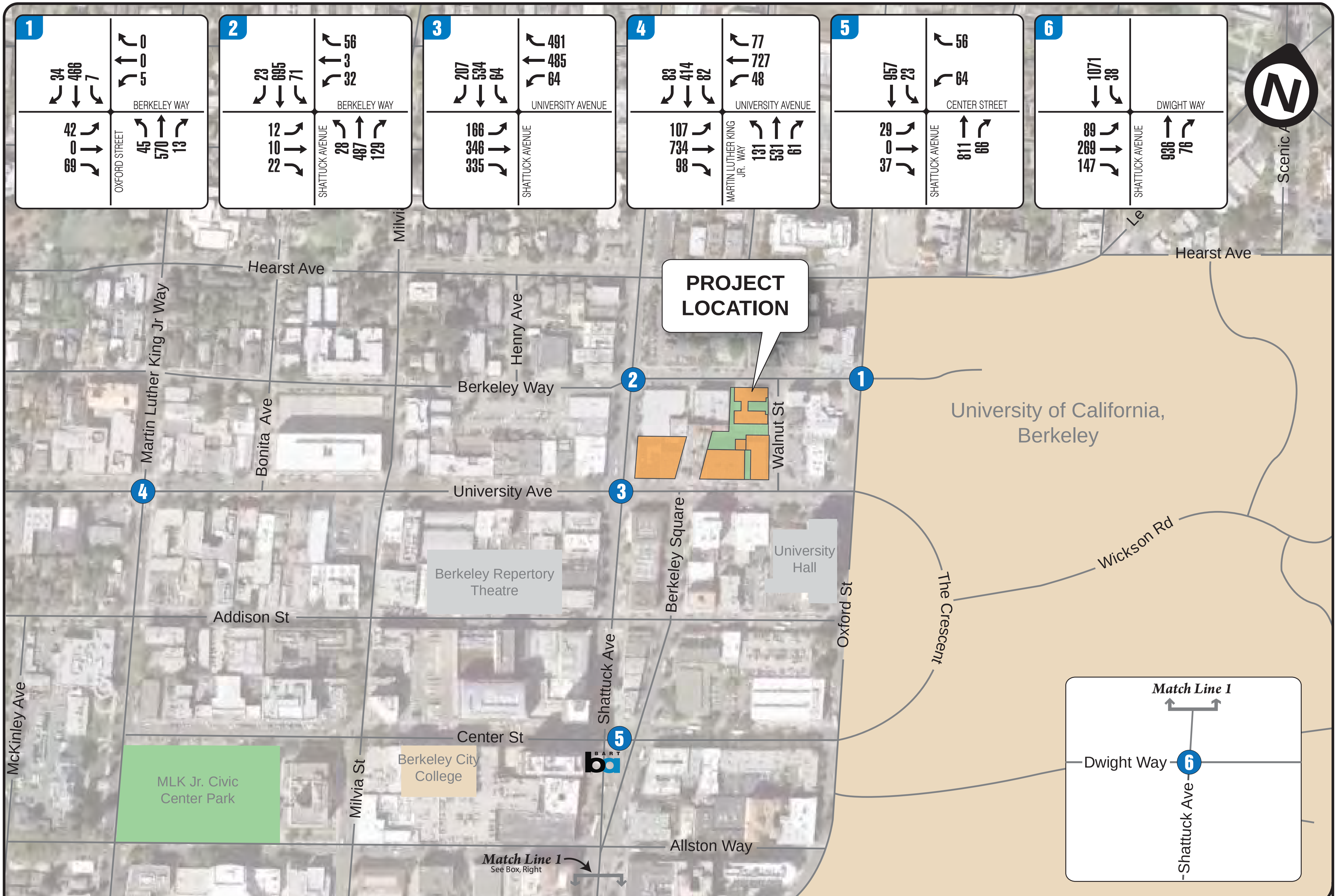


FIGURE 17

TRAFFIC IMPACT STUDY
Acheson Commons
City of Berkeley

CUMULATIVE PLUS PROJECT TRAFFIC VOLUMES
SATURDAY PEAK HOUR

Abrams Associates
TRAFFIC ENGINEERING, INC.

unusual intersection delay. However, based on the cumulative traffic forecasts the unsignalized intersection at Berkeley Way and Shattuck Avenue will be approaching to the threshold where a traffic signal could be warranted. However, it is important to note that meeting one of the traffic signal warrants only means that a traffic signal should be considered. It is also possible that the delays at this intersection could be addressed by restricting side street approaches to right turn only.

There are numerous factors that the City will ultimately need to consider when making the decision on whether or not to install a traffic signal at this location. These factors include safety, delay, queuing, pedestrian access, and the overall travel patterns in the area. For example, installing a signal at this location could make Berkeley Way a more attractive route for through traffic which could result in the diversion of traffic from University Avenue onto various residential streets. As mentioned previously, another option would be to restrict the side street approached to right turns only. Since the project represents about a 2% change to the overall intersection volumes it would not be expected to result in any noticeable changes to traffic operations or delay on Shattuck Avenue.

Weekend Parking Conditions

Parking conditions were surveyed at several times on weekends. The results are listed in **Table 23**. The parking area that was studied was shown previously in **Figure 11**. The parking studies covered approximately 10 blocks and included 294 on-street spaces.

Table 23
Weekend Parking Occupancy

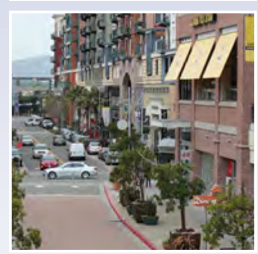
	No of Spaces	Number occupied on Saturday at 2:00 PM	Percent Occupancy
On-Street Parking	294	213	72.4%
Berkeley Way Public Parking Lot	110	63	57.2%
Addison Street Public Parking Lot	29	13	44.8%
Mike's Bikes	19	17	89.4%
Total	452	306	67.7%

The parking conditions on a weekend show a similar overall occupancy, but there are some differences in where people desire to park.

GETTING TRIP GENERATION RIGHT

Eliminating the Bias Against Mixed Use Development

By Jerry Walters, Brian Bochner, and Reid Ewing



American Planning Association

Making Great Communities Happen

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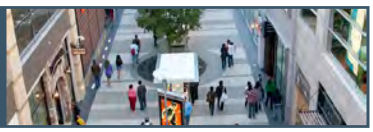
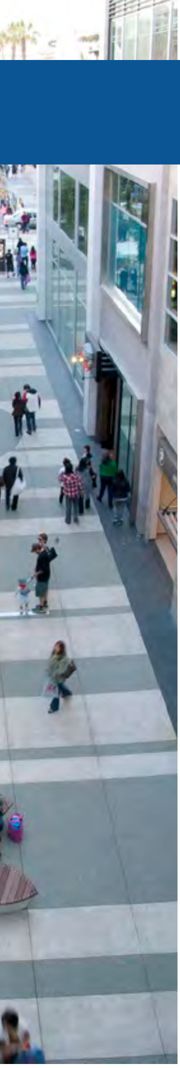




When planners, developers, or traffic engineers conduct traffic impact analyses for proposed developments, they typically use the trip-generation data and analysis methods published by the Institute of Transportation Engineers (ITE) in its *Trip Generation* report and *Trip Generation Handbook*. However, standard traffic engineering practice does not account for project characteristics such as the mix and balance of land uses, compactness of design, neighborhood connectivity and walkability, infill versus remote location, and the variety of transportation choices offered. This can have significant implications when the project in question is a mixed use development.

The conventional methods used by traffic engineers throughout the U.S. to evaluate traffic impacts fail to account for the benefits of mixed use and other forms of lower-impact development. They exaggerate estimates of impacts and result in excessive development costs, skewed public perceptions, and decision maker resistance. These techniques overlook the full potential for internalizing trips through interaction among on-site activities and the extent to which development with a variety of nearby complementary destinations and high-quality transit access will produce less traffic. These effects can reduce the number of vehicle trips generated to a far greater degree than recognized in standard traffic engineering practice.

The ITE trip-generation data and analysis methods apply primarily to single-use and freestanding sites, which limits their applicability to compact, mixed-use, transit oriented developments (ITE 2004, 2012). The *Handbook* does include an approach based on limited data on mixed use developments, but only from six sites in Florida, not nearly enough to cover today's diverse mixed use developments across the United States.

It is important that planners and developers recognize the implications of using standard ITE trip generation data and methodologies for mixed use developments and use methods that more accurately estimate traffic generated by these projects. Commonly used methods unjustifiably favor types of development that consume greater resources and generate greater impacts, shifting our attention away from development forms and locations that stimulate higher levels of social interaction and benefit to established communities.

Researchers have attempted to analyze how a mix of uses in a compact, walkable project design affects trip generation and on-the-ground traffic impacts. In 2011, two major studies introduced methodologies for predicting traffic generation from mixed use development. The researchers on those studies have now collaborated to combine the advantages of both and provide, in this *PAS Memo*, an even more complete and reliable approach to measuring the benefits of such forms of development. Using this new approach, planners conducting trip-generation analysis for mixed use development projects will produce more accurate forecasts of traffic generation, which will allow more appropriate on-site design features and off-site mitigation measures.

The Problem with Conventional Traffic Impact Analysis

Traffic analysis is intended to inform planners, community members, and public officials of the most suitable planning features and infrastructure elements needed to support new development. However, the conventional methods were developed during an era when most new development was single use, stand alone, highway oriented, and suburban. Standard practices ascribe similar levels of impact to mixed-use, integrated, transit-oriented, and infill development, and consequently overlook the benefits of — and impose unreasonable obstacles to — appropriate planning and approval of such "smart growth" forms.

The standard analytic process used for planning, design, and impact analysis does not account for the degree to which well-designed mixed use development places shops, restaurants, offices, and residences in close proximity to one another, shortening internal trips between them and making more trips conducive to walking, biking, or riding transit. Such reductions in traffic and vehicle miles traveled reduce fuel consumption, greenhouse-gas and other emissions, and exposure of residents to passing traffic and the related threats to comfort, health, and safety. Reduced vehicular travel can also lessen the need to construct new or wider streets and highways, allowing communities to economize on infrastructure. Mixed use developments (MXD) also create opportunities for shared parking, which can reduce the number of spaces needed in parking lot and garage construction.

Traffic-Reducing Attributes of Mixed Use Development

Many of the attributes of lower-impact development can reduce traffic generation compared with conventional single-use suburban development forms:

Diverse land uses and activities can fill basic needs nearby, thereby reducing automobile travel. They allow for linkage of trips in multipurpose trip chains, with a single auto trip to an activity center followed by several short trips on foot. Mixed use sites also create the opportunity for shared parking, which in turn encourages multipurpose trips and reduces the tendency to make separate automobile trips from one destination to the next.

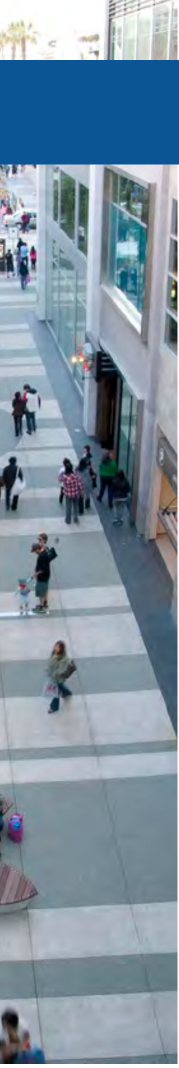
Higher densities and intensities of development provide opportunities for residents, employees, and visitors to circulate among larger numbers of businesses and activities by walking, bicycling, or making short trips by automobile. Higher concentrations of land use also support higher quality and higher-frequency transit service, offering tenants and visitors a viable alternative to driving. High land values and cost to provide parking also leads to higher parking prices, a disincentive to driving versus other available modes of travel.

Walkable urban design and interconnected streets generally reduce the perceived and real separation among destinations, encourage walking and cycling, and reduce the circuitousness and length of each trip.

Short distances to transit help make transit a viable alternative to the automobile and can create activity centers with sufficient street life, amenities, and walking connections where needs and entertainment can be accomplished without independent car trips.

Accessibility to complementary destinations outside the development reduces distances between jobs and housing, services and entertainment, and recreation, often making automobile travel unnecessary. Placed at infill locations, complementary new development that satisfies local needs can also reduce trip making by residents, employees, and shoppers in the surrounding community.

Socio-demographic compatibility can further reduce auto traffic to the extent that developments are designed to attract and accommodate residents with low auto ownership (through, for example, parking supply limits), low travel needs (based on, for example, family size,



fewer employed residents, lower income, or age range), or close affiliation with other project elements or surrounding land uses (linked, or simply compatible, jobs and residents).

Scale of development affects feasibility for communities and employers to provide travel demand options and management services that can shift traveler modes from the auto to alternative modes of travel. Residents and businesses that self-select into such sites and settings are also often more amenable to travelling less or using alternatives to the automobile. Transportation demand management (TDM) programs are both more likely to be available and more likely to be successful in compact, central, transit-supported settings.

The danger of using traditional traffic-generation data based on single-use facilities is that it misrepresents the true traffic generation impacts of mixed use development. The consequences of miscalculating the benefits of mixed-use development may include unreasonable development cost, exaggerated impacts and mitigation responsibilities, skewed public perceptions, and decision maker resistance. This penalizes mixed use development proposals, often tipping the balance in favor of projects that offer fewer benefits and ultimately generate higher impacts. Denying "smart" forms of development does not reduce the overall market demand for housing and business, so the building disallowed ends up in other locations within the region, often in less accessible locations, at lower densities, and in less-mixed use configurations. The end result can be more traffic and higher regional vehicle-miles traveled than had the smart-growth development been approved.

Understandably, communities and public reviewers want to minimize the risk of unmitigated impacts. However, doing so through the application of overly conservative project evaluation criteria undermines the pursuit of other community values, such as vibrant neighborhoods with integrated development and activities that minimize the need to travel and the impacts produced by excessive unnecessary use of the automobile.

Conservative traffic-generation estimates have supply-side impacts, affecting design and cost of streets and parking. Within constrained sites, over design of traffic elements can limit the space available for revenue-producing land uses and increase other development costs. Development fee programs also rely heavily on traffic-generation estimates from the ITE *Trip Generation Manual*; this can lead to setting excessively high fee rates on mixed use development. Unquestioning use of the ITE data can unreasonably jeopardize a MXD project's approval, financial feasibility, and design quality.

Mixed use sites can take many forms, but all offer a diversity of uses in walkable settings. Oakland City Center BART (left); RiverPlace, Portland, Oregon (opposite page).

New Research Evidence for Mixed Use Development Trip Generation

Several hundred studies over the past 20 years have confirmed that the built environment affects travel generation (Ewing and Cervero 2010). Development features associated with reduced trip rates include a series of "D" variables: density, diversity of uses, design of urban environment, distance from transit, destination accessibility, development scale, demographics of inhabitants, and demand management. In the past three years, research has examined more directly the relative influence of each factor and their interactions and has sought to corroborate the research results through field verification. Organizations such as the U.S. Environmental Protection Agency and the National Academy of Sciences Transportation Research Board have sponsored several of the more reputable studies on the subject.

The Eight "D" Variables

The most advanced research has confirmed that trip rate reductions are quantifiably associated with the attributes of mixed use development, defined in terms of these characteristics of urban development patterns:

Density: dwellings, jobs per acre. Higher densities shorten trip lengths, allow for more walking and biking, and support quality transit.

Diversity: mix of housing, jobs, retail. A diverse neighborhood allows for easier trip linking and shortens distances between trips. It also promotes higher levels of walking and biking and allows for shared parking.

Design: connectivity, walkability. Good design improves connectivity, encourages walking and biking, and reduces travel distance.

Destinations: regional accessibility. Destination accessibility links travel purposes, shortens trips, and offers transportation options.

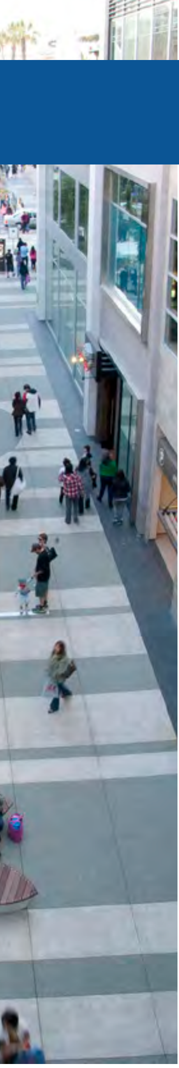
Distance to Transit: rail proximity. Close proximity to transit encourages its use, along with trip-linking and walking, and often creates accessible walking environments.

Development Scale: residents, jobs. Appropriate development scale provides critical mass, increases local opportunities, and supports transit investment.

Demographics: household size, income. Mixed use development allows self-selection by households into settings with their preferred activities and travel modes, allows businesses to locate convenient to clients, and supports a socioeconomic "fit" among residents, businesses, and activities.

Demand Management: pricing, incentives. Demand management ties incentives to the urban environment and allows alignment of auto disincentives with available alternate modes. It takes advantage of critical mass of travel resulting from density, diversity, and design.

A growing body of evidence indicates that these factors, individually or together, quantifiably explain the number of vehicle trips and vehicle-miles traveled for a development project and for a region as a whole. Each of the D factors influences traffic generation through a variety of mechanisms. There are also important interactions, both synergistic and mutually dampening, among the D factors that call for sophisticated techniques when quantifying the travel generation effects of different combinations proposed in any project or plan.



The Evidence that Conventional Methods Overstate MXD Impacts

Empirical evidence and research provides evidence that mixed-use, infill, and transit-oriented developments generate fewer external vehicle trips than equivalent stand-alone uses. A nationwide study sponsored by the U.S. EPA (Ewing et al. 2011) found statistical correlation between the D factors and increased trip internalization and increased walking and transit use. It further demonstrated, for 27 mixed-use development sites across the U.S., that:

1. On average, the sites' land uses would generate 49 percent more traffic if they were distributed among single-use sites in suburban settings, the situations to which the ITE *Trip Generation Manual* would apply.

2. The ITE *Handbook*, the current state-of-practice resource for estimating mixed use trip generation, would overestimate peak hour traffic by an average of 35 percent.

Atlantic Station offers residential units alongside walkable office and commercial space.

The following examples from recent studies demonstrate the degree by which such developments reduce traffic generation relative to what would be presumed under conventional traffic analysis methods.

Atlantic Station in Atlanta is a major mixed-use infill development located on a 138-acre former brownfield site in midtown Atlanta, connected by nonstop shuttle service to a MARTA metro rail station about a half-mile away. At the time it was studied, the development included 798 mid- and high-rise residential units, 550,600 square feet of office space, 434,500 square feet of retail space, a 101-room hotel, a restaurant, and a cinema.

For Atlantic Station, the "internal capture rate" (proportion of generated trips that remain internal to the site) is 15 percent in the morning peak hour and about 40 percent of evening peak-hour. Of the trips entering and leaving the site, between 5 and 7 percent use transit and another 5 to 7 percent walk or bicycle.

According to standard ITE trip-generation rates, were the Atlantic Station development elements located at single-use suburban sites, they would generate 37 percent more weekday traffic and 69 percent more PM peak traffic than actually counted at the centrally located, mixed use site.

RiverPlace in Portland is an award-winning mixed use waterfront development on a former brownfield within easy walking distance of downtown Portland, Oregon. Adjacent to the Tom McCall Waterfront Park, the site contains 700 residential units (condominiums and apartments), 40,000 square feet of office space, 26,500 square feet of small retail shops and restaurants, a 300-room hotel, and a marina, cinema, and athletic club. The waterfront walking environment conveniently links all of the activities within the development site and connects the site to the Portland central business district. Transit is also available at the site; the Portland Streetcar connects RiverPlace to downtown Portland and the greater Portland area.

RiverPlace (left) offers a mix of residential, office, and commercial uses on Portland's waterfront. Photo courtesy Fehr & Peers. Bay Street's walkable urban village (below) is designed on a Main Street theme.

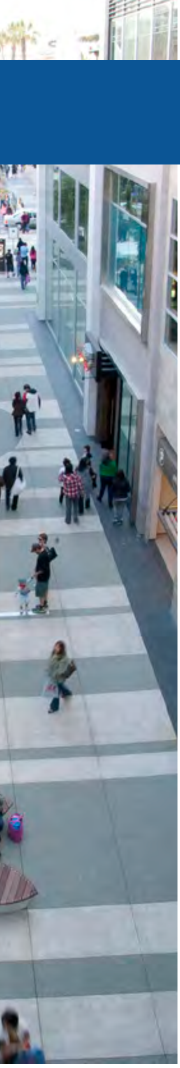
RiverPlace's internal capture rate is 36 percent. For internal and external trips combined, 40 percent are by walking and 5 percent by transit. These statistics are significantly higher than the regional averages of 15 percent of trips taken by walking and 2 percent by transit.

Bay Street in Emeryville is a vibrant, thriving recent redevelopment project in Emeryville, California, just outside San Francisco. The previously heavy-industrial area within and around Bay Street has undergone dramatic revitalization in the past two decades, and it now includes the headquarters of Pixar Studios and other businesses. Bay Street itself is a one-million-square-foot walkable urban village designed on a Main Street theme. It contains a major theater complex, hotel, and 382,000 square feet of fashionable retail shops (including an Apple Store) with 381 apartment units and offices above. The site is within walking distance of a Capitol Corridor commuter rail station and within a shuttle bus ride of BART metro rail.

Bay Street's daily traffic generation is about 41 percent less than the combined total that would be generated by similarly sized suburban shopping centers, theater complexes, residential uses, and office developments based on standard ITE trip rates for stand-alone land uses. It also generates 36 percent less daily traffic than would be estimated by traffic engineers applying the ITE *Handbook* and conventional analysis methods. In the PM peak hour, Bay Street traffic generation is 46 percent lower than would be generated by the same land uses scattered on individual suburban sites, and 41 percent lower than would be estimated by standard ITE traffic analysis.

New Models for Mixed Use Development Traffic Analysis

To address the shortcomings in conventional analysis methods, the National Cooperative Highway Research Program (NCHRP) and the U.S. EPA recently conducted significant research studies to improve quantification of the trip-reducing effects of mixed use development. Each study took a different approach: NCHRP undertook extensive visitor surveys and traffic counts at Atlantic Station and two mixed-use developments in Texas (Bochner et al. 2011), while EPA sponsored a nationwide study of more than 260 mixed use developments across the U.S. using regional travel survey data and verification traffic counts at a subset of the sites (Ewing et al. 2011). Using different analysis methods, each study developed a recommended approach to discounting traffic generation estimates to account for the mix of uses and other development characteristics. Each study represents a major advancement over conventional analysis methods.



NCHRP Report 684

National Cooperative Highway Research Program (NCHRP) Report 684, "Enhancing Internal Trip Capture Estimation for Mixed-Use Developments," analyzed internal-capture relationships of MXD sites and examined the travel interactions among six individual types of land uses: office, retail, restaurant, residential, cinema, and hotel. The study looked at three master-planned developments: Mockingbird Station, a single-block TOD in Dallas; Legacy Town C enter, a multiblock district in suburban Plano, Texas, containing fully integrated and adjacent complementary uses; and Atlantic Station (see above). It compared the survey results to those found in prior ITE studies at three Florida sites, Boca del Mar, Country Isles, and Village Commons, all containing a variety of land uses, though in single-use pods.

Based on traveler and vehicle counts and interviews, the study ascertained interactions among the six land-use types of interest and compared them with site characteristics. It then examined the percentage of visitors to each land-use type who also visited each of the other uses during the same trip. The study considered site context factors and described percentage reductions in sitewide traffic generation that might result from the availability of transit service and other factors.

Researchers then performed verification tests by comparing the analysis results to those available from ITE for three earlier studies at Florida mixed use sites. The validation confirmed that the estimated values were a reasonable match for actual counted traffic. The product of the study is a series of tables and spreadsheets that balance and apply the discovered use-to-use visitation percentages to the land uses within the project site under study. The interaction percentages are then used to discount ITE trip-generation rates and to reduce what would otherwise represent the number of trips entering and leaving the entire site.

EPA MXD

The U.S. EPA–sponsored 2011 report, "Traffic Generated by Mixed-Use Developments — A Six-Region Study Using Consistent Built Environmental Measures," investigated trip generation, mode choice, and trip length for trips produced and attracted by mixed use developments. Researchers selected six regions — Atlanta, Boston, Houston, Portland, Sacramento, and Seattle — to represent a wide range of urban scale, form, and climatic conditions. Regional travel survey data with geographic coordinates and parcel-level detail available for these areas allowed researchers to isolate trips to, from, and within MXDs and relate travel choices to fine-grained characteristics of these developments.

In each region, researchers worked with local planners and traffic engineers to identify a total of 239 MXDs that met the ITE definition of multi-use development. The MXDs ranged from compact infill sites near regional cores to low-rise freeway-oriented developments. They varied in size, population and employment densities, mixes of jobs and housing, presence or absence of transit, and locations within their regions. In total, the MXD sample for the six regions provided survey data on almost 36,000 trips.

The analysis found that one or more variables in each of seven D categories (see above) were statistically significant predictors of internal capture, external walking, external transit use, and external private vehicle trip length. Specifically, an MXD's external traffic generation was related to population and employment within the site (density); the relative balance of jobs and housing within the site and the amount of employment within 1 mile of the site (diversity); the density of intersections within the site as a measure of street connectivity (design); the presence of bus stops within a quarter mile or the presence of a rail station (distance from transit); employment within a mile of site boundaries and percentage of regional employment within 20 minutes by car, 30 minutes by car, and 30 minutes by transit (destination accessibility); the gross acreage of the development (development scale); and the average number of household members as well as household vehicle ownership per capita(demographics). The accuracy of the EPA MXD method was verified through traffic generation comparisons at 27 mixed-use sites across the U.S.

The EPA MXD product is a series of equations and instructions captured in a spreadsheet workbook. The methodology calculates the percentage reductions in ITE trip generation resulting from the national statistical analysis of seven D effects on internal trip capture, walking, and transit use. The spreadsheets produce reduced estimates of traffic generation on a daily basis and for peak traffic hours.

Combining the Approaches

The NCHRP 684 method and EPA MXD method each derive from different research approaches and produce different methods of analyzing trip generation at mixed use developments. They focus on overlapping but not identical aspects of mixed-use development sites and their contexts and offer respective strengths and weaknesses in terms of factors considered and ease of application. Selecting which method to employ under different circumstances requires both a comparison of their capabilities as well as professional judgment of their respective strengths and weaknesses.

Report 684 includes a refined assessment of on-site land-use categories, specifically recognizing the roles of restaurants, theaters, and hotels within the site land-use mix, along with an adjustment to account for the spatial separations among individual land uses within the development site. It is directly useful for the evaluation of proposed development sites that are similar to the one or more of the three surveyed in Atlanta and Texas for the report. However, it is not responsive to factors such as regional location, transit availability, density of development, walkability factors, and the socio-demographic profile of site residents and businesses.

In contrast, the EPA MXD method accounts directly and quantitatively for these factors. However, while it accounts for the balances of retail, office, and residential development, it does not explicitly differentiate subcategories such as restaurants, theaters, and hotels. Furthermore, it requires the analyst to account for off-site development, including employment within a one-mile radius of the MXD and the number of jobs available within 30 minutes of the site.

To develop a method that captures the best of both sets of research findings, the authors of the two original studies decided to collaborate on an integrated method that recognizes the full array of on-site and context characteristics that contribute to traffic reduction and, through a focus on empirical verification, achieves greater accuracy than either method individually.

In developing the integrated approach, we compared the performances of the methods to actual traffic counts at a diverse group of mixed use developments in a variety of settings. The 27 verification sites were successful mixed-use development, exhibiting moderate to high levels of activity in terms of business sales, occupied residential units, property value, and household income, with average or above-average person trips, at the time of the survey. They included those studied for NCHRP 684, the sites used as the basis for the ITE *Trip Generation Handbook*, and others surveyed by Fehr & Peers, transportation consultants. Six of the 27 sites were located in Florida, and three were located in Atlanta and Texas. Three of these nine were nationally known examples of smart growth or transit-oriented development: Atlantic Station, Mockingbird Station, and Celebration, Florida. Six sites were located in San Diego County and were designated by local planners and traffic engineers in 2009 as representing a wide range of examples of smart growth trip generators in that region. The 12 remaining sites were MXD developments located elsewhere in California and in Utah, ranging from TOD sites (commuter rail and ferry) to conventional suburban freeway-oriented mixed use sites.

A New Approach: The MXD+ Method

The new analytical approach, the MXD+ method, combines the strengths of NCHRP 684 and EPA MXD. The authors sought to (1) address the fact that each method has strengths relative to the other, (2) create a method that is more accurate than either of the individual methods alone, and (3) reduce confusion among practitioners on which is the most appropriate method.

The proposed MXD+ method incorporates the underlying data sources and logic that the two methods share. It offers the ability to assess the effects of spatial separation of uses and recognition of more specific land-use categories and to consider the dynamic influences of local development context, regional accessibility, transit availability, development density and walkability factors, and the characteristics of residents.

To develop the preferred method, the authors experimented with different methods of integrating the two methods and arrived at a direct calibration approach. The appropriate combination of the results of the two individual methods was determined through regression analysis to identify the proportions that provided the best correlation with the traffic counted at the 27 validation sites. Table 1 presents results from the regression analysis, listing the proportions of the two methods found most effective at matching the traffic generation at the diverse set of mixed use validation sites. Weighting the results of the two individual analyses by the percentages in Table 1 and combining the results produces more accurate estimates of traffic generation and captures the effects of all of the site description variables included in the NCHRP and EPA methods.

TABLE 1 **OPTIMAL BLEND OF NCHRP 684 AND EPA MXD METHODS**

	AM PEAK TRAFFIC	PM PEAK TRAFFIC	AVERAGE DAILY TRAFFIC
NCHRP 684	10.1%	36.5%	n/a
EPA MXD	89.9%	63.5%	100%

The step-by-step method is as follows:

1. Apply the full EPA MXD methodology to predict external traffic generation as influenced by site development scale, density, accessibility, walkability and transit availability, resident demographics, and general mix of uses.

2. Apply the full NCHRP 684 method to capture the effects of detailed land-use categories, including hotel, theater, and restaurant, and the spatial separation of uses within small and medium sites.

3. Combine the results of the two methods in terms of percentages of trips remaining internal to the development site, using proportioning factors presented in the table above.

4. Apply adjustments to account for off-site walking and transit travel using the EPA MXD method.

5. Discount standard ITE traffic-generation rates by the percentages of internalization produced in step 3 and the percentage of walk and transit travel in step 4 to obtain the estimate of site- generated traffic.

TABLE 2 COMPARISON OF THREE PRINCIPAL METHODS IN TERMS OF PROJECT CHARACTERISTICS CONSIDERED

	EPA MXD METHOD	NCHRP 684 METHOD	MXD+ METHOD
Project Characteristics Considered			
Density of Development	◆		◆
Diversity of Uses: Jobs/Housing	◆	◆	◆
Diversity of Uses: Housing/Retail		◆	◆
Diversity of Uses: Jobs/Services		◆	◆
Diversity of Uses: Entertainment, Hotel		◆	◆
Design: Connectivity, Walkability	◆	◆	◆
Design: Separation Among Uses		◆	◆
Destination Accessibility by Transit	◆		◆
Destination Accessibility by Walk/Bike	◆		◆
Distance from Transit Stop	◆		◆
Development Scale	◆		◆
Distance from Transit Stop	◆		◆
Development Scale	◆		◆
Demographic Profile	◆		◆
Data Needs (beyond Project Site Plan)			
Average Residents per Dwelling Unit	◆		◆
Average Autos Owned per Dwelling Unit	◆		◆
Nearby (1/4 mi) Bus Stops and Rail Stations	◆		◆
Jobs Within 1 Mile of Site	◆		◆
Jobs Within 30-Minute Transit Trip	◆		◆
Regional Employment	◆		◆
Located in CBD or TOD?	◆		◆
Site Development by Classification		◆	◆
Vehicle Occupancy Estimate		◆	
Mode Split Estimate		◆	

As Table 2 indicates, the MXD+ method improves traffic generation estimates by considering the full array of 12 site development and context characteristics shown to influence internal capture and mode share, while the individual methods consider only 5 to 8 factors each. Effects considered in MXD+ that are not included in the NCHRP 684 method include household size and auto ownership, site proximity to bus and rail stops, and accessibility to local and regional jobs. Effects considered in the NCHRP 684 method that do not appear in the EPA MXD method include specific land uses and proximity of interacting land uses to each other.

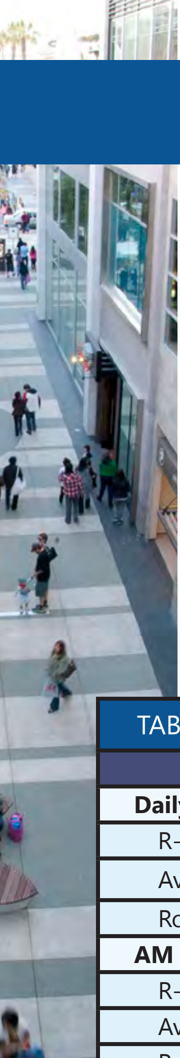


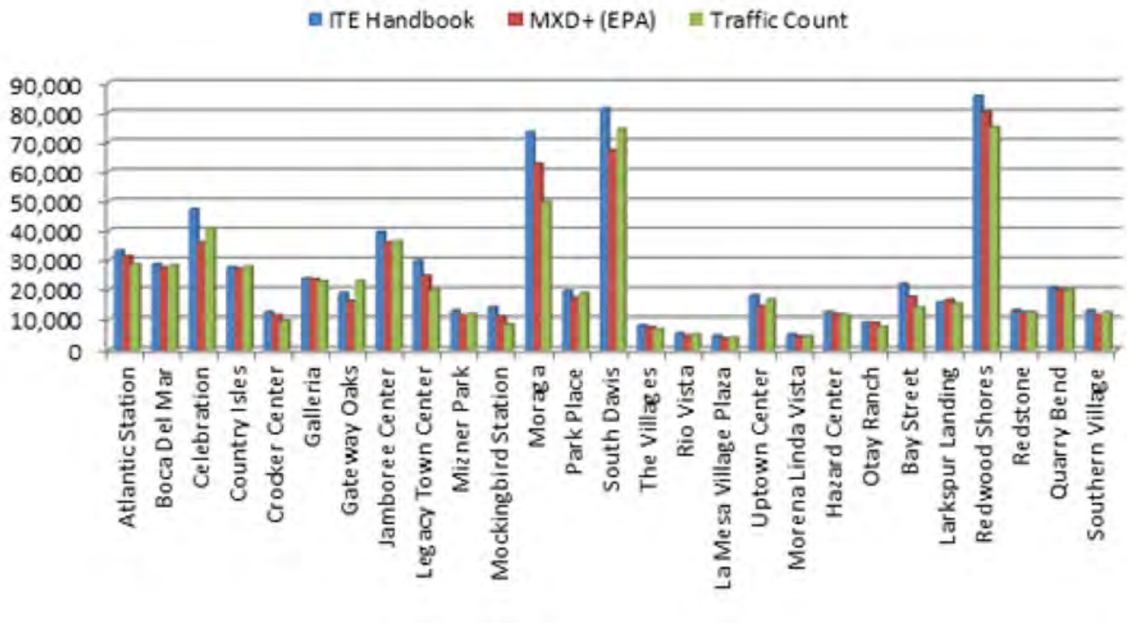
Table 3 presents the statistical performance of the MXD+ integrated method with the individual performance of the individual NCHRP 684 and EPA MXD methods. We compared the ability of each of the available methods to replicate the amount of traffic generated at the 27 validation sites in terms of statistical measures including percent root mean squared error, a metric used in the transportation field to evaluate model accuracy, and the coefficient of determination (or "R-squared"), which measures the ability of the analysis method to account for the variations in traffic generation among the 27 survey sites. For daily traffic generation, MXD+ is equivalent to the EPA MXD method, as the NCHRP 684 method does not address daily analysis. For peak hour traffic generation, MXD+ performs notably better than either of the individual methods.

TABLE 3 **COMPARISON OF THREE PRINCIPAL METHODS IN TERMS OF PERFORMANCE AT VALIDATION SITES**

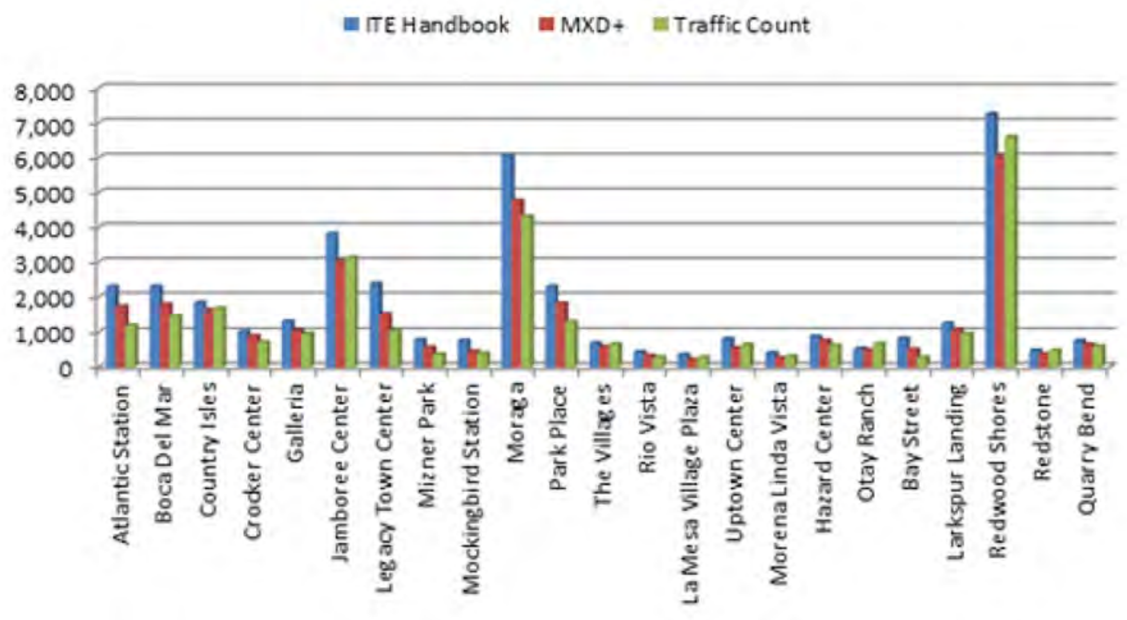
	EPA MXD METHOD	NCHRP 684 METHOD	MXD+ METHOD
Daily Traffic Generation			
R-squared	96%	89%*	**96%**
Average Error	2%	16%*	**2%**
Root Mean Square Error	17%	27%	**17%**
AM Peak Traffic Generation			
R-squared	97%	93%*	**97%**
Average Error	12%	30%	**12%**
Root Mean Square Error	21%	33%	**21%**
PM Peak Traffic Generation			
R-squared	95%	81%	**97%**
Average Error	8%	18%	**4%**
Root Mean Square Error	18%	36%	**15%**
** ITE Handbook internalization statistics (NCHRP 684 method does not address daily trip generation)*			

The graphs on the following page compare the performance of the MXD+ method to the ITE *Handbook* method at replicating traffic generation at the diverse group of mixed-use validation sites. Compared with the ITE *Handbook*, MXD+ method more accurately matches the amount of daily traffic actually counted at 20 of the 27 survey sites. In the AM peak hour, it is more accurate than the ITE Handbook at 21 of the 24 sites for which counts were available, and in the PM peak hour, MXD+ is more accurate than the ITE *Handbook* method at 23 of 25 sites.

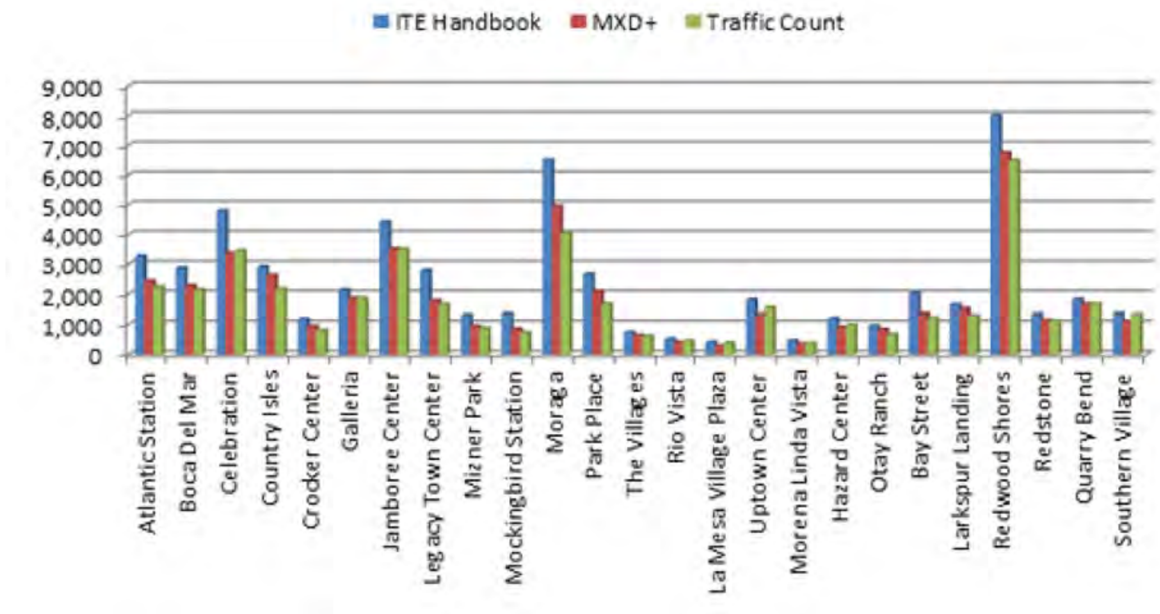
DAILY TRAFFIC GENERATION COMPARISON OF ITE HANDBOOK & MXD+ METHODS



AM PEAK HOUR TRAFFIC GENERATION COMPARISON OF ITE HANDBOOK & MXD+ METHODS



PM PEAK HOUR TRAFFIC GENERATION COMPARISON OF ITE HANDBOOK & MXD+ METHODS



The MXD+ method explains 97 percent of the variation in trip generation among mixed-use developments, compared with 65 percent for the ITE *Handbook* method. On average, the *Handbook* overestimates AM peak traffic generation by 49 percent, compared with 12 percent for MXD+. For the PM peak hour, the ITE *Handbook* overestimates actual traffic by 35 percent. The MXD+ method reduces this to 4 percent, remaining slightly conservative and unlikely to understate impacts.

By combining and refining the two most advanced methodologies for estimating traffic generation for mixed-use development, the MXD+ method provides transportation planners and engineers a more accurate single approach that accounts for the most important factors that distinguish lower impact development from other forms. Doing so advances development planning and impact assessment beyond the practices that have, to date, unreasonably discouraged mixed-use development.

Recommendations for Planners

We recommend that planners adopt the latest methods for evaluating traffic generation of mixed use and other forms of smart growth, including infill and transit-oriented development. The MXD methods developed under the U.S. EPA multiregional study and the NCHRP 684 study on enhancing trip-capture estimation each represent substantial advances to the conventional practices previously available through ITE. Combining the two new methods, as described above, improves upon both individual methods. Tools for all three approaches are available for use through the references and resources listed below.

Traffic engineers are beginning to take notice of the new methods, but we expect that natural sluggishness in adopting new practices will continue to impose unfair penalties on mixed use and other forms of lower-impact development. We recommend activism on the part of all planners, development reviewers, and impact analysts on behalf of the more accurate MXD methods.

Immediate adoption of the improved methods will allow planners to account for a project's regional location, transit availability, density of development, walkability factors, and the characteristics of residents and businesses and on-site adjacencies of land uses including residential, office, retail, restaurants, theaters, and hotels. Accounting for these factors through the MXD+ method will achieve the highest levels of accuracy possible in estimating traffic impacts of mixed use development.

We recommend applying and promoting the MXD+ method for day-to-day project planning and performance-based site-plan refinement, impact analysis, and discretionary review. Doing so will eliminate what is presently a systematic bias in traffic analysis that favors single-use, isolated, suburban-style development.

Conclusion

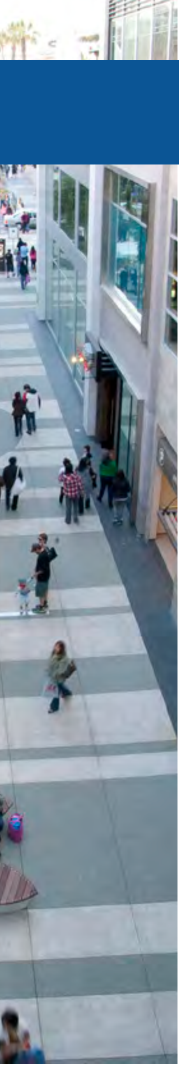
Standard traffic engineering practices are blind to the primary benefits of smart growth. A plan's development density, scale, design, accessibility, transit proximity, demographics, and mix of uses all affect traffic generation in ways unseen to prescribed methods. The Institute of Transportation Engineers (ITE) *Trip Generation Manual* and *Handbook* overestimate peak traffic generation for mixed-use development by an average of 35 percent. For conventional suburban stand-alone development, ITE rates portray the average for such sites; so hedging mixed-use analysis toward more conservative assumptions creates a systematic bias in favor of single-use suburban development.

ITE overestimation of traffic impacts reduces the likelihood of approval of mixed use and related forms of smart growth such as infill, compact, and transit-oriented development. Such overestimation escalates development costs, skews public perception, heightens community resistance, and favors isolated single-use development.

The methods of evaluating mixed use development described in this report represent a substantial improvement over conventional traffic-estimation methods. They improve accuracy and virtually eliminate overestimation bias, and they are supported by the substantial evidence of surveys and traffic counts at 266 mixed use sites across the U.S. The MXD+ analysis method explains 97 percent of the variation in trip generation among mixed use sites and all but eliminates the ITE systematic overestimation of traffic. We hope planners and other professionals will take advantage of the available spreadsheet tools listed below to help even the playing field between conventional development patterns and more sustainable, walkable, livable places.

About the Authors

Jerry Walters is a principal and sustainability practice leader with Fehr & Peers, transportation consultants. He has more than 30 years of experience in transportation planning, engineering, and travel forecasting and is a registered traffic engineer. Jerry developed project evaluation methods for the U.S. EPA study "Mixed-use Development and Vehicle Trips: Improving the Standard Estimation Methodology." He is a co-author of the book Growing Cooler – the Evidence on Urban Development and Climate Change (Urban Land Institute, 2008).



Brian S. Bochner is a senior research engineer at Texas Transportation Institute with over 40 years of experience in traffic engineering and planning. He is a certified professional traffic engineer, a professional traffic operations engineer and transportation planner, an affiliate with the Transportation Research Board, and past president and member of the International Board of Direction of the Institute of Transportation Engineers (ITE). His awards include Transportation Innovator, Texas Department of Transportation Research Program, and Transportation Engineer of the Year for the Texas Section of ITE.

Reid Ewing is a professor of city and metropolitan planning at the University of Utah, associate editor of the *Journal of the American Planning Association*, columnist for *Planning* magazine, and Fellow of the Urban Land Institute. His 2010 article, "Travel and the Built Environment: A Meta-Analysis," won the Best Article of the Year award from the American Planning Association, and his book, Best Development Practices (APA Planners Press, 1996), is listed by APA as one of the 100 essential planning books of the past 100 years.

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Additional Resources

Description, documentation, and spreadsheet tools for the NCHRP 684 method, Enhancing Internal Trip Capture Estimation for Mixed-Use Developments may be found at www.trb.org/Main/Blurbs/165014.aspx.

Description, documentation, and spreadsheet tools for the EPA MXD Trip Generation Tool for Mixed-Use Developments may be found at www.epa.gov/smartgrowth/mxd_tripgeneration.html.

Quick-response analysis tools for applying the EPA MXD method, the combined EPA /NCHRP method MXD+, and MXD in conjunction with analysis of vehicle-miles traveled, GHG emissions, and shared parking, Plan+, may be found at http://asap.fehrandpeers.com/tools/.

TCRP

REPORT 128

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Effects of TOD on Housing, Parking, and Travel

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TCRP REPORT 128

Effects of TOD on Housing, Parking, and Travel

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Subject Areas
Planning and Administration • Public Transit • Rail

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The nation's growth and the need to meet mobility, environmental, and energy objectives place demands on public transit systems. Current systems, some of which are old and in need of upgrading, must expand service area, increase service frequency, and improve efficiency to serve these demands. Research is necessary to solve operating problems, to adapt appropriate new technologies from other industries, and to introduce innovations into the transit industry. The Transit Cooperative Research Program (TCRP) serves as one of the principal means by which the transit industry can develop innovative near-term solutions to meet demands placed on it.

The need for TCRP was originally identified in *TRB Special Report 213—Research for Public Transit: New Directions,* published in 1987 and based on a study sponsored by the Urban Mass Transportation Administration—now the Federal Transit Administration (FTA). A report by the American Public Transportation Association (APTA), Transportation 2000, also recognized the need for local, problem-solving research. TCRP, modeled after the longstanding and successful National Cooperative Highway Research Program, undertakes research and other technical activities in response to the needs of transit service providers. The scope of TCRP includes a variety of transit research fields including planning, service configuration, equipment, facilities, operations, human resources, maintenance, policy, and administrative practices.

TCRP was established under FTA sponsorship in July 1992. Proposed by the U.S. Department of Transportation, TCRP was authorized as part of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA). On May 13, 1992, a memorandum agreement outlining TCRP operating procedures was executed by the three cooperating organizations: FTA, the National Academies, acting through the Transportation Research Board (TRB); and the Transit Development Corporation, Inc. (TDC), a nonprofit educational and research organization established by APTA. TDC is responsible for forming the independent governing board, designated as the TCRP Oversight and Project Selection (TOPS) Committee.

Research problem statements for TCRP are solicited periodically but may be submitted to TRB by anyone at any time. It is the responsibility of the TOPS Committee to formulate the research program by identifying the highest priority projects. As part of the evaluation, the TOPS Committee defines funding levels and expected products.

Once selected, each project is assigned to an expert panel, appointed by the Transportation Research Board. The panels prepare project statements (requests for proposals), select contractors, and provide technical guidance and counsel throughout the life of the project. The process for developing research problem statements and selecting research agencies has been used by TRB in managing cooperative research programs since 1962. As in other TRB activities, TCRP project panels serve voluntarily without compensation.

Because research cannot have the desired impact if products fail to reach the intended audience, special emphasis is placed on disseminating TCRP results to the intended end users of the research: transit agencies, service providers, and suppliers. TRB provides a series of research reports, syntheses of transit practice, and other supporting material developed by TCRP research. APTA will arrange for workshops, training aids, field visits, and other activities to ensure that results are implemented by urban and rural transit industry practitioners.

The TCRP provides a forum where transit agencies can cooperatively address common operational problems. The TCRP results support and complement other ongoing transit research and training programs.

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C O O P E R A T I V E   R E S E A R C H   P R O G R A M S

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FOREWORD

By Gwen Chisholm Smith
Staff Officer
Transportation Research Board

TCRP Report 128: Effects of TOD on Housing, Parking, and Travel provides original data on TOD residential trip generation and parking, the behavior and motivation of TOD residents, employees, and employers in their mode choice. The report also identifies best practices to promote, maintain, and improve TOD-related transit ridership.

This report will be helpful to project, land-use, and transportation planners; transit agencies; the development community; and federal, state, and local decision makers considering transit-oriented development.

This research builds on prior work done under TCRP Project H-27, which is published as *TCRP Research Results Digest 52*: *Transit-Oriented Development and Joint Development in the United States: A Literature* Review and as *TCRP Report 102: Transit-Oriented Development in the United States: Experiences, Challenges, and Prospects*.

A related publication to this report, *TCRP Research Results Digest 52*: *Transit-Oriented Development and Joint Development in the United States: A Literature Review,* reviews pertinent literature and research findings related to TOD and joint development. It contains a bibliography annotated by subject area.

TCRP Report 102 is a national assessment of TOD issues, barriers, and successes. *TCRP 102* included 10 case studies from a variety of geographic and development settings. *Report 102* indicated that increased ridership is the principal goal of transit agencies in supporting TODs. However, increased ridership as a result of TOD is a complex outcome involving behavioral, locational, and situational factors. The ties between livable communities and transit ridership remained largely unaddressed.

TCRP Report 128 addresses the following fundamental questions: (1) What are the demographic profiles of TOD residents and employers; (2) What motivates residents or employers to locate in TODs; (3) What are the travel characteristics (e.g., frequency of travel by different modes) of people who live or work in a TOD; (4) What was the travel pattern of the TOD resident prior to moving to the TOD; (5) What levels of transit connectivity to desired origins and destinations are required to promote transit ridership at TODs; (6)What motivates or impedes transit ridership in a TOD; (7)Which strategies have been effective in increasing transit ridership at TODs; (8) What steps should transit agencies take in supporting TODs to maximize transit ridership; and (9) What TOD land-use and design features (e.g., mixed land-use, traffic calming, bus bulbs, short blocks, street furniture) have had an effect on travel patterns, transit ridership, or the decision to locate in a TOD?

CONTENTS

SUMMARY

Effects of TOD on Housing, Parking, and Travel

This research helps confirm what had been intuitively obvious: in the four metropolitan areas studied, transit-oriented development (TOD) housing produced considerably less traffic than what is generated by conventional development. Yet the way parking is designed for most TODs is based on the assumption that there is little difference between TOD and conventional development with respect to the traffic they generate and the parking spaces they are built with. One likely result of this fallacious assumption is that fewer TOD projects get built. TOD developments that do get built are less affordable and less sustainable than they might be, because they are subject to incorrect assumptions about the traffic impact they generate. Many of the hoped for benefits (i.e., less time stuck in traffic and lower housing costs), from the nearly $75 billion in public dollars invested in rail transit over the past 11 years, are not being realized.

The policy value of TOD projects (e.g., less automobile travel) is well understood. Those potential benefits are muted since most U.S. TODs are parked oblivious to the fact that a rail stop is nearby. This study looks at the most recent literature on the subject and the actual transportation performance of 17 TOD projects.

The report is divided into two sections:

- Section 1 - Literature Review
- Section 2 - Research Findings

Literature Review

A lot more is known now about the travel performance of TODs. Whereas the first generations of TOD focused primarily on advocacy and assisting early adopters, there now is increased measurement and understanding of TOD travel outcomes. Some key findings in this literature review include:

- Between 1970 and 2000, transit ridership for work trips increased in TOD zones, whereas ridership declined markedly in the metro areas surrounding TODs.
- TOD households are twice as likely to not own a car and own roughly half as many cars as comparable households not living in TODs.
- Among the factors that attract households to TOD, households consistently place high value on neighborhood design, home prices and perceived value, and transit proximity.
- Access to high quality transit is becoming increasingly important to firms trying to attract creative class workers (professionals who use knowledge to create new forms and problem solve, such as architects, engineers, professors, artists, computer programmers, etc.) in the knowledge economy (the current phase of post-industrial United States, where economic

development in cities is primarily through jobs and industries that are based on intellectual property).

The literature review focused on nine questions related to TOD travel characteristics, transit system and land-use influences, TOD ridership strategies and TOD resident/tenant characteristics. The most current knowledge on TOD was analyzed. The following is a summary of the key conclusions for each question.

TOD Travel Characteristics

1. What are the travel characteristics (e.g., frequency of travel by different modes) of people who live or work in a TOD?
2. What was the travel pattern of the TOD resident prior to moving to the TOD?

TOD commuters typically use transit two to five times more than other commuters in the region. TOD transit mode share can vary from 5% to near 50%. The findings are similar for non-work trips: transit share is two to five times higher, although mode shares are typically lower than commute trips (2% to 20%). The primary reason for the range is that transit use is heavily influenced by relative travel times with automobile and extensiveness of transit service, which can vary markedly across regions. As the transit network links to more job centers, educational opportunities, and cultural facilities, transit use increases. From this perspective, TOD type (e.g., suburban neighborhood versus suburban center) is less important than specific location within the region and the quality of connecting transit service. Although one could reasonably infer the approximate transit mode share of a hypothetical new TOD by comparing it to similar TODs in the same, existing system, there is no rule of thumb or single mode share number that can be easily applied to a hypothetical new TOD along a new rail or bus system. This is due to widely varying local travel conditions and employment distributions.

A primary reason for higher TOD transit use is self-selection. Current transit users and those precluded to use transit seek out TOD. The travel pattern of TOD residents prior to moving to the TOD depended on their previous access to transit. When work location was unchanged, often a significant percent (e.g., 50%) were transit users. Among commuters with no previous transit access, transit use increased (up to 50%).

Transit System and Land Use Influences

1. What levels of transit connectivity to desired origins and destinations are required to promote transit ridership at TODs?
2. What TOD land-use and design features (e.g., mixed land use, traffic calming, bus bulbs, short blocks, street furniture) have had an effect on travel patterns, transit ridership, or the decision to locate in a TOD?

Research shows that system extensiveness is positively correlated with transit ridership. Extensive transit networks also are most often found in cities with worse traffic congestion (i.e., slow auto trip times) and higher parking costs, and these three factors work together to increase TOD transit ridership. The general consensus is that transit service headways of 10 minutes are ideal to support a transit lifestyle. There is no single, definitive threshold for connectivity, and measures such as track miles and number of transit stations are not the best predictors of ridership on their own. What matters is transit travel times relative to auto travel times. For example, an extensive but very slow transit system likely will attract few riders if highway congestion is not severe. Conversely, a single fast rail corridor adjacent to a highly congested auto corridor likely will attract high ridership.

The location of jobs accessible by transit influences transit ridership. Systems that generate the highest commute ridership have a high percentage of regional jobs accessible by fast transit. For work trips, proximity to rail stations is a stronger influence on transit use than land use mix or quality of walking environment. Thus, the most effective strategy to increase TOD ridership is to increase development densities in close proximity to transit. Employment densities at trip ends have more influence on ridership than population densities at trip origins. It is critical to locate jobs near transit in order to attract households to TODs. However, relative travel time (transit versus auto) is still more important than any land use factor (density, diversity of uses, design) in ridership.

Mixed uses in TODs allow the transit service to be used for a variety of trip purposes throughout the day and week, but as a travel benefit, this is not a primary consideration for prospective TOD residents. Employment access is a primary consideration. Mixed uses (e.g., local restaurants) and urban design treatments (e.g., pedestrian pathways) are important for their amenity and design value in attracting residents and visitors or customers. TOD residents highly value good neighborhood design in addition to transit access to work. Urban design and the local land-use mix may influence which TOD prospective residents choose to live in. Good design also may make a TOD a more desirable location to travel to.

TOD Ridership Strategies

1. What motivates or impedes transit ridership in a TOD?
2. What strategies have been effective in increasing transit ridership at TODs?
3. What steps should transit agencies take in supporting TODs to maximize transit ridership?

Factors that most influence transit ridership are station proximity, transit quality, and parking policies. Fast, frequent, and comfortable transit service will increase ridership, as will high parking charges and/or constrained parking supply. The availability of free or low-cost parking is a major deterrent to transit ridership.

Successful ridership strategies include: TOD transit pass programs, parking reductions, and car-sharing programs. TOD transit programs will be similar to other transit programs. That said, because TOD residents and households are by definition the nearest to transit, TODs should be among the first locations that transit agencies implement specialized programs.

TOD (e.g., mixed uses, high densities, reduced parking) is still illegal around station areas in many cities and transit districts, creating a barrier for development. Steps that transit agencies are taking to promote TOD include: reconsidering replacement parking requirements at park and rides, advocating for zoning changes with TOD entitlements, land assembly, joint development, and educational efforts (e.g., producing TOD guidebooks).

TOD Resident/Tenant Characteristics

1. What are the demographic profiles of TOD residents and employers?
2. What motivates residents or employers to locate in TODs? Examples of motivators may include the quality of schools, access to jobs, housing affordability, presence of transit services, neighborhood services and amenities, and community perception.

The majority of TOD residents along new transit systems are childless singles or couples. The age spectrum is wide: often younger working professionals or older empty-nesters. TOD residents may have low, medium, or high incomes; this is driven by the design and price of the specific TOD housing. TOD developers are researching the market and proactively building products for targeted market sectors. The demographic characteristics allow developers to more finely target their product to potential end users. More higher incomes are being served as the United States continues to go through a robust construction phase of denser urban residential product.

TOD households typically own fewer cars because they have smaller households and because they may forgo extra cars due to transit's proximity. TOD households are almost twice as likely to not own any car and own almost half the number of cars of other households.

The top three reasons households give for selecting a TOD are housing/neighborhood design, housing cost, and proximity to transit.

TOD Housing Transportation Performance

Actual transportation performance of 17 TOD built projects was assessed by using pneumatic tubes stretched across the driveways to count the passage of motorized vehicles. The housing projects of varying sizes are in four urbanized areas of the country: Philadelphia/N.E. New Jersey; Portland, Oregon; metropolitan Washington, D.C.; and the East Bay of the San Francisco Bay Area. To help understand the physical implications of the research, eight residential TOD site plan case studies were developed to test some of the physical implications of reducing residential parking ratios at a range of potential densities on a theoretical eight acre TOD.

One motivation for this research was to provide original and reliable data to help seed an update of the Institute of Transportation Engineers (ITE) trip generation and parking generation rates, from which local traffic and parking impacts are typically derived, and impact fees are set. (A specific objective of the research has been to help prepare the way for ITE and ULI to update their guidance on parking for TODs to better reflect actual performance.) Some analysts are of the opinion there is a serious suburban bias in current ITE rates. Typically, empirical data used to set generation rates are drawn from suburban areas with free and plentiful parking and low-density single land uses. Since ITE's auto trip reduction factors are based only on a few mixed-use projects in Florida (to reflect internal trip capture), there has been little or no observation of actual TODs. The end result is that auto trip generation is likely to be overstated for TODs. This can mean that TOD developers end up paying higher impact fees, proffers, and exactions than they should since such charges are usually tied to ITE rates.

Results of this research clearly show that TOD-housing results in fewer trips in the four urbanized areas that were studied. The research confirms the ITE trip generation and parking generation rates underestimate automobile trip reduction for TOD housing. The ITE manual presents weighted averages of trip generation. The weighted average vehicle trip rates for this study were computed for all 17 projects combined for weekday, AM peak, and PM peak. Over a typical weekday period, the 17 surveyed TOD-housing projects averaged 44% fewer vehicle trips than estimated by the ITE manual (3.754 trips versus 6.715). Weighted average differentials were even larger during peak periods: 49% lower rates during the AM peak and 48% lower rates during the PM peak. To the degree that impact fees are based on peak travel conditions, one can infer that traffic impacts studies might overstate the potential congestion-inducing effects of TOD-housing in large rail-served metropolitan areas, such as Washington, D.C., by up to 50%.

One implication of the research is that parking ratios for residential TODs are likely to be overstated by the same order of magnitude since they also are based on ITE data. Some of the cumulative impacts of over-parking TODs are illustrated in the site plan case studies. TOD site plan case studies help to demonstrate that under the right conditions lowering residential parking ratios by 50% for TODs in station areas with quality transit service can result in:

- An increase between 20% to 33% in the potential density of a residential TOD, depending on the residential building type;
- Savings from 5% to 36% on residential parking costs, after accounting for increases in the number of units to be parked from increased residential density; and

- Potentially greater developer profits and/or increased housing affordability from achieving higher densities, lower capital costs for parking, and reduced traffic impact fees.

Rightsizing parking ratios and traffic generation to the actual performance of TOD would likely result in some important implications on the physical form and performance of TOD developments:

- Local officials and neighborhoods may be more apt to support increases in residential densities near transit if research shows TODs result in fewer trips than conventional development.
- TOD developers would have easier development approvals and the benefits of TOD would not be compromised away.
- TOD developers would likely pay lower traffic-related impact fees and exactions. Those savings could be passed on to consumers as lower housing costs.
- With lower levels of traffic generated from TODs, it could be argued that it makes no sense to construct roadway improvements for TOD-related traffic that is not likely to materialize.
- Rightsizing new road and intersection improvements to reflect actual transportation performance could result in more compact development patterns and a higher quality pedestrian environment since less land may be used for road improvements.
- The potential for higher densities in TODs because of the decreased amount of land dedicated to parking and the reduced cost of parking.

Smart growth requires smart calculations; impact fees, parking ratios, and road improvements need to account for the likely trip-reduction effects of TOD. Research study results indicate that residential TOD parking ratios can be tightened and fees lowered to reflect the actual transportation performance of TODs. Given that TODs have historically been over-parked, the incorporation of research results into revised parking ratios is an important step toward national recognition of the expected community benefits of TOD.

SECTION 1

Literature Review

For the TCRP H-27A project, the panel identified a number of fundamental questions about transit ridership and TOD. For this literature review, the research team divided these questions into four general areas: 1) TOD travel characteristics; 2) transit system and land-use characteristics; 3) TOD ridership strategies; and 4) TOD resident/tenant characteristics. Findings related to these topic areas and specific questions follow.

The existing research provides a largely complete story about transit ridership and TOD. There is significant and very detailed information about specific TOD projects in Portland, Oregon, Arlington County, Virginia (suburban Washington, D.C.), and the San Francisco Bay Area, where a significant amount of travel behavior data has been collected through resident surveys (and academic research). At the macro level, U.S. Census data also has been thoroughly analyzed to reveal differences between TOD households and other households in travel behavior and demographics. The findings are consistent with each other and consistent with economic and behavior studies that explain why people travel as they do. Many cities still lack detailed primary (survey) data. That said, it is reasonable to assume that transportation and economic forces that shape TOD residency and travel behavior in California, for instance, also would apply to other settings (e.g., Dallas).

A lot more is known about the travel performance of TODs. Whereas the first generations of TOD focused primarily on advocacy and assisting early adopters, now there is increased measurement and understanding of TOD travel outcomes. Some key findings in this literature review include:

- Between 1970 and 2000, transit ridership for work trips increased in TOD zones, whereas ridership declined markedly in the metro areas surrounding TODs.
- TOD households are twice as likely to not own a car, and own roughly half as many cars as comparable households not living in TODs.
- Among the factors that attract households to TOD, households consistently place high value on neighborhood design, home prices and perceived value, and transit proximity.
- Access to high quality transit is becoming increasingly important to firms trying to attract "creative class" workers in the knowledge economy.

In addition to the literature on TOD, there are larger bodies of literature that address transit operations (to maximize ridership) and the travel impacts of development density, mixed uses, and urban design. This literature review does not describe all of those studies and focuses on research pertaining to TOD specifically. That said, some key findings from the general transit and land use literature are included, as they would not be expected to differ significantly for TODs.

TOD Travel Characteristics

1. What are the travel characteristics (e.g., frequency of travel by different modes) of people who live or work in a TOD?
2. What was the travel pattern of the TOD resident prior to moving to the TOD?

Key Conclusions

- TOD commuters typically use transit two to five times more than other commuters in the region. TOD transit mode share can vary from 5% to nearly 50%.
- Similar to findings for nonwork trips, transit share is two to five times higher, although mode shares are typically lower than commute trips (2% to 20%).
- The primary reason for range is that transit use is heavily influenced by relative travel times with automobile and extensiveness of transit service, which can vary markedly across regions. As the transit network links to more job centers, educational opportunities, and cultural facilities, transit use increases. From this perspective, TOD type

(e.g., suburban neighborhood versus suburban center) is less important than specific location within the region and the quality of connecting transit service.
- The transit mode shares are statistically reliable, and for an existing rail system, one could reasonably infer the approximate transit mode share of a hypothetical new TOD by comparing it to similar TODs in the same system.
- However, there is no rule of thumb or single mode share number that can be easily applied to a hypothetical new TOD along a new rail or bus system, due to widely varying local travel conditions and employment distributions.
- A primary reason for higher TOD transit use is self selection. Current transit users and those predisposed to use transit seek out TOD.
- When work location is unchanged, often a significant percent (e.g., 50%) were transit users before moving to the TOD.
- Among commuters with no previous transit access, transit use can increase (up to 50%).

Findings

The literature shows that those who live and work near transit stops patronize transit appreciably more than the typical resident of a region. The most recent comprehensive study on the travel characteristics of TOD residents and workers is the 2003 study, *Travel Characteristics of Transit-Oriented Development in California* (Lund, Cervero, Willson, 2004). In this study, ridership statistics were developed for those living at 26 residential sites near rail stations in California's four largest metropolitan areas, as well as for a smaller sample of office workers, retail shoppers, hotel workers, and guests of projects near rail stations.

Key findings about station-area residents include:

- Commute mode share: From travel-diary responses, about one-quarter of the surveyed California TOD residents took transit to work. This was nearly five times higher than transit's commute-trip modal share by residents who lived in the surrounding community. This five-fold ridership bonus associated with transit-oriented living is similar to that found in a comprehensive survey of California TOD residents conducted in 1992 (Cervero, 1994). Patterns varied significantly across the state, with transit capture rates of nearly 50% for several Bay Area TODs, and less than 5% for some Southern California locales. About half of the working residents of all California TODs said they never take transit to work.
- Frequency of travel: Across the 26 surveyed residential sites, 29% of tenants who responded to the survey indicated they commute by transit every workday, and another 7% reported they commute several times a week. In the case of the Pleasant Hill TOD, 49% of residents indicated they took Bay Area Rapid Transit (BART) to work every weekday.
- Noncommuter mode share: Transit served, on average, 8% of nonwork trips made by surveyed station-area residents, again with considerable variation across TODs. At BART's Pleasant Hill station for instance, transit served 15% of nonwork trips compared to less than 2% for sampled projects in Long Beach and Los Angeles. The differential between transit's modal splits for work versus nonwork trips highlights the role that self-selection plays in shaping travel choices. Notably, people tend to move to TODs partly because of the desire to rail-commute and express this preference most visibly in their work-trip modal choice.
- Trends: Transit's modal share remained fairly stable over the 1993-2003 period for neighborhoods surrounding rail stations. However, since transit's market share of trips generally eroded over this 10-year period, it appears that TOD areas have weathered the secular trend toward declining transit ridership better than most settings.
- Length of residency: There is some evidence that those who have lived the longest in California TODs tend to use transit most often. Among those who lived in a TOD for more than a decade, the share taking transit for their "main trips" (both work and nonwork purposes) averaged 29% versus 17% among those who had lived in the TOD for less than five years.
- Intervening factors: Consistent with other research on mode choice, many other factors played a critical role in influencing the modal choices of station-area residents. Policies that significantly affected modal choices included: free parking at the workplace, flex-time privileges, employer contributions to the cost of transit passes, and, to a less degree, land-use variables like density and street connectivity. Additional information about these intervening factors is included in subsequent sections of this literature review.

Key findings about station-area office workers include:

- Commute mode share: From the survey of those working at 10 predominantly suburban office buildings near California rail stations, on average, around 12% traveled to work via rail transit. This is around five percentage points more than rail's market share for TOD office workers who were surveyed in 1992 (Cervero, 1994). Modal splits varied markedly, however. For two of the 10 office projects, 25% or more of surveyed workers rail-commuted. These two projects are in downtown settings with comparatively high densities, good regional accessibility, mandatory parking charges, and within a block of the rail station.
- Intervening factors: Besides proximity to rail transit, other factors that encouraged office workers to rail-commute included: availability of free parking at the workplace;

employer-provided transit passes; quality of the walking corridor from the rail station to the office building; and feeder bus frequency.

Key findings about station-area hotel patrons and employees and retail customers include:

- Commute mode share: Of 111 workers surveyed at two hotels near rail transit in California, 41% traveled to work by rail transit.
- Travel by hotel patrons: Transit was not used to access hotels near rail stations among the small sample of guests who were surveyed. More than half of the surveyed guests indicated that they used transit during their stay.
- Travel by retail patrons: Of 1,259 retail patrons surveyed at three shopping facilities near rail stations in California, 13% had arrived by rail transit.

Research from metropolitan Washington, D.C. also found higher transit market shares among station-area residents, attributable in part to the high levels of accessibility conferred by the Washington Metropolitan Area Transit Authority (WMATA) rail network (JHK and Associates, 1989). Over the past three decades, Arlington County has channeled new development into high-density, mixed-use projects around five closely spaced urban rail stations in the Rosslyn-Ballston Corridor, and employed a variety of techniques, including transportation demand management programs, to encourage residents to use transit. As a result, 47% of residents use modes of travel other than the automobile to get to work, and 73% arrive at rail stations on foot, providing a cost savings because neither the county nor WMATA have to provide long-term commuter parking; land parcels that were devoted to parking early on have all been developed. About 40,000 riders board daily at the five urban stations in the Rosslyn-Ballston Corridor. About 29,000 riders board at the four suburban stations farther out along the Orange Line; only 15% of these transit riders arrive at their stations on foot, while 58% arrive by car (Dittmar and Ohland, 2004).

Dittmar and Ohland compiled 2000 Census Journey to Work data for selected TODs in three regions with high transit ridership. These TODs were defined by using a half-mile radius buffer around selected transit stops. Table 1.1 shows high levels of both transit and walking at each of the stations, higher than the levels in the county as a whole. The Evanston and urban downtown stops had particularly high walking shares, indicating that many downtown residents both live and work downtown, and that transit supports this lifestyle. The walk shares in Arlington, however, were comparatively low, and the authors suggest this is due to the high number of regional jobs in the capital, and a historic neglect of the pedestrian environment in Arlington (something that is currently being improved).

Renne (2005) used similar census data to more thoroughly examine trends in travel behavior and vehicle ownership from 1970 to 2000 for households living in 103 TODs compared with averages for the 12 metropolitan regions where the TODs are located. TODs were defined by using a half-mile radius buffer around selected transit stops. While TODs may not have existed in these locations as far back as 1970 or 1980, today they are recognized as TODs and include a train station and dense housing at a minimum. Regions were classified into

Table 1.1. 2000 journey to work mode share for selected TODs.

Community	Transit Share (%)	Walk Share (%)	Drove Alone Share (%)	TOD Type
Arlington County, VA	**23**	**5**	**55**	**County**
Court House	37	8	43	Suburban Center
Clarendon	34	6	47	Suburban Center
Rosslyn	38	10	42	Suburban Center
Ballston	38	7	42	Suburban Center
San Francisco, CA	**31**	**8**	**41**	**County**
Church/24th	34	6	38	Urban Neighborhood
Embarcadero	24	44	19	Urban Neighborhood
Cook County, IL	**17**	**4**	**63**	**County**
LaSalle	25	37	25	Urban Downtown
Chicago/Fullerton	44	8	36	Urban Neighborhood
Chicago/Berwyn	38	5	42	Urban Neighborhood
Evanston/Davis	19	24	42	Suburban Center
Evanston/Dempster	22	14	49	Suburban Neighborhood
Evanston/Main	55	22	7	Suburban Neighborhood

Source: Dittmar and Ohland, 2004

three groups: older and redeveloping (e.g., Chicago, Illinois; New York/New Jersey), maturing heavy rail (e.g., Atlanta, Georgia; Miami, Florida; San Francisco, California; Washington, D.C.), and growing regions with light rail (e.g., Portland, Oregon; San Diego, California; Los Angeles, California; Dallas, Texas; Denver, Colorado; and Salt Lake City, Utah).

Renne's results show that over the past 30 years, transit commuting has increased amongst TOD residents from 15.1% to 16.7%, while it has decreased across all regions from 19% to 7.1%. Despite the regions becoming increasingly auto-dependent for work trips, more than twice as many TOD residents used transit for commuting compared to the regional average (16.7% versus 7.1%) in 2000. Transit commuting was more than three times higher in maturing heavy rail regions, and more than twice as much in growing regions with light rail. (The data from New York/New Jersey produced unusual results, as transit ridership in suburban TODs, while robust, was outweighed by ridership in the rest of the MSA, which is very dense and metropolitan.) Table 1.2 shows detailed transit commute data from Renne's study.

From this data, Renne provides the following observations:

- Maturing-heavy rail regions experienced the highest transit ridership growth and collectively have promoted TOD through development partnerships (e.g., joint development in Washington, D.C.) and supportive policies. In comparison to Washington, D.C., Atlanta TODs have experienced declining transit mode share. Renne surmises this is because Washington TODs include more mixed uses and less parking, whereas Atlanta's TODs include primarily office space surrounded by large parking lots.

Table 1.2. Transit trends for journey to work trips for selected TODs.

Region	Transit Share 1970 (%)	Transit Share 1980 (%)	Transit Share 1990 (%)	Transit Share 2000 (%)	% Change 1970-2000 (%)
Older and Redeveloping Regions					
Chicago TOD Average (n=8)	24.0	21.7	18.7	16.7	-30.0
Chicago MSA Average	22.1	16.6	13.7	11.5	-48.0
NY/NJ TOD Average (n=26)	15.7	13.1	13.6	16.4	4.0
NY/NJ MSA Average	35.5	26.7	25.4	24.9	-30.0
TOD Average	**19.8**	**17.4**	**16.1**	**16.5**	**-17.0**
MSA Average	**28.8**	**21.6**	**19.5**	**18.2**	**-37.0**
Maturing - Heavy Rail Regions					
Atlanta TOD Average (n=4)	20.9	22.5	24.9	19.3	-8.0
Atlanta MSA Average	9.2	7.7	4.6	3.7	-60.0
Miami TOD Average (n=2)	0.5	2.7	5.4	6.5	1094.0
Miami MSA Average	7.1	5.0	4.4	3.9	-45.0
San Francisco TOD Average (n=18)	17.8	22.3	20.1	21.0	18.0
San Francicsco MSA Average	11.6	11.4	9.6	9.5	-18.0
Washington DC TOD Average (n=16)	19.0	27.4	32.5	30.0	58.0
Washington DC MSA Average	15.4	13.1	11.3	9.4	-39.0
TOD Average	**14.6**	**18.8**	**20.7**	**19.2**	**32.0**
MSA Average	**10.8**	**9.3**	**7.5**	**6.6**	**-39.0**
New Start - Light Rail Regions					
Portland TOD Average (n=5)	9.2	13.4	11.8	14.6	58.0
Portland MSA Average	5.5	7.6	5.0	5.7	3.0
San Diego TOD Average (n=6)	8.3	11.2	6.5	6.7	-19.0
San Diego MSA Average	3.7	3.4	3.5	3.4	-7.0
Los Angeles TOD Average (n=6)	6.2	11.5	10.2	8.4	37.0
Los Angeles MSA Average	4.2	5.2	4.7	4.7	11.0
Dallas TOD Average (n=6)	14.5	9.1	9.2	3.2	-78.0
Dallas MSA Average	5.2	3.5	2.3	1.8	-66.0
Denver TOD Average (n=2)	9.4	8.6	8.4	7.5	-20.0
Denver MSA Average	4.3	6.0	4.2	4.3	0.0
Salt Lake City TOD Average (n=4)	2.4	5.8	3.2	5.0	108.0
Salt Lake City MSA Average	2.2	5.0	3.1	3.0	36.0
TOD Average	**8.3**	**9.9**	**8.2**	**7.6**	**-9.0**
MSA Average	**4.2**	**5.1**	**3.8**	**3.8**	**-9.0**
Total TOD Average (n=103)	**15.1**	**17.0**	**16.9**	**16.7**	**11.0**
Total MSA Average (n=12)	**19.0**	**14.1**	**12.0**	**7.1**	**-63.0**

Source: Renne, 2005

- Portland also has experienced high growth in transit use, very likely due to aggressive policies to promote transit use and TOD.
- Transit ridership growth also was realized in the TODs of Miami, San Francisco, Los Angeles, and Salt Lake City.
- In San Diego, Dallas, and Denver, the rate of decline in transit use for TODs was greater than for the region, although transit use remains about twice as high. Since these TODs were not built until the late 1990s or after 2000, more time may be needed to fully evaluate the long term trend.

Renne also compiled national work trip information for walk and bike trips as shown in Table 1.3. Key observations regarding these modes include:

- TODs have about 3.5 times more walking and cycling than MSAs (11.2% in TODs versus 3.2% in regions).
- Although walking and biking to work has declined nationally, the decline has been less pronounced in TODs.
- The same cities that had the largest increases in transit ridership (Miami, San Francisco, Washington, D.C., and Portland) also had the lowest declines in walking and cycling to work.

High-transit commute modal shares among station-area residents are significantly a product of self-selection: those with a lifestyle preference to ride transit consciously move to neighborhoods well-served by transit and act upon their preferences by riding frequently. A recent study by Cervero and Duncan (2002) used nested logit analysis to predict transit ridership as a function of residential location choice in the San Francisco Bay Area. Around 40% of the rail commute choice was explained by residential location.

Understanding how TOD residents and employees previously traveled is important in sorting out the relative

Table 1.3. Walk/bike trends for journey to work trips for selected TODs.

Region	Walk Share 1970 (%)	Walk/Bike Share 1980 (%)	Walk/Bike Share 1990 (%)	Walk/Bike Share 2000 (%)	% Change 1970-2000 (%)
Older and Redeveloping Regions					
Chicago TOD Average (n=8)	13.6	14.1	9.8	8.9	-34.0
Chicago MSA Average	9.6	7.9	5.7	3.4	-64.0
NY/NJ TOD Average (n=26)	16.9	14.3	8.6	8.2	-51.0
NY/NJ MSA Average	10.0	10.2	7.3	5.8	-42.0
TOD Average	**15.2**	**14.2**	**9.2**	**8.6**	**-44.0**
MSA Average	**9.8**	**9.0**	**6.5**	**4.6**	**-53.0**
Maturing - Heavy Rail Regions					
Atlanta TOD Average (n=4)	13.1	16.1	7.9	7.4	-43.0
Atlanta MSA Average	4.4	3.2	3.1	1.4	-68.0
Miami TOD Average (n=2)	3.3	3.6	3.0	2.8	-15.0
Miami MSA Average	7.3	5.5	4.1	2.2	-70.0
San Francisco TOD Average (n=18)	19.8	19.1	14.9	16.1	-19.0
San Francicsco MSA Average	8.6	9.1	6.4	4.4	-49.0
Washington DC TOD Average (n=16)	17.3	18.3	14.9	14.2	-18.0
Washington DC MSA Average	8.4	7.0	5.4	3.2	-62.0
TOD Average	**13.4**	**14.3**	**10.2**	**10.1**	**-24.0**
MSA Average	**7.2**	**6.2**	**4.8**	**2.8**	**-61.0**
New Start - Light Rail Regions					
Portland TOD Average (n=5)	23.2	23.4	19.5	20.4	-12.0
Portland MSA Average	7.8	7.4	5.4	3.7	-52.0
San Diego TOD Average (n=6)	13.2	22.6	9.4	7.7	-42.0
San Diego MSA Average	9.5	9.1	6.1	4.0	-58.0
Los Angeles TOD Average (n=6)	15.2	13.5	10.7	9.5	-37.0
Los Angeles MSA Average	7.7	7.6	5.1	3.2	-58.0
Dallas TOD Average (n=6)	31.9	9.4	26.1	11.2	-65.0
Dallas MSA Average	5.8	3.4	3.2	1.6	-72.0
Denver TOD Average (n=2)	13.4	6.3	7.9	5.5	-59.0
Denver MSA Average	7.8	6.4	4.9	3.1	-60.0
Salt Lake City TOD Average (n=4)	12.9	8.0	6.9	7.1	-45.0
Salt Lake City MSA Average	6.5	5.7	4.5	2.3	-65.0
TOD Average	**18.3**	**13.9**	**13.4**	**10.2**	**-44.0**
MSA Average	**7.5**	**6.6**	**4.8**	**3.0**	**-60.0**
Total TOD Average (n=103)	**17.4**	**15.8**	**12.3**	**11.2**	**-36.0**
Total MSA Average (n=12)	**7.8**	**6.9**	**5.1**	**3.2**	**-59.0**

Source: Renne, 2005

importance of self-selection. If most TOD residents patronized transit prior to their move, then net ridership benefits are somewhat reduced. Two California research projects throw some light on this question. The 1992 study of ridership of people living near California rail stops examined how they travel to work at their prior residence (Cervero, 1994). For those whose job location did not change, surveys showed that 56% of station-area residents rode transit to work at the previous residence. Thus, TOD residency did not yield regional mobility benefits in the case of nearly half of the sample. However, impacts were not inconsequential. Among those who drove to work when they previously lived away from transit, 52% switched to transit commuting after moving within a half mile walking distance of a rail station.

Similar findings have been observed in Portland, Oregon. At the Center Commons, an urban neighborhood TOD, about 56% of survey respondents currently use an alternate mode of transportation (i.e., transit, bike, walk, carpool) to get to work; about 46% use transit. Prior to moving into the TOD, about 44% used an alternate mode for work trips, and 31% used transit. In comparison, transit work-trip mode share for the city of Portland was 12.3% according to the 2000 Census. (Almost 75% of Center Commons respondents had an annual household income of $25,000 or less. About 78% of work trips on transit and 84% of nonwork trips on transit are by residents who make $25,000 or less per year.) For nonwork trips, 55% currently use an alternate mode of transportation, and 32% use transit. Previously, 42% used an alternate mode for nonwork trips, and 20% used transit (Switzer, 2002).

At Orenco Station, a more affluent suburban neighborhood TOD, 18% of TOD commuters regularly use transit, 75% travel in single occupancy cars, and 2.7% carpool, bike, or walk (Podobnik, 2002). Sixty-nine percent of survey respondents indicated that they use transit more often than in their previous neighborhood, and 25% use transit at about the same level.

At The Merrick, an urban downtown TOD, 23% of residents regularly commute to work or school by transit, 44% commute in a private vehicle, and 16% walk (Dill, 2005). Overall in Portland, 12% commute by transit, 76% by private vehicle, and 5% walk. The mode split for all trips at The Merrick is: 18% transit, 53% personal vehicle, and 29% walk. The Merrick residents also claim to drive less and use transit and walk more compared to where they used to live:

- 45% claim to drive a lot less now;
- 23% claim to drive a little less now (total of 68% drive less now);
- 42% claim to use transit a lot more now;
- 28% claim to use transit a little more now (total of 70% use transit more now);
- 31% claim to walk a little more now; and
- 16% claim to walk a lot more now (total of 47% claim to walk more now).

The 2003 California survey of transit usage found a clear pattern of changes in travel behavior before and after moving to a TOD. Among all residents surveyed, around 12% shifted from some form of automobile travel to transit for their main trip purposes; however, around 10% shifted from taking transit to auto travel after moving to a TOD, and 56% drove as much as when they lived away from a TOD. The change to car commuting was thought to reflect the trend toward suburban employment in automobile-oriented settings.

The 2003 California study also provides longitudinal insights into ridership trends among TOD projects. Overall, no evidence was found that transit modal shares changed as TOD housing projects matured. In the case of several surveyed housing projects near BART's Hayward and Union City stations, the shares of commutes by transit were in the 26% to 28% range in 1992 and 2003. In a few TODs where transit's commute market shares increased over time, results could reflect filtering effects: those who use rail transit may stay in place and maintain longer residences while those not using transit may be more likely to leave.

In comparison to mode share, not much information about TOD trip generation rates has been captured. Because many TODs have grid-based street networks, there are more project access points than in conventional suburban projects, which tends to increase the cost and complexity of trip generation studies (because more locations must be monitored). Lee (2004) reviewed and compiled TOD trip generation data from four locations, and this data is shown in Table 1.4. From the data, it is difficult to conclude how TOD trip rates compare to standard ITE trip rates, as the TOD rates generally fall between the two ITE apartment benchmarks. In Portland, Lapham (2001) found that the lower auto trip rates could only partially be explained by higher transit use; the TODs had transit mode shares of 16% in the morning peak period and 11% in the afternoon peak, compared to about 5% for the city. After including transit and pedestrian trips to analyze total trips, he still found the TOD trip rates to be lower than the ITE rates. Lapham notes that:

- Few families were observed in the TODs, so smaller household size may be a factor.
- At suburban TODs, the AM peak period appeared to be earlier than the 7 AM to 9 AM recording period (i.e., TOD residents may travel at different times).
- Some of the larger TODs may have had more internal trips that were not captured.

Table 1.4. Selected TOD auto trip rates (total trips in and out).

	AM Peak Hour		PM Peak Hour	
Study Location	Apartments (trips per dwelling unit)	Office (trips per 1,000 sq. ft.)	Apartments (trips per dwelling unit)	Office (trips per 1,000 sq. ft.)
Pleasant Hill BART	0.33	1.20	0.41	1.10
San Mateo	0.44	NA	0.49	0.92
Portland TODs	0.29	NA	0.38	NA
Pleasanton Apartments	0.43	NA	0.47	NA
ITE Apartments (use 220)	0.51			
ITE Mid-Rise Apartments (use 223)	0.30			

Source: Lee, 2004

Table 1.5 shows trip rates for trips leaving The Merrick TOD in Portland, compiled by Dill (five bicycle trips were recorded and that mode is not shown). These numbers were recorded via travel diaries (not tube counters) and thus will be slightly lower than reality, as they do not include trips by visitors and The Merrick employees. However, these are likely to be a small number of trips.

Assuming every resident who leaves The Merrick returns, the numbers can be doubled to approximate total trips to and from The Merrick. Thus, the daily trip generation rate is approximately 5.4 total trips per apartment, and 2.8 auto trips. This is lower than the rate the MPO uses from the ITE *Trip Generation* book (about 6.6 total trips per apartment). Like Lapham, Dill speculates this is probably due to smaller household sizes. The average number of people per apartment at The Merrick was 1.3, with 73% of the households having only one person. In contrast, in the 2001 National Household Travel Survey (NHTS), the average household size for people living in apartments was just over 1.9 persons per household, with 26% only having one person. In addition, about 40% have three or more people. Since the ITE rates are based on an average from trip counts taken at apartments all across the United States, it is likely that the average household size for the apartments measured by ITE is larger than at The Merrick. Given this likely difference in household size, the lower total trip rate seems reasonable, and highlights the fact that current ITE trip generation rates may differ significantly from actual TOD trip rates.

Transit System and Land Use Influences

1. What levels of transit connectivity to desired origins and destinations are required to promote transit ridership at TODs?
2. What TOD land-use and design features (e.g., mixed land-use, traffic calming, bus bulbs, short blocks, street furniture) have had an effect on travel patterns, transit ridership, or the decision to locate in a TOD?

Key Conclusions

- Research shows that system extensiveness is positively correlated with transit ridership.
- Extensive transit networks, worse traffic congestion (i.e., slow auto trip times), and higher parking costs work together to increase TOD transit ridership.
- General consensus is that transit service headways of 10 minutes are ideal to support a transit lifestyle.
- There is no single, definitive threshold for connectivity, and measures such as “track miles” and “number of transit stations” on their own are not the best predictors of ridership. What matters is transit travel times relative to auto travel times. For example, an extensive but very slow transit system likely will attract few riders if highway congestion is not severe. Conversely, a single fast rail corridor adjacent to a highly congested auto corridor likely will attract high ridership.

Table 1.5. Trip rates by mode at The Merrick TOD.

	Trips From Merrick Per Person		Trips From Merrick Per Apartment Unit	
	Per Week	Per Day	Per Week	Per Day
Total Trips	16.72	2.39	18.81	2.69
Private Vehicle	8.81	1.26	9.91	1.42
Walk	4.82	0.69	5.42	0.77
Bus	1.10	0.16	1.23	0.18
Light Rail	1.93	0.28	2.17	0.31
Transit (Bus + LRT)	3.03	0.43	3.41	0.49

Source: Dill, 2005

- The systems that will generate the highest commute ridership will have a high percentage of regional jobs accessible by fast transit.
- For work trips, proximity to rail stations is a stronger influence on transit use than land use mix or quality of walking environment. The most effective strategy to increase TOD ridership is to increase development densities in close proximity to transit.
- Employment densities at trip ends have more influence on ridership than population densities at trip origins. It is critical to locate jobs near transit in order to attract households to TODs.
- Relative travel time (transit versus auto) is still more important than any land use factor (density, diversity of uses, or design).
- Mixed uses in TODs allow the transit service to be used for a variety of trip purposes throughout the day and week, but as a travel benefit, this is not a primary consideration for prospective TOD residents. Employment access is a primary consideration.
- Mixed uses (e.g., local restaurants) and urban design treatments (e.g., pedestrian pathways) are important for their amenity and design value in attracting residents and visitors/customers. TOD residents highly value good neighborhood design in addition to transit access to work. Urban design and the local land use mix may influence which TOD prospective residents choose to live in. Good design also may make a TOD a more desirable location to travel to.

Findings

There is no absolute dividing line or tipping point for transit connectivity that translates into high transit ridership. From a transit perspective, connectivity can relate to the number of origins and destinations that can be accessed, the speed of transit service, and/or the frequency of service connecting origins and destinations. Mode choice studies of TOD residents and office workers typically show that transit travel times and *their comparison to private car travel times* is the strongest predictor of transit ridership. In other words, travel time differentials are a critical factor, and these differentials can vary greatly depending on local circumstances.

Census research by Reconnecting America's Center for Transit-Oriented Development (CTOD, 2004) provides a macro-level view of this dynamic. CTOD looked at 3,341 fixed guideway transit stations in 27 metropolitan regions. Transit zones were defined as the half-mile radius around the stations, and the 27 transit systems were categorized as small, medium, large, and extensive. Like Renne, CTOD found that commuters in transit zones were much more likely to use transit, and concludes that the size (i.e., extensiveness) and relative speed of the rail transit system is a significant determinant of whether TOD households use cars or transit (Tables 1.6 and 1.7).

That said, less is known about specific accessibility thresholds (e.g., number of accessible jobs, households) to support a given TOD. In TCRP Project H27, the research team noted that the highest recorded rail capture rates are in the Washington, D.C. area, and surmised this likely is related to the fact that Metrorail has the most extensive network of any recent-generation system in the country. Lund, Cervero, and Willson (2004) partly attribute higher transit mode shares for TOD residents in the Bay Area (e.g., Pleasant Hill, Alameda City) to a more extensive and mature rail system than other TOD places [e.g., Long Beach (LA), Mission Valley (San Diego)]. In that research, the authors found a significant relationship between transit ridership and an accessibility measure that divides jobs reachable by transit in 30 minutes by jobs reachable by auto in 30 minutes. As one would expect, the more accessible a trip origin is to jobs by transit (relative to auto), the more likely the trip is to be made by transit. While regional travel models cannot predict the number of jobs or households needed to support a particular TOD, they can predict reasonably well the ridership that will result from a TOD based on regional accessibility measures.

Transit travel times have a strong bearing on relative accessibilities (by transit versus auto) and the decision to use transit. Cervero (2003) found that for non-transit users, auto travel was on average 42 minutes faster than transit (for all trip purposes), but for transit users, auto travel was only 23 minutes faster. This is consistent with many other studies that find

Table 1.6. 2000 transit shares for work trips.

Area	Transit Zones	Metro Area
Chicago	25%	11%
Washington DC	30%	9%
Memphis	6%	2%
Cleveland	13%	4%
Denver	12%	5%
Charlotte	4%	1%
Los Angeles	16%	5%

Source: CTOD, 2004

Table 1.7. 2000 percent auto commuters by transit system size.

Transit System Size	% Auto Commuters
Small	72%
Medium	77%
Large	65%
Extensive	49%

Source: CTOD, 2004

that slow transit travel times retard ridership growth. Riders also care a lot about service reliability. Riders have been shown to be more sensitive to unpredictable delay than predictable waiting times (Pratt, 2000, Chapter 9). TODs should be focused toward transit facilities that offer clear travel speed and reliability advantages (e.g., rail lines or bus corridors with priority design treatments).

Numerous studies under the broader topic of transit operations have been completed to understand how improved transit service (i.e., faster speeds, improved frequency, different configurations) affects transit ridership. These studies have typically been undertaken to increase transit ridership in general, although the findings are directly applicable to improving TOD-focused transit service and/or locating new TODs. These studies have not been exhaustively reviewed for this literature review. Rather, only some general findings are presented here.

As would be expected, improved transit service levels makes transit more convenient to use and improves transit ridership. Services may be so frequent that riders don't need schedules, and frequent service provides more flexibility regarding departure and arrival times. For TODs it is important to have good service levels all day. Because TODs typically have a diverse range of land uses, they require good service frequency during both the peak and off-peak periods, to serve both work and nonwork trips. Table 1.8 gives a rough indication of ridership impacts due to different transit service changes, and shows that off-peak frequency improvements can improve ridership more than other strategies (the data indicate that a 10% improvement in off-peak service levels increases ridership by 7% on average).

Table 1.8. Typical ridership response to one percent change in listed factor.

Factor	Percent Change
Peak Fare	0.20%
Peak Frequency	0.20%
Off-Peak Fare	0.58%
Off-Peak Frequency	0.70%
Out-of-Pocket Auto Costs	0.70%

Source: ECONorthwest, 1991. APTA, 1991.

Note: Influencing factors are: preexisting service levels, geographic and demographic environment, and period of day or week. The response is greatest when prior service is less than three vehicles per hour, when upper and middle income groups are served, when a high number of short trips can be served, and the local economy is strong. In some suburban places, off-peak frequencies have achieved elasticities near 1% when the service expansion was comprehensive and carefully planned. (Pratt, 2000, Chapter 9)

In Portland, for instance, TriMet has pursued a strategy of improving off-peak bus service in its most dense and mixed use (i.e., TOD-like) corridors to expand its nonwork trip market. From FY 99 to FY 03, TriMet improved service on 10 lines to "frequent service" (15 minutes or less all day, every day). On the improved lines, TriMet experienced a 9% increase in overall ridership, whereas ridership generally remained level for routes with only nominal increases in frequency. For the frequent lines, weekday ridership increased 8%, Saturday ridership increased 14%, and Sunday ridership increased 21%. Frequent bus service now accounts for 45% of weekly bus hours and 57% of weekly bus rides.

A generally accepted service level threshold for TODs is headways of 15 minutes or less during most of the day (Dittmar and Ohland, 2004). It makes little sense to build TOD in places that receive only hourly bus service, as service is not frequent enough to make transit use convenient. Table 1.9 describes in more detail generally recommended transit service levels for different types of TODs.

Other studies have focused more on the geographic aspects of transit service (e.g., system configuration) to see how ridership is impacted. Ewing (1995) and others have found that accessibility to regional activities has much more effect on household travel patterns than density or land use mix in the immediate area. Whereas accessibility to shopping or workplaces alone is relatively less important, good access to shopping, services, schools, work, and other households has a strong influence on travel patterns. While Ewing's research focused on vehicular hours of travel, the findings for TOD are clear. Even if TODs show a propensity to generate higher than average transit ridership, they should not be built in remote locations with reduced accessibility (by all modes) to a wide range of activities.

Recent research on the relative performance of alternative transit configurations reveals that network orientation greatly affects the performance of rail and bus service. Based on data from the National Transit Database, Thompson and Matoff (2000) conclude that:

- The best performing systems tend to be express bus-based systems oriented to strong central business districts (CBDs) in rapidly growing regions, and multi-destinational, coordinated bus/light rail systems in growing regions. In multi-destinational networks, a rail line is a feeder to suburban buses, just as buses are feeders to the rail line. Multidestinational networks typically appear in two configurations: as a grid in high-density areas where frequent service on all routes can be supported and as a timed transfer network in

Table 1.9. TOD types with land use and transit characteristics.

TOD Type	Land Use Mix	Minimum Housing Density	Regional Connectivity	Frequencies
Urban Downtown	Office Center Urban Entertainment Multiple Family Retail	> 60 units per acre	High Hub of regional system	<10 minutes
Urban Neighborhood	Residential Retail Class B Commercial	> 20 units per acre	Medium access to downtown Sub regional hub	10 minutes peak 20 minutes off peak
Suburban Center	Office Center Urban Entertainment Multiple Family Retail	> 50 units per acre	High access to downtown Sub regional hub	10 minutes peak 20 minutes off peak
Suburban Neighborhood	Residential Neighborhood retail Local Office	> 12 units per acre	Medium access to suburban center Access to downtown	20 minutes peak 30 minutes off peak
Neighborhood	Residential Neighborhood retail	> 7 units per acre	Low	25-30 minutes Demand responsive

Source: Dittmar and Ohland, 2004

lower-density places where frequent service on all routes can't be justified.

- Whereas express bus systems are more oriented to peak period commuters traveling to CBD's, multi-destinational rail/bus networks are oriented to a broader mix of passengers and destinations.
- In comparison, traditional CBD-oriented bus transit systems in rapidly growing regions are in decline. In this case, individual routes, or collections of unrelated routes, cannot compete in a dispersed trip market as each route only serves origins and destinations on that single line.

The implications for TOD are that ridership is likely to be maximized when TOD is located in express bus corridors linked to a healthy CBD, or located near rail corridors with robust connecting bus service.

Land use variables that affect travel are frequently described as pertaining to density, diversity (i.e., mixed uses), and design - the 3 Ds. Cervero and Kockelman (1997) found that the elasticities between various measures of the 3 Ds and travel demand are generally in the 0.06 to 0.18 range, expressed in absolute terms. They conclude that the elasticities between the land use factors and travel demand are modest to moderate, and higher densities, diverse land uses, and pedestrian-friendly designs must co-exist if ridership benefits are to accrue.

In its guidance for air quality conformance testing, FHWA notes that accessibility (i.e., the number of jobs accessible within a certain distance or time by mode) has a much stronger influence on travel than the 3 Ds, and unless density is above 7-10 dwelling units per acre, it is unlikely that the other Ds will have any effect, even in combination. (See www.fhwa.dot/gov/environment/conformity/benefits/benefitsd/htm.)

Density, or high shares of development within a 5-minute walk of a station, has generally been shown to be the strongest determinant of transit riding and walking among the land use variables. Cervero (2005) estimated the following density elasticities for transit ridership during the course of developing local ridership models for BART, Charlotte, North Carolina, and St. Louis, Missouri:

- Charlotte Transitway TOD Scenarios: 0.192 (for persons per gross acre within a half mile of a station).
- BART Extension: 0.233 (for population and employment within a half mile of a station).
- St. Louis MetroLink South Extension: 0.145 (for dwelling units per gross acre within half mile of a station).

While other studies have estimated much higher ridership impacts attributable to development density, these studies typically did not use control variables to hold the extraneous factors of transit service levels, household demographics, and parking constant (e.g., prices). As a result, these factors may have influenced the results. The TCRP H-1 study, for instance, estimated a high population density elasticity of 0.59, but failed to include a measure of transit service levels. After accounting for transit service levels and other factors, Cervero re-estimated the density elasticity to be 0.192 (and the elasticity for the number of morning inbound trains was 0.59).

Employment densities at destinations are more important than population densities at trip origins. Having an office or workplace near a transit stop is a strong motivator for many Americans to reside near transit and motivates people to buy into high transit-accessible neighborhoods. The end result is that having both ends of the trip within a convenient walk to and from a transit stop is key to high ridership levels.

Several studies have shown that good job accessibility via transit is among the strongest predictors of whether station-area residents will take transit to work. The 1994 Cervero study of commute choice among TOD residents of Bay Area TODs found that having a workplace near a rail station strongly encouraged rail commuting. Commuting to a job in BART-served downtown San Francisco or Oakland, for example, increased the likelihood of taking transit by 35% to 60% among residents of suburban East Bay TODs. In another study of California TODs, Cervero (1994) found that four variables–employment density, employment proximity to transit, commute behavior at the worker's previous job, and occupation–explained 92% of the mode split variation. Original research conducted by the team under TCRP H-27 for the Rosslyn-Ballston corridor of Arlington County, Virginia, showed that nodes of concentrated development along transit corridors translates into higher transit commute shares. In Arlington County, every 100,000 square feet of office and retail floorspace added from 1985 to 2002 increased average daily Metrorail boardings and alightings by nearly 50 daily boardings and alightings.

Research shows that proximity to rail stations is a stronger determinant of transit usage for work trips than land-use mix or quality of walking environment (Cervero, 1994). Concentrating growth around rail stops often will yield high ridership dividends almost regardless of the urban design attributes of the immediate area. Still, all transit trips involve walking to some degree, thus the provision of safe, efficient, and comfortable-feeling walking corridors between transit stations and surrounding communities is an essential attribute of successful TODs. Mixed uses like housing, offices, retail shopping, and entertainment centers are important components of TOD since they produce all-day and all-week transit trips, thus exploiting available transit capacity.

Studies show that the urban design features of TOD tend to have a modest influence (relative to physical proximity) on ridership patterns, and suggest the presence of an "indifference zone" for longer-distance work trips. That is, once work commuters are within one-quarter mile of a rail station, factors like mixed land uses, traffic calming, pedestrian amenities, and even density seem to matter little. This is a consistent finding from studies on the ridership impacts of TOD, including the previously-cited research by Lund, Cervero, and Willson (2004). Availability, price, and convenience of parking strongly determine whether or not those working in TODs take transit.

Lund, Cervero, and Willson found that the only neighborhood-design variable that explained commuting transit ridership among TOD residents was street connectivity at the trip destination. Once controlling for the influences of factors like travel time and transit accessibility, no attributes of walking quality or land-use composition in the neighborhoods of TOD residents had a significant impact on transit mode choice. Some of the correlations with transit ridership found in that study are:

- Pedestrian connectivity at trip destination: 0.37;
- Sidewalks along shortest walk route: 0.16;
- Street trees: 0.079;
- Street lights: 0.178; and
- Street furniture (benches, bus shelters): 0.137

The researchers also found that urban design variables exert a stronger influence for station area workers than for station area residents. Furthermore, within each TOD, some will value pedestrian treatments highly, while others will not be deterred by their absence if transit is nearby. Thus, resident attitudes matter considerably. That said, good urban design treatments probably make living at higher densities more attractive.

Ewing and Cervero (2001) note that individual urban design features seldom prove significant. Where an individual feature appears to be significant, as did striped crosswalks in one study, the causality almost is certainly confounded with other variables. In this case, painting a few stripes across the road is not likely to influence travel choices, and the number of crosswalks must have captured other unmeasured features of the built environment.

Cervero (1994) concluded that for work trips,

> Within a quarter to a half mile radius of a station, features of the built environment (ignoring issues of safety and urban blight) matter little—as long as places are near a station, the physical characteristics of the immediate neighborhood are inconsequential.

Another assessment underscores the importance of density and proximity to a station, however, more value was attached to the land-use composition of a TOD: "transit use depends primarily on local densities and secondarily on the degree of land use mixing" (Ewing and Cervero, 2001). For instance, using data on more than 15,000 households from the 1985

American Housing Survey, Cervero (1996) found the presence of retail shops within 300 feet of one's residence increased the probability of transit commuting, on average, by 3%—ostensibly because transit users could pick up convenience items when heading home after work.

Not all recent evidence diminishes the importance of urban design on the travel choices of TOD residents. The TCRP H-27 study found, for example, that the combination of high densities and small city block patterns significantly increased the share of station-area residents in the San Francisco Bay Area who took transit to work in 2000. In addition, auto-restraint measures, like traffic calming and car-free streets, likely have some marginal influence on ridership to the degree walking becomes safer, easier, and more enjoyable.

The quality of walk and bus access to and from stations should also be considered. Although parking supplies and prices at the trip destination more strongly influence ridership among TOD residents than parking at the nearby rail station, the design and siting of station parking lots bears some influence on transit demand. Peripheral parking lots that do not sever pedestrian paths to nearby residential neighborhoods, for example, may induce transit usage, although this has not been tested empirically.

Transit travel times, which tend to be short when transit enjoys high connectivity, are far stronger predictors of rail usage for TOD commuters than land-use, urban-design, and demand-management variables. Based on standardized model coefficients, the predictive power of transit travel-time variables tends to be two- to three-times greater than land-use and policy-related variables, and based on modal travel time differences many travel models can predict transit ridership at TODs reasonably well.

TOD land use features are more likely to affect travel behavior for shorter-distance, nonwork trips. To the degree that housing, offices, shops, restaurants and other activities are intermingled, people are less likely to drive and more likely to walk to nearby destinations. Similarly, while urban design is likely to only have a marginal impact on primary trips (e.g., whether and how to access work or a shopping center), it is more likely to affect secondary trips from an activity center, which can be made by car, transit, or on foot.

Because of their pedestrian orientation and mix of land uses, TODs can significantly increase the number and percent of local trips made by walking and cycling in particular. Table 1.10 shows how the share of walk, bike, and transit trips for the Portland metropolitan region are higher in neighborhoods with TOD characteristics. Most notably, walk trips almost double when mixed uses are included in areas with good transit service.

Using primary data from urban residents in the San Francisco-Oakland-San Jose MSA and San Diego County and negative binomial regressions, Chatman (2005) found that access by transit to nonwork activities increased by 22.6% for each 1,000 retail workers within a quarter mile of residences. This robust relationship was found for all of the nearly 1,000 residential households that were sampled. Adding a rail station yielded a significant further bump in ridership. For residences within a half mile of a light-rail station in San Jose or San Diego, the number of nonwork activities by transit rose an additional 6.5%. A far bigger bonus was found for high-performance regional rail services: for those living within a half mile of a BART heavy-rail or CalTrain commuter rail station, the number of nonworker activities via transit rose a resounding 284%. Besides retail density, pedestrian connectivity increased transit's mode share of nonwork trips. On the other hand, as walking quality increased, transit trips seemed to switch to travel by foot.

Chatman's work strongly suggests that the quality of the walking environment significantly influences travel choices for nonwork travel. Walk/bike travel to nonwork activities was found to increase by 7.1% for every 1,000 retail workers within a half mile radius of sampled residences. These results show that the combination of intensifying retail activities with good pedestrian facilities near regional rail stations can dramatically increase the use of transit for nonwork purposes.

Table 1.10. Metro travel behavior survey results, all trip purposes (Portland, Oregon).

	Mode Share					
Land Use Type	% Auto	% Walk	% Transit	% Bike	% Other	Daily VMT per Capita
Good Transit & Mixed Use	58.1%	27.0%	11.5%	1.9%	1.5%	9.80
Good Transit Only	74.4%	15.2%	7.9%	1.4%	1.1%	13.28
Rest of Multnomah Co.	81.5%	9.7%	3.5%	1.6%	3.7%	17.34
Rest of Region	87.3%	6.1%	1.2%	0.8%	4.6%	21.79

Source: Metro 1994 Travel Behavior Survey

VMT = vehicle miles traveled

Using 2000 data collected from more than 15,000 households sampled in the San Francisco Bay Area, Gossen (2005) studied travel and sociodemographic attributes for seven distance/density categories based on households' proximity to rails stations and ferry terminals. Regarding nonwork travel, Gossen found that transit made up these shares of nonwork trips for the following distance rings: 14.2% (up to ¼ mile); 11.5% (¼ to ½ mile); 6.1% (½ to 1 mile); 1.6% (> 1 mile - low-density suburbs). Gossen also found that VMT per capita increased with distance from rail/ferry stations in the following fashion: 19.9% (¼ mile); 24.1% (¼ to ½ mile); 29.4% (½ to 1 mile); 45.0% (> 1 mile - low-density suburbs).

Evans and Stryker (2005) conducted research on Portland TODs to see if the presence of TOD design features is detectable using a travel demand model for nonwork trips. In other words, does designating a travel analysis zone (TAZ) as including TOD add explanatory power to a base travel model for non-work trips?

In the Portland travel models, an urban design variable that captures the number of retail businesses, households, and street intersections within a half mile of each zone is currently used to estimate nonwork trips. The variable is formulated so that places with a moderate mix of all three elements score higher than places with very high amounts of only one element.

In a test model, the urban design variable was retained, and TAZs that contain built TOD projects were given an additional code (the TODs were identified via a qualitative assessment by local TOD experts). Table 1.11 shows how inclusion of the TOD variable allows the model to more closely match observed mode share totals.

Evans and Stryker's results show that in centrally located and outlying TODs, walking's share of nonwork trips is more than twice that for non-TOD areas, and that transit use is significantly higher in central TODs (7% compared to 1%) where local and connecting transit service is most robust. The results also show that the standard and urban form models capture most mode choice behavior for nonwork trips. Adding a TOD land use variable to account for the influences of unspecified factors (e.g., parking configuration, street lights) improves the model results only modestly and most noticeably for Central TOD transit use, which increased from 5% to 7%. [The urban form and TOD variables were not found to be correlated. The author also cautions against using TOD dummy variables in travel models, because 1) it is not good practice to overuse dummy variables, particularly ones that may measure a continuous attribute (e.g., degrees of TOD-ness) and 2) using a TOD variable requires an analyst to arbitrarily designate TODs in the base year and in future years, potentially introducing bias into the model.]

Table 1.11. Nonwork trip attractions by TOD types and travel mode (Portland, Oregon).

Area	Source	Walk		Bike		Transit		Auto	
Central TOD	Actual	444	16%	50	2%	198	7%	2043	75%
	Standard Model	373	14%	53	2%	133	5%	2176	80%
	Urban Form Model	453	17%	56	2%	126	5%	2100	77%
	TOD-Included Model	460	17%	50	2%	184	7%	2041	75%
Outlying TOD	Actual	133	17%	11	1%	12	2%	626	80%
	Standard Model	101	13%	11	1%	14	2%	656	84%
	Urban Form Model	106	14%	12	1%	15	2%	649	83%
	TOD-Included Model	117	15%	11	1%	26	3%	628	80%
Non-TOD	Actual	1401	7%	217	1%	195	1%	19,388	91%
	Standard Model	1504	7%	214	1%	258	1%	19,225	91%
	Urban Form Model	1419	7%	210	1%	263	1%	19,308	91%
	TOD-Included Model	1401	7%	217	1%	195	1%	19,388	91%
Overall	Actual	1978	8%	278	1%	405	2%	22,057	89%
	Standard Model	1978	8%	278	1%	405	2%	22,057	89%
	Urban Form Model	1978	8%	278	1%	405	2%	22,057	89%
	TOD-Included Model	1978	8%	278	1%	405	2%	22,057	89%

Source: Evans and Stryker, 2005.

Mixed uses and urban design treatments can also reduce average trip distances. Evaluating shopping trips only, Handy (1993) analyzed the impacts of local accessibility on trip distance and frequency, where accessibility reflected convenience to nearby supermarkets, drug stores, and dry cleaners nearby in small centers or stand-alone locations. In this case, accessibility was measured as a function of retail, service, and other non-industrial jobs in nearby zones (attractiveness) and off-peak travel times (impedance). The study concluded that high levels of local access are associated with shorter shopping distances, although no relationship was found for trip frequency.

TOD Ridership Strategies

1. What motivates or impedes transit ridership in a TOD?
2. What strategies have been effective in increasing transit ridership at TODs?
3. What steps should transit agencies take in supporting TODs to maximize transit ridership?

Key Conclusions

- Factors that most influence transit ridership are station proximity, transit quality, and parking policies.
- Fast, frequent, and comfortable transit service will increase ridership.
- High parking charges and/or constrained parking supply also will increase ridership.
- Free or low-cost parking is a major deterrent to transit ridership.
- Successful strategies include: TOD transit pass programs, parking reductions, and car-sharing programs.
- TOD transit programs will be similar to other transit programs. Because by definition TOD residents and households are the nearest to transit, TODs should be among the first locations that transit agencies implement specialized programs.
- TOD (e.g., mixed uses, high densities, reduced parking) is still illegal around station areas in many cities and transit districts.
- Steps transit agencies are taking to promote TOD include: reconsidering replacement parking requirements at park and rides, advocating for zoning changes with TOD entitlements, land assembly, joint development, and educational efforts (e.g., producing TOD guidebooks).

Findings

The travel fundamentals of TOD transit ridership are similar to general transit ridership. Among the variables amenable to policy change, transit service levels and prices are the strongest predictors of ridership in a TOD. Next in importance tends to be parking supplies and charges, followed by demand-management measures like employer provision of free transit passes. Least influential tends to be land-use and urban design factors. Mixed land use and high-quality urban design, however, can be important factors in drawing tenants to station areas in the first place, thus indirectly their role in shaping travel behavior in TODs can be substantial. While the factors listed above—transit service levels and parking management—strongly influence transit ridership, service enhancements and parking programs usually have not been introduced explicitly for the purposes of increasing ridership at TODs.

In the transit planning literature, there is a large body of research on what strategies are the most effective in generating increased transit ridership. The 1995 TCRP study, *Transit Ridership Initiative*, identified five main transit strategies to increase ridership: service adjustments; fare and pricing adaptations; market and information activities; planning orientation (community- and customer-based approaches); and, service coordination, consolidation, and market segmentation. It is reasonable to expect that this family of conventional transit ridership strategies also will be effective in generating increased ridership at TODs (that study is not summarized here). Transit agencies interested in taking steps to maximize ridership at TODs would be well advised to start with these proven strategies. Among factors within the direct control of transit agencies, the provision of frequent, reliable, and comfortable transit services will induce ridership among TOD residents and workers more than anything else. Past ridership models reveal that the quality of transit services (in terms of speed and accessibility) are significant predictors of transit mode choice among station-area residents. To identify the most effective transit service strategies, the key determinants of travel demand for a specific setting need to be known. One cannot easily generalize the findings from a few urban settings in California and the Washington, D.C. area to all parts of the country.

That said, transit agencies also have shown considerable creativity in pursuing a variety of TOD-specific strategies to increase ridership at TODs. Transportation Demand Management (TDM), initiating targeted pass programs, addressing parking at a number of levels, car-sharing, modifying transit facility design, providing planning assistance, and developing TOD design guidelines are some strategies undertaken by transit agencies to maximize ridership in TODs.

One of the best times to affect travel decisions and to encourage transit use is when there is a change in home or job location. New TOD development offers a good opportunity to implement transit pass programs to attract individuals to use transit, and in general encourage others to change their transportation habits. A survey of commuters offered Eco Transit Passes through the Santa Clara Valley Transportation

Authority (VTA) found that after passes were given away the number of people driving a vehicle by themselves declined from 76% to 60%. It also found that transit's mode share increased from 11% to 27%, while parking demand declined roughly 19% (Shoup, 1999).

Portland's TriMet initiated a TOD Pass Program in September 1998 at four TODs in Westside suburbs in conjunction with the startup of the Westside LRT project. Residents of these TODs were offered free transit passes. Among the key findings: in May 1999, 83% of Orenco Station respondents reported using transit, where only 30% of them used it prior to the Westside LRT opening. From September 1998 to May 1999, there was a 22% increase in the number of Orenco residents that use transit for commuting purposes.

To estimate the collective impacts of increased parking charges and a new transit pass program, Bianco (2000) conducted a study of the Lloyd District, a TOD employment center near downtown Portland, immediately following the installation of the on-street parking meters. Programs implemented in the Lloyd District included:

- The new on-street parking meters;
- A new transit pass program (Passport);
- Emergency Ride Home program;
- Two new express bus routes to the Lloyd District; and
- Transfer facility improvements.

Survey respondents were asked to note how their commute behavior changed one year after these programs were started. For all workers, SOV mode shared declined 7%. For Passport eligible workers, SOV use went down 19%, transit use increased 12%, and carpools increased also. The mode share impacts were immediate and large. Twenty-five percent of respondents indicated that their primary reason for change was for lifestyle reasons, 22% noted the parking charges, and 19% because of Passport (other reasons included new transit availability, change in car ownership, and other). Thirty-six percent of respondents listed Passport as their secondary reason for change.

Transit agencies also have tailored car-sharing strategies for TODs. Research described later in this review shows that car ownership rates at TODs are significantly lower than average. At the same time, the need to use a car for some trips remains. Some TODs such as Buckman Heights in Portland have utilized car-sharing as a means to reduce the need for parking in the TOD while providing the option to drive if needed. Car-sharing allows individuals to have the benefits of auto use for personal trips without the hassles and cost of car ownership and reinforces transit-oriented lifestyles. Transit agencies have played an important role in advocating for and helping to set-up car sharing. Companies like Flexcar provide car sharing in communities such as Portland, Vancouver (WA), Seattle, Washington D.C., the San Francisco Bay area, Long Beach, and other Los Angeles areas (TriMet 1999).

Together with density (i.e., proximity to transit) and good transit service, a major driver of TOD ridership is the provision and management of parking. Market profiles of TOD residences (e.g., small households with few cars) suggest that parking-related strategies, like a relaxation of supply codes and the unbundling of parking and housing costs, could yield long-term ridership dividends. Thus, many transit agencies and local governments desire to affect the amount and price of parking provided.

Numerous studies found that transit ridership increases when parking charges are implemented, and transit agencies and local governments try to affect these too. Mildner, Strathman, and Bianco (1997) found that cities with interventionist parking policies, high parking prices and limited supply, frequent transit service, and a high probability that travelers pay to park, are most likely to have high transit mode shares. Shifting from free to cost-recovery parking (prices that reflect the full cost of providing parking facilities) typically reduces automobile commuting by 10% to 30%, particularly if implemented with improved travel options and other TDM strategies. (See http://www.vtpi.org/tdm/tdm26.htm. Some studies have focused on the impacts of reducing parking supplies, but parking supplies are generally limited where land use is intense and land costs are high. In these cases, it is common to see parking fees that correlate with land values, and the relationship between parking supply and transit demand is captive to the dominant role of parking pricing.)

At The Merrick TOD, only 17% of workers commuted by private vehicle if required to pay for parking at school or work. In contrast, more than 70% of those with free parking used a private vehicle. The most recent California study found that the likelihood of transit commuting rose by nearly 70% if station-area residents enjoyed flex-time privileges and had to pay market rates for parking, compared to the scenario of no flex-time and free parking. The 1993 California study found the availability of abundant free parking to be the biggest deterrent to transit riding among those living and working near transit (Dill, 2005).

Restricted parking supplies at the workplace and employer financial assistance with transit costs also increased the odds of station-area workers opting for rail transit. Figure 1.1 from the Lund et al. study reveals the relationship. Based on the experiences of the typical California TOD office worker, the models showed with 25 feeder buses per day, a workplace with 50% more parking spaces than workers and no employer help with transit costs, just 9% of office workers near a California rail station likely will commute by transit. At the other extreme, for a worker leaving a station with 400 daily feeder buses and heading to a worksite where the employer provides transit-pass assistance and offers just one parking

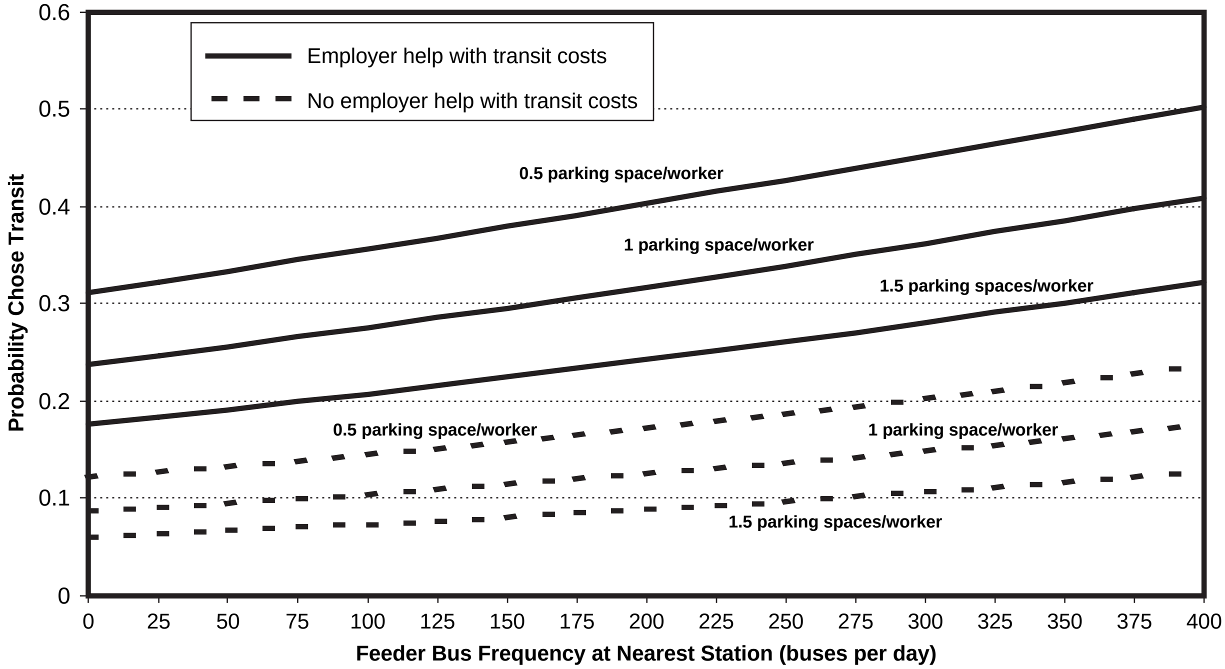


Figure 1.1. Sensitivity of rail commuting to parking prices, availability of flextime work schedules, and travel time ratios via highway verses transit, based on modeling for predicting the likelihood of California station area residents commuting by rail transit in 2003 (Lund et al., 2004).

space for every two workers, the likelihood the worker will commute by transit is 50%.

For transit agencies involved in the development of agency owned land, the policies and procedures for encouraging TOD can have a major impact on the implementation of TOD and directly from that, TOD ridership. Park-and-ride lots often are viewed as land banking for TOD. Ohlone-Chynoweth Commons, located on the Guadalupe light-rail transit line in San Jose, is an example of transforming part of a park-and-ride into a medium density mixed-use TOD. The project's housing, retail, and community facilities were developed on an under-used light-rail park-and-ride lot. For this project, Valley Transportation Authority (VTA) issued a request for proposal seeking a developer for the 7.3-acre site. The former 1,100-space park-and-ride now includes: 240 park-and-ride spaces, 195 units of affordable housing, 4,400 square feet of retail, and a day care center (Parsons Brinckerhoff, 2002).

One barrier to creating more TODs is that many transit agencies (WMATA in the Washington, D.C. region, the San Francisco Bay Area's BART, MTA in Maryland and RTD in Denver, among others) have parking replacement policies that result in one-to-one replacement of park-and-ride spaces. The H-27 team estimated that replacement parking strictures affect at least one third of TOD settings. This has proven to be a major obstacle to TOD implementation on transit agency owned parking lots. With structured parking costs running on average between $10,000 and $15,000 a space ($23,000 to $25,000 a space with special features like a retail wrap), the cost of replacement parking can have a debilitating effect on the financial viability of a proposed TOD and the financial return to the transit agency. For a theoretical 5-acre residential TOD project developed at 40 units per acre, the cost of replacement parking could add $30,000 to nearly $80,000 to the cost of each unit, making TOD infeasible in many places.

Sometimes, transit parking has more to do with parking location than the amount of parking. There is a growing interest in designing transit parking to encourage TOD. Portland's TriMet and DART in Dallas have moved parking at some stations away from the platform to accommodate TOD. Newly planned systems such as Phase II of the Gold Line in Los Angeles, Sound Transit in Seattle, and the Red Line in Baltimore are considering TOD early on in the location and design of stations. This balances the need for parking to generate ridership while preserving the opportunity to capture additional ridership from TODs within an interesting and attractive walk to the station.

Transit agencies have served as an educator, advocate, and financial resource for local jurisdictions to advance the understanding of TOD and facilitate the preparation and adoption of TOD plans and zoning. The presence of self-selection has clear implications for municipal land-use and zoning strategies. The desire of many households to live in a transit-accessible location argues for market-responsive planning and zoning. Introducing zoning and building codes consistent with lifestyle preferences of TOD residents means individuals can more easily sort themselves into transit-served settings and act upon their travel preferences. Preferential strategies, like Location Efficient Mortgages (LEM), also can make it easier for more households to sort themselves into highly transit-accessible neighborhoods.

Transit agencies, in this regard, cover a seemingly ever expanding range of activities. MTA in Maryland has been investing $500,000 to $600,000 annually in TOD administration and planning to create more livable places and increase ridership. MTA in Los Angeles, Sound Transit in Seattle, the RT in Sacramento, Triangle Transit in North Carolina, and TriMet in Portland are part of the growing list of transit agencies that have passed transit agency funds through to local governments to plan for TOD as part of developing new rail systems (Arrington, 2003).

BART has active planning partnerships underway at a dozen different stations with the objective of building stronger partnerships with local governments and to encourage ridership growth on its system. In an innovative twist on that theme, San Diego's MTDB has a San Diego city planner assigned to work with MTDB's planning staff as a liaison on TOD. NJ Transit, the nation's largest state transportation system, provides TOD assistance to cities through the Transit-Friendly Communities (TFC) program and the Transit Village Initiative. The TFC program, started in 1996, allocates roughly $100,000 per community to hire preselected consulting teams to get cities ready for serious transit village consideration. Charlotte Area Transit (CATS), together with the City of Charlotte/Mecklenburg County, has developed a 25-year regional transit/land-use plan, a joint development policy and station area plans to guide growth along centers and corridors. Metra, Chicago's commuter rail operator, has developed strategies, principles and approaches to residential development in station areas targeted at communities and real estate professionals. Finally, Parsons Brinckerhoff has identified nearly 100 transit agencies that have prepared TOD design guidelines as part of a strategy to grow ridership and encourage the implementation of more TODs.

TOD Resident/Tenant Characteristics

1. What are the demographic profiles of TOD residents and employers?
2. What motivates residents or employers to locate in TODs? Examples of motivators may include the quality of schools, access to jobs, housing affordability, presence of transit services, neighborhood services and amenities, and community perception.

Key Conclusions

- The majority of TOD residents along new transit systems are childless singles or couples.
- They are often younger working professionals, or older empty-nesters. There is a wide age spectrum.
- They may have low, medium or high incomes; this is driven by the design and price of the specific TOD housing, and TOD developers will target/be able to predict their market. More higher incomes are being served as the United States continues to go through a robust construction phase of denser urban residential product.
- TOD households typically own fewer cars because they have smaller households, and because they may forgo extra cars due to transit's proximity. TOD households are almost twice as likely to not own any car, and own almost half the number of cars of other households.
- The top three reasons households give for selecting a TOD are housing/neighborhood design, housing cost, and proximity to transit.

Findings

With an expanding inventory of built TODs to observe and learn from, there is a growing body of evidence about who is attracted to work, live, shop, and play in TODs. At the macro level, larger demographic trends washing over America with the aging of the baby boomers and the growth of the Generation X'ers (24-34) are helping drive a growing demand for a more urban real estate product. *New Urban News* (January/February 2003) cites the following factors as helping to drive the trend: a doubling of demand for homes within an easy walk of stores, and an increase in buyers who prefer dense, compact homes. *New Urban News* quotes Dowell Meyer's research indicating that this market segment is expected to account for 31% of 2000-2010 homeowner growth. In addition, the number of U.S. households with children is projected to decline. In 1990 they constituted 33.6% of households; by 2010 they will drop to 29.5% of households. These forces complement and reinforce the growing demand for TOD.

Survey data and anecdotal case-study data offer strong insights into the demographic make-up of TOD residents. TODs often have large shares of childless couples, empty-nesters, Generation X'ers, and foreign immigrants (some of whom come from places with a heritage of transit-oriented living). Table 1.12 shows the demographic characteristics of TODs studied in the H-27 research. These data are consistent with other data showing that TODs attract smaller, typically childless households.

Other research about who lives in TODs reinforces these findings. A recent study of Transit Villages in New Jersey (Renne, 2003) reveals that they cater to a younger population

Table 1.12. Snapshot of TOD demographics from selected TCRP-H27 case studies.

Project	Transit Mode	TOD Type	Demographic Snapshot
The Pearl District, Portland, OR	Streetcar	Urban Downtown	**High income, retiring seniors, childless urban professionals, limited lower income units by developer agreement**
Mockingbird Station, Dallas, TX	Light Rail	Urban Neighborhood	**30-45 year old professionals who can afford to own but prefer to rent**
The Cedars, Dallas, TX	Light Rail	Urban Neighborhood	**Lofts occupied by young professional couples and empty nesters**
Center Commons, Portland, OR	Light Rail	Urban Neighborhood	**Mixed income by design, 75% earn less than $25,000, seniors housing**
Village Green, Arlington Heights, IL	Commuter Rail	Suburban Center	**Empty nesters and childless professionals**
"Triangle TOD," La Grange, IL	Commuter Rail	Suburban Center	**Over 50 empty nesters, under 30 professionals with no kids**
Market Square Townhomes Elmhurst, IL	Commuter Rail	Suburban Center	**Long term local residents seeking smaller easy to maintain properties in town (likely empty nesters)**
Addison Circle, Addison, TX	Bus	Suburban Center	**"Choice renters" singles, empty nesters, yuppies with no kids**
The Round, Beaverton, OR	Light Rail	Suburban Center	**Sales targeted to urban, "edgy" market (DINKS, retirees)**
Gaslight Common, South Orange, NJ	Commuter Rail	Suburban Neighborhood	**"Rail-based housing for childless households." Just three school-age children live in the 200 apartments**

with more racial and ethnic diversity, more immigrants, more singles, and more lower-income households. AvalonBay, an apartment developer that has emphasized projects close to transit in high cost of entry markets, has learned that the prime market for its developments consists of Generation X'ers, singles, and couples with few children, as well as the over-65 market who want to sell the suburban home and move back to the city (AvalonBay, 2003).

In Portland's downtown Pearl District, where virtually all of the buildings are oriented towards transit, 6,400 units of new apartments and condominiums have been built in the past 10 years. According to school district demographers, only 25 school-age children live there, and less than 20 babies are expected each year (Gragg, 2005). (In response, Portland recently adopted developer bonuses and potential tax abatements for family-size units and children's play areas in new residential projects. In addition, the city will begin planning a neighborhood park for the northern end of the Pearl District with child play facilities.) Anecdotal reasons given for the lack of children include high housing costs (i.e., additional floor space for children is prohibitively expensive), a lack of outdoor play spaces and community center, and a lack of other children.

At The Merrick TOD in Portland, the survey respondents were split evenly between men and women. In addition, the respondents:

- Were primarily single-person households (73%); average household size was 1.3;
- Ranged in age from 20 to 87 (median age is 33 years);
- Have college degrees (68%) and work full time (75%);
- Are childless; only one respondent indicated having a child under age 18; and
- Have a wide range of household income levels, with 41% earning $50,000 or greater (Dill, 2005).

The most recent California study of TOD found the following attributes of 5,304 station-area residents residing in 26 housing projects near heavy-rail, light-rail, and commuter-rail stations (Lund, Cervero, and Willson, 2004):

- Youth: The age structure of station-area residents was younger than that of the surrounding city; 62% of respondents were age 18 to 35.
- Minorities: Because of a large affordable housing and redevelopment component, relatively higher shares of ethnic

minorities and non-whites were found among TOD housing projects.

- Office occupations: 70% of TOD employed-residents worked in office and professional occupations, which should be expected since California's rail systems provide good and frequent radial connections to downtown white-collar districts.
- Small households: TODs are more likely to have childless households; 83% of respondents lived in 1-2 person households.
- New residents: TOD residents are newer to their current location than the typical resident of cities studied.

The CTOD study, which looked at all built rail stations across the United States, also finds smaller households in station areas. Household size differences are more pronounced in areas with small and medium sized transit systems, compared to larger cities with more extensive transit systems, as shown in Table 1.13. In these latter cities (e.g., New York City), larger households are more inclined to live in smaller housing units more typically associated with TODs (attached condominiums, townhouses, apartments) due to land and housing constraints.

CTOD also concluded that TOD trends towards smaller, childless households is likely to continue. Table 1.14 shows that nearly two-thirds of the total demand for housing near transit will be generated by single households and couples without children, a higher share than this group represents of the U.S. population as a whole. Households with children likely will account for only 20% of demand for housing in TODs.

In addition, as shown in Table 1.15, CTOD projects that households headed by individuals age 65 or older will be disproportionately represented in TODs. In contrast, households in the 35 to 64 age range will be underrepresented, as these households are less likely to have a preference for TODs.

Regarding the racial and immigrant status of TOD residents, Renne (2005) found the following:

- Overall, in 2000 the percent of nonwhite and foreign born populations living in TODs was similar to the percent of nonwhite and foreign born residents within the larger region.

Table 1.14. 2025 household types and projected TOD demand.

Household Type	% of Total 2025 Households	Potential TOD Demand in 2025
Singles and Couples, No Children	55.5%	64.1%
Other Households, No Children	12.6%	15.1%
Married Couples with Children	21.8%	11.7%
Single Parents, Other Households with Children	10.1%	9.1%

Source: CTOD, 2004

Table 1.15. 2025 age distribution of households.

Age Group	% of Total 2025 Households	Potential TOD Demand in 2025
15-34	22.0%	23.2%
35-64	50.4%	42.1%
65+	27.5%	34.7%

Source: CTOD, 2004

- In San Francisco and Los Angeles, TODs have about 10% more nonwhites than their surrounding regions. In Miami, TODs have 18% fewer nonwhites than the MSA.
- In Atlanta, San Francisco, Washington D.C., and Los Angeles, the percentage of foreign born was more than 10% higher in the TODs than the region. In Miami and Denver, the percentage of foreign born population is slightly higher in the region than the TODs.

Generalizing about TOD income levels is more difficult than drawing conclusions about household size and lifestyle types. Apartment housing in older TODs often was built to serve lower income, transit dependent households, and some current TOD projects still are built to attract these households. Examples of these projects are the Center Commons,

Table 1.13. Household size by transit system size, 2000.

	One Person Housholds		Families of Three or More People	
System Size	Transit Zones	Metro Area	Transit Zones	Metro Area
Small	51%	27%	19%	40%
Medium	38%	26%	31%	41%
Large	38%	24%	34%	45%
Extensive	34%	27%	36%	42%

Source: CTOD, 2004

Ohlone-Chynoweth Commons, and Fruitvale Transit Village, where public sector participation and funding were used to construct new, affordable TOD housing that the market would not provide otherwise.

As policy makers have more consciously used TODs to shape development and increase transit ridership, the pool of prospective tenants has been expanded to include condo-living, higher-income groups that enjoy urban amenities (though they may live in suburban TODs). Thus, today's TODs show a broad income range that reflects local land and construction costs, specialized developer niches, and local government policies (e.g., subsidies) to proactively build housing for targeted income levels.

In the Portland region, for instance, downtown Pearl District condominiums sell for more than $200 per square foot and are the most expensive housing units in the region. Orenco Station is an affluent suburban TOD where median monthly incomes range from $5,000 to $6,000. At Center Commons, however, about 75% of TOD residents' annual incomes are less than $25,000 (this was a goal of the project). TOD income disparities like this exist throughout Portland and other regions.

At the national level, CTOD found that the median incomes of households in transit zones tend to be lower than those of households in larger metropolitan regions. For households with incomes between $10,000 and $60,000, the percent of households living in the region as a whole and in transit zones is similar. However, there are fewer households in transit zones than in the metro regions with incomes between $60,000 and $100,000. In Houston, Tampa, and Pittsburgh, transit zone median incomes are slightly higher than regional median incomes.

Renne (2005) found higher than average TOD incomes in Chicago, Atlanta, Miami, Washington, D.C., and Dallas and suggests these cities are building more expensive and upscale TODs. Renne found that TOD zone incomes were substantially lower than regional averages in San Francisco and Los Angeles, and that these TODs also were the only regions to have both significantly more nonwhite and foreign born residents than the region.

Research by Gossen (2005) suggests that in urban settings TOD residents generally have higher incomes than other households. The higher housing price premiums for TOD living could account for this. In the San Francisco Bay Area, Gossen found average incomes were higher within a quarter mile of rail stations than anywhere else in urban districts; only those living in suburban areas averaged higher incomes than TOD residents. The highest concentration of low-income households was within a half to one mile of rail stations.

Regarding auto ownership, TOD residents tend to own fewer cars, and may be inclined to reduce car ownership upon moving into a TOD. Switzer (2002) found that at the Center Commons TOD, 30% of respondents owned fewer cars than they did at their previous residence, and that 37% of respondents did not own any car, as shown in Table 1.16.

At The Merrick TOD, as shown in Table 1.17, only 8% of residents have no vehicle available, and 73% of households said moving to this place had no impact on the number of vehicles owned. Seventeen percent of households, however, said that they got rid of a vehicle because of the characteristics of the neighborhood. (Dill, 2005)

In her recent study of Bay Area TODs in 2000, Gossen (2005) found that car ownership levels systematically fell with distance from a station, consistent with other findings in the literature. The average vehicles per person were: 0.5 (< ¼ mile); 0.54 (¼ to ½ mile); 0.61 (½ to 1 mile); 0.75 (> 1 mile - low-density suburbs). In fact, 70% of zero-vehicle households live within one mile of a Bay Area rail or ferry station.

According to the 2000 Census, more than 12% of Arlington County households are without a vehicle, the highest rate in the region outside the District of Columbia. The proportion of carless households is even higher in Arlington County's increasingly urban Metro corridors, approaching 20%. In several smaller communities along the Metro system across the Potomac River in Maryland, such as Takoma Park and Silver Spring (to cite two examples), there is also a high proportion of carless households: 16.2% in Takoma Park and 15.5% in Silver Spring. But in the surrounding suburbs, households without a car are a rarity. In Fairfax County, 4% are without cars. In Prince William only 3.5% are without cars. Arlington's healthy proportion of households without cars is fueled in part by the number of singles who live in the county. According to the 2000 Census, 40% of households are made up of singles (Dittmar and Ohland, 2004). Auto ownership for selected TODs is shown in Table 1.18.

Table 1.16. Auto ownership at Center Commons TOD.

	Previously	Currently	Change
No Car	21	36	42%
One Car	60	54	-10%
Two Cars	11	4	-64%
Three Cars	3	2	-33%
Five Cars	1	0	-100%

Source: Switzer, 2002

Table 1.17. Auto ownership at The Merrick TOD.

	% of Households
No Car	8%
One Car	75%
Two Cars	14%
Three Cars	3%

Source: Dill, 2005

Table 1.18. 2000 auto ownership for selected TODs.

Community	Cars/ Household	TOD Type
Arlington County, VA	**1.4**	**County**
Court House	1.1	Suburban Center
Clarendon	1.3	Suburban Center
Rosslyn	1.1	Suburban Center
Ballston	1.2	Suburban Center
San Francisco, CA	**1.1**	**County**
Church/24th	1.1	Urban Neighborhood
Embarcadero	0.5	Urban Neighborhood
Cook County, IL	**1.4**	**County**
LaSalle	0.7	Urban Downtown
Chicago/Fullerton	1.1	Urban Neighborhood
Chicago/Berwyn	0.7	Urban Neighborhood
Evanston/Davis	1	Suburban Center
Evanston/Dempster	1.2	Suburban Neighborhood
Evanston/Main	1.3	Suburban Neighborhood

Source: Dittmar and Ohland, 2004

In his analysis of 2000 census data, Renne (2005) found that:

- TOD households own an average of 0.9 cars compared to 1.6 cars for comparable households not living in TODs.
- TOD households are almost twice as likely to not own a car (18.5% versus 10.7%).
- While about 66% of non-TOD households own 2 or more cars, only about 40% of TOD households own as many cars.
- In TODs, about 63% of households own fewer than two cars, compared to 45% for other households.

In the survey conducted for H-27, the reduction of parking requirements was cited as one of the most common incentives offered by local governments to accomplish TOD. At the same time, respondents rated "allowing a reduction in parking" as only a marginally effective strategy to encourage TOD, since developers rarely use it. The policy relationship between parking supply and TOD ridership is clearly understood. However, a remaining challenge is to identify effective strategies to reduce parking in TODs that local governments and developers can actually embrace in the give-and-take of the real world.

One of the factors that motivates residents to locate in TODs is referred to in research as self-selection. That is, those with a lifestyle predisposition for transit-oriented living conscientiously sort themselves into apartments, townhomes, and single-family homes with an easy walk of a transit station. Being near transit and being able to regularly get around via trains and buses is important in residential location choice. High ridership rates in TODs are partly explained as a manifestation of this lifestyle choice.

In the Los Angeles Family and Neighborhood Survey administered by RAND (Sastry, et al. 2000), residents were asked an open-ended question about factors they weighed in choosing a neighborhood. Twenty-one percent cited transit access, more than highway access (11%). When asked: "For your personal commute to school or work, which transportation modes were important considerations in deciding where to live," 14% cited only transit, 9% citied transit and walk/bike, and 9% cited some other combination involving transit—that is, around a third located with reference to transit commuting. Auto access alone was cited by just 12%.

In his 2005 doctoral dissertation based on a survey of residents in the San Francisco Bay Area and San Diego County, Chatman found 74.4% of people living within half a mile of a sampled California rail station sought transit access when making a residential location choice. Furthermore, those seeking transit access to shops or services live an average of 1.8 miles closer to a rail stop. However, proximity to transit for nonwork activities is likely a minor factor in residential location choices. Ben-Akiva and Bowman (1998) simultaneously modeled residential location choice and activity/travel schedules using a nested logit method, finding little relationship between nonwork accessibility and the choice of residential neighborhood. Weighing the collective evidence, Chatman (2005, p. 150) concluded that "auto-oriented self selection does not appear to be particularly important in out-of-home nonwork activity participation, but transit self-selection does play a limited role."

The most recent California study (Lund, et al., 2004) found that proximity to transit was ranked third among factors influencing households to move into TODs, behind the cost and quality of housing. The higher density housing found in

TODs tends to keep housing prices more affordable. While land prices are higher per square foot, this is more than offset by the smaller total area of dwelling units that are purchased or leased. The California survey found that proximity to transit was most important among residents who had lived in the TOD the longest. This suggests those who self-select into rail-served neighborhoods tend to stay in place. The higher premium they place on proximity to transit is reflected not only in survey responses but also ridership statistics. Because most TOD residents have no children, quality of schools was not a major factor in moving into TOD neighborhoods: fewer than one of 20 surveyed respondents identified this as a top three factor in influencing their residential location choice.

In his survey of Center Commons residents, Switzer (2002) found that the most common reasons given for moving into the project were: new product/appealing design (20%), proximity to transit (17%), price (16%; the project includes a significant affordable housing component), and general location (15%).

Other data, shown in Table 1.19, from Portland (Orenco Station) shows a similar pattern; while transit proximity can be an important factor in attracting TOD residents, the design of the housing units and larger community may be more important.

The Merrick TOD residents listed the following top 10 factors they considered when selecting their current home:

1. High quality living unit;
2. Easy access to downtown;
3. Good public transit service;
4. Relatively new living unit;
5. Affordable living unit;
6. Close to where I worked;
7. Shopping areas within walking distance;
8. High level of upkeep in neighborhood;
9. Attractive appearance of neighborhood; and
10. Safe neighborhood for walking (Dill, 2005).

Table 1.19. Best aspects/things liked about Orenco Station.

Feature	Percent
Design of Community	13.28%
Greenspaces/Parks	12.24%
Community Orientation	10.94%
Town Center	10.42%
Alley Parking/Garage Design	9.11%
Design of Homes	8.33%
Pedestrian Friendly	6.25%
Close to Mass Transit	4.95%
Small Lots/Yards	4.95%
Quiet Community	3.13%
Clubhouse/Pool	2.86%
Safety	2.80%
General Location	2.08%
Close to Work	1.30%
Other	7.55%

Source: Podobnik, 2002

These studies show that good transit access is a primary factor in residential location decisions, consistent with studies that find high rates of self-selection among TOD residents. Other features that consistently rate as being important are the quality of the housing and community design, and housing cost. In addition, suburban TOD residents often value local services and amenities (e.g., in mixed use buildings, or a TOD center), while households in more urban TODs value proximity to the full range of land uses and activities that cities offer. Not surprising, school quality does not even register among TOD households, as few TOD households have children.

For projects incorporating affordable housing into a TOD, experience indicates that affordability often outweighs any transit considerations in making locational decisions. In markets like Portland (e.g., Center Commons) and San Jose (e.g., Ohlone-Chynoweth) where there are shortages of new, well-designed affordable projects, affordability is a prime attractor to TOD (according to TOD project managers).

The most important considerations for all retail developments are location, market, and design; proximity to transit is not a prime consideration, and the market must be viable even in transit's absence [Urban Land Institute (ULI), 2003]. Although a retail component may eventually become an excitement generator within a TOD, it cannot be the justification for the development. According to ULI, "Retail is the one land use that is least likely to succeed where it lacks strong support. Thus retail does not drive development around transit; it 'follows rooftops'."

TOD plans should carefully consider the volumes that retail developers require, as the rules specifying the distance that customers will travel to any particular store are inflexible. High density offices and residences can be good sources of transit riders, but they do not always ensure retail demand, particularly if local retail demand already is being met.

According to CTOD, which tracks national demand for TOD, firms and workers are increasingly exhibiting a preference for 24-hour neighborhoods. In the past companies preferred suburban campus environments near freeways, and regions lured employers without regard to bigger picture development goals. Now other issues are coming into play, including the rise of the creative class and the increasing importance of technology and talent in a region's economic development strategy. Because firms are chasing talent, which is choosing to locate in diverse, lively urban regions, firms now prefer these locations. According to a recent Jones Lang LaSalle survey (CTOD, 2005), access to transit is very important to 70% of new economy companies.

In the Portland area, TOD is becoming increasingly integrated with the high tech sector. Orenco Station in Hillsboro is located very near to Intel (not part of the project), and a large share of Orenco residents are Intel employees that benefit from short commutes. Open Source Development Labs, a global consortium of leading technology companies dedicated to promoting the Linux operating system, located to The Round in Beaverton, in part to capitalize on rail access to downtown Portland and the airport. Just down the line in Hillsboro, Yahoo Inc. recently leased space right along the rail line, citing a mix of factors including: access to public transit, daycare options, affordable housing, and quality of life.

ULI (2003) reiterates that if companies see transit as slow, unreliable, or not reaching enough of their workers, staff in charge of locations decisions will not pay attention to transit. When transit is viewed as a tool for recruiting scarce talent, however, companies will list good transit access as a criterion in site selection choices. ULI also notes that more companies indeed seem to be focusing on transit access for their employees, even if management does not intend to use transit. Table 1.20 summarizes ULI's perception of broad office location trends.

Table 1.20. Workplace culture: what's out and what's in.

"Out"	"In"
Suburban/exurban campus locations	Locations close to transit
Corporate campuses	Mixed-use developments
Kiss and ride	Live, work, play, and ride
Location near CEO's home	Location convenient for workers
Free parking	Free transit passes
Driving to lunch	Walking to lunch
Errands on the way home	Errands at lunchtime
Commuting car	Fuel-efficient station car
Quality of the workplace	Quality of life

Source: ULI, 2003

From the perspective of the prospective TOD developer, the development process typically begins with an idea, either a site looking for a use, or a use looking for a site. A developer usually will initiate a TOD project based on experience with similar projects, but a TOD development also could be a natural evolution for a developer with a background in urban or infill projects. Market analysis for such a project, as with all developments, will consider who will buy or rent in such a development at what costs. Land cost sets the broad parameters of the project, with an understanding of the development costs for such a project, and any special construction or assessment costs, such as participation with the transit agency in associated facilities.

Once broad parameters of project costs have been established, often with some form of option to hold the property while further feasibility is examined, the developer initiates increasingly detailed studies of market, design, and finance. Market studies will examine not only potential clients, but also competitive projects, both supply and demand. The market analysis for a proposed multi-family residential project, for example, would compare rents for similar projects targeted to a similar clientele, including projects currently under construction. The analyst's challenge is to estimate the market share of household growth that would select that project, as well as the likely absorption rate of the houses (how long it would take for the houses on the market to sell, be leased, or rented). The developer's challenge is to make sure the estimated market share at the proposed price point is sufficient to ensure the project's success.

As indicated in H-27, there is growing experience with TOD projects in the development community (developers, market analysts, architects, transportation consultants, and lenders) and a growing base of information used to support the development process and understand the prospective clientele, residents, and businesses. In Washington, D.C., while there have not been statistically rigorous studies of the impact of transit access on property values, market studies establish the premium for rental properties at about 7%. This means that for a project well served by transit, rents can be 7% higher than comparable properties not so well located. It also would mean, for example, that if a developer were able to offer the same rents, such a project would have enormous competitive appeal.

The expanding portfolio of TOD projects is providing greater insight into TOD market advantages, as well as demographic and lifestyle characteristics of residents. These findings are useful not only in the product development phase, but also in marketing the product. There is growing awareness among developers that an important submarket of people are attracted to TOD projects, greater understanding of who the people are, and why they are attracted to TODs.

SECTION 2

Does TOD Housing Reduce Automobile Trips?

TOD has attracted interest as a tool for promoting smart growth, leveraging economic development, and catering to shifting market demands and lifestyle preferences. Part of the appeal TODs hold is they behave differently from conventional development patterns. People living and working in TODs walk more, use transit more, and own fewer cars than the rest of their region. TOD households are twice as likely to not own a car, and own roughly half as many cars as the average household. At an individual station TOD can increase ridership by 20% to 40% and up to 5% overall at the regional level. Residents living near transit are 5 to 6 times more likely to commute by transit than other residents in their region. Self-selection is a major contributor to the benefits of TOD, meaning that people choosing to live in a TOD are predisposed to use transit (Cervero, et al., 2004).

Given their performance characteristics, TODs present an opportunity to accommodate increased density without many negative impacts associated with the automobile. While research clearly points to how TODs perform differently, the body of information on TOD travel characteristics has yet to have an impact on industry guidance for projects near major transit stations.

This research seeks to bridge one of the widest knowledge gaps on the effects of TOD on travel demand: automobile trip generation rates for residential TODs. Empirical evidence on vehicle trip generation can inform the setting of parking requirements for projects near major transit stations. Despite the existing body of research and supportive local development, codes developers and financial institutions still tend to prefer conventional parking ratios in TODs. As a consequence most TODs are oblivious to the fact that a rail stop is nearby and as a result, their potential benefits (e.g., reduced auto travel) are muted. Structured parking in particular has a significant impact on development costs and is prohibitively expensive in most markets. Lower TOD parking ratios and reduced parking could reduce construction costs, leading to somewhat denser TODs in some markets.

Similarly, many proposed TOD projects have been halted abruptly or redesigned at lower densities due to fears that dense development will flood surrounding streets with auto traffic. Part of the problem lays in the inadequacy of current trip generation estimates, which are thought to overstate the potential auto impacts of TOD. ITE trip generation and parking generation rates are the standards from which local traffic and parking impacts are typically derived, and impact fees are set. Some analysts are of the opinion that there is a serious suburban bias in the current ITE rates. Typically, empirical data used to set generation rates are drawn from suburban areas with free and plentiful parking and low-density single land uses. Moreover, ITE's auto trip reduction factors, to reflect internal trip capture, are based on only a few mixed-use projects in Florida; there has been little or no observation of actual TODs. The end result is that auto trip generation is likely to be overstated for TODs. This can mean that TOD developers end up paying higher impact fees, proffers, and exactions than they should since such charges are usually tied to ITE rates. Smart growth requires smart calculations, thus impact fees need to account for the likely trip reduction effects of TOD.

Study Projects

This study aims to fill knowledge gaps by compiling and analyzing original empirical data on vehicle trip generation rates for a representative sample of multi-family housing projects near rail transit stations. This was done by counting the passage of motorized vehicles using pneumatic tubes stretched across the driveways of 17 transit-oriented housing projects of varying sizes in four urbanized areas of the country: Philadelphia/N.E. New Jersey; Portland, Oregon; metropolitan Washington, D.C.; and the East Bay of the San Francisco Bay Area (Figure 2.1). Rail services in these areas are of a high quality and span across four major urban rail technologies: commuter rail (Philadelphia SEPTA and NJ Transit); heavy

Figure 2.1. Case study metropolitan areas.

rail (San Francisco BART and Washington Metrorail); light rail (Portland MAX); and streetcar (Portland). Case study sites were chosen in conjunction with the H-27A panel.

The most current ITE *Trip Generation Manual* (7th Edition) includes trip generation data for nearly 1,000 land uses and combinations. The primary focus of this research is on residential housing (ITE, 2003). The aim is to seed the ITE manual with original and reliable trip generation data for one important TOD land use–residential housing–with the expectation that other TOD land uses and combinations (e.g., offices) will be added later. There is hope the research prompts local officials to challenge how they evaluate the likely traffic impacts of housing near major rail transit stations as well as the parking policies for these projects. The research, moreover, complements several other studies presently underway that aim to further refine trip generation rates to account for the trip-reducing impacts of mixed-use development (typically through internal capture).

The trip-reduction effects of transit-oriented housing are thought to come from three major sources: 1) residential self-selection: for lifestyle reasons people consciously seek out housing near major transit stops for the very reason they want to regularly take transit to work and other destinations; studies in California suggest as much as 40% of the mode choice decision to commute via transit can be attributed to the self-selection phenomenon (Cervero, 2007); 2) the presence of in-neighborhood retail sited between residences and stations that promote rail-pedestrian trip-chaining; an analysis of the American Housing Survey suggests the presence of retail near rail stations can boost transit's commute mode share by as much as 4% (Cervero, 1996); and 3) car-shedding (i.e., the tendency to reduce car-ownership when residing in efficient, transit-served locations) (Holtzclaw, et al., 2002).

For studying traffic impacts of multi-family housing near rail stations, we selected mainly multi-family apartments (rental) and in one instance, a condominium project (owner-occupied). Table 2.1 provides background information on the selected TOD-housing projects and Figures 2.2 through 2.5 show their locations within metropolitan areas and photo perspectives of the sampled housing projects.

Housing projects ranged in size from 90 units (Gresham Central Apartments) to 854 units (Park Regency). Most projects were garden-style in design, around three to four stories in height. The sampled Washington Metrorail projects, however, tended to be much higher as revealed by the photo images, with the exception of Avalon near the Bethesda Metrorail station. The average number of parking spaces per project was around 400, yielding an average rate of 1.16 spaces per dwelling unit. The only nonapartment project surveyed was Wayside Plaza in Walnut Creek, near the Pleasant Hill BART stations, a condominium project. Six of the surveyed housing projects had ground-floor retail and/or commercial uses, however all were primarily residential in nature (i.e., more than 90% of gross floor area was for residential activities). Another selection criterion was the project not be immediately accessible to a freeway interchange. All of the sampled projects were more than 500 feet from a freeway entrance; five were situated within a quarter mile of a freeway on-ramp. The

Table 2.1. Background on case study TOD housing projects.

	Housing					Other Characteristics	
	Housing Type	# Stories	# Units	# On-Site Parking Spaces	# Driveways	Nearest Rail Station	Shortest Walking Distance from Project to Nearest Station (feet)
Philadelphia/NJ							
Gaslight Commons (S. Orange NJ)	A	4	200	500	3	NJ Transit: South Orange	990
Station Square Apartments (Lansdale PA)	A	1-3	346	222	3	Pennbrook SEPTA	625
Portland							
Center Commons (Portland)	A	4	288	150	2	60th Avenue MAX	450
Collins Circle Apartments (Portland)	A	6	124	93	1	Goose Hallow MAX	525
Gresham Central Apartments (Gresham)	A	3	90	135	2	Gresham Central MAX	620
Merrick Apartments (Portland)	A	6	185	218	1	Convention Center MAX	700
Quatama Crossing Apartments (Beaverton)	A	3	711		3	Quatama MAX	2000
San Francisco							
Mission Wells (Fremont)	A	2-4	391	508	4	Fremont BART	3810
Montelena Apartment Homes (Hayward)	A	3	188	208	3	South Hayward BART	950
Park Regency (Walnut Creek)	A	3	854	1352	5	Pleasant Hill BART	1565
Verandas (Union City)	A	5	282	282	2	Union City BART	830
Wayside Plaza (Walnut Creek)	C	3-4	156	166	1	Pleasant Hill BART	1555
Washington DC							
Avalon (Bethesda)	A	4	497	746	2	Grosvenor Metro	1020
Gallery (Arlington)	A	20	231	258	2	Virginia Square Metro	50
Lenox Park Apts. (Silver Spring)	A	16	406	406	3	Silver Spring Metro	420
Meridian (Alexandria)	A	10-16	457	560	2	Braddock Metro	920
Quincy Plaza (Arlington)	A	15-21	499	499	2	Virginia Square Metro	1020

Note: A = Apartments (rental); C = Condominiums (owner-occupied)

average walking distance from the project entrance to the nearest rail station entrance was 1,060 feet.

Study Methods

Local traffic engineering firms were contacted about the availability of pre-existing data, however no examples of recent trip generation analyses for TOD housing projects were found that had relevant information to include in this study. After agreement was reached with the TCRP H-27A panel to survey projects in the four rail-served metropolitan areas, candidate sites were visited to make sure they met the selection criteria and also had limited access points and driveways where pneumatic tube count data could be reliably collected. (As shown in Table 2.1, all had five or fewer driveways and in most instances just a few ways to drive in and out of a project.) Once sites that met the selection criteria were chosen, property owners and property managers were contacted, informed about the purpose of the study, and asked permission to allow on-site observation and the installation of pneumatic-tube recorders at curb cuts and driveways.

After receiving permission from property owners to install pneumatic tube counters on their properties, empirical field-work commenced. Local traffic engineering firms that specialize in vehicle trip data-collection were contracted to set up the tube counters and compile the data. Pneumatic tube counters recorded daily vehicle traffic volumes by hour of day and day of week in accordance with standard ITE methods. [Due to the primarily residential nature of the projects, internal trip making was not expected to be as significant as it would be in larger TODs with a broad array of mixed uses. Measuring internal trip making would require supplemental surveys of residents (e.g., travel diaries) and/or local merchants, and the team has currently not budgeted to estimate these trips.] The consecutive two-day periods chosen to compile tube-count data were considered to correspond with peak conditions: middle of the week and prior to summer vacation season: Tuesday, May 29 and Wednesday, May 30, 2007 for the seven projects on the east coast (Washington, D.C. metropolitan area and Philadelphia/N.E. New Jersey); and Wednesday, May 30 and Thursday, May 31 for the 10 projects on the west coast (Portland, Oregon and East Bay).

To further segment collected data, the team used a national database from the CTOD to compile basic demographic data for the neighborhoods of each of the rail stations serving the selected TODs, including information on residential densities, car ownership, and median income. Also, pedestrian surveys were conducted to record measures regarding the quality of

Station Square

Gaslight Commons

Figure 2.2. Locations of study sites in Philadelphia and Northeast New Jersey: Station Square Apartments and Gaslight Commons.

walking, the availability of amenities (e.g., street trees and furniture), lack of provisions (e.g., no pedestrian cross-walks), and the shortest distance between the main entrance of each case-study project and the fare gates of the nearest rail station.

Data Compilation

Collected data were compiled, coded, cleaned, and entered into a data base. First, simple descriptive statistics were prepared on vehicle trip generation rates, defined in such standard terms as: average weekday vehicle trips per dwelling unit and one-hour AM and PM vehicle trips per dwelling unit. [ITE define average weekday trip rate as the weekday (Monday through Friday) average vehicle trip generation rate during a 24-hour period. Average rate for the peak hour is the trip generation rate during the highest volume of traffic entering and exiting the site during the AM or PM hours.] Vehicle count data obtained in the field were converted to 24-hour as well as AM and PM peak-hour rates per dwelling unit for each project. (Since 24-hour counts were obtained for two

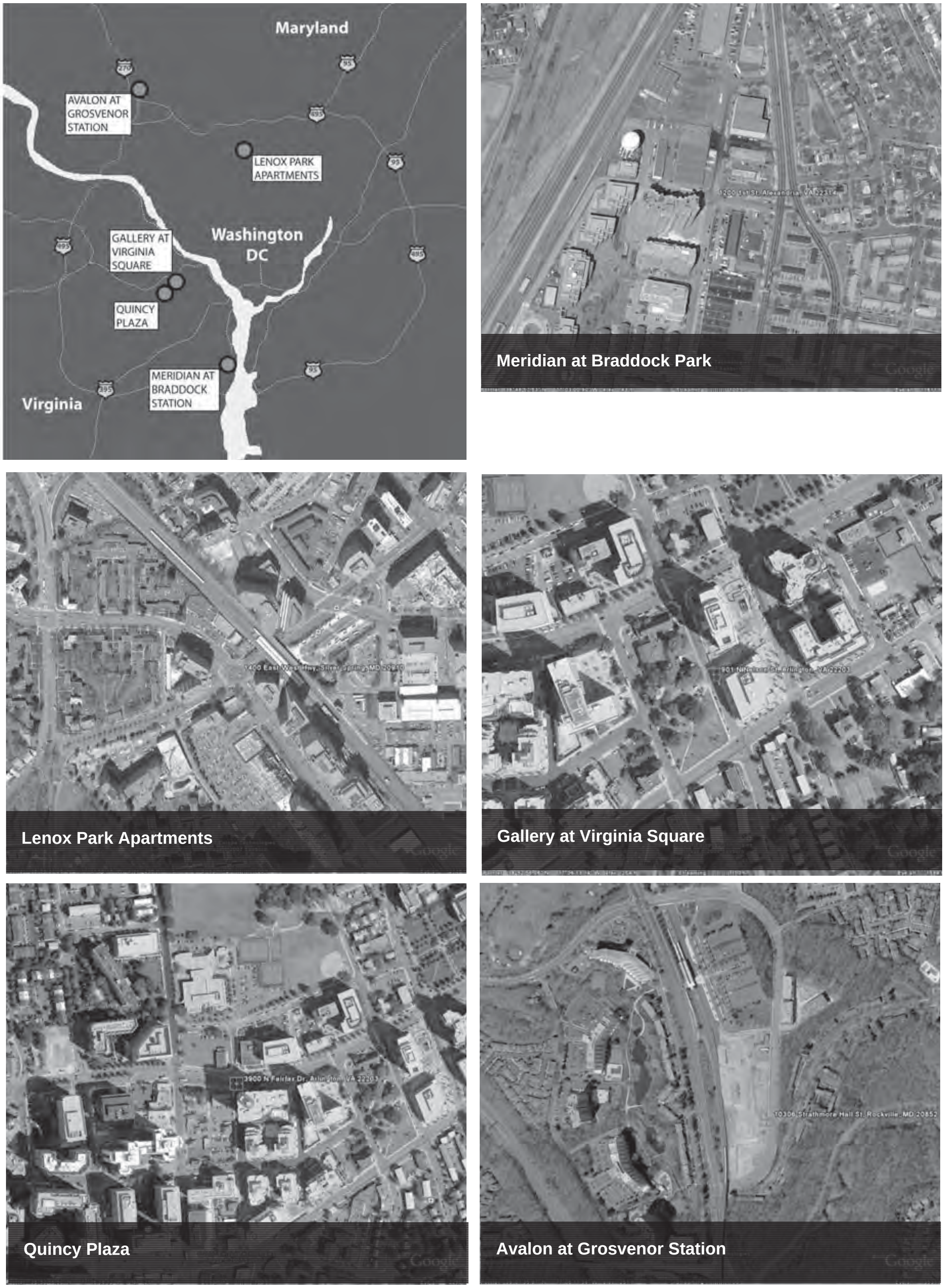


Figure 2.3. Locations of study sites in metropolitan Washington, D.C.: Avalon; Gallery at Virginia Square; Meridian; Quincy Plaza; Lenox Park.

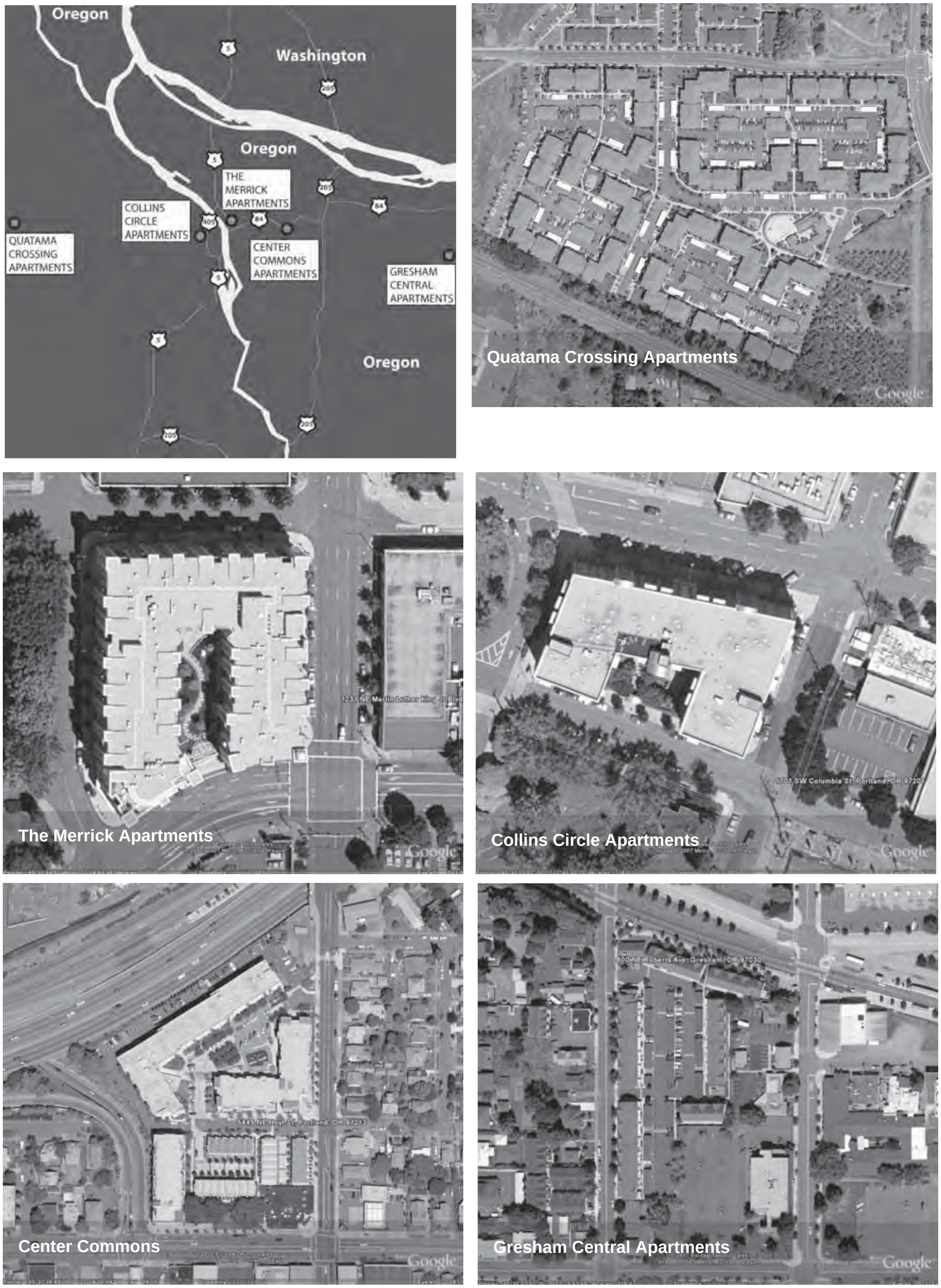


Figure 2.4. Locations of study sites in metropolitan Portland, Oregon: Center Commons; Collins Circle; Gresham Central; The Merrick; Quatama Crossing.

Figure 2.5. Locations of study sites in San Francisco-Oakland Metropolitan Area: Mission Wells, Montelena, Park Regency, Verandas, Wayside Commons.

consecutive weekdays, one-day estimates were computed by dividing the two 24-hour counts by two.) For all 17 TOD-housing projects combined, a weighted average trip generation rate was estimated. (The ITE manual defines weighted average as the sum of trip ends for all projects divided by the sum of the independent variable, which in this case is number of dwelling units.) The computed rates for TOD-housing projects were compared to those found in the latest edition of the ITE manual for the equivalent land use (i.e., apartments and condominiums) (ITE, 2003). Comparisons are drawn using the ITE manual's weighted averages as well as estimates derived from best-fitting regression equations. The degree to which there are systematic differences in estimated and actual trip generation and parking generation rates of TODs are highlighted. The types of TOD projects for which there appear to be the largest discrepancies are identified.

Additionally, results were cross-classified among sampled projects in terms of distance to CBD, distance to the nearest station, parking provisions, and other factors including the quality of walking environment (e.g., with or without adjoining sidewalks). Multivariate regression equations that predict the trip generation rates of TOD housing as a function of these and other variables also are estimated.

Lastly, the implications of research findings for various public policies and practices are discussed. To the degree that TOD-housing projects exhibit below-normal trip generation rates, a strong case can be made for using sliding-scale impact fees to evaluate new TOD proposals. This might, for instance, result in lowering the estimated trip generation rates within a quarter mile of a station and with continuous sidewalk access and in a mixed-use neighborhood by a fixed percent, such as 20%.

Comparison of Vehicle Trip Generation Rates

TOD-housing clearly reduces auto trips in the four urbanized areas that were studied. Below, results for both 24-hour periods as well as peak periods are summarized.

Average Weekday Trip Comparisons

Table 2.2 shows that in all cases, 24-hour weekday vehicle trip rates were considerably below the ITE weighted average rate for similar uses. [The comparable ITE land use category for 16 of the 17 projects is Apartments (ITE Code 220). The average trip rate for apartments is 6.72 vehicle trips per dwelling unit on a weekday based on the experiences of 86 apartment projects across the United States (averaging 212 dwelling units in size). The best-fitting regression equation for apartments is:

$$T = 6.01(X) + 150.35 \ (R^2 = 0.88)$$

where T = Vehicle Trip Ends and X = Number of Dwelling Units. For the Wayside Commons projects, the corresponding ITE land-use category is Residential Condominium (ITE Code 230). The average trip rate for condominiums is 5.68 vehicle trips per dwelling unit on a weekday based on the experiences of 54 owner-occupied condominium and townhouse projects across the United States (averaging 183 dwelling units in size). The best-fitting regression equation for condominiums is:

$$\mathrm{Ln}(T) = 0.85(X) + 2.55 \ (R^2 = 0.83)$$

where

T = Vehicle Trip Ends,
X = Number of Dwelling Units, and
Ln = natural logarithm.

Taking the (unweighted) average across the 17 case-study projects, TOD-housing projects generated around 47% less vehicle traffic than that predicted by the ITE manual (3.55 trips per dwelling unit for TOD-housing versus 6.67 trips per dwelling unit by ITE estimates). This held true using both the weighted average ITE rate as well as the ITE rates predicted using the best fitting regression equations. Results were quite similar in both cases.

The biggest trip reduction effects were found in the Washington, D.C. metropolitan area. Among the five mid-to-high rise apartment projects near Metrorail stations outside the District of Columbia, vehicle trip generation rates were more than 60% below that predicted by the ITE manual. There, 24-hour vehicle trip rates ranged from a high of 4.72 trip ends per dwelling unit at the more suburban Avalon project near the Grosvenor Metrorail Station (and outside the beltway) to a low of around one vehicle weekday for every two dwelling units at the Meridian near Alexandria's Braddock Station. The comparatively low vehicle trip generation rates for TOD-housing near Washington Metrorail stations matches up with recent findings on high transit modal splits for a 2005 survey of 18 residential sites (WMATA, 2006). For projects within a quarter mile of a Metrorail station (which matched the locations of all five TOD housing projects studied in the Washington metropolitan area), on average 49% of residents used Metrorail for their commute or school trips. One of the projects surveyed, the Avalon apartments at Grosvenor Station, also was surveyed in the 2005 study. The Avalon, which had the highest trip generation rate among the five projects surveyed in the Washington area, had an impressively high work-and-school trip transit modal split in the 2005 survey: 54%.

It is important to realize that high transit ridership levels and significant trip reduction in metropolitan Washington is tied to the region's successful effort to create a network of

Table 2.2. Comparison of TOD housing and ITE vehicle trip generation rates: 24 hour estimates.

	TOD Veh. Trip Rate (24 hr.)	Average ITE Rate (24 Hours)			Regression ITE Rate (24 Hours)		
		ITE Rate (24 hr.)	TOD rate as % of ITE Rate (24 hr.)	% point difference from ITE Rate	ITE Rate (24 hr.)	TOD rate as % of ITE Rate (24 hr.)	% point difference from ITE Rate
Philadelphia/NE NJ							
Gaslight Commons	5.08	6.72	75.52%	-24.48%	6.76	75.05%	-24.95%
Station Square	4.76	6.72	70.81%	-29.19%	6.44	73.84%	-26.16%
Mean	4.92	--	73.17%	-26.83%	6.60	74.45%	-25.55%
Std. Dev.	0.22	--	3.33%	3.33%	0.22	0.86%	0.86%
Portland, Oregon							
Center Commons	4.79	6.72	71.30%	-28.70%	6.53	73.36%	-26.64%
Collins Circle	0.88	6.72	13.08%	-86.92%	7.22	12.17%	-87.83%
Gresham Central	5.91	6.72	87.95%	-12.05%	7.68	76.95%	-23.05%
The Merrick Apts.	2.01	6.72	29.84%	-70.16%	6.82	29.39%	-70.61%
Quatama Crossing	6.34	6.72	94.38%	-5.62%	6.22	101.95%	1.95%
Mean	3.99	--	59.31%	-40.69%	6.52	58.76%	-41.24%
Std. Dev.	2.42	--	36.05%	36.05%	0.62	36.88%	36.88%
San Francisco Bay Area							
Mission Wells	3.21	6.72	47.80%	-52.20%	6.39	50.23%	-49.77%
Montelena Homes	2.46	6.72	36.57%	-63.43%	6.81	36.09%	-63.91%
Park Regency	5.01	6.72	74.61%	-25.39%	6.19	81.04%	-18.96%
Verandas	3.10	6.72	46.17%	-53.83%	6.54	47.42%	-52.58%
Wayside Commons	3.26	5.86	55.68%	-44.32%	6.00	54.34%	-45.66%
Mean	3.41	--	52.17%	-47.83%	6.39	53.83%	-46.17%
Std. Dev.	0.95	--	14.27%	14.27%	0.31	16.66%	16.66%
Washington, D.C. Area							
Avalon	4.72	6.72	70.21%	-29.79%	6.31	74.75%	-25.25%
Gallery	3.04	6.72	45.25%	-54.75%	6.66	45.66%	-54.34%
Lennox	2.38	6.72	35.41%	-64.59%	6.38	37.29%	-62.71%
Meridian	0.55	6.72	8.24%	-91.76%	6.34	8.73%	-91.27%
Quincey	1.91	6.72	28.49%	-71.51%	6.31	30.34%	-69.66%
Mean	2.52	--	37.52%	-62.48%	6.40	39.35%	-60.65%
Std. Dev.	1.53	--	22.76%	22.76%	0.15	24.06%	24.06%
Unweighted Average	3.55	6.67	53.29%	-46.71%	6.59	53.92%	-46.08%

Note: Fitted Curve Equation for Apartments: T = 6.01(X) + 150.35, where T = average vehicle trip ends and X = number of dwelling units.
Fitted Curve Equation for Condominiums (Wayside Commons): Ln(T) = 0.85 Ln(X) + 2.55

TODs, as revealed by the Rosslyn-Ballston corridor (and discussed in detail in *TCRP Report 102: Transit Oriented Development in the United States: Experiences, Challenges, and Prospects*). Synergies clearly derive from having transit-oriented housing tied to transit-oriented employment and transit-oriented shopping.

After the Washington, D.C. area, TOD-housing in the Portland area tended to have the lowest weekday trip generation rates, on average, around 40% below that predicted by the ITE manual. The range of experiences, however, varied a lot, from a low of 0.88 weekday vehicle trips per dwelling unit for Collins Circle in downtown Portland to a high of 6.34 for more suburban Quantama Crossing (only slightly below the average rate from the ITE manual and a bit above the regression-generated estimate from the ITE manual).

Also among the surveyed Portland-area apartments, notable for its low trip generation rate, is The Merrick Apartments near the MAX light rail Convention Center station in the Lloyd District, across the river from downtown Portland: 2.01 weekday trips. Travel behavior of the residents of The Merrick apartments also was studied in 2005 (Dill, 2005). Based on a 43% response rate from 150 surveyed households at The Merrick apartments, trip generation estimates can be imputed from that survey. The 2005 survey asked: "In the past week (Saturday January 29 through Friday February 4), how many times did you go to the following place *from your home* in a vehicle, walking, bicycling, riding the bus, or riding MAX light rail? Each time you left your home during the week is a trip." From household responses, an average of 1.42 daily vehicle trips per dwelling from The Merrick apartments was made. Doubling this rate (assuming those who drove away each day also returned) yields an estimated daily rate of 2.84 vehicle trips per dwelling unit. This is a bit higher than that found in the tube count survey, but still substantially lower than the ITE rate. (Differences are likely due to several factors. These results are based on objective physical counts whereas the 2005 survey results were based on a sample of self-reported responses. Also, the 2005 study included weekend days whereas this study was based on middle-of-the-week experiences.) The 2005 survey also estimated that 18% of all trips made by residents of The Merrick apartments are by transit (both rail and bus). For work and school trips, transit's estimated modal split was 23%. A follow-up 2005 survey of The Merrick apartment residents further indicated that transit is the primary commute mode for 27.9% of residents (Dill, 2006).

Another study further sheds light on the results for one of Portland's surveyed apartments: Center Commons in east Portland. This study's survey found a weekday rate of 4.79 trips per dwelling unit for Center Commons, more than one-quarter below ITE's estimated rates for apartments. For a thesis prepared for the Master of Urban and Regional Planning degree at Portland State University, a mailback survey of 246 residents of Center Commons was conducted in 2002, producing a response rate of 39%. That survey found that 45.8% of responding residents of Center Commons takes MAX light rail or bus to work.

As with metropolitan Washington D.C., Portland's success at reducing automobile trips around transit-oriented housing cannot be divorced from the regional context. High ridership and reduced car travel at the surveyed housing projects stems from the successful integration of urban development and rail investments along the Gresham-downtown-westside axis. In Portland, as in Washington, TODs are not isolated islands but rather nodes along corridors of compact, mixed-use, walking friendly development.

The San Francisco Bay Area also averaged vehicle trip generation rates substantially below estimates by the ITE manual. Among the East Bay TOD-housing projects studied, Montelena Homes (formerly Archstone Barrington Hills) had the lowest weekday rate: 2.46 trip ends per dwelling unit, 63% below ITE's rate. A 2003 survey of residents of this project found very high transit usage among Montelena Homes residents: 55% stated they commute by transit (both rail and bus) (Lund, et al, 2004). The 2003 survey found the following commute-trip transit modal splits (compared to this research's recorded weekday trip rates): Wayside Commons: 56% (3.26 daily trips per dwelling unit); Verandas: 54% (3.1 daily trips per dwelling unit); Park Regency: 37% (5.01 daily trips per dwelling unit); and Mission Wells: 13% (3.21 daily trips per dwelling unit).

Lastly, the two apartment projects near suburban commuter rail stations outside Philadelphia and the Newark metropolitan area of northeast New Jersey averaged weekday vehicle trip generation rates roughly one-quarter less than the number predicted by the ITE manual. This is an appreciable difference given the relatively low-density settings of these projects and that commuter rail offers limited midday and late-night services.

AM Peak Comparisons

Table 2.3 compares recorded trip generation rates with those from the ITE manual for the AM Peak. In tabulating the results, the one-hour period in the AM peak with the highest tube count was treated as the AM peak. In most instances, this fell between the 7 AM and 9 AM period. In general, patterns were quite similar to those found for the 24-hour period. As before, the greatest differential between AM trip generation and ITE estimates were for TOD-housing closest to CBDs - notably, Collins Circle and The Merrick Apartments in the case of Portland, and the Meridian Apartments near the Braddock Metrorail station in Alexandria, Virgina.

PM Peak Comparisons

Table 2.4 shows the results for the PM peak. (The one-hour period in the PM peak with the highest tube count was treated as the PM peak. This generally occurred in the 4 PM to 7 PM period.) PM trip generation rates are generally higher than the morning peak since commuter traffic often intermixes with trips for shopping, socializing, recreation, and other activities. In general, PM trip generation rates for TOD-housing were closer to ITE predictions than the AM peak. Notable exceptions were the lowest trip generators. For example, the PM rates for Collins Circle and Meridian were 84.3% and 91.7% below ITE predictions, respectively. For the AM period, the differentials were 78.7% and 90.0%, respectively (from Table 2.3).

Weighted Average Comparisons

The summary results presented so far are based on unweighted averages, that is, each project is treated as a data point in computing averages regardless of project size. The ITE manual, however, presents weighted averages of trip generation by summing all trip ends among cases and dividing by the sum of dwelling units. Thus for apple to apple comparisons, weighted average vehicle trip rates were computed for all

Table 2.3. Comparison of TOD housing and ITE vehicle trip generation rates: AM peak estimates.

		Average Rate			Regression Rate		
	Veh. Trip Rate (AM peak hr.)	ITE Rate (AM peak hr.)	TOD rate as % of ITE Rate (AM pk hr.)	% Below ITE Rate	ITE Rate (AM peak hr.)	TOD rate as % of ITE Rate (AM pk hr.)	% Below ITE Rate
Philadelphia/NE NJ							
Gaslight Commons	0.40	0.55	72.73%	-27.27%	0.55	72.59%	-27.41%
Station Square	0.36	0.55	66.21%	-33.79%	0.54	67.17%	-32.83%
Mean	0.38	--	69.47%	-30.53%	--	69.88%	-30.12%
Std. Dev.	0.03	--	4.61%	4.61%	--	3.83%	3.83%
Portland, Oregon							
Center Commons	0.25	0.55	45.45%	-54.55%	0.54	45.90%	-54.10%
Collins Circle	0.12	0.55	21.26%	-78.74%	0.56	20.74%	-79.26%
Gresham Central	0.59	0.55	107.07%	7.07%	0.58	102.10%	2.10%
The Merrick Apts.	0.13	0.55	23.10%	-76.90%	0.55	22.98%	-77.02%
Quatama Crossing	0.30	0.55	54.98%	-45.02%	0.54	56.42%	-43.58%
Mean	0.28	--	50.37%	-49.63%	--	39.70%	-60.30%
Std. Dev.	0.19	--	34.83%	34.83%	--	23.65%	23.65%
San Francisco Bay Area							
Mission Wells	0.48	0.55	86.72%	-13.28%	0.54	88.20%	-11.80%
Montelena Homes	0.17	0.55	31.43%	-68.57%	0.55	31.30%	-68.70%
Park Regency	0.34	0.55	61.85%	-38.15%	0.53	63.59%	-36.41%
Verandas	0.19	0.55	35.14%	-64.86%	0.54	35.47%	-64.53%
Wayside Commons	0.21	0.44	47.35%	-52.65%	0.62	33.50%	-66.50%
Mean	0.28	--	52.50%	-47.50%	--	50.41%	-49.59%
Std. Dev.	0.13	--	22.53%	22.53%	--	24.88%	24.88%
Washington							
Avalon	0.44	0.55	80.30%	-19.70%	0.54	82.02%	-17.98%
Gallery	0.25	0.55	44.86%	-55.14%	0.55	45.01%	-54.99%
Lennox	0.18	0.55	32.47%	-67.53%	0.54	33.05%	-66.95%
Meridian	0.05	0.55	9.95%	-90.05%	0.54	10.15%	-89.85%
Quincey	0.18	0.55	32.91%	-67.09%	0.54	33.62%	-66.38%
Mean	0.22	--	40.10%	-59.90%	--	21.88%	-78.12%
Std. Dev.	0.14	--	25.78%	25.78%	--	16.60%	16.60%
Unweighted Average	0.28	0.54	51.30%	-48.70%	0.55	50.64%	-49.36%

Note: Fitted Curve Equation for Apartments: T = 0.53(X) + 4.21 where T = average vehicle trip ends and X = number of dwelling units.
Fitted Curve Equation for Condominium (Wayside Commons): Ln(T) = 0.82 Ln(X) + 0.17

17 projects combined for weekday, AM peak, and PM peak. (As done in the ITE manual, the weighted average was computed by summing all trip ends among the 17 projects and dividing by the sum of dwelling units.) Figure 2.6 summarizes the results. Over a typical weekday period, the 17 surveyed TOD-housing projects averaged 44% fewer vehicle trips than estimated by the ITE manual (3.754 versus 6.715). The weighted average differentials were even larger during peak periods: 49% lower rates during the AM peak and 48% lower rates during the PM peak. To the degree that impact fees are based on peak travel conditions, one can infer that traffic impacts studies might end up overstating the potential congestion-inducing effects of TOD-housing in large rail-served metropolitan areas, such as Washington, D.C., by as much as 50%.

Scatterplots

The ITE *Trip Generation* manual reports summary findings in a scatterplot form, with summary best-fitting regression equations. Figures 2.7 through 2.9 show the best-fitting plots for the average weekday, AM peak, and PM peak periods, respectively. Linear plots fit the data points reasonably well, explaining over two-thirds of the variation in vehicle trip ends. The Merrick Apartments in Portland stands as an outlier, producing far fewer vehicle trip ends relative to its project size

Table 2.4. Comparison of TOD housing and ITE vehicle trip generation rates: PM peak estimates.

		Average Rate			Regression Rate		
	Veh. Trip Rate (PM peak hr.)	ITE Rate (PM peak hr.)	TOD rate as % of ITE Rate (PM pk hr.)	% Below ITE Rate	ITE Rate (PM peak hr.)	TOD rate as % of ITE Rate (PM pk hr.)	% Below ITE Rate
Philadelphia/NE NJ							
Gaslight Commons	0.460	0.67	68.66%	-31.34%	0.688	66.90%	-33.10%
Station Square	0.558	0.67	83.25%	-16.75%	0.651	85.73%	-14.27%
Mean	0.51	--	75.96%	-24.04%	0.67	76.32%	-23.68%
Std. Dev.	0.07	--	10.32%	10.32%	0.03	13.32%	13.32%
Portland, Oregon							
Center Commons	0.380	0.67	56.75%	-43.25%	0.661	57.53%	-42.47%
Collins Circle	0.105	0.67	15.65%	-84.35%	0.741	14.14%	-85.86%
Gresham Central	0.461	0.67	68.82%	-31.18%	0.795	58.03%	-41.97%
The Merrick Apts.	0.170	0.67	25.41%	-74.59%	0.695	24.51%	-75.49%
Quatama Crossing	0.487	0.67	72.63%	-27.37%	0.625	77.91%	-22.09%
Mean	0.32	--	47.85%	-52.15%	0.70	46.42%	-53.58%
Std. Dev.	0.17	--	25.85%	25.85%	0.07	26.32%	26.32%
San Francisco Bay Area							
Mission Wells	0.487	0.67	72.72%	-27.28%	0.645	75.56%	-24.44%
Montelena Homes	0.202	0.67	30.17%	-69.83%	0.693	29.16%	-70.84%
Park Regency	0.435	0.67	64.93%	-35.07%	0.621	70.10%	-29.90%
Verandas	0.367	0.67	54.78%	-45.22%	0.662	55.43%	-44.57%
Wayside Commons	0.337	0.52	64.72%	-35.28%	0.586	57.47%	-42.53%
Mean	0.37	--	57.46%	-42.54%	0.64	57.55%	-42.45%
Std. Dev.	0.11	--	16.53%	16.53%	0.04	17.98%	17.98%
Washington							
Avalon	0.370	0.67	55.26%	-44.74%	0.635	58.28%	-41.72%
Gallery	0.234	0.67	34.89%	-65.11%	0.676	34.59%	-65.41%
Lennox	0.220	0.67	32.90%	-67.10%	0.643	34.28%	-65.72%
Meridian	0.056	0.67	8.33%	-91.67%	0.638	8.74%	-91.26%
Quincey	0.201	0.67	30.06%	-69.94%	0.635	31.71%	-68.29%
Mean	0.22	--	32.29%	-67.71%	0.65	33.52%	-66.48%
Std. Dev.	0.11	--	16.69%	16.69%	0.02	17.55%	17.55%
Unweighted Average	0.391	0.661	62.10%	-37.90%	0.664	49.42%	-50.58%

Note: Fitted Curve Equation for Apartments: T = 0.60(X) + 17.52 where T = average vehicle trip ends and X = number of dwelling units
Fitted Curve Equation for Condominium (Wayside Commons): T = 0.34(X) + 38.17

than the other TOD-housing projects. Omitting this single case improved the regression fits considerably, with respective R-square values of 0.829, 0.800, and 0.847 for the weekday, AM peak, and PM peak.

Using the average weekday best-fitting regression equation in Figure 2.8, the estimated number of daily vehicle trips generated by a 400-unit apartment project is 1,508.3 [−523.7 + (5.26 ∗ 400) = 1,508.3]. For the same apartment land-use category (ITE code of 220), the latest *ITE Trip Generation Manual* would predict 2,554.35 daily vehicle trips for the same 400-unit apartment [150.35 + (6.01 ∗ 400) = 2,554.35]. Based on the empirical experiences of the sampled projects, the ITE regression equation for apartments overstates traffic impacts of transit-oriented housing by 39%.

How Do Rates Vary?

To better understand the nature of vehicle trip generation for TOD housing projects, additional analyses that explored associations between trip generation and various explanatory variables were carried out. For ratio-scale variables, scatterplots and bivariate regression equations were estimated. Such analyses treat every observation the same, thus the cases are unweighted. For those analyses with reasonably good statistical

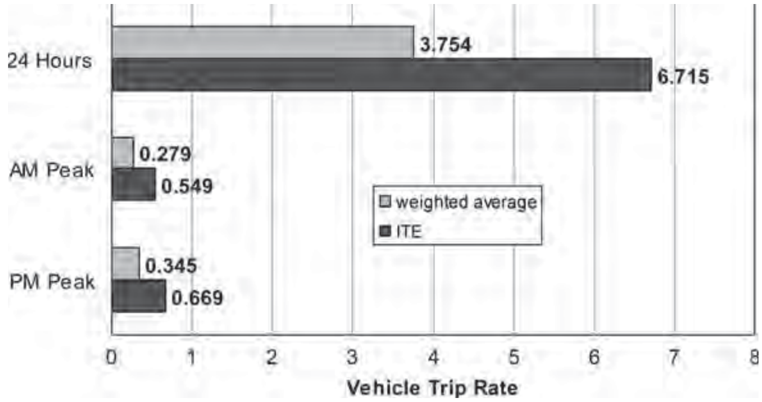


Figure 2.6. Comparison of weighted average vehicle trip rates: TOD housing and ITE estimates.

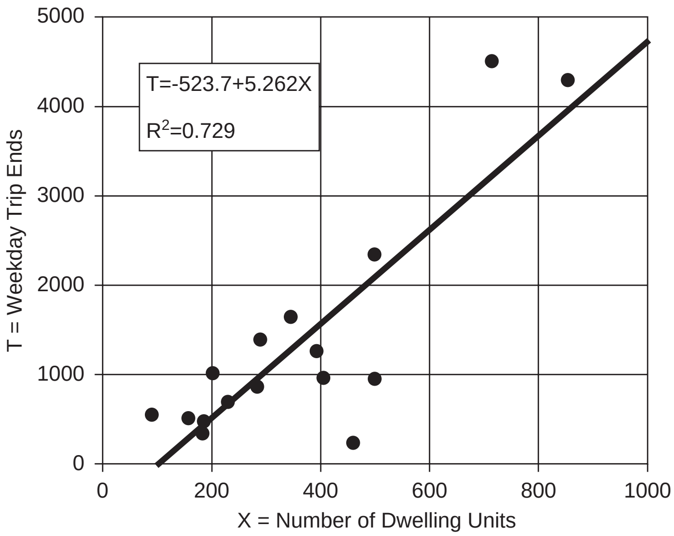


Figure 2.7. TOD housing weekday vehicle trip ends by number of dwelling units.

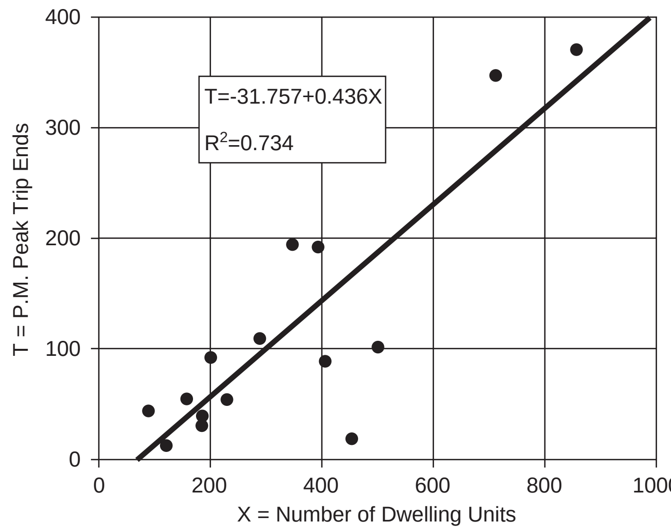


Figure 2.9. TOD housing PM peak vehicle trip ends by number of dwelling units.

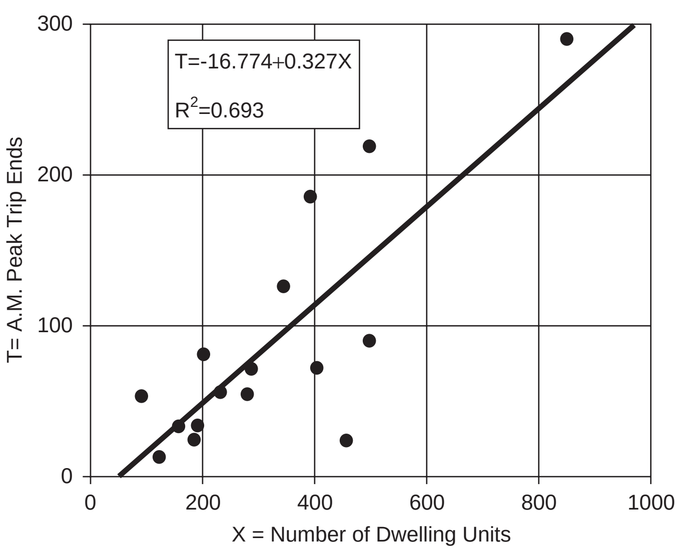


Figure 2.8. TOD housing AM peak vehicle trip ends by number of dwelling units.

fits, cases were broken into subgroups and weighted average values are presented for each category.

As suggested by Tables 2.2 through 2.4, the greatest variations in TOD trip generation rates are by metropolitan area/rail systems. Metropolitan Washington, with some of the nation's worst traffic conditions, most extensive modern-day railway networks, and densest (and arguably best planned) TOD housing projects, had the lowest trip generation rates. This was followed by Metro Portland, whose comparatively low rates are all the more remarkable given that it is smaller than the other urbanized regions and has a less extensive light rail system that operates in mixed-traffic conditions. Average trip generation rates were slightly higher for Bay Area TODs than in Portland and, as noted earlier, were the highest for the Philadelphia and Northeast New Jersey cases, due in part to the nature of commuter rail services (focused mainly on peak periods).

TOD trip generation rates are examined as a function of: 1) distance of project to CBD; 2) distance of project to station;

3) residential densities around station; and 4) parking provisions. While relationships were explored for other variables as well, only these factors proved to be reasonably strong predictors. The analysis ends with best-fitting multiple regression equations for predicting trip generation rates of TOD housing.

Distance to CBD

For the weekday period, a fairly weak relationship was found between TOD housing trip generation rates and distance to the CBD. This is suggested by Figure 2.10; rates were actually lower for projects more than 12 miles from the CBD than more intermediate-distance projects in the 6 to 12 mile range. (The >12 mile group is dominated by Bay Area cases; all five projects are more than 20 miles form downtown San Francisco.) During peak periods, however, relationships were stronger; rates increased with distance of a project from the CBD.

Table 2.5 summarizes the bivariate results for predicting trip generation rates as well as TOD rates as a proportion of ITE rates. In all cases, vehicle trip generation rates tend to rise as one goes farther away from the urban core. The weakest fit was for the 24-hour period whereas the strongest was for the PM peak. The best fit was the prediction of the TOD trip generation rate as a proportion of the ITE rate during the PM peak. That model explained more than 38% of the variation in vehicle trip rates. The scatterplot shown in Figure 2.11 reveals a fairly good fit for this variable (based on the reasonably steep slope).

Table 2.5. Summary regression equations for predicting TOD housing trip generation rates as functions of distance to CBD.

Period of Analysis	Dependent Variable	Bivariate Equation X = Distance of Project to CBD (miles)	R-Square
Weekday (24 hours)	Vehicle Trip Ends per Dwelling Unit	2.796 + .056X	0.097
	TOD Rate as a Proportion of ITE Rate	0.414 + .009X	0.109
AM Peak Hour	Vehicle Trip Ends per Dwelling Unit	0.198 + .006X	0.156
	TOD Rate as a Proportion of ITE Rate	0.358 + .012X	0.176
PM Peak Hour	Vehicle Trip Ends per Dwelling Unit	0.209 + .009X	0.350
	TOD Rate as a Proportion of ITE Rate	0.309 + .015X	0.388

Residential Densities

The finding that trip generation rates tend to be lower for TOD housing near urban centers suggests residential density is an important predictor. This is supported by the results shown in Table 2.6. The predictor variable in all of these equations is residential density, specifically the number of dwelling units per gross acre within a half mile radius of the rail station closest to the TOD housing project, estimated from the 2000 census. Residential densities were obtained from the national TOD database maintained by the CTOD.

In all cases shown in Table 2.6, TOD trip generation declines as surrounding residential densities increase. We suspect that residential density is serving as a broader surrogate of urbanicity, that is denser residential settings tend to have nearby retail and other mixed-use activities, better pedestrian connectivity, and often a more socially engaging environment. Residential densities most strongly influenced PM trip

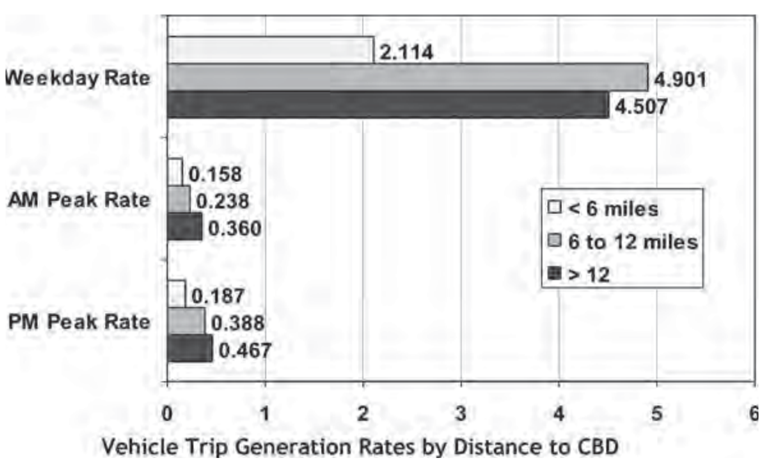


Figure 2.10. Vehicle trip generation rates by distance to CBD: comparisons of weighted averages for weekday, AM peak, and PM peak.

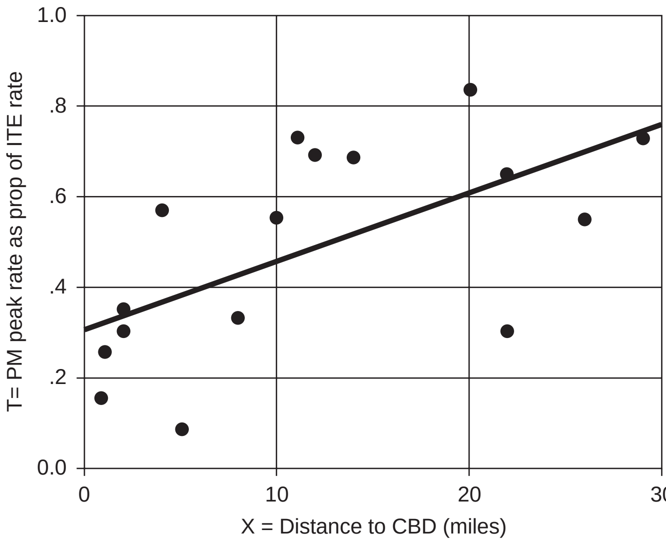


Figure 2.11. Scatterplot of PM trip generation rate to ITE rate with distance to CBD.

Table 2.6. Summary regression equations for predicting TOD housing trip generation rates as functions of residential densities (within 1/2 mile of stations).

Period of Analysis	Dependent Variable	Bivariate Equation X = Dwelling Units per Gross Acre within ½ Mile of Station	R-Square
Weekday (24 hours)	Vehicle Trip Ends per Dwelling Unit	5.369 - .211X	0.430
	TOD Rate as a Proportion of ITE Rate	0.801 - .096X	0.424
AM Peak Hour	Vehicle Trip Ends per Dwelling Unit	0.400 - .014X	0.276
	TOD Rate as a Proportion of ITE Rate	0.731 - .026X	0.274
PM Peak Hour	Vehicle Trip Ends per Dwelling Unit	0.493 - .019X	0.449
	TOD Rate as a Proportion of ITE Rate	0.741 + .028X	0.423

generation rates among the sample of 17 TOD housing projects. Figure 2.12 shows the scatterplot of these two variables.

TOD Parking Supplies

Parking provisions have a strong influence on travel behavior, particularly in suburban settings where most sample projects are located (Shoup, 2005; Willson, 1995). Bivariate equations for predicting TOD housing trip generation rates

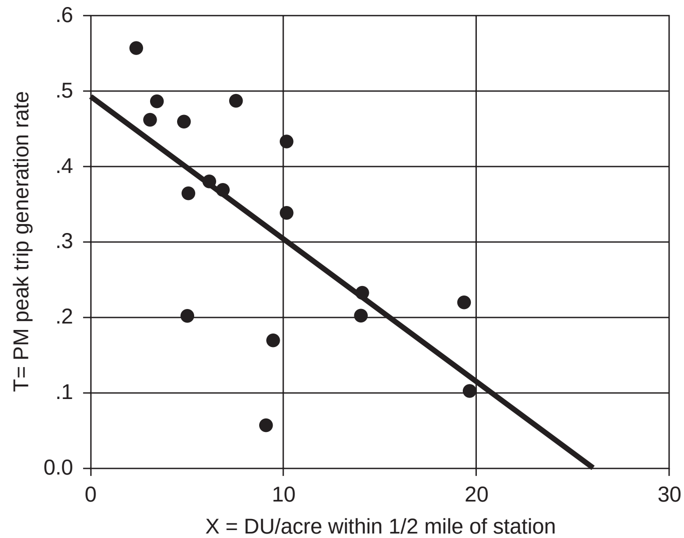


Figure 2.12. Scatterplot of PM trip generation rate with residential densities.

as a function of parking per dwelling unit are presented in Table 2.7. Relationships are weaker than that found for "Distance to CBD" and "Residential Densities." Vehicle trip generation rates tend to be higher for TOD projects with more plentiful parking. The strongest fit was between AM peak trip generation and parking supply. Figure 2.13 presents the scatterplot of this relationship.

The results in Table 2.7 and Figure 2.13 are unweighted by project size. Figure 2.14 compares average rates for three levels of parking supplies, weighted by project size. No clear pattern emerges from these weighted-average results, consistent with

Table 2.7. Summary regression equations for predicting TOD housing trip generation rates as functions of parking per dwelling unit.

Period of Analysis	Dependent Variable	Bivariate Equation X = Parking Spaces per Dwelling Units	R-Square
Weekday (24 hours)	Vehicle Trip Ends per Dwelling Unit	1.683 + 1.504X	0.158
	TOD Rate as a Proportion of ITE Rate	0.258+ .221X	0.153
AM Peak Hour	Vehicle Trip Ends per Dwelling Unit	0.098 + .145X	0.206
	TOD Rate as a Proportion of ITE Rate	0.189 + .260X	0.202
PM Peak Hour	Vehicle Trip Ends per Dwelling Unit	0.207 + .098X	0.088
	TOD Rate as a Proportion of ITE Rate	0.325 + .140X	0.078

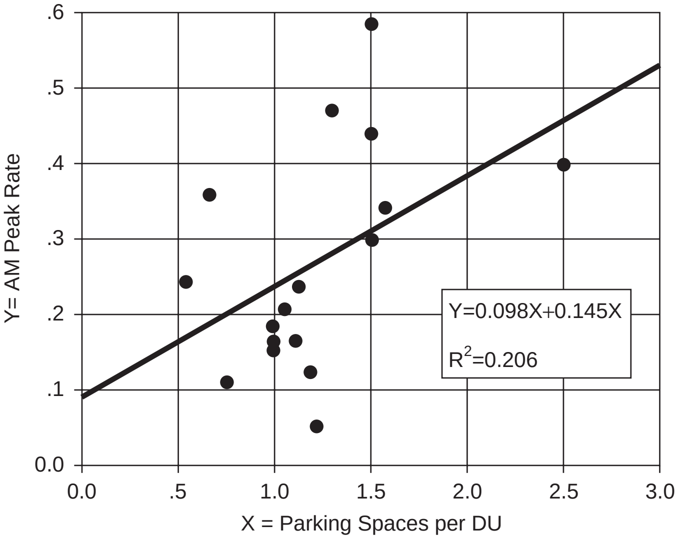


Figure 2.13. Scatterplot of AM trip generation rate with parking spaces per dwelling unit.

the fairly weak fits shown in Table 2.7. In general, trip generation rates were lower for TOD projects with intermediate levels of parking (1.0 to 1.15 spaces per dwelling unit). This was mainly an artifact of three of these projects being in metropolitan Washington, D.C.

Walking Distance to Station

The relationship between TOD housing trip generation and walking distance from the project to the nearest station was generally weaker than the other variables reviewed so far. Table 2.8 shows a positive slope for the explanatory variable, distance to station. This indicates that the closer a TOD housing project is to a rail station, the vehicle trip generation rates tend to be lower. The relationships were thrown off, in part, by Mission Wells, a Bay Area project situated beyond a half-mile of the nearest station. Figure 2.15 shows the weak scatterplot fit for the weekday (24 hour) estimate, with the Mission Wells observation (nearly 4000 feet from the station) standing out as an outlier. Dropping this single case provides an appreciably better fit, as revealed in Figure 2.16.

Table 2.8. Summary regression equations for predicting TOD housing trip generation rates as functions of walking distance to nearest station.

Period of Analysis	Dependent Variable	Bivariate Equation X = Walking Distance to Nearest Rail Station (in 1000s of feet)	R-Square
Weekday (24 hours)	Vehicle Trip Ends per Dwelling Unit	3.149 + .325X	0.027
	TOD Rate as a Proportion of ITE Rate	0.047 + .052X	0.030
AM Peak Hour	Vehicle Trip Ends per Dwelling Unit	0.209 + .060X	0.126
	TOD Rate as a Proportion of ITE Rate	0.382 + .00011X	0.137
PM Peak Hour	Vehicle Trip Ends per Dwelling Unit	0.249 + .071X	0.168
	TOD Rate as a Proportion of ITE Rate	0.374 + .00011X	0.182

As Table 2.8 indicates, the strongest linear pattern between TOD trip rate (as a proportion of the ITE rate) and distance to station was for the PM peak hour. Figure 2.17 shows this scatterplot. Retaining the Mission Wells observation, a slightly better fit was obtained using a quadratic equation of the form:

$$T = 0.195 + 0.21X - 0.0000032X^2 \qquad R^2 = .195$$

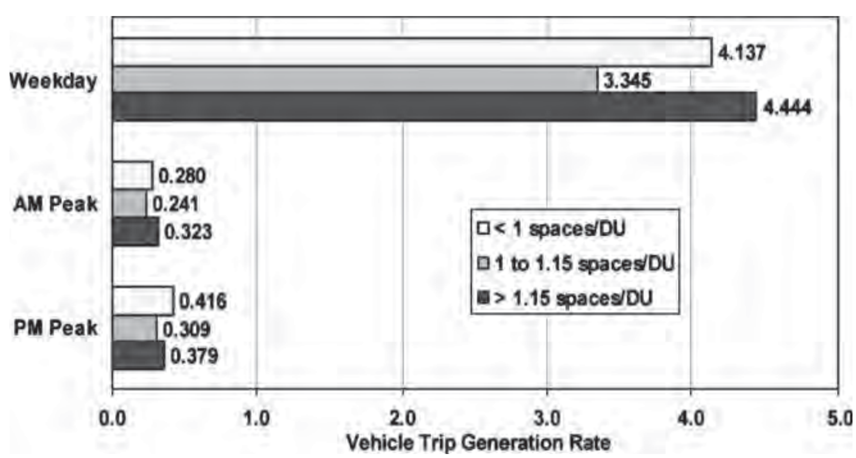


Figure 2.14. Vehicle trip generation rates by parking spaces per dwelling unit: comparisons of weighted averages for weekday, AM peak, and PM peak.

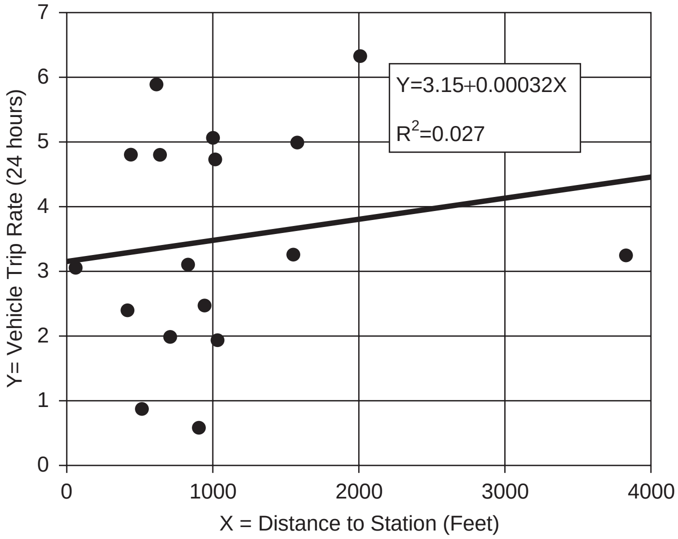


Figure 2.15. TOD housing vehicle trip rates by shortest walking distance to station; N = 17 (all cases).

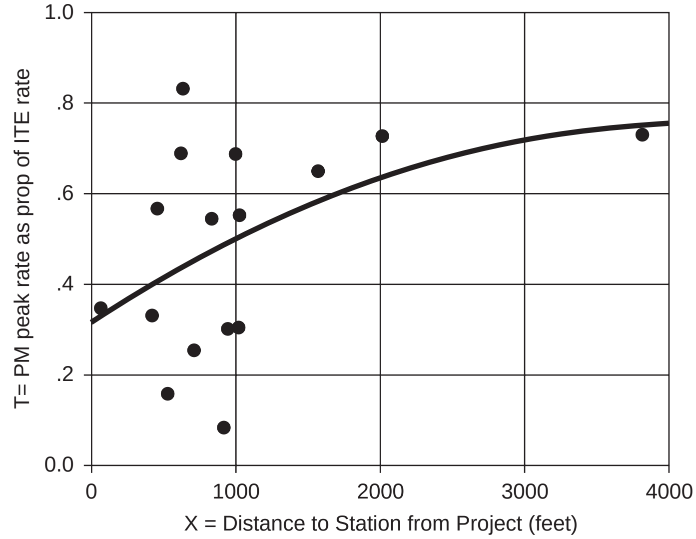


Figure 2.17. TOD-housing vehicle trip rate (as a proportion of ITE rate) by walking distance to station; quadratic curve; N = 17.

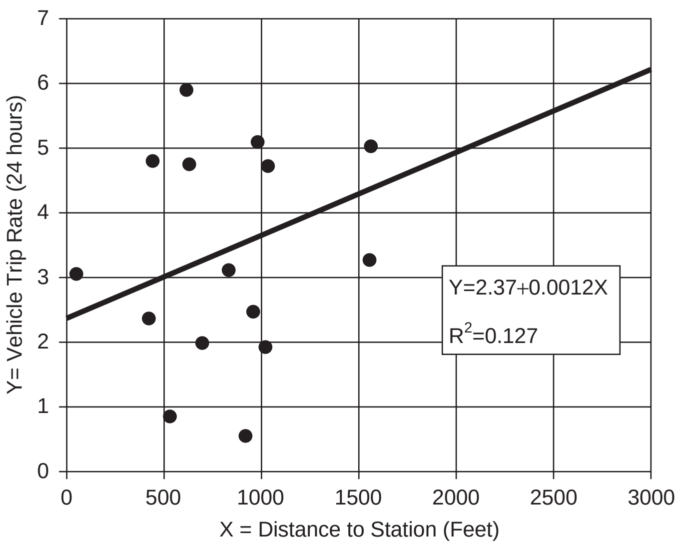


Figure 2.16. TOD housing vehicle trip rates by shortest walking distance to station, without Mission Wells Case; N = 16.

where T is TOD-housing PM trip rate as a proportion of ITE rate and X is the walking distance of project to the nearest station (in 1,000s of feet).

Multiple Regression Predictions of TOD Housing Trip Generation Rates

The previous section found modest to moderate relationships between TOD housing trip generation rates and four variables: distance to CBD, residential density, parking per dwelling unit, and distance to station. In general, the bivariate relationships between TOD trip generation and other explanatory variables (such as compiled in the pedestrian survey and through the CTOD database) were very weak and statistically insignificant.

This section presents a multiple regression equation that combines explanatory variables to produce the best-fitting predictive models. These results provide insight into how other factors combine with proximity of multi-family housing to rail stations to influence vehicle trip generation rates.

Weekday TOD Trip Generation Model

The simple bivariate models shown in Table 2.6 provided the best fit for predicting weekday TOD trip generation rates (as well as rates as a proportion of the ITE rate). That is, once controlling for residential density around the station, none of the other variables—walking quality, parking supply, socio-demographic characteristics of the surrounding neighborhood—provided significant marginal explanatory power. Again, density is thought to function as a proxy for many of these factors. The finding that walking quality has little bearing on vehicle trip generation rate also is consistent with research findings from California (Lund, et al, 2004). That work suggested the presence of an indifference zone; as long as most residents were within five or so minutes of a station, walking quality matters relatively little. The presence of an integrated sidewalk network, street trees, and various pedestrian amenities likely have more influence on longer-distance walking behavior than encountered by most TOD residents.

Model 1: TOD Trip Generation Model for the AM Peak

In predicting trip rates for the morning peak hour, the below output reveals that trip generation falls with residential densities and increases with project parking supplies (Table 2.9). The combination of higher densities and lower parking supplies holds promise for driving down morning vehicle trips for transit-based housing. The parking variable, however, is not statistically significant at the 0.10 probability level.

Model 2: TOD Trip Generation Model for AM Peak (as a Proportion of ITE Rate)

Comparable results were found for predicting AM peak rates as a proportion of the ITE rate (Table 2.10).

Table 2.9. Best-fitting multiple regression equation for predicting AM peak trip generation rates for TOD housing projects.

	AM Peak Rate			
	Coeff.	**Std. Err.**	***t* Statistic**	**Prob.**
Residential Density: Dwelling Units per Gross Acre within ½ mile of station	-0.012	0.006	-1.961	.075
Parking Supply: Parking Spaces per Dwelling Unit	0.106	0.070	1.507	.154
Constant	0.250	0.116	2.152	.039

Summary Statistics:

***F* statistics (prob.)** = 3.800 (.048)
***R* Square** = .352
Number of Cases = 17

Table 2.10. Best-fitting multiple regression equation for predicting AM peak trip generation rates as a proportion of ITE rate for TOD housing projects.

	AM Peak Rate			
	Coeff.	**Std. Err.**	***t* Statistic**	**Prob.**
Residential Density: Dwelling Units per Gross Acre within ½ mile of station	-0.021	0.011	-1.948	.072
Parking Supply: Parking Spaces per Dwelling Unit	0.189	0.128	1.484	.160
Constant	0.462	0.210	2.196	.045

Summary Statistics:

***F* statistics (prob.)** = 4.154 (.038)
***R* Square** = .372
Number of Cases = 17

Model 3: TOD Trip Generation Model for the PM Peak

A better fitting model was obtained for predicting TOD trip generation in the afternoon peak (Table 2.11). The results, which explained 60% of the variation in PM trip rates, reveal that vehicle travel in the afternoon rises with distance to the CBD and falls with both residential density and household size.

Model 4: TOD Trip Generation Model for PM Peak (as a Proportion of ITE Rate)

The best-fitting multiple regression equation was produced for predicting PM peak trip rates as a proportion of ITE rates (Table 2.12). This model explained 63% of the variation. Like the previous model, this one showed that TOD projects closest to the CBD, in higher density residential settings, and in neighborhoods with smaller household sizes averaged the lowest PM trip rates.

Using the best-fitting multiple regression model for the PM peak, Figure 2.18 reveals how PM trip rates for the TOD projects differ as a proportion of the rates predicted by the ITE manual. Assuming an average household size of two persons, the predicted values as a function of distance to CBD (horizontal axis) and residential densities (within half mile of the nearest rail station, represented by the five bars) are shown in the Figure. For example, the model predicts that for a transit-oriented apartment 20 miles from the CBD in a neighborhood with 10 units per residential acre, the PM trip rate will be 55% of (or 45% below) the ITE rate. If the same apartment in the same density setting were 5 miles from the CBD, the PM trip rate would be just 38% of the ITE rate. For

Table 2.11. Best-fitting multiple regression equation for predicting AM peak trip generation rates for TOD housing projects.

	AM Peak Rate			
	Coeff.	**Std. Err.**	***t* Statistic**	**Prob.**
Distance to CBD (in miles)	0.007	0.003	2.145	.051
Residential Density: Dwelling Units per Gross Acre within ½ mile of station	-0.018	0.006	-2.846	.014
Household Size: Persons per Dwelling Unit within ½ mile of station	-0.103	0.074	-1.390	.188
Constant	0.608	0.182	3.346	.005

Summary Statistics:

***F* statistics (prob.)** = 6.497 (.006)
***R* Square** = .600
Number of Cases = 17

Table 2.12. Best-fitting multiple regression equation for predicting PM peak trip generation rates as a proportion of ITE rate for TOD housing projects.

	AM Peak Rate			
	Coeff.	Std. Err.	*t* Statistic	Prob.
Distance to CBD (in miles)	0.013	0.005	2.631	.021
Residential Density: Dwelling Units per Gross Acre within ½ mile of station	-0.026	0.009	-2.893	.013
Household Size: Persons per Dwelling Unit within ½ mile of station	-0.190	0.107	-1.772	.100
Constant	0.964	0.264	3.657	.003
Summary Statistics: ***F* statistics (prob.)** = 7.491 (.004) ***R* Square** = .634 **Number of Cases** = 17				

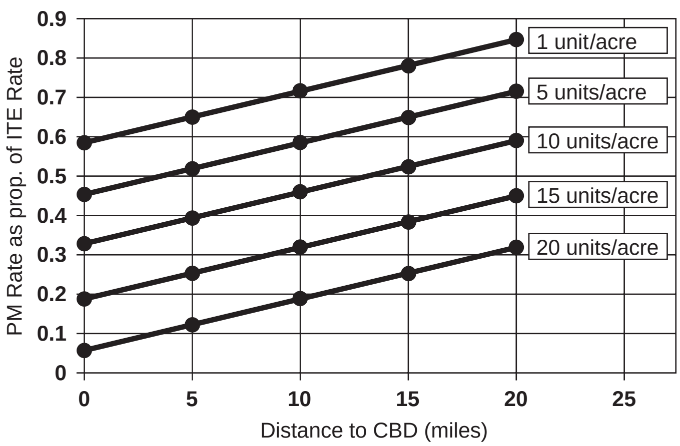


Figure 2.18. Influences of residential densities and distance to CBD on transit-oriented housing PM trip rate as a proportion of the ITE rate.

two transit-oriented apartments 10 miles from the CBD, if the surrounding residential densities are 10 units per acre, the PM trip rate will be 45% of the ITE manual's rate. If the surrounding densities are 20 units per acre, the PM trip rate will be just 20% of the ITE rate (or 80% lower).

Applying the Research: Four TOD Housing Case Studies

This section looks at some of the physical implications of varying residential parking by analyzing four TOD case studies designed with two different parking ratios. Using four different representative TOD residential development products, the analysis provides a glimpse at how changing parking within a TOD can have an impact, such as improving physical form, increasing the density of potential development, lowering the capital cost for parking, enhancing the financial viability of TODs, and increasing transit ridership.

Building TOD Case Studies

As an input to this part of the research, TOD master planners from PB PlaceMaking were asked to prepare alternative site plans for an eight-acre residential TOD. Parking ratios were varied between the alternatives: one reflected conventional ratios in many existing TODs and one tested tighter ratios more consistent with the results of this research. The site plans were prepared for four different representative TOD residential development products (garden apartments, townhomes, a Texas Donut and mid-rise housing) for a total of eight different site plans. (A Texas Donut refers to a parking structure surrounded by usable residential space. In an article in *Places,* Brian O'Looney and Neal Payton describe Texas Donuts as unadorned parking decks bordered on two sides by a 10-15 foot zone for open ventilation, and wrapped on all four sides by 35-40 foot deep four-story wood-frame liner residential buildings (http://repositories.cdlib.org/cgi/viewcontent.cgi?article=1998&context=ced/places). The development types tested were selected because they are indicative of the residential development products found in a number of U.S. TODs. The potential development types reflect the range of built products included in the field research for this study. The site plans ranged in density from 24 to 120 units per acre.

Since there are no clear national standards for parking TODs, a quick survey of parking ratios in adopted station area plans was conducted. The review revealed a considerable range of latitude in how TODs are parked. For the case studies, parking ratios were selected from two TOD zoning ordinances for station areas on the Washington Metrorail: one in Maryland and one in Virginia. The TOD 1 ratio of 1.1 parking spaces per unit (one space per unit and one visitor space for every 10 units) is consistent with how Arlington County, Virginia parks high density TOD in the Rosslyn-Ballston Corridor on the Orange Line (U.S. EPA, 2006). The TOD 2 ratio is 2.2 parking spaces per unit (two spaces per unit and one visitor space for every five units) and is consistent with how Prince Georges County, Maryland parks high density TOD for the West Hyattsville TOD on the Green Line (Prince Georges County, 2006).

For an apples to apples comparison, the underlying assumptions were held constant for each potential development product, even though in a real word example they would be expected to vary somewhat to respond to unique site conditions. In each case study the unit size was assumed to be 910 square feet net or 1200 square feet gross. This provides for a mix of unit sizes (1, 2, and 3 bedroom units) within the project.

Parking is assumed to consume 300 square feet per space allowing for aisles and landscaping. While parking ratios vary considerably across the United States, these ratios provide a means to help isolate the impacts of parking ratios on urban form. The parking ratios tested in the site plans were 2.2 spaces per unit and 1.1 spaces per unit.

Learning from the Case Studies

Representative site plans (Figures 2.19–2.22) help illustrate some potential implications for TOD housing of how adjusting parking ratios reflect the actual transportation performance of TODs in form, density, and performance. Varying parking ratios and holding other factors constant suggest a number of important differences in what could be constructed on the eight-acre theoretical TOD. Table 2.13 provides a summary of some of the quantifiable differences in density, cost, and ridership from varying parking ratios for the potential residential TOD products analyzed in the case studies. Those differences include:

- A 20% to 33% increase in the number of potential units in a TOD. As might be expected, a lower parking ratio results in less land being used for parking which can be used for development. In the four case studies, potential additional residential units from lower parking ratios ranged from an increase between 20% to 33%.

  The case studies show how the two ratios result in significantly different density on a site. The most pronounced percentage increase in potential units was seen with the lower density garden apartment and townhome examples because all the parking is surface spaces. Reducing parking from 2.2 to 1.1 spaces per unit resulted in the ability to increase the potential number of units on the site by 33% for both garden apartments and townhomes. The greatest absolute increase in the number of units was achieved by

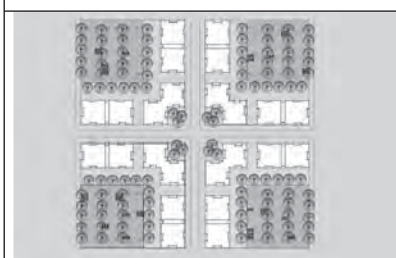
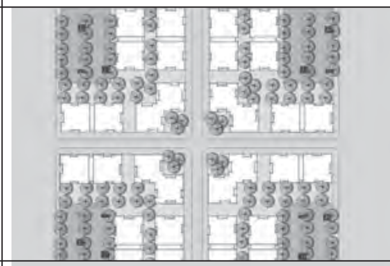
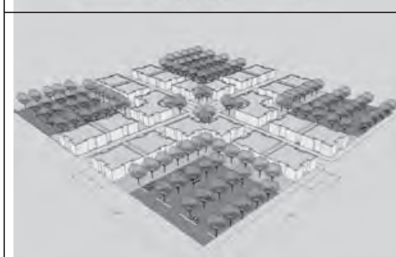
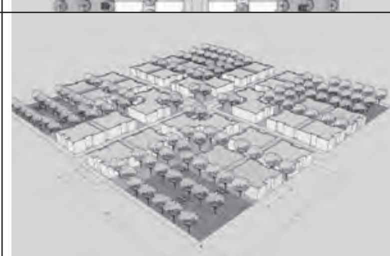
2.2 Parking spaces per unit	1.1 Parking spaces per unit
	
	
Total Area: 8 acres	Total Area: 8 acres
Total Units: 196	Total Units: 256
	Additional units: 60
Density: 24 Dwelling units per acre	Density: 32 Dwelling units per acre
	Increase in density: 33%
Parking Spaces: 432	Parking Spaces: 288
Parking capital cost: $2.1m	Parking capital cost: $2.02m
	Parking cost savings: $98,000
	Annual incremental ridership: +19,500 Annual incremental fare revenue: $19,750

Figure 2.19. Comparison of representative TOD housing: garden apartments.

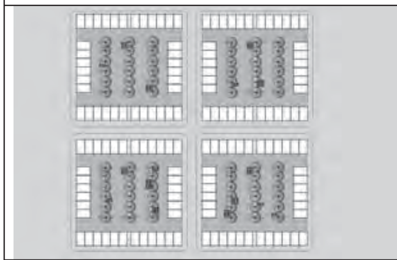
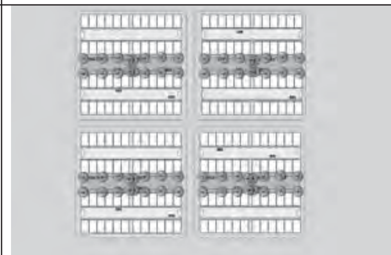
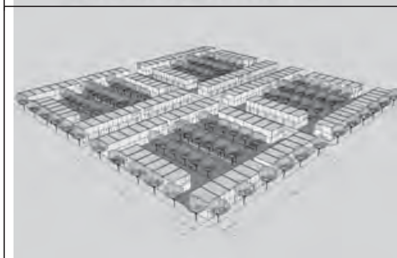
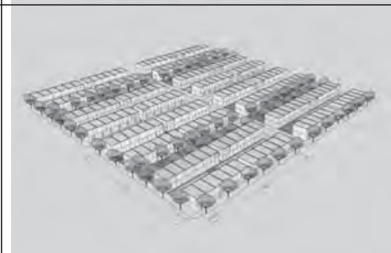
2.2 Parking spaces per unit	1.1 Parking spaces per unit
	
	
Total Area: 8 acres	Total Area: 8 acres
Total Units: 288	Total Units: 384
	Additional units: 96
Density: 36 Dwelling units per acre	Density: 48 Dwelling units per acre
	Increase in density: 33%
Parking Spaces: 648	Parking Spaces: 448
Parking capital cost: $6.56m	Parking capital cost: $5.82m
	Parking cost savings: $736,000
	Annual incremental ridership: +31,200 Annual incremental fare revenue: $31,600

Figure 2.20. Comparison of representative TOD housing: townhomes.

lowering the parking ratios for the higher density products, the Texas Donut and the mid-rise building.

- Lower total construction costs for parking even with more residential units. Parking in any form is expensive to build. Reducing the amount of parking required in a TOD by rightsizing parking as suggested by the results of this research can be important to the economic viability of a TOD. To help understand the cost implications of parking, a review of 2007 parking costs was completed (G. Stewart, e-mail message, December 2007). The review shows just how expensive parking can be. Surface parking spaces can cost from $5,000 per space for low-end asphalt to $10,000 with details like cobbles and brick pavers. Parking tucked under a townhome can cost about $14,000 a space. In dense conventional multi-family development such as the Texas Donut or mid-rise buildings open undecorated parking decks cost anywhere from $17 - $20,000 per space. If the parking deck is to be incorporated into the urban fabric of a community the cost of a special feature like a retail wrap or an enhanced façade typically pushes the cost of a space to around $28,000 to $32,000.

As the site plan studies help demonstrate, tighter parking ratios can be a key driver in the capital cost of TODs. The cost savings were most pronounced with the higher density development prototypes (mid-rise and Texas Donut) where structured parking is employed. In these examples the savings in reducing parking ranged from 25% to 36%. For the lower density examples the parking savings was in the order of between 5% and 11% depending on the development product.

The real significance of the parking capital cost numbers indicated in the case studies is to understand the numbers are not simply an apples-to-apples comparison of reducing the parking by half. As the case study shows, a reduction in parking results in an increase in the number of potential units on the site (which need to be parked) by 20% to 33%

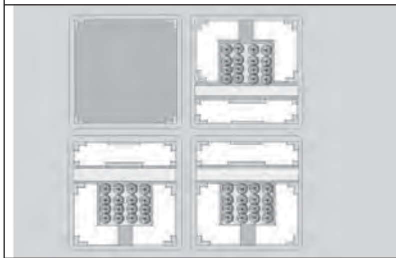
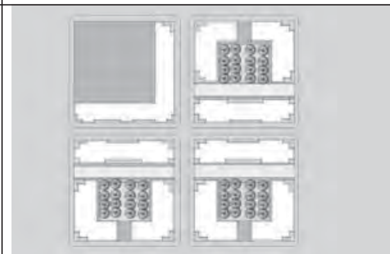
2.2 Parking spaces per unit	1.1 Parking spaces per unit
	
	
Total Area: 8 acres	Total Area: 8 acres
Total Units: 801	Total Units: 963
	Additional units: 162
Density: 100 Dwelling units per acre	Density: 120 Dwelling units per acre
	Increase in density: 20%
Parking Spaces: 1800	Parking Spaces: 1152
Parking capital cost: $33.3m	Parking capital cost: $21.31m
	Parking cost savings: $12m
	Annual incremental ridership: +52,650 Annual incremental fare revenue: $53,330

Figure 2.21. Comparison of representative TOD housing: mid-rise 6-story.

(see Table 2.14). With the mid-rise case study, for example, an additional 162 units could be built and still result in a developer saving approximately $12 million in the cost of parking. In this instance reducing the parking ratio by 50% resulted in a capital cost savings of 25% for parking while also increasing the number of residential units by 20%.

- Higher transit ridership. Increasing the potential number of residential units in a TOD also can be expected to increase transit ridership. The actual increase in ridership can be expected to vary considerably depending on local conditions. Drawing on the body of existing research summarized in the literature review, it is possible to make some crude preliminary assessments of the ridership implications of increasing the potential density in a TOD. [Transit ridership was estimated consistently for each of the case studies: drawing on the field research, 3.55 trips were assumed for each TOD household. Transit ridership: 3.55 trips per TOD household allocated as follows: 1.5 work trips per TOD HH $*$ TOD units $*$ .40 TOD work mode share + 4 nonwork trips per TOD HH $*$ TOD units $*$ .10 TOD nonwork mode share (Lund et al., 2004) = daily ridership $\times$ 325 annualization factor = the annual incremental increase in ridership attributable to changes in parking ratios. Because the mode share factors are specifically for TODs, no additional adjustments for changes in density or automobile ownership were made.] As one might expect the incremental ridership benefit increases proportionally to the number of additional units.

  The additional annual transit ridership which might be attributable from the potential units made possible by lowering parking ratios is summarized in Table 2.15.
- Parking and financial feasibility of TODs. Apart from the impacts on the physical form of a TOD the shear amount and cost of parking can be a driver in the financial viability of a proposed TOD and in turn the financial return to a developer. As discussed earlier, lowering parking ratios can affect the financial viability of a TOD in a number of ways. In

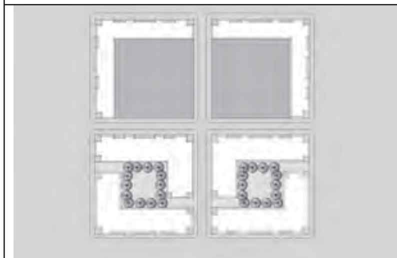
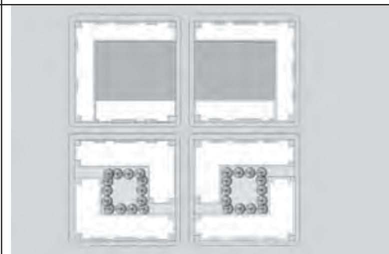
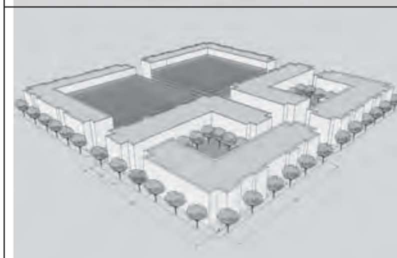
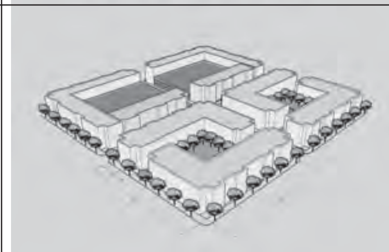
2.2 Parking spaces per unit	1.1 Parking spaces per unit
	
	
Total Area: 8 acres	Total Area: 8 acres
Total Units: 738	Total Units: 963
	Additional units: 225
Density: 92 Dwelling units per acre	Density: 120 Dwelling units per acre
	Increase in density: 20%
Parking Spaces: 1152	Parking Spaces: 864
Parking capital cost: $21.31m	Parking capital cost: $15.98m
	Parking cost savings: $5.3m
	Annual incremental ridership: +82,875 Annual incremental fare revenue: $83,950

Figure 2.22. Comparison of representative TOD housing: Texas Donut.

particular, lower capital costs for parking and a greater yield of units on a site could be expected to result in more TOD projects being financially viable since a developer would be able to potentially increase the number of units on a site while at the same time reduce the capital cost for parking.

With land cost constituting a growing percentage of housing prices, potentially increasing the number of units on a particular site can play an increasingly important role in the financial viability of a TOD. A 2006 Federal Reserve study shows the growing impact of land on housing prices. Averaging across the 46 largest U.S. cities, the value of residential land accounted for about 50% of the total market value of housing, up from 32% in 1984 (Davis and Palumbo, 2006).

- Parking and urban form. Creating an active pedestrian environment is a core principle and an essential characteristic of well planned TODs. For TOD designers that means creating as many active street edges (lining streets with people oriented uses) as possible. TOD site plans help to demonstrate the impact different parking ratios can have on creating an active pedestrian environment. The result is most noticeable with the moderate density garden apartment example where surface parking is employed. With the 2.2 parking ratio, approximately 50% of the street edge is dominated by parking. With the 1.1 parking ratio, the amount of the street edge taken by parking decreases by half to 25% of the total site street edge.

Implications of Applying New Standards for TOD Housing

The research findings and literature review provide solid evidence to support the belief that people living in TODs drive less often than their neighbors in conventional developments. Based on this evidence, public officials and government regulators may chose to develop new, more realistic standards for parking, assessing impact fees, and mitigation for TODs. The research suggests important implications are

Table 2.13. Summary of analysis for potential TOD housing site plan case studies: impact of lower TOD parking ratios.

	Units		Density		Parking			Annual Incremental Ridership
	Total	Additional	Per acre	% increase	Spaces	Cost	Difference	
Garden Apartments								
TOD 1 ratio	256	+60 units	32	+33%	288	$2.02m	$98,000 savings	19,500 transit trips $19,750 fares
TOD 2 ratio	196		24		432	$2.1m		
Townhomes								
TOD 1 ratio	384	+96 units	48	+ 33%	448	$5.82m	$736,000 savings	31,200 transit trips $31,600 fares
TOD 2 ratio	288		36		648	$6.56m		
Mid Rise 6-Story								
TOD 1 ratio	963	+162 units	120	+20%	1152	$21.31M	$12 million savings	52,650 transit trips $53,330 fares
TOD 2 ratio	801		100		1800	$33.3m		
Texas Donut								
TOD 1 ratio	963	+225 units	120	+30%	864	$15.98m	$5.3 million savings	82,875 transit trips $83,950 fares
TOD 2 ratio	738		92		1152	$21.31m		

Assumptions: Parking ratios: TOD 1 - 1.1 spaces per unit; TOD 2 - 2.2 spaces per unit
Cost per space: surface parking $7,000; tuck under parking $14,000; structured parking $18,500
Transit ridership: 3.55 trips per TOD household allocated as follows: 1.5 work trips per TOD HH * TOD units * .40 TOD work mode share + 4 non-work trips per TOD HH * TOD units * .10 TOD non-work mode share. (Lund et al) = daily ridership x 325 annualization factor = annual incremental increase in ridership. Fare revenue: assumes average fare of $1.013 TriMet March 2008 Month Performance Report, year-to-date Average Fare, April 2008.
HH=household

likely to flow from permitting and developing TODs based on an accurate assessment of their parking needs and trip generation.

Some of the likely consequences of permitting and building TOD consistent with the findings of this research include:

- More compact development. As the site plan case studies help to demonstrate, more compact environmentally sustainable development can result from less land being consumed for parking. Case studies showed an increase of 20% to 33% in density for residential TOD could be achieved. This tracks well with U.S. EPA estimates that each on-site parking space at infill locations can reduce the number of new housing units or other uses by 25% or more (EPA, 2006). It must be noted that the ability to increase density should not necessarily translate to the higher density in all cases. Parking and trip generation are only two variables of many in the very complex issue of increasing density.
- Easier development approvals. One major challenge developers face with TOD is the increased time and expense getting development approvals for infill development because of inevitable neighborhood concerns about traffic. Interviews with TOD developers (Parsons Brinckerhoff, 2002) reveal an interesting cycle that plays itself out over and over in response to community concerns about traffic impacts of new development. One way to explain the sequence is in a five act TOD morality play:

1. Act One: vision. Planners, citizens and smart growth advocates secure adoption of a compact transit village plan

Table 2.14. Impact of lower TOD parking ratios.

	Units Gained	Spaces Saved	Capital Cost Savings
Garden Apartments	60	144	$98,000 5%
Townhomes	96	200	$736,000 11%
Mid Rise 6-Story	162	648	$12,000,000 36%
Texas Donut	225	288	$5,300,000 25%

allowing compact dense residential development around a rail station.

2. Act Two: optimism. Time passes and a progressive developer presents the local community with a proposal for a dense TOD allowed under the transit village plan.
3. Act Three: opposition. Community members' concerns about change inevitably focus on perceived traffic impacts and overflow parking from the dense TOD development.
4. Act Four: compromise. The developer offers to cut the density below transit supportive levels in the adopted plan and increase the parking in order to get a development approval and recover his fixed costs.
5. Act Five: the lesson. Many of the hoped for community benefits of TOD at the rail station and the financial return to the developer are not realized because the development is built below the allowed density with increased parking, and the developer may be less apt to pursue TOD.

Getting new information on the performance of TODs out into the field may help to break this cycle of compromising away the benefits of TOD. Local officials and neighborhoods may be more apt to support increases in residential densities near transit if they are shown proof that up to half of the trips result from TODs than in conventional development. Using a 700-unit California condominium project as a reference point, the expected daily traffic rates would be reduced by as much as half with a likely number of 2,350 trips with the TOD traffic generation rates rather than 4700 daily trips using the ITE rates (S. Zuspan, personal e-mail, November 5, 2007).

- Lower fees for TODs. Applying new standards for trip generation could result in wholesale changes in how we address the cost, impact, and feasibility of residential development near transit. The implications of new standards are varied and would need to be scaled to the quality of transit service present.

  Developers likely would pay lower fees and exactions by as much as 50% to reflect the actual performance of residential TODs. Those savings could be passed on to homeowners and tenants as lower housing costs. For instance, that same 700-unit condominium development could see its traffic impact fee reduced by half–from $4,500 per unit to $2,250 per unit–if it were based on the likely traffic generation of a TOD rather than the ITE rates. In this case, the developer would save $1.6 million, presumably making the units more affordable.
- Downsizing new road construction. Traffic-based impact fees are used to help fund intersection and roadway improvements such as street widening. The same mathematical equations that result in over-charging impact fees for TODs also can result in over-building road facilities to serve TODs. With lower levels of traffic generated from TODs, it can be argued that it makes no sense to construct roadway improvements to serve TOD related traffic that is not likely to materialize.

  Right-sizing new road and intersection improvements to reflect the actual transportation performance can result in more compact development patterns and a higher quality pedestrian environment since less land may be used for road improvements.
- Enhanced housing affordability. Housing affordability is one area where research may have significant implications. Housing affordability is driven by a myriad of factors, with

Table 2.15. Impact of lower TOD parking ratios.

	Additional Units	Annual Incremental Ridership	Annual Incremental Fare Revenues
Garden Apartments	+60 units	19,500 transit trips	$19,750
Townhomes	+96 units	31,200 transit trips	$31,600
Mid Rise 6-Story	+162 units	52,650 transit trips	$53,330
Texas Donut	+225 units	82,875 transit trips	$83,950

land costs constituting 50% of the total market value of housing. TOD site plan case studies suggest reducing parking ratios to reflect that the transportation performance of TODs also can have the additional benefit of increasing the number of housing units on the same piece of land by between 20% and 33%, which can translate into lower housing costs (Davis and Palumbo, 2006).

The TOD housing affordability connection has received attention from some housing advocates because automobile ownership is one of a household's largest expenses, second only to the cost of housing. [According to the Bureau of Transportation Statistics, in 1998 the average household spent 33% of its income on housing and 19% on transportation (Only 6% of transportation spending went toward travel by air, taxi, and public transportation). Food related expenditures come in third, at 14%. Bureau of Transportation Statistics. *Pocket Guide to Transportation,* U. S. Department of Transportation, BTS00-08, 2000.]

The poorest families spend the greatest share of their income on transportation (Surface Transportation Policy Partnership, 2001). Instead of paying a quarter or a third of their income for housing, low-income families sometimes pay half or even more for a place to live. Reducing transportation expenditures by living in TODs can free-up disposable income to be used for other uses such as housing.

Conclusion and Recommendations

This research helps confirm what had been intuitively obvious: TOD housing produced considerably less traffic than is generated by conventional development. Yet most TODs are parked on the assumption that there is little difference between TOD and conventional development with respect to the traffic they generate. One likely result of this fallacious assumption is that fewer TOD projects get built. TOD developments that do get built are certainly less affordable and less sustainable than they might be because they are subject to incorrect assumptions about generated traffic impact. Therefore many hoped for benefits (such as less time stuck in traffic and lower housing costs) from nearly $75 billion in public dollars invested in rail transit (J. Neff, personal e-mail, October 26, 2007) over the past 11 years are not being realized.

One end result is that auto trip generation is likely to be overstated for TODs. This can mean TOD developers end up paying higher impact fees, proffers, and exactions than they should since such charges usually are tied to ITE rates. Another implication of the research is that parking ratios for residential TODs also are likely to be overstated for TODs by the same order of magnitude since they also are based on ITE data. More research on parking generation will be needed to confirm whether TOD residents own cars at the same rate as conventional development, but use them less.

Some cumulative impacts of over-parking TODs are illustrated in the site plan case studies. The TOD site plan case studies help to demonstrate that under the right conditions lowering residential parking ratios by 50% for TODs in station areas with quality transit service can result in:

- An increase in the density of a residential TOD by 20% to 33% depending on the residential building type;
- Savings on residential parking costs from 5% to 36% after accounting for increases in the number of units to be parked from increased residential density; and
- Potentially greater developer profits and/or increased housing affordability from higher densities, lower capital costs for parking, and reduced traffic impact fees.

Rightsizing parking ratios and traffic generation to the actual performance of TOD is likely to result in some important implications on the physical form and performance of TOD developments:

- Local officials and neighborhoods may be more apt to support increases in residential densities near transit if they are shown proof that fewer trips result from TODs than in conventional development.
- TOD developers likely would pay lower traffic related impact fees and exactions. Those savings can be passed on to consumers as lower housing costs.
- With lower levels of traffic generated from TODs, it can be argued that it simply makes no sense to construct roadway improvements for TOD related traffic that is not likely to materialize.
- Right-sizing new road and intersection improvements to reflect the actual transportation performance can result in more compact development patterns and a higher quality pedestrian environment since less land may be used for road improvements.

Clear policy directions come from this research. The appreciably lower trip-generation rates of transit-oriented housing projects call for adjustments in the measurement of traffic impacts. For peak periods (that often govern the design of roads and highways), this research shows transit-oriented apartments average around one half the norm of vehicle trips per dwelling unit. The rates varied, however, from 70%-90% lower for projects near downtown to 15% to 25% lower for complexes in low-density suburbs. Regardless, smart growth needs smart calculus; those who build projects that reduce trips should be rewarded in the form of reduced traffic impact fees and exactions. The expectation is developers would pass on some of the cost savings to tenants, thus making housing near rail stations more affordable.

To date, few jurisdictions have introduced sliding scale fee structures to reflect the lowering of trip generation for TODs. Santa Clara County California's Congestion Management Agency has produced guidelines for a 9% trip reduction for housing within 2,000 feet of a light-rail or commuter-rail station. While this is a positive step, according to our research findings, this adjustment is a bit tepid. Similarly, the URBEMIS software program sponsored by the California Air Resources Board, used to estimate the air quality impacts of new development, calls for up to a 15% lowering of trip rates for housing in settings with intensive transit services–again, likely on the low side based on these findings. More in line with the findings presented here are the vehicle trip reductions granted to the White Flint Metro Center project, a mega-scale, mixed-use joint development project being built at Washington, D.C. Metrorail's North Bethesda Station. With some 1.2 million square feet of office space, 250,000 square feet of commercial-retail, and 375 residential units scheduled at build out, the project was granted a 40% reduction in estimated trip rates for the housing component based on proximity to transit.

The trip reduction benefits of TOD call for other development incentives, like lower parking ratios, flexible parking codes, market-responsive zoning, streamlining the project review and permitting process, and investments in supportive public infrastructure. Trip reduction also suggests TODs are strong markets for car-sharing. Recent research in the San Francisco Bay Area reveals that those who participate in carsharing lower their car ownership levels around 10%, with higher vehicle-shedding rates among those living near rail stations (Cervero, Golub, and Nee, 2007). The combination of reducing off-street parking and increasing carsharing options would yield other benefits, including reducing the amount of impervious surface (and thus water run-off and heat island effects) and the creation of more walkable scales of development. Such practices are not heavy-handed planning interventions but rather market-oriented responses, namely efforts to set design standards and provide mobility options in keeping with the market preferences of those who opt to live near rail transit stations.

Recommendations

With this research data to support the belief that people living in TODs drive less often than their neighbors in conventional developments, public officials and government regulators have the evidence needed to develop new, more realistic standards for assessing impact fees and mitigation for TODs. Developing residential TODs based on an accurate assessment of their traffic impacts should result in easier development approvals, better planned and more compact communities, increased transit ridership, and more affordable housing. Tightening residential TOD parking ratios to reflect the actual transportation performance of TODs will be a very important step toward realizing the expected community benefits of TOD and enhancing their financial feasibility. In many TODs, the community and developer benefits have been understated because they have been over-parked. Additional research also is suggested to further address some of the questions addressed in the literature review.

To help realize the benefits of TOD the team recommends the following:

1. Work with ITE and ULI to develop new trip generation and parking guidance for TOD.

   In the opinion of the authors, the highest priority should be placed on working with ITE and the ULI to develop and implement new guidance on trip generation and parking for TOD housing. The research suggests developers are being charged impact fees for non-existent trips and required to build expensive parking spaces that are not needed. Parking ratios developed using ITE trip generation rates over-park TODs by as much as 50%. In developing new guidance on parking, it will be important to account for a variance in trip generation factors such as the quality of transit service and the distance of a station from the CBD.

   The project team contacted ITE to share the panel's interest in working with ITE to develop new guidelines. In response, Lisa M. Fontana Tierney, P.E., Traffic Engineering Senior Director ITE, commented, "Once the results of the study are finalized and submitted to ITE, we will review the information and consider it for inclusion in a future ITE resource. Based on my understanding of the work, it seems that it would be appropriate to consider the results of your study as part of a future edition of the ITE Trip Generation Handbook. We expect to begin the update process for this Handbook in early 2009."
2. Broadly disseminate the findings of this research.

   Benefits of TOD are muted since most TODs parking and traffic impacts assessments are oblivious to the fact that a rail stop is nearby. Broadly distributing results of the research can help lead to right-sizing TOD-housing regulations for parking and transportation impact fees and higher intensity of development appropriate for TODs. With information in hand to confirm TOD housing produces fewer trips than conventional development, it should be somewhat easier to get local approval to build additional TODs without unnecessarily negotiating away the intensity of development envisioned in adopted TOD plans.

   As an interim step, the findings of the research have been presented at the 2007 Rail~Volution Conference in

Miami, Florida, the 2008 Congress for the New Urbanism Conference in Austin, Texas, and a transportation seminar at Portland State University. Findings also are slated to be presented at the 2008 ITE Annual Conference in Anaheim, California, and have been accepted for publication by the *Journal of Public Transportation*.

The findings also will be shared with other researchers doing similar research, including the mixed-use trip generation research being done at the Texas Transportation Institute and NCHRP Project 08-66, "Trip Generation Rates for Transportation Impact Analysis of Infill Development."

3. Seek funding for additional research on TOD land uses.

The research presented here covers only one land use type found in TODs. Additional research will be necessary to broaden the knowledge of the trip generation, the parking characteristics of TOD land uses, and the impact of TOD on ensuring ridership in TODs.

The research needs identified by the team and the panel flow from the field research, the literature review and the state-of-the practice of what we know and don't know about ensuring ridership from TOD:

a. Research into the parking demand and trip generation characteristics of office, retail, and mixed-use in TODs. This research also should consider the parking demands of the land uses and the degree to which different land uses have different annual peak parking demands, and how the annual peak parking demands differ from the average daily demand. Parking utilization information is needed for all TOD land uses.
b. Research into self selection and change in travel patterns after residents move into a TOD. A mode share survey could be mailed to residents of selected TODs and analyzed at a cost of approximately $3,500 per TOD. The before and after study of Center Commons referenced in the literature review was done in this manner.
c. Research on the impact of design features (e.g., mixed land-use, traffic calming, bus bulbs, short blocks, street furniture), travel patterns, transit ridership, or the decision to locate in a TOD. Intuitively we know "design matters" but there is very little data to show the impact of design on transit use, location decisions to live in a TOD or what design features have the greatest impact.
d. Research into what motivates employers to locate in TODs. There is a growing body of information on residential TODs and locational decisions. At the same time, there is very little understanding how to impact retail and commercial locational decisions to be part of a TOD. As a starting point, phone interviews of commercial leasing agents and tenants in TODs could be taken to distinguish the role TOD/transit may play in locational decisions.

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Abbreviations and acronyms used without definitions in TRB publications:

AAAE	American Association of Airport Executives
AASHO	American Association of State Highway Officials
AASHTO	American Association of State Highway and Transportation Officials
ACI–NA	Airports Council International–North America
ACRP	Airport Cooperative Research Program
ADA	Americans with Disabilities Act
APTA	American Public Transportation Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATA	Air Transport Association
ATA	American Trucking Associations
CTAA	Community Transportation Association of America
CTBSSP	Commercial Truck and Bus Safety Synthesis Program
DHS	Department of Homeland Security
DOE	Department of Energy
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
IEEE	Institute of Electrical and Electronics Engineers
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991
ITE	Institute of Transportation Engineers
NASA	National Aeronautics and Space Administration
NASAO	National Association of State Aviation Officials
NCFRP	National Cooperative Freight Research Program
NCHRP	National Cooperative Highway Research Program
NHTSA	National Highway Traffic Safety Administration
NTSB	National Transportation Safety Board
SAE	Society of Automotive Engineers
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (2005)
TCRP	Transit Cooperative Research Program
TEA-21	Transportation Equity Act for the 21st Century (1998)
TRB	Transportation Research Board
TSA	Transportation Security Administration
U.S.DOT	United States Department of Transportation

Trip-Generation Rates for Urban Infill Land Uses in California

Phase 1: Data Collection Methodology And Pilot Application

FINAL REPORT

Prepared For:

The California Department of Transportation (Caltrans)
Headquarters Divisions of Transportation Planning
and Research & Innovation

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April 24, 2008

Abstract

This report presents the results of the first phase of a two phase research project undertaken by the California Department of Transportation (Caltrans) to study travel characteristics of infill development in California's metropolitan areas. This research was guided by goals to establish a database of empirical trip generation studies for various types of infill development, to standardize a data collection and analysis methodology, and to coordinate this research with the Institute of Transportation Engineers (ITE) with an objective to integrate the findings into a future ITE publication. The specific objectives of this research were to:

- Develop a methodology for identifying and describing urban infill locations suitable for collecting infill trip rate data,
- Define and test a methodology for collecting trip generation rate data in urban infill areas,
- Develop trip generation rates for common infill land use categories in urban areas of California,
- Establish a California urban infill land use trip generation database, and
- Supplement ITE trip generation data.

The first phase of this research project can be considered a pilot study for one of the nation's first comprehensive efforts to collect trip generation data for urban infill land uses. As a pilot study, it has been successful in identifying and testing data collection methods and determining ways to resolve challenges. A limited amount of data was collected in this first phase, and the lessons learned have strengthened the knowledge and techniques for continuing data collection in the second phase of this research.

The preliminary data collected and evaluated to date from 13 sites indicate that the studied land use categories have lower trip generation characteristics in urban infill contexts than ITE trip generation rates. More data points are required for the full set of selected land uses to substantiate and validate this preliminary conclusion and to establish statistical correlations between urban contexts and trip generation characteristics.

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Project Management and Consultant Team

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DISCLAIMER

The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of data presented herein. The contents do not necessarily reflect the official views or policies of the State of California or the Federal Highway Administration. This report does not constitute a standard, specification, or regulation.

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1 Introduction

Infill development is defined as new development and redevelopment projects located on vacant or underutilized land within existing developed areas. Infill development is one strategy for revitalizing declining city and suburban cores and town centers. It promotes efficient and cost-effective use of existing infrastructure and services (such as streets, transit, and utilities), and expands opportunities for housing, recreation, and economic growth.

During local land use review and development permitting processes, public agencies commonly require estimates of vehicle travel impacts associated with proposed land use projects, assessments of their potential contribution to traffic congestion, and identification of appropriate mitigation strategies. These strategies often include mitigation fees, private developer contributions, special tax assessment districts, and specific facility improvements.

In preparing traffic and transportation impact analyses, professionals often rely on the Institute of Transportation Engineers' (ITE) published trip-generation rates for various types of land uses. However, ITE data typically reflects isolated suburban development usually lacking availability and proximity of transit service, and the existence of pedestrian and bicycle facilities. As a result, the use of ITE trip-generation rates for proposed urban infill development projects served by transit and having good pedestrian access could significantly over-predict vehicular traffic impacts.

The use of trip generation data goes beyond traffic impact analysis. It also has significant economic and environmental consequences. Trip generation rates are used in the development and application of traffic impact fees and are a major determinant in the approval of infill development projects and parking provisions. The use of auto-oriented suburban traffic generation data for assessing urban infill projects can produce an inherent inequity in the approval process resulting in a potential disincentive for developers to take on the increased challenges of infill development.

Benefits of Infill Development

- Provides housing opportunities closer to jobs
- Encourages community revitalization
- Reduces suburban sprawl
- Makes better use of existing infrastructure
- Encourages walking and the use of transit
- Reduces need for automobile ownership

All of these consequences can result in a slower pace of infill development, higher costs, and delay and/or even rejection of otherwise beneficial infill projects stalling economic development, housing provisions, and job growth within existing urban and suburban areas.

It is clear that further research is needed to help better understand the trip generation characteristics of infill development. Although recently there have been a number of research projects to determine the travel characteristics of infill, transit-oriented, and mixed-use development, the one conclusion that can be drawn from this body of information is that, as a profession that studies the effect of land use on transportation, transportation professionals do not yet fully understand how much traffic is generated by these types of developments in higher-density urban and suburban settings.

1.1 Problem Statement

The Institute of Transportation Engineers (ITE) trip generation rates have been the primary source for travel demand analysis of new development throughout the United States, and they are relied upon for conducting California Environmental Quality Act (CEQA), and local agency development impact analyses. These rates were intentionally based on surveys of isolated suburban development with little or no pedestrian, bicycle, or transit accessibility for ease of data collection. Despite the vast amount of data collected by ITE over the past decades, these trip generation rates may not be sufficient to guide the approval of proposed developments in urban infill areas because the sources of the rates do not reflect variations in density, diversity (land use mix), site design, and the multimodal transportation systems of our larger metropolitan areas, which are critical factors on travel demand.[1] In metropolitan areas, the amount of vehicle trip generation is affected by multiple factors including:

- Proximity to transit
- Density of development
- Development compactness
- The pedestrian environment
- Cost of parking
- Traveler demographics such as income and auto ownership

[1] *Land Use and Site Design - Traveler Response to Transportation System Changes*. (Washington D.C., Transportation Research Board (TRB) Transit Cooperative Research Program (TCRP) Report 95: Chapter 15)

Because the ITE trip generation rates do not account for the variations in these factors, a significant challenge has been created resulting in sometimes speculative adjustments to better estimate urban and multimodal travel demand. The increased interest in land use typologies such as "mixed-use" and "transit-oriented" development in California has led to particular challenges and debate when it comes to travel demand analysis. Transportation and land use planners and engineers are seeking credible empirical trip generation and mode share data to more accurately assess the impacts and benefits of new development in our complex urban land use/transportation systems.

1.2 Purpose of the Study

This research was undertaken by the California Department of Transportation (Caltrans) to address the need for better and more accurate data regarding travel characteristics of infill development in California's metropolitan areas. Specifically, the primary objectives of this study were to:

- Develop a methodology for identifying and describing urban infill locations suitable for collecting infill trip rate data,
- Define and test a methodology for collecting trip generation rate data in urban infill areas of California,
- Develop trip generation rates for common infill land use categories in urban areas of California,
- Establish a California urban infill land use trip generation database, and
- Supplement ITE trip generation data.

1.3 Study Outcomes

This research is intended to provide empirical trip generation data for use in transportation planning and traffic engineering studies for urban infill areas throughout California. This study also provides the foundation for subsequent research to be conducted by Caltrans, local agencies, and/or private organizations to further build a comprehensive urban infill trip generation database.

The most applicable outcome of this study is the production of quantitative information on travel characteristics of urban infill land uses that can be used in traffic impact studies and environmental assessments in this state. This research is intended to establish a standardized data collection and analysis methodology, which will result in consistent information gathering in the future.

One of the goals of this study was to collaborate closely with ITE so that the resulting methodology and data, combined with the addition of national empirical data, eventually can be integrated into a future addition of the Trip Generation Manual or other ITE publication, such as the Trip Generation Handbook.

The methodology and data produced by this study will support transportation planning and assessment for the following types of land uses located in urban infill areas of California (and potentially elsewhere):

- Commercial and office developments,
- High density housing, and
- Mixed-use and transit-oriented developments.

1.4 Report Organization

The subsequent chapters of this report are organized as follows:

Chapter 2 – Defines trip generation, discusses current trip generation usage, and presents sources of trip generation data and relevant trip generation research.

Chapter 3 – Discusses the scope of work including goals, overview of the study, study team, and Technical Advisory Committee. This chapter also discusses coordination with ITE, site selection methodology, site selection criteria, and site selection procedures including challenges and effectiveness of various approaches.

Chapter 4 – Discusses the different data collection methods considered for this study and their challenges. This chapter also describes the chosen data collection methodology and provides an overview of the data analysis process. This chapter provides an overview of the sites surveyed in the "initial pilot" study (used to test the chosen survey methodology), and presents an evaluation of the study sites and their surrounding context.

Chapter 5 – Discusses the findings of the surveyed sites in the "expanded pilot study" (subsequent data collection using the method established in the initial pilot study), compares the derived trip generation rates with ITE trip generation rates, and summarizes the demographic data collected and the statistical analysis

of the data.

Chapter 6 – Presents a summary and the conclusions of this study. This chapter also provides recommendations for future research and the potential implication for transportation and planning policy in California.

Chapter 7 – Bibliography

Chapter 8 – Appendices

2 Current State of Trip Generation Research

2.1 Definitions

Definitions of many of the terms used in this study are as follows:

Context – The nature of the natural or built environment created by the land, topography, natural features, buildings and associated features, land use types, and activities on property adjacent to streets and on sidewalks, and a broader area created by the surrounding neighborhood, district, or community. Context also refers to the diversity of users of the environment.

Context Zone – One of a set of categories used to describe the overall character of the built and natural environment, building from the concept of the "transect" – a geographical cross-section through a sequence ranging from the natural to the highly-urbanized built environment. As defined in ITE's *Context Sensitive Solutions (CSS) in Designing Major Urban Thoroughfares for Walkable Communities*[2], there are six context zones plus special districts describing the range of environments including four urban context zones for the purpose of CSS—suburban, general urban, urban center, and urban core.

Infill development – Like the terms urban and suburban, infill development has many definitions. One definition is "the development or redevelopment of vacant or underutilized sites in economically or physically static or declining areas." The Congress for the New Urbanism describes infill development as "the creative recycling of vacant or underutilized lands within cities and suburbs." California Government Code Section 65088.1 provides a commonly-used definition of Infill development:

> (g) "Infill opportunity zone" means a specific area designated by a city or county, pursuant to subdivision (c) of Section 65088.4, zoned for new compact residential or mixed-use development within one-third mile of a site with an existing or future rail transit station, a ferry terminal served by either a bus or rail transit service, an intersection of at least two major bus routes, or within 300 feet of a bus rapid transit corridor, in counties with a population over 400,000.

Internal capture – The Institute of Transportation Engineers defines internal capture rate as "a percentage reduction that can be applied to the trip generation estimates for individual land uses to account for trips internal to

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[2] Daisa, James M., *Proposed Recommended Practice in Designing Major Urban Thoroughfares for Walkable Communities*, (Institute of Transportation Engineers, Washington D.C., 2006).

the site."[3] In transportation analyses, internal trips do not impact facilities external to the site and are often made by walking.

Mixed-use and multi-use development – The Urban Land Institute defines mixed-use as "three or more significant revenue-producing uses, with significant functional and physical integration of the project components, and development in conformance with a coherent plan."[4] Mixed-use development can be a single building or a site with multiple buildings. The mix of uses may be vertical (as in a single building) or horizontal, where each use is within independent buildings but proximate to each other. ITE defines multi-use development as "typically a single real-estate project that consists of two or more ITE land use classifications between which trips can be made without using the off-site road system."[5] For purposes of evaluating "internal capture," the ITE definition is explicit that multi-use development does not include central business districts, suburban activity centers, or shopping centers.

Mode share – The method of travel selected by a person expressed as a percentage of that person's total travel. The common modes of travel include walking, bicycling, using transit, carpooling, and driving alone. Mode share of new development is often measured as the total number of person-trips by each mode of travel as a percentage of the total person trips produced or attracted by the development.

Transit-oriented development – According to the *Statewide Transit-Oriented Development Study: Factors for Success in California*[6], transit-oriented development (TOD) is defined as "moderate to high-density development, located within an easy walk of a major transit stop, generally with a mix of residential, employment, and shopping opportunities designed for pedestrians without excluding the auto. TOD can be new construction or the redevelopment of one or more buildings whose design and orientation facilitate transit use."

Urban and suburban – An urban area is defined by federal-aid highway law (Section 101 of Title 23, U.S. Code) as a place designated by the Bureau of the Census as having a population of 50,000 or more. The traditional definition

[3] Institute of Transportation Engineers, Trip Generation Handbook Second Edition, Washington D.C.: Institute of Transportation Engineers, 2004.
[4] Smith, Mary S. Shared Parking, Second Edition, Washington D.C.: ULI-The Urban Land Institute and the International Council of Shopping Centers, 2005.
[5] Institute of Transportation Engineers, Trip Generation Handbook Second Edition, Washington D.C.: Institute of Transportation Engineers, 2004.
[6] G.B. Arrington, Topaz Faulkner, Janet Smith-Heimer, Ron Golem, Daniel Mayer, Terry Parker, Statewide Transit-Oriented Development Study – Factors for Success in California, Sacramento: California Department of Transportation, 2002.

of suburban is a "residential district located on the outskirts of a city." In more practical terms, there is a continuum of definitions for urban and suburban. People tend to have their own personal "feel" for what constitutes urban and suburban places, so not all definitions mean the same for everyone. ITE defines a gradient of place designations in its *Trip Generation and Parking Generation*[7] handbooks, and has adopted the "transect"[8] in the proposed recommended practice *Context Sensitive Solutions In Designing Major Urban Thoroughfares For Walkable Communities.* (Also see definition of "Context Zone")

Vehicle trip generation – A vehicle "trip" is defined as "a single or one-direction vehicle movement with either the origin or destination inside a study site." Trip generation, as it refers to new development, is the number of automobile trips that the development produces and attracts during a given time period. This data is typically reported for trips made during "peak periods" as well as an entire day.

Walkable – Streets, places, or areas designed or reconstructed to provide safe and comfortable facilities for pedestrians of all ages and abilities. Walkable streets and places provide a comfortable, attractive, and efficient environment for the pedestrian, including: an appropriate separation from passing traffic, adequate width of roadside to accommodate necessary pedestrian-related functions, pedestrian-scaled lighting, well-marked crossings, protection from the elements (e.g., street trees for shade, awnings or arcades to block rain), direct connections to destinations in a relatively compact area, facilities such as benches, attractive places to gather or rest such as plazas, and visually interesting elements (e.g., urban design, streetscapes, or architecture of adjacent buildings).

2.2 Definition of Trip Generation as Used in Transportation Impact Analysis

A Transportation Impact Analysis (TIA) is a study that assesses the demands and impacts of land use development on a community's or region's transportation system. The overall objective of TIAs is to disclose information to public agencies making land use decisions. As it relates to this study, a TIA evaluates the traffic generation of new development and how that traffic affects congestion of the roadway system and the need to invest in capital improvements of the system, whether it is in the form of new roads and highways, traffic signals, turn lanes, or

[7] *Parking Generation* 3rd Edition, Washington D.C.: Institute of Transportation Engineers, 2004.
[8] The transect, developed by Duany Plater-Zyberk and Company, is a continuum of contexts or place designations ranging from natural and agricultural (parks, open space, farmland) to varying intensities of urbanism (from suburban to urban core). The transect identifies six discreet zones.

improved safety. TIAs vary depending on the type, size, and location of the development and are often required by local agencies as part of their development review process. TIAs are also typically required by the California Environmental Quality Act (CEQA).

Trip generation is the first step in the conventional four-step transportation forecasting process commonly used in impact analysis. It predicts the number of trips originating in or destined to a particular development project, or from a "traffic analysis zone" when used in the context of a travel demand forecasting model.

2.3 Current Trip Generation Usage

Some of the key uses of trip generation and TIAs include:

- Identifying impacts and associated capital improvements required to accommodate a development's traffic in combination with other growth.
- Allocating impact fees by land use classification to fund transportation improvements that mitigate the effects of new development.
- Estimating air quality impacts and conformance with regional, state, and federal air quality standards.
- Being instrumental in the local agency entitlement and approval process for new development, which can be one of the leading causes of controversy for development projects.

Accurate trip generation information is important to public agencies because it ensures that adequate transportation facilities are provided to serve new development, and because it generates needed revenue through impact fees. Although public agencies may find that the potential over-estimation of traffic generated by urban infill development based on currently-available ITE data is acceptable—(because it tends to be "conservative")—private developers of infill projects are legitimately concerned about the costs and other impacts that can result from over-estimation. The same can be true when sizing public roadways and associated improvements, especially adjacent to major developments. Further, many agencies promote urban infill development as an important Smart Growth or sustainability principle and therefore need accurate trip generation information to better understand the transportation benefits of infill development.

2.4 Sources of Trip Generation Data

2.4.1 ITE Trip Generation Manual

There are few national sources of trip generation data specific to particular types of land uses. The most widely used and accepted source is ITE's *Trip Generation* manual, which contains the largest database and is periodically updated. The database is populated with contributions from ITE's national membership. ITE provides guidance on the collection of trip generation data and provides forms to contributors. This ensures, theoretically, consistency in data collection. However, since data submittal is voluntary and there is no control to ensure the consistency of data collection procedures and selection of study sites within land use classifications, the trip generation data contain variability within any given land use classification.

For many years, ITE trip generation rates have been the primary source for travel demand analysis of new development throughout California, and they are often used for CEQA and other local agency development impact analyses. Caltrans' *Guide for the Preparation of Traffic Impact Studies*[9] states that "the latest edition of the Institute of Transportation Engineers' Trip Generation report should be used for trip generation forecasts." The Caltrans guidelines also encourage the use of local trip generation rates if appropriate validation is provided to support them.

The *ITE Trip Generation* manual provides trip generation rates and equations for the average weekday, Saturday, and Sunday; the weekday morning and evening peak hours of the generator; the weekday morning and evening peak hours of the generator that coincides with the traditional commuting peak hours for adjacent street traffic (i.e. 7:00 a.m. to 9:00 a.m. and 4:00 p.m. to 6:00 p.m.); and the Saturday and Sunday peak hours of the generator (if any).

The *ITE Trip Generation* manual states that the trip generation data is an estimate and may not be truly representative of the trip generation characteristics of a particular land use. Moreover, these rates were intentionally developed based on surveys of isolated suburban development with little or no pedestrian, bicycle, or transit accessibility for ease of data collection. Therefore, there has been national concern that ITE rates may not be accurate for use in assessing urban infill development, mixed-use development, and transit-oriented development.

[9] *Guide for the Preparation of Traffic Impact Studies*. Sacramento: California Department of Transportation, 2002.

2.4.2 Other Sources of Trip Generation

Additional sources of trip generation data in California are more localized. The San Diego Association of Governments (SANDAG) publishes *Trip Generators*, trip generation rates collected within the San Diego region and widely used statewide. The California Department of Transportation (Caltrans) published the *Trip End Progress Report* from the 1960s through 1980s, an annual publication of trip generation studies for a collection of land uses in each publication. Although these Caltrans publications provided thorough and comprehensive studies of various land uses, they are considered too outdated for current use.

Unique trip generation studies are published in professional journals such as *ITE Journal*, and a few study results may also be found in TRB's *Transportation Research Records* and annual meeting compendiums. Finally, consultants conduct individual trip generation studies usually as supporting documentation for analysis of specific development projects. Some of these studies are submitted to ITE for inclusion in *Trip Generation,* but many are likely to remain proprietary or unpublished.

2.5 Other Relevant Trip Generation Research

This section summarizes recent and ongoing trip generation research being conducted both nationally and within California.

2.5.1 Transportation Research Board (TRB)

Transportation Research Board projects include projects within the National Cooperative Highway Research Program (NCHRP) and Transit Cooperative Research Program Panel (TCRP). Research projects within these programs are identified below.

Trip Generation Studies for Special Generators (Contract/Grant Number: SP808B4J): This upcoming research project, sponsored by the Maryland Department of Transportation, will provide help when travel forecasting is confronted with projecting traffic in areas with unusual land use proposals that are not adequately covered by the ITE trip generation data. Other details about the project are as follows:

Start Date: 01/01/2008
End Date: 12/31/2008
Status: Active
Source Organization: Maryland Department of Transportation

Vermont Trip Generation Manual (Contract/Grant Number: SPR 700): This research project, sponsored by the Vermont Agency of Transportation, will measure trip generation for the most widely proposed types of development in Vermont and relate it to some measure of the intensity of the particular land uses. The result of the research will be a *Vermont Trip Generation Manual* to be used in conjunction with the preparation and review of Traffic Impact Studies within the state. Other details about the project are as follows:

Start Date: 01/10/2007
End Date: 01/10/2009
Status: Active
Source Organization: Vermont Agency of Transportation

Enhancing Internal Trip Capture Estimation for Mixed-Use Developments (NCHRP Project 08-51): This research project, led by the Texas Transportation Institute at Texas A&M, is nearing completion. It will develop a methodology for enhancing internal trip capture estimates that includes: (1) a classification system of mixed-use developments that identifies the site characteristics, features, and contexts that are likely to influence internally captured trips, and (2) a data collection framework for quantifying the magnitude of internal travel to and around mixed-use developments to determine the appropriate reduction rates. This project is collecting data at about seven mixed-use developments. Other details about the project are as follows:

Start Date: 07/05/2005
End Date: 03/01/2008 (estimated)
Status: Active
Source: NCHRP

Trip Generation Rates for Transportation Impact Analyses of Infill Developments (NCHRP Project 08-66): This national-level research, proposed to NCHRP by Caltrans, will develop an easily applied methodology (for trip generation, modal split, and parking generation) in the preparation of site-specific transportation impact analyses of infill development projects located within higher-density urban and suburban areas. This research project is chaired by the Caltrans Project Manager for this California study. Other details about the project are as follows:

Start Date: 02/01/2008
End Date: 02/01/2010(estimated)
Status: Active
Source: NCHRP

Ensuring Full Potential Ridership from Transit-Oriented Development (TCRP H-27A): This study was a national assessment of TOD issues, barriers, and successes. This project included case studies from a variety of geographic and development settings with objectives to: (1) determine the behavior and motivation of TOD residents, employees, and employers in their mode choice; (2) identify best practices to promote TOD-related transit ridership; and (3) recommend contextual use of best practices. This study collected empirical trip generation data at 16 TOD sites nationally. Other details about the project are as follows:

Start Date: 12/10/2004
End Date: 12/30/2007
Status: Active
Source: TCRP

2.5.2 United States Environmental Protection Agency (EPA)

EPA has conducted a number of studies comparing urban infill and Greenfield developments. The following studies have been funded through EPA:

The Transportation and Environmental Impacts of Infill Versus Greenfield Development – A Comparative Case Study Analysis (EPA 231-R-99-005): The objective of this study, prepared in 1999, was to determine which type of development site (Infill or Greenfield) provided better or more efficient transportation services, and which site produced fewer transportation-related burdens on the environment.

Comparing Methodologies to Assess Transportation and Air Quality Impacts of Brownfields and Infill Development (EPA 231-R-01-001): The objective of this study, conducted in 2001, was to provide guidance on applicable methodologies to account for the benefits of infill developments in State Air Quality Implementation Plans and transportation conformity determination.

Although the two EPA sponsored studies described above did not estimate trip generation rates for urban infill areas, they presented qualitative and quantitative information about the advantages of infill development, including reductions in travel-time; increases in non-auto mode share; reduced air-pollutant emissions rates; reduced loss of open space; lower commute and infrastructure costs; and improved measures of community quality of life.

2.5.3 California-Specific Trip Generation Research

San Diego Association of Governments Smart Growth Trip Generation and Parking Demand Guidelines: The purpose of this project is to determine observed trip generation rates for automobile, transit, and non-motorized modes of travel, and to observe parking demand associated with smart growth development. The findings are intended to be published in the form of guidelines for use by local agencies in the San Diego region. This research project is expected to be completed in August 2008.

2.6 Conclusions of Relevant Trip Generation Research

Transportation professionals who evaluate the transportation-related impacts and benefits of proposed land use development projects have various tools at their disposal to estimate trip generation. The most common of these is the database of empirical trip generation studies compiled and published by ITE. However, many transportation and land use professionals (including ITE members) recognize the probable limitations of this data for assessing urban infill developments, and acknowledge the need for new research.

Trip generation plays a critical role in transportation and land use planning, and especially in the assessment of transportation impacts of new development. As many local jurisdictions attempt to implement Smart Growth and more sustainable transportation strategies, it has become clear that, as a profession, traffic engineers may lack appropriate data and tools to accurately assess transportation-related impacts and benefits of proposed urban infill, transit-oriented, and mixed-use development projects.

A review of recent and ongoing research leads to the conclusion that - while there are a number of studies related to trip generation - few of these are specific to urban infill development, and even fewer collect empirical data. Most of the research projects are specific to a unique type or pattern of development (i.e., transit-oriented or multi-use development) that may – or may not – also be located within infill areas. The most relevant research projects include the upcoming NCHRP 08-66 infill trip generation project, the nearly completed TCRP H-27A project, and the upcoming SANDAG Smart Growth trip generation research project (summarized in Section 2.5 above). These efforts all have, or are intended to, collect empirical trip generation data within urban infill areas.

It is not yet known whether and how the products of these related but separate research efforts will be integrated into ITE's future publications so that they can be distributed and applied throughout the nation. ITE is aware of these research projects and, in fact, is represented on some of the research panels. While ITE has not yet determined whether or how these efforts will be brought together in a single published resource, they are considering either a future update of the *Trip Generation Handbook* (an ITE Informational Report) or a separate informational report that compiles the various efforts.

3 Study Design

3.1 Scope of Work

3.1.1 Goals

This research was guided by the following primary goals:

1. To establish a database of empirical trip generation studies for various types of infill development in California's metropolitan areas.
2. To establish a standardized data collection and analysis methodology for urban infill trip generation that will result in consistent information gathering in the future.
3. To coordinate this research effort with the ITE with an objective to integrate the findings into a future ITE publication such as the *Trip Generation* manual, *Trip Generation Handbook*, or other ITE informational report.

Goal 1, in this phase of the research, was only partially met because the number of study sites and land use categories for which data was collected did not meet the objectives established in the scope of work (to collect data for 50 sites). In effect, therefore, this first phase of the research resulted in a pilot study to establish a methodology and to begin to address the challenges associated with data collection. In subsequent sections of this report, the research is divided into an "initial pilot study" used to test the chosen survey methodology, and an "expanded pilot study" which includes subsequent data collection using the method tested in the initial pilot study.

Goal 2 was met by developing and applying a methodology that provides a systematic approach to identifying "urban infill" locations, and specific data-collection sites within these locations. Additionally, this study developed a data collection and intercept survey methodology that has been used at all of the sites surveyed to date, but has yet to be validated. The criteria used to identify urban infill locations is consistent with ITE context classifications used in both *Trip Generation* and *Parking Generation* manuals, as well as in ITE's Proposed Recommended Practice for *Context Sensitive Solutions in Designing Major Urban Thoroughfares for Walkable Communities.* It uses readily available population and employment data and transit information.

The research team is still developing a method for collecting average daily traffic (ADT) data, in addition to peak-hour data. This report identifies several potential methods for estimating and/or collecting such data. During the second phase of this effort, one of these methods will be pilot-tested at a site where the selected method can be validated with automatic traffic counts.

All of the methodologies that have been developed in this research (which are described in detail in the appendices to this report) will be presented to a sub-committee of the ITE Trip Generation Committee for peer review and general professional acceptance. However, these methodologies and resulting data cannot be standardized until they are included in a future ITE publication.

The efforts identified in Goal 3 have been initiated with ITE. Interim deliverables and preliminary findings of this research have been shared with ITE staff on a preliminary basis. ITE staff has agreed that this research project, in conjunction with other research efforts underway nationally, will be introduced to a sub-committee of the ITE Trip Generation Committee. Additionally, because the Caltrans Project Manager and one of the principal investigators of this study are the Chair and Principal Investigator, respectively, of a similar new NCHRP study (NCHRP 08-66: Trip Generation Rates for Transportation Impact Analyses of Infill Developments), direct coordination between the California and national efforts will be expedited. Further, ITE is also represented on the review panel for NCHRP 08-66. Finally, ITE has tentatively stated that a synthesis of the various trip generation research efforts underway may be published in an ITE publication, such as a future update of the *Trip Generation Handbook* or an ITE Informational Report.

It is expected that the most applicable short-term outcome of this infill trip rates study will be the production of acceptable quantitative information regarding travel characteristics of ten urban infill land uses that can be used in traffic impact studies and environmental assessments within California. In the longer term, this research will contribute to a nationally established urban infill trip generation database.

3.1.2 Overview of Study

This research project is comprised of six parts:

1. Develop Criteria for Site Selection

This initial task developed a systematic approach to defining “urban” contexts and established criteria for selecting candidate sites. There are several nationally recognized ways to define urban areas and this study draws from several of these methods to derive an approach that is easy to implement with available data. Additionally, this study focuses on land uses within metropolitan areas where walking, bicycling, and transit are attractive and viable modes of transportation. Therefore, the site selection criterion includes proximity to transit to help ensure that the criterion capture land uses where automobile use is a choice, not a necessity. Finally, because the data is intended to represent a cross section of California land uses, the methodology includes a simple method for allocating study sites among metropolitan areas.

2. Develop Data Collection Methodology

Initially this study attempted to follow ITE's established trip generation data collection methodology,[10] but it quickly became apparent that the standard methodology could not be applied to urban infill development. Because infill land uses often lack parking lots or structures that are specific to a single building (unlike many single-use suburban sites), the use of automated traffic counters at driveways is generally not feasible to capture all of the site's trip generation. Users of urban infill sites who drive may park on-street or in nearby public or private parking facilities. The alternative method selected for this study uses a combination of counts and intercept surveys, and results in a more comprehensive collection of travel information than could be obtained using the standard ITE method of counting automobiles.

3. Select Study Sites

This part of the study consists of identifying candidate sites that meet the study's criteria and obtaining permission from property owners/managers to conduct intercept transportation surveys. The selection of study sites is a relatively straightforward process of comparing site characteristics to the required criteria using GIS mapping. Gaining permission to survey these sites, however, has turned out to be the most challenging aspect of the study. Sites are defined as individual buildings or individual businesses within buildings depending on the land use category being studied. Once a site was identified, persuading property owners and managers to allow the surveys was in itself a challenge that required development of a strategy.

4. Collect Data

Once permission to survey a site is obtained, data collection plans are prepared and implemented on a site-by-site basis. Data collection includes physical counts of all pedestrians entering and exiting buildings, automobile counts (if study site traffic can be distinguished from non-study site traffic),

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[10] Trip Generation Handbook Second Edition, Washington D.C.: Institute of Transportation Engineers, 2004. Chapter 4. Conducting a Trip Generation Study (Pgs. 15-28).

and in-person intercept surveys of a sampling of the building users. The surveys collect information on mode of travel, travel time, pass-by traffic, and multi-use trip capture, as well as optional demographic data for future cross-referencing. Finally, working with the building owner/manager, site specific and independent variable information is collected including building/business size, number of units, number of employees, occupied space, number of parking spaces and parking fees, and other data as applicable. Data collection is a joint effort between this research's consultants, traffic data collection firms, and professional surveying firms.

5. Analyze Data

The primary objective of the data analysis is to derive automobile trip generation rates for the selected infill land uses. Because the intercept surveys collect multi-modal information, it is also possible to identify the travel mode share of the site users. Cross-referencing between travel characteristics and demographic data can be performed at a later date. Once the database has grown to an appropriate number of points, a statistical analysis is conducted that includes: tabulation of data, summaries of computations, weighted average trip generation rates by independent variables, calculation of standard deviations, calculation of R^2, and plotting and graphing of trip generation findings.

6. Document Methods and Findings

The final task of the study is to document the study process and findings in a technical report. Documentation is important for several reasons. First, it is important to describe the methodology, analysis, and findings of the research so that others understand how the findings were derived, limitations of the research, and have detailed instructions for repeating the research if so desired. Second, the documentation describes the challenges and lessons learned from this research. This is important for those who continue the data collection methodology and continue to build the trip generation database. Finally, the documentation supports ITE's role in providing peer review of the methods and findings, and eventual integration of this research into national publications.

3.1.3 Study Team and Technical Advisory Committee

General oversight of this study was provided by Caltrans' Office of Community Planning in the HQ Division of Transportation Planning (Terry Parker, Caltrans' Project Manager). The consultant team responsible for conducting the study included:

- The Association of Bay Area Governments (ABAG) – Administration, facilitation of TAC meetings, and overall consultant project management.
- Kimley-Horn and Associates, Inc. (KHA) – Principal investigators, study design, and data collection and analysis.
- Economic Planning Systems (EPS) – Land use and context definitions, Geographic Information Systems, and technical analysis.

Kimley-Horn and Associates' data collection efforts were supported by several subcontractors including:

- Gene Bregman Associates (GBA) – Intercept surveys.
- Luth Research – Intercept surveys.
- Nichols Research, Inc. – Intercept surveys.
- Tony Quiroz – Site identification and selection.

Broad guidance for the research effort was provided through a Technical Advisory Committee (TAC) comprised of representatives of public agencies and consultants who are involved in regional and local planning, development review, and the preparation of traffic impact analyses. TAC members are listed on Page iii of the report.

3.1.4 Coordination with the Institute of Transportation Engineers (ITE)

As stated earlier, an important goal of this research project is eventual "acceptance" of the data and methodology by ITE, and publication of the data and findings in a future update of *Trip Generation* or similar ITE report. ITE has stated they do not "accept" trip generation research, but serve as the liaison between the research investigators and members of the profession. Although part of ITE's mission is to serve as a conduit for the exchange of professional information, they are not a standard-setting organization. As such, ITE will facilitate a process in which a committee of peers provides review and feedback. Beyond this, ITE has a formal process for preparing and publishing a Recommended Practice and an Informational Report. The goal of this study is that ITE publish urban infill trip generation methods and findings in one of the following ways:

- As a new chapter in the ITE *Trip Generation Handbook* specifically dedicated to collecting and applying data for urban infill development. The handbook is a recommended practice and publication of information in such a document constitutes an ITE supported recommendation. This is the way multi-use internal capture research and methodologies are published and used by practitioners. The California data could be combined with the findings of NCHRP 08-66 (Trip-Generation Rates for Transportation Impact Analyses of Infill Developments) and other similar research efforts to create a national dataset.

- As a separate publication of the research methodology and findings in an ITE informational report (note that the *Trip Generation* manual is an informational report). An informational report contains information that ITE believes is of use to practitioners. As above, the California data could be combined with the findings of NCHRP 08-66 and other research projects to provide a nationally relevant informational report.

The following steps are proposed for gaining ITE “acceptance” of the California Urban Infill Trip Generation Rate Study methods and data:

1. Work with ITE to convene an ITE-nominated subcommittee of the Trip Generation Committee to review the research methodology and initial findings. This step has been initiated with ITE.
2. Prepare and publish articles on the California trip generation method and findings in the “Westernite”, ITE’s District 6 newsletter, which includes California, as well as in *ITE Journal,* the national professional monthly publication.
3. Present updates on the research and findings at local and national conferences, such as ITE technical and annual meetings, local ITE chapter meetings, and other national organization meetings and conferences, including those of the American Planning Association, Rail~Volution, Congress for the New Urbanism, American Society of Civil Engineers, Transportation Research Board, etc.
4. Coordinate this effort with the research being prepared for NCHRP 08-66, which may result in discussion and presentation of the California methods and data in an NCHRP publication.
5. Work with ITE to determine how this research, in combination with other research efforts, could be synthesized into an ITE publication, following the Recommended Practice or Informational Report guidelines.

3.2 Methodology

3.2.1 Defining Urban Infill Areas

As an initial step in the measurement of trip generation from urban infill development, it is necessary to define what constitutes "urban infill" and where such development presently exists. This section defines the term "urban infill" and proposes a methodology for identifying Urban Infill Areas (UIAs). A more thorough discussion of the definition of urban infill and the site selection criteria used in this study is found in Appendix A (Working Paper #1 Selection of Urban infill Study Sites).

The terms "urban" and "infill" are in common usage throughout the disciplines of land use and transportation planning. Planners have an intuitive grasp of what urban means, and the concept of infill is widely understood to describe the development of new homes, commercial sites, and public facilities on vacant or under-utilized land in existing communities. However, "urban infill" is often defined in qualitative terms narrowly relevant to studies addressing economic redevelopment of blighted areas, or as a nebulous concept relevant to broad-brush policies aimed at preventing "leapfrog" development or sprawl.

It is therefore critical that this current study has a clearer and more applicable definition of "urban infill" that is both relevant to surveys of trip generation in California's urban areas and parametric, that is, based on site and site context characteristics that are measurable.

Components of a good working definition of "urban infill" are provided by ITE "Area" definitions for data collection surveys and by the Smart Growth concepts of Transect/Context Zones, by U.S. Bureau of the Census criteria for the 2000 Census, and in current California and Florida state laws on urban infill and redevelopment.

There is a general consensus in this research that the criteria used in defining UIAs should be applicable to other studies, and should have potential application to future development patterns (i.e., to projected as well as existing urbanized areas). The definition began with an initial set of working criteria for defining UIAs. The initial criteria were reviewed by the TAC, and were refined and finalized in collaboration with the TAC. As agreed upon by the TAC, the following criteria were used to select study sites:

An UIA designation may be applied to any site located either:

- Within a Central Business District (CBD), Central City Not Downtown (CND), or Suburban Center (SBC) Area, as defined by ITE for data collection surveys (see detailed description in next section); or
- Within a General Urban (T/CZ-4), Urban Center (T/CZ-5), or Urban Core (T/CZ-6) Zone, as defined in the Proposed Recommended Practice for *Context Sensitive Solutions in Designing Major Urban Thoroughfares for Walkable Communities* (see detailed description in next section).

The three area types used in the definition of UIAs, CBD, CND, and SBC, are consistent with the definitions used in ITE's *Parking Generation, 3rd Edition*. These area types provide distinctions that are familiar and intuitive to experienced land use and transportation planners. These area types are described as follows:

- Central Business District (CBD) is the downtown area for a city. CBD characteristics include good transit service, parking garages, shared parking, an extensive pedestrian sidewalk network, multi-storied buildings, priced parking, and a wide range of land uses (including mixed-use sites).
- Central City Not Downtown (CND) is the area outside the downtown area of a larger city. This area has greater land use density than suburban sites, but is substantially less dense than the CBD. The intent of this area designation is for the areas around large central cities (for example, Seattle, San Francisco, Oakland, Atlanta, and Washington, DC) where travel characteristics are likely to be unlike suburban conditions.
- Suburban Center (SBC) areas are those downtown areas of suburbs that have developed CBD characteristics, but are not the central city of a metropolitan region. These activity centers have characteristics that may include good transit service, a mix of surface and structured parking, connected streets, a connected pedestrian network, and a mix of land uses. Examples include the downtown areas of Bellevue, WA; Las Colinas, TX; and Walnut Creek, CA.

The limitations of these area types are two-fold. First, they reflect to some degree the traditional, mono-centric city form, which has employment-generating land uses concentrated primarily in a Central Business District surrounded by concentric rings of decreasing employment densities and proportionally more residential and rural land. However, since the 1980s, many parts of California and across the nation have experienced the decline of CBDs as the major employment center, and the emergence of urban and suburban employment centers located outside the CBDs. These trends have led to more poly-centric and dispersed urban regions.

In response to these trends, transportation and land use planners have reconceived the traditional "bull's-eye" CBD concept of urban form and concentric area types into the more flexible "Transect Zone" or "Context Zone" concepts. Transect/Context Zones have been introduced into the Proposed Recommended Practice for *Context Sensitive Solutions in Designing Major Urban Thoroughfares for Walkable Communities,* a joint project of the ITE and the Congress for the New Urbanism.

Transect/Context Zones are a systematic set of development intensity-based codes on a sliding scale ranging from the most rural or undeveloped area to the most urban or developed area. Three of the Transect/Context Zone types, General Urban (T/CZ-4), Urban Center (T/CZ-5), and Urban Core (T/CZ-6), are considered "urban" per ITE's *Context Sensitive Solutions in Designing Major Urban Thoroughfares for Walkable Communities* and can be included among the components of the desired definition of "urban infill" in parallel with or as alternatives to the more traditional CBD, CND, and SBC Area types. These three Transect/Context Zone types are described below:

- General Urban (T/CZ-4): Denser and primarily residential urban fabric. Mixed-use sites usually confined to corner locations. Characterized by a wide range of building types: single, side yard, and row houses. Setbacks and landscaping are variable. Streets typically define medium-sized blocks. Typical Land Uses - Medium density residential and home occupations; limited commercial and lodging. Typical Buildings - Houses and outbuildings, side yard houses, townhouses, live/work units, corner stores, inns.
- Urban Center (T/CZ-5): "Main Street" land uses, characterized by building types that accommodate retail, offices, row houses, and apartments. Typically has a compact network of streets, with wide sidewalks, uniform street tree planting and buildings set close to the frontages. Typical Land Uses - Medium intensity residential and commercial uses, (i.e., retail, offices, lodging, civic facilities). Typical Buildings - Townhouses, apartment houses, live-work units, shop-front buildings and office buildings, hotels, churches, schools.
- Urban Core (T/CZ-6): "Downtown" land uses, characterized by the tallest buildings, in the greatest variety, and unique civic buildings in particular. It is the least naturalistic zone type; street trees are uniformly planted and sometimes absent. Typical Land Uses - High intensity residential and commercial: retail and offices, lodging, civic buildings. Typical Buildings –

high and medium-rise apartment and office buildings, hotels, townhouses, live-work units, shop fronts, churches, and civic buildings.

- Detailed information regarding urban infill areas is presented in Working Paper #1 in Appendix A.

3.2.2 Selected Land Uses

Concurrent to the identification of the appropriate UIAs is the need to define appropriate land use types for selecting representative infill sites. This research is intended to produce trip generation data for at least ten infill land uses, including residential, office, shopping areas, restaurants, and other commercial land uses typical of urbanized areas. The land use selection criteria discussed and approved by the TAC members includes:

1. Common urban land use types that are consistent with ITE categories (*Trip Generation* [7th ed.]) and generally reflect a range of uses within residential, office, and retail (including entertainment) categories.
2. Land use types where there is a demand for empirical trip generation data based on professional knowledge and frequent applications for development review.
3. Land use types where there is a reasonable propensity for shifting drivers to another mode if the use is located in an urban area. For example, it may be likely that a significant number of patrons would shift significantly from autos to transit or walking if a grocery store was located in an urban area versus a suburban area.
4. Land use types that are considered beneficial to the revitalization of urban areas, and for which current trip generation data may act as a barrier to development approval. These may include types that are considered transit oriented, high-density residential, and urban retail uses.

Because parking availability and costs are often of crucial importance to the types and modes of trips generated by urban infill sites, consideration in choosing candidate uses was also given for those types already represented in ITE's *Parking Generation*. Preferences were given in the initial selection to higher-density residential types, and to nonresidential land uses that are of recurring interest in infill development impact analyses and in application of ITE standards to local transportation demand models. The following 10 land use types, arranged in order, by the ITE land use code in parentheses, were originally selected for this research by the TAC:

- Mid-rise apartment (223)

- Mid-rise residential condominium/townhouse (230)
- High-rise residential condominium/townhouse (232)
- Multiplex movie theater (445)
- Health/fitness club (492)
- Daycare center (565)
- General office building (710)
- Shopping center (820)
- Supermarket (850)
- High-turnover sit-down restaurant (932)

Table 1 starting on the following page lists these land uses and provides their descriptions as published in *ITE Trip Generation* (7th Edition). In addition to the ITE description, Table 1 presents qualifications or recommendations specific to this urban infill trip generation study, if applicable. There are qualifiers/recommendations for four of the categories:

- Residential condominium/townhouse (230) – This is a general category of residential use without a definition of the height of the building. The ITE data included, low - and high-rise buildings. For purposes of the urban infill trip generation study, this category is limited to mid-rise buildings of between three and 10 stories.
- High-rise residential condominium/townhouse (232) – This category represents buildings of three or more stories in height. For purposes of this study, this category is limited to high-rise buildings greater than 10 stories.
- Daycare center (565) – Daycare centers are defined as a free-standing facility. However, this research does not limit potential study sites to free-standing facilities (e.g., the building can be part of a larger building or facility) as long as it is open to the general public.
- Shopping center (820) – The *ITE Trip Generation* manual no longer provides different rates for different size shopping centers. This was discontinued in the 5th Edition of Trip Generation because: 1) there was confusion as to which rate to use when the shopping center was close to the threshold, and 2) it was determined that the regression equations accurately predicted the change in traffic based on the size of the center. For this research, retail sites can be located in a shopping center, along a street, or as part of a mixed-used development.

In addition to the above qualifiers, most of the land uses include qualifiers that allow the site to be part of a mixed-use development, or integrated into a larger complex. This qualifier reflects the change in data collection methodology from traffic counts to intercept surveys. The data collection process will be discussed in detail in Section 4 of this report.

Table 1: Initial List of Land Uses and Descriptions for California Urban Infill Trip Generation Research

Land Use Group	ITE LU Code	ITE Land Use Type	ITE Description	Additional Qualifiers for Trip Generation Study
Residential	223	Mid-Rise Apartment	Mid-rise apartments are apartments (rental dwelling units) in rental buildings that have between three and 10 levels (floors).	No additional qualifiers
Residential	230	Mid-Rise Residential Condominium/Townhouse	Residential condominiums/townhouses are defined as ownership units that have at least one other owned unit within the same building structure. Both condominiums and townhouses are included in this land use. The studies of this land use did not identify whether the condominiums/ townhouses were low-rise or high-rise.	The ITE description does not specify number of floors in this category. This category is limited to mid-rise units of between three and 10 stories.
Residential	232	High-Rise Residential Condominium/Townhouse	High-rise residential condominiums/townhouses are units located in buildings that have three or more levels (floors). Both condominiums and townhouses are included in this land use.	To distinguish from the mid-rise category, the high-rise category is limited to buildings greater than 10 stories.
Recreational	445	Multiplex Movie Theater	A multiplex movie theater consists of audience seating, a minimum of ten screens, a lobby, and a refreshment area. The development generally has one or more of the following amenities: digital sound, tiered stadium seating, and moveable or expandable walls. Theaters included in this category are primarily stand-alone facilities with separate parking and dedicated driveways. All theaters in this category show only first-run movies or movies not previously seen through any other media. They may also have matinee showings.	No additional qualifiers
Recreational	492	Health/Fitness Club	Health/fitness clubs are privately owned facilities that primarily focus on individual fitness or training. Typically they provide exercise classes; weightlifting; fitness and gymnastic equipment; spas; locker rooms; and small restaurants and snack bars. This land use may also include ancillary facilities, such as swimming pools; whirlpools; saunas; tennis, racquetball and handball courts; and limited retail. These facilities are membership clubs that may allow access to the	No additional qualifiers

Land Use Group	ITE LU Code	ITE Land Use Type	ITE Description	Additional Qualifiers for Trip Generation Study
			general public for a fee.	
Institutional	565	Daycare Center	A daycare center is a free-standing facility where care for pre-school aged children is provided normally during the daytime hours. Daycare facilities generally include classrooms, offices, eating areas, and playgrounds. Some centers also provide after-school care for children.	Does not necessarily need to be a free-standing facility and may be integrated into a shopping center, office complex, or mixed-use building.
Office	710	General Office Building	A general office building houses multiple tenants. It is a location where affairs of businesses, commercial or industrial organizations, or professional persons or firms are conducted. An office building or buildings may contain a mixture of tenants including professional services; insurance companies; investment brokers; and tenant services, such as a bank or savings and loan institution, a restaurant or cafeteria, and service retail facilities.	No additional qualifiers
Retail	820	Shopping Center [1]	A shopping center is an integrated group of commercial establishments that is planned, developed, owned, and managed as a unit. A shopping center's composition is related to its market area in terms of size, location, and type of store. A shopping center also provides on-site parking facilities sufficient to serve its own parking demands. [2]	Selection of shopping centers limited to "Neighborhood" and "Community" center classifications as defined by ITE (see definitions below). Additionally, retail land uses can range from small urban shopping centers (less than 190,000 square feet) to individual businesses within buildings.

Land Use Group	ITE LU Code	ITE Land Use Type	ITE Description	Additional Qualifiers for Trip Generation Study
Retail	850	Supermarket	Supermarkets are free-standing retail stores selling a complete assortment of food, food preparation and wrapping materials, and household cleaning items. Supermarkets may also contain the following products and services: ATMs, automobile supplies, bakeries, books and magazines, dry cleaning, floral arrangements, greeting cards, limited-service banks, photo centers, pharmacies, and video rental areas. Some facilities are open 24 hours a day.	No additional qualifiers
Services	932	High-Turnover (Sit-Down) Restaurant	This land use consists of sit-down, full-service eating establishments with turnover rates of approximately one hour or less. This type of restaurant is usually moderately priced and frequently belongs to a restaurant chain. Generally, these restaurants serve lunch and dinner; they may also be open for breakfast and are sometimes open 24 hours per day. These restaurants typically do not take reservations. Some facilities contained within this land use may also contain a bar area for serving food and alcoholic drinks.	No additional qualifiers

[1] In the 6th Edition of Trip Generation, ITE discontinued the distinction in trip generation rate by size of shopping center. A study published in the ITE Journal found that while the trip generation rate did vary by size of center, the regression equations published in the manual did not accurately reflect the variation in trip generation by size of center. See "Trip Generation Characteristics of Shopping Centers", ITE Journal, June 1996.

[2] Additional description in ITE Trip Generation (7th Edition): Shopping Centers, including neighborhood centers, community centers, regional centers and super regional centers, were surveyed for this land use. Some of these centers contained non-merchandising facilities, such as office buildings, movie theaters, restaurants, post offices, banks, health clubs, and recreational facilities (e.g., ice skating rinks). The centers ranged in size from 1,700 to 2.2 million square feet of gross leasable area (GLA).

Definitions:

Neighborhood Shopping Center	Provides for the sale of convenience goods (foods, drugs and sundries) and personal services (such as laundry and dry cleaning, barbering, and shoe repairing) for day-to-day living needs of the immediate neighborhood. It is built around a supermarket as the principal tenant. In theory, the neighborhood center has a typical gross leasable area of 50,000 square feet; in practice it may range in size from 30,000 to 100,000 square feet.

Land Use Group	ITE LU Code	ITE Land Use Type	ITE Description	Additional Qualifiers for Trip Generation Study
		Community Center	Provides a wider range of facilities for the sale of soft lines (wearing apparel for men, women, and children) and hard lines (hardware and appliances), in addition to convenience goods and personal services. It is built around a junior department store, variety store, or discount department store as the major tenant, in addition to a supermarket. In theory, its typical size is 150,000 square feet of gross leasable area, but in practice it may range in size from 100,000 to 450,000 square feet.	

During the study process, as it became apparent that gaining permission to survey sites was challenging, the list of land uses was consolidated to the highest priority uses (the top eight) with a shorter list of essential land uses. The essential land uses included:

- Mid-rise apartment (223)
- Residential condominium/townhouse (mid-rise) (230)
- High-rise residential condominium/townhouse (232)
- General office building (710)
- Shopping center (820)

3.2.3 Site Selection Criteria

The overall purpose of the site selection was three-fold: 1) to identify sites distributed within urban areas throughout the state so that data collection is representative of the trip generation of uses within all regions of California, 2) to chose candidate sites that are within areas that meet the criteria for urban infill area, and 3) to chose candidate sites that have the appropriate characteristics for proper data collection. Specific objectives of the site selection were:

- To choose candidate sites that are distributed throughout the state, capturing a cross-section of the state's urban areas. Statewide distribution of sites is intended to capture differences in trip generation that might be reflective of geographic location.
- To select candidate sites in a distribution of urban infill areas at the regional and county level proportional to population.
- Working with the TAC, the following final site selection criteria were adopted for the study:

Urban Infill Area Criteria

1. A candidate site must be located either:
   a. within a Central Business District (CBD), Central City, Not Downtown (CND), or Suburban Center (SBC) Area, as defined by the ITE; or
   b. within a General Urban (T/CZ-4), Urban Center (T/CZ-5), or Urban Core (T/CZ-6) Context Zone, as defined in the *Proposed Recommended Practice for Context Sensitive Solutions in Designing Major Urban Thoroughfares for*

Walkable Communities, and must also meet all of the other criteria defined below.

Transit Proximity Criteria

2. The site must be within 1/3 mile of a site with an existing or future rail transit station, a ferry terminal served by either a bus or rail transit service, an intersection of at least two major bus routes, or within 300 feet of a bus rapid transit corridor. The transit service shall have maximum scheduled headways of 15 minutes for at least five hours per day. It is acceptable to use the collective headways of multiple routes as long as the routes serve the same corridor for a considerable length of the corridor. This criterion pertains to corridors where people can use any route to reach any point within a significant length of the corridor.

The transit proximity criterion is derived from California Government Code Section 65088.4, defining urban infill opportunity zones.

Vacant Developable Land Criteria

3. The site must be within a UIA that contains no more than 10 percent Vacant Developable Land. Vacant Developable Land as defined excludes water bodies, public rights-of-way, land designated for conservation and public recreation, and any other land designated by local governments' policies or comprehensive plans as unavailable for development. However, parking lots on land designated and/or zoned as developable under current policy qualify as Vacant Developable Land.

Population (Residential) and Employment Density Criteria

The site must be located within a UIA that meets one or more of the following density criteria:

4. Where residential land uses comprise at least 60 percent of developed land, average residential density shall be at least 10.0 dwelling units per gross acre[11] of residentially developed land, or

5. Where nonresidential land uses comprise at least 60 percent of developed land, average nonresidential density shall be a floor

[11] Gross acres is the total area including land used for public or private street, alleys, easements, open space, and other such uses. In contrast, net acres is the amount of land remaining after necessary deductions have been made for streets, open space, utility easements, access corridors, or other necessary dedications.

area ratio (FAR) of at least 1.0 and/or an employment density of at least 35.0 jobs per gross acre of nonresidential developed land, or

6. Where neither residential nor nonresidential uses comprise more than 60 percent of developed land, both residential and nonresidential uses must meet the density and intensity criteria prescribed above.

Additional Criteria

Other qualitative criteria to be considered in the selection of sites include:

- The maturity of the site. Newly constructed buildings are poor candidates for data collection, as they may not have developed stable travel characteristics or tenancy.
- Destination retail. Large destination retail shopping centers attract traffic from a larger market area than typical infill development, and often attract tourist traffic. This type of land use is considered a special generator and is not the subject of this study.
- Practicality of collecting data. The ability to cost-effectively collect travel data is critical. Very large and complex sites (such as multiple office towers and large mixed-use centers) with multiple entrances on multiple levels, skywalk connections to adjacent buildings, and large plazas, are difficult to survey and to verify that all trips have been captured.
- Ability to gain permission. The property owner/manager must provide permission to conduct intercept surveys at the site. Not only is this a courtesy to the owner/manager, but is necessary to be able to obtain independent variable data such as building size, number of units, and level of occupancy.
- Located within a walkable district. Although implied by the definition of an UIA and proximity to transit, the site must be located in a district that is walkable (see definition in Section 2.1). No quantitative measurable criteria are applied to walkability, therefore, it is determined through observation.

To assist in the identification of candidate sites, the study team used a map-based or GIS approach using digital map layers and socioeconomic data that are available nationwide from Federal agencies and information centers. Population and employment density was mapped for the entire state identifying, at the 2000 Census Block Group level; those block groups which had residential development densities of at least 10 housing units per land acre, or, employment densities of at least 35 jobs per land acre. Additionally, digital map layers of California fixed-route bus services and fixed-rail transit routes were integrated into the mapping. Transit route headways are not included in the available map layers and therefore identification of the minimum service criterion was performed manually.

3.2.3.1 Geographic Distribution of Sites

The collection of data is intended to represent infill development in any of California's metropolitan regions. For the purposes of this study, the state was divided into the following four metropolitan areas:

- San Francisco Bay Area (including Santa Cruz/Monterey Bay area)
- Sacramento Area
- Los Angeles Area
- San Diego Area

In general, the data collection effort attempted to survey 50% of the study sites in Northern California and 50% of the study sites in Southern California regions. These metropolitan regions contain concentrations of census block groups that meet the study's minimum density for housing and employment.

<u>Geographic Distribution of Study Sites by Counties/Cities</u>

Within each metropolitan region, site selection was generally intended to be distributed in proportion to the population of each individual county within each region, then by cities within each county that meet the population and employment density criteria and that contain the minimum transit requirements. In practice, given the difficulty encountered in obtaining permission to survey sites, site selection during this phase of the study focused on the larger urbanized cities in the San Francisco Bay Area, greater Los Angeles area, and San Diego.

3.2.4 Site Selection Approach

A number of approaches were used to identify and select the sites. The candidate sites identified by using any of the approaches described below were checked against the site selection criteria described above. This section includes brief descriptions of each approach, its effectiveness, and the challenges of the approach.

3.2.4.1 Study Site Identification Using Aerial Photography or Inspection

Potential sites were identified using aerial photography (e.g., via Google Maps) or identified by direct visual inspection. The following qualitative criteria were applied to the identified sites:

1) From observation, the site was located within a compact, mixed-use, walkable urban area with good pedestrian connections within the district to transit and to adjacent districts; and

2) The site contained the selected ITE land use categories, identified either through a web-based search of businesses, knowledge of the area, or by visual inspection.

Effectiveness of the Approach

This approach was the quickest, but not necessarily the most effective, method of identifying sites that meet the population, employment density, and transit proximity criteria. Once the potential site was identified, the site owner/manager was contacted to obtain permission to conduct the surveys and also to obtain independent variable data such as number of units, gross floor area, occupancy, etc.

Challenges of the Approach

The challenges of this approach included:

- Aerial photography, combined with GIS density mapping, can accurately identify districts that meet the quantitative and qualitative criteria, but cannot identify the types of land uses within individual buildings. Some buildings as viewed from aerials were clearly either residential, office, or commercial retail, but required field observation to confirm.
- Contacting and persuading the site owner/manager to participate in the survey is the most challenging aspect of this approach. Selection by inspection of the site entails "cold calling" the site owner/manager whose first inclination is to decline participation citing tenant privacy and inconvenience, no solicitation policies, or simple rejection. The researchers have found that owners/managers are focused on the day-to-day operations of their properties and addressing the needs of their tenants. Generally, they are less interested in the need or benefits

of this research than those involved in entitling property for development. Therefore, they are not usually aware of the importance of infill-specific trip generation rates data for use in transportation planning.

3.2.4.2 Study Site Identification using TAC Members

The TAC members also provided preliminary identification of sites through local knowledge of their jurisdictions and their personal contacts. The effectiveness of this approach and the challenges involved are described below.

Effectiveness of the Approach

This approach is potentially more effective than site identification by inspection. Since TAC members are involved in the study, the sites identified by them are more likely to be available for the surveys because of the TAC members' relationships with site owners/ managers. This process still involves contacting each site owner/ manager directly to obtain permission to conduct the surveys.

Challenges of the Approach

The challenges of this approach include:

- Requires a moderate to significant level of effort on the part of the TAC member to consult with other TAC agency staff and identify individual building owners/managers who might be willing to participate. TAC members can readily identify appropriate districts containing candidate sites, but because they are voluntarily serving as TAC members (in addition to full-time jobs), they have little time to spend on the effort.
- Most of the TAC members work for public agencies, some of which have development review and approval responsibilities. However, while TAC members may have relationships with the developers of candidate sites, mature sites are typically no longer owned by the developer, resulting in challenges similar to the inspection approach described above.

3.2.4.3 Study Site Identification by Contacting Developers

This method of identifying sites involves contacting developers with whom members of the study team, or others, have a relationship. The effectiveness of this approach and the challenges involved are described below.

Effectiveness of the Approach

Developers have a comprehensive knowledge of the development review process, including the preparation of environmental documents and traffic impact studies. Therefore, they are aware of the ramifications of accurate trip generation estimates, and understand the objectives of the research study. Convincing developers to participate, or to find time to participate is difficult. This approach is theoretically more effective than the previous approaches because of their inherent understanding that the results of the study directly benefit the developers.

Challenges of the Approach

The challenges of this approach include:

- Most developers are involved with the entitlement process and the construction of the site. Once the building is completed, however, the building typically is either sold or, if retained by the developing company, is usually managed by a different branch of the organization. Even if the developers can direct the study team to a particular owner/manager or management branch of their organization, contact with the owner/manager typically results in challenges similar to the inspection approach described above.
- Developers did not commit the time and effort required to pursue participation through their contacts and management branches. Unless the research provides immediate benefits to their current projects, they are less inclined to make such a commitment.

3.2.4.4 Study Site Identification by Contacting Organizations

This is a “top-down” approach in which key individuals of an organization agree to assist in gaining permission from their members who own/manage candidate sites. This entails initial contact with organizations, associations, corporations, and other institutions that can either provide high level and broad permission to survey sites or put the study team in direct contact with the appropriate persons. This approach establishes and prioritizes a list of entities for initial contact. Contacts can include:

- Property owner/management associations or professional organizations
- Corporations and development companies that develop, own, and manage multiple properties
- Public agencies within metropolitan regions
- Practitioner organizations such as the Urban Land Institute, the American Planning Association, and the Congress for the New Urbanism
- Non-profit or promotional organizations such as downtown business associations or chambers of commerce

The effectiveness of this approach and the challenges involved are described below.

Effectiveness of the Approach

This approach is based on the understanding that because organizations are groups of members working together towards achieving common goals, something that benefits the organization also benefits the individual members. Organizations involved in the planning, construction, management, and operation of land uses or businesses are typically aware of how traffic data can affect the development approval process. They are also usually aware of fiscal ramifications and barriers related to over-estimating traffic impacts, such as development impact fees. This approach is probably the most effective approach since it: 1) involves influential members of the organization, some of whom can make decisions organization-wide, 2) provides a means of communicating the benefits to a broader audience of potential candidates, and 3) helps target the key motivation for owners/managers of candidate sites, such as lower traffic impact fees, sustainable development practices, and/or political and technical support for their industry.

Challenges to the Approach

The challenges of this approach include:

- Some organizations are large and bureaucratic and thus take a long time to make decisions.
- Organizations typically deal with issues associated with their members and thus are not interested in participating in a study unless it directly benefits their members. For example, a property management

organization may not directly benefit from this study, as it does not affect their day-to-day concerns of managing their properties.

- Even if the organization understands the importance of the study, often it can only communicate the benefits and request voluntary member participation.
- Even if the organization agrees to participate, success often still comes down to persuading an individual building owner/manager to participate in the research.
- A moderate to significant effort is required on the part of each organization to communicate the benefits, support the research, and follow up with its members.

3.2.4.5 Solicitation for Participation

The site selection process required that the study team develop a concise summary of the research study to solicit interest and participation. This summary is provided when researchers are making initial contact with individuals and organizations. It also assists organizations in communicating the study objectives, benefits, and procedures to its members. Appendix B contains a list of organizations and individuals contacted as part of this research, and a copy of a letter used to solicit participation.

3.2.4.6 Conclusion of the Site Selection Approaches

Gaining permission to survey sites remains by far the most challenging aspect of this research study. It is a time-consuming task, typically requiring multiple phone conversations, follow-up phone calls, and face-to-face meetings with property owners or managers. Often times, the candidate site is corporate-owned, thus requiring permission from a remote location. Even with a thorough explanation of the purpose of the study, property owners/managers are often reluctant to give permission for on-site surveying, citing tenant and patron privacy and inconvenience or internal policies against soliciting of any type.

Key findings from the experience to date include:

- A general lack of commitment, time, and motivation of most property owners/managers to allow researchers to conduct on-site intercept surveying. This is because the benefits of the research to the building/development industry are not directly apparent or relevant to the individuals or companies who own and manage properties after they are permitted and constructed.

- A prior relationship with the property owner/manager results in a more receptive introduction to the study and its importance. Therefore, approaching owners/managers who may have relationships with the study team or through organizations such as professional/industry organizations, Downtown Business Associations, and/or public agencies appears to be the most effective approach.

- An appropriate amount of time needs to be allocated to the site selection process. Gaining permission and setting up a survey for a single site requires numerous person hours for making initial contact, follow-up phone calls, site inspection, and arranging personnel and survey subcontractors.

4 Data Collection

This chapter discusses the different types of trip generation data collection methods considered for this research. It describes the conventional data collection approach, its challenges, and why the conventional approach is not applicable to urban infill development. It further describes the alternate data collection methods considered and provides an overview of the methodology adopted by the TAC. Finally, this chapter provides an overview of the initial pilot study to test the methodology and an overview of the type of data collected for each site.

4.1 The Conventional Approach to Trip Generation Studies

The conventional approach for collecting vehicular trip generation data is outlined in the ITE *Trip Generation Handbook*. ITE has established a standardized procedure that results in data consistent with the current data presentation in the *Trip Generation* manual. In essence, the conventional approach relies on manual or automatic traffic counts established at the access points of the subject site. When studying a single land use type, the conventional approach requires that the site be a stand-alone facility with its parking dedicated only to that site, and isolated enough so that visitors to the site do not park off-site and walk. Therefore, by definition, sites that meet the ITE requirements are typically isolated locations with ample free parking, and little transit and pedestrian accessibility. Finally, the conventional approach does not provide guidance or procedures for determining the site's non-vehicular mode share.

The limitations described above are the underlying reasons why ITE trip generation rates may not be accurate when used to assess proposed urban infill development. If an urban infill site meets the ITE guidance, it often is an anomaly and may have other characteristics that would cause the site to be unrepresentative of typical urban infill development.

4.2 Limitations of the Conventional Approach

By its very nature, urban infill development cannot be studied using the conventional approach because it would not capture all the vehicle trips likely to be generated by the site. The characteristics of urban infill development users (including residents, employees, customers, and visitors) that lead to this conclusion include:

- Users can park in off-site facilities and walk to a site that may have limited, expensive, or no on-site parking.
- Users can park on-street, sometime many blocks away from the site.

- Users in urban contexts often park nearby and link trips to multiple purposes and uses/destinations.
- Residents of urban residential development may park additional vehicles off-site if their residence cannot accommodate all of their vehicles.

For these reasons, it was determined that surveying site users was the best means of collecting not only vehicular trip generation data, but also mode share data. The survey methods considered for this research are described below.

4.3 Alternative Data Collection Methods

Survey methods include travel journals, mail-in surveys, telephone surveys, combined telephone and mail-in surveys, and in-person intercept surveys. Each method is briefly described below:

4.3.1 Travel Journals

A travel journal is a daily or weekly diary filled in by an individual traveler for the purpose of documenting all of their trips. These surveys can document information about an individual's socio-economic and demographic status, household information, vehicle ownership, and daily travel choices by purpose and mode. This method of survey is one of the most effective means of collecting many types of data, but requires a significant commitment on the part of the journalist and a relatively high response rate. Additionally, this method is reasonable for collecting travel data on the individual, but not for a specific land use or site.

4.3.2 Mail-In Surveys

The most common method of data collection is the mail-in survey. This method involves mailing questionnaires with respondents mailing back the completed surveys. Mail-in survey requires moderate effort to implement and analyze and could provide substantial demographic and travel information, providing that respondents actually participate. Mail-in surveys can be targeted for individual sites or businesses (i.e., residents and employees of a single building or business), but are difficult for surveying visitors and customers. Furthermore, the response rate for mail-in surveys is typically very low, unless made mandatory by an employer or the respondents are provided some form of incentive.

4.3.3 Telephone Surveys

Telephone surveys usually provide a higher response rate when compared to the mail-in surveys, but identifying and contacting the appropriate individual to survey is challenging. This kind of survey allows for deeper understanding of the respondent's travel behavior through follow-up questions. Telephone surveys are difficult to target to an individual site or business and cannot capture visitors and customers.

Sometimes mail-in surveys and telephone surveys are combined to provide a better response rate. In this approach, the telephone contact is made prior to the mail-in survey, which helps increase the response rate. However, the cost of implementation significantly increases with this approach.

4.3.4 Intercept Surveys

Intercept surveys collect data from a sample of the population being surveyed in-person. Sampling is intended to represent the population of interest. A random sampling procedure assures that each element in the population has an equal chance of being selected. The results of a sample of the population can be applied to the total population. This method is relatively easy to implement, and can specifically target a site, business, and time period. The statistical reliability for this approach is also quite high and, unlike other types of surveys, this method avoids the problem of identifying the appropriate person to contact and the need to follow-up. This approach allows interaction between the survey personnel and respondents to clarify specific questions and misunderstandings. Limitations include the potential to miss a portion of the population, the need to ensure that the total population (i.e., everyone entering and exiting a site) is captured during the survey period, and the response rate (i.e., people willing to take the time to respond).

4.4 Overview of Selected Data Collection Methodology

For this study, intercept surveys were selected as the preferred method of data collection. The intercept surveys collected travel information from users of the selected sites, which was then used to derive automobile trip generation rates for the time periods under study.

As mentioned earlier, intercept surveys collect data from a random sample of the population. The results of surveying a sample of the population can be applied to the total population. For example, if 60% of the random sample drove alone to the site, this proportion is applied to the entire population.

Sampling through intercept surveys requires a precise count of the population. A survey of a portion of a population always has some margin of error in the results, but when the margin of error is reduced to just a few percentage points, it often becomes of little concern. A rule of thumb is to target a 95% confidence with a

5% error level, but surveys may not be able to achieve this high a level. The confidence level is expressed as a percentage, and indicates how often one would expect to get similar results if the survey were repeated.

4.4.1 Data Requirements for Intercept Surveys

In addition to the intercept surveys of individuals, the following information is required for each site:

Population size: The population is the number of people accessing a site during the study period. This information is collected by conducting counts of all people entering and exiting the site during the survey period. Therefore the data collection requires a counter at each individual entrance point in order to capture the entire population.

Independent variable: The computation of a trip generation rate requires establishing an independent variable such as 1,000's of square feet or number of dwelling units. If the selected independent variable is related to the population, then that information needs to be collected at the time of survey. For example, if the independent variable was employees, the number of employees present on the day of the survey is needed. It is desirable to use a fixed independent variable, such as square feet of building area, to avoid variability. This research selected the common independent variables used in the ITE *Trip Generation* manual for each of the selected land use categories, primarily building square footage for commercial uses and dwelling units for residential uses.

4.4.2 Travel Data by Land Use

An objective of the intercept surveys is to collect the necessary information in as short as time as possible so as not to inconvenience the individuals being surveyed. This travel data includes:

- The primary means of travel to the surveyed site on the day of survey
- Information on the primary destination of the site user to identify whether their trip is a primary trip, a pass-by trip, or a linked trip[12]

[12] According to the Institute of Transportation Engineers' Trip Generation Handbook, primary trips are defined as "trips made for the specific purpose of visiting the generator". The stop at the site is the primary reason for making the trip. A pass-by trip is an intermediate stop on the way from an origin to a primary trip destination, such as stopping at a grocery store on the way home from work.

- The number of visits to the site in a typical week, and whether the respondents reside at, work at, or are visiting the site
- The approximate time it took to reach the site
- For mixed-use sites, whether the individual visited multiple uses on the site

These questions can be specifically tailored to the site being surveyed if circumstances warrant different questions.

Sample questionnaires are included in Appendix C.

4.4.3 Demographic Data

In addition to the questions related to travel, the survey asks optional questions to gather demographic data for future cross-referencing with travel characteristics. As with the travel questions, the intent of the optional demographic questions is to keep the survey as short as practical. The demographic information collected during the intercept surveys includes:

- Zip code of residence
- Gender
- Age
- Number of vehicles in the respondent's household
- Purpose of the trip
- Occupation
- Salary range
- Number of people residing in their household
- Household income
- Benefits or incentives offered at their workplace including flexible hours, transit passes, company car, or free parking

Sample questionnaires are included in Appendix C.

A linked trip is where a person makes multiple stops to different land uses as a pedestrian even if they drive to the site, or a nearby site.

4.4.4 Random Sampling Survey Goal

Determining sample size requires a knowledge of the size of the population. For example, a population of 300 persons traveling to/from a site in the peak hour requires that 168 persons be surveyed to achieve a 95% confidence with a 5% error level, or 143 persons to achieve a 90% confidence with a 5% error level. Because the population size cannot be determined in advance, the goal is to collect a simple minimum number of surveys at each site, established at 100 surveys. This is consistent with ITE's recommendation for a minimum of 100 intercept surveys when conducting multi-use development interviews. Low trip-generating land uses may have a lower quota because it may not be practical to collect the minimum number of surveys at each site.

4.4.5 Personnel Requirements

Personnel requirements for the intercept surveys depend primarily on the number of access points that exist at the study site. The methodology requires counting all people entering and exiting the site during the study periods. Trained surveyors are stationed at primary entrance and exit points to conduct the intercept surveys. Because the intercept survey is a random sampling, not all access points need to be surveyed. Additional personnel are stationed at all entries and exits to count all persons entering and exiting the site. This is the site population. Additionally, if the site has its own parking, personnel are required to count vehicle entries and exits, or automatic machine counts can be used to count vehicles.

4.4.6 Time Periods of Data Collection

This research study was initially scoped to collect data representing weekday (Tuesday, Wednesday, or Thursday) morning and evening peak hours of adjacent street traffic, the most commonly used time periods for traffic impact analysis. This is also consistent with the peak hour data presented in ITE's *Trip Generation* manual for most land use categories. The peak hour of adjacent street traffic covers a morning period from 7:00 to 9:00 a.m. and an evening period from 4:00 to 6:00 p.m. For retail and restaurant uses, the midday survey covers a period from 10:00 a.m. to 3:00 p.m. depending on each use's operating hours and peak generating times.

A limitation of the selected methodology for this study is that it is not easily modified for collecting average daily traffic (ADT) information. To date, the surveys have only collected peak period data. While traffic impact studies mostly rely on peak hour data for intersection and roadway analysis, some traffic analyses and travel demand forecasting models use average daily traffic data (for informational purposes at a minimum). Additionally, air quality analyses rely on average daily traffic data to estimate emissions. True average daily traffic data would require the intercept surveys to extend through a 24-hour period, or at least an 18-hour period for most sites. This has cost implications. However, it is desirable to collect average daily traffic data to the extent it is feasible. Several methods have been considered. In all of the approaches described below, machine counts would be conducted at on-site parking facilities to count site traffic.

The following methods provide <u>empirical</u> daily trip generation data:

1. Conduct 24-hour intercept surveys and pedestrian ingress/ egress counts (or at least from 5:00 a.m. to closing time for most commercial sites, depending on hours of operation), at all survey sites. Permission to survey over extended periods may be more difficult to obtain than just peak period surveys.
2. Conduct a 24-hour trip journal survey of tenants of prototypical sites and land uses, combined with 18-hour or 24-hour counts of pedestrian ingress/egress. Apply journal-derived daily mode share to pedestrian counts to calculate daily trip generation. Challenges include logistics of arranging the journal survey to include multiple tenants of single sites, collecting completed journals, credibility of journal entries, and obtaining a good return rate.
3. Conduct 18-hour or 24-hour pedestrian ingress/egress counts and observe mode of travel for a sampling of users. This avoids the need to intercept people - particularly in late evening or very early morning when it is most inconvenient. This requires careful selection of sites where an observer could view how a person accesses the site (e.g., from the nearest transit stop, nearby parking garage, walking, biking). Also combine with machine counts of sites' parking facility (if one exists) to capture those vehicle trips. Challenges include the selection of sites where observations can be done without alarming the persons being observed.

Alternatively, the following options provide <u>estimates</u> of daily trip generation:

1. Conduct 18-hour or 24-hour pedestrian ingress/egress counts and apply peak period mode shares (from intercept surveys) to the daily population. This assumes the same mode share applies to non-peak period travel as well as peak period travel - which is not likely to be an accurate assumption - but could still provide a

reasonable estimate, particularly since the survey would be collecting pedestrian access data. Challenges include the accuracy of applying peak period mode share to daily travel. Accuracy could be improved with extended intercept surveys covering mid-day and evening periods. The cost of surveys would be significant.

2. Conduct full 18-hour or 24-hour intercept surveys at one typical site per land use category to derive a daily mode share profile, and to determine a peak-to-daily factor. Apply the profile/factor to 18-hour/24-hour pedestrian ingress/egress counts collected at all other sites. This method may be the most cost-effective since it would be restricting 18 to 24-hour intercept surveys to a limited number of sites. However, the accuracy of daily profiles would be dependent on only one or a limited number of sites per land use category. Selection of one typical site may not reflect all possible contexts.

3. Conduct 24-hour machine counts at parking facility driveways of the sites being surveyed to capture on-site vehicle trips. Use this data to develop a peak to daily factor and to validate the peak period estimates of traffic from intercept surveys. Apply the peak to daily factor to the peak period data from the intercept surveys to estimate daily traffic generation.

These alternative methods been reviewed by several TAC members (those involved in traffic analysis) and other transportation professionals. Based on the suggestions that resulted from the review, one or two pilot studies of the 24-hour trip generation methodologies should be conducted to determine each method's viability. Estimate option #3 appears to be the most viable based on the input received in the review, if urban infill sites with individual parking can be located.

Both an "initial" pilot study of three sites and an "expanded" study of ten more sites were conducted. These are described in the following sections.

4.5 Initial Pilot Study

Once the decision was made to use the intercept survey methodology, an initial pilot study was conducted to test the method. The initial pilot study sites focused on urban infill areas in Oakland and San Francisco. Figure 1 shows the pilot study locations.

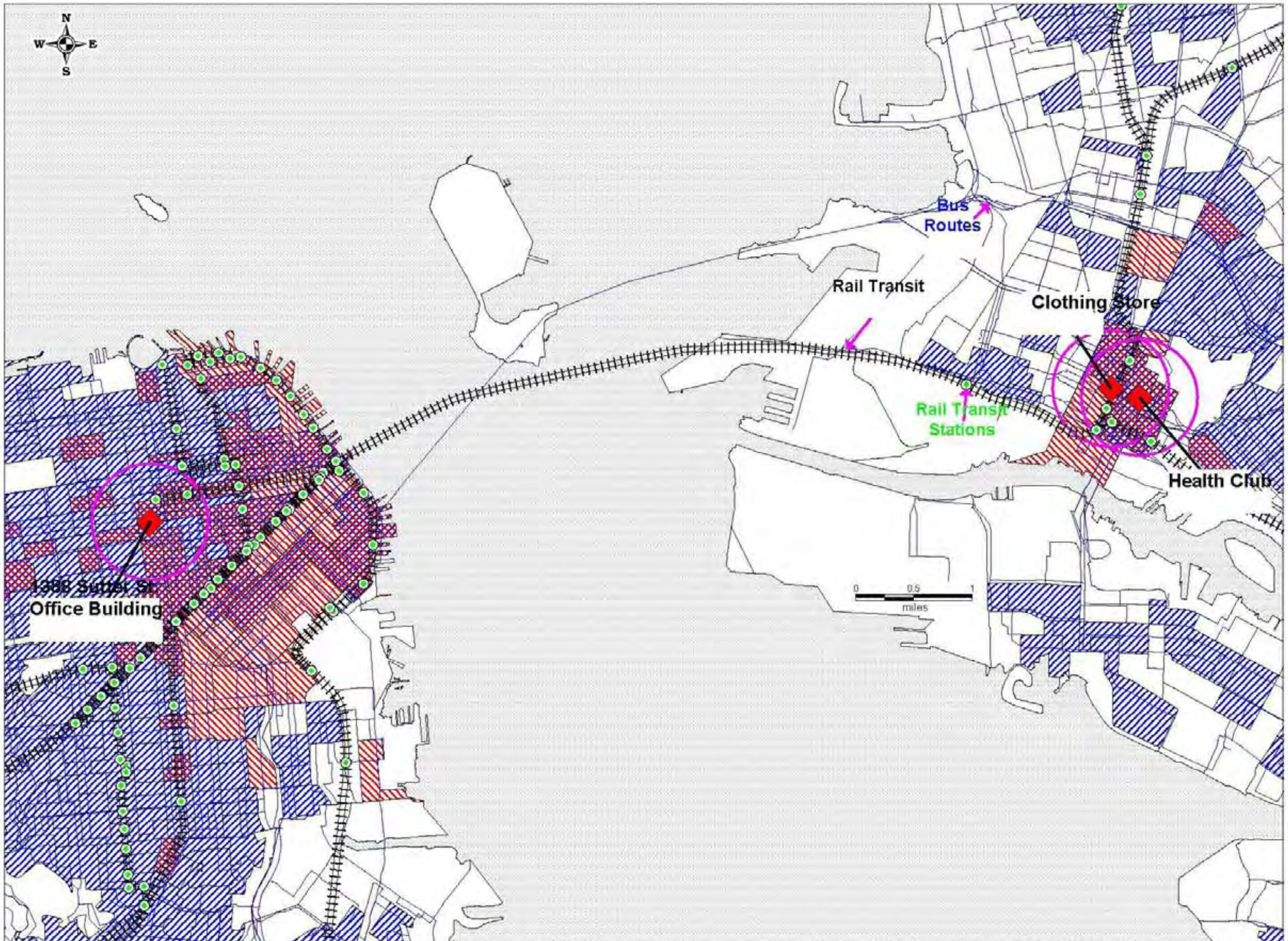
The study sites selected for the pilot study included:

- General Office Building located at 1388 Sutter Street in San Francisco
- Health Club located at 298 14th Street in Oakland
- National chain clothing store located at 1333 Broadway in the Oakland City Center

A brief description of the pilot study sites follows:

General Office Building – This is a privately-owned 120,000 square foot (gross leasable area) office building with a wide variety of tenants comprising primarily professional and service activities. The building was 100% occupied at the time of the survey. The building is located less than one block from Van Ness Avenue, a major transportation and transit corridor. The Civic Center BART Station is located within eight blocks of the office building, too distant to meet the transit proximity criteria. However, MUNI Routes 2 and 3 are within 300 feet of the site each providing a 10-minute headway for four hours a day. The office building has an attached public parking garage, which charges market rates, about $21.00 per day. The location of the office building meets both the nonresidential and residential density requirements. The surrounding land uses include a mix of commercial, retail, and residential. Although the office building does not contain any other uses, the ground floors of adjacent buildings contain cafes and retail. Upper floors of adjacent buildings contain offices and residential uses. There are several high-rise residential towers located within two blocks of the site. The surrounding uses can be classified as Central City (Not Downtown) or Urban Center.

Figure 1 Location of Initial Pilot Study



* Block Groups Shown with Red hachure had Year 2000 workers >= 35 per gross land acre; with Blue hachure had Year 2000 DU >= 10 per gross land acre.

Economic & Planning Systems, Inc. One-half mile radii shown around surveyed sites. *P:\14000s\14002abag_infil\Maps\MapInfo\Fig_Final_MTX5.wor*

Health/Fitness Club – This health club is located in Oakland at 298 14th Street. This site is a locally-owned, non-chain, 18,000 square foot health club. The site is located adjacent to AC Bus Transit Route 82, which has a less than 15-minute headway for more than five hours each weekday. The site is also within four blocks (0.29 miles) of the City Center/12th Street BART Station. The surrounding area is mostly high to moderate rise, mixed-use, commercial office, and residential buildings. The ground floors are comprised of restaurants and retail shops. This health club is bordered by an outdoor pay parking lot and is also surrounded by metered on-street parking. A City-owned parking garage is located within two blocks of the site, and charges about $10.00 per day. This location is within a UIA that meets both the nonresidential and residential density requirements. The surrounding area could be classified as Central Business District or Urban Core.

Retail – Shopping Center – Two clothing stores located in the Oakland City Center at 1333 Broadway. The two stores operate as a single retail store occupying 11,000 square feet. The surrounding area primarily consists of high-rise office buildings with ground floor retail and apartment/condominium buildings. This site is situated directly above the City Center/12th Street BART Station, and directly along AC Transit's Routes 14 and 15, both with less than 15-minute headways for more than five hours a day. This location is within a UIA that meets the requirements for both the nonresidential and residential density requirements. The surrounding area could be classified as Central Business District or Urban Core.

4.5.1 Survey Time Periods and Data Collection

General Office Building: Intercept surveys were conducted during the morning (7:30 – 9:30 a.m.) and afternoon (4:00 – 6:00 p.m.) peak periods on Wednesday, May 31, 2006. A total of 107 surveys were collected, and a total of 637 people were counted entering or exiting the site.

Health Club: Intercept surveys were conducted during the morning (7:00 – 9:00 a.m.) and afternoon (4:00 – 6:00 p.m.) peak periods on Wednesday, May 31, 2006. A total of 25 surveys were collected, and a total of 128 people were counted entering or exiting the site (The survey size was very small).

Retail – Shopping Center: Intercept surveys were conducted during the mid-day and afternoon peak periods (11:00 a.m. – 6:00 p.m.) on Thursday June 1, 2006. A total of 83 surveys were collected, and a total of 1,108 people were counted entering or exiting the site.

4.5.2 Observations and Analysis

Table 2 shows the average mode split for pilot study land uses and Table 3 shows the observed trip generation rates and compares them to ITE's average trip generation rate and/or fitted curve equation (from *Trip Generation*, 7th Edition). Key findings include:

- All three of the sites have a relatively low drive-alone mode share (less than 50%), but when all automobile modes are summed, the sites ranged from 36% to 60% auto mode. Total transit (rail and bus) mode shares range from 22% to 52%, with the highest transit mode share occurring at the retail site directly above the BART station. Walking also constituted a relatively high share of travel, ranging from 12% to 16%.
- The observed trip rate for the office building was significantly lower than the ITE average rate and the ITE equation rate in both peak periods, by 50% to 93%.
- The observed rate for the health club was nearly equal (2% difference) to the ITE average for the morning peak hour rate (ITE does not have an equation for this land use category). The observed afternoon peak hour trip rate, however, was significantly lower than the ITE average rate (by 235%). It is important to note that the survey size for this site was very low (25 surveys) and additional health club sites will need to be surveyed to verify the conclusions drawn from this site.

Table 2: Average Mode Split for Initial Pilot Study Land Uses

MODE SPLIT	Office Building	Health/ Fitness Club	Retail – Shopping Center
Drove Alone	46%	47%	24%
Drove with Others	8%	5%	5%
Passenger (car parked nearby)	1%	4%	2%
Passenger (was dropped off)	3%	0%	5%
Taxi	0%	4%	0%
Subtotal all automobile trips	58%	60%	36%
Rail (BART/MUNI/CalTrain/Amtrak)	10%	10%	34%
Bus	17%	12%	18%
Subtotal all transit trips	27%	22%	52%
Bicycle	2%	5%	0%
Walk	12%	16%	12%
Other (scooter)	1%	0%	0%
Note: Percentages do not add to 100% due to rounding.			

- The observed rate for the retail site was significantly lower than the ITE average rate for a shopping center in the PM peak hour, by about 230%. There appears to be a match between the observed rate (12.09) for the midday (PM peak hour of the generator) and the ITE PM peak hour trip rate (13.27). However, the observed PM peak hour rate for clothing store studied was nearly identical to the PM peak hour rate presented in the *Trip Generation* manual for an apparel store. It is clear that more retail sites need to be studied before drawing any conclusions about trip generation or comparisons with ITE. A greater diversity in retail types needs to be surveyed to best estimate urban shopping center trip generation rates.

Table 3: Comparison of Surveyed and ITE Trip Rates for the Initial Pilot Study

Land Use	ITE Code	Observed Trip Rate (trips/ KSF)		ITE Average Trip Rate (trips/KSF)		ITE Trip Rate from Equation (trips/KSF)		Difference between Observed and ITE Trip Rates	
		AM	PM	AM	PM	AM	PM	AM	PM
Office Building	710	1.21	0.92	1.55	1.49	1.81	1.78	50%[1]	93%[1]
Health / Fitness Club	492	1.19	1.21	1.21	4.05	N/A	N/A	2%[2]	235%[2]
Retail Shopping Center	820	12.09[3]	4.01	N/A[4]	3.75	N/A[4]	13.27	N/A	231%

[1] Difference calculated using ITE rate from equation.
[2] Difference calculated using ITE average rate.
[3] This rate is the midday rate representing the PM peak hour of the generator as defined by ITE.
[4] ITE Trip Generation does not provide a weekday rate for "peak hour of the generator" for shopping centers. The trip generation manual provides rates for "apparel store" (Code 870). The average PM peak hour rate for this land use is 3.83 trips per 1,000 SF (rate based on equation is 3.82), and 4.20 trips for the PM peak hour of the generator (rate based on equation is also 4.20).
KSF = 1,000's of square feet.

4.5.3 Lessons Learned from the Initial Pilot Study

There were lessons learned in terms of site selection, conducting the surveys, and the analysis of the data. These lessons from the initial pilot study are discussed below and have been integrated into the approach to the rest of the study.

Site Selection

The selection of individual sites for surveying appears to be one of the most difficult tasks in this research project. The selection of an urban infill area is a straight-forward process, once the residential, non-residential, and transit lines that meet urban infill criteria have been mapped. Even selecting an individual building within an urban infill area is relatively straight-forward. However, gaining permission to conduct surveys is a time-consuming aspect, typically requiring many phone calls, follow-up phone calls, and face-to-face meetings with property owners or managers. Often times, the site is corporate owned requiring permission from a remote location. Even with a thorough explanation of the purpose of the survey, property owners/ managers remain reluctant to give permission citing tenant and patron privacy and inconvenience, or internal policies against soliciting of any type. Key findings from the pilot study include:

- A prior relationship with the property owner/management results in a more receptive introduction to the survey and its importance. Approaching owners/managers of past clients or contacts, or through organizations such as Transportation Management Associations, Downtown Business Associations or public agencies, therefore should be the priority approach to selecting the remaining survey sites.

Conducting the Surveys

- While conducting the surveys, complete knowledge of all access points of the site is critical to ensure that the surveys capture an accurate pedestrian count. It is critical to count all pedestrians entering and exiting the building or the statistical application of the survey results will be invalid. A pre-survey site visit is therefore crucial to plan the survey. The initial pilot study was successful in identifying all site entrances and capturing the total population.

- It is also important to supervise the surveyors to ensure the necessary time periods are manned and that they approach individuals in a polite and professional manner. There is some flexibility in the precise timing of the intercept surveys, but the pedestrian counts must be started and ended on time.

- Use of trained surveyors to conduct the intercept surveys is highly desirable. Surveyors who do not fully understand the purpose of the survey had difficulty explaining it to the people being surveyed. Therefore, it is important to provide adequate information to the surveyors so that they are received as being knowledgeable and trustworthy. Pre-survey meetings should be held to explain the purpose and hear the surveyor's "pitch" to make sure they sound professional, knowledgeable, and friendly.

- It was observed that many people entering/exiting sites, particularly places of employment, are in a hurry and do not want to take time to participate in the survey. Surveyors should be directed to politely ask for participation, indicate the questions will only take about 15 seconds, but not to persist. Tenant complaints to management is cited by property owners/managers as one of the reasons they reject participation in such surveys.

- The initial pilot study found that it worked well when the surveyors filled out the surveys for respondents waiting for an elevator, making it more convenient for the respondents.

- It is important to confirm with the site owner/manager that the appropriate independent variable data and other relevant information is available (e.g., building square footage, number of units, and occupancy) before conducting the survey. It is also important to explain that anecdotal information is unacceptable, that the survey requires more precise information.

- The pilot study found that it was difficult to obtain a minimum of 100 completed surveys. Our return rate was 7%, 17%, and 20% for the three initial pilot sites. If these sites are typical, then it would take multiple days to obtain 100 surveys, which would have a significant effect on the cost of the study.

Analyzing the Data

Since the initial pilot study involved a limited number of surveys, no significant issues related to data analysis were encountered. However, the one key finding regarding the data analysis was potential double counting of automobile trips.

There is the potential to double count automobile trips when a group of visitors fill out multiple surveys. For example, when the driver and a passenger both fill out a survey, the single automobile trip can be counted as two trips. For the pilot study, about 5% to 8% drove others, and 1% to 4% were passengers (car parked nearby). If the driver and passenger of the same vehicle were surveyed, their one trip has been double counted. One solution for this is to give the surveyors instructions to indicate on the survey if multiple surveys are from groups, if possible. If this is not feasible the trip generation estimates may be somewhat conservative.

4.6 General Overview of Sites for Initial and Expanded Pilot Studies

This section provides a general overview of site characteristics and the data analysis process.

4.6.1 Site Characteristics

The site characteristics data typically collected include:

- For residential sites - total number of dwelling units by bedroom (studios, 1-bedroom, 2-bedroom, etc.).
- For commercial sites – the gross leasable square feet (GLA) of the commercial use. If there are multiple uses within the site, then individual gross leasable square feet by type of use is collected.
- The percent occupancy of the study site at the time of the survey.
- The number of parking spaces provided within the site, and the cost of on-site parking. If off-site parking is provided, then the number of off-site parking spaces provided, their location, and cost.
- The total number of access points (entrance and exits) for the site's buildings. This is typically part of a site floor plan or access diagram.
- Photographs of the site and its surroundings, including an aerial photograph.

4.6.2 Surrounding Context

The surrounding context data collected for the study includes:

- Predominant land-uses within 0.5 mile radius of the site
- A qualitative estimation of connectivity (measure of walking environment)
- Percent of blocks within 0.5 miles with sidewalks
- Distance from Central Business District (CBD)
- Surrounding residential density

- Surrounding employment density
- Area type as defined by ITE
- Transect/Context Zone Type as defined by ITE

Table 4: Connectivity presents the criterion used to measure the level of connectivity for each surveyed site.

Table 4: Connectivity Measure

Connectivity Measure	Description
High	Surrounding areas with small blocks (approx. 200 by 400 feet), compact interconnected street grid, marked crosswalks at every intersection approach, sidewalk on both sides of street, no significant pedestrian barriers, predominantly narrow streets (2-4 lanes), relatively low vehicle speeds.
Medium	Surrounding areas with moderately sized blocks (400 by 600 feet) , crosswalks provided at critical intersections, sidewalks provided on at least one side of the street, predominantly wider streets (4-6 lanes), some pedestrian barriers, and higher vehicle speeds.
Low	Surrounding areas with large blocks (more than 600 feet on a side), crosswalks not provided at intersections, no sidewalk or sidewalk provided on one side of the street with significant gaps, wide streets with multiple travel lanes in each direction (6-8 lanes), higher vehicle speeds, significant pedestrian barriers such as freeways, railroads, drainage channels, etc.
Source: Kimley-Horn and Associates, Inc.	

4.7 General Overview of Data Analysis

The data analysis is comprised of the selection of independent variable(s), determination of a time period for computation of rates, computation of the trip generation rates, and comparison with the ITE trip generation rates. Once enough data has been collected, the process includes a statistical analysis. The steps involved in the data analysis are described below:

1. Selection of Independent Variable(s) for Trip Rate Calculation

   - The independent variable(s) selected for trip rate calculation is consistent with the variable used in the ITE *Trip Generation* manual (7th Edition) for the subject land use category. The minimum independent variable data required for the different land use types are as follows:
     - Gross leasable square footage for the commercial and retail properties
     - Total number of units by bedroom for residential properties

- Total number of staff and number of students at day care centers
- Number of screens at multiplex movie theaters

- Information on independent variable(s) is collected during the preliminary data collection (owner/tenant interview) prior to the collection of traffic data.

2. Determine Time Period for Computation of Rates

- Trip generation rates are typically computed for the "peak hour of adjacent street traffic" as defined by ITE. This is the most common time period published in the ITE *Trip Generation* manual. These periods include the highest one hour of trip generation between 7:00 a.m. and 9:00 a.m. [AM Peak Hour] and the highest one hour of trip generation between 4:00 p.m. and 6:00 p.m. [PM Peak Hour]. For retail sites, instead of morning surveys, mid-day surveys are conducted covering an extended period between 10:00 a.m. and 3:00 p.m. (depending on the site's operating hours). This is to collect data representing the "peak hour of the generator" as defined by ITE (the highest hour of generation of the site regardless of the adjacent street traffic volume).

3. Compute Urban Infill Trip Generation Rates for Peak Hours of Adjacent Street Traffic

The intercept surveys result in two primary pieces of data, 1) the total population for the time period (all pedestrians entering and exiting the building), and 2) the travel mode of persons using the site stated as a proportion of all trips as determined through random sampling. The modes of travel are divided into the following categories:

Automobile Trips

- Drove alone
- Drove with others
- Passenger in car (car parked nearby)
- Passenger (was dropped off)
- Taxi

Transit Trips

- Rail (commuter rail, light rail, trolley)
- Bus

Other

- Bicycle
- Walk
- Other (i.e., scooter)

From this information, the total number of auto trips for the site and time period can be derived. Vehicle trips are the sum of all vehicle related trips (drove alone, passenger, and taxi), and are estimated by applying the applicable mode shares to the highest hour of pedestrian counts in the morning, midday, or afternoon period. Trip generation rates are then derived by dividing the number of auto trips by the gross leasable square footage of the building (or other independent variable). The steps involved in computing the urban infill trip generation rates for peak hours of adjacent street traffic included the following:

- Compute trip generation rate for each site for each time period (AM and PM peak)
- Equation: ∑ Peak Hour Auto Trip Ends / ∑ Independent Variable Units
- The peak hour trip ends were derived from the intercept surveys as described above.
- Determine inbound and outbound percentage for each peak hour
- Equations: Inbound Trip Ends / ∑ (Inbound + Outbound Trip Ends)
- Outbound Trip Ends / ∑ Inbound + Outbound Trip Ends
- Inbound and outbound trip ends were derived from entry counts from the intercept surveys as described above.
- Computing the weighted average trip generation rate. A weighted average trip rate was computed separately for each different land use category.
- Equation: ∑ Trip Ends for All Sites (by land use category) / ∑ Independent Variable Units for All Sites (by land use category)
- Compute standard deviation using standard statistical methods to measure how widely dispersed the data points are around the calculated average. This is performed after sufficient numbers of data points have been obtained.

- Compute the correlation coefficient (R) and coefficient of determination (R^2) using standard statistical methods. This is performed after sufficient numbers of data points have been obtained.
- Develop regression equation (if $R^2 \geq 0.50$)
- Prepare scatter plots of trips versus independent variables.

4. Compare Computed Rates to ITE Rates for Similar Land Use Categories

- The computed urban infill trip generation rates are compared to the ITE published rates for the same land use categories.
- Appendix D presents Working Paper #2 - Site Selection and Data Collection/Analysis Methodology.

4.8 Overview of Surveyed Sites for Expanded Pilot Study

To date, the expanded pilot study includes a total of 10 sites (in addition to the three sites surveyed as part of the initial pilot study previously described) that have been surveyed. Six of these study sites are located in the City of Berkeley, three are located in the City of San Diego, and one is located in the City of Los Angeles. This section describes the sites and their surroundings and summarizes the findings of the trip generation data collection in the expanded pilot study.

4.9 Site Evaluation

Each individual site was evaluated to determine whether it met the criteria established in Section 2.

4.10 Site Overview by Land Use

The study sites surveyed are divided into the residential and non-residential (commercial) land use categories.

4.10.1 Residential Land Use Categories

The residential land use category included mid-rise apartments, mid-rise residential condominiums/townhouses, and high-rise residential condominiums/townhouses. A brief description of the sites surveyed in the expanded pilot study under each category is described below.

Mid-Rise Apartments

All study sites surveyed under the mid-rise apartment category are located in the City of Berkeley. All of these sites are rental apartments. Most of the sites are mixed-use buildings containing commercial businesses on the ground floor. Residential and commercial uses were surveyed separately. It is important to note that a large proportion of the residents surveyed at the six sites are associated with the University of California at Berkeley as either students or employees (about 50%). This does not invalidate the data and, in fact, is representative of university town urban infill development. However, due to the proximity of the sites to the University, the non-auto mode share may be higher than if the sites were not located near the University.

Before and after pictures Bachenheimer Building

1. Bachenheimer Building: The Bachenheimer building is located at 2111 University Avenue, in Berkeley, California. This building has a total of 44 dwelling units—12 1-bedroom and 32 2-bedroom units—and 3,000 square feet of ground floor commercial use. The ground floor commercial is a copy/printing shop. At the time of the survey, the building manager indicated that the residential and the commercial occupancy was 100%. A total of 30 parking spaces are provided within the building. The site location meets both the non-residential and residential density requirements. The Downtown Berkeley BART Station is located within 2.5 blocks (0.17 miles) of the study site, within 1/3 of a mile thereby meeting the transit proximity criteria. Also, AC Transit Routes 51 and 52L are within 300 feet of the site providing 15 minute headways for five hours of the day.
2. Gaia Building: The Gaia building is located at 2116 Allston Way in Berkeley, California. This building has a total of 99 dwelling units—26 1-bedroom and 73 2-bedroom units—and 12,000 square feet of ground floor commercial use. The ground floor commercial is a drinking establishment that provides live entertainment. At the time of the survey, the building manager indicated that the residential occupancy was 99% and the commercial occupancy was 100%. A total of 40 parking spaces are provided within the building. The site location meets the non-residential density requirement. The Downtown Berkeley BART Station is located within 1 block (300 feet) of the study site, meeting the transit proximity criteria. Also, AC Transit Routes 1, 1R, 18, 51, and 52L are within 300 feet of the site providing 15-minute headways for five hours of the day.
3. Acton Courtyard Building: The Acton Courtyard building is located at 1370 University Avenue in Berkeley, California. This building has a total of 71 dwelling units—4 studios, 7 1-bedroom, and 60 2-bedroom units—and 8,000 square feet of ground floor commercial use. The ground

floor commercial is comprised of a sign shop, a piano school, a book store, and a bakery/café. None of these uses, except the café, are among the selected land use categories for this study. The cafe was surveyed. At the time of the survey, the building manager indicated that the residential and the commercial occupancy was 100%. A total of 62 parking spaces are provided within the building. The site location meets the residential density requirement. The Downtown Berkeley BART Station is located about 8 blocks (0.89 miles) away from the study site (more than the 1/3 mile criteria), but AC Transit Routes 51 and 52L are within 300 feet of the site providing 15 minute headways for five hours of the day. These AC Transit Routes 51 and 52L also connect to the BART Station.

4. Touriel Building: The Touriel building is located at 2004 University Avenue, in Berkeley, California. This building has a total of 35 dwelling units (10 1-bedroom and 25 2-bedroom units) with 2,400 square feet of ground floor commercial use. The ground floor commercial is a retail flower shop. At the time of the survey, the building manager indicated that the residential occupancy was 97% and the commercial occupancy was 100%. A total of five parking spaces are provided within the building. The site location meets both the non-residential and residential density requirements. The Downtown Berkeley BART Station is located within 2 blocks (0.17 miles) of the study site, meeting the transit proximity criteria. Also, AC Transit Routes 51 and 52 are within 300 feet of the site providing 15 minute headways for five hours of the day.

Before and after pictures
Touriel Building

5. Berkeleyan Apartments: The Berkeleyan Apartment building is located at 1910 Oxford Street in Berkeley, California. This building has a total of 56 dwelling units—5 1-bedroom and 51 2-bedroom units—with 4,500 square feet of ground floor commercial use. The ground floor commercial use is a non-chain coffee shop. At the time of the survey, the building manager indicated that the residential and the commercial occupancy was 100%. A total of 36 parking spaces are provided within the building. The site location meets both the non-residential and residential density requirements. The Downtown Berkeley BART Station is located within 4 blocks (0.28 miles) of the study site, meeting the transit proximity criteria. Also, AC Transit Route 52L is within 300 feet of the site providing 15 minute headways for five hours of the day.

6. Fine Arts Building: The Fine Arts building is located at 2110 Haste Street, Berkeley, California. This building has a total of 100 dwelling units—4 studios, 32 1-bedroom, and 64 2-bedroom units—with 10,000 square feet of ground floor commercial use. This building has three ground floor commercial units, of which only one commercial unit was occupied. The occupied ground floor commercial use was an architectural design firm and was not surveyed. At the time of the survey, the building manager indicated that the residential occupancy was 100%. A total of 63 parking spaces are provided within the building. The site location meets both the non-residential and residential density requirements. The Downtown Berkeley BART Station is located within six blocks (0.36 miles) of the study site, a little over the 1/3 of a mile transit proximity criteria. However, AC Transit Route 18 is within 300 feet of the site providing 15 minute headways for 5 hours of the day, and connects to the BART Station. AC Transit Routes 1, 1R, and 51 are 600 feet from the study site and these routes also connect to the BART Station.

The following two mid-rise and high-rise condominium/townhouse sites are located in downtown San Diego. They include a mix of rental and owner occupied units.

Mid-Rise Residential Condominiums/Townhouses

7. Atria: The Atria building is located at 101 Market Street in downtown San Diego, California. This building has 4 floors, a total of 149 dwelling units—39 lofts, 21 studios, 58 1-bedroom, and 31 2-bedroom units—with 1,250 square feet of ground floor commercial use. The ground commercial use is a national chain coffee shop, Starbucks. At the time of the survey, the building manager indicated that the residential and commercial occupancy was 100%. A total of 183 parking spaces are provided within the building. The site location meets the non-residential density requirement. The site is within 1/3 of a mile of the San Diego Trolley Gold Route and meets the transit proximity criteria. The site is also within 300 feet of San Diego Metropolitan Transit System (SDMTS) Route 11 which provides 15-minute headways for five hours of the day.

High-Rise Residential Condominiums/Townhouses

8. Horizon: The Horizon building is located at 505 Front Street in downtown San Diego, California. This building has 25 floors, a total of 211 dwelling units—unit count by bedroom is unavailable. There is no ground floor commercial associated with this building. At the time of

the survey, the building manager indicated that the residential occupancy was 100%. A total of 415 parking spaces are provided within the building. The site is within 1/3 of a mile from the San Diego Trolley Gold Route and meets the transit proximity criteria. The site is also within 300 feet of SDMTS Route 11 which provides 15-minute headways for 5 hours of the day.

4.10.2 Non-Residential Categories

The non-residential land use categories surveyed in the expanded pilot study include general office building, supermarket, shopping center (retail), and high-turnover sit-down restaurant. Brief descriptions of the sites surveyed under each of the different non-residential land use categories are described below.

General Office Building

9. Central City Association of Los Angeles (CCALA): The CCALA building is located at 626 Wilshire Boulevard in downtown Los Angeles, California. This building has a total of 138,542 gross leasable square feet of office use and 11,380 square feet of retail uses on the ground floor. The retail use includes a credit union bank, a wine & spirit shop, and a cellular phone store. Surveys were not conducted for the retail uses. At the time of the survey, the building manager indicated that the commercial occupancy was approximately 98%. A total of 136 parking spaces are provided in two parking levels within the building. The site location meets the non-residential density requirement. The site is located within 1/3 mile of the existing Metro Rail Station at 7th Street/Flower Street. It is also within 300 feet of multiple MTA Transit Routes and Metro Rapid Lines which provide 15-minute headways for 5 hours of the day.

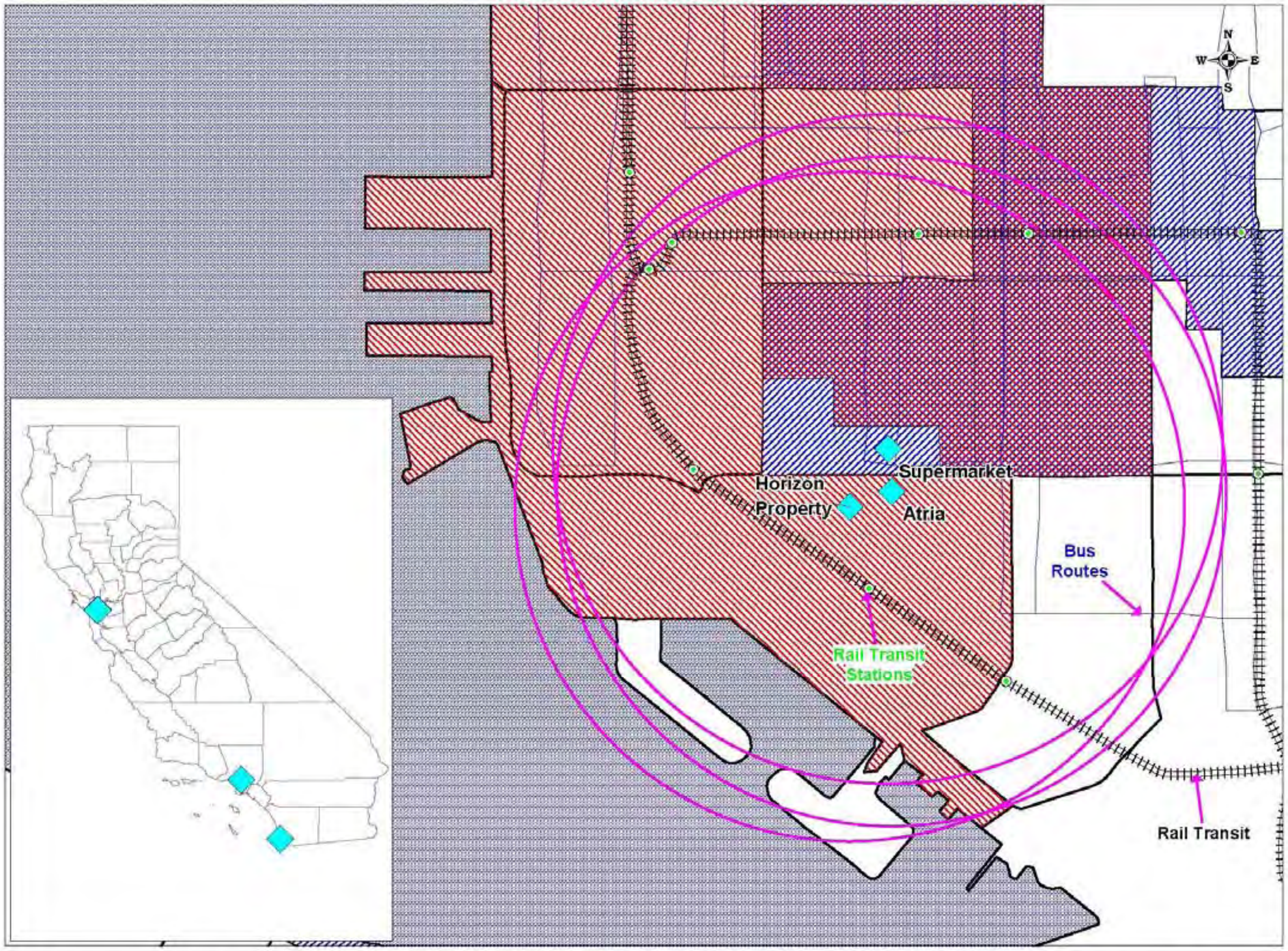
Supermarket

10. Supermarket: The expanded pilot study includes a supermarket located at 101 G Street in downtown San Diego, California. This supermarket has a total of 43,318 gross leasable square feet of commercial space. At the time of the survey, the store manager indicated that the commercial occupancy was 100%. A total of 156 parking spaces are provided on-site. The site location meets the residential density requirement. The site is within 1/3 of a mile from the San Diego Trolley Gold Route meeting the transit proximity criteria. The site is also within 300 feet of SDMTS Route 11 which provides 15-minute headways for 5 hours of the day.

The location of the surveyed sites is shown in Figure 2 (on the following three pages). A one-page summary showing the site characteristics, site description, and comparison of the trip generation rates with published ITE trip rates for each of the studied sites can be found in Appendix E. This appendix contains one-page summaries for each study site which provide an overview of the site's characteristics (floor area, number of units, number of parking spaces), a site description and photograph, an indicator the site's surrounding UIA, how the site surroundings meet the selection criteria, a measure of the pedestrian environment, and a summary of the site's trip generation and mode share data. Appendix F contains additional details for each site.

Figure 2: Location of Surveyed Sites in California

Downtown San Diego Sites

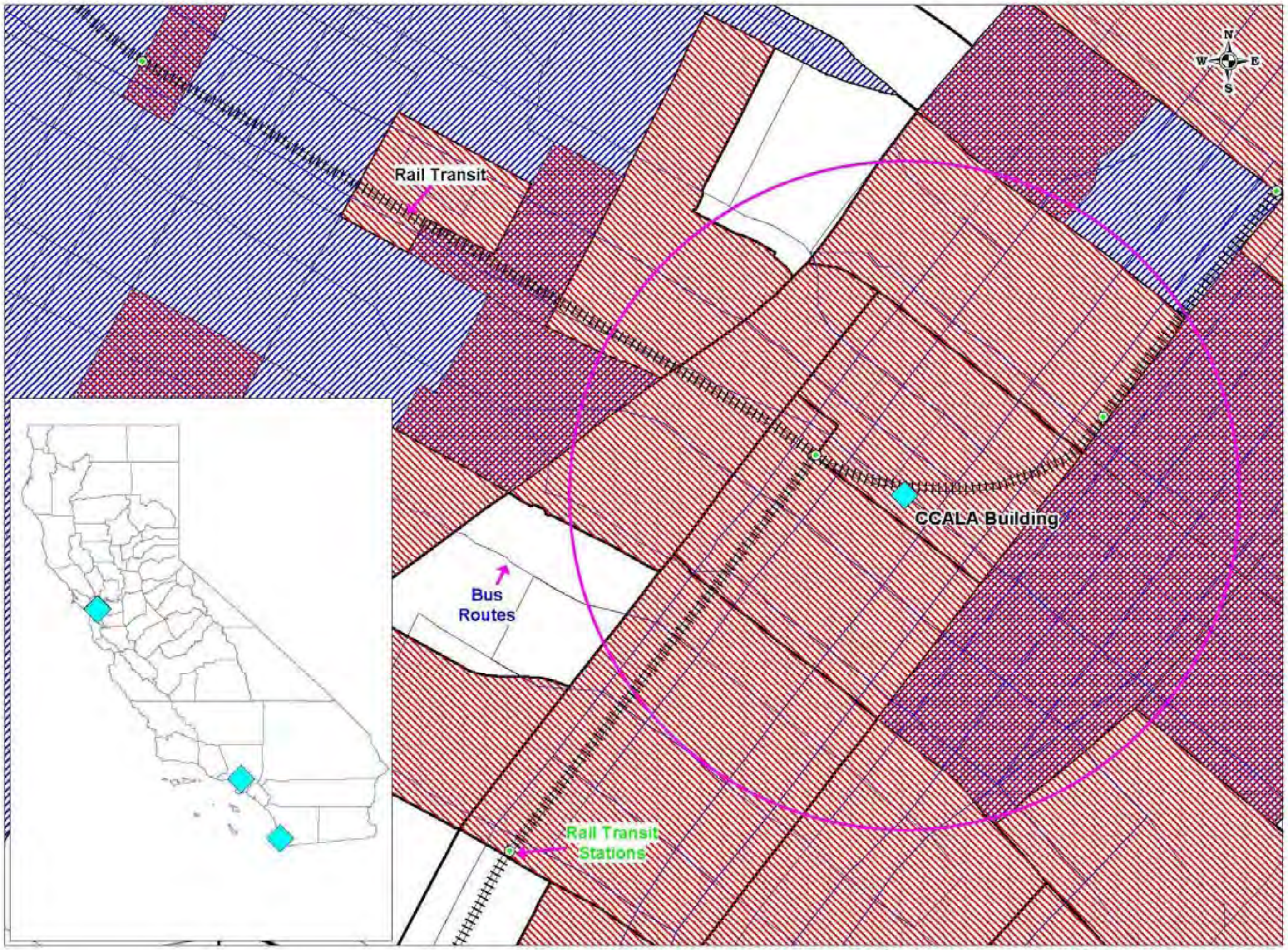


* Block Groups Shown with Red hachure had Year 2000 workers >= 35 per gross land acre; with Blue hachure had Year 2000 DU >= 10 per gross land acre.

Economic & Planning Systems, Inc. One-half mile radii shown around surveyed sites. *P:\14000s\14002abag_infill\Maps\MapInfo\Fig_Final_E5rev.wor*

Figure 2: Location of Surveyed Sites in California (Cont.)

Los Angeles Sites

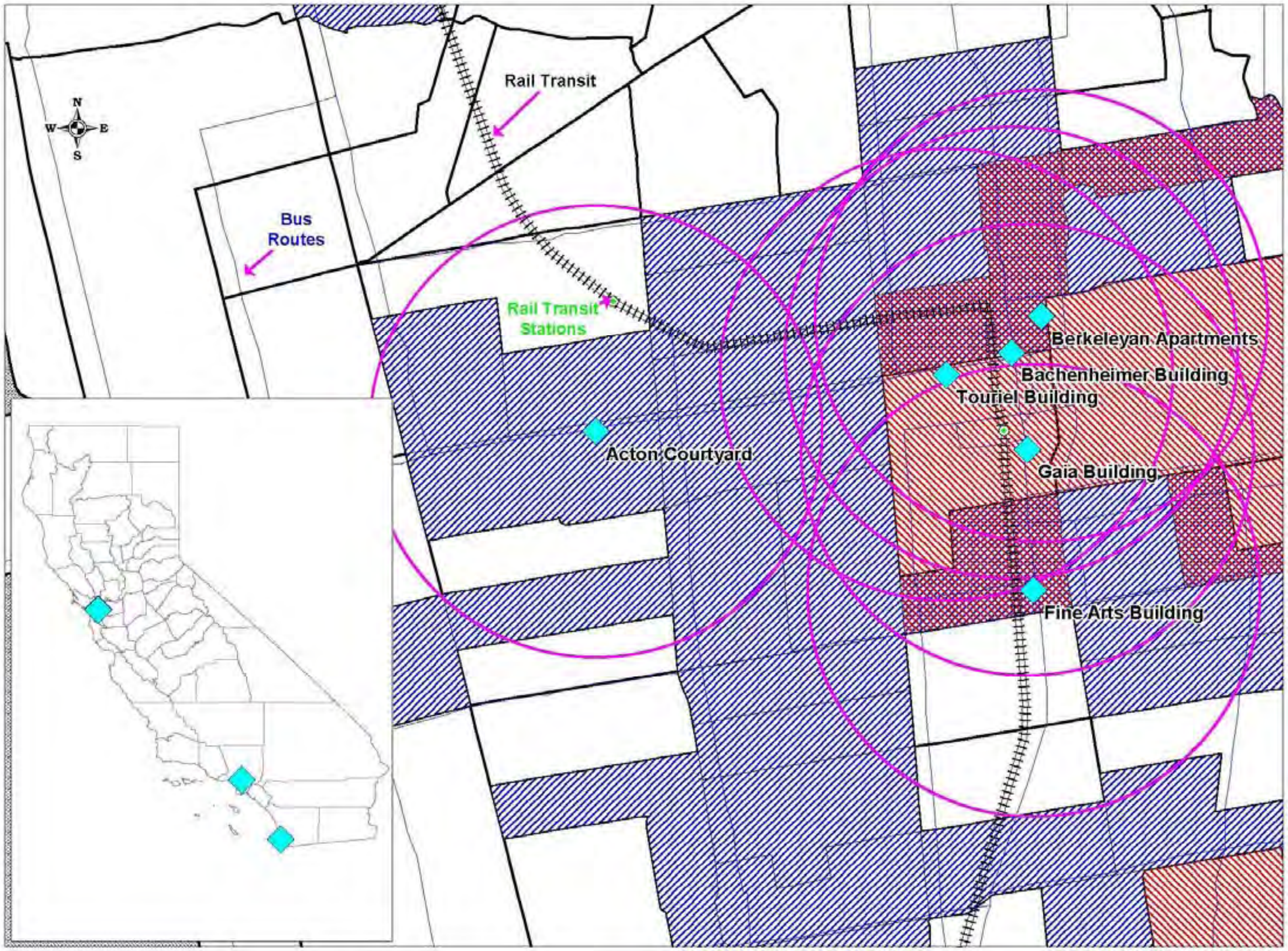


* Block Groups Shown with Red hachure had Year 2000 workers >= 35 per gross land acre; with Blue hachure had Year 2000 DU >= 10 per gross land acre.

Economic & Planning Systems, Inc. One-half mile radii shown around surveyed sites. *P:\14000s\14002abag_infil\Maps\MapInfo\Fig_Final_B5.wor*

Figure 2: Location of Surveyed Sites in California (Cont.)

Berkeley Sites



* Block Groups Shown with Red hachure had Year 2000 workers >= 35 per gross land acre; with Blue hachure had Year 2000 DU >= 10 per gross land acre.

Economic & Planning Systems, Inc. One-half mile radii shown around surveyed sites. *P:\14000s\14002abag_infill\Maps\MapInfo\Fig_Final_A5.wor*

5 Findings

5.1 Overview of Derived Trip Generation Rates by Land Use

The trip generation rates for the sites surveyed to date from both the initial and expanded pilot studies (the observed rates) were derived by estimating the number of vehicle trips (from surveys and pedestrian counts) and dividing these trips by the gross leasable square footage of the building or number of dwelling units. Vehicle trips are the sum of all vehicle related trips (drove alone, passenger, and taxi), and are estimated by applying the applicable mode shares (derived from intercept surveys) to the highest hour of pedestrian counts in either the morning (7:00 – 9:00 a.m.) or afternoon (4:00 – 6:00 p.m.) peak periods.

An overall finding for the limited data collected to date is that the observed trip generation rates for the surveyed sites under different land use categories are generally lower during the morning and afternoon peak hours than comparable ITE trip generation rates. One exception is the supermarket category in which the one site surveyed has observed trip generation rates slightly higher than ITE rates. Also, the observed trip generation rate for residential condominiums/townhouses during the morning peak hour is slightly higher than comparable ITE trip rates.

5.2 Comparison with ITE Trip Generation Rates

Table 5 compares the observed and ITE vehicle trip generation rates for each land use category. It is important to note that this comparison is based on a very small number of sites and surveys (only one site for some categories) and is intended as the beginning of a more comprehensive database.

For residential land use categories, the observed vehicle trip generation rates were lower than ITE trip rates at all locations surveyed during the AM and the PM peak hours, with the exception of the Atria site in San Diego, where the observed AM peak hour trip rate was slightly higher than the standard ITE trip rates. For the surveyed site locations in Berkeley, the observed trip rates were significantly lower than compared to ITE trip rates. As suggested earlier, this may in part be due to the fact that the sites were close to the University of California at Berkeley and the apartment buildings were about 50% occupied by students and employees of the University.

Table 5: Comparison of Derived Trip Rates and ITE Trip Rates

Name	Land Use	Location	AM Peak Hour		PM Peak Hour	
			Observed Trip Rate	ITE Trip Rate (ITE Code)	Observed Trip Rate	ITE Trip Rate (ITE Code)
Residential Land Use						
Bachenheimer Bldg. 1	Mid-Rise Apartments	Berkeley	0.00	0.30 (ITE 223)	0.04	0.39 (ITE 223)
Gaia Building	Mid-Rise Apartments	Berkeley	0.04		0.28	
Acton Courtyard	Mid-Rise Apartments	Berkeley	0.22		0.17	
Touriel Building	Mid-Rise Apartments	Berkeley	0.05		0.15	
Berkeleyan Apartments	Mid-Rise Apartments	Berkeley	0.07		0.09	
Fine Arts Building	Mid-Rise Apartments	Berkeley	0.13		0.13	
Weighted Average of Berkeley Sites			0.10		0.16	
Horizon Property	High-Rise Apartments	San Diego	0.10	0.34 (ITE 232)	0.17	0.38 (ITE 232)
Atria	Mid-Rise Residential Condominiums/ Townhouses	San Diego	0.46	0.44 (ITE 230)	0.41	0.52 (ITE 230)
Weighted Average of San Diego Sites			0.25		0.27	
Weighted Average of All Sites			0.17		0.21	
Non-Residential Land Use						
Supermarket	Supermarket	San Diego	4.66	3.25 (ITE 850)	10.82	10.45 (ITE 850)
CCALA Building	General Office Building	Los Angeles	0.81	1.55 (ITE 710)	0.62	1.49 (ITE 710)
Bachenheimer Bldg. 2	Copy/Printing Shop	Berkeley	n/a	1.03 (ITE 820)	4.00	3.75 (ITE 820)
Touriel Building	Flower Shop	Berkeley	0.83	1.03 (ITE 820)	2.92	3.75 (ITE 820)

Notes:

ITE trip rates from *Trip Generation* manual, 7th Edition, 2004.

ITE average trip rate for 'Peak Hour of Adjacent Street Traffic' was used for comparison.

1. Intercept survey indicated no AM peak hour automobile trips.
2. The copy/printing shop is closed during the AM peak hour.

Figure 3 and Figure 4 provide scatter plots comparing the observed trip rates to ITE trip rates for the AM and the PM peak hour. Further details on the mode of travel observed at these survey sites are presented in the following section.

For the non-residential land use categories surveyed, the derived urban infill trip rates were lower than the standard ITE trip rates at all the locations surveyed during the AM and the PM peak hours, except for the Supermarket in San Diego. For the Supermarket, the derived urban infill trip generation rates were slightly higher than the ITE standard rates during both the AM and the PM peak hour.

The weighted average trip rate of the Berkeley sites (representing an urban university town setting) was observed to be 60 to 66% lower than ITE average rates for mid-rise apartments. This is a substantial difference, and an important finding for the study of residential rental apartments near universities.

The weighted average of the San Diego sites may be more representative of typical urban infill residential sites, but also representative of higher-end development with a mix of moderate to high-income owners and renters. The weighted average trip rate of the San Diego sites is not directly comparable to ITE average rates because the 2 sites are within different land use categories. However, the weighted average of all the sites is lower than any of the ITE average rates.

Some of the surveyed sites contained non-residential land use categories that are not included in the list of priority land use categories for this study. Nevertheless, these locations were also surveyed along with the residential component of the site for future reference. The observed trip generation rates for these land use categories were compared to ITE average trip rates for similar land use categories. Table 6 summarizes the comparison of trips rates for non-selected land uses.

For the non-priority land use categories, the observed trip generation rates were found to be lower than the ITE average trip rates for similar land use categories at all the surveyed sites, except for the ground floor commercial land use at Acton Courtyard (bakery and café) in Berkeley, where the AM peak hour rate was slightly higher than the ITE trip rates.

Figure 3: Comparison Between Derived Trip Rates and ITE Standard Trip Estimates - All Residential Land Use Categories - AM Peak Hour

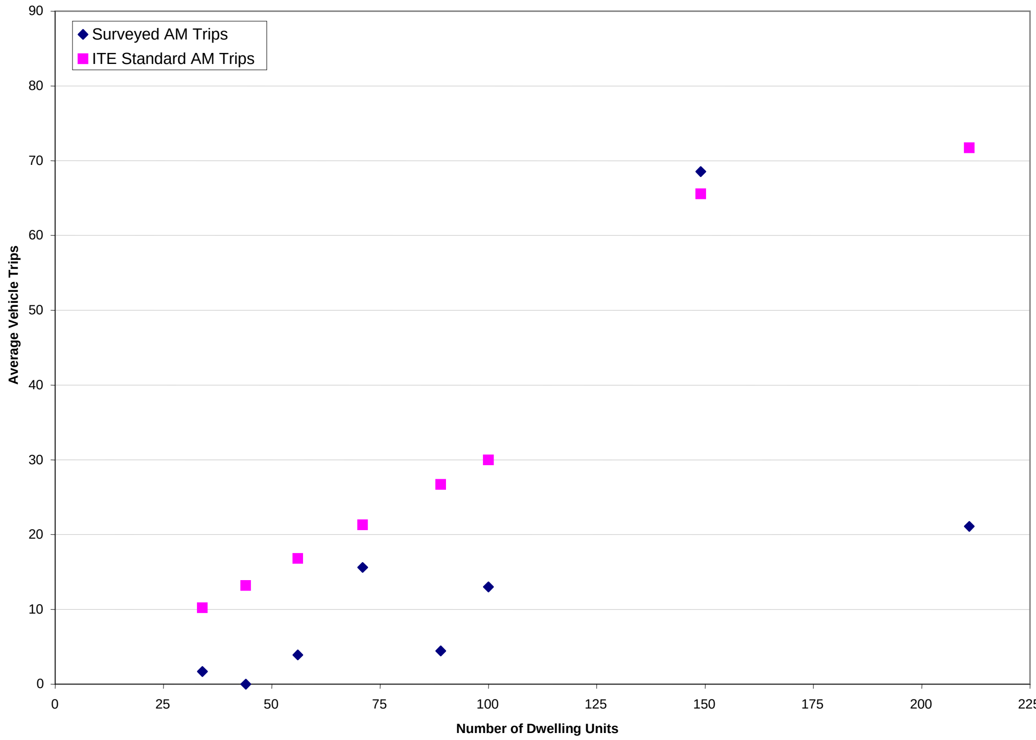


Figure 4: Comparison Between Derived Trip Rates and ITE Standard Trip Estimates All Residential Land Use Categories - PM Peak Hour

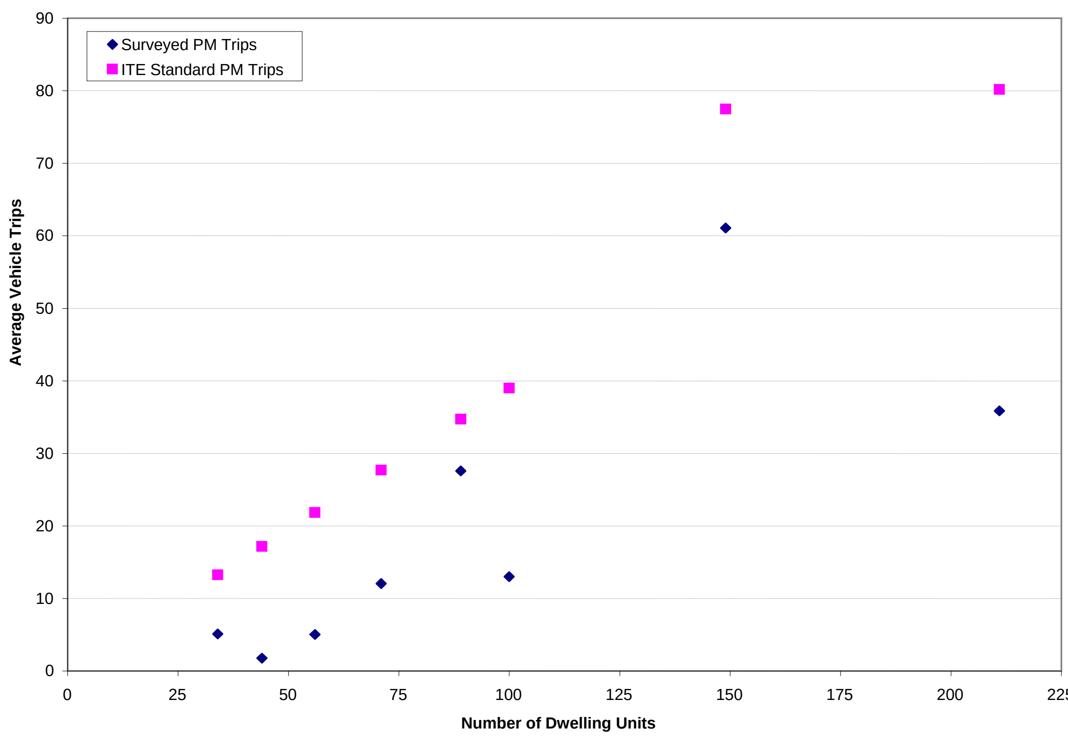


Figure 5 and 6 provide scatter plots comparing the trip generation of the two surveyed office buildings (including the office building surveyed in the pilot study) using the observed and ITE average rates and ITE equations for the AM and PM peak hours.

Table 6: Comparison of Derived Trip Rates and ITE Trip Rates (For Non-Prioritized Land Use Categories)

Name	Commercial Land Use	Location	AM Peak Hour		PM Peak Hour	
			Derived Trip Rate	ITE Trip Rate (ITE Code)	Derived Trip Rate	ITE Trip Rate (ITE Code)
Non-Residential Land Use (not selected for this study)						
Gaia Building [1]	Drinking Place	Berkeley	n/a	0.00 (ITE 936)	0.14	11.34 (ITE 936)
Acton Courtyard	Bakery and Cafe	Berkeley	5.21	4.33 (ITE 933)	8.46	28.00 (ITE 933)
Berkeleyan Apartments [2]	Coffee Shop	Berkeley	17.89	73.03 (ITE 933)	7.85	28.79 (ITE 933)
Atria	Coffee Shop	San Diego	50.80	73.03 (ITE 933)	8.77	28.79 (ITE 933)

Notes:

ITE average trip rates from *Trip Generation* manual, 7th Edition, 2004

ITE average trip rate for 'Peak Hour of Adjacent Street Traffic' was used for comparison.

1. The drinking place was closed in the AM peak hour. Compared to ITE land use code 936 Drinking Place
2. Compared to ITE's coffee shop subcategory under land use code 933 (Fast-Food Restaurant without Drive-Through Window)

Figure 5: Comparison Between Derived Trip Rates and ITE Average and Equation Trip Estimates
ITE 710 – General Office Building – AM Peak Hour

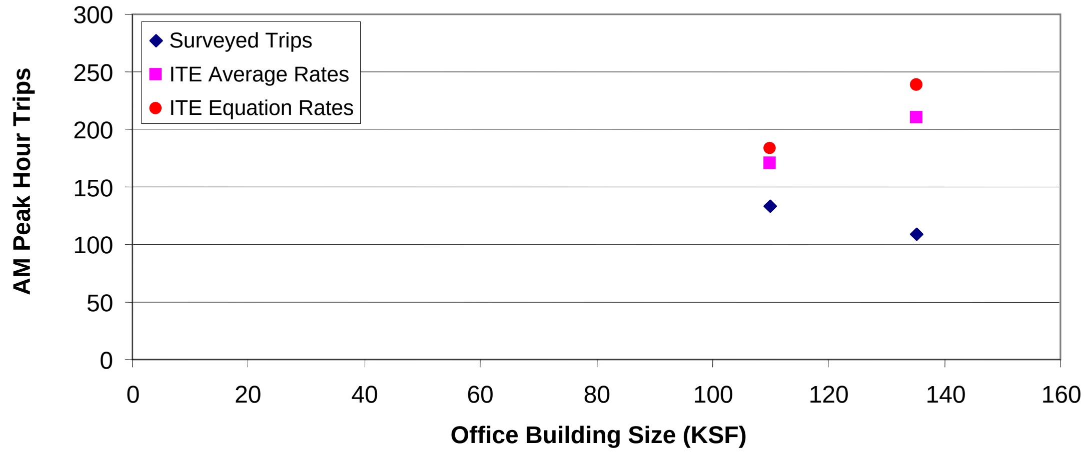
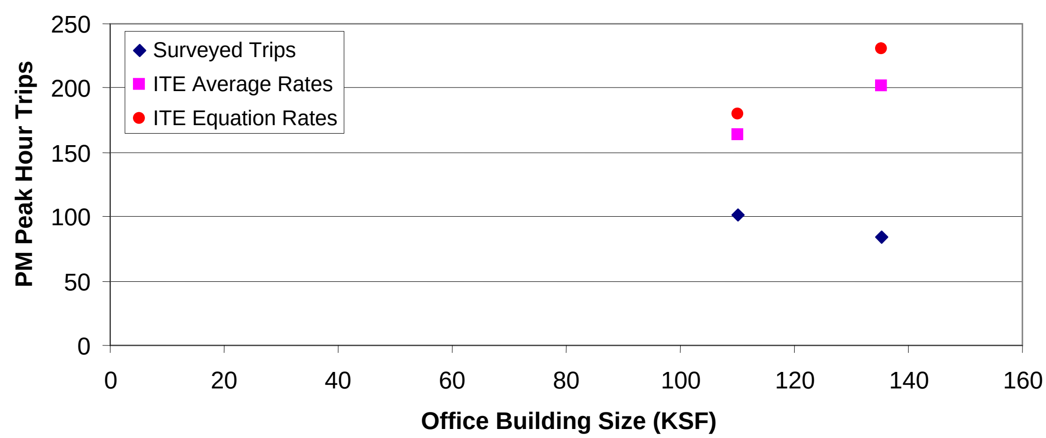


Figure 6: Comparison Between Derived Trip Rates and ITE Average and Equation Trip Estimates
ITE 710 – General Office Building – PM Peak Hour



5.3 Mode of Travel by Land Use

Table 7 summarizes the observed mode of travel by land use and site during the AM and the PM peak hour. For the residential land uses surveyed within the City of Berkeley, the weighted average of percent walk/bicycle trips is approximately 50% in the AM peak hour and 64% in the PM peak hour, indicative of the relationship between these sites and the University. The weighted average of percent transit trips was approximately 23% in the AM peak and 15% in the PM peak hour. Residential land uses in downtown San Diego show higher percentage of auto trips than transit and walk/ bicycle trips, indicating that these residents may commute to areas outside of downtown. However, both San Diego sites have a relatively high walk/bike mode of travel, indicating that the location of these sites is conducive to walking and biking for daily errands.

For the non-residential land uses the following key observations can be made:

- While the CCALA office building in downtown Los Angeles shows that auto trips are the predominant mode of travel (95% in the AM and 77% in the PM peak hour), the observed trip generation rates are nearly half of the ITE average rates. This would indicate that this building generates fewer person trips per 1,000 square feet of built space than a comparably sized building in a suburban environment. This may be due to a lower employee density and an indication that employee density should be identified at future office building sites. However, the transit mode share is very high in the PM peak hour (over 20%). Clearly more data is needed to determine if this finding is a trend among urban office buildings.
- The Supermarket surveyed in downtown San Diego was observed to have a relatively low auto mode of travel (about 50%) and a very high walk/bike mode of travel (about 40%), but the auto trip generation rates are nearly equal to ITE average rates for supermarkets. This would indicate that this supermarket generates many more person trips than a typical suburban supermarket. One would expect that people shopping for groceries would use their vehicle to get groceries home, but the mode share indicates that many people access this supermarket without vehicles, possibly indicating an urban shopping trend of purchasing on a daily basis rather than shopping for an entire week (Also it's the only grocery store available in the downtown San Diego to a large number of residents).

Table 7: Comparison of Mode of Travel by Land Use

Name	Land Use	Location	AM Peak Hour			PM Peak Hour		
			% Auto Trips	% Transit Trips	% Walk / Bicycle Trips	% Auto Trips	% Transit Trips	% Walk / Bicycle Trips
Residential Land Use								
Bachenheimer Bldg.	Mid-Rise Apartments	Berkeley	0%	11%	89%	7%	27%	66%
Gaia Building	Mid-Rise Apartments	Berkeley	20%	7%	73%	24%	5%	71%
Acton Courtyard	Mid-Rise Apartments	Berkeley	57%	29%	14%	35%	30%	35%
Touriel Building	Mid-Rise Apartments	Berkeley	25%	50%	25%	15%	9%	74%
Berkeleyan Apartments	Mid-Rise Apartments	Berkeley	21%	17%	62%	20%	7%	73%
Fine Arts Building	Mid-Rise Apartments	Berkeley	44%	22%	34%	24%	14%	62%
Weighted Average of Berkeley Sites			31%	20%	49%	23%	15%	62%
Horizon Property	High-Rise Apartments	San Diego	77%	3%	20%	73%	7%	20%
Atria	Mid-Rise Residential Condominiu ms / Townhouses	San Diego	85%	2%	13%	69%	0%	31%
Weighted Average of San Diego Sites			80%	3%	17%	71%	4%	25%
Weighted Average of All Sites			54%	12%	34%	46%	10%	44%
Non-Residential Land Use								
Supermarket	Supermarket	San Diego	50%	10%	40%	49%	12%	38%
CCALA Building	General Office Building	Los Angeles	95%	4%	1%	77%	23%	0%
Bachenheimer Bldg. [1]	Copy/Printing Shop	Berkeley	N/A	N/A	N/A	38%	0%	62%
Touriel Building	Flower Shop	Berkeley	100%	0%	0%	100%	0%	0%

- The Berkeley copy/printing shop may be representative of a neighborhood serving or university serving service, as its automobile mode of travel is relatively low.

5.4 Statistical Analysis of Data

A statistical analysis of the data will be conducted as more data points are collected for each land use category.

6 Summary and Conclusion

This chapter provides preliminary conclusions based on this first phase of the research study which can be considered a pilot study for one of the nation's first comprehensive efforts to collect trip generation data for urban infill land uses. As a pilot study (comprised of an initial and expanded pilot), it has been successful in identifying and testing data collection methods and determining ways to resolve challenges, such as promoting participation in the research. The limited amount of data collected has been disappointing, but the lessons learned in this phase of the study have strengthened the knowledge and techniques for continuing data collection in subsequent second phases of this research.

6.1 Key Conclusions

The preliminary data collected and evaluated to date from 13 sites indicate that certain land use categories have lower trip generation characteristics in urban infill contexts than ITE trip generation rates. Clearly, more data points are required for the full set of selected land uses to substantiate this preliminary conclusion and to establish statistical correlations between urban contexts and trip generation characteristics.

6.2 Recommendations for Further Research

Subsequent research should include the following:

- Continue data collection with the goal of developing a larger database that includes at least five data points for up to ten land use categories. This will provide enough data to perform a reasonable statistical analysis and to correlate the data.
- Conduct a pilot study to test a method of collecting average daily traffic data using intercept surveys. Optimally, the pilot study would locate a site with an isolated parking facility that would allow validation of the method using automatic machine counts. This same pilot study could be used to validate the observed peak hour trip generation rates.
- Use the optional demographic data to cross-reference trip generation to income, auto ownership, and other socio-economic factors.
- Develop additional indicators correlating trip generation rates to urban infill characteristics, such as distance to the Central Business District, walking environment, residential densities, number of on-site parking spaces, and distance to transit.

6.3 Policy Implications for California

The results of this research are crucial to California policies related to transportation and land use planning. Evidence that urban infill development generates less traffic than suburban development (currently felt to be true by many practitioners, but not yet proven) can affect a number of state, regional, and local policies including:

- Development and implementation of Traffic Impact Fees under Government Code 66000
- Guidelines for the preparation of Traffic Impact Analyses
- Support for Smart Growth principles integrated into regional and local agency planning
- Development approval processes
- Air quality and conformity analyses

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8 Appendices

A. Working Paper #1 – Selection of Urban Infill Sites

B. Organizations and individuals contacted, and copy of participation solicitation letter

C. Sample intercept survey questionnaires

D. Working Paper #2 - Site Selection and Data Collection/Analysis Methodology

E. Site summaries

F. Additional survey site details

G. Institute of Transportation Engineers Summary of Land Use Categories

H. Excerpts from Institute of Transportation Engineers Trip Generation Handbook (Data Collection Methodologies)

APPENDIX A

Economic & Planning Systems

Public Finance
Real Estate Economics
Regional Economics
Land Use Policy

WORKING PAPER #1
SELECTION OF URBAN INFILL STUDY SITES

Prepared for:

The Association of Bay Area Governments, under
State of California Department of Transportation
Division of Research and Innovation
Agreement Number 65A0188:
Trip Generation Rates for Urban Infill in California

Prepared by:

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EXECUTIVE SUMMARY

Institute of Transportation Engineers (ITE) trip generation rates are the primary source for travel demand analysis of new development throughout the United States, and they are relied upon for IGR/CEQA and local agencies' development impact analyses. These rates were intentionally based on surveys of isolated suburban development with little or no pedestrian, bicycle, or transit accessibility, for ease of data collection.

Despite the vast amount of data collected by ITE over the past decades, the existing trip generation rates are not sufficient to guide the approval of proposed developments in urban areas, because the source of the rates do not reflect variations in density, diversity (land use mix), site design and the multimodal transportation systems of our larger metropolitan areas, which are critical factors on travel demand[1]. In addition, the advent of land use typologies such as "urban infill" and "transit-oriented" development in response to Smart Growth policies in California have led to particular challenges and debate when it comes to travel demand analysis.

As an initial step in the measurement of trip generation from urban infill development, it is necessary to arrive at a clear definition of what constitutes "urban infill" and where such development presently exists. It is also necessary to establish criteria to be used in selection of the actual study sites where measurements will be taken. The purposes of this **Working Paper # 1** are, therefore:

1. To recommend a parametric definition for the term 'Urban Infill' and propose a methodology for identifying Urban Infill Areas (UIAs), and

2. To suggest appropriate land use categories, ranges of development densities and other criteria relevant to the selection of study sites.

Working Paper # 1 begins with a general definition of 'Urban Infill' development and the functional attributes of UIAs, followed by a more focused identification of infill land use types. Finally, methods and criteria for the identification and selection of appropriate infill zones and survey sites across the state of California are provided.

The Project Team has a general consensus that the criteria used in defining "Urban Infill Areas" should be applicable to other studies, and should have potential application to future development patterns, i.e., to projected as well as existing urbanized areas. The Project Team suggested an initial set of working criteria for defining UIAs in the Draft version of this Working Paper. The initial criteria were reviewed by the Technical Advisory Committee (TAC) for this study, and refined and finalized in collaboration with the TAC. As agreed upon by the TAC at its December 20th, 2005 teleconference, the following criteria will be used to select study sites:

[1] Land Use and Site Design – Traveler Response to Transportation System Changes, TRB's Transit Cooperative Research Program (TCRP) Report 95: Chapter 15

1) An Urban Infill Area (UIA) designation may be applied to any site located either:
   a) within a **Central Business District (CBD)**, **Central City, Not Downtown (CND)** or **Suburban Center (SBC) Area**, as defined by the ITE for data collection surveys; or alternatively,
   b) within a **General Urban (T/CZ-4)**, **Urban Center (T/CZ-5)**, or **Urban Core (T/CZ-6) Zone**, as defined in the Proposed Recommended Practice for Context Sensitive Solutions in Designing Major Urban Thoroughfares for Walkable Communities estimated to be published in February 2006 (Appendix E provides characteristics of these context zones),

   which **also** meets all of the other criteria defined immediately below.

2) The UIA must be within 1/3 mile of a site with an existing or future rail transit station, a ferry terminal served by either a bus or rail transit service, an intersection of at least two major bus routes, or within 300 feet of a bus rapid transit corridor. The transit service shall have maximum scheduled headways of 15 minutes for at least 5 hours per day.

3) The UIA can contain no more than 10 percent Vacant Developable Land. Vacant Developable Land as defined excludes water bodies, public rights-of-way, land designated for conservation and public recreation, and any other land designated by local governments' policies or comprehensive plans as unavailable for development. Parking lots on land designated and/or zoned as developable under current policy qualify as Vacant Developable Land.

4) Where residential land uses comprise at least 60 percent of developed land, average residential density shall be at least 10.0 dwelling units per gross acre of residentially developed land.

5) Where nonresidential land uses comprise at least 60 percent of developed land, average nonresidential density shall be a floor area ratio (FAR) of at least 1.0 and/or an employment density of at least 35.0 per gross acre of nonresidential developed land.

6) Where neither residential nor nonresidential uses comprise more than 60 percent of developed land, both residential and nonresidential uses must meet the density and intensity criteria prescribed above.

In adopting the above quantitative criteria as a functional definition for "Urban Infill Area", the Study Team and the TAC are mindful of the need for practical measurements that can be applied to or extracted from data that are readily available across the State of California, and at relatively small-area levels, e.g., the census block group level. Economic & Planning Systems prototyped a map-based or GIS approach to identifying candidate UIAs for this **Working Paper #1** using digital map layers and socioeconomic data that are available nationwide from Federal agencies and information centers. These map layers and data have now been assembled into a functional set covering the State of California, for use with desktop GIS platforms like MapInfo and ArcView, and copies have been made available for use by the Project Team.

Parallel to the identification of the appropriate UIAs, i.e., the 'neighborhoods' or zones within which Urban Infill development conditions pertain, is the need to define appropriate land use types for selecting representative infill sites. The current Study is intended to produce trip generation data for at least ten infill land uses, potentially including apartments, condominiums, office buildings, shopping areas, entertainment sites, restaurants, schools, and other land uses typical of urbanized areas.

The Project Team suggested the land-use selection effort begin with the following criteria:

1) Common urban land use types that are consistent with ITE categories (*Trip Generation* [7th ed.]) and generally reflect a range of uses within residential, office and retail (including entertainment) categories.

2) Land use types for which there is a demand for empirical trip generation data (this would be based on professional knowledge and any information ITE can provide).

3) Land use types for which there is a reasonable propensity for shifting drivers to another mode if the use is located in an urban area. For example, it may be unlikely that patrons would shift from autos to transit or walking if a grocery store is located in an urban area versus a suburban area.

4) Land use types that are considered beneficial to the revitalization of urban areas, but for which current trip generation data may act as a barrier to development approval. These may include types that are considered transit oriented, high density residential, and urban retail uses.

Because parking availability and costs are often of crucial importance to the trips and trip types generated by urban infill sites, consideration in choosing candidate uses was also suggested for those types already represented in ITE's *Parking Generation*.

The Project Team selected a preliminary list of 20 land uses for consideration as appropriate candidates for urban infill trip generation surveys. Preference was given in the initial selection to higher-density residential types, and to nonresidential land uses that are of recurring interest in infill development impact analyses and in application of ITE standards to local transportation demand models. Most, but not all, of the uses in the initial list were among the 91 types represented in the 3rd edition of *Parking Generation.*

In presenting this **Working Paper** for review and comment by the Technical Advisory Committee, the Project Team sought in particular TAC members' discussion and input regarding:

- The suggested definition of UIAs—identifying the requisite attributes of areas from which we will select study sites; and

- The suggested types of land use to study—both in terms of specific site uses and the appropriate priority or weighting of criteria for their selection.

I. INTRODUCTION

As an initial step in the measurement of traffic generation from urban infill development it is necessary to arrive at a clear definition of what constitute "urban infill" development and where such development presently exists. It is also necessary to establish criteria to be used in selection of the actual study sites where measurements will be taken. These are the subjects of this report, **Working Paper #1**.

Working Paper #1 was prepared by Economic & Planning Systems (EPS), in association with Kimley Horn Associates and the Association of Bay Area Governments for review and comment by the Technical Advisory Committee (TAC). Following refinement in response to comments and suggestions, and approval by the TAC, **Working Paper #1** has now been finalized and the Project Team will utilize the agreed-upon definitions and criteria to design and conduct the measurement process.

The purposes of **Working Paper # 1** are:

1) To establish a parametric definition for the term 'Urban Infill' and propose a methodology for identifying UIAs, and

2) To select appropriate land use categories, ranges of development densities and other criteria relevant to the selection of study sites.

The discussion that follows begins with a general definition of 'Urban Infill' development and the functional attributes of UIAs followed by a more focused identification of infill land use types. Finally, methods and criteria for the identification and selection of appropriate infill zones and survey sites across the state of California are provided.

The attached appendices include **Appendix A**, a brief literature review; **Appendix B**, an initial listing of possible locales for urban survey study sites; and **Appendix C**, comprising additional technical background information including a listing of US Census Block Groups in California with high employment and residential densities, a sample parking demand survey form, and a sample of a site characterization checklist. **Appendix D** provides a detailed explanation of the methodology and sources Economic & Planning Systems has applied in a prototype approach to identifying candidate UIAs. Appendix E explains Context Zones, as applied in the Proposed Recommended (ITE) Practice for Context Sensitive Solutions in Designing Major Urban Thoroughfares for Walkable Communities

URBAN INFILL AREAS: CONCEPTS AND DEFINITIONS

The terms "urban" and "infill" are in common usage throughout the disciplines of land use and transportation planning. Planners have an intuitive grasp of what "urban" means, and the concept of "infill" is widely understood to describe the development of new homes, commercial sites, and public facilities on vacant or under-utilized land in existing communities. However, "Urban Infill" is often defined in qualitative terms narrowly relevant to studies addressing economic redevelopment of blighted areas, or as a nebulous concept relevant to broad-brush policies aimed at preventing "leapfrog" development or sprawl within urban limit lines.

It is therefore critical that this current study has a clearer and more applicable definition of "Urban Infill" that is both relevant to surveys of trip generation in California's urban areas and parametric, that is, based on site and site context characteristics that are measurable.

Components of a good working definition of "Urban Infill" are provided by ITE 'Area' definitions for data collection surveys and by Smart Growth concepts of Transect/Context Zones, by U.S. Bureau of the Census criteria for the 2000 Census, and in current California and Florida state laws on urban infill and redevelopment. In the selections from these sources cited immediately below, recommended components for further consideration/consolidation are underlined.

The ITE has established five 'Area' types for the purpose of identifying sites' context. As reported in *Parking Generation* (3rd ed.),
http://trafficincident.org/parkgen/datasubmission.asp
The five Area types are:

Central Business District (CBD): This would be the downtown area of a city. Characteristics would include very good transit service, street grid, parking garages, extensive pedestrian sidewalk network, multi-story buildings and a wide range of land uses (including mixed-use sites). Obvious CBDs would be downtown New York, Chicago or San Francisco. CBDs also exist in smaller cities such as downtown areas of Portland, Maine, or Bakersfield, California.

Central City, Not Downtown (CND): This would be the area outside the downtown area of a larger city (typically cities above 250,000 or more in population). These sites typically exhibit greater land use density than suburban sites but are substantially less density than the CBD. The intent of this area designation is for the areas around large central cities such as Seattle, San Francisco, Oakland, Atlanta or Washington, DC—but not large suburban cities which are addressed separately).

Suburban (SUB): Suburban locations are those outside the central city of a metropolitan area. Characteristics would include limited transit services, surface parking, less than complete pedestrian networks, single story buildings and larger groupings of homogeneous land uses. In smaller metropolitan areas (less than 250,000) the area surrounding the CBD could be characterized as suburban.

Suburban Center (SBC): Suburban center areas are those downtown areas of suburbs that have developed CBD characteristics but are not the central city of a metropolitan region. Characteristics can include good transit service, mix of surface and structured parking, connected streets, connected pedestrian network and a mix of land uses. Examples would include the downtown areas of Bellevue, Washington, Las Colinas, Texas or Walnut Creek, California.

Rural (RUR): Areas outside a metropolitan region (any SMSAs) would be considered rural.

Three of the Area types, **CBD, CND,** and **SBC**, are considered "urban" per *Parking Generation* and provide distinctions which are familiar and intuitive to experienced land use and transportation planners. The **CBD**, **CND** and **SBC** Area types can be usefully included among the components of the desired definition of "urban infill" as necessary (but not sufficient) context conditions.

The limitations of the Area types are two-fold. First, they reflect to some degree the traditional, monocentric city form, with employment-generating land uses concentrated primarily in a Central Business District surrounded by concentric rings of decreasing employment densities and proportionally more residential and rural land. Since the 1980's, urban development in many parts of California and across the nation has seen the decline of CBDs, and the emergence of urban and suburban employment centers outside the CBDs, in trends leading to more polycentric and dispersed urban regions.

In response to these trends, transportation and land use planners have reconceived the traditional 'bull's-eye' CBD concept of urban form and concentric Area types into the more flexible Transect Zone or Context Zone concepts. Transect/Context Zones are being introduced into the current development of *Guidelines for Context Sensitive Solutions for the Design of Major Urban Thoroughfares*, a joint project of the Institute of Transportation Engineers and the Congress for the New Urbanism. The final product of this project will be a Recommended Practice published by ITE (See also Appendix E).

Transect/Context Zones are a systematic set of development-intensity-based codes on a sliding scale ranging from the most rural or undeveloped state to the most urban or developed state. The Transect/Context Zone types established by Duany Plater-Zyberk & Company (DBZ) and in common planning usage are:

Natural (T/CZ-1): Approximating or reverting a wilderness condition, including land unsuitable for settlement because of topography, hydrology or vegetation. Typical Land Uses—Natural preserve, recreation and camping. Typical Buildings—Utility infrastructure and camp buildings.

Rural (T/CZ-2): In an open space or cultivated state or sparsely settled. These areas may include woodland, agricultural lands, grasslands and irrigable deserts. Typical Land Uses—Natural reserve, agriculture, recreation and camping.

Typical Buildings: Utility infrastructure, agricultural buildings and farmhouses, migrant worker housing and campgrounds.

Suburban (T/CZ-3): Conventional low-density residential areas, allowing home occupations. Planting is naturalistic with deep setbacks. Blocks may be large and the roads irregular to accommodate natural conditions. Typical Land Uses—Low-density residential and home occupations. Typical Buildings—Houses and outbuildings.

General Urban (T/CZ-4): Denser and primarily residential urban fabric. Mixed-use sites usually confined to corner locations. Characterized by a wide range of building types: single, side yard, and row houses. Setbacks and landscaping are variable. Streets typically define medium-sized blocks. Typical Land Uses—Medium density residential and home occupations; limited commercial and lodging. Typical Buildings—Houses and outbuildings, side yard houses, townhouses, live/work units, corner stores, inns.

Urban Center (T/CZ-5): 'Main Street' land uses, characterized by building types that Accommodate retail, offices, row houses and apartments. Typically has a tight network of streets, with wide sidewalks, steady street tree planting and buildings set close to the frontages. Typical Land Uses—Medium intensity residential and commercial uses, i.e., retail, offices, lodging, civic facilities. Typical Buildings—Townhouses, apartment houses, live-work units, shop front buildings and office buildings, hotels, churches, schools.

Urban Core (T/CZ-6): 'Downtown' land uses, characterized by the tallest buildings, in the greatest variety, and unique civic buildings in particular. It is the least naturalistic zone type; street trees are steadily planted and sometimes absent. Typical Land Uses—High intensity residential and commercial: retail and offices, lodging, civic buildings. Typical Buildings—High- and medium-rise apartment and office buildings, hotels; townhouses, live-work units, shop fronts, churches, civic buildings.

Special Districts (SD): Areas with buildings and building complexes that by their intrinsic function, disposition, or configuration, cannot conform to any of the other six normative Transect Zones types. Single use areas such as heavy industrial, refineries, airports, hospitals and university campuses.

A 'snapshot' of the current application of Transect zones to guide design principles for urban thoroughfares, by the Institute of Transportation Engineers and the Congress for the New Urbanism, is shown in **Table 1**. More detailed explanations and examples of

Table 1
Transect/Context Zone Characteristics
Selection of Urban Infill Study Sites, EPS #14002

Context Zone	Distinguishing Characteristics	General Character	Building Placement	Frontage Types	Typical Building	Type of Public Open Space
T/CZ-1 Natural	Natural landscape	Natural features	Not applicable	Not applicable	Not applicable	Natural open space
T/CZ-2 Rural	Agricultural with scattered development	Agricultural activity and natural features	Very large setbacks	Not applicable	Not applicable	Agricultural and natural
T/CZ-3 Suburban	Single family residential	Detached houses Landscaped yards Low pedestrian activity	Varying front and side yard setbacks	Lawns, porches, fences, landscaping	1 to 2 story Some 3 story	Parks, greenbelts
T/CZ-4 General Urban	Mix of single and moderate density multifamily residential Commercial separated from residential shopping centers, office parks)	Predominantly detached buildings Large landscaped areas Low pedestrian activity	Shallow to medium front and side yard setback Commercial with parking in front	Porches, fences Landscaped buffer areas Parking lots	2 to 3 story Some taller workplace buildings	Parks, greenbelts
T/CZ-5 Urban Center	Mixed-use High-density multifamily residential with retail, workplace, and civic uses at the community or subregional scale	Predominantly attached buildings Landscaping within the public right of way Substantial pedestrian activity	Small or no setbacks Building oriented to street	Stoops, dooryards. Storefronts, Arcaded walkways	3-to-5 story	Parks, plazas and squares
T/CZ-6 Urban Core	Mixed-use Highest-intensity areas in subregion or region, with high-density residential and workplace uses entertainment, civic and cultural uses	Attached buildings forming continuous street wall Landscaping within the public right of way Highest pedestrian and transit activity	Small or no setbacks Building oriented to street, placed at front property line	Stoops, dooryards, forecourts. Storefronts, Arcaded walkways	4+ story Few lower buildings	Parks, plazas and squares
SD Special Districts	Single use areas such as heavy industrial, refineries, airports, hospitals and university campuses, that by their intrinsic function, disposition, or configuration, cannot conform to any of the other six Transect/Context Zone types					

After: 'Table 3.1 Context Zone Characteristics', in *Context Sensitive Solutions in Designing Major Urban Thoroughfares - 3rd Draft,* August 1, 2005 (page 29); provided by Kimley Horn Associates the Transect concept in applied land use and thoroughfare planning are provided in *SmartCode v 7.0*, by Duany Plater-Zyberk & Company, June 2005: http://www.dpz.com/pdf/SmartCodeV7.0-6-06-05.pdf.

Three of the Transect/Context Zone types, **General Urban (T/CZ-4)**; **Urban Center (T/CZ-5)**; and **Urban Core (T/CZ-6)**, are considered "urban" per the ITE *Context Sensitive Solutions for the Design of Major Urban Thoroughfares* project described above and can be included among the components of the desired definition of "urban infill" in parallel with or as alternatives to the more traditional **CBD**. **CND** and **SBC** Area types.

A second limitation of the Area types, shared in common with the Transect/Context Zone types, is their primarily qualitative descriptions of urban forms and contexts. Densities and types of development and transit, parking, and pedestrian accessibility and levels or service associated with the Area types and Transect/Context Zones have typically been defined in relative terms, e.g., 'Low-', 'Medium-' and 'High-', rather than with parametric measures such as dwelling units/population/jobs per acre; built space coverage and FARs; or transit service headways. Precedents for more quantitative approaches to defining "urban" areas are available, and will now be discussed.

For the 2000 Census, the Census Bureau classified as "urban" all territory, population, and housing units located within an urbanized area (UA) or an urban cluster (UC). UA and UC boundaries were delineated to encompass densely settled territory, which were defined as aggregates of:

- Core census block groups or blocks that had a Year 2000 population density of at least 1,000 people per square mile, and
- Surrounding census blocks that had a Year 2000 overall density of at least 500 people per square mile. In addition, under certain conditions, less densely settled territory could be included as part of each UA or UC.

http://www.census.gov/geo/www/ua/1ua_2k.html

As further documented in the Federal Register Notice for Urban Area Criteria http://www.census.gov/geo/www/ua/uafedreg031502.pdf
(Federal Register / Vol. 67, No. 51 / Friday, March 15, 2002 / Notices):

URBAN AREA CRITERIA FOR CENSUS 2000

As a part of the US Census 2000, definitions for UA and UC were developed. The following criteria apply to the 50 states, the District of Columbia, Puerto Rico, American Samoa, Guam, the Northern Mariana Islands, and the Virgin Islands of the United States.

- For Census 2000, a UA consists of contiguous[2], densely settled census block groups[3] (BGs) and census blocks[4] that meet minimum population density requirements, along with adjacent densely settled census blocks that together encompass a population of at least 50,000 people.

- For Census 2000, a UC consists of contiguous, densely settled census BGs and census blocks that meet minimum population density requirements, along with adjacent densely settled census blocks that together encompass a population of at least 2,500 people, but fewer than 50,000 people.

- All criteria based on land area, population, and population density reflect the information contained in the Census Bureau's Topologically Integrated Geographic Encoding and Referencing (TIGER) database (the Census 2000 TIGER/Line file at the time of initial delineation) and the official Census 2000 redistricting data file (the Public Law 94–171 file at the time of initial delineation).

Census 2000 UAs and UCs for the State of California are listed in **Tables 2** and **3**, and shown in **Figure 1.** It can be seen from the tables and in **Figure 1** that some UAs and UCs are located outside of California counties typically as "urban"; however, most of the census-defined urban regions are found in California counties having reached total populations of at least 400,000 in the year 2000.

While UAs and UCs as defined for the Census 2000 counts generally indicate California regions of interest, they are not sufficient definitions of 'Urban Infill' for the intended purposes of this study. First, the use of population density as the sole selective criterion ignores urban nonresidential land uses of equal interest for trip-generation surveys, and does not address the possible impacts of complimentary mixes of adjacent zoning and development on trip generation. Second, there are no considerations of availability or proximity of parking facilities or transit service.

Finally, census UAs and UCs were intentionally defined to be inclusive. Within UA and UC boundaries, the Census Bureau could and did include "green space" and other islands of vacant or only sparsely developed territory, with "jumps" of up to 2.5 miles separating blocks and block groups that met the threshold population densities of 500 to 1,000 persons per square mile. This means that many neighborhoods and sites within

[2] Contiguity requires at least one point of intersection.

[3] A census block group is a group of census blocks within a census tract whose numbers begin with the same digit; for example, BG 3 within a census tract includes all census blocks numbered from 3000 to 3999.

[4] A census block is an area normally bounded by visible features, such as streets, streams, and railroads, and by nonvisible features, such as the boundary of an incorporated place, minor civil division (MCD), county, or other Census 2000 tabulation entity.

Table 2
Census 2000 Urbanized Areas - California
Selection of Urban Infill Study Sites, EPS #14002

State Code	FIPS Code	Census 2000 Urbanized Area	Population in 2000	Area (sq meters)	Area (sq miles)	Population per sq. mile
06	02683	Antioch	217,591	156,121,048	60.28	3,609.8
06	03574	Atascadero--El Paso de Robles	54,762	79,747,822	30.79	1,778.5
06	04681	Bakersfield	396,125	285,740,955	110.32	3,590.5
06	12754	Camarillo	62,798	55,228,642	21.32	2,945.0
06	16318	Chico	89,221	90,463,755	34.93	2,554.4
06	19504	Concord	552,624	457,017,877	176.45	3,131.8
06	22420	Davis	66,022	35,290,113	13.63	4,845.4
06	26416	El Centro	52,954	42,741,615	16.50	3,208.8
06	28657	Fairfield	112,446	66,862,270	25.82	4,355.7
06	31843	Fresno	554,923	359,030,809	138.62	4,003.1
06	33328	Gilroy--Morgan Hill	84,620	99,185,327	38.30	2,209.6
06	03670	Hanford	69,639	65,966,809	25.47	2,734.2
06	38215	Hemet	117,200	108,290,815	41.81	2,803.1
06	41347	Indio--Cathedral City--Palm Springs	254,856	255,344,357	98.59	2,585.0
06	47611	Lancaster--Palmdale	263,532	234,122,253	90.39	2,915.3
06	50527	Livermore	75,202	54,060,803	20.87	3,602.8
06	50851	Lodi	83,735	60,961,956	23.54	3,557.5
06	51040	Lompoc	55,667	155,667,328	60.10	926.2
06	51445	Los Angeles--Long Beach--Santa Ana	11,789,487	4,319,930,311	1,667.93	7,068.3
06	52984	Madera	58,027	58,572,339	22.61	2,565.9
06	54145	Manteca	51,176	35,247,429	13.61	3,760.4
06	56251	Merced	110,483	93,155,694	35.97	3,071.7
06	57709	Mission Viejo	533,015	354,533,330	136.89	3,893.9
06	58006	Modesto	310,945	222,937,057	86.08	3,612.4
06	61057	Napa	79,867	60,929,170	23.52	3,395.0
06	66673	Oxnard	337,591	196,057,094	75.70	4,459.7
06	68887	Petaluma	59,958	47,840,726	18.47	3,246.0
06	71074	Porterville	60,261	54,639,137	21.10	2,856.5
06	73774	Redding	105,267	182,949,567	70.64	1,490.2
06	75340	Riverside--San Bernardino	1,506,816	1,136,422,783	438.77	3,434.1
06	77068	Sacramento	1,393,498	955,784,543	369.03	3,776.1
06	78310	Salinas	179,173	116,284,529	44.90	3,990.7
06	78661	San Diego	2,674,436	2,026,112,024	782.28	3,418.7
06	78904	San Francisco--Oakland	3,228,605	1,364,031,382	526.65	6,130.4
06	79039	San Jose	1,538,312	673,683,711	260.11	5,914.1
06	79147	San Luis Obispo	53,498	38,415,106	14.83	3,606.9
06	79282	Santa Barbara	196,263	154,823,889	59.78	3,283.2
06	79309	Santa Clarita	170,481	140,721,950	54.33	3,137.7
06	79336	Santa Cruz	157,348	142,196,828	54.90	2,866.0
06	79417	Santa Maria	120,297	92,062,185	35.55	3,384.3
06	79498	Santa Rosa	285,408	264,142,433	101.99	2,798.5
06	80362	Seaside--Monterey--Marina	125,503	105,252,097	40.64	3,088.3
06	82144	Simi Valley	112,345	70,123,206	27.07	4,149.4
06	85087	Stockton	313,392	192,415,050	74.29	4,218.4
06	87004	Temecula--Murrieta	229,810	247,585,114	95.59	2,404.0
06	87490	Thousand Oaks	210,990	223,171,056	86.17	2,448.6
06	88273	Tracy	59,020	33,075,133	12.77	4,621.6
06	89083	Turlock	69,507	48,323,193	18.66	3,725.4
06	89866	Vacaville	90,264	65,598,046	25.33	3,563.9
06	90028	Vallejo	158,967	87,939,538	33.95	4,681.9
06	90541	Victorville--Hesperia--Apple Valley	200,436	321,082,129	123.97	1,616.8
06	90946	Visalia	120,044	103,376,801	39.91	3,007.6
06	92890	Watsonville	66,500	49,512,247	19.12	3,478.6
06	97939	Yuba City	97,645	91,599,143	35.37	2,760.9
06	98020	Yuma, AZ--CA	1,095	3,533,642	1.36	802.6

Sources: U.S. Bureau of the Census, Federal Register Notice November 20, 2002, EPS
http://www.census.gov/geo/www/ua/uaucinfo.html#lists

Table 3
Census 2000 Urban Clusters - California
Selection of Urban Infill Study Sites, EPS #14002

State Code	FIPS Code	Census 2000 Urban Clusters	Population in 2000	Area (sq meters)	Area (sq miles)	Population per sq. mile
06	00523	Adelanto	9,008	9,419,732	3.64	2,476.8
06	01819	Alturas	2,831	5,568,545	2.15	1,316.7
06	02494	Angels City	2,776	5,302,914	2.05	1,355.8
06	02926	Arcata	30,429	49,109,067	18.96	1,604.8
06	03169	Aromas	2,701	11,188,959	4.32	625.2
06	03196	Arroyo Grande--Grover Beach	47,550	47,841,654	18.47	2,574.2
06	03250	Arvin	13,234	10,629,775	4.10	3,224.5
06	04438	Avalon	3,096	3,219,471	1.24	2,490.7
06	04465	Avenal	14,641	6,917,136	2.67	5,482.0
06	05302	Barstow	28,234	39,004,717	15.06	1,874.8
06	05950	Beale AFB	5,112	10,464,053	4.04	1,265.3
06	07435	Bethel Island	2,816	13,765,064	5.31	529.8
06	07516	Big Bear Lake	15,123	31,603,160	12.20	1,239.4
06	07840	Bishop	10,359	19,628,150	7.58	1,366.9
06	08623	Blythe--AZ	11,434	16,860,068	6.51	1,756.5
06	08893	Bonadelle Ranchos-Madera Ranchos	6,249	19,698,898	7.61	821.6
06	09730	Brawley	22,035	14,563,837	5.62	3,918.6
06	11836	Burney	3,239	9,091,092	3.51	922.8
06	12430	Calexico	27,095	15,440,579	5.96	4,544.9
06	12565	California City	7,803	16,801,424	6.49	1,202.9
06	12592	Calipatria	4,095	1,291,602	0.50	8,211.5
06	12646	Calistoga	5,190	6,729,753	2.60	1,997.4
06	12781	Cambria	5,746	8,661,728	3.34	1,718.1
06	13105	Cameron Park	22,066	36,122,122	13.95	1,582.2
06	16696	Chowchilla	7,592	9,893,487	3.82	1,987.5
06	17479	Clearlake	13,873	20,047,341	7.74	1,792.3
06	18181	Cloverdale	7,488	8,087,401	3.12	2,398.0
06	18289	Coalinga	11,724	12,358,842	4.77	2,456.9
06	19342	Colusa	6,066	4,693,428	1.81	3,347.4
06	20044	Corcoran	22,758	14,932,987	5.77	3,947.2
06	20206	Corning	7,671	15,715,378	6.07	1,264.2
06	20584	Cottonwood	4,089	9,737,677	3.76	1,087.6
06	20908	Crescent City	18,812	45,022,944	17.38	1,082.2
06	20989	Crestline	21,531	50,663,833	19.56	1,100.7
06	22987	Delano	39,512	15,360,705	5.93	6,662.2
06	23716	Desert Hot Springs	24,333	30,026,967	11.59	2,098.9
06	24256	Discovery Bay	9,087	8,142,841	3.14	2,890.3
06	24283	Dixon	16,085	11,743,033	4.53	3,547.6
06	24445	Dos Palos	6,327	8,661,531	3.34	1,891.9
06	25579	Earlimart	7,119	5,837,475	2.25	3,158.6
06	26281	Edwards AFB	5,386	20,735,824	8.01	672.7
06	27820	Escalon	6,267	9,842,437	3.80	1,649.1
06	28198	Eureka	43,452	52,637,713	20.32	2,138.0
06	28792	Fairfield Southwest	9,096	10,654,865	4.11	2,211.1
06	29710	Fillmore	13,631	6,035,519	2.33	5,849.4
06	29764	Firebaugh	6,483	7,761,078	3.00	2,163.5
06	30385	Forestville	3,625	8,941,262	3.45	1,050.0
06	30574	Fort Bragg	9,325	13,482,664	5.21	1,791.3
06	30736	Fort Irwin	9,315	220,819,213	85.26	109.3
06	30979	Fortuna	10,483	11,033,854	4.26	2,460.7
06	31492	Frazier Park	3,128	6,757,976	2.61	1,198.8
06	33841	Gonzales	7,695	5,098,755	1.97	3,908.8
06	34597	Grass Valley	34,019	83,899,571	32.39	1,050.2
06	34921	Greenfield	13,220	7,871,005	3.04	4,350.1
06	35677	Gridley	7,512	12,191,498	4.71	1,595.9
06	35839	Guadalupe	5,651	3,709,064	1.43	3,946.0
06	35893	Guerneville	4,990	10,763,923	4.16	1,200.7

Table 3
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State Code	FIPS Code	Census 2000 Urban Clusters	Population in 2000	Area (sq meters)	Area (sq miles)	Population per sq. mile
06	36055	Gustine	4,681	3,101,647	1.20	3,908.8
06	36271	Half Moon Bay	22,037	28,663,482	11.07	1,991.2
06	38188	Helendale	3,980	5,278,093	2.04	1,953.0
06	39025	Hilmar-Irwin	4,573	6,785,052	2.62	1,745.6
06	39511	Hollister	39,923	24,950,663	9.63	4,144.2
06	39619	Holtville	6,727	8,199,327	3.17	2,124.9
06	40834	Huron	6,306	3,071,540	1.19	5,317.4
06	41104	Incline Village-Crystal Bay, NV--CA	9,056	16,462,996	6.36	1,424.7
06	41509	Ione	7,058	6,742,234	2.60	2,711.3
06	41968	Ivanhoe	4,474	5,199,630	2.01	2,228.5
06	42049	Jackson	6,227	10,263,370	3.96	1,571.4
06	44290	Kelseyville	2,534	2,598,056	1.00	2,526.1
06	44587	Kerman	8,539	3,335,458	1.29	6,630.5
06	45073	King City	12,054	6,774,198	2.62	4,608.6
06	46774	Lake Isabella	3,727	8,925,286	3.45	1,081.5
06	46855	Lake Los Angeles	11,181	17,382,327	6.71	1,666.0
06	46963	Lake of the Pines	6,323	12,955,095	5.00	1,264.1
06	47071	Lakeport	10,883	25,162,589	9.72	1,120.2
06	47233	Lake Wildwood	6,527	16,537,417	6.39	1,022.2
06	49042	Lemoore Station	5,749	5,098,606	1.97	2,920.4
06	49879	Lincoln	10,230	7,471,239	2.88	3,546.3
06	50041	Lindsay	12,644	16,157,966	6.24	2,026.7
06	50473	Live Oak (Sutter County)	6,471	5,598,680	2.16	2,993.5
06	50581	Livingston	11,014	11,300,577	4.36	2,524.3
06	51472	Los Banos	26,036	24,408,913	9.42	2,762.6
06	51931	Lucerne	5,035	7,414,605	2.86	1,758.8
06	52552	McFarland	10,071	10,144,305	3.92	2,571.3
06	53605	Mammoth Lakes	5,800	6,520,662	2.52	2,303.7
06	55927	Mecca	6,589	6,555,740	2.53	2,603.1
06	56170	Mendota	7,870	3,910,671	1.51	5,212.2
06	58276	Mono Vista	10,733	29,636,292	11.44	938.0
06	59437	Morro Bay	26,960	42,342,783	16.35	1,649.1
06	60220	Mount Shasta	5,352	13,927,791	5.38	995.2
06	61435	Needles--AZ	3,987	7,682,871	2.97	1,344.1
06	62569	Newman	7,408	10,983,389	4.24	1,746.9
06	64270	Oakdale	17,946	25,050,664	9.67	1,855.4
06	64432	Oakhurst	2,501	7,646,910	2.95	847.1
06	65377	One Hundred Palms	2,924	6,810,545	2.63	1,112.0
06	65755	Orange Cove	7,720	3,580,913	1.38	5,583.7
06	65836	Orland	7,575	13,948,583	5.39	1,406.5
06	65917	Orosi	12,917	12,447,480	4.81	2,687.7
06	65944	Oroville	34,474	57,433,078	22.17	1,554.6
06	67375	Paradise	35,274	70,389,537	27.18	1,297.9
06	67753	Parlier	11,138	3,676,528	1.42	7,846.3
06	67861	Patterson	12,121	15,315,869	5.91	2,049.7
06	69805	Pixley	2,831	3,901,876	1.51	1,879.2
06	69832	Placerville	27,108	62,483,734	24.13	1,123.6
06	70021	Planada	4,138	2,579,268	1.00	4,155.2
06	71398	Portola	2,626	3,350,372	1.29	2,030.0
06	73288	Ramona	22,954	45,114,125	17.42	1,317.8
06	73315	Rancho Calaveras	4,142	12,507,810	4.83	857.7
06	73342	Rancho Murieta	2,634	4,373,234	1.69	1,560.0
06	73720	Red Bluff	17,633	31,544,651	12.18	1,447.8
06	74044	Reedley--Dinuba	38,662	24,841,550	9.59	4,030.9
06	74449	Richgrove	2,728	3,151,808	1.22	2,241.7
06	74827	Ridgecrest	27,274	43,220,939	16.69	1,634.4
06	75043	Rio Dell	3,763	4,012,704	1.55	2,428.8
06	75097	Rio Vista	4,064	7,160,624	2.76	1,469.9
06	76285	Rosamond	12,077	16,902,241	6.53	1,850.6
06	76717	Running Springs	4,941	7,451,930	2.88	1,717.3
06	77500	St. Helena	6,793	15,077,189	5.82	1,166.9
06	78931	Sanger	20,541	12,035,422	4.65	4,420.4
06	79012	San Joaquin	3,678	4,265,037	1.65	2,233.5
06	79444	Santa Paula	29,070	10,953,006	4.23	6,874.0

Table 3
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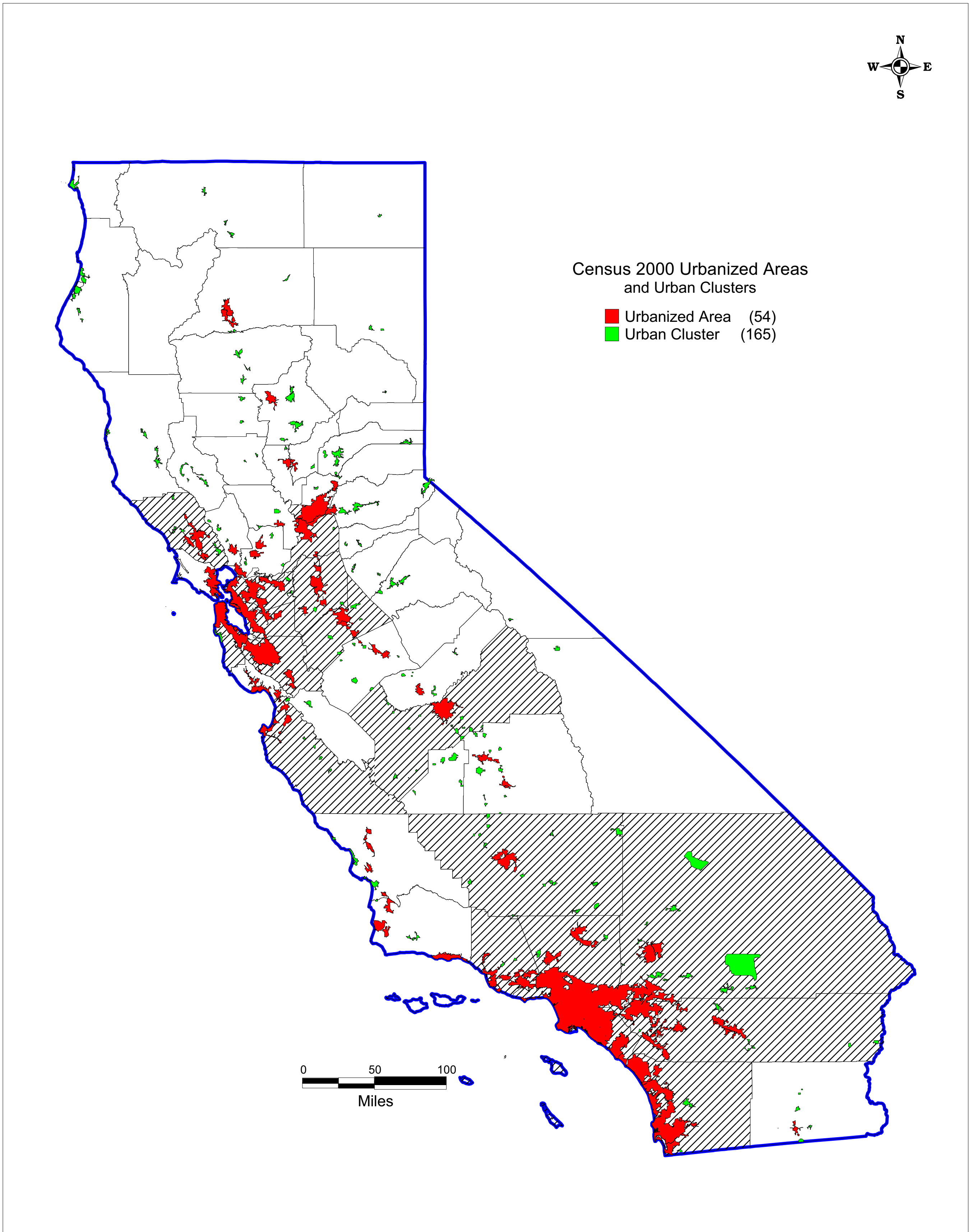
Selection of Urban Infill Study Sites, EPS #14002

State Code	FIPS Code	Census 2000 Urban Clusters	Population in 2000	Area (sq meters)	Area (sq miles)	Population per sq. mile
06	80551	Selma	34,716	31,661,981	12.22	2,839.8
06	80929	Shafter	13,668	10,460,473	4.04	3,384.2
06	82846	Soledad	11,524	5,948,150	2.30	5,017.9
06	82873	Solvang--Buellton	14,521	26,878,570	10.38	1,399.2
06	83008	Sonoma	31,487	33,093,624	12.78	2,464.2
06	83035	Sonora	14,300	36,750,505	14.19	1,007.8
06	83305	South Lake Tahoe--NV	31,705	47,681,206	18.41	1,722.2
06	85870	Susanville	9,430	11,131,012	4.30	2,194.2
06	86329	Taft	13,302	14,302,810	5.52	2,408.8
06	86869	Tehachapi	12,990	20,797,744	8.03	1,617.7
06	86923	Tehama	3,261	5,831,195	2.25	1,448.4
06	87031	Temescal Valley	4,897	4,236,302	1.64	2,993.9
06	87112	Terra Bella	3,430	3,649,733	1.41	2,434.1
06	87274	Thermal	3,239	6,596,159	2.55	1,271.8
06	88624	Truckee	8,018	23,700,433	9.15	876.2
06	88840	Tulare	47,294	42,512,151	16.41	2,881.3
06	89191	Twentynine Palms	12,496	24,136,412	9.32	1,340.9
06	89218	Twentynine Palms Base	14,090	707,875,475	273.31	51.6
06	89380	Ukiah	28,871	39,710,238	15.33	1,883.0
06	90109	Val Verde	18,752	25,209,301	9.73	1,926.6
06	92161	Wasco	14,986	6,522,215	2.52	5,951.0
06	92539	Waterford	7,016	3,873,893	1.50	4,690.7
06	93538	Weed	2,865	6,380,158	2.46	1,163.0
06	95374	Williams	3,537	2,436,864	0.94	3,759.3
06	95671	Willits	8,053	18,475,908	7.13	1,128.9
06	95725	Willows	7,410	8,244,106	3.18	2,327.9
06	96724	Winters	6,496	7,465,679	2.88	2,253.6
06	96967	Woodlake	6,895	7,228,367	2.79	2,470.5
06	96994	Woodland	49,168	22,552,879	8.71	5,646.5
06	97372	Wrightwood	3,705	3,399,553	1.31	2,822.7
06	97885	Yountville	2,916	4,217,385	1.63	1,790.8
06	97912	Yreka	7,327	13,157,477	5.08	1,442.3
06	97966	Yucca Valley	18,992	46,018,144	17.77	1,068.9

Sources: U.S. Bureau of the Census, Federal Register Notice November 20, 2002, EPS
http://www.census.gov/geo/www/ua/uaucinfo.html#lists

Figure 1:
Census 2000 Urbanized Areas and Urban Clusters - California



Shaded counties had Year 2000 total populations greater than 400,000.

Economic & Planning Systems, Inc. *P:\14000s\14002abag_infil\Maps\MapInfo\Fig_WRKP_1_01.wor* established UAs and UCs, evaluated in isolation, would not be considered as having "urban" levels of development. By simple extension, such neighborhoods and sites would generally not be good prospects for studies of "Urban Infill" trip generation.

Fortunately, recent legislation passed in the states of California and Florida provides several additional concepts and potential criteria for enhancing the definition of "urban" in ways directly relevant to infill development and transportation impacts.

California Senate Bill (SB) 1636 (Figueroa) was sponsored by the Surface Transportation Policy Project and signed in to law on September 12, 2002. California Government Code Section 65088.1 now reads:

> (g) "Infill opportunity zone" means a specific area designated by a city or county, pursuant to subdivision (c) of Section 65088.4, zoned for new compact residential or mixed use development within one-third mile of a site with an existing or future rail transit station, a ferry terminal served by either a bus or rail transit service, an intersection of at least two major bus routes, or within 300 feet of a bus rapid transit corridor, in counties with a population over 400,000. The mixed use development zoning shall consist of three or more land uses that facilitate significant human interaction in close proximity, with residential use as the primary land use supported by other land uses such as office, hotel, health care, hospital, entertainment, restaurant, retail, and service uses. The transit service shall have maximum scheduled headways of 15 minutes for at least 5 hours per day. A qualifying future rail station shall have broken ground on construction of the station and programmed operational funds to provide maximum scheduled headways of 15 minutes for at least 5 hours per day.

The State of Florida has also adopted policy legislation and government codes providing useful criteria for consideration. While the Florida Growth Policy Act's focus on socio-economic blighted areas is too restrictive to the intent of the proposed California trip generation surveys, the requirements for existing public services and infrastructure and proximity to established transit service are relevant:

> Florida 163.2514 Growth Policy Act; definitions (as used in ss. 163.2511-163.2526):
>
> "Local government" means any county or municipality.
>
> (2) "Urban infill and redevelopment area" means an area or areas designated by a local government where:
>
> (a) Public services such as water and wastewater, transportation, schools, and recreation are already available or are scheduled to be provided in an adopted 5-year schedule of capital improvements;

(b) The area, or one or more neighborhoods within the area, suffers from pervasive poverty, unemployment, and general distress as defined by s. 290.0058;

(c) The area exhibits a proportion of properties that are substandard, overcrowded, dilapidated, vacant or abandoned, or functionally obsolete which is higher than the average for the local government;

(d) More than 50 percent of the area is within 1/4 mile of a transit stop, or a sufficient number of such transit stops will be made available concurrent with the designation; and

(e) The area includes or is adjacent to community redevelopment areas, brown fields, enterprise zones, or Main Street programs, or has been designated by the state or Federal Government as an urban redevelopment, revitalization, or infill area under empowerment zone, enterprise community, or Brownfield showcase community programs or similar programs.

In addition, Florida administrative codes supply clear examples for the specification of threshold limits of 'floor' density levels for both residential and nonresidential development appropriate to Urban Infill designations.

VACANT LAND AND DENSITY AND INTENSITY REQUIREMENTS

Florida Administrative Code 9J-5.0055 Section (6) sets forth the following requirements:

If an area is delineated for urban infill development in the comprehensive plan, it must meet the following vacant land and density and intensity requirements:

- The area cannot contain more than 10 percent vacant developable land. This vacant developable land must exclude water bodies, land designated for conservation, public rights-of-way, public recreation and any other land designated in the local government's comprehensive plan as unavailable for development.
- For areas where residential land uses compose at least 60 percent of the developed land, the average residential density shall be at least five dwelling units per acre.
- For areas where nonresidential land uses compose at least 60 percent of the developed land, the average nonresidential density shall be at least a FAR of 1.0 per gross nonresidentially developed acre of land.

- <u>If neither residential nor nonresidential uses compose more than 60 percent of the developed land, both must meet the density and intensity criteria prescribed above</u>.

II. SUGGESTED (PRELIMINARY) URBAN INFILL AREA CRITERIA

The Project Team has a general consensus that the criteria used in defining "Urban Infill Areas" should be quantitative in nature, be applicable to other studies, and have potential application to future development patterns, i.e., to projected as well as existing urbanized areas. , EPS prepared a set of initial working criteria of "Urban Infill Areas" which combined and revised the components indicated above for further discussion and refinement by the Project Team and the Technical Advisory Committee (TAC). The initial criteria were reviewed by the TAC, and refined and finalized in collaboration with its members. As agreed upon by the TAC at its December 20th, 2005 teleconference, the following criteria will be used to select study sites:

1) An Urban Infill Area (UIA) designation may be applied to any site located either:

   a) within a **CBD**, **CND** or **SBC Area**, as defined by the ITE for data collection surveys; or alternatively,

   b) within a **General Urban (T/CZ-4)**, **Urban Center (T/CZ-5)**, or **Urban Core (T/CZ-6) Zone**, as defined in the Proposed Recommended Practice for Context Sensitive Solutions in Designing Major Urban Thoroughfares for Walkable Communities estimated to be published in February 2006 (Appendix E provides characteristics of these context zones),

   which **<u>also</u>** meets all of the other criteria defined immediately below.

2) The UIA must be within 1/3 mile of a site with an existing or future rail transit station, a ferry terminal served by either a bus or rail transit service, an intersection of at least two major bus routes, or within 300 feet of a bus rapid transit corridor. The transit service shall have maximum scheduled headways of 15 minutes for at least 5 hours per day.

3) The UIA can contain no more than 10 percent Vacant Developable Land. Vacant Developable Land as defined excludes water bodies, public rights-of-way, land designated for conservation and public recreation, and any other land designated by local governments' policies or comprehensive plans as <u>unavailable</u> for development. Parking lots on land designated and/or zoned as developable under current policy qualify as Vacant Developable Land.

4) Where residential land uses comprise at least 60 percent of developed land, average residential density shall be at least 10.0 dwelling units per gross acre of residentially developed land.

5) Where nonresidential land uses comprise at least 60 percent of developed land, average nonresidential density shall be a FAR of at least 1.0 and/or an employment density of at least [35.0] per gross acre of nonresidential developed land.

6) Where neither residential nor nonresidential uses comprise more than [60] percent of developed land, both residential and nonresidential uses must meet the density and intensity criteria prescribed above.

All six criteria are proposed for practical application by this Study's researchers in identifying and documenting UIAs. However, it is possible and even likely that traffic engineers and other practitioners seeking to apply the urban infill trip rates developed during this and other studies will want and need fewer and simpler criteria. UIA Criteria **1** and **2,** which require compliance with widely recognized thresholds for urban development and transit access and levels of service, may be sufficient for many future users and applications. The practical need for the more restrictive UIA Criteria **4** through **6** in future applications will be evaluated as the Study progresses to site selection, survey and analysis.

The final criteria have been made as simple and as clear as possible, to encourage appropriate and accurate application of resulting survey data and derived trip generation rates. At the same time, the final criteria are intended as definitive and unambiguous, to prevent uncertainty in determining whether specific sites do or do not qualify as "urban infill" development.

In collaboration with the TAC, the Project Team may subsequently include or substitute specific qualitative attributes as complements and/or replacements for one or more of the quantitative criteria. As a practical consideration, the Team and the TAC will understand the crucial equilibrium that must be maintained between flexibility and ease of application on the one hand, and the economic and fiscal pressures that can encourage 'gaming behavior' by urban developers, planners and public works directors on the other.

The choice of trip generation rates can determine the approval or non-approval of proposed urban developments, and frequently determine the nature and scale of required mitigations and traffic impact fees. To the extent specific qualitative attributes are not definitive and unambiguous identifiers of UIAs, and there are potential regulatory and economic benefits to developments proposed as "urban infill", there may be understandable economic pressures on prospective developers to 'push the envelope' and equally understandable fiscal and financial pressures on local jurisdictions to 'constrain the envelope'. It is hoped the end products of this current Study will facilitate the creation of a common basis for analysis and modeling by all parties interested in urban infill developments.

A map-based or GIS approach to identifying candidate UIAs is consistent with current research such as that described in *Using the Internet to Envision Neighborhoods with Transit-Oriented Development Potential* , a June 2002 publication of the Mineta Transportation Institute. EPS prototyped a map-based approach to identifying candidate UIAs for this **Working Paper**, using digital map layers and socioeconomic data that are available nationwide from Federal agencies and information centers. The following section presents this approach in summary overview; a more detailed explanation of the methodology and sources is provided as **Appendix D**.

Census 2000 definitions of urbanized areas depend upon population density only; this is not an oversight but a known area of weakness that generated much comment and discussion in the run-up to the publication of the actual census counts. Census 2000 Journey-to-Work data, as distributed in the Census Transportation Planning Package (CTPP 2000) Part 2 tables, include both employment-by-industry and -by-occupation estimates down to the census Block Group (BG) level for the entire State of California. The CTPP occupational and industrial categories are shown in **Table 4**. The CTPP employment data, in combination with population and housing counts and geographic information available from Census 2000 Summary Files 1 and 3 (SF1 and SF3), can be used to identify Block Groups that meet proposed Urban Infill Area (UIA) development density threshold criteria.

Using threshold filters to limit Block Group selection to those BGs which had (at the beginning of the year 2000) residential development densities of at least 10 housing units per land acre, **OR**, employment densities of at least 35 jobs per land acre, subsets of 2,325 **OR** 298 BGs (of a possible 22,100 California Block Groups) can be identified, as shown in **Figures 2H and 2E.** If we combine the threshold filters, to select those BGs which have both high-density residential and nonresidential development, with circa 2000 residential development densities of at least 10 housing units per land acre and employment densities of at least 35 jobs per land acre, a subset of 135 BGs is identified, as shown in **Figure 2X.**

A complete listing of these 135 mixed-development Block Groups, including County and Census Place of location, land area, Year 2000 population, housing and worker counts and population and employment densities per gross land acre is provided as **Appendix C Table 1**. The furthest column on the right in this table contains hyperlinks to Google Maps. If the reader is viewing this table on a computer with a web browser and an active internet connection, clicking on the hyperlink for any of the BGs in the table will open the browser and show a high-resolution aerial/satellite and road map view of the BG's urban context. Using the Google Maps search tools, the reader can easily 'bring up' many of the land uses being considered for trip-generation analysis.

The adopted density criteria or filter values (Block Groups having 10 or more housing units per land acre or 35 or more jobs per land acre in the year 2000) were chosen in a collaborative effort among Project Team members and the TAC. Many alternative threshold densities are suggested in the planning literature, however.

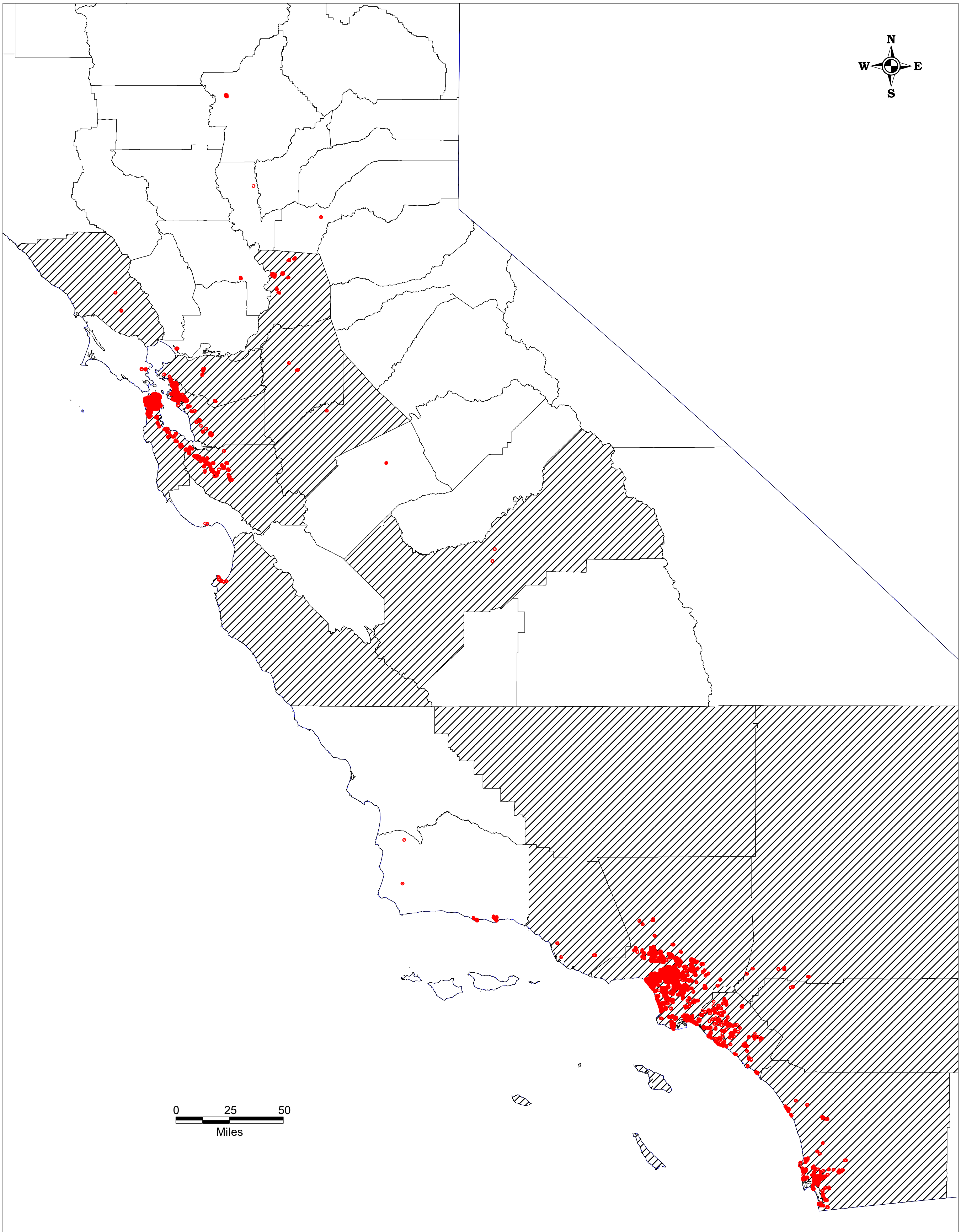
Table 4
Census 2000 Occupation and Industry Categories
Selection of Urban Infill Study Sites, EPS #14002

Occupation Code	Occupation
1	Total Occupation
2	Management
3	Farmers and farm managers
4	Business and financial operations specialists
5	Computer and mathematical
6	Architecture and engineering
7	Life, physical, and social science
8	Community and social service
9	Legal
10	Education, training, and library
11	Arts, design, entertainment, sports, and media
12	Healthcare practitioners and technicians
13	Healthcare support
14	Protective service
15	Food preparation and serving related
16	Building and grounds cleaning and maintenance
17	Personal care and service
18	Sales and related
19	Office and administrative support
20	Farming, fishing, and forestry
21	Construction and excavation
22	Installation, maintenance, and repair
23	Production
24	Transportation and material moving
25	Armed Forces

Industry Code	Industry
1	Total Industry
2	Agriculture, forestry, fishing and hunting, and mining
3	Construction
4	Manufacturing
5	Wholesale trade
6	Retail trade
7	Transportation and warehousing, and utilities
8	Information
9	Finance, insurance, real estate and rental and leasing
10	Professional, scientific, management, administrative, and waste management services
11	Educational, health and social services
12	Arts, entertainment, recreation, accommodation and food services
13	Other services (except public administration)
14	Public administration
15	Armed forces

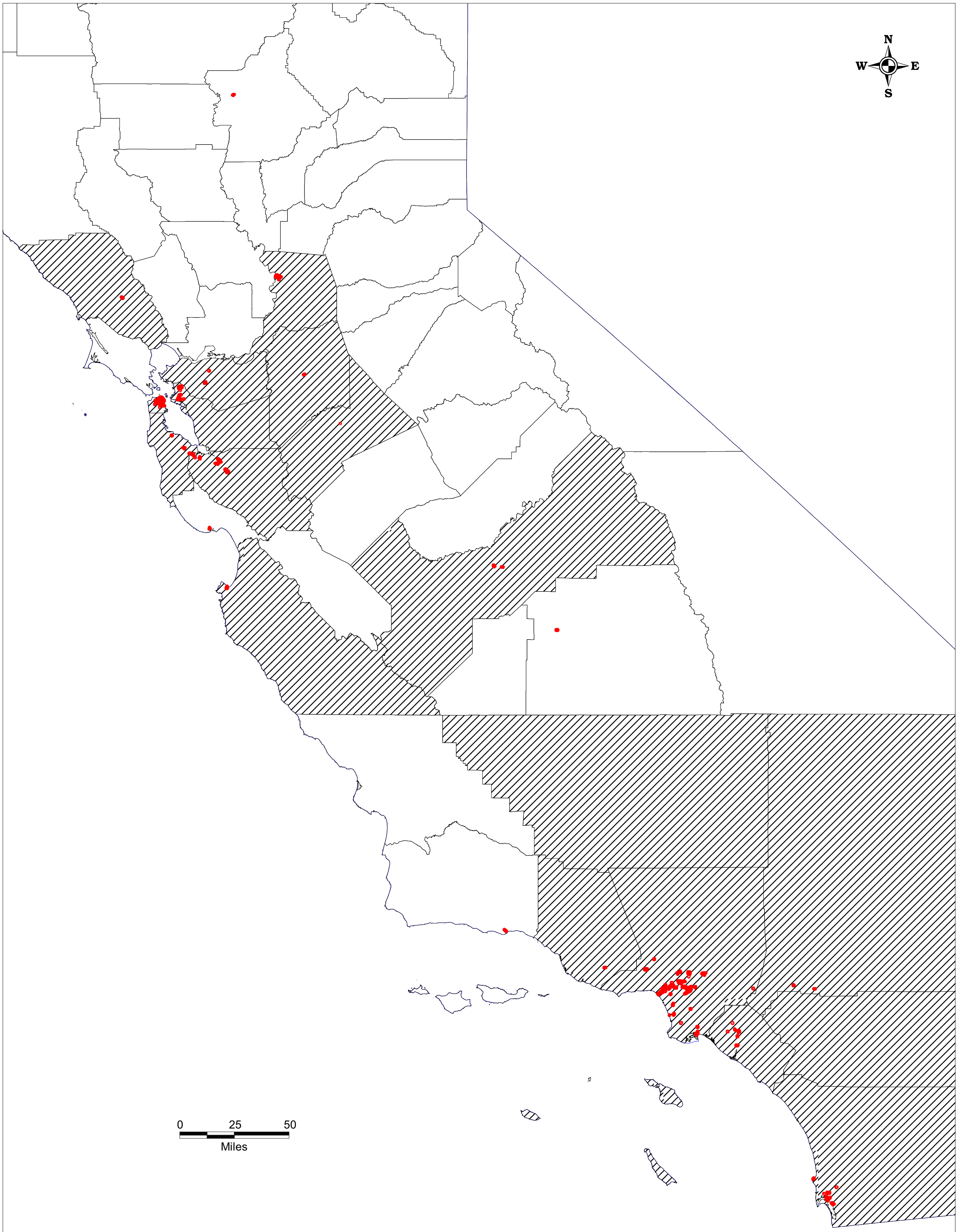
Source: U.S. Bureau of the Census, CTPP 2000 Documentation

Figure 2H:
Block Groups with High Residential Densities* in 2000



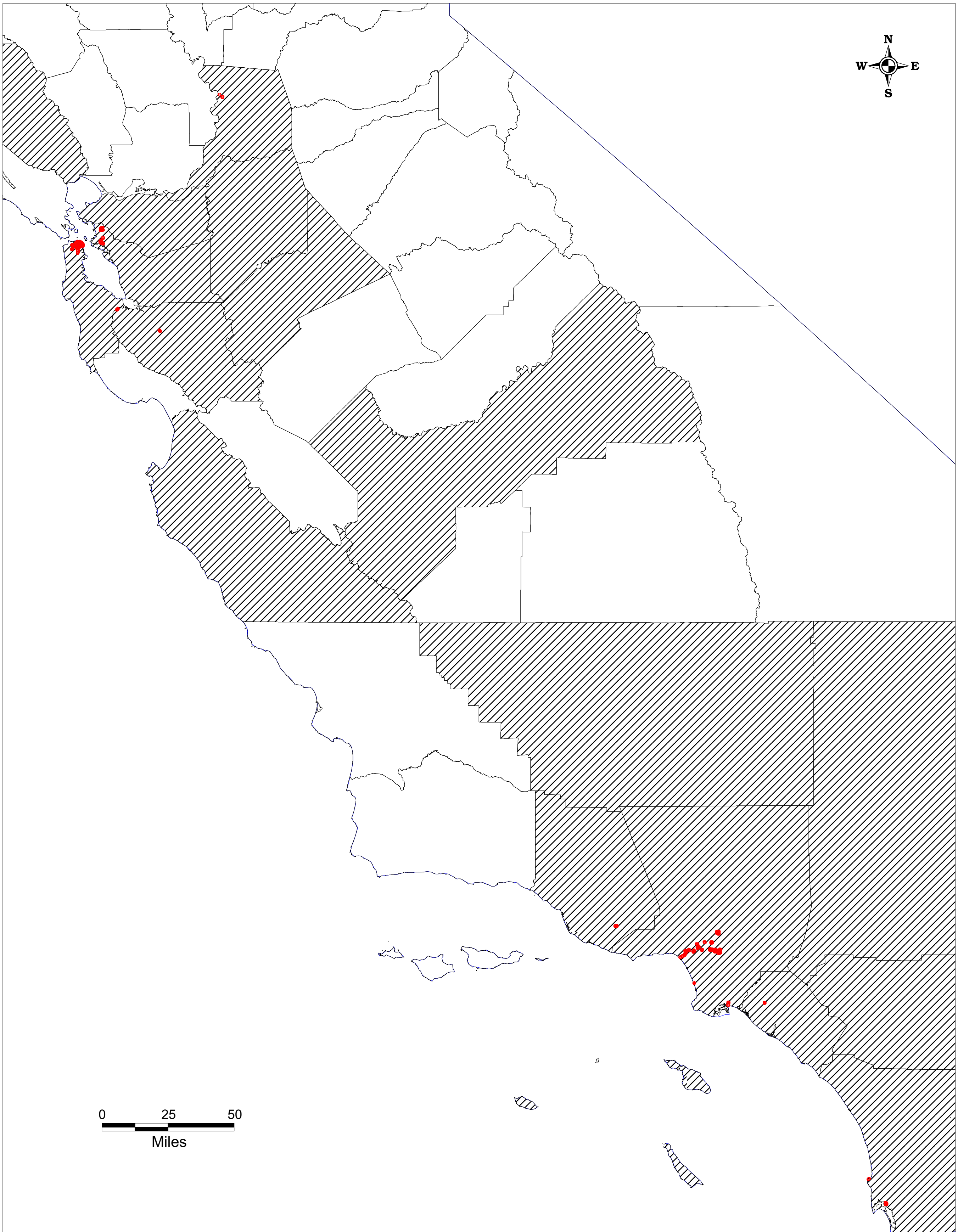
Shaded counties had Year 2000 total populations greater than 400,000.
* Block Groups Shown in Red had Year 2000 DU >= 10 per gross land acre.

Figure 2E:
Block Groups with High Employment Densities* in 2000



Shaded counties had Year 2000 total populations greater than 400,000.
* Block Groups Shown in Red had Year 2000 Workers >= 35 per gross land acre.

Figure 2X:
Block Groups with both High Residential and Employment Densities* in 2000



Shaded counties had Year 2000 total populations greater than 400,000.

* Block Groups Shown in Red had Year 2000 DU >= 10 per gross land acre & Workers >= 35 per gross land acre.

As a sensitivity test, EPS calculated the number of California BGs meeting the following ranges of combined residential and employment densities:

>=	12	DU	and	>=	50	Jobs	per acre	-	64	Block Groups
>=	9	DU	and	>=	37.5	Jobs	per acre	-	68	Block Groups
>=	6	DU	and	>=	25	Jobs	per acre	-	152	Block Groups
>=	5	DU	and	>=	20	Jobs	per acre	-	125	Block Groups
>=	4	DU	and	>=	15	Jobs	per acre	-	219	Block Groups
>=	3	DU	and	>=	10	Jobs	per acre	-	714	Block Groups

Figure 3 is a thematic map of San Francisco and the nearby North, East, and South Bay areas, displaying by color variation the BGs that meet the six alternatives tabulated above.

The proximity of selected BGs of interest to active transit lines and transit stops/stations can be determined using readily available GIS resources. EPS obtained digital map layers of California fixed-route bus services from an online site hosted by the Moakley Center Geographics Laboratory of Bridgewater State College. Fixed-rail transit route and station spatial data for California were obtained from the National Transportation Atlas Databases 2005.

The California bus and rail transit layers described immediately above were combined with the Block Groups in the vicinity of San Francisco and the East Bay selected by the preliminary threshold filters as shown in **Figure 4. Equivalent selection of Block Groups was performed and working maps were prepared for the** Stockton, Sacramento, Los Angeles, and San Diego areas.

Collectively, the Census and other Federal Agency data and GIS components described above and in **Appendix D** can support alternative quantitative criteria for UIA selection.

Figure 3: Sensitivity Test of Development Densities for Potential Urban Infill Surveys - San Francisco/East Bay Focus

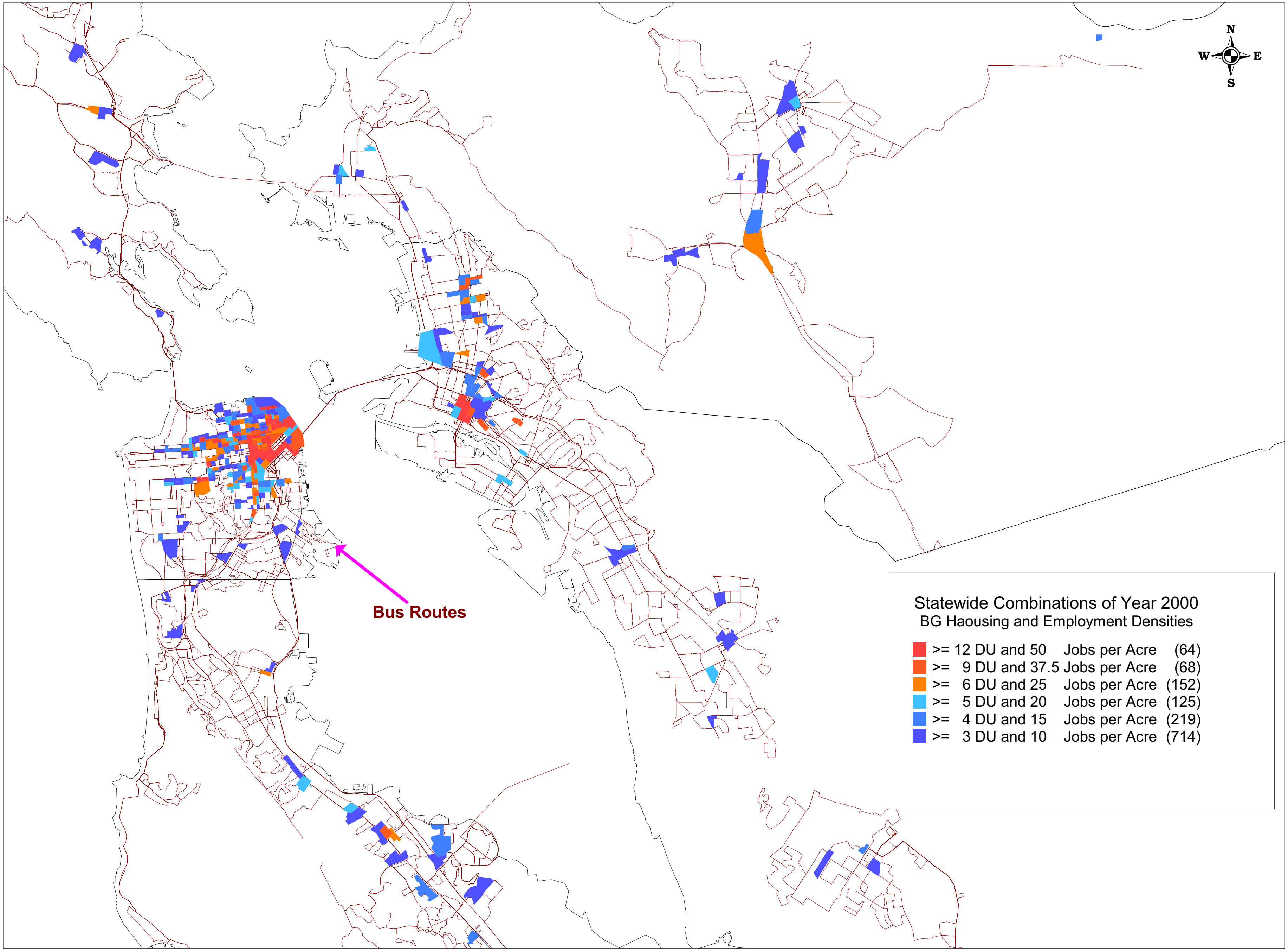
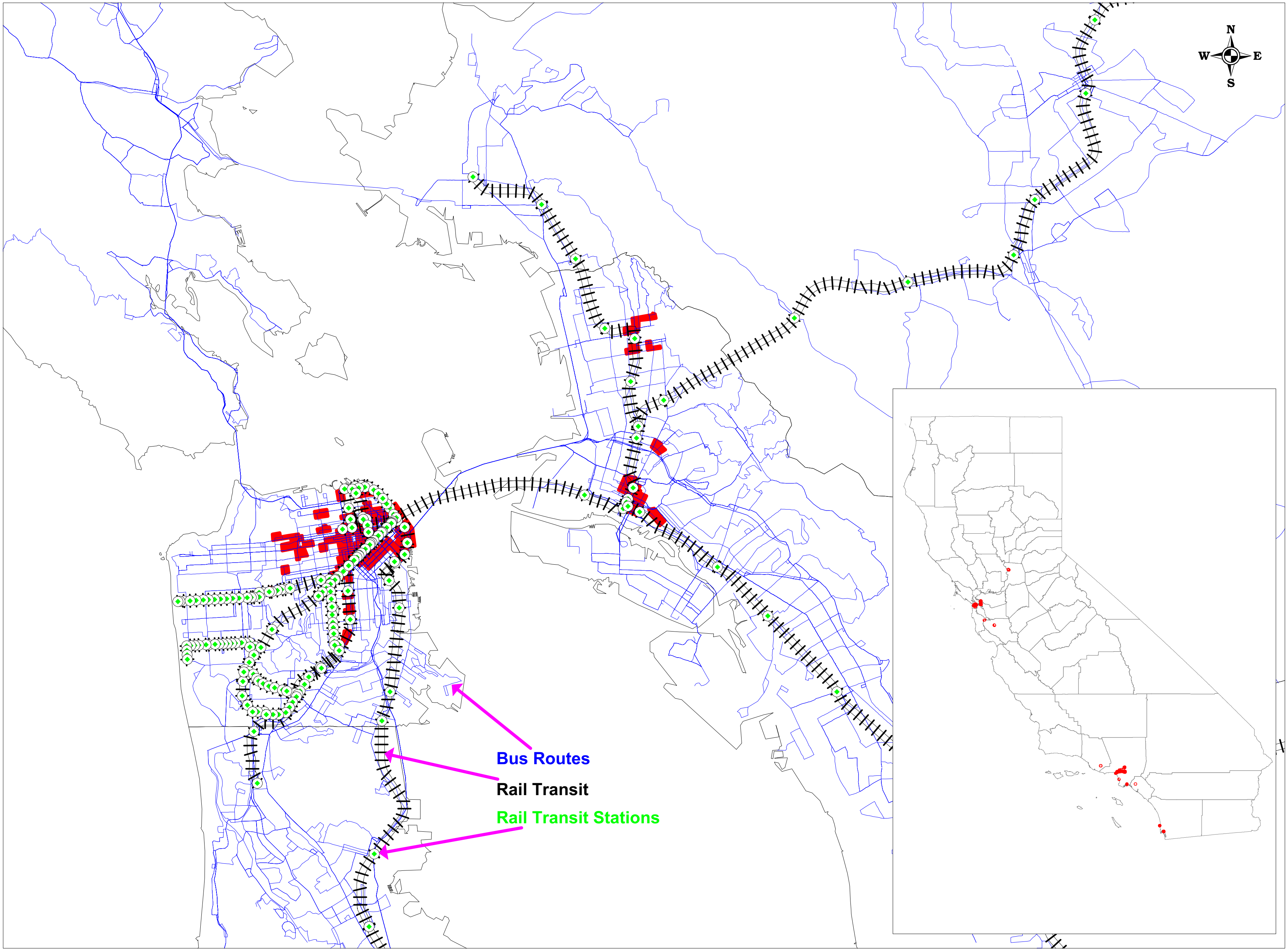


Figure 4: Preliminary Selection* of Block Groups for Potential Urban Infill Surveys - San Francisco/East Bay Focus



* Block Groups Shown in Red had Year 2000 DU >= 10 per gross land acre & workers >= 35 per gross land acre.

III. Recommended Urban Infill Land Uses

In parallel with the identification of the appropriate small-area 'neighborhoods' or zones within which Urban Infill development conditions pertain, is the need to define appropriate land use types for selecting representative infill sites.

The Project Team began the land-use selection effort with the following criteria::

1) Common urban land use types that are consistent with ITE categories (*Trip Generation* [7th ed.]) and generally reflect a range of uses within residential, office and retail (including entertainment) categories.

2) Land use types for which there is a demand for empirical trip generation data (this would be based on professional knowledge and any information ITE can provide).

3) Land use types for which there is a reasonable propensity for shifting drivers to another mode if the use is located in an urban area. For example, it may be unlikely that patrons would shift from autos to transit or walking if a grocery store is located in an urban area versus a suburban area.

4) Land use types that are considered beneficial to the revitalization of urban areas, but for which current trip generation data may act as a barrier to development approval. These may include types that are considered transit oriented, high-density residential, and urban retail uses.

Because parking availability and costs are often of crucial importance to the trips and trip types generated by urban infill sites, consideration in choosing candidate uses was also suggested for those types already represented in ITE's *Parking Generation* (3rd ed.).

The recent 3rd edition of *Parking Generation* includes data representing 91 of the ITE-defined land uses. These are all indicated in **Table 5**, as line items in bold font.

The Project Team selected a preliminary list of 20 land uses for discussion as appropriate candidates for infill trip generation surveys. Preference was given in the initial selection to higher-density residential types, and to nonresidential land uses that are of recurring interest in infill development impact analyses and in application of ITE standards to local transportation demand models. Most, but not all, of the uses in the initial list were among the 91 types represented in the 3rd edition of *Parking Generation.*

The initial candidates were:

ITE LU Code	ITE Land Use Type
221	Low-Rise Apartment
222	High-Rise Apartment
230	Residential Condominium/Townhouse
310	Hotel
444	Movie Theater with Matinee
445	Multiplex Movie Theater
492	Health/Fitness Club
565	Day Care Center
595	Convention Center
710	General Office Building
720	Medical-Dental Office Building
814	Specialty Retail Center
820	Shopping Center
851	Convenience Market (open 24 hours)
880	Pharmacy/Drugstore without Drive-Through Window
896	Video Rental Store
931	Quality Restaurant.
932	High-Turnover (Sit-Down) Restaurant
934	Fast-Food Restaurant with Drive-Through Window
960	Dry Cleaners

This preliminary list has subsequently been reviewed and discussed with the TAC, and a revised list of ten land uses are now recommended for study. These are, in order by ITE land use code:

ITE LU Code	ITE Land Use Type
223	Mid-Rise Apartment
230	Residential Condominium/Townhouse (midsize)
232	High-Rise Residential Condominium/Townhouse
445	Multiplex Movie Theater
492	Health/Fitness Club
565	Day Care Center
710	General Office Building
820	Shopping Center
850	Supermarket
932	High-Turnover (Sit-Down) Restaurant

Table 5
ITE Land Use Types, with Preliminary Selection of Candidates for Urban Infill Site Surveys
Selection of Urban Infill Study Sites, EPS #14002

ITE Trip Generation (7th ed.) Land Use (LU) Group	ITE LU Code	ITE Land Use Type	Land Use Represented in ITE Parking Generation (3rd ed.)	Preliminary Selection of Candidate LU Types for Urban Infill Site Surveys	Final Candidate Flag
Portand Terminal (Land Uses 000-099)	10	Waterport/Marine Terminal			
Portand Terminal (Land Uses 000-099)	21	Commercial Airport.	T		
Portand Terminal (Land Uses 000-099)	22	General Aviation Airport.			
Portand Terminal (Land Uses 000-099)	30	Truck Terminal.			
Portand Terminal (Land Uses 000-099)	90	Park-and-Ride Lot with Bus Service.			
Portand Terminal (Land Uses 000-099)	93	Light Rail Transit Station with Parking	T		
Industrial/Agricultural (Land Uses 100-199)	110	General Light Industrial.	T		
Industrial/Agricultural (Land Uses 100-199)	120	General Heavy Industrial.			
Industrial/Agricultural (Land Uses 100-199)	130	Industrial Park	T		
Industrial/Agricultural (Land Uses 100-199)	140	Manufacturing	T		
Industrial/Agricultural (Land Uses 100-199)	150	Warehousing	T		
Industrial/Agricultural (Land Uses 100-199)	151	Mini-Warehouse.	T		
Industrial/Agricultural (Land Uses 100-199)	152	High-Cube Warehouse			
Industrial/Agricultural (Land Uses 100-199)	170	Utilities			
Residential (Land Uses 200-299)	210	Single-Family Detached Housing.	T		
Residential (Land Uses 200-299)	220	Apartment			
Residential (Land Uses 200-299)	221	Low-Rise Apartment.	T	T	
Residential (Land Uses 200-299)	222	High-Rise Apartment	T	T	
Residential (Land Uses 200-299)	223	Mid-Rise Apartment.			T
Residential (Land Uses 200-299)	224	Rental Townhouse.	T		
Residential (Land Uses 200-299)	230	Residential Condominium/Townhouse	T	T	T
Residential (Land Uses 200-299)	231	Low-Rise Residential Condominium/Townhouse.			
Residential (Land Uses 200-299)	232	High-Rise Residential Condominium/Townhouse			T
Residential (Land Uses 200-299)	233	Luxury Condominium/Townhouse.			
Residential (Land Uses 200-299)	240	Mobile Home Park.			
Residential (Land Uses 200-299)	251	Senior Housing--Detached.			
Residential (Land Uses 200-299)	252	Senior Housing--Attached.	T		
Residential (Land Uses 200-299)	253	Congregate Care Facility.	T		
Residential (Land Uses 200-299)	254	Assisted Living	T		
Residential (Land Uses 200-299)	255	Continuing Care Retirement Community (CCRC)	T		
Residential (Land Uses 200-299)	260	Recreational Homes.			
Residential (Land Uses 200-299)	270	Residential Planned Unit Development (PUD).			
Lodging (Land Uses 300-399)	310	Hotel	T	T	
Lodging (Land Uses 300-399)	311	All Suites Hotel.	T		
Lodging (Land Uses 300-399)	312	Business Hotel.	T		
Lodging (Land Uses 300-399)	320	Motel	T		
Lodging (Land Uses 300-399)	330	Resort Hotel.	T		
Recreational (Land Uses 400-499)	411	City Park	T		
Recreational (Land Uses 400-499)	412	County Park			
Recreational (Land Uses 400-499)	413	State Park.			
Recreational (Land Uses 400-499)	414	Water Slide Park.	T		
Recreational (Land Uses 400-499)	415	Beach Park.			
Recreational (Land Uses 400-499)	416	Campground/Recreational Vehicle Park.			
Recreational (Land Uses 400-499)	417	Regional Park			
Recreational (Land Uses 400-499)	418	National Monument			
Recreational (Land Uses 400-499)	420	Marina.	T		
Recreational (Land Uses 400-499)	430	Golf Course	T		
Recreational (Land Uses 400-499)	431	Miniature Golf Course			
Recreational (Land Uses 400-499)	432	Golf Driving Range.			
Recreational (Land Uses 400-499)	433	Batting Cages			
Recreational (Land Uses 400-499)	435	Multipurpose Recreational Facility.	T		
Recreational (Land Uses 400-499)	437	Bowling Alley	T		
Recreational (Land Uses 400-499)	438	Billiard Hall	T		
Recreational (Land Uses 400-499)	440	Adult Cabaret	T		
Recreational (Land Uses 400-499)	441	Live Theater.	T		

Table 5
ITE Land Use Types, with Preliminary Selection of Candidates for Urban Infill Site Surveys
Selection of Urban Infill Study Sites, EPS #14002

ITE Trip Generation (7th ed.) Land Use (LU) Group	ITE LU Code	ITE Land Use Type	Land Use Represented in ITE Parking Generation (3rd ed.)	Preliminary Selection of Candidate LU Types for Urban Infill Site Surveys	Final Candidate Flag
Recreational (Land Uses 400-499)	443	Movie Theater without Matinee			
Recreational (Land Uses 400-499)	**444**	**Movie Theater with Matinee.**	**T**	**T**	
Recreational (Land Uses 400-499)	445	Multiplex Movie Theater		T	T
Recreational (Land Uses 400-499)	452	Horse Racetrack			
Recreational (Land Uses 400-499)	453	Automobile Racetrack.			
Recreational (Land Uses 400-499)	454	Dog Racetrack			
Recreational (Land Uses 400-499)	460	Arena			
Recreational (Land Uses 400-499)	**464**	**Roller Skating Rink**	**T**		
Recreational (Land Uses 400-499)	**465**	**Ice Skating Rink.**	**T**		
Recreational (Land Uses 400-499)	**466**	**Snow Ski Area**	**T**		
Recreational (Land Uses 400-499)	**473**	**Casino/Video Lottery Establishment.**	**T**		
Recreational (Land Uses 400-499)	480	Amusement Park.			
Recreational (Land Uses 400-499)	481	Zoo			
Recreational (Land Uses 400-499)	488	Soccer Complex.			
Recreational (Land Uses 400-499)	**490**	**Tennis Courts**	**T**		
Recreational (Land Uses 400-499)	**491**	**Racquet/Tennis Club**	**T**		
Recreational (Land Uses 400-499)	**492**	**Health/Fitness Club**	**T**	**T**	**T**
Recreational (Land Uses 400-499)	**493**	**Athletic Club**	**T**		
Recreational (Land Uses 400-499)	**495**	**Recreational Community Center**	**T**		
Institutional (Land Uses 500-599)	501	Military Base			
Institutional (Land Uses 500-599)	**520**	**Elementary School**	**T**		
Institutional (Land Uses 500-599)	**522**	**Middle School/Junior High School.**	**T**		
Institutional (Land Uses 500-599)	**525**	**School for the Blind**	**T**		
Institutional (Land Uses 500-599)	**530**	**High School**	**T**		
Institutional (Land Uses 500-599)	534	Private School (K-8).			
Institutional (Land Uses 500-599)	536	Private School (K-12)			
Institutional (Land Uses 500-599)	**540**	**Junior/Community College.**	**T**		
Institutional (Land Uses 500-599)	**550**	**University/College.**	**T**		
Institutional (Land Uses 500-599)	**560**	**Church.**	**T**		
Institutional (Land Uses 500-599)	561	Synagogue			
Institutional (Land Uses 500-599)	**565**	**Day Care Center**	**T**	**T**	**T**
Institutional (Land Uses 500-599)	566	Cemetery.			
Institutional (Land Uses 500-599)	571	Prison.			
Institutional (Land Uses 500-599)	**580**	**Museum**	**T**		
Institutional (Land Uses 500-599)	**590**	**Library**	**T**		
Institutional (Land Uses 500-599)	591	Lodge/Fraternal Organization.			
Institutional (Land Uses 500-599)	**595**	**Convention Center**	**T**	**T**	
Medical (Land Uses 600-699)	**610**	**Hospital.**	**T**		
Medical (Land Uses 600-699)	**612**	**Surgery Center**	**T**		
Medical (Land Uses 600-699)	**620**	**Nursing Home.**	**T**		
Medical (Land Uses 600-699)	**630**	**Clinic.**	**T**		
Medical (Land Uses 600-699)	**640**	**Animal Hospital/Veterinary Clinic**	**T**		
Office (Land Uses 700-799)	**710**	**General Office Building**	**T**	**T**	**T**
Office (Land Uses 700-799)	714	Corporate Headquarters Building			
Office (Land Uses 700-799)	715	Single Tenant Office Building			
Office (Land Uses 700-799)	**720**	**Medical-Dental Office Building.**	**T**	**T**	
Office (Land Uses 700-799)	**730**	**Government Office Building.**	**T**		
Office (Land Uses 700-799)	731	State Motor Vehicles Department			
Office (Land Uses 700-799)	**732**	**United States Post Office**	**T**		
Office (Land Uses 700-799)	**733**	**Government Office Complex**	**T**		
Office (Land Uses 700-799)	735	Judicial Complex			
Office (Land Uses 700-799)	750	Office Park			
Office (Land Uses 700-799)	760	Research and Development Center			
Office (Land Uses 700-799)	770	Business Park			
Retail (Land Uses 800-899)	**812**	**Building Materials and Lumber Store**	**T**		

Table 5
ITE Land Use Types, with Preliminary Selection of Candidates for Urban Infill Site Surveys
Selection of Urban Infill Study Sites, EPS #14002

ITE Trip Generation (7th ed.) Land Use (LU) Group	ITE LU Code	ITE Land Use Type	Land Use Represented in ITE Parking Generation (3rd ed.)	Preliminary Selection of Candidate LU Types for Urban Infill Site Surveys	Final Candidate Flag
Retail (Land Uses 800-899)	813	Free-Standing Discount Superstore			
Retail (Land Uses 800-899)	814	Specialty Retail Center		T	
Retail (Land Uses 800-899)	**815**	**Free-Standing Discount Store.**	**T**		
Retail (Land Uses 800-899)	**816**	**Hardware/Paint Store.**	**T**		
Retail (Land Uses 800-899)	817	Nursery (Garden Center)			
Retail (Land Uses 800-899)	818	Nursery (Wholesale)			
Retail (Land Uses 800-899)	**820**	**Shopping Center**	**T**	**T**	**T**
Retail (Land Uses 800-899)	823	Factory Outlet Center			
Retail (Land Uses 800-899)	841	New Car Sales			
Retail (Land Uses 800-899)	843	Automobile Parts Sales.			
Retail (Land Uses 800-899)	**848**	**Tire Store.**	**T**		
Retail (Land Uses 800-899)	849	Tire Superstore			
Retail (Land Uses 800-899)	850	Supermarket	T		**T**
Retail (Land Uses 800-899)	**851**	**Convenience Market (Open 24 Hours).**	**T**	**T**	
Retail (Land Uses 800-899)	852	Convenience Market (Open 15-16 Hours)			
Retail (Land Uses 800-899)	853	Convenience Market with Gasoline Pumps.			
Retail (Land Uses 800-899)	**854**	**Discount Supermarket.**	**T**		
Retail (Land Uses 800-899)	**857**	**Discount Club**	**T**		
Retail (Land Uses 800-899)	**859**	**Liquor Store**	**T**		
Retail (Land Uses 800-899)	860	Wholesale Market.			
Retail (Land Uses 800-899)	861	Discount Club			
Retail (Land Uses 800-899)	**861**	**Sporting Goods Superstore**	**T**		
Retail (Land Uses 800-899)	**862**	**Home Improvement Superstore**	**T**		
Retail (Land Uses 800-899)	**863**	**Electronics Superstore.**	**T**		
Retail (Land Uses 800-899)	**864**	**Toy/Children's Superstore**	**T**		
Retail (Land Uses 800-899)	865	Baby Superstore			
Retail (Land Uses 800-899)	**866**	**Pet Supply Store.**	**T**		
Retail (Land Uses 800-899)	**867**	**Office Supply Superstore.**	**T**		
Retail (Land Uses 800-899)	**868**	**Book Superstore**	**T**		
Retail (Land Uses 800-899)	869	Discount Home Furnishing Superstore			
Retail (Land Uses 800-899)	**870**	**Apparel Store**	**T**		
Retail (Land Uses 800-899)	879	Arts and Crafts Store			
Retail (Land Uses 800-899)	**880**	**Pharmacy/Drugstore without Drive-Through Window**	**T**	**T**	
Retail (Land Uses 800-899)	**881**	**Pharmacy/Drugstore with Drive-Through Window.**	**T**		
Retail (Land Uses 800-899)	**890**	**Furniture Store**	**T**		
Retail (Land Uses 800-899)	**892**	**Carpet Store**	**T**		
Retail (Land Uses 800-899)	**896**	**Video Rental Store.**	**T**	**T**	
Services (Land Uses 900-999)	**911**	**Walk-in Bank.**	**T**		
Services (Land Uses 900-999)	**912**	**Drive-in Bank**	**T**		
Services (Land Uses 900-999)	**931**	**Quality Restaurant.**	**T**	**T**	
Services (Land Uses 900-999)	**932**	**High-Turnover (Sit-Down) Restaurant**	**T**	**T**	**T**
Services (Land Uses 900-999)	**933**	**Fast-Food Restaurant without Drive-Through Window**	**T**		
Services (Land Uses 900-999)	**934**	**Fast-Food Restaurant with Drive-Through Window.**	**T**	**T**	
Services (Land Uses 900-999)	935	Fast-Food Restaurant with Drive-Through Window and No Indoor Seating.			
Services (Land Uses 900-999)	936	Drinking Place.			
Services (Land Uses 900-999)	941	Quick Lubrication Vehicle Shop.			
Services (Land Uses 900-999)	942	Automobile Care Center.			
Services (Land Uses 900-999)	943	Automobile Parts and Service Center			
Services (Land Uses 900-999)	944	Gasoline/Service Station.			
Services (Land Uses 900-999)	945	Gasoline/Service Station with Convenience Market.			
Services (Land Uses 900-999)	946	Gasoline/Service Station with Convenience Market and Car Wash			
Services (Land Uses 900-999)	947	Self-Service Car Wash			
Services (Land Uses 900-999)	948	Automated Car Wash.			
Services (Land Uses 900-999)	**960**	**Dry Cleaners**	**T**	**T**	

Table 5
ITE Land Use Types, with Preliminary Selection of Candidates for Urban Infill Site Surveys
Selection of Urban Infill Study Sites, EPS #14002

ITE Trip Generation (7th ed.) Land Use (LU) Group	ITE LU Code	ITE Land Use Type	Land Use Represented in ITE Parking Generation (3rd ed.)	Preliminary Selection of Candidate LU Types for Urban Infill Site Surveys	Final Candidate Flag
Total Count			**91**	**20**	**10**
Initial Selection for Review and Comment			**91**	**20**	

Notes: Land Use Classifications from ITE Trip Generation, 7th Ed. and Parking Generation, 3rd Ed.
91 uses represented in Parking Generation, 3rd. Ed. Initial Selection of Candidate Urban Infill Survey Site candidate land uses by EPS; Final Selections made in collaborative effort with Project Team amd TAC.

Sources: ITE Trip Generation (7th ed.) and Parking Generation (3rd ed.); EPS

SUGGESTED (PRELIMINARY) MINIMUM URBAN INFILL SURVEY SITE CRITERIA

The Project Team will need to evaluate and rate specific candidate sites for suitability as representatives of the final selected uses. Review and refinement of specific site selection criteria will be undertaken as part of **Working Paper #2**; to begin the discussion process, however, the following list of minimum criteria has been suggested for all candidate Urban Infill Survey Sites (UISS):

1) The UISS shall be selected on the basis of the ability to obtain accurate trip generation data for the land use under consideration, and to obtain independent variables per ITE trip generation study guidelines.

2) Survey data must be transferable; it is therefore essential that site development characteristics are representative of the land uses to be analyzed. Considerations of transferability pertain to the application of survey data not only to other existing sites, but to new urban infill development.

3) Land uses appropriate for UISS consideration shall be selected as a subset of the uses defined in ITE's *Trip Generation*, 7th ed.

4) The development within the UISS should be mature (at least two years old) and located in a mature development area. Transit service should have been in place for at least two years.

5) There shall be minimal or no on-site construction or adjacent roadway construction at the time of the survey.

6) The UISS shall be at full occupancy (at least 85 percent) and appear to be economically healthy. The precise percent occupancy at survey time is important, and must be recorded.

7) There shall be no potential for "through" trips or other trips within the trip generation counts (such as significant vehicle, transit, truck, or pedestrian trips generated by adjacent sites).

8) The UISS itself shall not be a mixed-use development. This does not preclude selections of study sites located in mixed zoning contexts.

9) The UISS must be capable of isolation for purposes of counting trips (i.e., no shared parking, consolidated driveways, etc). The survey team must develop effective plans for collecting data on prospective UISS with no private parking facilities.

10) Permission shall be obtainable from the owner/manager of the prospective UISS.

This initial list of site criteria was adapted in part from similar site selection criteria suggested by the ITE for the purpose of parking generation studies (see http://www.ite.org/parkgen/datacollection.asp#Site%20Selection).

We note with interest that the above-referenced ITE web site includes the statements "For sites with complex characteristics (TDM, extensive transit use, shared parking, bicycle parking) a separate web-data entry form is being developed (under construction at this time)" and "The web-based data entry form asks questions with pull-down selections about site characteristics that are important for consideration of parking demand (e.g. parking costs, type of surrounding area, etc…)".

We suggest as a follow-on task for the implementation of concepts discussed in this Working Paper that the Project Team discuss with the designated ITE contact, Lisa Fontana Tierney (mailto:lfontana@ite.org) the possibility of including relevant items from the draft ITE complex site criteria in the selection and rating criteria for Urban Infill Survey Sites. As envisioned by the ITE and as applied in site analyses carried out in the United Kingdom (http://www.trics.org/the_system.htm) to maintain the UK-wide TRICS trip generation database, the complex site criteria include both checklist and parametric data entries designed to capture site contextual information (e.g., parking availability and costs, transit accessibility and frequency of service, etc.).

For comparison purposes, we have included the current ITE Basic Site entry form for Parking Demand as **Appendix C Table 2**, and a summary of the TRICS site survey criteria as **Appendix C Table 3.** A complete list of TRICS site, development and trip data collection criteria can be examined at http://www.trics.org/analysis_of_sites.htm# (requires Internet Explorer 4.1 or later).

In advance of the proposed collaboration with ITE, and suggestions on UISS evaluation criteria from the Project Team and the TAC, EPS prepared a brief summary of the literature regarding several elasticity factors that influence travel demand within urban/infill sites. This technical memorandum is attached as **Appendix A**. EPS also prepared an initial short list of possible locales for potential UISS. This list, attached as **Appendix B,** is intended only as a stimulus to further discussion and to point out the potential for selecting UISS in areas which have considerable data available from previous studies.

The preliminary locale listing has a definite bias toward Pedestrian-Oriented- and Transit-Oriented-Development areas, and the field may well be broadened after the Project Team and TAC settle on the current Study's preferred definition of UIAs and selected Land Uses.

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Appendix A for Working Paper #1

Literature Review on Site Selection Criteria

LITERATURE REVIEW ON SITE SELECTION CRITERIA

This Appendix offers a brief summary of the literature regarding several factors that may influence travel demand within urban infill sites. This information was offered to the Team as part of our start-up effort to measure trip generation for specific land uses located in such areas and to provide guidelines for evaluating travel demand and related travel demand management measures. This Appendix introduced and described several candidate criteria at a concept level for the consideration of the Team. The Team amended, edited and refined the list of potential criteria as part of the preparation of **Working Paper #1.**

The literature describing recent studies of trip generation/trip reduction factors and VMT/VT elasticity measures appropriate to urban infill land uses frequently emphasize the importance of characterizing and quantifying sites' external settings (contexts) as well as defining their intrinsic (onsite) attributes. There is much discussion of the development diversity and residential and employment densities and thresholds that distinguish 'urban' and 'infill' contexts from suburban development. There are also many references to transit parking proximity (distance), accessibility, and availability factors that appear to significantly impact trip generation rates for urban and infill uses.

Such contextual measures are being applied in current practice as elasticity factors, to provide reproducible and quantifiable methods for adjusting established ITE trip generation rates to urban high-density development sites, mixed-use sites, and transit- and pedestrian-oriented- development sites. For the new Infill/Trip Generation Study now underway, EPS suggests the Team undertake a systematic translation of selected contextual qualifiers and elasticity measures into appropriate urban infill site selection and evaluation criteria. The choice of appropriate contextual criteria will be guided by relevance, clarity of definition, and ease of measurement/evaluation.

This initial list of proposed criteria were gleaned from the studies identified in the References citations distributed to the Team in hard-copy and CD-ROM format by EPS, and from readings in the Online TDM Encyclopedia, a hypertext resource created and actively maintained by the Victoria Transport Policy Institute of British Columbia, Canada: http://www.vtpi.org/tdm/. The Online TDM Encyclopedia draws heavily on U.S. as well as Canadian and international transportation agencies and organizations, assembling and summarizing current and recent research being performed by governmental, private and academic practitioners.

Among the major contextual trip reduction and urban infill elasticity measures that appear repeatedly in the literature are:

- Density
- Clustering of Complimentary Mixed Uses
- Diversity
- Pedestrian-Oriented Design Index
- Parking Accessibility

- Transit Accessibility
- Transit Availability Index

For each of these potential site selection and evaluation criteria, this Appendix provides a concept definition, a formulaic/parametric definition (where available), and quantified ranges and thresholds relevant to the selection and ranking of potential urban infill study site candidates using the proposed criterion.

DENSITY

Definition: Population and/or Jobs within a given area or per unit area.

Formula: [(Population + Employment) per Square Mile]

Relevant Ranges and Thresholds:

URBAN CONTEXT:
- **Urban Area** >= 10 square miles
- **Population** >= 50,000 in contiguous urban area
- **Jobs** >= 50,000 in contiguous urban area
- **Job Density** >= at least 30-50 per gross acre

AUTOMOTIVE TRAVEL CONTEXT:
- **Jobs accessible by car within 30 minutes drive time** >= 100,000

TOD/POD CONTEXT:
- **Jobs** >= 15,000 within 1 to 12 miles of transit center
- **Jobs accessible by transit within 30 minutes commute time** >= 105,000

SITE-SPECIFIC LAND USE DENSITY THRESHOLDS:
- **Residential SF Attached and Detached Density** =15-24 DU per gross acre
- **Residential MF Density** >= 24 DU per gross acre
- **Office FAR** >= .5 FAR
- **Commercial FAR** >= .35 FAR
- **Urban Commercial Job Density** >= 30 jobs per gross acre
- **Regional Commercial Job Density** >= 30 jobs per gross acre

The detailed thresholds and ranges suggested for Density and the other candidate criteria described in this Appendix are open to adjustment and refinement by the Study Team and the TAC. The concept of operationalized, parametric criteria is vital, however, to the Study's purposes in producing new urban infill trip rates acceptable to the ITE while simultaneously establishing a methodology for consistently identifying, characterizing and ranking 'urban' and 'infill' development contexts relevant to trip generation. Broad definitions of these contexts, such as those typically used in regional planning and listed below, are too subjective and qualitative to capture and quantify crucial factors impacting VMT VT and non-automotive travel options:

Urbanized Area: A U.S. Bureau of Census-designated area of 50,000 or more inhabitants consisting of a central city or two adjacent cities plus surrounding densely settled territory, but excluding the rural portion of cities.

Infill development: In land-use and transit planning, development of vacant parcels in urbanized or suburbanized areas.

CLUSTERING OF COMPLIMENTARY MIXED USES

Definitions: Land use patterns with common destinations located close together, with good pedestrian conditions that create accessible, multi-modal Centers. Alternately, the degree to which two or more complimentary land uses exist within the same Urban Area (typically, within a one-mile radius or one-square-mile grid cell).

Formula: For one operationalized and parametric approach, see *Wrestling Sprawl to the Ground: Defining and Measuring and Elusive Concept*, by George Galster et al. al, Housing Policy Debate Volume 12, Issue 4, pages 681- 717, Fannie Mae Foundation 2001.

http://www.fanniemaefoundation.org/programs/hpd/pdf/HPD_1204_galster.pdf

Relevant Ranges and Thresholds:

TOD/POD CONTEXT:

- **Clustering within 'walkable' neighborhoods 0.5 - 1.0 miles in diameter (typical pedestrian catchment area for commercial centers and transit stations), an area of 125 to 500 acres**

DIVERSITY

Definition: The ratio of jobs to population in proximity to the site.

Formula: {1 - [ABS(b * population - employment) /
(b * population + employment)]}

where: b = regional employment / regional population

Relevant Ranges and Thresholds:

- **The areas within which local Diversity indices are calculated are recommended to be less than two miles in diameter or less than 2,000 acres in coverage.**

Described in *INDEX ® 4D METHOD:A Quick-Response Method of Estimating Travel Impacts from Land-Use Changes*, Prepared for the U.S. Environmental Protection Agency by Criterion Planners/Engineers and Fehr & Peers Associates, Technical Memorandum October 2001.

PEDESTRIAN-ORIENTED DESIGN INDEX

Definition: A measure of the pedestrian environment, including street grid density, sidewalk completeness, and route directness.

Formula: 0.0195 * street network density + 1.18 * sidewalk completeness + 3.63 * route directness.

Where:
0.0195 = coefficient applied to street network density, expressing the relative weighting of this variable relative to the other variables in the Design Index formula,

street network density = length of street in miles/area of neighborhood in square miles

1.18 = coefficient applied to sidewalk completeness, expressing the relative weighting of this variable relative to the other variables in the Design Index formula,

sidewalk completeness = length of sidewalk/length of public street frontage

3.63 = coefficient applied to route directness, expressing the relative weighting of this variable relative to the other variables in the Design Index formula,

route directness = average airline distance to center/average road distance to center

Relevant Ranges and Thresholds:

- **The areas within which local Design indices are calculated are recommended to be less than two miles in diameter or less than 2,000 acres in coverage.**

Described in *INDEX ® 4D METHOD:A Quick-Response Method of Estimating Travel Impacts from Land-Use Changes*, ibid..

PARKING ACCESSIBILITY

Definition: Walking distance in feet between destination/origin site and parking.

Formula: [Walking Distance in Feet to Available Parking]

Relevant Ranges and Thresholds:

- **Adjacent/Excellent Accessibility** <= 100 feet from parking
- **Short Walk/Good Accessibility** > 100 and <= 800 feet from parking
- **Medium Walk/Fair Accessibility** > 800 and <= 1,200 feet from parking
- **Long Walk/Poor Accessibility** > 1,200 and <= 1,600 feet from parking
- **Effectively Non-Accessible** > 1,600 feet from parking

TRANSIT ACCESSIBILITY

Definition: Distance between destination/origin site and nearest transit node(s).

Formula: [Distance to Transit Node(s)]

Relevant Ranges and Thresholds:

- **Short Walk/Good Pedestrian Accessibility** <= .25 miles from transit.
- **Medium Walk/Fair Pedestrian Accessibility** > .25 miles and <= .5 miles from transit.
- **Long Walk/Poor Pedestrian Accessibility** > .5 miles and <= 1.0 miles from transit.
- **Effectively Non-Accessible By Walking**> 1.0 miles from transit node.
- **Automobile and Bicycle Accessibility** 0 to 12 miles from transit node.

TRANSIT AVAILABILITY

Definition: Transit vehicle seats per hour within ¼-mile (½-mile for rail and ferries) of destination/origin site, averaged over 24 hours).

Formula: [Transit vehicle seats per hour within ¼-mile (½-mile), averaged over 24 hours]

Relevant Ranges and Thresholds:

- **One Bus** ~= 50 transit seats.

There are more elaborate measures of transit availability, such as the LITA index summarized below, but their complexity/difficulty/expense of calculation may place them beyond appropriate application for the immediate study of selected urban infill sites.

LOCAL INDEX OF TRANSIT AVAILABILITY

Definition: For a census tract or TAZ, the average of standardized scores of each of three transit components: capacity, frequency, and service coverage.

Formula: [Capacity score] + [Frequency score] + [Service Coverage score]]

Where:
Capacity = Vehicle Capacity * Route Miles / Total Population
Frequency = Total Daily Transit Vehicles, for transit lines having at least one stop in tract
Service Coverage = Number of Stops or Stations In Tract, by transit line / Sq. Mi. of Land Area

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APPENDIX B FOR WORKING PAPER #1

POSSIBLE LOCALES FOR URBAN SURVEY STUDY SITES

POSSIBLE LOCALES FOR URBAN SURVEY STUDY SITES

Berkeley Bart Station Area, Berkeley, Alameda County

"Emery Station", Emeryville, Alameda County

Fruitvale Transit Village, Oakland, Alameda County

North Pleasanton Improvement District, Alameda County

Pleasant Hill Bart Station Area, Pleasant Hill, Contra Costa County

7th Street/Metro Center, Los Angeles

Hollywood/Highland, Los Angeles

'Noho' (North Hollywood) Arts District, Los Angeles

Pacific Court, Long Beach, Los Angeles

American Plaza, San Diego, San Diego County

Rio Vista West, San Diego, San Diego County

Uptown District, San Diego, San Diego County

Mission Street Corridor, San Francisco County

CityPark/Metro Center Project Area, Foster City, San Mateo County

Moffett Park, Sunnyvale, Santa Clara County

Ohlone-Chynoweth, San Jose, Santa Clara County

Cotati CoHousing Development, Cotati, Sonoma County

Aspen Neighborhood, West Davis, Yolo County

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APPENDIX C FOR WORKING PAPER #1

ADDITIONAL TECHNICAL BACKGROUND

Appendix C Table 1
Block Groups with both High Residential and Employment Densities* in 2000
Selection of Urban Infill Study Sites, EPS #14002

STFID	County	Census Designated Place	CDP Type	Tract	Block Group	2000 Total Pop.	2000 Housing Units	2000 Workers (POW)	Land Acres	2000 Pop. / Sq. Mile	2000 Pop. / Acre	2000 HU / Acre	2000 Workers per Acre	Google Maps Link
060014224001	Alameda	Berkeley	city	422400	1	1,457	963	1,870	44.990	20,726.2	32.4	21.4	41.6	060014224001
060014224002	Alameda	Berkeley	city	422400	2	888	514	1,410	30.609	18,566.9	29.0	16.8	46.1	060014224002
060014225001	Alameda	Berkeley	city	422500	1	1,066	619	1,800	40.560	16,820.5	26.3	15.3	44.4	060014225001
060014228002	Alameda	Berkeley	city	422800	2	3,119	373	1,070	30.495	65,458.3	102.3	12.2	35.1	060014228002
060014229002	Alameda	Berkeley	city	422900	2	1,934	1,170	1,815	50.209	24,652.1	38.5	23.3	36.1	060014229002
060014028001	Alameda	Oakland	city	402800	1	1,910	1,356	6,040	93.706	13,045.1	20.4	14.5	64.5	060014028001
060014029002	Alameda	Oakland	city	402900	2	1,286	919	10,460	65.284	12,607.2	19.7	14.1	160.2	060014029002
060014030001	Alameda	Oakland	city	403000	1	1,484	855	6,550	34.756	27,326.1	42.7	24.6	188.5	060014030001
060014030002	Alameda	Oakland	city	403000	2	1,250	696	2,665	48.269	16,573.7	25.9	14.4	55.2	060014030002
060014033002	Alameda	Oakland	city	403300	2	1,536	605	2,860	42.739	23,001.0	35.9	14.2	66.9	060014033002
060014034002	Alameda	Oakland	city	403400	2	1,329	828	1,190	24.491	34,729.1	54.3	33.8	48.6	060014034002
060014034003	Alameda	Oakland	city	403400	3	1,774	1,215	835	18.767	60,496.6	94.5	64.7	44.5	060014034003
060014040002	Alameda	Oakland	city	404000	2	951	564	3,210	53.002	11,483.4	17.9	10.6	60.6	060014040002
060014060003	Alameda	Oakland	city	406000	3	1,866	765	3,160	64.788	18,433.1	28.8	11.8	48.8	060014060003
060377008002	Los Angeles	Beverly Hills	city	700800	2	2,318	1,297	2,700	70.656	20,996.4	32.8	18.4	38.2	060377008002
060373018002	Los Angeles	Glendale	city	301800	2	2,224	951	4,040	83.227	17,102.1	26.7	11.4	48.5	060373018002
060373018004	Los Angeles	Glendale	city	301800	4	2,001	777	3,765	75.384	16,988.2	26.5	10.3	49.9	060373018004
060373019001	Los Angeles	Glendale	city	301900	1	2,165	1,067	2,935	71.460	19,390.0	30.3	14.9	41.1	060373019001
060373019004	Los Angeles	Glendale	city	301900	4	2,132	993	3,320	45.573	29,940.2	46.8	21.8	72.8	060373019004
060373020025	Los Angeles	Glendale	city	302002	5	1,897	995	2,255	39.477	30,753.8	48.1	25.2	57.1	060373020025
060373022013	Los Angeles	Glendale	city	302201	3	1,101	651	2,975	61.745	11,412.1	17.8	10.5	48.2	060373022013
060375761003	Los Angeles	Long Beach	city	576100	3	747	610	4,365	46.945	10,183.9	15.9	13.0	93.0	060375761003
060375763007	Los Angeles	Long Beach	city	576300	7	1,004	459	2,325	44.396	14,473.3	22.6	10.3	52.4	060375763007
060371901003	Los Angeles	Los Angeles	city	190100	3	1,448	803	2,670	55.161	16,800.3	26.3	14.6	48.4	060371901003
060371912011	Los Angeles	Los Angeles	city	191201	1	2,474	920	4,320	79.620	19,886.3	31.1	11.6	54.3	060371912011
060371912012	Los Angeles	Los Angeles	city	191201	2	2,300	906	2,270	60.295	24,413.2	38.1	15.0	37.6	060371912012
060372062002	Los Angeles	Los Angeles	city	206200	2	1,208	738	2,365	64.181	12,045.9	18.8	11.5	36.8	060372062002
060372062003	Los Angeles	Los Angeles	city	206200	3	2,168	473	1,555	43.933	31,582.5	49.3	10.8	35.4	060372062003
060372063003	Los Angeles	Los Angeles	city	206300	3	3,526	1,075	1,790	43.999	51,288.5	80.1	24.4	40.7	060372063003
060372071002	Los Angeles	Los Angeles	city	207100	2	1,404	696	2,475	59.428	15,120.1	23.6	11.7	41.6	060372071002
060372073001	Los Angeles	Los Angeles	city	207300	1	2,860	2,798	17,625	93.325	19,613.1	30.6	30.0	188.9	060372073001
060372073002	Los Angeles	Los Angeles	city	207300	2	879	840	15,225	79.066	7,115.1	11.1	10.6	192.6	060372073002
060372075002	Los Angeles	Los Angeles	city	207500	2	2,018	1,543	1,630	38.998	33,117.6	51.7	39.6	41.8	060372075002
060372087202	Los Angeles	Los Angeles	city	208720	2	757	293	1,490	18.105	26,760.1	41.8	16.2	82.3	060372087202
060372088002	Los Angeles	Los Angeles	city	208800	2	1,072	603	1,170	23.661	28,996.6	45.3	25.5	49.4	060372088002
060372089032	Los Angeles	Los Angeles	city	208903	2	1,547	459	1,090	25.511	38,810.2	60.6	18.0	42.7	060372089032
060372091022	Los Angeles	Los Angeles	city	209102	2	1,516	572	2,640	23.667	40,994.8	64.1	24.2	111.5	060372091022
060372093002	Los Angeles	Los Angeles	city	209300	2	1,248	516	1,655	39.255	20,346.8	31.8	13.1	42.2	060372093002
060372095201	Los Angeles	Los Angeles	city	209520	1	1,731	665	1,240	33.653	32,919.1	51.4	19.8	36.8	060372095201
060372118023	Los Angeles	Los Angeles	city	211802	3	2,710	1,216	1,975	46.750	37,099.5	58.0	26.0	42.2	060372118023
060372121002	Los Angeles	Los Angeles	city	212100	2	1,214	800	5,760	42.013	18,493.4	28.9	19.0	137.1	060372121002
060372123031	Los Angeles	Los Angeles	city	212303	1	3,154	1,101	2,860	37.631	53,641.5	83.8	29.3	76.0	060372123031
060372123041	Los Angeles	Los Angeles	city	212304	1	2,285	861	2,245	50.522	28,945.8	45.2	17.0	44.4	060372123041

Appendix C Table 1
Block Groups with both High Residential and Employment Densities* in 2000
Selection of Urban Infill Study Sites, EPS #14002

STFID	County	Census Designated Place	CDP Type	Tract	Block Group	2000 Total Pop.	2000 Housing Units	2000 Workers (POW)	Land Acres	2000 Pop. / Sq. Mile	2000 Pop. / Acre	2000 HU / Acre	2000 Workers per Acre	Google Maps Link
060372124101	Los Angeles	Los Angeles	city	212410	1	1,355	545	3,695	22.021	39,379.8	61.5	24.7	167.8	060372124101
060372125001	Los Angeles	Los Angeles	city	212500	1	1,439	516	2,925	50.518	18,230.4	28.5	10.2	57.9	060372125001
060372149001	Los Angeles	Los Angeles	city	214900	1	2,154	1,523	3,545	78.548	17,550.5	27.4	19.4	45.1	060372149001
060372163002	Los Angeles	Los Angeles	city	216300	2	1,284	683	2,815	60.388	13,608.1	21.3	11.3	46.6	060372163002
060372641012	Los Angeles	Los Angeles	city	264101	2	2,293	1,566	1,885	53.432	27,465.0	42.9	29.3	35.3	060372641012
060372643013	Los Angeles	Los Angeles	city	264301	3	1,613	1,076	3,585	34.973	29,517.5	46.1	30.8	102.5	060372643013
060372653012	Los Angeles	Los Angeles	city	265301	2	278	279	1,830	24.154	7,366.0	11.5	11.6	75.8	060372653012
060372655101	Los Angeles	Los Angeles	city	265510	1	2,868	1,717	13,955	77.383	23,719.9	37.1	22.2	180.3	060372655101
060372674022	Los Angeles	Los Angeles	city	267402	2	2,832	1,581	3,120	53.895	33,629.6	52.5	29.3	57.9	060372674022
060372679001	Los Angeles	Los Angeles	city	267900	1	3,250	2,217	8,030	182.064	11,424.6	17.9	12.2	44.1	060372679001
060376209025	Los Angeles	Manhattan Beach	city	620902	5	347	239	940	19.392	11,452.4	17.9	12.3	48.5	060376209025
060377014003	Los Angeles	Santa Monica	city	701400	3	1,559	1,057	1,865	38.987	25,592.0	40.0	27.1	47.8	060377014003
060377015022	Los Angeles	Santa Monica	city	701502	2	1,316	729	1,960	49.588	16,984.6	26.5	14.7	39.5	060377015022
060377017012	Los Angeles	Santa Monica	city	701701	2	1,291	681	3,560	63.685	12,973.8	20.3	10.7	55.9	060377017012
060377005003	Los Angeles	West Hollywood	city	700500	3	1,580	1,218	3,340	63.245	15,988.6	25.0	19.3	52.8	060377005003
060590887011	Orange	Garden Grove	city	088701	1	1,370	370	1,715	34.151	25,674.2	40.1	10.8	50.2	060590887011
060670007001	Sacramento	Sacramento	city	000700	1	2,247	232	2,175	18.246	78,817.5	123.2	12.7	119.2	060670007001
060670013003	Sacramento	Sacramento	city	001300	3	1,215	838	2,135	58.869	13,209.0	20.6	14.2	36.3	060670013003
060730053001	San Diego	San Diego	city	005300	1	739	681	4,150	50.196	9,422.3	14.7	13.6	82.7	060730053001
060730053002	San Diego	San Diego	city	005300	2	1,107	649	4,940	49.430	14,333.1	22.4	13.1	99.9	060730053002
060730053003	San Diego	San Diego	city	005300	3	1,933	545	7,380	41.441	29,852.5	46.6	13.2	178.1	060730053003
060730056001	San Diego	San Diego	city	005600	1	1,045	768	2,295	57.329	11,666.1	18.2	13.4	40.0	060730056001
060730082003	San Diego	San Diego	city	008200	3	547	422	2,165	31.990	10,943.5	17.1	13.2	67.7	060730082003
060750101002	San Francisco	San Francisco	city	010100	2	2,227	1,399	2,955	52.784	27,001.9	42.2	26.5	56.0	060750101002
060750102003	San Francisco	San Francisco	city	010200	3	1,043	787	1,460	30.613	21,804.9	34.1	25.7	47.7	060750102003
060750105002	San Francisco	San Francisco	city	010500	2	1,598	1,409	23,135	87.662	11,666.7	18.2	16.1	263.9	060750105002
060750106002	San Francisco	San Francisco	city	010600	2	1,321	745	1,605	17.471	48,392.4	75.6	42.6	91.9	060750106002
060750106003	San Francisco	San Francisco	city	010600	3	1,497	689	1,215	15.180	63,115.2	98.6	45.4	80.0	060750106003
060750107002	San Francisco	San Francisco	city	010700	2	3,008	1,583	1,140	20.181	95,391.5	149.0	78.4	56.5	060750107002
060750107003	San Francisco	San Francisco	city	010700	3	1,653	923	1,225	14.271	74,131.9	115.8	64.7	85.8	060750107003
060750110001	San Francisco	San Francisco	city	011000	1	868	537	570	15.930	34,872.4	54.5	33.7	35.8	060750110001
060750111001	San Francisco	San Francisco	city	011100	1	2,241	1,208	910	21.587	66,439.1	103.8	56.0	42.2	060750111001
060750111002	San Francisco	San Francisco	city	011100	2	2,280	1,297	915	21.636	67,443.2	105.4	59.9	42.3	060750111002
060750111003	San Francisco	San Francisco	city	011100	3	1,038	532	1,635	15.099	43,998.1	68.7	35.2	108.3	060750111003
060750112003	San Francisco	San Francisco	city	011200	3	829	492	1,160	19.387	27,366.3	42.8	25.4	59.8	060750112003
060750113001	San Francisco	San Francisco	city	011300	1	1,781	695	560	12.210	93,351.7	145.9	56.9	45.9	060750113001
060750113002	San Francisco	San Francisco	city	011300	2	1,483	934	490	13.573	69,928.6	109.3	68.8	36.1	060750113002
060750114001	San Francisco	San Francisco	city	011400	1	1,119	581	470	6.778	105,658.4	165.1	85.7	69.3	060750114001
060750114002	San Francisco	San Francisco	city	011400	2	2,056	1,090	1,205	14.465	90,964.1	142.1	75.4	83.3	060750114002
060750115001	San Francisco	San Francisco	city	011500	1	759	582	14,180	39.419	12,322.9	19.3	14.8	359.7	060750115001
060750117002	San Francisco	San Francisco	city	011700	2	984	734	42,280	72.002	8,746.4	13.7	10.2	587.2	060750117002
060750118001	San Francisco	San Francisco	city	011800	1	1,528	789	3,865	13.663	71,576.2	111.8	57.7	282.9	060750118001
060750119001	San Francisco	San Francisco	city	011900	1	1,620	1,230	1,210	18.670	55,531.5	86.8	65.9	64.8	060750119001

Appendix C Table 1
Block Groups with both High Residential and Employment Densities* in 2000
Selection of Urban Infill Study Sites, EPS #14002

STFID	County	Census Designated Place	CDP Type	Tract	Block Group	2000 Total Pop.	2000 Housing Units	2000 Workers (POW)	Land Acres	2000 Pop. / Sq. Mile	2000 Pop. / Acre	2000 HU / Acre	2000 Workers per Acre	Google Maps Link
060750120001	San Francisco	San Francisco	city	012000	1	1,965	1,516	1,170	15.373	81,806.5	127.8	98.6	76.1	060750120001
060750121001	San Francisco	San Francisco	city	012100	1	2,541	1,886	695	14.875	109,327.5	170.8	126.8	46.7	060750121001
060750121002	San Francisco	San Francisco	city	012100	2	921	619	2,810	15.610	37,760.8	59.0	39.7	180.0	060750121002
060750122003	San Francisco	San Francisco	city	012200	3	2,312	1,363	1,025	22.310	66,324.2	103.6	61.1	45.9	060750122003
060750123001	San Francisco	San Francisco	city	012300	1	3,070	2,622	3,365	22.960	85,576.0	133.7	114.2	146.6	060750123001
060750123002	San Francisco	San Francisco	city	012300	2	3,135	1,829	3,290	22.696	88,405.0	138.1	80.6	145.0	060750123002
060750124002	San Francisco	San Francisco	city	012400	2	2,785	1,350	565	11.705	152,272.4	237.9	115.3	48.3	060750124002
060750124003	San Francisco	San Francisco	city	012400	3	1,220	665	2,075	25.949	30,089.9	47.0	25.6	80.0	060750124003
060750124004	San Francisco	San Francisco	city	012400	4	749	598	10,685	47.971	9,992.7	15.6	12.5	222.7	060750124004
060750124005	San Francisco	San Francisco	city	012400	5	1,567	991	1,270	15.467	64,838.9	101.3	64.1	82.1	060750124005
060750125002	San Francisco	San Francisco	city	012500	2	1,110	958	1,790	14.657	48,466.7	75.7	65.4	122.1	060750125002
060750125003	San Francisco	San Francisco	city	012500	3	2,687	1,169	950	20.724	82,979.5	129.7	56.4	45.8	060750125003
060750130003	San Francisco	San Francisco	city	013000	3	1,031	653	875	22.972	28,724.2	44.9	28.4	38.1	060750130003
060750130004	San Francisco	San Francisco	city	013000	4	975	613	1,045	22.875	27,278.7	42.6	26.8	45.7	060750130004
060750133003	San Francisco	San Francisco	city	013300	3	772	500	930	22.649	21,815.0	34.1	22.1	41.1	060750133003
060750133005	San Francisco	San Francisco	city	013300	5	707	364	1,635	26.200	17,270.4	27.0	13.9	62.4	060750133005
060750135002	San Francisco	San Francisco	city	013500	2	1,381	1,016	3,915	30.994	28,516.7	44.6	32.8	126.3	060750135002
060750151001	San Francisco	San Francisco	city	015100	1	1,626	1,104	1,485	22.333	46,595.9	72.8	49.4	66.5	060750151001
060750151002	San Francisco	San Francisco	city	015100	2	794	680	2,330	21.496	23,640.2	36.9	31.6	108.4	060750151002
060750154001	San Francisco	San Francisco	city	015400	1	732	381	1,415	28.024	16,716.9	26.1	13.6	50.5	060750154001
060750154003	San Francisco	San Francisco	city	015400	3	1,481	789	1,960	53.889	17,588.8	27.5	14.6	36.4	060750154003
060750155001	San Francisco	San Francisco	city	015500	1	1,507	1,115	1,245	30.210	31,925.6	49.9	36.9	41.2	060750155001
060750155003	San Francisco	San Francisco	city	015500	3	807	304	1,940	22.826	22,627.3	35.4	13.3	85.0	060750155003
060750157001	San Francisco	San Francisco	city	015700	1	1,124	638	2,075	59.036	12,185.1	19.0	10.8	35.1	060750157001
060750159002	San Francisco	San Francisco	city	015900	2	2,111	1,203	885	23.103	58,478.3	91.4	52.1	38.3	060750159002
060750160001	San Francisco	San Francisco	city	016000	1	2,026	1,609	2,730	41.060	31,578.9	49.3	39.2	66.5	060750160001
060750162001	San Francisco	San Francisco	city	016200	1	676	451	2,670	29.041	14,897.3	23.3	15.5	91.9	060750162001
060750162002	San Francisco	San Francisco	city	016200	2	896	519	1,970	22.570	25,407.7	39.7	23.0	87.3	060750162002
060750165004	San Francisco	San Francisco	city	016500	4	1,114	482	1,575	23.390	30,481.8	47.6	20.6	67.3	060750165004
060750168001	San Francisco	San Francisco	city	016800	1	816	502	1,345	21.363	24,445.8	38.2	23.5	63.0	060750168001
060750168003	San Francisco	San Francisco	city	016800	3	735	460	885	22.170	21,218.1	33.2	20.7	39.9	060750168003
060750176012	San Francisco	San Francisco	city	017601	2	3,248	1,425	4,750	46.737	44,476.7	69.5	30.5	101.6	060750176012
060750176013	San Francisco	San Francisco	city	017601	3	1,946	1,001	4,545	45.000	27,676.2	43.2	22.2	101.0	060750176013
060750178001	San Francisco	San Francisco	city	017800	1	1,010	799	2,900	25.883	24,974.0	39.0	30.9	112.0	060750178001
060750178002	San Francisco	San Francisco	city	017800	2	1,443	1,049	3,010	26.901	34,330.6	53.6	39.0	111.9	060750178002
060750178003	San Francisco	San Francisco	city	017800	3	2,513	1,040	4,115	77.129	20,852.4	32.6	13.5	53.4	060750178003
060750179011	San Francisco	San Francisco	city	017901	1	1,549	1,130	10,215	95.882	10,339.4	16.2	11.8	106.5	060750179011
060750179012	San Francisco	San Francisco	city	017901	2	2,441	1,419	3,490	75.774	20,617.0	32.2	18.7	46.1	060750179012
060750179013	San Francisco	San Francisco	city	017901	3	1,205	906	13,840	65.364	11,798.6	18.4	13.9	211.7	060750179013
060750201001	San Francisco	San Francisco	city	020100	1	871	513	3,390	48.620	11,465.4	17.9	10.6	69.7	060750201001
060750208001	San Francisco	San Francisco	city	020800	1	1,514	441	890	18.268	53,042.3	82.9	24.1	48.7	060750208001
060750208004	San Francisco	San Francisco	city	020800	4	2,053	747	1,370	28.680	45,813.2	71.6	26.0	47.8	060750208004
060750253004	San Francisco	San Francisco	city	025300	4	1,671	603	1,625	35.427	30,187.3	47.2	17.0	45.9	060750253004
060750301011	San Francisco	San Francisco	city	030101	1	1,390	704	1,195	23.438	37,954.9	59.3	30.0	51.0	060750301011
060750301012	San Francisco	San Francisco	city	030101	2	1,312	595	3,615	25.228	33,283.2	52.0	23.6	143.3	060750301012
060750607003	San Francisco	San Francisco	city	060700	3	333	336	1,790	23.727	8,982.3	14.0	14.2	75.4	060750607003
060855113002	Santa Clara	Palo Alto	city	511300	2	1,375	873	3,150	79.259	11,102.8	17.3	11.0	39.7	060855113002
060855009012	Santa Clara	San Jose	city	500901	2	1,625	912	3,065	82.294	12,637.7	19.7	11.1	37.2	060855009012
061110061002	Ventura	Thousand Oaks	city	006100	2	3,847	1,314	4,670	125.060	19,687.1	30.8	10.5	37.3	061110061002
Totals						**218,272**	**120,244**	**468,080**	**5,621.979**	**24,847.8**	**38.8**	**21.4**	**83.3**	
Minima						**278**	**232**	**470**	**6.778**	**7,115.1**	**11.1**	**10.2**	**35.1**	

Appendix C Table 1
Block Groups with both High Residential and Employment Densities* in 2000
Selection of Urban Infill Study Sites, EPS #14002

STFID	County	Census Designated Place	CDP Type	Tract	Block Group	2000 Total Pop.	2000 Housing Units	2000 Workers (POW)	Land Acres	2000 Pop. / Sq. Mile	2000 Pop. / Acre	2000 HU / Acre	2000 Workers per Acre	Google Maps Link

Notes: * This listing of 135 Block Groups includes all those that had Housing Densities of at least 10.0 units per Land Acre, **AND** (in combination with) Employment Densities of at least 35.0 workers per Land Acre in the Census year 2000.

Within this selection, individual Block Groups had Housing Densities as high as 15.2 units per Land Acre, and Employment Densities as high as 59.8 workers per Land Acre. For the approximately 22,100 Block Groups defined for the 2000 Census, estimated Year 2000 Housing Densities were as high as 159.37 units per Land Acre; Employment Densities as high as 794.05 workers per Land Acre.

Sources: U.S. Bureau of the Census, Census 2000 Summary Files 1 and 3; Bureau of Transportation Statistics, CTPP 2000 Part 2; EPS

Appendix C Table 2
Selection of Urban Infill Study Sites, EPS #14002

Parking Demand Survey Form
Institute of Transportation Engineers
*(fill in all highlighted cells - * are required data)*

Land Use Code*
Name of Site
Brief Description of Site

Transit*					
Area*			**City**		
TMP*			**State**		**Country**
Parking Price*		$	Daily Rate	$	Hourly Rate

Site Size*		**Units***		**Occupancy***		**Land Use**
Site Size		**Units**		**Occupancy**		
Site Size		**Units**		**Occupancy**		
Site Size		**Units**		**Occupancy**		

Number of Parking Spaces Provided at Site

Highest Observed Parking Demand for the following hours of the day *(hour beginning)**

Date							
Day							
12 Mid							
1:00 AM							
2:00 AM							
3:00 AM							
4:00 AM							
5:00 AM							
6:00 AM							
7:00 AM							
8:00 AM							
9:00 AM							
10:00 AM							
11:00 AM							
12 Noon							
1:00 PM							
2:00 PM							
3:00 PM							
4:00 PM							
5:00 PM							
6:00 PM							
7:00 PM							
8:00 PM							
9:00 PM							
10:00 PM							
11:00 PM							

Person		**Organization**	
Phone			
Fax			
Email			
Notes			

Enter data on the web at www.ite.org
Comments to: ite_staff@ite.org
IF not entered on web site, please mail to:
Institute of Transportation Engineers, 1099 14th Street, NW Suite 300 West; Washington, DC 20005-3438

Form version 1.4

Appendix C Table 3

Each site within the TRICS system contains data within Site, Development and Survey Day sections. Some items of Development data vary according to which land use category sites are located under; most items are shown below.

SITE DETAILS

Bus (or tram) Site Accessibility:	Information regarding site specific bus services, local bus stops, crossing facilities and frequencies of bus services, with a table showing bus destinations, numbers of services per hour and approximate journey times.
Description and address:	Site type identification and full address of the site, including its postcode.
Design Features Encouraging Non-Car Modes:	Comments sections for any relevant information relating to design features at the site which encourage non-car modes, including pedestrians, pedal cycles, public transport and car parking restraint. A set of guidance notes are listed.
Grid Reference:	10-digit Ordnance Survey grid reference of the site.
Location:	Brief description of the type of area that the site is located in (e.g. Edge of Town, Town Centre, Industrial Zone, etc).
Population & Car Ownership:	Ranges for 1 and 5 miles for population, and 5 miles for car ownership (per household).
Public Transport Comments:	Any relevant comments relating to local public transport, its relevance, quality and importance.
Public Transport Provision:	Range based on the number of buses/trains to the site per day, or to within a reasonable walking distance.
Rail Accessibility:	Information regarding local rail stations, pedestrian access to stations, and frequencies of rail services, with a table showing rail destinations, numbers of services per hour and approximate journey times.
Site Comment:	Any relevant comments relating to the site's location, its accesses and the surrounding area.
Use Class:	Alphanumeric 2-digit code representing land use as in the 1998 Use Classes Order.
Walk-in Catchment (500 metres):	The population within 500 metres radius of the site.
Green Travel Plan:	Whether or not the site is associated with a Green Travel Plan.

DEVELOPMENT DETAILS

Bays (civic amenity land use categories):	The total number of recycling/waste bays at the site.
Bedrooms (hotel land use category):	The total number of bedrooms at the site.
Beds (hospital land use categories):	The total number of beds at the site.
Berths (marina land use category):	The total number of boat berths at the site.
Caravans (non-residential caravan park land use category):	Total number of caravans at the site.
Cashcard Facilities (retail land use categories):	A "Yes" or "No" shown to indicate if cashcard facilities are available at the site.
Courts (tennis club land use category):	The total number of tennis courts at the site.
Development Comments:	Any relevant additional information relating to the site's activities and operating hours, employment patterns, the nature of the buildings at the site and its occupants.
Distance to Nearest Similar Site:	The distance (in kilometres) to a site of a similar nature, in size and land use category.
Doctors (GP surgery land use category):	Total number of doctors that work at the site.
Employees (not all land use categories):	The total number of people employed at the site. Within Employment land use categories, this figure is split between Part Time Employees and Full Time Employees.
Filling Bays (petrol filling station land use categories):	The total number of vehicles that can be refuelled at any one time.
Filling Station (retail land use categories):	A "Yes" or "No" shown to indicate if a petrol filling station is located within the site. A "Yes" means that it was included in the survey count.
Gross Floor Area (not all land use categories):	The total floor area of buildings within the site's boundary (including multi-levels), including storage areas. In some land use categories external areas are also included.
Holes (golf course land use categories):	The total number of golf holes at the site.
Households (residential land use categories):	The total number of residential households at the site
Lanes (bowling alley land use category):	The total number of bowling lanes at the site.
Number of Units (not all land use categories):	The number of building units within the site.

Appendix C Table 3

Off-Site Parking Details (not all land use categories):	There are 2 "Yes" or "No" questions within this section. The first question asks if there is off-site parking available close to the site, and the second question asks whether or not this parking was included in the survey counts.
On-Site Parking Details (not all land use categories):	A total number of vehicle parking spaces within the site, with this figure then broken down into Visitor/Customer, Employee, Disabled, OGV Loading Bays, OGV Parking Spaces, Mother & Toddler spaces and Motorcycle spaces. A figure for the number of cycle racks is also given.
Opening Times (not all land use categories):	The operating hours of the site in 24-hour format, shown separately for Monday-Thursday, Friday, Saturday and Sunday.
Open Since:	Year of site opening.
Parking Charges (not all land use categories):	A "Yes" or "No" shown to indicate if there are charges for parking at the site.
Pitches (5-a-side football land use category):	The total number of football pitches at the site.
Pitches (car boot sale land use category):	The total number of pitches for car boot traders at the site.
Pupils/Students (educational land use categories):	The total number of pupils/students registered at the site.
Ranges (driving range land use category):	The total number of driving range bays at the site.
Residential Details (residential land use categories):	Consists of data for bedrooms per household, garages per household, on-street parking per household and unit density.
Residents (nursing home and institutional hostel land use categories):	The total number of residents registered at the site.
Retail Floor Area (retail land use categories):	The total floor area of buildings within the site's boundary that is accessible by the general public. In some land use categories external areas are also included
Rink Size (ice rink land use category):	The area in square metres of the ice at the site.
Seats (multiplex cinema, bingo hall, road-side food and restaurant land use categories):	The total number of seats at the site.
Site Area:	The area of the whole site in hectares, including car parking and other use of space, up to the site's boundary.
Surface Parking (not all land use categories)**:**	A "Yes" represents surface parking, a "No" represents underground or multi-storey parking.
Trade/Site Name:	The official name of the development.
Units (holiday accommodation land use category):	Total number of accommodation units at the site.

SURVEY DAY DETAILS

Car Park Occupancy:	The initial number of vehicles in the site's car park at the time the survey began, and the number remaining as the survey ended.
Cycle, OGV and public service vehicle counts:	Separate hourly count screens throughout the duration of the total vehicles survey for pedal cycles, OGV's (with a percentage split shown between OGV1 and OGV2), and buses. All except pedal cycles are included in the total vehicles count.
Vehicle Occupant, Public Transport User, Pedestrian and Total People Counts	For multi-modal surveys only, separate hourly count screens throughout the duration of the Total Vehicles survey for Vehicle Occupants, Public Transport Users, Pedestrians and Total People.
Survey Date:	Date on which the survey count took place.
Survey Type:	Either "Manual Count" for a manual classified survey or "ATC Survey" for an automatic traffic count (usually 24-hours in duration).
Total Vehicles Count:	Hourly numbers of vehicles arriving at the site, exiting the site, and total vehicle movements, throughout the survey's duration. Also, parking accumulation in the site's car park is shown, the first hourly figure being based on the initial car parking occupancy and the traffic movements for the first hour of the survey.
Vehicle Percentages:	The percentage of the total vehicles count excluding pedal cycles (inbound plus outbound) that consisted of cars (including taxis), motorcycles, light goods vehicles, OGV1 (up to 3 axles), OGV2 (greater than 3 axles), and public service vehicles.
Weather:	Details of weather conditions for the morning and the afternoon on the day of the survey count, taken from a range of possibilities.

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APPENDIX D FOR WORKING PAPER #1

A GIS APPROACH TO IDENTIFYING CANDIDATE URBAN IMPACT AREAS

A GIS APPROACH TO IDENTIFYING CANDIDATE URBAN IMPACT AREAS (UIAS)

In suggesting quantitative criteria as a functional definition for "Urban Infill Area", the Study Team was mindful of the need for practical measurements that can be applied to or extracted from data are readily available across the State of California and the United States, and at relatively small-area levels, e.g., the census block group level. EPS prototyped a map-based or GIS approach to identifying candidate UIAs for **Working Paper #1** using digital map layers and socioeconomic data that are available nationwide from Federal agencies and information centers.

Census 2000 definitions of UAs and UCs focus on population density only; this is not an oversight, but a known area of weakness that generated much comment and discussion in the run-up to the publication of the actual census counts. In the end, "The Census Bureau determined that it could not include industrial or commercial areas on the fringes of UAs or UCs because it could not find a consistent national database that identifies such areas, as it found for major airports. Thus, the Census Bureau does not have the capability to specifically identify commercial and industrial areas on a uniform and comprehensive basis." (Federal Register / Vol. 67, No. 51 / Friday, March 15, 2002 / Notices)

Currently, there is no comprehensive and consistent database of California commercial, industrial, or public service land uses (existing development) available at the parcel or site level. In the absence of such a resource, the employment-by-workplace data collected annually by the Census Bureau for its *County Business Patterns* series and by the California Economic Development Department for its *Labor Market Information* reports could provide workable substitutes, if confidentiality regulations did not restrict those agencies' ability to release small-area and site information. As is, none of the *County Business Patterns* or *Labor Market Information* data on employment-by-industry or -by-occupation is currently available below the ZIP code level, even as special tabulations.

Census 2000 Journey-to-Work data, however, as distributed in the Census Transportation Planning Package (CTPP 2000) Part 2 tables, do include both employment-by-industry and -by-occupation estimates down to the census Block Group (BG) level for the entire State of California. The CTPP occupational and industrial categories are shown in **Table 4 (Working Paper #1 – main text)**. The CTPP employment data, in combination with population and housing counts and geographic information available from Census 2000 Summary Files 1 and 3 (SF1 and SF3), can be used to identify Block Groups that meet several of UIA Criteria proposed above.

As an example, if we use threshold filters to limit Block Group selection to those BGs which have both residential and nonresidential development, and which had (at the beginning of the year 2000) residential development densities of at least 10 housing units per land acre and employment densities of at least 35 jobs per land acre, a subset of 135 (of a possible 22,100 California Block Groups) is selected, as shown in **Figure 2X (Working Paper #1 – main text).**

A complete listing of these 135 Block Groups, including County and Urbanized Area of location, land area, Year 2000 population, housing and worker counts and population and employment densities per gross land acre, is provided as **Appendix C Table 1**. As it happens, all but two of the BGs meeting our initial test criteria for density are located in defined Census 2000 Urbanized Areas, and within California counties having more than 400,000 total populations.Alternative threshold densities are suggested in the planning literature, and it is anticipated these test values may be a focus of further discussion and revision.

As a preliminary sensitivity test, EPS calculated the number of BGs meeting the following ranges of combined residential and employment densities:

>=	12	DU	and	>=	50	Jobs	per acre	-	64	Block Groups
>=	9	DU	and	>=	37.5	Jobs	per acre	-	68	Block Groups
>=	6	DU	and	>=	25	Jobs	per acre	-	152	Block Groups
>=	5	DU	and	>=	20	Jobs	per acre	-	125	Block Groups
>=	4	DU	and	>=	15	Jobs	per acre	-	219	Block Groups
>=	3	DU	and	>=	10	Jobs	per acre	-	714	Block Groups

These counts were made mutually exclusive; the first three ranges subdivide the 284 BG test set into 3 subsets with no double-counts of individual Block Groups. It can be seen that lowering the selection threshold to include BGs having at least 5 dwelling units (DU) per acre and at least 20 jobs per acre would increase the match by 125 BGs or by 44%; lowering the threshold to 4+ DU and 15+ jobs per acre would increase the total match to 628 BGs, more than double the count of the initial test. **Figure 3 (Working Paper #1 – main text)** is a thematic map of San Francisco and the nearby North, East, and South Bay areas, displaying by color variation the BGs that meet the six alternatives tabulated above.

One weakness of this proposed filtering/selection approach is a dependency on the geographic boundaries defined for Census 2000 enumeration. It is possible and likely that some localities could be either erroneously included or excluded from selection as a result of the peculiar size and orientation of their Census Blocks, Block Groups and Tracts. A methodological mitigation for this source of potential error is suggested by the Giuliano and Small method for identifying employment centers. Giuliano and Small defined an employment center as a cluster of contiguous zones, each zone having a minimum employment density of D, and together containing total employment of at least E. D and E cutoffs are typically expressed as 'D-E'; for example '10-10' corresponds to D = 10 jobs/acre and E = 10,000 jobs.

An example of this Giuliano and Small method in application is reported in *Not All Sprawl: Evolution of Employment Concentrations in Los Angeles, 1980 – 2000*, February 2005, by Genevieve Giuliano, et. al., School of Policy, Planning and Development, University of Southern California: http://www.usc.edu/schools/sppd/lusk/research/pdf/wp_2005-1002.pdf.

On first review, the Giuliano and Small method seems extendable to the task of identifying Urban Infill Areas which occupy adjacent Block Groups, but EPS requests review of this idea and of the entire Working Paper #1 before proceeding along that particular path of investigation.

The proximity of selected BGs of interest to active transit lines and transit stops/stations can be determined using readily available Geographic Information System (GIS) resources. Many of these resources may be available to authorized users through the Caltrans GIS Data Library, which maintains an online catalog at http://www.dot.ca.gov/hq/tsip/TSIPGSC/library/libdatalist.htm. For this study, however, we feel it is important to propose GIS reference data that are available nationwide, so that the core methodologies are 'portable' and can be applied to other studies in other states.

A map-based or GIS approach to identifying candidate UIAs is consistent with current research such as that described in *Using the Internet to Envision Neighborhoods with Transit-Oriented Development Potential* , a June 2002 publication of the Mineta Transportation Institute and the College of Business at San José State University http://transweb.sjsu.edu/publications/01-24.pdf and in the *California Infill Estimation Methodology Project Final Report*, June 30, 2004, describing tools and methods developed by the City of Los Angeles, the County of Los Angeles and the Environment Now Foundation with consultants Terrell Watt and the Solimar Research Group, under Caltrans Contract #07A1466
http://www.solimar.org/pdfs/Infill_Methdology_Final_Report.pdf

EPS obtained digital map layers of California fixed-route bus services from an online site hosted by the Moakley Center Geographics Laboratory of Bridgewater State College, which maintains nationwide bus service databases and route system GIS information in a cooperative project with the Federal Transit Administration (FTA) at http://geolab.bridgew.edu/docs/busroutes/ . Fixed-rail transit route and station spatial data for California have been obtained from the National Transportation Atlas Databases (NTAD) 2005; this set of nationwide geographic databases is available free of charge from the U.S. Department of Transportation, Bureau of Transportation Statistics at https://www.bts.gov/pdc/user/products/src/products.xml?p=1978&c=-1.

The California bus and rail transit layers described immediately above can be combined with the Block Groups selected by the preliminary threshold filters as shown in **Figure 4 (Working Paper #1 – main text).** The proximity of selected BG centroids to bus routes, rail lines and rail transit stations can be determined either interactively, using GIS 'drag and drop' measurement tools, or programmatically, using Co-ordinate Geometry (CoGo) algorithms.

Figure 4 (Working Paper #1 – main text) shows the distribution of preliminarily chosen BGs in the vicinity of San Francisco and the East Bay; similar maps for the larger San Francisco Bay Area, and for the Stockton, Sacramento, Los Angeles, and San Diego Areas, are provided as **Appendix Figures X1 through** X**5**.For up-to-date information on transit schedules and headways, individual service operators will need to be contacted as potential Urban Infill Survey Sites (UISS) are evaluated for actual trip-generation work-ups. Preliminary information on route scheduling is available for nearly all major California transit services from the Federal Transit Authority, either from the Moakley Center Geographics Laboratory resource described above or from the Integrated National Transit Database Analysis System (INTDAS), developed as part of the Florida Transit Information System (FTIS) by the Lehman Center of Transportation Research (LCTR) at the Florida International University, at http://lctr.eng.fiu.edu/Ftis/index.htm. Summary service statistics for individual California transit agencies are also available from the Federal Transit Administration's National Transit Database (NTD) online at http://www.ntdprogram.com/NTD/ntdhome.nsf?OpenDatabase. The NTD summary information is updated annually; reports for 2003 are the most current available.

Collectively, the Census, BTS and FTA data and GIS components described and applied above can support many alternative sets of criteria for Urban Infill Area selection. It is expected that the Project Team will refine the preferred criteria in discussion with members of the Technical Advisory Committee. EPS respectfully recommends that the Team and the TAC give careful consideration to including mixed-use zoning (complimentary proximate development types, but not mixed-use within a single building or on the same site) among the essential components.

This does not mean the acceptance of mixed land uses for any proposed individual study site, but rather the recognition of immediately adjacent residential and nonresidential development as a fundamental aspect of the 'urban' environment, and at the heart of the need for this special study of trip generation in infill areas. This would also be consistent with current California Government Code, as set forth in California Senate Bill (SB) 1636 (Figueroa).

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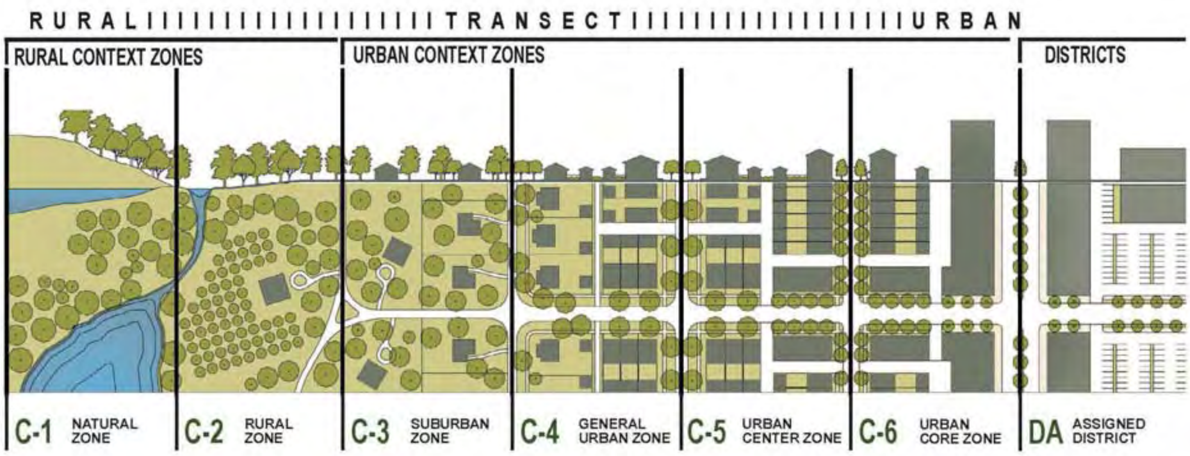
APPENDIX E FOR WORKING PAPER #1

CONTEXT ZONE CHARACTERISTICS

CONTEXT SENSITIVE SOLUTIONS IN DESIGNING MAJOR URBAN THOROUGHFARES FOR WALKABLE COMMUNITIES

ATTACHMENT 3
CONTEXT ZONE CHARACTERISTICS
Context Sensitive Solutions in Designing Major Urban Thoroughfares for Walkable Communities, Institute of Transportation Engineers Proposed Recommended Practice (est. February 2006)

A wide variety of factors create context in the urban environment. Every thoroughfare has an immediate physical context created by buildings and activities on adjacent properties, and is also part of a broader context created by the surrounding neighborhood or district. While the elements of context relating to buildings, landscape, land uses, and public facilities can combine in almost infinite varieties, a set of four context zones serve to define urban areas. The four context zones are a subset of a more inclusive system of contexts that can be used to describe the full range of environments from natural to highly urbanized. The figure below illustrates this concept through a diagram. Although the diagram graphically represents context zones as a linear continuum from most natural to most urban, in fact the zones are most frequently found arranged in mosaic-like patterns reflecting the complexity of metropolitan regions.



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Many communities have found that context zones are useful in presenting information to the public. Local illustration of context zone examples can offer useful models that aid stakeholders in expressing their desires to create distinctive parts of their communities.

Selecting a Context Zone

Context is defined by multiple parameters, including land use, density, and design features. The following table presents the full range of context zones, but focuses on the suburban through urban core contexts (C-3 through C-6) representing urban conditions. The "distinguishing characteristics" column in the table, for example, describes the overall relationship between buildings and landscape that contribute to context. In addition to the distinguishing characteristics and general character, four attributes assist the practitioner in identifying a context zone:

1) building placement - how buildings are oriented and set back in relation to the thoroughfare,

2) frontage type – what part of the site or building fronts onto the thoroughfare,

3) typical building height, and

4) type of public open space.

Guidelines for identifying and selecting a context zone include:

1. Consider both the existing conditions and the plans for the future, recognizing that thoroughfares often last longer than adjacent buildings.

2. Assess area plans and review general, comprehensive, and specific plans, zoning codes, and community goals and objectives. These often provide detailed guidance on the vision for the area.

3. Compare the area's predominant land use patterns, building types, and land uses to the characteristics presented in the following table.

4. Pay particular attention to residential densities, commercial floor area ratios, and building heights.

5. If an area or corridor has a diversity of characteristics that could fall under multiple context zones, consider dividing the area into two or more context zones.

6. Identify current levels of pedestrian and transit activity, or estimate future levels based on the type, mix, and proximity of land uses. This is a strong indicator of urban context.

7. Consider the area's existing and future characteristics beyond the thoroughfare under design, possibly extending consideration to include entire neighborhoods or districts.

Context Zone Characteristics

	A	B	C	D	E	F	G
	Context Zone	**Summary Character**	**Building Setback/Build To and Frontage**	**Thoroughfare Network Scale**	**Building Height**	**Land Use Mix**	**Public Open Space Type**
1	NATURAL (CZ-1)	Natural	Not Applicable	Regional to State Scale	Not Applicable	Restricted protected natural open space	Natural
2	RURAL (CZ-2)	Agricultural and landscaped, no pedestrians	Large setbacks porch, fence, & work yard	Regional Scale	1 to 2 story with some taller work buildings	Restricted agriculture, limited support residential and commercial	Agricultural
3	SUBURBAN (CZ-3)	Landscaped, few pedestrians, detached buildings widely separated	Deep yard setbacks dominant landscaped character (fence/hedge, yard, & porch)	Predominantly Neighborhood Scale	1 to 2 story with some 3 story	Restricted residential with "at-home" businesses and limited commercial, institutional/civic, and open space	Parks with adjacency to greenbelts
4	GENERAL URBAN (CZ-4)	Urban, pedestrians present, balanced landscape and predominantly detached buildings	Medium yard setbacks balanced landscape and building character (fence/hedge, yard, & porch)	Neighborhood to Regional Scale	2 to 3 story with some 1 story and some above 3 story; and few taller work buildings	Limited medium-density residential with limited mix of other uses typically ground level - institutional/civic, commercial, and open space	Parks
5	URBAN CENTER (CZ-5)	Urban, substantial pedestrian activity, predominantly built with attached buildings with most landscape within the thoroughfare right-of-way	Small or no setback, build to lines common, building character defining street wall (storefront, stoop, & forecourt)	Neighborhood to Regional Scale	3 to 5 story with some lower and few taller buildings	Open higher-density commercial, employment, and residential use with support institutional/civic and open space	Parks, plazas and squares
6	URBAN CORE (CZ-6)	Urban, most pedestrian activity, predominantly built with attached buildings providing a strong sense of enclosure with some landscape within the thoroughfare right-of-way	Small or no setback, build to line at sidewalk/RW, building character defining street wall (storefront, stoop, & forecourt)	Neighborhood to Sector Scale	4+ story with few lower buildings	Open highest-density commercial, employment, and residential use with support institutional/civic and open space	Parks, plazas and squares

APPENDIX B

Appendix B - List of Organizations / Individuals Contacted

Contact Name	Position	Agency/Organization	Telephone Number	City
Barbara Pauly	Administrative Assistant	Albertsons	925-833-6200	Dublin
Ronnetta Lewis	In charge Manager	Albertsons	208-395-6200	Boise
James	Manager	24 Hour Fitness	510-548-4653	Berkeley
Jeff Hudson		Transportation and Land Use Coalition	510-740-3150 x312	California
Adam Smith	Manager	Albertsons	510-538-7120	Hayward
Sonny Astani	Chairman	Astani Enterprises	310-273-2999	Beverly Hills
Patrick Kennedy	Owner	Panoramic Interests	510-883-1000 x300	Berkeley
Christina Jones	V. P Property Management	The Allegro, SNK Development	602-261-7511 x5	
Kate White		Urban Land Institute	415-772-0390	San Francisco
Geeta Rao			415-989-8160 x 22	San Francisco
Kim Havens		Wilson Meany Sullivan	415-905-5300	San Francisco
Jim Ghielmetti	Owner	Signature Properties	925-463-1122	
Paul Peninger	Associate	Non-Profit Housing Association		
Nicki Tyner		Archstone Smith	877-260-3085	
Sharron King	General Manager	South Bay Pavilion	310-366-6636	Carson
Linda Mogadam / Veronica Perez Becker	Vice President of Legislature	CCALA	213-624-1213 x218	Los Angeles
Carol E Schartz	President & CEO	CCALA & Downtown Center Business Improvement District	213-624-1213 x215	Los Angeles
Catherine Leland		CCALA	213-524-1213 x208	Los Angeles
Kim Moore	Manager	The South Group	213-741-2959 x263	Los Angeles
Mike Bates	President	The Mobility Group	949-474-1591 x11	Irvine
Holly	Property Manager	Camden/Tuscany	619-255-4000	San Diego
Allegro	Property Manager		619-595-7801	San Diego
Portico	Property Management	Piescott Property Management	619-702-2354	San Diego
Sabrina	Property Manager	Treo @ Kettner	619-231-4315	San Diego
Barbara Prince	HOA President	Grande Santa Fe Place	619-236-1122	San Diego

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Contact Name	Position	Agency/Organization	Telephone Number	City
Huberts	HOA President	Pinnacle Museum Towers	619-985-7100	San Diego
Horizons		Horizon Marina District	619-338-4096	San Diego
Steven Bodle	Property Manager	Ralph's	619-595-1581	San Diego
Rashid Kassir	Property Manager	Atria	619-230-1891	San Diego
Diana E. Norbury	Property Manager	Equity Residential	510-849-2000	Berkeley
Heather Carter	Property Manager	Baker Pacific Group	213-553-1176	Los Angeles
Michele Dennis	President	BOMA - Greater Los Angeles	213-629-2662	Los Angeles
Martha Cox	Directors of Government and Public Affairs	BOMA - Greater Los Angeles	213-629-2662	Los Angeles
Marc L. Intermaggio	Executive Vice President	BOMA - San Francisco	415-362-2662	San Francisco
Ken Cleveland	Directors of Government and Public Affairs	BOMA - San Francisco	415-362-2662 x11	San Francisco
Robert O. Robledo	Executive Vice President	BOMA - Oakland/East Bay	510-893-8780	Oakland
Yvonne Parker	Executive	BOMA - Inland Empire	909-825-2000	Grand Terrace
Robin Jochims	Executive	BOMA - Orange County	714-258-8330	Tustin
Paul Yoder / Shaw Yoder	Executive	BOMA - Sacramento	916-443-9092	Sacramento
Audrey Benedetto / Craig Benedetto	Executive	BOMA - San Diego	619-243-1817	San Diego
Robert Jacobvitz	Executive Director	BOMA - Silicon Valley	408-453-7222	San Jose
Steve Piperen				Sacramento
George Tsakopolus	Businessman			Beverly Hills
Richard Rich	Developer			
Robert Dunphry		Urban Land Institute		
San Francisco Planning Department		City of San Francisco	415-558-6378	San Francisco
Ellen Dektar	Executive Director	Local Investment in Child Care (LINCC)	510-208-9578	Oakland
Paul Richards	Director of Property Management	Wilson Meany Sullivan	415-905-5300	San Francisco
Kim Martinson	Executive Director	San Francisco TMA	415-392-0210	San Francisco
Zac Wald	Chief of Staff for Oakland Councilwoman Jane Brunner	Oakland		Oakland

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Contact Name	Position	Agency/Organization	Telephone Number	City
Rex Himes		Business Property Managers Association (BPMA)		
Doug Willie		Shopping Center Council		
Mario Torress	Developer	Primestor Development, Inc.	310-652-1177	Los Angeles
Andrew Goodman	Regional Director of Leasing	Equity Office Properties	310-446-2212	Los Angeles
Angela Rinebold	Portfolio Manager	Equity Office Properties	310-446-2208	Los Angeles
Randall Sakamoto	Vice President, Research	Rosen Consulting Group		Los Angeles
Patrick Lacey	Director of Assest Management and Operations	Cabi Developers		Los Angeles
Mary Marx	Managing Director	Cushman & Wakefield	213-955-5187	Los Angeles
Thomas Hilal / Mandana Kohen		Nourmad and Associates		Los Angeles
Criag Peirson	Vice President Dispositions	Arden Realty	310-966-2600	Los Angeles
David Swartz	General Counsel	Arden Realty	310-966-2600	Los Angeles
Greg Husebye	Vice President	Arden Realty	310-966-2664	Los Angeles
Scott Lyle	First Vice President, Operations	Arden Realty	310-966-2600	Los Angeles
Mark Levy	Director of Acquisition	Arden Realty	310-966-2600	Los Angeles
Ann Gary	FAIA, Architect	Murdouch Plaza		Los Angeles
Kambiz Hekmat	Owner	Murdouch Plaza	310-824-3000	Los Angeles
Matthew C. Fragner	Counsel	CIM	310-779-7284	Los Angeles
Gregory R. Hambly	Chief Accounting Officer	Douglas & Emmett	310-255-7831	Los Angeles
Carl Muhlstein	Executive Vice President	Cushman & Wakefield		Los Angeles

APPENDIX C

Association of Bay Area Governments

Caltrans

LOS ANGELES AREA OFFICE TRAVEL SURVEY

This survey is part of a statewide effort to determine how people travel in California's urban areas. Your responses will be used to plan effective transportation improvements. Your responses are completely confidential. Thank you for your time.

Do you work here?

- ❑ Yes
- ❑ No

What primary means of travel did you use to either get here or leave here today?

- ❑ Drove alone
- ❑ Drove others: How many including yourself_______
- ❑ Rode as passenger, car parked nearby
- ❑ Rode as passenger: was dropped off
- ❑ Bus
- ❑ Bicycle
- ❑ Walk
- ❑ Train/Trolley
- ❑ Taxi
- ❑ Other ___________

Is this location your primary destination or did you stop here on the way to another destination?

- ❑ Primary destination
- ❑ Stopped here on the way to another destination

How often do you visit this location in a typical week? ______

If you are arriving, approximately how long did it take you to get here today? _______ (minutes)

OPTIONAL QUESTIONS (PLEASE ANSWER AS MANY OR AS FEW AS YOU WANT)

What is the zip code of your home address?

____

What is your age? (circle one)

19-24 years　　25-34 years

35-44 years　　45-54 years

55-64 years

65 years or more

Are you:

- ❑ Male
- ❑ Female

How many autos, pickups, vans and motorcycles are available for use by members of your household?

_____________ **(enter number)**

What is your occupation?

- ❑ Professional/technical
- ❑ Manager/administrator
- ❑ Sales/account representative
- ❑ Secretarial/clerical
- ❑ Student/intern
- ❑ Service worker
- ❑ Craftsman/mechanic
- ❑ Other _____________ (specify)
- ❑ Retired
- ❑ Homemaker
- ❑ Not currently employed

Including yourself, how many people live in your household?

__________ **(enter number)**

What is your approximate household income?

- ❑ 0-$20,000
- ❑ $20,000 - $40,000
- ❑ $40,000 - $60,000
- ❑ $60,000 - $80,000
- ❑ Greater than $80,000

If you are employed, does your employer offer any of the following? (check all that apply)

- ❑ Flexible work hours
- ❑ Free or discounted transit passes or allowance
- ❑ Provide a company car for midday use
- ❑ Free parking

For survey taker use only. Date:　　Time: Period:　　Site:

Association of Bay Area Governments

Caltrans

LOS ANGELES AREA RETAIL TRAVEL SURVEY

This survey is part of a statewide effort to determine how people travel in California's urban areas. Your responses will be used to plan effective transportation improvements. Your responses are completely confidential. Thank you for your time.

What primary means of travel did you use to either get here or leave here today?

- q Drove alone
- q Drove others: How many including yourself_______
- q Rode as passenger, car parked nearby
- q Rode as passenger: was dropped off
- q Bus
- q Bicycle
- q Walk
- q Taxi
- q Other ___________

Do you work here?

- q Yes
- q No

Is this location your primary destination or did you stop here on the way to another destination?

- q Primary destination
- q Stopped here on the way to another destination

If this location was NOT your primary destination, would you have passed by this location if you did not stop here today?

- q Yes
- q No

How often do you visit this location in a typical week? ______

If you are arriving, approximately how long did it take you to get here today? _______ (minutes)

OPTIONAL QUESTIONS (PLEASE ANSWER AS MANY OR AS FEW AS YOU WANT)

What is the zip code of your home address?

____

What is your age? (circle one)

19-24 years　　25-34 years

35-44 years　　45-54 years

55-64 years

65 years or more

Are you:

- q Male
- q Female

How many autos, pickups, vans and motorcycles are available for use by members of your household?

______________ **(enter number)**

What is your occupation?

- q Professional/technical
- q Manager/administrator
- q Sales/account representative
- q Secretarial/clerical
- q Student/intern
- q Service worker
- q Craftsman/mechanic
- q Other _____________ (specify)
- q Retired
- q Homemaker
- q Not currently employed

Including yourself, how many people live in your household?

__________ **(enter number)**

What is your approximate household income?

- q 0-$20,000
- q $20,000 - $40,000
- q $40,000 - $60,000
- q $60,000 - $80,000
- q Greater than $80,000

If you are employed, does your employer offer any of the following? (check all that apply)

- q Flexible work hours
- q Free or discounted transit passes or allowance
- q Provide a company car for midday use
- q Free parking

For survey taker use only. Date:　　Time: Period:　　Site:

BERKELEY AREA RESIDENTIAL TRAVEL SURVEY

This survey is part of a statewide effort to determine how people travel in California's urban areas. Your responses will be used to plan effective transportation improvements. Your responses are completely confidential. Thank you for your time.

Do you live here?

- ❑ Yes
- ❑ No

What primary means of travel did you use to either get here or leave here today?

- ❑ Drive alone
- ❑ Drive others: How many including yourself_______
- ❑ Ride as passenger/Carpool
- ❑ Bus
- ❑ Bicycle
- ❑ Walk
- ❑ Taxi
- ❑ Train/trolley
- ❑ Other ___________

How long is your average commute to and from your final destination?_____________(minutes)

Are you a student /employee/staff of U.C Berkeley?______

OPTIONAL QUESTIONS (PLEASE ANSWER AS MANY OR AS FEW AS YOU WANT)

What is the zip code of your home address?

____

What is your age? (circle one)

19-24 years 25-34 years

35-44 years 45-54 years

55-64 years

65 years or more

Are you:

- ❑ Male
- ❑ Female

How many autos, pickups, vans and motorcycles are available for use by members of your household?________ (enter number)

What is the purpose of your trip? ______

What is your occupation?

- ❑ Professional/technical
- ❑ Manager/administrator
- ❑ Sales/account representative
- ❑ Secretarial/clerical
- ❑ Student/intern
- ❑ Service worker
- ❑ Craftsman/mechanic
- ❑ Other _____________ (specify)
- ❑ Retired
- ❑ Homemaker
- ❑ Not currently employed

Including yourself, how many people live in your household?

__________ **(enter number)**

What is your approximate household income?

- ❑ 0-$20,000
- ❑ $20,000 - $40,000
- ❑ $40,000 - $60,000
- ❑ $60,000 - $80,000
- ❑ Greater than $80,000

If you are employed, does your employer offer any of the following? (check all that apply)

- ❑ Flexible work hours
- ❑ Free or discounted transit passes or allowance
- ❑ Provide a company car for midday use
- ❑ Free parking

For survey taker use only. Date: Time: Period: Site:

APPENDIX D

FINAL

WORKING PAPER #2
SITE SELECTION AND DATA COLLECTION/ANALYSIS METHODOLOGY

REVISED MAY 2006

Prepared for:

California Department of Transportation
Technical Advisory Committee

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In Association with:

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I. Revisions to the Working Paper

Subsequent to the February 13, 2006 discussion with the TAC and further conversations with the ITE liaison (Gene Arnold), the consultant team has revised the proposed methodology (see Attachment 1 for a summary of the February 13 meeting). It was agreed that the ITE methodology for conducting trip generation surveys was only suitable for isolated suburban locations and even if an urban site could be identified that met ITE's criteria, the resulting data may not be representative of typical urban site characteristics. Therefore it was agreed that the trip generation study would use intercept surveys for the collection of data. Gene Arnold agreed with this approach and indicated that because the ITE Trip Generation Manual is an Information Report, they would accept our methodology into their collection of trip generation studies. We would need to provide a detailed description of our methodology. Section VII below has been revised to reflect the change in methodology.

Additional issues addressed in this revised working paper include:

- Final Land Use Categories:
  - Expand on the qualifier to all land use categories that selected sites can be part of a mixed-use development as long as use is isolated enough to collect necessary data (in this case intercept survey data).
  - It is acceptable to diverge from the strict ITE definition of land use categories to better reflect urban areas.

- Final Urban Infill Area Criteria:
  - Revise criteria to accept the use the collective headways of multiple routes as long as the routes served the same corridor for a considerable length of the corridor.

- Site Selection Methodology:
  - Combine the Monterey Bay/Santa Cruz region with the San Francisco Bay Area region.
  - Combine San Bernadino and Riverside counties with the metropolitan Los Angeles region.
  - Retain the Sacramento area as a separate region.
  - Allocate 50% of study sites to the Northern California regions and 50% to the Southern California regions, then allocate study sites to counties based on the proportion of population and employment in the census block groups that meet UIA criteria, rather than countywide population.

- Data Collection Methodology:
  - Use intercept surveys to collect data (see revised Section VII below).
  - Include retail study sites as small as 10,000 square feet for the Shopping Center land use category.
  - The Data Summary Report will list each study site separately with all the independent variable data and count data collected for that site.
  - The study will report additional information on the characteristics of the areas surrounding the study sites and provided as supplemental data in the appendices.

This additional information would include a combination of quantitative and qualitative characteristics of the site's surrounding district such as land use mix, densities, network attributes, pedestrian system, predominate uses, amenities, etc.

- Use of Pilot Surveys:
  - The use of intercept surveys will be tested through a series of pilot studies in the San Francisco Bay Area region. An initial selection of between 5 and 10 land uses will be selected for the pilot studies. The findings of these surveys will be used to refine the methodology for collection of the full set of sites.

II. Introduction and Objectives

This paper presents a detailed methodology and criteria for selecting candidate sites for data collection, guidelines for data collection at individual sites, and a methodology for analyzing data. The objectives of this working paper are:

1) Establish a technical procedure that moves the study from mapping of Urban Infill Areas to the selection of individual sites for data collection.
2) Develop guidelines for the collection and analysis of trip generation data recognizing that the study of urban areas will not be able to utilize the Institute of Transportation Engineers' (ITE) recommended data collection methods.
3) Establish a process with the ITE liaison to review and approve key steps and procedures.

III. Proposed ITE Review Process

The Institute of Transportation Engineers (ITE) has agreed to review material developed as part of this study. The project team has proposed to ITE participation of a technical liaison comprised of ITE staff and/or member(s) of the ITE Trip Generation Committee. ITE staff participation will be limited to receipt of material developed as part of the study and be available to provide advice on technical matters. ITE will review the trip generation findings at the time we submit them. For participation in the development of the study, we have tentatively agreed to work with Mr. Gene Arnold, a Senior Research Scientist at the Virginia Transportation Research Council. While Mr. Arnold does not represent ITE, he was recommended by ITE and has been involved in the review and development of past trip generation manuals. The process for ITE review is outlined below:

- The project team will provide key information to be reviewed and considered by the liaison. ITE will be copied on all material provided to the liaison. Proposed key information includes:
  - definition of urban infill areas (UIA);
  - UIA selection criteria;
  - proposed ITE land use categories;
  - method and criteria for selecting individual study sites;
  - data collection guidelines and technical methods;
  - identification of independent variables; and

  - o statistical analysis methods.

- The liaison will be invited to participate in relevant TAC discussions.
- The project team will hold discussions with the liaison specifically on the proposed methodology.
- The project team will work with both ITE staff and the liaison document the methods, data, and analysis for eventual submission to ITE for possible incorporation into a future version of the Trip Generation manual or other trip generation Informational Report.

IV. Final Site Selection Criteria

As agreed upon by the TAC at its December 20th, 2005 teleconference, the following criteria will be used to select study sites:

1) A Urban Infill Area (UIA) designation may be applied to any site located either:

   a) within a **Central Business District (CBD)**, **Central City, Not Downtown (CND)** or **Suburban Center (SBC) Area**, as defined by the ITE for data collection surveys (ITE definitions of these areas is attached as Attachment 2); or alternatively,
   b) within a **General Urban (T/CZ-4)**, **Urban Center (T/CZ-5)**, or **Urban Core (T/CZ-6) Context Zones**, as defined in the Proposed Recommended Practice for Context Sensitive Solutions in Designing Major Urban Thoroughfares for Walkable Communities estimated to be published in February 2006 (Attachment 3 provides characteristics of these context zones), which **also** meets all of the other criteria defined immediately below.

2) The UIA must be within 1/3 mile of a site with an existing or future rail transit station, a ferry terminal served by either a bus or rail transit service, an intersection of at least two major bus routes, or within 300 feet of a bus rapid transit corridor. The transit service shall have maximum scheduled headways of 15-minutes for at least 5 hours per day. It is acceptable to use the collective headways of multiple routes as long as the routes serve the same corridor for a considerable length of the corridor. This reflect corridors where people can use any route to reach any point within a significant length of the corridor.

3) The UIA can contain no more than 10 percent Vacant Developable Land. Vacant Developable Land as defined excludes water bodies, public rights-of-way, land designated for conservation and public recreation, and any other land designated by local governments' policies or comprehensive plans as unavailable for development. Parking lots on land designated and/or zoned as developable under current policy qualify as Vacant Developable Land.

4) Where residential land uses comprise at least 60 percent of developed land, average residential density shall be at least 10.0 dwelling units per gross acre of residentially developed land, or

5) Where nonresidential land uses comprise at least 60 percent of developed land, average nonresidential density shall be a floor area ratio (FAR) of at least 1.0 and/or an employment density of at least 35.0 per gross acre of nonresidential developed land, or

6) Where neither residential nor nonresidential uses comprise more than 60 percent of developed land, both residential and nonresidential uses must meet the density and intensity criteria prescribed above.

V. Recommended Land Uses (ITE Categories)

Below are the ten land uses agreed upon by the TAC, arranged in order by ITE land use code:

- (223) Mid-rise apartment
- (230) Residential condominium/townhouse (mid-rise)
- (232) High-rise residential condominium/townhouse
- (445) Multiplex movie theater
- (492) Health/fitness club
- (565) Day care center
- (710) General office building
- (820) Shopping center
- (850) Supermarket
- (932) High-turnover sit down restaurant

Table 1 also lists these land uses and provides their descriptions as published in the ITE Trip Generation Manual (7^{th} Edition). In addition to the ITE description, Table 1 presents qualifications or recommendations specific to the urban infill trip generation study, if applicable. There are qualifiers/recommendations for four of the categories:

- (230) Residential condominium/townhouse – In the ITE Trip Generation Manual, this is a general category of residential use without a definition of height of building. The data included low and high-rise buildings. For purposes of the urban infill trip generation study, we recommend that we limit this category to mid-rise buildings of between three and ten stories.

- (232) High-rise residential condominium/townhouse – In the ITE Trip Generation Manual, this category represents buildings of three or more stories in height. For purposes of the urban infill trip generation study, we recommend that we limit this category to high-rise buildings greater than ten stories.

- (565) Day care center – In the ITE Trip Generation Manual, day-care centers are defined as a free-standing facility. For purposes of the urban infill trip generation study, we recommend that we do not limit potential study sites to free-standing facilities (e.g., can be part of a larger building or facility) as long as it is open to the general public and has access/parking isolated enough for the collection of accurate data.

- (820) Shopping center – The ITE Trip Generation Manual no longer provides different rates for different size shopping centers (less than or greater than 600,000 square feet). This was discontinued in the 5th Edition of Trip Generation because 1) there was confusion as to which rate to use when the shopping center was close to the threshold, and 2) it was determined that the regression equations accurately predicted the change in traffic based on the size of the center. These findings were based on a study of 345 shopping centers classified as either neighborhood, community, regional, or super-regional centers (Peyrebrune, Joan C. "Trip Generation Characteristics of Shopping Centers". ITE Journal. June 1996, Pg. 46-50.) For this study retail sites can be part of a mixed-used development.

In addition to the above qualifiers, most of the land uses include qualifiers that allow the site to be part of a mixed-use development, or integrated into a larger complex. This qualifier reflects the change in data collection from traffic counts to intercept surveys.

VI. Proposed Site Selection Methodology

The proposed site selection is based on an approach that relies on both quantitative and qualitative measures and decision-making procedures. It is useful to organize the site selection process in terms of region, county, city, district, and site and to develop criteria for selecting study areas at each geographic level. This organization is summarized below.

<u>Objectives of Site Selection</u>

The overall purpose of the site selection is three-fold, 1) to identify sites distributed within urban areas throughout the state so that data collection is representative of the trip generation of uses within all regions of California, 2) to ensure candidate site are within areas that meet the criteria for UIA, and 3) to ensure that the candidate sites have the appropriate characteristics for proper data collection. Specific objectives of site selection are:

- To ensure a distribution of candidate sites throughout the state, capturing a cross-section of the state's urban areas. Statewide distribution of sites is intended to capture differences in trip generation that might be reflective of geographic location.

- To select candidate sites in a distribution of urban infill areas at the region and county level proportional to population.

A. Determine the Geographic Distribution of Study Sites

- Geographic Distribution of Study Sites by Region

Selection criteria: divide number of study sites (50) to survey 50% of the sites in Northern California and 50% of the sites in Southern California regions. Divide state into four metropolitan regions. These regions contain concentrations of census block groups which meet the minimum density criteria for housing or employment (see Working Paper #1).

Table 1: Final List of Land Uses for the Urban Infill Trip Generation Study

Land Use Group	ITE LU Code	ITE Land Use Type	ITE Description	Additional Qualifiers for Trip Generation Study
Residential	223	Mid-Rise Apartment.	Mid-rise apartments are apartments (rental dwelling units) in rental buildings that have between three and ten levels (floors).	No additional qualifiers.
Residential	230	Residential Condominium/Townhouse (mid-rise)	Residential condominiums/townhouses are defined as ownership units that have at least one other owned unit within the same building structure. Both condominiums and townhouses are included in this land use. The studies of this land use did not identify whether the condominiums/townhouses were low-rise or high-rise.	The ITE description does not specify number of floors in this category. We recommend that we limit this category to mid-rise units of between 3 and 10 stories.
Residential	232	High-Rise Residential Condominium/Townhouse	High-rise residential condominiums/townhouses are units located in buildings that have three or more levels (floors). Both condominiums and townhouses are included in this land use.	To distinguish from the mid-rise category, we recommend that the high-rise category include buildings greater than 10 stories.
Recreational	445	Multiplex Movie Theater	A multiplex movie theater consists of audience seating, a minimum of ten screens, a lobby and a refreshment area. The development generally has one or more of the following amenities: digital sound, tiered stadium seating and moveable or expandable walls. Theaters included in this category are primarily stand-alone facilities with separate parking and dedicated driveways. All theaters in this category show only first-run movies or movies not previously seen through any other media. They may also have matinee showings.	Does not necessarily need to be a free-standing facility (may be integrated into a mixed-use development).
Recreational	492	Health/Fitness Club	Health/fitness clubs are privately owned facilities that primarily focus on individual fitness or training. Typically they provide exercise classes, weightlifting, fitness and gymnastic equipment; spas; locker rooms; and small restaurant and snack bars. This land use may also include ancillary facilities, such as swimming pools, whirlpools, saunas, tennis, racquetball and handball courts and limited retail. These facilities are membership clubs that may allow access to the general public for a fee.	Does not necessarily need to be a free-standing facility (may be integrated into a mixed-use development).
Institutional	565	Day Care Center	A day center is a free-standing facility where care for pre-school aged children is provided normally during the daytime hours. Day care facilities generally include classrooms, offices, eating areas and playgrounds. Some centers also provide after-school care for children.	Does not necessarily need to be a free-standing facility (may be integrated into a mixed-use development).
Office	710	General Office Building	A general office building houses multiple tenants; it is a location where affairs of businesses, commercial or industrial organizations, or professional persons or firms are conducted. An office building or buildings may contain a mixture of tenants including professional services; insurance companies; investment brokers; and tenant services, such as a bank or savings and loan institution, a restaurant or cafeteria and service retail facilities.	Does not necessarily need to be a free-standing facility (may be integrated into a mixed-use development).
Retail	820	Shopping Center [1]	A shopping center is an integrated group of commercial establishments that is planned, developed, owned and managed as a unit. A shopping center's composition is related to its market area in terms of size, location, and type of store. A shopping center also provides on-site parking facilities sufficient to serve its own parking demands. [2]	We recommend that the selection of shopping centers be limited to "Neighborhood" and "Community" center classifications as defined by ITE (see definitions below). Additionally, the trip generation study should attempt to select sites that are near the average size of the neighborhood and community shopping centers identified in the study cited in footnote [1] but also reflect smaller urban retail sites as low as 10,000 square feet.
Retail	850	Supermarket	Supermarkets are free-standing retail stores selling a complete assortment of food, food preparation and wrapping materials and household cleaning items. Supermarkets may also contain the following products and services: ATMs, automobile supplies, bakeries, books and magazines, dry cleaning, floral arrangements, greeting cards, limited-service banks, photo centers, pharmacies and video rental areas. Some facilities are open 24 hours a day.	Does not necessarily need to be a free-standing facility (may be integrated into a mixed-use development).
Services	932	High-Turnover (Sit-Down) Restaurant	This land use consists of sit-down, full-service eating establishments with turnover rates of approximately one hour or less. This type of restaurant is usually moderately priced and frequently belongs to a restaurant chain. Generally, these restaurants serve lunch and dinner; they may also be open for breakfast and are sometimes open 24 hours per day. These restaurants typically do not take reservations. Some facilities contained within this land use may also contain a bar area for serving food and alcoholic drinks.	Does not necessarily need to be a free-standing facility (may be integrated into a mixed-use development).

[1] In the 6th Edition of Trip Generation, ITE discontinued the distinction in trip generation rate by size of shopping center. A study published in the ITE Journal found that while the trip generation rate did vary by size of center, the regression equations published in the manual did accurately reflect the variation in trip generation by size of center. See "Trip Generation Characteristics of Shopping Centers", ITE Journal, June 1996.

[2] Additional description in ITE Trip Generation (7th Edition): Shopping Centers, including neighborhood centers, community centers, regional centers and super regional centers, were surveyed for this land use. Some of these centers contained non-merchandising facilities, such as office buildings, movie theaters, restaurants, post offices, banks, health clubs, and recreational facilities (e.g., ice skating rinks). The centers ranged in size from 1,700 to 2.2 million square feet of gross leasable area (GLA).

Definitions:

Neighborhood Shopping Center	Provides for the sale of convenience goods (foods, drugs and sundries) and personal services (such as laundry and dry cleaning, barbering and show repairing) for day-to-day living needs of the immediate neighborhood. It is built around a supermarket as the principal tenant. In theory, the neighborhood center has a typical gross leasable area of 50,000 square feet; in practice it may range in size from 10,000 to 100,000 square feet.

1. San Francisco Bay Area (including Santa Cruz/Monterey Bay area)
2. Sacramento Area
3. Los Angeles Area
4. San Diego Area

- Geographic Distribution of Study Sites

Selection criteria: The proportion of population and employment within the census block groups that meet the UIA criteria will be used to allocate the regional distribution of study sites to individual counties within each region. The selection of study areas within cities is based on two criteria:

1) Cities with census blocks that meet either housing or employment density criteria and mapped in Working Paper #1, and
2) Cities that have transit systems that meet the minimum service criteria described above (rail stations, BRT systems, and/or maximum headways of 15-minutes for at least 5 hours per day).

This selection criteria requires mapping transit lines (both rail and fixed route) that meet the minimum service criteria.

- Geographic Distribution of Study Sites by District

Selection criteria: the district (an area of contiguous census block groups) must meet the following criteria:

1) District is within 1/3 mile of a an existing or future rail transit station, a ferry terminal served by either a bus or rail transit service, an intersection of at least two major bus routes, or within 300 feet of a bus rapid transit corridor. Transit lines must meet the headway criteria described above. It is acceptable to use the collective headways of multiple routes as long as the routes serve the same corridor for a considerable length of the corridor. This reflects corridors where people can use any route to reach any point within a significant length of the corridor.

This step involves using GIS to map the districts within the distance criteria around transit lines, then identify census block groups within these mapped districts that meet either the housing or employment minimum density criteria. The TAC will be given an opportunity to review identified districts.

B. Preliminary Study Site Identification

Selection criteria: use aerial photography and business search capabilities (e.g., google search) to review identified census block groups and apply the following qualitative criteria:

1) From observation, district or census block groups are located within a compact, mixed-use, walkable urban area with good pedestrian connections within the district, to transit, and to adjacent districts, and
2) District contains the selected ITE land use categories, identified either through web-based search of businesses, knowledge of area, or by visual inspection in field.

Note: The TAC may also provide preliminary identification of sites through local knowledge of their jurisdictions. Sites identified by the TAC will go through the same steps above the consultant uses to identify sites.

C. Site Owner/Tenant Interview

The site owner or tenant interview is necessary to determine the ability to obtain "population" data (needed for statistical analysis of intercept surveys) and independent variable data such as number of units, gross floor area, occupancy, etc. and to gain permission to conduct intercept surveys. The consultant will contact the owner or major tenant of the site and provide an initial interview to 1) gain permission to conduct intercept surveys and gather data about the site, and 2) ensure critical information is available to conduct a study of the site. The initial interview will be followed up with a detailed survey requesting additional data about the site and independent variables. The minimum independent variable data that must be available includes:

- Gross floor area (GFA), and occupied floor area for commercial properties.
- Number of staff and number of students at day care centers.
- Number of screens at multi-plex movie theaters.
- Number of units, and number of occupied units for residential properties.

Based on the owner/tenant interview, the site may be eliminated and review of alternative sites may be required.

E. Finalize Study Site Selection

Final selection of study sites (including TAC review and agreement) occurs when the site meets the criteria described in sections A through D above. A checklist will be developed to ensure criteria is met.

VII. Data Collection Methodology (Intercept Surveys)

A. Develop Schedule and Staffing Plan for Each Site

The purpose of the site data collection plan is to ensure that the appropriate resources are scheduled to collect data within the specified timeframes. The plan will include a schedule and identify the consultant staff person responsible for organizing the data collection, collecting independent variable data and additional site data, and managing the traffic counting subcontractor.

B. Develop Quality Control Plan

The purpose of the quality control plan is to identify staff responsible for reviewing individual site data collection plans, data collection, independent variable information, and additional site information. Quality control is conducted by someone not directly involved in the study. The quality control reviewer is responsible for the checking the data collection methodology and the collected data against the checklist developed above. The quality control reviewer will also check data for reasonableness.

C. Conduct Intercept Surveys

Objective: Use random intercept surveys to collect travel information from users of urban land uses in the derivation of automobile trip generation rates for the peak hours of adjacent street traffic. Initially, a pilot survey of between 5 and 10 sites will be conducted to test the effectiveness of the intercept survey method and to refine subsequent surveys.

Overall methodology: Intercept surveys collect data from a sample of the "population". Sampling is intended to represent the population of interest, in this case the travelers who access a particular land use. The sampling procedure that assures that each element in the population has an equal chance of being selected is referred to as simple random sampling. The results of surveying a sample of the population can be applied to the total population. For example, if 60% of the sample drove alone to the site we could apply this finding to the entire population.

Sampling through intercept surveys requires that we know how many people are in the "population" and how accurate the results should be (see Statistical Confidence below). A survey of a portion of a population always has some margin of error in the results, but when the margin of error is reduced to just a few percentage points, it often becomes of little concern. A rule of thumb is to target a 95% confidence with a 5% error level, but we may not be able to achieve this high a level. The confidence tells us how confident we are about the error level. Expressed as a percentage, it is the same as saying if we were to conduct the survey multiple times, how often would you expect to get similar results.

Determining a sample size to achieve a desired confidence and error level requires that we know the size of our population. For example, if the population is 300 persons travel to/from a land use in the peak hour we would need to survey 168 persons to achieve a 95% confidence with a 5% error level, or 143 persons to achieve a 90% confidence with a 5% error level. Because we may not know the size of population in advance, we would need to collect population information at the time of the survey as discussed below.

Data collection periods and Rate Derivation: The intercept survey is intended to provide data to compute trip generation rates for the peak hour of adjacent street traffic (7:00 to 9:00 AM and 4:00 to 6:00 PM). This is most common rate used by transportation planners and traffic engineers. Intercept surveys can also be used to compute the peak hour of the generator, but is typically only used for special generators such as theaters, theme parks, and other large venues. The use of intercept surveys will not provide enough information to develop average daily trip generations rates because it is not feasible to collect data for a 24-hour period. Average daily trip generation may be estimated from peak hour data by dividing by a peak to daily factor, but its accuracy would be questionable.

Data requirements: The intercept survey and associated data collection includes the following information for each surveyed site:

Population size: Since our objective to determine how many automobile trips are being generated and using mode share information to determine this number, the population is the number of people accessing a site during the study period. This information would be collected in different ways, but the primary way would be to count the people entering and exiting the site during the survey periods. Therefore the sites selected require that we can survey each individual entrance point to capture the entire population.

Random sampling of population: The intercept surveys will ask specific questions of the random sample of people accessing the site during the study period (see draft questionnaire). The questions will primarily derive the mode of travel used to reach or leave the site, but additional information can be collected as well.

Independent variable: The computation of a trip generation rate requires establishing an independent variable (e.g., trips per 1,000 square feet or trips per employee). If the selected independent variable is related to the population, then that information needs to be collected at the time of survey. For example, if the independent variable was employees, we would need to know how many employees were present on the day of the survey. It is desirable to use a fixed independent variable such as square feet of building area to avoid variability. We will select the most common independent variables used in the ITE Trip Generation Manual.

Conducting the pilot surveys:

1) The methodology is based on the use of a professional surveying firm to conduct the intercept surveys (pilot studies will be conducted by Gene Bregman Associates, San Francisco).
    - The pilot surveys will be conducted on a Tuesday, Wednesday or Thursday of the week of May 29 through June 2. The surveys will be conducted from 7:00 a.m. to 9:00 a.m. and from 4:00 p.m. to 6:00 p.m. Each completed survey will contain the time of arrival or departure.
    - We have established a quota of a minimum of 100 completed surveys per site and will continue the surveys each day until the minimum quota is reached. Low generation land uses such as day care centers may have a lower quota because it may not be possible to collect the minimum. ITE recommends a minimum of 100 surveys when conducting multi-use development intercept interviews.
    - One or two surveyors will ask people entering and exiting the site to fill out a short questionnaire and hand them a clipboard with a one-page series of questions (see draft questionnaire in Attachment 2). The questionnaire incl
    - KHA will arrange to have additional persons count every person entering and exiting the site from all access points.

2) KHA will contact the candidate sites prior to the surveys to gain permission to conduct surveys and ensure that additional independent variable information can be collected.

E. Conducting the Final Surveys

The outcome of the pilot surveys will identify issues, problems, and additional data collection requirements for completing the full set of surveys. The consultant team will use the pilot surveys to refine the methodology. After refining the survey methodology, the remaining sites will be selected and additional surveys will be scheduled and conducted.

F. Quality Review

Essentially, quality review is a second look at the data. In addition to review by the staff responsible for data collection, the quality control reviewer examines the collected data focusing on identifying missing and inconsistent data, and obvious anomalies.

VIII. Data Analysis Methodology

A. Select Independent Variable(s) for Rate Calculation

The selection of independent variables to be used in calculating rates will be consistent with the variables used in the ITE Trip Generation Manual (7^{th} Edition). The minimum independent variable data required is listed in Section VI.C above. This information would be collected in the preliminary data collection (owner/tenant interview) prior to the collection of traffic data. Should the owner/tenant of the site be unwilling to disclose the required minimum information, the site will be discarded.

B. Determine Time Period for Computation of Rates

Trip generation rates will be computed for the "peak hour of adjacent street traffic". This is the most common time period published in the ITE Trip Generation Manual. These periods will be one hour between the time of 7:00 a.m. and 9:00 a.m. and between 4:00 p.m. and 6:00 p.m.

C. Compute Urban Infill Trip Generation Rates for Peak Hours of Adjacent Street Traffic

The steps for computing and evaluating trip generation rates are outlined below.

- Compute trip generation rate for each site for each time period (AM and PM peak)

  Equation: $\sum$ Peak Hour Trip Ends*/ $\sum$ Independent Variable Units

  * Peak hour trip ends will be derived from the intercept surveys as described in Section VII.C above.

- Determine inbound and outbound percentage for each peak hour

Equations: Inbound Trip Ends** / ∑ Inbound + Outbound Trip Ends
Outbound Trip Ends** / ∑ Inbound + Outbound Trip Ends

** Inbound and outbound trip ends will be derived from entry counts as described in Section VII.C above.

- Compute weighted average rate for all sites [This will not be done for the pilot studies]

  Equation: ∑ Trip Ends for All Sites / ∑ Independent Variable Units for All Sites

- Compute standard deviation using standard statistical methods
  (e.g., $S = \sqrt{ [\sum X^2 - (\sum X)^2 / n] / (n-1) }$)

- Compute the correlation coefficient (R) and coefficient of determination (R^2) using standard statistical methods (e.g., least squares method)

- Develop regression equation (if $R^2 \geq 0.50$)

- Prepare scatter plots of trips versus independent variable

C. Quality Review

In addition to review by the staff responsible for data analysis, the quality control reviewer examines the trip generation and statistical computations to ensure correct formulae are used and calculations are correct.

D. Compare Computed Rates to ITE Rates for Similar Land Use Categories

Computed trip generation rates will be compared to ITE published rates for the same land use categories in a comparative matrix.

E. Develop Data Summary Report

The data collection plans, collected data, and analysis described above will be consolidated and summarized in a Draft Data Summary Report and associated technical appendices. Additional data in the report will include a general description of the site and surrounding neighborhood characteristics, as well as a summary of transportation access to the site. The report will be distributed to the TAC for review.

ATTACHMENT 1

Draft Questionnaire

What primary means of travel did you use to either get here or leave here today?

- ❑ Drove alone
- ❑ Drove others: How many including yourself_______
- ❑ Rode as passenger, car parked nearby
- ❑ Rode as passenger: dropped off
- ❑ Bus
- ❑ Rail (BART, Muni, Caltrain)
- ❑ Bicycle
- ❑ Walk
- ❑ Taxi
- ❑ Other ___________

Is this location your primary destination or did you stop here on the way to another destination?

- ❑ Primary destination
- ❑ Stopped here on the way to another destination

If this location was NOT your primary destination, would you have passed by this location if you did not stop here today?

- ❑ Yes
- ❑ No

Is this your place of employment or residence?

- ❑ Yes
- ❑ No

How often do you visit this location in a typical week? ______

If you are arriving, approximately how long did it take you to get here today? _______ (minutes)

Optional Respondent Information:

What is the zip code of your home address? _______
What is your age? (circle one)

1. 18 years or under	2. 19-14 years	3. 25-34 years	4. 35-44 years
5. 45-54 years	6. 55-64 years	7. 65 years or more	

- ❑ Male
- ❑ Female

How many autos, pickups, vans and motorcycles are available for use by members of your household?_______________ (enter number)

What is your occupation?

- ❑ Professional/technical
- ❑ Manager/administrator
- ❑ Sales/account representative
- ❑ Secretarial/clerical
- ❑ Student/intern
- ❑ Service worker
- ❑ Craftsman/mechanic

Including yourself, how many people live in your household? ___________ (enter number)

Are you a full-time employee or part-time employee? (circle one)

What is your approximate household income?

- ❑ 0-$20,000
- ❑ $20,000 - $40,000
- ❑ $40,000 - $60,000
- ❑ $60,000 - $80,000
- ❑ Greater than $80,000

If you are employed, does your employer offer any of the following? (check all that apply)

- ❑ Flexible work hours
- ❑ Transit allowance
- ❑ Provide a company car for midday use
- ❑ Free parking

ATTCHMENT 2
INSTITUTE OF TRANSPORTATION ENGINEERS'
AREA TYPE DEFINITIONS
Parking Generation, 3rd Edition

Urban locations are comprised of one of the three area types:

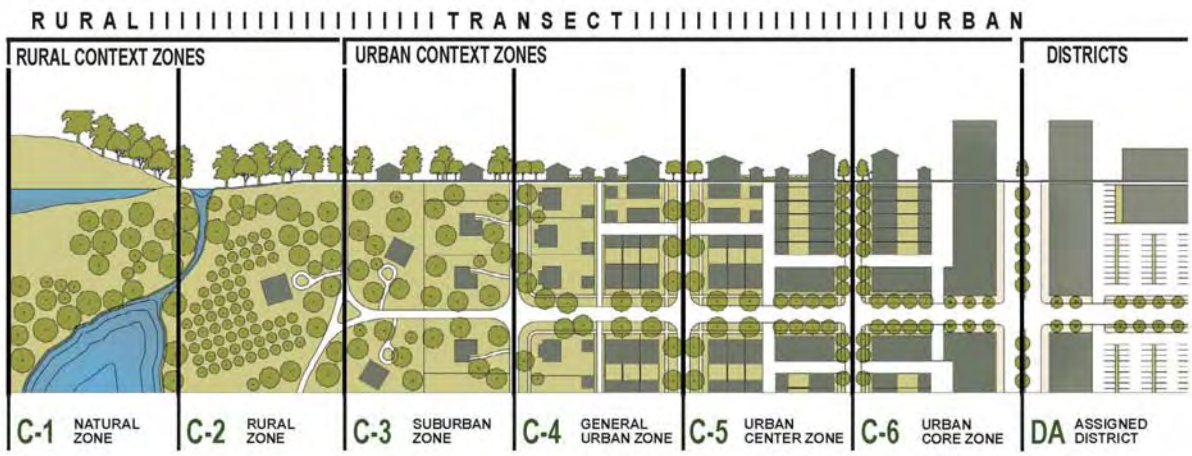
Central Business District (CBD) is the downtown area for a city. CBD characteristics include good transit service, parking garages, shared parking, and extensive pedestrian sidewalk network, multi-storied buildings, priced parking and a wide range of land uses (including mixed-use sites).

Central City, Not Downtown (CND) is the area outside the downtown area of a larger city. This area has greater land use density than suburban sites but is substantially less dense than the CBD. The intent of this area designation is for the areas around large central cities (for example, Seattle, San Francisco, Oakland, Atlanta, or Washington DC) where travel characteristics are likely to be unlike suburban conditions.

Suburban Center (SBC) areas are those downtown areas of suburbs that have developed CBD characteristics but are not the central city of a metropolitan region. These activity centers have characteristics that may include good transit service, a mix of surface and structured parking, connected streets, a connected pedestrian network and a mix of land uses. Examples include the downtown areas of Bellevue, WA; Las Colinas, TX; and Walnut Creek, CA.

ATTACHMENT 3
CONTEXT ZONE CHARACTERISTICS
Context Sensitive Solutions in Designing Major Urban Thoroughfares for Walkable Communities, Institute of Transportation Engineers Proposed Recommended Practice (est. February 2006)

A wide variety of factors create context in the urban environment. Every thoroughfare has an immediate physical context created by buildings and activities on adjacent properties, and is also part of a broader context created by the surrounding neighborhood or district. While the elements of context relating to buildings, landscape, land uses, and public facilities can combine in almost infinite varieties, a set of four context zones serve to define urban areas. The four context zones are a subset of a more inclusive system of contexts that can be used to describe the full range of environments from natural to highly urbanized. The figure below illustrates this concept through a diagram. Although the diagram graphically represents context zones as a linear continuum from most natural to most urban, in fact the zones are most frequently found arranged in mosaic-like patterns reflecting the complexity of metropolitan regions.



CREDIT: DUANY PLATER-ZYBERK & COMPANY

Many communities have found that context zones are useful in presenting information to the public. Local illustration of context zone examples can offer useful models that aid stakeholders in expressing their desires to create distinctive parts of their communities.

Selecting a Context Zone

Context is defined by multiple parameters, including land use, density, and design features. The following table presents the full range of context zones, but focuses on the suburban through urban core contexts (C-3 through C-6) representing urban conditions. The "distinguishing characteristics" column in the table, for example, describes the overall relationship between buildings and landscape that contribute to context. In addition to the distinguishing characteristics and general character, four attributes assist the practitioner in identifying a context zone:

1) building placement - how buildings are oriented and set back in relation to the thoroughfare,

2) frontage type – what part of the site or building fronts onto the thoroughfare,

3) typical building height, and

4) type of public open space.

Guidelines for identifying and selecting a context zone include:

1. Consider both the existing conditions and the plans for the future, recognizing that thoroughfares often last longer than adjacent buildings.

2. Assess area plans and review general, comprehensive, and specific plans, zoning codes, and community goals and objectives. These often provide detailed guidance on the vision for the area.

3. Compare the area's predominant land use patterns, building types, and land uses to the characteristics presented in the following table.

4. Pay particular attention to residential densities, commercial floor area ratios, and building heights.

5. If an area or corridor has a diversity of characteristics that could fall under multiple context zones, consider dividing the area into two or more context zones.

6. Identify current levels of pedestrian and transit activity, or estimate future levels based on the type, mix, and proximity of land uses. This is a strong indicator of urban context.

7. Consider the area's existing and future characteristics beyond the thoroughfare under design, possibly extending consideration to include entire neighborhoods or districts.

Context Zone Characteristics

	A	B	C	D	E	F	G
	Context Zone	**Summary Character**	**Building Setback/Build To and Frontage**	**Thoroughfare Network Scale**	**Building Height**	**Land Use Mix**	**Public Open Space Type**
1	NATURAL (CZ-1)	Natural	Not Applicable	Regional to State Scale	Not Applicable	Restricted protected natural open space	Natural
2	RURAL (CZ-2)	Agricultural and landscaped, no pedestrians	Large setbacks porch, fence, & work yard	Regional Scale	1 to 2 story with some taller work buildings	Restricted agriculture, limited support residential and commercial	Agricultural
3	SUBURBAN (CZ-3)	Landscaped, few pedestrians, detached buildings widely separated	Deep yard setbacks dominant landscaped character (fence/hedge, yard, & porch)	Predominantly Neighborhood Scale	1 to 2 story with some 3 story	Restricted residential with "at-home" businesses and limited commercial, institutional/civic, and open space	Parks with adjacency to greenbelts
4	GENERAL URBAN (CZ-4)	Urban, pedestrians present, balanced landscape and predominantly detached buildings	Medium yard setbacks balanced landscape and building character (fence/hedge, yard, & porch)	Neighborhood to Regional Scale	2 to 3 story with some 1 story and some above 3 story; and few taller work buildings	Limited medium-density residential with limited mix of other uses typically ground level - institutional/civic, commercial, and open space	Parks
5	URBAN CENTER (CZ-5)	Urban, substantial pedestrian activity, predominantly built with attached buildings with most landscape within the thoroughfare right-of-way	Small or no setback, build to lines common, building character defining street wall (storefront, stoop, & forecourt)	Neighborhood to Regional Scale	3 to 5 story with some lower and few taller buildings	Open higher-density commercial, employment, and residential use with support institutional/civic and open space	Parks, plazas and squares
6	URBAN CORE (CZ-6)	Urban, most pedestrian activity, predominantly built with attached buildings providing a strong sense of enclosure with some landscape within the thoroughfare right-of-way	Small or no setback, build to line at sidewalk/RW, building character defining street wall (storefront, stoop, & forecourt)	Neighborhood to Sector Scale	4+ story with few lower buildings	Open highest-density commercial, employment, and residential use with support institutional/civic and open space	Parks, plazas and squares

APPENDIX E

Site Name: Bachenheimer Building.

Site Location: 2111 University Avenue, Berkeley, CA 94704

Land Use Type: Residential with ground floor commercial

Site Characteristics:	Quantity
Studios Units:	0 D.U
1 Bedroom Units:	12 D.U
2 Bedrooms Units:	32 D.U
3 + Bedrooms Units:	0 D.U
Total	44 D.U
Ground Floor Commercial:	3,000 Sq. Ft.
Residential Occupancy:	100%
Commercial Occupancy:	100%
Number of parking spaces:	30
Number of spaces per unit:	0.68
Density of Site:	155 units/acre

Site Description:

Meets Residential Criteria: Yes
Meets Employment Criteria: Yes
Meets Transit Proximity Criteria: Yes

Area Type: CBD
Transect / Context Zone Type: Urban Center (T/CZ-5)

Predominant Land Use within 0.5 miles: Non-Residential
Connectivity Index (Measure of Walking Environment): High
% of blocks within 0.5 miles with sidewalks: 100%

Distance from CBD: Within CBD
Surrounding Residential Density: 11.63 units/gross land acre
Surrounding Employment Density: 36.23 workers/gross land acre

Survey Date: 10th May, 2007

ITE Land Use Codes: ITE 223 Mid-Rise Apartments
ITE 820 Shopping Center

Residential Trip Rate Comparison

	AM Peak Hour In	AM Peak Hour Out	AM Peak Hour Total	PM Peak Hour In	PM Peak Hour Out	PM Peak Hour Total
ITE Trip Rate	0.09	0.21	0.30	0.23	0.16	0.39
Directional Distribution	31%	69%	100%	58%	42%	100%
Surveyed Trip Rate	0.00	0.00	0.00	0.03	0.01	0.04
Directional Distribution				70%	30%	100%

Surveyed Mode Split

	AM Peak - % Trips		PM Peak - % Trips
Auto	0%	Auto	7%
Transit	11%	Transit	27%
Walk/Bicycle	89%	Walk/Bicycle	66%

Commercial Trip Rate Comparison

	AM Peak Hour In	AM Peak Hour Out	AM Peak Hour Total	PM Peak Hour In	PM Peak Hour Out	PM Peak Hour Total
ITE Trip Rate	0.65	0.38	1.03	1.80	1.95	3.75
Directional Distribution	63%	37%	100%	48%	52%	100%
Surveyed Trip Rate	0.00	0.00	0.00	1.72	2.28	4.00
Directional Distribution				43%	57%	100%

Surveyed Mode Split

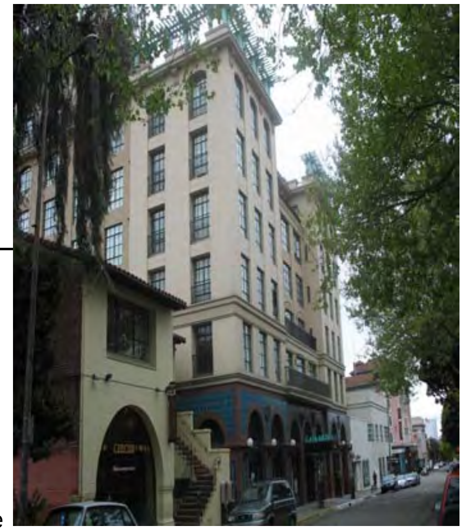
	AM Peak - % Trips		PM Peak - % Trips
Auto	0%	Auto	38%
Transit	0%	Transit	0%
Walk/Bicycle	0%	Walk/Bicycle	62%

Note: The commercial shop was closed during the AM peak hour

Site Name: Gaia Building.

Site Location: 2116 Allston Way, Berkeley, CA 94704

Land Use Type: Residential with ground floor Drinking Place



Site Characteristics:	Quantity
Studios Units:	0 D.U
1 Bedroom Units:	26 D.U
2 Bedrooms Units:	73 D.U
3 + Bedrooms Units:	0 D.U
Total	99 D.U
Ground Floor Commercial:	12,000 Sq. Ft.
Residential Occupancy:	99%
Commercial Occupancy:	100%
Number of parking spaces:	40
Number of spaces per unit:	0.40
Density of Site:	267 units/acre

Site Description:

Meets Residential Criteria: Yes
Meets Employment Criteria: Yes
Meets Transit Proximity Criteria: Yes

Area Type: CBD
Transect / Context Zone Type: Urban Center (T/CZ-5)

Predominant Land Use within 0.5 miles: Commercial and Residential
Connectivity Index (Measure of Walking Environment): High
% of blocks within 0.5 miles with sidewalks: 100%

Distance from CBD: Within CBD
Surrounding Residential Density: 12.09 units/gross land acre
Surrounding Employment Density: 36.32 workers/gross land acre

Survey Date: 10th May, 2007

ITE Land Use Codes: ITE 223 Mid-Rise Apartments
ITE 936 Drinking Place

Residential Trip Rate Comparison

	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
ITE Trip Rate	0.09	0.21	0.30	0.23	0.16	0.39
Directional Distribution	31%	69%	100%	58%	42%	100%
Surveyed Trip Rate	0.01	0.03	0.04	0.17	0.11	0.28
Directional Distribution	22%	78%		59%	41%	100%

Surveyed Mode Split

AM Peak - % Trips		PM Peak - % Trips	
Auto	20%	Auto	24%
Transit	7%	Transit	5%
Walk/Bicycle	73%	Walk/Bicycle	71%

Commercial Trip Rate Comparison

	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
ITE Trip Rate	0.00	0.00	0.00	7.48	3.86	11.34
Directional Distribution				66%	34%	100%
Surveyed Trip Rate	0.00	0.00	0.00	0.14	0.00	0.14
Directional Distribution				100%	0%	100%

Surveyed Mode Split

AM Peak - % Trips		PM Peak - % Trips	
Auto	0%	Auto	43%
Transit	0%	Transit	29%
Walk/Bicycle	0%	Walk/Bicycle	28%

Note: The Drinking Place is closed during the AM peak hour

Site Name: Acton Courtyard

Site Location: 1370 University Ave., Berkeley, CA 94704

Land Use Type: Residential with ground floor commercial

Site Characteristics:	Quantity
Studios Units:	4 D.U
1 Bedroom Units:	7 D.U
2 Bedrooms Units:	60 D.U
3 + Bedrooms Units:	0 D.U
Total	71 D.U
Ground Floor Commercial:	5,000 Sq. Ft.
Residential Occupancy:	100%
Commercial Occupancy:	100%
Number of parking spaces:	62
Number of spaces per unit:	0.87
Density of Site:	141 units/acre

Site Description:

Meets Residential Criteria: Yes
Meets Employment Criteria: No
Meets Transit Proximity Criteria: No

Area Type: CND
Transect / Context Zone Type: Urban Center (T/CZ-5)

Predominant Land Use within 0.5 miles: Residential
Connectivity Index (Measure of Walking Environment): High
% of blocks within 0.5 miles with sidewalks: 100%

Distance from CBD: < 1 mile
Surrounding Residential Density: 10.75 units/gross land acre
Surrounding Employment Density: 6.25 workers/gross land acre

Survey Date: May 8th, 2007

ITE Land Use Codes: ITE 223 Mid-Rise Apartments
ITE 933 Fast Food Restaurant without Drive-Through Window (Bread Shop)

Residential Trip Rate Comparison	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
ITE Trip Rate	0.09	0.21	0.30	0.23	0.16	0.39
Directional Distribution	31%	69%	100%	58%	42%	100%
Surveyed Trip Rate	0.04	0.18	0.22	0.09	0.08	0.17
Directional Distribution	19%	81%	100%	52%	48%	100%

Surveyed Mode Split

AM Peak - % Trips		PM Peak - % Trips	
Auto	57%	Auto	35%
Transit	29%	Transit	30%
Walk/Bicycle	14%	Walk/Bicycle	35%

Commercial Trip Rate Comparison	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
ITE Trip Rate	2.21	2.12	4.33	14.00	14.00	28.00
Directional Distribution	51%	49%	100%	50%	50%	100%
Surveyed Trip Rate	2.13	1.67	3.80	4.23	4.23	8.46
Directional Distribution	56%	44%	100%	50%	50%	100%

Surveyed Mode Split

AM Peak - % Trips		PM Peak - % Trips	
Auto	33%	Auto	57%
Transit	11%	Transit	10%
Walk/Bicycle	56%	Walk/Bicycle	33%

Site Name: Touriel Building

Site Location: 2004 University Ave., Berkeley, CA 94704

Land Use Type: Residential with ground floor commercial (Flower Shop)

Site Characteristics:	Quantity
Studios Units:	0 D.U
1 Bedroom Units:	10 D.U
2 Bedrooms Units:	25 D.U
3 + Bedrooms Units:	0 D.U
Total	35 D.U
Ground Floor Commercial:	2,400 Sq. Ft.
Residential Occupancy:	97%
Commercial Occupancy:	100%
Number of parking spaces:	5
Number of spaces per unit:	0.14
Density of Site:	218 units/acre

Site Description:

Meets Residential Criteria: Yes
Meets Employment Criteria: No
Meets Transit Proximity Criteria: Yes

Area Type: CBD
Transect / Context Zone Type: Urban Center (T/CZ-5)

Predominant Land Use within 0.5 miles: Commercial and Residential
Connectivity Index (Measure of Walking Environment): High
% of blocks within 0.5 miles with sidewalks: 100%

Distance from CBD: Within CBD
Surrounding Residential Density: 12.13 units/gross land acre
Surrounding Employment Density: 32.77 workers/gross land acre

Survey Date: May 9th, 2007

ITE Land Use Codes: ITE 223 Mid-Rise Apartments
ITE 820 Shopping Center

Residential Trip Rate Comparison

	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
ITE Trip Rate	0.09	0.21	0.30	0.23	0.16	0.39
Directional Distribution	31%	69%	100%	58%	42%	100%
Surveyed Trip Rate	0.01	0.04	0.05	0.07	0.08	0.15
Directional Distribution	14%	86%	100%	46%	54%	100%

Surveyed Mode Split

	AM Peak - % Trips	PM Peak - % Trips
Auto	25%	15%
Transit	50%	9%
Walk/Bicycle	25%	74%

Commercial Trip Rate Comparison

	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
ITE Trip Rate	0.65	0.38	1.03	1.80	1.95	3.75
Directional Distribution	63%	37%	100%	48%	52%	100%
Surveyed Trip Rate	0.44	0.00	0.44	0.85	2.07	2.92
Directional Distribution	100%	0%	100%	29%	71%	100%

Surveyed Mode Split

	AM Peak - % Trips	PM Peak - % Trips
Auto	100%	100%
Transit	0%	0%
Walk/Bicycle	0%	0%

Site Name: Berkeleyan Apartments

Site Location: 1910 Oxford St., Berkeley, CA 94704

Land Use Type: Residential with ground floor commercial (Coffee Shop)

Site Characteristics:	Quantity
Studios Units:	0 D.U
1 Bedroom Units:	5 D.U
2 Bedrooms Units:	51 D.U
3 + Bedrooms Units:	0 D.U
Total	56 D.U
Ground Floor Commercial:	4,500 Sq. Ft.
Residential Occupancy:	100%
Commercial Occupancy:	100%
Number of parking spaces:	36
Number of spaces per unit:	0.64
Density of Site:	227 units/acre

Site Description:

Meets Residential Criteria:	Yes	Area Type:	CBD
Meets Employment Criteria:	Yes	Transect / Context Zone Type:	Urban Center (T/CZ-5)
Meets Transit Proximity Criteria:	Yes		
Predominant Land Use within 0.5 miles:	Non-Residential	Distance from CBD:	Within CBD
Connectivity Index (Measure of Walking Environment):	High	Surrounding Residential Density:	11.07 units/gross land acre
% of blocks within 0.5 miles with sidewalks:	100%	Surrounding Employment Density:	35.72 workers/gross land acre

Survey Date: May 10th, 2007

ITE Land Use Codes: ITE 223 Mid-Rise Apartments
ITE 933 Fast Food Restaurant without Drive-Through Window (Coffee Shop)

Residential Trip Rate Comparison

	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
ITE Trip Rate	0.09	0.21	0.30	0.23	0.16	0.39
Directional Distribution	31%	69%	100%	58%	42%	100%
Surveyed Trip Rate	0.02	0.05	0.07	0.07	0.02	0.09
Directional Distribution	28%	72%	100%	80%	20%	100%

Surveyed Mode Split

AM Peak - % Trips		PM Peak - % Trips	
Auto	21%	Auto	20%
Transit	17%	Transit	7%
Walk/Bicycle	62%	Walk/Bicycle	73%

Commercial Trip Rate Comparison

	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
ITE Trip Rate	37.25	35.78	73.03	14.97	13.82	28.79
Directional Distribution	51%	49%	100%	52%	48%	100%
Surveyed Trip Rate	8.23	9.66	17.89	3.22	4.63	7.85
Directional Distribution	46%	54%	100%	41%	59%	100%

Surveyed Mode Split

AM Peak - % Trips		PM Peak - % Trips	
Auto	64%	Auto	35%
Transit	0%	Transit	8%
Walk/Bicycle	36%	Walk/Bicycle	57%

Site Name: Fine Arts Building

Site Location: 2110 Haste St., Berkeley, CA 94704

Land Use Type: Residential

Site Characteristics:	Quantity
Studios Units:	4 D.U
1 Bedroom Units:	32 D.U
2 Bedrooms Units:	64 D.U
3 + Bedrooms Units:	0 D.U
Total	100 D.U
Ground Floor Commercial:	0 Sq. Ft.
Residential Occupancy:	100%
Commercial Occupancy:	0%
Number of parking spaces:	63
Number of spaces per unit:	0.63
Density of Site:	168 units/acre

Site Description:

Meets Residential Criteria:	Yes	Area Type:	CBD
Meets Employment Criteria:	No	Transect / Context Zone Type:	Urban Center (T/CZ-5)
Meets Transit Proximity Criteria:	Yes		
Predominant Land Use within 0.5 miles:	Residential	Distance from CBD:	Within CBD
Connectivity Index (Measure of Walking Environment):	High	Surrounding Residential Density:	12.91 units/gross land acre
% of blocks within 0.5 miles with sidewalks:	100%	Surrounding Employment Density:	26.45 workers/gross land acre

Survey Date: May 9th, 2007

ITE Land Use Codes: ITE 223 Mid-Rise Apartments

Residential Trip Rate Comparison

	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
ITE Trip Rate	0.09	0.21	0.30	0.23	0.16	0.39
Directional Distribution	31%	69%	100%	58%	42%	100%
Surveyed Trip Rate	0.01	0.12	0.13	0.08	0.05	0.13
Directional Distribution	7%	93%	100%	61%	39%	100%

Surveyed Mode Split

AM Peak - % Trips		PM Peak - % Trips	
Auto	44%	Auto	24%
Transit	22%	Transit	14%
Walk/Bicycle	34%	Walk/Bicycle	62%

Commercial Trip Rate Comparison

	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
ITE Trip Rate						
Directional Distribution						
Surveyed Trip Rate						
Directional Distribution						

Surveyed Mode Split

AM Peak - % Trips		PM Peak - % Trips	
Auto		Auto	
Transit		Transit	
Walk/Bicycle		Walk/Bicycle	

Site Name: Central City Association of Los Angeles

Site Location: 626 Wilshire Boulevard, Los Angeles, CA 90017

Land Use Type: Office Building

Site Characteristics:	Quantity
Studios Units:	0 D.U
1 Bedroom Units:	0 D.U
2 Bedrooms Units:	0 D.U
3 + Bedrooms Units:	0 D.U
Total	0 D.U
Ground Floor Commercial:	138,542 Sq. Ft.
Residential Occupancy:	0%
Commercial Occupancy:	97.66%
Number of parking spaces:	136
Number of spaces per 1,000 square feet:	0.98
Density of Site:	N/A units/acre

Site Description:

Meets Residential Criteria:	No	Area Type:	CBD
Meets Employment Criteria:	Yes	Transect / Context Zone Type:	Urban Core (T/CZ-6)
Meets Transit Proximity Criteria:	Yes		
Predominant Land Use within 0.5 miles:	Non-Residential	Distance from CBD:	Within CBD
Connectivity Index (Measure of Walking Environment):	High	Surrounding Residential Density:	9.55 units/gross land acre
% of blocks within 0.5 miles with sidewalks:	100%	Surrounding Employment Density:	197.78 workers/gross land acre

Survey Date: October 10th, 2007

ITE Land Use Codes: ITE 710 General Office Building

Residential Trip Rate Comparison

	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
ITE Trip Rate						
Directional Distribution						
Surveyed Trip Rate						
Directional Distribution						

Surveyed Mode Split

AM Peak - % Trips		PM Peak - % Trips	
Auto		Auto	
Transit		Transit	
Walk/Bicycle		Walk/Bicycle	

Commercial Trip Rate Comparison

	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
ITE Trip Rate	1.36	0.19	1.55	0.25	1.24	1.49
Directional Distribution	88%	12%	100%	17%	83%	100%
Surveyed Trip Rate	0.67	0.14	0.81	0.12	0.50	0.62
Directional Distribution	83%	17%	100%	19%	81%	100%

Surveyed Mode Split

AM Peak - % Trips		PM Peak - % Trips	
Auto	95%	Auto	77%
Transit	4%	Transit	23%
Walk/Bicycle	1%	Walk/Bicycle	0%

Site Name: Ralphs

Site Location: 101 G Street, San Diego, CA 92101

Land Use Type: Supermarket

Site Characteristics:	Quantity
Studios Units:	0 D.U
1 Bedroom Units:	0 D.U
2 Bedrooms Units:	0 D.U
3 + Bedrooms Units:	0 D.U
Total	0 D.U
Ground Floor Commercial:	43,318 Sq. Ft.
Residential Occupancy:	0%
Commercial Occupancy:	100.00%
Number of parking spaces:	156
Number of spaces per 1,000 square feet:	3.60
Density of Site:	N/A units/acre

Site Description:

Meets Residential Criteria:	No	Area Type:	CBD
Meets Employment Criteria:	Yes	Transect / Context Zone Type:	Urban Core (T/CZ-6)
Meets Transit Proximity Criteria:	Yes		
Predominant Land Use within 0.5 miles:	Non-Residential	Distance from CBD:	Within CBD
Connectivity Index (Measure of Walking Environment):	High	Surrounding Residential Density:	8.79 units/gross land acre
% of blocks within 0.5 miles with sidewalks:	100%	Surrounding Employment Density:	88.26 workers/gross land acre

Survey Date: February 7th, 2007

ITE Land Use Codes: ITE 850 Supermarket

Residential Trip Rate Comparison	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
ITE Trip Rate						
Directional Distribution						
Surveyed Trip Rate						
Directional Distribution						

Surveyed Mode Split	AM Peak - % Trips		PM Peak - % Trips	
	Auto		Auto	
	Transit		Transit	
	Walk/Bicycle		Walk/Bicycle	

Commercial Trip Rate Comparison	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
ITE Trip Rate	1.98	1.27	3.25	5.33	5.12	10.45
Directional Distribution	61%	39%	100%	51%	49%	100%
Surveyed Trip Rate	2.28	2.38	4.66	5.19	5.63	10.82
Directional Distribution	49%	51%	100%	48%	52%	100%

Surveyed Mode Split	AM Peak - % Trips		PM Peak - % Trips	
	Auto	50%	Auto	49%
	Transit	10%	Transit	12%
	Walk/Bicycle	40%	Walk/Bicycle	38%

Site Name: Horizon

Site Location: 505 Front Street, San Diego, CA 92101

Land Use Type: Residential

Site Characteristics:	Quantity
Studios Units:	n/A D.U
1 Bedroom Units:	n/A D.U
2 Bedrooms Units:	n/A D.U
3 + Bedrooms Units:	n/A D.U
Total	211 D.U

n/a - not available

Ground Floor Commercial: 0 Sq. Ft.

Residential Occupancy: 100%
Commercial Occupancy: 0%

Number of parking spaces: 415 (includes 22 motorcycle parking stalls)
Number of spaces per unit: 1.97
Density of Site: 109 units/acre

Site Description:

Meets Residential Criteria: No
Meets Employment Criteria: Yes
Meets Transit Proximity Criteria: Yes

Area Type: CBD
Transect / Context Zone Type: Urban Core (T/CZ-6)

Predominant Land Use within 0.5 miles: Non-Residential
Connectivity Index (Measure of Walking Environment): High
% of blocks within 0.5 miles with sidewalks: 100%

Distance from CBD: Within CBD
Surrounding Residential Density: 8.86 units/gross land acre
Surrounding Employment Density: 83.96 workers/gross land acre

Survey Date: May 31st, 2007

ITE Land Use Codes: ITE 232 High-Rise Residential Condominiums / Townhouses

Residential Trip Rate Comparison

	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
ITE Trip Rate	0.06	0.28	0.34	0.24	0.14	0.38
Directional Distribution	19%	81%	100%	62%	38%	100%
Surveyed Trip Rate	0.02	0.08	0.10	0.11	0.06	0.17
Directional Distribution	21%	79%	100%	67%	33%	100%

Surveyed Mode Split

AM Peak - % Trips		PM Peak - % Trips	
Auto	77%	Auto	73%
Transit	3%	Transit	7%
Walk/Bicycle	20%	Walk/Bicycle	20%

Commercial Trip Rate Comparison

	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
ITE Trip Rate						
Directional Distribution						
Surveyed Trip Rate						
Directional Distribution						

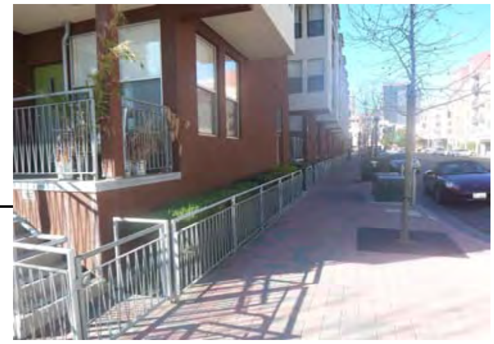
Surveyed Mode Split

AM Peak - % Trips		PM Peak - % Trips	
Auto		Auto	
Transit		Transit	
Walk/Bicycle		Walk/Bicycle	

Site Name: Atria

Site Location: 101 Market Street, San Diego, CA 92101

Land Use Type: Residential with ground floor commercial (Coffee Shop)



Site Characteristics:	Quantity
Studios / lofts Units:	60 D.U
1 Bedroom Units:	58 D.U
2 Bedrooms Units:	31 D.U
3 + Bedrooms Units:	0 D.U
Total	149 D.U
Ground Floor Commercial:	1,250 Sq. Ft.
Residential Occupancy:	100%
Commercial Occupancy:	100%
Number of parking spaces:	183
Number of spaces per unit:	1.23
Density of Site:	83 units/acre

Site Description:

Meets Residential Criteria:	No	Area Type:	CBD
Meets Employment Criteria:	Yes	Transect / Context Zone Type:	Urban Center (T/CZ-5)
Meets Transit Proximity Criteria:	Yes		
Predominant Land Use within 0.5 miles:	Non-Residential	Distance from CBD:	Within CBD
Connectivity Index (Measure of Walking Environment):	High	Surrounding Residential Density:	8.64 units/gross land acre
% of blocks within 0.5 miles with sidewalks:	100%	Surrounding Employment Density:	81.20 workers/gross land acre

Survey Date: March 20th, 2007

ITE Land Use Codes: ITE 230 Residential Condominiums / Townhouses
ITE 933 Fast Food Restaurant without Drive-Through Window (Coffee Shop)

Residential Trip Rate Comparison

	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
ITE Trip Rate	0.07	0.37	0.44	0.35	0.17	0.52
Directional Distribution	17%	83%	100%	67%	33%	100%
Surveyed Trip Rate	0.14	0.32	0.46	0.21	0.20	0.41
Directional Distribution	30%	70%	100%	51%	49%	100%

Surveyed Mode Split

AM Peak - % Trips		PM Peak - % Trips	
Auto	85%	Auto	69%
Transit	2%	Transit	0%
Walk/Bicycle	13%	Walk/Bicycle	31%

Commercial Trip Rate Comparison

	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
ITE Trip Rate	37.25	35.78	73.03	14.97	13.82	28.79
Directional Distribution	51%	49%	100%	52%	48%	100%
Surveyed Trip Rate	23.88	26.92	50.80	4.47	4.30	8.77
Directional Distribution	47%	53%	100%	51%	49%	100%

Surveyed Mode Split

AM Peak - % Trips		PM Peak - % Trips	
Auto	50%	Auto	17%
Transit	13%	Transit	0%
Walk/Bicycle	37%	Walk/Bicycle	83%

APPENDIX F

Projects

< **[Rental Properties]**

BACHENHEIMER BUILDING (2004)

Location
2119 University Avenue
Berkeley, California

Lot Size
12,400 sf

Units
44 Apartments
(7 low-income)

Density
155 units / acre

Parking
30 spaces

Commercial Space
3,000 sf
Offices/Retail

Amenities
High-speed internet access
Rooftop gardens
Stacked hydraulic parking lifts

August 2004

October 2002

Source: *http://www.panoramicinterests.com/projects/bachenheimer.html*

PANORAMIC INTERESTS

Berkeley Apartments

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Fax: 510.883.9000
info@panoramicinterests.com

2116 Allston Way, Suite One • Berkeley, CA 94704

contact us

Projects

< **Rental Properties**

GAIA BUILDING (2001)

Location
2116 Allston Way
Berkeley, California

Lot Size
14,850 sf

Units
91 Apartments
(19 low-income)

Density
267 units / acre

Parking
42 spaces

Commercial Space
12,000 sf
No leases signed yet

Amenities
High-speed internet access
Interior courtyard
Rooftop gardens
Stacked hydraulic parking lifts

August 2001

June 2000

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info@panoramicinterests.com

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contact us

Projects

< **Rental Properties**

ACTON COURTYARD (2003)

Location
1392 University Avenue
Berkeley, California

Lot Size
22,000 sf

Units
71 Apartments
(20 low-income)

Density
141 units / acre

Parking
56 spaces

Commercial Space
8,000 sf
Jubilee Restoration
Restaurant
Offices/Retail

Amenities
High-speed internet access
Interior courtyard
Stacked hydraulic parking lifts

Completed 2004

May 2003

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info@panoramicinterests.com

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Projects

< **Rental Properties**

TOURIEL BUILDING (2004)

Location
2004 University Avenue
Berkeley, California

Lot Size
7,000 sf

Units
35 Apartments

Density
218 units / acre

Parking
8 spaces

Commercial Space
2,400 sf
Darling Florists

Amenities
High-speed internet access
Rooftop gardens
Stacked hydraulic parking lifts

August 2004

January 2003

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info@panoramicinterests.com

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Projects

< **Rental Properties**

BERKELEYAN APARTMENTS (1998)

Location
1910 Oxford Street
Berkeley, California

Lot Size
10,700 sf

Units
56 Apartments

Density
227 units / acre

Parking
39 spaces

Commercial Space
4,500 sf
Yali's Cafe
Computer Training Program

Amenities
Interior courtyard
Rooftop gardens
Stacked hydraulic parking lifts

Awards
Excellence in Design,
Downtown Berkeley Association

1998

1996

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info@panoramicinterests.com

Berkeley Apartments

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Projects

< **Rental Properties**

Fine Arts Building (2004)

Location
2110 Haste Street
Berkeley, California

Lot Size
26,000 sf

Units
100 Apartments
(20 low-income)

Density
168 units / acre

Parking
55 spaces

Commercial Space
12,000 sf
Fine Arts Theater
Retail
Cafe

Amenities
High-speed internet access
Interior courtyard
Rooftop gardens
Stacked hydraulic parking lifts

August 2004

January 1972

For information please contact Lew Breeze at (619) 846-5889

San Diego's Comprehensive Source for Downtown Living

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Dream Homes California
Little Italy Branch in
Downtown San Diego
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Email downtown@sdcondo.com

• Currently For Sale •

• Summary of Downtown Condos •

Choose another Downtown Community:

Choose a development:

Name: Horizons
by Bosa Development

Location: 510 First Ave. and 555 Front St.
in the Marina District

More Details:
Completed in 2001
211 condos and town homes
1036 sq.ft. to 2200 sq.ft.
Full Amenities
Designed by ARC Design International

Rating: ★★★★

Click Here For Available Properties

Click Here For A Slideshow of Images

Atria On Market San Diego in Downtown's Marina District

For more information on Atria on Market in San Diego, currently available condo and townhome listings call George Alexiou toll-free at **800-334-1650** or direct **619-921-0284**

Atria On Market is located in the heart of the Marina District, downtown San Diego's premier residential neighborhood. Direct across from the new Ralph's and within steps to Horton Plaza and upscale boutiques, live music and fine restaurants of the Gaslamp. Walk to the ballpark to catch a game of the San Diego Padres, to the San Diego Convention Center and to the Seaport Village.

Community amenities include - Grand lobby entrance with drop-off area, Computer/business center with conference room, State-of-the-art exercise/fitness facility, Media room, Street-level retail services, including Starbucks Coffee, Elevators, Rooftop deck with barbeque, fireplace and downtown views, Gated underground parking.

SAN DIEGO 92101
The Special Section

Downtown Ralphs Thriving In Urban Market

Store director says he's seen it all, shared a popsicle with Jerry Lewis

Chip Walsh runs Ralphs and a snappy deli.

In few places do the wealthy and homeless, executives and tourists, all stand in line every day for the same service. Then again, few places are like the 24-hour Ralphs grocery store on G Street Downtown.

Overseeing the urban market and its eclectic clientele is Chip Walsh, the store director and a Ralphs employee for 20 years.

"It's certainly an exciting environment," says Walsh, who has managed the 6-year-old market for the last two and a half years. "With such a diverse group of customers, there's never a dull moment."

The store has its own particular rules, like not selling alcohol after midnight. Shoppers get two hours of free parking in the underground lot, where a private management service uses handheld computers to monitor and tow unauthorized cars.

While some Downtown boosters brag the market is No. 1 in the region, corporate Ralphs says this isn't so. The store does rank among the top five in San Diego, somewhere among those in Hillcrest, La Jolla, Del Mar and Mission Valley.

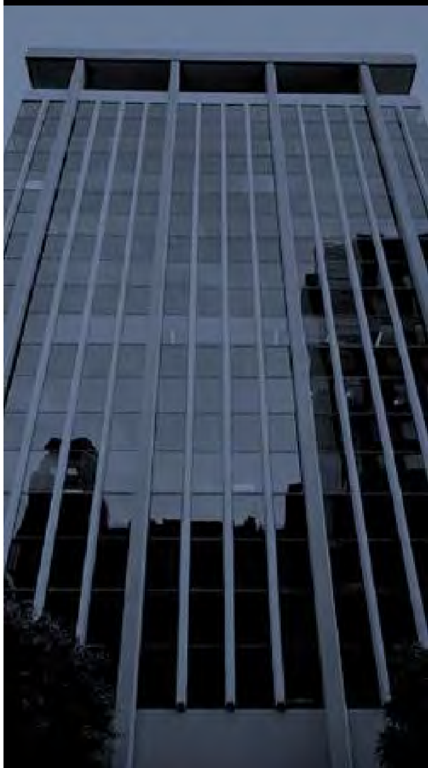
Among its star attractions is the service deli and salad bar, which boasts one of the highest lunch sales in the Ralphs corporation. Those who have shopped the store during the lunch-hour rush, from 11:30 a.m to 1:30 p.m., can attest to its popularity. It takes 35 employees to run the deli, about a third of the 107 that Walsh supervises.

With its unique location blocks from the San Diego Convention Center, Gaslamp Quarter, and adjacent to Horton Plaza and Downtown's priciest homes, this Ralphs gets more than its fair share of famous clientele and unusual shoppers. Walsh recalls one evening when actor Jerry Lewis, who lives on his boat in the harbor, came in looking for his favorite popsicle. Walsh did not stock this brand but Lewis said he'd pay whatever it took to get them. Within 24 hours, the frozen treats arrived. Soon after, Walsh found himself seated on a stack of beer cases eating one with Lewis. Now the novelties are a regular.

"Down here, you have to prepare yourself for the unexpected," Walsh says.

— Maria L. Kirkpatrick

The Rising Real Estate Group is a privately held real estate investment company based in downtown Los Angeles, California.



Oscar de la Hoya Hops in the Downtown LA Ring with Office Buy

RENTV News Headline
10.11.04

In a deal that closed on the first of October, Oscar de la Hoya's Golden Boy Enterprises LLP has just acquired a majority interest in a 148.7k sf Class B office building at 626 Wilshire Blvd in downtown Los Angeles. De la Hoya purchased the stake from Barker Pacific Group (BPG) and together, along with Christopher Rising of Rising Real Estate Group, formed a new real estate partnership called Golden Boy Wilshire LLP. Rising also acquired a minority interest in the building, which was valued at $16 mil, or about $108/sf, in this deal.

BPG acquired the building from AEW for about $8.5 mil last October when it was less than 40% leased, but since then they have been on a leasing tear, as Michael Barker, managing director of the Los Angeles-based development company said, "For the last twelve months we have been quickly leasing the available space in the building and we saw an opportunity to capitalize on the value our team created by increasing the tenancy to over 80 percent,"

The 12-story building is located on the corner of Hope St and Wilshire Blvd, about three blocks from the Harbor Freeway/Interstate 110 in the heart of the financial district of downtown Los Angeles.

Barker is retaining a reduced ownership position in the property, and will continue to manage it as well as retain its offices in the building. Handling the leasing will be Rising's firm, called The Rising Real Estate Group. Adding to the ownership party at the building is the fact that the de la Hoya's firm, Golden Boy Enterprises, will relocate to into 5.5k sf at the property next month from Library Tower, at 533 West 5th St. Other tenants in the building include Telehouse, Gianelli & Morris, Wescom Credit Union, Consensus Planning Group, and Nextel of California. The rest of the tenant roster includes a number of law firms and other professional service companies.

The building, originally designed by Langdon Wilson and built in 1967, was renovated in 2002 under the direction of architect Scott Johnson of Johnson Fain Partners. Johnson is renowned for his architectural design work at Fox Tower, 1999 Avenue of the Stars and MGM Tower in Los Angeles, and Rincon Plaza in San Francisco. The modern renovations included a sleek new main entrance and lobby with translucent glass walls, rich wood framed portals and redesigned security console with stainless steel and marble finishes.

Barker Pacific Group Inc is a 20-year-old firm that has completed or has under development or redevelopment in excess of $1 billion in commercial projects, including the award winning Hamilton Landing, a 550k sf Class-A office conversion project on Hamilton Air Force Base in Marin County. Several of Barker Pacific Group's other notable projects include: 100 First Plaza and 500 Sansome Street in San Francisco, The Fine Arts Building and 5055 Wilshire Boulevard in Los Angeles, the Xerox Centre in El Segundo, and The Miami Arena and Columbus Center in South Florida.

This deal could be an appetizer for a few larger courses to follow. As Andy Fixmer of the LABJ noted a few editions ago, several sizable properties are now on the market in downtown LA. Sumitimo Life Realty hired Cushman & Wakefield's David Hasbrouck, Richard Plummer and Anthony Gatti to market 1000 Wilshire Blvd, the stylish 471k sf office building hovering over the 110 Fwy with the Wedbush Morgan sign at its peak. Sumitomo picked up this asset in 1999 for $73 mil and Fixmer suggests it might command as much as $100 mil, or $212/sf. Wedbush occupies 113k sf pursuant to a lease with seven years left. Another large tenant is the law firm of Buchalter Nemer Fields & Younger, which this year committed to 70k sf here for 10 years at an average effective rent of roughly $2.38/sf/mo FSG.

Other properties being shopped include: Figueroa Plaza, the asset the City of LA almost bought and then decided not too… again, which is owned by Northridge Capital who has it listed with Secured Capital; Transamerica Tower, the 32-story high-rise, which is owned by Canyon-Johnson Urban Fund LP and is being marketed by CB Richard Ellis; and the Hyatt hotel on Hope, which is being shopped by Cargill, who bought it as part of the mixed use complex at 7th and Flower that contains the hotel, the Macy's Plaza mall and the 700 S. Flower St office building. Secured Capital and Kennedy-Wilson are both handling the hotel listing.

APPENDIX G

Volume 2, Trip Generation Rates, Plots and Equations

Port and Terminal (Land Uses 000-099)

Industrial (Land Uses 100-199)

Residential (Land Uses 200-299)

Lodging (Land Uses 300-399)

Recreational (Land Uses 400-499)

Volume 3, Trip Generation Rates, Plots and Equations

Institutional (Land Uses 500-599)

Medical (Land Uses 600-699)

Office (Land Uses 700-799)

Retail (Land Uses 800-899)

Services (Land Uses 900-999)

APPENDIX H

CHAPTER 4

Conducting a Trip Generation Study

4.1 Background

A local jurisdiction may wish to conduct its own trip generation study to validate use of ITE *Trip Generation* rates or equations in its community, establish its own rates reflecting unique conditions found in that community, or establish rates for land use types not included in *Trip Generation*. A state or province may wish to investigate trip generation rates in detail for land use types of particular concern in its jurisdiction. Consultants, ITE districts, sections, or individual ITE members may want to supplement the ITE national database on trip generation.

To maintain consistency with ITE's nationally recognized database and procedures, local studies should follow procedures consistent with those described below. However, it is recognized that local jurisdictions may need to tailor the process to meet the specific needs of the community and the characteristics of the sites being studied.

To enhance the national database, ITE encourages the submittal of all new trip generation data. Sample data collection forms for reporting the information are included at the end of this chapter. These forms should be used whenever possible.

4.2 Reasons to Conduct a Trip Generation Study

The general purpose of a trip generation study is to collect and analyze data on the relationships between trip ends and site characteristics for a particular land use.

Before initiating the study, its specific purpose should be identified. The specific purpose will help the analyst target the characteristics of the sites, the data to be collected, the number of sites to survey and the analysis to be conducted.

◈ If the description of a site is **not covered by the land use classifications** presented in *Trip Generation*, the analyst should collect local data and establish a local rate.

When to Conduct a Trip Generation Study

- **New land use not covered by *Trip Generation***
- **Inadequate number of studies in *Trip Generation***
- **Size of site outside of range of *Trip Generation* data points**
- **Establish a local trip generation rate**
- **Validate *Trip Generation* for local application**
- **Supplement national database**

◈ If the site is located in a downtown setting, served by significant public transportation, or is the site of an extensive transportation demand management program, the site is **not consistent with the ITE data** and the analyst should collect local data and establish a local rate.

◈ If the size of a site **is not within the range of data points** presented in *Trip Generation* for the land use, the analyst should collect local data and establish a local rate.

◈ If the *Trip Generation* database has an **insufficient number of data points,** the analyst should collect local data and establish a local rate.

◈ If the *Trip Generation* database produces curves with **unsatisfactory standard deviation or regression coefficients**, the analyst should collect local data and establish a local rate.

◈ If local circumstances (e.g., age of residents, worker shifts, other differences in independent variables) make a site **noticeably different from the sites for which data were collected and reported** in *Trip Generation*, the analyst should collect local data and establish a local rate.

◈ If the site is a **multi-use development,** the analyst should refer to Chapter 7 in this handbook for guidance on special data collection and analysis efforts required for multi-use developments.

◆ If the applicability or validity of ITE *Trip Generation* data for local use is **questioned by traffic professionals or local officials,** the analyst may need to collect local data and either validate the national data or establish a local rate.

◆ If it is desirable to establish trip generation characteristics for a **land use not included in the current edition of *Trip Generation*,** the analyst should collect and analyze the data for local use and submit the data to ITE.

4.3 Trip Generation Study Design

Trip generation study design should include the land use to be surveyed, number of survey sites, selection of appropriate sites, survey period, independent variable data to be compiled and traffic counting methodology.

Information is often available from analyses undertaken in either the same jurisdiction or other jurisdictions. In planning the local study, reviewing existing data is helpful in determining issues that may be encountered and identifying expected results. Also, because existing data may be integrated into the local study to reduce the amount of new data that need to be collected, it is important to have prior knowledge of the availability and procedures used to collect the data.

Selection of Land Use to Study

Trip generation studies should be considered to supplement the *Trip Generation* database when the following conditions apply:

◆ Land uses of local interest for which ITE *Trip Generation* presents little or no data;

◆ Local land uses that do not fit into existing ITE land use classifications;

◆ Land uses that are more specific than the generalized land use categories in *Trip Generation;*

◆ Land uses for which the range in development size in the *Trip Generation* data plots does not cover the local range in development sizes; or

◆ Land uses for which local trip generation rates are theorized to be substantially different from those in *Trip Generation*.

Sample Size Determination

Sufficient sample size is necessary to enable the analyst to draw valid conclusions from the trip generation study. However, no simple statistical methodology has been established for determining the number of sites that should be studied to obtain statistically significant trip generation results. In reality, trip generation is influenced by far more than one or two independent variables. As a result, significant variation of individual sites from the weighted average rate or regression curve is frequent. Common practice in the traffic planning industry has been to collect trip generation data at three to five sites that truly meet the recommended site selection criteria with the assumption that these data will yield a relatively stable sample.

To establish a local trip generation rate
◆ Survey at least three sites (preferably five)

To validate the ITE* Trip Generation *rate
◆ Survey at least three sites

To combine local trip generation data with ITE* Trip Generation *data
◆ Survey at least two sites

To submit data to ITE
◆ Survey at least one site

If the analyst intends to establish a local trip generation rate, it is recommended that at least three sites (and preferably at least five) be surveyed. The higher number is suggested because it will enable the analyst to more readily identify—and potentially discard—outlier values and to produce a more reliable estimate of local trip generation characteristics. It is recognized, however, that budgetary constraints and perhaps even the lack of suitable survey sites may limit the trip generation study to three sites.

If the analyst intends to validate *Trip Generation* data for local use, it is recommended that no fewer than three sites be surveyed. If the analyst intends to supplement the *Trip Generation* data with local data and produce a consolidated trip generation rate, it is recommended that at least two sites be counted. ITE will accept data from one site.

Site Selection

Site selection is critical in achieving representative and consistent trip generation rates. Failure to select sites appropriately may lead to inaccurate trip generation rates and equations. Use of unrepresentative sites as a basis for trip generation estimates can result in over- or underestimating trips to be generated by a proposed development.

Suggested criteria for identifying sites for collection of trip generation data are as follows:

◆ Data should be transferrable; therefore, it is critical that both trip data and development characteristics be representative of the land uses to be analyzed. This includes development size, mix of development components and geographic location with respect to the area roadway network and area development patterns.

◆ The development should have reasonably full occupancy (i.e., at least 85 percent) and appear to be economically healthy (note: percent occupancy at the time of the survey, if applicable, should be recorded).

◆ The development should be mature (i.e., at least two years old) and located in a mature area so it represents the ultimate characteristics of a "successful" development.

◆ The data needed to describe the independent variables should be available.

◆ The site should be selected on the ability to obtain accurate trip generation and development characteristics.

◆ It should be possible to isolate the site for counting purposes:

- No shared parking (unless the parking areas for the site are easily distinguishable);
- No shared driveways (unless the driveways for the site are easily distinguishable);
- Limited ability for pedestrians to walk into the site from nearby parcels;
- Limited transit availability or use (unless transit usage can be counted—e.g., elementary students who ride a school bus); and
- No through-traffic.

◆ The site should have a limited number of driveways (as a data collection cost consideration).

Key Site Selection Criteria

◆ Satisfies definition of ITE Land Use Code

◆ Reasonably full occupancy

◆ Mature

◆ Necessary data can be obtained readily and accurately

◆ Typical of sites in area with no unusual activities underway

◆ The driveways (or the method of counting traffic) should ensure against double-counting vehicles.

◆ It should be possible for counts to be made safely. The need for any special security measures should be identified.

◆ The site should consist of a single land use activity (unless a multi-use study is being conducted as described in Chapter 7).

◆ There should be minimal to no on-site construction or adjacent roadway construction.

◆ Permission should be obtained from the owner or the building manager (note: owners/managers are sometimes more willing to be surveyed if the confidentiality of their site is guaranteed or if the results are provided to them).

Independent Variable Selection

For a new land use being surveyed, one or more appropriate independent variables need to be identified, measured and analyzed. When identifying a potential independent variable, the following points should be considered.

◈ The data for the independent variable should be readily available, for the survey site and any potential proposed development of this land use type for which trip generation estimates may be desired.

◈ The number of trips generated at the site should be influenced in a logical way by the independent variable. **Correlation does not equal causation.**

◈ Available site data should be accurate, for sites being counted and proposed future development (i.e., if it cannot be projected for new development, it is not an appropriate independent variable).

◈ Variables for similar sites should be provided directly and not merely estimated from a different variable. For example, the number of employees at a site may appear to be a valid independent variable, but it should not be used if the value is typically derived by factoring in another independent variable, such as gross square footage of the development site.

Key Characteristics of Independent Variables to Include in a Local Trip Generation Study

◈ **Logical relationship to site trip generation**

◈ **Value measured directly for the survey site, not derived**

◈ **At least those used in similar *Trip generation* land uses**

◈ **Confidence that the available site data are accurate**

When in doubt about which independent variables may be most appropriate, refer to *Trip Generation* under the same or similar land use to see which ones have produced the most stable relationships and reliable rates or equations. Typical independent variables include number of employees, gross floor area, gross leasable area and number of occupied rooms or dwelling units. It is critical that the definitions of independent variables be the same as those defined in *Trip Generation* (Chapter 3 in the *User's Guide*, Seventh Edition) or Appendix D of this handbook.

For a trip generation study involving a land use for which trip end and independent variable information is already provided in *Trip Generation*, the choice of independent variables should (at the minimum) include those presented in *Trip Generation*. If other independent variables appear to be logical and satisfy the criteria cited above, data for them should be collected and analyzed as well.

In general, it is recommended that data be collected and compiled for as many potential, appropriate independent variables as practical. As the *Trip Generation* database grows, it is quite likely that future analyses of the available data will identify additional relationships involving more than the currently used independent variables.

The sample data collection forms presented at the end of this chapter contain a list of suggested data to obtain.

Development Data Requirements

Trip generation estimates are based on development characteristics that are used as independent variables. This normally requires a check with the owners or managers of the development to ensure the availability of accurate data on physical characteristics. For example, it is insufficient to merely count dwelling units or square feet. A count of *occupied* square feet or units is needed. The occupied space represents the portion of the development that is actually generating trips.

Occupied square footage should also be carefully evaluated to make sure that it is actually being occupied *and used* rather than merely leased or purchased. For example, in some land use classifications (particularly warehousing, industrial and office), it is common practice for tenants to lease or purchase future expansion space, but not to occupy it for some time. Use of "leased or purchased" square footage instead of "occupied and used" square footage can be misleading and may be one reason for the scatter in the historical data points within certain classifications in *Trip Generation.*

Typical Development Data

- **Description of site**
  - **Square footage and/or units**
  - **Percent occupancy**
  - **Site acreage**
  - **Location within area (CBD, suburban, rural)**
  - **Name and description of principal uses**
- **Site plan**
- **Adjacent street traffic volumes**

At this stage in the study design process, it is necessary to decide whether to include consideration of transit use, parking accumulation and automobile occupancy. If these issues are to be considered as factors in the analysis of the local trip generation data, then appropriate data should be collected.

Survey Periods

Site-generated traffic should be counted, if feasible, for a full 7-day period to determine when total site-generated traffic volumes peak during weekdays and the weekend. At the minimum, automatic traffic recorder counts should be taken through a full 24-hour period, although a preferred length of time would consist of 48 consecutive hours.

Some sites require manual counting techniques because automatic traffic recorder devices will not capture all trips (or may not he accurate due to the configuration of the site driveways). Manual traffic counts should last for a minimum of 2 hours for each peak period, depending on whether the adjacent street traffic peak or the generator's peak is being surveyed. If the desired traffic analysis requires other periods, counts for those periods should also be obtained.

The day of the week and time of day are also important considerations in obtaining meaningful results. The purpose of the study will dictate the critical time period for analysis.

In many cases, the season of the year is also important. In general, traffic generation for land uses with little or no seasonal variation should be counted on average days. For land uses with significant seasonal variation, time periods representing the 30th to 50th highest hours of the year may be used. Retail centers and recreational uses are typical examples of land uses with significant seasonal variation.

Care should be taken to avoid making counts during special events, holidays, construction periods, bad weather, or other times when conditions at the study site or in its vicinity may affect site trip generation. The time period being surveyed should represent typical activity for the site (e.g., no data collection should be conducted during a super sale at a retail site) unless the study is specifically designed for collecting data during a peak time (e.g., holiday shopping season for retail sites).

4.4 Conducting the Study

The following guidelines should be reviewed and followed to the extent possible when collecting traffic volume and site characteristics data.

- Count directional traffic volumes (entering and exiting) by 15-minute period.
- Where directional counts cannot be made automatically, manual counts should be made during the street peak periods, plus the peak period of the generator to record the peak-hour entering and exiting volumes. Two or more days of peak period traffic counts are desirable.
- If possible, collect hourly traffic volume data (or obtain from the governing jurisdiction) on all streets adjacent to and with access to or from the site so that adjacent street peak hours can be determined. The traffic counts of multiple driveway volumes must be done concurrently.
- Surveys or traffic counts conducted on public streets may require a courtesy call to the proper governing authority. Providing a copy of the traffic volume data or the final study to either the public or private agency involved is another good policy.

Use of ITE's data collection forms (found at the end of this chapter) is recommended. These forms identify the information needed for a successful study, and their use will increase standardization of data collection and facilitate the inclusion of the data into ITE's existing database.

◈ Data concerning the site should be obtained through interviews with the site owner or manager and, if necessary, by means of measurements.

◈ Verify automatic counts with manual counts for short period(s). If pneumatic road tube counters are used, exercise extra caution and verification because the accuracy of this equipment may degrade at low-speed traffic conditions.

◈ If the site could be considered a multi-use development, refer to Chapter 7 (Multi-Use Developments) for guidance on additional data collection needs.

◈ If pass-by data are being collected, specific intercept surveys will be needed (as described in Chapter 5, Pass-By, Primary and Diverted Linked Trips).

◈ If needed, record hourly entering and exiting traffic by vehicle classification and vehicle occupancy and compare with corresponding automatic counts to determine a factor for adjusting the raw automatic counts. This may require classifying vehicles by number of axles if automatic counters have been used. Refer to the latest edition of the ITE *Manual of Transportation Engineering Studies* for guidance.

4.5 Establishment of a Local Trip Generation Rate or Equation

This section provides guidance if the **purpose of the trip generation study is to establish a new local trip generation rate or equation.** If the purpose of the study is to validate the use of *Trip Generation* for a local application, Section 4.6 provides appropriate guidance.

It is recommended that the first analysis step in the establishment of a local trip generation rate or equation be the development of a hypothesis for why the *Trip Generation* data might not be appropriate for local application. For example, the rationale could involve the age of residents, metropolitan area characteristics and/or the availability of transit. It is important that the local community have **a common-sense rationale for believing that the local rate is or should be significantly different from that presented in *Trip Generation*.**

(Note: the absence of any data covering a particular land use is also a valid reason for conducting a local trip generation study.)

The second analysis step in the establishment of a local trip generation rate or equation should be confirmation that a local trip generation rate/equation is indeed justified. This confirmation should be predicated on satisfying the following three criteria:

◈ At least three local sites are counted **(five sites are preferable)**;

◈ The weighted average rate for the counted sites is at least 15 percent higher or lower than the comparative *Trip Generation* rate **or** if *Trip Generation* provides only two or fewer data points; and

◈ The local counts provide consistent results.

If establishment of a local trip generation rate or equation is justified based on these three criteria, the next step should involve the selection of either the computed trip generation rates or equations (if applicable) as the local trip generation estimator. The development of the local rate or equation should likewise **satisfy the standards assigned to *Trip Generation* data for its use.** In other words, the local data should be used with the same caution and desire for statistical integrity as the ITE database.

As described in Chapter 3 (Guidelines for Estimating Trip

HOW TO ESTABLISH A LOCAL RATE

- **Formulate hypothesis for why local trip generation is unique**
- **Confirm that local data justify a local trip generation rate/equation**
  - **At least three sites counted (five preferred)**
  - **Local rate at least 15 percent different from *Trip Generation* rate**
  - **Locally consistent data**
- **Satisfy statistical validity standards applied to *Trip Generation* data**

Generation), an acceptable use of the weighted average trip generation rate requires at least three data points with a computed **standard deviation that is no more than 110 percent of the weighted average rate.** The acceptable use of a regression equation requires at least four data points with a computed **R^2 of at least 0.75.**

The local trip generation documentation should clearly state the local rates and/or equations, the situations in which they are applicable and what to do in situations where they are not applicable. The documentation should also present the site-specific information.

Consideration should be given to submitting the data to ITE for use in subsequent editions of *Trip Generation*. Sources will be cited, but the identity of specific sites will be kept confidential. Data should be transmitted to:

Institute of Transportation Engineers
1099 14th St., NW, Suite 300W
Washington, D.C. 20005-3438
Tel: +1 202-289-0222
Fax: +1 202-289-7722

4.6 Validation of *Trip Generation* Rates/Equations for Local Use

This section provides guidance if the **purpose of the trip generation study is to validate the use of *Trip Generation* data for a local application.** If the purpose of the study is to establish a new local rate, Section 4.5 provides appropriate guidance.

Validation of *Trip Generation* data for local use does not preclude the development of local rates with the local data.

Validation of *Trip Generation* rates or equations for use in a particular locale should be accomplished using a two-step process. The first step is to collect local trip generation data at no fewer than three local sites (or supplemental data obtained from other sources to create a database of three or more local data sites).

The second step involves analysis of the local data and comparison of it to the ITE *Trip Generation* data. A *Trip Generation* rate/equation should be considered valid for local use if it meets the following criteria:

- The trip generation rate for each of the locally surveyed sites falls within one standard deviation of the *Trip Generation* rate;
- Of the sites surveyed locally, at least one has a rate higher than the *Trip Generation* weighted average rate or equation and one has a lower rate; **or** all of the survey sites generated trips with totals within 15 percent of the *Trip Generation* average rate or equation (calculated as follows: the difference between the survey site rate and the *Trip Generation* rate, divided by the *Trip Generation* rate);
- The locally collected data generally fall within the scatter of points shown in the current *Trip Generation* data plot; and
- Common sense derived from the local trip generation study indicates that the *Trip Generation* data are valid for local application.

If the local data do not meet all of the above criteria, development of a local rate or equation should be considered (refer to Section 4.5 for guidance).

Consideration should be given to submitting the data to ITE for use in subsequent editions of *Trip*

Generation. Sources will be cited, but the identity of specific sites will be kept confidential.

4.7 Combining *Trip Generation* and Local Data

If the *Trip Generation* database for a particular land use is relatively small (e.g., nine or fewer sites), the local community should **consider merging the national and local databases to create a consolidated trip generation rate.** It is recommended that this merging of the data sets take place **if the local and national average rates are reasonably close (e.g., within 15 percent of each other).** The merging of the two databases under those circumstances should improve the statistical strength of the overall database for the particular land use.

If the local and national rates are substantially different, refer to Section 4.5 for guidance on the establishment of a local rate.

The following procedure demonstrates the proper steps for merging the local and national databases.

This procedure can be used for any land use, time period and independent variable for which weighted average trip rates, average size of the independent variables and number of studies are provided in *Trip Generation*.

Note: This method of combining data sets does not allow precise calculation of the standard deviation or of a revised regression equation because of the unavailability of the exact data points in the ITE national database.

The basic equation for calculating a combined weighted average trip generation rate is:

(1) combined weighted average trip rate $= \dfrac{\sum \text{trip ends (ITE)} + \sum \text{trip ends (local)}}{\sum \text{independent variable units (ITE)} + \sum \text{independent variable units (local)}}$

The parameters "$\sum$ trip ends (ITE)" and "$\sum$ independent variable units (ITE)" can be calculated from statistics provided in *Trip Generation*.

(2) $\sum$ trip ends (ITE) = (weighted average trip rate) x (average value of independent variable unit) x (number of studies)

(3) $\sum$ independent variable units (ITE) = (average value of independent variable unit) x (number of studies)

The parameters "$\sum$ independent variable units (local)" and "$\sum$ trip ends (local)" should be available from the local data base.

The following is a sample application of this process. Assume the following information is known about three local Free-Standing Discount Superstore (Land Use 813):

	Average Weekday Trip Ends	GFA (1,000 sq. ft.)
Site 1	10,000	160
Site 2	7,000	190
Site 3	9,000	135
Total	26,000	485

From page 1,328 of Volume 3, *Trip Generation*, Seventh Edition:

weighted average trip rate = 49.21
average value for the independent variable unit = 160
number of studies = 10

The weighted average trip rate for the three new sites is 53.61, which is 9 percent higher than the *Trip Generation* rate. Because the new data are within 15 percent, the following calculations can be used.

From equation (2): $\sum$ trip ends (ITE) = 46.21 x 160 x 10 = 78,736
From equation (3): $\sum$ independent variable units (ITE) = 160 x 10 = 1,600
From local data: $\sum$ independent variable units (local) = 485
From local data: $\sum$ trip ends (local) = 26,000
Applying equation (1): combined weighted average trip rate
= (78,736 + 26,000)/(1,600 + 485) ≈ 50.2

The updated weighted average rate is 50.2 weekday trips per 1,000 sq. ft. of gross floor area.

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Trip Generation Data Form (Part 1)

Land Use/Building Type:[1]	ITE Land Use Code:
Source:	Source No. (*ITE use only*):
Name of Development:	Day of the Week:
City: State/Province: Zip/Postal Code:	Day: Month: Year:
Country:	Metropolitan Area:

1. For fast-food land use, please specify if hamburger- or nonhamburger-based.

Location Within Area:

- ☐ (1) CBD
- ☐ (2) Urban (Non-CBD)
- ☐ (3) Suburban (Non-CBD)
- ☐ (4) Suburban CBD
- ☐ (5) Rural
- ☐ (6) Freeway Interchange Area (Rural)
- ☐ (7) Not Given

Detailed Description of Development:

Independent Variable: (include data for as many as possible)[2]	Actual	Estimated		Actual	Estimated
______ (1) Employees (#)	☐	☐	______ (9) Parking Spaces (% occupied: ______)	☐	☐
______ (2) Persons (#)	☐	☐	______ (10) Beds (% occupied: ______)	☐	☐
______ (3) Total Units (#) (indicate unit: ______)	☐	☐	______ (11) Seats (#)	☐	☐
______ (4) Occupied Units (#) (indicate unit: ______)	☐	☐	______ (12) Servicing Positions/Vehicle Fueling Positions	☐	☐
______ (5) Gross Floor Area (sq. ft.) (% of development occupied: ______)	☐	☐	______ (13) Shopping Center % Out-parcels/pads	☐	☐
______ (6) Net Rentable Area (sq. ft.)	☐	☐	______ (14) A.M. Peak Hour Volume of Adjacent Street Traffic	☐	☐
______ (7) Gross Leasable Area (sq. ft.) (% of development occupied: ______)	☐	☐	______ (15) P.M. Peak Hour Volume of Adjacent Street Traffic	☐	☐
			______ (16) Other ______	☐	☐
______ (8) Total Acres (% developed: ______)	☐	☐	______ (17) Other ______	☐	☐

2. Definitions for several independent variables can be found in the *Trip Generation User's Guide* Glossary.

3. Please provide all pertinent information that helps to describe the subject project. If necessary, attach a detailed report.

Other Data:

Vehicle Occupancy (#):
______ A.M. ______ P.M. ______ 24-hour %
Percent by Transit:
______ A.M. % ______ P.M. % ______ 24-hour %
Percent by Carpool/Vanpool:
______ A.M. % ______ P.M. % ______ 24-hour %

Employees by Shift:

First Shift: Start Time ______ End Time ______ Employees (#) ______
Second Shift: Start Time ______ End Time ______ Employees (#) ______
Third Shift: Start Time ______ End Time ______ Employees (#) ______

Parking Cost on Site: Hourly ______ Daily ______

Transportation Demand Management (TDM) Information:

At the time of this study, was there a TDM program (that may have impacted the trip generation characteristics of this site) underway?

- ☐ No
- ☐ Yes (If yes, please check appropriate box/boxes, describe the nature of the TDM program(s) and provide a source for any studies that may help quantify this impact. Attach additional sheets if necessary)

- ☐ (1) Transit Service
- ☐ (2) Carpool Programs
- ☐ (3) Vanpool Programs
- ☐ (4) Bicycle/Pedestrian Facilities and Site Improvements
- ☐ (5) Employer Support Measures
- ☐ (6) Preferential HOV Treatments
- ☐ (7) Transit and Ridesharing Incentives
- ☐ (8) Parking Supply and Pricing Management
- ☐ (9) Tolls and Congestion Pricing
- ☐ (10) Variable Work Hours/Compressed Work Weeks
- ☐ (11) Telecommuting
- ☐ (12) Other ______

Please Complete Form on Other Side

ITE Institute of Transportation Engineers

Trip Generation Data Form (Part 2)

Summary of Driveway Volumes *(All = All Vehicles Counted, Including Trucks; Trucks = Heavy Duty Trucks and Buses)*

	Average Weekday (M-F)						*Saturday*						*Sunday*					
	Enter		*Exit*		*Total*		*Enter*		*Exit*		*Total*		*Enter*		*Exit*		*Total*	
	All	*Trucks*	*All*	*Trucks*	*All*	*Trucks*	*All*	*Trucks*	*All*	*Trucks*	*All*	*Trucks*	*All*	*Trucks*	*All*	*Trucks*	*All*	*Trucks*
24-Hour Volume																		
A.M. Peak Hour of Adjacent[1] Street Traffic (7 – 9) Time (ex.: 7:15 - 8:15):																		
P.M. Peak Hour of Adjacent[1] Street Traffic (4 – 6) Time:																		
A.M. Peak Hour Generator[2] Time:																		
P.M. Peak Hour Generator[2] Time:																		
Peak Hour Generator[3] Time (Weekend):																		

[1] Highest hourly volume between 7 a.m. and 9 a.m. (4 p.m. and 6 p.m.).
[2] Highest hourly volume during the a.m. or p.m. period.
[3] Highest hourly volume during the entire day.
Please refer to the *Trip Generation User's Guide* for full definition of terms.

Hourly Driveway Volumes- Average Weekday (M-F)

A.M. Period	*Enter*		*Exit*		*Total*		*Mid-Day Period*	*Enter*		*Exit*		*Total*		*P.M. Period*	*Enter*		*Exit*		*Total*	
	All	*Trucks*	*All*	*Trucks*	*All*	*Trucks*		*All*	*Trucks*	*All*	*Trucks*	*All*	*Trucks*		*All*	*Trucks*	*All*	*Trucks*	*All*	*Trucks*
6:00-7:00							11:00-12:00							3:00-4:00						
6:15-7:15							11:15-12:15							3:15-4:15						
6:30-7:30							11:30-12:30							3:30-4:30						
6:45-7:45							11:45-12:45							3:45-4:45						
7:00-8:00							12:00-1:00							4:00-5:00						
7:15-8:15							12:15-1:15							4:15-5:15						
7:30-8:30							12:30-1:30							4:30-5:30						
7:45-8:45							12:45-1:45							4:45-5:45						
8:00-9:00							1:00-2:00							5:00-6:00						

☐ **Check if Part 3 and/or additional information is attached.**

Survey conducted by: Name: ____________________

Organization: ____________________

Address: ____________________

City/State/Zip: ____________________

Telephone #: __________ Fax #: __________ E-mail: __________

Please return to:

Institute of Transportation Engineers
Technical Projects Division
1099 14th Street, NW, Suite 300 West
Washington, DC 20005-3438 USA
Telephone: +1 202-289-0222
FAX: +1 202-289-7722
ITE on the Web: www.ite.org.

Institute of Transportation Engineers

Trip Generation Data Form (Part 3)

Name/Organization: ______________________________ *City/State:* ______________

Telephone Number: ______________________________

Detailed Driveway Volumes: Attach this sheet to Parts 1 and 2 if you are providing additional information.

Day of the week: ______________________________ *(All – All Vehicles Counted, Including Trucks; Trucks – Heavy Duty Trucks and Buses)*

A.M. Period	*Enter*		*Exit*		*Total*		*P.M. Period*	*Enter*		*Exit*		*Total*	
	All	*Trucks*	*All*	*Trucks*	*All*	*Trucks*		*All*	*Trucks*	*All*	*Trucks*	*All*	*Trucks*
12:00-12:15							12:00-12:15						
12:15-12:30							12:15-12:30						
12:30-12:45							12:30-12:45						
12:45-1:00							12:45-1:00						
1:00-1:15							1:00-1:15						
1:15-1:30							1:15-1:30						
1:30-1:45							1:30-1:45						
1:45-2:00							1:45-2:00						
2:00-2:15							2:00-2:15						
2:15-2:30							2:15-2:30						
2:30-2:45							2:30-2:45						
2:45-3:00							2:45-3:00						
3:00-3:15							3:00-3:15						
3:15-3:30							3:15-3:30						
3:30-3:45							3:30-3:45						
3:45-4:00							3:45-4:00						
4:00-4:15							4:00-4:15						
4:15-4:30							4:15-4:30						
4:30-4:45							4:30-4:45						
4:45-5:00							4:45-5:00						
5:00-5:15							5:00-5:15						
5:15-5:30							5:15-5:30						
5:30-5:45							5:30-5:45						
5:45-6:00							5:45-6:00						
6:00-6:15							6:00-6:15						
6:15-6:30							6:15-6:30						
6:30-6:45							6:30-6:45						
6:45-7:00							6:45-7:00						
7:00-7:15							7:00-7:15						
7:15-7:30							7:15-7:30						
7:30-7:45							7:30-7:45						
7:45-8:00							7:45-8:00						
8:00-8:15							8:00-8:15						
8:15-8:30							8:15-8:30						
8:30-8:45							8:30-8:45						
8:45-9:00							8:45-9:00						
9:00-9:15							9:00-9:15						
9:15-9:30							9:15-9:30						
9:30-9:45							9:30-9:45						
9:45-10:00							9:45-10:00						
10:00-10:15							10:00-10:15						
10:15-10:30							10:15-10:30						
10:30-10:45							10:30-10:45						
10:45-11:00							10:45-11:00						
11:00-11:15							11:00-11:15						
11:15-11:30							11:15-11:30						
11:30-11:45							11:30-11:45						
11:45-12:00							11:45-12:00						

Appendix L

City Bicycle Master Plan

Figure 3.2. Proposed Bicycle Network for San Ramon