

Appendix G: **Traffic Impact Study**

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Traffic Impact Study for the Blake-Griggs Multi-Family Residential Facility EIR



Prepared for the City of Pleasant Hill

Submitted by
W-Trans

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Executive Summary

The proposed Blake-Griggs Multi-Family Residential Facility project would replace the existing vacant office building at 85 Cleaveland Road in Pleasant Hill, California, with 210 apartment units. The anticipated trip generation of this project would be 1,142 new daily trips, including 76 morning peak hour trips and 92 evening peak hour trips.

The study area includes 16 intersections in and around Downtown Pleasant Hill, as well as Contra Costa Boulevard, I-680, and several nearby freeway on-ramps and off-ramps. The study intersections were assessed using *Highway Capacity Manual* (HCM) methodologies with the Synchro software package. Roadway segment analysis for Contra Costa Boulevard was completed using SimTraffic microsimulations to determine speeds, which were then assessed based on the minimum acceptable threshold of 15 miles per hour as specified in the Central County Action Plan. Nearby access ramps and mainline segments of I-680 were assessed using HCM methodology and the HCS7 software package.

Existing conditions were assessed using traffic volume counts collected in March 2019 for the weekday a.m. and p.m. peak periods. Future cumulative conditions were determined using growth rates in traffic volumes from the CCTA's travel forecast model for future traffic. In addition, the addition of a traffic signal at the intersection of Gregory Lane/Elinora Drive was assumed per the City of Pleasant Hill's *FY 2018-2023 Capital Improvement Plan*. It was determined that while the Gregory Lane/Elinora Drive and Boyd Road/Cleaveland Road intersections operate unacceptably under Existing conditions, and Boyd Road/Cleaveland Road operates unacceptably under Future conditions, the addition of project-generated traffic would not result in significant impacts at any study intersections.

Traffic operations along arterial roadway segments on Contra Costa Boulevard and I-680 freeway mainline segments were assessed, and there were no significant project impacts determined. While northbound Contra Costa Boulevard would operate deficiently without project traffic during the Existing and Future p.m. peak hours, the addition of project traffic would not change the arterial speed along the corridor. This would result in a less than significant impact to the corridor.

Queue lengths were evaluated for turn lanes at study intersections as well as for freeway off-ramps. The project would result in a significant impact in the northbound left-turn lane at the Contra Costa Boulevard/Crescent Plaza-Monument Boulevard intersection, which could be mitigated by extending the northbound left-turn lane by 35 feet, from 190 feet to 225 feet. While the existing westbound right-turn lanes at Monument Boulevard/I-680 are currently over-capacity without the project, the project would add 34 feet and 57 feet of queue length under Existing and Future conditions, respectively. It is recommended that adjustments to the intersection be made to account for this existing queue deficiency.

The proposed pedestrian, bicycle, and transit facilities were assessed and determined to be adequate with respect to the proposed project. Sight distance was also computed for the project driveway and determined to be adequate.

Introduction

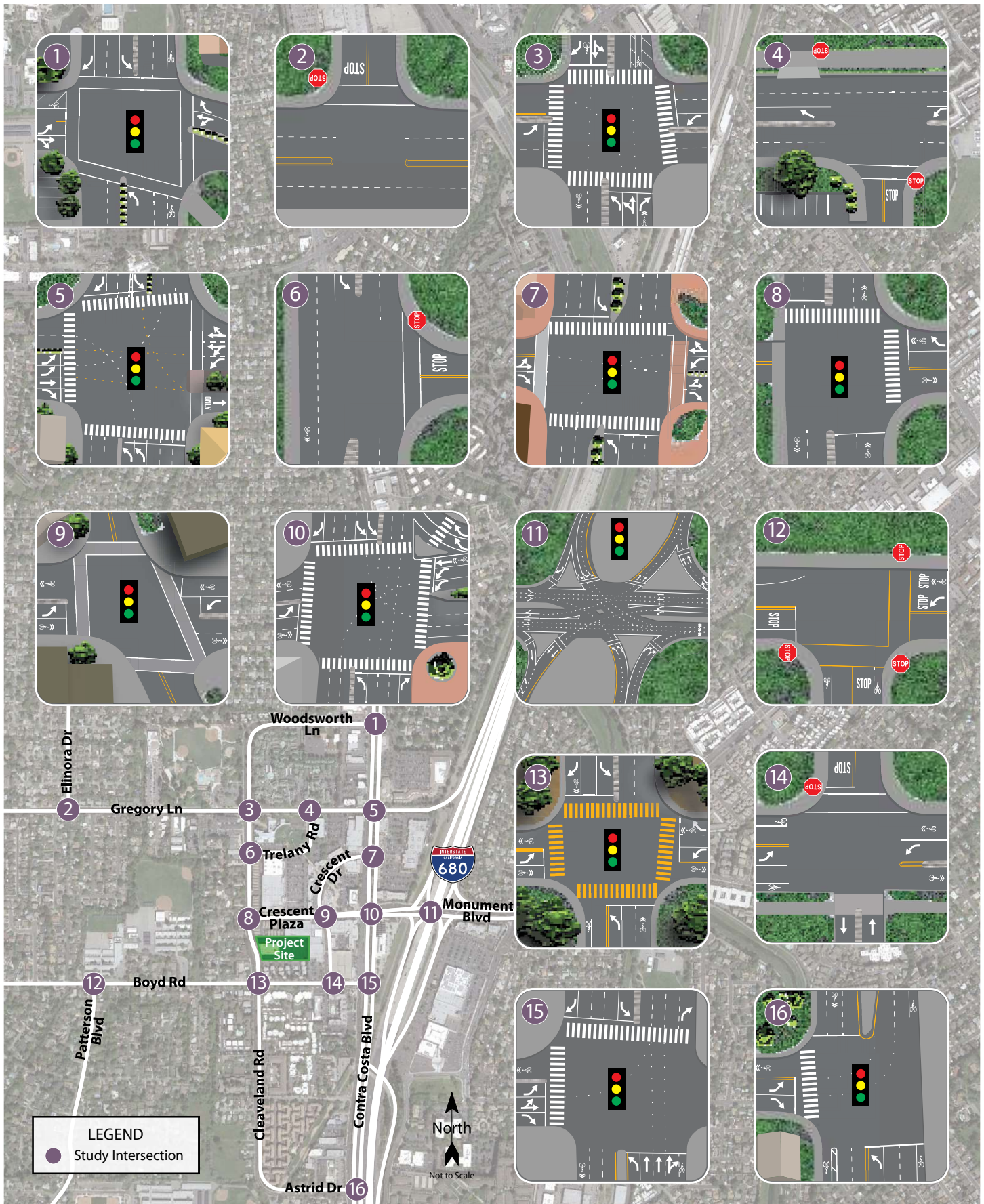
This report presents an analysis of the potential traffic impacts that would be associated with the redevelopment of the vacant Wells Fargo office building located at 85 Cleaveland Road in the City of Pleasant Hill. The traffic study was completed in accordance with the criteria established by the City of Pleasant Hill, including requirements per the Contra Costa Transportation Authority (CCTA), and is consistent with standard traffic engineering techniques.

Prelude

The purpose of a traffic impact study is to provide City staff and policy makers with data they can use to make an informed decision regarding the potential traffic impacts of a proposed project, and any associated improvements that would be required to mitigate these impacts to a level of insignificance as defined by the City's General Plan or other policies. Vehicular traffic impacts are typically evaluated by determining the number of new trips that the proposed use would be expected to generate, distributing these trips to the surrounding street system based on existing travel patterns or anticipated travel patterns specific to the proposed project, then analyzing the impact the new traffic would be expected to have on critical intersections or roadway segments. Impacts relative to access for pedestrians, bicyclists, and to transit are also addressed.

Project Profile

The proposed project includes 210 apartment units that would replace the existing 38,694 square-foot Wells Fargo office building on Cleaveland Road between Crescent Plaza and Boyd Road in the City of Pleasant Hill. The apartment structure would range from three stories near Cleaveland Road to five stories away from the road and by the existing theater. In addition to the apartment structure, there would be 293 residential assigned and 50 unassigned guest parking spaces provided in an underground structure, for a total of 343 parking stalls. The parking garage would also include 60 long-term bicycle storage spaces. The project site is located in Downtown Pleasant Hill, as shown in Figure 1.



Traffic Impact Study for the Blake-Griggs Multi-Family Residential Facility EIR
Figure 1 – Study Area and Existing Lane Configurations

Transportation Setting

Operational Analysis

Study Area and Periods

The study area includes the following intersections:

1. Contra Costa Boulevard/Woodsworth Lane
2. Gregory Lane/Elinora Drive
3. Gregory Lane/Cleaveland Road
4. Gregory Lane/Trelany Road
5. Contra Costa Boulevard/Gregory Lane
6. Cleaveland Road/Trelany Road
7. Contra Costa Boulevard/Crescent Drive
8. Cleaveland Road/Crescent Plaza
9. Crescent Drive/Crescent Plaza
10. Contra Costa Boulevard/Crescent Plaza-Monument Boulevard
11. Monument Boulevard/I-680 Ramps
12. Boyd Road/Patterson Boulevard
13. Boyd Road/Cleaveland Road
14. Boyd Road/Crescent Drive
15. Contra Costa Boulevard/Boyd Road
16. Contra Costa Boulevard/Astrid Drive

The study area also includes the following I-680 mainline segments and ramps:

1. I-680 North to the South of Oak Park Boulevard
2. I-680 North Off-Ramp to Contra Costa Boulevard
3. I-680 North Off-Ramp to Monument Boulevard
4. I-680 North On-Ramp from Monument Boulevard
5. I-680 North to the North of Monument Boulevard
6. I-680 South to the North of Willow Pass Road
7. I-680 South Off-Ramp to Monument Boulevard
8. I-680 South On-Ramp from Monument Boulevard
9. I-680 South On-Ramp from Contra Costa Boulevard
10. I-680 South to the South of Oak Park Boulevard

Contra Costa Boulevard is also included in the study area as a roadway study segment.

Operating conditions during the a.m. and p.m. peak periods were evaluated to capture the highest potential impacts for the proposed project as well as the highest volumes on the local transportation network. The morning peak hour occurs between 7:00 and 9:00 a.m. and reflects conditions during the home to work or school commute, while the p.m. peak hour occurs between 4:00 and 6:00 p.m. and typically reflects the highest level of congestion during the homeward bound commute.

Study Intersections

Contra Costa Boulevard/Woodsworth Lane is a signalized intersection with crosswalks and curb ramps across all four legs. The left turns on Contra Costa Boulevard have protected phasing, and the approaches on

Woodsworth Lane have split phasing. There are bicycle lanes on the west leg. There are two approach lanes from all but the west leg, which has one approach lane.

Gregory Lane/Elinora Drive is a tee-intersection with a stop control on the southbound (Elinora Drive) approach. There is a crosswalk across the north leg of the intersection. The Elinora Drive leg has one approach while the Gregory Lane legs each have two approach lanes.

Gregory Lane/Cleaveland Road includes crosswalks across all four legs. The intersection is signalized with protected left-turn phasing on Gregory Lane and split phasing on Cleaveland Road. The north leg has bicycle lanes, while a bicycle route (sharrows) is on the south leg. The north leg has one approach lane while the other legs each have two approach lanes.

Gregory Lane/Trelany Road is a tee intersection, with stop control, curb ramps, and a crosswalk only on the Trelany Road approach. There are two approach lanes in each direction on Gregory Lane, and one approach lane on the Trelany Road approach.

Contra Costa Boulevard/Gregory Lane is a large signalized intersection, with protected left-turn phasing on Contra Costa Boulevard and split phasing on Gregory Lane and the I-680 Off-Ramp. A right-turn overlap is provided on the eastbound Gregory Lane approach. There are crosswalks and curb ramps on all four approaches. The I-680 Off-Ramp approach has one lane, compared with two lanes for the Gregory Lane approach and three for each of the Contra Costa Boulevard approaches.

Cleaveland Road/Trelany Road is similar to Gregory Lane/Trelany Road, in that it is a tee-intersection with stop control, curb ramps, a crosswalk on the Trelany Road approach only, and that the Trelany Road approach has one lane while the Cleaveland Road approach has two lanes. There are also bicycle facilities in the form of sharrows on Cleaveland Road.

Contra Costa Boulevard/Crescent Drive is a signalized intersection with protected left-turn phasing provided on Contra Costa Boulevard and permissive left-turn phasing on Crescent Drive. There are crosswalks and curb ramps on each leg. Contra Costa Boulevard has three approach lanes in each direction, while Crescent Drive has one.

Cleaveland Road/Crescent Plaza is a signalized intersection with simple two-phase operation. There are crosswalks and curb ramps on the north and east legs, while the west leg is designed in the manner of a driveway (laterally sloped sidewalk). There are sharrows on Cleaveland Road and on the east leg of Crescent Plaza. Cleaveland Road has two approach lanes in each direction and Crescent Plaza has one approach lane.

Crescent Drive/Crescent Plaza is a four-legged signalized intersection with split phasing on Crescent Drive and permissive left-turn phasing on Crescent Plaza. Crosswalks and associated pedestrian signal heads are present at all legs of the intersection. There are sharrows along Crescent Plaza. All four legs have two approach lanes.

Contra Costa Boulevard/Crescent Plaza-Monument Boulevard is a four-legged signalized intersection with protected left-turn phasing for all four approaches. The westbound approach has a channelized right-turn lane with protected right-turn phasing. There are crosswalks and associated pedestrian signal heads at all four legs and at the channelized right turn on the east leg.

Monument Boulevard/I-680 Ramps is a six-legged signalized single-point urban interchange (SPUI) under the I-680 freeway, also known as an “airport interchange.” A SPUI is a modification of the more common diamond interchange, combining the two ramp intersections into one larger intersection that operates under one set of traffic signals, effectively converting the six-legged intersection into a four-legged intersection. At Monument Boulevard/I-680 Ramps, the northbound and southbound left-turn off-ramp approaches are phased at the same time, as are the eastbound and westbound left-turn movements from Monument Boulevard to the on-ramps. The

right-turn movements are channelized, with all but the eastbound right-turn movement having protected phasing. Crosswalks are present at all four ramps legs.

Boyd Road/Patterson Boulevard is an all-way stop controlled tee-intersection. There are sharrows along Boyd Road, and bicycle lanes are present along Patterson Boulevard. Crosswalks are present at the south and east legs. All three legs have one approach lane.

Boyd Road/Cleaveland Road is a four-legged signalized intersection with protected left-turn phasing for all four approaches. There are bicycle sharrows along Boyd Road and the north leg on Cleaveland Road, with a bicycle lane south of the intersection. High visibility crosswalks and associated pedestrian signal heads are present at all four legs.

Boyd Road/Crescent Drive is a tee-intersection with stop controls on the southbound Crescent Drive approach. There are sharrows on Boyd Road to the east of the intersection that connect to bicycle lanes west of the intersection. A crosswalk is present on the north leg.

Contra Costa Boulevard/Boyd Road is a four-legged signalized intersection with protected left-turn phasing on the northbound and southbound Contra Costa Boulevard approaches. The westbound approach is a driveway from an underground parking lot. Crosswalk and associated pedestrian signal heads are present at the north and west legs as well as on the east driveway approach leg of the intersection. There are sharrows along the Contra Costa Boulevard and Boyd Road approaches.

Contra Costa Boulevard/Astrid Drive is a signalized tee intersection with protected left-turn phasing at the northbound approach. There are bicycle lanes along Contra Costa Boulevard and sharrows along Astrid Drive. There is a crosswalk with an associated set of pedestrian signal heads at the west leg of the intersection.

The locations of the study intersections and the existing lane configurations and controls are shown in Figure 1.

Study Roadway

Contra Costa Boulevard is a CCTA route of regional significance that traverses Pleasant Hill from North Main Street in Walnut Creek to the south to Pacheco Boulevard in Pacheco to the north. In the study area, Contra Costa Boulevard has four to six vehicle lanes, bicycle lanes, sidewalks, a landscaped median, and a speed limit of 35 miles per hour (mph).

Study Freeway

I-680 predominately runs north-south, connecting Pleasant Hill north to Fairfield and south to San Jose. The freeway has four to six 12-foot travel lanes in each direction in the study area, with a posted speed limit of 65 mph. According to average daily traffic volume (ADT) data from Caltrans, the segment of I-680 within the study area had an ADT of approximately 275,100 vehicles in 2017.

Collision History

The collision history for the study area was reviewed to determine any trends or patterns that may indicate a safety issue. Collision rates were calculated based on records available from the California Highway Patrol as published in their Statewide Integrated Traffic Records System (SWITRS) reports. The most current five-year period available is October 1, 2013 through September 30, 2018.

Calculated collision rates for the study intersections were compared to average collision rates for similar facilities statewide, as indicated in *2014 Collision Data on California State Highways*, California Department of Transportation

(Caltrans). The average collision rates for intersections differ based on whether the intersection is controlled by a traffic signal, all-way stop signs, or is uncontrolled, as well as the number of approaches (three or four).

As presented in Table 1, five of the 16 study intersections (Gregory Lane/Trelany Road, Cleaveland Road/Trelany Road, Boyd Road/Patterson Boulevard, Boyd Road/Cleaveland Road, and Contra Costa Boulevard/Astrid Drive) had lower collision rates than the statewide averages within the most recent five-year period. The other 11 study intersections were examined further due to having a higher collision rate than the statewide average for similar facilities. The collision rate calculations are provided in Appendix A.

Table 1 – Collision Rates at the Study Intersections

Study Intersection	Number of Collisions (2013-2018)	Calculated Collision Rate (c/mve)	Statewide Average Collision Rate (c/mve)
1. Contra Costa Blvd/Woodsworth Ln	32	0.64	0.27
2. Gregory Ln/Elinora Dr	6	0.21	0.18
3. Gregory Ln/Cleaveland Rd	17	0.49	0.27
4. Gregory Ln/Trelany Rd	1	0.05	0.18
5. Contra Costa Blvd/Gregory Ln	40	0.62	0.27
6. Cleaveland Rd/Trelany Rd	2	0.12	0.18
7. Contra Costa Blvd/Crescent Dr	30	0.56	0.27
8. Cleaveland Rd/Crescent Plz	10	0.61	0.27
9. Crescent Dr/Crescent Plz	12	0.83	0.27
10. Contra Costa Blvd/Crescent Plz-Monument Blvd	41	0.59	0.27
11. Monument Blvd/I-680 Ramps	34	0.38	0.27
12. Boyd Rd/Patterson Blvd	3	0.16	0.18
13. Boyd Rd/Cleaveland Rd	5	0.26	0.27
14. Boyd Rd/Crescent Dr	6	0.48	0.15
15. Contra Costa Blvd/Boyd Rd	19	0.42	0.27
16. Contra Costa Blvd/Astrid Dr	2	0.08	0.21

Note: c/mve = collisions per million vehicles entering

The top collision factors at Contra Costa Boulevard/Woodsworth Lane were red-light running which was cited for eight collisions, seven of which were caused by northbound or southbound through drivers, as well as speeding and drunk driving which led to five collisions each. Of the 32 reported collisions, ten occurred on a Friday between 3:00 and 11:30 p.m. Increased enforcement, especially during this peak time for collisions, may reduce the high rate of collisions at this location.

Of the six collisions at Gregory Lane/Elinora Drive, four involved drivers turning left into or out of Elinora Drive failing to yield the right-of-way to conflicting through traffic on Gregory Lane. Signalization of this intersection, which is programmed in the City's *FY 2018-2023 Capital Improvement Plan*, would be expected to reduce this collision type.

Seven of the 17 reported collisions at Gregory Lane/Cleaveland Road were rear-ends, with five right-angle collisions as the collision type cited in the next highest number of incidents. The top primary cause factor was red-

light running with five crashes, followed by speeding with three collisions. Replacing the eight-inch signal heads with standard 12-inch heads would increase signal visibility at this location and may help reduce the rate of collisions. A City review of the signal timings, visibility, and vehicle speeds may reveal other contributing factors to the above-average collision rate.

The intersection of Contra Costa Boulevard/Gregory Lane had 40 collisions, of which 18 were caused by southbound drivers. Of those, 16 were collisions with other southbound drivers, and 12 of these occurred between 11:30 a.m. and 4:30 p.m. Updating the traffic signal timing and coordination during the afternoon period to better align with arriving platoons of southbound traffic may help alleviate this collision type.

Twenty of the 30 collisions reported at Contra Costa Boulevard/Crescent Drive occurred during the day between the morning and evening peak hours, from 9:00 a.m. to 4:00 p.m. Six collisions were the result of southbound drivers failing to stop at a red light, including five of the 12 collisions that resulted in an injury. As there is one mast arm signal head for three lanes of southbound traffic, at least one or perhaps two additional signal heads on the southbound mast arm (one for each lane) would improve visibility of signal indications. Five collisions were the result of drunk driving, which increased DUI enforcement may deter. There were three collisions involving pedestrians crossing Contra Costa Boulevard reported in 2017 or earlier. There is now a leading pedestrian interval for the pedestrian phase across Contra Costa Boulevard, which may have led to the reduced rate of collisions involving pedestrians.

Half of the collisions reported for Cleaveland Road/Crescent Plaza (five out of ten total) were between drivers making a southbound left-turn and the northbound through movements. Installation of updated R10-12 "Left Turn Yield on Green (symbolic circular green)" signs, similar to those at Crescent Drive/Crescent Plaza, may better communicate the need for drivers turning left to yield to oncoming vehicles. Alternatively, splitting the northbound and southbound phasing would time-separate conflicting traffic on Cleaveland Road, although it would somewhat increase the average delay at the intersection. Another alternative would be to install a southbound left-turn pocket with protective left-turn phasing, which may require reconfiguration of Cleaveland Road.

The collisions reported for Crescent Plaza/Crescent Drive did not form a trend, other than three instances of westbound left-turning drivers failing to yield the right-of-way to oncoming eastbound through drivers. While providing protected left-turn phasing on Crescent Plaza is not warranted at this time per criteria in the *California Manual on Uniform Traffic Control Devices Revision 4*, Caltrans, 2019, the City should monitor the situation for future changes in conditions at this location.

The top three collision factors for Contra Costa Boulevard/Crescent Plaza-Monument Boulevard were unsafe lane changes (12 collisions), speeding (nine collisions), and failing to stop for a red light (five collisions). There were ten collisions at, or just east of, the intersection, all involving westbound drivers and occurring between 1:00 p.m. and 7:15 p.m. Increasing signal visibility to westbound drivers may reduce this trend, through such measures as additional westbound signal heads, increased signal head illumination, and darkening of the signal head housing and backplates.

The intersection of Monument Boulevard/I-680 Ramps had 38 collisions reported during the study period. The most common collision factor was speeding which was cited for nine collisions, followed by right-of-way violations for five collisions and red light running for four collisions. The most common location for collisions was on the northbound off-ramp approach. Darkening the signal heads, replacing eight-inch indications with 12-inch indications, and adding signal heads where they would be more visible to drivers on the straight portion of the off-ramp may alleviate this collision trend.

No two collisions reported for Boyd Road/Crescent Drive had similar details. One injury collision was caused by a southbound driver on Crescent Drive failing to yield the right-of-way to a driver on Boyd Road. Installation of a W4-4p "Cross Traffic Does Not Stop" placard below the southbound stop sign would provide an additional alert to drivers that traffic on Boyd Road has the right-of-way. Another injury collision occurred between a speeding

driver and a pedestrian in a crosswalk, although additional details are not provided. There was one fatal collision between a westbound driver and a pedestrian crossing Boyd Road approximately 50 feet west of the intersection.

For Contra Costa Boulevard/Boyd Road, unsafe lane changes accounted for four collisions, speeding led to three collisions, failing to stop at a red light resulted in three collisions, and improper passing was the primary cause of two collisions. No other collision factor accounted for more than one collision. There were six right-angle crashes, six rear-end crashes, five sideswipe crashes, and one collision each with a fixed object and a bicyclist. With no specific trend identified, no remedial measures could be developed.

Alternative Modes

Pedestrian Facilities

Pedestrian facilities include sidewalks, crosswalks, pedestrian signal phases, curb ramps, curb extensions, and various streetscape amenities such as lighting, benches, etc. In general, a network of sidewalks, crosswalks, pedestrian signals, and curb ramps provide access for pedestrians in the vicinity of the proposed project site. The project site is located within Downtown Pleasant Hill, with continuous sidewalks provided within the Downtown area and to surrounding residential neighborhoods.

Bicycle Facilities

The *Highway Design Manual*, Caltrans, 2017, classifies bikeways into four categories:

- **Class I Multi-Use Path** – a completely separated right-of-way for the exclusive use of bicycles and pedestrians with cross flows of motorized traffic minimized.
- **Class II Bike Lane** – a striped and signed lane for one-way bike travel on a street or highway.
- **Class III Bike Route** – signing only for shared use with motor vehicles within the same travel lane on a street or highway.
- **Class IV Bikeway** – also known as a separated bikeway, a Class IV Bikeway is for the exclusive use of bicycles and includes a separation between the bikeway and the motor vehicle traffic lane. The separation may include, but is not limited to, grade separation, flexible posts, inflexible physical barriers, or on-street parking.

Class III facilities are present on several roads within the study area, and are designated with shared lane markings, or “sharrows.” Within the immediate vicinity of the project site, there is a Class III facility along Cleaveland Road between Gregory Lane and Boyd Road, which is planned to be re-striped into Class II bicycle lanes according to the *Pleasant Hill Bicycle and Pedestrian Master Plan*, 2011. Table 2 summarizes the existing and planned bicycle facilities in the project vicinity, as contained in the *Pleasant Hill Bicycle and Pedestrian Master Plan*.

Table 2 – Bicycle Facility Summary

Status Facility	Class	Length (miles)	Begin Point	End Point
Existing				
Contra Costa Blvd	II	1.90	North City Limit	Woodsworth Ln
Woodsworth Ln	II	0.20	Contra Costa Blvd	Gregory Ln
Cleaveland Rd	II	0.20	Boyd Rd	W Hookston Rd
Boyd Rd	II	0.10	Cleaveland Rd	Crescent Dr
Cleaveland Rd	III	0.30	Gregory Ln	Boyd Rd
Monument Blvd-Crescent Plaza	III	0.80	Cleaveland Rd	East City Limit
Contra Costa Blvd	III	0.40	Boyd Rd	Astrid Dr
Boyd Rd	III	0.05	Crescent Dr	Contra Costa Blvd
Planned				
Cleaveland Rd	II	0.30	Gregory Ln	Boyd Rd
Gregory Ln	II	1.00	Pleasant Hill Rd	Cleaveland Rd

Source: *Pleasant Hill Bicycle and Pedestrian Master Plan*, City of Pleasant Hill, 2011

Transit Facilities

Regional and local, fixed-route bus transit service is provided by the County of Contra Costa through its County Connection Service. These bus services connect to regional Bay Area Rapid Transit (BART) stations, as well as the Martinez AMTRAK train station. Bus stops in the downtown area provide a connection between local and regional transit services and the project site as summarized in Table 3. The nearest bus stops for Routes 9, 16, 314, and 316 are at Cleaveland Road/Crescent Plaza, and the nearest bus stops for Route 18 are at Cleaveland Road/Crescent Plaza and Boyd Road/Cleaveland Road.

Table 3 – Transit Routes

Transit Agency Route	Distance to Stop (mi) ¹	Service			Connection
		Days of Operation	Time	Frequency	
County Connection					
Route 9	0.05	Weekdays	5:45 AM – 10:15 PM	50 min	Diablo Valley College to Walnut Creek BART
Route 16	0.05	Weekdays	5:30 AM – 10:00 PM	40 min	Martinez AMTRAK to Concord BART
Route 18	0.03	Weekdays	6:00 AM – 9:30 PM	80 min	Martinez AMTRAK to Pleasant Hill BART
Route 314	0.05	Weekends	7:00 AM – 8:30 PM	40 min	Diablo Valley College to Concord BART continues as Route 320 & 310
Route 316	0.05	Weekends	7:30 AM – 8:00 PM	80 min	Martinez AMTRAK to Pleasant Hill BART

Note: ¹ Defined as the shortest walking distance between the project site and the nearest bus stop

Two bicycles can be carried on most County Connector buses. Bike rack space is on a first come, first served basis. Additional bicycles are allowed on the buses at the discretion of the driver. There are also designated spaces for riders to have bicycles on BART trains.

LINK Paratransit is designed to serve the needs of individuals within the City and the greater Contra Costa County area who are unable to travel independently. This service operates in similar areas and times as existing fixed-route transit services. Trips can be reserved up to two days in advance for travel Monday through Friday, 4:30 a.m. to 11:00 p.m., and weekends 7:00 a.m. to 10:30 p.m.

Capacity Analysis

Intersection Level of Service Methodologies

Level of Service (LOS) is used to rank traffic operation on various types of facilities based on traffic volumes and roadway capacity using a series of letter designations ranging from A to F. Generally, Level of Service A represents free flow conditions and Level of Service F represents forced flow or breakdown conditions. A unit of measure that indicates a level of delay generally accompanies the LOS designation.

The study intersections were analyzed using methodologies published in the *Highway Capacity Manual 2010* (HCM 2010), Transportation Research Board, 2010. This source contains methodologies for various types of intersection control, all of which are related to a measurement of delay in average number of seconds per vehicle.

The Levels of Service for the intersections with side street stop controls, or those which are unsignalized and have one or two approaches stop controlled, were analyzed using the “Two-Way Stop-Controlled” intersection capacity method from the HCM 2010. This methodology determines a Level of Service for each minor turning movement by estimating the level of average delay in seconds per vehicle. Results are presented for individual movements together with the weighted overall average delay for the intersection.

The study intersection with stop signs on all approaches, Boyd Road/Patterson Boulevard, was analyzed using the “All-Way Stop-Controlled” Intersection methodology from the HCM 2010. This methodology evaluates delay for each approach based on turning movements, opposing and conflicting traffic volumes, and the number of lanes. Average vehicle delay is computed for the intersection as a whole, and is then related to a Level of Service.

The study intersections that are currently controlled by a traffic signal, or may be in the future, were evaluated using the signalized methodology from the HCM 2010. This methodology is based on factors including traffic volumes, green time for each movement, phasing, whether the signals are coordinated or not, truck traffic, and pedestrian activity. Average stopped delay per vehicle in seconds is used as the basis for evaluation in this LOS methodology. For purposes of this study, delays were calculated using signal timing obtained from the City of Pleasant Hill and Caltrans.

The ranges of delay associated with the various Levels of Service are indicated in Table 4.

Table 4 – Intersection Level of Service Criteria

LOS	Two-Way Stop-Controlled	All-Way Stop-Controlled	Signalized
A	Delay of 0 to 10 seconds. Gaps in traffic are readily available for drivers exiting the minor street.	Delay of 0 to 10 seconds. Upon stopping, drivers are immediately able to proceed.	Delay of 0 to 10 seconds. Most vehicles arrive during the green phase, so do not stop at all.
B	Delay of 10 to 15 seconds. Gaps in traffic are somewhat less readily available than with LOS A, but no queuing occurs on the minor street.	Delay of 10 to 15 seconds. Drivers may wait for one or two vehicles to clear the intersection before proceeding from a stop.	Delay of 10 to 20 seconds. More vehicles stop than with LOS A, but many drivers still do not have to stop.
C	Delay of 15 to 25 seconds. Acceptable gaps in traffic are less frequent, and drivers may approach while another vehicle is already waiting to exit the side street.	Delay of 15 to 25 seconds. Drivers will enter a queue of one or two vehicles on the same approach, and wait for vehicle to clear from one or more approaches prior to entering the intersection.	Delay of 20 to 35 seconds. The number of vehicles stopping is significant, although many still pass through without stopping.
D	Delay of 25 to 35 seconds. There are fewer acceptable gaps in traffic, and drivers may enter a queue of one or two vehicles on the side street.	Delay of 25 to 35 seconds. Queues of more than two vehicles are encountered on one or more approaches.	Delay of 35 to 55 seconds. The influence of congestion is noticeable, and most vehicles have to stop.
E	Delay of 35 to 50 seconds. Few acceptable gaps in traffic are available, and longer queues may form on the side street.	Delay of 35 to 50 seconds. Longer queues are encountered on more than one approach to the intersection.	Delay of 55 to 80 seconds. Most, if not all, vehicles must stop and drivers consider the delay excessive.
F	Delay of more than 50 seconds. Drivers may wait for long periods before there is an acceptable gap in traffic for exiting the side streets, creating long queues.	Delay of more than 50 seconds. Drivers enter long queues on all approaches.	Delay of more than 80 seconds. Vehicles may wait through more than one cycle to clear the intersection.

Reference: *Highway Capacity Manual 2010*, Transportation Research Board, 2010

Multi-Lane Highway Level of Service Methodology

The Multi-lane Highway methodologies published in Chapter 14 of the *Highway Capacity Manual 6th Edition* (HCM 6), Transportation Research Board, 2018, along with the HCS7 software package were used to evaluate operation on I-680. The metric used to determine the LOS of a multi-lane highway is density, measured as passenger cars per mile per lane (pc/mi/ln) with consideration included for the free-flow speed of the facility. For LOS D or better operations, the density thresholds established are identical for all free-flow speeds. However, for LOS E and LOS F, the density thresholds vary based on the facility's free-flow speed. A summary of density breakpoints is shown in Table 5.

Table 5 – Multilane Highway Level of Service Criteria

LOS	Free-Flow Speed (mph)	Density (pc/mi/ln)
A	All	>0-11
B	All	>11-18
C	All	>18-26
D	All	>26-35
E	60	>35-40
	55	>35-41
	50	>35-43
	45	>35-45
F	60	>40
	55	>41
	50	>43
	45	>45

Notes: LOS = Level of Service; mph = miles per hour; pc/mi/ln=passenger cars per mile per lane

Traffic Operation Standards

Caltrans has jurisdiction over I-680 and its associated on- and off-ramps. Caltrans indicates that they endeavor to maintain operation at the transition from LOS C to LOS D, per their *Guide for the Preparation of Traffic Impact Studies*, 2002. Where intersections are integral to a local jurisdictions transportation system, Caltrans often accepts the operational standard applied by the local agency, in this case, the County of Contra Costa through the CCTA and the City of Pleasant Hill.

The City of Pleasant Hill *General Plan*, 2003, established LOS criteria for the City's roadway network. The Growth Management Element, which contains the LOS criteria, was amended in 2013 and has the following condition:

Growth Management Program 2.5: Maintain a Level of Service (LOS) of LOS D or better (as defined in the Circulation Element) for all public roadways, excluding Routes of Regional Significance.

In the Circulation Element, Contra Costa Boulevard and I-680 are defined as Routes of Regional Significance, to which CCTA LOS standards apply. According to the *2017 Contra Costa Congestion Management Program (CMP)*, Contra Costa Boulevard through the City of Pleasant Hill has an LOS standard of E for each intersection, except for Contra Costa Boulevard/Monument Boulevard which has an LOS standard of F. I-680 in both the northbound and southbound directions within the study area has an operational standard of LOS F.

The *Central County Action Plan*, CCTA, 2017, prescribes a multimodal transportation service objective (MTSO) for Contra Costa Boulevard of 15 mph or faster during the a.m. and p.m. peak hours in both directions. Slower speeds would be considered deficient.

For intersections with stop control on the minor approaches only, such as Gregory Lane/Trelany Road, the *General Plan* and CMP do not distinguish between minor street delay and overall intersection delay. However, the HCM 2010 states that because the delay on the uncontrolled major street is assumed to be zero seconds, the worst delay on a minor street approach should be used as the threshold of significance for the overall intersection.

Therefore, the delays on the minor streets were assessed and reported alongside the overall intersection delay for intersections with stop controls on the minor street only.

The threshold for a significant impact for an intersection that is already operating deficiently without project traffic is not defined in either the *General Plan* or the *CMP*. In these cases, it is common to apply an increase in average intersection delay of five seconds or greater as the threshold for a significant impact. This methodology has been applied previously in traffic studies prepared for the City of Pleasant Hill, such as for the CarMax project.

The *General Plan* and *CMP* do not prescribe thresholds of significance regarding queue lengths. However, an increase in queue length due to project traffic was considered a potential impact if the increase would cause the queue to extend out of a dedicated turn lane into a through traffic lane, or the back of queue into a visually restricted area, such as a blind corner. If queues would already be expected to extend past a dedicated turn lane or into a visually restricted area without project traffic, the addition of more than one vehicle of queue length (25 feet) due to project traffic is considered to constitute a potentially significant impact. For freeway off-ramps, the applied threshold of significance was if a queue that was contained within the off-ramp without project traffic would extend past the gore point and onto the freeway mainline with the addition of project traffic.

Together, the applied thresholds for acceptable operation were:

- LOS F or better for the intersection of Contra Costa Boulevard/Monument Boulevard;
- LOS E or better for the other intersections along Contra Costa Boulevard;
- LOS D or better for the remaining study intersections;
- LOS F or better for I-680 and its ramps;
- 15 mph or faster along Contra Costa Boulevard; and/or
- Queue length shorter than provided capacity for turn pockets and off-ramps.

A project impact would be considered significant if the addition of project traffic would cause one of the following:

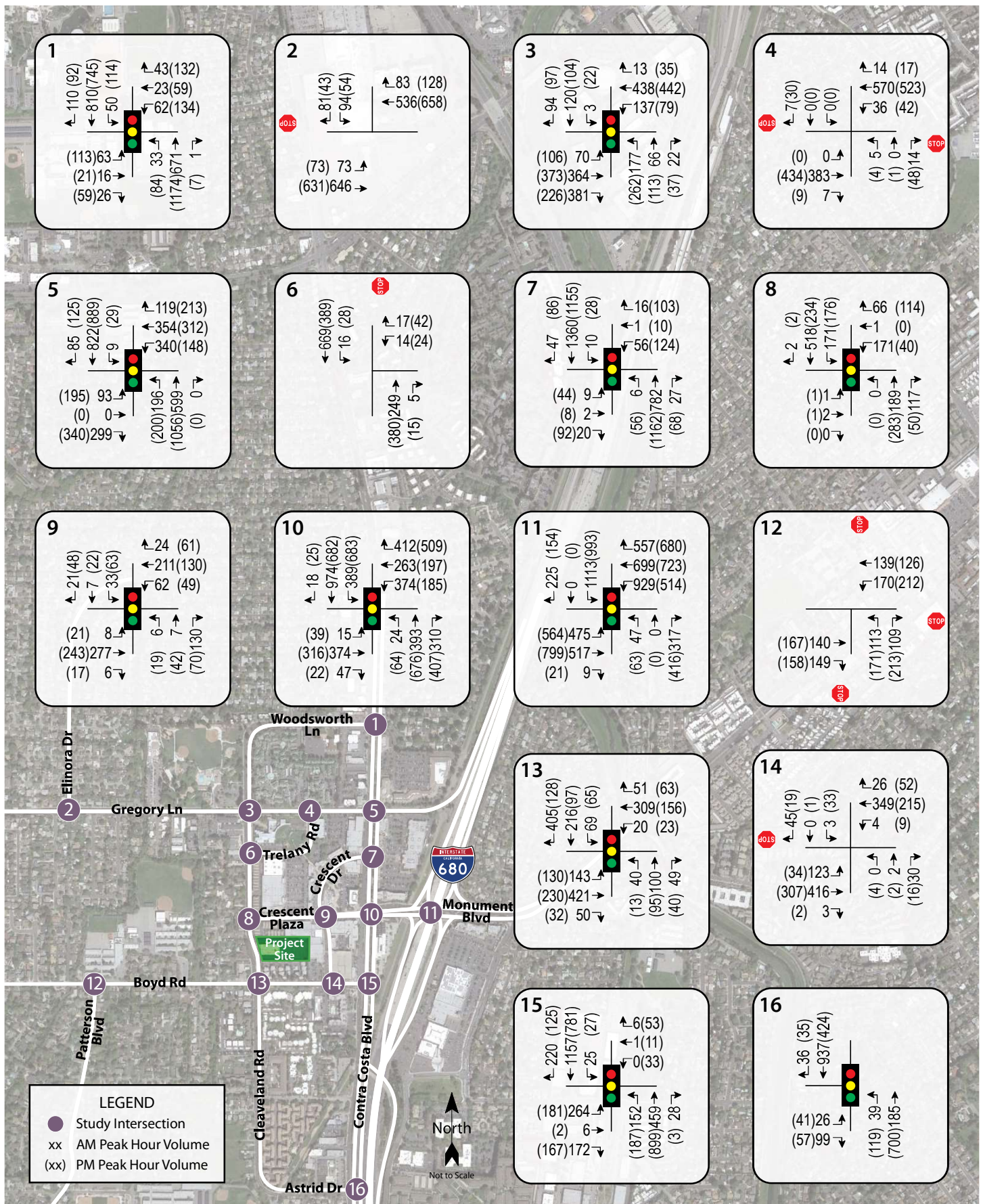
- Acceptable operations at a facility without project traffic to degrade past one of the above thresholds for deficient operation;
- The delay at an intersection operating deficiently without project traffic to increase by five seconds or more; and/or
- The addition of more than one vehicle of queue length (25 feet) to a queue that extends past a turn lane or into a visually restricted area without project traffic.

Existing Conditions

The Existing Conditions scenario provides an evaluation of current operation based on existing traffic volumes during the a.m. and p.m. peak periods. This condition does not include project-generated traffic volumes. Volume data was collected in March 2019 while local schools were in session.

Intersection Levels of Service

Under existing conditions, 14 of the 16 study intersections are operating acceptably. The two exceptions occur during the a.m. peak hour when the southbound approach on Elinora Drive to Gregory Lane is operating at LOS F and the Boyd Road/Cleveland Road intersection is operating at LOS E. The existing traffic volumes are shown in Figure 2. A summary of the intersection Level of Service calculations is contained in Table 6, and copies of the calculations are provided in Appendix B.



Traffic Impact Study for the Blake-Griggs Multi-Family Residential Facility EIR
Figure 2 – Existing Traffic Volumes

Table 6 – Existing Peak Hour Intersection Levels of Service

Study Intersection Approach	Standard		AM Peak		PM Peak	
	Delay	LOS	Delay	LOS	Delay	LOS
1. Contra Costa Blvd/Woodsworth Ln	<80.0	E	47.5	D	33.1	C
2. Gregory Ln/Elinora Dr <i>Southbound (Elinora Dr) Approach</i>	<35.0 ¹	D	7.2 54.9	A F	2.1 23.5	A C
3. Gregory Ln/Cleaveland Rd	<55.0	D	37.7	D	33.2	C
4. Gregory Ln/Trelany Rd <i>Northbound (Trelany Rd) Approach</i> <i>Southbound (Mozden Ln) Approach</i>	<35.0 ¹	D	0.6 12.9 10.6	A B B	1.1 10.9 10.4	A B B
5. Contra Costa Blvd/Gregory Ln	<80.0	E	32.9	C	30.5	C
6. Cleaveland Rd/Trelany Rd <i>Westbound (Trelany Rd) Approach</i>	<35.0 ¹	D	0.6 12.9	A B	1.2 12.2	A B
7. Contra Costa Blvd/Crescent Dr	<80.0	E	29.1	C	26.4	C
8. Cleaveland Rd/Crescent Plz	<55.0	D	6.2	A	4.6	A
9. Crescent Dr/Crescent Plz	<55.0	D	7.5	A	7.8	A
10. Contra Costa Blvd/Crescent Plz-Monument Blvd	-	F	24.2	C	34.3	C
11. Monument Blvd/I-680 Ramps	<55.0	D	38.4	D	34.5	C
12. Boyd Rd/Patterson Blvd	<35.0 ¹	D	12.2	B	19.1	C
13. Boyd Rd/Cleaveland Rd	<55.0	D	71.9	E	31.0	C
14. Boyd Rd/Crescent Dr <i>Northbound (Driveway) Approach</i> <i>Southbound (Crescent Dr) Approach</i>	<35.0 ¹	D	2.1 12.8 12.9	A B B	2.0 12.0 15.0	A B C
15. Contra Costa Blvd/Boyd Rd	<80.0	E	38.7	D	43.6	D
16. Contra Costa Blvd/Astrid Dr	<80.0	E	6.6	A	6.1	A

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; Results for minor approaches to two-way stop-controlled intersections are indicated in *italics*; **Bold** text = deficient operation

¹ The delay thresholds for each Level of Service are lower for intersections with stop controls than for signalized intersections

Freeway Levels of Service

The HCS7 software package was used to determine the merging, diverging, weaving, and mainline Levels of Service for I-680. Merging, diverging, and weaving analyses were completed for the on-ramps and off-ramps that would be subject to project traffic, including the ramps for Contra Costa Boulevard, Monument Boulevard, and Gregory Lane. Mainline analysis was assessed for I-680 North to the north of the Monument Boulevard on-ramp, I-680 North to the south of the Oak Road/Elena Court on-ramp, I-680 South to the north of the eastbound Willow Pass Road on-ramp, and I-680 South to the south of the Treat Boulevard/Geary Road off-ramp. These locations were selected to assess mainline operations with and without project traffic while avoiding weaving areas created by closely spaced on-ramps and off-ramps.

Under existing conditions, all the study freeway facilities are operating acceptably at LOS B or C. A summary of the freeway operational calculations is shown in Table 7, and copies of the calculations are provided in Appendix C.

Table 7 – Existing Peak Hour Freeway Levels of Service

Study Segment Facility	LOS Standard	AM Peak		PM Peak	
		Density	LOS	Density	LOS
I-680 North					
I-680 to the South of Oak Park Blvd	F	15.9	B	18.6	C
Off-Ramp to Contra Costa Blvd	F	21.7	C	28.0	C
Off-Ramp to Monument Blvd	F	16.2	B	20.7	C
On-Ramp from Monument Blvd	F	18.1	C	23.2	C
I-680 to the North of Monument Blvd	F	18.5	C	23.7	C
I-680 South					
I-680 to the North of Willow Pass Rd	F	13.2	B	14.1	B
Off-Ramp to Monument Blvd	F	16.2	B	16.4	B
On-Ramp from Monument Blvd	F	17.7	B	17.7	B
On-Ramp from Contra Costa Blvd	F	16.4	B	16.3	B
I-680 to the South of Oak Park Blvd	F	21.6	C	19.7	C

Notes: Density is measured in passenger cars per mile per lane; LOS = Level of Service

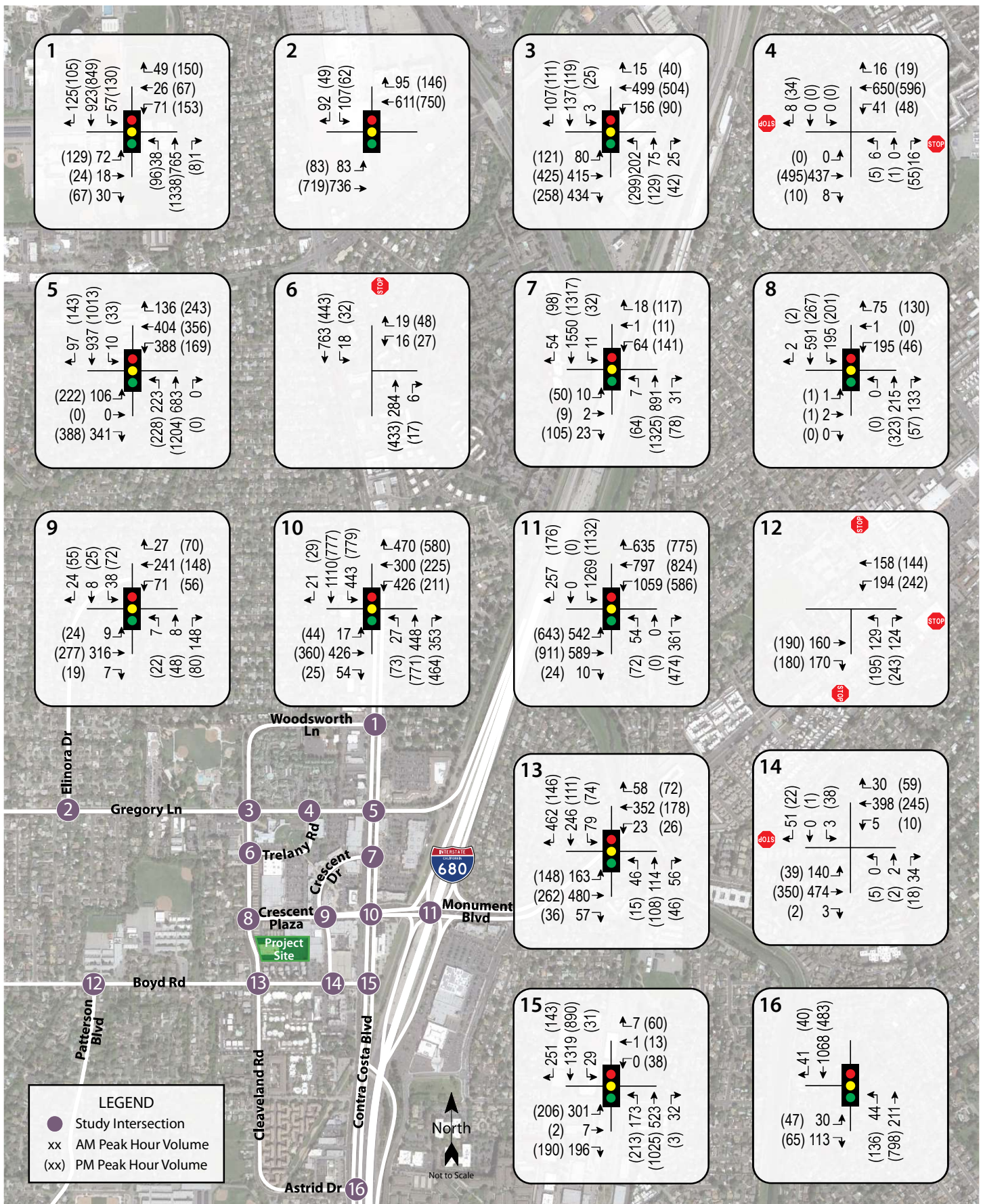
Future Conditions

Segment volumes for the horizon year of 2040 were obtained from the CCTA's travel forecast model for the 2013 and 2040 model years. The growth rate in study area traffic volumes during this 27-year model window was reduced to a 21-year growth rate to represent the more recent 2019 traffic counts. This resulted in an estimated 14.0-percent growth in area traffic volumes.

Intersection Levels of Service

Per the *FY 2018-2023 Capital Improvement Plan (CIP)*, City of Pleasant Hill, 2018, a traffic signal is programmed to be installed at Gregory Lane/Elinora Drive, which is operating deficiently under Existing conditions. This traffic signal was assumed to be operational by 2040, so was included in the Future conditions analysis.

Under the anticipated Future volumes, and with the addition of the Gregory Lane/Elinora Drive traffic signal, the study intersections are expected to operate acceptably except for the Boyd Road/Cleveland Road intersection during the a.m. peak hour. Future volumes are shown in Figure 3 and operating conditions are summarized in Table 8.



Traffic Impact Study for the Blake-Griggs Multi-Family Residential Facility EIR
Figure 3 – Future Traffic Volumes (2040)

Table 8 – Future Peak Hour Intersection Levels of Service

Study Intersection Approach	Standard		AM Peak		PM Peak	
	Delay	LOS	Delay	LOS	Delay	LOS
1. Contra Costa Blvd/Woodsworth Ln	<80.0	E	70.9	E	37.0	D
2. Gregory Ln/Elinora Dr	<55.0	D	6.9	A	6.0	A
3. Gregory Ln/Cleaveland Rd	<55.0	D	42.2	D	34.2	C
4. Gregory Ln/Trelany Rd	<35.0 ¹	D	0.6	A	1.2	A
Northbound (Trelany Rd) Approach			14.5	B	12.0	B
Southbound (Mozden Ln) Approach			11.1	B	10.8	B
5. Contra Costa Blvd/Gregory Ln	<80.0	E	35.2	D	35.5	D
6. Cleaveland Rd/Trelany Rd	<35.0 ¹	D	0.6	A	1.3	A
Westbound (Trelany Rd) Approach			14.2	B	13.2	B
7. Contra Costa Blvd/Crescent Dr	<80.0	E	36.0	D	23.1	C
8. Cleaveland Rd/Crescent Plz	<55.0	D	6.5	A	4.8	A
9. Crescent Dr/Crescent Plz	<55.0	D	7.7	A	8.0	A
10. Contra Costa Blvd/Crescent Plz-Monument Blvd	-	F	24.8	C	36.1	C
11. Monument Blvd/I-680 Ramps	<55.0	D	49.5	D	36.4	C
12. Boyd Rd/Patterson Blvd	<35.0 ¹	D	14.1	B	30.7	D
13. Boyd Rd/Cleaveland Rd	<55.0	D	97.1	F	32.2	C
14. Boyd Rd/Crescent Dr	<35.0 ¹	D	2.2	A	2.2	A
Northbound (Driveway) Approach			13.8	B	12.9	B
Southbound (Crescent Dr) Approach			14.1	B	17.0	C
15. Contra Costa Blvd/Boyd Rd	<80.0	E	40.7	D	44.8	D
16. Contra Costa Blvd/Astrid Dr	<80.0	E	7.0	A	6.3	A

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; Results for minor approaches to two-way stop-controlled intersections are indicated in *italics*; **Bold** text = deficient operation

¹ The delay thresholds for each Level of Service are lower for intersections with stop controls than for signalized intersections

Freeway Levels of Service

Likewise, under projected future volumes, the freeway study segments would operate acceptably. These results are summarized in Table 9.

Table 9 – Future Peak Hour Freeway Levels of Service

Study Segment Facility	LOS Standard	AM Peak		PM Peak	
		Density	LOS	Density	LOS
I-680 North					
I-680 to the South of Oak Park Blvd	F	18.2	C	21.7	C
Off-Ramp to Contra Costa Blvd	F	25.6	C	33.4	D
Off-Ramp to Monument Blvd	F	18.8	C	24.6	C
On-Ramp from Monument Blvd	F	21.1	C	28.0	D
I-680 to the North of Monument Blvd	F	21.6	C	28.5	D
I-680 South					
I-680 to the North of Willow Pass Rd	F	15.1	B	16.1	B
Off-Ramp to Monument Blvd	F	19.2	B	19.4	B
On-Ramp from Monument Blvd	F	20.6	C	20.7	C
On-Ramp from Contra Costa Blvd	F	19.0	C	18.8	C
I-680 to the South of Oak Park Blvd	F	25.5	C	23.1	C

Notes: Density is measured in passenger cars per mile per lane; LOS = Level of Service

Project Description

The proposed project would be located at 85 Cleaveland Road in the City of Pleasant Hill and includes 210 apartment units that would replace the existing 38,694 square-foot Wells Fargo office building on Cleaveland Road between Crescent Plaza and Boyd Road. The apartment structure would range from three to five stories above ground, with two levels of underground parking containing 343 parking stalls split between 293 residential assigned stalls and 50 unassigned guest stalls, as well as 60 long-term bicycle storage spaces. The proposed project site plan is shown in Figure 4.

Trip Generation

The anticipated trip generation for the proposed project was estimated using standard rates published by the Institute of Transportation Engineers (ITE) in *Trip Generation Manual*, 10th Edition, 2017. The trip generation potential of the project as planned was developed using the published standard rates for Mid-Rise Multifamily Housing (Land Use #221), as this description most closely matches the proposed project.

A trip credit for the existing bank office building was not included in the analysis, as the office was vacated in November 2017 and the trips from the office are not reflected in traffic counts conducted in 2019.

Based on application of these assumptions, the proposed project is expected to generate an average of 1,142 trips per day, including 76 a.m. peak hour trips and 92 trips during the p.m. peak hour. These results are summarized in Table 10.

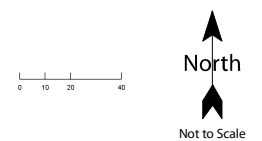
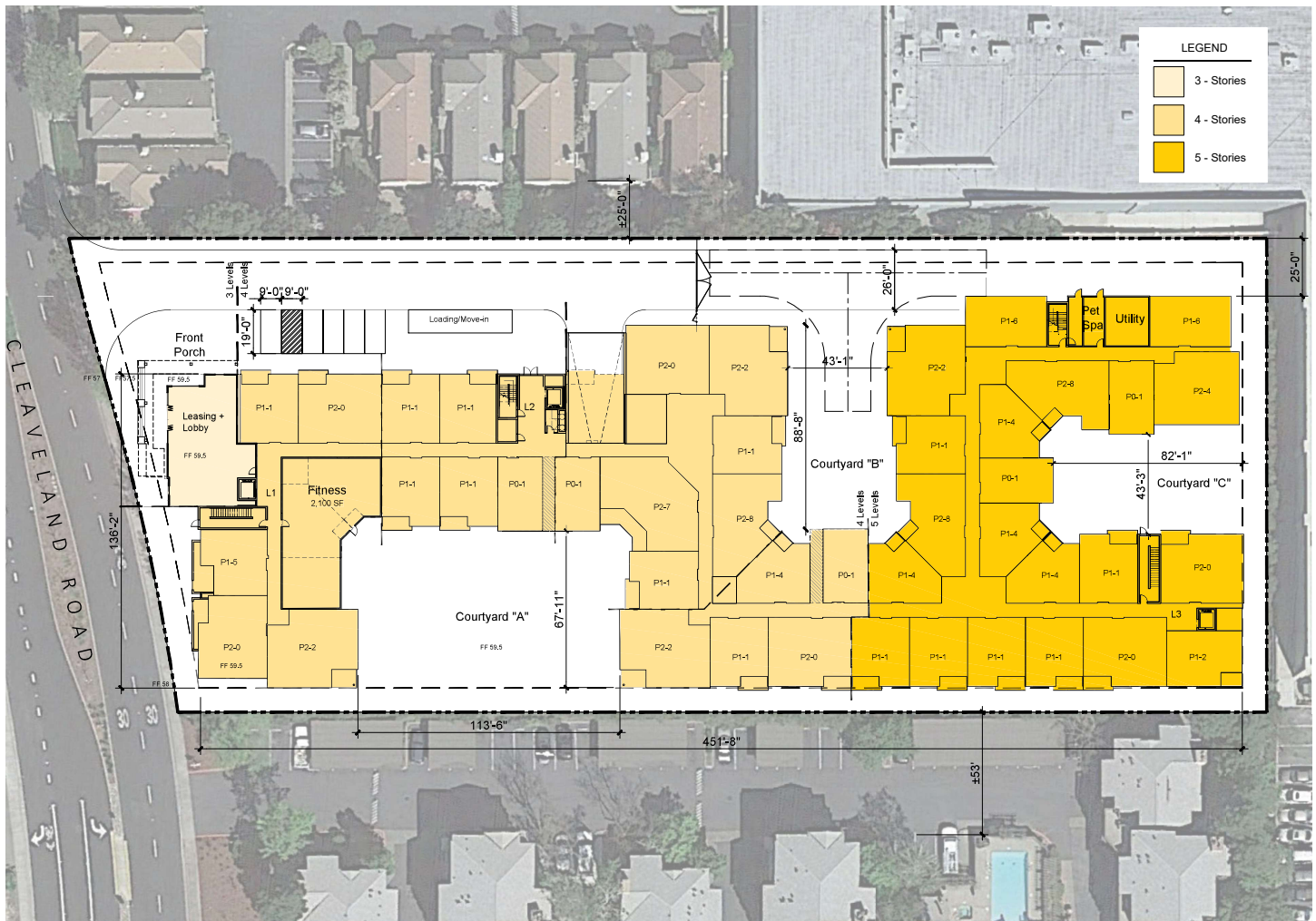


Table 10 – Trip Generation Summary

Land Use	Units	Daily		AM Peak Hour				PM Peak Hour			
		Rate	Trips	Rate	Trips	In	Out	Rate	Trips	In	Out
Proposed											
Apartments	210 du	5.44	1,142	0.36	76	20	56	0.44	92	56	36

Note: du = dwelling unit

As the project site is occupied by a vacant office building, the trip generation for this use was estimated solely to provide a comparative reference point, using the “General Office Building” land use (LU #710) as published in the *Trip Generation Manual*. The 38,694 square-foot existing office building is estimated to have generated 45 trips during the a.m. peak hour, 44 trips during the p.m. peak hour, and 377 trips per weekday. The estimated trip generation of the prior office space is presented in Table 11.

Table 11 – Trip Generation Summary for the Vacant Office Building

Land Use	Units	Daily		AM Peak Hour				PM Peak Hour			
		Rate	Trips	Rate	Trips	In	Out	Rate	Trips	In	Out
Prior Use											
Office Building	38.7 ksf	9.74	377	1.16	45	39	6	1.15	44	7	37

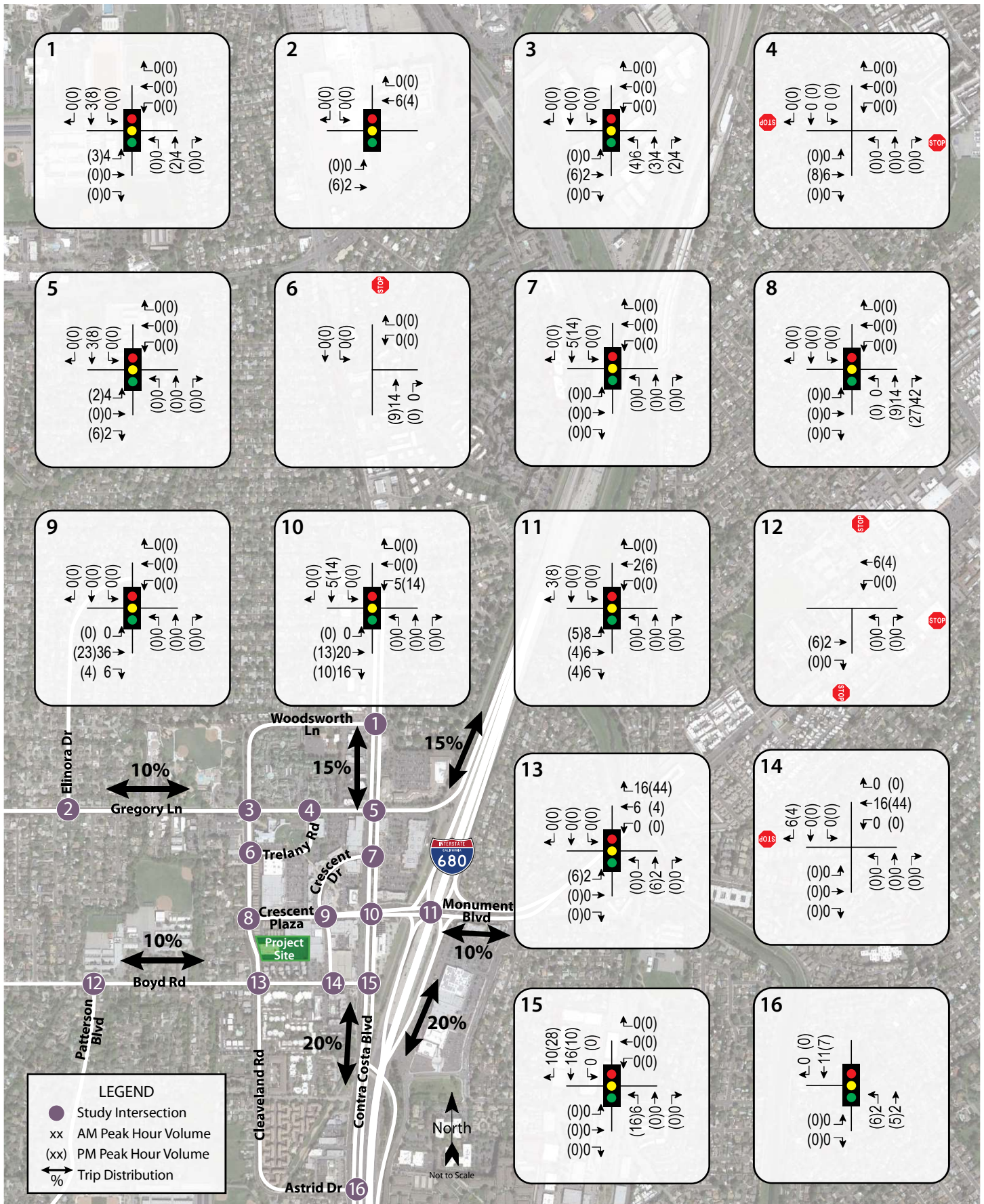
Note: ksf = thousand square feet

Trip Distribution

The trip distribution pattern used to allocate new project trips to the street network was based on data from the 2015 Census for home-to-work trips, in addition to expected travel patterns for retail customers. Based on the applied assumptions in Table 12, the ensuing daily and peak hour trip generation was calculated as noted in the table. These trip distribution assumptions are shown on Figure 5.

Table 12 – Trip Distribution Assumptions

Gateway	Percent (%)	Daily (trips)	AM Peak Hour (trips)	PM Peak Hour (trips)
I-680 to/from the North	15%	171	11	14
I-680 to/from the South	20%	229	15	19
Contra Costa Blvd to/from the North	15%	171	11	14
Contra Costa Blvd to/from the South	20%	229	15	18
Monument Blvd to/from the East	10%	114	8	9
Boyd Rd to/from the West	10%	114	8	9
Gregory Ln to/from the West	10%	114	8	9
TOTAL	100	1,142	76	92



Traffic Impact Study for the Blake-Griggs Multi-Family Residential Facility EIR
Figure 5 – Project Traffic Volumes and Trip Distribution

Trip Assignment

It is assumed that the existing median on Cleaveland Road would remain, resulting in right-in/right-out operation at the project driveway, and all project vehicles entering or exiting the site would be traveling northbound on Cleaveland Road. To access each of the gateways included in Table 12, the following trip assignments were assessed.

I-680 to/from the North would be accessed primarily using the I-680 ramps on Monument Boulevard, with entering trips routing through Contra Costa Boulevard and Boyd Road, and exiting vehicles using Crescent Plaza to Monument Boulevard.

I-680 to/from the South would be accessed by all arriving drivers using the I-680/Contra Costa Boulevard exit to Boyd Road, while departing drivers would split along two routes: half would access I-680 via Crescent Plaza to Monument Boulevard; and half would access I-680 via Crescent Plaza to Contra Costa Boulevard southbound.

Contra Costa Boulevard to/from the North would be assessed along two routes: half of the exiting drivers would access Contra Costa Boulevard from Gregory Lane; and half of exiting vehicles would continue north on Cleaveland Road to Woodsworth Lane. For arriving vehicles, it is assumed that all drivers would access the site by traveling southbound on Contra Costa Boulevard to westbound Boyd Road then northbound Cleaveland Road.

Contra Costa Boulevard to/from the South would be accessed by exiting drivers via Crescent Plaza, whereas entering drivers would use two different routes: half would use Astrid Drive to Cleaveland Road; and the other half would continue on Contra Costa Boulevard northbound to Boyd Road.

Monument Boulevard to/from the East would be accessed via Crescent Plaza for drivers exiting the site, and via Contra Costa Boulevard southbound to westbound Boyd Road for drivers approaching the site.

Boyd Road to/from the West would be accessed by drivers turning left at the Boyd Road/Cleaveland Road intersection to access the site, whereas departing drivers would route to Boyd Road via Crescent Plaza and Crescent Drive.

Gregory Lane to/from the West would be accessed by exiting drivers via northbound Cleaveland Road and then a left-turn at the Gregory Lane/Cleaveland Road intersection, whereas arriving drivers would route to the site via Contra Costa Boulevard and Boyd Road.

Using these trip assignments, the assessed project trips at each study intersection are shown on Figure 5.

Vehicle Miles Traveled

Average vehicle miles traveled (VMT) are published by the Metropolitan Transportation Commission in the Plan Bay Area Model. The Bay Area, Contra Costa County, and project traffic analysis zone (TAZ) have daily VMTs of 22.9, 21.3, and 16.0 miles per person for the project TAZ, respectively.

The proposed project includes ten percent below-market-rate (BMR) units. These units will provide an opportunity for lower income families to live in downtown Pleasant Hill and closer to civic and retail destinations. Based on the California Air Pollution Officers Association (CAPCOA) report *Quantifying Greenhouse Gas Mitigation Measures*, 2010, it is estimated that the inclusion of BMR housing would reduce the residential use's VMT by up to 0.4 percent.

The on-site pedestrian network would link the residential units to the common space and on-site retail establishments. The design does not include any physical barriers such as walls, landscaping, or slopes that could

impede pedestrian circulation. The on-site pedestrian network seamlessly connects to the public sidewalks on Cleveland Road, Crescent Drive, and Boyd Road. This network could reduce VMT by up to one percent, per CAPCOA.

The site is approximately 1.4 miles from the Pleasant Hill BART station, which provides high frequency transit service. This could reduce VMT by 3.0 percent according to CAPCOA, as residents walk, bike, or drive a shorter distance as compared to developments further from high frequency transit.

Mixed-use developments are another way to reduce VMT. As the site provides fitness and recreation areas, some residents may choose to remain onsite rather than drive elsewhere. Per CAPCOA, this could reduce the VMT of the project by up to 0.5 percent.

The project would consist of 210 apartments on 2.33 acres, for a density of 90.3 units per acre. Higher densities usually correlate to lower VMT as homes and workplaces are enabled to be closer together. Using CAPCOA methodology, up to a 30 percent reduction in VMT may occur at this density.

One project element that may increase VMT is the distance to regional employment centers, such as San Francisco, San Jose, or Oakland. As these job centers are further from the project site than the 12-mile average determined by CAPCOA, the methodology predicts an increase in VMT.

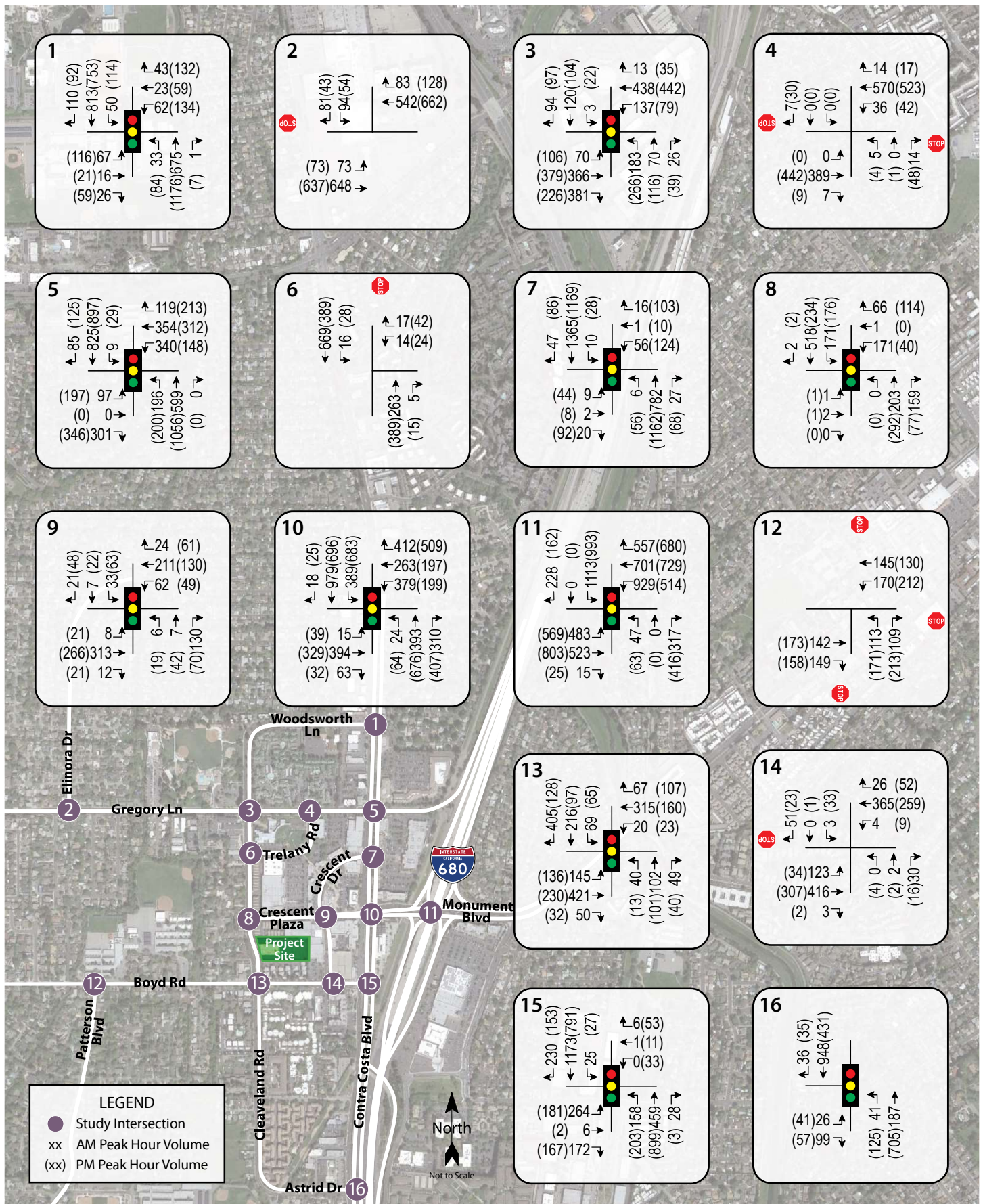
The proposed parking supply for the residential use is 343 spaces for 210 units, or approximately 1.63 spaces per unit. This is greater than the projected demand of 1.47 spaces per unit estimated in the *Parking Generation Handbook, 5th Edition*, ITE, 2019. According to CAPCOA methodology, this has the potential to increase VMT by up to 5.6 percent through enabling residents to increase the rate of, and reliance on, household car ownership.

As the CCTA and City of Pleasant Hill have not defined VMT policies or thresholds of significance, this information is provided for informational purposes only.

Intersection Operation

Existing plus Project Conditions

Upon the addition of project-related traffic to the Existing volumes, the study intersections are expected to operate at the same Levels of Service as without the project. These results are summarized in Table 13. Existing plus Project traffic volumes are shown in Figure 6.



Traffic Impact Study for the Blake-Griggs Multi-Family Residential Facility EIR
Figure 6 – Existing plus Project Traffic Volumes

Table 13 – Existing and Existing plus Project Peak Hour Intersection Levels of Service

Study Intersection Approach	Standard Delay (LOS)	Existing Conditions Delay (LOS)		Existing plus Project Conditions Delay (LOS)	
		AM Peak	PM Peak	AM Peak	PM Peak
1. Contra Costa Blvd/Woodsworth Ln	<80.0 (E)	47.5 (D)	33.1 (C)	47.9 (D)	33.2 (C)
2. Gregory Ln/Elinora Dr <i>Southbound (Elinora Dr) Approach</i>	<35.0 ¹ (D)	7.2 (A) 54.9 (F)	2.1 (A) 23.5 (C)	7.2 (A) 56.0 (F)	2.2 (A) 23.9 (C)
3. Gregory Ln/Cleaveland Rd	<55.0 (D)	37.7 (D)	33.2 (C)	37.8 (D)	33.2 (C)
4. Gregory Ln/Trelany Rd <i>Northbound (Trelany Rd) Approach</i> <i>Southbound (Mozden Ln) Approach</i>	<35.0 ¹ (D)	0.6 (A) 12.9 (B) 10.6 (B)	1.1 (A) 10.9 (B) 10.4 (B)	0.6 (A) 13.0 (B) 10.6 (B)	1.1 (A) 11.3 (B) 10.4 (B)
5. Contra Costa Blvd/Gregory Ln	<80.0 (E)	32.9 (C)	30.5 (C)	32.9 (C)	30.6 (C)
6. Cleaveland Rd/Trelany Rd <i>Westbound (Trelany Rd) Approach</i>	<35.0 ¹ (D)	0.6 (A) 12.9 (B)	1.2 (A) 12.2 (B)	0.6 (A) 13.1 (B)	1.2 (A) 12.3 (B)
7. Contra Costa Blvd/Crescent Dr	<80.0 (E)	29.1 (C)	26.4 (C)	29.1 (C)	26.2 (C)
8. Cleaveland Rd/Crescent Plz	<55.0 (D)	6.2 (A)	4.6 (A)	6.1 (A)	4.6 (A)
9. Crescent Dr/Crescent Plz	<55.0 (D)	7.5 (A)	7.8 (A)	7.7 (A)	7.9 (A)
10. Contra Costa Blvd/Crescent Plz-Monument Blvd	- (F)	24.2 (C)	34.3 (C)	24.5 (C)	34.4 (C)
11. Monument Blvd/I-680 Ramps	<55.0 (D)	38.4 (D)	34.5 (C)	38.7 (D)	34.7 (C)
12. Boyd Rd/Patterson Blvd	<35.0 ¹ (D)	12.2 (B)	19.1 (C)	12.3 (B)	19.4 (C)
13. Boyd Rd/Cleaveland Rd	<55.0 (D)	71.9 (E)	31.0 (C)	72.4 (E)	31.4 (C)
14. Boyd Rd/Crescent Dr <i>Northbound (Driveway) Approach</i> <i>Southbound (Crescent Dr) Approach</i>	<35.0 ¹ (D)	2.1 (A) 12.8 (B) 12.9 (B)	2.0 (A) 12.0 (B) 15.0 (C)	2.2 (A) 12.8 (B) 13.1 (B)	2.0 (A) 12.2 (B) 15.6 (C)
15. Contra Costa Blvd/Boyd Rd	<80.0 (E)	38.7 (D)	43.6 (D)	39.0 (D)	43.9 (D)
16. Contra Costa Blvd/Astrid Dr	<80.0 (E)	6.6 (A)	6.1 (A)	6.7 (A)	6.2 (A)

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; Results for minor approaches to two-way stop-controlled intersections are indicated in *italics*; **Bold** text = deficient operation

¹ The delay thresholds for each Level of Service are lower for intersections with stop controls than for signalized intersections

With the addition of project traffic to Existing volumes, the average delay at each intersection would increase by 1.1 seconds or less, with most intersections undergoing an increase in delay of less than 0.5 seconds. As the two intersections of Gregory Lane/Elinora Drive and Boyd Road/Cleaveland Road that are already operating deficiently would have an increase in delay of less than 5.0 seconds, this would constitute a less-than-significant impact.

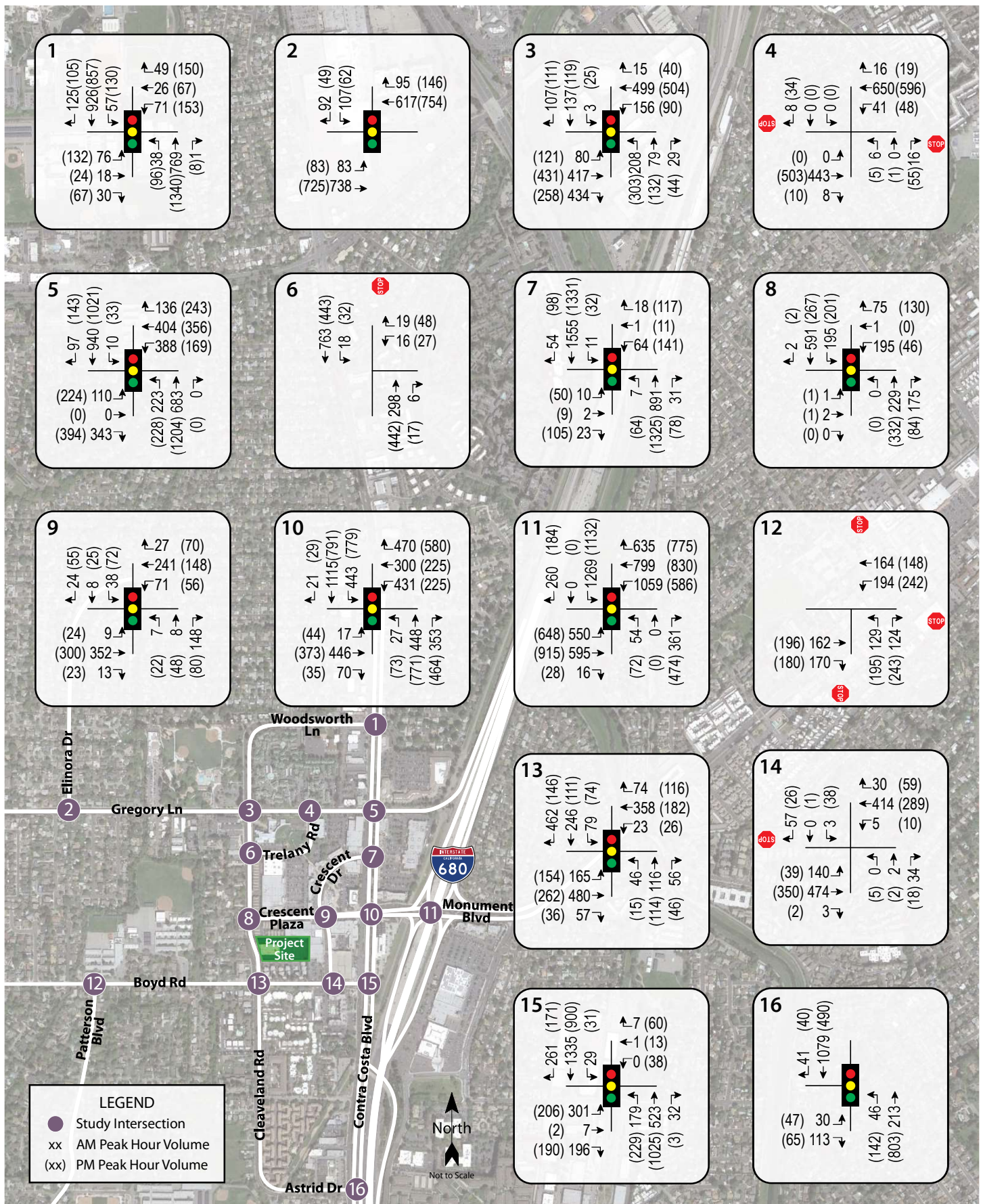
It should be noted that with the addition of project-related traffic volumes, average delay at the intersection of Cleaveland Road/Crescent Plaza would be expected to decrease during the a.m. peak hour, as would the average delay at Contra Costa Boulevard/Crescent Drive during the p.m. peak hour. While this is counter-intuitive, this condition occurs when a project would add trips to movements that are currently underutilized or have delays that are below the intersection average, resulting in a better balance between approaches and lower overall

average delay. The project would add traffic predominantly to the northbound movements at Cleaveland Road/Crescent Plaza and the north-south through movements at Contra Costa Boulevard/Crescent Drive. These movements have average delays that are lower than the average for the intersections on the whole, resulting in a slight reduction in the overall average delay for each intersection. The conclusion could incorrectly be drawn that the project would improve operations based on this data alone; however, it is more appropriate to conclude that the project trips are expected to make use of excess capacity, so drivers would experience little, if any, change in conditions as a result of the project.

Finding – The study intersections are expected to continue operating at the same Levels of Service upon the addition of project-generated traffic. The intersections that are operating deficiently without project traffic would have an increase in delay of 1.1 seconds or less with the addition of project-generated traffic, which is below the threshold of significance of 5.0 seconds of added delay, resulting in a less-than-significant impact on operations.

Future plus Project Conditions

Upon the addition of project-generated traffic to the anticipated Future volumes, and with the planned signalization of Gregory Lane/Elinora Drive, the study intersections are expected to operate acceptably other than Boyd Road/Cleaveland Road during the a.m. peak hour. The Future plus Project operating conditions are summarized in Table 14, and the Future plus Project traffic volumes are shown in Figure 7.



Traffic Impact Study for the Blake-Griggs Multi-Family Residential Facility EIR
Figure 7 – Future plus Project Traffic Volumes (2040)

Table 14 – Future and Future plus Project Peak Hour Intersection Levels of Service

Study Intersection Approach	Standard Delay (LOS)	Future Conditions Delay (LOS)		Future plus Project Conditions Delay (LOS)	
		AM Peak	PM Peak	AM Peak	PM Peak
1. Contra Costa Blvd/Woodsworth Ln	<80.0 (E)	70.9 (E)	37.0 (D)	71.7 (E)	37.2 (D)
2. Gregory Ln/Elinora Dr	<55.0 (D)	6.9 (A)	6.0 (A)	6.9 (A)	6.0 (A)
3. Gregory Ln/Cleaveland Rd	<55.0 (D)	42.2 (D)	34.2 (C)	42.2 (D)	34.2 (C)
4. Gregory Ln/Trelany Rd	<35.0 ¹ (D)	0.6 (A)	1.2 (A)	0.6 (A)	1.2 (A)
Northbound (Trelany Rd) Approach		14.5 (B)	12.0 (B)	14.5 (B)	12.1 (B)
Southbound (Mozden Ln) Approach		11.1 (B)	10.8 (B)	11.1 (B)	10.8 (B)
5. Contra Costa Blvd/Gregory Ln	<80.0 (E)	35.2 (D)	35.5 (D)	35.3 (D)	35.9 (D)
6. Cleaveland Rd/Trelany Rd	<35.0 ¹ (D)	0.6 (A)	1.3 (A)	0.6 (A)	1.3 (A)
Westbound (Trelany Rd) Approach		14.2 (B)	13.2 (B)	14.4 (B)	13.2 (B)
7. Contra Costa Blvd/Crescent Dr	<80.0 (E)	36.0 (D)	23.1 (C)	36.7 (D)	23.0 (C)
8. Cleaveland Rd/Crescent Plz	<55.0 (D)	6.5 (A)	4.8 (A)	6.6 (A)	4.8 (A)
9. Crescent Dr/Crescent Plz	<55.0 (D)	7.7 (A)	8.0 (A)	7.8 (A)	8.1 (A)
10. Contra Costa Blvd/Crescent Plz-Monument Blvd	- (F)	24.8 (C)	36.1 (C)	25.4 (C)	36.1 (C)
11. Monument Blvd/I-680 Ramps	<55.0 (D)	49.5 (D)	36.4 (C)	50.3 (D)	36.7 (C)
12. Boyd Rd/Patterson Blvd	<35.0 ¹ (D)	14.1 (B)	30.7 (D)	14.2 (B)	31.4 (D)
13. Boyd Rd/Cleaveland Rd	<55.0 (D)	97.1 (F)	32.2 (C)	97.5 (F)	32.5 (C)
14. Boyd Rd/Crescent Dr	<35.0 ¹ (D)	2.2 (A)	2.2 (A)	2.3 (A)	2.2 (A)
Northbound (Driveway) Approach		13.8 (B)	12.9 (B)	13.9 (B)	13.2 (B)
Southbound (Crescent Dr) Approach		14.1 (B)	17.0 (C)	14.3 (B)	17.8 (C)
15. Contra Costa Blvd/Boyd Rd	<80.0 (E)	40.7 (D)	44.8 (D)	40.9 (D)	45.2 (D)
16. Contra Costa Blvd/Astrid Dr	<80.0 (E)	7.0 (A)	6.3 (A)	7.0 (A)	6.3 (A)

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; Results for minor approaches to two-way stop-controlled intersections are indicated in *italics*; **Bold** text = deficient operation

¹ The delay thresholds for each Level of Service are lower for intersections with stop controls than for signalized intersections

Finding – The study intersections would continue operating at the same Levels of Service with the addition of project traffic as without it, with all locations subjected to an increase in delay of 0.8 seconds per vehicle or less. The one intersection operating deficiently without project traffic added, Boyd Road/Cleaveland Road during the a.m. peak hour, would be expected to see a slight increase in delay of 0.4 seconds per vehicle, resulting in a less-than-significant impact as this is less than the threshold of 5.0 seconds of added delay.

Freeway Operation

Existing plus Project Conditions

Under Existing plus Project volumes, the study freeway facilities are expected to continue to operate acceptably. These results are summarized in Table 15.

Table 15 – Existing and Existing plus Project Peak Hour Freeway Levels of Service

Study Segment Facility	LOS Standard	Existing Conditions				Existing plus Project			
		AM Peak		PM Peak		AM Peak		PM Peak	
		Density	LOS	Density	LOS	Density	LOS	Density	LOS
I-680 North									
I-680 to the South of Oak Park Blvd	F	15.9	B	18.6	C	15.9	B	18.6	C
Off-Ramp to Contra Costa Blvd	F	21.7	C	28.0	C	21.7	C	28.1	C
Off-Ramp to Monument Blvd	F	16.2	B	20.7	C	16.2	B	20.7	C
On-Ramp from Monument Blvd	F	18.1	C	23.2	C	18.1	C	23.3	C
I-680 to the North of Monument Blvd	F	18.5	C	23.7	C	18.6	C	23.7	C
I-680 South									
I-680 to the North of Willow Pass Rd	F	13.2	B	14.1	B	13.2	B	14.2	B
Off-Ramp to Monument Blvd	F	16.2	B	16.4	B	16.2	B	16.5	B
On-Ramp from Monument Blvd	F	17.7	B	17.7	B	17.7	B	17.7	B
On-Ramp from Contra Costa Blvd	F	16.4	B	16.3	B	16.4	B	16.3	B
I-680 to the South of Oak Park Blvd	F	21.6	C	19.7	C	21.6	C	19.8	C

Notes: Density is measured in passenger cars per mile per lane; LOS = Level of Service

Finding – The study freeway facilities are expected to continue operating acceptably at the same Levels of Service upon the addition of project-generated traffic as without it.

Future plus Project Conditions

With project-generated traffic added to the anticipated Future volumes, the study freeway facilities are expected to continue to operate acceptably. The Future plus Project operating conditions are summarized in Table 16.

Table 16 – Future and Future plus Project Peak Hour Freeway Levels of Service

Study Segment Facility	LOS Standard	Future Conditions				Future plus Project			
		AM Peak		PM Peak		AM Peak		PM Peak	
		Density	LOS	Density	LOS	Density	LOS	Density	LOS
I-680 North									
I-680 to the South of Oak Park Blvd	F	18.2	C	21.7	C	18.2	C	21.7	C
Off-Ramp to Contra Costa Blvd	F	25.6	C	33.4	D	25.6	C	33.5	D
Off-Ramp to Monument Blvd	F	18.8	C	24.6	C	18.8	C	24.6	C
On-Ramp from Monument Blvd	F	21.1	C	28.0	D	21.1	C	28.1	D
I-680 to the North of Monument Blvd	F	21.6	C	28.5	D	21.6	C	28.5	D
I-680 South									
I-680 to the North of Willow Pass Rd	F	15.1	B	16.1	B	15.1	B	16.1	B
Off-Ramp to Monument Blvd	F	19.2	B	19.4	B	19.2	B	19.4	B
On-Ramp from Monument Blvd	F	20.6	C	20.7	C	20.7	C	20.7	C
On-Ramp from Contra Costa Blvd	F	19.0	C	18.8	C	19.0	C	18.8	C
I-680 to the South of Oak Park Blvd	F	25.5	C	23.1	C	25.5	C	23.1	C

Notes: Density is measured in passenger cars per mile per lane; LOS = Level of Service

Finding – All study freeway segments would continue operating at acceptable Levels of Service with the project added to anticipated future volumes.

Arterial Speeds

The SimTraffic application of the Synchro software package was used to assess the average speeds along Contra Costa Boulevard, which has a minimum standard operational speed of 15 mph per the CCTA *Central County Action Plan*. The average speeds for northbound and southbound Contra Costa Boulevard for the various scenarios are presented in Table 17. Copies of the SimTraffic calculations from which these arterial speeds were obtained are provided in Appendix D.

Table 17 – Arterial Speeds

Study Segment Direction	Average Speed (mph)							
	AM Peak Hour				PM Peak Hour			
	E	E+P	F	F+P	E	E+P	F	F+P
Contra Costa Blvd								
Northbound	18	18	17	18	14	14	11	11
Southbound	17	17	15	15	18	19	16	17

Notes: Average speed determined from ten SimTraffic runs; all speeds are measured in miles per hour; E = existing conditions; E+P = existing plus project conditions; F = future conditions; F+P = future plus project conditions; **Bold** text = speed is below standard

As shown, the arterial speeds along Contra Costa Boulevard would not decrease with the addition of project traffic. In the northbound direction during the p.m. peak hour where there are deficient operations under Existing and Future conditions, the addition of project traffic would result in no impact to arterial speeds.

Finding – The addition of project-generated traffic to Contra Costa Boulevard would not result in speeds falling below the minimum standard of 15 mph nor would it cause already-deficient conditions to deteriorate further. The project's impact would therefore be less-than-significant.

Queuing

The estimated queue lengths were determined for each project intersection for turning movements with turn lanes, as well as for the longest queue length on each off-ramp. The turn lane queues were compared to existing turn lane lengths to determine if the project would cause the back of queue to extend from within the turn pocket out of the pocket and into the through lane. The ramp queue lengths were compared to the distance from the stop bar to the gore point to determine if project traffic would potentially cause the back of queue to extend onto the freeway mainline.

The projected maximum queue in the turn pockets and off-ramps at the study intersections were determined using the SimTraffic application of Synchro and averaging the 95th-Percentile queue for each of ten runs. Summarized in Table 18 are the predicted queue lengths for approaches to study intersections with turn pockets or from freeway off-ramps. Copies of the SimTraffic projections are contained in Appendix E.

Table 18 – Maximum Queues Lengths and Available Storage

Study Intersection Approach	Available Storage (ft.)	Maximum Queues (ft.)							
		AM Peak Hour				PM Peak Hour			
		E	E+P	F	F+P	E	E+P	F	F+P
1. Contra Costa Blvd/Woodsworth Ln									
Eastbound Through-Right	215	73	70	77	65	99	92	101	102
Northbound Left-Turn	140	67	66	67	65	188	174	200	198
Southbound Left-Turn	140	102	117	139	142	203	194	212	209
Southbound Right-Turn	140	91	87	119	119	138	136	173	173
3. Gregory Ln/Cleaveland Rd									
Eastbound Left-Turn	180	93	92	117	102	121	134	141	154
Westbound Left-Turn	215	154	154	163	166	108	118	124	120
Northbound Left-Turn	190	117	114	119	121	156	166	184	176
Southbound Right-Turn	225	65	71	77	76	74	75	78	93
4. Gregory Ln/Trelany Rd									
Westbound Left-Turn	125	32	32	36	36	38	36	39	37
5. Contra Costa Blvd/Gregory Ln									
Eastbound Left-Turn	200	66	77	85	89	139	131	143	144
Westbound Left-Turn	200	278	276	287	292	223	225	236	238
Westbound Off-Ramp ¹	1190	447	463	725	713	398	388	556	617
Westbound Right-Turn	425	155	173	316	344	194	223	314	348
Northbound Left-Turn	165	118	126	145	141	171	175	182	178
Southbound Left-Turn	170	54	64	71	85	112	103	167	132
6. Cleaveland Rd/Trelany Rd									
Southbound Left-Turn	65	21	17	21	20	31	33	35	36
7. Contra Costa Blvd/Crescent Dr									
Eastbound Right-Turn	105	38	39	38	40	91	89	101	97
Northbound Left-Turn	105	25	23	34	22	94	89	105	102
Southbound Left-Turn	160	50	34	49	40	118	92	134	120
8. Cleaveland Rd/Crescent Plz									
Westbound Right-Turn	70	86	89	90	91	80	80	82	83
9. Crescent Dr/Crescent Plz									
Eastbound Left-Turn	65	22	24	25	22	37	40	44	42
Westbound Left-Turn	320	64	69	66	72	68	64	68	61
10. Contra Costa Blvd/Crescent Plz-Monument Blvd									
Eastbound Left-Turn	145	56	61	82	99	115	116	128	120
Westbound Left-Turn	270	182	189	188	190	135	138	116	126

Table 18 – Maximum Queues Lengths and Available Storage

Study Intersection Approach	Available Storage (ft.)	Maximum Queues (ft.)							
		AM Peak Hour				PM Peak Hour			
		E	E+P	F	F+P	E	E+P	F	F+P
Westbound Right-Turn	220	73	88	83	65	214	217	128	127
Northbound Left-Turn	190	48	59	69	69	164	163	185	205
Southbound Left-Turn	330	199	195	259	272	302	291	313	313
11. Monument Blvd/I-680 Ramps									
Eastbound Left-Turn	250	262	259	269	268	213	211	228	223
Westbound Left-Turn	435	454	455	455	454	313	328	336	326
Westbound Right-Turn	335	70	N/A	70	79	344	378	433	490
Northbound Left-Turn	460	18	14	16	16	12	18	10	13
Northbound Off-Ramp ¹	1375	116	150	197	218	243	216	392	388
Northbound Right-Turn	830	22	58	72	85	101	48	334	309
Southbound Left-Turn	480	296	353	341	342	307	317	570	573
Southbound Off-Ramp ¹	1465	386	389	448	438	472	460	670	654
Southbound Right-Turn	125	20	16	27	18	40	N/A	N/A	N/A
12. Boyd Rd/Patterson Blvd									
Westbound Left-Turn	125	90	97	103	103	109	111	119	119
13. Boyd Rd/Cleveland Rd									
Eastbound Left-Turn	50	141	147	149	151	103	107	120	122
Westbound Left-Turn	125	92	83	88	93	75	84	88	75
Westbound Right-Turn	165	149	160	172	178	106	133	121	143
Northbound Left-Turn	60	74	75	76	77	52	51	51	52
Northbound Through-Right	105	99	102	111	108	91	94	96	99
Southbound Left-Turn	185	147	133	173	167	97	99	107	117
14. Boyd Rd/Crescent Dr									
Eastbound Left-Turn	145	73	71	91	93	33	39	40	47
Westbound Left-Turn	125	13	14	14	19	18	18	16	17
15. Contra Costa Blvd/Boyd Rd									
Eastbound Left-Turn	125	140	152	164	167	111	119	127	136
Eastbound Right-Turn	70	122	124	124	122	116	119	119	120
Northbound Left-Turn	610	183	191	204	218	243	248	270	317
Northbound Through-Right	185	156	151	175	180	214	223	230	235
Southbound Left-Turn	230	99	99	119	115	60	69	84	81
Southbound Right-Turn	340	137	124	143	157	64	74	73	85

Table 18 – Maximum Queues Lengths and Available Storage

Study Intersection Approach	Available Storage (ft.)	Maximum Queues (ft.)							
		AM Peak Hour				PM Peak Hour			
		E	E+P	F	F+P	E	E+P	F	F+P
16. Contra Costa Blvd/Astrid Dr									
Eastbound Left-Turn	100	49	47	50	51	58	56	63	60
Northbound Left-Turn	135	50	51	56	53	78	79	86	88

Notes: Maximum Queue based on the average of the 95th Percentile value from ten SimTraffic runs; all distances are measured in feet; N/A = No length returned due to too few vehicles in simulations; E = existing conditions; E+P = existing plus project conditions; F = future conditions; F+P = future plus project conditions; *Italic* text = queue length exceeds available storage; **Bold** text = queue length is within available storage without project and exceeds available storage with project, or queue length exceeds storage without project and increases by more than 25 feet with project

¹ The off-ramp distance indicated is the longest for that off-ramp.

Finding – For several locations assessed, the queue would exceed the provided storage without the project and while the added project traffic would increase the queue length, the back of queue would remain visible to oncoming traffic, resulting in a less-than-significant impact.

In many locations, the queue is projected to decrease by a few feet with the addition of project traffic. This is due to the nature of the SimTraffic simulation software and not representative of expectations that the added project traffic would reduce queuing.

The addition of project traffic to future volumes would increase the northbound left-turn queue at Contra Costa Boulevard/Crescent Plaza-Monument Boulevard beyond the limits of the existing 190-foot turn lane during the p.m. peak hour. The future queue without project traffic is estimated to be 185 feet, whereas the project traffic would increase this to 205 feet. This would be a significant impact of the proposed project.

Recommendation – It is recommended that the northbound left-turn lane at Contra Costa Boulevard/Crescent Plaza-Monument Boulevard be extended by 35 feet to accommodate up to 225 feet of stacking, or nine vehicles, to mitigate this impact. This could be accomplished by reducing the median upstream of the northbound left-turn lane to make way for additional storage capacity. The northbound left-turn lane could be extended without conflicting with the southbound left-turn lane at Contra Costa Boulevard/Boyd Road.

Finding – The westbound right-turn queue at Monument Boulevard/I-680 Ramps exceeds the right turn pocket during the p.m. peak hour under Existing conditions and is projected to do so under Future conditions without project traffic. The addition of project traffic is projected to increase the queue lengths under these conditions by 34 feet (Existing plus Project) and 57 feet (Future plus Project). Because this deficiency would exist without the proposed project and the project would result in a queue length increase of greater than 25 feet, this would be a significant impact of the proposed project.

Recommendation – To improve this existing deficiency, it is recommended that either one or both of the westbound right-turn lanes be extended to accommodate an additional combined 75 feet, or three vehicles, of queue length. This could be accommodated by widening the outside of the road (to the north), narrowing the existing westbound through lanes, and reducing the width of the median.

Alternative Modes

Pedestrian Facilities

Given the location of the site within Downtown Pleasant Hill and its proximity to retail, restaurants, and civic facilities, it is reasonable to assume that some project residents would want to walk, bicycle, and/or use transit between the project site and surrounding environs. Sidewalks exist along the project frontage on Cleaveland Road.

Finding – Pedestrian facilities serving the project site are adequate.

Bicycle Facilities

It is noted that the section of Cleaveland Road between Gregory Lane and Boyd Road is currently striped as a Class III bicycle route with sharrows, which is allowed given the posted speed limit of 30 mph. While this meets current roadway design standards, the City has identified this section of Cleaveland Road to include Class II bicycle lanes in the future per the *Pleasant Hill Bicycle and Pedestrian Master Plan*.

Existing bicycle facilities, including the sharrows on Cleaveland Road, together with planned improvements and shared use of minor streets, would provide adequate access for bicyclists associated with the proposed project.

Bicycle Storage

The project's Notice of Preparation specifies that there would be 60 bicycle parking spaces provided in an enclosed bicycle storage area in the parking garage. The Pleasant Hill *Municipal Code Chapter 18.55 Off-Street Parking and Loading Regulations* does not specify bicycle parking requirements for multifamily residential land uses. However, the Contra Costa County *Municipal Code Chapter 82-16.412 Bicycle Parking* prescribes long-term spaces at a rate of 15-percent of the number of bedrooms, and short-term spaces at a rate of five percent of the number of bedrooms. Per the project site plan, 277 bedrooms are proposed to be provided among the 210 dwelling units. This would result in 34 required long-term bicycle parking spaces and 11 required short-term bicycle parking spaces, for 45 total bicycle parking spaces. These requirements are provided for informational purposes only, as the proposed project is within the jurisdiction of the City and not the County.

Finding – Bicycle facilities serving the project site are adequate. While the City of Pleasant Hill does not require bicycle parking for multifamily residential land uses, the County of Contra Costa would require 45 bicycle parking spaces, which is less than the 60 proposed to be provided.

Transit

Existing transit routes are adequate to accommodate project-generated transit trips. Existing stops are within an acceptable walking distance of the site, with stops for County Connection Routes 9, 16, 18, 314, and 316 located 0.06 miles (300 feet) or less from a project building. Sidewalks and crosswalks would provide pedestrian connections between the site and nearby transit stops.

Finding – Transit facilities serving the project site are adequate.

Access and Circulation

Site Access

Site access would be provided by a driveway on Cleaveland Road at the northwest corner of the project site, approximately where the existing northern driveway is located for the office building. This driveway would provide access into the project site, including access to the parking garage, guest spaces, loading zones, and trash collection. Due to the landscaped median on Cleaveland Road, use of this driveway would be restricted to right-in/right-out operation.

Sight Distance

Sight distances along Cleaveland Road at the proposed project driveway location was evaluated based on sight distance criteria and methodology contained in the *Highway Design Manual* published by Caltrans. The recommended sight distance for minor street approaches that are either a private road or a driveway is based on stopping sight distance and the approach travel speed.

The speed limit on Cleaveland Road is posted at 30 mph, resulting in a recommended minimum stopping sight distance of 200 feet. Due to the relatively level terrain of the area combined with the straight roadway geometry, over 200 feet of sight distance was observed at the project driveway location, exceeding the recommended minimum and providing sight distance adequate for approach speeds of 30 mph.

Access Analysis

Right-Turn Lane Warrants

Site access for inbound right-turning traffic was assessed, although this driveway would not satisfy criteria that are considered for right-turn lanes or tapers, such as volumes or safety, based on a review of local conditions. Due to the low speed, low volume, and downtown nature of Cleaveland Road, designated right-turn lanes or tapers would not be warranted the project driveway and are therefore not recommended.

Access and Circulation Summary

Findings – Sight distances at the proposed driveway location would be sufficient for the posted speed limit of 25 mph on Cleaveland Road. A right-turn lane or tapers would not be warranted at the project driveway given local conditions. Left turns into the Boyd Road driveway would present a potential safety impact for eastbound traffic on Boyd Road.

Conclusions and Recommendations

Conclusions

- With 210 apartment units, the project is anticipated to generate an average of 1,142 daily trips, including 76 during the a.m. peak hour and 92 during the p.m. peak hour.
- Of the 16 study intersections, 14 are operating acceptably under Existing conditions, while the Gregory Lane/Elinora Drive and Boyd Road/Cleaveland Road intersections currently operate unacceptably. The addition of project-generated traffic would increase the delay at these two intersections by less than five seconds, resulting in a less than significant impact. Project traffic added to other intersections would not degrade operations to an unacceptable level, also resulting in a less than significant impact.
- Under Future conditions, the existing deficient delay at Gregory Lane/Elinora Drive would be improved to an acceptable level based on the programmed installation of a traffic signal at this location, replacing the current stop control on Elinora Drive and free-flow conditions on Gregory Lane. The Boyd Road/Cleaveland Road intersection would continue to operate unacceptably. The addition of project traffic would increase the delay at the Boyd Road/Cleaveland Road intersection by less than five seconds, resulting in a less than significant impact. The operation of the other 15 study intersections would remain acceptable under Future plus Project conditions.
- Under all study conditions the analyzed freeway segments would operate acceptably at LOS D or better, with or without the addition of project-generated traffic.
- Less-than-significant impacts are projected along Contra Costa Boulevard as the addition of project-generated traffic would not decrease the arterial speed below the threshold of 15 mph. Under northbound p.m. peak hour volumes when the roadway operates at less than 15 mph for both Existing and Future volumes, the addition of project-generated traffic would be expected to result in no impact to arterial speed along the corridor.
- With respect to queue lengths at study intersections, it was determined that additional turn lane capacity would be required for the northbound left-turn lane at the Contra Costa Boulevard/Crescent Plaza-Monument Boulevard intersection to mitigate a queuing impact. Also, the project would increase the westbound right-turn queue at Monument Boulevard/I-680 Ramps during the p.m. peak hour by 34 feet under Existing conditions and 57 feet under Future conditions, representing a significant impact as this is an increase in queue length of greater than 25 feet as compared to conditions without project volumes.
- There are adequate existing pedestrian, bicycle, and transit facilities to serve the proposed project. The existing bicycle facility (Class III) does meet roadway design standards, and the City has identified the section of Cleaveland Road between Gregory Lane and Boyd Road for future Class II bicycle lanes.
- The sight distance at the proposed project driveway location would be adequate. Given the Downtown location of the project and its low speed and low-volume fronting roadway, right-turn lanes are not warranted, nor are right-turn tapers.

Recommendations

- To mitigate a significant project queueing impact, it is recommended that the northbound left-turn lane at Contra Costa Boulevard/Crescent Plaza-Monument Boulevard be extended to accommodate up to 225 feet

of queue length, or 35 feet more than exists. Reducing the median upstream of the northbound left-turn lane would enable extension of the turn lane, which could be extended without conflicting with the southbound left-turn lane at Contra Costa Boulevard/Boyd Road. With this mitigation measure, the impact would be reduced to a less than significant level.

- To address an existing queue deficiency, it is recommended that one or both of the westbound right-turn lanes at Monument Boulevard/I-680 Ramps be extended by a combined 75 feet to accommodate the Future and Future plus Project projected queue lengths. This could be accommodated by widening the outside of the road (to the north), narrowing the existing westbound through lanes, and reducing the width of the median.

Study Participants and References

Study Participants

Principal in Charge	Mark E. Spencer, TE
Associate Engineer	Kevin Carstens, PE
Assistant Engineer	Allison Woodworth, EIT
Assistant Planner	Julia Walker
Graphics	Katia Wolfe
Editing/Formatting	Hannah Yung-Boxdell
Quality Control	Dalene J. Whitlock, PE, PTOE

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Appendix A

Collision Rate Calculations



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Intersection Collision Rate Calculations

Blake-Griggs Multi-Family Residential Facility EIR

Intersection # 1: Contra Costa Boulevard & Woodsworth Lane

Date of Count: Thursday, March 14, 2019

Number of Collisions: 32

Number of Injuries: 13

Number of Fatalities: 0

ADT: 27600

Start Date: October 1, 2013

End Date: September 30, 2018

Number of Years: 5

Intersection Type: Four-Legged

Control Type: Signals

Area: Urban

$$\text{collision rate} = \frac{\text{Number of Collisions} \times 1 \text{ Million}}{\text{ADT} \times 365 \text{ Days per Year} \times \text{Number of Years}}$$

$$\text{collision rate} = \frac{32}{27,600} \times \frac{1,000,000}{365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	0.64 c/mve	0.0%	40.6%
Statewide Average*	0.27 c/mve	0.4%	41.9%

ADT = average daily total vehicles entering intersection

c/mve = collisions per million vehicles entering intersection

* 2013 Collision Data on California State Highways, Caltrans

Intersection # 2: Gregory Lane & Elinora Drive

Date of Count: Tuesday, April 9, 2019

Number of Collisions: 6

Number of Injuries: 4

Number of Fatalities: 0

ADT: 15900

Start Date: October 1, 2013

End Date: September 30, 2018

Number of Years: 5

Intersection Type: Tee

Control Type: Stop & Yield Controls

Area: Urban

$$\text{collision rate} = \frac{\text{Number of Collisions} \times 1 \text{ Million}}{\text{ADT} \times 365 \text{ Days per Year} \times \text{Number of Years}}$$

$$\text{collision rate} = \frac{6}{15,900} \times \frac{1,000,000}{365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	0.21 c/mve	0.0%	66.7%
Statewide Average*	0.18 c/mve	0.7%	36.4%

ADT = average daily total vehicles entering intersection

c/mve = collisions per million vehicles entering intersection

* 2013 Collision Data on California State Highways, Caltrans

Intersection Collision Rate Calculations

Blake-Griggs Multi-Family Residential Facility EIR

Intersection # 3: Gregory Lane & Cleaveland Road

Date of Count: Thursday, March 14, 2019

Number of Collisions: 17

Number of Injuries: 9

Number of Fatalities: 0

ADT: 19000

Start Date: October 1, 2013

End Date: September 30, 2018

Number of Years: 5

Intersection Type: Four-Legged

Control Type: Signals

Area: Urban

$$\text{collision rate} = \frac{\text{Number of Collisions} \times 1 \text{ Million}}{\text{ADT} \times 365 \text{ Days per Year} \times \text{Number of Years}}$$

$$\text{collision rate} = \frac{17}{19,000} \times \frac{1,000,000}{365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	0.49 c/mve	0.0%	52.9%
Statewide Average*	0.27 c/mve	0.4%	41.9%

ADT = average daily total vehicles entering intersection
c/mve = collisions per million vehicles entering intersection
* 2013 Collision Data on California State Highways, Caltrans

Intersection # 4: Gregory Lane & Trelany Road

Date of Count: Thursday, March 14, 2019

Number of Collisions: 1

Number of Injuries: 0

Number of Fatalities: 0

ADT: 11100

Start Date: October 1, 2013

End Date: September 30, 2018

Number of Years: 5

Intersection Type: Tee

Control Type: Stop & Yield Controls

Area: Urban

$$\text{collision rate} = \frac{\text{Number of Collisions} \times 1 \text{ Million}}{\text{ADT} \times 365 \text{ Days per Year} \times \text{Number of Years}}$$

$$\text{collision rate} = \frac{1}{11,100} \times \frac{1,000,000}{365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	0.05 c/mve	0.0%	0.0%
Statewide Average*	0.18 c/mve	0.7%	36.4%

ADT = average daily total vehicles entering intersection
c/mve = collisions per million vehicles entering intersection
* 2013 Collision Data on California State Highways, Caltrans

Intersection Collision Rate Calculations

Blake-Griggs Multi-Family Residential Facility EIR

Intersection # 5: Contra Costa Boulevard & Gregory Lane
Date of Count: Thursday, March 14, 2019

Number of Collisions: 40
Number of Injuries: 19
Number of Fatalities: 0
ADT: 35100
Start Date: October 1, 2013
End Date: September 30, 2018
Number of Years: 5

Intersection Type: Four-Legged
Control Type: Signals
Area: Urban

$$\text{collision rate} = \frac{\text{Number of Collisions} \times 1 \text{ Million}}{\text{ADT} \times 365 \text{ Days per Year} \times \text{Number of Years}}$$

$$\text{collision rate} = \frac{40}{35,100} \times \frac{1,000,000}{365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	0.62 c/mve	0.0%	47.5%
Statewide Average*	0.27 c/mve	0.4%	41.9%

ADT = average daily total vehicles entering intersection
c/mve = collisions per million vehicles entering intersection
* 2013 Collision Data on California State Highways, Caltrans

Intersection # 6: Cleaveland Road & Trelany Road
Date of Count: Thursday, March 14, 2019

Number of Collisions: 2
Number of Injuries: 1
Number of Fatalities: 0
ADT: 8800
Start Date: October 1, 2013
End Date: September 30, 2018
Number of Years: 5

Intersection Type: Tee
Control Type: Stop & Yield Controls
Area: Urban

$$\text{collision rate} = \frac{\text{Number of Collisions} \times 1 \text{ Million}}{\text{ADT} \times 365 \text{ Days per Year} \times \text{Number of Years}}$$

$$\text{collision rate} = \frac{2}{8,800} \times \frac{1,000,000}{365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	0.12 c/mve	0.0%	50.0%
Statewide Average*	0.18 c/mve	0.7%	36.4%

ADT = average daily total vehicles entering intersection
c/mve = collisions per million vehicles entering intersection
* 2013 Collision Data on California State Highways, Caltrans

Intersection Collision Rate Calculations

Blake-Griggs Multi-Family Residential Facility EIR

Intersection # 7: Contra Costa Boulevard & Crescent Drive

Date of Count: Thursday, March 14, 2019

Number of Collisions: 30

Number of Injuries: 12

Number of Fatalities: 0

ADT: 29400

Start Date: October 1, 2013

End Date: September 30, 2018

Number of Years: 5

Intersection Type: Four-Legged

Control Type: Signals

Area: Urban

$$\text{collision rate} = \frac{\text{Number of Collisions} \times 1 \text{ Million}}{\text{ADT} \times 365 \text{ Days per Year} \times \text{Number of Years}}$$

$$\text{collision rate} = \frac{30}{29,400} \times \frac{1,000,000}{365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	0.56 c/mve	0.0%	40.0%
Statewide Average*	0.27 c/mve	0.4%	41.9%

ADT = average daily total vehicles entering intersection

c/mve = collisions per million vehicles entering intersection

* 2013 Collision Data on California State Highways, Caltrans

Intersection # 8: Cleaveland Road & Crescent Plaza

Date of Count: Thursday, March 14, 2019

Number of Collisions: 10

Number of Injuries: 6

Number of Fatalities: 0

ADT: 9000

Start Date: October 1, 2013

End Date: September 30, 2018

Number of Years: 5

Intersection Type: Four-Legged

Control Type: Signals

Area: Urban

$$\text{collision rate} = \frac{\text{Number of Collisions} \times 1 \text{ Million}}{\text{ADT} \times 365 \text{ Days per Year} \times \text{Number of Years}}$$

$$\text{collision rate} = \frac{10}{9,000} \times \frac{1,000,000}{365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	0.61 c/mve	0.0%	60.0%
Statewide Average*	0.27 c/mve	0.4%	41.9%

ADT = average daily total vehicles entering intersection

c/mve = collisions per million vehicles entering intersection

* 2013 Collision Data on California State Highways, Caltrans

Intersection Collision Rate Calculations

Blake-Griggs Multi-Family Residential Facility EIR

Intersection # 9: Crescent Drive & Crescent Plaza

Date of Count: Thursday, March 14, 2019

Number of Collisions: 12

Number of Injuries: 6

Number of Fatalities: 0

ADT: 7900

Start Date: October 1, 2013

End Date: September 30, 2018

Number of Years: 5

Intersection Type: Four-Legged

Control Type: Signals

Area: Urban

$$\text{collision rate} = \frac{\text{Number of Collisions} \times 1 \text{ Million}}{\text{ADT} \times 365 \text{ Days per Year} \times \text{Number of Years}}$$

$$\text{collision rate} = \frac{12}{7,900} \times \frac{1,000,000}{365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	0.83 c/mve	0.0%	50.0%
Statewide Average*	0.27 c/mve	0.4%	41.9%

ADT = average daily total vehicles entering intersection

c/mve = collisions per million vehicles entering intersection

* 2013 Collision Data on California State Highways, Caltrans

Intersection # 10: Contra Costa Boulevard & Crescent Plaza-Monument Boulevard

Date of Count: Thursday, March 14, 2019

Number of Collisions: 41

Number of Injuries: 9

Number of Fatalities: 0

ADT: 38100

Start Date: October 1, 2013

End Date: September 30, 2018

Number of Years: 5

Intersection Type: Four-Legged

Control Type: Signals

Area: Urban

$$\text{collision rate} = \frac{\text{Number of Collisions} \times 1 \text{ Million}}{\text{ADT} \times 365 \text{ Days per Year} \times \text{Number of Years}}$$

$$\text{collision rate} = \frac{41}{38,100} \times \frac{1,000,000}{365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	0.59 c/mve	0.0%	22.0%
Statewide Average*	0.27 c/mve	0.4%	41.9%

ADT = average daily total vehicles entering intersection

c/mve = collisions per million vehicles entering intersection

* 2013 Collision Data on California State Highways, Caltrans

Intersection Collision Rate Calculations

Blake-Griggs Multi-Family Residential Facility EIR

Intersection # 11: Monument Boulevard & I-680 Ramps

Date of Count: Tuesday, April 9, 2019

Number of Collisions: 34

Number of Injuries: 16

Number of Fatalities: 0

ADT: 49300

Start Date: October 1, 2013

End Date: September 30, 2018

Number of Years: 5

Intersection Type: Four-Legged

Control Type: Signals

Area: Urban

$$\text{collision rate} = \frac{\text{Number of Collisions} \times 1 \text{ Million}}{\text{ADT} \times 365 \text{ Days per Year} \times \text{Number of Years}}$$

$$\text{collision rate} = \frac{34}{49,300} \times \frac{1,000,000}{365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	0.38 c/mve	0.0%	47.1%
Statewide Average*	0.27 c/mve	0.4%	41.9%

ADT = average daily total vehicles entering intersection

c/mve = collisions per million vehicles entering intersection

* 2013 Collision Data on California State Highways, Caltrans

Intersection # 12: Boyd Road & Patterson Boulevard

Date of Count: Tuesday, April 9, 2019

Number of Collisions: 3

Number of Injuries: 1

Number of Fatalities: 0

ADT: 10500

Start Date: October 1, 2013

End Date: September 30, 2018

Number of Years: 5

Intersection Type: Tee

Control Type: Stop & Yield Controls

Area: Urban

$$\text{collision rate} = \frac{\text{Number of Collisions} \times 1 \text{ Million}}{\text{ADT} \times 365 \text{ Days per Year} \times \text{Number of Years}}$$

$$\text{collision rate} = \frac{3}{10,500} \times \frac{1,000,000}{365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	0.16 c/mve	0.0%	33.3%
Statewide Average*	0.18 c/mve	0.7%	36.4%

ADT = average daily total vehicles entering intersection

c/mve = collisions per million vehicles entering intersection

* 2013 Collision Data on California State Highways, Caltrans

Intersection Collision Rate Calculations

Blake-Griggs Multi-Family Residential Facility EIR

Intersection # 13: Boyd Road & Cleaveland Road

Date of Count: Thursday, March 14, 2019

Number of Collisions: 5

Number of Injuries: 3

Number of Fatalities: 0

ADT: 10700

Start Date: October 1, 2013

End Date: September 30, 2018

Number of Years: 5

Intersection Type: Four-Legged

Control Type: Signals

Area: Urban

$$\text{collision rate} = \frac{\text{Number of Collisions} \times 1 \text{ Million}}{\text{ADT} \times 365 \text{ Days per Year} \times \text{Number of Years}}$$

$$\text{collision rate} = \frac{5}{10,700} \times \frac{1,000,000}{365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	0.26 c/mve	0.0%	60.0%
Statewide Average*	0.27 c/mve	0.4%	41.9%

ADT = average daily total vehicles entering intersection

c/mve = collisions per million vehicles entering intersection

* 2013 Collision Data on California State Highways, Caltrans

Intersection # 14: Boyd Road & Crescent Drive

Date of Count: Thursday, March 14, 2019

Number of Collisions: 6

Number of Injuries: 2

Number of Fatalities: 1

ADT: 6900

Start Date: October 1, 2013

End Date: September 30, 2018

Number of Years: 5

Intersection Type: Four-Legged

Control Type: Stop & Yield Controls

Area: Urban

$$\text{collision rate} = \frac{\text{Number of Collisions} \times 1 \text{ Million}}{\text{ADT} \times 365 \text{ Days per Year} \times \text{Number of Years}}$$

$$\text{collision rate} = \frac{6}{6,900} \times \frac{1,000,000}{365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	0.48 c/mve	16.7%	33.3%
Statewide Average*	0.15 c/mve	1.0%	41.9%

ADT = average daily total vehicles entering intersection

c/mve = collisions per million vehicles entering intersection

* 2013 Collision Data on California State Highways, Caltrans

Intersection Collision Rate Calculations

Blake-Griggs Multi-Family Residential Facility EIR

Intersection # 15: Contra Costa Boulevard & Boyd Road

Date of Count: Thursday, March 14, 2019

Number of Collisions: 19

Number of Injuries: 6

Number of Fatalities: 0

ADT: 24700

Start Date: October 1, 2013

End Date: September 30, 2018

Number of Years: 5

Intersection Type: Four-Legged

Control Type: Signals

Area: Urban

$$\text{collision rate} = \frac{\text{Number of Collisions} \times 1 \text{ Million}}{\text{ADT} \times 365 \text{ Days per Year} \times \text{Number of Years}}$$

$$\text{collision rate} = \frac{19}{24,700} \times \frac{1,000,000}{365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	0.42 c/mve	0.0%	31.6%
Statewide Average*	0.27 c/mve	0.4%	41.9%

ADT = average daily total vehicles entering intersection

c/mve = collisions per million vehicles entering intersection

* 2013 Collision Data on California State Highways, Caltrans

Intersection # 16: Contra Costa Boulevard & Astrid Drive

Date of Count: Tuesday, April 9, 2019

Number of Collisions: 2

Number of Injuries: 1

Number of Fatalities: 0

ADT: 13800

Start Date: October 1, 2013

End Date: September 30, 2018

Number of Years: 5

Intersection Type: Tee

Control Type: Signals

Area: Urban

$$\text{collision rate} = \frac{\text{Number of Collisions} \times 1 \text{ Million}}{\text{ADT} \times 365 \text{ Days per Year} \times \text{Number of Years}}$$

$$\text{collision rate} = \frac{2}{13,800} \times \frac{1,000,000}{365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	0.08 c/mve	0.0%	50.0%
Statewide Average*	0.21 c/mve	0.3%	42.4%

ADT = average daily total vehicles entering intersection

c/mve = collisions per million vehicles entering intersection

* 2013 Collision Data on California State Highways, Caltrans

Appendix B

Intersection Level of Service Calculations



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HCM 2010 Signalized Intersection Summary

1: Contra Costa Blvd & Woodsworth Ln/Pleasant Hill Plaza Way

06/13/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	63	16	26	62	23	43	33	671	1	50	810	110
Future Volume (veh/h)	63	16	26	62	23	43	33	671	1	50	810	110
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.98	1.00		0.97	1.00		0.94
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1900	1863	1863	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	68	17	15	67	25	11	35	722	1	54	871	117
Adj No. of Lanes	1	1	0	0	1	1	1	2	0	1	2	1
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	131	66	59	111	42	131	783	2347	3	70	837	351
Arrive On Green	0.07	0.07	0.07	0.09	0.09	0.09	0.59	0.86	0.86	0.04	0.24	0.24
Sat Flow, veh/h	1774	901	795	1309	488	1544	1774	3626	5	1774	3539	1487
Grp Volume(v), veh/h	68	0	32	92	0	11	35	352	371	54	871	117
Grp Sat Flow(s),veh/h/ln	1774	0	1695	1797	0	1544	1774	1770	1862	1774	1770	1487
Q Serve(g_s), s	4.1	0.0	2.0	5.4	0.0	0.7	0.9	4.1	4.1	3.3	26.0	7.2
Cycle Q Clear(g_c), s	4.1	0.0	2.0	5.4	0.0	0.7	0.9	4.1	4.1	3.3	26.0	7.2
Prop In Lane	1.00		0.47	0.73		1.00	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	131	0	125	153	0	131	783	1145	1205	70	837	351
V/C Ratio(X)	0.52	0.00	0.26	0.60	0.00	0.08	0.04	0.31	0.31	0.77	1.04	0.33
Avail Cap(c_a), veh/h	452	0	431	457	0	393	783	1145	1205	194	837	351
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.33	1.33	1.33	1.00	1.00	1.00
Upstream Filter(I)	0.82	0.00	0.82	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	49.1	0.0	48.1	48.5	0.0	46.4	12.9	3.0	3.0	52.3	42.0	34.8
Incr Delay (d2), s/veh	2.6	0.0	0.9	3.8	0.0	0.3	0.0	0.7	0.7	16.4	42.3	2.5
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(50%),veh/ln	2.1	0.0	0.9	2.9	0.0	0.3	0.5	2.1	2.2	1.9	17.6	3.2
LnGrp Delay(d),s/veh	51.7	0.0	49.0	52.3	0.0	46.6	12.9	3.7	3.6	68.7	84.3	37.3
LnGrp LOS	D		D	D		D	B	A	A	E	F	D
Approach Vol, veh/h		100			103			758			1042	
Approach Delay, s/veh		50.8			51.7			4.1			78.3	
Approach LOS		D			D			A			E	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.3	76.2		12.1	53.5	31.0		13.4				
Change Period (Y+Rc), s	4.0	5.0		4.0	5.0	* 5		4.0				
Max Green Setting (Gmax), s	12.0	25.0		28.0	11.0	* 26		28.0				
Max Q Clear Time (g_c+I1), s	5.3	6.1		6.1	2.9	28.0		7.4				
Green Ext Time (p_c), s	0.0	9.3		0.3	0.0	0.0		0.5				
Intersection Summary												
HCM 2010 Ctrl Delay			47.5									
HCM 2010 LOS			D									
Notes												

Intersection

Int Delay, s/veh 7.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑		↑↑	
Traffic Vol, veh/h	73	646	536	83	94	81
Future Vol, veh/h	73	646	536	83	94	81
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	81	81	81	81	81	81
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	90	798	662	102	116	100

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	764	0	0 1292 382
Stage 1	-	-	- 713 -
Stage 2	-	-	- 579 -
Critical Hdwy	4.14	-	- 6.1 6.2
Critical Hdwy Stg 1	-	-	- 5.84 -
Critical Hdwy Stg 2	-	-	- 5.84 -
Follow-up Hdwy	2.22	-	- 3 3
Pot Cap-1 Maneuver	845	-	- 219 726
Stage 1	-	-	- 501 -
Stage 2	-	-	- 591 -
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	845	-	- 177 726
Mov Cap-2 Maneuver	-	-	- 177 -
Stage 1	-	-	- 405 -
Stage 2	-	-	- 591 -

Approach	EB	WB	SB
HCM Control Delay, s	1.7	0	54.9
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	845	-	-	-	272
HCM Lane V/C Ratio	0.107	-	-	-	0.794
HCM Control Delay (s)	9.8	0.8	-	-	54.9
HCM Lane LOS	A	A	-	-	F
HCM 95th %tile Q(veh)	0.4	-	-	-	6.2

HCM 2010 Signalized Intersection Summary

3: Cleaveland Rd/Woodsworth Ln & Gregory Ln

06/13/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	70	364	381	137	438	13	177	66	22	3	120	94
Future Volume (veh/h)	70	364	381	137	438	13	177	66	22	3	120	94
Number	5	2	12	1	6	16	3	8	18	7	4	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		0.98	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1863	1900	1863	1863
Adj Flow Rate, veh/h	88	455	394	171	548	16	152	179	20	4	150	92
Adj No. of Lanes	1	2	0	1	2	0	1	1	1	0	1	1
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	696	884	764	177	697	20	219	230	192	5	195	168
Arrive On Green	0.39	0.49	0.49	0.10	0.20	0.20	0.12	0.12	0.12	0.11	0.11	0.11
Sat Flow, veh/h	1774	1801	1556	1774	3512	102	1774	1863	1556	48	1812	1561
Grp Volume(v), veh/h	88	447	402	171	276	288	152	179	20	154	0	92
Grp Sat Flow(s),veh/h/ln	1774	1770	1588	1774	1770	1845	1774	1863	1556	1860	0	1561
Q Serve(g_s), s	2.9	15.5	15.5	8.6	13.3	13.4	7.4	8.4	1.0	7.2	0.0	5.0
Cycle Q Clear(g_c), s	2.9	15.5	15.5	8.6	13.3	13.4	7.4	8.4	1.0	7.2	0.0	5.0
Prop In Lane	1.00		0.98	1.00		0.06	1.00		1.00	0.03		1.00
Lane Grp Cap(c), veh/h	696	869	780	177	351	366	219	230	192	201	0	168
V/C Ratio(X)	0.13	0.51	0.52	0.96	0.79	0.79	0.69	0.78	0.10	0.77	0.00	0.55
Avail Cap(c_a), veh/h	696	869	780	177	413	430	453	476	398	393	0	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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.00	0.97
Uniform Delay (d), s/veh	17.5	15.6	15.6	40.3	34.3	34.3	37.8	38.2	35.0	39.0	0.0	38.1
Incr Delay (d2), s/veh	0.0	2.2	2.4	56.5	16.1	15.7	1.5	2.2	0.1	2.2	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(50%),veh/ln	1.4	8.1	7.3	7.0	8.1	8.4	3.7	4.5	0.4	3.8	0.0	2.2
LnGrp Delay(d),s/veh	17.5	17.8	18.0	96.8	50.4	49.9	39.3	40.4	35.1	41.3	0.0	39.1
LnGrp LOS	B	B	B	F	D	D	D	D	D	D		D
Approach Vol, veh/h		937			735			351			246	
Approach Delay, s/veh		17.9			61.0			39.6			40.5	
Approach LOS		B			E			D			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	13.0	48.2		13.7	39.3	21.9		15.1				
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0				
Max Green Setting (Gmax), s	9.0	23.0		19.0	11.0	21.0		23.0				
Max Q Clear Time (g_c+I1), s	10.6	17.5		9.2	4.9	15.4		10.4				
Green Ext Time (p_c), s	0.0	3.6		0.5	0.0	2.5		0.7				
Intersection Summary												
HCM 2010 Ctrl Delay				37.7								
HCM 2010 LOS				D								
Notes												

Intersection												
Int Delay, s/veh	0.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑			↕				↗
Traffic Vol, veh/h	0	383	7	36	570	14	5	0	14	0	0	7
Future Vol, veh/h	0	383	7	36	570	14	5	0	14	0	0	7
Conflicting Peds, #/hr	4	0	4	4	0	4	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	120	-	-	-	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	451	8	42	671	16	6	0	16	0	0	8
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	-	0	0	463	0	0	879	1234	234	-	-	348
Stage 1	-	-	-	-	-	-	459	459	-	-	-	-
Stage 2	-	-	-	-	-	-	420	775	-	-	-	-
Critical Hdwy	-	-	-	4.14	-	-	7.54	6.54	6.94	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	-	-	-
Follow-up Hdwy	-	-	-	2.22	-	-	3.52	4.02	3.32	-	-	3.32
Pot Cap-1 Maneuver	0	-	-	1095	-	-	242	175	768	0	0	648
Stage 1	0	-	-	-	-	-	551	565	-	0	0	-
Stage 2	0	-	-	-	-	-	581	406	-	0	0	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	-	-	-	1091	-	-	231	167	765	-	-	646
Mov Cap-2 Maneuver	-	-	-	-	-	-	231	167	-	-	-	-
Stage 1	-	-	-	-	-	-	551	563	-	-	-	-
Stage 2	-	-	-	-	-	-	552	389	-	-	-	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			0.5			12.9			10.6		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	WBR	SBLn1					
Capacity (veh/h)	476	-	-	1091	-	-	646					
HCM Lane V/C Ratio	0.047	-	-	0.039	-	-	0.013					
HCM Control Delay (s)	12.9	-	-	8.4	-	-	10.6					
HCM Lane LOS	B	-	-	A	-	-	B					
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-	-	0					

HCM Signalized Intersection Capacity Analysis

5: Contra Costa Blvd & Gregory Ln/I-680 SB Off-Ramp

06/12/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	93	0	299	340	354	119	196	599	0	9	822	85
Future Volume (vph)	93	0	299	340	354	119	196	599	0	9	822	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0	4.0	5.0		4.0	5.0	5.0
Lane Util. Factor	0.97		1.00	1.00	1.00	1.00	0.97	0.91		1.00	0.95	1.00
Frpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	0.99
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00		0.85	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95		1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3433		1583	1770	1863	1583	3433	5085		1770	3539	1563
Flt Permitted	0.95		1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	3433		1583	1770	1863	1583	3433	5085		1770	3539	1563
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	100	0	322	366	381	128	211	644	0	10	884	91
RTOR Reduction (vph)	0	0	77	0	0	92	0	0	0	0	0	60
Lane Group Flow (vph)	100	0	246	366	381	36	211	644	0	10	884	31
Confl. Bikes (#/hr)									1			1
Turn Type	Split		pm+ov	Split	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	4	4	5	3	3		5	2		1	6	
Permitted Phases			4			3						6
Actuated Green, G (s)	9.8		25.0	31.1	31.1	31.1	15.2	50.7		1.4	36.9	36.9
Effective Green, g (s)	9.8		25.0	31.1	31.1	31.1	15.2	50.7		1.4	36.9	36.9
Actuated g/C Ratio	0.09		0.23	0.28	0.28	0.28	0.14	0.46		0.01	0.34	0.34
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0	4.0	5.0		4.0	5.0	5.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0	3.0	4.0		3.0	4.0	4.0
Lane Grp Cap (vph)	305		417	500	526	447	474	2343		22	1187	524
v/s Ratio Prot	0.03		c0.08	c0.21	0.20		0.06	0.13		0.01	c0.25	
v/s Ratio Perm			0.07			0.02						0.02
v/c Ratio	0.33		0.59	0.73	0.72	0.08	0.45	0.27		0.45	0.74	0.06
Uniform Delay, d1	47.0		37.9	35.7	35.6	29.0	43.5	18.3		53.9	32.4	24.8
Progression Factor	1.00		1.00	1.00	1.00	1.00	0.93	0.67		1.42	0.88	2.20
Incremental Delay, d2	0.6		2.1	5.5	4.9	0.1	0.7	0.3		13.4	4.0	0.2
Delay (s)	47.6		40.0	41.2	40.5	29.0	41.0	12.5		90.2	32.5	54.7
Level of Service	D		D	D	D	C	D	B		F	C	D
Approach Delay (s)		41.8			39.1			19.5			35.1	
Approach LOS		D			D			B			D	
Intersection Summary												
HCM 2000 Control Delay			32.9									
HCM 2000 Volume to Capacity ratio			0.72									
Actuated Cycle Length (s)			110.0									
Intersection Capacity Utilization			70.9%									
Analysis Period (min)			15									
c Critical Lane Group												

Intersection						
Int Delay, s/veh	0.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	14	17	249	5	16	669
Future Vol, veh/h	14	17	249	5	16	669
Conflicting Peds, #/hr	0	2	0	6	6	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	81	81	81	81	81	81
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	17	21	307	6	20	826
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	769	165	0	0	319	0
Stage 1	316	-	-	-	-	-
Stage 2	453	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22	-
Pot Cap-1 Maneuver	338	850	-	-	1238	-
Stage 1	712	-	-	-	-	-
Stage 2	607	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	331	844	-	-	1231	-
Mov Cap-2 Maneuver	331	-	-	-	-	-
Stage 1	708	-	-	-	-	-
Stage 2	597	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	12.9	0		0.2		
HCM LOS	B					
Minor Lane/Major Mvmt	NBT	NBRWBLn1		SBL	SBT	
Capacity (veh/h)	-	-		496	1231	
HCM Lane V/C Ratio	-	-		0.077	0.016	
HCM Control Delay (s)	-	-		12.9	8	
HCM Lane LOS	-	-		B	A	
HCM 95th %tile Q(veh)	-	-		0.2	0	

HCM 2010 Signalized Intersection Summary

7: Contra Costa Blvd & Crescent Dr

06/13/2019

																		
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR						
Lane Configurations								  			  							
Traffic Volume (veh/h)	9	2	20	56	1	16	6	782	27	10	1360	47						
Future Volume (veh/h)	9	2	20	56	1	16	6	782	27	10	1360	47						
Number	7	4	14	3	8	18	5	2	12	1	6	16						
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0						
Ped-Bike Adj(A_pbT)	0.98		0.98	0.98		0.98	1.00		1.00	1.00		1.00						
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00						
Adj Sat Flow, veh/h/ln	1900	1863	1863	1863	1863	1900	1863	1863	1900	1863	1863	1900						
Adj Flow Rate, veh/h	10	2	17	64	1	15	7	889	19	11	1545	50						
Adj No. of Lanes	0	1	1	1	1	0	1	3	0	1	2	0						
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88						
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2						
Cap, veh/h	165	28	151	181	10	143	583	1311	28	937	1594	51						
Arrive On Green	0.10	0.10	0.10	0.10	0.10	0.10	0.44	0.34	0.34	1.00	0.91	0.91						
Sat Flow, veh/h	1073	284	1544	1357	98	1464	1774	5124	109	1774	3499	113						
Grp Volume(v), veh/h	12	0	17	64	0	16	7	588	320	11	780	815						
Grp Sat Flow(s),veh/h/ln	1357	0	1544	1357	0	1561	1774	1695	1843	1774	1770	1843						
Q Serve(g_s), s	0.3	0.0	1.1	5.0	0.0	1.0	0.2	16.4	16.4	0.0	36.3	37.7						
Cycle Q Clear(g_c), s	1.4	0.0	1.1	6.3	0.0	1.0	0.2	16.4	16.4	0.0	36.3	37.7						
Prop In Lane	0.83		1.00	1.00		0.94	1.00		0.06	1.00		0.06						
Lane Grp Cap(c), veh/h	193	0	151	181	0	153	583	868	472	937	806	839						
V/C Ratio(X)	0.06	0.00	0.11	0.35	0.00	0.10	0.01	0.68	0.68	0.01	0.97	0.97						
Avail Cap(c_a), veh/h	481	0	463	456	0	468	583	1633	888	937	853	888						
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.33	1.33	1.33	2.00	2.00	2.00						
Upstream Filter(I)	0.98	0.00	0.98	1.00	0.00	1.00	0.97	0.97	0.97	0.65	0.65	0.65						
Uniform Delay (d), s/veh	45.3	0.0	45.3	48.3	0.0	45.2	20.9	32.4	32.4	0.0	4.3	4.3						
Incr Delay (d2), s/veh	0.2	0.0	0.5	1.7	0.0	0.4	0.0	4.1	7.4	0.0	18.7	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(50%),veh/ln	0.3	0.0	0.5	2.0	0.0	0.5	0.1	8.1	9.2	0.0	18.5	19.8						
LnGrp Delay(d),s/veh	45.5	0.0	45.7	49.9	0.0	45.7	20.9	36.5	39.8	0.0	23.0	23.3						
LnGrp LOS	D		D	D		D	C	D	D	A	C	C						
Approach Vol, veh/h	29		80				915				1606							
Approach Delay, s/veh	45.6		49.1				37.5				23.0							
Approach LOS	D		D				D				C							
Timer	1	2	3	4	5	6	7	8										
Assigned Phs	1	2			4	5	6	8										
Phs Duration (G+Y+Rc), s	62.1	33.1			14.8	40.1	55.1	14.8										
Change Period (Y+Rc), s	4.0	5.0			4.0	4.0	5.0	4.0										
Max Green Setting (Gmax), s	11.0	53.0			33.0	11.0	53.0	33.0										
Max Q Clear Time (g_c+I1), s	2.0	18.4			3.4	2.2	39.7	8.3										
Green Ext Time (p_c), s	0.0	9.8			0.1	0.0	10.5	0.4										
Intersection Summary																		
HCM 2010 Ctrl Delay 29.1																		
HCM 2010 LOS C																		

HCM 2010 Signalized Intersection Summary

8: Cleaveland Rd & Crescent Plaza

06/13/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	2	0	171	1	66	0	189	117	171	518	2
Future Volume (veh/h)	1	2	0	171	1	66	0	189	117	171	518	2
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		1.00	0.98		0.98	1.00		0.98	0.99		0.95
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1900	1900	1863	1863	1900	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	1	2	0	201	1	74	0	222	113	201	609	2
Adj No. of Lanes	0	1	0	0	1	1	0	2	0	0	2	0
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.80	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	253	372	0	651	3	418	0	1014	495	448	1108	4
Arrive On Green	0.27	0.27	0.00	0.27	0.27	0.27	0.00	0.44	0.44	0.44	0.44	0.44
Sat Flow, veh/h	302	1378	0	1457	10	1546	0	2380	1117	574	2499	8
Grp Volume(v), veh/h	3	0	0	202	0	74	0	170	165	397	0	415
Grp Sat Flow(s),veh/h/ln	1679	0	0	1467	0	1546	0	1770	1634	1387	0	1693
Q Serve(g_s), s	0.0	0.0	0.0	1.1	0.0	1.0	0.0	1.6	1.8	4.1	0.0	5.0
Cycle Q Clear(g_c), s	3.3	0.0	0.0	2.9	0.0	1.0	0.0	1.6	1.8	5.8	0.0	5.0
Prop In Lane	0.33		0.00	1.00		1.00	0.00		0.68	0.51		0.00
Lane Grp Cap(c), veh/h	626	0	0	653	0	418	0	785	724	809	0	751
V/C Ratio(X)	0.00	0.00	0.00	0.31	0.00	0.18	0.00	0.22	0.23	0.49	0.00	0.55
Avail Cap(c_a), veh/h	1584	0	0	1466	0	1329	0	1774	1638	1547	0	1698
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	0.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	7.5	0.0	0.0	8.4	0.0	7.8	0.0	4.8	4.8	5.8	0.0	5.7
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.1	0.1	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(50%),veh/ln	0.0	0.0	0.0	1.3	0.0	0.4	0.0	0.8	0.8	2.2	0.0	2.4
LnGrp Delay(d),s/veh	7.5	0.0	0.0	8.5	0.0	7.9	0.0	4.8	4.9	5.9	0.0	6.0
LnGrp LOS	A			A		A		A	A	A		A
Approach Vol, veh/h		3			276			335			812	
Approach Delay, s/veh		7.5			8.4			4.9			6.0	
Approach LOS		A			A			A			A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		16.4		11.4		16.4		11.4				
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0				
Max Green Setting (Gmax), s		28.0		24.0		28.0		24.0				
Max Q Clear Time (g_c+I1), s		3.8		5.3		7.8		4.9				
Green Ext Time (p_c), s		1.3		0.0		3.7		0.9				
Intersection Summary												
HCM 2010 Ctrl Delay				6.2								
HCM 2010 LOS				A								

HCM 2010 Signalized Intersection Summary

9: Crescent Dr & Crescent Plaza

06/13/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	277	6	62	211	24	6	7	130	33	7	21
Future Volume (veh/h)	8	277	6	62	211	24	6	7	130	33	7	21
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.96	0.98		0.96	0.98		0.99	0.99		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1900	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	9	326	7	73	248	28	7	8	153	39	8	25
Adj No. of Lanes	1	1	0	1	1	0	0	1	0	0	1	0
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	480	592	13	441	534	60	142	47	557	444	118	193
Arrive On Green	0.33	0.33	0.33	0.33	0.33	0.33	0.39	0.39	0.39	0.39	0.39	0.39
Sat Flow, veh/h	1077	1815	39	1025	1637	185	20	121	1440	634	306	500
Grp Volume(v), veh/h	9	0	333	73	0	276	168	0	0	72	0	0
Grp Sat Flow(s),veh/h/ln	1077	0	1854	1025	0	1822	1581	0	0	1440	0	0
Q Serve(g_s), s	0.2	0.0	4.1	1.8	0.0	3.4	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	3.5	0.0	4.1	5.9	0.0	3.4	2.0	0.0	0.0	0.7	0.0	0.0
Prop In Lane	1.00		0.02	1.00		0.10	0.04		0.91	0.54		0.35
Lane Grp Cap(c), veh/h	480	0	605	441	0	594	746	0	0	756	0	0
V/C Ratio(X)	0.02	0.00	0.55	0.17	0.00	0.46	0.23	0.00	0.00	0.10	0.00	0.00
Avail Cap(c_a), veh/h	902	0	1331	843	0	1308	2388	0	0	2190	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	8.9	0.0	7.7	10.1	0.0	7.5	5.9	0.0	0.0	5.5	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.3	0.1	0.0	0.2	0.2	0.0	0.0	0.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	2.1	0.5	0.0	1.6	0.9	0.0	0.0	0.4	0.0	0.0
LnGrp Delay(d),s/veh	8.9	0.0	8.0	10.2	0.0	7.7	6.1	0.0	0.0	5.5	0.0	0.0
LnGrp LOS	A		A	B		A	A			A		
Approach Vol, veh/h	342				349		168				72	
Approach Delay, s/veh	8.0				8.2		6.1				5.5	
Approach LOS	A				A		A				A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	2		4		6		8					
Phs Duration (G+Y+Rc), s	14.8		13.1		14.8		13.1					
Change Period (Y+Rc), s	4.0		4.0		4.0		4.0					
Max Green Setting (Gmax), s	40.0		20.0		40.0		20.0					
Max Q Clear Time (g_c+I1), s	4.0		6.1		2.7		7.9					
Green Ext Time (p_c), s	1.6		1.2		0.6		1.1					
Intersection Summary												
HCM 2010 Ctrl Delay			7.5									
HCM 2010 LOS			A									

HCM 2010 Signalized Intersection Summary

10: Contra Costa Blvd & Crescent Plaza/Monument Blvd

06/13/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↷		↰	↷	↷	↰	↷	↷	↰	↷	↷
Traffic Volume (veh/h)	15	374	47	374	263	412	24	393	310	389	974	18
Future Volume (veh/h)	15	374	47	374	263	412	24	393	310	389	974	18
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	16	407	51	407	286	448	26	427	337	423	1059	20
Adj No. of Lanes	1	2	0	2	1	2	1	3	1	2	3	1
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	25	506	63	482	532	1872	35	765	460	1329	2674	832
Arrive On Green	0.01	0.16	0.16	0.14	0.29	0.29	0.01	0.05	0.05	0.77	1.00	1.00
Sat Flow, veh/h	1774	3168	395	3442	1863	2787	1774	5085	1583	3442	5085	1583
Grp Volume(v), veh/h	16	226	232	407	286	448	26	427	337	423	1059	20
Grp Sat Flow(s), veh/h/ln	1774	1770	1793	1721	1863	1393	1774	1695	1583	1721	1695	1583
Q Serve(g_s), s	1.0	13.6	13.7	12.7	14.3	1.1	1.6	9.0	5.5	4.1	0.0	0.0
Cycle Q Clear(g_c), s	1.0	13.6	13.7	12.7	14.3	1.1	1.6	9.0	5.5	4.1	0.0	0.0
Prop In Lane	1.00		0.22	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	25	283	286	482	532	1872	35	765	460	1329	2674	832
V/C Ratio(X)	0.64	0.80	0.81	0.84	0.54	0.24	0.74	0.56	0.73	0.32	0.40	0.02
Avail Cap(c_a), veh/h	210	402	408	626	542	1887	242	1387	654	1329	2674	832
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33	2.00	2.00	2.00
Upstream Filter(I)	0.83	0.83	0.83	0.89	0.89	0.89	0.97	0.97	0.97	0.81	0.81	0.81
Uniform Delay (d), s/veh	54.0	44.5	44.6	46.1	33.2	2.7	54.3	48.7	18.0	8.1	0.0	0.0
Incr Delay (d2), s/veh	20.4	6.2	6.6	7.4	0.9	0.1	24.5	2.8	9.6	0.2	0.4	0.0
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%), veh/ln	0.6	7.1	7.3	6.5	7.4	1.5	1.0	4.4	7.6	1.9	0.1	0.0
LnGrp Delay(d), s/veh	74.4	50.7	51.2	53.5	34.1	2.7	78.8	51.5	27.6	8.4	0.4	0.0
LnGrp LOS	E	D	D	D	C	A	E	D	C	A	A	A
Approach Vol, veh/h		474			1141			790			1502	
Approach Delay, s/veh		51.8			28.7			42.2			2.6	
Approach LOS		D			C			D			A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	47.5	21.5	19.4	21.6	6.2	62.8	5.5	35.4				
Change Period (Y+Rc), s	5.0	* 5	4.0	4.0	4.0	5.0	4.0	4.0				
Max Green Setting (Gmax), s	10.0	* 30	20.0	25.0	15.0	33.0	13.0	32.0				
Max Q Clear Time (g_c+I), s	10.0	11.0	14.7	15.7	3.6	2.0	3.0	16.3				
Green Ext Time (p_c), s	2.5	5.5	0.7	1.8	0.0	15.6	0.0	3.2				
Intersection Summary												
HCM 2010 Ctrl Delay			24.2									
HCM 2010 LOS			C									
Notes												

HCM Signalized Intersection Capacity Analysis

11: I-680 Ramps & Monument Blvd

06/12/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 	  		 	  	 	 		 	  		
Traffic Volume (vph)	475	517	9	929	699	557	47	0	317	1113	0	225
Future Volume (vph)	475	517	9	929	699	557	47	0	317	1113	0	225
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	11.2	8.7		10.2	8.7	8.7	8.7		10.2	9.7		11.2
Lane Util. Factor	0.97	0.91		0.97	0.91	0.88	0.97		0.88	0.94		1.00
Frt	1.00	1.00		1.00	1.00	0.85	1.00		0.85	1.00		0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95		1.00	0.95		1.00
Satd. Flow (prot)	3433	5072		3433	5085	2787	3433		2787	4990		1583
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95		1.00	0.95		1.00
Satd. Flow (perm)	3433	5072		3433	5085	2787	3433		2787	4990		1583
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	511	556	10	999	752	599	51	0	341	1197	0	242
RTOR Reduction (vph)	0	0	0	0	0	49	0	0	0	0	0	0
Lane Group Flow (vph)	511	566	0	999	752	550	51	0	341	1197	0	242
Turn Type	Prot	NA		Prot	NA	custom	Prot		pm+ov	Prot		pm+ov
Protected Phases	5	2		1	6	3	3		1	7		5
Permitted Phases						6			6			7
Actuated Green, G (s)	22.2	16.0		40.1	32.9	67.7	34.8		66.3	33.8		56.0
Effective Green, g (s)	22.2	16.0		40.1	32.9	67.7	34.8		66.3	33.8		56.0
Actuated g/C Ratio	0.19	0.14		0.34	0.28	0.57	0.29		0.56	0.29		0.47
Clearance Time (s)	11.2	8.7		10.2	8.7	8.7	8.7		10.2	9.7		11.2
Vehicle Extension (s)	3.0	2.0		2.0	2.5	2.0	2.0		2.0	3.0		3.0
Lane Grp Cap (vph)	643	684		1161	1411	1796	1008		1559	1423		748
v/s Ratio Prot	0.15	c0.11		c0.29	0.15	0.09	0.01		0.07	c0.24		0.06
v/s Ratio Perm						0.11			0.05			0.09
v/c Ratio	0.79	0.83		0.86	0.53	0.31	0.05		0.22	0.84		0.32
Uniform Delay, d1	46.0	49.9		36.6	36.3	13.2	30.0		13.1	39.8		19.5
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00		1.00
Incremental Delay, d2	6.7	7.8		6.5	0.3	0.0	0.0		0.0	4.7		0.3
Delay (s)	52.7	57.7		43.1	36.6	13.2	30.0		13.1	44.5		19.7
Level of Service	D	E		D	D	B	C		B	D		B
Approach Delay (s)		55.3			33.4			15.3			40.3	
Approach LOS		E			C			B			D	
Intersection Summary												
HCM 2000 Control Delay			38.4		HCM 2000 Level of Service					D		
HCM 2000 Volume to Capacity ratio			0.86									
Actuated Cycle Length (s)			118.5		Sum of lost time (s)					29.6		
Intersection Capacity Utilization			81.7%		ICU Level of Service					D		
Analysis Period (min)			15									

c Critical Lane Group

Intersection

Intersection Delay, s/veh 12.2

Intersection LOS B

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	140	149	170	139	113	109
Future Vol, veh/h	140	149	170	139	113	109
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	169	180	205	167	136	131
Number of Lanes	1	0	1	1	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	2	1	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	1	1
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	1	0	2
HCM Control Delay	12.8	11.5	12.3
HCM LOS	B	B	B

Lane	NBLn1	EBLn1	WBLn1	WBLn2
Vol Left, %	51%	0%	100%	0%
Vol Thru, %	0%	48%	0%	100%
Vol Right, %	49%	52%	0%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	222	289	170	139
LT Vol	113	0	170	0
Through Vol	0	140	0	139
RT Vol	109	149	0	0
Lane Flow Rate	267	348	205	167
Geometry Grp	2	5	7	7
Degree of Util (X)	0.408	0.487	0.354	0.266
Departure Headway (Hd)	5.498	5.032	6.229	5.723
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	655	717	578	628
Service Time	3.53	3.059	3.957	3.451
HCM Lane V/C Ratio	0.408	0.485	0.355	0.266
HCM Control Delay	12.3	12.8	12.3	10.5
HCM Lane LOS	B	B	B	B
HCM 95th-tile Q	2	2.7	1.6	1.1

HCM 2010 Signalized Intersection Summary

13: Astrid Dr/Cleaveland Rd & Boyd Rd

06/13/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	143	421	50	20	309	51	40	100	49	69	216	405
Future Volume (veh/h)	143	421	50	20	309	51	40	100	49	69	216	405
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	174	513	59	24	377	45	49	122	32	84	263	457
Adj No. of Lanes	1	1	0	1	1	1	1	2	0	1	1	1
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	690	974	112	30	405	345	63	596	152	106	435	366
Arrive On Green	0.39	0.59	0.59	0.02	0.22	0.22	0.04	0.21	0.21	0.06	0.23	0.23
Sat Flow, veh/h	1774	1641	189	1774	1863	1583	1774	2796	711	1774	1863	1566
Grp Volume(v), veh/h	174	0	572	24	377	45	49	76	78	84	263	457
Grp Sat Flow(s),veh/h/ln	1774	0	1829	1774	1863	1583	1774	1770	1737	1774	1863	1566
Q Serve(g_s), s	8.5	0.0	23.8	1.7	25.5	2.9	3.5	4.5	4.8	6.0	16.2	30.0
Cycle Q Clear(g_c), s	8.5	0.0	23.8	1.7	25.5	2.9	3.5	4.5	4.8	6.0	16.2	30.0
Prop In Lane	1.00		0.10	1.00		1.00	1.00		0.41	1.00		1.00
Lane Grp Cap(c), veh/h	690	0	1086	30	405	345	63	377	370	106	435	366
V/C Ratio(X)	0.25	0.00	0.53	0.81	0.93	0.13	0.77	0.20	0.21	0.79	0.61	1.25
Avail Cap(c_a), veh/h	690	0	1086	276	435	369	276	413	405	414	435	366
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	26.6	0.0	15.4	63.0	49.3	40.5	61.5	41.6	41.7	59.6	44.0	49.3
Incr Delay (d2), s/veh	0.9	0.0	1.8	16.9	24.9	0.1	7.3	0.9	1.0	4.9	5.1	133.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.4	0.0	12.5	1.0	15.9	1.3	1.9	2.3	2.4	3.1	8.9	26.5
LnGrp Delay(d),s/veh	27.5	0.0	17.3	79.9	74.3	40.6	68.7	42.5	42.7	64.5	49.1	182.7
LnGrp LOS	C		B	E	E	D	E	D	D	E	D	F
Approach Vol, veh/h		746			446			203			804	
Approach Delay, s/veh		19.7			71.2			48.9			126.7	
Approach LOS		B			E			D			F	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	11.2	31.4	5.7	80.3	8.6	34.0	54.0	32.0				
Change Period (Y+Rc), s	3.5	4.0	3.5	4.0	4.0	4.0	4.0	4.0				
Max Green Setting (Gmax), s	30.0	30.0	20.0	50.0	20.0	30.0	50.0	30.0				
Max Q Clear Time (g_c+I), s	19.0	6.8	3.7	25.8	5.5	32.0	10.5	27.5				
Green Ext Time (p_c), s	0.1	1.9	0.0	6.0	0.0	0.0	0.9	0.5				
Intersection Summary												
HCM 2010 Ctrl Delay			71.9									
HCM 2010 LOS			E									

Intersection												
Int Delay, s/veh	2.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	123	416	3	4	349	26	0	2	30	3	0	45
Future Vol, veh/h	123	416	3	4	349	26	0	2	30	3	0	45
Conflicting Peds, #/hr	3	0	0	0	0	3	3	0	1	1	0	3
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	105	-	-	75	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	87	87	87	87	87	87	87	87	87	87	87	87
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	141	478	3	5	401	30	0	2	34	3	0	52
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	434	0	0	481	0	0	1217	1206	481	1210	1192	422
Stage 1	-	-	-	-	-	-	762	762	-	429	429	-
Stage 2	-	-	-	-	-	-	455	444	-	781	763	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1126	-	-	1082	-	-	158	184	585	159	187	632
Stage 1	-	-	-	-	-	-	397	414	-	604	584	-
Stage 2	-	-	-	-	-	-	585	575	-	388	413	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1123	-	-	1082	-	-	130	160	584	133	162	628
Mov Cap-2 Maneuver	-	-	-	-	-	-	130	160	-	133	162	-
Stage 1	-	-	-	-	-	-	347	362	-	527	579	-
Stage 2	-	-	-	-	-	-	533	570	-	317	361	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	2			0.1			12.8			12.9		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	501	1123	-	-	1082	-	-	509				
HCM Lane V/C Ratio	0.073	0.126	-	-	0.004	-	-	0.108				
HCM Control Delay (s)	12.8	8.7	-	-	8.3	-	-	12.9				
HCM Lane LOS	B	A	-	-	A	-	-	B				
HCM 95th %tile Q(veh)	0.2	0.4	-	-	0	-	-	0.4				

HCM 2010 Signalized Intersection Summary

15: Contra Costa Blvd & Boyd Rd

06/13/2019

																		
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR						
Lane Configurations																		
Traffic Volume (veh/h)	264	6	172	0	1	6	152	459	28	25	1157	220						
Future Volume (veh/h)	264	6	172	0	1	6	152	459	28	25	1157	220						
Number	7	4	14	3	8	18	5	2	12	1	6	16						
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0						
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00						
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00						
Adj Sat Flow, veh/h/ln	1863	1863	1863	1900	1863	1900	1863	1863	1900	1863	1863	1863						
Adj Flow Rate, veh/h	295	0	75	0	1	4	167	504	30	27	1271	239						
Adj No. of Lanes	2	0	1	0	1	0	1	3	0	1	3	1						
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91						
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2						
Cap, veh/h	391	0	175	0	2	8	198	711	42	1020	3093	963						
Arrive On Green	0.11	0.00	0.11	0.00	0.01	0.01	0.11	0.14	0.14	0.19	0.20	0.20						
Sat Flow, veh/h	3548	0	1583	0	326	1306	1774	4912	290	1774	5085	1583						
Grp Volume(v), veh/h	295	0	75	0	0	5	167	347	187	27	1271	239						
Grp Sat Flow(s),veh/h/ln	1774	0	1583	0	0	1632	1774	1695	1812	1774	1695	1583						
Q Serve(g_s), s	8.9	0.0	4.9	0.0	0.0	0.3	10.2	10.7	10.9	1.4	24.0	14.0						
Cycle Q Clear(g_c), s	8.9	0.0	4.9	0.0	0.0	0.3	10.2	10.7	10.9	1.4	24.0	14.0						
Prop In Lane	1.00		1.00	0.00		0.80	1.00		0.16	1.00		1.00						
Lane Grp Cap(c), veh/h	391	0	175	0	0	11	198	491	262	1020	3093	963						
V/C Ratio(X)	0.75	0.00	0.43	0.00	0.00	0.48	0.84	0.71	0.71	0.03	0.41	0.25						
Avail Cap(c_a), veh/h	613	0	273	0	0	415	242	709	379	1020	3093	963						
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33						
Upstream Filter(I)	1.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	0.84	0.84	0.84						
Uniform Delay (d), s/veh	47.5	0.0	45.7	0.0	0.0	54.5	47.9	44.8	44.9	19.5	26.8	22.8						
Incr Delay (d2), s/veh	4.2	0.0	2.4	0.0	0.0	29.8	21.6	8.3	15.4	0.0	0.3	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(50%),veh/ln	4.6	0.0	2.2	0.0	0.0	0.2	6.2	5.6	6.5	0.7	11.3	6.3						
LnGrp Delay(d),s/veh	51.7	0.0	48.1	0.0	0.0	84.3	69.6	53.1	60.2	19.5	27.1	23.3						
LnGrp LOS	D		D			F	E	D	E	B	C	C						
Approach Vol, veh/h	370				5			701			1537							
Approach Delay, s/veh	50.9				84.3			59.0			26.4							
Approach LOS	D				F			E			C							
Timer	1	2	3	4	5	6	7	8										
Assigned Phs	1	2			4	5	6	8										
Phs Duration (G+Y+Rc), s	68.2	20.9			16.1	17.3	71.9	4.7										
Change Period (Y+Rc), s	5.0	* 5			4.0	5.0	5.0	4.0										
Max Green Setting (Gmax), s	23.0	* 23			19.0	15.0	30.0	28.0										
Max Q Clear Time (g_c+I1), s	3.4	12.9			10.9	12.2	26.0	2.3										
Green Ext Time (p_c), s	0.0	3.1			1.3	0.2	3.3	0.0										
Intersection Summary																		
HCM 2010 Ctrl Delay	38.7																	
HCM 2010 LOS	D																	
Notes																		

HCM 2010 Signalized Intersection Summary

16: Contra Costa Blvd & Astrid Dr

06/13/2019

								
Movement	EBL	EBR	NBL	NBT	SBT	SBR		
Lane Configurations								
Traffic Volume (veh/h)	26	99	39	185	937	36		
Future Volume (veh/h)	26	99	39	185	937	36		
Number	7	14	5	2	6	16		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863		
Adj Flow Rate, veh/h	27	20	41	193	976	35		
Adj No. of Lanes	1	1	1	2	2	1		
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96		
Percent Heavy Veh, %	2	2	2	2	2	2		
Cap, veh/h	48	43	69	2293	1515	677		
Arrive On Green	0.03	0.03	0.04	0.65	0.43	0.43		
Sat Flow, veh/h	1774	1583	1774	3632	3632	1581		
Grp Volume(v), veh/h	27	20	41	193	976	35		
Grp Sat Flow(s),veh/h/ln	1774	1583	1774	1770	1770	1581		
Q Serve(g_s), s	0.4	0.3	0.6	0.6	6.0	0.4		
Cycle Q Clear(g_c), s	0.4	0.3	0.6	0.6	6.0	0.4		
Prop In Lane	1.00	1.00	1.00			1.00		
Lane Grp Cap(c), veh/h	48	43	69	2293	1515	677		
V/C Ratio(X)	0.57	0.47	0.59	0.08	0.64	0.05		
Avail Cap(c_a), veh/h	1282	1145	2244	4477	2558	1143		
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	13.3	13.3	13.1	1.8	6.2	4.6		
Incr Delay (d2), s/veh	3.9	3.0	10.9	0.0	0.2	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	0.2	0.3	0.5	0.3	2.9	0.2		
LnGrp Delay(d),s/veh	17.2	16.2	24.0	1.8	6.4	4.6		
LnGrp LOS	B	B	C	A	A	A		
Approach Vol, veh/h	47			234	1011			
Approach Delay, s/veh	16.8			5.7	6.4			
Approach LOS	B			A	A			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		22.9		4.7	6.1	16.8		
Change Period (Y+Rc), s		5.0		4.0	5.0	* 5		
Max Green Setting (Gmax), s		35.0		20.0	35.0	* 20		
Max Q Clear Time (g_c+I1), s		2.6		2.4	2.6	8.0		
Green Ext Time (p_c), s		1.7		0.0	0.1	3.8		
Intersection Summary								
HCM 2010 Ctrl Delay			6.6					
HCM 2010 LOS			A					
Notes								

HCM 2010 Signalized Intersection Summary

1: Contra Costa Blvd & Woodsworth Ln/Pleasant Hill Plaza Way

06/13/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	113	21	59	134	59	132	84	1174	7	114	745	92
Future Volume (veh/h)	113	21	59	134	59	132	84	1174	7	114	745	92
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.97	1.00		0.94
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1900	1863	1863	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	115	21	33	137	60	49	86	1198	7	116	760	79
Adj No. of Lanes	1	1	0	0	1	1	1	2	0	1	2	1
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	178	64	101	176	77	219	600	1933	11	144	959	404
Arrive On Green	0.10	0.10	0.10	0.14	0.14	0.14	0.45	0.71	0.71	0.08	0.27	0.27
Sat Flow, veh/h	1774	644	1011	1252	548	1556	1774	3607	21	1774	3539	1493
Grp Volume(v), veh/h	115	0	54	197	0	49	86	588	617	116	760	79
Grp Sat Flow(s),veh/h/ln	1774	0	1655	1800	0	1556	1774	1770	1858	1774	1770	1493
Q Serve(g_s), s	7.5	0.0	3.6	12.7	0.0	3.4	3.4	20.5	20.5	7.7	23.9	4.9
Cycle Q Clear(g_c), s	7.5	0.0	3.6	12.7	0.0	3.4	3.4	20.5	20.5	7.7	23.9	4.9
Prop In Lane	1.00		0.61	0.70		1.00	1.00		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	178	0	166	254	0	219	600	948	996	144	959	404
V/C Ratio(X)	0.65	0.00	0.33	0.78	0.00	0.22	0.14	0.62	0.62	0.80	0.79	0.20
Avail Cap(c_a), veh/h	414	0	386	420	0	363	600	948	996	177	1062	448
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.33	1.33	1.33	1.00	1.00	1.00
Upstream Filter(l)	0.72	0.00	0.72	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	51.9	0.0	50.2	49.7	0.0	45.7	22.8	10.9	10.9	54.2	40.6	33.7
Incr Delay (d2), s/veh	2.9	0.0	0.8	5.1	0.0	0.5	0.1	3.0	2.9	19.2	6.7	1.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.8	0.0	1.7	6.7	0.0	1.5	1.7	10.6	11.1	4.5	12.6	2.1
LnGrp Delay(d),s/veh	54.8	0.0	51.0	54.8	0.0	46.2	22.9	14.0	13.8	73.3	47.3	34.8
LnGrp LOS	D		D	D		D	C	B	B	E	D	C
Approach Vol, veh/h	169				246				1291			
Approach Delay, s/veh	53.6				53.1				14.5			
Approach LOS	D				D				B			
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	13.8	69.3		16.0	45.6	37.5		20.9				
Change Period (Y+Rc), s	4.0	5.0		4.0	5.0	* 5		4.0				
Max Green Setting (Gmax), s	12.0	35.0		28.0	11.0	* 36		28.0				
Max Q Clear Time (g_c+I1), s	9.7	22.5		9.5	5.4	25.9		14.7				
Green Ext Time (p_c), s	0.1	10.2		0.5	0.1	6.6		1.1				
Intersection Summary												
HCM 2010 Ctrl Delay	33.1											
HCM 2010 LOS	C											
Notes												

Intersection						
Int Delay, s/veh	2.1					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	73	631	658	128	54	43
Future Vol, veh/h	73	631	658	128	54	43
Conflicting Peds, #/hr	2	0	0	2	1	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	76	657	685	133	56	45
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	820	0	-	0	1236	411
Stage 1	-	-	-	-	754	-
Stage 2	-	-	-	-	482	-
Critical Hdwy	4.14	-	-	-	6.1	6.2
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3	3
Pot Cap-1 Maneuver	805	-	-	-	237	698
Stage 1	-	-	-	-	476	-
Stage 2	-	-	-	-	667	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	803	-	-	-	201	697
Mov Cap-2 Maneuver	-	-	-	-	201	-
Stage 1	-	-	-	-	404	-
Stage 2	-	-	-	-	666	-
Approach	EB	WB		SB		
HCM Control Delay, s	1.6	0		23.5		
HCM LOS				C		
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	
Capacity (veh/h)	803	-	-	-	294	
HCM Lane V/C Ratio	0.095	-	-	-	0.344	
HCM Control Delay (s)	10	0.6	-	-	23.5	
HCM Lane LOS	A	A	-	-	C	
HCM 95th %tile Q(veh)	0.3	-	-	-	1.5	

HCM 2010 Signalized Intersection Summary

3: Cleaveland Rd/Woodsworth Ln & Gregory Ln

06/13/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	106	373	226	79	442	35	262	113	37	22	104	97
Future Volume (veh/h)	106	373	226	79	442	35	262	113	37	22	104	97
Number	5	2	12	1	6	16	3	8	18	7	4	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		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1863	1900	1863	1863
Adj Flow Rate, veh/h	108	381	182	81	451	34	191	221	30	22	106	85
Adj No. of Lanes	1	2	0	1	2	0	1	1	1	0	1	1
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	711	1202	566	119	602	45	261	274	229	30	144	146
Arrive On Green	0.40	0.51	0.51	0.07	0.18	0.18	0.15	0.15	0.15	0.09	0.09	0.09
Sat Flow, veh/h	1774	2337	1101	1774	3337	251	1774	1863	1557	317	1529	1557
Grp Volume(v), veh/h	108	287	276	81	238	247	191	221	30	128	0	85
Grp Sat Flow(s),veh/h/ln	1774	1770	1668	1774	1770	1818	1774	1863	1557	1847	0	1557
Q Serve(g_s), s	3.5	8.5	8.7	4.0	11.5	11.6	9.3	10.3	1.5	6.1	0.0	4.7
Cycle Q Clear(g_c), s	3.5	8.5	8.7	4.0	11.5	11.6	9.3	10.3	1.5	6.1	0.0	4.7
Prop In Lane	1.00		0.66	1.00		0.14	1.00		1.00	0.17		1.00
Lane Grp Cap(c), veh/h	711	910	858	119	319	328	261	274	229	173	0	146
V/C Ratio(X)	0.15	0.32	0.32	0.68	0.75	0.75	0.73	0.81	0.13	0.74	0.00	0.58
Avail Cap(c_a), veh/h	711	910	858	177	413	424	453	476	398	390	0	329
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	0.83	0.00	0.83
Uniform Delay (d), s/veh	17.2	12.7	12.7	41.0	34.9	35.0	36.7	37.2	33.4	39.7	0.0	39.1
Incr Delay (d2), s/veh	0.0	0.9	1.0	2.5	14.7	14.6	1.5	2.2	0.1	1.9	0.0	1.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.7	4.4	4.2	2.0	6.9	7.2	4.6	5.5	0.7	3.2	0.0	2.1
LnGrp Delay(d),s/veh	17.2	13.6	13.7	43.6	49.6	49.6	38.2	39.3	33.5	41.6	0.0	40.2
LnGrp LOS	B	B	B	D	D	D	D	D	C	D		D
Approach Vol, veh/h		671			566			442			213	
Approach Delay, s/veh		14.2			48.8			38.4			41.1	
Approach LOS		B			D			D			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	10.0	50.3		12.5	40.1	20.2		17.2				
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0				
Max Green Setting (Gmax), s	9.0	23.0		19.0	11.0	21.0		23.0				
Max Q Clear Time (g_c+I1), s	6.0	10.7		8.1	5.5	13.6		12.3				
Green Ext Time (p_c), s	0.0	4.6		0.4	0.1	2.7		0.9				
Intersection Summary												
HCM 2010 Ctrl Delay				33.2								
HCM 2010 LOS				C								
Notes												

Intersection												
Int Delay, s/veh	1.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑			↕				↗
Traffic Vol, veh/h	0	434	9	42	523	17	4	1	48	0	0	30
Future Vol, veh/h	0	434	9	42	523	17	4	1	48	0	0	30
Conflicting Peds, #/hr	12	0	5	5	0	12	2	0	0	0	0	2
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	120	-	-	-	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	98	98	98	98	98	98	98	98	98	98	98	98
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	443	9	43	534	17	4	1	49	0	0	31
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	-	0	0	457	0	0	808	1102	231	-	-	290
Stage 1	-	-	-	-	-	-	453	453	-	-	-	-
Stage 2	-	-	-	-	-	-	355	649	-	-	-	-
Critical Hdwy	-	-	-	4.14	-	-	7.54	6.54	6.94	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	-	-	-
Follow-up Hdwy	-	-	-	2.22	-	-	3.52	4.02	3.32	-	-	3.32
Pot Cap-1 Maneuver	0	-	-	1100	-	-	272	210	771	0	0	707
Stage 1	0	-	-	-	-	-	556	568	-	0	0	-
Stage 2	0	-	-	-	-	-	635	464	-	0	0	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	-	-	-	1095	-	-	251	199	767	-	-	698
Mov Cap-2 Maneuver	-	-	-	-	-	-	251	199	-	-	-	-
Stage 1	-	-	-	-	-	-	556	565	-	-	-	-
Stage 2	-	-	-	-	-	-	582	441	-	-	-	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			0.6			11.2			10.4		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	WBR	SBLn1					
Capacity (veh/h)	634	-	-	1095	-	-	698					
HCM Lane V/C Ratio	0.085	-	-	0.039	-	-	0.044					
HCM Control Delay (s)	11.2	-	-	8.4	-	-	10.4					
HCM Lane LOS	B	-	-	A	-	-	B					
HCM 95th %tile Q(veh)	0.3	-	-	0.1	-	-	0.1					

HCM Signalized Intersection Capacity Analysis

5: Contra Costa Blvd & Gregory Ln/I-680 SB Off-Ramp

06/13/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	195	0	340	148	312	213	200	1056	0	29	889	125
Future Volume (vph)	195	0	340	148	312	213	200	1056	0	29	889	125
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0	4.0	5.0		4.0	5.0	5.0
Lane Util. Factor	0.97		1.00	1.00	1.00	1.00	0.97	0.91		1.00	0.95	1.00
Frpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	0.99
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00		0.85	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95		1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3433		1583	1770	1863	1583	3433	5085		1770	3539	1564
Flt Permitted	0.95		1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	3433		1583	1770	1863	1583	3433	5085		1770	3539	1564
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	203	0	354	154	325	222	208	1100	0	30	926	130
RTOR Reduction (vph)	0	0	134	0	0	171	0	0	0	0	0	74
Lane Group Flow (vph)	203	0	220	154	325	51	208	1100	0	30	926	56
Confl. Bikes (#/hr)									1			1
Turn Type	Split		pm+ov	Split	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	4	4	5	3	3		5	2		1	6	
Permitted Phases			4			3						6
Actuated Green, G (s)	12.6		23.7	27.4	27.4	27.4	11.1	53.5		9.5	51.9	51.9
Effective Green, g (s)	12.6		23.7	27.4	27.4	27.4	11.1	53.5		9.5	51.9	51.9
Actuated g/C Ratio	0.10		0.20	0.23	0.23	0.23	0.09	0.45		0.08	0.43	0.43
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0	4.0	5.0		4.0	5.0	5.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0	3.0	4.0		3.0	4.0	4.0
Lane Grp Cap (vph)	360		312	404	425	361	317	2267		140	1530	676
v/s Ratio Prot	0.06		c0.07	0.09	c0.17		0.06	0.22		0.02	c0.26	
v/s Ratio Perm			0.07			0.03						0.04
v/c Ratio	0.56		0.71	0.38	0.76	0.14	0.66	0.49		0.21	0.61	0.08
Uniform Delay, d1	51.1		44.9	39.1	43.3	36.9	52.6	23.5		51.8	26.2	20.0
Progression Factor	1.00		1.00	1.00	1.00	1.00	1.16	0.87		0.58	0.47	0.15
Incremental Delay, d2	2.0		7.1	0.6	8.0	0.2	4.6	0.7		0.7	1.7	0.2
Delay (s)	53.1		52.0	39.7	51.3	37.1	65.5	21.2		30.8	13.9	3.2
Level of Service	D		D	D	D	D	E	C		C	B	A
Approach Delay (s)		52.4			44.2			28.2			13.1	
Approach LOS		D			D			C			B	
Intersection Summary												
HCM 2000 Control Delay			30.5				HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio			0.67									
Actuated Cycle Length (s)			120.0				Sum of lost time (s)			17.0		
Intersection Capacity Utilization			66.4%				ICU Level of Service			C		
Analysis Period (min)			15									
c Critical Lane Group												

Intersection						
Int Delay, s/veh	1.2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	24	42	380	15	28	389
Future Vol, veh/h	24	42	380	15	28	389
Conflicting Peds, #/hr	0	1	0	7	7	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	98	98	98	80	98	98
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	24	43	388	19	29	397
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	662	212	0	0	414	0
Stage 1	405	-	-	-	-	-
Stage 2	257	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22	-
Pot Cap-1 Maneuver	395	793	-	-	1141	-
Stage 1	642	-	-	-	-	-
Stage 2	762	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	382	787	-	-	1133	-
Mov Cap-2 Maneuver	382	-	-	-	-	-
Stage 1	638	-	-	-	-	-
Stage 2	742	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	12.2	0		0.6		
HCM LOS	B					
Minor Lane/Major Mvmt	NBT	NBRWBLn1		SBL	SBT	
Capacity (veh/h)	-	- 568		1133	-	
HCM Lane V/C Ratio	-	- 0.119		0.025	-	
HCM Control Delay (s)	-	- 12.2		8.3	-	
HCM Lane LOS	-	- B		A	-	
HCM 95th %tile Q(veh)	-	- 0.4		0.1	-	

HCM 2010 Signalized Intersection Summary

7: Contra Costa Blvd & Crescent Dr

06/13/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations								  			 	
Traffic Volume (veh/h)	44	8	92	124	10	103	56	1162	68	28	1155	86
Future Volume (veh/h)	44	8	92	124	10	103	56	1162	68	28	1155	86
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.98	0.98		0.98	1.00		0.97	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1863	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	46	8	27	129	10	50	58	1210	71	29	1203	88
Adj No. of Lanes	0	1	1	1	1	0	1	3	0	1	2	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	250	39	306	243	52	262	528	1574	92	662	1324	97
Arrive On Green	0.20	0.20	0.20	0.20	0.20	0.20	0.60	0.64	0.64	0.75	0.79	0.79
Sat Flow, veh/h	983	198	1547	1343	265	1327	1774	4905	288	1774	3339	244
Grp Volume(v), veh/h	54	0	27	129	0	60	58	836	445	29	637	654
Grp Sat Flow(s),veh/h/ln	1181	0	1547	1343	0	1592	1774	1695	1802	1774	1770	1813
Q Serve(g_s), s	3.6	0.0	1.7	11.0	0.0	3.8	1.7	20.9	20.9	0.5	31.9	32.2
Cycle Q Clear(g_c), s	7.4	0.0	1.7	18.4	0.0	3.8	1.7	20.9	20.9	0.5	31.9	32.2
Prop In Lane	0.85		1.00	1.00		0.83	1.00		0.16	1.00		0.13
Lane Grp Cap(c), veh/h	289	0	306	243	0	314	528	1088	578	662	702	719
V/C Ratio(X)	0.19	0.00	0.09	0.53	0.00	0.19	0.11	0.77	0.77	0.04	0.91	0.91
Avail Cap(c_a), veh/h	441	0	477	392	0	491	528	1667	886	662	870	891
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00
Upstream Filter(I)	0.99	0.00	0.99	1.00	0.00	1.00	0.92	0.92	0.92	0.74	0.74	0.74
Uniform Delay (d), s/veh	42.7	0.0	39.3	49.5	0.0	40.2	17.4	18.3	18.3	9.6	10.8	10.8
Incr Delay (d2), s/veh	0.4	0.0	0.2	2.6	0.0	0.4	0.1	4.8	8.8	0.0	13.9	13.9
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(50%),veh/ln	1.6	0.0	0.7	4.3	0.0	1.7	0.8	10.3	11.5	0.2	17.2	18.0
LnGrp Delay(d),s/veh	43.1	0.0	39.5	52.1	0.0	40.6	17.5	23.2	27.1	9.6	24.7	24.7
LnGrp LOS	D		D	D		D	B	C	C	A	C	C
Approach Vol, veh/h		81			189			1339			1320	
Approach Delay, s/veh		41.9			48.4			24.2			24.4	
Approach LOS		D			D			C			C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	48.8	43.5		27.7	39.7	52.6		27.7				
Change Period (Y+Rc), s	4.0	5.0		4.0	4.0	5.0		4.0				
Max Green Setting (Gmax), s	11.0	59.0		37.0	11.0	59.0		37.0				
Max Q Clear Time (g_c+I1), s	2.5	22.9		9.4	3.7	34.2		20.4				
Green Ext Time (p_c), s	0.0	15.6		0.5	0.0	13.4		0.9				
Intersection Summary												
HCM 2010 Ctrl Delay			26.4									
HCM 2010 LOS			C									

HCM 2010 Signalized Intersection Summary

8: Cleaveland Rd & Crescent Plaza

06/13/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	1	0	40	0	114	0	283	50	176	234	2
Future Volume (veh/h)	1	1	0	40	0	114	0	283	50	176	234	2
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		1.00	0.98		0.99	1.00		0.96	0.99		0.96
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1900	1900	1863	1863	1900	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	1	1	0	42	0	115	0	295	47	183	244	2
Adj No. of Lanes	0	1	0	0	1	1	0	2	0	0	2	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	363	203	0	617	0	273	0	1249	196	648	814	7
Arrive On Green	0.17	0.17	0.00	0.17	0.00	0.17	0.00	0.41	0.41	0.41	0.41	0.41
Sat Flow, veh/h	471	1164	0	1391	0	1567	0	3140	479	759	1985	17
Grp Volume(v), veh/h	2	0	0	42	0	115	0	170	172	229	0	200
Grp Sat Flow(s),veh/h/ln	1635	0	0	1391	0	1567	0	1770	1756	1070	0	1691
Q Serve(g_s), s	0.0	0.0	0.0	0.5	0.0	1.3	0.0	1.2	1.2	2.2	0.0	1.5
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.5	0.0	1.3	0.0	1.2	1.2	3.4	0.0	1.5
Prop In Lane	0.50		0.00	1.00		1.00	0.00		0.27	0.80		0.01
Lane Grp Cap(c), veh/h	566	0	0	617	0	273	0	725	720	775	0	693
V/C Ratio(X)	0.00	0.00	0.00	0.07	0.00	0.42	0.00	0.23	0.24	0.30	0.00	0.29
Avail Cap(c_a), veh/h	2176	0	0	2107	0	1955	0	2575	2556	1954	0	2462
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	0.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	6.6	0.0	0.0	6.8	0.0	7.1	0.0	3.7	3.7	4.4	0.0	3.8
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.1	0.1	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(50%),veh/ln	0.0	0.0	0.0	0.2	0.0	0.6	0.0	0.6	0.6	0.9	0.0	0.7
LnGrp Delay(d),s/veh	6.6	0.0	0.0	6.8	0.0	7.5	0.0	3.8	3.8	4.5	0.0	3.9
LnGrp LOS	A			A		A		A	A	A		A
Approach Vol, veh/h		2			157			342			429	
Approach Delay, s/veh		6.6			7.3			3.8			4.2	
Approach LOS		A			A			A			A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		11.9		7.4		11.9		7.4				
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0				
Max Green Setting (Gmax), s		28.0		24.0		28.0		24.0				
Max Q Clear Time (g_c+I1), s		3.2		2.0		5.4		3.3				
Green Ext Time (p_c), s		1.3		0.0		1.9		0.3				
Intersection Summary												
HCM 2010 Ctrl Delay			4.6									
HCM 2010 LOS			A									

HCM 2010 Signalized Intersection Summary

9: Crescent Dr & Crescent Plaza

06/13/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	21	243	17	49	130	61	19	42	70	63	22	48
Future Volume (veh/h)	21	243	17	49	130	61	19	42	70	63	22	48
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.94		0.91	0.95		0.91	0.94		0.95	0.96		0.92
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1900	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	23	264	18	53	141	66	21	46	76	68	24	52
Adj No. of Lanes	1	1	0	1	1	0	0	1	0	0	1	0
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	465	515	35	420	349	163	179	285	371	411	162	224
Arrive On Green	0.30	0.30	0.30	0.30	0.30	0.30	0.43	0.43	0.43	0.43	0.43	0.43
Sat Flow, veh/h	1105	1712	117	1041	1161	544	97	659	858	542	374	518
Grp Volume(v), veh/h	23	0	282	53	0	207	143	0	0	144	0	0
Grp Sat Flow(s),veh/h/ln	1105	0	1829	1041	0	1705	1614	0	0	1434	0	0
Q Serve(g_s), s	0.5	0.0	3.8	1.3	0.0	2.9	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	3.4	0.0	3.8	5.2	0.0	2.9	1.6	0.0	0.0	1.6	0.0	0.0
Prop In Lane	1.00		0.06	1.00		0.32	0.15		0.53	0.47		0.36
Lane Grp Cap(c), veh/h	465	0	550	420	0	513	836	0	0	798	0	0
V/C Ratio(X)	0.05	0.00	0.51	0.13	0.00	0.40	0.17	0.00	0.00	0.18	0.00	0.00
Avail Cap(c_a), veh/h	869	0	1218	800	0	1135	2233	0	0	2039	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	9.7	0.0	8.7	10.8	0.0	8.4	5.3	0.0	0.0	5.3	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.3	0.0	0.0	0.2	0.1	0.0	0.0	0.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	1.9	0.4	0.0	1.3	0.7	0.0	0.0	0.8	0.0	0.0
LnGrp Delay(d),s/veh	9.7	0.0	9.0	10.9	0.0	8.6	5.4	0.0	0.0	5.4	0.0	0.0
LnGrp LOS	A		A	B		A	A			A		
Approach Vol, veh/h	305				260		143				144	
Approach Delay, s/veh	9.0				9.0		5.4				5.4	
Approach LOS	A				A		A				A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	2		4		6		8					
Phs Duration (G+Y+Rc), s	17.0		13.0		17.0		13.0					
Change Period (Y+Rc), s	4.0		4.0		4.0		4.0					
Max Green Setting (Gmax), s	40.0		20.0		40.0		20.0					
Max Q Clear Time (g_c+I1), s	3.6		5.8		3.6		7.2					
Green Ext Time (p_c), s	1.3		1.0		1.4		0.8					
Intersection Summary												
HCM 2010 Ctrl Delay			7.8									
HCM 2010 LOS			A									

HCM 2010 Signalized Intersection Summary

10: Contra Costa Blvd & Crescent Plaza/Monument Blvd

06/13/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	39	316	22	185	197	509	64	676	407	683	682	25
Future Volume (veh/h)	39	316	22	185	197	509	64	676	407	683	682	25
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	40	322	22	189	201	519	65	690	415	697	696	26
Adj No. of Lanes	1	2	0	2	1	2	1	3	1	2	3	1
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	51	466	32	253	342	1639	84	1163	474	1408	3043	943
Arrive On Green	0.03	0.14	0.14	0.07	0.18	0.18	0.02	0.08	0.08	0.41	0.60	0.60
Sat Flow, veh/h	1774	3360	228	3442	1863	2719	1774	5085	1563	3442	5085	1575
Grp Volume(v), veh/h	40	169	175	189	201	519	65	690	415	697	696	26
Grp Sat Flow(s),veh/h/ln	1774	1770	1818	1721	1863	1359	1774	1695	1563	1721	1695	1575
Q Serve(g_s), s	2.7	10.9	11.0	6.5	11.9	1.8	4.4	15.8	19.3	18.0	7.6	0.8
Cycle Q Clear(g_c), s	2.7	10.9	11.0	6.5	11.9	1.8	4.4	15.8	19.3	18.0	7.6	0.8
Prop In Lane	1.00		0.13	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	51	245	252	253	342	1639	84	1163	474	1408	3043	943
V/C Ratio(X)	0.78	0.69	0.69	0.75	0.59	0.32	0.77	0.59	0.88	0.50	0.23	0.03
Avail Cap(c_a), veh/h	163	398	409	516	528	1910	237	1314	520	1408	3043	943
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00
Upstream Filter(I)	0.87	0.87	0.87	0.79	0.79	0.79	0.94	0.94	0.94	0.83	0.83	0.83
Uniform Delay (d), s/veh	57.9	49.2	49.3	54.5	44.9	5.7	58.4	50.1	33.2	26.3	11.2	9.8
Incr Delay (d2), s/veh	19.5	3.0	3.0	3.4	1.3	0.1	12.8	2.1	18.8	0.5	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.6	5.5	5.8	3.2	6.2	2.8	2.5	7.6	15.0	8.6	3.6	0.4
LnGrp Delay(d),s/veh	77.4	52.2	52.3	57.9	46.1	5.8	71.2	52.2	52.0	26.7	11.4	9.9
LnGrp LOS	E	D	D	E	D	A	E	D	D	C	B	A
Approach Vol, veh/h	384				909		1170				1419	
Approach Delay, s/veh	54.8				25.5		53.2				18.9	
Approach LOS	D				C		D				B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	54.1	32.4	12.8	20.6	9.7	76.8	7.5	26.0				
Change Period (Y+Rc), s	5.0	* 5	4.0	4.0	4.0	5.0	4.0	4.0				
Max Green Setting (Gmax), s	27.6	* 31	18.0	27.0	16.0	42.0	11.0	34.0				
Max Q Clear Time (g_c+20.0), s	20.0	21.3	8.5	13.0	6.4	9.6	4.7	13.9				
Green Ext Time (p_c), s	3.0	5.5	0.4	1.6	0.1	10.0	0.0	3.3				
Intersection Summary												
HCM 2010 Ctrl Delay	34.3											
HCM 2010 LOS	C											
Notes												

HCM Signalized Intersection Capacity Analysis

11: I-680 Ramps & Monument Blvd

06/13/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	564	799	21	514	723	680	63	0	416	993	0	154
Future Volume (vph)	564	799	21	514	723	680	63	0	416	993	0	154
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	11.2	8.7		10.2	8.7	8.7	8.7		10.2	9.7		11.2
Lane Util. Factor	0.97	0.91		0.97	0.91	0.88	0.97		0.88	0.94		1.00
Frt	1.00	1.00		1.00	1.00	0.85	1.00		0.85	1.00		0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95		1.00	0.95		1.00
Satd. Flow (prot)	3433	5065		3433	5085	2787	3433		2787	4990		1583
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95		1.00	0.95		1.00
Satd. Flow (perm)	3433	5065		3433	5085	2787	3433		2787	4990		1583
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	581	824	22	530	745	701	65	0	429	1024	0	159
RTOR Reduction (vph)	0	0	0	0	0	51	0	0	0	0	0	0
Lane Group Flow (vph)	581	846	0	530	745	650	65	0	429	1024	0	159
Turn Type	Prot	NA		Prot	NA	custom	Prot		pm+ov	Prot		pm+ov
Protected Phases	5	2		1	6	3	3		1	7		5
Permitted Phases						6			6			7
Actuated Green, G (s)	26.6	27.3		24.3	24.0	55.7	31.7		48.3	30.7		57.3
Effective Green, g (s)	26.6	27.3		24.3	24.0	55.7	31.7		48.3	30.7		57.3
Actuated g/C Ratio	0.24	0.25		0.22	0.22	0.50	0.29		0.44	0.28		0.52
Clearance Time (s)	11.2	8.7		10.2	8.7	8.7	8.7		10.2	9.7		11.2
Vehicle Extension (s)	3.0	2.0		2.0	2.5	2.0	2.0		2.0	3.0		3.0
Lane Grp Cap (vph)	823	1246		752	1100	1618	981		1213	1381		817
v/s Ratio Prot	c0.17	c0.17		0.15	0.15	0.11	0.02		0.08	c0.21		0.05
v/s Ratio Perm						0.12			0.08			0.05
v/c Ratio	0.71	0.68		0.70	0.68	0.40	0.07		0.35	0.74		0.19
Uniform Delay, d1	38.6	37.8		40.0	39.9	17.2	28.8		20.9	36.5		14.4
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00		1.00
Incremental Delay, d2	2.8	1.2		2.5	1.5	0.1	0.0		0.1	2.2		0.1
Delay (s)	41.3	39.0		42.5	41.4	17.3	28.8		20.9	38.7		14.5
Level of Service	D	D		D	D	B	C		C	D		B
Approach Delay (s)		40.0			33.1			22.0			35.4	
Approach LOS		D			C			C			D	
Intersection Summary												
HCM 2000 Control Delay			34.5									
HCM 2000 Volume to Capacity ratio			0.74									
Actuated Cycle Length (s)			110.9									
Intersection Capacity Utilization			72.2%									
Analysis Period (min)			15									
c Critical Lane Group												

Intersection

Intersection Delay, s/veh 19.1

Intersection LOS C

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	167	158	212	126	171	213
Future Vol, veh/h	167	158	212	126	171	213
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	199	188	252	150	204	254
Number of Lanes	1	0	1	1	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	2	1	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	1	1
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	1	0	2
HCM Control Delay	18.4	15	23.4
HCM LOS	C	B	C

Lane	NBLn1	EBLn1	WBLn1	WBLn2
Vol Left, %	45%	0%	100%	0%
Vol Thru, %	0%	51%	0%	100%
Vol Right, %	55%	49%	0%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	384	325	212	126
LT Vol	171	0	212	0
Through Vol	0	167	0	126
RT Vol	213	158	0	0
Lane Flow Rate	457	387	252	150
Geometry Grp	2	5	7	7
Degree of Util (X)	0.736	0.629	0.497	0.274
Departure Headway (Hd)	5.798	5.849	7.092	6.581
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	622	611	505	542
Service Time	3.871	3.929	4.882	4.371
HCM Lane V/C Ratio	0.735	0.633	0.499	0.277
HCM Control Delay	23.4	18.4	16.8	11.9
HCM Lane LOS	C	C	C	B
HCM 95th-tile Q	6.4	4.4	2.7	1.1

HCM 2010 Signalized Intersection Summary

13: Astrid Dr/Cleaveland Rd & Boyd Rd

06/13/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	130	230	32	23	156	63	13	95	40	65	97	128
Future Volume (veh/h)	130	230	32	23	156	63	13	95	40	65	97	128
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.97	1.00		0.93	1.00		0.93
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	148	261	31	26	177	36	15	108	18	74	110	140
Adj No. of Lanes	1	1	0	1	1	1	1	2	0	1	1	1
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	922	1082	129	32	293	242	17	325	52	96	273	216
Arrive On Green	0.52	0.66	0.66	0.02	0.16	0.16	0.01	0.11	0.11	0.05	0.15	0.15
Sat Flow, veh/h	1774	1628	193	1774	1863	1538	1774	3018	488	1774	1863	1474
Grp Volume(v), veh/h	148	0	292	26	177	36	15	62	64	74	110	140
Grp Sat Flow(s),veh/h/ln	1774	0	1821	1774	1863	1538	1774	1770	1737	1774	1863	1474
Q Serve(g_s), s	4.2	0.0	6.2	1.4	8.5	1.9	0.8	3.1	3.3	4.0	5.2	8.6
Cycle Q Clear(g_c), s	4.2	0.0	6.2	1.4	8.5	1.9	0.8	3.1	3.3	4.0	5.2	8.6
Prop In Lane	1.00		0.11	1.00		1.00	1.00		0.28	1.00		1.00
Lane Grp Cap(c), veh/h	922	0	1210	32	293	242	17	190	187	96	273	216
V/C Ratio(X)	0.16	0.00	0.24	0.82	0.60	0.15	0.87	0.33	0.34	0.77	0.40	0.65
Avail Cap(c_a), veh/h	922	0	1210	369	581	480	369	552	542	553	581	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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	12.1	0.0	6.4	47.1	37.7	35.0	47.6	39.7	39.8	44.9	37.2	38.7
Incr Delay (d2), s/veh	0.4	0.0	0.5	17.5	0.7	0.1	35.8	3.5	3.9	4.8	3.4	11.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.2	0.0	3.2	0.8	4.4	0.8	0.6	1.7	1.8	2.1	2.9	4.2
LnGrp Delay(d),s/veh	12.5	0.0	6.9	64.6	38.5	35.1	83.4	43.2	43.7	49.7	40.7	49.9
LnGrp LOS	B		A	E	D	D	F	D	D	D	D	D
Approach Vol, veh/h	440			239			141			324		
Approach Delay, s/veh	8.8			40.8			47.7			46.7		
Approach LOS	A			D			D			D		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	8.7	14.3	5.2	67.9	4.9	18.1	54.0	19.1				
Change Period (Y+Rc), s	3.5	4.0	3.5	4.0	4.0	4.0	4.0	4.0				
Max Green Setting (Gmax), s	30.0	30.0	20.0	50.0	20.0	30.0	50.0	30.0				
Max Q Clear Time (g_c+I), s	10.0	5.3	3.4	8.2	2.8	10.6	6.2	10.5				
Green Ext Time (p_c), s	0.1	1.5	0.0	3.0	0.0	2.6	0.7	0.7				
Intersection Summary												
HCM 2010 Ctrl Delay	31.0											
HCM 2010 LOS	C											

Intersection												
Int Delay, s/veh	2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	34	307	2	9	215	52	4	2	16	33	1	19
Future Vol, veh/h	34	307	2	9	215	52	4	2	16	33	1	19
Conflicting Peds, #/hr	8	0	5	5	0	8	7	0	3	3	0	7
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	105	-	-	75	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	36	327	2	10	229	55	4	2	17	35	1	20

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	292	0	0	334	0	0	699	717	336	698	691	272
Stage 1	-	-	-	-	-	-	405	405	-	285	285	-
Stage 2	-	-	-	-	-	-	294	312	-	413	406	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1270	-	-	1225	-	-	354	355	706	355	368	767
Stage 1	-	-	-	-	-	-	622	598	-	722	676	-
Stage 2	-	-	-	-	-	-	714	658	-	616	598	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1260	-	-	1219	-	-	330	338	701	332	350	756
Mov Cap-2 Maneuver	-	-	-	-	-	-	330	338	-	332	350	-
Stage 1	-	-	-	-	-	-	601	578	-	696	665	-
Stage 2	-	-	-	-	-	-	684	647	-	580	578	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.8			0.3			12			15		
HCM LOS							B			C		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	538	1260	-	-	1219	-	-	416
HCM Lane V/C Ratio	0.044	0.029	-	-	0.008	-	-	0.136
HCM Control Delay (s)	12	7.9	-	-	8	-	-	15
HCM Lane LOS	B	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	0.1	0.1	-	-	0	-	-	0.5

HCM 2010 Signalized Intersection Summary

15: Contra Costa Blvd & Boyd Rd

06/13/2019

																		
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR						
Lane Configurations																		
Traffic Volume (veh/h)	181	2	167	33	11	53	187	899	3	27	781	125						
Future Volume (veh/h)	181	2	167	33	11	53	187	899	3	27	781	125						
Number	7	4	14	3	8	18	5	2	12	1	6	16						
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0						
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00						
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00						
Adj Sat Flow, veh/h/ln	1863	1863	1863	1900	1863	1900	1863	1863	1900	1863	1863	1863						
Adj Flow Rate, veh/h	200	0	70	36	12	55	205	988	2	30	858	134						
Adj No. of Lanes	2	0	1	0	1	0	1	3	0	1	3	1						
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91						
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2						
Cap, veh/h	296	0	132	46	15	70	239	1330	3	771	2816	877						
Arrive On Green	0.08	0.00	0.08	0.08	0.08	0.08	0.13	0.25	0.25	0.14	0.18	0.18						
Sat Flow, veh/h	3548	0	1583	586	195	895	1774	5240	11	1774	5085	1583						
Grp Volume(v), veh/h	200	0	70	103	0	0	205	639	351	30	858	134						
Grp Sat Flow(s),veh/h/ln	1774	0	1583	1676	0	0	1774	1695	1861	1774	1695	1583						
Q Serve(g_s), s	6.6	0.0	5.1	7.2	0.0	0.0	13.6	20.8	20.8	1.7	17.5	8.5						
Cycle Q Clear(g_c), s	6.6	0.0	5.1	7.2	0.0	0.0	13.6	20.8	20.8	1.7	17.5	8.5						
Prop In Lane	1.00		1.00	0.35		0.53	1.00		0.01	1.00		1.00						
Lane Grp Cap(c), veh/h	296	0	132	131	0	0	239	860	472	771	2816	877						
V/C Ratio(X)	0.68	0.00	0.53	0.78	0.00	0.00	0.86	0.74	0.74	0.04	0.30	0.15						
Avail Cap(c_a), veh/h	769	0	343	377	0	0	370	1102	605	771	2816	877						
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33						
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	0.97	0.97	0.97						
Uniform Delay (d), s/veh	53.4	0.0	52.7	54.3	0.0	0.0	50.8	41.2	41.2	29.8	29.0	25.4						
Incr Delay (d2), s/veh	3.8	0.0	4.6	9.8	0.0	0.0	14.4	5.8	10.1	0.0	0.3	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(50%),veh/ln	3.4	0.0	2.4	3.7	0.0	0.0	7.6	10.5	12.0	0.9	8.3	3.8						
LnGrp Delay(d),s/veh	57.2	0.0	57.4	64.1	0.0	0.0	65.2	46.9	51.3	29.8	29.3	25.7						
LnGrp LOS	E		E	E			E	D	D	C	C	C						
Approach Vol, veh/h	270				103			1195			1022							
Approach Delay, s/veh	57.3				64.1			51.3			28.9							
Approach LOS	E				E			D			C							
Timer	1	2	3	4	5	6	7	8										
Assigned Phs	1	2			4	5	6	8										
Phs Duration (G+Y+Rc), s	57.1	35.5			14.0	21.1	71.5	13.4										
Change Period (Y+Rc), s	5.0	* 5			4.0	5.0	5.0	4.0										
Max Green Setting (Gmax), s	11.0	* 39			26.0	25.0	24.0	27.0										
Max Q Clear Time (g_c+I1), s	3.7	22.8			8.6	15.6	19.5	9.2										
Green Ext Time (p_c), s	0.0	7.6			1.3	0.6	2.8	0.5										
Intersection Summary																		
HCM 2010 Ctrl Delay	43.6																	
HCM 2010 LOS	D																	
Notes																		

HCM 2010 Signalized Intersection Summary

16: Contra Costa Blvd & Astrid Dr

06/13/2019

								
Movement	EBL	EBR	NBL	NBT	SBT	SBR		
Lane Configurations								
Traffic Volume (veh/h)	41	57	119	700	424	35		
Future Volume (veh/h)	41	57	119	700	424	35		
Number	7	14	5	2	6	16		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			0.97		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863		
Adj Flow Rate, veh/h	46	13	134	787	476	38		
Adj No. of Lanes	1	1	1	2	2	1		
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89		
Percent Heavy Veh, %	2	2	2	2	2	2		
Cap, veh/h	64	57	190	2097	987	428		
Arrive On Green	0.04	0.04	0.11	0.59	0.28	0.28		
Sat Flow, veh/h	1774	1583	1774	3632	3632	1536		
Grp Volume(v), veh/h	46	13	134	787	476	38		
Grp Sat Flow(s),veh/h/ln	1774	1583	1774	1770	1770	1536		
Q Serve(g_s), s	0.6	0.2	1.8	2.8	2.7	0.4		
Cycle Q Clear(g_c), s	0.6	0.2	1.8	2.8	2.7	0.4		
Prop In Lane	1.00	1.00	1.00			1.00		
Lane Grp Cap(c), veh/h	64	57	190	2097	987	428		
V/C Ratio(X)	0.72	0.23	0.71	0.38	0.48	0.09		
Avail Cap(c_a), veh/h	1464	1307	2562	5112	2921	1268		
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	11.6	11.3	10.4	2.6	7.3	6.5		
Incr Delay (d2), s/veh	5.5	0.7	6.6	0.2	0.1	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	0.4	0.1	1.2	1.4	1.3	0.2		
LnGrp Delay(d),s/veh	17.0	12.1	17.1	2.7	7.4	6.5		
LnGrp LOS	B	B	B	A	A	A		
Approach Vol, veh/h	59			921	514			
Approach Delay, s/veh	15.9			4.8	7.3			
Approach LOS	B			A	A			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		19.4		4.9	7.6	11.8		
Change Period (Y+Rc), s		5.0		4.0	5.0	* 5		
Max Green Setting (Gmax), s		35.0		20.0	35.0	* 20		
Max Q Clear Time (g_c+l1), s		4.8		2.6	3.8	4.7		
Green Ext Time (p_c), s		8.5		0.1	0.6	1.9		
Intersection Summary								
HCM 2010 Ctrl Delay			6.1					
HCM 2010 LOS			A					
Notes								

HCM 2010 Signalized Intersection Summary

1: Contra Costa Blvd & Woodsworth Ln/Pleasant Hill Plaza Way

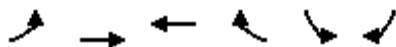
06/13/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	72	18	30	71	26	49	38	765	1	57	923	125
Future Volume (veh/h)	72	18	30	71	26	49	38	765	1	57	923	125
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.98	1.00		0.97	1.00		0.94
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1900	1863	1863	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	77	19	19	76	28	18	41	823	1	61	992	133
Adj No. of Lanes	1	1	0	0	1	1	1	2	0	1	2	1
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	141	67	67	122	45	143	759	2282	3	79	837	351
Arrive On Green	0.08	0.08	0.08	0.09	0.09	0.09	0.57	0.84	0.84	0.04	0.24	0.24
Sat Flow, veh/h	1774	843	843	1313	484	1547	1774	3627	4	1774	3539	1487
Grp Volume(v), veh/h	77	0	38	104	0	18	41	402	422	61	992	133
Grp Sat Flow(s),veh/h/ln	1774	0	1687	1797	0	1547	1774	1770	1862	1774	1770	1487
Q Serve(g_s), s	4.6	0.0	2.3	6.1	0.0	1.2	1.1	5.8	5.8	3.7	26.0	8.3
Cycle Q Clear(g_c), s	4.6	0.0	2.3	6.1	0.0	1.2	1.1	5.8	5.8	3.7	26.0	8.3
Prop In Lane	1.00		0.50	0.73		1.00	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	141	0	134	166	0	143	759	1113	1171	79	837	351
V/C Ratio(X)	0.55	0.00	0.28	0.63	0.00	0.13	0.05	0.36	0.36	0.77	1.19	0.38
Avail Cap(c_a), veh/h	452	0	429	457	0	394	759	1113	1171	194	837	351
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.33	1.33	1.33	1.00	1.00	1.00
Upstream Filter(I)	0.77	0.00	0.77	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	48.7	0.0	47.7	48.1	0.0	45.8	13.8	3.8	3.8	52.0	42.0	35.2
Incr Delay (d2), s/veh	2.5	0.0	0.9	3.8	0.0	0.4	0.0	0.9	0.9	14.7	95.6	3.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.3	0.0	1.1	3.2	0.0	0.5	0.6	3.0	3.2	2.2	23.8	3.7
LnGrp Delay(d),s/veh	51.3	0.0	48.6	51.9	0.0	46.2	13.8	4.7	4.7	66.7	137.6	38.3
LnGrp LOS	D		D	D		D	B	A	A	E	F	D
Approach Vol, veh/h		115			122			865			1186	
Approach Delay, s/veh		50.4			51.1			5.1			122.8	
Approach LOS		D			D			A			F	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.9	74.2		12.7	52.1	31.0		14.2				
Change Period (Y+Rc), s	4.0	5.0		4.0	5.0	* 5		4.0				
Max Green Setting (Gmax), s	12.0	25.0		28.0	11.0	* 26		28.0				
Max Q Clear Time (g_c+I1), s	5.7	7.8		6.6	3.1	28.0		8.1				
Green Ext Time (p_c), s	0.0	9.9		0.4	0.0	0.0		0.5				
Intersection Summary												
HCM 2010 Ctrl Delay				70.9								
HCM 2010 LOS				E								
Notes												

HCM 2010 Signalized Intersection Summary

2: Gregory Ln & Elinora Dr

06/13/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR		
Lane Configurations		↕↕	↕↕		↕↕			
Traffic Volume (veh/h)	83	736	611	95	107	92		
Future Volume (veh/h)	83	736	611	95	107	92		
Number	7	4	8	18	1	16		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1900	1863	1863	1900	1863	1900		
Adj Flow Rate, veh/h	102	909	754	117	132	114		
Adj No. of Lanes	0	2	2	0	0	0		
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81		
Percent Heavy Veh, %	2	2	2	2	0	0		
Cap, veh/h	229	1475	1553	241	194	167		
Arrive On Green	0.51	0.51	0.51	0.51	0.22	0.22		
Sat Flow, veh/h	187	3002	3165	477	898	776		
Grp Volume(v), veh/h	496	515	434	437	247	0		
Grp Sat Flow(s),veh/h/ln	1494	1610	1770	1779	1681	0		
Q Serve(g_s), s	1.1	7.5	5.2	5.2	4.4	0.0		
Cycle Q Clear(g_c), s	6.3	7.5	5.2	5.2	4.4	0.0		
Prop In Lane	0.21			0.27	0.53	0.46		
Lane Grp Cap(c), veh/h	890	814	895	899	363	0		
V/C Ratio(X)	0.56	0.63	0.49	0.49	0.68	0.00		
Avail Cap(c_a), veh/h	1350	1371	1507	1515	963	0		
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	0.00		
Uniform Delay (d), s/veh	5.4	5.8	5.2	5.2	11.6	0.0		
Incr Delay (d2), s/veh	0.6	0.8	0.4	0.4	2.3	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	8.0	3.5	2.5	2.5	2.2	0.0		
LnGrp Delay(d),s/veh	6.0	6.6	5.6	5.6	13.9	0.0		
LnGrp LOS	A	A	A	A	B			
Approach Vol, veh/h		1011	871		247			
Approach Delay, s/veh		6.3	5.6		13.9			
Approach LOS		A	A		B			
Timer	1	2	3	4	5	6	7	8
Assigned Phs				4		6		8
Phs Duration (G+Y+Rc), s				20.8		11.5		20.8
Change Period (Y+Rc), s				4.5		4.5		4.5
Max Green Setting (Gmax), s				27.5		18.5		27.5
Max Q Clear Time (g_c+I1), s				9.5		6.4		7.2
Green Ext Time (p_c), s				6.8		0.6		5.5
Intersection Summary								
HCM 2010 Ctrl Delay			6.9					
HCM 2010 LOS			A					

HCM 2010 Signalized Intersection Summary

3: Cleaveland Rd/Woodsworth Ln & Gregory Ln

06/13/2019

																		
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR						
Lane Configurations																		
Traffic Volume (veh/h)	80	415	434	156	499	15	202	75	25	3	137	107						
Future Volume (veh/h)	80	415	434	156	499	15	202	75	25	3	137	107						
Number	5	2	12	1	6	16	3	8	18	7	4	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		0.98	1.00		0.99						
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00						
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1863	1900	1863	1863						
Adj Flow Rate, veh/h	100	519	460	195	624	19	173	205	24	4	171	108						
Adj No. of Lanes	1	2	0	1	2	0	1	1	1	0	1	1						
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80						
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2						
Cap, veh/h	622	826	732	177	751	23	245	257	215	5	217	187						
Arrive On Green	0.35	0.46	0.46	0.10	0.21	0.21	0.14	0.14	0.14	0.12	0.12	0.12						
Sat Flow, veh/h	1774	1778	1576	1774	3507	107	1774	1863	1557	43	1818	1561						
Grp Volume(v), veh/h	100	516	463	195	315	328	173	205	24	175	0	108						
Grp Sat Flow(s),veh/h/ln	1774	1770	1585	1774	1770	1844	1774	1863	1557	1861	0	1561						
Q Serve(g_s), s	3.5	19.9	19.9	9.0	15.3	15.3	8.4	9.6	1.2	8.2	0.0	5.9						
Cycle Q Clear(g_c), s	3.5	19.9	19.9	9.0	15.3	15.3	8.4	9.6	1.2	8.2	0.0	5.9						
Prop In Lane	1.00		0.99	1.00		0.06	1.00		1.00	0.02		1.00						
Lane Grp Cap(c), veh/h	622	822	736	177	379	395	245	257	215	222	0	187						
V/C Ratio(X)	0.16	0.63	0.63	1.10	0.83	0.83	0.71	0.80	0.11	0.79	0.00	0.58						
Avail Cap(c_a), veh/h	622	822	736	177	413	430	453	476	398	393	0	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)	0.71	0.71	0.71	1.00	1.00	1.00	1.00	1.00	1.00	0.96	0.00	0.96						
Uniform Delay (d), s/veh	20.1	18.2	18.2	40.5	33.8	33.8	37.1	37.6	34.0	38.5	0.0	37.5						
Incr Delay (d2), s/veh	0.0	2.6	2.9	96.6	18.7	18.1	1.4	2.2	0.1	2.2	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(50%),veh/ln	1.7	10.2	9.2	9.1	9.4	9.7	4.2	5.1	0.5	4.4	0.0	2.6						
LnGrp Delay(d),s/veh	20.1	20.8	21.1	137.1	52.5	52.0	38.5	39.7	34.0	40.7	0.0	38.5						
LnGrp LOS	C	C	C	F	D	D	D	D	C	D		D						
Approach Vol, veh/h	1079			838			402			283								
Approach Delay, s/veh	20.8			72.0			38.8			39.9								
Approach LOS	C			E			D			D								
Timer	1	2	3	4	5	6	7	8										
Assigned Phs	1	2			4	5	6	8										
Phs Duration (G+Y+Rc), s	3.0	45.8			14.8	35.6	23.3	16.4										
Change Period (Y+Rc), s	4.0	4.0			4.0	4.0	4.0	4.0										
Max Green Setting (Gmax), s	23.0	23.0			19.0	11.0	21.0	23.0										
Max Q Clear Time (g_c+I1), s	21.9	21.9			10.2	5.5	17.3	11.6										
Green Ext Time (p_c), s	0.0	0.9			0.5	0.0	2.0	0.8										
Intersection Summary																		
HCM 2010 Ctrl Delay	42.2																	
HCM 2010 LOS	D																	
Notes																		

Intersection												
Int Delay, s/veh	0.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑			↕				↗
Traffic Vol, veh/h	0	437	8	41	650	16	6	0	16	0	0	8
Future Vol, veh/h	0	437	8	41	650	16	6	0	16	0	0	8
Conflicting Peds, #/hr	4	0	4	4	0	4	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	120	-	-	-	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	514	9	48	765	19	7	0	19	0	0	9
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	-	0	0	527	0	0	1002	1407	266	-	-	396
Stage 1	-	-	-	-	-	-	523	523	-	-	-	-
Stage 2	-	-	-	-	-	-	479	884	-	-	-	-
Critical Hdwy	-	-	-	4.14	-	-	7.54	6.54	6.94	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	-	-	-
Follow-up Hdwy	-	-	-	2.22	-	-	3.52	4.02	3.32	-	-	3.32
Pot Cap-1 Maneuver	0	-	-	1036	-	-	197	138	732	0	0	603
Stage 1	0	-	-	-	-	-	505	529	-	0	0	-
Stage 2	0	-	-	-	-	-	537	362	-	0	0	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	-	-	-	1032	-	-	186	130	729	-	-	601
Mov Cap-2 Maneuver	-	-	-	-	-	-	186	130	-	-	-	-
Stage 1	-	-	-	-	-	-	505	527	-	-	-	-
Stage 2	-	-	-	-	-	-	504	344	-	-	-	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			0.5			14.5			11.1		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	WBR	SBLn1					
Capacity (veh/h)	406	-	-	1032	-	-	601					
HCM Lane V/C Ratio	0.064	-	-	0.047	-	-	0.016					
HCM Control Delay (s)	14.5	-	-	8.7	-	-	11.1					
HCM Lane LOS	B	-	-	A	-	-	B					
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-	-	0					

HCM Signalized Intersection Capacity Analysis

5: Contra Costa Blvd & Gregory Ln/I-680 SB Off-Ramp

06/12/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	106	0	341	388	404	136	223	683	0	10	937	97
Future Volume (vph)	106	0	341	388	404	136	223	683	0	10	937	97
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0	4.0	5.0		4.0	5.0	5.0
Lane Util. Factor	0.97		1.00	1.00	1.00	1.00	0.97	0.91		1.00	0.95	1.00
Frpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	0.99
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00		0.85	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95		1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3433		1583	1770	1863	1583	3433	5085		1770	3539	1563
Flt Permitted	0.95		1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	3433		1583	1770	1863	1583	3433	5085		1770	3539	1563
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	114	0	367	417	434	146	240	734	0	11	1008	104
RTOR Reduction (vph)	0	0	78	0	0	102	0	0	0	0	0	70
Lane Group Flow (vph)	114	0	289	417	434	44	240	734	0	11	1008	34
Confl. Bikes (#/hr)									1			1
Turn Type	Split		pm+ov	Split	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	4	4	5	3	3		5	2		1	6	
Permitted Phases			4			3						6
Actuated Green, G (s)	10.1		23.7	33.3	33.3	33.3	13.6	48.2		1.4	36.0	36.0
Effective Green, g (s)	10.1		23.7	33.3	33.3	33.3	13.6	48.2		1.4	36.0	36.0
Actuated g/C Ratio	0.09		0.22	0.30	0.30	0.30	0.12	0.44		0.01	0.33	0.33
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0	4.0	5.0		4.0	5.0	5.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0	3.0	4.0		3.0	4.0	4.0
Lane Grp Cap (vph)	315		398	535	563	479	424	2228		22	1158	511
v/s Ratio Prot	0.03		c0.09	c0.24	0.23		0.07	0.14		0.01	c0.28	
v/s Ratio Perm			0.09			0.03						0.02
v/c Ratio	0.36		0.73	0.78	0.77	0.09	0.57	0.33		0.50	0.87	0.07
Uniform Delay, d1	46.9		40.1	35.0	34.9	27.5	45.4	20.3		54.0	34.8	25.4
Progression Factor	1.00		1.00	1.00	1.00	1.00	0.88	0.54		1.43	0.88	2.03
Incremental Delay, d2	0.7		6.5	7.1	6.5	0.1	1.7	0.4		15.3	8.3	0.2
Delay (s)	47.6		46.6	42.1	41.3	27.6	41.5	11.3		92.5	38.9	52.0
Level of Service	D		D	D	D	C	D	B		F	D	D
Approach Delay (s)		46.9			39.6			18.8			40.6	
Approach LOS		D			D			B			D	
Intersection Summary												
HCM 2000 Control Delay			35.2		HCM 2000 Level of Service					D		
HCM 2000 Volume to Capacity ratio			0.83									
Actuated Cycle Length (s)			110.0		Sum of lost time (s)					17.0		
Intersection Capacity Utilization			79.3%		ICU Level of Service					D		
Analysis Period (min)			15									
c Critical Lane Group												

Intersection						
Int Delay, s/veh	0.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	16	19	284	6	18	763
Future Vol, veh/h	16	19	284	6	18	763
Conflicting Peds, #/hr	0	2	0	6	6	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	81	81	81	81	81	81
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	20	23	351	7	22	942
Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	876	187	0	0	364	0
Stage 1	361	-	-	-	-	-
Stage 2	515	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22	-
Pot Cap-1 Maneuver	288	823	-	-	1191	-
Stage 1	676	-	-	-	-	-
Stage 2	565	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	281	817	-	-	1184	-
Mov Cap-2 Maneuver	281	-	-	-	-	-
Stage 1	672	-	-	-	-	-
Stage 2	554	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	14.2	0		0.2		
HCM LOS	B					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	-	436	1184	-	
HCM Lane V/C Ratio	-	-	0.099	0.019	-	
HCM Control Delay (s)	-	-	14.2	8.1	-	
HCM Lane LOS	-	-	B	A	-	
HCM 95th %tile Q(veh)	-	-	0.3	0.1	-	

HCM 2010 Signalized Intersection Summary

7: Contra Costa Blvd & Crescent Dr

06/13/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	2	23	64	1	18	7	891	31	11	1550	54
Future Volume (veh/h)	10	2	23	64	1	18	7	891	31	11	1550	54
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.98	0.98		0.98	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1863	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	11	2	20	73	1	17	8	1012	23	12	1761	58
Adj No. of Lanes	0	1	1	1	1	0	1	3	0	1	2	0
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	176	27	166	191	9	158	520	1469	33	865	1685	55
Arrive On Green	0.11	0.11	0.11	0.11	0.11	0.11	0.39	0.38	0.38	0.98	0.96	0.96
Sat Flow, veh/h	1084	255	1548	1356	87	1476	1774	5116	116	1774	3497	115
Grp Volume(v), veh/h	13	0	20	73	0	18	8	670	365	12	887	932
Grp Sat Flow(s),veh/h/ln	1339	0	1548	1356	0	1562	1774	1695	1842	1774	1770	1843
Q Serve(g_s), s	0.4	0.0	1.3	5.7	0.0	1.1	0.3	18.2	18.3	0.0	53.0	53.0
Cycle Q Clear(g_c), s	1.6	0.0	1.3	7.3	0.0	1.1	0.3	18.2	18.3	0.0	53.0	53.0
Prop In Lane	0.85		1.00	1.00		0.94	1.00		0.06	1.00		0.06
Lane Grp Cap(c), veh/h	204	0	166	191	0	167	520	974	529	865	853	888
V/C Ratio(X)	0.06	0.00	0.12	0.38	0.00	0.11	0.02	0.69	0.69	0.01	1.04	1.05
Avail Cap(c_a), veh/h	478	0	464	453	0	469	520	1633	888	865	853	888
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.33	1.33	1.33	2.00	2.00	2.00
Upstream Filter(I)	0.98	0.00	0.98	1.00	0.00	1.00	0.95	0.95	0.95	0.49	0.49	0.49
Uniform Delay (d), s/veh	44.5	0.0	44.4	47.9	0.0	44.4	23.8	29.9	29.9	0.7	2.0	2.0
Incr Delay (d2), s/veh	0.2	0.0	0.4	1.8	0.0	0.4	0.0	3.8	6.8	0.0	33.0	35.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.0	0.6	2.2	0.0	0.5	0.2	9.0	10.3	0.0	21.1	22.5
LnGrp Delay(d),s/veh	44.7	0.0	44.9	49.6	0.0	44.8	23.8	33.6	36.7	0.7	35.0	37.4
LnGrp LOS	D		D	D		D	C	C	D	A	F	F
Approach Vol, veh/h		33			91			1043			1831	
Approach Delay, s/veh		44.8			48.7			34.6			36.0	
Approach LOS		D			D			C			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	57.6	36.6		15.8	36.2	58.0		15.8				
Change Period (Y+Rc), s	4.0	5.0		4.0	4.0	5.0		4.0				
Max Green Setting (Gmax), s	11.0	53.0		33.0	11.0	53.0		33.0				
Max Q Clear Time (g_c+I1), s	2.0	20.3		3.6	2.3	55.0		9.3				
Green Ext Time (p_c), s	0.0	11.3		0.1	0.0	0.0		0.4				
Intersection Summary												
HCM 2010 Ctrl Delay				36.0								
HCM 2010 LOS				D								

HCM 2010 Signalized Intersection Summary

8: Cleaveland Rd & Crescent Plaza

06/13/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	2	0	195	1	75	0	215	133	195	591	2
Future Volume (veh/h)	1	2	0	195	1	75	0	215	133	195	591	2
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		1.00	0.98		0.98	1.00		0.98	0.99		0.96
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1900	1900	1863	1863	1900	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	1	2	0	229	1	84	0	253	131	229	695	2
Adj No. of Lanes	0	1	0	0	1	1	0	2	0	0	2	0
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.80	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	231	348	0	625	2	399	0	1105	552	453	1170	3
Arrive On Green	0.26	0.26	0.00	0.26	0.26	0.26	0.00	0.49	0.49	0.49	0.49	0.49
Sat Flow, veh/h	304	1350	0	1533	7	1545	0	2362	1134	572	2403	7
Grp Volume(v), veh/h	3	0	0	230	0	84	0	195	189	438	0	488
Grp Sat Flow(s),veh/h/ln	1653	0	0	1540	0	1545	0	1770	1633	1289	0	1694
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	1.3	0.0	2.0	2.1	6.0	0.0	6.5
Cycle Q Clear(g_c), s	3.5	0.0	0.0	3.5	0.0	1.3	0.0	2.0	2.1	8.1	0.0	6.5
Prop In Lane	0.33		0.00	1.00		1.00	0.00		0.69	0.52		0.00
Lane Grp Cap(c), veh/h	580	0	0	627	0	399	0	862	795	802	0	824
V/C Ratio(X)	0.01	0.00	0.00	0.37	0.00	0.21	0.00	0.23	0.24	0.55	0.00	0.59
Avail Cap(c_a), veh/h	1401	0	0	1328	0	1182	0	1580	1458	1317	0	1512
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	0.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	8.6	0.0	0.0	9.9	0.0	9.1	0.0	4.6	4.7	6.1	0.0	5.8
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.1	0.2	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(50%),veh/ln	0.0	0.0	0.0	1.7	0.0	0.6	0.0	0.9	1.0	2.8	0.0	3.0
LnGrp Delay(d),s/veh	8.6	0.0	0.0	10.1	0.0	9.2	0.0	4.7	4.7	6.3	0.0	6.1
LnGrp LOS	A			B		A		A	A	A		A
Approach Vol, veh/h		3			314			384			926	
Approach Delay, s/veh		8.6			9.9			4.7			6.2	
Approach LOS		A			A			A			A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		19.3		12.1		19.3		12.1				
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0				
Max Green Setting (Gmax), s		28.0		24.0		28.0		24.0				
Max Q Clear Time (g_c+I1), s		4.1		5.5		10.1		5.5				
Green Ext Time (p_c), s		1.5		0.0		4.3		1.0				
Intersection Summary												
HCM 2010 Ctrl Delay				6.5								
HCM 2010 LOS				A								

HCM 2010 Signalized Intersection Summary

9: Crescent Dr & Crescent Plaza

06/13/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	9	316	7	71	241	27	7	8	148	38	8	24
Future Volume (veh/h)	9	316	7	71	241	27	7	8	148	38	8	24
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.97	0.99		0.97	0.98		0.99	0.99		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1900	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	11	372	8	84	284	32	8	9	174	45	9	28
Adj No. of Lanes	1	1	0	1	1	0	0	1	0	0	1	0
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	479	651	14	436	588	66	136	44	530	430	111	182
Arrive On Green	0.36	0.36	0.36	0.36	0.36	0.36	0.37	0.37	0.37	0.37	0.37	0.37
Sat Flow, veh/h	1041	1815	39	984	1638	185	21	119	1439	650	302	494
Grp Volume(v), veh/h	11	0	380	84	0	316	191	0	0	82	0	0
Grp Sat Flow(s),veh/h/ln	1041	0	1854	984	0	1823	1580	0	0	1446	0	0
Q Serve(g_s), s	0.2	0.0	4.9	2.2	0.0	3.9	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	4.2	0.0	4.9	7.1	0.0	3.9	2.5	0.0	0.0	0.9	0.0	0.0
Prop In Lane	1.00		0.02	1.00		0.10	0.04		0.91	0.55		0.34
Lane Grp Cap(c), veh/h	479	0	665	436	0	654	710	0	0	723	0	0
V/C Ratio(X)	0.02	0.00	0.57	0.19	0.00	0.48	0.27	0.00	0.00	0.11	0.00	0.00
Avail Cap(c_a), veh/h	815	0	1263	753	0	1242	2265	0	0	2063	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	8.9	0.0	7.6	10.4	0.0	7.3	6.7	0.0	0.0	6.1	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.3	0.1	0.0	0.2	0.3	0.0	0.0	0.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	2.5	0.6	0.0	2.0	1.2	0.0	0.0	0.5	0.0	0.0
LnGrp Delay(d),s/veh	8.9	0.0	7.9	10.5	0.0	7.5	6.9	0.0	0.0	6.2	0.0	0.0
LnGrp LOS	A		A	B		A	A			A		
Approach Vol, veh/h		391			400			191			82	
Approach Delay, s/veh		7.9			8.1			6.9			6.2	
Approach LOS		A			A			A			A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		14.8		14.5		14.8		14.5				
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0				
Max Green Setting (Gmax), s		40.0		20.0		40.0		20.0				
Max Q Clear Time (g_c+I1), s		4.5		6.9		2.9		9.1				
Green Ext Time (p_c), s		1.8		1.4		0.7		1.2				
Intersection Summary												
HCM 2010 Ctrl Delay				7.7								
HCM 2010 LOS				A								

HCM 2010 Signalized Intersection Summary

10: Contra Costa Blvd & Crescent Plaza/Monument Blvd

06/13/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	17	426	54	426	300	470	27	448	353	443	1110	21
Future Volume (veh/h)	17	426	54	426	300	470	27	448	353	443	1110	21
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	18	463	59	463	326	511	29	487	384	482	1207	23
Adj No. of Lanes	1	2	0	2	1	2	1	3	1	2	3	1
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	27	560	71	534	590	1821	38	853	511	1158	2501	779
Arrive On Green	0.02	0.18	0.18	0.16	0.32	0.32	0.01	0.06	0.06	0.67	0.98	0.98
Sat Flow, veh/h	1774	3161	401	3442	1863	2787	1774	5085	1583	3442	5085	1583
Grp Volume(v), veh/h	18	258	264	463	326	511	29	487	384	482	1207	23
Grp Sat Flow(s),veh/h/ln	1774	1770	1792	1721	1863	1393	1774	1695	1583	1721	1695	1583
Q Serve(g_s), s	1.1	15.5	15.6	14.4	15.9	1.3	1.8	10.3	7.0	7.0	0.8	0.0
Cycle Q Clear(g_c), s	1.1	15.5	15.6	14.4	15.9	1.3	1.8	10.3	7.0	7.0	0.8	0.0
Prop In Lane	1.00		0.22	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	27	313	317	534	590	1821	38	853	511	1158	2501	779
V/C Ratio(X)	0.66	0.82	0.83	0.87	0.55	0.28	0.76	0.57	0.75	0.42	0.48	0.03
Avail Cap(c_a), veh/h	210	402	407	626	590	1821	242	1387	678	1158	2501	779
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33	2.00	2.00	2.00
Upstream Filter(I)	0.79	0.79	0.79	0.78	0.78	0.78	0.96	0.96	0.96	0.73	0.73	0.73
Uniform Delay (d), s/veh	53.9	43.6	43.7	45.4	31.1	3.2	54.3	48.1	16.3	13.1	0.5	0.5
Incr Delay (d2), s/veh	19.3	8.4	8.8	8.9	0.9	0.1	25.7	2.7	9.4	0.4	0.5	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(50%),veh/ln	0.7	8.3	8.5	7.5	8.3	2.0	1.2	5.0	8.2	3.3	0.3	0.0
LnGrp Delay(d),s/veh	73.1	52.0	52.5	54.2	32.0	3.3	80.0	50.8	25.6	13.5	1.0	0.5
LnGrp LOS	E	D	D	D	C	A	E	D	C	B	A	A
Approach Vol, veh/h	540			1300			900			1712		
Approach Delay, s/veh	53.0			28.6			41.0			4.5		
Approach LOS	D			C			D			A		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	42.0	23.4	21.1	23.5	6.4	59.1	5.7	38.9				
Change Period (Y+Rc), s	5.0	* 5	4.0	4.0	4.0	5.0	4.0	4.0				
Max Green Setting (Gmax), s	18.0	* 30	20.0	25.0	15.0	33.0	13.0	32.0				
Max Q Clear Time (g_c+I), s	19.0	12.3	16.4	17.6	3.8	2.8	3.1	17.9				
Green Ext Time (p_c), s	2.4	6.2	0.6	1.9	0.0	17.6	0.0	3.5				
Intersection Summary												
HCM 2010 Ctrl Delay	24.8											
HCM 2010 LOS	C											
Notes												

HCM Signalized Intersection Capacity Analysis

11: I-680 Ramps & Monument Blvd

06/12/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	542	589	10	1059	797	635	54	0	361	1269	0	257
Future Volume (vph)	542	589	10	1059	797	635	54	0	361	1269	0	257
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	11.2	8.7		10.2	8.7	8.7	8.7		10.2	9.7		11.2
Lane Util. Factor	0.97	0.91		0.97	0.91	0.88	0.97		0.88	0.94		1.00
Frt	1.00	1.00		1.00	1.00	0.85	1.00		0.85	1.00		0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95		1.00	0.95		1.00
Satd. Flow (prot)	3433	5072		3433	5085	2787	3433		2787	4990		1583
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95		1.00	0.95		1.00
Satd. Flow (perm)	3433	5072		3433	5085	2787	3433		2787	4990		1583
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	583	633	11	1139	857	683	58	0	388	1365	0	276
RTOR Reduction (vph)	0	0	0	0	0	33	0	0	0	0	0	0
Lane Group Flow (vph)	583	644	0	1139	857	650	58	0	388	1365	0	276
Turn Type	Prot	NA		Prot	NA	custom	Prot		pm+ov	Prot		pm+ov
Protected Phases	5	2		1	6	3	3		1	7		5
Permitted Phases						6			6			7
Actuated Green, G (s)	25.8	16.0		40.1	29.3	69.8	40.5		66.3	39.5		65.3
Effective Green, g (s)	25.8	16.0		40.1	29.3	69.8	40.5		66.3	39.5		65.3
Actuated g/C Ratio	0.21	0.13		0.32	0.24	0.56	0.33		0.53	0.32		0.53
Clearance Time (s)	11.2	8.7		10.2	8.7	8.7	8.7		10.2	9.7		11.2
Vehicle Extension (s)	3.0	2.0		2.0	2.5	2.0	2.0		2.0	3.0		3.0
Lane Grp Cap (vph)	713	653		1108	1199	1761	1119		1487	1586		832
v/s Ratio Prot	0.17	c0.13		c0.33	c0.17	0.12	0.02		0.08	c0.27		0.07
v/s Ratio Perm						0.11			0.06			0.11
v/c Ratio	0.82	0.99		1.03	0.71	0.37	0.05		0.26	0.86		0.33
Uniform Delay, d1	47.0	54.0		42.0	43.6	15.0	28.7		15.7	39.8		16.9
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00		1.00
Incremental Delay, d2	7.2	31.4		34.4	1.9	0.0	0.0		0.0	5.0		0.2
Delay (s)	54.2	85.4		76.5	45.5	15.1	28.7		15.7	44.8		17.2
Level of Service	D	F		E	D	B	C		B	D		B
Approach Delay (s)		70.6			50.9			17.4			40.2	
Approach LOS		E			D			B			D	
Intersection Summary												
HCM 2000 Control Delay			49.5			HCM 2000 Level of Service			D			
HCM 2000 Volume to Capacity ratio			0.98									
Actuated Cycle Length (s)			124.2			Sum of lost time (s)			29.6			
Intersection Capacity Utilization			89.8%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												

Intersection

Intersection Delay, s/veh 14.1

Intersection LOS B

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	160	170	194	158	129	124
Future Vol, veh/h	160	170	194	158	129	124
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	193	205	234	190	155	149
Number of Lanes	1	0	1	1	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	2	1	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	1	1
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	1	0	2
HCM Control Delay	15.5	12.8	14.2
HCM LOS	C	B	B

Lane	NBLn1	EBLn1	WBLn1	WBLn2
Vol Left, %	51%	0%	100%	0%
Vol Thru, %	0%	48%	0%	100%
Vol Right, %	49%	52%	0%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	253	330	194	158
LT Vol	129	0	194	0
Through Vol	0	160	0	158
RT Vol	124	170	0	0
Lane Flow Rate	305	398	234	190
Geometry Grp	2	5	7	7
Degree of Util (X)	0.488	0.583	0.421	0.316
Departure Headway (Hd)	5.759	5.275	6.485	5.977
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	625	684	554	600
Service Time	3.806	3.318	4.232	3.724
HCM Lane V/C Ratio	0.488	0.582	0.422	0.317
HCM Control Delay	14.2	15.5	13.9	11.5
HCM Lane LOS	B	C	B	B
HCM 95th-tile Q	2.7	3.8	2.1	1.4

HCM 2010 Signalized Intersection Summary

13: Astrid Dr/Cleaveland Rd & Boyd Rd

06/13/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	163	480	57	23	352	58	46	114	56	79	246	462
Future Volume (veh/h)	163	480	57	23	352	58	46	114	56	79	246	462
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	199	585	68	28	429	54	56	139	40	96	300	526
Adj No. of Lanes	1	1	0	1	1	1	1	2	0	1	1	1
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	675	972	113	35	425	362	72	562	157	119	425	358
Arrive On Green	0.38	0.59	0.59	0.02	0.23	0.23	0.04	0.21	0.21	0.07	0.23	0.23
Sat Flow, veh/h	1774	1639	190	1774	1863	1583	1774	2735	763	1774	1863	1566
Grp Volume(v), veh/h	199	0	653	28	429	54	56	88	91	96	300	526
Grp Sat Flow(s),veh/h/ln	1774	0	1829	1774	1863	1583	1774	1770	1728	1774	1863	1566
Q Serve(g_s), s	10.3	0.0	29.7	2.1	30.0	3.6	4.1	5.5	5.8	7.0	19.5	30.0
Cycle Q Clear(g_c), s	10.3	0.0	29.7	2.1	30.0	3.6	4.1	5.5	5.8	7.0	19.5	30.0
Prop In Lane	1.00		0.10	1.00		1.00	1.00		0.44	1.00		1.00
Lane Grp Cap(c), veh/h	675	0	1085	35	425	362	72	364	355	119	425	358
V/C Ratio(X)	0.29	0.00	0.60	0.79	1.01	0.15	0.77	0.24	0.26	0.80	0.71	1.47
Avail Cap(c_a), veh/h	675	0	1085	270	425	362	270	404	395	405	425	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	0.00	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	28.4	0.0	16.9	64.1	50.7	40.5	62.4	43.6	43.7	60.4	46.6	50.7
Incr Delay (d2), s/veh	1.1	0.0	2.5	13.7	45.7	0.1	6.5	1.2	1.4	4.7	8.3	226.5
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(50%),veh/ln	5.2	0.0	15.6	1.1	20.8	1.6	2.2	2.8	2.9	3.6	11.0	35.5
LnGrp Delay(d),s/veh	29.5	0.0	19.4	77.8	96.4	40.6	68.9	44.9	45.1	65.1	54.9	277.2
LnGrp LOS	C		B	E	F	D	E	D	D	E	D	F
Approach Vol, veh/h	852					511		235		922		
Approach Delay, s/veh	21.8					89.5		50.7		182.8		
Approach LOS	C					F		D		F		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	12.3	31.0	6.1	81.9	9.4	34.0	54.0	34.0				
Change Period (Y+Rc), s	3.5	4.0	3.5	4.0	4.0	4.0	4.0	4.0				
Max Green Setting (G_max), s	30.0	30.0	20.0	50.0	20.0	30.0	50.0	30.0				
Max Q Clear Time (g_c+1/3), s	19.0	7.8	4.1	31.7	6.1	32.0	12.3	32.0				
Green Ext Time (p_c), s	0.1	2.2	0.0	6.3	0.0	0.0	1.0	0.0				
Intersection Summary												
HCM 2010 Ctrl Delay			97.1									
HCM 2010 LOS			F									

Intersection												
Int Delay, s/veh	2.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	140	474	3	5	398	30	0	2	34	3	0	51
Future Vol, veh/h	140	474	3	5	398	30	0	2	34	3	0	51
Conflicting Peds, #/hr	3	0	0	0	0	3	3	0	1	1	0	3
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	105	-	-	75	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	87	87	87	87	87	87	87	87	87	87	87	87
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	161	545	3	6	457	34	0	2	39	3	0	59
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	494	0	0	548	0	0	1388	1375	548	1379	1359	480
Stage 1	-	-	-	-	-	-	869	869	-	489	489	-
Stage 2	-	-	-	-	-	-	519	506	-	890	870	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1070	-	-	1021	-	-	120	145	536	122	149	586
Stage 1	-	-	-	-	-	-	347	369	-	561	549	-
Stage 2	-	-	-	-	-	-	540	540	-	337	369	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1067	-	-	1021	-	-	95	122	535	98	125	583
Mov Cap-2 Maneuver	-	-	-	-	-	-	95	122	-	98	125	-
Stage 1	-	-	-	-	-	-	295	313	-	475	544	-
Stage 2	-	-	-	-	-	-	481	535	-	263	313	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	2			0.1			13.8			14.1		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	450	1067	-	-	1021	-	-	457				
HCM Lane V/C Ratio	0.092	0.151	-	-	0.006	-	-	0.136				
HCM Control Delay (s)	13.8	9	-	-	8.5	-	-	14.1				
HCM Lane LOS	B	A	-	-	A	-	-	B				
HCM 95th %tile Q(veh)	0.3	0.5	-	-	0	-	-	0.5				

HCM 2010 Signalized Intersection Summary

15: Contra Costa Blvd & Boyd Rd

06/13/2019

																		
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR						
Lane Configurations																		
Traffic Volume (veh/h)	301	7	196	0	1	7	173	523	32	29	1319	251						
Future Volume (veh/h)	301	7	196	0	1	7	173	523	32	29	1319	251						
Number	7	4	14	3	8	18	5	2	12	1	6	16						
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0						
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00						
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00						
Adj Sat Flow, veh/h/ln	1863	1863	1863	1900	1863	1900	1863	1863	1900	1863	1863	1863						
Adj Flow Rate, veh/h	337	0	101	0	1	5	190	575	34	32	1449	273						
Adj No. of Lanes	2	0	1	0	1	0	1	3	0	1	3	1						
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91						
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2						
Cap, veh/h	435	0	194	0	2	10	220	782	46	970	2960	922						
Arrive On Green	0.12	0.00	0.12	0.00	0.01	0.01	0.12	0.16	0.16	0.18	0.19	0.19						
Sat Flow, veh/h	3548	0	1583	0	271	1353	1774	4913	289	1774	5085	1583						
Grp Volume(v), veh/h	337	0	101	0	0	6	190	396	213	32	1449	273						
Grp Sat Flow(s),veh/h/ln	1774	0	1583	0	0	1624	1774	1695	1812	1774	1695	1583						
Q Serve(g_s), s	10.1	0.0	6.6	0.0	0.0	0.4	11.6	12.2	12.3	1.6	28.0	16.2						
Cycle Q Clear(g_c), s	10.1	0.0	6.6	0.0	0.0	0.4	11.6	12.2	12.3	1.6	28.0	16.2						
Prop In Lane	1.00		1.00	0.00		0.83	1.00		0.16	1.00		1.00						
Lane Grp Cap(c), veh/h	435	0	194	0	0	12	220	539	288	970	2960	922						
V/C Ratio(X)	0.77	0.00	0.52	0.00	0.00	0.49	0.86	0.73	0.74	0.03	0.49	0.30						
Avail Cap(c_a), veh/h	613	0	273	0	0	413	242	709	379	970	2960	922						
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33						
Upstream Filter(I)	1.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	0.77	0.77	0.77						
Uniform Delay (d), s/veh	46.8	0.0	45.2	0.0	0.0	54.4	47.3	44.0	44.1	21.1	29.9	25.1						
Incr Delay (d2), s/veh	5.1	0.0	3.0	0.0	0.0	26.6	25.8	8.6	15.7	0.0	0.4	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(50%),veh/ln	5.3	0.0	3.0	0.0	0.0	0.3	7.2	6.4	7.4	0.8	13.2	7.3						
LnGrp Delay(d),s/veh	51.8	0.0	48.3	0.0	0.0	81.0	73.1	52.6	59.8	21.1	30.3	25.8						
LnGrp LOS	D		D			F	E	D	E	C	C	C						
Approach Vol, veh/h	438				6			799			1754							
Approach Delay, s/veh	51.0				81.0			59.4			29.4							
Approach LOS	D				F			E			C							
Timer	1	2	3	4	5	6	7	8										
Assigned Phs	1	2			4	5	6	8										
Phs Duration (G+Y+Rc), s	65.2	22.5			17.5	18.6	69.0	4.8										
Change Period (Y+Rc), s	5.0	* 5			4.0	5.0	5.0	4.0										
Max Green Setting (Gmax), s	23.0	* 23			19.0	15.0	30.0	28.0										
Max Q Clear Time (g_c+I1), s	3.6	14.3			12.1	13.6	30.0	2.4										
Green Ext Time (p_c), s	0.0	3.2			1.4	0.1	0.0	0.0										
Intersection Summary																		
HCM 2010 Ctrl Delay	40.7																	
HCM 2010 LOS	D																	
Notes																		

HCM 2010 Signalized Intersection Summary

16: Contra Costa Blvd & Astrid Dr

06/13/2019

								
Movement	EBL	EBR	NBL	NBT	SBT	SBR		
Lane Configurations								
Traffic Volume (veh/h)	30	113	44	211	1068	41		
Future Volume (veh/h)	30	113	44	211	1068	41		
Number	7	14	5	2	6	16		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863		
Adj Flow Rate, veh/h	31	35	46	220	1112	40		
Adj No. of Lanes	1	1	1	2	2	1		
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96		
Percent Heavy Veh, %	2	2	2	2	2	2		
Cap, veh/h	68	61	75	2344	1605	717		
Arrive On Green	0.04	0.04	0.04	0.66	0.45	0.45		
Sat Flow, veh/h	1774	1583	1774	3632	3632	1582		
Grp Volume(v), veh/h	31	35	46	220	1112	40		
Grp Sat Flow(s),veh/h/ln	1774	1583	1774	1770	1770	1582		
Q Serve(g_s), s	0.5	0.7	0.8	0.7	7.5	0.4		
Cycle Q Clear(g_c), s	0.5	0.7	0.8	0.7	7.5	0.4		
Prop In Lane	1.00	1.00	1.00			1.00		
Lane Grp Cap(c), veh/h	68	61	75	2344	1605	717		
V/C Ratio(X)	0.46	0.58	0.61	0.09	0.69	0.06		
Avail Cap(c_a), veh/h	1180	1053	2065	4121	2355	1052		
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	14.1	14.2	14.1	1.8	6.5	4.6		
Incr Delay (d2), s/veh	1.8	3.2	10.9	0.0	0.2	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	0.3	0.6	0.6	0.3	3.6	0.2		
LnGrp Delay(d),s/veh	15.9	17.4	25.0	1.9	6.7	4.6		
LnGrp LOS	B	B	C	A	A	A		
Approach Vol, veh/h	66			266	1152			
Approach Delay, s/veh	16.7			5.9	6.7			
Approach LOS	B			A	A			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		24.9		5.2	6.3	18.6		
Change Period (Y+Rc), s		5.0		4.0	5.0	* 5		
Max Green Setting (Gmax), s		35.0		20.0	35.0	* 20		
Max Q Clear Time (g_c+I1), s		2.7		2.7	2.8	9.5		
Green Ext Time (p_c), s		2.0		0.1	0.2	4.1		
Intersection Summary								
HCM 2010 Ctrl Delay			7.0					
HCM 2010 LOS			A					
Notes								

HCM 2010 Signalized Intersection Summary

1: Contra Costa Blvd & Woodsworth Ln/Pleasant Hill Plaza Way

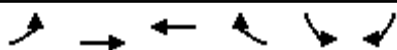
06/13/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	129	24	67	153	67	150	96	1338	8	130	849	105
Future Volume (veh/h)	129	24	67	153	67	150	96	1338	8	130	849	105
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.97	1.00		0.95
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1900	1863	1863	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	132	24	41	156	68	67	98	1365	8	133	866	92
Adj No. of Lanes	1	1	0	0	1	1	1	2	0	1	2	1
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	194	67	114	194	84	241	530	1818	11	161	1017	430
Arrive On Green	0.11	0.11	0.11	0.15	0.15	0.15	0.40	0.67	0.67	0.09	0.29	0.29
Sat Flow, veh/h	1774	610	1042	1254	546	1559	1774	3607	21	1774	3539	1496
Grp Volume(v), veh/h	132	0	65	224	0	67	98	670	703	133	866	92
Grp Sat Flow(s),veh/h/ln	1774	0	1651	1800	0	1559	1774	1770	1858	1774	1770	1496
Q Serve(g_s), s	8.6	0.0	4.4	14.4	0.0	4.6	4.3	30.1	30.2	8.8	27.7	5.6
Cycle Q Clear(g_c), s	8.6	0.0	4.4	14.4	0.0	4.6	4.3	30.1	30.2	8.8	27.7	5.6
Prop In Lane	1.00		0.63	0.70		1.00	1.00		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	194	0	180	278	0	241	530	892	937	161	1017	430
V/C Ratio(X)	0.68	0.00	0.36	0.81	0.00	0.28	0.18	0.75	0.75	0.83	0.85	0.21
Avail Cap(c_a), veh/h	414	0	385	420	0	364	530	892	937	177	1062	449
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.33	1.33	1.33	1.00	1.00	1.00
Upstream Filter(I)	0.70	0.00	0.70	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	51.4	0.0	49.6	49.0	0.0	44.8	26.6	14.8	14.8	53.6	40.3	32.5
Incr Delay (d2), s/veh	2.9	0.0	0.8	6.7	0.0	0.6	0.2	5.8	5.5	24.7	9.0	1.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.4	0.0	2.0	7.7	0.0	2.0	2.1	15.8	16.6	5.4	14.9	2.5
LnGrp Delay(d),s/veh	54.4	0.0	50.4	55.7	0.0	45.4	26.8	20.6	20.3	78.3	49.3	33.6
LnGrp LOS	D		D	E		D	C	C	C	E	D	C
Approach Vol, veh/h		197			291			1471			1091	
Approach Delay, s/veh		53.1			53.3			20.8			51.5	
Approach LOS		D			D			C			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	14.9	65.5		17.1	40.9	39.5		22.5				
Change Period (Y+Rc), s	4.0	5.0		4.0	5.0	* 5		4.0				
Max Green Setting (Gmax), s	12.0	35.0		28.0	11.0	* 36		28.0				
Max Q Clear Time (g_c+I1), s	10.8	32.2		10.6	6.3	29.7		16.4				
Green Ext Time (p_c), s	0.0	2.7		0.6	0.1	4.8		1.2				
Intersection Summary												
HCM 2010 Ctrl Delay			37.0									
HCM 2010 LOS			D									
Notes												

HCM 2010 Signalized Intersection Summary

2: Gregory Ln & Elinora Dr

06/13/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR		
Lane Configurations		↑↑	↑↑		↑↑			
Traffic Volume (veh/h)	83	719	750	146	62	49		
Future Volume (veh/h)	83	719	750	146	62	49		
Number	7	4	8	18	1	16		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00			0.98	1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1900	1863	1863	1900	1863	1900		
Adj Flow Rate, veh/h	86	749	781	152	65	51		
Adj No. of Lanes	0	2	2	0	0	0		
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96		
Percent Heavy Veh, %	2	2	2	2	0	0		
Cap, veh/h	238	1303	1336	260	184	144		
Arrive On Green	0.45	0.45	0.45	0.45	0.20	0.20		
Sat Flow, veh/h	152	2955	3036	573	936	734		
Grp Volume(v), veh/h	414	421	470	463	117	0		
Grp Sat Flow(s),veh/h/ln	1412	1610	1770	1746	1685	0		
Q Serve(g_s), s	0.4	5.0	5.1	5.1	1.5	0.0		
Cycle Q Clear(g_c), s	5.5	5.0	5.1	5.1	1.5	0.0		
Prop In Lane	0.21			0.33	0.56	0.44		
Lane Grp Cap(c), veh/h	810	731	803	793	331	0		
V/C Ratio(X)	0.51	0.58	0.58	0.58	0.35	0.00		
Avail Cap(c_a), veh/h	1128	1127	1238	1221	1179	0		
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	0.00		
Uniform Delay (d), s/veh	4.9	5.2	5.2	5.2	8.9	0.0		
Incr Delay (d2), s/veh	0.5	0.7	0.7	0.7	0.6	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	2.1	2.3	2.5	2.5	0.8	0.0		
LnGrp Delay(d),s/veh	5.4	5.9	5.9	5.9	9.6	0.0		
LnGrp LOS	A	A	A	A	A			
Approach Vol, veh/h		835	933		117			
Approach Delay, s/veh		5.7	5.9		9.6			
Approach LOS		A	A		A			
Timer	1	2	3	4	5	6	7	8
Assigned Phs				4		6		8
Phs Duration (G+Y+Rc), s				16.2		9.5		16.2
Change Period (Y+Rc), s				4.5		4.5		4.5
Max Green Setting (Gmax), s				18.0		18.0		18.0
Max Q Clear Time (g_c+I1), s				7.5		3.5		7.1
Green Ext Time (p_c), s				4.1		0.2		4.4
Intersection Summary								
HCM 2010 Ctrl Delay		6.0						
HCM 2010 LOS		A						
Notes								

HCM 2010 Signalized Intersection Summary

3: Cleaveland Rd/Woodsworth Ln & Gregory Ln

06/13/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	121	425	258	90	504	40	299	129	42	25	119	111
Future Volume (veh/h)	121	425	258	90	504	40	299	129	42	25	119	111
Number	5	2	12	1	6	16	3	8	18	7	4	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		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1863	1900	1863	1863
Adj Flow Rate, veh/h	123	434	214	92	514	39	218	253	35	26	121	99
Adj No. of Lanes	1	2	0	1	2	0	1	1	1	0	1	1
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	632	1107	541	130	656	50	292	306	256	34	159	163
Arrive On Green	0.36	0.48	0.48	0.07	0.20	0.20	0.16	0.16	0.16	0.10	0.10	0.10
Sat Flow, veh/h	1774	2307	1127	1774	3335	252	1774	1863	1558	327	1520	1558
Grp Volume(v), veh/h	123	332	316	92	272	281	218	253	35	147	0	99
Grp Sat Flow(s),veh/h/ln	1774	1770	1664	1774	1770	1818	1774	1863	1558	1846	0	1558
Q Serve(g_s), s	4.3	10.8	11.0	4.6	13.1	13.2	10.5	11.8	1.7	7.0	0.0	5.5
Cycle Q Clear(g_c), s	4.3	10.8	11.0	4.6	13.1	13.2	10.5	11.8	1.7	7.0	0.0	5.5
Prop In Lane	1.00		0.68	1.00		0.14	1.00		1.00	0.18		1.00
Lane Grp Cap(c), veh/h	632	849	798	130	348	358	292	306	256	193	0	163
V/C Ratio(X)	0.19	0.39	0.40	0.71	0.78	0.78	0.75	0.83	0.14	0.76	0.00	0.61
Avail Cap(c_a), veh/h	632	849	798	177	413	424	453	476	398	390	0	329
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.79	0.79	0.79	1.00	1.00	1.00	1.00	1.00	1.00	0.80	0.00	0.80
Uniform Delay (d), s/veh	20.0	15.0	15.0	40.8	34.3	34.3	35.8	36.4	32.1	39.2	0.0	38.5
Incr Delay (d2), s/veh	0.0	1.1	1.2	3.8	15.9	15.8	1.4	3.7	0.1	1.9	0.0	1.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.1	5.5	5.3	2.4	8.0	8.2	5.3	6.4	0.7	3.7	0.0	2.4
LnGrp Delay(d),s/veh	20.1	16.1	16.2	44.5	50.2	50.1	37.3	40.0	32.2	41.0	0.0	39.6
LnGrp LOS	C	B	B	D	D	D	D	D	C	D		D
Approach Vol, veh/h	771				645		506				246	
Approach Delay, s/veh	16.8				49.4		38.3				40.5	
Approach LOS	B				D		D				D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2			4	5	6	8				
Phs Duration (G+Y+Rc), s	10.6	47.2			13.4	36.1	21.7	18.8				
Change Period (Y+Rc), s	4.0	4.0			4.0	4.0	4.0	4.0				
Max Green Setting (Gmax), s	23.0	23.0			19.0	11.0	21.0	23.0				
Max Q Clear Time (g_c+I), s	13.0	13.0			9.0	6.3	15.2	13.8				
Green Ext Time (p_c), s	0.0	4.5			0.5	0.1	2.5	1.0				
Intersection Summary												
HCM 2010 Ctrl Delay	34.2											
HCM 2010 LOS	C											
Notes												

Intersection												
Int Delay, s/veh	1.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑			↕				↗
Traffic Vol, veh/h	0	495	10	48	596	19	5	1	55	0	0	34
Future Vol, veh/h	0	495	10	48	596	19	5	1	55	0	0	34
Conflicting Peds, #/hr	12	0	5	5	0	12	2	0	0	0	0	2
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	120	-	-	-	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	98	98	98	98	98	98	98	98	98	98	98	98
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	505	10	49	608	19	5	1	56	0	0	35
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	-	0	0	520	0	0	919	1252	263	-	-	328
Stage 1	-	-	-	-	-	-	515	515	-	-	-	-
Stage 2	-	-	-	-	-	-	404	737	-	-	-	-
Critical Hdwy	-	-	-	4.14	-	-	7.54	6.54	6.94	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	-	-	-
Follow-up Hdwy	-	-	-	2.22	-	-	3.52	4.02	3.32	-	-	3.32
Pot Cap-1 Maneuver	0	-	-	1042	-	-	226	171	735	0	0	668
Stage 1	0	-	-	-	-	-	511	533	-	0	0	-
Stage 2	0	-	-	-	-	-	594	423	-	0	0	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	-	-	-	1037	-	-	205	160	732	-	-	659
Mov Cap-2 Maneuver	-	-	-	-	-	-	205	160	-	-	-	-
Stage 1	-	-	-	-	-	-	511	530	-	-	-	-
Stage 2	-	-	-	-	-	-	535	399	-	-	-	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			0.6			12			10.8		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	WBR	SBLn1					
Capacity (veh/h)	577	-	-	1037	-	-	659					
HCM Lane V/C Ratio	0.108	-	-	0.047	-	-	0.053					
HCM Control Delay (s)	12	-	-	8.6	-	-	10.8					
HCM Lane LOS	B	-	-	A	-	-	B					
HCM 95th %tile Q(veh)	0.4	-	-	0.1	-	-	0.2					

HCM Signalized Intersection Capacity Analysis

5: Contra Costa Blvd & Gregory Ln/I-680 SB Off-Ramp

06/13/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	222	0	388	169	356	243	228	1204	0	33	1013	143
Future Volume (vph)	222	0	388	169	356	243	228	1204	0	33	1013	143
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0	4.0	5.0		4.0	5.0	5.0
Lane Util. Factor	0.97		1.00	1.00	1.00	1.00	0.97	0.91		1.00	0.95	1.00
Frpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	0.99
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00		0.85	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95		1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3433		1583	1770	1863	1583	3433	5085		1770	3539	1563
Flt Permitted	0.95		1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	3433		1583	1770	1863	1583	3433	5085		1770	3539	1563
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	231	0	404	176	371	253	238	1254	0	34	1055	149
RTOR Reduction (vph)	0	0	109	0	0	153	0	0	0	0	0	90
Lane Group Flow (vph)	231	0	295	176	371	100	238	1254	0	34	1055	59
Confl. Bikes (#/hr)									1			1
Turn Type	Split		pm+ov	Split	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	4	4	5	3	3		5	2		1	6	
Permitted Phases			4			3						6
Actuated Green, G (s)	13.4		23.8	31.7	31.7	31.7	10.4	49.3		8.6	47.5	47.5
Effective Green, g (s)	13.4		23.8	31.7	31.7	31.7	10.4	49.3		8.6	47.5	47.5
Actuated g/C Ratio	0.11		0.20	0.26	0.26	0.26	0.09	0.41		0.07	0.40	0.40
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0	4.0	5.0		4.0	5.0	5.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0	3.0	4.0		3.0	4.0	4.0
Lane Grp Cap (vph)	383		313	467	492	418	297	2089		126	1400	618
v/s Ratio Prot	0.07		c0.08	0.10	c0.20		0.07	0.25		0.02	c0.30	
v/s Ratio Perm			0.10			0.06						0.04
v/c Ratio	0.60		0.94	0.38	0.75	0.24	0.80	0.60		0.27	0.75	0.10
Uniform Delay, d1	50.8		47.4	36.1	40.6	34.7	53.8	27.6		52.7	31.2	22.8
Progression Factor	1.00		1.00	1.00	1.00	1.00	1.30	0.79		0.62	0.45	0.26
Incremental Delay, d2	2.7		35.8	0.5	6.5	0.3	13.3	1.2		1.0	3.3	0.3
Delay (s)	53.4		83.2	36.6	47.0	35.0	83.3	23.0		33.6	17.5	6.1
Level of Service	D		F	D	D	C	F	C		C	B	A
Approach Delay (s)		72.4			40.9			32.6			16.5	
Approach LOS		E			D			C			B	
Intersection Summary												
HCM 2000 Control Delay			35.5									HCM 2000 Level of Service D
HCM 2000 Volume to Capacity ratio			0.80									
Actuated Cycle Length (s)			120.0									Sum of lost time (s) 17.0
Intersection Capacity Utilization			73.7%									ICU Level of Service D
Analysis Period (min)			15									
c Critical Lane Group												

Intersection						
Int Delay, s/veh	1.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	27	48	433	17	32	443
Future Vol, veh/h	27	48	433	17	32	443
Conflicting Peds, #/hr	0	1	0	7	7	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	98	98	98	80	98	98
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	28	49	442	21	33	452
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	752	240	0	0	470	0
Stage 1	460	-	-	-	-	-
Stage 2	292	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22	-
Pot Cap-1 Maneuver	346	761	-	-	1088	-
Stage 1	602	-	-	-	-	-
Stage 2	732	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	333	755	-	-	1081	-
Mov Cap-2 Maneuver	333	-	-	-	-	-
Stage 1	598	-	-	-	-	-
Stage 2	709	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	13.2	0		0.6		
HCM LOS	B					
Minor Lane/Major Mvmt	NBT	NBRWBLn1		SBL	SBT	
Capacity (veh/h)	-	-	518	1081	-	
HCM Lane V/C Ratio	-	-	0.148	0.03	-	
HCM Control Delay (s)	-	-	13.2	8.4	-	
HCM Lane LOS	-	-	B	A	-	
HCM 95th %tile Q(veh)	-	-	0.5	0.1	-	

HCM 2010 Signalized Intersection Summary

7: Contra Costa Blvd & Crescent Dr

06/13/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	50	9	105	141	11	117	64	1325	78	32	1317	98
Future Volume (veh/h)	50	9	105	141	11	117	64	1325	78	32	1317	98
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.98	0.98		0.98	1.00		0.97	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1863	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	52	9	40	147	11	65	67	1380	81	33	1372	100
Adj No. of Lanes	0	1	1	1	1	0	1	3	0	1	2	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	264	41	340	253	50	298	421	1739	102	565	1454	106
Arrive On Green	0.22	0.22	0.22	0.22	0.22	0.22	0.48	0.71	0.71	0.64	0.87	0.87
Sat Flow, veh/h	950	189	1551	1329	230	1359	1774	4905	288	1774	3341	243
Grp Volume(v), veh/h	61	0	40	147	0	76	67	954	507	33	724	748
Grp Sat Flow(s),veh/h/ln	1139	0	1551	1329	0	1589	1774	1695	1803	1774	1770	1814
Q Serve(g_s), s	4.1	0.0	2.5	12.8	0.0	4.7	2.6	22.5	22.5	0.8	35.1	36.5
Cycle Q Clear(g_c), s	8.8	0.0	2.5	21.6	0.0	4.7	2.6	22.5	22.5	0.8	35.1	36.5
Prop In Lane	0.85		1.00	1.00		0.86	1.00		0.16	1.00		0.13
Lane Grp Cap(c), veh/h	305	0	340	253	0	348	421	1202	639	565	770	789
V/C Ratio(X)	0.20	0.00	0.12	0.58	0.00	0.22	0.16	0.79	0.79	0.06	0.94	0.95
Avail Cap(c_a), veh/h	426	0	478	372	0	490	421	1667	887	565	870	892
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00
Upstream Filter(I)	0.98	0.00	0.98	1.00	0.00	1.00	0.87	0.87	0.87	0.56	0.56	0.56
Uniform Delay (d), s/veh	41.5	0.0	37.6	49.3	0.0	38.4	24.7	14.5	14.5	15.0	6.7	6.8
Incr Delay (d2), s/veh	0.4	0.0	0.2	3.0	0.0	0.4	0.2	4.8	8.6	0.0	13.7	14.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.8	0.0	1.1	4.9	0.0	2.1	1.2	10.9	12.2	0.4	18.2	19.3
LnGrp Delay(d),s/veh	41.9	0.0	37.8	52.2	0.0	38.9	24.8	19.3	23.2	15.0	20.4	21.1
LnGrp LOS	D		D	D		D	C	B	C	B	C	C
Approach Vol, veh/h		101			223			1528			1505	
Approach Delay, s/veh		40.3			47.7			20.8			20.6	
Approach LOS		D			D			C			C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	42.2	47.5		30.3	32.5	57.2		30.3				
Change Period (Y+Rc), s	4.0	5.0		4.0	4.0	5.0		4.0				
Max Green Setting (Gmax), s	11.0	59.0		37.0	11.0	59.0		37.0				
Max Q Clear Time (g_c+I1), s	2.8	24.5		10.8	4.6	38.5		23.6				
Green Ext Time (p_c), s	0.0	18.1		0.6	0.1	13.7		1.1				
Intersection Summary												
HCM 2010 Ctrl Delay			23.1									
HCM 2010 LOS			C									

HCM 2010 Signalized Intersection Summary

8: Cleaveland Rd & Crescent Plaza

06/13/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔	↔		↔			↔	
Traffic Volume (veh/h)	1	1	0	46	0	130	0	323	57	201	267	2
Future Volume (veh/h)	1	1	0	46	0	130	0	323	57	201	267	2
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		1.00	0.98		0.99	1.00		0.96	0.99		0.96
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1900	1900	1863	1863	1900	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	1	1	0	48	0	131	0	336	54	209	278	2
Adj No. of Lanes	0	1	0	0	1	1	0	2	0	0	2	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	335	210	0	587	0	281	0	1356	215	645	847	6
Arrive On Green	0.18	0.18	0.00	0.18	0.00	0.18	0.00	0.45	0.45	0.45	0.45	0.45
Sat Flow, veh/h	458	1174	0	1391	0	1565	0	3136	483	752	1900	14
Grp Volume(v), veh/h	2	0	0	48	0	131	0	194	196	250	0	239
Grp Sat Flow(s),veh/h/ln	1632	0	0	1391	0	1565	0	1770	1756	974	0	1692
Q Serve(g_s), s	0.0	0.0	0.0	0.6	0.0	1.6	0.0	1.5	1.5	3.2	0.0	1.9
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.6	0.0	1.6	0.0	1.5	1.5	4.7	0.0	1.9
Prop In Lane	0.50		0.00	1.00		1.00	0.00		0.28	0.84		0.01
Lane Grp Cap(c), veh/h	546	0	0	587	0	281	0	789	783	744	0	754
V/C Ratio(X)	0.00	0.00	0.00	0.08	0.00	0.47	0.00	0.25	0.25	0.34	0.00	0.32
Avail Cap(c_a), veh/h	1953	0	0	1900	0	1760	0	2322	2304	1666	0	2220
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	0.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	7.2	0.0	0.0	7.4	0.0	7.8	0.0	3.7	3.7	4.8	0.0	3.8
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.1	0.1	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(50%),veh/ln	0.0	0.0	0.0	0.2	0.0	0.7	0.0	0.7	0.7	1.1	0.0	0.9
LnGrp Delay(d),s/veh	7.2	0.0	0.0	7.5	0.0	8.3	0.0	3.7	3.8	4.9	0.0	3.9
LnGrp LOS	A			A		A		A	A	A		A
Approach Vol, veh/h		2			179			390			489	
Approach Delay, s/veh		7.2			8.1			3.7			4.4	
Approach LOS		A			A			A			A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		13.5		7.8		13.5		7.8				
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0				
Max Green Setting (Gmax), s		28.0		24.0		28.0		24.0				
Max Q Clear Time (g_c+I1), s		3.5		2.0		6.7		3.6				
Green Ext Time (p_c), s		1.5		0.0		2.3		0.3				
Intersection Summary												
HCM 2010 Ctrl Delay				4.8								
HCM 2010 LOS				A								

HCM 2010 Signalized Intersection Summary

9: Crescent Dr & Crescent Plaza

06/13/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	24	277	19	56	148	70	22	48	80	72	25	55
Future Volume (veh/h)	24	277	19	56	148	70	22	48	80	72	25	55
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.95		0.92	0.96		0.92	0.94		0.95	0.96		0.92
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1900	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	26	301	21	61	161	76	24	52	87	78	27	60
Adj No. of Lanes	1	1	0	1	1	0	0	1	0	0	1	0
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	556	39	413	377	178	173	274	360	395	154	217
Arrive On Green	0.32	0.32	0.32	0.32	0.32	0.32	0.42	0.42	0.42	0.42	0.42	0.42
Sat Flow, veh/h	1083	1710	119	1011	1161	548	97	653	859	538	367	517
Grp Volume(v), veh/h	26	0	322	61	0	237	163	0	0	165	0	0
Grp Sat Flow(s),veh/h/ln	1083	0	1829	1011	0	1709	1610	0	0	1422	0	0
Q Serve(g_s), s	0.6	0.0	4.5	1.6	0.0	3.4	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	4.0	0.0	4.5	6.2	0.0	3.4	2.0	0.0	0.0	2.0	0.0	0.0
Prop In Lane	1.00		0.07	1.00		0.32	0.15		0.53	0.47		0.36
Lane Grp Cap(c), veh/h	464	0	594	413	0	555	807	0	0	766	0	0
V/C Ratio(X)	0.06	0.00	0.54	0.15	0.00	0.43	0.20	0.00	0.00	0.22	0.00	0.00
Avail Cap(c_a), veh/h	806	0	1171	731	0	1094	2140	0	0	1943	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	9.8	0.0	8.6	11.2	0.0	8.3	5.8	0.0	0.0	5.8	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.3	0.1	0.0	0.2	0.2	0.0	0.0	0.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	2.3	0.5	0.0	1.6	0.9	0.0	0.0	1.0	0.0	0.0
LnGrp Delay(d),s/veh	9.9	0.0	8.9	11.2	0.0	8.5	6.0	0.0	0.0	6.0	0.0	0.0
LnGrp LOS	A		A	B		A	A			A		
Approach Vol, veh/h		348			298			163			165	
Approach Delay, s/veh		9.0			9.0			6.0			6.0	
Approach LOS		A			A			A			A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		17.1		14.2		17.1		14.2				
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0				
Max Green Setting (Gmax), s		40.0		20.0		40.0		20.0				
Max Q Clear Time (g_c+I1), s		4.0		6.5		4.0		8.2				
Green Ext Time (p_c), s		1.5		1.1		1.7		0.9				
Intersection Summary												
HCM 2010 Ctrl Delay				8.0								
HCM 2010 LOS				A								

HCM 2010 Signalized Intersection Summary

10: Contra Costa Blvd & Crescent Plaza/Monument Blvd

06/13/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	44	360	25	211	225	580	73	771	464	779	777	29
Future Volume (veh/h)	44	360	25	211	225	580	73	771	464	779	777	29
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.98	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	45	367	26	215	230	592	74	787	473	795	793	30
Adj No. of Lanes	1	2	0	2	1	2	1	3	1	2	3	1
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	58	503	35	280	371	1593	96	1226	506	1298	2913	902
Arrive On Green	0.03	0.15	0.15	0.08	0.20	0.20	0.02	0.08	0.08	0.38	0.57	0.57
Sat Flow, veh/h	1774	3350	236	3442	1863	2721	1774	5085	1564	3442	5085	1575
Grp Volume(v), veh/h	45	193	200	215	230	592	74	787	473	795	793	30
Grp Sat Flow(s),veh/h/ln	1774	1770	1817	1721	1863	1361	1774	1695	1564	1721	1695	1575
Q Serve(g_s), s	3.0	12.5	12.6	7.3	13.5	2.2	5.0	18.0	22.5	22.4	9.5	1.0
Cycle Q Clear(g_c), s	3.0	12.5	12.6	7.3	13.5	2.2	5.0	18.0	22.5	22.4	9.5	1.0
Prop In Lane	1.00		0.13	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	58	266	273	280	371	1593	96	1226	506	1298	2913	902
V/C Ratio(X)	0.78	0.73	0.73	0.77	0.62	0.37	0.77	0.64	0.94	0.61	0.27	0.03
Avail Cap(c_a), veh/h	163	398	409	516	528	1822	237	1314	533	1298	2913	902
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00
Upstream Filter(I)	0.83	0.83	0.83	0.76	0.76	0.76	0.91	0.91	0.91	0.75	0.75	0.75
Uniform Delay (d), s/veh	57.6	48.6	48.7	54.0	43.9	6.4	58.2	50.2	33.0	30.3	13.0	11.2
Incr Delay (d2), s/veh	16.6	3.2	3.2	3.4	1.3	0.1	11.4	2.4	25.1	0.9	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(50%),veh/ln	1.8	6.3	6.6	3.6	7.1	3.5	2.8	8.7	17.9	10.8	4.5	0.4
LnGrp Delay(d),s/veh	74.2	51.8	51.9	57.4	45.2	6.5	69.6	52.6	58.0	31.2	13.1	11.2
LnGrp LOS	E	D	D	E	D	A	E	D	E	C	B	B
Approach Vol, veh/h	438			1037			1334			1618		
Approach Delay, s/veh	54.1			25.7			55.4			22.0		
Approach LOS	D			C			E			C		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	50.3	33.9	13.8	22.0	10.5	73.7	7.9	27.9				
Change Period (Y+Rc), s	5.0	* 5	4.0	4.0	4.0	5.0	4.0	4.0				
Max Green Setting (Gmax), s	27.6	* 31	18.0	27.0	16.0	42.0	11.0	34.0				
Max Q Clear Time (g_c+24.4), s	24.4	24.5	9.3	14.6	7.0	11.5	5.0	15.5				
Green Ext Time (p_c), s	1.4	4.4	0.4	1.8	0.1	11.3	0.0	3.7				
Intersection Summary												
HCM 2010 Ctrl Delay	36.1											
HCM 2010 LOS	D											
Notes												

HCM Signalized Intersection Capacity Analysis

11: I-680 Ramps & Monument Blvd

06/13/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	643	911	24	586	824	775	72	0	474	1132	0	176
Future Volume (vph)	643	911	24	586	824	775	72	0	474	1132	0	176
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	11.2	8.7		10.2	8.7	8.7	8.7		10.2	9.7		11.2
Lane Util. Factor	0.97	0.91		0.97	0.91	0.88	0.97		0.88	0.94		1.00
Frt	1.00	1.00		1.00	1.00	0.85	1.00		0.85	1.00		0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95		1.00	0.95		1.00
Satd. Flow (prot)	3433	5066		3433	5085	2787	3433		2787	4990		1583
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95		1.00	0.95		1.00
Satd. Flow (perm)	3433	5066		3433	5085	2787	3433		2787	4990		1583
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	663	939	25	604	849	799	74	0	489	1167	0	181
RTOR Reduction (vph)	0	0	0	0	0	47	0	0	0	0	0	0
Lane Group Flow (vph)	663	964	0	604	849	752	74	0	489	1167	0	181
Turn Type	Prot	NA		Prot	NA	custom	Prot		pm+ov	Prot		pm+ov
Protected Phases	5	2		1	6	3	3		1	7		5
Permitted Phases						6			6			7
Actuated Green, G (s)	19.2	19.9		17.3	17.0	40.8	23.8		34.3	22.8		42.0
Effective Green, g (s)	19.2	19.9		17.3	17.0	40.8	23.8		34.3	22.8		42.0
Actuated g/C Ratio	0.22	0.22		0.20	0.19	0.46	0.27		0.39	0.26		0.47
Clearance Time (s)	11.2	8.7		10.2	8.7	8.7	8.7		10.2	9.7		11.2
Vehicle Extension (s)	3.0	2.0		2.0	2.5	2.0	2.0		2.0	3.0		3.0
Lane Grp Cap (vph)	743	1137		670	975	1557	922		1078	1284		750
v/s Ratio Prot	c0.19	c0.19		0.18	0.17	0.13	0.02		0.09	c0.23		0.05
v/s Ratio Perm						0.14			0.09			0.06
v/c Ratio	0.89	0.85		0.90	0.87	0.48	0.08		0.45	0.91		0.24
Uniform Delay, d1	33.7	32.9		34.8	34.7	16.6	24.2		20.2	31.9		13.8
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00		1.00
Incremental Delay, d2	13.0	5.8		15.1	8.5	0.1	0.0		0.1	9.5		0.2
Delay (s)	46.7	38.7		49.9	43.3	16.7	24.2		20.3	41.4		14.0
Level of Service	D	D		D	D	B	C		C	D		B
Approach Delay (s)		42.0			35.6			20.8			37.7	
Approach LOS		D			D			C			D	
Intersection Summary												
HCM 2000 Control Delay			36.4			HCM 2000 Level of Service				D		
HCM 2000 Volume to Capacity ratio			0.93									
Actuated Cycle Length (s)			88.6			Sum of lost time (s)				29.6		
Intersection Capacity Utilization			79.2%			ICU Level of Service				D		
Analysis Period (min)			15									
c Critical Lane Group												

Intersection

Intersection Delay, s/veh30.7

Intersection LOS D

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	190	180	242	144	195	243
Future Vol, veh/h	190	180	242	144	195	243
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	226	214	288	171	232	289
Number of Lanes	1	0	1	1	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	2	1	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	1	1
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	1	0	2
HCM Control Delay	28.9	19.1	42.4
HCM LOS	D	C	E

Lane	NBLn1	EBLn1	WBLn1	WBLn2
Vol Left, %	45%	0%	100%	0%
Vol Thru, %	0%	51%	0%	100%
Vol Right, %	55%	49%	0%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	438	370	242	144
LT Vol	195	0	242	0
Through Vol	0	190	0	144
RT Vol	243	180	0	0
Lane Flow Rate	521	440	288	171
Geometry Grp	2	5	7	7
Degree of Util (X)	0.903	0.783	0.618	0.343
Departure Headway (Hd)	6.232	6.397	7.718	7.204
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	584	564	467	499
Service Time	4.269	4.447	5.477	4.963
HCM Lane V/C Ratio	0.892	0.78	0.617	0.343
HCM Control Delay	42.4	28.9	22.3	13.7
HCM Lane LOS	E	D	C	B
HCM 95th-tile Q	10.9	7.3	4.1	1.5

HCM 2010 Signalized Intersection Summary

13: Astrid Dr/Cleaveland Rd & Boyd Rd

06/13/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	148	262	36	26	178	72	15	108	46	74	111	146
Future Volume (veh/h)	148	262	36	26	178	72	15	108	46	74	111	146
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.97	1.00		0.94	1.00		0.93
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	168	298	36	30	202	46	17	123	25	84	126	161
Adj No. of Lanes	1	1	0	1	1	1	1	2	0	1	1	1
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	898	1064	129	37	307	254	20	324	64	108	291	231
Arrive On Green	0.51	0.66	0.66	0.02	0.17	0.17	0.01	0.11	0.11	0.06	0.16	0.16
Sat Flow, veh/h	1774	1624	196	1774	1863	1540	1774	2914	572	1774	1863	1478
Grp Volume(v), veh/h	168	0	334	30	202	46	17	73	75	84	126	161
Grp Sat Flow(s),veh/h/ln	1774	0	1821	1774	1863	1540	1774	1770	1717	1774	1863	1478
Q Serve(g_s), s	5.1	0.0	7.7	1.7	10.0	2.5	0.9	3.8	4.0	4.6	6.1	10.2
Cycle Q Clear(g_c), s	5.1	0.0	7.7	1.7	10.0	2.5	0.9	3.8	4.0	4.6	6.1	10.2
Prop In Lane	1.00		0.11	1.00		1.00	1.00		0.33	1.00		1.00
Lane Grp Cap(c), veh/h	898	0	1193	37	307	254	20	197	191	108	291	231
V/C Ratio(X)	0.19	0.00	0.28	0.81	0.66	0.18	0.86	0.37	0.39	0.78	0.43	0.70
Avail Cap(c_a), veh/h	898	0	1193	359	565	468	359	537	521	539	565	449
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	13.3	0.0	7.2	48.2	38.6	35.5	48.8	40.7	40.8	45.7	37.8	39.5
Incr Delay (d2), s/veh	0.5	0.0	0.6	14.1	0.9	0.1	30.3	4.2	4.7	4.4	3.7	12.9
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(50%),veh/ln	2.6	0.0	4.0	1.0	5.2	1.1	0.6	2.1	2.1	2.4	3.4	5.0
LnGrp Delay(d),s/veh	13.8	0.0	7.8	62.3	39.5	35.6	79.1	44.9	45.5	50.1	41.4	52.4
LnGrp LOS	B		A	E	D	D	E	D	D	D	D	D
Approach Vol, veh/h	502				278				165		371	
Approach Delay, s/veh	9.8				41.4				48.7		48.2	
Approach LOS	A				D				D		D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	9.5	15.0	5.6	68.7	5.1	19.4	54.0	20.3				
Change Period (Y+Rc), s	3.5	4.0	3.5	4.0	4.0	4.0	4.0	4.0				
Max Green Setting (Gmax), s	30.0	30.0	20.0	50.0	20.0	30.0	50.0	30.0				
Max Q Clear Time (g_c+I), s	10.6	6.0	3.7	9.7	2.9	12.2	7.1	12.0				
Green Ext Time (p_c), s	0.1	1.8	0.0	3.5	0.0	3.0	0.9	0.8				
Intersection Summary												
HCM 2010 Ctrl Delay			32.2									
HCM 2010 LOS			C									

Intersection												
Int Delay, s/veh	2.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	39	350	2	10	245	59	5	2	18	38	1	22
Future Vol, veh/h	39	350	2	10	245	59	5	2	18	38	1	22
Conflicting Peds, #/hr	8	0	5	5	0	8	7	0	3	3	0	7
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	105	-	-	75	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	41	372	2	11	261	63	5	2	19	40	1	23

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	332	0	0	379	0	0	794	814	381	792	784	308
Stage 1	-	-	-	-	-	-	460	460	-	323	323	-
Stage 2	-	-	-	-	-	-	334	354	-	469	461	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1227	-	-	1179	-	-	306	312	666	307	325	732
Stage 1	-	-	-	-	-	-	581	566	-	689	650	-
Stage 2	-	-	-	-	-	-	680	630	-	575	565	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1218	-	-	1173	-	-	282	295	661	284	307	722
Mov Cap-2 Maneuver	-	-	-	-	-	-	282	295	-	284	307	-
Stage 1	-	-	-	-	-	-	559	544	-	661	639	-
Stage 2	-	-	-	-	-	-	646	619	-	536	543	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.8			0.3			12.9			17		
HCM LOS							B			C		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	483	1218	-	-	1173	-	-	364
HCM Lane V/C Ratio	0.055	0.034	-	-	0.009	-	-	0.178
HCM Control Delay (s)	12.9	8.1	-	-	8.1	-	-	17
HCM Lane LOS	B	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	0.2	0.1	-	-	0	-	-	0.6

HCM 2010 Signalized Intersection Summary

15: Contra Costa Blvd & Boyd Rd

06/13/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	206	2	190	38	13	60	213	1025	3	31	890	143
Future Volume (veh/h)	206	2	190	38	13	60	213	1025	3	31	890	143
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1900	1863	1900	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	227	0	95	42	14	63	234	1126	2	34	978	154
Adj No. of Lanes	2	0	1	0	1	0	1	3	0	1	3	1
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	325	0	145	53	18	79	267	1456	3	694	2637	821
Arrive On Green	0.09	0.00	0.09	0.09	0.09	0.09	0.15	0.28	0.28	0.13	0.17	0.17
Sat Flow, veh/h	3548	0	1583	592	197	888	1774	5242	9	1774	5085	1583
Grp Volume(v), veh/h	227	0	95	119	0	0	234	728	400	34	978	154
Grp Sat Flow(s),veh/h/ln	1774	0	1583	1677	0	0	1774	1695	1861	1774	1695	1583
Q Serve(g_s), s	7.4	0.0	7.0	8.4	0.0	0.0	15.5	23.7	23.7	2.0	20.4	10.0
Cycle Q Clear(g_c), s	7.4	0.0	7.0	8.4	0.0	0.0	15.5	23.7	23.7	2.0	20.4	10.0
Prop In Lane	1.00		1.00	0.35		0.53	1.00		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	325	0	145	149	0	0	267	941	517	694	2637	821
V/C Ratio(X)	0.70	0.00	0.65	0.80	0.00	0.00	0.88	0.77	0.77	0.05	0.37	0.19
Avail Cap(c_a), veh/h	769	0	343	377	0	0	370	1102	605	694	2637	821
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	0.95	0.95	0.95
Uniform Delay (d), s/veh	52.9	0.0	52.7	53.6	0.0	0.0	49.9	39.9	39.9	32.7	32.4	28.1
Incr Delay (d2), s/veh	3.8	0.0	6.9	9.3	0.0	0.0	17.7	6.2	10.8	0.0	0.4	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(50%),veh/ln	3.8	0.0	3.3	4.3	0.0	0.0	8.9	11.9	13.8	1.0	9.7	4.5
LnGrp Delay(d),s/veh	56.7	0.0	59.6	62.8	0.0	0.0	67.5	46.0	50.6	32.7	32.8	28.6
LnGrp LOS	E		E	E			E	D	D	C	C	C
Approach Vol, veh/h	322			119			1362			1166		
Approach Delay, s/veh	57.5			62.8			51.1			32.2		
Approach LOS	E			E			D			C		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	52.0	38.3		15.0	23.1	67.2		14.7				
Change Period (Y+Rc), s	5.0	* 5		4.0	5.0	5.0		4.0				
Max Green Setting (Gmax), s	11.0	* 39		26.0	25.0	24.0		27.0				
Max Q Clear Time (g_c+I1), s	4.0	25.7		9.4	17.5	22.4		10.4				
Green Ext Time (p_c), s	0.0	7.6		1.6	0.6	1.2		0.5				
Intersection Summary												
HCM 2010 Ctrl Delay	44.8											
HCM 2010 LOS	D											
Notes												

HCM 2010 Signalized Intersection Summary

16: Contra Costa Blvd & Astrid Dr

06/13/2019

								
Movement	EBL	EBR	NBL	NBT	SBT	SBR		
Lane Configurations								
Traffic Volume (veh/h)	47	65	136	798	483	40		
Future Volume (veh/h)	47	65	136	798	483	40		
Number	7	14	5	2	6	16		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			0.97		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863		
Adj Flow Rate, veh/h	53	22	153	897	543	44		
Adj No. of Lanes	1	1	1	2	2	1		
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89		
Percent Heavy Veh, %	2	2	2	2	2	2		
Cap, veh/h	81	72	221	2158	1038	451		
Arrive On Green	0.05	0.05	0.12	0.61	0.29	0.29		
Sat Flow, veh/h	1774	1583	1774	3632	3632	1536		
Grp Volume(v), veh/h	53	22	153	897	543	44		
Grp Sat Flow(s),veh/h/ln	1774	1583	1774	1770	1770	1536		
Q Serve(g_s), s	0.8	0.4	2.2	3.5	3.3	0.5		
Cycle Q Clear(g_c), s	0.8	0.4	2.2	3.5	3.3	0.5		
Prop In Lane	1.00	1.00	1.00			1.00		
Lane Grp Cap(c), veh/h	81	72	221	2158	1038	451		
V/C Ratio(X)	0.65	0.30	0.69	0.42	0.52	0.10		
Avail Cap(c_a), veh/h	1359	1213	2378	4745	2711	1177		
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	12.3	12.1	10.9	2.7	7.7	6.7		
Incr Delay (d2), s/veh	3.3	0.9	5.4	0.2	0.2	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	0.4	0.3	1.4	1.7	1.6	0.2		
LnGrp Delay(d),s/veh	15.6	12.9	16.4	2.8	7.9	6.7		
LnGrp LOS	B	B	B	A	A	A		
Approach Vol, veh/h	75			1050	587			
Approach Delay, s/veh	14.8			4.8	7.8			
Approach LOS	B			A	A			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		20.9		5.2	8.3	12.7		
Change Period (Y+Rc), s		5.0		4.0	5.0	* 5		
Max Green Setting (Gmax), s		35.0		20.0	35.0	* 20		
Max Q Clear Time (g_c+I1), s		5.5		2.8	4.2	5.3		
Green Ext Time (p_c), s		9.9		0.1	0.7	2.1		
Intersection Summary								
HCM 2010 Ctrl Delay			6.3					
HCM 2010 LOS			A					
Notes								

HCM 2010 Signalized Intersection Summary

1: Contra Costa Blvd & Woodsworth Ln/Pleasant Hill Plaza Way

08/09/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	67	16	26	62	23	43	33	675	1	50	813	110
Future Volume (veh/h)	67	16	26	62	23	43	33	675	1	50	813	110
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.98	1.00		0.97	1.00		0.94
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1900	1863	1863	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	72	17	15	67	25	11	35	726	1	54	874	117
Adj No. of Lanes	1	1	0	0	1	1	1	2	0	1	2	1
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	135	68	60	111	42	131	779	2339	3	70	837	351
Arrive On Green	0.08	0.08	0.08	0.09	0.09	0.09	0.58	0.86	0.86	0.04	0.24	0.24
Sat Flow, veh/h	1774	901	795	1309	488	1544	1774	3626	5	1774	3539	1487
Grp Volume(v), veh/h	72	0	32	92	0	11	35	354	373	54	874	117
Grp Sat Flow(s),veh/h/ln	1774	0	1696	1797	0	1544	1774	1770	1862	1774	1770	1487
Q Serve(g_s), s	4.3	0.0	2.0	5.4	0.0	0.7	0.9	4.3	4.3	3.3	26.0	7.2
Cycle Q Clear(g_c), s	4.3	0.0	2.0	5.4	0.0	0.7	0.9	4.3	4.3	3.3	26.0	7.2
Prop In Lane	1.00		0.47	0.73		1.00	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	135	0	129	153	0	131	779	1141	1201	70	837	351
V/C Ratio(X)	0.53	0.00	0.25	0.60	0.00	0.08	0.04	0.31	0.31	0.77	1.04	0.33
Avail Cap(c_a), veh/h	452	0	432	457	0	393	779	1141	1201	194	837	351
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.33	1.33	1.33	1.00	1.00	1.00
Upstream Filter(I)	0.81	0.00	0.81	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	48.9	0.0	47.9	48.5	0.0	46.4	13.0	3.1	3.1	52.3	42.0	34.8
Incr Delay (d2), s/veh	2.6	0.0	0.8	3.8	0.0	0.3	0.0	0.7	0.7	16.4	43.4	2.5
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(50%),veh/ln	2.2	0.0	0.9	2.9	0.0	0.3	0.5	2.3	2.4	1.9	17.7	3.2
LnGrp Delay(d),s/veh	51.6	0.0	48.7	52.3	0.0	46.6	13.1	3.8	3.7	68.7	85.4	37.3
LnGrp LOS	D		D	D		D	B	A	A	E	F	D
Approach Vol, veh/h		104			103			762			1045	
Approach Delay, s/veh		50.7			51.7			4.2			79.2	
Approach LOS		D			D			A			E	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.3	76.0		12.4	53.3	31.0		13.4				
Change Period (Y+Rc), s	4.0	5.0		4.0	5.0	* 5		4.0				
Max Green Setting (Gmax), s	12.0	25.0		28.0	11.0	* 26		28.0				
Max Q Clear Time (g_c+I1), s	5.3	6.3		6.3	2.9	28.0		7.4				
Green Ext Time (p_c), s	0.0	9.3		0.3	0.0	0.0		0.5				
Intersection Summary												
HCM 2010 Ctrl Delay			47.9									
HCM 2010 LOS			D									
Notes												

Intersection

Int Delay, s/veh 7.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	73	648	542	83	94	81
Future Vol, veh/h	73	648	542	83	94	81
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	81	81	81	81	81	81
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	90	800	669	102	116	100

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	771	0	0 1300 386
Stage 1	-	-	- 720 -
Stage 2	-	-	- 580 -
Critical Hdwy	4.14	-	- 6.1 6.2
Critical Hdwy Stg 1	-	-	- 5.84 -
Critical Hdwy Stg 2	-	-	- 5.84 -
Follow-up Hdwy	2.22	-	- 3 3
Pot Cap-1 Maneuver	840	-	- 217 722
Stage 1	-	-	- 496 -
Stage 2	-	-	- 591 -
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	840	-	- 175 722
Mov Cap-2 Maneuver	-	-	- 175 -
Stage 1	-	-	- 400 -
Stage 2	-	-	- 591 -

Approach	EB	WB	SB
HCM Control Delay, s	1.7	0	56
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	840	-	-	-	270
HCM Lane V/C Ratio	0.107	-	-	-	0.8
HCM Control Delay (s)	9.8	0.8	-	-	56
HCM Lane LOS	A	A	-	-	F
HCM 95th %tile Q(veh)	0.4	-	-	-	6.2

HCM 2010 Signalized Intersection Summary

3: Cleaveland Rd/Woodsworth Ln & Gregory Ln

08/09/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	70	366	381	137	438	13	183	70	26	3	120	94
Future Volume (veh/h)	70	366	381	137	438	13	183	70	26	3	120	94
Number	5	2	12	1	6	16	3	8	18	7	4	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		0.98	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1863	1900	1863	1863
Adj Flow Rate, veh/h	88	458	394	171	548	16	158	187	24	4	150	92
Adj No. of Lanes	1	2	0	1	2	0	1	1	1	0	1	1
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	688	879	755	177	697	20	227	238	199	5	195	168
Arrive On Green	0.39	0.49	0.49	0.10	0.20	0.20	0.13	0.13	0.13	0.11	0.11	0.11
Sat Flow, veh/h	1774	1807	1551	1774	3512	102	1774	1863	1556	48	1812	1561
Grp Volume(v), veh/h	88	448	404	171	276	288	158	187	24	154	0	92
Grp Sat Flow(s),veh/h/ln	1774	1770	1589	1774	1770	1845	1774	1863	1556	1860	0	1561
Q Serve(g_s), s	2.9	15.7	15.7	8.6	13.3	13.4	7.7	8.8	1.2	7.2	0.0	5.0
Cycle Q Clear(g_c), s	2.9	15.7	15.7	8.6	13.3	13.4	7.7	8.8	1.2	7.2	0.0	5.0
Prop In Lane	1.00		0.98	1.00		0.06	1.00		1.00	0.03		1.00
Lane Grp Cap(c), veh/h	688	861	773	177	351	366	227	238	199	201	0	168
V/C Ratio(X)	0.13	0.52	0.52	0.96	0.79	0.79	0.70	0.78	0.12	0.77	0.00	0.55
Avail Cap(c_a), veh/h	688	861	773	177	413	430	453	476	398	393	0	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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.00	0.97
Uniform Delay (d), s/veh	17.7	15.9	15.9	40.3	34.3	34.3	37.6	38.0	34.8	39.0	0.0	38.1
Incr Delay (d2), s/veh	0.0	2.3	2.5	56.5	16.1	15.7	1.4	2.2	0.1	2.2	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(50%),veh/ln	1.4	8.1	7.4	7.0	8.1	8.4	3.9	4.7	0.5	3.8	0.0	2.2
LnGrp Delay(d),s/veh	17.8	18.2	18.4	96.8	50.4	49.9	39.0	40.2	34.9	41.3	0.0	39.1
LnGrp LOS	B	B	B	F	D	D	D	D	C	D		D
Approach Vol, veh/h		940			735			369			246	
Approach Delay, s/veh		18.2			61.0			39.3			40.5	
Approach LOS		B			E			D			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	13.0	47.8		13.7	38.9	21.9		15.5				
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0				
Max Green Setting (Gmax), s	9.0	23.0		19.0	11.0	21.0		23.0				
Max Q Clear Time (g_c+I1), s	10.6	17.7		9.2	4.9	15.4		10.8				
Green Ext Time (p_c), s	0.0	3.4		0.5	0.0	2.5		0.8				
Intersection Summary												
HCM 2010 Ctrl Delay				37.8								
HCM 2010 LOS				D								
Notes												

Intersection												
Int Delay, s/veh	0.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑			↕				↗
Traffic Vol, veh/h	0	389	7	36	570	14	5	0	14	0	0	7
Future Vol, veh/h	0	389	7	36	570	14	5	0	14	0	0	7
Conflicting Peds, #/hr	4	0	4	4	0	4	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	120	-	-	-	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	458	8	42	671	16	6	0	16	0	0	8
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	-	0	0	470	0	0	886	1241	237	-	-	348
Stage 1	-	-	-	-	-	-	466	466	-	-	-	-
Stage 2	-	-	-	-	-	-	420	775	-	-	-	-
Critical Hdwy	-	-	-	4.14	-	-	7.54	6.54	6.94	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	-	-	-
Follow-up Hdwy	-	-	-	2.22	-	-	3.52	4.02	3.32	-	-	3.32
Pot Cap-1 Maneuver	0	-	-	1088	-	-	239	174	764	0	0	648
Stage 1	0	-	-	-	-	-	546	561	-	0	0	-
Stage 2	0	-	-	-	-	-	581	406	-	0	0	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	-	-	-	1084	-	-	228	166	761	-	-	646
Mov Cap-2 Maneuver	-	-	-	-	-	-	228	166	-	-	-	-
Stage 1	-	-	-	-	-	-	546	559	-	-	-	-
Stage 2	-	-	-	-	-	-	551	389	-	-	-	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			0.5			13			10.6		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	WBR	SBLn1					
Capacity (veh/h)	471	-	-	1084	-	-	646					
HCM Lane V/C Ratio	0.047	-	-	0.039	-	-	0.013					
HCM Control Delay (s)	13	-	-	8.5	-	-	10.6					
HCM Lane LOS	B	-	-	A	-	-	B					
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-	-	0					

HCM Signalized Intersection Capacity Analysis

5: Contra Costa Blvd & Gregory Ln/I-680 SB Off-Ramp

08/09/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	97	0	301	340	354	119	196	599	0	9	825	85
Future Volume (vph)	97	0	301	340	354	119	196	599	0	9	825	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0	4.0	5.0		4.0	5.0	5.0
Lane Util. Factor	0.97		1.00	1.00	1.00	1.00	0.97	0.91		1.00	0.95	1.00
Frpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	0.99
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00		0.85	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95		1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3433		1583	1770	1863	1583	3433	5085		1770	3539	1563
Flt Permitted	0.95		1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	3433		1583	1770	1863	1583	3433	5085		1770	3539	1563
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	104	0	324	366	381	128	211	644	0	10	887	91
RTOR Reduction (vph)	0	0	76	0	0	92	0	0	0	0	0	60
Lane Group Flow (vph)	104	0	248	366	381	36	211	644	0	10	887	31
Confl. Bikes (#/hr)									1			1
Turn Type	Split		pm+ov	Split	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	4	4	5	3	3		5	2		1	6	
Permitted Phases			4			3						6
Actuated Green, G (s)	9.9		25.1	31.0	31.0	31.0	15.2	50.7		1.4	36.9	36.9
Effective Green, g (s)	9.9		25.1	31.0	31.0	31.0	15.2	50.7		1.4	36.9	36.9
Actuated g/C Ratio	0.09		0.23	0.28	0.28	0.28	0.14	0.46		0.01	0.34	0.34
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0	4.0	5.0		4.0	5.0	5.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0	3.0	4.0		3.0	4.0	4.0
Lane Grp Cap (vph)	308		418	498	525	446	474	2343		22	1187	524
v/s Ratio Prot	0.03		c0.08	c0.21	0.20		0.06	0.13		0.01	c0.25	
v/s Ratio Perm			0.07			0.02						0.02
v/c Ratio	0.34		0.59	0.73	0.73	0.08	0.45	0.27		0.45	0.75	0.06
Uniform Delay, d1	47.0		37.9	35.8	35.7	29.0	43.5	18.3		53.9	32.4	24.8
Progression Factor	1.00		1.00	1.00	1.00	1.00	0.92	0.65		1.42	0.88	2.21
Incremental Delay, d2	0.7		2.2	5.6	5.0	0.1	0.7	0.3		13.4	4.1	0.2
Delay (s)	47.6		40.1	41.4	40.6	29.1	40.9	12.3		90.1	32.5	54.8
Level of Service	D		D	D	D	C	D	B		F	C	D
Approach Delay (s)		42.0			39.2			19.3			35.2	
Approach LOS		D			D			B			D	
Intersection Summary												
HCM 2000 Control Delay			32.9			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.73									
Actuated Cycle Length (s)			110.0			Sum of lost time (s)				17.0		
Intersection Capacity Utilization			71.1%			ICU Level of Service				C		
Analysis Period (min)			15									
c Critical Lane Group												

Intersection						
Int Delay, s/veh	0.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	14	17	263	5	16	669
Future Vol, veh/h	14	17	263	5	16	669
Conflicting Peds, #/hr	0	2	0	6	6	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	81	81	81	81	81	81
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	17	21	325	6	20	826
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	787	174	0	0	337	0
Stage 1	334	-	-	-	-	-
Stage 2	453	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22	-
Pot Cap-1 Maneuver	329	839	-	-	1219	-
Stage 1	697	-	-	-	-	-
Stage 2	607	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	321	833	-	-	1212	-
Mov Cap-2 Maneuver	321	-	-	-	-	-
Stage 1	693	-	-	-	-	-
Stage 2	597	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	13.1	0		0.2		
HCM LOS	B					
Minor Lane/Major Mvmt	NBT	NBRWBLn1		SBL	SBT	
Capacity (veh/h)	-	-	484	1212	-	
HCM Lane V/C Ratio	-	-	0.079	0.016	-	
HCM Control Delay (s)	-	-	13.1	8	-	
HCM Lane LOS	-	-	B	A	-	
HCM 95th %tile Q(veh)	-	-	0.3	0.1	-	

HCM 2010 Signalized Intersection Summary

7: Contra Costa Blvd & Crescent Dr

08/09/2019

																		
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR						
Lane Configurations																		
Traffic Volume (veh/h)	9	2	20	56	1	16	6	782	27	10	1365	47						
Future Volume (veh/h)	9	2	20	56	1	16	6	782	27	10	1365	47						
Number	7	4	14	3	8	18	5	2	12	1	6	16						
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0						
Ped-Bike Adj(A_pbT)	0.98		0.98	0.98		0.98	1.00		1.00	1.00		1.00						
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00						
Adj Sat Flow, veh/h/ln	1900	1863	1863	1863	1863	1900	1863	1863	1900	1863	1863	1900						
Adj Flow Rate, veh/h	10	2	17	64	1	15	7	889	19	11	1551	50						
Adj No. of Lanes	0	1	1	1	1	0	1	3	0	1	2	0						
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88						
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2						
Cap, veh/h	165	28	151	181	10	143	581	1311	28	937	1598	51						
Arrive On Green	0.10	0.10	0.10	0.10	0.10	0.10	0.44	0.34	0.34	1.00	0.91	0.91						
Sat Flow, veh/h	1073	284	1544	1357	98	1464	1774	5124	109	1774	3500	113						
Grp Volume(v), veh/h	12	0	17	64	0	16	7	588	320	11	782	819						
Grp Sat Flow(s),veh/h/ln	1357	0	1544	1357	0	1561	1774	1695	1843	1774	1770	1843						
Q Serve(g_s), s	0.3	0.0	1.1	5.0	0.0	1.0	0.2	16.4	16.4	0.0	36.5	37.9						
Cycle Q Clear(g_c), s	1.4	0.0	1.1	6.3	0.0	1.0	0.2	16.4	16.4	0.0	36.5	37.9						
Prop In Lane	0.83		1.00	1.00		0.94	1.00		0.06	1.00		0.06						
Lane Grp Cap(c), veh/h	193	0	151	181	0	153	581	868	472	937	808	842						
V/C Ratio(X)	0.06	0.00	0.11	0.35	0.00	0.10	0.01	0.68	0.68	0.01	0.97	0.97						
Avail Cap(c_a), veh/h	481	0	463	456	0	468	581	1633	888	937	853	888						
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.33	1.33	1.33	2.00	2.00	2.00						
Upstream Filter(I)	0.98	0.00	0.98	1.00	0.00	1.00	0.97	0.97	0.97	0.64	0.64	0.64						
Uniform Delay (d), s/veh	45.3	0.0	45.3	48.3	0.0	45.2	21.0	32.4	32.4	0.0	4.2	4.2						
Incr Delay (d2), s/veh	0.2	0.0	0.5	1.7	0.0	0.4	0.0	4.1	7.4	0.0	18.8	19.1						
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0						
%ile BackOfQ(50%),veh/ln	0.3	0.0	0.5	2.0	0.0	0.5	0.1	8.1	9.2	0.0	18.6	19.9						
LnGrp Delay(d),s/veh	45.5	0.0	45.7	49.9	0.0	45.7	21.0	36.5	39.8	0.0	23.0	23.4						
LnGrp LOS	D		D	D		D	C	D	D	A	C	C						
Approach Vol, veh/h	29		80				915				1612							
Approach Delay, s/veh	45.6		49.1				37.5				23.0							
Approach LOS	D		D				D				C							
Timer	1	2	3	4	5	6	7	8										
Assigned Phs	1	2			4	5	6	8										
Phs Duration (G+Y+Rc), s	62.1	33.1			14.8	40.0	55.2	14.8										
Change Period (Y+Rc), s	4.0	5.0			4.0	4.0	5.0	4.0										
Max Green Setting (Gmax), s	11.0	53.0			33.0	11.0	53.0	33.0										
Max Q Clear Time (g_c+I1), s	2.0	18.4			3.4	2.2	39.9	8.3										
Green Ext Time (p_c), s	0.0	9.8			0.1	0.0	10.3	0.4										
Intersection Summary																		
HCM 2010 Ctrl Delay																		
HCM 2010 LOS																		

HCM 2010 Signalized Intersection Summary

8: Cleaveland Rd & Crescent Plaza

08/09/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	2	0	171	1	66	0	203	159	171	518	2
Future Volume (veh/h)	1	2	0	171	1	66	0	203	159	171	518	2
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		1.00	0.98		0.98	1.00		0.98	0.99		0.96
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1900	1900	1863	1863	1900	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	1	2	0	201	1	74	0	239	162	201	609	2
Adj No. of Lanes	0	1	0	0	1	1	0	2	0	0	2	0
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.80	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	250	365	0	643	3	399	0	937	608	440	1128	4
Arrive On Green	0.26	0.26	0.00	0.26	0.26	0.26	0.00	0.46	0.46	0.46	0.46	0.46
Sat Flow, veh/h	313	1413	0	1509	10	1545	0	2133	1323	540	2455	8
Grp Volume(v), veh/h	3	0	0	202	0	74	0	206	195	391	0	421
Grp Sat Flow(s),veh/h/ln	1726	0	0	1519	0	1545	0	1770	1593	1310	0	1693
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	1.1	0.0	2.0	2.1	4.0	0.0	5.1
Cycle Q Clear(g_c), s	0.0	0.0	0.0	2.8	0.0	1.1	0.0	2.0	2.1	6.2	0.0	5.1
Prop In Lane	0.33		0.00	1.00		1.00	0.00		0.83	0.51		0.00
Lane Grp Cap(c), veh/h	615	0	0	646	0	399	0	813	732	794	0	778
V/C Ratio(X)	0.00	0.00	0.00	0.31	0.00	0.19	0.00	0.25	0.27	0.49	0.00	0.54
Avail Cap(c_a), veh/h	1572	0	0	1459	0	1308	0	1748	1573	1461	0	1672
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	0.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	7.8	0.0	0.0	8.8	0.0	8.2	0.0	4.7	4.7	5.6	0.0	5.5
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.1	0.1	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(50%),veh/ln	0.0	0.0	0.0	1.3	0.0	0.5	0.0	1.0	0.9	2.3	0.0	2.4
LnGrp Delay(d),s/veh	7.8	0.0	0.0	8.9	0.0	8.3	0.0	4.7	4.8	5.8	0.0	5.7
LnGrp LOS	A			A		A		A	A	A		A
Approach Vol, veh/h		3			276			401			812	
Approach Delay, s/veh		7.8			8.7			4.8			5.8	
Approach LOS		A			A			A			A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		17.0		11.2		17.0		11.2				
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0				
Max Green Setting (Gmax), s		28.0		24.0		28.0		24.0				
Max Q Clear Time (g_c+I1), s		4.1		2.0		8.2		4.8				
Green Ext Time (p_c), s		1.6		0.0		3.8		0.9				
Intersection Summary												
HCM 2010 Ctrl Delay				6.1								
HCM 2010 LOS				A								

HCM 2010 Signalized Intersection Summary

9: Crescent Dr & Crescent Plaza

08/09/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	313	12	62	211	24	6	7	130	33	7	21
Future Volume (veh/h)	8	313	12	62	211	24	6	7	130	33	7	21
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.97	0.99		0.97	0.98		0.99	0.99		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1900	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	9	368	14	73	248	28	7	8	153	39	8	25
Adj No. of Lanes	1	1	0	1	1	0	0	1	0	0	1	0
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	497	615	23	423	566	64	138	45	541	432	115	188
Arrive On Green	0.35	0.35	0.35	0.35	0.35	0.35	0.38	0.38	0.38	0.38	0.38	0.38
Sat Flow, veh/h	1078	1780	68	982	1638	185	21	120	1439	636	306	501
Grp Volume(v), veh/h	9	0	382	73	0	276	168	0	0	72	0	0
Grp Sat Flow(s),veh/h/ln	1078	0	1848	982	0	1823	1580	0	0	1444	0	0
Q Serve(g_s), s	0.2	0.0	4.9	1.9	0.0	3.4	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	3.5	0.0	4.9	6.8	0.0	3.4	2.1	0.0	0.0	0.8	0.0	0.0
Prop In Lane	1.00		0.04	1.00		0.10	0.04		0.91	0.54		0.35
Lane Grp Cap(c), veh/h	497	0	639	423	0	630	725	0	0	736	0	0
V/C Ratio(X)	0.02	0.00	0.60	0.17	0.00	0.44	0.23	0.00	0.00	0.10	0.00	0.00
Avail Cap(c_a), veh/h	875	0	1286	767	0	1268	2315	0	0	2125	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	8.6	0.0	7.8	10.6	0.0	7.3	6.3	0.0	0.0	5.8	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.3	0.1	0.0	0.2	0.2	0.0	0.0	0.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	2.5	0.5	0.0	1.7	1.0	0.0	0.0	0.4	0.0	0.0
LnGrp Delay(d),s/veh	8.6	0.0	8.1	10.6	0.0	7.4	6.5	0.0	0.0	5.9	0.0	0.0
LnGrp LOS	A		A	B		A	A			A		
Approach Vol, veh/h	391				349		168				72	
Approach Delay, s/veh	8.1				8.1		6.5				5.9	
Approach LOS	A				A		A				A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	2		4		6		8					
Phs Duration (G+Y+Rc), s	14.8		13.9		14.8		13.9					
Change Period (Y+Rc), s	4.0		4.0		4.0		4.0					
Max Green Setting (Gmax), s	40.0		20.0		40.0		20.0					
Max Q Clear Time (g_c+I1), s	4.1		6.9		2.8		8.8					
Green Ext Time (p_c), s	1.6		1.4		0.6		1.0					
Intersection Summary												
HCM 2010 Ctrl Delay			7.7									
HCM 2010 LOS			A									

HCM 2010 Signalized Intersection Summary

10: Contra Costa Blvd & Crescent Plaza/Monument Blvd

08/09/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↷		↰	↷	↷	↰	↷	↷	↰	↷	↷
Traffic Volume (veh/h)	15	394	63	379	263	412	24	393	310	389	979	18
Future Volume (veh/h)	15	394	63	379	263	412	24	393	310	389	979	18
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	16	428	68	412	286	448	26	427	337	423	1064	20
Adj No. of Lanes	1	2	0	2	1	2	1	3	1	2	3	1
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	25	523	83	487	555	1872	35	765	462	1286	2610	813
Arrive On Green	0.01	0.17	0.17	0.14	0.30	0.30	0.01	0.05	0.05	0.75	1.00	1.00
Sat Flow, veh/h	1774	3063	484	3442	1863	2787	1774	5085	1583	3442	5085	1583
Grp Volume(v), veh/h	16	246	250	412	286	448	26	427	337	423	1064	20
Grp Sat Flow(s),veh/h/ln	1774	1770	1777	1721	1863	1393	1774	1695	1583	1721	1695	1583
Q Serve(g_s), s	1.0	14.7	14.9	12.8	14.0	1.1	1.6	9.0	5.8	4.5	0.0	0.0
Cycle Q Clear(g_c), s	1.0	14.7	14.9	12.8	14.0	1.1	1.6	9.0	5.8	4.5	0.0	0.0
Prop In Lane	1.00		0.27	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	25	302	304	487	555	1872	35	765	462	1286	2610	813
V/C Ratio(X)	0.64	0.81	0.82	0.85	0.51	0.24	0.74	0.56	0.73	0.33	0.41	0.02
Avail Cap(c_a), veh/h	210	402	404	626	555	1872	242	1387	656	1286	2610	813
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33	2.00	2.00	2.00
Upstream Filter(I)	0.78	0.78	0.78	0.89	0.89	0.89	0.97	0.97	0.97	0.81	0.81	0.81
Uniform Delay (d), s/veh	54.0	43.9	44.0	46.1	32.0	2.7	54.3	48.7	17.5	9.3	0.0	0.0
Incr Delay (d2), s/veh	19.5	7.4	7.9	7.6	0.7	0.1	24.5	2.8	9.4	0.3	0.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	7.8	8.0	6.6	7.3	1.6	1.0	4.4	7.4	2.2	0.1	0.0
LnGrp Delay(d),s/veh	73.4	51.3	51.9	53.6	32.7	2.7	78.8	51.5	26.9	9.5	0.4	0.0
LnGrp LOS	E	D	D	D	C	A	E	D	C	A	A	A
Approach Vol, veh/h		512			1146			790			1507	
Approach Delay, s/veh		52.3			28.5			41.9			2.9	
Approach LOS		D			C			D			A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	46.1	21.5	19.6	22.8	6.2	61.5	5.5	36.8				
Change Period (Y+Rc), s	5.0	* 5	4.0	4.0	4.0	5.0	4.0	4.0				
Max Green Setting (Gmax), s	10.0	* 30	20.0	25.0	15.0	33.0	13.0	32.0				
Max Q Clear Time (g_c+I), s	10.5	11.0	14.8	16.9	3.6	2.0	3.0	16.0				
Green Ext Time (p_c), s	2.4	5.5	0.7	1.9	0.0	15.6	0.0	3.2				
Intersection Summary												
HCM 2010 Ctrl Delay			24.5									
HCM 2010 LOS			C									
Notes												

HCM Signalized Intersection Capacity Analysis

11: I-680 Ramps & Monument Blvd

08/09/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	483	523	15	929	701	557	47	0	317	1113	0	228
Future Volume (vph)	483	523	15	929	701	557	47	0	317	1113	0	228
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	11.2	8.7		10.2	8.7	8.7	8.7		10.2	9.7		11.2
Lane Util. Factor	0.97	0.91		0.97	0.91	0.88	0.97		0.88	0.94		1.00
Frt	1.00	1.00		1.00	1.00	0.85	1.00		0.85	1.00		0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95		1.00	0.95		1.00
Satd. Flow (prot)	3433	5064		3433	5085	2787	3433		2787	4990		1583
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95		1.00	0.95		1.00
Satd. Flow (perm)	3433	5064		3433	5085	2787	3433		2787	4990		1583
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	519	562	16	999	754	599	51	0	341	1197	0	245
RTOR Reduction (vph)	0	0	0	0	0	47	0	0	0	0	0	0
Lane Group Flow (vph)	519	578	0	999	754	552	51	0	341	1197	0	245
Turn Type	Prot	NA		Prot	NA	custom	Prot		pm+ov	Prot		pm+ov
Protected Phases	5	2		1	6	3	3		1	7		5
Permitted Phases						6			6			7
Actuated Green, G (s)	22.5	16.0		40.1	32.6	67.4	34.8		66.3	33.8		56.3
Effective Green, g (s)	22.5	16.0		40.1	32.6	67.4	34.8		66.3	33.8		56.3
Actuated g/C Ratio	0.19	0.14		0.34	0.28	0.57	0.29		0.56	0.29		0.48
Clearance Time (s)	11.2	8.7		10.2	8.7	8.7	8.7		10.2	9.7		11.2
Vehicle Extension (s)	3.0	2.0		2.0	2.5	2.0	2.0		2.0	3.0		3.0
Lane Grp Cap (vph)	651	683		1161	1398	1789	1008		1559	1423		752
v/s Ratio Prot	0.15	c0.11		c0.29	0.15	0.09	0.01		0.07	c0.24		0.06
v/s Ratio Perm						0.11			0.05			0.09
v/c Ratio	0.80	0.85		0.86	0.54	0.31	0.05		0.22	0.84		0.33
Uniform Delay, d1	45.8	50.0		36.6	36.6	13.4	30.0		13.1	39.8		19.3
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00		1.00
Incremental Delay, d2	6.7	9.1		6.5	0.3	0.0	0.0		0.0	4.7		0.3
Delay (s)	52.6	59.2		43.1	36.9	13.4	30.0		13.1	44.5		19.6
Level of Service	D	E		D	D	B	C		B	D		B
Approach Delay (s)		56.0			33.5			15.3			40.3	
Approach LOS		E			C			B			D	
Intersection Summary												
HCM 2000 Control Delay			38.7	HCM 2000 Level of Service			D					
HCM 2000 Volume to Capacity ratio			0.86									
Actuated Cycle Length (s)			118.5	Sum of lost time (s)			29.6					
Intersection Capacity Utilization			81.9%	ICU Level of Service			D					
Analysis Period (min)			15									

c Critical Lane Group

Intersection

Intersection Delay, s/veh 12.3

Intersection LOS B

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	142	149	170	145	113	109
Future Vol, veh/h	142	149	170	145	113	109
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	171	180	205	175	136	131
Number of Lanes	1	0	1	1	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	2	1	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	1	1
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	1	0	2
HCM Control Delay	12.9	11.6	12.4
HCM LOS	B	B	B

Lane	NBLn1	EBLn1	WBLn1	WBLn2
Vol Left, %	51%	0%	100%	0%
Vol Thru, %	0%	49%	0%	100%
Vol Right, %	49%	51%	0%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	222	291	170	145
LT Vol	113	0	170	0
Through Vol	0	142	0	145
RT Vol	109	149	0	0
Lane Flow Rate	267	351	205	175
Geometry Grp	2	5	7	7
Degree of Util (X)	0.41	0.491	0.355	0.278
Departure Headway (Hd)	5.518	5.045	6.235	5.728
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	653	715	578	627
Service Time	3.55	3.074	3.965	3.459
HCM Lane V/C Ratio	0.409	0.491	0.355	0.279
HCM Control Delay	12.4	12.9	12.4	10.7
HCM Lane LOS	B	B	B	B
HCM 95th-tile Q	2	2.7	1.6	1.1

HCM 2010 Signalized Intersection Summary

13: Astrid Dr/Cleaveland Rd & Boyd Rd

08/09/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	145	421	50	20	315	67	40	102	49	69	216	405
Future Volume (veh/h)	145	421	50	20	315	67	40	102	49	69	216	405
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	177	513	59	24	384	65	49	124	32	84	263	457
Adj No. of Lanes	1	1	0	1	1	1	1	2	0	1	1	1
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	687	976	112	30	411	350	63	595	149	106	433	364
Arrive On Green	0.39	0.60	0.60	0.02	0.22	0.22	0.04	0.21	0.21	0.06	0.23	0.23
Sat Flow, veh/h	1774	1641	189	1774	1863	1583	1774	2806	703	1774	1863	1566
Grp Volume(v), veh/h	177	0	572	24	384	65	49	77	79	84	263	457
Grp Sat Flow(s),veh/h/ln	1774	0	1829	1774	1863	1583	1774	1770	1739	1774	1863	1566
Q Serve(g_s), s	8.8	0.0	23.8	1.7	26.1	4.3	3.5	4.6	4.9	6.0	16.3	30.0
Cycle Q Clear(g_c), s	8.8	0.0	23.8	1.7	26.1	4.3	3.5	4.6	4.9	6.0	16.3	30.0
Prop In Lane	1.00		0.10	1.00		1.00	1.00		0.40	1.00		1.00
Lane Grp Cap(c), veh/h	687	0	1089	30	411	350	63	375	369	106	433	364
V/C Ratio(X)	0.26	0.00	0.53	0.81	0.93	0.19	0.77	0.20	0.21	0.79	0.61	1.26
Avail Cap(c_a), veh/h	687	0	1089	275	433	368	275	411	404	412	433	364
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	26.9	0.0	15.4	63.3	49.4	40.9	61.7	41.9	42.0	59.9	44.3	49.6
Incr Delay (d2), s/veh	0.9	0.0	1.8	16.9	26.1	0.1	7.3	1.0	1.0	4.9	5.2	135.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.5	0.0	12.5	1.0	16.4	1.9	1.9	2.4	2.4	3.1	9.0	26.7
LnGrp Delay(d),s/veh	27.8	0.0	17.2	80.2	75.5	41.0	69.0	42.9	43.0	64.8	49.5	185.2
LnGrp LOS	C		B	F	E	D	E	D	D	E	D	F
Approach Vol, veh/h		749			473			205			804	
Approach Delay, s/veh		19.7			71.0			49.2			128.2	
Approach LOS		B			E			D			F	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	11.2	31.4	5.7	80.8	8.6	34.0	54.0	32.5				
Change Period (Y+Rc), s	3.5	4.0	3.5	4.0	4.0	4.0	4.0	4.0				
Max Green Setting (Gmax), s	30.0	30.0	20.0	50.0	20.0	30.0	50.0	30.0				
Max Q Clear Time (g_c+I), s	19.0	6.9	3.7	25.8	5.5	32.0	10.8	28.1				
Green Ext Time (p_c), s	0.1	1.9	0.0	6.0	0.0	0.0	0.9	0.4				
Intersection Summary												
HCM 2010 Ctrl Delay			72.4									
HCM 2010 LOS			E									

Intersection												
Int Delay, s/veh	2.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	123	416	3	4	365	26	0	2	30	3	0	51
Future Vol, veh/h	123	416	3	4	365	26	0	2	30	3	0	51
Conflicting Peds, #/hr	3	0	0	0	0	3	3	0	1	1	0	3
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	105	-	-	75	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	87	87	87	87	87	87	87	87	87	87	87	87
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	141	478	3	5	420	30	0	2	34	3	0	59

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	453	0	0	481	0	0	1240	1225	481	1229	1211	441
Stage 1	-	-	-	-	-	-	762	762	-	448	448	-
Stage 2	-	-	-	-	-	-	478	463	-	781	763	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1108	-	-	1082	-	-	152	179	585	155	182	616
Stage 1	-	-	-	-	-	-	397	414	-	590	573	-
Stage 2	-	-	-	-	-	-	568	564	-	388	413	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1105	-	-	1082	-	-	123	155	584	129	157	612
Mov Cap-2 Maneuver	-	-	-	-	-	-	123	155	-	129	157	-
Stage 1	-	-	-	-	-	-	346	361	-	513	568	-
Stage 2	-	-	-	-	-	-	510	559	-	316	360	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	2			0.1			12.8			13.1		
HCM LOS							B			B		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	498	1105	-	-	1082	-	-	507
HCM Lane V/C Ratio	0.074	0.128	-	-	0.004	-	-	0.122
HCM Control Delay (s)	12.8	8.7	-	-	8.3	-	-	13.1
HCM Lane LOS	B	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.2	0.4	-	-	0	-	-	0.4

HCM 2010 Signalized Intersection Summary

15: Contra Costa Blvd & Boyd Rd

08/09/2019

																		
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR						
Lane Configurations								  			  							
Traffic Volume (veh/h)	264	6	172	0	1	6	158	459	28	25	1173	230						
Future Volume (veh/h)	264	6	172	0	1	6	158	459	28	25	1173	230						
Number	7	4	14	3	8	18	5	2	12	1	6	16						
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0						
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00						
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00						
Adj Sat Flow, veh/h/ln	1863	1863	1863	1900	1863	1900	1863	1863	1900	1863	1863	1863						
Adj Flow Rate, veh/h	295	0	75	0	1	4	174	504	30	27	1289	250						
Adj No. of Lanes	2	0	1	0	1	0	1	3	0	1	3	1						
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91						
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2						
Cap, veh/h	391	0	175	0	2	8	204	711	42	1020	3073	957						
Arrive On Green	0.11	0.00	0.11	0.00	0.01	0.01	0.12	0.14	0.14	0.19	0.20	0.20						
Sat Flow, veh/h	3548	0	1583	0	326	1306	1774	4912	290	1774	5085	1583						
Grp Volume(v), veh/h	295	0	75	0	0	5	174	347	187	27	1289	250						
Grp Sat Flow(s),veh/h/ln	1774	0	1583	0	0	1632	1774	1695	1812	1774	1695	1583						
Q Serve(g_s), s	8.9	0.0	4.9	0.0	0.0	0.3	10.6	10.7	10.9	1.4	24.4	14.7						
Cycle Q Clear(g_c), s	8.9	0.0	4.9	0.0	0.0	0.3	10.6	10.7	10.9	1.4	24.4	14.7						
Prop In Lane	1.00		1.00	0.00		0.80	1.00		0.16	1.00		1.00						
Lane Grp Cap(c), veh/h	391	0	175	0	0	11	204	491	262	1020	3073	957						
V/C Ratio(X)	0.75	0.00	0.43	0.00	0.00	0.48	0.85	0.71	0.71	0.03	0.42	0.26						
Avail Cap(c_a), veh/h	613	0	273	0	0	415	242	709	379	1020	3073	957						
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33						
Upstream Filter(I)	1.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	0.83	0.83	0.83						
Uniform Delay (d), s/veh	47.5	0.0	45.7	0.0	0.0	54.5	47.7	44.8	44.9	19.5	27.2	23.3						
Incr Delay (d2), s/veh	4.2	0.0	2.4	0.0	0.0	29.8	22.9	8.3	15.4	0.0	0.4	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(50%),veh/ln	4.6	0.0	2.2	0.0	0.0	0.2	6.5	5.6	6.5	0.7	11.6	6.6						
LnGrp Delay(d),s/veh	51.7	0.0	48.1	0.0	0.0	84.3	70.6	53.1	60.2	19.5	27.5	23.8						
LnGrp LOS	D		D			F	E	D	E	B	C	C						
Approach Vol, veh/h	370				5			708			1566							
Approach Delay, s/veh	50.9				84.3			59.3			26.8							
Approach LOS	D				F			E			C							
Timer	1	2	3	4	5	6	7	8										
Assigned Phs	1	2			4	5	6	8										
Phs Duration (G+Y+Rc), s	68.2	20.9			16.1	17.7	71.5	4.7										
Change Period (Y+Rc), s	5.0	* 5			4.0	5.0	5.0	4.0										
Max Green Setting (Gmax), s	23.0	* 23			19.0	15.0	30.0	28.0										
Max Q Clear Time (g_c+I1), s	3.4	12.9			10.9	12.6	26.4	2.3										
Green Ext Time (p_c), s	0.0	3.1			1.3	0.2	3.0	0.0										
Intersection Summary																		
HCM 2010 Ctrl Delay	39.0																	
HCM 2010 LOS	D																	
Notes																		

HCM 2010 Signalized Intersection Summary

16: Contra Costa Blvd & Astrid Dr

08/09/2019

								
Movement	EBL	EBR	NBL	NBT	SBT	SBR		
Lane Configurations								
Traffic Volume (veh/h)	26	99	41	187	948	36		
Future Volume (veh/h)	26	99	41	187	948	36		
Number	7	14	5	2	6	16		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863		
Adj Flow Rate, veh/h	27	20	43	195	988	35		
Adj No. of Lanes	1	1	1	2	2	1		
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96		
Percent Heavy Veh, %	2	2	2	2	2	2		
Cap, veh/h	48	43	72	2302	1523	681		
Arrive On Green	0.03	0.03	0.04	0.65	0.43	0.43		
Sat Flow, veh/h	1774	1583	1774	3632	3632	1581		
Grp Volume(v), veh/h	27	20	43	195	988	35		
Grp Sat Flow(s),veh/h/ln	1774	1583	1774	1770	1770	1581		
Q Serve(g_s), s	0.4	0.3	0.7	0.6	6.2	0.4		
Cycle Q Clear(g_c), s	0.4	0.3	0.7	0.6	6.2	0.4		
Prop In Lane	1.00	1.00	1.00			1.00		
Lane Grp Cap(c), veh/h	48	43	72	2302	1523	681		
V/C Ratio(X)	0.57	0.47	0.60	0.08	0.65	0.05		
Avail Cap(c_a), veh/h	1273	1136	2227	4443	2539	1134		
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	13.4	13.4	13.1	1.8	6.3	4.6		
Incr Delay (d2), s/veh	3.9	3.0	10.7	0.0	0.2	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	0.2	0.3	0.5	0.3	2.9	0.2		
LnGrp Delay(d),s/veh	17.3	16.3	23.9	1.8	6.5	4.6		
LnGrp LOS	B	B	C	A	A	A		
Approach Vol, veh/h	47			238	1023			
Approach Delay, s/veh	16.9			5.8	6.4			
Approach LOS	B			A	A			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		23.1		4.8	6.1	17.0		
Change Period (Y+Rc), s		5.0		4.0	5.0	* 5		
Max Green Setting (Gmax), s		35.0		20.0	35.0	* 20		
Max Q Clear Time (g_c+I1), s		2.6		2.4	2.7	8.2		
Green Ext Time (p_c), s		1.7		0.0	0.1	3.8		
Intersection Summary								
HCM 2010 Ctrl Delay			6.7					
HCM 2010 LOS			A					
Notes								

HCM 2010 Signalized Intersection Summary

1: Contra Costa Blvd & Woodsworth Ln/Pleasant Hill Plaza Way

08/09/2019

																		
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR						
Lane Configurations																		
Traffic Volume (veh/h)	116	21	59	134	59	132	84	1176	7	114	753	92						
Future Volume (veh/h)	116	21	59	134	59	132	84	1176	7	114	753	92						
Number	7	4	14	3	8	18	5	2	12	1	6	16						
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0						
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.97	1.00		0.94						
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00						
Adj Sat Flow, veh/h/ln	1863	1863	1900	1900	1863	1863	1863	1863	1900	1863	1863	1863						
Adj Flow Rate, veh/h	118	21	33	137	60	49	86	1200	7	116	768	79						
Adj No. of Lanes	1	1	0	0	1	1	1	2	0	1	2	1						
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98						
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2						
Cap, veh/h	180	65	103	176	77	219	595	1928	11	144	964	407						
Arrive On Green	0.10	0.10	0.10	0.14	0.14	0.14	0.45	0.71	0.71	0.08	0.27	0.27						
Sat Flow, veh/h	1774	644	1012	1252	548	1556	1774	3607	21	1774	3539	1493						
Grp Volume(v), veh/h	118	0	54	197	0	49	86	589	618	116	768	79						
Grp Sat Flow(s),veh/h/ln	1774	0	1655	1800	0	1556	1774	1770	1858	1774	1770	1493						
Q Serve(g_s), s	7.7	0.0	3.6	12.7	0.0	3.4	3.4	20.7	20.7	7.7	24.2	4.9						
Cycle Q Clear(g_c), s	7.7	0.0	3.6	12.7	0.0	3.4	3.4	20.7	20.7	7.7	24.2	4.9						
Prop In Lane	1.00		0.61	0.70		1.00	1.00		0.01	1.00		1.00						
Lane Grp Cap(c), veh/h	180	0	168	254	0	219	595	946	993	144	964	407						
V/C Ratio(X)	0.65	0.00	0.32	0.78	0.00	0.22	0.14	0.62	0.62	0.80	0.80	0.19						
Avail Cap(c_a), veh/h	414	0	386	420	0	363	595	946	993	177	1062	448						
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.33	1.33	1.33	1.00	1.00	1.00						
Upstream Filter(I)	0.72	0.00	0.72	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00						
Uniform Delay (d), s/veh	51.9	0.0	50.1	49.7	0.0	45.7	23.1	11.1	11.1	54.2	40.6	33.5						
Incr Delay (d2), s/veh	2.9	0.0	0.8	5.1	0.0	0.5	0.1	3.1	2.9	19.2	6.8	1.1						
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0						
%ile BackOfQ(50%),veh/ln	3.9	0.0	1.7	6.7	0.0	1.5	1.7	10.6	11.1	4.5	12.8	2.1						
LnGrp Delay(d),s/veh	54.7	0.0	50.8	54.8	0.0	46.2	23.2	14.2	14.0	73.3	47.4	34.6						
LnGrp LOS	D		D	D		D	C	B	B	E	D	C						
Approach Vol, veh/h	172				246			1293			963							
Approach Delay, s/veh	53.5				53.1			14.7			49.5							
Approach LOS	D				D			B			D							
Timer	1	2	3	4	5	6	7	8										
Assigned Phs	1	2			4	5	6	8										
Phs Duration (G+Y+Rc), s	13.8	69.1			16.2	45.2	37.7	20.9										
Change Period (Y+Rc), s	4.0	5.0			4.0	5.0	* 5	4.0										
Max Green Setting (Gmax), s	12.0	35.0			28.0	11.0	* 36	28.0										
Max Q Clear Time (g_c+I1), s	9.7	22.7			9.7	5.4	26.2	14.7										
Green Ext Time (p_c), s	0.1	10.1			0.5	0.1	6.5	1.1										
Intersection Summary																		
HCM 2010 Ctrl Delay	33.2																	
HCM 2010 LOS	C																	
Notes																		

Intersection						
Int Delay, s/veh	2.2					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	73	637	662	128	54	43
Future Vol, veh/h	73	637	662	128	54	43
Conflicting Peds, #/hr	2	0	0	2	1	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	76	664	690	133	56	45
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	825	0	-	0	1244	414
Stage 1	-	-	-	-	759	-
Stage 2	-	-	-	-	485	-
Critical Hdwy	4.14	-	-	-	6.1	6.2
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.22	-	-	-	3	3
Pot Cap-1 Maneuver	801	-	-	-	234	695
Stage 1	-	-	-	-	473	-
Stage 2	-	-	-	-	664	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	799	-	-	-	198	694
Mov Cap-2 Maneuver	-	-	-	-	198	-
Stage 1	-	-	-	-	401	-
Stage 2	-	-	-	-	663	-
Approach	EB	WB		SB		
HCM Control Delay, s	1.6	0		23.9		
HCM LOS				C		
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	
Capacity (veh/h)	799	-	-	-	290	
HCM Lane V/C Ratio	0.095	-	-	-	0.348	
HCM Control Delay (s)	10	0.6	-	-	23.9	
HCM Lane LOS	A	A	-	-	C	
HCM 95th %tile Q(veh)	0.3	-	-	-	1.5	

HCM 2010 Signalized Intersection Summary

3: Cleaveland Rd/Woodsworth Ln & Gregory Ln

08/09/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	106	379	226	79	442	35	266	116	39	22	104	97
Future Volume (veh/h)	106	379	226	79	442	35	266	116	39	22	104	97
Number	5	2	12	1	6	16	3	8	18	7	4	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		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1863	1900	1863	1863
Adj Flow Rate, veh/h	108	387	182	81	451	34	194	225	32	22	106	85
Adj No. of Lanes	1	2	0	1	2	0	1	1	1	0	1	1
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	707	1203	558	119	602	45	265	278	232	30	144	146
Arrive On Green	0.40	0.51	0.51	0.07	0.18	0.18	0.15	0.15	0.15	0.09	0.09	0.09
Sat Flow, veh/h	1774	2350	1090	1774	3337	251	1774	1863	1557	317	1529	1557
Grp Volume(v), veh/h	108	290	279	81	238	247	194	225	32	128	0	85
Grp Sat Flow(s),veh/h/ln	1774	1770	1670	1774	1770	1818	1774	1863	1557	1847	0	1557
Q Serve(g_s), s	3.5	8.6	8.8	4.0	11.5	11.6	9.4	10.5	1.6	6.1	0.0	4.7
Cycle Q Clear(g_c), s	3.5	8.6	8.8	4.0	11.5	11.6	9.4	10.5	1.6	6.1	0.0	4.7
Prop In Lane	1.00		0.65	1.00		0.14	1.00		1.00	0.17		1.00
Lane Grp Cap(c), veh/h	707	906	855	119	319	328	265	278	232	173	0	146
V/C Ratio(X)	0.15	0.32	0.33	0.68	0.75	0.75	0.73	0.81	0.14	0.74	0.00	0.58
Avail Cap(c_a), veh/h	707	906	855	177	413	424	453	476	398	390	0	329
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	0.83	0.00	0.83
Uniform Delay (d), s/veh	17.3	12.8	12.9	41.0	34.9	35.0	36.6	37.1	33.3	39.7	0.0	39.1
Incr Delay (d2), s/veh	0.0	0.9	1.0	2.5	14.7	14.6	1.5	2.2	0.1	1.9	0.0	1.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.7	4.4	4.3	2.0	6.9	7.2	4.7	5.5	0.7	3.2	0.0	2.1
LnGrp Delay(d),s/veh	17.4	13.7	13.9	43.6	49.6	49.6	38.1	39.2	33.4	41.6	0.0	40.2
LnGrp LOS	B	B	B	D	D	D	D	D	C	D		D
Approach Vol, veh/h		677			566			451			213	
Approach Delay, s/veh		14.4			48.8			38.3			41.1	
Approach LOS		B			D			D			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	10.0	50.1		12.5	39.9	20.2		17.4				
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0				
Max Green Setting (Gmax), s	9.0	23.0		19.0	11.0	21.0		23.0				
Max Q Clear Time (g_c+I1), s	6.0	10.8		8.1	5.5	13.6		12.5				
Green Ext Time (p_c), s	0.0	4.6		0.4	0.1	2.7		0.9				
Intersection Summary												
HCM 2010 Ctrl Delay			33.2									
HCM 2010 LOS			C									
Notes												

Intersection												
Int Delay, s/veh	1.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↵	↑↑			↕				↵
Traffic Vol, veh/h	0	442	9	42	523	17	4	1	48	0	0	30
Future Vol, veh/h	0	442	9	42	523	17	4	1	48	0	0	30
Conflicting Peds, #/hr	12	0	5	5	0	12	2	0	0	0	0	2
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	120	-	-	-	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	98	98	98	98	98	98	98	98	98	98	98	98
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	451	9	43	534	17	4	1	49	0	0	31
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	-	0	0	465	0	0	816	1110	235	-	-	290
Stage 1	-	-	-	-	-	-	461	461	-	-	-	-
Stage 2	-	-	-	-	-	-	355	649	-	-	-	-
Critical Hdwy	-	-	-	4.14	-	-	7.54	6.54	6.94	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	-	-	-
Follow-up Hdwy	-	-	-	2.22	-	-	3.52	4.02	3.32	-	-	3.32
Pot Cap-1 Maneuver	0	-	-	1093	-	-	269	208	767	0	0	707
Stage 1	0	-	-	-	-	-	550	564	-	0	0	-
Stage 2	0	-	-	-	-	-	635	464	-	0	0	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	-	-	-	1088	-	-	248	197	763	-	-	698
Mov Cap-2 Maneuver	-	-	-	-	-	-	248	197	-	-	-	-
Stage 1	-	-	-	-	-	-	550	561	-	-	-	-
Stage 2	-	-	-	-	-	-	582	440	-	-	-	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			0.6			11.3			10.4		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	WBR	SBLn1					
Capacity (veh/h)	630	-	-	1088	-	-	698					
HCM Lane V/C Ratio	0.086	-	-	0.039	-	-	0.044					
HCM Control Delay (s)	11.3	-	-	8.4	-	-	10.4					
HCM Lane LOS	B	-	-	A	-	-	B					
HCM 95th %tile Q(veh)	0.3	-	-	0.1	-	-	0.1					

HCM Signalized Intersection Capacity Analysis

5: Contra Costa Blvd & Gregory Ln/I-680 SB Off-Ramp

08/09/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	197	0	346	148	312	213	200	1056	0	29	897	125
Future Volume (vph)	197	0	346	148	312	213	200	1056	0	29	897	125
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0	4.0	5.0		4.0	5.0	5.0
Lane Util. Factor	0.97		1.00	1.00	1.00	1.00	0.97	0.91		1.00	0.95	1.00
Frpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	0.99
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00		0.85	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95		1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3433		1583	1770	1863	1583	3433	5085		1770	3539	1564
Flt Permitted	0.95		1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	3433		1583	1770	1863	1583	3433	5085		1770	3539	1564
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	205	0	360	154	325	222	208	1100	0	30	934	130
RTOR Reduction (vph)	0	0	133	0	0	171	0	0	0	0	0	74
Lane Group Flow (vph)	205	0	227	154	325	51	208	1100	0	30	934	56
Confl. Bikes (#/hr)									1			1
Turn Type	Split		pm+ov	Split	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	4	4	5	3	3		5	2		1	6	
Permitted Phases			4			3						6
Actuated Green, G (s)	12.7		23.8	27.3	27.3	27.3	11.1	53.4		9.6	51.9	51.9
Effective Green, g (s)	12.7		23.8	27.3	27.3	27.3	11.1	53.4		9.6	51.9	51.9
Actuated g/C Ratio	0.11		0.20	0.23	0.23	0.23	0.09	0.44		0.08	0.43	0.43
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0	4.0	5.0		4.0	5.0	5.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0	3.0	4.0		3.0	4.0	4.0
Lane Grp Cap (vph)	363		313	402	423	360	317	2262		141	1530	676
v/s Ratio Prot	0.06		c0.07	0.09	c0.17		0.06	0.22		0.02	c0.26	
v/s Ratio Perm			0.08			0.03						0.04
v/c Ratio	0.56		0.72	0.38	0.77	0.14	0.66	0.49		0.21	0.61	0.08
Uniform Delay, d1	51.0		45.0	39.2	43.4	37.0	52.6	23.6		51.7	26.3	20.0
Progression Factor	1.00		1.00	1.00	1.00	1.00	1.16	0.87		0.58	0.47	0.16
Incremental Delay, d2	2.0		8.1	0.6	8.2	0.2	4.6	0.7		0.7	1.7	0.2
Delay (s)	53.0		53.1	39.8	51.6	37.2	65.5	21.1		30.8	13.9	3.3
Level of Service	D		D	D	D	D	E	C		C	B	A
Approach Delay (s)		53.1			44.4			28.2			13.1	
Approach LOS		D			D			C			B	
Intersection Summary												
HCM 2000 Control Delay			30.6									
HCM 2000 Volume to Capacity ratio			0.68									
Actuated Cycle Length (s)			120.0									
Intersection Capacity Utilization			66.7%									
Analysis Period (min)			15									
c Critical Lane Group												

Intersection						
Int Delay, s/veh	1.2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	24	42	389	15	28	389
Future Vol, veh/h	24	42	389	15	28	389
Conflicting Peds, #/hr	0	1	0	7	7	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	98	98	98	80	98	98
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	24	43	397	19	29	397
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	671	216	0	0	423	0
Stage 1	414	-	-	-	-	-
Stage 2	257	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22	-
Pot Cap-1 Maneuver	390	789	-	-	1133	-
Stage 1	635	-	-	-	-	-
Stage 2	762	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	377	783	-	-	1125	-
Mov Cap-2 Maneuver	377	-	-	-	-	-
Stage 1	631	-	-	-	-	-
Stage 2	742	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	12.3	0		0.6		
HCM LOS	B					
Minor Lane/Major Mvmt	NBT	NBRWBLn1		SBL	SBT	
Capacity (veh/h)	-	- 563		1125	-	
HCM Lane V/C Ratio	-	- 0.12		0.025	-	
HCM Control Delay (s)	-	- 12.3		8.3	-	
HCM Lane LOS	-	- B		A	-	
HCM 95th %tile Q(veh)	-	- 0.4		0.1	-	

HCM 2010 Signalized Intersection Summary

7: Contra Costa Blvd & Crescent Dr

08/09/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations								  			 	
Traffic Volume (veh/h)	44	8	92	124	10	103	56	1162	68	28	1169	86
Future Volume (veh/h)	44	8	92	124	10	103	56	1162	68	28	1169	86
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.98	0.98		0.98	1.00		0.97	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1863	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	46	8	27	129	10	50	58	1210	71	29	1218	88
Adj No. of Lanes	0	1	1	1	1	0	1	3	0	1	2	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	250	39	306	243	52	262	522	1574	92	662	1336	96
Arrive On Green	0.20	0.20	0.20	0.20	0.20	0.20	0.59	0.64	0.64	0.75	0.80	0.80
Sat Flow, veh/h	983	198	1547	1343	265	1327	1774	4905	288	1774	3342	241
Grp Volume(v), veh/h	54	0	27	129	0	60	58	836	445	29	644	662
Grp Sat Flow(s),veh/h/ln	1181	0	1547	1343	0	1592	1774	1695	1802	1774	1770	1814
Q Serve(g_s), s	3.6	0.0	1.7	11.0	0.0	3.8	1.7	20.9	20.9	0.5	32.1	32.5
Cycle Q Clear(g_c), s	7.4	0.0	1.7	18.4	0.0	3.8	1.7	20.9	20.9	0.5	32.1	32.5
Prop In Lane	0.85		1.00	1.00		0.83	1.00		0.16	1.00		0.13
Lane Grp Cap(c), veh/h	289	0	306	243	0	314	522	1088	578	662	708	725
V/C Ratio(X)	0.19	0.00	0.09	0.53	0.00	0.19	0.11	0.77	0.77	0.04	0.91	0.91
Avail Cap(c_a), veh/h	441	0	477	392	0	491	522	1667	886	662	870	892
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00
Upstream Filter(I)	0.99	0.00	0.99	1.00	0.00	1.00	0.92	0.92	0.92	0.73	0.73	0.73
Uniform Delay (d), s/veh	42.7	0.0	39.3	49.5	0.0	40.2	17.8	18.3	18.3	9.6	10.4	10.5
Incr Delay (d2), s/veh	0.4	0.0	0.2	2.6	0.0	0.4	0.1	4.8	8.7	0.0	14.0	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(50%),veh/ln	1.6	0.0	0.7	4.3	0.0	1.7	0.8	10.2	11.5	0.2	17.4	17.9
LnGrp Delay(d),s/veh	43.1	0.0	39.5	52.1	0.0	40.6	17.9	23.2	27.1	9.6	24.4	24.5
LnGrp LOS	D		D	D		D	B	C	C	A	C	C
Approach Vol, veh/h		81			189			1339			1335	
Approach Delay, s/veh		41.9			48.4			24.2			24.1	
Approach LOS		D			D			C			C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	48.8	43.5		27.7	39.3	53.0		27.7				
Change Period (Y+Rc), s	4.0	5.0		4.0	4.0	5.0		4.0				
Max Green Setting (Gmax), s	11.0	59.0		37.0	11.0	59.0		37.0				
Max Q Clear Time (g_c+I1), s	2.5	22.9		9.4	3.7	34.5		20.4				
Green Ext Time (p_c), s	0.0	15.6		0.5	0.0	13.5		0.9				
Intersection Summary												
HCM 2010 Ctrl Delay			26.2									
HCM 2010 LOS			C									

HCM 2010 Signalized Intersection Summary

8: Cleaveland Rd & Crescent Plaza

08/09/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	1	0	40	0	114	0	292	77	176	234	2
Future Volume (veh/h)	1	1	0	40	0	114	0	292	77	176	234	2
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		1.00	0.98		0.99	1.00		0.96	0.99		0.96
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1900	1900	1863	1863	1900	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	1	1	0	42	0	115	0	304	75	183	244	2
Adj No. of Lanes	0	1	0	0	1	1	0	2	0	0	2	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	355	203	0	606	0	271	0	1180	286	639	821	7
Arrive On Green	0.17	0.17	0.00	0.17	0.00	0.17	0.00	0.42	0.42	0.42	0.42	0.42
Sat Flow, veh/h	465	1174	0	1390	0	1566	0	2896	678	732	1950	17
Grp Volume(v), veh/h	2	0	0	42	0	115	0	190	189	226	0	203
Grp Sat Flow(s),veh/h/ln	1639	0	0	1390	0	1566	0	1770	1712	1007	0	1691
Q Serve(g_s), s	0.0	0.0	0.0	0.5	0.0	1.3	0.0	1.4	1.4	2.3	0.0	1.6
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.5	0.0	1.3	0.0	1.4	1.4	3.8	0.0	1.6
Prop In Lane	0.50		0.00	1.00		1.00	0.00		0.40	0.81		0.01
Lane Grp Cap(c), veh/h	558	0	0	606	0	271	0	745	720	755	0	712
V/C Ratio(X)	0.00	0.00	0.00	0.07	0.00	0.42	0.00	0.25	0.26	0.30	0.00	0.29
Avail Cap(c_a), veh/h	2127	0	0	2058	0	1909	0	2516	2434	1844	0	2405
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	0.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	6.7	0.0	0.0	6.9	0.0	7.3	0.0	3.7	3.7	4.5	0.0	3.8
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.1	0.1	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(50%),veh/ln	0.0	0.0	0.0	0.2	0.0	0.6	0.0	0.6	0.6	1.0	0.0	0.7
LnGrp Delay(d),s/veh	6.7	0.0	0.0	7.0	0.0	7.7	0.0	3.8	3.8	4.6	0.0	3.8
LnGrp LOS	A			A		A		A	A	A		A
Approach Vol, veh/h		2			157			379			429	
Approach Delay, s/veh		6.7			7.5			3.8			4.2	
Approach LOS		A			A			A			A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		12.3		7.4		12.3		7.4				
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0				
Max Green Setting (Gmax), s		28.0		24.0		28.0		24.0				
Max Q Clear Time (g_c+I1), s		3.4		2.0		5.8		3.3				
Green Ext Time (p_c), s		1.5		0.0		2.0		0.3				
Intersection Summary												
HCM 2010 Ctrl Delay				4.6								
HCM 2010 LOS				A								

HCM 2010 Signalized Intersection Summary

9: Crescent Dr & Crescent Plaza

08/09/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	21	266	21	49	130	61	19	42	70	63	22	48
Future Volume (veh/h)	21	266	21	49	130	61	19	42	70	63	22	48
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.95		0.91	0.96		0.91	0.93		0.95	0.96		0.92
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1900	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	23	289	23	53	141	66	21	46	76	68	24	52
Adj No. of Lanes	1	1	0	1	1	0	0	1	0	0	1	0
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	474	525	42	407	361	169	177	281	366	405	160	221
Arrive On Green	0.31	0.31	0.31	0.31	0.31	0.31	0.43	0.43	0.43	0.43	0.43	0.43
Sat Flow, veh/h	1107	1690	134	1018	1163	544	97	659	857	542	374	518
Grp Volume(v), veh/h	23	0	312	53	0	207	143	0	0	144	0	0
Grp Sat Flow(s),veh/h/ln	1107	0	1824	1018	0	1707	1613	0	0	1433	0	0
Q Serve(g_s), s	0.5	0.0	4.3	1.4	0.0	2.9	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	3.4	0.0	4.3	5.7	0.0	2.9	1.7	0.0	0.0	1.6	0.0	0.0
Prop In Lane	1.00		0.07	1.00		0.32	0.15		0.53	0.47		0.36
Lane Grp Cap(c), veh/h	474	0	567	407	0	530	824	0	0	786	0	0
V/C Ratio(X)	0.05	0.00	0.55	0.13	0.00	0.39	0.17	0.00	0.00	0.18	0.00	0.00
Avail Cap(c_a), veh/h	856	0	1195	758	0	1118	2196	0	0	2005	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	9.6	0.0	8.8	11.1	0.0	8.3	5.5	0.0	0.0	5.5	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.3	0.1	0.0	0.2	0.1	0.0	0.0	0.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	2.2	0.4	0.0	1.3	0.8	0.0	0.0	0.8	0.0	0.0
LnGrp Delay(d),s/veh	9.6	0.0	9.1	11.2	0.0	8.4	5.6	0.0	0.0	5.6	0.0	0.0
LnGrp LOS	A		A	B		A	A			A		
Approach Vol, veh/h	335				260		143				144	
Approach Delay, s/veh	9.1				9.0		5.6				5.6	
Approach LOS	A				A		A				A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	2		4		6		8					
Phs Duration (G+Y+Rc), s	17.0		13.5		17.0		13.5					
Change Period (Y+Rc), s	4.0		4.0		4.0		4.0					
Max Green Setting (Gmax), s	40.0		20.0		40.0		20.0					
Max Q Clear Time (g_c+I1), s	3.7		6.3		3.6		7.7					
Green Ext Time (p_c), s	1.3		1.1		1.4		0.7					
Intersection Summary												
HCM 2010 Ctrl Delay			7.9									
HCM 2010 LOS			A									

HCM 2010 Signalized Intersection Summary

10: Contra Costa Blvd & Crescent Plaza/Monument Blvd

08/09/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	39	329	32	199	197	509	64	676	407	683	696	25
Future Volume (veh/h)	39	329	32	199	197	509	64	676	407	683	696	25
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.98	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	40	336	33	203	201	519	65	690	415	697	710	26
Adj No. of Lanes	1	2	0	2	1	2	1	3	1	2	3	1
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	51	472	46	268	361	1643	84	1153	478	1378	2989	926
Arrive On Green	0.03	0.15	0.15	0.08	0.19	0.19	0.02	0.07	0.07	0.40	0.59	0.59
Sat Flow, veh/h	1774	3254	317	3442	1863	2721	1774	5085	1562	3442	5085	1575
Grp Volume(v), veh/h	40	182	187	203	201	519	65	690	415	697	710	26
Grp Sat Flow(s),veh/h/ln	1774	1770	1801	1721	1863	1360	1774	1695	1562	1721	1695	1575
Q Serve(g_s), s	2.7	11.7	11.9	6.9	11.7	1.8	4.4	15.8	18.8	18.3	8.0	0.8
Cycle Q Clear(g_c), s	2.7	11.7	11.9	6.9	11.7	1.8	4.4	15.8	18.8	18.3	8.0	0.8
Prop In Lane	1.00		0.18	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	51	257	261	268	361	1643	84	1153	478	1378	2989	926
V/C Ratio(X)	0.78	0.71	0.72	0.76	0.56	0.32	0.77	0.60	0.87	0.51	0.24	0.03
Avail Cap(c_a), veh/h	163	398	405	516	528	1886	237	1314	527	1378	2989	926
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00
Upstream Filter(I)	0.84	0.84	0.84	0.81	0.81	0.81	0.94	0.94	0.94	0.82	0.82	0.82
Uniform Delay (d), s/veh	57.9	48.9	48.9	54.2	43.7	5.6	58.4	50.2	32.3	27.1	11.9	10.4
Incr Delay (d2), s/veh	19.0	3.0	3.1	3.6	1.1	0.1	12.8	2.2	17.9	0.5	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.6	6.0	6.2	3.4	6.1	2.8	2.5	7.6	14.9	8.8	3.8	0.4
LnGrp Delay(d),s/veh	76.9	51.9	52.0	57.8	44.8	5.7	71.2	52.4	50.3	27.6	12.0	10.4
LnGrp LOS	E	D	D	E	D	A	E	D	D	C	B	B
Approach Vol, veh/h	409				923		1170				1433	
Approach Delay, s/veh	54.4				25.7		52.7				19.5	
Approach LOS	D				C		D				B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	53.0	32.2	13.3	21.4	9.7	75.5	7.5	27.3				
Change Period (Y+Rc), s	5.0	* 5	4.0	4.0	4.0	5.0	4.0	4.0				
Max Green Setting (Gmax), s	27.6	* 31	18.0	27.0	16.0	42.0	11.0	34.0				
Max Q Clear Time (g_c+20), s	20.3	20.8	8.9	13.9	6.4	10.0	4.7	13.7				
Green Ext Time (p_c), s	2.9	5.7	0.4	1.7	0.1	10.2	0.0	3.3				
Intersection Summary												
HCM 2010 Ctrl Delay	34.4											
HCM 2010 LOS	C											
Notes												

HCM Signalized Intersection Capacity Analysis

11: I-680 Ramps & Monument Blvd

08/09/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	569	803	25	514	729	680	63	0	416	993	0	162
Future Volume (vph)	569	803	25	514	729	680	63	0	416	993	0	162
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	11.2	8.7		10.2	8.7	8.7	8.7		10.2	9.7		11.2
Lane Util. Factor	0.97	0.91		0.97	0.91	0.88	0.97		0.88	0.94		1.00
Frt	1.00	1.00		1.00	1.00	0.85	1.00		0.85	1.00		0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95		1.00	0.95		1.00
Satd. Flow (prot)	3433	5062		3433	5085	2787	3433		2787	4990		1583
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95		1.00	0.95		1.00
Satd. Flow (perm)	3433	5062		3433	5085	2787	3433		2787	4990		1583
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	587	828	26	530	752	701	65	0	429	1024	0	167
RTOR Reduction (vph)	0	0	0	0	0	49	0	0	0	0	0	0
Lane Group Flow (vph)	587	854	0	530	752	652	65	0	429	1024	0	167
Turn Type	Prot	NA		Prot	NA	custom	Prot		pm+ov	Prot		pm+ov
Protected Phases	5	2		1	6	3	3		1	7		5
Permitted Phases						6			6			7
Actuated Green, G (s)	26.9	27.7		24.4	24.2	56.1	31.9		48.6	30.9		57.8
Effective Green, g (s)	26.9	27.7		24.4	24.2	56.1	31.9		48.6	30.9		57.8
Actuated g/C Ratio	0.24	0.25		0.22	0.22	0.50	0.29		0.44	0.28		0.52
Clearance Time (s)	11.2	8.7		10.2	8.7	8.7	8.7		10.2	9.7		11.2
Vehicle Extension (s)	3.0	2.0		2.0	2.5	2.0	2.0		2.0	3.0		3.0
Lane Grp Cap (vph)	827	1256		750	1102	1618	981		1213	1381		819
v/s Ratio Prot	c0.17	c0.17		0.15	0.15	0.12	0.02		0.08	c0.21		0.05
v/s Ratio Perm						0.12			0.08			0.06
v/c Ratio	0.71	0.68		0.71	0.68	0.40	0.07		0.35	0.74		0.20
Uniform Delay, d1	38.8	37.9		40.3	40.2	17.3	29.0		21.0	36.7		14.5
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00		1.00
Incremental Delay, d2	2.8	1.2		2.5	1.6	0.1	0.0		0.1	2.2		0.1
Delay (s)	41.6	39.1		42.8	41.8	17.4	29.0		21.1	38.9		14.6
Level of Service	D	D		D	D	B	C		C	D		B
Approach Delay (s)		40.1			33.4			22.1			35.5	
Approach LOS		D			C			C			D	
Intersection Summary												
HCM 2000 Control Delay			34.7									
HCM 2000 Volume to Capacity ratio			0.74									
Actuated Cycle Length (s)			111.6									
Intersection Capacity Utilization			72.4%									
Analysis Period (min)			15									
c Critical Lane Group												

Intersection

Intersection Delay, s/veh 19.4

Intersection LOS C

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	173	158	212	130	171	213
Future Vol, veh/h	173	158	212	130	171	213
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	206	188	252	155	204	254
Number of Lanes	1	0	1	1	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	2	1	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	1	1
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	1	0	2
HCM Control Delay	19	15	23.8
HCM LOS	C	B	C

Lane	NBLn1	EBLn1	WBLn1	WBLn2
Vol Left, %	45%	0%	100%	0%
Vol Thru, %	0%	52%	0%	100%
Vol Right, %	55%	48%	0%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	384	331	212	130
LT Vol	171	0	212	0
Through Vol	0	173	0	130
RT Vol	213	158	0	0
Lane Flow Rate	457	394	252	155
Geometry Grp	2	5	7	7
Degree of Util (X)	0.74	0.642	0.499	0.284
Departure Headway (Hd)	5.825	5.867	7.112	6.601
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	617	611	502	540
Service Time	3.901	3.951	4.906	4.394
HCM Lane V/C Ratio	0.741	0.645	0.502	0.287
HCM Control Delay	23.8	19	16.9	12
HCM Lane LOS	C	C	C	B
HCM 95th-tile Q	6.4	4.6	2.7	1.2

HCM 2010 Signalized Intersection Summary

13: Astrid Dr/Cleaveland Rd & Boyd Rd

08/09/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	136	230	32	23	160	107	13	101	40	65	97	128
Future Volume (veh/h)	136	230	32	23	160	107	13	101	40	65	97	128
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.97	1.00		0.93	1.00		0.93
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	155	261	31	26	182	86	15	115	18	74	110	140
Adj No. of Lanes	1	1	0	1	1	1	1	2	0	1	1	1
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	919	1083	129	32	298	246	17	327	50	96	273	216
Arrive On Green	0.52	0.67	0.67	0.02	0.16	0.16	0.01	0.11	0.11	0.05	0.15	0.15
Sat Flow, veh/h	1774	1628	193	1774	1863	1539	1774	3049	464	1774	1863	1474
Grp Volume(v), veh/h	155	0	292	26	182	86	15	65	68	74	110	140
Grp Sat Flow(s),veh/h/ln	1774	0	1821	1774	1863	1539	1774	1770	1743	1774	1863	1474
Q Serve(g_s), s	4.5	0.0	6.2	1.4	8.8	4.8	0.8	3.3	3.5	4.0	5.2	8.6
Cycle Q Clear(g_c), s	4.5	0.0	6.2	1.4	8.8	4.8	0.8	3.3	3.5	4.0	5.2	8.6
Prop In Lane	1.00		0.11	1.00		1.00	1.00		0.27	1.00		1.00
Lane Grp Cap(c), veh/h	919	0	1212	32	298	246	17	190	187	96	273	216
V/C Ratio(X)	0.17	0.00	0.24	0.82	0.61	0.35	0.87	0.34	0.36	0.77	0.40	0.65
Avail Cap(c_a), veh/h	919	0	1212	368	579	478	368	550	542	552	579	458
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	12.3	0.0	6.4	47.2	37.7	36.1	47.7	39.9	40.0	45.0	37.3	38.8
Incr Delay (d2), s/veh	0.4	0.0	0.5	17.4	0.8	0.3	35.7	3.9	4.2	4.8	3.5	11.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.3	0.0	3.2	0.8	4.6	2.1	0.6	1.8	1.9	2.1	2.9	4.2
LnGrp Delay(d),s/veh	12.7	0.0	6.9	64.7	38.5	36.4	83.5	43.8	44.2	49.9	40.8	50.1
LnGrp LOS	B		A	E	D	D	F	D	D	D	D	D
Approach Vol, veh/h		447			294			148			324	
Approach Delay, s/veh		8.9			40.2			48.0			46.9	
Approach LOS		A			D			D			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	7.7	14.4	5.2	68.2	4.9	18.1	54.0	19.4				
Change Period (Y+Rc), s	3.5	4.0	3.5	4.0	4.0	4.0	4.0	4.0				
Max Green Setting (Gmax), s	30.0	30.0	20.0	50.0	20.0	30.0	50.0	30.0				
Max Q Clear Time (g_c+I), s	10.0	5.5	3.4	8.2	2.8	10.6	6.5	10.8				
Green Ext Time (p_c), s	0.1	1.6	0.0	3.0	0.0	2.6	0.8	0.8				
Intersection Summary												
HCM 2010 Ctrl Delay			31.4									
HCM 2010 LOS			C									

Intersection												
Int Delay, s/veh	2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	34	307	2	9	259	52	4	2	16	33	1	23
Future Vol, veh/h	34	307	2	9	259	52	4	2	16	33	1	23
Conflicting Peds, #/hr	8	0	5	5	0	8	7	0	3	3	0	7
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	105	-	-	75	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	36	327	2	10	276	55	4	2	17	35	1	24
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	339	0	0	334	0	0	748	764	336	745	738	319
Stage 1	-	-	-	-	-	-	405	405	-	332	332	-
Stage 2	-	-	-	-	-	-	343	359	-	413	406	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1220	-	-	1225	-	-	329	334	706	330	346	722
Stage 1	-	-	-	-	-	-	622	598	-	681	644	-
Stage 2	-	-	-	-	-	-	672	627	-	616	598	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1211	-	-	1219	-	-	304	317	701	308	329	712
Mov Cap-2 Maneuver	-	-	-	-	-	-	304	317	-	308	329	-
Stage 1	-	-	-	-	-	-	601	577	-	656	634	-
Stage 2	-	-	-	-	-	-	638	617	-	579	577	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.8			0.2			12.2			15.6		
HCM LOS							B			C		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	520	1211	-	-	1219	-	-	400				
HCM Lane V/C Ratio	0.045	0.03	-	-	0.008	-	-	0.152				
HCM Control Delay (s)	12.2	8.1	-	-	8	-	-	15.6				
HCM Lane LOS	B	A	-	-	A	-	-	C				
HCM 95th %tile Q(veh)	0.1	0.1	-	-	0	-	-	0.5				

HCM 2010 Signalized Intersection Summary

15: Contra Costa Blvd & Boyd Rd

08/09/2019

																		
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR						
Lane Configurations																		
Traffic Volume (veh/h)	181	2	167	33	11	53	203	899	3	27	791	153						
Future Volume (veh/h)	181	2	167	33	11	53	203	899	3	27	791	153						
Number	7	4	14	3	8	18	5	2	12	1	6	16						
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0						
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00						
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00						
Adj Sat Flow, veh/h/ln	1863	1863	1863	1900	1863	1900	1863	1863	1900	1863	1863	1863						
Adj Flow Rate, veh/h	200	0	70	36	12	55	223	988	2	30	869	165						
Adj No. of Lanes	2	0	1	0	1	0	1	3	0	1	3	1						
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91						
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2						
Cap, veh/h	296	0	132	46	15	70	257	1330	3	771	2765	861						
Arrive On Green	0.08	0.00	0.08	0.08	0.08	0.08	0.14	0.25	0.25	0.14	0.18	0.18						
Sat Flow, veh/h	3548	0	1583	586	195	895	1774	5240	11	1774	5085	1583						
Grp Volume(v), veh/h	200	0	70	103	0	0	223	639	351	30	869	165						
Grp Sat Flow(s),veh/h/ln	1774	0	1583	1676	0	0	1774	1695	1861	1774	1695	1583						
Q Serve(g_s), s	6.6	0.0	5.1	7.2	0.0	0.0	14.8	20.8	20.8	1.7	17.8	10.6						
Cycle Q Clear(g_c), s	6.6	0.0	5.1	7.2	0.0	0.0	14.8	20.8	20.8	1.7	17.8	10.6						
Prop In Lane	1.00		1.00	0.35		0.53	1.00		0.01	1.00		1.00						
Lane Grp Cap(c), veh/h	296	0	132	131	0	0	257	860	472	771	2765	861						
V/C Ratio(X)	0.68	0.00	0.53	0.78	0.00	0.00	0.87	0.74	0.74	0.04	0.31	0.19						
Avail Cap(c_a), veh/h	769	0	343	377	0	0	370	1102	605	771	2765	861						
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33						
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	0.96	0.96	0.96						
Uniform Delay (d), s/veh	53.4	0.0	52.7	54.3	0.0	0.0	50.2	41.2	41.2	29.8	29.8	26.8						
Incr Delay (d2), s/veh	3.8	0.0	4.6	9.8	0.0	0.0	16.4	5.8	10.1	0.0	0.3	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(50%),veh/ln	3.4	0.0	2.4	3.7	0.0	0.0	8.4	10.5	12.0	0.9	8.5	4.8						
LnGrp Delay(d),s/veh	57.2	0.0	57.4	64.1	0.0	0.0	66.7	46.9	51.3	29.8	30.1	27.3						
LnGrp LOS	E		E	E			E	D	D	C	C	C						
Approach Vol, veh/h	270				103				1213									
Approach Delay, s/veh	57.3				64.1				51.8									
Approach LOS	E				E				D									
Timer	1	2	3	4	5	6	7	8										
Assigned Phs	1	2			4	5	6	8										
Phs Duration (G+Y+Rc), s	57.1	35.5			14.0	22.4	70.2	13.4										
Change Period (Y+Rc), s	5.0	* 5			4.0	5.0	5.0	4.0										
Max Green Setting (Gmax), s	11.0	* 39			26.0	25.0	24.0	27.0										
Max Q Clear Time (g_c+I1), s	3.7	22.8			8.6	16.8	19.8	9.2										
Green Ext Time (p_c), s	0.0	7.6			1.3	0.6	2.7	0.5										
Intersection Summary																		
HCM 2010 Ctrl Delay	43.9																	
HCM 2010 LOS	D																	
Notes																		

HCM 2010 Signalized Intersection Summary

16: Contra Costa Blvd & Astrid Dr

08/09/2019

								
Movement	EBL	EBR	NBL	NBT	SBT	SBR		
Lane Configurations								
Traffic Volume (veh/h)	41	57	125	705	431	35		
Future Volume (veh/h)	41	57	125	705	431	35		
Number	7	14	5	2	6	16		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			0.97		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863		
Adj Flow Rate, veh/h	46	13	140	792	484	38		
Adj No. of Lanes	1	1	1	2	2	1		
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89		
Percent Heavy Veh, %	2	2	2	2	2	2		
Cap, veh/h	64	57	200	2112	992	430		
Arrive On Green	0.04	0.04	0.11	0.60	0.28	0.28		
Sat Flow, veh/h	1774	1583	1774	3632	3632	1536		
Grp Volume(v), veh/h	46	13	140	792	484	38		
Grp Sat Flow(s),veh/h/ln	1774	1583	1774	1770	1770	1536		
Q Serve(g_s), s	0.6	0.2	1.9	2.9	2.8	0.4		
Cycle Q Clear(g_c), s	0.6	0.2	1.9	2.9	2.8	0.4		
Prop In Lane	1.00	1.00	1.00			1.00		
Lane Grp Cap(c), veh/h	64	57	200	2112	992	430		
V/C Ratio(X)	0.72	0.23	0.70	0.37	0.49	0.09		
Avail Cap(c_a), veh/h	1447	1291	2532	5051	2886	1252		
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	11.7	11.5	10.5	2.6	7.4	6.5		
Incr Delay (d2), s/veh	5.5	0.7	6.2	0.2	0.1	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	0.4	0.2	1.2	1.4	1.4	0.2		
LnGrp Delay(d),s/veh	17.2	12.2	16.7	2.7	7.5	6.5		
LnGrp LOS	B	B	B	A	A	A		
Approach Vol, veh/h	59			932	522			
Approach Delay, s/veh	16.1			4.8	7.4			
Approach LOS	B			A	A			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		19.6		4.9	7.8	11.9		
Change Period (Y+Rc), s		5.0		4.0	5.0	* 5		
Max Green Setting (Gmax), s		35.0		20.0	35.0	* 20		
Max Q Clear Time (g_c+I1), s		4.9		2.6	3.9	4.8		
Green Ext Time (p_c), s		8.5		0.1	0.6	1.9		
Intersection Summary								
HCM 2010 Ctrl Delay			6.2					
HCM 2010 LOS			A					
Notes								

HCM 2010 Signalized Intersection Summary

1: Contra Costa Blvd & Woodsworth Ln/Pleasant Hill Plaza Way

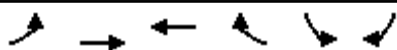
08/09/2019

																		
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR						
Lane Configurations																		
Traffic Volume (veh/h)	76	18	30	71	26	49	38	769	1	57	926	125						
Future Volume (veh/h)	76	18	30	71	26	49	38	769	1	57	926	125						
Number	7	4	14	3	8	18	5	2	12	1	6	16						
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0						
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.98	1.00		0.97	1.00		0.94						
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00						
Adj Sat Flow, veh/h/ln	1863	1863	1900	1900	1863	1863	1863	1863	1900	1863	1863	1863						
Adj Flow Rate, veh/h	82	19	19	76	28	18	41	827	1	61	996	133						
Adj No. of Lanes	1	1	0	0	1	1	1	2	0	1	2	1						
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	146	69	69	122	45	143	755	2272	3	79	837	351						
Arrive On Green	0.08	0.08	0.08	0.09	0.09	0.09	0.57	0.83	0.83	0.04	0.24	0.24						
Sat Flow, veh/h	1774	844	844	1313	484	1547	1774	3627	4	1774	3539	1487						
Grp Volume(v), veh/h	82	0	38	104	0	18	41	403	425	61	996	133						
Grp Sat Flow(s),veh/h/ln	1774	0	1688	1797	0	1547	1774	1770	1862	1774	1770	1487						
Q Serve(g_s), s	4.9	0.0	2.3	6.1	0.0	1.2	1.1	6.0	6.0	3.7	26.0	8.3						
Cycle Q Clear(g_c), s	4.9	0.0	2.3	6.1	0.0	1.2	1.1	6.0	6.0	3.7	26.0	8.3						
Prop In Lane	1.00		0.50	0.73		1.00	1.00		0.00	1.00		1.00						
Lane Grp Cap(c), veh/h	146	0	139	166	0	143	755	1108	1166	79	837	351						
V/C Ratio(X)	0.56	0.00	0.27	0.63	0.00	0.13	0.05	0.36	0.36	0.77	1.19	0.38						
Avail Cap(c_a), veh/h	452	0	430	457	0	394	755	1108	1166	194	837	351						
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.33	1.33	1.33	1.00	1.00	1.00						
Upstream Filter(I)	0.76	0.00	0.76	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00						
Uniform Delay (d), s/veh	48.6	0.0	47.4	48.1	0.0	45.8	14.0	3.9	3.9	52.0	42.0	35.2						
Incr Delay (d2), s/veh	2.6	0.0	0.8	3.8	0.0	0.4	0.0	0.9	0.9	14.7	97.6	3.1						
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0						
%ile BackOfQ(50%),veh/ln	2.5	0.0	1.1	3.2	0.0	0.5	0.6	3.1	3.2	2.2	24.0	3.7						
LnGrp Delay(d),s/veh	51.2	0.0	48.2	51.9	0.0	46.2	14.0	4.9	4.8	66.7	139.6	38.3						
LnGrp LOS	D		D	D		D	B	A	A	E	F	D						
Approach Vol, veh/h	120				122			869			1190							
Approach Delay, s/veh	50.2				51.1			5.3			124.5							
Approach LOS	D				D			A			F							
Timer	1	2	3	4	5	6	7	8										
Assigned Phs	1	2			4	5	6	8										
Phs Duration (G+Y+Rc), s	8.9	73.9			13.0	51.8	31.0	14.2										
Change Period (Y+Rc), s	4.0	5.0			4.0	5.0	* 5	4.0										
Max Green Setting (Gmax), s	12.0	25.0			28.0	11.0	* 26	28.0										
Max Q Clear Time (g_c+I1), s	5.7	8.0			6.9	3.1	28.0	8.1										
Green Ext Time (p_c), s	0.0	9.8			0.4	0.0	0.0	0.5										
Intersection Summary																		
HCM 2010 Ctrl Delay	71.7																	
HCM 2010 LOS	E																	
Notes																		

HCM 2010 Signalized Intersection Summary

2: Gregory Ln & Elinora Dr

08/09/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR		
Lane Configurations		↕↕	↕↕		↕↕			
Traffic Volume (veh/h)	83	738	617	95	107	92		
Future Volume (veh/h)	83	738	617	95	107	92		
Number	7	4	8	18	1	16		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1900	1863	1863	1900	1863	1900		
Adj Flow Rate, veh/h	102	911	762	117	132	114		
Adj No. of Lanes	0	2	2	0	0	0		
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81		
Percent Heavy Veh, %	2	2	2	2	0	0		
Cap, veh/h	228	1474	1557	239	194	167		
Arrive On Green	0.51	0.51	0.51	0.51	0.22	0.22		
Sat Flow, veh/h	185	2997	3170	472	898	776		
Grp Volume(v), veh/h	497	516	438	441	247	0		
Grp Sat Flow(s),veh/h/ln	1487	1610	1770	1779	1681	0		
Q Serve(g_s), s	1.2	7.5	5.3	5.3	4.4	0.0		
Cycle Q Clear(g_c), s	6.4	7.5	5.3	5.3	4.4	0.0		
Prop In Lane	0.21			0.27	0.53	0.46		
Lane Grp Cap(c), veh/h	887	815	896	901	362	0		
V/C Ratio(X)	0.56	0.63	0.49	0.49	0.68	0.00		
Avail Cap(c_a), veh/h	1343	1369	1504	1512	961	0		
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	0.00		
Uniform Delay (d), s/veh	5.4	5.8	5.2	5.2	11.7	0.0		
Incr Delay (d2), s/veh	0.6	0.8	0.4	0.4	2.3	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	8.0	3.5	2.5	2.6	2.2	0.0		
LnGrp Delay(d),s/veh	6.0	6.6	5.7	5.7	13.9	0.0		
LnGrp LOS	A	A	A	A	B			
Approach Vol, veh/h		1013	879		247			
Approach Delay, s/veh		6.3	5.7		13.9			
Approach LOS		A	A		B			
Timer	1	2	3	4	5	6	7	8
Assigned Phs				4		6		8
Phs Duration (G+Y+Rc), s				20.9		11.5		20.9
Change Period (Y+Rc), s				4.5		4.5		4.5
Max Green Setting (Gmax), s				27.5		18.5		27.5
Max Q Clear Time (g_c+I1), s				9.5		6.4		7.3
Green Ext Time (p_c), s				6.8		0.6		5.5
Intersection Summary								
HCM 2010 Ctrl Delay			6.9					
HCM 2010 LOS			A					

HCM 2010 Signalized Intersection Summary

3: Cleaveland Rd/Woodsworth Ln & Gregory Ln

08/09/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	80	417	434	156	499	15	208	79	29	3	137	107
Future Volume (veh/h)	80	417	434	156	499	15	208	79	29	3	137	107
Number	5	2	12	1	6	16	3	8	18	7	4	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		0.98	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1863	1900	1863	1863
Adj Flow Rate, veh/h	100	521	460	195	624	19	180	212	28	4	171	108
Adj No. of Lanes	1	2	0	1	2	0	1	1	1	0	1	1
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	615	821	725	177	751	23	252	264	221	5	217	187
Arrive On Green	0.35	0.46	0.46	0.10	0.21	0.21	0.14	0.14	0.14	0.12	0.12	0.12
Sat Flow, veh/h	1774	1782	1573	1774	3507	107	1774	1863	1557	43	1818	1561
Grp Volume(v), veh/h	100	517	464	195	315	328	180	212	28	175	0	108
Grp Sat Flow(s),veh/h/ln	1774	1770	1585	1774	1770	1844	1774	1863	1557	1861	0	1561
Q Serve(g_s), s	3.5	20.1	20.1	9.0	15.3	15.3	8.7	9.9	1.4	8.2	0.0	5.9
Cycle Q Clear(g_c), s	3.5	20.1	20.1	9.0	15.3	15.3	8.7	9.9	1.4	8.2	0.0	5.9
Prop In Lane	1.00		0.99	1.00		0.06	1.00		1.00	0.02		1.00
Lane Grp Cap(c), veh/h	615	815	730	177	379	395	252	264	221	222	0	187
V/C Ratio(X)	0.16	0.63	0.63	1.10	0.83	0.83	0.72	0.80	0.13	0.79	0.00	0.58
Avail Cap(c_a), veh/h	615	815	730	177	413	430	453	476	398	393	0	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)	0.70	0.70	0.70	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.00	0.95
Uniform Delay (d), s/veh	20.4	18.5	18.5	40.5	33.8	33.8	36.9	37.4	33.7	38.5	0.0	37.5
Incr Delay (d2), s/veh	0.0	2.7	3.0	96.6	18.7	18.1	1.4	2.2	0.1	2.2	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(50%),veh/ln	1.7	10.4	9.4	9.1	9.4	9.7	4.3	5.3	0.6	4.4	0.0	2.6
LnGrp Delay(d),s/veh	20.4	21.1	21.4	137.1	52.5	52.0	38.3	39.6	33.8	40.7	0.0	38.5
LnGrp LOS	C	C	C	F	D	D	D	D	C	D		D
Approach Vol, veh/h	1081				838		420				283	
Approach Delay, s/veh	21.2				72.0		38.6				39.9	
Approach LOS	C				E		D				D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2			4	5	6	8				
Phs Duration (G+Y+Rc), s	3.0	45.5			14.8	35.2	23.3	16.8				
Change Period (Y+Rc), s	4.0	4.0			4.0	4.0	4.0	4.0				
Max Green Setting (Gmax), s	23.0	23.0			19.0	11.0	21.0	23.0				
Max Q Clear Time (g_c+M1), s	22.1	22.1			10.2	5.5	17.3	11.9				
Green Ext Time (p_c), s	0.0	0.7			0.5	0.0	2.0	0.9				
Intersection Summary												
HCM 2010 Ctrl Delay			42.2									
HCM 2010 LOS			D									
Notes												

Intersection												
Int Delay, s/veh	0.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑			↕				↗
Traffic Vol, veh/h	0	443	8	41	650	16	6	0	16	0	0	8
Future Vol, veh/h	0	443	8	41	650	16	6	0	16	0	0	8
Conflicting Peds, #/hr	4	0	4	4	0	4	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	120	-	-	-	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	521	9	48	765	19	7	0	19	0	0	9
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	-	0	0	534	0	0	1009	1414	269	-	-	396
Stage 1	-	-	-	-	-	-	530	530	-	-	-	-
Stage 2	-	-	-	-	-	-	479	884	-	-	-	-
Critical Hdwy	-	-	-	4.14	-	-	7.54	6.54	6.94	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	-	-	-
Follow-up Hdwy	-	-	-	2.22	-	-	3.52	4.02	3.32	-	-	3.32
Pot Cap-1 Maneuver	0	-	-	1030	-	-	194	136	729	0	0	603
Stage 1	0	-	-	-	-	-	500	525	-	0	0	-
Stage 2	0	-	-	-	-	-	537	362	-	0	0	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	-	-	-	1026	-	-	184	129	726	-	-	601
Mov Cap-2 Maneuver	-	-	-	-	-	-	184	129	-	-	-	-
Stage 1	-	-	-	-	-	-	500	523	-	-	-	-
Stage 2	-	-	-	-	-	-	504	344	-	-	-	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			0.5			14.5			11.1		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	WBR	SBLn1					
Capacity (veh/h)	403	-	-	1026	-	-	601					
HCM Lane V/C Ratio	0.064	-	-	0.047	-	-	0.016					
HCM Control Delay (s)	14.5	-	-	8.7	-	-	11.1					
HCM Lane LOS	B	-	-	A	-	-	B					
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-	-	0					

HCM Signalized Intersection Capacity Analysis

5: Contra Costa Blvd & Gregory Ln/I-680 SB Off-Ramp

08/09/2019

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	110	0	343	388	404	136	223	683	0	10	940	97	
Future Volume (vph)	110	0	343	388	404	136	223	683	0	10	940	97	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0	4.0	5.0		4.0	5.0	5.0	
Lane Util. Factor	0.97		1.00	1.00	1.00	1.00	0.97	0.91		1.00	0.95	1.00	
Frpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	0.99	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	
Frt	1.00		0.85	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85	
Flt Protected	0.95		1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	
Satd. Flow (prot)	3433		1583	1770	1863	1583	3433	5085		1770	3539	1563	
Flt Permitted	0.95		1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	
Satd. Flow (perm)	3433		1583	1770	1863	1583	3433	5085		1770	3539	1563	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	
Adj. Flow (vph)	118	0	369	417	434	146	240	734	0	11	1011	104	
RTOR Reduction (vph)	0	0	78	0	0	102	0	0	0	0	0	70	
Lane Group Flow (vph)	118	0	291	417	434	44	240	734	0	11	1011	34	
Confl. Bikes (#/hr)									1			1	
Turn Type	Split		pm+ov	Split	NA	Perm	Prot	NA		Prot	NA	Perm	
Protected Phases	4	4	5	3	3		5	2		1	6		
Permitted Phases			4			3						6	
Actuated Green, G (s)	10.2		23.8	33.2	33.2	33.2	13.6	48.2		1.4	36.0	36.0	
Effective Green, g (s)	10.2		23.8	33.2	33.2	33.2	13.6	48.2		1.4	36.0	36.0	
Actuated g/C Ratio	0.09		0.22	0.30	0.30	0.30	0.12	0.44		0.01	0.33	0.33	
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0	4.0	5.0		4.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0	3.0	4.0		3.0	4.0	4.0	
Lane Grp Cap (vph)	318		400	534	562	477	424	2228		22	1158	511	
v/s Ratio Prot	0.03		c0.09	c0.24	0.23		0.07	0.14		0.01	c0.29		
v/s Ratio Perm			0.09			0.03						0.02	
v/c Ratio	0.37		0.73	0.78	0.77	0.09	0.57	0.33		0.50	0.87	0.07	
Uniform Delay, d1	46.9		40.1	35.1	35.0	27.6	45.4	20.3		54.0	34.8	25.4	
Progression Factor	1.00		1.00	1.00	1.00	1.00	0.88	0.54		1.44	0.88	2.04	
Incremental Delay, d2	0.7		6.5	7.3	6.5	0.1	1.7	0.4		15.2	8.4	0.2	
Delay (s)	47.6		46.6	42.4	41.5	27.7	41.6	11.3		93.1	39.0	52.0	
Level of Service	D		D	D	D	C	D	B		F	D	D	
Approach Delay (s)		46.9			39.8			18.8			40.7		
Approach LOS		D			D			B			D		
Intersection Summary													
HCM 2000 Control Delay			35.3									HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio			0.83										
Actuated Cycle Length (s)			110.0									Sum of lost time (s)	17.0
Intersection Capacity Utilization			79.6%									ICU Level of Service	D
Analysis Period (min)			15										
c Critical Lane Group													

Intersection						
Int Delay, s/veh	0.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	16	19	298	6	18	763
Future Vol, veh/h	16	19	298	6	18	763
Conflicting Peds, #/hr	0	2	0	6	6	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	81	81	81	81	81	81
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	20	23	368	7	22	942
Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	893	196	0	0	381	0
Stage 1	378	-	-	-	-	-
Stage 2	515	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22	-
Pot Cap-1 Maneuver	281	812	-	-	1174	-
Stage 1	663	-	-	-	-	-
Stage 2	565	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	274	806	-	-	1167	-
Mov Cap-2 Maneuver	274	-	-	-	-	-
Stage 1	659	-	-	-	-	-
Stage 2	554	-	-	-	-	-
Approach	WB	NB	SB			
HCM Control Delay, s	14.4	0	0.2			
HCM LOS	B					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	-	427	1167	-	
HCM Lane V/C Ratio	-	-	0.101	0.019	-	
HCM Control Delay (s)	-	-	14.4	8.1	-	
HCM Lane LOS	-	-	B	A	-	
HCM 95th %tile Q(veh)	-	-	0.3	0.1	-	

HCM 2010 Signalized Intersection Summary

7: Contra Costa Blvd & Crescent Dr

08/09/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	2	23	64	1	18	7	891	31	11	1555	54
Future Volume (veh/h)	10	2	23	64	1	18	7	891	31	11	1555	54
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.98	0.98		0.98	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1863	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	11	2	20	73	1	17	8	1012	23	12	1767	58
Adj No. of Lanes	0	1	1	1	1	0	1	3	0	1	2	0
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	176	27	166	191	9	158	520	1469	33	865	1685	55
Arrive On Green	0.11	0.11	0.11	0.11	0.11	0.11	0.39	0.38	0.38	0.98	0.96	0.96
Sat Flow, veh/h	1084	255	1548	1356	87	1476	1774	5116	116	1774	3498	114
Grp Volume(v), veh/h	13	0	20	73	0	18	8	670	365	12	890	935
Grp Sat Flow(s),veh/h/ln	1339	0	1548	1356	0	1562	1774	1695	1842	1774	1770	1843
Q Serve(g_s), s	0.4	0.0	1.3	5.7	0.0	1.1	0.3	18.2	18.3	0.0	53.0	53.0
Cycle Q Clear(g_c), s	1.6	0.0	1.3	7.3	0.0	1.1	0.3	18.2	18.3	0.0	53.0	53.0
Prop In Lane	0.85		1.00	1.00		0.94	1.00		0.06	1.00		0.06
Lane Grp Cap(c), veh/h	204	0	166	191	0	167	520	974	529	865	853	888
V/C Ratio(X)	0.06	0.00	0.12	0.38	0.00	0.11	0.02	0.69	0.69	0.01	1.04	1.05
Avail Cap(c_a), veh/h	478	0	464	453	0	469	520	1633	888	865	853	888
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.33	1.33	1.33	2.00	2.00	2.00
Upstream Filter(I)	0.97	0.00	0.97	1.00	0.00	1.00	0.95	0.95	0.95	0.48	0.48	0.48
Uniform Delay (d), s/veh	44.5	0.0	44.4	47.9	0.0	44.4	23.8	29.9	29.9	0.7	2.0	2.0
Incr Delay (d2), s/veh	0.2	0.0	0.4	1.8	0.0	0.4	0.0	3.8	6.8	0.0	34.0	36.5
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(50%),veh/ln	0.4	0.0	0.6	2.2	0.0	0.5	0.2	9.0	10.3	0.0	21.3	22.8
LnGrp Delay(d),s/veh	44.7	0.0	44.9	49.6	0.0	44.8	23.8	33.6	36.7	0.7	36.0	38.5
LnGrp LOS	D		D	D		D	C	C	D	A	F	F
Approach Vol, veh/h		33			91			1043			1837	
Approach Delay, s/veh		44.8			48.7			34.6			37.1	
Approach LOS		D			D			C			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	57.6	36.6		15.8	36.2	58.0		15.8				
Change Period (Y+Rc), s	4.0	5.0		4.0	4.0	5.0		4.0				
Max Green Setting (Gmax), s	11.0	53.0		33.0	11.0	53.0		33.0				
Max Q Clear Time (g_c+I1), s	2.0	20.3		3.6	2.3	55.0		9.3				
Green Ext Time (p_c), s	0.0	11.3		0.1	0.0	0.0		0.4				
Intersection Summary												
HCM 2010 Ctrl Delay			36.7									
HCM 2010 LOS			D									

HCM 2010 Signalized Intersection Summary

8: Cleaveland Rd & Crescent Plaza

08/09/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	2	0	195	1	75	0	229	175	195	591	2
Future Volume (veh/h)	1	2	0	195	1	75	0	229	175	195	591	2
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		1.00	0.98		0.98	1.00		0.98	0.99		0.96
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1900	1900	1863	1863	1900	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	1	2	0	229	1	84	0	269	181	229	695	2
Adj No. of Lanes	0	1	0	0	1	1	0	2	0	0	2	0
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.80	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	225	340	0	614	2	394	0	1015	658	441	1170	3
Arrive On Green	0.26	0.26	0.00	0.26	0.26	0.26	0.00	0.50	0.50	0.50	0.50	0.50
Sat Flow, veh/h	300	1334	0	1536	7	1544	0	2134	1324	543	2353	7
Grp Volume(v), veh/h	3	0	0	230	0	84	0	232	218	429	0	497
Grp Sat Flow(s),veh/h/ln	1634	0	0	1542	0	1544	0	1770	1595	1209	0	1694
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	1.4	0.0	2.5	2.6	6.4	0.0	6.7
Cycle Q Clear(g_c), s	3.7	0.0	0.0	3.7	0.0	1.4	0.0	2.5	2.6	8.9	0.0	6.7
Prop In Lane	0.33		0.00	1.00		1.00	0.00		0.83	0.53		0.00
Lane Grp Cap(c), veh/h	566	0	0	616	0	394	0	880	793	772	0	842
V/C Ratio(X)	0.01	0.00	0.00	0.37	0.00	0.21	0.00	0.26	0.27	0.56	0.00	0.59
Avail Cap(c_a), veh/h	1355	0	0	1290	0	1147	0	1533	1382	1219	0	1467
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	0.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	9.0	0.0	0.0	10.3	0.0	9.5	0.0	4.7	4.7	6.2	0.0	5.8
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.1	0.1	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(50%),veh/ln	0.0	0.0	0.0	1.7	0.0	0.6	0.0	1.2	1.1	2.9	0.0	3.1
LnGrp Delay(d),s/veh	9.0	0.0	0.0	10.5	0.0	9.6	0.0	4.8	4.8	6.5	0.0	6.0
LnGrp LOS	A			B		A		A	A	A		A
Approach Vol, veh/h		3			314			450			926	
Approach Delay, s/veh		9.0			10.2			4.8			6.2	
Approach LOS		A			B			A			A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		20.1		12.3		20.1		12.3				
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0				
Max Green Setting (Gmax), s		28.0		24.0		28.0		24.0				
Max Q Clear Time (g_c+I1), s		4.6		5.7		10.9		5.7				
Green Ext Time (p_c), s		1.8		0.0		4.3		1.0				
Intersection Summary												
HCM 2010 Ctrl Delay				6.6								
HCM 2010 LOS				A								

HCM 2010 Signalized Intersection Summary

9: Crescent Dr & Crescent Plaza

08/09/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	9	352	13	71	241	27	7	8	148	38	8	24
Future Volume (veh/h)	9	352	13	71	241	27	7	8	148	38	8	24
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.97	0.99		0.97	0.98		0.99	0.99		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1900	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	11	414	15	84	284	32	8	9	174	45	9	28
Adj No. of Lanes	1	1	0	1	1	0	0	1	0	0	1	0
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	496	675	24	417	620	70	132	43	515	418	108	177
Arrive On Green	0.38	0.38	0.38	0.38	0.38	0.38	0.36	0.36	0.36	0.36	0.36	0.36
Sat Flow, veh/h	1042	1784	65	943	1639	185	22	119	1438	653	302	495
Grp Volume(v), veh/h	11	0	429	84	0	316	191	0	0	82	0	0
Grp Sat Flow(s),veh/h/ln	1042	0	1849	943	0	1823	1579	0	0	1451	0	0
Q Serve(g_s), s	0.2	0.0	5.7	2.4	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	4.2	0.0	5.7	8.1	0.0	4.0	2.7	0.0	0.0	1.0	0.0	0.0
Prop In Lane	1.00		0.03	1.00		0.10	0.04		0.91	0.55		0.34
Lane Grp Cap(c), veh/h	496	0	699	417	0	689	689	0	0	703	0	0
V/C Ratio(X)	0.02	0.00	0.61	0.20	0.00	0.46	0.28	0.00	0.00	0.12	0.00	0.00
Avail Cap(c_a), veh/h	790	0	1220	683	0	1203	2194	0	0	2000	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	8.7	0.0	7.6	10.9	0.0	7.1	7.1	0.0	0.0	6.6	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.3	0.1	0.0	0.2	0.3	0.0	0.0	0.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	2.9	0.6	0.0	2.0	1.2	0.0	0.0	0.5	0.0	0.0
LnGrp Delay(d),s/veh	8.7	0.0	8.0	11.0	0.0	7.3	7.4	0.0	0.0	6.7	0.0	0.0
LnGrp LOS	A		A	B		A	A			A		
Approach Vol, veh/h	440				400		191				82	
Approach Delay, s/veh	8.0				8.0		7.4				6.7	
Approach LOS	A				A		A				A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	2		4		6		8					
Phs Duration (G+Y+Rc), s	14.8		15.5		14.8		15.5					
Change Period (Y+Rc), s	4.0		4.0		4.0		4.0					
Max Green Setting (Gmax), s	40.0		20.0		40.0		20.0					
Max Q Clear Time (g_c+I1), s	4.7		7.7		3.0		10.1					
Green Ext Time (p_c), s	1.8		1.5		0.7		1.2					
Intersection Summary												
HCM 2010 Ctrl Delay			7.8									
HCM 2010 LOS			A									

HCM 2010 Signalized Intersection Summary

10: Contra Costa Blvd & Crescent Plaza/Monument Blvd

08/09/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↷		↰	↷	↷	↰	↷	↷	↰	↷	↷
Traffic Volume (veh/h)	17	446	70	431	300	470	27	448	353	443	1115	21
Future Volume (veh/h)	17	446	70	431	300	470	27	448	353	443	1115	21
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	18	485	76	468	326	511	29	487	384	482	1212	23
Adj No. of Lanes	1	2	0	2	1	2	1	3	1	2	3	1
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	27	576	90	539	612	1821	38	853	513	1117	2441	760
Arrive On Green	0.02	0.19	0.19	0.16	0.33	0.33	0.01	0.06	0.06	0.65	0.96	0.96
Sat Flow, veh/h	1774	3069	479	3442	1863	2787	1774	5085	1583	3442	5085	1583
Grp Volume(v), veh/h	18	279	282	468	326	511	29	487	384	482	1212	23
Grp Sat Flow(s),veh/h/ln	1774	1770	1778	1721	1863	1393	1774	1695	1583	1721	1695	1583
Q Serve(g_s), s	1.1	16.7	16.9	14.6	15.7	1.3	1.8	10.3	7.4	7.5	2.0	0.1
Cycle Q Clear(g_c), s	1.1	16.7	16.9	14.6	15.7	1.3	1.8	10.3	7.4	7.5	2.0	0.1
Prop In Lane	1.00		0.27	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	27	332	334	539	612	1821	38	853	513	1117	2441	760
V/C Ratio(X)	0.66	0.84	0.85	0.87	0.53	0.28	0.76	0.57	0.75	0.43	0.50	0.03
Avail Cap(c_a), veh/h	210	402	404	626	612	1821	242	1387	680	1117	2441	760
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33	2.00	2.00	2.00
Upstream Filter(I)	0.78	0.78	0.78	0.78	0.78	0.78	0.96	0.96	0.96	0.73	0.73	0.73
Uniform Delay (d), s/veh	53.9	43.1	43.2	45.3	30.0	3.2	54.3	48.1	15.9	14.3	1.2	1.1
Incr Delay (d2), s/veh	19.1	10.1	10.6	9.0	0.7	0.1	25.7	2.7	9.2	0.4	0.5	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(50%),veh/ln	0.7	9.1	9.3	7.6	8.2	1.9	1.2	5.0	8.0	3.5	0.8	0.0
LnGrp Delay(d),s/veh	73.0	53.2	53.8	54.3	30.7	3.3	80.0	50.8	25.1	14.8	1.7	1.2
LnGrp LOS	E	D	D	D	C	A	E	D	C	B	A	A
Approach Vol, veh/h		579			1305			900			1717	
Approach Delay, s/veh		54.1			28.5			40.7			5.4	
Approach LOS		D			C			D			A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	40.7	23.4	21.2	24.6	6.4	57.8	5.7	40.2				
Change Period (Y+Rc), s	5.0	* 5	4.0	4.0	4.0	5.0	4.0	4.0				
Max Green Setting (Gmax), s	18.0	* 30	20.0	25.0	15.0	33.0	13.0	32.0				
Max Q Clear Time (g_c+1.5), s	19.5	12.3	16.6	18.9	3.8	4.0	3.1	17.7				
Green Ext Time (p_c), s	2.3	6.2	0.6	1.8	0.0	17.2	0.0	3.6				
Intersection Summary												
HCM 2010 Ctrl Delay			25.4									
HCM 2010 LOS			C									
Notes												

HCM Signalized Intersection Capacity Analysis

11: I-680 Ramps & Monument Blvd

08/09/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	550	595	16	1059	799	635	54	0	361	1269	0	260
Future Volume (vph)	550	595	16	1059	799	635	54	0	361	1269	0	260
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	11.2	8.7		10.2	8.7	8.7	8.7		10.2	9.7		11.2
Lane Util. Factor	0.97	0.91		0.97	0.91	0.88	0.97		0.88	0.94		1.00
Frt	1.00	1.00		1.00	1.00	0.85	1.00		0.85	1.00		0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95		1.00	0.95		1.00
Satd. Flow (prot)	3433	5066		3433	5085	2787	3433		2787	4990		1583
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95		1.00	0.95		1.00
Satd. Flow (perm)	3433	5066		3433	5085	2787	3433		2787	4990		1583
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	591	640	17	1139	859	683	58	0	388	1365	0	280
RTOR Reduction (vph)	0	0	0	0	0	32	0	0	0	0	0	0
Lane Group Flow (vph)	591	657	0	1139	859	651	58	0	388	1365	0	280
Turn Type	Prot	NA		Prot	NA	custom	Prot		pm+ov	Prot		pm+ov
Protected Phases	5	2		1	6	3	3		1	7		5
Permitted Phases						6			6			7
Actuated Green, G (s)	26.1	16.0		40.1	29.0	69.5	40.5		66.3	39.5		65.6
Effective Green, g (s)	26.1	16.0		40.1	29.0	69.5	40.5		66.3	39.5		65.6
Actuated g/C Ratio	0.21	0.13		0.32	0.23	0.56	0.33		0.53	0.32		0.53
Clearance Time (s)	11.2	8.7		10.2	8.7	8.7	8.7		10.2	9.7		11.2
Vehicle Extension (s)	3.0	2.0		2.0	2.5	2.0	2.0		2.0	3.0		3.0
Lane Grp Cap (vph)	721	652		1108	1187	1754	1119		1487	1586		836
v/s Ratio Prot	0.17	c0.13		c0.33	c0.17	0.12	0.02		0.08	c0.27		0.07
v/s Ratio Perm						0.11			0.06			0.11
v/c Ratio	0.82	1.01		1.03	0.72	0.37	0.05		0.26	0.86		0.33
Uniform Delay, d1	46.8	54.1		42.0	43.9	15.2	28.7		15.7	39.8		16.8
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00		1.00
Incremental Delay, d2	7.3	37.1		34.4	2.1	0.0	0.0		0.0	5.0		0.2
Delay (s)	54.1	91.2		76.5	46.0	15.3	28.7		15.7	44.8		17.0
Level of Service	D	F		E	D	B	C		B	D		B
Approach Delay (s)		73.6			51.1			17.4			40.1	
Approach LOS		E			D			B			D	
Intersection Summary												
HCM 2000 Control Delay			50.3									
HCM 2000 Volume to Capacity ratio			0.99									
Actuated Cycle Length (s)			124.2									
Intersection Capacity Utilization			90.0%									
Analysis Period (min)			15									
c Critical Lane Group												

Intersection

Intersection Delay, s/veh 14.2

Intersection LOS B

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	162	170	194	164	129	124
Future Vol, veh/h	162	170	194	164	129	124
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	195	205	234	198	155	149
Number of Lanes	1	0	1	1	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	2	1	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	1	1
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	1	0	2
HCM Control Delay	15.6	12.8	14.3
HCM LOS	C	B	B

Lane	NBLn1	EBLn1	WBLn1	WBLn2
Vol Left, %	51%	0%	100%	0%
Vol Thru, %	0%	49%	0%	100%
Vol Right, %	49%	51%	0%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	253	332	194	164
LT Vol	129	0	194	0
Through Vol	0	162	0	164
RT Vol	124	170	0	0
Lane Flow Rate	305	400	234	198
Geometry Grp	2	5	7	7
Degree of Util (X)	0.489	0.587	0.421	0.328
Departure Headway (Hd)	5.777	5.287	6.491	5.983
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	622	680	554	601
Service Time	3.823	3.329	4.238	3.73
HCM Lane V/C Ratio	0.49	0.588	0.422	0.329
HCM Control Delay	14.3	15.6	13.9	11.6
HCM Lane LOS	B	C	B	B
HCM 95th-tile Q	2.7	3.8	2.1	1.4

HCM 2010 Signalized Intersection Summary

13: Astrid Dr/Cleaveland Rd & Boyd Rd

08/09/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	165	480	57	23	358	74	46	116	56	79	246	462
Future Volume (veh/h)	165	480	57	23	358	74	46	116	56	79	246	462
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	201	585	68	28	437	73	56	141	40	96	300	526
Adj No. of Lanes	1	1	0	1	1	1	1	2	0	1	1	1
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	675	972	113	35	425	362	72	564	155	119	425	358
Arrive On Green	0.38	0.59	0.59	0.02	0.23	0.23	0.04	0.21	0.21	0.07	0.23	0.23
Sat Flow, veh/h	1774	1639	190	1774	1863	1583	1774	2744	755	1774	1863	1566
Grp Volume(v), veh/h	201	0	653	28	437	73	56	89	92	96	300	526
Grp Sat Flow(s),veh/h/ln	1774	0	1829	1774	1863	1583	1774	1770	1730	1774	1863	1566
Q Serve(g_s), s	10.4	0.0	29.7	2.1	30.0	4.9	4.1	5.5	5.8	7.0	19.5	30.0
Cycle Q Clear(g_c), s	10.4	0.0	29.7	2.1	30.0	4.9	4.1	5.5	5.8	7.0	19.5	30.0
Prop In Lane	1.00		0.10	1.00		1.00	1.00		0.44	1.00		1.00
Lane Grp Cap(c), veh/h	675	0	1085	35	425	362	72	364	356	119	425	358
V/C Ratio(X)	0.30	0.00	0.60	0.79	1.03	0.20	0.77	0.25	0.26	0.80	0.71	1.47
Avail Cap(c_a), veh/h	675	0	1085	270	425	362	270	404	395	405	425	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	0.00	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	28.4	0.0	16.9	64.1	50.7	41.0	62.4	43.6	43.8	60.4	46.6	50.7
Incr Delay (d2), s/veh	1.1	0.0	2.5	13.7	50.8	0.1	6.5	1.3	1.4	4.7	8.3	226.5
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(50%),veh/ln	5.3	0.0	15.6	1.1	21.4	2.1	2.2	2.8	2.9	3.6	11.0	35.5
LnGrp Delay(d),s/veh	29.5	0.0	19.4	77.8	101.4	41.1	68.9	44.9	45.1	65.1	54.9	277.2
LnGrp LOS	C		B	E	F	D	E	D	D	E	D	F
Approach Vol, veh/h	854					538		237		922		
Approach Delay, s/veh	21.8					92.0		50.7		182.8		
Approach LOS	C					F		D		F		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	12.3	31.0	6.1	81.9	9.4	34.0	54.0	34.0				
Change Period (Y+Rc), s	3.5	4.0	3.5	4.0	4.0	4.0	4.0	4.0				
Max Green Setting (Gmax), s	30.0	30.0	20.0	50.0	20.0	30.0	50.0	30.0				
Max Q Clear Time (g_c+1.0), s	19.0	7.8	4.1	31.7	6.1	32.0	12.4	32.0				
Green Ext Time (p_c), s	0.1	2.2	0.0	6.3	0.0	0.0	1.0	0.0				
Intersection Summary												
HCM 2010 Ctrl Delay			97.5									
HCM 2010 LOS			F									

Intersection												
Int Delay, s/veh	2.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	140	474	3	5	414	30	0	2	34	3	0	57
Future Vol, veh/h	140	474	3	5	414	30	0	2	34	3	0	57
Conflicting Peds, #/hr	3	0	0	0	0	3	3	0	1	1	0	3
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	105	-	-	75	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	87	87	87	87	87	87	87	87	87	87	87	87
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	161	545	3	6	476	34	0	2	39	3	0	66
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	513	0	0	548	0	0	1410	1394	548	1398	1378	499
Stage 1	-	-	-	-	-	-	869	869	-	508	508	-
Stage 2	-	-	-	-	-	-	541	525	-	890	870	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1052	-	-	1021	-	-	116	141	536	118	145	572
Stage 1	-	-	-	-	-	-	347	369	-	547	539	-
Stage 2	-	-	-	-	-	-	525	529	-	337	369	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1049	-	-	1021	-	-	90	118	535	94	122	569
Mov Cap-2 Maneuver	-	-	-	-	-	-	90	118	-	94	122	-
Stage 1	-	-	-	-	-	-	294	313	-	462	534	-
Stage 2	-	-	-	-	-	-	460	524	-	262	313	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	2.1			0.1			13.9			14.3		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	447	1049	-	-	1021	-	-	454				
HCM Lane V/C Ratio	0.093	0.153	-	-	0.006	-	-	0.152				
HCM Control Delay (s)	13.9	9.1	-	-	8.5	-	-	14.3				
HCM Lane LOS	B	A	-	-	A	-	-	B				
HCM 95th %tile Q(veh)	0.3	0.5	-	-	0	-	-	0.5				

HCM 2010 Signalized Intersection Summary

15: Contra Costa Blvd & Boyd Rd

08/09/2019

																		
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR						
Lane Configurations																		
Traffic Volume (veh/h)	301	7	196	0	1	7	179	523	32	29	1335	261						
Future Volume (veh/h)	301	7	196	0	1	7	179	523	32	29	1335	261						
Number	7	4	14	3	8	18	5	2	12	1	6	16						
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0						
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00						
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00						
Adj Sat Flow, veh/h/ln	1863	1863	1863	1900	1863	1900	1863	1863	1900	1863	1863	1863						
Adj Flow Rate, veh/h	337	0	101	0	1	5	197	575	34	32	1467	284						
Adj No. of Lanes	2	0	1	0	1	0	1	3	0	1	3	1						
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91						
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2						
Cap, veh/h	435	0	194	0	2	10	226	782	46	970	2941	916						
Arrive On Green	0.12	0.00	0.12	0.00	0.01	0.01	0.13	0.16	0.16	0.18	0.19	0.19						
Sat Flow, veh/h	3548	0	1583	0	271	1353	1774	4913	289	1774	5085	1583						
Grp Volume(v), veh/h	337	0	101	0	0	6	197	396	213	32	1467	284						
Grp Sat Flow(s),veh/h/ln	1774	0	1583	0	0	1624	1774	1695	1812	1774	1695	1583						
Q Serve(g_s), s	10.1	0.0	6.6	0.0	0.0	0.4	12.0	12.2	12.3	1.6	28.4	17.0						
Cycle Q Clear(g_c), s	10.1	0.0	6.6	0.0	0.0	0.4	12.0	12.2	12.3	1.6	28.4	17.0						
Prop In Lane	1.00		1.00	0.00		0.83	1.00		0.16	1.00		1.00						
Lane Grp Cap(c), veh/h	435	0	194	0	0	12	226	539	288	970	2941	916						
V/C Ratio(X)	0.77	0.00	0.52	0.00	0.00	0.49	0.87	0.73	0.74	0.03	0.50	0.31						
Avail Cap(c_a), veh/h	613	0	273	0	0	413	242	709	379	970	2941	916						
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33						
Upstream Filter(I)	1.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	0.75	0.75	0.75						
Uniform Delay (d), s/veh	46.8	0.0	45.2	0.0	0.0	54.4	47.1	44.0	44.1	21.1	30.2	25.6						
Incr Delay (d2), s/veh	5.1	0.0	3.0	0.0	0.0	26.6	27.1	8.6	15.7	0.0	0.5	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(50%),veh/ln	5.3	0.0	3.0	0.0	0.0	0.3	7.6	6.4	7.4	0.8	13.5	7.6						
LnGrp Delay(d),s/veh	51.8	0.0	48.3	0.0	0.0	81.0	74.2	52.6	59.8	21.1	30.7	26.3						
LnGrp LOS	D		D			F	E	D	E	C	C	C						
Approach Vol, veh/h	438				6			806			1783							
Approach Delay, s/veh	51.0				81.0			59.8			29.8							
Approach LOS	D				F			E			C							
Timer	1	2	3	4	5	6	7	8										
Assigned Phs	1	2			4	5	6	8										
Phs Duration (G+Y+Rc), s	65.2	22.5			17.5	19.0	68.6	4.8										
Change Period (Y+Rc), s	5.0	* 5			4.0	5.0	5.0	4.0										
Max Green Setting (Gmax), s	23.0	* 23			19.0	15.0	30.0	28.0										
Max Q Clear Time (g_c+I1), s	3.6	14.3			12.1	14.0	30.4	2.4										
Green Ext Time (p_c), s	0.0	3.2			1.4	0.1	0.0	0.0										
Intersection Summary																		
HCM 2010 Ctrl Delay	40.9																	
HCM 2010 LOS	D																	
Notes																		

HCM 2010 Signalized Intersection Summary

16: Contra Costa Blvd & Astrid Dr

08/09/2019

								
Movement	EBL	EBR	NBL	NBT	SBT	SBR		
Lane Configurations								
Traffic Volume (veh/h)	30	113	46	213	1079	41		
Future Volume (veh/h)	30	113	46	213	1079	41		
Number	7	14	5	2	6	16		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863		
Adj Flow Rate, veh/h	31	35	48	222	1124	40		
Adj No. of Lanes	1	1	1	2	2	1		
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96		
Percent Heavy Veh, %	2	2	2	2	2	2		
Cap, veh/h	68	61	78	2352	1612	720		
Arrive On Green	0.04	0.04	0.04	0.66	0.46	0.46		
Sat Flow, veh/h	1774	1583	1774	3632	3632	1582		
Grp Volume(v), veh/h	31	35	48	222	1124	40		
Grp Sat Flow(s),veh/h/ln	1774	1583	1774	1770	1770	1582		
Q Serve(g_s), s	0.5	0.7	0.8	0.7	7.7	0.4		
Cycle Q Clear(g_c), s	0.5	0.7	0.8	0.7	7.7	0.4		
Prop In Lane	1.00	1.00	1.00			1.00		
Lane Grp Cap(c), veh/h	68	61	78	2352	1612	720		
V/C Ratio(X)	0.46	0.58	0.62	0.09	0.70	0.06		
Avail Cap(c_a), veh/h	1172	1046	2050	4090	2337	1044		
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	14.3	14.3	14.2	1.8	6.6	4.6		
Incr Delay (d2), s/veh	1.8	3.2	10.8	0.0	0.2	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	0.3	0.6	0.6	0.3	3.6	0.2		
LnGrp Delay(d),s/veh	16.0	17.5	25.0	1.8	6.8	4.6		
LnGrp LOS	B	B	C	A	A	A		
Approach Vol, veh/h	66			270	1164			
Approach Delay, s/veh	16.8			6.0	6.7			
Approach LOS	B			A	A			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		25.1		5.2	6.3	18.8		
Change Period (Y+Rc), s		5.0		4.0	5.0	* 5		
Max Green Setting (Gmax), s		35.0		20.0	35.0	* 20		
Max Q Clear Time (g_c+l1), s		2.7		2.7	2.8	9.7		
Green Ext Time (p_c), s		2.0		0.1	0.2	4.1		
Intersection Summary								
HCM 2010 Ctrl Delay			7.0					
HCM 2010 LOS			A					
Notes								

HCM 2010 Signalized Intersection Summary

1: Contra Costa Blvd & Woodsworth Ln/Pleasant Hill Plaza Way

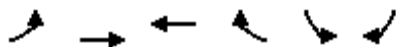
08/09/2019

																		
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR						
Lane Configurations																		
Traffic Volume (veh/h)	132	24	67	153	67	150	96	1340	8	130	857	105						
Future Volume (veh/h)	132	24	67	153	67	150	96	1340	8	130	857	105						
Number	7	4	14	3	8	18	5	2	12	1	6	16						
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0						
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.97	1.00		0.95						
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00						
Adj Sat Flow, veh/h/ln	1863	1863	1900	1900	1863	1863	1863	1863	1900	1863	1863	1863						
Adj Flow Rate, veh/h	135	24	41	156	68	67	98	1367	8	133	874	92						
Adj No. of Lanes	1	1	0	0	1	1	1	2	0	1	2	1						
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98						
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2						
Cap, veh/h	196	67	115	194	84	241	526	1813	11	161	1020	431						
Arrive On Green	0.11	0.11	0.11	0.15	0.15	0.15	0.39	0.67	0.67	0.09	0.29	0.29						
Sat Flow, veh/h	1774	610	1042	1254	546	1559	1774	3607	21	1774	3539	1497						
Grp Volume(v), veh/h	135	0	65	224	0	67	98	671	704	133	874	92						
Grp Sat Flow(s),veh/h/ln	1774	0	1652	1800	0	1559	1774	1770	1858	1774	1770	1497						
Q Serve(g_s), s	8.8	0.0	4.4	14.4	0.0	4.6	4.3	30.4	30.4	8.8	28.0	5.6						
Cycle Q Clear(g_c), s	8.8	0.0	4.4	14.4	0.0	4.6	4.3	30.4	30.4	8.8	28.0	5.6						
Prop In Lane	1.00		0.63	0.70		1.00	1.00		0.01	1.00		1.00						
Lane Grp Cap(c), veh/h	196	0	183	278	0	241	526	889	934	161	1020	431						
V/C Ratio(X)	0.69	0.00	0.36	0.81	0.00	0.28	0.19	0.75	0.75	0.83	0.86	0.21						
Avail Cap(c_a), veh/h	414	0	385	420	0	364	526	889	934	177	1062	449						
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.33	1.33	1.33	1.00	1.00	1.00						
Upstream Filter(I)	0.69	0.00	0.69	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00						
Uniform Delay (d), s/veh	51.4	0.0	49.4	49.0	0.0	44.8	26.9	14.9	14.9	53.6	40.4	32.4						
Incr Delay (d2), s/veh	3.0	0.0	0.8	6.7	0.0	0.6	0.2	5.9	5.6	24.7	9.2	1.1						
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0						
%ile BackOfQ(50%),veh/ln	4.5	0.0	2.0	7.7	0.0	2.0	2.1	16.1	16.9	5.4	15.0	2.5						
LnGrp Delay(d),s/veh	54.3	0.0	50.2	55.7	0.0	45.4	27.0	20.8	20.6	78.3	49.6	33.5						
LnGrp LOS	D		D	E		D	C	C	C	E	D	C						
Approach Vol, veh/h	200				291			1473			1099							
Approach Delay, s/veh	53.0				53.3			21.1			51.7							
Approach LOS	D				D			C			D							
Timer	1	2	3	4	5	6	7	8										
Assigned Phs	1	2			4	5	6	8										
Phs Duration (G+Y+Rc), s	14.9	65.3			17.3	40.6	39.6	22.5										
Change Period (Y+Rc), s	4.0	5.0			4.0	5.0	* 5	4.0										
Max Green Setting (Gmax), s	12.0	35.0			28.0	11.0	* 36	28.0										
Max Q Clear Time (g_c+I1), s	10.8	32.4			10.8	6.3	30.0	16.4										
Green Ext Time (p_c), s	0.0	2.4			0.6	0.1	4.6	1.2										
Intersection Summary																		
HCM 2010 Ctrl Delay	37.2																	
HCM 2010 LOS	D																	
Notes																		

HCM 2010 Signalized Intersection Summary

2: Gregory Ln & Elinora Dr

08/09/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR		
Lane Configurations		↑↑	↑↑		↑↑			
Traffic Volume (veh/h)	83	725	754	146	62	49		
Future Volume (veh/h)	83	725	754	146	62	49		
Number	7	4	8	18	1	16		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00			0.98	1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1900	1863	1863	1900	1863	1900		
Adj Flow Rate, veh/h	86	755	785	152	65	51		
Adj No. of Lanes	0	2	2	0	0	0		
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96		
Percent Heavy Veh, %	2	2	2	2	0	0		
Cap, veh/h	237	1308	1341	260	183	144		
Arrive On Green	0.46	0.46	0.46	0.46	0.20	0.20		
Sat Flow, veh/h	151	2957	3039	570	936	734		
Grp Volume(v), veh/h	417	424	472	465	117	0		
Grp Sat Flow(s),veh/h/ln	1413	1610	1770	1746	1685	0		
Q Serve(g_s), s	0.4	5.0	5.1	5.1	1.5	0.0		
Cycle Q Clear(g_c), s	5.5	5.0	5.1	5.1	1.5	0.0		
Prop In Lane	0.21			0.33	0.56	0.44		
Lane Grp Cap(c), veh/h	812	733	806	795	330	0		
V/C Ratio(X)	0.51	0.58	0.59	0.59	0.35	0.00		
Avail Cap(c_a), veh/h	1126	1124	1235	1219	1176	0		
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	0.00		
Uniform Delay (d), s/veh	4.9	5.2	5.2	5.2	9.0	0.0		
Incr Delay (d2), s/veh	0.5	0.7	0.7	0.7	0.6	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	2.1	2.3	2.5	2.5	0.8	0.0		
LnGrp Delay(d),s/veh	5.5	5.9	5.9	5.9	9.6	0.0		
LnGrp LOS	A	A	A	A	A			
Approach Vol, veh/h		841	937		117			
Approach Delay, s/veh		5.7	5.9		9.6			
Approach LOS		A	A		A			
Timer	1	2	3	4	5	6	7	8
Assigned Phs				4		6		8
Phs Duration (G+Y+Rc), s				16.2		9.5		16.2
Change Period (Y+Rc), s				4.5		4.5		4.5
Max Green Setting (Gmax), s				18.0		18.0		18.0
Max Q Clear Time (g_c+I1), s				7.5		3.5		7.1
Green Ext Time (p_c), s				4.2		0.2		4.4
Intersection Summary								
HCM 2010 Ctrl Delay		6.0						
HCM 2010 LOS		A						
Notes								

HCM 2010 Signalized Intersection Summary

3: Cleaveland Rd/Woodsworth Ln & Gregory Ln

08/09/2019

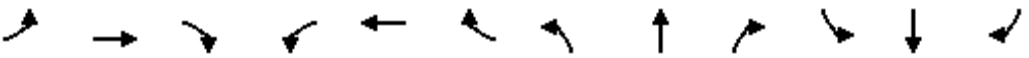
												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	121	431	258	90	504	40	303	132	44	25	119	111
Future Volume (veh/h)	121	431	258	90	504	40	303	132	44	25	119	111
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1863	1900	1863	1863
Adj Flow Rate, veh/h	123	440	214	92	514	39	222	257	37	26	121	99
Adj No. of Lanes	1	2	0	1	2	0	1	1	1	0	1	1
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	628	1107	534	130	656	50	296	310	260	34	159	163
Arrive On Green	0.35	0.48	0.48	0.07	0.20	0.20	0.17	0.17	0.17	0.10	0.10	0.10
Sat Flow, veh/h	1774	2318	1117	1774	3335	252	1774	1863	1558	327	1520	1558
Grp Volume(v), veh/h	123	335	319	92	272	281	222	257	37	147	0	99
Grp Sat Flow(s),veh/h/ln	1774	1770	1666	1774	1770	1818	1774	1863	1558	1846	0	1558
Q Serve(g_s), s	4.3	11.0	11.1	4.6	13.1	13.2	10.7	12.0	1.8	7.0	0.0	5.5
Cycle Q Clear(g_c), s	4.3	11.0	11.1	4.6	13.1	13.2	10.7	12.0	1.8	7.0	0.0	5.5
Prop In Lane	1.00		0.67	1.00		0.14	1.00		1.00	0.18		1.00
Lane Grp Cap(c), veh/h	628	845	796	130	348	358	296	310	260	193	0	163
V/C Ratio(X)	0.20	0.40	0.40	0.71	0.78	0.78	0.75	0.83	0.14	0.76	0.00	0.61
Avail Cap(c_a), veh/h	628	845	796	177	413	424	453	476	398	390	0	329
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.80	0.80	0.80	1.00	1.00	1.00	1.00	1.00	1.00	0.80	0.00	0.80
Uniform Delay (d), s/veh	20.2	15.1	15.2	40.8	34.3	34.3	35.7	36.3	32.0	39.2	0.0	38.5
Incr Delay (d2), s/veh	0.0	1.1	1.2	3.8	15.9	15.8	1.5	4.1	0.1	1.9	0.0	1.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.1	5.6	5.4	2.4	8.0	8.2	5.4	6.5	0.8	3.7	0.0	2.4
LnGrp Delay(d),s/veh	20.2	16.3	16.4	44.5	50.2	50.1	37.2	40.3	32.1	41.0	0.0	39.6
LnGrp LOS	C	B	B	D	D	D	D	D	C	D		D
Approach Vol, veh/h	777					645	516			246		
Approach Delay, s/veh	16.9					49.4	38.4			40.5		
Approach LOS	B					D	D			D		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2			4	5	6	8				
Phs Duration (G+Y+Rc), s	10.6	47.0			13.4	35.9	21.7	19.0				
Change Period (Y+Rc), s	4.0	4.0			4.0	4.0	4.0	4.0				
Max Green Setting (Gmax), s	23.0	23.0			19.0	11.0	21.0	23.0				
Max Q Clear Time (g_c+I), s	13.1	13.1			9.0	6.3	15.2	14.0				
Green Ext Time (p_c), s	0.0	4.5			0.5	0.1	2.5	1.0				
Intersection Summary												
HCM 2010 Ctrl Delay			34.2									
HCM 2010 LOS			C									
Notes												

Intersection												
Int Delay, s/veh	1.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑			↕				↗
Traffic Vol, veh/h	0	503	10	48	596	19	5	1	55	0	0	34
Future Vol, veh/h	0	503	10	48	596	19	5	1	55	0	0	34
Conflicting Peds, #/hr	12	0	5	5	0	12	2	0	0	0	0	2
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	120	-	-	-	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	98	98	98	98	98	98	98	98	98	98	98	98
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	513	10	49	608	19	5	1	56	0	0	35
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	-	0	0	528	0	0	927	1260	267	-	-	328
Stage 1	-	-	-	-	-	-	523	523	-	-	-	-
Stage 2	-	-	-	-	-	-	404	737	-	-	-	-
Critical Hdwy	-	-	-	4.14	-	-	7.54	6.54	6.94	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	-	-	-
Follow-up Hdwy	-	-	-	2.22	-	-	3.52	4.02	3.32	-	-	3.32
Pot Cap-1 Maneuver	0	-	-	1035	-	-	223	169	731	0	0	668
Stage 1	0	-	-	-	-	-	505	529	-	0	0	-
Stage 2	0	-	-	-	-	-	594	423	-	0	0	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	-	-	-	1030	-	-	202	158	728	-	-	659
Mov Cap-2 Maneuver	-	-	-	-	-	-	202	158	-	-	-	-
Stage 1	-	-	-	-	-	-	505	526	-	-	-	-
Stage 2	-	-	-	-	-	-	535	398	-	-	-	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			0.6			12.1			10.8		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	WBR	SBLn1					
Capacity (veh/h)	572	-	-	1030	-	-	659					
HCM Lane V/C Ratio	0.109	-	-	0.048	-	-	0.053					
HCM Control Delay (s)	12.1	-	-	8.7	-	-	10.8					
HCM Lane LOS	B	-	-	A	-	-	B					
HCM 95th %tile Q(veh)	0.4	-	-	0.1	-	-	0.2					

HCM Signalized Intersection Capacity Analysis

5: Contra Costa Blvd & Gregory Ln/I-680 SB Off-Ramp

08/09/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔↔	↑	↔	↔	↑	↔	↔↔	↑↑↑		↔	↑↑	↔
Traffic Volume (vph)	224	0	394	169	356	243	228	1204	0	33	1021	143
Future Volume (vph)	224	0	394	169	356	243	228	1204	0	33	1021	143
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0	4.0	5.0		4.0	5.0	5.0
Lane Util. Factor	0.97		1.00	1.00	1.00	1.00	0.97	0.91		1.00	0.95	1.00
Frpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	0.99
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00		0.85	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95		1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3433		1583	1770	1863	1583	3433	5085		1770	3539	1563
Flt Permitted	0.95		1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	3433		1583	1770	1863	1583	3433	5085		1770	3539	1563
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	233	0	410	176	371	253	238	1254	0	34	1064	149
RTOR Reduction (vph)	0	0	108	0	0	153	0	0	0	0	0	90
Lane Group Flow (vph)	233	0	302	176	371	100	238	1254	0	34	1064	59
Confl. Bikes (#/hr)									1			1
Turn Type	Split		pm+ov	Split	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	4	4	5	3	3		5	2		1	6	
Permitted Phases			4			3						6
Actuated Green, G (s)	13.4		23.9	31.5	31.5	31.5	10.5	49.3		8.8	47.6	47.6
Effective Green, g (s)	13.4		23.9	31.5	31.5	31.5	10.5	49.3		8.8	47.6	47.6
Actuated g/C Ratio	0.11		0.20	0.26	0.26	0.26	0.09	0.41		0.07	0.40	0.40
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0	4.0	5.0		4.0	5.0	5.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0	3.0	4.0		3.0	4.0	4.0
Lane Grp Cap (vph)	383		315	464	489	415	300	2089		129	1403	619
v/s Ratio Prot	0.07		c0.08	0.10	c0.20		0.07	0.25		0.02	c0.30	
v/s Ratio Perm			0.11			0.06						0.04
v/c Ratio	0.61		0.96	0.38	0.76	0.24	0.79	0.60		0.26	0.76	0.10
Uniform Delay, d1	50.8		47.6	36.2	40.8	34.8	53.7	27.6		52.5	31.2	22.7
Progression Factor	1.00		1.00	1.00	1.00	1.00	1.29	0.79		0.62	0.45	0.26
Incremental Delay, d2	2.7		39.2	0.5	6.7	0.3	12.4	1.2		0.9	3.4	0.3
Delay (s)	53.5		86.7	36.8	47.4	35.1	82.0	22.9		33.3	17.5	6.1
Level of Service	D		F	D	D	D	F	C		C	B	A
Approach Delay (s)		74.7			41.2			32.3			16.6	
Approach LOS		E			D			C			B	
Intersection Summary												
HCM 2000 Control Delay			35.9									HCM 2000 Level of Service D
HCM 2000 Volume to Capacity ratio			0.80									
Actuated Cycle Length (s)			120.0									Sum of lost time (s) 17.0
Intersection Capacity Utilization			74.0%									ICU Level of Service D
Analysis Period (min)			15									
c Critical Lane Group												

Intersection						
Int Delay, s/veh	1.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	27	48	442	17	32	443
Future Vol, veh/h	27	48	442	17	32	443
Conflicting Peds, #/hr	0	1	0	7	7	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	98	98	98	80	98	98
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	28	49	451	21	33	452
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	761	244	0	0	479	0
Stage 1	469	-	-	-	-	-
Stage 2	292	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22	-
Pot Cap-1 Maneuver	342	757	-	-	1080	-
Stage 1	596	-	-	-	-	-
Stage 2	732	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	329	751	-	-	1073	-
Mov Cap-2 Maneuver	329	-	-	-	-	-
Stage 1	592	-	-	-	-	-
Stage 2	709	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	13.2	0		0.6		
HCM LOS	B					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	-	514	1073	-	
HCM Lane V/C Ratio	-	-	0.149	0.03	-	
HCM Control Delay (s)	-	-	13.2	8.5	-	
HCM Lane LOS	-	-	B	A	-	
HCM 95th %tile Q(veh)	-	-	0.5	0.1	-	

HCM 2010 Signalized Intersection Summary

7: Contra Costa Blvd & Crescent Dr

08/09/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations								  			  	
Traffic Volume (veh/h)	50	9	105	141	11	117	64	1325	78	32	1331	98
Future Volume (veh/h)	50	9	105	141	11	117	64	1325	78	32	1331	98
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.98	0.98		0.98	1.00		0.97	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1863	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	52	9	40	147	11	65	67	1380	81	33	1386	100
Adj No. of Lanes	0	1	1	1	1	0	1	3	0	1	2	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	264	41	340	253	50	298	416	1739	102	565	1464	105
Arrive On Green	0.22	0.22	0.22	0.22	0.22	0.22	0.47	0.71	0.71	0.64	0.88	0.88
Sat Flow, veh/h	950	189	1551	1329	230	1359	1774	4905	288	1774	3344	240
Grp Volume(v), veh/h	61	0	40	147	0	76	67	954	507	33	731	755
Grp Sat Flow(s),veh/h/ln	1139	0	1551	1329	0	1589	1774	1695	1803	1774	1770	1814
Q Serve(g_s), s	4.1	0.0	2.5	12.8	0.0	4.7	2.6	22.5	22.5	0.8	35.4	36.9
Cycle Q Clear(g_c), s	8.8	0.0	2.5	21.6	0.0	4.7	2.6	22.5	22.5	0.8	35.4	36.9
Prop In Lane	0.85		1.00	1.00		0.86	1.00		0.16	1.00		0.13
Lane Grp Cap(c), veh/h	305	0	340	253	0	348	416	1202	639	565	775	795
V/C Ratio(X)	0.20	0.00	0.12	0.58	0.00	0.22	0.16	0.79	0.79	0.06	0.94	0.95
Avail Cap(c_a), veh/h	426	0	478	372	0	490	416	1667	887	565	870	892
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00
Upstream Filter(I)	0.98	0.00	0.98	1.00	0.00	1.00	0.86	0.86	0.86	0.55	0.55	0.55
Uniform Delay (d), s/veh	41.5	0.0	37.6	49.3	0.0	38.4	25.0	14.5	14.5	15.0	6.4	6.5
Incr Delay (d2), s/veh	0.4	0.0	0.2	3.0	0.0	0.4	0.2	4.7	8.6	0.0	13.8	14.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.8	0.0	1.1	4.9	0.0	2.1	1.3	10.9	12.2	0.4	18.4	19.5
LnGrp Delay(d),s/veh	41.9	0.0	37.8	52.2	0.0	38.9	25.2	19.3	23.1	15.0	20.1	20.9
LnGrp LOS	D		D	D		D	C	B	C	B	C	C
Approach Vol, veh/h		101			223			1528			1519	
Approach Delay, s/veh		40.3			47.7			20.8			20.4	
Approach LOS		D			D			C			C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	42.2	47.5		30.3	32.2	57.6		30.3				
Change Period (Y+Rc), s	4.0	5.0		4.0	4.0	5.0		4.0				
Max Green Setting (Gmax), s	11.0	59.0		37.0	11.0	59.0		37.0				
Max Q Clear Time (g_c+I1), s	2.8	24.5		10.8	4.6	38.9		23.6				
Green Ext Time (p_c), s	0.0	18.1		0.6	0.1	13.6		1.1				
Intersection Summary												
HCM 2010 Ctrl Delay				23.0								
HCM 2010 LOS				C								

HCM 2010 Signalized Intersection Summary

8: Cleaveland Rd & Crescent Plaza

08/09/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔	↔		↔			↔	
Traffic Volume (veh/h)	1	1	0	46	0	130	0	332	84	201	267	2
Future Volume (veh/h)	1	1	0	46	0	130	0	332	84	201	267	2
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		1.00	0.98		0.99	1.00		0.96	0.99		0.96
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1900	1900	1863	1863	1900	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	1	1	0	48	0	131	0	346	83	209	278	2
Adj No. of Lanes	0	1	0	0	1	1	0	2	0	0	2	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	328	208	0	575	0	278	0	1290	305	636	855	6
Arrive On Green	0.18	0.18	0.00	0.18	0.00	0.18	0.00	0.46	0.46	0.46	0.46	0.46
Sat Flow, veh/h	461	1170	0	1391	0	1565	0	2913	666	724	1869	14
Grp Volume(v), veh/h	2	0	0	48	0	131	0	215	214	245	0	244
Grp Sat Flow(s),veh/h/ln	1631	0	0	1391	0	1565	0	1770	1716	915	0	1692
Q Serve(g_s), s	0.0	0.0	0.0	0.6	0.0	1.6	0.0	1.6	1.7	3.5	0.0	2.0
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.6	0.0	1.6	0.0	1.6	1.7	5.1	0.0	2.0
Prop In Lane	0.50		0.00	1.00		1.00	0.00		0.39	0.85		0.01
Lane Grp Cap(c), veh/h	536	0	0	575	0	278	0	809	785	723	0	774
V/C Ratio(X)	0.00	0.00	0.00	0.08	0.00	0.47	0.00	0.27	0.27	0.34	0.00	0.31
Avail Cap(c_a), veh/h	1902	0	0	1851	0	1714	0	2262	2193	1562	0	2163
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	0.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	7.4	0.0	0.0	7.7	0.0	8.1	0.0	3.7	3.7	4.9	0.0	3.8
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.1	0.1	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(50%),veh/ln	0.0	0.0	0.0	0.2	0.0	0.7	0.0	0.8	0.8	1.1	0.0	0.9
LnGrp Delay(d),s/veh	7.4	0.0	0.0	7.7	0.0	8.6	0.0	3.7	3.8	5.0	0.0	3.9
LnGrp LOS	A			A		A		A	A	A		A
Approach Vol, veh/h		2			179			429			489	
Approach Delay, s/veh		7.4			8.3			3.7			4.4	
Approach LOS		A			A			A			A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		14.0		7.9		14.0		7.9				
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0				
Max Green Setting (Gmax), s		28.0		24.0		28.0		24.0				
Max Q Clear Time (g_c+I1), s		3.7		2.0		7.1		3.6				
Green Ext Time (p_c), s		1.7		0.0		2.3		0.3				
Intersection Summary												
HCM 2010 Ctrl Delay				4.8								
HCM 2010 LOS				A								

HCM 2010 Signalized Intersection Summary

9: Crescent Dr & Crescent Plaza

08/09/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	24	300	23	56	148	70	22	48	80	72	25	55
Future Volume (veh/h)	24	300	23	56	148	70	22	48	80	72	25	55
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.95		0.92	0.96		0.92	0.93		0.95	0.96		0.92
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1900	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	26	326	25	61	161	76	24	52	87	78	27	60
Adj No. of Lanes	1	1	0	1	1	0	0	1	0	0	1	0
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	473	568	44	401	389	183	170	270	355	389	152	214
Arrive On Green	0.33	0.33	0.33	0.33	0.33	0.33	0.41	0.41	0.41	0.41	0.41	0.41
Sat Flow, veh/h	1084	1697	130	988	1162	548	98	652	859	538	366	517
Grp Volume(v), veh/h	26	0	351	61	0	237	163	0	0	165	0	0
Grp Sat Flow(s),veh/h/ln	1084	0	1827	988	0	1710	1609	0	0	1421	0	0
Q Serve(g_s), s	0.6	0.0	5.0	1.7	0.0	3.4	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	4.0	0.0	5.0	6.7	0.0	3.4	2.0	0.0	0.0	2.0	0.0	0.0
Prop In Lane	1.00		0.07	1.00		0.32	0.15		0.53	0.47		0.36
Lane Grp Cap(c), veh/h	473	0	611	401	0	572	795	0	0	755	0	0
V/C Ratio(X)	0.05	0.00	0.57	0.15	0.00	0.41	0.20	0.00	0.00	0.22	0.00	0.00
Avail Cap(c_a), veh/h	793	0	1150	692	0	1077	2105	0	0	1911	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	9.7	0.0	8.7	11.5	0.0	8.2	6.1	0.0	0.0	6.1	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.3	0.1	0.0	0.2	0.2	0.0	0.0	0.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	2.6	0.5	0.0	1.6	0.9	0.0	0.0	1.0	0.0	0.0
LnGrp Delay(d),s/veh	9.7	0.0	9.0	11.5	0.0	8.3	6.2	0.0	0.0	6.3	0.0	0.0
LnGrp LOS	A		A	B		A	A			A		
Approach Vol, veh/h	377				298				163		165	
Approach Delay, s/veh	9.1				9.0				6.2		6.3	
Approach LOS	A				A				A		A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	2		4		6		8					
Phs Duration (G+Y+Rc), s	17.1		14.6		17.1		14.6					
Change Period (Y+Rc), s	4.0		4.0		4.0		4.0					
Max Green Setting (Gmax), s	40.0		20.0		40.0		20.0					
Max Q Clear Time (g_c+I1), s	4.0		7.0		4.0		8.7					
Green Ext Time (p_c), s	1.5		1.2		1.7		0.9					
Intersection Summary												
HCM 2010 Ctrl Delay			8.1									
HCM 2010 LOS			A									

HCM 2010 Signalized Intersection Summary

10: Contra Costa Blvd & Crescent Plaza/Monument Blvd

08/09/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	44	373	35	225	225	580	73	771	464	779	791	29
Future Volume (veh/h)	44	373	35	225	225	580	73	771	464	779	791	29
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.98	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	45	381	36	230	230	592	74	787	473	795	807	30
Adj No. of Lanes	1	2	0	2	1	2	1	3	1	2	3	1
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	58	510	48	296	390	1597	96	1218	511	1268	2859	886
Arrive On Green	0.03	0.16	0.16	0.09	0.21	0.21	0.02	0.08	0.08	0.37	0.56	0.56
Sat Flow, veh/h	1774	3266	307	3442	1863	2723	1774	5085	1564	3442	5085	1575
Grp Volume(v), veh/h	45	205	212	230	230	592	74	787	473	795	807	30
Grp Sat Flow(s),veh/h/ln	1774	1770	1804	1721	1863	1361	1774	1695	1564	1721	1695	1575
Q Serve(g_s), s	3.0	13.3	13.5	7.9	13.4	2.2	5.0	18.0	21.9	22.8	9.9	1.0
Cycle Q Clear(g_c), s	3.0	13.3	13.5	7.9	13.4	2.2	5.0	18.0	21.9	22.8	9.9	1.0
Prop In Lane	1.00		0.17	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	58	276	282	296	390	1597	96	1218	511	1268	2859	886
V/C Ratio(X)	0.78	0.74	0.75	0.78	0.59	0.37	0.77	0.65	0.93	0.63	0.28	0.03
Avail Cap(c_a), veh/h	163	398	406	516	528	1798	237	1314	540	1268	2859	886
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00
Upstream Filter(I)	0.80	0.80	0.80	0.63	0.63	0.63	0.91	0.91	0.91	0.74	0.74	0.74
Uniform Delay (d), s/veh	57.6	48.3	48.4	53.7	42.8	6.4	58.2	50.3	32.1	31.1	13.7	11.7
Incr Delay (d2), s/veh	16.1	3.5	3.7	2.8	0.9	0.1	11.4	2.4	23.6	1.1	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(50%),veh/ln	1.7	6.8	7.0	3.9	7.0	3.4	2.8	8.8	17.7	11.0	4.7	0.5
LnGrp Delay(d),s/veh	73.7	51.9	52.1	56.5	43.7	6.4	69.6	52.7	55.6	32.2	13.8	11.8
LnGrp LOS	E	D	D	E	D	A	E	D	E	C	B	B
Approach Vol, veh/h	462		1052				1334			1632		
Approach Delay, s/veh	54.1		25.5				54.7			22.7		
Approach LOS	D		C				D			C		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	49.2	33.7	14.3	22.7	10.5	72.5	7.9	29.1				
Change Period (Y+Rc), s	5.0	* 5	4.0	4.0	4.0	5.0	4.0	4.0				
Max Green Setting (Gmax), s	27.6	* 31	18.0	27.0	16.0	42.0	11.0	34.0				
Max Q Clear Time (g_c+24.8), s	24.8	23.9	9.9	15.5	7.0	11.9	5.0	15.4				
Green Ext Time (p_c), s	1.3	4.8	0.5	1.9	0.1	11.5	0.0	3.7				
Intersection Summary												
HCM 2010 Ctrl Delay			36.1									
HCM 2010 LOS			D									
Notes												

HCM Signalized Intersection Capacity Analysis

11: I-680 Ramps & Monument Blvd

08/09/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	648	915	28	586	830	775	72	0	474	1132	0	184
Future Volume (vph)	648	915	28	586	830	775	72	0	474	1132	0	184
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	11.2	8.7		10.2	8.7	8.7	8.7		10.2	9.7		11.2
Lane Util. Factor	0.97	0.91		0.97	0.91	0.88	0.97		0.88	0.94		1.00
Frt	1.00	1.00		1.00	1.00	0.85	1.00		0.85	1.00		0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95		1.00	0.95		1.00
Satd. Flow (prot)	3433	5063		3433	5085	2787	3433		2787	4990		1583
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95		1.00	0.95		1.00
Satd. Flow (perm)	3433	5063		3433	5085	2787	3433		2787	4990		1583
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	668	943	29	604	856	799	74	0	489	1167	0	190
RTOR Reduction (vph)	0	0	0	0	0	47	0	0	0	0	0	0
Lane Group Flow (vph)	668	972	0	604	856	752	74	0	489	1167	0	190
Turn Type	Prot	NA		Prot	NA	custom	Prot		pm+ov	Prot		pm+ov
Protected Phases	5	2		1	6	3	3		1	7		5
Permitted Phases						6			6			7
Actuated Green, G (s)	19.3	19.9		17.3	16.9	40.7	23.8		34.2	22.8		42.1
Effective Green, g (s)	19.3	19.9		17.3	16.9	40.7	23.8		34.2	22.8		42.1
Actuated g/C Ratio	0.22	0.22		0.20	0.19	0.46	0.27		0.39	0.26		0.48
Clearance Time (s)	11.2	8.7		10.2	8.7	8.7	8.7		10.2	9.7		11.2
Vehicle Extension (s)	3.0	2.0		2.0	2.5	2.0	2.0		2.0	3.0		3.0
Lane Grp Cap (vph)	747	1137		670	969	1553	922		1075	1284		752
v/s Ratio Prot	c0.19	c0.19		0.18	0.17	0.13	0.02		0.09	c0.23		0.06
v/s Ratio Perm						0.14			0.09			0.06
v/c Ratio	0.89	0.85		0.90	0.88	0.48	0.08		0.45	0.91		0.25
Uniform Delay, d1	33.7	33.0		34.8	34.9	16.7	24.2		20.3	31.9		13.9
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00		1.00
Incremental Delay, d2	13.2	6.2		15.1	9.6	0.1	0.0		0.1	9.5		0.2
Delay (s)	46.8	39.2		49.9	44.5	16.7	24.2		20.4	41.4		14.0
Level of Service	D	D		D	D	B	C		C	D		B
Approach Delay (s)		42.3			36.1			20.9			37.6	
Approach LOS		D			D			C			D	
Intersection Summary												
HCM 2000 Control Delay			36.7			HCM 2000 Level of Service			D			
HCM 2000 Volume to Capacity ratio			0.93									
Actuated Cycle Length (s)			88.6			Sum of lost time (s)			29.6			
Intersection Capacity Utilization			79.3%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

Intersection

Intersection Delay, s/veh31.4

Intersection LOS D

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	196	180	242	148	195	243
Future Vol, veh/h	196	180	242	148	195	243
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	233	214	288	176	232	289
Number of Lanes	1	0	1	1	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	2	1	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	1	1
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	1	0	2
HCM Control Delay	30.3	19.2	43.2
HCM LOS	D	C	E

Lane	NBLn1	EBLn1	WBLn1	WBLn2
Vol Left, %	45%	0%	100%	0%
Vol Thru, %	0%	52%	0%	100%
Vol Right, %	55%	48%	0%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	438	376	242	148
LT Vol	195	0	242	0
Through Vol	0	196	0	148
RT Vol	243	180	0	0
Lane Flow Rate	521	448	288	176
Geometry Grp	2	5	7	7
Degree of Util (X)	0.907	0.798	0.62	0.354
Departure Headway (Hd)	6.261	6.418	7.745	7.231
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	579	564	467	497
Service Time	4.299	4.468	5.505	4.991
HCM Lane V/C Ratio	0.9	0.794	0.617	0.354
HCM Control Delay	43.2	30.3	22.4	13.9
HCM Lane LOS	E	D	C	B
HCM 95th-tile Q	11	7.7	4.1	1.6

HCM 2010 Signalized Intersection Summary

13: Astrid Dr/Cleaveland Rd & Boyd Rd

08/09/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	154	262	36	26	182	116	15	114	46	74	111	146
Future Volume (veh/h)	154	262	36	26	182	116	15	114	46	74	111	146
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.97	1.00		0.94	1.00		0.93
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	175	298	36	30	207	96	17	130	25	84	126	161
Adj No. of Lanes	1	1	0	1	1	1	1	2	0	1	1	1
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	895	1065	129	37	311	258	20	327	61	108	291	231
Arrive On Green	0.50	0.66	0.66	0.02	0.17	0.17	0.01	0.11	0.11	0.06	0.16	0.16
Sat Flow, veh/h	1774	1624	196	1774	1863	1541	1774	2944	548	1774	1863	1478
Grp Volume(v), veh/h	175	0	334	30	207	96	17	76	79	84	126	161
Grp Sat Flow(s),veh/h/ln	1774	0	1821	1774	1863	1541	1774	1770	1723	1774	1863	1478
Q Serve(g_s), s	5.4	0.0	7.7	1.7	10.3	5.5	0.9	4.0	4.2	4.6	6.1	10.2
Cycle Q Clear(g_c), s	5.4	0.0	7.7	1.7	10.3	5.5	0.9	4.0	4.2	4.6	6.1	10.2
Prop In Lane	1.00		0.11	1.00		1.00	1.00		0.32	1.00		1.00
Lane Grp Cap(c), veh/h	895	0	1194	37	311	258	20	197	191	108	291	231
V/C Ratio(X)	0.20	0.00	0.28	0.81	0.66	0.37	0.86	0.39	0.41	0.78	0.43	0.70
Avail Cap(c_a), veh/h	895	0	1194	358	564	466	358	535	521	537	564	447
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	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	13.5	0.0	7.2	48.3	38.7	36.7	48.9	40.9	41.0	45.9	37.9	39.6
Incr Delay (d2), s/veh	0.5	0.0	0.6	14.1	0.9	0.3	30.3	4.5	5.1	4.4	3.7	13.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.7	0.0	4.0	1.0	5.4	2.4	0.6	2.2	2.3	2.4	3.4	5.0
LnGrp Delay(d),s/veh	14.0	0.0	7.8	62.5	39.6	37.0	79.2	45.4	46.1	50.3	41.6	52.6
LnGrp LOS	B		A	E	D	D	E	D	D	D	D	D
Approach Vol, veh/h	509				333				172		371	
Approach Delay, s/veh	9.9				40.9				49.1		48.3	
Approach LOS	A				D				D		D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	9.6	15.0	5.6	69.0	5.1	19.5	54.0	20.6				
Change Period (Y+Rc), s	3.5	4.0	3.5	4.0	4.0	4.0	4.0	4.0				
Max Green Setting (G_max), s	30.0	30.0	20.0	50.0	20.0	30.0	50.0	30.0				
Max Q Clear Time (g_c+1), s	10.6	6.2	3.7	9.7	2.9	12.2	7.4	12.3				
Green Ext Time (p_c), s	0.1	1.9	0.0	3.5	0.0	2.9	0.9	0.9				
Intersection Summary												
HCM 2010 Ctrl Delay			32.5									
HCM 2010 LOS			C									

Intersection												
Int Delay, s/veh	2.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	39	350	2	10	289	59	5	2	18	38	1	26
Future Vol, veh/h	39	350	2	10	289	59	5	2	18	38	1	26
Conflicting Peds, #/hr	8	0	5	5	0	8	7	0	3	3	0	7
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	105	-	-	75	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	41	372	2	11	307	63	5	2	19	40	1	28
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	378	0	0	379	0	0	842	860	381	838	830	354
Stage 1	-	-	-	-	-	-	460	460	-	369	369	-
Stage 2	-	-	-	-	-	-	382	400	-	469	461	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1180	-	-	1179	-	-	284	294	666	286	306	690
Stage 1	-	-	-	-	-	-	581	566	-	651	621	-
Stage 2	-	-	-	-	-	-	640	602	-	575	565	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1171	-	-	1173	-	-	260	278	661	264	289	680
Mov Cap-2 Maneuver	-	-	-	-	-	-	260	278	-	264	289	-
Stage 1	-	-	-	-	-	-	558	543	-	624	610	-
Stage 2	-	-	-	-	-	-	603	592	-	535	542	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.8			0.2			13.2			17.8		
HCM LOS							B			C		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	466	1171	-	-	1173	-	-	350				
HCM Lane V/C Ratio	0.057	0.035	-	-	0.009	-	-	0.198				
HCM Control Delay (s)	13.2	8.2	-	-	8.1	-	-	17.8				
HCM Lane LOS	B	A	-	-	A	-	-	C				
HCM 95th %tile Q(veh)	0.2	0.1	-	-	0	-	-	0.7				

HCM 2010 Signalized Intersection Summary

15: Contra Costa Blvd & Boyd Rd

08/09/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	206	2	190	38	13	60	229	1025	3	31	900	171
Future Volume (veh/h)	206	2	190	38	13	60	229	1025	3	31	900	171
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1900	1863	1900	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	227	0	95	42	14	63	252	1126	2	34	989	185
Adj No. of Lanes	2	0	1	0	1	0	1	3	0	1	3	1
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	325	0	145	53	18	79	285	1456	3	694	2586	805
Arrive On Green	0.09	0.00	0.09	0.09	0.09	0.09	0.16	0.28	0.28	0.13	0.17	0.17
Sat Flow, veh/h	3548	0	1583	592	197	888	1774	5242	9	1774	5085	1583
Grp Volume(v), veh/h	227	0	95	119	0	0	252	728	400	34	989	185
Grp Sat Flow(s),veh/h/ln	1774	0	1583	1677	0	0	1774	1695	1861	1774	1695	1583
Q Serve(g_s), s	7.4	0.0	7.0	8.4	0.0	0.0	16.7	23.7	23.7	2.0	20.8	12.1
Cycle Q Clear(g_c), s	7.4	0.0	7.0	8.4	0.0	0.0	16.7	23.7	23.7	2.0	20.8	12.1
Prop In Lane	1.00		1.00	0.35		0.53	1.00		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	325	0	145	149	0	0	285	941	517	694	2586	805
V/C Ratio(X)	0.70	0.00	0.65	0.80	0.00	0.00	0.88	0.77	0.77	0.05	0.38	0.23
Avail Cap(c_a), veh/h	769	0	343	377	0	0	370	1102	605	694	2586	805
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	0.94	0.94	0.94
Uniform Delay (d), s/veh	52.9	0.0	52.7	53.6	0.0	0.0	49.3	39.9	39.9	32.7	33.2	29.6
Incr Delay (d2), s/veh	3.8	0.0	6.9	9.3	0.0	0.0	19.7	6.2	10.8	0.0	0.4	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(50%),veh/ln	3.8	0.0	3.3	4.3	0.0	0.0	9.7	11.9	13.8	1.0	9.9	5.5
LnGrp Delay(d),s/veh	56.7	0.0	59.6	62.8	0.0	0.0	69.0	46.0	50.6	32.7	33.6	30.2
LnGrp LOS	E		E	E			E	D	D	C	C	C
Approach Vol, veh/h	322			119			1380			1208		
Approach Delay, s/veh	57.5			62.8			51.5			33.0		
Approach LOS	E			E			D			C		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	4		5	6	8					
Phs Duration (G+Y+Rc), s	52.0	38.3	15.0		24.3	66.0	14.7					
Change Period (Y+Rc), s	5.0	* 5	4.0		5.0	5.0	4.0					
Max Green Setting (Gmax), s	11.0	* 39	26.0		25.0	24.0	27.0					
Max Q Clear Time (g_c+I1), s	4.0	25.7	9.4		18.7	22.8	10.4					
Green Ext Time (p_c), s	0.0	7.6	1.6		0.6	1.0	0.5					
Intersection Summary												
HCM 2010 Ctrl Delay	45.2											
HCM 2010 LOS	D											
Notes												

HCM 2010 Signalized Intersection Summary

16: Contra Costa Blvd & Astrid Dr

08/09/2019

								
Movement	EBL	EBR	NBL	NBT	SBT	SBR		
Lane Configurations								
Traffic Volume (veh/h)	47	65	142	803	490	40		
Future Volume (veh/h)	47	65	142	803	490	40		
Number	7	14	5	2	6	16		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			0.97		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863		
Adj Flow Rate, veh/h	53	22	160	902	551	44		
Adj No. of Lanes	1	1	1	2	2	1		
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89		
Percent Heavy Veh, %	2	2	2	2	2	2		
Cap, veh/h	81	72	233	2174	1042	452		
Arrive On Green	0.05	0.05	0.13	0.61	0.29	0.29		
Sat Flow, veh/h	1774	1583	1774	3632	3632	1537		
Grp Volume(v), veh/h	53	22	160	902	551	44		
Grp Sat Flow(s),veh/h/ln	1774	1583	1774	1770	1770	1537		
Q Serve(g_s), s	0.8	0.4	2.3	3.5	3.4	0.6		
Cycle Q Clear(g_c), s	0.8	0.4	2.3	3.5	3.4	0.6		
Prop In Lane	1.00	1.00	1.00			1.00		
Lane Grp Cap(c), veh/h	81	72	233	2174	1042	452		
V/C Ratio(X)	0.65	0.30	0.69	0.41	0.53	0.10		
Avail Cap(c_a), veh/h	1340	1196	2346	4680	2674	1161		
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	12.4	12.2	11.0	2.6	7.8	6.8		
Incr Delay (d2), s/veh	3.3	0.9	5.1	0.2	0.2	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	0.4	0.3	1.4	1.7	1.6	0.2		
LnGrp Delay(d),s/veh	15.7	13.1	16.1	2.8	8.0	6.8		
LnGrp LOS	B	B	B	A	A	A		
Approach Vol, veh/h	75			1062	595			
Approach Delay, s/veh	15.0			4.8	7.9			
Approach LOS	B			A	A			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		21.3		5.2	8.5	12.8		
Change Period (Y+Rc), s		5.0		4.0	5.0	* 5		
Max Green Setting (Gmax), s		35.0		20.0	35.0	* 20		
Max Q Clear Time (g_c+I1), s		5.5		2.8	4.3	5.4		
Green Ext Time (p_c), s		9.9		0.1	0.7	2.2		
Intersection Summary								
HCM 2010 Ctrl Delay			6.3					
HCM 2010 LOS			A					
Notes								

Appendix C

Freeway Level of Service Calculations



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HCS7 Freeway Facilities Report

Project Information

Analyst	W-Trans	Date	6/13/2019
Agency	W-Trans	Analysis Year	Existing
Jurisdiction	Pleasant Hill	Time Period Analyzed	I-680 NB AM
Project Description	Blake-Griggs Multi-Family Residential Facility EIR	Unit	United States Customary

Facility Global Input

Jam Density, pc/mi/ln	190.0	Density at Capacity, pc/mi/ln	45.0
Queue Discharge Capacity Drop, %	7	Total Segments	6
Total Time Periods	1	Time Period Duration, min	15
Facility Length, mi	3.40		

Facility Segment Data

No.	Coded	Analyzed	Name	Length, ft	Lanes
1	Basic	Basic	NB I-680 to South of Oak-Elena Onramp	5280	6
2	Weaving	Weaving	NB I-680 b/w Oak-Elena Onramp and Contra Costa Blvd Offramp	2410	6
3	Diverge	Basic	NB I-680 at Monument Offramp	1140	6
4	Basic	Basic	NB I-680 b/w Monument Ramps	2350	5
5	Merge	Basic	NB I-680 at Monument Onramp	1500	6
6	Basic	Basic	NB I-680 to North of Monument Onramp	5280	6

Facility Segment Data

Segment 1: Basic

Time Period	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.92	0.962	6951	14400	0.48	73.0	15.9	B

Segment 2: Weaving

Time Period	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.92	0.962	7753	13121	0.59	59.6	21.7	C

Segment 3: Diverge

Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1	0.92	0.92	0.962	0.980	7292	404	14400	2000	0.51	0.20	74.5	-	16.2	-	B

Segment 4: Basic

Time Period	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.92	0.962	6881	12000	0.57	72.1	19.1	C

Segment 5: Merge

Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1	0.92	0.92	0.962	0.980	8026	1145	14400	2000	0.56	0.57	74.0	-	18.1	-	C

Segment 6: Basic

Time Period	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.92	0.962	8047	14400	0.56	72.3	18.5	C

Facility Time Period Results

T	Speed, mi/h	Density, pc/mi/ln	Density, veh/mi/ln	Travel Time, min	LOS
1	70.6	18.0	17.1	2.90	C

Facility Overall Results

Space Mean Speed, mi/h	70.6	Density, veh/mi/ln	17.1
Average Travel Time, min	2.90	Density, pc/mi/ln	18.0

Messages

WARNING 1	Weaving segment 2 should have one auxiliary lane.
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Comments

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HCS7 Freeway Facilities Report																
Project Information																
Analyst				W-Trans				Date				6/13/2019				
Agency				W-Trans				Analysis Year				Existing				
Jurisdiction				Pleasant Hill				Time Period Analyzed				I-680 SB AM				
Project Description				Blake-Griggs Multi-Family Residential Facility EIR				Unit				United States Customary				
Facility Global Input																
Jam Density, pc/mi/ln				190.0				Density at Capacity, pc/mi/ln				45.0				
Queue Discharge Capacity Drop, %				7				Total Segments				8				
Total Time Periods				1				Time Period Duration, min				15				
Facility Length, mi				4.28												
Facility Segment Data																
No.		Coded		Analyzed		Name				Length, ft				Lanes		
1		Basic		Basic		SB I-680 to North of Willow Pass Rd Onramp (second of two)				5280				4		
2		Weaving		Weaving		SB I-680 b/w second Willow Pass Rd Onramp and Monument Offramp				2230				5		
3		Merge		Merge		SB I-680 and SR-242 Merge				3960				6		
4		Basic		Basic		SB I-680 b/w SR-242 and Monument Onramp				2780				6		
5		Merge		Basic		SB I-680 at Monument Onramp				730				7		
6		Merge		Basic		SB I-680 at Contra Costa Blvd Onramp				600				8		
7		Diverge		Diverge		SB I-680 at N Main St Offramp				1740				7		
8		Basic		Basic		SB I-680 to South of N Main St Offramp				5280				6		
Facility Segment Data																
Segment 1: Basic																
Time Period		PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
1		0.92		0.962		3813		9600		0.40		72.2		13.2		B
Segment 2: Weaving																
Time Period		PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
1		0.92		0.962		4582		5298		0.86		56.5		16.2		B
Segment 3: Merge																
Time Period		PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
		F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1		0.92	0.92	0.962	0.980	8059	4804	14400	4400	0.56	1.09	32.0	28.0	42.0	39.0	E
Segment 4: Basic																
Time		PHF		fHV		Flow Rate		Capacity		d/c		Speed		Density		LOS

Period					(pc/h)		(pc/h)		Ratio		(mi/h)		(pc/mi/ln)		
1	0.92		0.962		8149		14400		0.57		71.5		19.0		C
Segment 5: Merge															
Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1	0.92	0.92	0.962	0.980	9189	1040	16800	2000	0.55	0.52	74.2	-	17.7	-	B
Segment 6: Merge															
Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1	0.92	0.92	0.962	0.980	9794	585	19200	2000	0.51	0.29	74.8	-	16.4	-	B
Segment 7: Diverge															
Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1	0.92	0.92	0.962	0.980	9804	689	16800	4000	0.58	0.17	69.1	59.0	20.3	16.0	B
Segment 8: Basic															
Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
1	0.92		0.962		9102		14400		0.63		70.3		21.6		C
Facility Time Period Results															
T	Speed, mi/h				Density, pc/mi/ln		Density, veh/mi/ln		Travel Time, min				LOS		
1	56.6				22.7		21.8		4.50				C		
Facility Overall Results															
Space Mean Speed, mi/h					56.6				Density, veh/mi/ln				21.8		
Average Travel Time, min					4.50				Density, pc/mi/ln				22.7		
Messages															
WARNING 1					Weaving segment 2 should have one auxiliary lane.										
WARNING 2					On-ramp demand is larger than capacity										
Comments															

HCS7 Freeway Facilities Report

Project Information

Analyst	W-Trans	Date	6/13/2019
Agency	W-Trans	Analysis Year	Existing
Jurisdiction	Pleasant Hill	Time Period Analyzed	I-680 NB PM
Project Description	Blake-Griggs Multi-Family Residential Facility EIR	Unit	United States Customary

Facility Global Input

Jam Density, pc/mi/ln	190.0	Density at Capacity, pc/mi/ln	45.0
Queue Discharge Capacity Drop, %	7	Total Segments	6
Total Time Periods	1	Time Period Duration, min	15
Facility Length, mi	3.40		

Facility Segment Data

No.	Coded	Analyzed	Name	Length, ft	Lanes
1	Basic	Basic	NB I-680 to South of Oak-Elena Onramp	5280	6
2	Weaving	Weaving	NB I-680 b/w Oak-Elena Onramp and Contra Costa Blvd Offramp	2410	6
3	Diverge	Basic	NB I-680 at Monument Offramp	1140	6
4	Basic	Basic	NB I-680 b/w Monument Ramps	2350	5
5	Merge	Basic	NB I-680 at Monument Onramp	1500	6
6	Basic	Basic	NB I-680 to North of Monument Onramp	5280	6

Facility Segment Data

Segment 1: Basic

Time Period	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.92	0.962	8072	14400	0.56	72.3	18.6	C

Segment 2: Weaving

Time Period	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.92	0.962	9368	13056	0.72	55.8	28.0	C

Segment 3: Diverge

Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1	0.92	0.92	0.962	0.980	9006	531	14400	2000	0.63	0.27	72.5	-	20.7	-	C

Segment 4: Basic

Time Period	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.92	0.962	8465	12000	0.71	68.8	24.6	C

Segment 5: Merge

Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1	0.92	0.92	0.962	0.980	9845	1380	14400	2000	0.68	0.69	70.7	-	23.2	-	C

Segment 6: Basic

Time Period	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.92	0.962	9871	14400	0.69	69.4	23.7	C

Facility Time Period Results

T	Speed, mi/h	Density, pc/mi/ln	Density, veh/mi/ln	Travel Time, min	LOS
1	68.0	22.6	21.5	3.00	C

Facility Overall Results

Space Mean Speed, mi/h	68.0	Density, veh/mi/ln	21.5
Average Travel Time, min	3.00	Density, pc/mi/ln	22.6

Messages

WARNING 1	Weaving segment 2 should have one auxiliary lane.
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Comments

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HCS7 Freeway Facilities Report

Project Information

Analyst	W-Trans	Date	6/13/2019
Agency	W-Trans	Analysis Year	Existing
Jurisdiction	Pleasant Hill	Time Period Analyzed	I-680 SB PM
Project Description	Blake-Griggs Multi-Family Residential Facility EIR	Unit	United States Customary

Facility Global Input

Jam Density, pc/mi/ln	190.0	Density at Capacity, pc/mi/ln	45.0
Queue Discharge Capacity Drop, %	7	Total Segments	8
Total Time Periods	1	Time Period Duration, min	15
Facility Length, mi	4.28		

Facility Segment Data

No.	Coded	Analyzed	Name	Length, ft	Lanes
1	Basic	Basic	SB I-680 to North of Willow Pass Rd Onramp (second of two)	5280	4
2	Weaving	Weaving	SB I-680 b/w second Willow Pass Rd Onramp and Monument Offramp	2230	5
3	Merge	Merge	SB I-680 and SR-242 Merge	3960	6
4	Basic	Basic	SB I-680 b/w SR-242 and Monument Onramp	2780	6
5	Merge	Basic	SB I-680 at Monument Onramp	730	7
6	Merge	Basic	SB I-680 at Contra Costa Blvd Onramp	600	8
7	Diverge	Diverge	SB I-680 at N Main St Offramp	1740	7
8	Basic	Basic	SB I-680 to South of N Main St Offramp	5280	6

Facility Segment Data

Segment 1: Basic

Time Period	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.92	0.962	4082	9600	0.43	72.2	14.1	B

Segment 2: Weaving

Time Period	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.92	0.962	4749	6316	0.75	57.9	16.4	B

Segment 3: Merge

Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1	0.92	0.92	0.962	0.980	8513	4920	14400	4400	0.59	1.12	21.2	17.8	66.9	40.7	E

Segment 4: Basic

Time	PHF	fHV	Flow Rate	Capacity	d/c	Speed	Density	LOS
------	-----	-----	-----------	----------	-----	-------	---------	-----

Period					(pc/h)		(pc/h)		Ratio		(mi/h)		(pc/mi/ln)		
1	0.92		0.962		8605		14400		0.60		71.0		20.2		C
Segment 5: Merge															
Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1	0.92	0.92	0.962	0.980	9198	593	16800	2000	0.55	0.30	74.2	-	17.7	-	B
Segment 6: Merge															
Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1	0.92	0.92	0.962	0.980	9727	517	19200	2000	0.51	0.26	74.8	-	16.3	-	B
Segment 7: Diverge															
Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1	0.92	0.92	0.962	0.980	9736	1277	16800	4000	0.58	0.32	68.2	57.3	20.4	15.9	B
Segment 8: Basic															
Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
1	0.92		0.962		8436		14400		0.59		71.2		19.7		C
Facility Time Period Results															
T	Speed, mi/h				Density, pc/mi/ln		Density, veh/mi/ln		Travel Time, min				LOS		
1	47.5				27.3		26.1		5.40				D		
Facility Overall Results															
Space Mean Speed, mi/h					47.5			Density, veh/mi/ln				26.1			
Average Travel Time, min					5.40			Density, pc/mi/ln				27.3			
Messages															
WARNING 1					Weaving segment 2 should have one auxiliary lane.										
WARNING 2					On-ramp demand is larger than capacity										
Comments															

HCS7 Freeway Facilities Report

Project Information

Analyst	W-Trans	Date	6/13/2019
Agency	W-Trans	Analysis Year	Future
Jurisdiction	Pleasant Hill	Time Period Analyzed	I-680 NB AM
Project Description	Blake-Griggs Multi-Family Residential Facility EIR	Unit	United States Customary

Facility Global Input

Jam Density, pc/mi/ln	190.0	Density at Capacity, pc/mi/ln	45.0
Queue Discharge Capacity Drop, %	7	Total Segments	6
Total Time Periods	1	Time Period Duration, min	15
Facility Length, mi	3.40		

Facility Segment Data

No.	Coded	Analyzed	Name	Length, ft	Lanes
1	Basic	Basic	NB I-680 to South of Oak-Elena Onramp	5280	6
2	Weaving	Weaving	NB I-680 b/w Oak-Elena Onramp and Contra Costa Blvd Offramp	2410	6
3	Diverge	Basic	NB I-680 at Monument Offramp	1140	6
4	Basic	Basic	NB I-680 b/w Monument Ramps	2350	5
5	Merge	Basic	NB I-680 at Monument Onramp	1500	6
6	Basic	Basic	NB I-680 to North of Monument Onramp	5280	6

Facility Segment Data

Segment 1: Basic

Time Period	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.92	0.962	7924	14400	0.55	72.4	18.2	C

Segment 2: Weaving

Time Period	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.92	0.962	8837	13121	0.67	57.6	25.6	C

Segment 3: Diverge

Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1	0.92	0.92	0.962	0.980	8313	460	14400	2000	0.58	0.23	73.6	-	18.8	-	C

Segment 4: Basic

Time Period	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.92	0.962	7844	12000	0.65	70.4	22.3	C

Segment 5: Merge																
Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS	
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp		
1	0.92	0.92	0.962	0.980	9148	1304	14400	2000	0.64	0.65	72.2	-	21.1	-	C	
Segment 6: Basic																
Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS	
1	0.92		0.962		9172		14400		0.64		70.8		21.6		C	
Facility Time Period Results																
T	Speed, mi/h			Density, pc/mi/ln			Density, veh/mi/ln			Travel Time, min			LOS			
1	69.2			21.0			19.9			2.90			C			
Facility Overall Results																
Space Mean Speed, mi/h					69.2				Density, veh/mi/ln				19.9			
Average Travel Time, min					2.90				Density, pc/mi/ln				21.0			
Messages																
WARNING 1					Weaving segment 2 should have one auxiliary lane.											
Comments																

HCS7 Freeway Facilities Report																
Project Information																
Analyst				W-Trans				Date				6/13/2019				
Agency				W-Trans				Analysis Year				Future				
Jurisdiction				Pleasant Hill				Time Period Analyzed				I-680 SB AM				
Project Description				Blake-Griggs Multi-Family Residential Facility EIR				Unit				United States Customary				
Facility Global Input																
Jam Density, pc/mi/ln				190.0				Density at Capacity, pc/mi/ln				45.0				
Queue Discharge Capacity Drop, %				7				Total Segments				8				
Total Time Periods				1				Time Period Duration, min				15				
Facility Length, mi				4.28												
Facility Segment Data																
No.		Coded		Analyzed		Name				Length, ft				Lanes		
1		Basic		Basic		SB I-680 to North of Willow Pass Rd Onramp (second of two)				5280				4		
2		Weaving		Weaving		SB I-680 b/w second Willow Pass Rd Onramp and Monument Offramp				2230				5		
3		Merge		Merge		SB I-680 and SR-242 Merge				3960				6		
4		Basic		Basic		SB I-680 b/w SR-242 and Monument Onramp				2780				6		
5		Merge		Basic		SB I-680 at Monument Onramp				730				7		
6		Merge		Basic		SB I-680 at Contra Costa Blvd Onramp				600				8		
7		Diverge		Diverge		SB I-680 at N Main St Offramp				1740				7		
8		Basic		Basic		SB I-680 to South of N Main St Offramp				5280				6		
Facility Segment Data																
Segment 1: Basic																
Time Period		PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
1		0.92		0.962		4348		9600		0.45		72.2		15.1		B
Segment 2: Weaving																
Time Period		PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
1		0.92		0.962		5225		5298		0.99		54.5		19.2		B
Segment 3: Merge																
Time Period		PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
		F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1		0.92	0.92	0.962	0.980	9188	5476	14400	4400	0.64	1.24	1.2	0.0	1276.1	45.0	E
Segment 4: Basic																
Time		PHF		fHV		Flow Rate		Capacity		d/c		Speed		Density		LOS

Period					(pc/h)		(pc/h)		Ratio		(mi/h)		(pc/mi/ln)		
1	0.92		0.962		9290		14400		0.65		70.0		22.1		C
Segment 5: Merge															
Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1	0.92	0.92	0.962	0.980	10476	1186	16800	2000	0.62	0.59	72.5	-	20.6	-	C
Segment 6: Merge															
Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1	0.92	0.92	0.962	0.980	11165	667	19200	2000	0.58	0.33	73.5	-	19.0	-	C
Segment 7: Diverge															
Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1	0.92	0.92	0.962	0.980	11177	785	16800	4000	0.67	0.20	68.4	58.7	23.3	19.6	B
Segment 8: Basic															
Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
1	0.92		0.962		10377		14400		0.72		67.9		25.5		C
Facility Time Period Results															
T	Speed, mi/h				Density, pc/mi/ln		Density, veh/mi/ln		Travel Time, min				LOS		
1	5.7				257.0		247.1		45.10				F		
Facility Overall Results															
Space Mean Speed, mi/h					5.7			Density, veh/mi/ln				247.1			
Average Travel Time, min					45.10			Density, pc/mi/ln				257.0			
Messages															
WARNING 1					Weaving segment 2 should have one auxiliary lane.										
WARNING 2					On-ramp demand is larger than capacity										
Comments															

HCS7 Freeway Facilities Report

Project Information

Analyst	W-Trans	Date	6/13/2019
Agency	W-Trans	Analysis Year	Future
Jurisdiction	Pleasant Hill	Time Period Analyzed	I-680 NB PM
Project Description	Blake-Griggs Multi-Family Residential Facility EIR	Unit	United States Customary

Facility Global Input

Jam Density, pc/mi/ln	190.0	Density at Capacity, pc/mi/ln	45.0
Queue Discharge Capacity Drop, %	7	Total Segments	6
Total Time Periods	1	Time Period Duration, min	15
Facility Length, mi	3.40		

Facility Segment Data

No.	Coded	Analyzed	Name	Length, ft	Lanes
1	Basic	Basic	NB I-680 to South of Oak-Elena Onramp	5280	6
2	Weaving	Weaving	NB I-680 b/w Oak-Elena Onramp and Contra Costa Blvd Offramp	2410	6
3	Diverge	Basic	NB I-680 at Monument Offramp	1140	6
4	Basic	Basic	NB I-680 b/w Monument Ramps	2350	5
5	Merge	Basic	NB I-680 at Monument Onramp	1500	6
6	Basic	Basic	NB I-680 to North of Monument Onramp	5280	6

Facility Segment Data

Segment 1: Basic

Time Period	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.92	0.962	9202	14400	0.64	70.7	21.7	C

Segment 2: Weaving

Time Period	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.92	0.962	10679	13056	0.82	53.3	33.4	D

Segment 3: Diverge

Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1	0.92	0.92	0.962	0.980	10267	606	14400	2000	0.71	0.30	69.6	-	24.6	-	C

Segment 4: Basic

Time Period	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.92	0.962	9650	12000	0.80	64.9	29.7	D

Segment 5: Merge																
Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS	
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp		
1	0.92	0.92	0.962	0.980	11223	1573	14400	2000	0.78	0.79	66.8	-	28.0	-	D	
Segment 6: Basic																
Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS	
1	0.92		0.962		11253		14400		0.78		65.9		28.5		D	
Facility Time Period Results																
T	Speed, mi/h			Density, pc/mi/ln			Density, veh/mi/ln			Travel Time, min			LOS			
1	65.1			27.0			25.6			3.10			D			
Facility Overall Results																
Space Mean Speed, mi/h					65.1				Density, veh/mi/ln				25.6			
Average Travel Time, min					3.10				Density, pc/mi/ln				27.0			
Messages																
WARNING 1					Weaving segment 2 should have one auxiliary lane.											
Comments																

HCS7 Freeway Facilities Report																
Project Information																
Analyst				W-Trans				Date				6/13/2019				
Agency				W-Trans				Analysis Year				Future				
Jurisdiction				Pleasant Hill				Time Period Analyzed				I-680 SB PM				
Project Description				Blake-Griggs Multi-Family Residential Facility EIR				Unit				United States Customary				
Facility Global Input																
Jam Density, pc/mi/ln				190.0				Density at Capacity, pc/mi/ln				45.0				
Queue Discharge Capacity Drop, %				7				Total Segments				8				
Total Time Periods				1				Time Period Duration, min				15				
Facility Length, mi				4.28												
Facility Segment Data																
No.		Coded		Analyzed		Name				Length, ft				Lanes		
1		Basic		Basic		SB I-680 to North of Willow Pass Rd Onramp (second of two)				5280				4		
2		Weaving		Weaving		SB I-680 b/w second Willow Pass Rd Onramp and Monument Offramp				2230				5		
3		Merge		Merge		SB I-680 and SR-242 Merge				3960				6		
4		Basic		Basic		SB I-680 b/w SR-242 and Monument Onramp				2780				6		
5		Merge		Basic		SB I-680 at Monument Onramp				730				7		
6		Merge		Basic		SB I-680 at Contra Costa Blvd Onramp				600				8		
7		Diverge		Diverge		SB I-680 at N Main St Offramp				1740				7		
8		Basic		Basic		SB I-680 to South of N Main St Offramp				5280				6		
Facility Segment Data																
Segment 1: Basic																
Time Period		PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
1		0.92		0.962		4654		9600		0.48		72.2		16.1		B
Segment 2: Weaving																
Time Period		PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
1		0.92		0.962		5414		6316		0.86		55.8		19.4		B
Segment 3: Merge																
Time Period		PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
		F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1		0.92	0.92	0.962	0.980	9705	5609	14400	4400	0.67	1.27	1.3	0.0	1244.2	46.9	E
Segment 4: Basic																
Time		PHF		fHV		Flow Rate		Capacity		d/c		Speed		Density		LOS

Period					(pc/h)		(pc/h)		Ratio		(mi/h)		(pc/mi/ln)		
1	0.92		0.962		9810		14400		0.68		69.1		23.7		C
Segment 5: Merge															
Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1	0.92	0.92	0.962	0.980	10487	677	16800	2000	0.62	0.34	72.5	-	20.7	-	C
Segment 6: Merge															
Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1	0.92	0.92	0.962	0.980	11088	589	19200	2000	0.58	0.29	73.6	-	18.8	-	C
Segment 7: Diverge															
Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1	0.92	0.92	0.962	0.980	11099	1455	16800	4000	0.66	0.36	67.3	56.7	23.6	19.4	B
Segment 8: Basic															
Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
1	0.92		0.962		9617		14400		0.67		69.5		23.1		C
Facility Time Period Results															
T	Speed, mi/h				Density, pc/mi/ln		Density, veh/mi/ln		Travel Time, min				LOS		
1	5.9				250.9		241.2		43.70				F		
Facility Overall Results															
Space Mean Speed, mi/h					5.9			Density, veh/mi/ln				241.2			
Average Travel Time, min					43.70			Density, pc/mi/ln				250.9			
Messages															
WARNING 1					Weaving segment 2 should have one auxiliary lane.										
WARNING 2					On-ramp demand is larger than capacity										
Comments															

HCS7 Freeway Facilities Report

Project Information

Analyst	W-Trans	Date	8/13/2019
Agency	W-Trans	Analysis Year	Existing plus Project
Jurisdiction	Pleasant Hill	Time Period Analyzed	I-680 NB AM
Project Description	Blake-Griggs Multi-Family Residential Facility EIR	Unit	United States Customary

Facility Global Input

Jam Density, pc/mi/ln	190.0	Density at Capacity, pc/mi/ln	45.0
Queue Discharge Capacity Drop, %	7	Total Segments	6
Total Time Periods	1	Time Period Duration, min	15
Facility Length, mi	3.40		

Facility Segment Data

No.	Coded	Analyzed	Name	Length, ft	Lanes
1	Basic	Basic	NB I-680 to South of Oak-Elena Onramp	5280	6
2	Weaving	Weaving	NB I-680 b/w Oak-Elena Onramp and Contra Costa Blvd Offramp	2410	6
3	Diverge	Basic	NB I-680 at Monument Offramp	1140	6
4	Basic	Basic	NB I-680 b/w Monument Ramps	2350	5
5	Merge	Basic	NB I-680 at Monument Onramp	1500	6
6	Basic	Basic	NB I-680 to North of Monument Onramp	5280	6

Facility Segment Data

Segment 1: Basic

Time Period	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.92	0.962	6956	14400	0.48	73.0	15.9	B

Segment 2: Weaving

Time Period	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.92	0.962	7757	13122	0.59	59.6	21.7	C

Segment 3: Diverge

Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1	0.92	0.92	0.962	0.980	7292	404	14400	2000	0.51	0.20	74.5	-	16.2	-	B

Segment 4: Basic

Time Period	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.92	0.962	6881	12000	0.57	72.1	19.1	C

Segment 5: Merge

Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1	0.92	0.92	0.962	0.980	8035	1154	14400	2000	0.56	0.58	74.0	-	18.1	-	C

Segment 6: Basic

Time Period	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.92	0.962	8056	14400	0.56	72.3	18.6	C

Facility Time Period Results

T	Speed, mi/h	Density, pc/mi/ln	Density, veh/mi/ln	Travel Time, min	LOS
1	70.6	18.1	17.2	2.90	C

Facility Overall Results

Space Mean Speed, mi/h	70.6	Density, veh/mi/ln	17.2
Average Travel Time, min	2.90	Density, pc/mi/ln	18.1

Messages

WARNING 1	Weaving segment 2 should have one auxiliary lane.
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Comments

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HCS7 Freeway Facilities Report

Project Information

Analyst	W-Trans	Date	8/13/2019
Agency	W-Trans	Analysis Year	Existing plus Project
Jurisdiction	Pleasant Hill	Time Period Analyzed	I-680 SB AM
Project Description	Blake-Griggs Multi-Family Residential Facility EIR	Unit	United States Customary

Facility Global Input

Jam Density, pc/mi/ln	190.0	Density at Capacity, pc/mi/ln	45.0
Queue Discharge Capacity Drop, %	7	Total Segments	8
Total Time Periods	1	Time Period Duration, min	15
Facility Length, mi	4.28		

Facility Segment Data

No.	Coded	Analyzed	Name	Length, ft	Lanes
1	Basic	Basic	SB I-680 to North of Willow Pass Rd Onramp (second of two)	5280	4
2	Weaving	Weaving	SB I-680 b/w second Willow Pass Rd Onramp and Monument Offramp	2230	5
3	Merge	Merge	SB I-680 and SR-242 Merge	3960	6
4	Basic	Basic	SB I-680 b/w SR-242 and Monument Onramp	2780	6
5	Merge	Basic	SB I-680 at Monument Onramp	730	7
6	Merge	Basic	SB I-680 at Contra Costa Blvd Onramp	600	8
7	Diverge	Diverge	SB I-680 at N Main St Offramp	1740	7
8	Basic	Basic	SB I-680 to South of N Main St Offramp	5280	6

Facility Segment Data

Segment 1: Basic

Time Period	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.92	0.962	3817	9600	0.40	72.2	13.2	B

Segment 2: Weaving

Time Period	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.92	0.962	4585	5298	0.87	56.5	16.2	B

Segment 3: Merge

Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1	0.92	0.92	0.962	0.980	8059	4804	14400	4400	0.56	1.09	32.0	28.0	42.0	39.0	E

Segment 4: Basic

Time	PHF	fHV	Flow Rate	Capacity	d/c	Speed	Density	LOS
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Period					(pc/h)		(pc/h)		Ratio		(mi/h)		(pc/mi/ln)		
1	0.92		0.962		8149		14400		0.57		71.5		19.0		C
Segment 5: Merge															
Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1	0.92	0.92	0.962	0.980	9196	1047	16800	2000	0.55	0.52	74.2	-	17.7	-	B
Segment 6: Merge															
Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1	0.92	0.92	0.962	0.980	9805	590	19200	2000	0.51	0.30	74.8	-	16.4	-	B
Segment 7: Diverge															
Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1	0.92	0.92	0.962	0.980	9817	689	16800	4000	0.58	0.17	69.1	59.0	20.3	16.1	B
Segment 8: Basic															
Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
1	0.92		0.962		9115		14400		0.63		70.3		21.6		C
Facility Time Period Results															
T	Speed, mi/h				Density, pc/mi/ln		Density, veh/mi/ln		Travel Time, min				LOS		
1	56.6				22.7		21.8		4.50				C		
Facility Overall Results															
Space Mean Speed, mi/h					56.6			Density, veh/mi/ln				21.8			
Average Travel Time, min					4.50			Density, pc/mi/ln				22.7			
Messages															
WARNING 1					Weaving segment 2 should have one auxiliary lane.										
WARNING 2					On-ramp demand is larger than capacity										
Comments															

HCS7 Freeway Facilities Report

Project Information

Analyst	W-Trans	Date	8/13/2019
Agency	W-Trans	Analysis Year	Existing plus Project
Jurisdiction	Pleasant Hill	Time Period Analyzed	I-680 NB PM
Project Description	Blake-Griggs Multi-Family Residential Facility EIR	Unit	United States Customary

Facility Global Input

Jam Density, pc/mi/ln	190.0	Density at Capacity, pc/mi/ln	45.0
Queue Discharge Capacity Drop, %	7	Total Segments	6
Total Time Periods	1	Time Period Duration, min	15
Facility Length, mi	3.40		

Facility Segment Data

No.	Coded	Analyzed	Name	Length, ft	Lanes
1	Basic	Basic	NB I-680 to South of Oak-Elena Onramp	5280	6
2	Weaving	Weaving	NB I-680 b/w Oak-Elena Onramp and Contra Costa Blvd Offramp	2410	6
3	Diverge	Basic	NB I-680 at Monument Offramp	1140	6
4	Basic	Basic	NB I-680 b/w Monument Ramps	2350	5
5	Merge	Basic	NB I-680 at Monument Onramp	1500	6
6	Basic	Basic	NB I-680 to North of Monument Onramp	5280	6

Facility Segment Data

Segment 1: Basic

Time Period	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.92	0.962	8084	14400	0.56	72.3	18.6	C

Segment 2: Weaving

Time Period	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.92	0.962	9380	13055	0.72	55.7	28.1	D

Segment 3: Diverge

Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1	0.92	0.92	0.962	0.980	9006	531	14400	2000	0.63	0.27	72.5	-	20.7	-	C

Segment 4: Basic

Time Period	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.92	0.962	8465	12000	0.71	68.8	24.6	C

Segment 5: Merge

Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1	0.92	0.92	0.962	0.980	9850	1385	14400	2000	0.68	0.69	70.6	-	23.3	-	C

Segment 6: Basic

Time Period	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.92	0.962	9876	14400	0.69	69.4	23.7	C

Facility Time Period Results

T	Speed, mi/h	Density, pc/mi/ln	Density, veh/mi/ln	Travel Time, min	LOS
1	68.0	22.6	21.5	3.00	C

Facility Overall Results

Space Mean Speed, mi/h	68.0	Density, veh/mi/ln	21.5
Average Travel Time, min	3.00	Density, pc/mi/ln	22.6

Messages

WARNING 1	Weaving segment 2 should have one auxiliary lane.
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Comments

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HCS7 Freeway Facilities Report																
Project Information																
Analyst				W-Trans				Date				8/13/2019				
Agency				W-Trans				Analysis Year				Existing plus Project				
Jurisdiction				Pleasant Hill				Time Period Analyzed				I-680 SB PM				
Project Description				Blake-Griggs Multi-Family Residential Facility EIR				Unit				United States Customary				
Facility Global Input																
Jam Density, pc/mi/ln				190.0				Density at Capacity, pc/mi/ln				45.0				
Queue Discharge Capacity Drop, %				7				Total Segments				8				
Total Time Periods				1				Time Period Duration, min				15				
Facility Length, mi				4.28												
Facility Segment Data																
No.		Coded		Analyzed		Name				Length, ft				Lanes		
1		Basic		Basic		SB I-680 to North of Willow Pass Rd Onramp (second of two)				5280				4		
2		Weaving		Weaving		SB I-680 b/w second Willow Pass Rd Onramp and Monument Offramp				2230				5		
3		Merge		Merge		SB I-680 and SR-242 Merge				3960				6		
4		Basic		Basic		SB I-680 b/w SR-242 and Monument Onramp				2780				6		
5		Merge		Basic		SB I-680 at Monument Onramp				730				7		
6		Merge		Basic		SB I-680 at Contra Costa Blvd Onramp				600				8		
7		Diverge		Diverge		SB I-680 at N Main St Offramp				1740				7		
8		Basic		Basic		SB I-680 to South of N Main St Offramp				5280				6		
Facility Segment Data																
Segment 1: Basic																
Time Period		PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
1		0.92		0.962		4091		9600		0.43		72.2		14.2		B
Segment 2: Weaving																
Time Period		PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
1		0.92		0.962		4758		6299		0.76		57.8		16.5		B
Segment 3: Merge																
Time Period		PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
		F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1		0.92	0.92	0.962	0.980	8513	4920	14400	4400	0.59	1.12	21.2	17.8	66.9	40.7	E
Segment 4: Basic																
Time		PHF		fHV		Flow Rate		Capacity		d/c		Speed		Density		LOS

Period					(pc/h)		(pc/h)		Ratio		(mi/h)		(pc/mi/ln)		
1	0.92		0.962		8605		14400		0.60		71.0		20.2		C
Segment 5: Merge															
Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1	0.92	0.92	0.962	0.980	9203	598	16800	2000	0.55	0.30	74.2	-	17.7	-	B
Segment 6: Merge															
Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1	0.92	0.92	0.962	0.980	9734	520	19200	2000	0.51	0.26	74.8	-	16.3	-	B
Segment 7: Diverge															
Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1	0.92	0.92	0.962	0.980	9744	1277	16800	4000	0.58	0.32	68.2	57.3	20.4	15.9	B
Segment 8: Basic															
Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
1	0.92		0.962		8444		14400		0.59		71.2		19.8		C
Facility Time Period Results															
T	Speed, mi/h				Density, pc/mi/ln		Density, veh/mi/ln		Travel Time, min				LOS		
1	47.5				27.3		26.2		5.40				D		
Facility Overall Results															
Space Mean Speed, mi/h					47.5			Density, veh/mi/ln				26.2			
Average Travel Time, min					5.40			Density, pc/mi/ln				27.3			
Messages															
WARNING 1					Weaving segment 2 should have one auxiliary lane.										
WARNING 2					On-ramp demand is larger than capacity										
Comments															

HCS7 Freeway Facilities Report

Project Information

Analyst	W-Trans	Date	8/13/2019
Agency	W-Trans	Analysis Year	Future plus Project
Jurisdiction	Pleasant Hill	Time Period Analyzed	I-680 NB AM
Project Description	Blake-Griggs Multi-Family Residential Facility EIR	Unit	United States Customary

Facility Global Input

Jam Density, pc/mi/ln	190.0	Density at Capacity, pc/mi/ln	45.0
Queue Discharge Capacity Drop, %	7	Total Segments	6
Total Time Periods	1	Time Period Duration, min	15
Facility Length, mi	3.40		

Facility Segment Data

No.	Coded	Analyzed	Name	Length, ft	Lanes
1	Basic	Basic	NB I-680 to South of Oak-Elena Onramp	5280	6
2	Weaving	Weaving	NB I-680 b/w Oak-Elena Onramp and Contra Costa Blvd Offramp	2410	6
3	Diverge	Basic	NB I-680 at Monument Offramp	1140	6
4	Basic	Basic	NB I-680 b/w Monument Ramps	2350	5
5	Merge	Basic	NB I-680 at Monument Onramp	1500	6
6	Basic	Basic	NB I-680 to North of Monument Onramp	5280	6

Facility Segment Data

Segment 1: Basic

Time Period	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.92	0.962	7928	14400	0.55	72.4	18.2	C

Segment 2: Weaving

Time Period	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.92	0.962	8842	13122	0.67	57.6	25.6	C

Segment 3: Diverge

Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1	0.92	0.92	0.962	0.980	8313	460	14400	2000	0.58	0.23	73.6	-	18.8	-	C

Segment 4: Basic

Time Period	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.92	0.962	7844	12000	0.65	70.4	22.3	C

Segment 5: Merge

Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1	0.92	0.92	0.962	0.980	9157	1313	14400	2000	0.64	0.66	72.2	-	21.1	-	C

Segment 6: Basic

Time Period	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.92	0.962	9182	14400	0.64	70.8	21.6	C

Facility Time Period Results

T	Speed, mi/h	Density, pc/mi/ln	Density, veh/mi/ln	Travel Time, min	LOS
1	69.2	21.0	19.9	2.90	C

Facility Overall Results

Space Mean Speed, mi/h	69.2	Density, veh/mi/ln	19.9
Average Travel Time, min	2.90	Density, pc/mi/ln	21.0

Messages

WARNING 1	Weaving segment 2 should have one auxiliary lane.
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Comments

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HCS7 Freeway Facilities Report

Project Information

Analyst	W-Trans	Date	8/13/2019
Agency	W-Trans	Analysis Year	Future plus Project
Jurisdiction	Pleasant Hill	Time Period Analyzed	I-680 SB AM
Project Description	Blake-Griggs Multi-Family Residential Facility EIR	Unit	United States Customary

Facility Global Input

Jam Density, pc/mi/ln	190.0	Density at Capacity, pc/mi/ln	45.0
Queue Discharge Capacity Drop, %	7	Total Segments	8
Total Time Periods	1	Time Period Duration, min	15
Facility Length, mi	4.28		

Facility Segment Data

No.	Coded	Analyzed	Name	Length, ft	Lanes
1	Basic	Basic	SB I-680 to North of Willow Pass Rd Onramp (second of two)	5280	4
2	Weaving	Weaving	SB I-680 b/w second Willow Pass Rd Onramp and Monument Offramp	2230	5
3	Merge	Merge	SB I-680 and SR-242 Merge	3960	6
4	Basic	Basic	SB I-680 b/w SR-242 and Monument Onramp	2780	6
5	Merge	Basic	SB I-680 at Monument Onramp	730	7
6	Merge	Basic	SB I-680 at Contra Costa Blvd Onramp	600	8
7	Diverge	Diverge	SB I-680 at N Main St Offramp	1740	7
8	Basic	Basic	SB I-680 to South of N Main St Offramp	5280	6

Facility Segment Data

Segment 1: Basic

Time Period	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.92	0.962	4351	9600	0.45	72.2	15.1	B

Segment 2: Weaving

Time Period	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.92	0.962	5228	5298	0.99	54.4	19.2	B

Segment 3: Merge

Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1	0.92	0.92	0.962	0.980	9188	5476	14400	4400	0.64	1.24	1.2	0.0	1276.1	45.0	E

Segment 4: Basic

Time	PHF	fHV	Flow Rate	Capacity	d/c	Speed	Density	LOS
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Period					(pc/h)		(pc/h)		Ratio		(mi/h)		(pc/mi/ln)		
1	0.92		0.962		9290		14400		0.65		70.0		22.1		C
Segment 5: Merge															
Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1	0.92	0.92	0.962	0.980	10482	1192	16800	2000	0.62	0.60	72.5	-	20.7	-	C
Segment 6: Merge															
Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1	0.92	0.92	0.962	0.980	11177	672	19200	2000	0.58	0.34	73.5	-	19.0	-	C
Segment 7: Diverge															
Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1	0.92	0.92	0.962	0.980	11189	785	16800	4000	0.67	0.20	68.4	58.7	23.4	19.6	B
Segment 8: Basic															
Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
1	0.92		0.962		10389		14400		0.72		67.8		25.5		C
Facility Time Period Results															
T	Speed, mi/h				Density, pc/mi/ln		Density, veh/mi/ln		Travel Time, min				LOS		
1	5.7				257.1		247.1		45.10				F		
Facility Overall Results															
Space Mean Speed, mi/h					5.7			Density, veh/mi/ln				247.1			
Average Travel Time, min					45.10			Density, pc/mi/ln				257.1			
Messages															
WARNING 1					Weaving segment 2 should have one auxiliary lane.										
WARNING 2					On-ramp demand is larger than capacity										
Comments															

HCS7 Freeway Facilities Report

Project Information

Analyst	W-Trans	Date	8/13/2019
Agency	W-Trans	Analysis Year	Future plus Project
Jurisdiction	Pleasant Hill	Time Period Analyzed	I-680 NB PM
Project Description	Blake-Griggs Multi-Family Residential Facility EIR	Unit	United States Customary

Facility Global Input

Jam Density, pc/mi/ln	190.0	Density at Capacity, pc/mi/ln	45.0
Queue Discharge Capacity Drop, %	7	Total Segments	6
Total Time Periods	1	Time Period Duration, min	15
Facility Length, mi	3.40		

Facility Segment Data

No.	Coded	Analyzed	Name	Length, ft	Lanes
1	Basic	Basic	NB I-680 to South of Oak-Elena Onramp	5280	6
2	Weaving	Weaving	NB I-680 b/w Oak-Elena Onramp and Contra Costa Blvd Offramp	2410	6
3	Diverge	Basic	NB I-680 at Monument Offramp	1140	6
4	Basic	Basic	NB I-680 b/w Monument Ramps	2350	5
5	Merge	Basic	NB I-680 at Monument Onramp	1500	6
6	Basic	Basic	NB I-680 to North of Monument Onramp	5280	6

Facility Segment Data

Segment 1: Basic

Time Period	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.92	0.962	9214	14400	0.64	70.7	21.7	C

Segment 2: Weaving

Time Period	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.92	0.962	10692	13055	0.82	53.2	33.5	D

Segment 3: Diverge

Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1	0.92	0.92	0.962	0.980	10267	606	14400	2000	0.71	0.30	69.6	-	24.6	-	C

Segment 4: Basic

Time Period	PHF	fHV	Flow Rate (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.92	0.962	9650	12000	0.80	64.9	29.7	D

Segment 5: Merge																
Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS	
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp		
1	0.92	0.92	0.962	0.980	11228	1578	14400	2000	0.78	0.79	66.7	-	28.1	-	D	
Segment 6: Basic																
Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS	
1	0.92		0.962		11258		14400		0.78		65.9		28.5		D	
Facility Time Period Results																
T	Speed, mi/h			Density, pc/mi/ln			Density, veh/mi/ln			Travel Time, min			LOS			
1	65.1			27.0			25.6			3.10			D			
Facility Overall Results																
Space Mean Speed, mi/h					65.1				Density, veh/mi/ln				25.6			
Average Travel Time, min					3.10				Density, pc/mi/ln				27.0			
Messages																
WARNING 1					Weaving segment 2 should have one auxiliary lane.											
Comments																

HCS7 Freeway Facilities Report																
Project Information																
Analyst				W-Trans				Date				8/13/2019				
Agency				W-Trans				Analysis Year				Future plus Project				
Jurisdiction				Pleasant Hill				Time Period Analyzed				I-680 SB PM				
Project Description				Blake-Griggs Multi-Family Residential Facility EIR				Unit				United States Customary				
Facility Global Input																
Jam Density, pc/mi/ln				190.0				Density at Capacity, pc/mi/ln				45.0				
Queue Discharge Capacity Drop, %				7				Total Segments				8				
Total Time Periods				1				Time Period Duration, min				15				
Facility Length, mi				4.28												
Facility Segment Data																
No.		Coded		Analyzed		Name				Length, ft				Lanes		
1		Basic		Basic		SB I-680 to North of Willow Pass Rd Onramp (second of two)				5280				4		
2		Weaving		Weaving		SB I-680 b/w second Willow Pass Rd Onramp and Monument Offramp				2230				5		
3		Merge		Merge		SB I-680 and SR-242 Merge				3960				6		
4		Basic		Basic		SB I-680 b/w SR-242 and Monument Onramp				2780				6		
5		Merge		Basic		SB I-680 at Monument Onramp				730				7		
6		Merge		Basic		SB I-680 at Contra Costa Blvd Onramp				600				8		
7		Diverge		Diverge		SB I-680 at N Main St Offramp				1740				7		
8		Basic		Basic		SB I-680 to South of N Main St Offramp				5280				6		
Facility Segment Data																
Segment 1: Basic																
Time Period		PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
1		0.92		0.962		4663		9600		0.49		72.2		16.1		B
Segment 2: Weaving																
Time Period		PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
1		0.92		0.962		5423		6299		0.86		55.8		19.4		B
Segment 3: Merge																
Time Period		PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
		F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1		0.92	0.92	0.962	0.980	9705	5609	14400	4400	0.67	1.27	1.3	0.0	1244.2	46.9	E
Segment 4: Basic																
Time		PHF		fHV		Flow Rate		Capacity		d/c		Speed		Density		LOS

Period					(pc/h)		(pc/h)		Ratio		(mi/h)		(pc/mi/ln)		
1	0.92		0.962		9810		14400		0.68		69.1		23.7		C
Segment 5: Merge															
Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1	0.92	0.92	0.962	0.980	10491	681	16800	2000	0.62	0.34	72.5	-	20.7	-	C
Segment 6: Merge															
Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1	0.92	0.92	0.962	0.980	11095	592	19200	2000	0.58	0.30	73.6	-	18.8	-	C
Segment 7: Diverge															
Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R	Freeway	Ramp	
1	0.92	0.92	0.962	0.980	11107	1455	16800	4000	0.66	0.36	67.3	56.7	23.6	19.4	B
Segment 8: Basic															
Time Period	PHF		fHV		Flow Rate (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
1	0.92		0.962		9624		14400		0.67		69.4		23.1		C
Facility Time Period Results															
T	Speed, mi/h				Density, pc/mi/ln		Density, veh/mi/ln		Travel Time, min				LOS		
1	5.9				250.9		241.2		43.60				F		
Facility Overall Results															
Space Mean Speed, mi/h					5.9			Density, veh/mi/ln				241.2			
Average Travel Time, min					43.60			Density, pc/mi/ln				250.9			
Messages															
WARNING 1					Weaving segment 2 should have one auxiliary lane.										
WARNING 2					On-ramp demand is larger than capacity										
Comments															

Appendix D

Arterial Speed Calculations



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Arterial Level of Service: NB Contra Costa Blvd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Astrid Dr	16	1.9	7.5	0.1	28
	32	0.6	18.3	0.2	34
	15	14.8	29.3	0.2	26
Monument Blvd	10	45.3	58.2	0.1	8
Crescent Dr	7	10.5	21.2	0.1	17
I-680 SB Off-Ramp	5	10.3	18.1	0.1	15
	34	2.2	14.1	0.1	25
Pleasant Hill Plaza	1	5.3	11.4	0.1	18
Total		91.0	178.0	0.9	18

Arterial Level of Service: SB Contra Costa Blvd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Woodsworth Ln	1	12.3	22.0	0.1	16
	34	1.3	8.3	0.1	25
Gregory Ln	5	25.1	36.0	0.1	10
Crescent Dr	7	4.4	13.0	0.1	21
Crescent Plaza	10	24.7	34.2	0.1	11
Boyd Rd	15	24.4	38.6	0.1	12
	32	7.0	27.9	0.2	26
Astrid Dr	16	4.6	19.8	0.2	31
Total		103.7	199.8	0.9	17

Arterial Level of Service: NB Contra Costa Blvd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Astrid Dr	16	1.9	7.6	0.1	29
	32	0.9	18.6	0.2	33
	15	17.9	35.6	0.2	21
Monument Blvd	10	45.1	58.2	0.1	8
Crescent Dr	7	10.3	20.4	0.1	18
I-680 SB Off-Ramp	5	32.1	39.8	0.1	7
	34	8.9	20.8	0.1	17
Pleasant Hill Plaza	1	19.7	25.8	0.1	8
Total		136.8	226.7	0.9	14

Arterial Level of Service: SB Contra Costa Blvd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Woodsworth Ln	1	27.9	37.7	0.1	9
	34	2.4	9.4	0.1	22
Gregory Ln	5	20.0	33.5	0.1	11
Crescent Dr	7	9.1	17.5	0.1	16
Crescent Plaza	10	11.4	21.1	0.1	17
Boyd Rd	15	13.3	27.1	0.1	18
	32	4.7	25.9	0.2	28
Astrid Dr	16	2.8	15.8	0.2	39
Total		91.6	188.0	0.9	18

Arterial Level of Service: NB Contra Costa Blvd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Astrid Dr	16	2.1	7.7	0.1	28
	32	0.6	18.3	0.2	34
	15	18.2	32.7	0.2	23
Monument Blvd	10	47.2	60.0	0.1	8
Crescent Dr	7	11.4	22.1	0.1	16
I-680 SB Off-Ramp	5	10.5	18.2	0.1	15
	34	2.6	14.5	0.1	24
Pleasant Hill Plaza	1	6.7	12.8	0.1	16
Total		99.3	186.4	0.9	17

Arterial Level of Service: SB Contra Costa Blvd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Woodsworth Ln	1	14.7	24.4	0.1	14
	34	2.1	9.1	0.1	22
Gregory Ln	5	33.9	45.0	0.1	8
Crescent Dr	7	6.1	14.7	0.1	19
Crescent Plaza	10	28.8	38.2	0.1	9
Boyd Rd	15	25.8	39.9	0.1	12
	32	8.3	29.3	0.2	25
Astrid Dr	16	5.1	20.2	0.2	30
Total		124.7	220.8	0.9	15

Arterial Level of Service: NB Contra Costa Blvd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Astrid Dr	16	1.9	7.6	0.1	28
	32	0.9	18.6	0.2	33
	15	20.4	38.2	0.2	19
Monument Blvd	10	54.5	67.6	0.1	7
Crescent Dr	7	19.1	29.9	0.1	12
I-680 SB Off-Ramp	5	48.6	56.2	0.1	5
	34	19.8	31.6	0.1	11
Pleasant Hill Plaza	1	29.5	35.6	0.1	6
Total		194.8	285.3	0.9	11

Arterial Level of Service: SB Contra Costa Blvd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Woodsworth Ln	1	30.6	40.9	0.1	9
	34	3.3	10.3	0.1	20
Gregory Ln	5	31.7	51.7	0.1	8
Crescent Dr	7	12.4	20.8	0.1	13
Crescent Plaza	10	15.2	24.8	0.1	15
Boyd Rd	15	15.1	28.7	0.1	17
	32	5.7	26.9	0.2	27
Astrid Dr	16	3.1	15.9	0.2	39
Total		117.1	220.1	0.9	16

Arterial Level of Service: NB Contra Costa Blvd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Astrid Dr	16	1.7	7.3	0.1	29
	32	0.6	18.2	0.2	34
	15	15.8	30.4	0.2	25
Monument Blvd	10	45.9	58.7	0.1	8
Crescent Dr	7	9.5	20.2	0.1	18
I-680 SB Off-Ramp	5	9.8	17.6	0.1	16
	34	2.1	14.1	0.1	25
Pleasant Hill Plaza	1	5.3	11.5	0.1	18
Total		90.8	178.0	0.9	18

Arterial Level of Service: SB Contra Costa Blvd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Woodsworth Ln	1	12.2	21.8	0.1	16
	34	1.3	8.2	0.1	25
Gregory Ln	5	25.7	36.5	0.1	9
Crescent Dr	7	4.3	12.9	0.1	21
Crescent Plaza	10	24.4	33.8	0.1	11
Boyd Rd	15	23.6	37.7	0.1	13
	32	7.0	28.0	0.2	26
Astrid Dr	16	4.9	20.1	0.2	31
Total		103.2	199.1	0.9	17

Arterial Level of Service: NB Contra Costa Blvd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Astrid Dr	16	1.7	7.4	0.1	29
	32	0.9	18.6	0.2	33
	15	19.9	37.7	0.2	20
Monument Blvd	10	47.6	60.8	0.1	8
Crescent Dr	7	7.9	18.0	0.1	20
I-680 SB Off-Ramp	5	30.1	37.8	0.1	7
	34	9.0	20.9	0.1	17
Pleasant Hill Plaza	1	20.0	26.0	0.1	8
Total		137.2	227.2	0.9	14

Arterial Level of Service: SB Contra Costa Blvd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Woodsworth Ln	1	27.0	36.8	0.1	10
	34	1.9	8.9	0.1	23
Gregory Ln	5	17.2	27.8	0.1	13
Crescent Dr	7	7.2	15.6	0.1	18
Crescent Plaza	10	11.9	21.5	0.1	17
Boyd Rd	15	14.4	28.1	0.1	17
	32	4.9	26.1	0.2	28
Astrid Dr	16	2.8	15.8	0.2	39
Total		87.3	180.6	0.9	19

Arterial Level of Service: NB Contra Costa Blvd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Astrid Dr	16	2.3	7.8	0.1	27
	32	0.7	18.4	0.2	33
	15	16.6	31.1	0.2	24
Monument Blvd	10	48.6	61.4	0.1	8
Crescent Dr	7	9.8	20.5	0.1	18
I-680 SB Off-Ramp	5	10.3	18.1	0.1	15
	34	2.5	14.5	0.1	24
Pleasant Hill Plaza	1	7.0	13.1	0.1	16
Total		97.8	184.9	0.9	18

Arterial Level of Service: SB Contra Costa Blvd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Woodsworth Ln	1	15.2	24.9	0.1	14
	34	1.8	8.8	0.1	23
Gregory Ln	5	33.2	44.3	0.1	8
Crescent Dr	7	5.6	14.2	0.1	19
Crescent Plaza	10	29.0	38.5	0.1	9
Boyd Rd	15	25.0	39.2	0.1	12
	32	8.2	29.3	0.2	25
Astrid Dr	16	5.9	21.0	0.2	29
Total		123.9	220.2	0.9	15

Arterial Level of Service: NB Contra Costa Blvd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Astrid Dr	16	2.1	7.8	0.1	28
	32	1.0	18.6	0.2	33
	15	22.0	39.7	0.2	19
Monument Blvd	10	55.5	68.5	0.1	7
Crescent Dr	7	16.0	26.3	0.1	14
I-680 SB Off-Ramp	5	47.0	54.6	0.1	5
	34	21.4	33.1	0.1	10
Pleasant Hill Plaza	1	31.3	37.4	0.1	5
Total		196.2	286.1	0.9	11

Arterial Level of Service: SB Contra Costa Blvd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Woodsworth Ln	1	30.8	40.7	0.1	9
	34	2.8	9.8	0.1	21
Gregory Ln	5	26.1	39.6	0.1	9
Crescent Dr	7	10.9	19.3	0.1	14
Crescent Plaza	10	15.7	25.3	0.1	14
Boyd Rd	15	14.9	28.6	0.1	17
	32	5.9	27.0	0.2	27
Astrid Dr	16	3.3	16.3	0.2	38
Total		110.5	206.6	0.9	17

Appendix E

Queuing Calculations



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Intersection: 1: Contra Costa Blvd & Woodsworth Ln/Pleasant Hill Plaza Way

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	TR	LT	R	L	T	TR	L	T	T	R
Maximum Queue (ft)	124	89	135	54	85	136	162	161	293	263	130
Average Queue (ft)	51	33	58	14	27	44	66	44	141	106	31
95th Queue (ft)	107	73	114	37	67	101	125	102	256	219	91
Link Distance (ft)		1827	276	276		225	225		471	471	
Upstream Blk Time (%)							0				
Queuing Penalty (veh)							0				
Storage Bay Dist (ft)	225				115			105			105
Storage Blk Time (%)					0	0		0	13	6	
Queuing Penalty (veh)					0	0		1	6	7	

Intersection: 2: Gregory Ln & Elinora Dr

Movement	EB	EB	WB	WB	SB
Directions Served	LT	T	T	TR	LR
Maximum Queue (ft)	154	100	7	22	198
Average Queue (ft)	41	4	0	2	83
95th Queue (ft)	103	40	5	12	161
Link Distance (ft)	668	668	1637	1637	206
Upstream Blk Time (%)					1
Queuing Penalty (veh)					0
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 3: Cleaveland Rd/Woodsworth Ln & Gregory Ln

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	LT	R	LT	R
Maximum Queue (ft)	107	268	372	189	188	194	151	171	39	165	82
Average Queue (ft)	48	77	188	86	73	87	62	95	14	81	38
95th Queue (ft)	93	180	321	154	155	166	117	145	39	140	65
Link Distance (ft)		1637	1637		466	466		326	326	1827	
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	170			195			165				225
Storage Blk Time (%)		0		0	0		0	1			
Queuing Penalty (veh)		0		1	0		0	1			

Intersection: 4: Trelany Rd & Gregory Ln

Movement	EB	WB	WB	NB	SB
Directions Served	TR	L	T	LTR	R
Maximum Queue (ft)	6	46	3	37	31
Average Queue (ft)	0	9	0	14	5
95th Queue (ft)	5	32	3	40	22
Link Distance (ft)	466		518	785	111
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		120			
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 5: Contra Costa Blvd & Gregory Ln/I-680 SB Off-Ramp

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	NB	SB
Directions Served	L	L	R	L	T	R	L	L	T	T	TR	L
Maximum Queue (ft)	94	104	292	244	560	352	147	169	178	198	115	81
Average Queue (ft)	28	43	130	192	242	43	62	72	56	76	23	12
95th Queue (ft)	66	83	238	278	447	155	118	130	138	163	83	54
Link Distance (ft)			518		876				317	317	317	
Upstream Blk Time (%)					0							
Queuing Penalty (veh)					0							
Storage Bay Dist (ft)	170	170		170		400	120	120				150
Storage Blk Time (%)				14	13		1	1	1			
Queuing Penalty (veh)				67	61		2	3	2			

Intersection: 5: Contra Costa Blvd & Gregory Ln/I-680 SB Off-Ramp

Movement	SB	SB	SB	B34
Directions Served	T	T	R	T
Maximum Queue (ft)	402	380	69	5
Average Queue (ft)	183	165	25	0
95th Queue (ft)	330	309	59	5
Link Distance (ft)	428	428	428	225
Upstream Blk Time (%)	0	0		
Queuing Penalty (veh)	0	0		
Storage Bay Dist (ft)				
Storage Blk Time (%)	15			
Queuing Penalty (veh)	1			

Intersection: 6: Cleaveland Rd & Trelany Rd

Movement	WB	NB	SB	SB	SB
Directions Served	LR	T	L	T	T
Maximum Queue (ft)	52	14	30	22	16
Average Queue (ft)	21	0	4	1	1
95th Queue (ft)	47	8	21	10	10
Link Distance (ft)	785	538		326	326
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)			50		
Storage Blk Time (%)			0	0	
Queuing Penalty (veh)			0	0	

Intersection: 7: Contra Costa Blvd & Crescent Dr

Movement	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	L	TR	L	T	T	TR	L	T	TR
Maximum Queue (ft)	43	42	87	72	41	213	206	162	74	250	273
Average Queue (ft)	8	13	42	14	5	59	62	28	13	81	87
95th Queue (ft)	30	38	80	47	25	165	163	100	50	192	203
Link Distance (ft)	750			288		413	413	413		317	317
Upstream Blk Time (%)										0	0
Queuing Penalty (veh)										0	0
Storage Bay Dist (ft)		100	70		75				150		
Storage Blk Time (%)			6	0	0	5				2	
Queuing Penalty (veh)			1	0	0	0				0	

Intersection: 8: Cleaveland Rd & Crescent Plaza

Movement	EB	WB	WB	NB	NB	SB	SB
Directions Served	LTR	LT	R	LT	TR	LT	TR
Maximum Queue (ft)	29	188	85	111	85	192	144
Average Queue (ft)	1	69	35	41	36	93	59
95th Queue (ft)	12	156	86	86	72	161	117
Link Distance (ft)	111	602		556	556	538	538
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)			60				
Storage Blk Time (%)		6	1				
Queuing Penalty (veh)		4	2				

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Intersection: 9: Crescent Dr & Crescent Plaza

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	LTR	LTR
Maximum Queue (ft)	46	162	86	246	80	56
Average Queue (ft)	4	71	27	86	35	22
95th Queue (ft)	22	130	64	187	67	49
Link Distance (ft)		602	321	321	557	750
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	50					
Storage Blk Time (%)	0	12				
Queuing Penalty (veh)	0	1				

Intersection: 10: Contra Costa Blvd & Crescent Plaza/Monument Blvd

Movement	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	NB	NB
Directions Served	L	T	TR	L	L	T	R	R	L	T	T	T
Maximum Queue (ft)	74	235	211	188	239	281	207	135	59	214	195	137
Average Queue (ft)	18	133	114	106	129	131	46	11	18	123	97	47
95th Queue (ft)	56	207	184	182	209	252	164	73	48	191	166	115
Link Distance (ft)		321	321		446	446	446			602	602	602
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	115			230				190	160			
Storage Blk Time (%)		19		0	0		1	0		4		
Queuing Penalty (veh)		3		0	0		1	0		1		

Intersection: 10: Contra Costa Blvd & Crescent Plaza/Monument Blvd

Movement	NB	SB	SB	SB	SB	SB	SB
Directions Served	R	L	L	T	T	T	R
Maximum Queue (ft)	220	221	223	285	290	257	115
Average Queue (ft)	89	122	112	141	161	145	18
95th Queue (ft)	171	199	189	241	257	235	74
Link Distance (ft)	602			413	413	413	
Upstream Blk Time (%)				0	0		
Queuing Penalty (veh)				1	0		
Storage Bay Dist (ft)		250	250				40
Storage Blk Time (%)		0	0	0		37	0
Queuing Penalty (veh)		0	1	1		7	2

Intersection: 11: I-680 Ramps & Monument Blvd

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	WB	NB
Directions Served	L	L	T	T	TR	L	L	T	T	T	R	L
Maximum Queue (ft)	205	234	442	316	306	405	455	741	706	668	50	18
Average Queue (ft)	160	189	191	163	182	404	454	709	371	231	3	1
95th Queue (ft)	241	262	369	267	273	407	454	724	815	498	70	10
Link Distance (ft)			446	446	446			690	690	690		
Upstream Blk Time (%)			1	0	0			58	2	0		
Queuing Penalty (veh)			2	0	0			0	0	0		
Storage Bay Dist (ft)	175	175				355	355				400	445
Storage Blk Time (%)	3	15	4			30	67	0		1		
Queuing Penalty (veh)	5	26	20			70	156	1		4		

Intersection: 11: I-680 Ramps & Monument Blvd

Movement	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	R	R	L	L	L	R
Maximum Queue (ft)	30	201	23	416	409	341	21
Average Queue (ft)	3	19	1	288	250	144	1
95th Queue (ft)	18	116	22	386	363	296	20
Link Distance (ft)	878	878	878	959	959	959	959
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 12: Patterson Blvd & Boyd Rd

Movement	EB	WB	WB	NB
Directions Served	TR	L	T	LR
Maximum Queue (ft)	156	111	108	132
Average Queue (ft)	72	54	46	62
95th Queue (ft)	124	90	79	104
Link Distance (ft)	460		1497	512
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		100		
Storage Blk Time (%)		1	0	
Queuing Penalty (veh)		1	0	

Intersection: 13: Astrid Dr/Cleaveland Rd & Boyd Rd

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	T	R	L	T	TR	L	T	R
Maximum Queue (ft)	124	354	124	421	155	69	203	104	174	300	271
Average Queue (ft)	75	168	29	237	51	37	59	53	69	133	129
95th Queue (ft)	141	302	92	398	149	74	136	99	147	234	229
Link Distance (ft)		1497		588			2661			556	556
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	100		100		130	45		80	150		
Storage Blk Time (%)	3	14	0	42	0	16	16	3	0	7	
Queuing Penalty (veh)	14	20	0	30	0	25	22	3	0	5	

Intersection: 14: Boyd Rd & Crescent Dr

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	LTR	LTR
Maximum Queue (ft)	101	157	24	29	56	67
Average Queue (ft)	31	11	2	1	21	26
95th Queue (ft)	73	76	13	13	49	56
Link Distance (ft)		588		250	95	557
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	105		75			
Storage Blk Time (%)	0	1				
Queuing Penalty (veh)	0	1				

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Intersection: 15: Contra Costa Blvd & Boyd Rd

Movement	EB	EB	EB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	LT	R	LTR	L	T	T	TR	L	T	T	T
Maximum Queue (ft)	144	263	95	32	210	153	192	181	186	350	372	318
Average Queue (ft)	63	131	74	7	106	61	32	73	29	170	202	130
95th Queue (ft)	140	247	122	27	183	125	117	156	99	291	331	269
Link Distance (ft)		250		144		1004	1004			602	602	602
Upstream Blk Time (%)		2										
Queuing Penalty (veh)		8										
Storage Bay Dist (ft)	120		70		580			170	190			
Storage Blk Time (%)	0	31	2				0	1		6		0
Queuing Penalty (veh)	0	96	4				0	2		1		0

Intersection: 15: Contra Costa Blvd & Boyd Rd

Movement	SB
Directions Served	R
Maximum Queue (ft)	205
Average Queue (ft)	61
95th Queue (ft)	137
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	300
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 16: Contra Costa Blvd & Astrid Dr

Movement	EB	EB	NB	NB	NB	SB	SB	SB	B32	B32
Directions Served	L	R	L	T	T	T	T	R	T	T
Maximum Queue (ft)	69	102	50	55	58	181	199	86	187	200
Average Queue (ft)	15	40	23	12	10	64	72	11	6	7
95th Queue (ft)	49	77	50	41	38	144	153	52	132	141
Link Distance (ft)		2661		272	272	832	832		1004	1004
Upstream Blk Time (%)										0
Queuing Penalty (veh)										0
Storage Bay Dist (ft)	100		115					120		
Storage Blk Time (%)		0					2	0		
Queuing Penalty (veh)		0					1	0		

Network Summary

Network wide Queuing Penalty: 699

Intersection: 1: Contra Costa Blvd & Woodsworth Ln/Pleasant Hill Plaza Way

Movement	EB	EB	WB	WB	NB	NB	NB	B34	B34	B34	SB	SB
Directions Served	L	TR	LT	R	L	T	TR	T	T		L	T
Maximum Queue (ft)	177	134	265	128	189	306	312	404	454	92	180	447
Average Queue (ft)	85	49	125	48	87	223	240	71	86	3	112	241
95th Queue (ft)	145	99	219	100	188	350	353	271	307	62	203	404
Link Distance (ft)		1827	276	276		225	225	428	428	428		471
Upstream Blk Time (%)			0			12	16	0	0	0		0
Queuing Penalty (veh)			0			91	114	1	2	0		0
Storage Bay Dist (ft)	225				115						105	
Storage Blk Time (%)		0			3	28					10	31
Queuing Penalty (veh)		0			18	23					36	36

Intersection: 1: Contra Costa Blvd & Woodsworth Ln/Pleasant Hill Plaza Way

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	390	180
Average Queue (ft)	175	46
95th Queue (ft)	325	138
Link Distance (ft)	471	
Upstream Blk Time (%)	0	
Queuing Penalty (veh)	0	
Storage Bay Dist (ft)		105
Storage Blk Time (%)	16	
Queuing Penalty (veh)	15	

Intersection: 2: Gregory Ln & Elinora Dr

Movement	EB	EB	WB	WB	SB
Directions Served	LT	T	T	TR	LR
Maximum Queue (ft)	164	116	8	34	133
Average Queue (ft)	48	6	0	3	51
95th Queue (ft)	123	56	6	19	99
Link Distance (ft)	668	668	1637	1637	206
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 3: Cleaveland Rd/Woodsworth Ln & Gregory Ln

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	LT	R	LT	R
Maximum Queue (ft)	136	170	280	136	198	218	187	237	48	189	87
Average Queue (ft)	69	70	134	55	87	104	84	127	19	87	40
95th Queue (ft)	121	135	227	108	173	191	156	192	45	153	74
Link Distance (ft)		1637	1637		466	466		326	326	1827	
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	170			195			165				225
Storage Blk Time (%)	0	0		0	0		0	3		0	
Queuing Penalty (veh)	0	0		0	0		0	3		0	

Intersection: 4: Trelany Rd & Gregory Ln

Movement	EB	EB	WB	WB	WB	NB	SB
Directions Served	T	TR	L	T	TR	LTR	R
Maximum Queue (ft)	10	3	52	11	5	56	56
Average Queue (ft)	0	0	11	0	0	27	20
95th Queue (ft)	7	3	38	6	4	49	47
Link Distance (ft)	466	466		518	518	785	111
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)			120				
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 5: Contra Costa Blvd & Gregory Ln/I-680 SB Off-Ramp

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	NB
Directions Served	L	L	T	R	L	T	R	L	L	T	T	TR
Maximum Queue (ft)	161	169	45	288	194	506	309	132	144	338	354	328
Average Queue (ft)	70	84	2	125	122	224	73	75	103	177	183	125
95th Queue (ft)	129	139	32	226	223	398	194	138	171	357	353	317
Link Distance (ft)			518	518		876				317	317	317
Upstream Blk Time (%)										6	4	2
Queuing Penalty (veh)										26	19	7
Storage Bay Dist (ft)	170	170			170		400	120	120			
Storage Blk Time (%)	0	0			1	19	0	3	8	22		
Queuing Penalty (veh)	0	0			7	70	0	11	29	45		

Intersection: 5: Contra Costa Blvd & Gregory Ln/I-680 SB Off-Ramp

Movement	SB	SB	SB	SB	B34	B34
Directions Served	L	T	T	R	T	T
Maximum Queue (ft)	152	419	350	99	40	22
Average Queue (ft)	37	199	140	35	10	6
95th Queue (ft)	112	402	314	77	85	63
Link Distance (ft)		428	428	428	225	225
Upstream Blk Time (%)		3	0		0	0
Queuing Penalty (veh)		10	0		1	0
Storage Bay Dist (ft)	150					
Storage Blk Time (%)	0	15				
Queuing Penalty (veh)	0	4				

Intersection: 6: Cleaveland Rd & Trelany Rd

Movement	WB	NB	SB	SB	SB
Directions Served	LR	T	L	T	T
Maximum Queue (ft)	69	9	41	14	11
Average Queue (ft)	32	0	8	1	0
95th Queue (ft)	58	6	31	9	8
Link Distance (ft)	785	538		326	326
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)			50		
Storage Blk Time (%)			0	0	
Queuing Penalty (veh)			0	0	

Intersection: 7: Contra Costa Blvd & Crescent Dr

Movement	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	L	TR	L	T	T	TR	L	T	TR
Maximum Queue (ft)	113	111	94	258	99	315	367	312	174	330	323
Average Queue (ft)	36	46	71	86	44	114	122	81	38	183	141
95th Queue (ft)	83	91	108	195	94	257	281	223	118	330	279
Link Distance (ft)	750			288		413	413	413		317	317
Upstream Blk Time (%)				1		0	0	0		2	0
Queuing Penalty (veh)				0		0	0	0		14	3
Storage Bay Dist (ft)		100	70		75				150		
Storage Blk Time (%)	1	1	26	5	3	14			0	14	
Queuing Penalty (veh)	0	1	29	6	12	8			0	4	

Intersection: 8: Cleaveland Rd & Crescent Plaza

Movement	EB	WB	WB	NB	NB	SB	SB
Directions Served	LTR	LT	R	LT	TR	LT	TR
Maximum Queue (ft)	24	107	83	105	86	157	83
Average Queue (ft)	2	25	42	39	24	66	16
95th Queue (ft)	13	71	80	89	63	128	51
Link Distance (ft)	111	602		556	556	538	538
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)			60				
Storage Blk Time (%)		0	3				
Queuing Penalty (veh)		1	1				

Intersection: 9: Crescent Dr & Crescent Plaza

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	LTR	LTR
Maximum Queue (ft)	59	166	88	209	87	109
Average Queue (ft)	10	68	28	74	37	43
95th Queue (ft)	37	133	68	168	72	88
Link Distance (ft)		602	321	321	557	750
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	50					
Storage Blk Time (%)	0	11				
Queuing Penalty (veh)	1	2				

Intersection: 10: Contra Costa Blvd & Crescent Plaza/Monument Blvd

Movement	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	NB	NB
Directions Served	L	T	TR	L	L	T	R	R	L	T	T	T
Maximum Queue (ft)	139	252	205	165	256	319	411	215	185	352	318	262
Average Queue (ft)	48	128	102	66	96	134	114	65	70	157	140	99
95th Queue (ft)	115	218	170	135	184	271	318	214	164	286	258	209
Link Distance (ft)		321	321		446	446	446			602	602	602
Upstream Blk Time (%)		0	0				0					
Queuing Penalty (veh)		0	0				1					
Storage Bay Dist (ft)	115			230				190	160			
Storage Blk Time (%)	0	19		0	0		3	0	0	15		
Queuing Penalty (veh)	0	8		0	0		8	1	0	10		

Intersection: 10: Contra Costa Blvd & Crescent Plaza/Monument Blvd

Movement	NB	SB	SB	SB	SB	SB	SB
Directions Served	R	L	L	T	T	T	R
Maximum Queue (ft)	394	262	274	397	276	142	64
Average Queue (ft)	146	195	195	127	87	62	14
95th Queue (ft)	309	292	302	369	193	128	50
Link Distance (ft)	602			413	413	413	
Upstream Blk Time (%)				3	0		
Queuing Penalty (veh)				12	0		
Storage Bay Dist (ft)		250	250				40
Storage Blk Time (%)		4	6	0		16	1
Queuing Penalty (veh)		9	14	0		4	1

Intersection: 11: I-680 Ramps & Monument Blvd

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	WB	WB
Directions Served	L	L	T	T	TR	L	L	T	T	T	R	R
Maximum Queue (ft)	187	200	463	418	411	307	349	358	520	677	425	285
Average Queue (ft)	179	195	351	245	247	176	220	126	218	311	78	15
95th Queue (ft)	211	213	519	372	349	278	313	253	401	517	344	140
Link Distance (ft)			446	446	446			690	690	690		
Upstream Blk Time (%)			5	0	0			0	0	1		
Queuing Penalty (veh)			21	0	0			0	0	0		
Storage Bay Dist (ft)	175	175				355	355				400	400
Storage Blk Time (%)	5	32	8			0	0	0		2	1	0
Queuing Penalty (veh)	12	84	48			0	1	0		13	1	0

Intersection: 11: I-680 Ramps & Monument Blvd

Movement	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	L	R	R	L	L	L	R
Maximum Queue (ft)	23	80	281	144	508	484	360	43
Average Queue (ft)	1	15	72	12	346	297	138	3
95th Queue (ft)	12	55	243	101	472	449	307	40
Link Distance (ft)		878	878	878	959	959	959	959
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	445							
Storage Blk Time (%)								
Queuing Penalty (veh)								

Intersection: 12: Patterson Blvd & Boyd Rd

Movement	EB	WB	WB	NB
Directions Served	TR	L	T	LR
Maximum Queue (ft)	130	123	163	158
Average Queue (ft)	67	66	50	78
95th Queue (ft)	107	109	102	128
Link Distance (ft)	460		1497	512
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		100		
Storage Blk Time (%)		3	0	
Queuing Penalty (veh)		3	0	

Intersection: 13: Astrid Dr/Cleaveland Rd & Boyd Rd

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	T	R	L	T	TR	L	T	R
Maximum Queue (ft)	121	206	109	262	145	68	115	103	130	153	103
Average Queue (ft)	49	63	25	102	38	18	48	45	49	61	44
95th Queue (ft)	103	141	75	197	106	52	92	91	97	123	77
Link Distance (ft)		1497		588			2661			556	556
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	100		100		130	45		80	150		
Storage Blk Time (%)	1	2	0	13	0	3	17	1	0	0	
Queuing Penalty (veh)	3	2	0	11	0	4	17	1	0	0	

Intersection: 14: Boyd Rd & Crescent Dr

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	LTR	LTR
Maximum Queue (ft)	45	72	32	30	44	71
Average Queue (ft)	9	4	3	2	17	31
95th Queue (ft)	33	31	18	15	43	60
Link Distance (ft)		588		250	95	557
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	105		75			
Storage Blk Time (%)		0				
Queuing Penalty (veh)		0				

Queuing and Blocking Report

Existing PM

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Intersection: 15: Contra Costa Blvd & Boyd Rd

Movement	EB	EB	EB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	LT	R	LTR	L	T	T	TR	L	T	T	T
Maximum Queue (ft)	137	251	95	146	289	318	326	195	76	225	260	198
Average Queue (ft)	46	100	66	62	130	124	113	117	24	105	129	72
95th Queue (ft)	111	206	116	121	243	242	258	214	60	190	220	167
Link Distance (ft)		250		144		1004	1004			602	602	602
Upstream Blk Time (%)		1		1								
Queuing Penalty (veh)		3		0								
Storage Bay Dist (ft)	120		70		580			170	190			
Storage Blk Time (%)	0	24	1				1	5		1		
Queuing Penalty (veh)	0	61	2				3	14		0		

Intersection: 15: Contra Costa Blvd & Boyd Rd

Movement	SB
Directions Served	R
Maximum Queue (ft)	78
Average Queue (ft)	29
95th Queue (ft)	64
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	300
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 16: Contra Costa Blvd & Astrid Dr

Movement	EB	EB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	L	T	T	T	T	R
Maximum Queue (ft)	71	78	92	95	93	103	122	44
Average Queue (ft)	26	28	46	31	25	36	49	9
95th Queue (ft)	58	60	78	80	68	79	98	34
Link Distance (ft)		2661		272	272	832	832	
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	100		115					120
Storage Blk Time (%)	0	0	0	0			0	
Queuing Penalty (veh)	0	0	0	0			0	

Network Summary

Network wide Queuing Penalty: 1026

Intersection: 1: Contra Costa Blvd & Woodsworth Ln/Pleasant Hill Plaza Way

Movement	EB	EB	WB	WB	NB	NB	NB	B34	SB	SB	SB	SB
Directions Served	L	TR	LT	R	L	T	TR	T	L	T	T	R
Maximum Queue (ft)	133	94	165	57	93	159	176	3	173	387	344	179
Average Queue (ft)	58	34	69	18	28	58	79	0	61	173	133	40
95th Queue (ft)	110	77	132	42	67	121	144	3	139	310	274	119
Link Distance (ft)		1827	276	276		225	225	428		471	471	
Upstream Blk Time (%)						0	0			0	0	
Queuing Penalty (veh)						0	0			0	0	
Storage Bay Dist (ft)	225				115				105			105
Storage Blk Time (%)						1			1	18	9	
Queuing Penalty (veh)						1			6	10	11	

Intersection: 2: Gregory Ln & Elinora Dr

Movement	EB	EB	WB	WB	SB
Directions Served	LT	T	T	TR	LR
Maximum Queue (ft)	218	190	133	152	144
Average Queue (ft)	97	74	51	68	66
95th Queue (ft)	175	146	106	122	118
Link Distance (ft)	668	668	1637	1637	206
Upstream Blk Time (%)					0
Queuing Penalty (veh)					0
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 3: Cleaveland Rd/Woodsworth Ln & Gregory Ln

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	LT	R	LT	R
Maximum Queue (ft)	160	387	530	190	186	203	137	184	55	174	101
Average Queue (ft)	56	124	268	94	86	101	65	101	15	86	42
95th Queue (ft)	117	284	458	163	173	186	119	157	43	148	77
Link Distance (ft)		1637	1637		466	466		326	326	1827	
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	170			195			165				225
Storage Blk Time (%)	0	1		0	0			1			
Queuing Penalty (veh)	0	1		1	0			1			

Intersection: 4: Trelany Rd & Gregory Ln

Movement	EB	WB	NB	SB
Directions Served	TR	L	LTR	R
Maximum Queue (ft)	14	47	40	29
Average Queue (ft)	1	11	16	7
95th Queue (ft)	14	36	40	27
Link Distance (ft)	466		785	111
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		120		
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 5: Contra Costa Blvd & Gregory Ln/I-680 SB Off-Ramp

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	NB	SB
Directions Served	L	L	R	L	T	R	L	L	T	T	TR	L
Maximum Queue (ft)	85	103	426	245	802	433	150	168	187	209	129	138
Average Queue (ft)	31	47	193	219	376	85	71	80	54	74	25	15
95th Queue (ft)	69	85	351	287	725	316	133	145	136	164	87	71
Link Distance (ft)			518		876				317	317	317	
Upstream Blk Time (%)			0		2					0		
Queuing Penalty (veh)			1		0					0		
Storage Bay Dist (ft)	170	170		170		400	120	120				150
Storage Blk Time (%)				26	23		2	3	1			
Queuing Penalty (veh)				139	120		4	6	1			

Intersection: 5: Contra Costa Blvd & Gregory Ln/I-680 SB Off-Ramp

Movement	SB	SB	SB	B34	B34	B34
Directions Served	T	T	R	T	T	T
Maximum Queue (ft)	479	464	86	64	56	20
Average Queue (ft)	232	215	30	7	4	1
95th Queue (ft)	424	409	66	63	49	23
Link Distance (ft)	428	428	428	225	225	225
Upstream Blk Time (%)	3	2		0	0	
Queuing Penalty (veh)	12	8		0	0	
Storage Bay Dist (ft)						
Storage Blk Time (%)	25					
Queuing Penalty (veh)	2					

Intersection: 6: Cleaveland Rd & Trelany Rd

Movement	WB	NB	NB	SB	SB	SB
Directions Served	LR	T	TR	L	T	T
Maximum Queue (ft)	59	5	3	30	9	3
Average Queue (ft)	22	0	0	4	0	0
95th Queue (ft)	50	5	3	21	6	3
Link Distance (ft)	785	538	538		326	326
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)				50		
Storage Blk Time (%)				0		
Queuing Penalty (veh)				0		

Intersection: 7: Contra Costa Blvd & Crescent Dr

Movement	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	L	TR	L	T	T	TR	L	T	TR
Maximum Queue (ft)	41	42	91	109	60	243	241	183	64	287	286
Average Queue (ft)	8	13	48	17	7	75	75	36	12	113	124
95th Queue (ft)	29	38	87	61	34	194	183	119	49	258	267
Link Distance (ft)	750			288		413	413	413		317	317
Upstream Blk Time (%)										1	0
Queuing Penalty (veh)										4	3
Storage Bay Dist (ft)		100	70		75				150		
Storage Blk Time (%)			8	0		6				5	
Queuing Penalty (veh)			2	0		0				1	

Intersection: 8: Cleaveland Rd & Crescent Plaza

Movement	EB	WB	WB	NB	NB	SB	SB
Directions Served	LTR	LT	R	LT	TR	LT	TR
Maximum Queue (ft)	21	226	85	107	106	306	198
Average Queue (ft)	2	80	38	47	41	126	71
95th Queue (ft)	15	173	90	95	80	238	144
Link Distance (ft)	111	602		556	556	538	538
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)			60				
Storage Blk Time (%)		7	2				
Queuing Penalty (veh)		6	4				

Intersection: 9: Crescent Dr & Crescent Plaza

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	LTR	LTR
Maximum Queue (ft)	40	184	85	240	115	71
Average Queue (ft)	4	84	28	92	42	26
95th Queue (ft)	25	155	66	193	83	57
Link Distance (ft)		602	321	321	557	750
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	50					
Storage Blk Time (%)	0	15				
Queuing Penalty (veh)	0	1				

Intersection: 10: Contra Costa Blvd & Crescent Plaza/Monument Blvd

Movement	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	NB	NB
Directions Served	L	T	TR	L	L	T	R	R	L	T	T	T
Maximum Queue (ft)	156	298	256	215	249	283	213	169	95	234	215	203
Average Queue (ft)	22	165	142	112	134	133	38	12	26	131	106	61
95th Queue (ft)	82	266	232	188	213	253	153	83	69	205	180	154
Link Distance (ft)		321	321		446	446	446			602	602	602
Upstream Blk Time (%)		1	0									
Queuing Penalty (veh)		2	0									
Storage Bay Dist (ft)	115			230				190	160			
Storage Blk Time (%)		32		0	0		1	0		6		
Queuing Penalty (veh)		5		0	0		2	0		2		

Intersection: 10: Contra Costa Blvd & Crescent Plaza/Monument Blvd

Movement	NB	SB	SB	SB	SB	SB	SB
Directions Served	R	L	L	T	T	T	R
Maximum Queue (ft)	356	264	269	317	330	283	115
Average Queue (ft)	135	153	142	188	197	184	21
95th Queue (ft)	309	256	259	318	299	274	84
Link Distance (ft)	602			413	413	413	
Upstream Blk Time (%)	1			2	0		
Queuing Penalty (veh)	1			13	0		
Storage Bay Dist (ft)		250	250				40
Storage Blk Time (%)		5	3	1		41	0
Queuing Penalty (veh)		17	9	5		9	2

Intersection: 11: I-680 Ramps & Monument Blvd

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	WB	NB
Directions Served	L	L	T	T	TR	L	L	T	T	T	R	L
Maximum Queue (ft)	205	235	459	426	414	405	455	737	710	694	50	29
Average Queue (ft)	179	215	305	259	270	404	454	710	402	244	3	2
95th Queue (ft)	242	269	512	421	413	408	455	725	835	514	70	16
Link Distance (ft)			446	446	446			690	690	690		
Upstream Blk Time (%)			5	1	1			58	2	0		
Queuing Penalty (veh)			21	2	4			0	0	0		
Storage Bay Dist (ft)	175	175				355	355				400	445
Storage Blk Time (%)	4	23	26			27	67	0		1		
Queuing Penalty (veh)	9	46	140			73	176	2		8		

Intersection: 11: I-680 Ramps & Monument Blvd

Movement	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	R	R	L	L	L	R
Maximum Queue (ft)	51	267	135	494	452	356	38
Average Queue (ft)	5	48	6	339	294	181	1
95th Queue (ft)	26	197	72	448	404	341	27
Link Distance (ft)	878	878	878	959	959	959	959
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 12: Patterson Blvd & Boyd Rd

Movement	EB	WB	WB	NB
Directions Served	TR	L	T	LR
Maximum Queue (ft)	215	116	125	160
Average Queue (ft)	94	62	53	71
95th Queue (ft)	171	103	93	122
Link Distance (ft)	460		1497	512
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		100		
Storage Blk Time (%)		2	0	
Queuing Penalty (veh)		3	1	

Intersection: 13: Astrid Dr/Cleaveland Rd & Boyd Rd

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	T	R	L	T	TR	L	T	R
Maximum Queue (ft)	124	448	125	531	155	69	208	105	174	325	313
Average Queue (ft)	90	227	29	299	63	41	72	61	84	166	155
95th Queue (ft)	149	392	88	498	172	76	162	111	173	276	269
Link Distance (ft)		1497		588			2661			556	556
Upstream Blk Time (%)				0							
Queuing Penalty (veh)				1							
Storage Bay Dist (ft)	100		100		130	45		80	150		
Storage Blk Time (%)	6	20	0	52	0	20	18	3	1	12	
Queuing Penalty (veh)	32	32	0	42	0	35	29	3	2	10	

Intersection: 14: Boyd Rd & Crescent Dr

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	LTR	LTR
Maximum Queue (ft)	116	287	26	61	69	77
Average Queue (ft)	41	34	2	5	25	28
95th Queue (ft)	91	170	14	35	56	61
Link Distance (ft)		588		250	95	557
Upstream Blk Time (%)		0			0	
Queuing Penalty (veh)		1			0	
Storage Bay Dist (ft)	105		75			
Storage Blk Time (%)	0	3		0		
Queuing Penalty (veh)	1	4		0		

Queuing and Blocking Report

Future AM

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Intersection: 15: Contra Costa Blvd & Boyd Rd

Movement	EB	EB	EB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	LT	R	LTR	L	T	T	TR	L	T	T	T
Maximum Queue (ft)	144	265	95	29	229	205	235	192	200	385	427	359
Average Queue (ft)	83	170	80	7	121	75	52	88	38	194	231	153
95th Queue (ft)	164	291	124	26	204	160	161	175	119	344	385	318
Link Distance (ft)		250		144		1004	1004			602	602	602
Upstream Blk Time (%)		6										
Queuing Penalty (veh)		29										
Storage Bay Dist (ft)	120		70		580			170	190			
Storage Blk Time (%)	0	40	2				0	3		10		0
Queuing Penalty (veh)	2	140	7				0	5		3		0

Intersection: 15: Contra Costa Blvd & Boyd Rd

Movement	SB
Directions Served	R
Maximum Queue (ft)	182
Average Queue (ft)	70
95th Queue (ft)	143
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	300
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 16: Contra Costa Blvd & Astrid Dr

Movement	EB	EB	NB	NB	NB	SB	SB	SB	B32	B32
Directions Served	L	R	L	T	T	T	T	R	T	T
Maximum Queue (ft)	75	98	67	60	58	207	216	123	105	301
Average Queue (ft)	17	46	27	15	11	74	85	13	4	10
95th Queue (ft)	50	82	56	44	40	158	173	59	103	175
Link Distance (ft)		2661		272	272	832	832		1004	1004
Upstream Blk Time (%)									0	0
Queuing Penalty (veh)									0	0
Storage Bay Dist (ft)	100		115					120		
Storage Blk Time (%)		0					2	0		
Queuing Penalty (veh)		0					1	0		

Network Summary

Network wide Queuing Penalty: 1275

Intersection: 1: Contra Costa Blvd & Woodsworth Ln/Pleasant Hill Plaza Way

Movement	EB	EB	WB	WB	NB	NB	NB	B34	B34	B34	SB	SB
Directions Served	L	TR	LT	R	L	T	TR	T	T		L	T
Maximum Queue (ft)	193	128	269	165	190	312	320	450	492	423	180	486
Average Queue (ft)	96	52	137	59	94	270	279	239	263	124	124	291
95th Queue (ft)	166	101	234	120	200	363	360	546	578	449	212	475
Link Distance (ft)		1827	276	276		225	225	428	428	428		471
Upstream Blk Time (%)			1			33	38	3	7	2		2
Queuing Penalty (veh)			0			280	315	14	37	14		0
Storage Bay Dist (ft)	225				115						105	
Storage Blk Time (%)	0				4	43					17	35
Queuing Penalty (veh)	0				24	42					72	46

Intersection: 1: Contra Costa Blvd & Woodsworth Ln/Pleasant Hill Plaza Way

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	448	180
Average Queue (ft)	226	62
95th Queue (ft)	400	173
Link Distance (ft)	471	
Upstream Blk Time (%)	0	
Queuing Penalty (veh)	0	
Storage Bay Dist (ft)		105
Storage Blk Time (%)	21	0
Queuing Penalty (veh)	22	0

Intersection: 2: Gregory Ln & Elinora Dr

Movement	EB	EB	WB	WB	SB
Directions Served	LT	T	T	TR	LR
Maximum Queue (ft)	269	239	136	166	100
Average Queue (ft)	115	82	63	86	43
95th Queue (ft)	212	175	113	140	81
Link Distance (ft)	668	668	1637	1637	206
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 3: Cleaveland Rd/Woodsworth Ln & Gregory Ln

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	LT	R	LT	R
Maximum Queue (ft)	169	276	330	159	219	241	190	265	53	195	103
Average Queue (ft)	78	101	178	64	101	124	104	145	20	96	43
95th Queue (ft)	141	201	291	124	198	220	184	224	47	165	78
Link Distance (ft)		1637	1637		466	466		326	326	1827	
Upstream Blk Time (%)								0			
Queuing Penalty (veh)								0			
Storage Bay Dist (ft)	170			195			165				225
Storage Blk Time (%)	0	1		0	1		0	5		0	
Queuing Penalty (veh)	0	1		0	1		1	7		0	

Intersection: 4: Trelany Rd & Gregory Ln

Movement	EB	EB	WB	WB	WB	NB	SB
Directions Served	T	TR	L	T	TR	LTR	R
Maximum Queue (ft)	5	6	49	3	23	54	56
Average Queue (ft)	0	0	13	0	1	28	21
95th Queue (ft)	5	4	39	3	15	49	47
Link Distance (ft)	466	466		518	518	785	111
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)			120				
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 5: Contra Costa Blvd & Gregory Ln/I-680 SB Off-Ramp

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	NB
Directions Served	L	L	T	R	L	T	R	L	L	T	T	TR
Maximum Queue (ft)	156	167	50	365	195	642	371	132	144	350	359	349
Average Queue (ft)	74	91	2	171	140	294	118	87	122	233	236	190
95th Queue (ft)	131	143	36	305	236	556	314	148	182	405	401	396
Link Distance (ft)			518	518		876				317	317	317
Upstream Blk Time (%)						0				16	14	9
Queuing Penalty (veh)						0				80	69	47
Storage Bay Dist (ft)	170	170			170		400	120	120			
Storage Blk Time (%)	0	0			4	30	0	4	14	38		
Queuing Penalty (veh)	0	0			22	122	0	16	57	86		

Intersection: 5: Contra Costa Blvd & Gregory Ln/I-680 SB Off-Ramp

Movement	SB	SB	SB	SB	B34	B34	B34
Directions Served	L	T	T	R	T	T	T
Maximum Queue (ft)	174	482	406	134	107	94	22
Average Queue (ft)	61	289	201	40	21	10	1
95th Queue (ft)	167	513	412	97	123	80	23
Link Distance (ft)		428	428	428	225	225	225
Upstream Blk Time (%)		7	1		1	0	0
Queuing Penalty (veh)		25	2		4	0	0
Storage Bay Dist (ft)	150						
Storage Blk Time (%)	0	35					
Queuing Penalty (veh)	0	12					

Intersection: 6: Cleaveland Rd & Trelany Rd

Movement	WB	NB	NB	SB	SB
Directions Served	LR	T	TR	L	T
Maximum Queue (ft)	71	3	2	39	8
Average Queue (ft)	33	0	0	10	0
95th Queue (ft)	60	3	2	35	6
Link Distance (ft)	785	538	538		326
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)				50	
Storage Blk Time (%)				0	0
Queuing Penalty (veh)				0	0

Intersection: 7: Contra Costa Blvd & Crescent Dr

Movement	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	L	TR	L	T	T	TR	L	T	TR
Maximum Queue (ft)	138	118	95	273	99	344	397	362	167	335	315
Average Queue (ft)	41	50	74	115	51	160	167	124	46	240	176
95th Queue (ft)	98	101	112	262	105	353	377	329	134	372	307
Link Distance (ft)	750			288		413	413	413		317	317
Upstream Blk Time (%)				8		0	1	1		3	0
Queuing Penalty (veh)				0		2	6	5		25	3
Storage Bay Dist (ft)		100	70		75				150		
Storage Blk Time (%)	1	2	26	18	4	25			0	26	
Queuing Penalty (veh)	1	1	34	25	19	16			0	8	

Intersection: 8: Cleaveland Rd & Crescent Plaza

Movement	EB	WB	WB	NB	NB	SB	SB
Directions Served	LTR	LT	R	LT	TR	LT	TR
Maximum Queue (ft)	23	136	82	136	93	236	122
Average Queue (ft)	2	25	47	48	27	90	22
95th Queue (ft)	15	76	82	103	68	177	71
Link Distance (ft)	111	602		556	556	538	538
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)			60				
Storage Blk Time (%)		0	4				
Queuing Penalty (veh)		0	2				

Intersection: 9: Crescent Dr & Crescent Plaza

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	LTR	LTR
Maximum Queue (ft)	74	179	100	219	110	121
Average Queue (ft)	13	81	27	74	42	47
95th Queue (ft)	44	150	68	164	82	93
Link Distance (ft)		602	321	321	557	750
Upstream Blk Time (%)				0		
Queuing Penalty (veh)				0		
Storage Bay Dist (ft)	50					
Storage Blk Time (%)	0	14				
Queuing Penalty (veh)	0	3				

Intersection: 10: Contra Costa Blvd & Crescent Plaza/Monument Blvd

Movement	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	NB	NB
Directions Served	L	T	TR	L	L	T	R	R	L	T	T	T
Maximum Queue (ft)	140	273	212	142	155	211	213	194	185	399	366	302
Average Queue (ft)	57	137	115	56	80	108	71	28	82	196	170	127
95th Queue (ft)	128	227	189	116	133	187	197	128	185	351	310	266
Link Distance (ft)		321	321		446	446	446			602	602	602
Upstream Blk Time (%)		0								0		
Queuing Penalty (veh)		0								0		
Storage Bay Dist (ft)	115			230				190	160			
Storage Blk Time (%)	1	22					1	0	0	24		
Queuing Penalty (veh)	2	10					2	0	1	18		

Intersection: 10: Contra Costa Blvd & Crescent Plaza/Monument Blvd

Movement	NB	SB	SB	SB	SB	SB	SB
Directions Served	R	L	L	T	T	T	R
Maximum Queue (ft)	429	262	274	433	330	149	66
Average Queue (ft)	183	231	240	227	102	78	14
95th Queue (ft)	363	299	313	512	219	136	53
Link Distance (ft)	602			413	413	413	
Upstream Blk Time (%)				3	0		
Queuing Penalty (veh)				18	0		
Storage Bay Dist (ft)		250	250				40
Storage Blk Time (%)		6	10	0		27	0
Queuing Penalty (veh)		15	25	0		8	1

Intersection: 11: I-680 Ramps & Monument Blvd

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	WB	WB
Directions Served	L	L	T	T	TR	L	L	T	T	T	R	R
Maximum Queue (ft)	187	200	443	370	279	324	368	699	723	744	425	289
Average Queue (ft)	158	179	227	171	189	132	194	322	617	708	424	22
95th Queue (ft)	228	226	417	288	261	281	336	683	834	751	433	174
Link Distance (ft)			446	446	446			690	690	690		
Upstream Blk Time (%)			1	0				1	9	64		
Queuing Penalty (veh)			3	0				0	0	0		
Storage Bay Dist (ft)	175	175				355	355				400	400
Storage Blk Time (%)	2	15	1			0	0	1		58	2	0
Queuing Penalty (veh)	7	45	7			0	1	3		453	6	0

Intersection: 11: I-680 Ramps & Monument Blvd

Movement	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	L	R	R	L	L	L
Maximum Queue (ft)	22	50	349	315	697	669	551
Average Queue (ft)	1	9	206	117	525	484	248
95th Queue (ft)	10	34	392	334	670	635	570
Link Distance (ft)		878	878	878	959	959	959
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	445						
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 12: Patterson Blvd & Boyd Rd

Movement	EB	WB	WB	NB
Directions Served	TR	L	T	LR
Maximum Queue (ft)	172	123	186	218
Average Queue (ft)	83	73	57	98
95th Queue (ft)	140	119	120	173
Link Distance (ft)	460		1497	512
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		100		
Storage Blk Time (%)		3	0	
Queuing Penalty (veh)		5	0	

Intersection: 13: Astrid Dr/Cleaveland Rd & Boyd Rd

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	T	R	L	T	TR	L	T	R
Maximum Queue (ft)	124	223	124	273	155	65	126	102	137	168	106
Average Queue (ft)	60	85	32	119	46	16	51	48	58	66	46
95th Queue (ft)	120	173	88	226	121	51	100	96	107	128	83
Link Distance (ft)		1497		588			2661			556	556
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	100		100		130	45		80	150		
Storage Blk Time (%)	2	4	0	16	0	3	19	1	0	0	
Queuing Penalty (veh)	5	5	0	16	0	5	22	1	0	0	

Intersection: 14: Boyd Rd & Crescent Dr

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	LTR	LTR
Maximum Queue (ft)	53	164	30	68	42	72
Average Queue (ft)	11	12	2	3	20	33
95th Queue (ft)	40	88	16	29	45	61
Link Distance (ft)		588		250	95	557
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	105		75			
Storage Blk Time (%)		1		0		
Queuing Penalty (veh)		0		0		

Intersection: 15: Contra Costa Blvd & Boyd Rd

Movement	EB	EB	EB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	LT	R	LTR	L	T	T	TR	L	T	T	T
Maximum Queue (ft)	144	251	95	151	305	312	383	195	146	255	300	236
Average Queue (ft)	58	112	71	69	156	147	159	142	30	117	140	84
95th Queue (ft)	127	224	119	135	270	266	342	230	84	212	246	185
Link Distance (ft)		250		144		1004	1004			602	602	602
Upstream Blk Time (%)		2		2								
Queuing Penalty (veh)		9		0								
Storage Bay Dist (ft)	120		70		580			170	190			
Storage Blk Time (%)	0	27	2				1	8		2		
Queuing Penalty (veh)	1	80	4				5	27		1		

Intersection: 15: Contra Costa Blvd & Boyd Rd

Movement	SB
Directions Served	R
Maximum Queue (ft)	108
Average Queue (ft)	33
95th Queue (ft)	73
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	300
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 16: Contra Costa Blvd & Astrid Dr

Movement	EB	EB	NB	NB	NB	SB	SB	SB	B32
Directions Served	L	R	L	T	T	T	T	R	T
Maximum Queue (ft)	77	66	109	113	96	131	140	75	56
Average Queue (ft)	28	28	50	36	25	41	57	14	2
95th Queue (ft)	63	57	86	89	71	97	115	49	55
Link Distance (ft)		2661		272	272	832	832		1004
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	100		115					120	
Storage Blk Time (%)	0	0	0	0			0	0	
Queuing Penalty (veh)	0	0	1	0			0	0	

Network Summary

Network wide Queuing Penalty: 2380

Intersection: 1: Contra Costa Blvd & Woodsworth Ln/Pleasant Hill Plaza Way

Movement	EB	EB	WB	WB	NB	NB	NB	B34	SB	SB	SB	SB
Directions Served	L	TR	LT	R	L	T	TR	T	L	T	T	R
Maximum Queue (ft)	131	85	127	45	85	136	158	99	179	300	236	141
Average Queue (ft)	53	30	57	14	28	45	69	3	48	139	101	28
95th Queue (ft)	106	70	110	34	66	101	125	70	117	252	203	87
Link Distance (ft)		1827	276	276		225	225	428		471	471	
Upstream Blk Time (%)							0	0		0		
Queuing Penalty (veh)							0	0		0		
Storage Bay Dist (ft)	225				115				105			105
Storage Blk Time (%)					0	0			1	13	6	0
Queuing Penalty (veh)					0	0			2	6	6	0

Intersection: 2: Gregory Ln & Elinora Dr

Movement	EB	EB	WB	SB
Directions Served	LT	T	TR	LR
Maximum Queue (ft)	131	45	21	215
Average Queue (ft)	36	2	1	87
95th Queue (ft)	93	29	11	169
Link Distance (ft)	668	668	1637	206
Upstream Blk Time (%)			1	
Queuing Penalty (veh)			0	
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 3: Cleaveland Rd/Woodsworth Ln & Gregory Ln

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	LT	R	LT	R
Maximum Queue (ft)	122	305	407	186	180	195	145	173	52	154	91
Average Queue (ft)	48	87	202	88	76	89	62	98	15	79	41
95th Queue (ft)	92	208	346	154	149	166	114	156	43	138	71
Link Distance (ft)		1637	1637		466	466		326	326	1827	
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	170			195			165				225
Storage Blk Time (%)		0		0	0		0	1			
Queuing Penalty (veh)		0		1	0		0	1			

Intersection: 4: Trelany Rd & Gregory Ln

Movement	WB	NB	SB
Directions Served	L	LTR	R
Maximum Queue (ft)	39	36	29
Average Queue (ft)	10	14	6
95th Queue (ft)	32	38	24
Link Distance (ft)		785	111
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	120		
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: Contra Costa Blvd & Gregory Ln/I-680 SB Off-Ramp

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	NB	SB
Directions Served	L	L	R	L	T	R	L	L	T	T	TR	L
Maximum Queue (ft)	71	84	286	245	570	271	144	150	154	179	98	110
Average Queue (ft)	28	44	141	195	247	45	61	71	51	73	16	13
95th Queue (ft)	63	77	245	276	463	173	116	126	123	154	63	64
Link Distance (ft)			518		876				317	317	317	
Upstream Blk Time (%)					0							
Queuing Penalty (veh)					0							
Storage Bay Dist (ft)	170	170		170		400	120	120				150
Storage Blk Time (%)				15	14		1	1	1			
Queuing Penalty (veh)				73	66		1	3	1			

Intersection: 5: Contra Costa Blvd & Gregory Ln/I-680 SB Off-Ramp

Movement	SB	SB	SB	B34	B34
Directions Served	T	T	R	T	T
Maximum Queue (ft)	392	371	90	6	2
Average Queue (ft)	183	164	28	0	0
95th Queue (ft)	325	312	65	6	2
Link Distance (ft)	428	428	428	225	225
Upstream Blk Time (%)	0	0			
Queuing Penalty (veh)	1	1			
Storage Bay Dist (ft)					
Storage Blk Time (%)	15				
Queuing Penalty (veh)	1				

Intersection: 6: Cleaveland Rd & Trelany Rd

Movement	WB	NB	SB	SB	SB
Directions Served	LR	T	L	T	T
Maximum Queue (ft)	49	18	27	28	24
Average Queue (ft)	20	1	3	1	1
95th Queue (ft)	46	8	17	12	13
Link Distance (ft)	785	538		326	326
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)			50		
Storage Blk Time (%)			0	0	
Queuing Penalty (veh)			0	0	

Intersection: 7: Contra Costa Blvd & Crescent Dr

Movement	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	L	TR	L	T	T	TR	L	T	TR
Maximum Queue (ft)	42	45	87	72	45	220	205	143	45	250	255
Average Queue (ft)	8	14	39	13	4	56	59	22	10	77	87
95th Queue (ft)	29	39	79	48	23	158	156	86	34	189	196
Link Distance (ft)	750			288		413	413	413		317	317
Upstream Blk Time (%)										0	0
Queuing Penalty (veh)										0	0
Storage Bay Dist (ft)		100	70		75				150		
Storage Blk Time (%)			5	0	0	4				2	
Queuing Penalty (veh)			1	0	0	0				0	

Intersection: 8: Cleaveland Rd & Crescent Plaza

Movement	EB	WB	WB	NB	NB	SB	SB
Directions Served	LTR	LT	R	LT	TR	LT	TR
Maximum Queue (ft)	24	182	85	112	110	202	156
Average Queue (ft)	2	66	36	43	43	97	60
95th Queue (ft)	13	145	89	90	81	173	120
Link Distance (ft)	111	602		556	556	538	538
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)			60				
Storage Blk Time (%)		6	1				
Queuing Penalty (veh)		4	2				

Intersection: 9: Crescent Dr & Crescent Plaza

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	LTR	LTR
Maximum Queue (ft)	48	188	90	220	83	71
Average Queue (ft)	4	79	27	85	35	22
95th Queue (ft)	24	145	69	184	66	54
Link Distance (ft)		602	321	321	557	750
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	50					
Storage Blk Time (%)	0	12				
Queuing Penalty (veh)	0	1				

Intersection: 10: Contra Costa Blvd & Crescent Plaza/Monument Blvd

Movement	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	NB	NB
Directions Served	L	T	TR	L	L	T	R	R	L	T	T	T
Maximum Queue (ft)	93	248	223	200	221	274	198	158	80	222	194	126
Average Queue (ft)	18	147	131	113	137	128	45	15	23	123	97	51
95th Queue (ft)	61	225	203	189	210	253	159	88	59	195	170	117
Link Distance (ft)		321	321		446	446	446			602	602	602
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	115			230				190	160			
Storage Blk Time (%)		22		0	1		0	0		5		
Queuing Penalty (veh)		3		0	1		0	0		1		

Intersection: 10: Contra Costa Blvd & Crescent Plaza/Monument Blvd

Movement	NB	SB	SB	SB	SB	SB	SB
Directions Served	R	L	L	T	T	T	R
Maximum Queue (ft)	241	208	226	242	258	260	115
Average Queue (ft)	94	118	107	137	157	145	19
95th Queue (ft)	184	195	179	225	244	236	76
Link Distance (ft)	602			413	413	413	
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)		250	250				40
Storage Blk Time (%)		0	0	0		37	0
Queuing Penalty (veh)		0	0	1		7	2

Intersection: 11: I-680 Ramps & Monument Blvd

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	L	T	T	TR	L	L	T	T	T	L	L
Maximum Queue (ft)	205	234	414	348	312	405	455	737	710	696	31	38
Average Queue (ft)	160	189	188	174	189	404	454	709	427	248	2	4
95th Queue (ft)	239	259	355	275	276	409	455	725	863	544	14	20
Link Distance (ft)			446	446	446			690	690	690		878
Upstream Blk Time (%)			0	0				57	3	0		
Queuing Penalty (veh)			1	0				0	0	0		
Storage Bay Dist (ft)	175	175				355	355				445	
Storage Blk Time (%)	3	16	3			30	67	0		0		
Queuing Penalty (veh)	5	28	16			69	156	1		0		

Intersection: 11: I-680 Ramps & Monument Blvd

Movement	NB	NB	SB	SB	SB	SB
Directions Served	R	R	L	L	L	R
Maximum Queue (ft)	240	103	423	370	311	17
Average Queue (ft)	29	4	287	247	141	1
95th Queue (ft)	150	58	389	353	295	16
Link Distance (ft)	878	878	959	959	959	959
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 12: Patterson Blvd & Boyd Rd

Movement	EB	WB	WB	NB
Directions Served	TR	L	T	LR
Maximum Queue (ft)	152	111	94	137
Average Queue (ft)	78	59	49	64
95th Queue (ft)	128	97	80	108
Link Distance (ft)	460		1497	512
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		100		
Storage Blk Time (%)		1	0	
Queuing Penalty (veh)		2	0	

Intersection: 13: Astrid Dr/Cleaveland Rd & Boyd Rd

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	T	R	L	T	TR	L	T	R
Maximum Queue (ft)	124	391	124	491	155	69	172	105	174	279	284
Average Queue (ft)	82	184	24	259	60	38	61	56	64	130	133
95th Queue (ft)	147	333	83	451	160	75	138	102	133	225	237
Link Distance (ft)		1497		588			2661			556	556
Upstream Blk Time (%)				0							
Queuing Penalty (veh)				2							
Storage Bay Dist (ft)	100		100		130	45		80	150		
Storage Blk Time (%)	4	15	1	44	0	18	15	4	0	7	
Queuing Penalty (veh)	20	22	2	39	0	28	22	3	1	5	

Intersection: 14: Boyd Rd & Crescent Dr

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	LTR	LTR
Maximum Queue (ft)	100	161	24	50	63	65
Average Queue (ft)	32	16	2	3	25	28
95th Queue (ft)	71	85	14	28	52	56
Link Distance (ft)		588		250	95	557
Upstream Blk Time (%)					0	
Queuing Penalty (veh)					0	
Storage Bay Dist (ft)	105		75			
Storage Blk Time (%)	0	1		0		
Queuing Penalty (veh)	1	1		0		

Queuing and Blocking Report
Existing plus Project AM

08/09/2019

Intersection: 15: Contra Costa Blvd & Boyd Rd

Movement	EB	EB	EB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	LT	R	LTR	L	T	T	TR	L	T	T	T
Maximum Queue (ft)	144	260	95	29	229	179	175	172	171	358	390	347
Average Queue (ft)	73	155	76	6	110	63	36	73	29	168	198	131
95th Queue (ft)	152	277	124	26	191	137	110	151	99	305	341	283
Link Distance (ft)		250		144		1004	1004			602	602	602
Upstream Blk Time (%)		4								0	0	
Queuing Penalty (veh)		19								0	0	
Storage Bay Dist (ft)	120		70		580			170	190			
Storage Blk Time (%)	0	36	2				0	1		6		0
Queuing Penalty (veh)	1	110	4				0	1		2		0

Intersection: 15: Contra Costa Blvd & Boyd Rd

Movement	SB
Directions Served	R
Maximum Queue (ft)	154
Average Queue (ft)	58
95th Queue (ft)	124
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	300
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 16: Contra Costa Blvd & Astrid Dr

Movement	EB	EB	NB	NB	NB	SB	SB	SB	B32	B32	B32
Directions Served	L	R	L	T	T	T	T	R	T	T	
Maximum Queue (ft)	70	102	57	56	43	187	220	114	201	307	7
Average Queue (ft)	15	41	25	13	7	70	77	11	10	14	0
95th Queue (ft)	47	79	51	43	29	151	167	51	175	203	7
Link Distance (ft)		2661		272	272	832	832		1004	1004	1004
Upstream Blk Time (%)									0	0	
Queuing Penalty (veh)									0	0	
Storage Bay Dist (ft)	100		115					120			
Storage Blk Time (%)	0	0		0			2	0			
Queuing Penalty (veh)	0	0		0			1	0			

Network Summary

Network wide Queuing Penalty: 749

Intersection: 1: Contra Costa Blvd & Woodsworth Ln/Pleasant Hill Plaza Way

Movement	EB	EB	WB	WB	NB	NB	NB	B34	B34	B34	SB	SB
Directions Served	L	TR	LT	R	L	T	TR	T	T		L	T
Maximum Queue (ft)	176	113	265	123	190	310	312	377	434	235	180	404
Average Queue (ft)	84	46	122	47	80	218	236	67	88	9	104	222
95th Queue (ft)	149	92	216	94	174	352	354	252	305	109	194	369
Link Distance (ft)		1827	276	276		225	225	428	428	428		471
Upstream Blk Time (%)			0			13	17	0	0	0		0
Queuing Penalty (veh)			0			99	126	0	2	0		0
Storage Bay Dist (ft)	225				115						105	
Storage Blk Time (%)	0				2	28					9	30
Queuing Penalty (veh)	0				12	24					33	34

Intersection: 1: Contra Costa Blvd & Woodsworth Ln/Pleasant Hill Plaza Way

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	346	180
Average Queue (ft)	170	44
95th Queue (ft)	308	136
Link Distance (ft)	471	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		105
Storage Blk Time (%)	16	0
Queuing Penalty (veh)	15	0

Intersection: 2: Gregory Ln & Elinora Dr

Movement	EB	EB	WB	WB	SB
Directions Served	LT	T	T	TR	LR
Maximum Queue (ft)	172	83	43	56	146
Average Queue (ft)	53	3	1	5	57
95th Queue (ft)	125	39	22	27	116
Link Distance (ft)	668	668	1637	1637	206
Upstream Blk Time (%)					0
Queuing Penalty (veh)					0
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 3: Cleaveland Rd/Woodsworth Ln & Gregory Ln

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	LT	R	LT	R
Maximum Queue (ft)	158	190	262	149	200	213	190	262	53	181	92
Average Queue (ft)	71	74	135	61	90	110	89	133	19	82	41
95th Queue (ft)	134	148	228	118	179	199	166	215	46	149	75
Link Distance (ft)		1637	1637		466	466		326	326	1827	
Upstream Blk Time (%)								0			
Queuing Penalty (veh)								0			
Storage Bay Dist (ft)	170			195			165				225
Storage Blk Time (%)	0	0			0		0	4		0	
Queuing Penalty (veh)	1	0			0		0	6		0	

Intersection: 4: Trelany Rd & Gregory Ln

Movement	EB	EB	WB	WB	WB	NB	SB
Directions Served	T	TR	L	T	TR	LTR	R
Maximum Queue (ft)	8	7	45	6	12	55	49
Average Queue (ft)	0	0	11	0	0	27	19
95th Queue (ft)	6	5	36	4	7	49	45
Link Distance (ft)	466	466		518	518	785	111
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)			120				
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 5: Contra Costa Blvd & Gregory Ln/I-680 SB Off-Ramp

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	NB	SB
Directions Served	L	L	R	L	T	R	L	L	T	T	TR	L
Maximum Queue (ft)	150	151	312	194	460	328	132	144	335	348	326	145
Average Queue (ft)	68	81	129	123	225	78	77	105	176	179	115	36
95th Queue (ft)	125	131	243	225	388	223	142	175	344	337	283	103
Link Distance (ft)			518		876				317	317	317	
Upstream Blk Time (%)									4	2	1	
Queuing Penalty (veh)									16	10	4	
Storage Bay Dist (ft)	170	170		170		400	120	120				150
Storage Blk Time (%)	0	0		1	20	0	3	9	23			
Queuing Penalty (veh)	0	0		5	73	0	10	33	46			

Intersection: 5: Contra Costa Blvd & Gregory Ln/I-680 SB Off-Ramp

Movement	SB	SB	SB	B34
Directions Served	T	T	R	T
Maximum Queue (ft)	394	330	112	29
Average Queue (ft)	196	136	40	1
95th Queue (ft)	362	284	87	30
Link Distance (ft)	428	428	428	225
Upstream Blk Time (%)	0	0		
Queuing Penalty (veh)	1	0		
Storage Bay Dist (ft)				
Storage Blk Time (%)	12			
Queuing Penalty (veh)	3			

Intersection: 6: Cleaveland Rd & Trelany Rd

Movement	WB	NB	SB	SB	SB
Directions Served	LR	T	L	T	T
Maximum Queue (ft)	59	31	41	6	3
Average Queue (ft)	31	1	9	0	0
95th Queue (ft)	54	16	33	4	3
Link Distance (ft)	785	538		326	326
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)			50		
Storage Blk Time (%)			0		
Queuing Penalty (veh)			0		

Intersection: 7: Contra Costa Blvd & Crescent Dr

Movement	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	L	TR	L	T	T	TR	L	T	TR
Maximum Queue (ft)	123	116	94	260	99	228	236	207	151	324	288
Average Queue (ft)	37	46	71	85	41	91	93	56	31	162	123
95th Queue (ft)	88	89	107	196	89	200	204	159	92	289	231
Link Distance (ft)	750			288		413	413	413		317	317
Upstream Blk Time (%)				0						1	0
Queuing Penalty (veh)				0						5	0
Storage Bay Dist (ft)		100	70		75				150		
Storage Blk Time (%)	1	1	24	6	4	11			0	9	
Queuing Penalty (veh)	1	1	27	8	15	6			0	3	

Intersection: 8: Cleaveland Rd & Crescent Plaza

Movement	EB	WB	WB	NB	NB	SB	SB
Directions Served	LTR	LT	R	LT	TR	LT	TR
Maximum Queue (ft)	30	111	83	122	103	171	70
Average Queue (ft)	3	25	44	43	30	73	15
95th Queue (ft)	17	72	80	94	72	141	46
Link Distance (ft)	111	602		556	556	538	538
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)			60				
Storage Blk Time (%)		1	3				
Queuing Penalty (veh)		1	1				

Intersection: 9: Crescent Dr & Crescent Plaza

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	LTR	LTR
Maximum Queue (ft)	72	179	82	205	82	110
Average Queue (ft)	11	71	27	73	37	43
95th Queue (ft)	40	137	64	167	68	89
Link Distance (ft)		602	321	321	557	750
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	50					
Storage Blk Time (%)	0	11				
Queuing Penalty (veh)	0	2				

Intersection: 10: Contra Costa Blvd & Crescent Plaza/Monument Blvd

Movement	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	NB	NB
Directions Served	L	T	TR	L	L	T	R	R	L	T	T	T
Maximum Queue (ft)	140	258	221	163	225	302	345	215	184	349	324	263
Average Queue (ft)	48	129	106	72	99	133	105	67	69	165	145	102
95th Queue (ft)	116	214	183	138	170	263	282	217	163	305	269	219
Link Distance (ft)		321	321		446	446	446			602	602	602
Upstream Blk Time (%)		0					0					
Queuing Penalty (veh)		0					0					
Storage Bay Dist (ft)	115			230				190	160			
Storage Blk Time (%)	0	21			0		3	0	0	17		
Queuing Penalty (veh)	0	8			0		7	1	0	11		

Intersection: 10: Contra Costa Blvd & Crescent Plaza/Monument Blvd

Movement	NB	SB	SB	SB	SB	SB	SB
Directions Served	R	L	L	T	T	T	R
Maximum Queue (ft)	406	262	274	417	289	161	65
Average Queue (ft)	167	198	195	114	85	67	12
95th Queue (ft)	333	284	291	331	181	136	49
Link Distance (ft)	602			413	413	413	
Upstream Blk Time (%)				1	0		
Queuing Penalty (veh)				6	0		
Storage Bay Dist (ft)		250	250				40
Storage Blk Time (%)		3	4			17	1
Queuing Penalty (veh)		6	10			4	1

Intersection: 11: I-680 Ramps & Monument Blvd

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	WB	WB
Directions Served	L	L	T	T	TR	L	L	T	T	T	R	R
Maximum Queue (ft)	187	200	464	439	382	325	357	330	445	578	424	203
Average Queue (ft)	180	196	354	258	251	180	226	127	210	304	94	9
95th Queue (ft)	207	211	505	397	345	289	328	245	369	482	378	110
Link Distance (ft)			446	446	446			690	690	690		
Upstream Blk Time (%)			4	0	0					0		
Queuing Penalty (veh)			18	0	0					0		
Storage Bay Dist (ft)	175	175				355	355				400	400
Storage Blk Time (%)	5	32	9			0	0			1	1	0
Queuing Penalty (veh)	14	86	52			0	1			9	2	0

Intersection: 11: I-680 Ramps & Monument Blvd

Movement	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	L	R	R	L	L	L
Maximum Queue (ft)	33	81	257	94	490	454	362
Average Queue (ft)	3	13	61	3	347	288	142
95th Queue (ft)	18	48	216	48	460	426	317
Link Distance (ft)		878	878	878	959	959	959
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	445						
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 12: Patterson Blvd & Boyd Rd

Movement	EB	WB	WB	NB
Directions Served	TR	L	T	LR
Maximum Queue (ft)	176	121	149	174
Average Queue (ft)	75	67	52	82
95th Queue (ft)	132	111	104	137
Link Distance (ft)	460		1497	512
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		100		
Storage Blk Time (%)		2	0	
Queuing Penalty (veh)		3	0	

Intersection: 13: Astrid Dr/Cleaveland Rd & Boyd Rd

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	T	R	L	T	TR	L	T	R
Maximum Queue (ft)	117	184	107	272	155	65	132	102	121	146	97
Average Queue (ft)	53	66	28	111	57	17	49	47	53	61	42
95th Queue (ft)	107	140	84	215	133	51	101	94	99	118	75
Link Distance (ft)		1497		588			2661			556	556
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	100		100		130	45		80	150		
Storage Blk Time (%)	1	2	0	17	0	2	16	1	0	0	
Queuing Penalty (veh)	3	2	0	22	0	3	17	1	0	0	

Intersection: 14: Boyd Rd & Crescent Dr

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	LTR	LTR
Maximum Queue (ft)	52	89	30	45	37	72
Average Queue (ft)	12	5	3	4	16	32
95th Queue (ft)	39	39	18	34	41	60
Link Distance (ft)		588		250	95	557
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	105		75			
Storage Blk Time (%)		0		0		
Queuing Penalty (veh)		0		0		

Intersection: 15: Contra Costa Blvd & Boyd Rd

Movement	EB	EB	EB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	LT	R	LTR	L	T	T	TR	L	T	T	T
Maximum Queue (ft)	144	261	95	157	280	297	318	195	91	236	268	215
Average Queue (ft)	50	104	68	63	143	133	128	132	29	109	131	76
95th Queue (ft)	119	210	119	126	248	242	282	223	69	193	225	172
Link Distance (ft)		250		144		1004	1004			602	602	602
Upstream Blk Time (%)		1		2								
Queuing Penalty (veh)		4		0								
Storage Bay Dist (ft)	120		70		580			170	190			
Storage Blk Time (%)	0	26	1				1	6		1		
Queuing Penalty (veh)	0	68	2				4	19		0		

Intersection: 15: Contra Costa Blvd & Boyd Rd

Movement	SB
Directions Served	R
Maximum Queue (ft)	97
Average Queue (ft)	36
95th Queue (ft)	74
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	300
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 16: Contra Costa Blvd & Astrid Dr

Movement	EB	EB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	L	T	T	T	T	R
Maximum Queue (ft)	65	71	92	93	88	98	117	60
Average Queue (ft)	25	26	47	29	23	33	50	11
95th Queue (ft)	56	57	79	74	64	79	96	40
Link Distance (ft)		2661		272	272	832	832	
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	100		115					120
Storage Blk Time (%)	0	0	0	0			0	
Queuing Penalty (veh)	0	0	0	0			0	

Network Summary

Network wide Queuing Penalty: 1012

Intersection: 1: Contra Costa Blvd & Woodsworth Ln/Pleasant Hill Plaza Way

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	TR	LT	R	L	T	TR	L	T	T	R
Maximum Queue (ft)	137	80	147	54	81	169	197	179	353	300	167
Average Queue (ft)	57	31	66	18	28	59	81	64	175	141	40
95th Queue (ft)	111	65	126	41	65	129	149	142	308	266	119
Link Distance (ft)		1827	276	276		225	225		471	471	
Upstream Blk Time (%)						0	0				
Queuing Penalty (veh)						0	0				
Storage Bay Dist (ft)	225				115			105			105
Storage Blk Time (%)						2		1	19	10	
Queuing Penalty (veh)						1		5	11	12	

Intersection: 2: Gregory Ln & Elinora Dr

Movement	EB	EB	WB	WB	SB
Directions Served	LT	T	T	TR	LR
Maximum Queue (ft)	210	180	139	140	132
Average Queue (ft)	101	76	52	68	65
95th Queue (ft)	179	148	104	121	109
Link Distance (ft)	668	668	1637	1637	206
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 3: Cleaveland Rd/Woodsworth Ln & Gregory Ln

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	LT	R	LT	R
Maximum Queue (ft)	123	327	460	194	206	213	148	182	53	178	93
Average Queue (ft)	55	120	251	96	90	108	66	105	17	87	44
95th Queue (ft)	102	254	411	166	172	192	121	158	45	151	76
Link Distance (ft)		1637	1637		466	466		326	326	1827	
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	170			195			165				225
Storage Blk Time (%)	0	1		0	0		0	1			
Queuing Penalty (veh)	0	0		1	1		0	1			

Intersection: 4: Trelany Rd & Gregory Ln

Movement	EB	WB	NB	SB
Directions Served	TR	L	LTR	R
Maximum Queue (ft)	7	44	38	29
Average Queue (ft)	1	11	15	6
95th Queue (ft)	12	36	39	25
Link Distance (ft)	466		785	111
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		120		
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 5: Contra Costa Blvd & Gregory Ln/I-680 SB Off-Ramp

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	NB	SB
Directions Served	L	L	R	L	T	R	L	L	T	T	TR	L
Maximum Queue (ft)	91	105	397	245	792	433	148	172	191	214	132	115
Average Queue (ft)	34	50	177	219	374	95	71	80	56	74	24	17
95th Queue (ft)	76	89	332	292	713	344	129	141	141	172	88	85
Link Distance (ft)			518		876				317	317	317	
Upstream Blk Time (%)			0		1							
Queuing Penalty (veh)			1		0							
Storage Bay Dist (ft)	170	170		170		400	120	120				150
Storage Blk Time (%)				24	26		1	2	1			
Queuing Penalty (veh)				128	138		3	5	2			

Intersection: 5: Contra Costa Blvd & Gregory Ln/I-680 SB Off-Ramp

Movement	SB	SB	SB	B34	B34
Directions Served	T	T	R	T	T
Maximum Queue (ft)	478	476	86	47	46
Average Queue (ft)	225	211	28	4	2
95th Queue (ft)	417	407	64	38	25
Link Distance (ft)	428	428	428	225	225
Upstream Blk Time (%)	2	1			
Queuing Penalty (veh)	5	4			
Storage Bay Dist (ft)					
Storage Blk Time (%)	25				
Queuing Penalty (veh)	2				

Intersection: 6: Cleaveland Rd & Trelany Rd

Movement	WB	NB	SB	SB	SB
Directions Served	LR	T	L	T	T
Maximum Queue (ft)	50	3	31	27	10
Average Queue (ft)	23	0	4	2	1
95th Queue (ft)	48	3	20	17	9
Link Distance (ft)	785	538		326	326
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)			50		
Storage Blk Time (%)			0	0	
Queuing Penalty (veh)			0	0	

Intersection: 7: Contra Costa Blvd & Crescent Dr

Movement	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	L	TR	L	T	T	TR	L	T	TR
Maximum Queue (ft)	34	50	91	122	30	221	225	173	58	295	296
Average Queue (ft)	7	13	45	19	5	63	66	32	11	103	110
95th Queue (ft)	27	40	83	68	22	174	169	110	40	240	246
Link Distance (ft)	750			288		413	413	413		317	317
Upstream Blk Time (%)										0	0
Queuing Penalty (veh)										2	2
Storage Bay Dist (ft)		100	70		75				150		
Storage Blk Time (%)			8	0		5				4	
Queuing Penalty (veh)			2	0		0				0	

Intersection: 8: Cleaveland Rd & Crescent Plaza

Movement	EB	WB	WB	NB	NB	SB	SB
Directions Served	LTR	LT	R	LT	TR	LT	TR
Maximum Queue (ft)	24	205	85	109	105	354	227
Average Queue (ft)	3	80	39	47	47	143	76
95th Queue (ft)	16	169	91	91	87	290	179
Link Distance (ft)	111	602		556	556	538	538
Upstream Blk Time (%)						0	
Queuing Penalty (veh)						1	
Storage Bay Dist (ft)			60				
Storage Blk Time (%)		8	1				
Queuing Penalty (veh)		6	2				

Intersection: 9: Crescent Dr & Crescent Plaza

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	LTR	LTR
Maximum Queue (ft)	37	240	101	233	108	73
Average Queue (ft)	3	113	30	93	43	26
95th Queue (ft)	22	287	72	199	84	60
Link Distance (ft)		602	321	321	557	750
Upstream Blk Time (%)		0		0		
Queuing Penalty (veh)		1		0		
Storage Bay Dist (ft)	50					
Storage Blk Time (%)	0	20				
Queuing Penalty (veh)	0	2				

Intersection: 10: Contra Costa Blvd & Crescent Plaza/Monument Blvd

Movement	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	NB	NB
Directions Served	L	T	TR	L	L	T	R	R	L	T	T	T
Maximum Queue (ft)	150	315	286	203	260	286	262	137	107	244	201	147
Average Queue (ft)	25	191	164	115	139	122	44	8	24	132	107	66
95th Queue (ft)	99	318	271	190	220	238	172	65	69	205	176	134
Link Distance (ft)		321	321		446	446	446			602	602	602
Upstream Blk Time (%)		5	0				0					
Queuing Penalty (veh)		14	1				0					
Storage Bay Dist (ft)	115			230				190	160			
Storage Blk Time (%)		40		0	0		1	0		7		
Queuing Penalty (veh)		7		0	1		1	0		2		

Intersection: 10: Contra Costa Blvd & Crescent Plaza/Monument Blvd

Movement	NB	SB	SB	SB	SB	SB	SB
Directions Served	R	L	L	T	T	T	R
Maximum Queue (ft)	316	260	276	343	335	304	106
Average Queue (ft)	134	159	148	186	196	180	20
95th Queue (ft)	252	261	272	320	307	280	82
Link Distance (ft)	602			413	413	413	
Upstream Blk Time (%)				2	0	0	
Queuing Penalty (veh)				12	0	0	
Storage Bay Dist (ft)		250	250				40
Storage Blk Time (%)		6	4	1		42	0
Queuing Penalty (veh)		22	13	3		9	1

Intersection: 11: I-680 Ramps & Monument Blvd

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	WB	NB
Directions Served	L	L	T	T	TR	L	L	T	T	T	R	L
Maximum Queue (ft)	205	235	461	437	426	405	455	742	702	673	85	32
Average Queue (ft)	184	219	326	274	284	404	454	710	362	233	5	2
95th Queue (ft)	242	268	521	437	431	407	454	727	797	493	79	16
Link Distance (ft)			446	446	446			690	690	690		
Upstream Blk Time (%)			8	1	2			58	2	0		
Queuing Penalty (veh)			31	5	7			0	0	0		
Storage Bay Dist (ft)	175	175				355	355				400	445
Storage Blk Time (%)	5	25	30			30	67	0		1		
Queuing Penalty (veh)	11	50	162			79	178	1		8		

Intersection: 11: I-680 Ramps & Monument Blvd

Movement	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	R	R	L	L	L	R
Maximum Queue (ft)	43	266	175	474	447	367	18
Average Queue (ft)	5	59	9	334	294	185	1
95th Queue (ft)	25	218	85	438	405	342	18
Link Distance (ft)	878	878	878	959	959	959	959
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 12: Patterson Blvd & Boyd Rd

Movement	EB	WB	WB	NB
Directions Served	TR	L	T	LR
Maximum Queue (ft)	212	118	105	161
Average Queue (ft)	93	62	52	75
95th Queue (ft)	170	103	86	130
Link Distance (ft)	460		1497	512
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		100		
Storage Blk Time (%)		1	0	
Queuing Penalty (veh)		2	1	

Intersection: 13: Astrid Dr/Cleaveland Rd & Boyd Rd

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	T	R	L	T	TR	L	T	R
Maximum Queue (ft)	124	502	124	573	155	69	234	105	174	336	330
Average Queue (ft)	91	236	32	350	70	40	72	61	82	162	161
95th Queue (ft)	151	421	93	574	178	77	163	108	167	280	275
Link Distance (ft)		1497		588			2661			556	556
Upstream Blk Time (%)				2							
Queuing Penalty (veh)				9							
Storage Bay Dist (ft)	100		100		130	45		80	150		
Storage Blk Time (%)	7	19	0	56	0	21	17	5	0	11	
Queuing Penalty (veh)	39	31	1	55	0	36	28	5	1	9	

Intersection: 14: Boyd Rd & Crescent Dr

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	LTR	LTR
Maximum Queue (ft)	118	223	34	146	62	82
Average Queue (ft)	41	30	3	13	24	30
95th Queue (ft)	93	133	19	87	52	63
Link Distance (ft)		588		250	95	557
Upstream Blk Time (%)				0	0	
Queuing Penalty (veh)				1	0	
Storage Bay Dist (ft)	105		75			
Storage Blk Time (%)	0	2		2		
Queuing Penalty (veh)	1	2		0		

Queuing and Blocking Report
Future plus Project AM

08/09/2019

Intersection: 15: Contra Costa Blvd & Boyd Rd

Movement	EB	EB	EB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	LT	R	LTR	L	T	T	TR	L	T	T	T
Maximum Queue (ft)	144	265	95	34	265	170	225	193	200	383	425	340
Average Queue (ft)	88	172	80	7	126	69	45	89	34	193	227	148
95th Queue (ft)	167	293	122	28	218	140	139	180	115	338	378	303
Link Distance (ft)		250		144		1004	1004			602	602	602
Upstream Blk Time (%)		5										
Queuing Penalty (veh)		28										
Storage Bay Dist (ft)	120		70		580			170	190			
Storage Blk Time (%)	1	43	2				0	2		9		0
Queuing Penalty (veh)	4	147	6				0	4		2		1

Intersection: 15: Contra Costa Blvd & Boyd Rd

Movement	SB
Directions Served	R
Maximum Queue (ft)	219
Average Queue (ft)	74
95th Queue (ft)	157
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	300
Storage Blk Time (%)	0
Queuing Penalty (veh)	0

Intersection: 16: Contra Costa Blvd & Astrid Dr

Movement	EB	EB	NB	NB	NB	SB	SB	SB	B32	B32
Directions Served	L	R	L	T	T	T	T	R	T	T
Maximum Queue (ft)	69	110	59	61	63	236	259	121	173	495
Average Queue (ft)	17	47	27	16	11	88	97	16	6	17
95th Queue (ft)	51	88	53	48	41	182	198	67	123	213
Link Distance (ft)		2661		272	272	832	832		1004	1004
Upstream Blk Time (%)									0	0
Queuing Penalty (veh)									0	0
Storage Bay Dist (ft)	100		115					120		
Storage Blk Time (%)	0	0					4	0		
Queuing Penalty (veh)	0	0					2	0		

Network Summary

Network wide Queuing Penalty: 1373

Intersection: 1: Contra Costa Blvd & Woodsworth Ln/Pleasant Hill Plaza Way

Movement	EB	EB	WB	WB	NB	NB	NB	B34	B34	B34	SB	SB
Directions Served	L	TR	LT	R	L	T	TR	T	T		L	T
Maximum Queue (ft)	195	121	266	141	190	314	311	464	482	472	180	485
Average Queue (ft)	97	54	134	55	95	276	283	262	286	138	121	291
95th Queue (ft)	169	102	230	109	198	360	348	567	596	470	209	474
Link Distance (ft)		1827	276	276		225	225	428	428	428		471
Upstream Blk Time (%)			0			37	41	2	7	2		1
Queuing Penalty (veh)			0			311	343	14	39	13		0
Storage Bay Dist (ft)	225				115						105	
Storage Blk Time (%)	0				3	46					17	35
Queuing Penalty (veh)	0				19	44					73	46

Intersection: 1: Contra Costa Blvd & Woodsworth Ln/Pleasant Hill Plaza Way

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	449	180
Average Queue (ft)	222	64
95th Queue (ft)	397	173
Link Distance (ft)	471	
Upstream Blk Time (%)	0	
Queuing Penalty (veh)	0	
Storage Bay Dist (ft)		105
Storage Blk Time (%)	23	
Queuing Penalty (veh)	24	

Intersection: 2: Gregory Ln & Elinora Dr

Movement	EB	EB	WB	WB	SB
Directions Served	LT	T	T	TR	LR
Maximum Queue (ft)	271	234	147	158	89
Average Queue (ft)	119	81	63	85	42
95th Queue (ft)	215	174	117	137	73
Link Distance (ft)	668	668	1637	1637	206
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 3: Cleaveland Rd/Woodsworth Ln & Gregory Ln

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	LT	R	LT	R
Maximum Queue (ft)	187	261	349	162	243	255	185	276	60	200	130
Average Queue (ft)	83	100	178	61	106	129	98	142	22	94	48
95th Queue (ft)	154	197	300	120	205	225	176	224	50	162	93
Link Distance (ft)		1637	1637		466	466		326	326	1827	
Upstream Blk Time (%)								0			
Queuing Penalty (veh)								0			
Storage Bay Dist (ft)	170			195			165				225
Storage Blk Time (%)	1	1			1		0	5		0	
Queuing Penalty (veh)	2	1			1		1	7		0	

Intersection: 4: Trelany Rd & Gregory Ln

Movement	EB	EB	WB	WB	WB	NB	SB
Directions Served	T	TR	L	T	TR	LTR	R
Maximum Queue (ft)	13	7	46	10	19	55	58
Average Queue (ft)	1	0	12	1	1	28	23
95th Queue (ft)	8	4	37	8	11	50	50
Link Distance (ft)	466	466		518	518	785	111
Upstream Blk Time (%)							0
Queuing Penalty (veh)							0
Storage Bay Dist (ft)			120				
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 5: Contra Costa Blvd & Gregory Ln/I-680 SB Off-Ramp

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	NB
Directions Served	L	L	T	R	L	T	R	L	L	T	T	TR
Maximum Queue (ft)	164	170	43	381	194	744	398	132	144	352	358	354
Average Queue (ft)	77	92	1	183	146	313	128	87	124	237	239	190
95th Queue (ft)	134	144	42	335	238	617	348	150	178	401	398	390
Link Distance (ft)			518	518		876				317	317	317
Upstream Blk Time (%)				0		2				14	12	7
Queuing Penalty (veh)				0		0				71	59	35
Storage Bay Dist (ft)	170	170			170		400	120	120			
Storage Blk Time (%)	0	0			2	30	0	5	14	37		
Queuing Penalty (veh)	0	0			13	123	0	19	57	85		

Intersection: 5: Contra Costa Blvd & Gregory Ln/I-680 SB Off-Ramp

Movement	SB	SB	SB	SB	B34	B34	B34
Directions Served	L	T	T	R	T	T	T
Maximum Queue (ft)	164	470	428	145	116	55	21
Average Queue (ft)	45	262	183	39	13	7	1
95th Queue (ft)	132	471	378	97	100	69	21
Link Distance (ft)		428	428	428	225	225	225
Upstream Blk Time (%)		4	1	0	1	0	0
Queuing Penalty (veh)		14	2	0	2	0	0
Storage Bay Dist (ft)	150						
Storage Blk Time (%)	0	27					
Queuing Penalty (veh)	0	9					

Intersection: 6: Cleaveland Rd & Trelany Rd

Movement	WB	NB	SB	SB	SB
Directions Served	LR	T	L	T	T
Maximum Queue (ft)	68	12	43	3	6
Average Queue (ft)	33	0	11	0	0
95th Queue (ft)	59	6	36	3	5
Link Distance (ft)	785	538		326	326
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)			50		
Storage Blk Time (%)			0		
Queuing Penalty (veh)			0		

Intersection: 7: Contra Costa Blvd & Crescent Dr

Movement	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	L	TR	L	T	T	TR	L	T	TR
Maximum Queue (ft)	152	119	94	291	99	374	395	323	174	332	328
Average Queue (ft)	41	48	74	115	48	148	152	102	40	227	176
95th Queue (ft)	98	97	112	261	102	320	327	266	120	356	304
Link Distance (ft)	750			288		413	413	413		317	317
Upstream Blk Time (%)				5		0	1	0		2	0
Queuing Penalty (veh)				0		1	4	1		16	3
Storage Bay Dist (ft)		100	70		75				150		
Storage Blk Time (%)	1	2	28	15	4	22				22	
Queuing Penalty (veh)	2	1	35	21	19	14				7	

Intersection: 8: Cleaveland Rd & Crescent Plaza

Movement	EB	WB	WB	NB	NB	SB	SB
Directions Served	LTR	LT	R	LT	TR	LT	TR
Maximum Queue (ft)	24	130	83	111	75	215	95
Average Queue (ft)	2	30	47	44	28	91	17
95th Queue (ft)	13	81	83	93	60	172	56
Link Distance (ft)	111	602		556	556	538	538
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)			60				
Storage Blk Time (%)		0	4				
Queuing Penalty (veh)		0	2				

Intersection: 9: Crescent Dr & Crescent Plaza

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	LTR	LTR
Maximum Queue (ft)	57	228	74	191	98	117
Average Queue (ft)	12	88	26	67	42	45
95th Queue (ft)	42	175	61	142	76	90
Link Distance (ft)		602	321	321	557	750
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	50					
Storage Blk Time (%)	0	15				
Queuing Penalty (veh)	0	4				

Intersection: 10: Contra Costa Blvd & Crescent Plaza/Monument Blvd

Movement	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	NB	NB
Directions Served	L	T	TR	L	L	T	R	R	L	T	T	T
Maximum Queue (ft)	140	246	227	152	179	254	217	203	185	413	358	317
Average Queue (ft)	50	134	117	64	90	109	76	28	81	202	173	129
95th Queue (ft)	120	210	193	126	150	205	201	127	185	366	316	268
Link Distance (ft)		321	321		446	446	446			602	602	602
Upstream Blk Time (%)		0	0									
Queuing Penalty (veh)		0	0									
Storage Bay Dist (ft)	115			230				190	160			
Storage Blk Time (%)	0	21			0		1	0	1	26		
Queuing Penalty (veh)	1	9			0		2	0	1	19		

Intersection: 10: Contra Costa Blvd & Crescent Plaza/Monument Blvd

Movement	NB	SB	SB	SB	SB	SB	SB
Directions Served	R	L	L	T	T	T	R
Maximum Queue (ft)	457	262	274	430	369	188	65
Average Queue (ft)	199	227	231	195	106	85	15
95th Queue (ft)	392	299	313	471	230	156	54
Link Distance (ft)	602			413	413	413	
Upstream Blk Time (%)	0			3	0	0	
Queuing Penalty (veh)	0			14	0	0	
Storage Bay Dist (ft)		250	250				40
Storage Blk Time (%)		4	8	0		29	1
Queuing Penalty (veh)		12	22	0		8	2

Intersection: 11: I-680 Ramps & Monument Blvd

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	WB	WB
Directions Served	L	L	T	T	TR	L	L	T	T	T	R	R
Maximum Queue (ft)	187	200	415	333	320	316	364	702	711	746	425	122
Average Queue (ft)	160	179	207	168	191	133	187	341	633	705	420	4
95th Queue (ft)	219	223	380	273	270	272	326	724	822	773	490	71
Link Distance (ft)			446	446	446			690	690	690		
Upstream Blk Time (%)			0	0				1	12	62		
Queuing Penalty (veh)			2	0				0	0	0		
Storage Bay Dist (ft)	175	175				355	355				400	400
Storage Blk Time (%)	2	12	2			0	0	0		58	2	0
Queuing Penalty (veh)	7	37	11			0	1	3		445	5	0

Intersection: 11: I-680 Ramps & Monument Blvd

Movement	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	L	R	R	L	L	L
Maximum Queue (ft)	33	58	357	334	667	629	543
Average Queue (ft)	2	10	200	95	525	483	244
95th Queue (ft)	13	39	388	309	654	621	573
Link Distance (ft)		878	878	878	959	959	959
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	445						
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 12: Patterson Blvd & Boyd Rd

Movement	EB	WB	WB	NB
Directions Served	TR	L	T	LR
Maximum Queue (ft)	184	123	175	226
Average Queue (ft)	87	73	56	95
95th Queue (ft)	145	119	119	178
Link Distance (ft)	460		1497	512
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		100		
Storage Blk Time (%)		4	0	
Queuing Penalty (veh)		5	1	

Intersection: 13: Astrid Dr/Cleaveland Rd & Boyd Rd

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	T	R	L	T	TR	L	T	R
Maximum Queue (ft)	124	236	113	326	155	63	141	105	151	156	107
Average Queue (ft)	64	87	25	130	61	18	52	53	61	69	46
95th Queue (ft)	122	181	75	257	143	52	104	99	117	131	83
Link Distance (ft)		1497		588			2661			556	556
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	100		100		130	45		80	150		
Storage Blk Time (%)	2	4	0	18	0	2	17	2	0	0	
Queuing Penalty (veh)	5	6	0	26	0	4	20	2	0	0	

Intersection: 14: Boyd Rd & Crescent Dr

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	LTR	LTR
Maximum Queue (ft)	80	248	31	68	42	84
Average Queue (ft)	13	18	3	4	19	34
95th Queue (ft)	47	114	17	30	44	66
Link Distance (ft)		588		250	95	557
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	105		75			
Storage Blk Time (%)		2		0		
Queuing Penalty (veh)		1		0		

Intersection: 15: Contra Costa Blvd & Boyd Rd

Movement	EB	EB	EB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	LT	R	LTR	L	T	T	TR	L	T	T	T
Maximum Queue (ft)	144	262	95	158	359	359	398	195	131	266	300	249
Average Queue (ft)	60	124	73	71	181	161	178	151	30	123	146	91
95th Queue (ft)	136	247	120	137	317	291	375	235	81	219	251	198
Link Distance (ft)		250		144		1004	1004			602	602	602
Upstream Blk Time (%)		4		2								
Queuing Penalty (veh)		15		0								
Storage Bay Dist (ft)	120		70		580			170	190			
Storage Blk Time (%)	0	30	2				3	10		2		0
Queuing Penalty (veh)	1	89	4				9	34		1		0

Intersection: 15: Contra Costa Blvd & Boyd Rd

Movement	SB
Directions Served	R
Maximum Queue (ft)	106
Average Queue (ft)	39
95th Queue (ft)	85
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	300
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 16: Contra Costa Blvd & Astrid Dr

Movement	EB	EB	NB	NB	NB	SB	SB	SB	B32
Directions Served	L	R	L	T	T	T	T	R	T
Maximum Queue (ft)	72	76	102	112	92	108	132	66	87
Average Queue (ft)	28	30	53	38	28	44	63	11	3
95th Queue (ft)	60	61	88	88	70	95	116	42	86
Link Distance (ft)		2661		272	272	832	832		1004
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	100		115					120	
Storage Blk Time (%)	0	0	0	0			0	0	
Queuing Penalty (veh)	0	0	1	0			0	0	

Network Summary

Network wide Queuing Penalty: 2381