FINAL REPORT

Balboa Park Station Area Circulation Study

April 2014

SAN FRANCISCO COUNTY TRANSPORTATION AUTHORITY

FEHR & PEERS ARUP NELSON NYGAARD

BALBOA PARK STATION AREA CIRCULATION STUDY

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EXECUTIVE SUMMARY

Introduction and Study Purpose

The Balboa Park Station Area, located on the central south side of San Francisco, is a busy and multi-faceted hub of transportation activity. Home to the busiest Bay Area Rapid Transit (BART) station outside of Downtown San Francisco, a San Francisco Municipal Transportation Agency (SFMTA) Muni light rail terminal and maintenance facility, multiple bus lines along Geneva and Ocean Avenues, and a historic streetcar depot, this area is one of the most important and heavily used transit hubs in the region. Meanwhile, Interstate 280 (I-280) traverses the neighborhood, with six freeway ramps tying into the local street network directly adjacent to the BART Station. While this interchange provides vehicular access to regional transit and other neighborhood destinations, it also contributes to congestion, safety, and access issues, and degrades the quality of the surrounding area.

Multiple planning and engineering feasibility studies have explored ways to improve various aspects of the station area, beginning with the *Balboa Park Station Area Plan* (2009), the comprehensive long-range planning vision for the station area. Two recent technical studies - the *Balboa Park Station Pedestrian and Bicycle Connection Project* (2009) and the *Balboa Park Station Capacity and Conceptual Engineering Study* (2011) – identified projects to improve pedestrian access and transit operations at the station as well as the feasibility of the proposals for larger infrastructure improvements within the area. The SFMTA has also pursued opportunities to improve transit travel times along Geneva Avenue and pedestrian crossings along Ocean Avenue. While those efforts advanced some of the pedestrian and transit improvements identified previously, they also identified the need for multimodal operations analyses to develop a broader set of circulation changes for the surrounding roadway network, including and especially relating to freeway access.

Following these recent studies, the *Balboa Park Circulation Study,* made possible in part by a grant from the California Department of Transportation (Caltrans), has focused specifically on re-configurations of the I-280 Geneva and Ocean Avenue freeway ramps that could further improve station access and circulation. This study also addressed the impacts generated by the various station area automobile access and circulation alternatives on non-automobile travel modes to provide a comprehensive exploration of station area access and circulation.

The *Circulation Study's* purpose is to seek potential changes to the circulation system to:

1. Reduce the negative impacts on the local community resulting from automobiles accessing the regional road network
2. Support efficient, reliable bus and light rail operations
3. Enhance safety, accessibility, and convenience for pedestrians and bicyclists
4. Minimize impacts to traffic going to/coming from I-280
5. Develop feasible solutions that can be implemented within ten years

Study Area Context

The Balboa Park Station Area, near the southern edge of San Francisco, functions as a key hub of transportation services, including BART, three Muni Metro light rail lines, seven Muni bus lines, private shuttle services, designated bikeway routes, and the I-280 freeway. The station is surrounded by residential neighborhoods and the main campus of City College of San Francisco.

In some ways, the Balboa Park BART station has attributes of an end-of-the-line station. Entering from the south side, it is the first station within the City's limits and is therefore the first station available for use with a Muni Fast Pass. This fare policy attracts many passengers from the south via I-280 who might otherwise board BART at other stations such as Daly City. In addition, the station area experiences a high number of drop-offs and pick-ups because of its easy freeway access. The J, K, and M Muni light rail lines terminate at Balboa Park. At the time of the study, 38 Muni buses and 14 light rail vehicles (LRVs) per hour traversed Geneva and Ocean Avenues during the peak period, navigating lanes shared with or crossed by automobiles, pedestrians, and bicyclists. The result of these conditions is tremendous intermodal activity, with over 25,000 transit passengers moving through the station area every day.

The Circulation Study's area of focus is bounded by Ocean Avenue, Geneva Avenue, and San Jose Avenue. Existing freeway access and transit routes are shown in **Figure ES-1**.

Figure ES-1: Freeway Access and Transit Routes

The local street network surrounding Balboa Park Station serves a diversity of travel modes. The streets accommodate high volumes of automobiles (many of which access the nearby I-280 ramps), Muni buses, Muni light rail vehicles, bicycles, and pedestrians. Several studies have been undertaken in recent

years that define many of the multimodal conflicts. The *Station Capacity Study* and *Pedestrian and Bike Connections Study* have identified the potential constraints of concepts discussed in the *Station Area Plan*.

The key multimodal issues and opportunities include:

1. **The southbound I-280 off-ramp at Ocean Avenue is a high-speed, uncontrolled merge.** This configuration presents a major pedestrian crossing challenge as well as automobile conflicts with bicycles and buses.

2. **The I-280 interchange has closely-spaced southbound off- and northbound on-ramps.** Reducing the number of ramps may create opportunities to improve transit service and the pedestrian and bicycle experience.

3. **The I-280 northbound off- and on-ramps at Geneva Avenue conflict with pedestrian activity.** Automobile volumes and the number of conflicts could be reduced at this intersection by reconfiguring one or more of the freeway ramps.

4. **I-280 northbound freeway access on Ocean Avenue conflicts with light rail vehicles entering the Muni Yard, bicycles using the westbound bicycle lane, and pedestrians.** This intersection experiences delays that may be improved through changes in circulation, lane configurations, and traffic signal timing.

5. **Geneva Avenue is the most congested street within the study area.** The congestion negatively impacts automobile movements, Muni bus operations, bicycle travel, and pedestrian activity.

6. **The designated passenger drop-off and pick-up (kiss-and-ride) area is underutilized, particularly during the AM peak period, and its owner, BART, has signaled a desire to remove it for new development on the site, posing a challenge for future PM peak period pick-up activity.** Morning drop-offs occur at bus stops and on off-ramps, presenting conflicts with other travel modes; alternative locations for kiss-and-ride activity are needed.

Alternatives

The study began by generating several design concepts to address Station Area circulation issues, undertaking a screening process to identify two primary concept alternatives for the formal evaluation, described here in **Table ES-1** and in further detail in Chapter 4 of the report.

The alternatives incorporate a set of previously identified Baseline network improvements that are moving forward for implementation. In addition, they feature targeted freeway ramp closures and/or modifications designed to better manage congested locations and reduce pedestrian, bicycle, and transit conflicts at the freeway ramp intersections. The alternatives also consider and accommodate potential locations for kiss-and-ride operations.

Alternative 1, shown in **Figure ES-2**, is a partial split interchange between Ocean and Geneva Avenues, in which northbound I-280 traffic would exit onto Geneva Avenue but enter the freeway from Ocean Avenue. Southbound traffic would still be able to exit to both Geneva and Ocean Avenues while only entering from Geneva Avenue. The concept here would be to accommodate all travel modes

on both Ocean and Geneva Avenues while eliminating some key multimodal conflict points on both Geneva and Ocean Avenues. Alternative 1 is comprised of elements that are complementary to, but also partly independent of each other. One element is the re-configuration of the I-280 southbound off-ramp to Ocean Avenue from a high-speed merge to a signalized intersection to improve pedestrian safety (Element 2). Another element, as discussed above, is the closure of the northbound on-ramp from Geneva Avenue (Element 1). In its place would be a third element (Element 3) conditional on Element 1 being carried out, consisting of a new northbound frontage road on the east side of I-280 from Geneva Avenue to Ocean Avenue, which would exist in space diverted from the closure of the northbound I-280 Geneva Avenue on-ramp. The frontage road could be constructed without replacing the Ocean Avenue Bridge if paired with re-constructing and shifting the existing Westside Walkway. Alternative 1 envisions the use of this new frontage road as the new kiss-and-ride location. The Study recommends that all elements in this alternative be implemented, yet finds it appropriate to implement them separately over time, allowing simpler and less costly improvements to proceed while the more complex ones are developed further.

Alternative 2, shown in **Figure ES-3**, would consolidate the interchange at Geneva Avenue. This concept provides all freeway access only at Geneva Avenue, dramatically reducing the automobile volume on Ocean Avenue and therefore enabling Ocean Avenue to prioritize travel for transit and non-motorized modes. The alternative consists primarily of two elements: permanently closing the northbound on-ramp to I-280 from Ocean Avenue (Element 1) and permanently closing the southbound off-ramp from I-280 to Ocean Avenue (Element 2). Both elements should be implemented jointly to be most effective. A potential third element is a new transit- and bike-only frontage road from Geneva Avenue to Ocean Avenue (Element 3), split off from the northbound I-280 on-ramp from Geneva Avenue and accommodating a new transit stop. The frontage road could be constructed without replacing the Ocean Avenue Bridge if paired with re-constructing and shifting the existing Westside Walkway; direct access from the new station stop to a new walkway would be included in the design. While this rerouting is technically feasible and may mitigate negative effects to transit delay, further study and consultation with SFMTA is required to fully evaluate its overall impact and feasibility and is therefore considered as a *potential* element within Alternative 2.

Table ES-1: Study Alternatives

ALTERNATIVE/ELEMENT		COST
ALTERNATIVE 1: PARTIAL SPLIT INTERCHANGE		**$18 MILLION**
Element 1	Close the Geneva Avenue northbound on-ramp	
Element 2	Realign Ocean Avenue southbound off-ramp into a "T" intersection	
Element 3	Construct a new northbound frontage road between Geneva and Ocean to accommodate a new kiss-and-ride drop-off area with direct connection to the BART Westside Walkway.	
ALTERNATIVE 2: CONSOLIDATED INTERCHANGE ON GENEVA AVE		**$3 MILLION**
Element 1	Close the Ocean Avenue northbound on-ramp	
Element 2	Close the Ocean Avenue southbound off-ramp	
Element 3 *[Potential]*	Construct a new northbound transit- and bike-only frontage road between Geneva and Ocean to accommodate a transit stop with direct connection to the BART Westside Walkway.	*[$9 MILLION]*

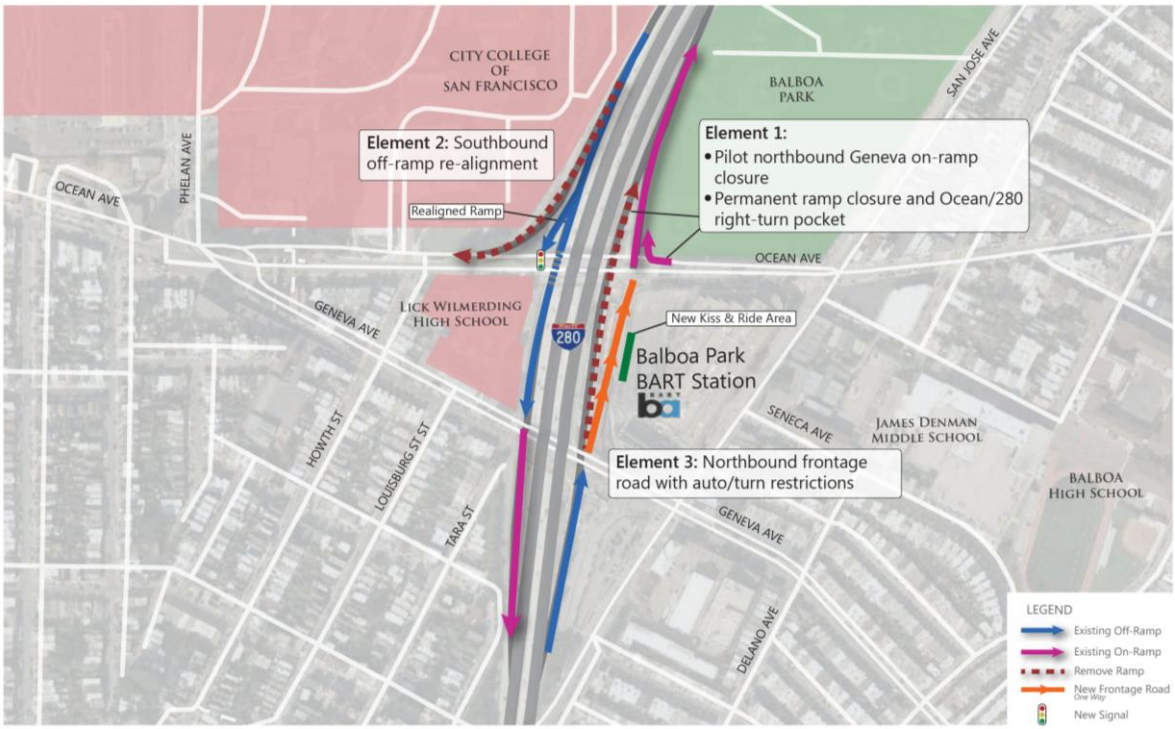

Figure ES-2: Alternative 1: Partial Split Interchange

Figure ES-3: Alternative 2: Consolidated Interchange on Geneva Avenue

Evaluation

The study evaluated the two alternatives to understand their performance in criteria relating to the study goals. The evaluation included a traffic operations analysis, a feasibility analysis for engineering and capital cost considerations, and a multimodal performance assessment to identify benefits and constraints. The results are shown in **Table ES-2**. The study found Alternative 1 to fulfill all study goals but that both alternatives involve important trade-offs. For instance, while Alternative 1 addressed multimodal conflict points at the I-280 southbound off-ramp intersection at Ocean Avenue and at the I-280 northbound on-ramp intersection at Geneva Avenue, these changes increased traffic and transit delays on Ocean Avenue. The study found Alternative 2's trade-offs to be especially dramatic; in removing all freeway-related traffic from Ocean Avenue, it improved transit and multimodal conditions there, but in doing so, it significantly exacerbated traffic congestion, delays and conflicts on Geneva Avenue.

The study therefore identified Alternative 1 as the higher-performing alternative. It also found Alternative 1 to be composed of elements that, if implemented individually, could spread over time the funds required for implementation and allow the agencies and community to select, at a more fine-grained level, which trade-offs are deemed worthwhile.

Table ES-2: Evaluation Summary

STUDY GOALS	ALTERNATIVE 1	ALTERNATIVE 2	NOTES
Goal #1: Reduce the negative impacts on the local community resulting from automobiles accessing the regional road network	-	↓	Alternative 1 would have a neutral impact, decreasing vehicle delay on Geneva and increasing vehicle delay on Ocean. While Alternative 2 would decrease delay on Ocean, it would substantially increase delay on Geneva, resulting in severe delays at both ramp intersections.
Goal # 2: Support efficient, reliable bus and light rail operations	-	↓	Alternative 1 would have a neutral impact and Alternative 2 would have a negative impact on transit operations since Muni vehicles would be subject to the intersection delays described above.
Goal #3: Enhance safety, accessibility, and convenience for pedestrians and bicyclists	↑	↑	Both alternatives have a net positive influence on the pedestrian and bicycle environment.
Goal #4: Minimize impacts to traffic going to/coming from I-280	-	-	Neither alternative shows notable impacts to freeway operations.
Goal #5: Develop feasible solutions that can be implemented within ten years	↑	↑	Both projects can be feasibly implemented within 10 years.

Notes:
"↑ " = positive impact; "—" = neutral impact; "↓ " = negative impact

Agency and Community Process

The Study engaged the community and key agency stakeholders to inform its findings and recommendations. The public agencies that own, manage, and operate transportation facilities and services within the Balboa Station Area, including Caltrans, BART, and SFMTA, participated in a Technical Working Group (TWG) which convened three times to provide guidance and feedback on the project goals, analysis and recommendations. In addition, Transportation Authority staff met individually with SFMTA, BART, and Caltrans staff throughout the project to discuss specific issues.

Outreach to the community and key stakeholders included two community workshops held at the City College of San Francisco, regular presentations to the Balboa Park Community Advisory Committee meetings, presentations to existing neighborhood groups, a 250-address email list for project updates, over 3,500 postcards mailed to residents in the area, and over 700 flyers distributed at local businesses and gathering spots.

Key messages heard through the outreach include the following, with further detail provided in Chapter 5 of this report:

1. Strong support for reducing multimodal conflicts around the station
2. Desire for continuity with previous station area planning
3. Concern about existing and potential delays to auto travel
4. Desire to accommodate all travel modes on both Geneva and Ocean Avenues

The Study incorporated this input into its evaluation and recommendation by seeking a circulation alternative that not only reduced multimodal conflicts but also minimized impacts to automobile travel and balanced the needs of all travel modes on both Geneva and Ocean Avenue.

Recommendations and Next Steps

While both Alternative 1 and Alternative 2 would improve pedestrian and bicycle conditions within the Study Area, Alternative 1 would provide a more balanced approach to the area, reducing conflicts between motorized and non-motorized users on both Ocean and Geneva Avenues. In addition, Alternative 1 provides new space directly adjacent to the station that can be used for kiss-and-ride activity, preventing that activity from occurring elsewhere and interfering with freeway ramp and transit stop operations.

The study recommends advancing **Alternative 1** as the higher-performing alternative for further study and implementation.

This study is the first stage of project development for proposed improvements, establishing a viable overall vision for re-configuring the I-280 Geneva and Ocean Avenue freeway ramps and the local transportation network to improve Balboa Park Station Area access and circulation. Several more steps lie between conclusion of this stage and the time improvements would be ready for implementation, including funding gathering and prioritization within overall city priorities, additional stakeholder and public outreach, environmental review including further transportation analysis, and detailed design and engineering.

In addition, given that some elements of Alternative 1 are independent of and may reflect stronger community and agency consensus than others, one step ahead is to identify parallel implementation tracks for the separate elements. For each element, potential subsequent phases of project development are shown in **Figure ES-4**. Overall, with agency and community consensus on all the elements of Alternative 1, a schedule could see the various elements constructed and potential pilot projects conducted within six years of the study approval date.

Figure ES-4: Potential Implementation Steps

As the project advances through the next steps of development and approvals, Transportation Authority staff will seek possible sources of funding for the project. Some funds are available from the Proposition K Sales Tax in its Balboa Park Station Access category; Chapter 6 of this report lists several additional potential sources.

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CHAPTER 1

INTRODUCTION

The Balboa Park Station Area is one of the busiest transit hubs in San Francisco, providing service to local and regional destinations via BART, Muni buses and light rail. However, it has long been recognized that the surrounding neighborhood has greater potential as a socially and economically vital place. Competing transportation functions and land uses have reduced the quality of the surrounding area. Specifically, six freeway ramps are sited directly adjacent to the BART Station and contribute to congestion, safety and access issues for all users. The Balboa Park Station Area Circulation Study identifies a set of implementable station- and freeway-related access and circulation improvements based on the conceptual vision set forth in the *Balboa Park Station Area Plan* and refined in subsequent technical analyses.

1.1 Study Purpose and Goals

This study is focused on potential re-configurations of the I-280 Geneva and Ocean Avenue freeway ramps and associated changes to the local transportation network that could further improve station access and circulation. This study also addresses other modes (i.e., transit, pedestrian and bicyclists) to the extent that modifications to the roadway network may affect them. The purpose of the Circulation Study is to identify potential ramp re-configurations to reduce multimodal conflicts at freeway ramp junctions and transit stops, with consideration toward automobile circulation for regional (i.e., freeway-bound) and local traffic, transit access and operations, kiss-and-ride (private automobile passenger drop-off and pick-up) activities; and pedestrian and bicyclist access.

While each previous study has built on the framework developed in the *Station Area Plan*, none has analyzed the potential vehicle circulation issues in depth. One of the primary purposes of this study is to identify a preferred circulation alternative that reduces the multimodal conflicts and identifies a feasible circulation alternative for freeway and local access. The five key goals of the project are to:

1. Reduce the negative impacts on the local community resulting from automobiles accessing the regional road network
2. Support efficient, reliable bus and light rail operations
3. Enhance safety, accessibility, and convenience for pedestrians and bicyclists
4. Minimize impacts to traffic going to/coming from I-280
5. Develop feasible solutions that can be implemented within ten years

1.2 Study Process

This Study began in the spring of 2012 and included a series of technical analysis and evaluation tasks to arrive at a final set of recommendations. The process was supported by an extensive public outreach effort that included partner agencies, key stakeholders and the community.

1.2.1 | Development of Goals and Objectives

The study, with input from the stakeholder agencies and the community, developed a set of goals and objectives to respond to the purpose and need of the study. This set of goals served as the policy framework for proposed freeway ramp reconfigurations and local network improvements. Chapter 4 describes these goals and objectives in detail.

1.2.2 | Existing Conditions

The study conducted a multimodal evaluation of existing conditions of 17 intersections within the study area to assess existing automobile traffic operations, transit delays, and pedestrian and bicycle conditions. Chapter 2 summarizes this information, which was used to develop the study's circulation improvements and assess the impact of the improvements on transit, traffic, pedestrians, and bicyclists.

1.2.3 | Alternatives Development and Evaluation

The study developed a number of initial alternatives to address multimodal conflicts and circulation issues within the Balboa Park Station Area based on findings from the existing conditions analysis. The process began with a planning charrette involving Transportation Authority staff and the consultant team, who worked collaboratively to develop several initial alternatives. A preliminary assessment conducted of the alternatives' engineering feasibility and operational performance resulted in elimination of some alternatives and refinement of others. The remaining two alternatives underwent an additional round of design evolution, the results of which are proposed in this report. Further analysis in a future phase will be needed to more fully assess the benefits and impacts of the alternative to be advanced.

1.2.4 | Agency and Community Process

Several public agencies operate transportation facilities and services in the station area, and decisions about each facility and service affect each other as well as overall circulation. The study aimed to bring these agencies together to build a coordinated and holistic vision for station area circulation. To do so, the study team created a Technical Working Group to enable discussions and consensus-building among the key stakeholder agencies, with supplemental in-depth discussions with particular agency staff as needed. **Table 1** shows the key agencies, including the funders of this study.

For community input, the study hosted two community workshops to inform the public about the study process and project alternatives, and to solicit feedback on initial ideas and recommendations. The study team also made presentations to existing neighborhood groups as well as the Balboa Park Community Advisory Committee (CAC). These outreach activities informed the analysis and final study recommendations.

Table 1: Study Partner Agencies

AGENCY	STATION AREA ROLE
Bay Area Rapid Transit District (BART)	Own and operate BART facilities, including kiss-and-ride lane
California Department of Transportation (Caltrans)*	Own and operate I-280 freeway and interchange ramps
San Francisco Municipal Transportation Agency (SFMTA)	Own and operate local street system Own and operate bus and light rail system and service
San Francisco County Transportation Authority (SFCTA)	Plan and fund transportation investments across all modes

* Fund contributor to this study

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CHAPTER 2

EXISTING CONDITIONS

This chapter describes the Station Area's existing conditions, as well as how those conditions may change with future planned land use and transportation projects. Where relevant, the chapter also identifies the critical needs that the Study aims to address through the Station Area design alternatives (discussed in Chapter 3).

2.1 Land Use Context

The Balboa Park BART Station is located in a predominantly residential area in southwest San Francisco. The station sits alongside I-280, which is a ground-level freeway that divides local neighborhoods in two. To the immediate north of the station is Balboa Park, a public park with playing fields. There is also a large concentration of schools and colleges in the immediate area, including the main campus for the City College of San Francisco. The 2009 *Balboa Park Station Area Plan* proposed the creation of a transit village on the SFMTA's Upper Yard on the southwest corner of Geneva and San Jose Avenues as well as building a deck over I-280 to support additional land development. While the decking of the freeway has been found to be infeasible due to engineering limitations and significant costs (on the scale of the Presidio Parkway project, which had a total cost of over $800 million), redevelopment of the Upper Yard is moving forward in partnership with BART, which owns the adjacent site.

2.2 Related Studies and Plans

The Balboa Park Station Area has been the subject of a number of planning and engineering feasibility studies, most of which were direct follow-up studies on issues identified in the *Balboa Park Station Area Plan* (2009), the comprehensive long-range planning vision for the station area. The two most recent technical studies – the *Balboa Park Station Pedestrian and Bicycle Connection Project* (2009) and the *Balboa Park Station Capacity and Conceptual Engineering Study* (2011) – identified short-term and medium-term projects to improve pedestrian access and transit operations at the station as well as evaluated the feasibility of the proposals for larger infrastructure improvements within the area. The latter effort also addressed specific elements of station access and rider experience at Balboa Park, including uncomfortable or limited pedestrian access to the station, passenger drop-off activities in problematic areas, and feasibility of the long-range neighborhood planning vision (e.g., construction above the rail yards). The SFMTA has pursued opportunities to improve transit travel times in the area, specifically along Geneva Avenue through its Transit Effectiveness Project (TEP) as well as enhanced pedestrian crossings, such as the Ocean/San Jose Avenue crosswalk.

While those studies advanced some of the pedestrian and transit improvements identified in the *Station Area Plan*, they also identified the need to do additional multimodal operations analyses to develop a longer-range, feasible and preferred circulation plan for the Ocean and Geneva Avenue freeway on- and

off-ramps. This study focuses specifically on auto operations at and near the station. This study also addresses other modes (i.e., transit, pedestrian and bicyclists) to the extent that modifications to the roadway network may affect them.

Table 2 summarizes the projects and studies that have examined issues and opportunities at the Balboa Park Station. This study relied heavily on these previous studies in order to advance and refine some of the circulation concepts previously considered.

Table 2: Related Balboa Park Station Area Studies and Projects

STUDY/PROJECT TITLE	LEAD AGENCY	YEAR	KEY ISSUES	STATUS OF PROJECTS
Completed Studies				
Daly City Fast Pass Extension Study	BART	2012	Evaluated the feasibility and potential transportation effects of extending the "in-city" BART/Muni Fast Pass agreement to Daly City Station	Recommended Strategies: • Further analyze a Bus+BART Discount • Further analyze a Muni Eco-Pass for participating organizations • Reject Muni "A" Fast Pass extension Reject creation of a new premium Muni Fast Pass
Capacity and Conceptual Engineering Study ("Capacity Study")	SFMTA	2011	Provided engineering feasibility analysis and planning recommendations for the long-range concepts identified in the Station Area Plan.	Improvements Identified and Subsequently Funded: • Construct Eastside Pedestrian Connection • Close Track Walkway near Ocean Avenue • Construct Accessible J/K platform on San Jose Avenue • Upgrade Existing J/K platform next to BART Station • Improve pedestrian connection between the BART station and San Jose Avenue • Straighten Geneva Avenue/NB I-280 crosswalk at BART Station • Add signal at Geneva Avenue/Howth St
Pedestrian and Bicycle Connections Project ("Ped and Bike Study")	SFMTA	2009	Identified and prioritized short-term access and safety improvements for pedestrians and bicyclists around the station, including recommended conceptual designs.	Recently Completed: • Westside Walkway between Ocean Avenue and the BART Station • Ocean Avenue/NB I-280 Crosswalk • Westbound Ocean Avenue Bike Lane • Westbound Ocean Avenue Bus Stop at BART Station • Pedestrian beacon at southbound Ocean Avenue off-ramp

STUDY/PROJECT TITLE	LEAD AGENCY	YEAR	KEY ISSUES	STATUS OF PROJECTS
Station Area Plan and EIR	SF Planning	2008/09	• Established preferred broad, long-term land use and circulation goals for Balboa Park neighborhood • Identified the need for improvements to connectivity for transit passengers • Identified the creation of a transit village on the Upper Yard and decking of I-280	The Station Area Plan is the most current long-range vision for the Station Area.
Station Profile Study	BART	2008	Summary of BART station access characteristics by station and system-wide	
BART Comprehensive Station Plan	BART	2002	• Identified a vision for the BART station consistent with the City's prior Station Area Plan, including an intermodal transit village concept • Focused on BART access to/from Ocean Avenue, including the Westside Walkway along the Muni tracks	
Forthcoming Studies				
Transit Effectiveness Project (TEP)	SFMTA	On-going	• Identifies short- and long-range transit improvements to make Muni operate more efficiently and reliably • Identifies specific route changes within the Balboa Park study area	Proposed Improvements: • Reroute 29 Sunset from Geneva to Ocean • Reroute the 54 Felton through Excelsior • Create M Ocean View Short Line • Make Various Headway Modifications • Add WB transit-only lane on Geneva Ave between Delano Ave and the NB I-280 ramps. • Add signal at Geneva Ave/Cayuga Ave
Geneva Avenue Transit Travel Time Reduction Project ("TTRP")	SFMTA	On-going	• Identifies short-term signal operation changes to improve transit operations on Geneva Avenue	

Source: Prepared by Fehr & Peers, 2012

2.3 Transportation Context and Needs

This section describes the existing and future transportation context within the Station Area, as shown in **Figure 1**. It begins by describing the multimodal street network, addressing Geneva Avenue and Ocean Avenue in turn. Existing conditions are then discussed by mode. Finally, the key access needs identified in the early part of the study are described.

Figure 1: Study Area Transportation Context

2.3.1 | Geneva Avenue

Geneva Avenue is the neighborhood's key east-west arterial, carrying the most automobile and transit bus traffic of any street in the study area. Pedestrian activity is particularly high on Geneva Avenue in the immediate vicinity of the BART Station. Turning automobiles at the intersections of Geneva Avenue/I-280 ramps and Geneva Avenue/San Jose Avenue frequently conflict with pedestrians crossing at these locations (see Figure 2). Automobiles turning onto I-280 also frequently conflict with through bus service along Geneva Avenue, for which all lines in the area (8X Bayshore Express, 8BX Bayshore B Express, 29 Sunset, 43 Masonic, 54 Felton, 88 BART Shuttle, 91 Owl) use to provide access to the BART Station.

Figure 2: Intersection at Geneva Avenue and I-280 NB On-Ramp

2.3.2 | Ocean Avenue

Ocean Avenue is the other key east-west arterial in the neighborhood, although it carries lower volumes of travelers compared to Geneva Avenue. Ocean Avenue takes precedence over Geneva Avenue as the primary east-west bicycle route with a mix of Class II bike lanes and Class III bicycle routes in each direction. Bicycles conflict with automobiles turning to access the freeway as well as with light rail vehicles (LRVs) which turn to enter and exit the Green Yard. On Ocean Avenue, one bus route (49 Mission/Van Ness) operates curbside and one LRV route (K Ingleside) operates (west of San Jose Avenue) in center-running LRV-only lanes.

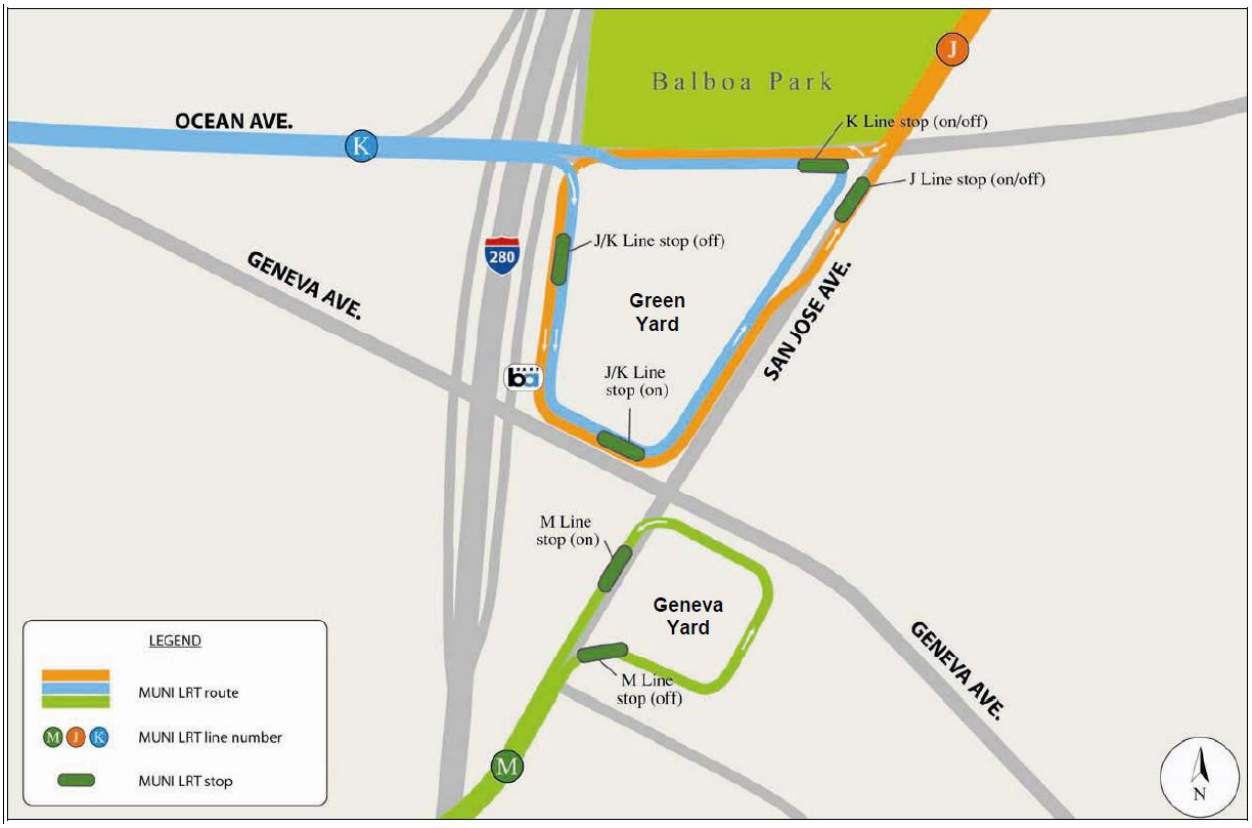
2.3.3 | Transit Conditions

The study area is served by regional BART rail service and citywide Muni bus services. **Figure 3** presents the existing transit network in the vicinity of the Balboa Park BART Station. **Table 3** provides details on the transit service, hours of operation, and frequencies for the BART and Muni service in the Balboa Park BART Station area. **Table 4** shows Muni bus and light rail ridership by transit stop.

Total daily ridership at the transit stops varies substantially depending on the number of transit routes serving the stop and whether the stop is a local stop serving the neighborhood or a transfer point to other bus or rail lines. The transit stops on Geneva Avenue between the Muni/BART station entrance and San Jose Avenue serve over 11,000 Muni passengers daily, whereas the stop at the station on Ocean Avenue serves only about 3,000 passengers daily. Realignment of the 29 Sunset and 54 Felton to Ocean

Avenue as part of the TEP will substantially increase the number of passengers using the Ocean Avenue entrance to the station; however, Geneva Avenue will continue to serve a substantial number of transit passengers. The bus routes with the greatest number of passengers in the study area are the 8X Bayshore Express, the 43 Masonic, and the 49 Van Ness-Mission, with a total of nearly 5,000 boardings and alightings per day in the study area. Of the light rail lines serving the study area, the M Ocean View has the highest ridership, with about 3,300 total boardings and alightings per day.

The Balboa Park BART Station is one of the highest volume intermodal transfer stations within the BART/Muni system. There are a number of existing constraints related to station and transit stop design/location that affect the efficiency and operations of transit in the vicinity of the Balboa Park BART Station.



Source: *Capacity Study*, SFMTA, 2011

Figure 3: Light Rail Vehicle Circulation at Balboa Park BART Station

TRANSIT STOP/STATION DESIGN - The primary entrance to the Balboa Park BART and Muni Metro Station is located on Geneva Avenue immediately east of the I-280 northbound off-ramp and on-ramp. Bus stops are located on both sides of Geneva Avenue, just east of the BART station. Most Muni bus routes that operate in this area stop at this location. However, there are several other bus and rail stops located on surface streets in the study area, including a major off-street terminal loop for buses and electric trolley buses at Ocean and Phelan Avenues. Two lines in particular are more disconnected from the station entrance: the M Ocean View's terminal stop is located 600 feet south of the Station entrance on San Jose Avenue, and the 49 Van Ness stops 350 feet north of the station on Ocean Avenue. The construction of the Westside Walkway at the station in 2010 improved north-south access; however, M

Ocean View riders must cross San Jose Avenue and walk two or three minutes to BART or other Muni bus routes on Geneva.

Passenger waiting areas for the J Church and K Ingleside light rail lines are located just to the east of the BART station, north of Geneva Avenue. Due to the design of the station complex and the high volume of light rail vehicles serving it, there is limited waiting space for passengers. In addition to loading and unloading passengers in the below-grade trench-like platform area for the J Church and K Ingleside lines, the site is also used for LRV layovers. The convergence of transit operations at this single location provides numerous services and routes for the community but also presents an uncomfortable pedestrian environment with potential conflicts between LRVs and passengers, particularly at the San Jose/Geneva intersection where LRV can exit the station area.

Table 3: Weekday BART & Muni Transit Service in the Balboa Park Bart Station Area

ROUTE	DESTINATION	DAILY HEADWAY RANGE (MIN.)	AM/PM PEAK HOUR HEADWAY (MIN.)	WEEKDAY HOURS OF OPERATION
BART				
Richmond-Millbrae		15-20	15	4:00 am – 1:00 am
Fremont-Daly City		15-20	15	
Dublin/Pleasanton-Millbrae		15-20	15	
Pittsburg/Bay Point-SFO		15-20	15	
Muni Light Rail				
J Church	Balboa Park and downtown San Francisco via Church St and the Market St Subway (from the Van Ness Station to the Embarcadero Station)	9-20	9 / 7	5:00 am – 12:50 am
K Ingleside	Balboa Park and downtown San Francisco via Ocean Ave, Geneva Ave, Junipero Serra Blvd, and the Market St Subway (from the West Portal Station to the Embarcadero Station). After the Embarcadero Station, the K Ingleside switches names to the T Third line	9-20	10 / 9	5:00 am – 12:50 am
M Ocean View	Balboa Park and downtown San Francisco via San Jose Ave, Broad St, Randolph St, 19th Ave, and the Market St Subway (from the West Portal Station to the Embarcadero Station)	9-20	9 / 9	5:00 am – 12:50 am
Muni Bus				
8X Bayshore Express	Balboa Park to Downtown San Francisco via Bayshore Blvd and US-101	8-15	8 / 8	4:40 am – 1:15 am
8BX Bayshore Express		8	8 / 8	6:20 – 10:00 am; 3:30 – 7:50 pm
29 Sunset	Visitacion Valley to Presidio via Balboa Park and Sunset District	10-20	10 / 10	5:15 am – 1:30 am
43 Masonic	Balboa Park BART to Forest Hill (serves CCSF campus)	10-30	10 / 12	5:00 am to 1:30 am
49 Van Ness-Mission	Balboa Park to North Point via Mission St and Van Ness Ave	8-20	8 / 8	4:30 am – 1:15 am
54 Felton	Daly City BART to Hunters Point via Balboa Park	20-30	20 / 20	5:30 am – 1:00 am
88 BART Shuttle	San Francisco State University to Balboa Park BART via Mission St	20	20 / 20	6:40 – 9:00 am; 4:00 to 6:40 pm
Shuttle Service				
Brisbane-Crocker Park BART/Caltrain Shuttle	Balboa Park BART Station to the Brisbane - Crocker Industrial Park via the Bayshore Caltrain Station.	10-30	--	5:45 am – 9:35 am
Red Brisbane		20-60	--	3:15 pm – 7:30 pm
Blue Brisbane		10-30	--	5:45 am – 9:35 am
Sierra Point	Balboa Park BART Station to Sierra Point Office Park via US 101	10-15	--	7:00 am – 9:45 am; 4:00 pm – 6:45 pm
Paratransit				
San Francisco Paratransit	--	On-Call	On-Call	24 hours/day; 7 days/week

Source: SFMTA, 2012; LCW Consulting, 2012; Nelson\Nygaard, 2012

Table 4: Daily Muni Ridership by Transit Stop

STREET/STATION STOP	DAILY RIDERSHIP		
	BOARDINGS	ALIGHTINGS	TOTAL
Geneva Avenue – Eastbound[1]			
Ocean Ave & Geneva Ave	1,120	220	1,340
Geneva Ave & Howth St	160	110	270
Balboa Park BART Station/Muni Metro Terminal	2,990	1,100	4,090
Geneva Avenue – Westbound[1]			
Balboa Park BART station/Muni Metro Terminal	1,270	2,980	4,250
Geneva Ave & Howth St	80	340	420
Phelan Loop at SFCC	0	920	920
Ocean Avenue – Eastbound[2]			
Ocean Ave & Geneva Ave	450	10	460
City College Pedestrian Bridge	60	350	410
Ocean Ave & Howth St	300	10	310
Balboa Park BART Station/Ocean Avenue	50	1,180	1,130
Ocean Ave & San Jose Ave	220	50	270
Ocean Avenue – Westbound[2]			
Ocean Ave & San Jose Ave	40	220	260
Balboa Park BART Station/Ocean Avenue	820	0	820
Ocean Ave & Howth St	20	400	420
City College Pedestrian Bridge	470	60	530
San Jose Avenue – Northbound[3]			
San Jose Ave & Geneva Ave	0	1,530	1,530
Geneva Terminal	0	30	30
Green Division Yard	650	0	650
San Jose Ave & Ocean Ave	210	20	230
San Jose Avenue – Southbound[3]			
San Jose Ave & Ocean Ave	10	170	180
Green Division Yard	0	410	410
Geneva Terminal	30	0	30
San Jose Ave & Geneva Ave	1,750	0	1,750

Notes:
1. Includes 8x, 8BX, 29, 43, 54, and 88 (note pending data from SFMTA: 54 Felton not included in eastbound ridership, and 29 Sunset not included in westbound ridership)
2. Includes 49 Mission-Van Ness and K Ingleside.
3. Includes J Church and M Ocean View
4. Note pending data from SFMTA: 29 Sunset does not include southbound ridership
Source: SFMTA, 2007-2011; Fehr & Peers, 2012

On Ocean Avenue, the traffic signals stop all other traffic to allow LRVs to cross into the light rail yard, causing intermittent congestion at the northbound Ocean Avenue on-ramp intersection, as the LRVs enter the Muni Green Yard and hold traffic. When a number of light rail vehicles need to enter the site, this can cause substantial congestion on Ocean Avenue. When Muni vehicles enter the Green Yard from the west, eastbound traffic, both through-traffic on Ocean Avenue and left-turning automobiles traveling to the freeway, is held with a red light. According to scheduled headways, this occurs approximately seven to eight times per hour during the peak hours. Transit vehicles exiting the Green Yard at this intersection cause similar delay to automobiles along Ocean Avenue.

On Geneva Avenue, the high traffic volumes accessing I-280 freeway ramps and the bus activity at the station entrance conflict, resulting in transit vehicle delay. Transit vehicles pull out of the travel lane to pick up passengers on both the north and south sides of Geneva, but high traffic volumes make re-entering the travel lane challenging. Automobile queues on Geneva also result in additional travel delay. SFMTA is currently working on travel time reduction proposals for Geneva Avenue to address some of the existing issues in the area.

INDEPENDENT SHUTTLES - As indicated in **Table 3**, four independent shuttles travel to the Balboa Park BART Station. Employer shuttles currently use the section of Geneva Avenue adjacent to the entrance of the BART station as a loading and unloading location as well as for shuttle vehicle layovers. Because there is no official shuttle loading area, and shuttle operators may not perceive the nearby kiss-and-ride area as convenient, they wait along Geneva Avenue and reduce the available space for Muni buses to load and unload at the Balboa Park BART Station. Depending on bus and shuttle traffic, the loading area can reach capacity and cause queues that block through-traffic on Geneva Avenue. The Transportation Authority is currently evaluating the role these shuttles provide within San Francisco.

2.3.4 | Auto Conditions

The seventeen study intersections represent those most directly affected by traffic congestion and transit operations in the vicinity of the Balboa Park BART Station. They include those intersections adjacent to I-280 ramps to the north and south of the station, as circulation improvements may result in shifts in traffic patterns that could impact intersection operations.

Existing intersection operating conditions were evaluated for the peak hour (the hour of the day with the highest traffic volumes) of the PM peak period (4:00 to 6:00 PM). Intersection turning movement counts were obtained from previous studies conducted in the area, including the Station Area Plan and more recent analyses, and are shown in **Figure 4**.

The study assessed traffic conditions using intersection Level of Service (LOS) methodology. This method determines the average delay at the intersection and assigns a letter grade for that performance from A (lowest delay) to F (highest delay) and is summarized (for signalized intersections) in **Table 5**. The results of the intersection LOS analysis for the existing weekday PM peak hour conditions are presented in **Figure 5**. Appendix A contains the intersection LOS calculation sheets. During the PM peak hour, all but two intersections in the study area operate satisfactorily, i.e. at LOS D or better. Two study intersections operate at LOS E: Geneva/Cayuga and the Geneva/I-280 NB on-ramp. At Geneva Avenue/I-280 NB ramps, the LOS E reflects the peak period congestion associated with passenger drop-offs and pick-ups, transit service, and pedestrian movements. Also, there are anecdotal reports that the northbound and southbound off-ramp queues for both Ocean and Geneva sometimes extend upstream onto the freeway.

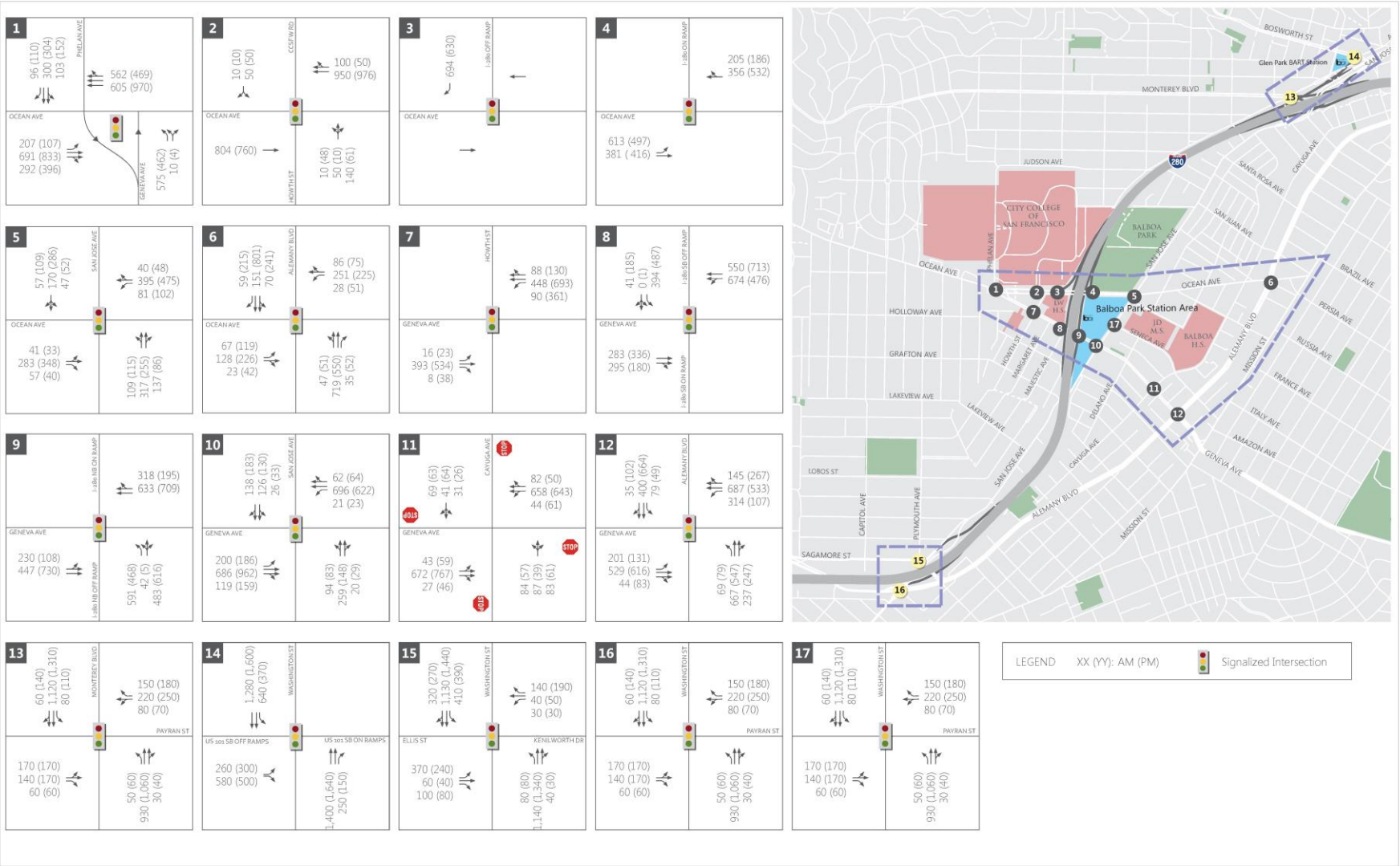


Figure 4: Peak Hour Intersection Lane Configurations, Traffic Control, and Vehicle Volumes

Table 5: Signalized Intersection Level of Service Criteria

LEVEL OF SERVICE	DESCRIPTION	AVERAGE CONTROL DELAY PER VEHICLE (SECONDS)
A	Operations with very low delay occurring with favorable progression and/or short cycle length.	< 10.0
B	Operations with low delay occurring with good progression and/or short cycle lengths.	10.1 – 20.0
C	Operations with average delays resulting from fair progression and/or longer cycle lengths. Individual cycle failures begin to appear.	20.1 – 35.0
D	Operations with longer delays due to a combination of unfavorable progression, long cycle lengths, or high volume-to-capacity (V/C) ratios. Many vehicles stop and individual cycle failures are noticeable.	35.1 – 55.0
E	Operations with high delay values indicating poor progression, long cycle lengths, and high V/C ratios. Individual cycle failures are frequent occurrences. This is considered to be the limit of acceptable delay.	55.1 - 80.0
F	Operations with delays unacceptable to most drivers occurring due to over-saturation, poor progression, and/or very long cycle lengths.	> 80.1

Source: Highway Capacity Manual – Special Report 209 (Transportation Research Board, 2000).

In general, the intersections in the area were observed to operate with less delay and queuing during the summer as compared to the school year when automobile and pedestrian volumes in the area are higher.

Figure 5: PM Peak Hour Automobile Level of Service

2.3.5 | Pedestrian Conditions

Major pedestrian destinations within the Balboa Park BART Station vicinity include the City College of San Francisco, Lick-Wilmerding High School, Balboa Park, and neighborhood retail along Ocean Avenue to the west of the study area. The I-280 freeway ramps on Ocean and Geneva Avenue are a major impediment to safe, comfortable walking trips around the Station Area (see Figure 2 above and Figure 6 below). In addition, high pedestrian volumes at these crossings delay automobiles turning off and on to the ramps. Pedestrian volumes are shown in **Figure 7**.

Figure 6: Intersection at Ocean Avenue and I-280 SB Off-Ramp

Efforts to identify pedestrian safety issues and improve conditions have been an important citywide focus in recent years. As part of the WalkFirst pedestrian safety analysis, the San Francisco Department of Public Health (SFDPH) has identified trends in pedestrian-vehicle collision data for 2005 through 2011 across the city. Based on this analysis, SFDPH classified key streets and intersections where high numbers of pedestrian injuries occur as "High Injury Corridors" and "High Collision Density Intersections." Collision records from this dataset reveal the following findings for the Balboa Park BART Station Area:

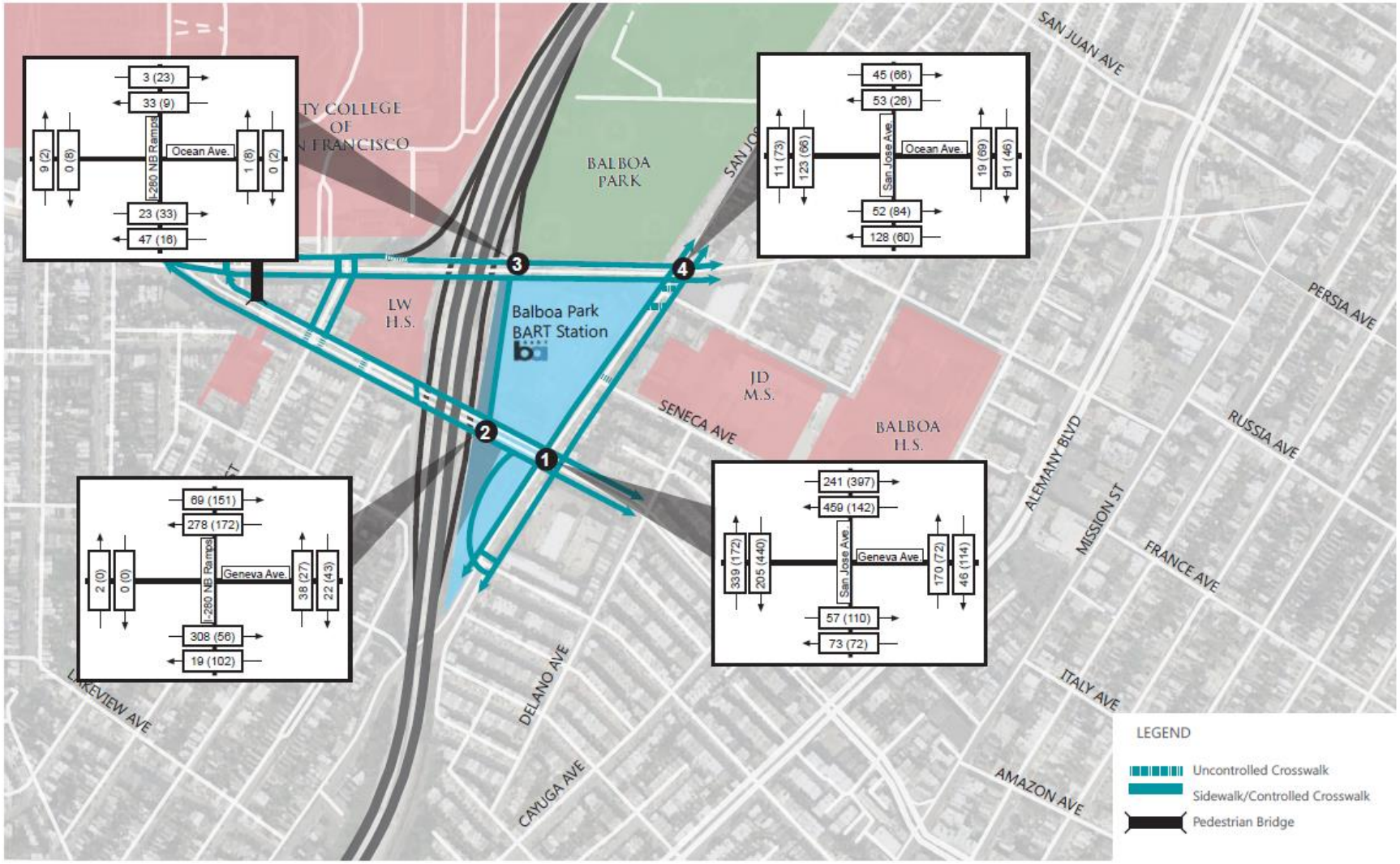
- The majority of pedestrian-vehicle collisions occurred at three intersections: Geneva/Ocean Avenue, Geneva Avenue/I-280 ramps, and Geneva/San Jose Avenue.
- Geneva Avenue has been identified as a High Injury Corridor for the length of the project study area, and the intersection of Ocean Avenue/I-280 southbound off-ramp has been identified as a High Collision Density Intersection.
- Collisions are attributed to a variety of different factors, including driver failure to yield, pedestrians crossing against crosswalk signal, pedestrians crossing not in crosswalk and midblock crossings.
- Half of all parties involved are between the ages of 15 and 32, indicating that students and student-age pedestrians are highly represented in these pedestrian collisions.

These findings reflect high levels of pedestrian and vehicle activity, at key intersections and corridors, the demographics of the local community, and the design of the freeway ramps and local street network. Collision locations are illustrated in **Figure 8**.

2.3.6 | Bicycling Conditions

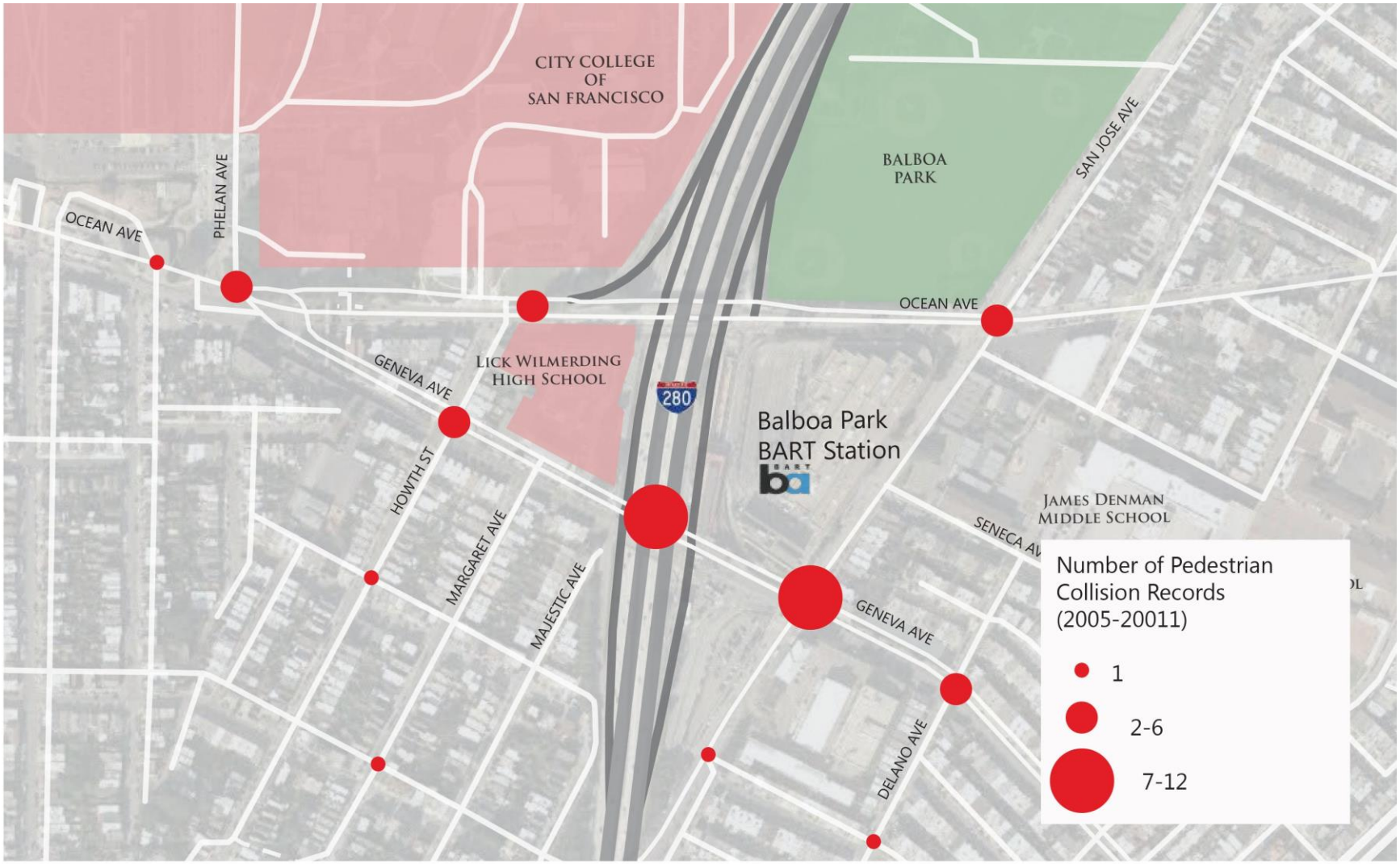
The Balboa Park BART Station Pedestrian and Bicycle Connection Project conducted in 2009 observed more bicyclists on Ocean Avenue than on Geneva Avenue and observed that bicycle volumes are generally low in the Balboa Park study area.[10] The low bicycle volumes were generally attributed to heavy traffic volumes, challenging topography, and the lack of on-street bicycle facilities. Bicycle volumes are shown in **Figure 9**.

[10] *Final Report, Balboa Park BART Station Pedestrian and Bicycle Connection Project*, SFMTA, October 2009.



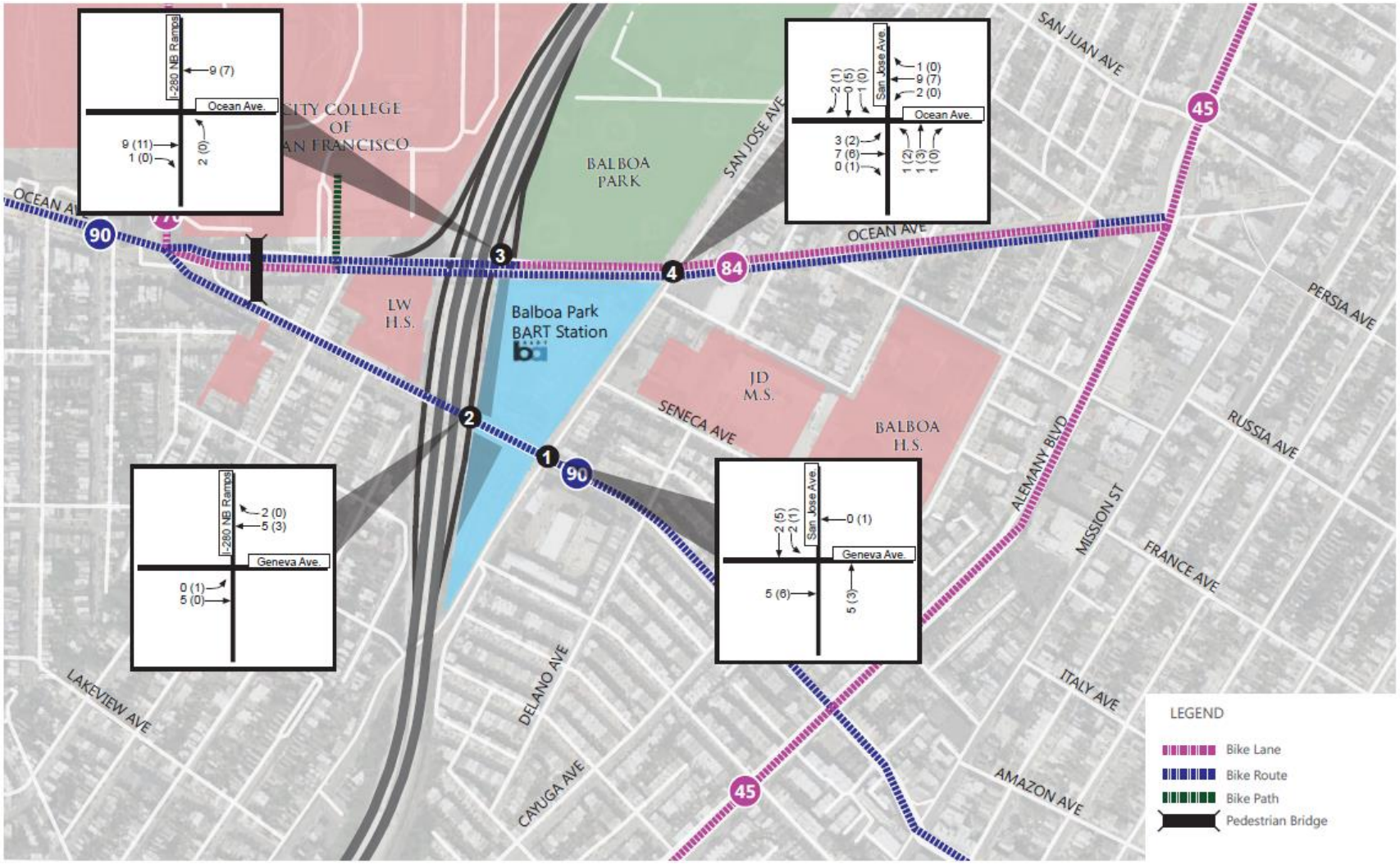
Source: Fehr & Peers, March 2009

Figure 7: Pedestrian Volumes in 2009: AM (PM) Peak Hour



Source: SWITRS, SFDPH

Figure 8: Pedestrian-Vehicle Collisions in the Balboa Park BART Station Study Area (2005-2011)



Source: Fehr & Peers, March 2009

Figure 9: Bicycling Network with AM (and PM) Peak Hour Volumes

2.3.7 | Kiss-and-Ride Conditions

Private automobile drop-offs and pick-ups of transit passengers, also referred to as kiss-and-ride activity, represent an important component of the station area circulation. BART's *2009 Transit Passenger Intercept Survey* noted that seven percent of all users of the Balboa Park BART Station are dropped off at the station[11], a figure representing several hundred passengers per day. The existing designated kiss-and-ride area is a two-lane facility with entrances and exits at Geneva Avenue, across from the main BART station entrance, and San Jose Avenue south of Geneva Avenue. The capacity is estimated at approximately 40 passenger automobiles.

The study collected observations of kiss-and-ride activity for multiple days in the fall of 2012 for both the AM and PM peak periods in order to better understand usage patterns. The study team found that the kiss-and-ride area serves about 58 percent of kiss-and-ride activity in the AM peak period and 84 percent of kiss-and-ride activity in the PM peak period. In the AM peak period, the existing kiss-and-ride area is underutilized, likely because of the out-of-direction travel required in order to utilize it. Many drivers would need to make a considerable detour before dropping off their passengers. Much of the activity was observed to occur at the curb on Geneva Avenue, including at the bus stops, at the curb on San Jose Avenue, and even on the northbound Geneva Avenue off-ramp during the red light phase, with passengers walking up the ramp to access the station.

In terms of the origins and destinations of drivers before and after their drop-offs, two-thirds of the drop-offs originated from the south (either from I-280, San Jose Avenue, or Niagara Avenue), half of which were from I-280. Only 12 percent of all drivers were observed to access the freeway after drop-off, of which almost all went northbound. A plurality of drivers, 45 percent, headed to the south after dropping off passengers, almost exclusively along San Jose Avenue. Five routes accounted for half of the drop-off activity in the AM peak hour. The five routes are shown in **Figure 10**.

[11] *Balboa Park BART Station Capacity and Conceptual Engineering Study*, SFMTA, 2011.

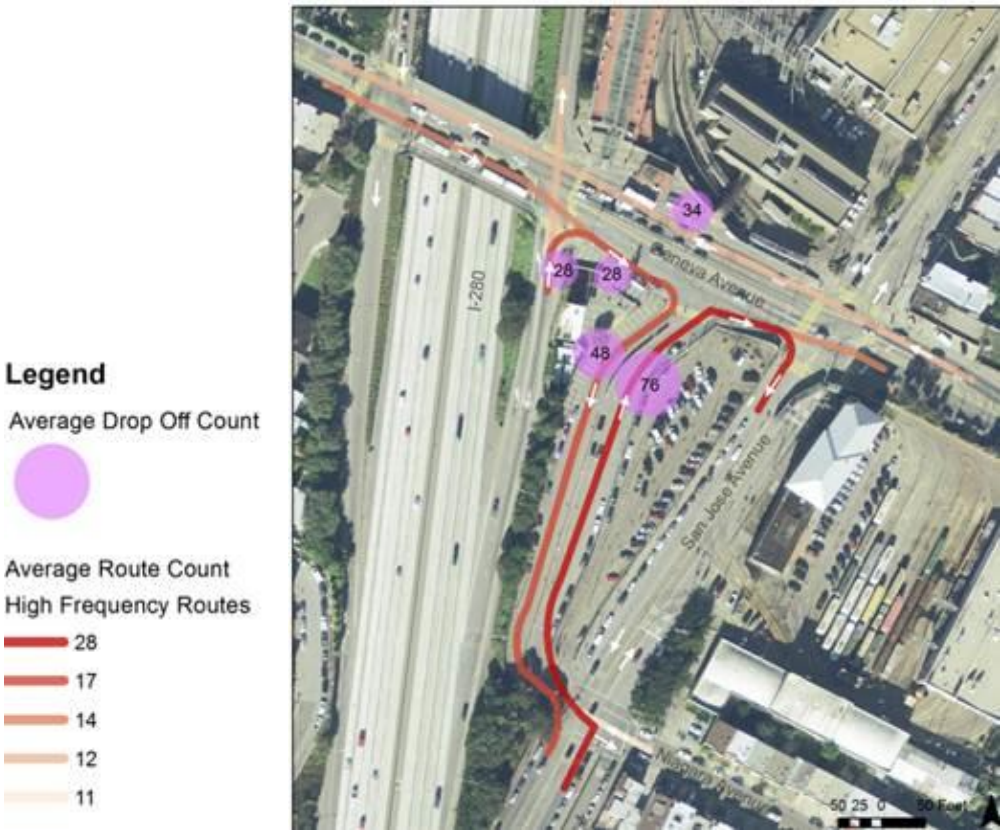


Figure 10: AM Peak Drop-Off Route Frequencies, Top 50%

In the PM peak period, when drivers need a place to wait for their passengers to arrive, the kiss-and-ride activity is more concentrated in the designated area. During the PM peak hours, the kiss-and-ride area is close to but not at capacity, with no queuing observed. Because of the time delay between the arrival of an automobile and its departure after obtaining its passenger, it was not feasible to observe the origin and destination of automobiles before and after the pick-up.

As a final note, BART owns and operates the kiss-and-ride area and has recently signaled plans to eliminate the kiss-and-ride area in order to develop affordable housing on that site. Therefore, it is likely that an alternative site for kiss-and-ride activity will be needed in the near future.

2.3.8 | Multimodal Conflicts

The local street network surrounding Balboa Park Station is highly multimodal. The streets accommodate high volumes of automobiles (many of which access the nearby I-280 ramps), Muni buses, Muni light rail, bicyclists, and pedestrians. Several studies have been undertaken in recent years that define many of the multimodal conflicts (see **Table 2** above). The *Station Capacity Study* and *Pedestrian and Bike Connections Study* identified potential constraints of concepts discussed in the *Station Area Plan*.

The key multimodal issues are shown in **Figure 11** and include:

1. **The southbound I-280 off-ramp onto Ocean Avenue is a high-speed, uncontrolled ramp.** It provides automobile access to westbound Ocean Avenue only. The ramp configuration creates an unsafe condition for pedestrians. Bicyclists and buses that are attempting to shift to the right lane immediately past the ramp intersection also face challenging operations and safety conditions. A realignment of the ramp to square off the intersection with a new traffic signal would improve pedestrian and bicyclist safety and also create an opportunity for automobiles exiting the freeway onto Ocean Avenue to turn left and head eastbound.

2. **The I-280 interchange has closely-spaced southbound off- and northbound on-ramps**. While distributed ramps disperse automobile traffic throughout multiple roads, the freeway-related traffic patterns negatively impact other travel modes. Freeway access at Ocean Avenue provides access to local destinations, whereas Geneva Avenue serves as a major transit transfer hub. Reducing the number of ramps may create opportunities to improve transit service, passenger drop-offs, and the pedestrian and bicycle experience. However, no ramp closure is without potential impacts to the local circulation network.

3. **The I-280 northbound on- and off-ramps on Geneva Avenue conflict with pedestrian activity**. Passenger drop-offs along the off-ramps create safety issues and contribute to queues. In addition, high pedestrian volumes at the ramp crossings conflict with automobile turning movements and cause delay along Geneva Avenue and the off-ramp. Automobile volumes and the number of conflicts could be reduced at this intersection by reconfiguring one or more of the freeway ramps.

4. **I-280 northbound freeway access on Ocean Avenue** conflicts with light rail vehicles entering and existing the Muni yard, bicycles using the westbound bicycle lane, and pedestrians. This intersection experiences delays that may be improved through changes to circulation, lane configurations, and traffic signal timing.

5. **Geneva Avenue is the most congested street within the study area**. The congestion negatively impacts automobile movements, SFMTA bus operations, bicycle travel, and pedestrian activity. The SFMTA's TEP recommendations to relocate some bus activity to Ocean Avenue are assumed as part of a Baseline scenario as discussed in Chapter 3.

6. **The designated passenger drop-off and pick-up (kiss-and-ride) area is underutilized, particularly during the AM peak period, and its owner, BART, has signaled a desire to remove it for new development on the site, posing a challenge for future PM peak period pick-up activity.** Morning drop-offs occur at locations where that activity creates multimodal conflicts, such as bus stops and freeway off-ramps. Afternoon pick-ups generally occur in the designated area, but that area has been slated for other future uses. Alternative locations for kiss-and-ride activity are needed.

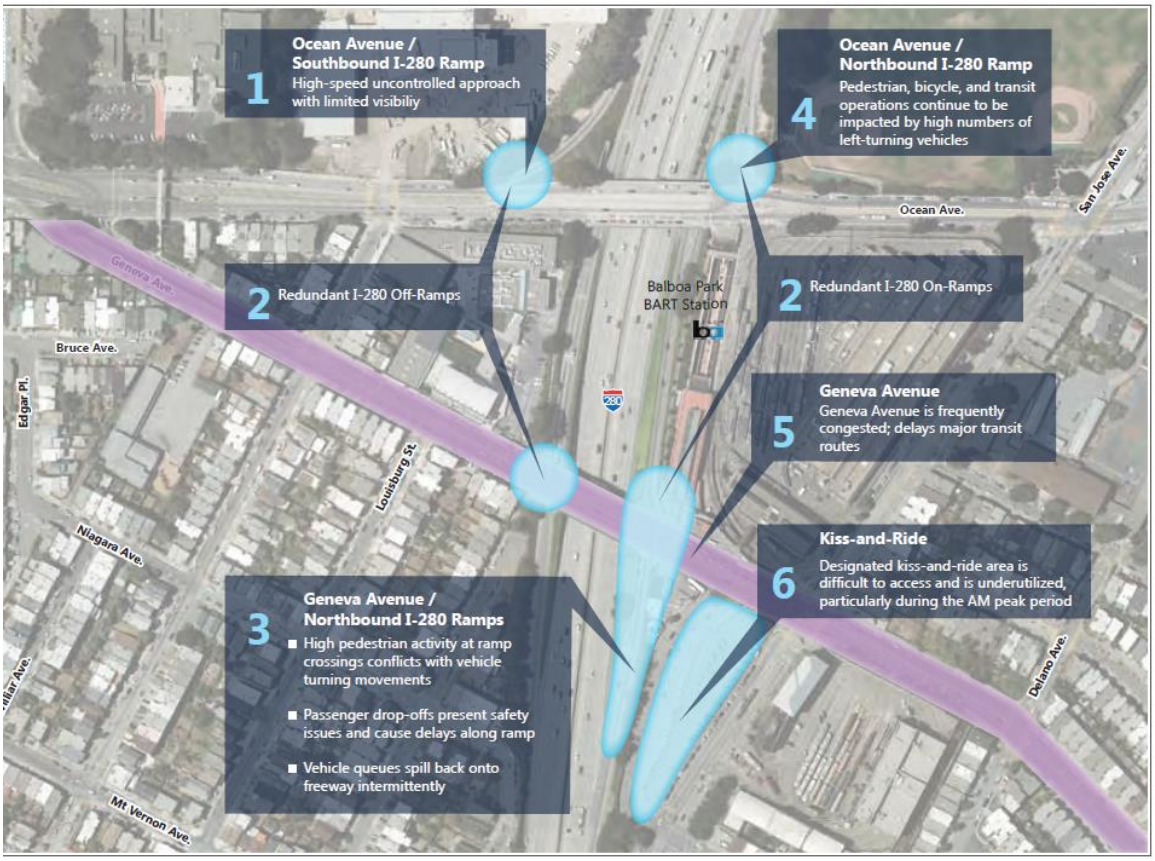


Figure 11: Key Multimodal Issues

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CHAPTER 3

STUDY ALTERNATIVES

A number of conceptual design alternatives were developed to improve circulation, access, and safety around the Station Area. In particular, alternatives were developed to explore ways to accommodate station design challenges such as providing convenient access to transit and connections between transit services, providing adequate freeway ramp access for automobiles, providing kiss-and-ride areas, and improving pedestrian and bicycle accessibility and safety. These alternatives were then evaluated to understand their performance on a range of criteria developed to assess consistency with the Balboa Park Station Area vision. This chapter describes the alternatives development process and the resulting concepts. This chapter also contains details on other planned local network improvements and enhancements to kiss-and-ride loading around the Station Area. The evaluation of the alternatives, including a discussion of potential traffic impacts, is provided in Chapter 4.

3.1 Alternatives Development Process

Based on findings from the Circulation Study Existing Conditions section, a series of design alternatives were developed to address multimodal conflicts and circulation issues within the Balboa Park Station Area. The process began with a planning charrette involving Transportation Authority staff and the Consultant team, who worked collaboratively to develop several initial alternatives. These alternatives were then refined through feedback from the Technical Working Group (TWG), which included representatives from SFMTA, BART and Caltrans; follow-up meetings with Muni Operations staff; and by the Balboa Park Community Advisory Committee (CAC).

Study Goals

- Reduce the negative impacts on the local community resulting from automobiles accessing the regional road network
- Support efficient, reliable bus and light rail operations
- Enhance safety, accessibility, and convenience for pedestrians and bicyclists
- Minimize impacts to traffic going to/coming from I-280
- Develop feasible solutions that can be implemented within ten years

Using the study goals as a guiding reference, a number of potential design concepts were explored, largely involving different combinations of modal priority along Geneva and Ocean Avenues. For example, the team discussed options to separate automobile traffic and transit routes across Geneva and Ocean Avenues. In addition, options to better accommodate kiss-and-ride activities, such as converting current on-street parking spaces and repurposing space adjacent to the freeway ramps, were identified. Based on these initial conversations, concepts were distilled into a set of primary alternatives and secondary or "modular" alternatives.

For each alternative, the dominant feature included some kind of modification to the freeway ramps. Based on a preliminary evaluation process, two alternatives were carried forward for more detailed analysis.

3.2 Conceptual Design Alternatives

The proposed alternatives incorporate the Baseline network improvements, and feature targeted freeway ramp closures and/or modifications designed to better manage congested locations and reduce pedestrian, bicycle, and transit conflicts at the ramp intersections. Where possible, kiss-and-ride operations have been considered and accommodated. The alternatives are listed below:

- Baseline Alternative
- Alternative 1: Partial Split Interchange
  - Element 1: Close northbound Geneva Avenue on-ramp (initiated as a pilot project)
  - Element 2: Realign southbound Ocean Avenue off-ramp into a "T" intersection
  - Element 3: Install kiss-and-ride northbound frontage road between ramps
- Alternative 2: Consolidated Interchange on Geneva Ave
  - Element 1: Close the northbound Ocean Avenue on-ramp
  - Element 2: Close the southbound Ocean Avenue off-ramp
  - Element 3 [Potential]: Construct a new northbound transit- and bike-only frontage road between Geneva and Ocean to accommodate a transit stop with direct connection to the BART Westside Walkway.

3.2.1 | Baseline Alternative

The Baseline alternative includes seven previously identified local network improvements that SFMTA is moving forward to implement (see **Table 6**). The Baseline alternative represents near-term future conditions in the Study Area once the City has implemented each of the improvements. For the purposes of this study, the Baseline is used as a point of comparison for the two alternatives, both of which incorporate all of the Baseline improvements.

3.2.2 | Alternative 1: Partial Split Interchange

Alternative 1, shown in **Figure 12**, is a partial split interchange between Ocean and Geneva Avenues, in which northbound I-280 traffic would exit onto Geneva Avenue but enter the freeway from Ocean Avenue. Southbound traffic would still be able to exit to both Geneva and Ocean Avenues while only entering from Geneva Avenue. The concept here is to accommodate all travel modes on both Ocean and Geneva Avenues while eliminating some key multimodal conflict points on both Geneva and Ocean Avenues.

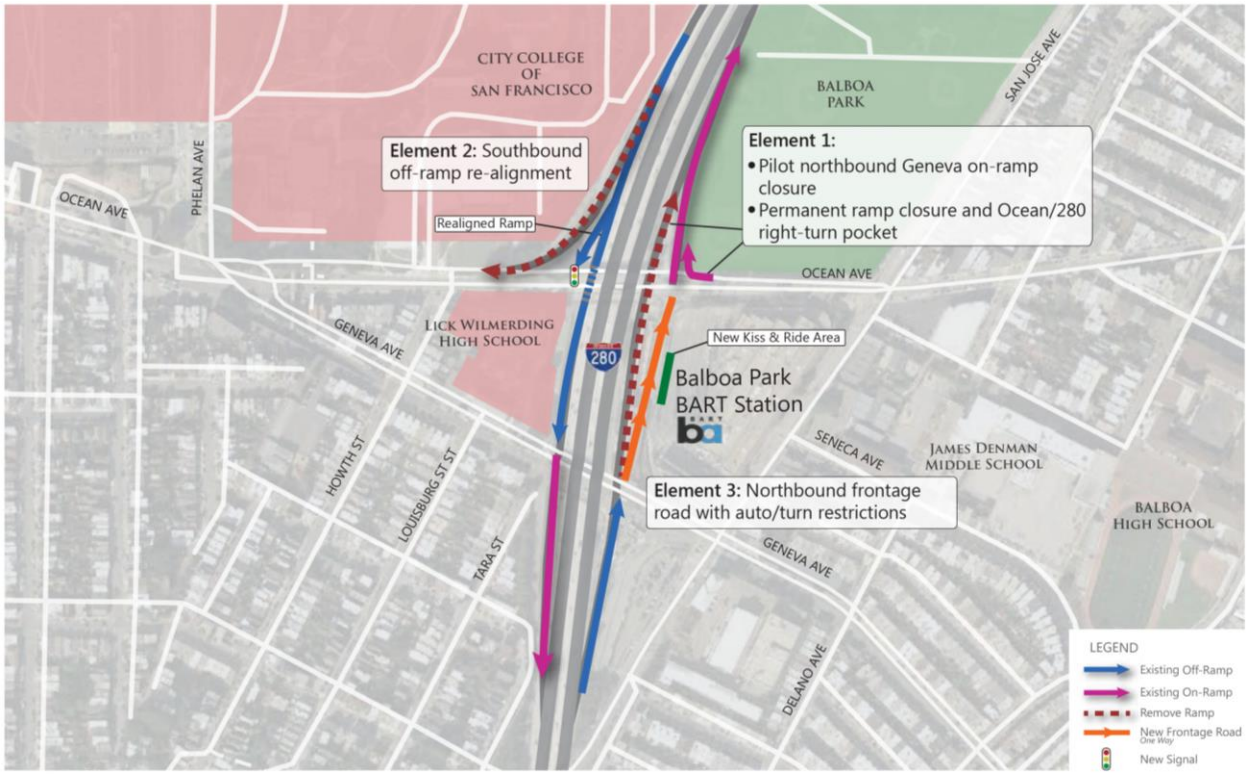

Figure 12: Alternative 1 Partial Split Interchange

The Study finds this alternative appropriate to implement in phases over time, allowing simpler and less costly improvements to proceed while the more complex and costly improvements are further developed. This approach also offers a modular set of improvements. Potential elements are as follows:

- *Element 1. Close the northbound Geneva Avenue on-ramp.* Closure of this ramp would greatly reduce the pedestrian and transit conflicts with turning automobiles at this intersection. This element would likely necessitate a new right-turn pocket on westbound Ocean Avenue by Balboa Park to accommodate the increase in right-turning automobiles accessing northbound I-280. The option to re-align the bus lines using Ocean Avenue into the existing center-running light rail lanes in order to minimize delays to transit could be explored based on SFMTA recommendations. This element lends itself to being first implemented as a pilot project, allowing for the traffic impacts associated with the circulation changes to be evaluated and mitigation measures fully developed prior to permanent closure of the ramp. No changes would be made to the Ocean Avenue/ I-280 on-ramp intersection under a pilot program. This element is shown in **Figure 13**.
- *Element 2. Realign the southbound Ocean Avenue off-ramp to a T-intersection and construct a new traffic signal to allow for left-turns onto Ocean Avenue.* The current off-ramp is a high-speed, uncontrolled, free right-turn to westbound Ocean Avenue, which creates an unsafe condition for pedestrians and bicyclists. This ramp realignment would entail some earthwork and minor utility and light rail adjustments. This element is shown in **Figure 14**.
- *Element 3. Construct a northbound frontage road between Geneva and Ocean Avenues.* This frontage road would serve as a new kiss-and-ride location but be designed to discourage general circulation usage. The road could be constructed without replacing the Ocean Avenue bridge if paired with

re-constructing and shifting the existing Westside Walkway; direct access from the drop-off to a new walkway would be included in the design. This element is shown in **Figure 15**.

It is important to recognize that Element 1 and Element 2 can be considered as independent projects. They do not need to be constructed sequentially, nor must they both be implemented. Element 3, however, is an option that would follow a permanent implementation of Element 1. **Figure 16** shows what Alternative 1 would look like if all three elements were constructed.

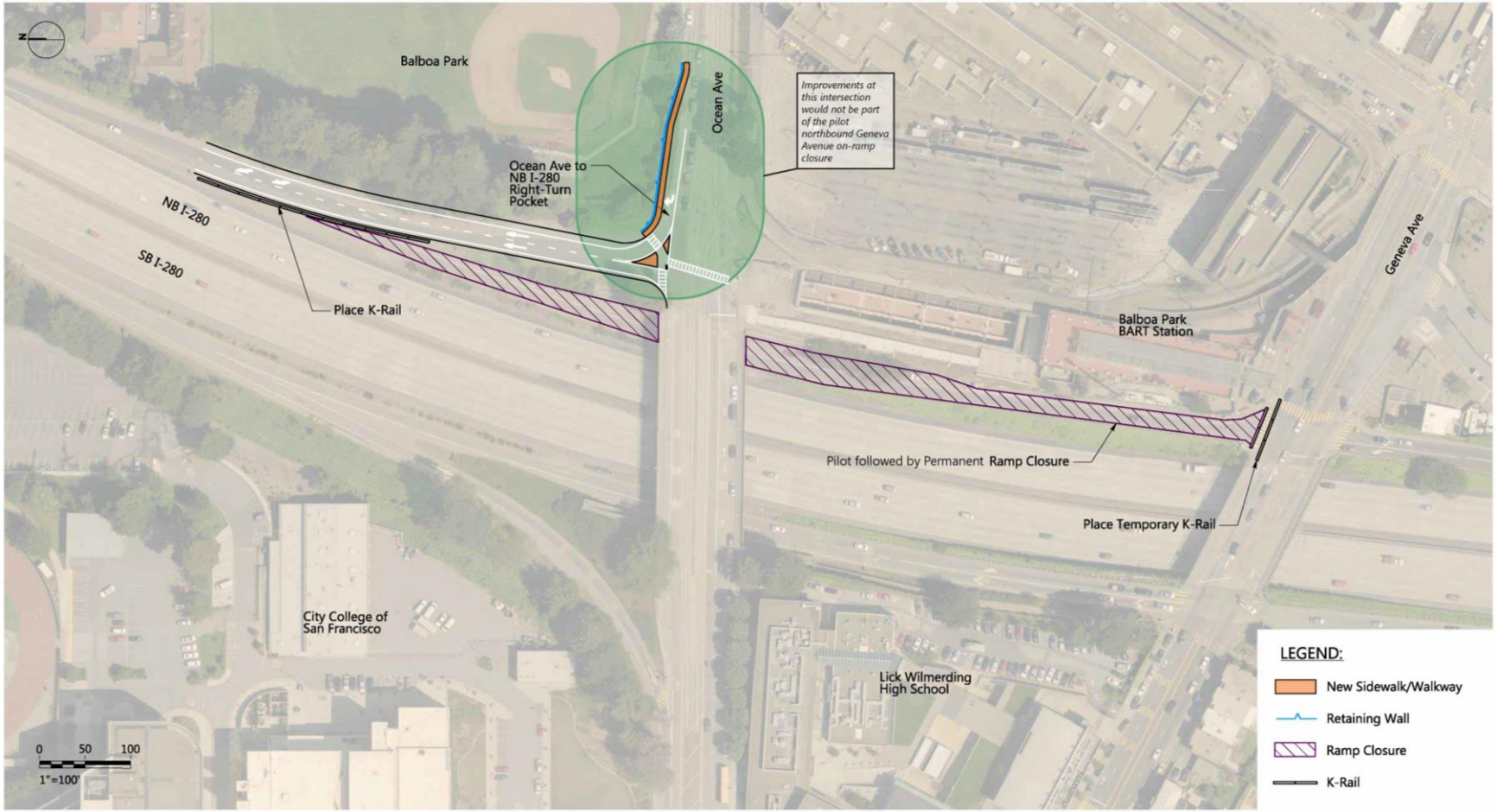

Figure 13: Alternative 1, Element 1 – Closure of Northbound Geneva On-Ramp and Re-Configuration of Northbound Ocean On-Ramp Intersection

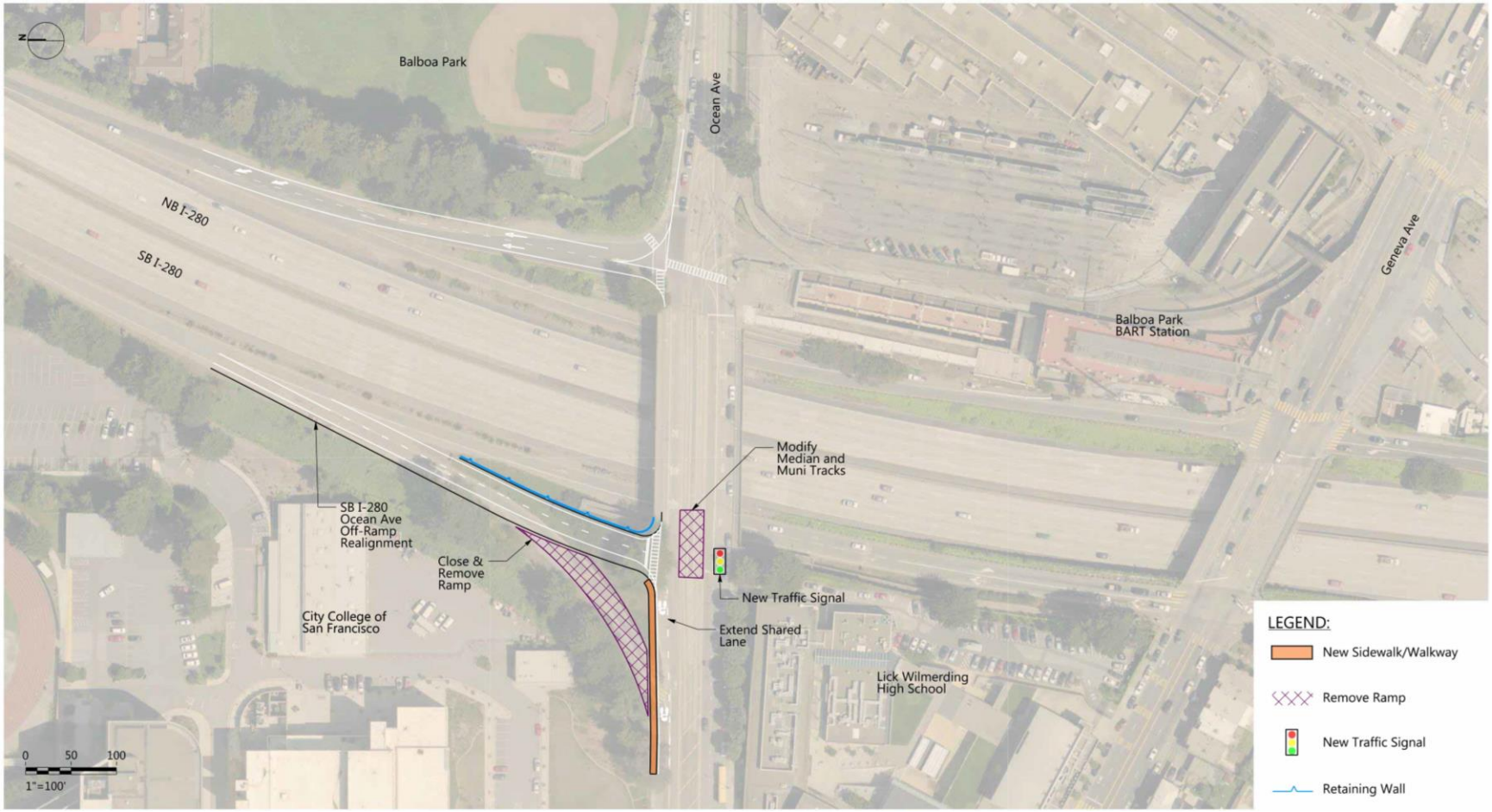

Figure 14: Alternative 1, Element 2 – Re-Configuration of Southbound Ocean Off-Ramp Intersection

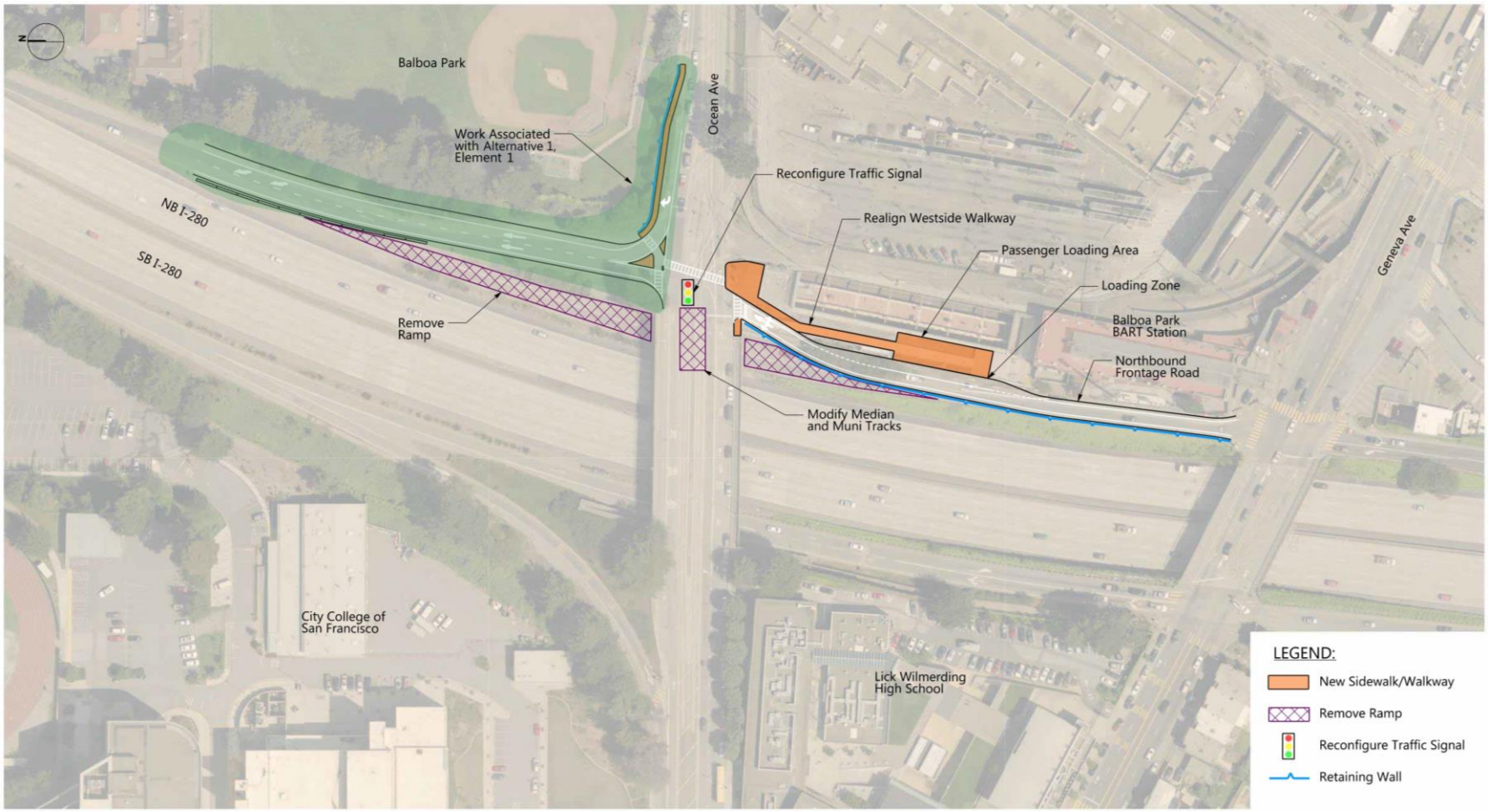

Figure 15: Alternative 1, Element 3 – Addition of New Northbound Kiss-And-Ride Frontage Road

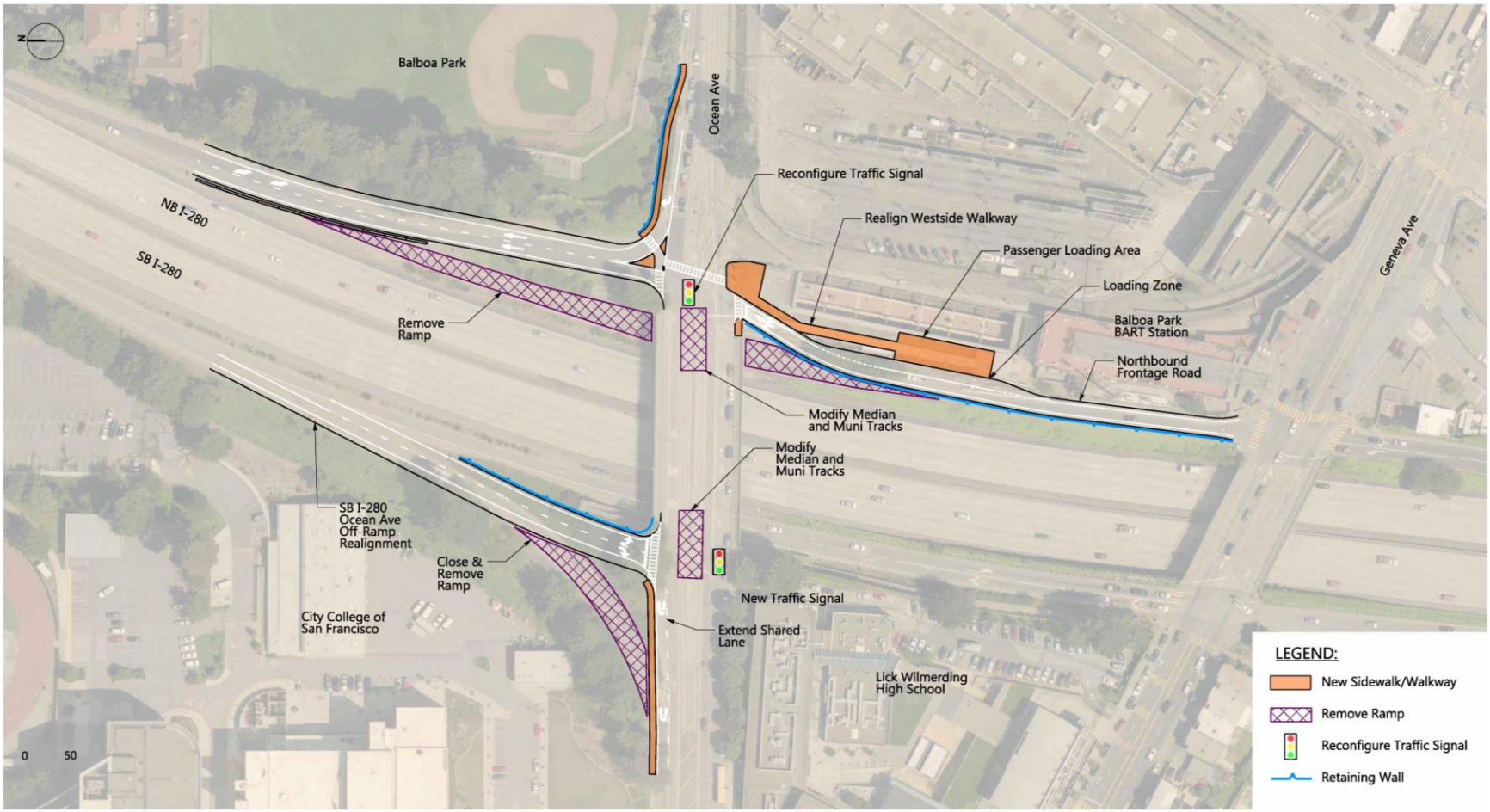

Figure 16: Alternative 1, Combined Elements 1, 2, and 3

3.2.3 | Alternative 2: Consolidated Interchange on Geneva Avenue

Alternative 2, shown in **Figure 17**, would consolidate the interchange at Geneva Avenue. This concept provides freeway access only to/from Geneva Avenue, dramatically reducing the automobile volume on Ocean Avenue and therefore enabling Ocean Avenue to prioritize travel for transit and non-motorized modes. The alternative consists primarily of two elements: permanently closing the northbound Ocean Avenue on-ramp and the southbound Ocean Avenue off-ramp.

Figure 17: Alternative 2 Consolidated Interchange on Geneva Avenue

A potential third element of this alternative would be the construction of a transit- and bike-only frontage road from Geneva Avenue to Ocean Avenue, split off from the northbound Geneva Avenue on-ramp and accommodating a new transit stop. The frontage road could be constructed without replacing the Ocean Avenue Bridge if paired with re-constructing and shifting the existing Westside Walkway; direct access from the new station stop to a new walkway would be included in the design. While this rerouting is technically feasible and may mitigate negative effects to transit delay, further study is required to fully evaluate its overall impact.

Although the potential transit- and bike-only frontage road is not shown in **Figure 17,** the frontage road with transit station would be similar to Alternative 1, Element 3 as shown in **Figure 15** above.

To replace the existing kiss-and-ride site that is likely to be eliminated in the near future, three different areas have been identified that could serve as designated on-street kiss-and-ride areas. These identified areas have on-street parking that could be repurposed as a kiss-and-ride lane with a short walk to a BART Station entrance. These three areas are: San Jose Avenue between Geneva Avenue and Niagara Avenue, the north side of Ocean Avenue between San Jose Avenue and the Ocean Avenue Bridge, and the south side of Ocean Avenue on the Ocean Avenue Bridge. Given the surrounding land uses and the

origin and destination patterns of BART patrons, the San Jose Avenue location is the preferred option. That location would need to be studied in more detail in relation to potential conflicts with the existing M-Ocean View light rail terminus stop, which may be moved in the future as discussed in the *Balboa Park Station Capacity and Conceptual Engineering Study* (2011), though plans have not yet been finalized.

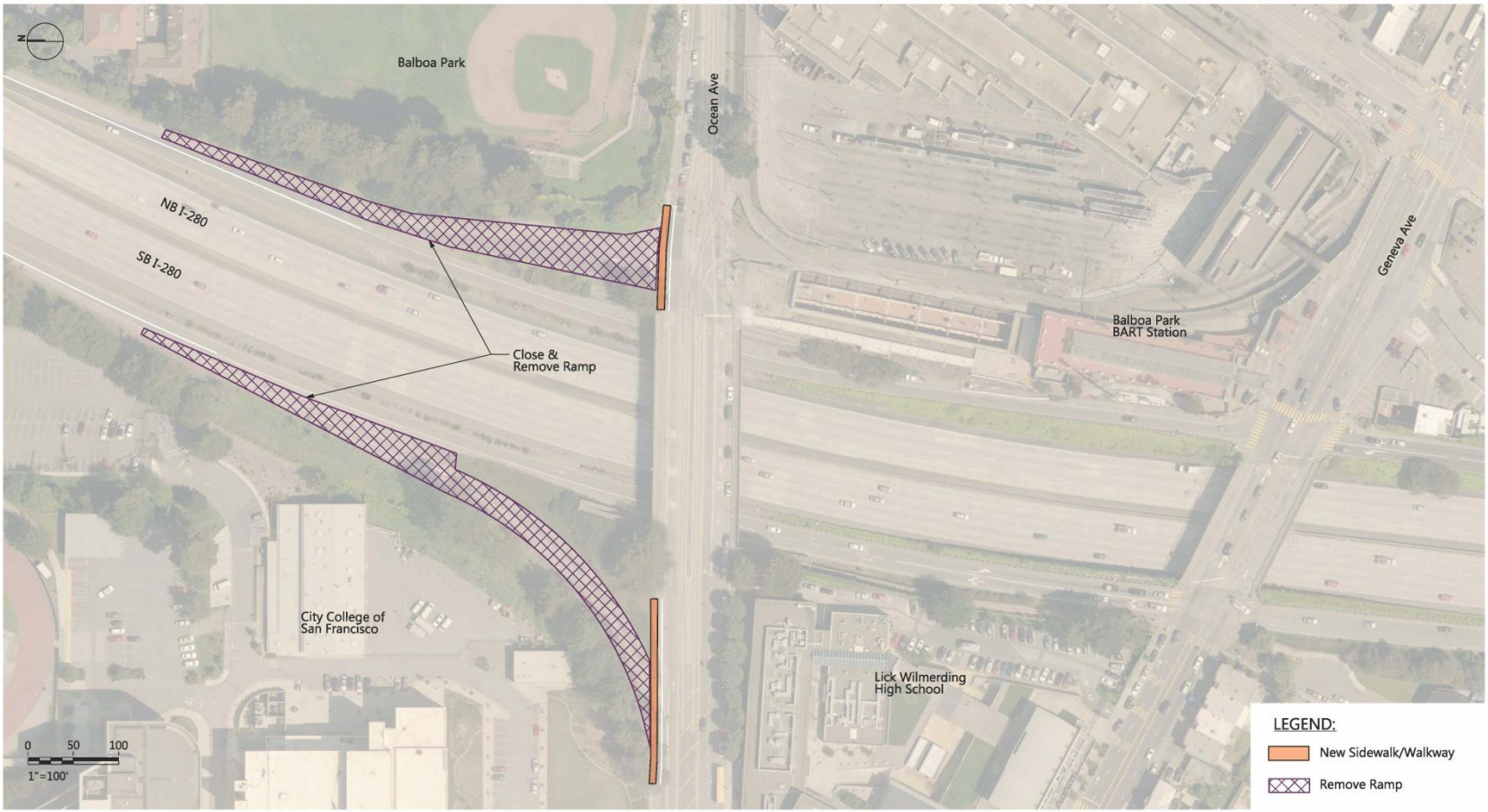

Figure 18: Alternative 2 – Closure of Ocean Avenue Ramps

3.3 Alternatives/Variants Considered and Discarded

Throughout the evaluation process, some alternatives and variants were found to be either unfavorable or unworkable within the framework of the study. The following alternatives were considered but eliminated from further consideration.

3.3.1 | Alternative 1, Element 4: Close the southbound Geneva Avenue off-ramp

This final element of Alternative 1 would complete a symmetrical split interchange by closing the southbound Geneva Avenue off-ramp. This element was evaluated in conjunction with Elements 1, and 2; and also in conjunction with Elements 1, 2, and 3 and the construction of a southbound frontage road along the west side of I-280 between Ocean and Geneva Avenues. Detailed traffic analysis indicated that this element may not provide meaningful benefit for the long-term circulation needs of the area. Preliminary analysis of the ramp closure indicated that there would be considerable congestion spilling back onto the I-280 mainline from the southbound Ocean Avenue off-ramp. In addition, construction of a southbound frontage road would require either the reconstruction of the Ocean Avenue Bridge, which would be a long-term improvement costing in excess of $500 million, or the acquisition of significant right-of-way from Lick Wilmerding High School. Due to these issues, this element was eliminated from further consideration.

3.3.2 | Alternative 3: Consolidated Interchange at Ocean Avenue

Alternative 3 would close the four freeway ramps on Geneva Avenue and construct a new northbound off-ramp and southbound on-ramp on Ocean Avenue to create a consolidated interchange. This alternative was conceptualized to shift automobile traffic to Ocean Avenue and enhance Geneva Avenue as a transit-priority street.

However, this alternative was determined to be infeasible because of traffic capacity limitations and impacts to both the local network and freeway operations, in addition to the need to re-construct the Ocean and Geneva Avenue Bridges. This alternative would be a long-term project due to the necessity to relocate the Geneva Avenue Bridge abutment back (to accommodate a 1,400-foot off-ramp likely needed for the ramp to meet Caltrans traffic warrants) and the need for a full reconstruction of the Ocean Avenue Bridge. Given that the preliminary traffic analysis also shows that multiple intersections would receive a Level of Service grade F, the viability of this alternative in the long-term is not promising and therefore this alternative was eliminated from further consideration.

3.3.3 | Conversion of Howth Street to Two-Way between Geneva Avenue and Ocean Avenue

The conversion of Howth Street to two-way operation was considered as part of Alternative 1 but ruled out when it was determined that very few automobiles would likely travel along Howth Street after exiting the freeway in the southbound direction due to the large delay that would be experienced when traveling along this route. The benefit of the additional travel options did not outweigh the inconvenience and disturbance caused to the local residents of this neighborhood street; thus, further consideration of this variant was dropped.

3.4 Local Network Improvements

There are a number of previously planned local network improvements within the Balboa Park Station Area, such as the Transit Effectiveness Project (TEP) and Geneva Travel Time Reduction Project (TTRP) recommendations. These improvements are reflected in the Baseline Alternative, a scenario against which the project alternatives were evaluated. Other improvements, such as the addition of a right-turn pocket on westbound Ocean Avenue at the northbound Ocean Avenue on-ramp, were identified to support the freeway ramp modifications and further improve multimodal circulation, safety and access. The pairing of these improvements with alternatives is shown in **Table 6**.

Table 6: Local Network Improvements

	BASELINE	ALTERNATIVE 1	ALTERNATIVE 2	FUTURE OPPORTUNITY
Signalize Geneva/Howth to improve ped safety (adjacent to Lick Wilmerding HS)	✓	✓	✓	
Remove parking on south side of Ocean between Howth and northbound Ocean Avenue on-ramp, extend EB (eastbound) bike lane				✓
TEP 29, 54 realignments	✓	✓	✓	
Remove parking on Ocean Ave bridge and extend bus stop adjacent to NB on-ramp				✓
Re-time LRV priority at Ocean NB on-ramp so red cycle ends when intersection is clear	✓	✓	✓	
Convert LRV lanes on San Jose to transit-only	✓	✓	✓	
Geneva TTRP improvements: Remove loading zone on north side of Geneva between San Jose and Delano, restripe to provide WB transit lane Provide right-turn pocket on WB Geneva at San Jose Avenue Addition of WB right-turn pocket and EB left-turn pocket at southbound Geneva Avenue ramp	✓	✓	✓	
Provide a transit only lane on WB Geneva between San Jose and the NB ramp (in lieu of queue jump stated in TTRP)	✓	✓	✓	
Signalize Geneva/Cayuga, provide transit priority	✓	✓	✓	
RT pocket on WB Ocean at NB I-280 on-ramp		✓		

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CHAPTER 4

KEY FINDINGS AND EVALUATION RESULTS

4.1 Evaluation Framework

The framework for evaluation consisted of 32 metrics and corresponding criteria that fall within each of the study goals, as shown in **Table 7**. The framework focused on automobile, transit, bicycle, and pedestrian performance. It called for analyses of transportation performance, engineering feasibility, and capital cost, providing ways to identifying benefits, constraints, and impacts for each alternative.

Table 7: Evaluation Framework

GOAL	METRIC	CRITERIA
1. Reduce negative impacts on the local community resulting from automobiles accessing the regional road network	Intersection configuration/geometry	Potential increase/decrease in intermodal conflicts (at each location)
	Volume of conflicting users (e.g., pedestrians-vehicle volumes)	Number of users benefitting/impacted
	Intersection operations, including delay to transit	Increase/decrease in transit travel time (select routes/segments)
	Existing and future intersection vehicle operations (v/c, average delay)	Increase/decrease in intersection LOS (various intersections)
	On- and off-ramp peak-hour volumes	Increase/decrease in automobile volumes (at each ramp)
	Ramp intersection operations	Increase/decrease in intersection LOS (at each ramp)
	Ramp queuing lengths	Increase/decrease in queue lengths
	Convenience of drop-off areas for users, proximity to transit connections	Distance from platforms/stops / # of arterial streets that must be crossed / likely usage of each location
	Kiss-and-ride design	Potential increase/decrease in intermodal conflicts (at each location)
2. Support efficient, reliable bus and light rail operations	Number of types & character of conflicts, volume of conflicting movements involving buses	Peak transit/private vehicles per hour (at each location)
	Traffic operational delay for bus movements / pace	Increase/decrease in transit travel time (select routes/segments)
	Maximize opportunities to support goals of near- and long-term improvements	Level of support for/consistency with Transit Effectiveness Project recommendations
	Number of types & character of conflicts, volume of conflicting movements involving LRV	Increase/decrease in intersection LOS (at each location)
	Traffic operational delay for LRV movements	Increase/decrease in intersection LOS (at each location); increase in the number of conflicts for LRVs exiting Green Yard
	Location of stops, walk distance to station platforms	Aggregate walk distance (stop-level ridership x distance in feet from platform)

GOAL	METRIC	CRITERIA
	Ridership at stops	Aggregate walk distance (stop-level ridership x distance in feet from platform)
3. Enhance safety, accessibility, and convenience for pedestrians and bicyclists	Alternative supports pedestrian demand/patterns (informed by pedestrian volumes, key institutions near the station, and transit ridership volumes)	Potential increase/decrease in intermodal conflicts (at each location)
	Number of types & character of vehicle-pedestrian conflicts, volume of motorized movements conflicting with pedestrian crossings	Numbers of pedestrians benefitting (e.g., in crosswalk where automobile traffic eliminated)
	Distance and character of intermodal transfers	Aggregate walk distance (stop-level ridership x distance in feet from platform)
	Supports bicycle activity (informed by bicycle volumes)	Increase/decrease in automobile volumes on bicycle routes
	Number of types & character of vehicle-bicycle conflicts, volume of motorized movements conflicting with bike routes	Increase/decrease in automobile volumes on bicycle routes
	Conflicts between bicycle routes and transit routes	Increase/decrease in transit vehicle volumes on bicycle routes
	Directness of pedestrian routes between transit stops and destinations.	Aggregate walk distance (stop-level ridership x distance in feet from platform)
4. Minimize impacts to traffic going to/coming from I-280	On- and off-ramp peak-hour volumes	Increase/decrease in automobile volumes (at each ramp)
	Ramp queuing lengths	Increase/decrease in queue lengths
5. Develop feasible solutions that can be implemented within ten years	Ability to get through Caltrans PSR process	Qualitative assessment
	Relative cost	Order-of-magnitude cost estimates
	Engineering feasibility	Qualitative assessment
	Alternatives reflect community's vision & values	Qualitative assessment
	Alternatives are cost effective ways to address identified issues	Qualitative assessment
	Alternatives do not result in substantial rerouting of transit or automobiles to other ramps	Qualitative assessment
	Ability to integrate improvements into programmed routine maintenance/construction.	Qualitative assessment

4.2 Analysis and Assumptions

The development of the alternatives involved two steps. First, a preliminary screening step explored potential traffic operational and engineering feasibility at a high level. Then, based on this analysis, the study advanced two alternatives for formal evaluation. The evaluation included two main elements: an in-depth analysis of traffic and transit operations for both the local roadway network and freeway ramp junction intersections and a civil engineering assessment of the feasibility, construction, and cost implications for each alternative.

For purposes of the evaluation, the Baseline Alternative was established to appropriately compare the proposed alternatives. The Baseline includes a package of near-term planned local network improvements that would also apply to Alternatives 1 and 2 (see **Table 6**), but does not include any

changes to the configuration of the I-280 freeway ramps. As such, the Baseline Alternative was compared to existing conditions, while the remaining alternatives were compared to the Baseline.

In addition, as part of the transportation analysis, several assumptions were made for vehicle volume shifts throughout the study area:

- For this study's analysis it was assumed that ramp closures would not result in any change in total travel demand within the study area.
- The proposed closure of the northbound Geneva Avenue on-ramp would divert all trips to the equivalent ramp on Ocean Avenue, via San Jose Avenue.
- The introduction of the signalized left turn at the realigned southbound Ocean Avenue off-ramp would shift 15% of the volume away from the SB left turn movement at the existing southbound Geneva off-ramp.
- No changes to transit routes, other than those associated with the TEP improvements, were assumed in the analysis.

The Study team recognizes that these assumptions are conservative and result in what could be considered a worst-case traffic analysis of the immediate station area.

Finally, the development and evaluation of the alternatives were refined in an iterative process. The transportation and engineering feasibility analysis led to a final round of design refinements for both Alternatives. As a result, the preliminary alternatives evaluated in the transportation analysis differ slightly from the ones presented in Chapter 3. In particular, Elements 1 and 2 of Alternative 1 were evaluated as distinct options, independent of one another. In addition, a full analysis of all the elements in Alternative 1 included the closure of the southbound Geneva Avenue off-ramp (Element 4), an element that was ultimately removed from consideration. This resulted in a more conservative evaluation than the final proposal for Alternative 1. For Alternative 2, the idea for the potential transit-only frontage road (Element 3) was identified after the transportation analysis was completed. Although the analyzed scenarios do not exactly match the final alternatives, the results here should be taken as representative of potential performance as a whole, but additional analysis is needed to confirm in the next phase of project development. Ultimately, future phases of project development would include more detailed analyses for the design alternatives.

The detailed analysis supporting the evaluation is documented in three appendices:

- **Appendix A: Transportation Analysis** documents the operational analysis of automobile and transit delays.
- **Appendix B: Detailed Alternative Evaluation Results** provides a detailed evaluation of how each alternative meets the goals of the study.
- **Appendix C: Engineering Feasibility & Cost Estimates** includes an assessment of the civil engineering feasibility of each alternative, a summary of the construction considerations required for each alternative, and planning-level cost estimates.

4.3 Key Evaluation Results

The Station Area has several competing land uses and modal functions that are often in conflict with one another. Station Area users (drivers, transit riders, pedestrians, and bicyclists) experience these issues on a daily basis. There is no single solution for these complex issues. Each alternative presents benefits and impacts for different modes, thus implementing any capital improvement inherently comes with trade-offs. This evaluation presents the preliminary traffic evaluation for each alternative as it pertains to the different modes, provides an assessment of how the alternative does (does not) meet each of the study goals, and gives a description of the engineering feasibility of each of the project elements. Cost estimates for each element of each alternative are provided in subsection 4.3.4; a summary of the evaluation results is provided in subsection 4.3.5. A comprehensive description of the evaluation, including all metrics for both alternatives, is provided in **Appendix B**.

4.3.1 | Baseline

The Baseline includes a range of multimodal improvements to the local roadway network, listed in **Table 6**, but no major changes to vehicular circulation in the area. These changes result in marginally better transportation performance compared with existing conditions, including small improvements in auto level of service at certain locations. Signal timing modifications at the northbound Ocean Avenue on-ramp improve operations at the intersection from LOS D to LOS C in the PM peak hour. The addition of a westbound left-turn pocket and an eastbound right-turn pocket on Geneva Avenue at the southbound Geneva Avenue off-ramp (in combination with signal timing modifications) improves operations at the intersection from LOS D to LOS C in the PM peak hour. Lastly, signal timing optimization at the northbound Geneva Avenue off-ramp intersection, in response to changes to street configurations in the area, improves operations at the intersection from LOS E to LOS D in the PM peak hour. The level of service results are shown in **Table 8** below.

The Baseline incorporates TEP recommendations, including a major shift of bus service from Geneva Avenue onto Ocean Avenue where there is currently less traffic congestion. This shift results in approximately twice as many transit vehicles on Ocean Avenue as on Geneva Avenue during peak periods. In addition, the TEP recommendations add a new westbound transit-only lane on Geneva Avenue from Delano Avenue to the I-280 ramps and include several signal improvement projects within the Study Area. The TEP plans also include implementation of eastbound-left and westbound-right turn pockets at the intersection of Geneva Avenue and the southbound ramps, both of which are included in the Baseline scenario. The preliminary traffic analysis comparing Baseline improvements to existing conditions indicates that there would be a reduction in average PM peak period delay of about 45 seconds for transit vehicles traveling westbound on Geneva Avenue, including Rapid Network Line 8BX. The eastbound delay would be reduced by around 20 seconds. On Ocean Avenue, transit delay would stay largely unchanged in the eastbound direction but would be reduced in the westbound direction by around 30 seconds. Baseline conditions would also experience a slight reduction in delay at the critical intersection of Ocean Avenue/northbound on-ramp, near where light rail vehicles exit the Green Yard. Converting LRV lanes on San Jose Avenue to transit-only will reduce transit delay on San Jose Avenue.

The Baseline also contains some modest improvements for both bicyclists and pedestrians. Conflicts between vehicles, bicyclists and pedestrians would be reduced due to the proposed eastbound bike lane on Ocean Avenue and the proposed flashing pedestrian warning signal on the southbound Ocean Avenue off-ramp.

Table 8: PM Peak Hour Level of Service Analysis

INTERSECTION	TRAFFIC CONTROL	EXISTING	BASELINE	ALTERNATIVE 1: PARTIAL SPLIT INTERCHANGE	ALTERNATIVE 2: CONSOLIDATED INTERCHANGE
				ELEMENTS 1 AND 2[1]	ELEMENTS 1 AND 2
1. Ocean/Geneva	Signal	C	C	C	C
2. Ocean/Howth	Signal	A	A	A	A
3. Ocean/I-280 SB	Signal	N/A[2]	N/A[2]	C	N/A[3]
4. Ocean/I-280 NB	Signal	D	C	D	A
5. Ocean/San Jose	Signal	B	C	C	B
6. Ocean/Alemany	Signal	C	C	C	C
7. Geneva/Howth	SSSC	A	A[4]	A[4]	D[4]
8. Geneva/I-280 SB	Signal	D	C	C	**F (1.35[5])** → ↓
9. Geneva/I-280 NB	Signal	E	D	D	**F (1.36[5])** → ↱
10. Geneva/San Jose	Signal	C	C	C	D
11. Geneva/Cayuga	AWSC	E	B[4]	C[4]	C[4]
12. Geneva/Alemany	Signal	C	C	C	C
13. Monterey/I-280 Ramps	Signal	D	D	D	D
14. Bosworth/Arlington	SSSC	C	C	D	C
15. Sagamore/San Jose	Signal	C	C	C	C
16. Alemany/I-280 Ramp	Signal	C	C	C	C
17. Seneca/San Jose	SSSC	A	A	A	A

Notes:

Bold indicates unacceptable operation. Red symbols indicate critical movements. AWSC = all-way stop control. SSSC = side-street stop control.

1. As part of the iterative process, Alternative 1 with only 3 elements emerged after the detailed analysis was completed.
2. The ramp at this location is a free right-turn SB off-ramp onto WB Geneva Avenue.
3. There is no ramp or signalized intersection at this location.
4. This intersection is signalized in this scenario. A traffic signal at Geneva/Howth was constructed after this analysis had been completed.
5. Volume/capacity ratio shown only for intersections with unacceptable operations (i.e., LOS E or F). A value greater than 1.0 indicates that the traffic volume exceeds the available capacity of the roadway.

Source: Prepared by Fehr & Peers, 2013

4.3.2 | Alternative 1: Partial Split Interchange

This section summarizes the evaluation of Alternative 1, including key travel patterns, the effects on each mode, overall ability to meet each of the study goals, and construction feasibility and impacts.

4.3.2.1 | KEY TRAVEL PATTERNS

As discussed above, a number of volume shifts were assumed due to the closure of freeway ramps. In analyzing Alternative 1, the closure of the northbound Geneva Avenue on-ramp is assumed to result in all of the freeway-bound traffic (approximately 200 automobiles from the east and 100 automobiles from the west during the peak hour) rerouting via San Jose Avenue from the east and via Ocean Avenue from the west to access the freeway using the northbound Ocean Avenue on-ramp. In addition, the realignment of the southbound Ocean Avenue off-ramp and introduction of a new signal allowing left turns is assumed to result in a15 percent shift (approximately 75 automobiles) in the left turning traffic at the southbound Geneva Avenue off-ramp to make this movement from the Ocean Avenue off-ramp instead.

4.3.2.2 | PERFORMANCE

GOAL #1 Vehicle Circulation Maintained – This alternative has a neutral impact overall on Goal #1, improving vehicle circulation in some locations and making it worse in other locations. As a whole, Alternative 1 would result in decreases to vehicle delay on Geneva and increases for Ocean and, as shown in Table 8, slightly better LOS conditions along Geneva Avenue and slightly worse LOS conditions along Ocean Avenue.

Element 1, the closure of the northbound Geneva Avenue on-ramp, would have a minor effect on traffic operations, removing traffic from Geneva Avenue while adding slightly to Ocean Avenue traffic. The Study assumed that all of the automobiles currently using the Geneva Avenue on-ramp would instead use the Ocean Avenue on-ramp. Although this diversion would add an additional 300 turning automobiles in the peak hour to Ocean Avenue, the effect on vehicular operations there would be small, especially given the alternative's proposed addition of a westbound right-turn pocket on westbound Ocean Avenue adjacent to Balboa Park to accommodate the added volume.

The realignment and signalization of the southbound Ocean Avenue off-ramp in Element 2 would also have a minor effect on traffic operations on Ocean Avenue. This element results in a small reduction in eastbound traffic along Geneva Avenue, as approximately 75 peak-hour automobiles would now exit the freeway onto Ocean Avenue and use the newly permitted left turn. This small volume shift could be accommodated with appropriate signal timing and would not impact the freeway mainline. Anecdotal evidence indicates some current queue spillback onto the mainline of I-280; further study for this alternative would determine the extent to which this is occurring and, if needed, additional design work could be done to address queues, including adding lanes to the off-ramp. In combination, Elements 1 and 2 would cause minor changes to automobile LOS at intersections on Ocean Avenue compared to the Baseline, and only one additional intersection would deteriorate to LOS D, which is the worst level in Baseline conditions at which any one intersection operates.

The introduction of the kiss-and-ride-only frontage road in Element 3 has the potential to provide space for station-related passenger access closer to the station's BART and light rail platforms. For instance, the frontage road could be used as a new kiss-and-ride area or for new bus routing and loading. Within the context of this study, the project team proposes that the new frontage road be used as a kiss-and-ride area as a way to reduce the intermodal conflicts and safety concerns around the station area that result from informal kiss-and-ride activity. The frontage road would be designed to discourage through-traffic from using the road to cut across from Geneva Avenue to Ocean Avenue. The analysis indicates potential signal phasing issues related to the new northbound movement that would require more detailed analysis to consider operational solutions such as signage, turn movement restrictions, and other measures that would restrict the new frontage road strictly to automobiles

conducting kiss-and-ride activity. All other aspects of the circulation system appear to function well for this element. While the analyzed scenarios do not exactly match the final alternatives, the results here should be taken as representative of potential performance as a whole. A more detailed analysis will be conducted in the future to this effect.

GOAL #2 Efficient and Reliable Transit – Alternative 1 also has a neutral impact on Goal #2 to support efficient transit operations. Element 1's northbound Geneva Avenue on-ramp closure provides an opportunity to further improve transit travel times by removing a key auto-transit conflict. In Element 2, while transit travel times on Geneva Avenue are largely similar to Baseline conditions, travel times on Ocean Avenue worsen slightly from the addition of the new signal for the southbound off-ramp and slight increase in traffic, increasing bus delay by approximately one minute in each direction. This added delay is in exchange for remedying the major pedestrian and bicycle safety issue that the existing I-280 southbound free-right off-ramp design presents. In addition, the re-design of the off-ramp would eliminate the current weave movement that westbound buses must make to transition to the right lane immediately after the ramp merge, thus improving transit safety. Element 3 would have little impact to transit conditions on either Geneva or Ocean Avenues. When evaluated cumulatively, the three elements of Alternative 1 would have a relatively neutral impact on transit operations in the study area.

GOAL #3 Ped-Bike Safety, Accessibility, and Convenience – Alternative 1 greatly improves safety, access and convenience for pedestrians and bicycles, achieving Goal #3. For pedestrians, elimination of the northbound Geneva Avenue on-ramp and associated automobile turning movements would reduce conflicts at a key location, vastly improving pedestrian conditions adjacent to the BART entrance. While that ramp closure would increase traffic and westbound-right turning movements at the northbound Ocean Avenue on-ramp, the re-design and signalization of the southbound Ocean Avenue off-ramp in Element 2 would greatly improve pedestrian safety at what is now a high-speed, uncontrolled crossing. Similarly, bicycle travel along Ocean Avenue's designated bicycle route would improve with removal of the high-speed weaving maneuver that bicyclists must currently undertake with automobiles exiting the freeway. While the proposed frontage road in Element 3 would increase turning movement conflicts where Element 1 had removed them, its design and restriction to kiss-and-ride activity imply low automobile volumes. Taken in total, Alternative 1 would provide a significant reduction in conflict movements over existing or baseline conditions.

GOAL #4 Freeway Ramp Operations Maintained – The study's analysis of observed automobile volumes for the northbound Geneva Avenue off-ramp concludes no effect on mainline operations. There are anecdotal reports that queues sometimes extend back to the mainline, but Alternative 1 does not alter that circulation movement in comparison to existing conditions or the baseline. The study also concludes that the southbound Ocean Avenue off-ramp would have no effect on mainline operations, even upon re-design and signalization. Since there are anecdotal reports here as well that queues sometimes extend back to the mainline, further analysis and design could identify the required Ocean Avenue off-ramp re-configuration to address needed queue storage capacity. There is enough space to include a turn pocket on the re-configured off-ramp, not only increasing the capacity for throughput at the location but also increasing the queue storage. Therefore, the study concludes that Alternative 1 meets Goal #4 because it does not have an impact on freeway mainline operations.

GOAL #5 Feasibly Implementable within Ten Years - Alternative 1 is feasible from a civil engineering standpoint with no major challenges. Element 1 of this alternative (shown in Figure 13 above) proposes construction of a 100-foot-long right-turn pocket for accommodating right-turning automobiles from Ocean Avenue onto the northbound on-ramp to accompany the closure of the northbound Geneva

Avenue on-ramp. The turn pocket would lead into its own lane on the on-ramp for approximately 300 feet. A new crosswalk island would be constructed for pedestrian refuge and right-turn channelization. The new turn pocket on Ocean Avenue would shift the north sidewalk along Balboa Park approximately 12 feet to the north, which would require constructing a 160-foot long retaining wall of approximately five feet in height with safety railing and fencing between Ocean Avenue and Balboa Park. There are several utilities that would require relocation and modifications, such as: traffic signals, Muni Overhead Contact System (OCS), street lights, and pedestrian crossing devices.

Element 2 (shown in Figure 14 above) proposes the permanent realignment of the southbound Ocean Avenue off-ramp to a T-intersection just west of the western abutment for the Ocean Avenue. The realigned ramp would be expanded to two lanes for approximately 380 feet before the intersection, with one lane each dedicated to right-only and left-only turning movements. The intersection would be located west of the Ocean Avenue Bridge western abutment to avoid impacts to the bridge. A new 200-foot long retaining wall would be required as well as re-grading of the area near the ramp. The retaining wall would rise along with the ramp and be approximately 20 feet at its highest point near Ocean Avenue. The existing southbound Ocean Avenue off-ramp would be removed, with limited re-grading for erosion control.

For Element 3 (Figure 15), the proposed frontage road is planned to be 20 feet wide to accommodate a 12-foot wide lane with four-foot buffers. The Westside Walkway to the BART Station would be reconstructed adjacent to the frontage roadway. A retaining wall would run along the west side of the frontage road, vertically separating the roadway from NB I-280. A 110-foot-long passenger loading area is proposed to be placed just north of the BART entrance plaza. The road would be widened for several hundred feet on either side of the loading area to accommodate additional automobile standing zones and a sidewalk connection to the loading area, thus providing waiting area capacity similar to the existing area.

Element 1 could be implemented initially as a pilot project, with full implementation (including construction of the right-turn pocket by Balboa Park). Element 2 could also be implemented in a relatively short time period, with Element 3 requiring a slightly longer time frame due to the need to reconstruct the Westside Walkway. The total cost of Alternative 1 is approximately $18 million (see Section 4.1.4 of this chapter below.); it does not require the reconstruction of either the Ocean Avenue or the Geneva Avenue bridges. Therefore, Alternative 1 meets Goal #5 to develop a feasible solution implementable within 10 years.

4.3.3 | Alternative 2: Consolidated Interchange

This section summarizes the evaluation of Alternative 2, including key travel patterns, the effects on each mode, and overall ability to meet the study goals, and construction feasibility and impacts.

4.3.3.1| KEY TRAVEL PATTERNS

In analyzing Alternative 2, the closure of the Ocean Avenue freeway ramps is assumed to result in all of the freeway traffic utilizing the Geneva Avenue ramps. An estimated 500 automobiles would shift from the southbound Ocean Avenue off-ramp to the southbound Geneva Avenue off-ramp, and 500 automobiles would shift from entering the freeway at the northbound Ocean Avenue on-ramp to entering at the northbound Geneva Avenue on-ramp.

4.3.3.2 | PERFORMANCE

GOAL #1 Vehicle Circulation Maintained - Eliminating the Ocean Avenue freeway ramps would substantially decrease vehicle volumes and delay on Ocean Avenue. However, it would also increase vehicle volumes and delay on Geneva Avenue, resulting in level of service (LOS) F traffic operating conditions at both ramp intersections in the PM peak period. This would result in substantial traffic congestion along Geneva Avenue; thus, Alternative 2 would not be able to fully achieve Goal #1. **Table 8** shows LOS conditions at the area intersections for Alternative 2. With regard to accommodating kiss-and-ride activity, the feasible options for such locations under this alternative are Ocean Avenue curb space on the bridge over I-280, next to the park, or San Jose Avenue curb space south of Geneva Avenue. The San Jose Avenue location is most promising considering the overall origin and destination patterns. That location would need to be studied in more detail in relation to potential conflicts with the existing M-Ocean View light rail terminus stop. The light rail stop may be moved in the future, but plans have not yet been finalized.

GOAL #2 Efficient and Reliable Transit - The decreased automobile volumes on Ocean Avenue would slightly improve transit operations on Ocean Avenue, reducing travel times by around 30 seconds in the westbound direction, while eastbound travel times would stay largely constant. In both directions, turning movement conflicts would also be reduced on Ocean Avenue. However, due to the increased automobile volumes on Geneva Avenue, this alternative would negatively affect transit on Geneva Avenue, increasing the PM peak delay in the eastbound direction by close to five minutes per trip. This alternative could potentially be paired with a transit-only northbound frontage road, which would alleviate some of the transit impacts from this alternative. This concept would be similar to the kiss and ride frontage road but for the purpose of rerouting transit away from congested areas of Geneva Avenue instead. Therefore, there could be a mix of benefits and dis-benefits for transit users in the area and Goal #2 may not be fully attained.

GOAL #3 Bike-Ped Safety, Accessibility, and Convenience - By shifting traffic away from Ocean Avenue and eliminating turning movement conflicts at the closed ramp entrances, Alternative 2 would provide an enormous benefit to cyclists and pedestrians on Ocean Avenue. However, shifting large volumes of traffic from Ocean Avenue onto Geneva Avenue, where there are many more pedestrians in the vicinity of the station area, would not result in a positive outcome for pedestrian safety, access and comfort on Geneva Avenue. In particular, there would be more turning movements and conflicts at the northbound on-ramp and southbound off-ramp. Therefore, Goal #3 would only be partially attained.

GOAL #4 Freeway Ramp Operations Maintained - The Study's analysis based on observed automobile volumes indicates that the southbound Geneva Avenue off-ramp would provide sufficient capacity to store exiting automobiles so as not to affect the mainline, even with the southbound Ocean Avenue off-ramp closed. Alternative 2 therefore meets Goal #4 of not affecting the mainline of I-280. However, the study recognizes that, under existing conditions, there is anecdotal evidence reported of queue spillback along the southbound Geneva Avenue off-ramp from the mainline which would require further analysis to clarify.

GOAL #5 Feasibly Implementable Within Ten Years - Alternative 2 (shown in Figure 18) proposes the permanent closure of the northbound Ocean Avenue on-ramp and the southbound Ocean Avenue off-ramp. The ramp closures would require removing the existing ramp pavement, guardrail, and utilities associated with the ramps. Sidewalks would be extended across the closed ramp intersections creating a continuous path on the north side of Ocean Avenue between Balboa Park and the City College of San Francisco.

Alternative 2 is feasible from a civil engineering standpoint and does not present any significant engineering challenges. This alternative would only close ramps and would not require any major construction, resulting in a total cost of approximately $3 million for Elements 1 and 2 (plus $9 million for the potential Element 3). Therefore, it meets Goal #5 to develop a feasible solution implementable within 10 years.

4.3.4 | Cost Estimates

The purpose of the cost estimates in this study is to provide a Level 5 or Rough Order of Magnitude (ROM) estimate for the proposed alternatives. The cost estimate for each alternative was developed for each of its major components of work. This includes ramp modifications to and from I-280, new frontage roads along I-280, and other improvements identified herein on Ocean and Geneva Avenues.

The Level 5 ROM is typically used for schematic or conceptual level design. The estimated cost is prepared using factored historical costs in accordance with accepted professional standards and procedures agreed on by organizations including the Association for the Advancement of Cost Engineers (AACE), American Society of Professional Estimators (ASPE), and the Royal Institute of Chartered Surveyors (RICS).

Table 9 summarizes the cost estimate for each component by alternative. The total estimated cost for each component, which is also the Total Expected Price, is presented along with a -20% Total Optimistic Price and +30% Total Pessimistic Price. The Optimistic and Pessimistic Prices form an accuracy range, typical for this Level 5 estimate.

Table 9: Cost Estimate Summary of Alternatives

PROPOSED IMPROVEMENT	ALTERNATIVE 1: PARTIAL SPLIT INTERCHANGE			ALTERNATIVE 2: CONSOLIDATED INTERCHANGE		
	ELEMENT 1	ELEMENT 2	ELEMENT 3	ELEMENT 1	ELEMENT 2	ELEMENT 3 [POTENTIAL]
Northbound Geneva Avenue on-ramp	Close & Remove $ 1,641 K	-	-	-	-	-
Northbound Ocean Avenue on-ramp	Right-Turn Pocket $ 2,373 K	-	-	Close & Remove $ 1,024 K	-	-
Southbound Ocean Avenue off-ramp	-	T-Intersection $ 5,623 K	-	-	Close & Remove $ 2,064K	-
Northbound Frontage Road with Station Access	-	-	$ 8,483 K	-	-	$ 8,483 K
Total	$ 4,014 K	$ 5,623 K	$ 8,483 K	$ 1,024 K	$ 2,064 K	$ 8,483 K
Total Optimistic Cost (-20%)	$ 3,211 K	$ 4,498 K	$ 6,786 K	$ 819 K	$ 1651 K	$ 6786 K
Total Expected Cost	**$ 4,014 K**	**$ 5,623 K**	**$ 8,483 K**	**$ 1,024 K**	**$ 2,064 K**	**$ 8,483 K**
Total Pessimistic Cost (+30%)	$ 5,218 K	$ 7,310 K	$ 11,028 K	$ 1331 K	$ 2683 K	$ 11,028 K
TOTAL EXPECTED COST EACH ALTERNATIVE	**$ 18,120 K**			**$ 3,088 K** *[+ $ 8,483 K for Potential Element]*		

4.3.5 | Evaluation Summary

Table 10 summarizes the alternatives in terms of their ability to fulfill the Study goals. Evaluation results indicate trade-offs associated with each element of each alternative: any improvement that benefits one mode of transportation may be a dis-benefit to other modes. **Table 11** shows these the benefits and dis-benefits for each element of each alternative as it relates to each mode of transportation on Ocean and Geneva Avenues in comparison the Baseline scenario, using a plus (+)/minus (-) scale; a zero (0) indicates there is no net impact to the mode. Note that for Alternative 1, Elements 1 and 2 are evaluated independently, each in comparison to the Baseline, while Element 3 is assumed to include Element 1 as a prerequisite element.

Table 10: Evaluation Summary

STUDY GOALS	ALTERNATIVE 1	ALTERNATIVE 2	NOTES
Goal #1: Reduce the negative impacts on the local community resulting from automobiles accessing the regional road network	-	↓	Alternative 1 would have a neutral impact, decreasing vehicle delay on Geneva and increasing vehicle delay on Ocean. While Alternative 2 would decrease delay on Ocean, it would substantially increase delay on Geneva, resulting in severely congested conditions at both ramp intersections.
Goal #2: Support efficient, reliable bus and light rail operations	-	↓	Alternative 1 would have a neutral impact and Alternative 2 would have a negative impact on transit operations since Muni vehicles would be subject to the intersection delays described above.
Goal #3: Enhance safety, accessibility, and convenience for pedestrians and bicyclists	↑	↑	Both alternatives have a net positive influence on the pedestrian and bicycle environment.
Goal #4: Minimize impacts to traffic going to/coming from I-280	-	-	Neither alternative shows notable impacts to freeway operations.
Goal #5: Develop feasible solutions that can be implemented within ten years	↑	↑	Both projects can be feasibly implemented within 10 years.

Notes:
"↑" = positive impact; "—" = neutral impact; "↓" = negative impact

Table 11: Summary Comparison Findings by Mode

MODE	ALTERNATIVE 1		ALTERNATIVE 2	
	Elements 1, 2, and 3		Elements 1 and 2	
	Geneva	Ocean	Geneva	Ocean
Automobile	↑	↓	↓↓	↑↑
Transit	↑	(↓)[1]	(↓)[1]↓	↑↑
Pedestrian	↑	↑	↓↓	↑↑
Bicycle	↑	↑	↓	↑↑

Notes:

1. Parentheses indicate an impact that may be mitigated with the inclusion of additional improvements that have not been fully vetted, such as running the buses in the median LRV lanes on Ocean Avenue.
2. "↑" = positive impact; "↓" = negative impact
3. A double up-arrow (↑↑) or down-arrow (↓↓) indicates a higher level of benefit or impact than a single arrow.

CHAPTER 5

AGENCY PARTNERSHIPS AND COMMUNITY PROCESS

Outreach to the community and key stakeholders was a fundamental part of the project that informed the Study findings and recommendations. This chapter describes the outreach activities conducted during the Study, then summarizes the key feedback messages heard during outreach and describes how public input was incorporated into the Study's findings and recommendations. Summaries of the two outreach events are included in Appendix D and Appendix E.

5.1 Outreach Activities

5.1.1 | Agency Partnerships

Many public transportation agencies play an important role in the planning and oversight of the Balboa Park Station Area, including Caltrans, BART, and SFMTA. Representatives from each of these agencies participated in a Technical Working Group (TWG) to provide guidance and feedback on the project goals, analysis and recommendations. The TWG also provided insight on concurrent planning activities and agency priorities that affected the study outcomes. The TWG convened three times correspondent to key project milestones. In addition, Transportation Authority staff met individually with SFMTA, BART, and Caltrans staff throughout the project to discuss specific issues. **Table 12** lists the key stakeholders.

5.1.2 | Balboa Park Community Advisory Committee

The Balboa Park Community Advisory Committee (CAC) is an advisory body to the SFMTA, and provides recommendations on local transportation issues. The CAC was kept apprised of the Circulation Study and process through informational presentations and updates during the regularly scheduled meetings. In addition, Transportation Authority staff met with District 7 Supervisor Norman Yee, District 11 Supervisor John Avalos, and the District 11 Council (another citizen advisory group) to provide information about the project and gather input on key issues.

Table 12: Key Stakeholders

AGENCY
San Francisco County Transportation Authority (Transportation Authority)
San Francisco Municipal Transportation Agency (SFMTA)
San Francisco Planning Department
California Department of Transportation (Caltrans)
Bay Area Rapid Transit District (BART)
San Francisco Department of Public Works
District 7 Supervisor Norman Yee
District 11 Supervisor John Avalos
Balboa Park Community Advisory Committee

5.1.3 | Community Meetings

The Study hosted two rounds of public outreach. The Transportation Authority conducted the following outreach and noticing activities to promote the community meetings as well as the overall project:

- Posted announcements and updates on the Balboa Park Station Area Circulation Study website: **www.sfcta.org/balboa.**
- Emailed invitations to San Francisco County Transportation Authority's Balboa Park email group, which included community groups and local stakeholders, multiple times in advance of each meeting.
- Outreach to partners/stakeholders who committed to forwarding the above email blast notifications to their email lists.
- Reached out to over 30 community-based organizations to inform them about the community meeting times and dates (see **Table 13**).
- Distributed over 500 meeting announcement flyers to the Balboa Park Station Area's surrounding businesses, grocery stores/corner markets, libraries, schools, community centers, gathering places, and transit shelters.
- Displayed Muni bus banner ads on local lines to promote the project and notify about the meetings.
- Sent a mailer notification to all addresses within a 300-foot radius of the primary project area (3,740 total).
- Distributed a media advisory to various media outlets in advance of the meetings.

Table 13: Community Stakeholders

EDUCATIONAL INSTITUTIONS	
Balboa High School and PTSA	James Denman Middle School and PTSA
Center for Arts Education	Lick Wilmerding High School
City College of San Francisco	Riordan High School
Civic Center Secondary School	Seventh Day Adventist Elementary School
COMMUNITY/RESIDENTIAL	
Bernal Heights Neighborhood Center	Miraloma Park Improvement Club
Balboa Park Community Advisory Committee	New Mission Terrace Improvement Association
Cayuga Improvement Association	Ocean Avenue Association
Coleman Advocates for Children and Youth	OMI Community Collaborative (OMI-CC)
Communities United for Health and Justice (CUHJ)	OMI Neighbors in Action (OMI-NIA)
District 7 Council	OMI/Excelsior Beacon Center
District 11 Council	Outer Mission Merchants and Residents Association (OMMRA)
Excelsior Action Group (EAG)	People Organizing to Demand Environmental & Economic Rights (PODER)
Excelsior District Improvement Association (EDIA)	Rebuilding Together
Excelsior Planning Collaborative	Ridge Lane Neighbors*
Filipino Community Center (FCC)	San Francisco Recreation and Park*
Friends of Balboa Playground	Sunnyside Neighborhood Association*
Geneva Car and Barn Power House	Westwood Park Association*
Glen Park Association	

* These stakeholders were added between Outreach Event 1 and Outreach Event 2

The purpose of the meetings was to present findings of the Circulation Study and demonstrate how the Study would address community values and issues raised during previous studies. Another objective was to build understanding of feasible concepts, related trade-offs and phasing of circulation options. Most importantly, the meetings were a venue to explain the implementation process and solicit community feedback on circulation options. **Table 14** summarizes the purpose and solicited feedback for each meeting. Input received at these meetings informed the Study process and recommendations and is summarized in the following section.

Table 14: Summary of Community Meetings, Purpose and Solicited Feedback

COMMUNITY MEETINGS	PURPOSE	SOLICITED FEEDBACK	MEETING FORMAT
Community Meeting 1 September 30, 2013 City College of San Francisco	Present preliminary findings. Demonstrate how the Study addressed community values and issues raised during previous studies. Build understanding of feasible concepts and introduce trade-offs and constraints of circulation options. Explain implementation process and how to follow and provide feedback on the Study. Solicit community feedback.	Community goals and issues. Community priorities for improving the circulation of the station and evaluation criteria. Public comments on Study products.	Presentation with break-out group discussions
Community Meeting 2 January 30, 2014 City College of San Francisco	Present preliminary findings of the Circulation Study. Build understanding of feasible concepts and introduce trade-offs and constraints of circulation options. Provide explanation of project process and timeline, next steps and possibility of pilot projects. Solicit community feedback.	Community goals and issues. Community prioritization of transportation modes on Ocean and Geneva Avenues. Public comments on Study products.	Presentation with Q&A and open house with staffed info-stations

5.2 Community Feedback and Input

The community provided multiple types of input throughout the study. This section lists key messages heard through the Study's outreach activities and describes how the Study responded to the feedback. It also summarizes the input received as responses to survey questions on prioritizing improvements, locations, and travel modes in the study area.

5.2.1 | Key Messages and Study Responses

1. Support for improving multimodal travel around the station area

COMMUNITY MESSAGE: Balboa Park residents are generally supportive of improving pedestrian and bicycle safety and movement, and transit service. There is particular agreement with the study's identification of key pedestrian safety and access issues. Moreover, residents are eager to see planned concepts be implemented.

STUDY RESPONSE: The study alternatives and final recommendations described in Chapter 3 include a series of multimodal improvements that can be implemented over the next two to 10 years in phases as funds become available.

2. Desire for continuity with previous planning

COMMUNITY MESSAGE: Some community members recall previous planning efforts, such as the Balboa Park Station Area Plan (2009), and want to understand how current projects are adhering to the vision.

STUDY RESPONSE: The study included an alternative in its analysis (Alternative 1) to represent a circulation network similar to that envisioned in the Balboa Park Station Area Plan. While that plan's

vision for the area's transportation network, including a deck over I-280, has been shown to be financially infeasible in the short term, this study's Alternative 1 network reproduces some of the same vehicle circulation patterns.

3. Concern about existing and potential delays to auto travel

COMMUNITY MESSAGE: Balboa Park stakeholders are sensitive to changes that would exacerbate traffic congestion, particularly along residential streets. In addition, although the community recognizes that the existing I-280 freeway configuration presents problematic conditions for other travel modes, many feel that auto access is similarly hampered and should be at least maintained, if not improved. Some community members stated they are hesitant to support moving forward with freeway ramp closures and would like to see more incremental measures implemented first, such as improving sidewalks and pavement markings, improving bike lanes, and restriping interchange off-ramp lane configurations.

STUDY RESPONSE: The study's alternatives development process incorporated considerations for auto travel in order to generate a set of alternative circulation networks that did not overly impact auto travel. For instance, the study dropped alternatives from consideration in part because of their potential impacts to auto travel. Based on the input received, the study looked to develop balanced approaches to improving travel conditions in the Study Area, such as the final version of Alternative 1.

4. Desire to accommodate all travel modes on both Geneva Avenue and Ocean Avenue

COMMUNITY MESSAGE: Travelers of all modes use both Geneva and Ocean for circulation and access, as these streets make connections in and through the area. They are the only two east-west through-routes in this part of the city. Many transit routes, pedestrians, bicyclists, and automobiles, for varying reasons, are reliant on one or the other corridor and alternative routing would create more difficult travel conditions or require out-of-direction travel. Both streets, therefore, need to accommodate all travel modes.

STUDY RESPONSE: The study's recommendation incorporates this feedback and proposes a balanced approach to area circulation.

5.2.2 | Community Meeting Survey Responses

At the Study's Round 2 community workshop, the project team solicited structured feedback from community members via a written survey. The survey asked respondents to indicate the priority they thought should be placed on the various travel modes for Geneva Avenue and Ocean Avenue. Results are shown in **Figure 19** and **Figure 20** below.

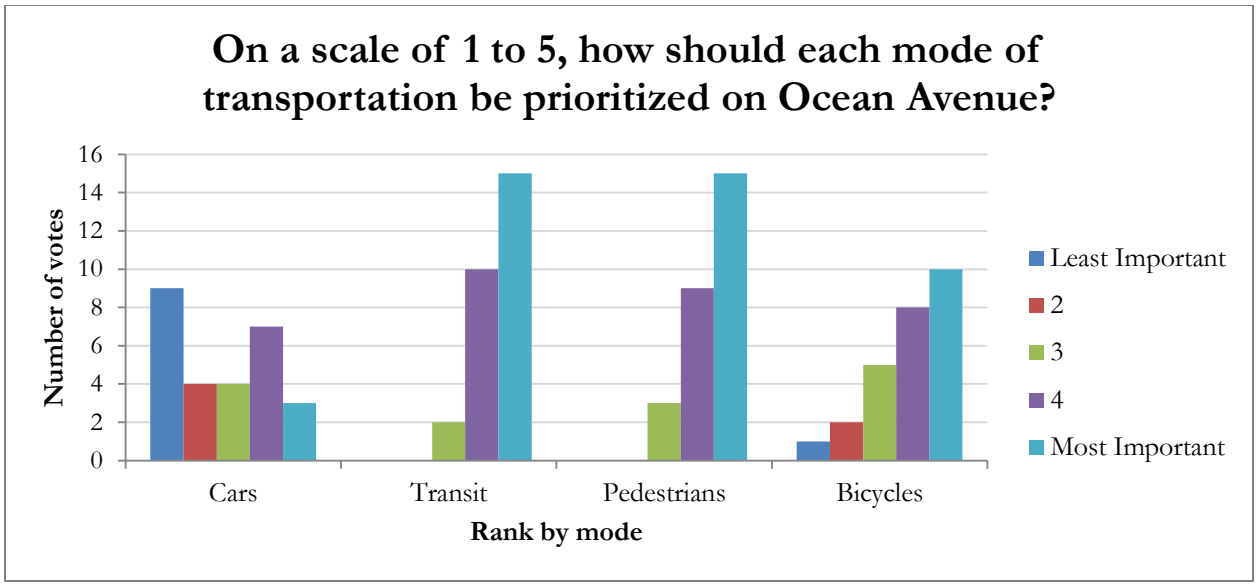


Figure 19: Survey Results for Modal Priorities on Ocean Avenue

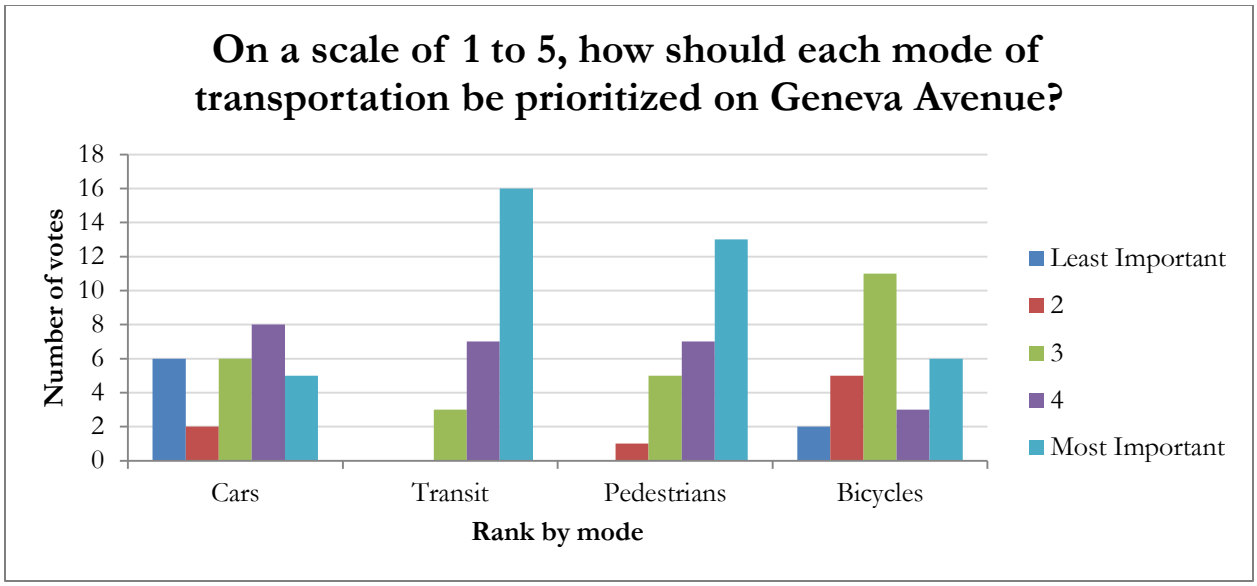


Figure 20: Survey Results for Modal Priorities on Geneva Avenue

In total, 27 survey responses were collected. Overall, survey respondents indicated that both streets are important for all modes of travel. The varied distribution of votes suggests a desire against prioritizing any particular mode for either street. However, a few trends did emerge. For Ocean Avenue, respondents indicated a preference for prioritizing transit and pedestrians, and then bicycles. Similarly, on Geneva Avenue transit was given the highest priority, followed closely by pedestrians. Bicycles and cars each split community opinion on Geneva Avenue, where some favor prioritization and some do not. In general, cars received the lowest priority compared to other modes.

CHAPTER 6

RECOMMENDATION AND NEXT STEPS

This Study is the first stage of project development for the proposed project: a feasibility study that identifies viable re-configurations of the Geneva Avenue and Ocean Avenue I-280 freeway ramps and the local transportation network in order to improve Balboa Park Station Area access and circulation. Several more steps lie between conclusion of this stage and the time a project is ready for implementation, including additional stakeholder and public coordination and outreach, environmental review, and more detailed design and engineering work. This chapter provides an initial description of the staff recommendation, key implementation considerations, including project development steps and schedule, and funding strategy options.

6.1 Staff Recommendation

Within the Balboa Park Station Area there are numerous projects at various stages of development. Many of them aim to improve the pedestrian experience immediately proximate to the station. While the area will benefit from planned improvements to existing infrastructure, such as sidewalks, pavement markings, and signage, none of those improvements would satisfy Goal #1: Reduce the negative impacts on the local community resulting from automobiles accessing the regional road network.

As seen in **Table 11** above, both Alternative 1 and Alternative 2 would improve pedestrian and bicycle conditions on Ocean Avenue, with Alternative 2 providing significant benefits and eliminating all turning-movement conflicts between non-motorized and motorized users. However, Alternative 2 would induce heavy traffic delays on Geneva Avenue and increase the multimodal conflicts associated with the northbound ramps, particularly for pedestrians crossing at the Geneva Avenue ramp intersections. In addition, Alternative 2's traffic delays on Geneva Avenue could heavily affect transit travel times.

Alternative 1 would provide a more balanced approach to the area, reducing conflicts between motorized and non-motorized users on both Ocean and Geneva Avenues and also reducing the weave conflict between transit and auto vehicles on Ocean Avenue. Elements 1 and 2 of Alternative 1 can be considered as separate and independent projects. They do not need to be constructed sequentially, nor must they both be implemented. Element 3 is an option that would follow a permanent implementation of Element 1 and offers a new location for kiss-and-ride drop-offs that would reduce the conflicts currently resulting from impromptu use of the freeway ramps and transit stops for dropping off passengers. As shown in **Table 10** above, Alternative 1 satisfies all five Study goals, whereas Alternative 2 does not.

Therefore, this study recommends **Alternative 1** as the high-performing Alternative to advance for additional study and development.

a. Project Development Steps and Schedule

The subsequent phases of development for the potential improvements are described below and shown in **Figure 21**. The overall schedule is uncertain given the early stage in the planning process, but with strong support, consensus, and high priority from the community, agencies, and elected officials, the initial pilot projects could begin in 2016, with full implementation by 2020.

Figure 21: Potential Implementation Steps

Implementation Planning: Immediately following approval of this final report, a three-month period for implementation planning is needed. During this period, the SFCTA will coordinate with its partner agencies to develop detailed scopes of work for the next steps, which involve determining whether and how to divide the recommended alternative into separate elements to advance. This coordination also entails identifying roles for each agency, including which agency will lead the next steps and how the other agencies will support the work.

Full Traffic Analysis: The next phase of work would be to complete a full traffic analysis, including 20-year projection forecasts, for all elements of the project as both independent and cumulative projects. This analysis would use the SF-CHAMP travel demand model to more accurately predict vehicle circulation changes resulting from the project improvements and highlight any additional areas where improvements may also be needed. This phase of work could be completed within approximately six months.

Pre-Environmental Review Conceptual Design: The subsequent phase of work for the improvements would be to advance project development and to define the scope of environmental analysis. This phase fulfills a required document by Caltrans as part of that agency's multi-step process to implement improvements on the State Highway System. The purpose of this phase is to develop enough project definition to enter environmental review with a clear understanding of the project's potential environmental impacts while maintaining flexibility to modify aspects of the project to minimize potential significant environmental impacts. This phase would include advancing engineering design to approximately 10% and preparing a Project Study Report (PSR) for the portion of the project affecting the state-owned right-of-way as required by Caltrans. This phase of work is expected to last approximately 12 to 18 months.

Potential Pilot Projects: The closure of any ramp could potentially be implemented initially as a pilot project in order to more effectively gauge the potential impacts to traffic circulation. For Alternative 1, a pilot closure of the northbound Geneva Avenue on-ramp would be recommended. This pilot could be feasibly implemented for less than $100,000. Data from site evaluations of the pilot project would inform the traffic analysis necessary for environmental approval of a permanent closure and would ensure that necessary mitigation measures are included in full project implementation.

Environmental Review and Design: Next, the proposed project's environmental impacts would be analyzed both under the state California Environmental Quality Act (CEQA) as required for any project requiring local action as well as under the Federal National Environmental Protection Act (NEPA) to make the project eligible for Federal funding sources. Environmental review would identify resource

areas potentially affected by the proposed project (e.g. transportation, air quality, visual, noise, etc.) and quantify and analyze potential impacts. The process would identify any impacts that are found to be significant and develop mitigations to those impacts. Engineering design would be advanced to 30% in order for impacts to be assessed adequately. This phase would also include a Caltrans Project Report, which provides the scope, schedule and estimated cost of the project, analyzes alternatives considered, and documents the design criteria and special considerations that would guide detailed design. The environmental review process is expected to last approximately one year.

Detailed Design and Construction: After completion of environmental review and the Caltrans Project Report, detailed design and construction of each project phase would proceed. The duration of the design and construction of each phase depends on funding availability and the complexity of the phase, but all construction is expected to be completed by 2020.

b. Funding Opportunities

As the project advances through the next steps of development and approvals, Transportation Authority staff will continue to identify possible sources of funding for the project. The project will seek funds from multiple sources. The following are some of the most promising opportunities:

- **Proposition K Sales Tax.** This half-cent sales tax program, managed by the Transportation Authority, includes approximately $6.5 million in remaining funds in the Balboa Park Station Access category and approximately $3 million in remaining funds for the general BART Station Access, Safety, and Capacity category. Other expenditure plan categories that this project could draw from for eligible scope components include Pedestrian Safety and Circulation, Bike Safety and Circulation, and Traffic Calming.

- **Proposition AA Vehicle Registration Fee.** Also administered by the Transportation Authority, this modest grant program (approximately $5 million/year citywide) includes funding for pedestrian safety and transit efficiency projects.

- **One Bay Area Grant (OBAG) Program.** Projects funded through this program are selected by the Transportation Authority to compete for regional funding through the Metropolitan Transportation Commission (MTC). With nearly $40 million programmed to San Francisco projects through the first grant cycle in 2012, it represents a significant investment in streetscape upgrades, bicycle and pedestrian safety improvements, and local road rehabilitation. Funding for the next OBAG cycle is anticipated to be available in Fiscal Year 2016/17.

- **Lifeline Transportation Program (LTP).** Similar to OBAG, LTP is comprised of state and federal funds programmed by MTC, but San Francisco projects are selected by the Transportation Authority. The LTP supports projects that improve transportation choices for low-income or otherwise disadvantaged communities or close barriers to mobility. Infrastructure projects in and around the Balboa Park station have received funding through prior grant cycles, so a project providing additional mobility and safety improvements would likely compete well in future cycles.

- **Balboa Park Community Infrastructure Impact Fee.** This fee, established in 2009 to be levied on new land development and managed by the San Francisco Planning Department,

supports a range of transportation improvements at the Balboa Park station. However, the funding is anticipated to be modest, with projected revenues of approximately $750,000 through Fiscal Year 2018/19.

Other funding programs could support certain subsets of the project's scope, particularly those elements that improve pedestrian and bicyclist safety or transit efficiency. For instance, the bicycle and pedestrian safety components could compete well for funding from California's new **Active Transportation Program**, with grant cycles administered both regionally and at the state level, or for the state **Highway Safety Improvement Program** which focuses on reducing fatalities and injuries on public roads. Improving safety and access to Lick Wilmerding High School or other nearby schools could also compete for **Safe Routes to Schools** funding at the regional or state level. There are fund sources for projects that improve the efficiency of transit infrastructure and operations, including MTC's **Transit Performance Initiative** grant program.

Aside from these known funding opportunities, this project would likely compete well for new sources of transportation funding since its focus on pedestrian and bicyclist safety and transit efficiency is consistent with San Francisco's overall transportation priorities. As the City and the region set their sights on new revenue measures for transportation, advancing this project through conceptual design would give it further definition and improve its attractiveness as a project ready to receive funds as various new expenditure plans are developed.

FINAL REPORT
APPENDICES

Balboa Park Station Area Circulation Study

April 2014

SAN FRANCISCO COUNTY TRANSPORTATION AUTHORITY

FEHR & PEERS ARUP NELSON NYGAARD

APPENDIX A:

TRANSPORTATION ANALYSIS

DESCRIPTION

This appendix contains the technical transportation analysis of existing conditions, baseline conditions, and the two proposed alternatives. Intersection level of service has been calculated for all study intersections for these alternatives in addition to transit delay. A traffic microsimulation was undertaken for Alternative 1, Element 4.

Element 3 of Alternative 1 was not under consideration as a standalone element at the time that this evaluation took place, and is therefore not assessed in this document. As part of the iterative process, the inception of Element 3 occurred after the detailed analysis stage. While the exact configuration of this element was not part of the detailed analysis, it is a subset of Alternative 1, Element 4, which was analyzed in detail. As such, the findings from detailed analysis of Alternative 1, Element 4 informed the decision to include Element 3 as a viable concept.

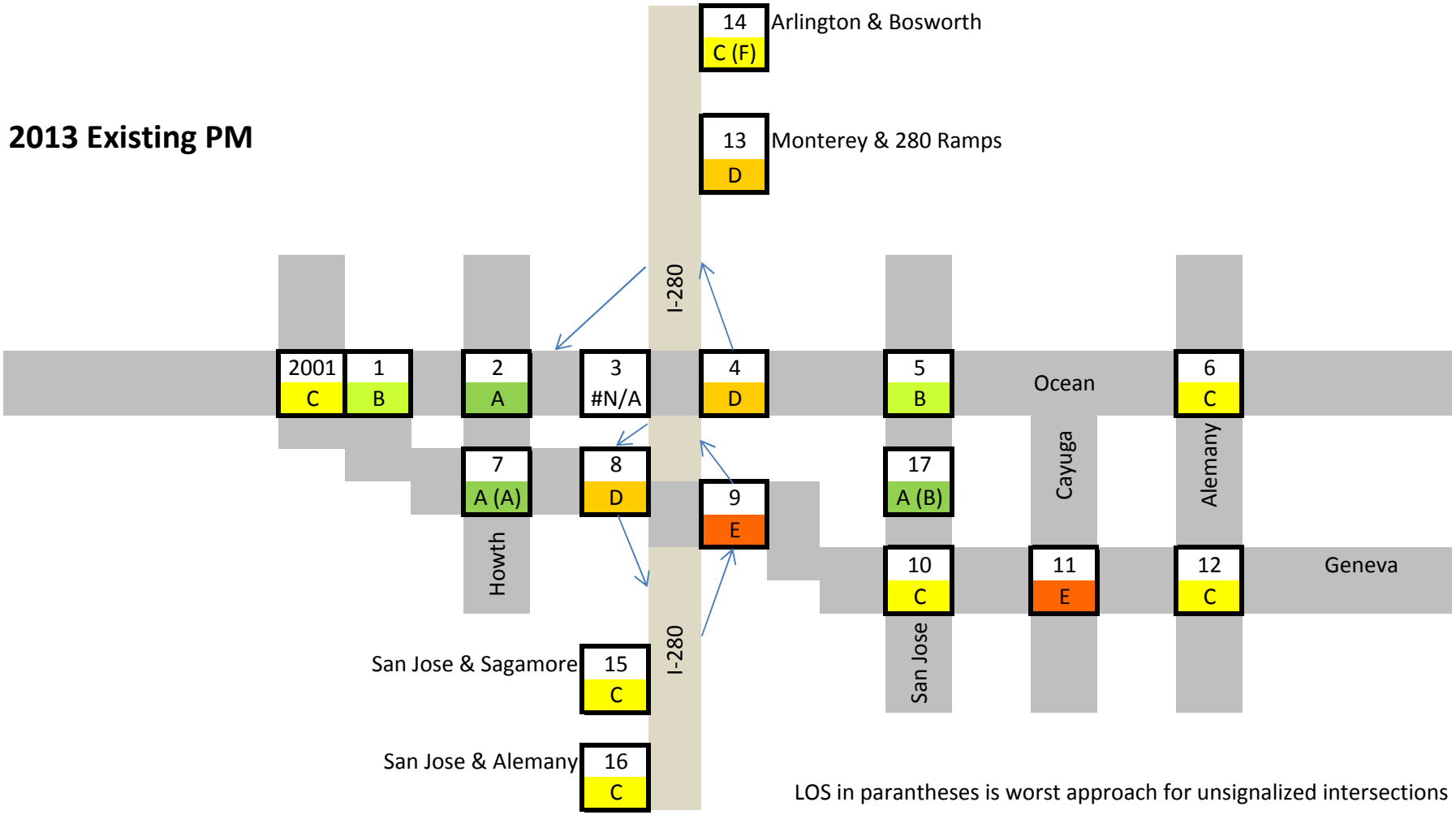
Similarly, the potential Element 3 of Alternative 2 was not under consideration at the time that this evaluation took place. Moreover, Elements 1 and 2 of Alternative 2 were evaluated as a single element and is presented as such in this appendix.

CONTENTS

- Summary of Intersection Levels of Service
- Study Intersection Level of Service Reports
    - Existing Conditions
    - Baseline Conditions
    - Alternative 1, Element 1
    - Alternative 1, Element 2
    - Alternative 1, Element 4
    - Alternative 2
- Transit Delay Sheets
- SimTraffic Reports
    - Alternative 1, Element 4

11/19/2013

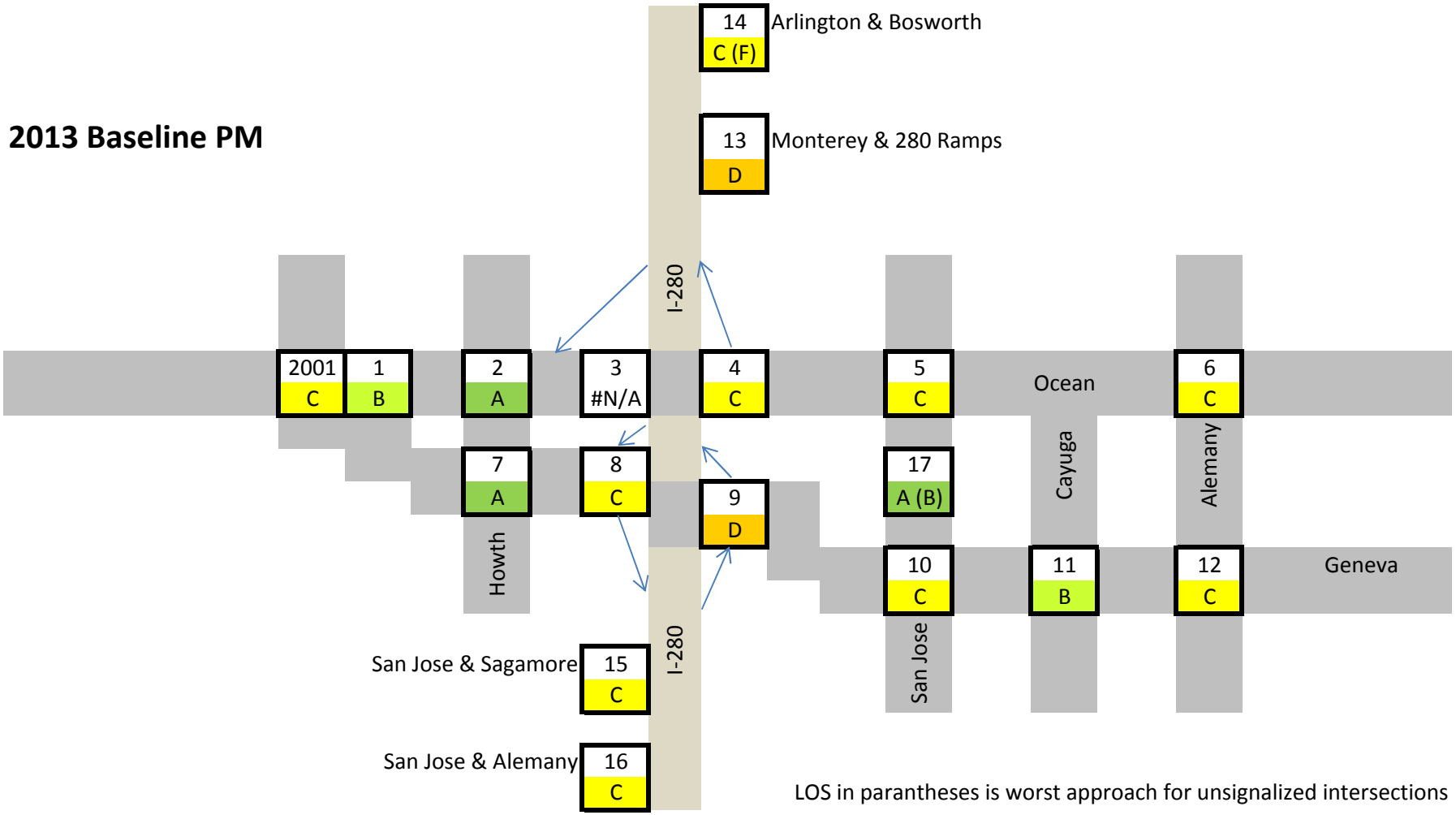
2013 Existing PM



LOS in parantheses is worst approach for unsignalized intersections

11/21/2013

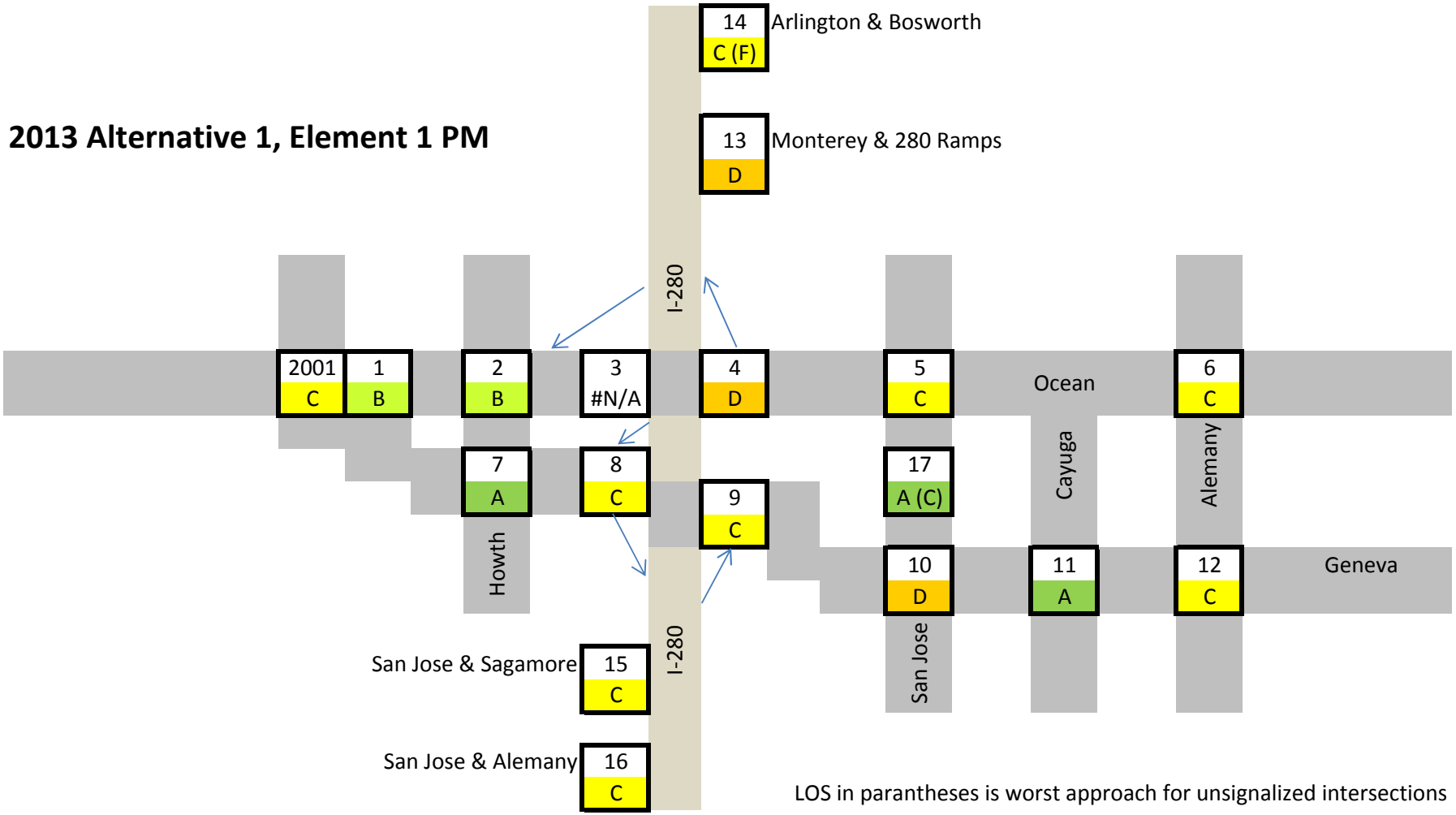
2013 Baseline PM



LOS in parantheses is worst approach for unsignalized intersections

11/19/2013

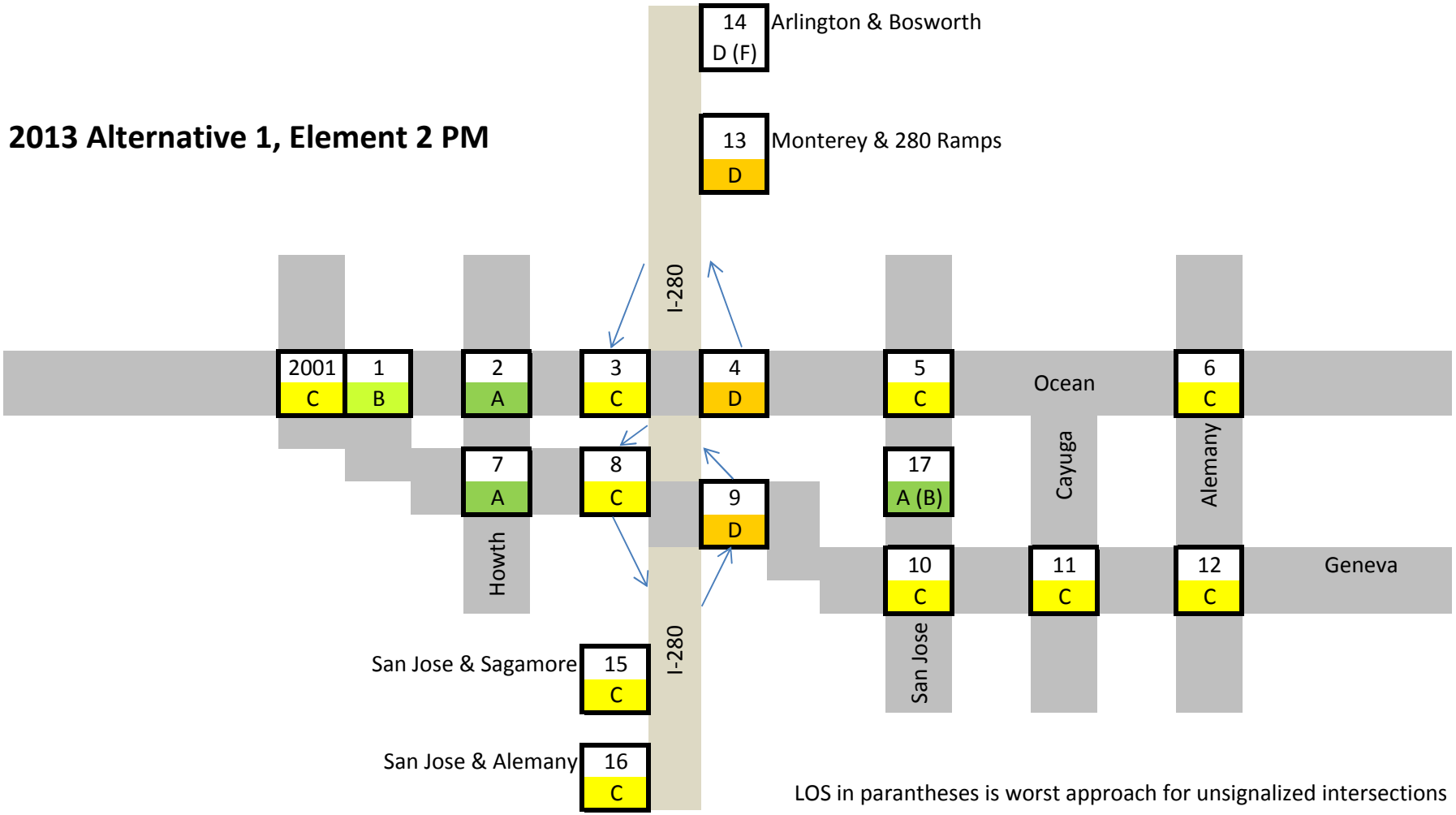
2013 Alternative 1, Element 1 PM



LOS in parantheses is worst approach for unsignalized intersections

11/19/2013

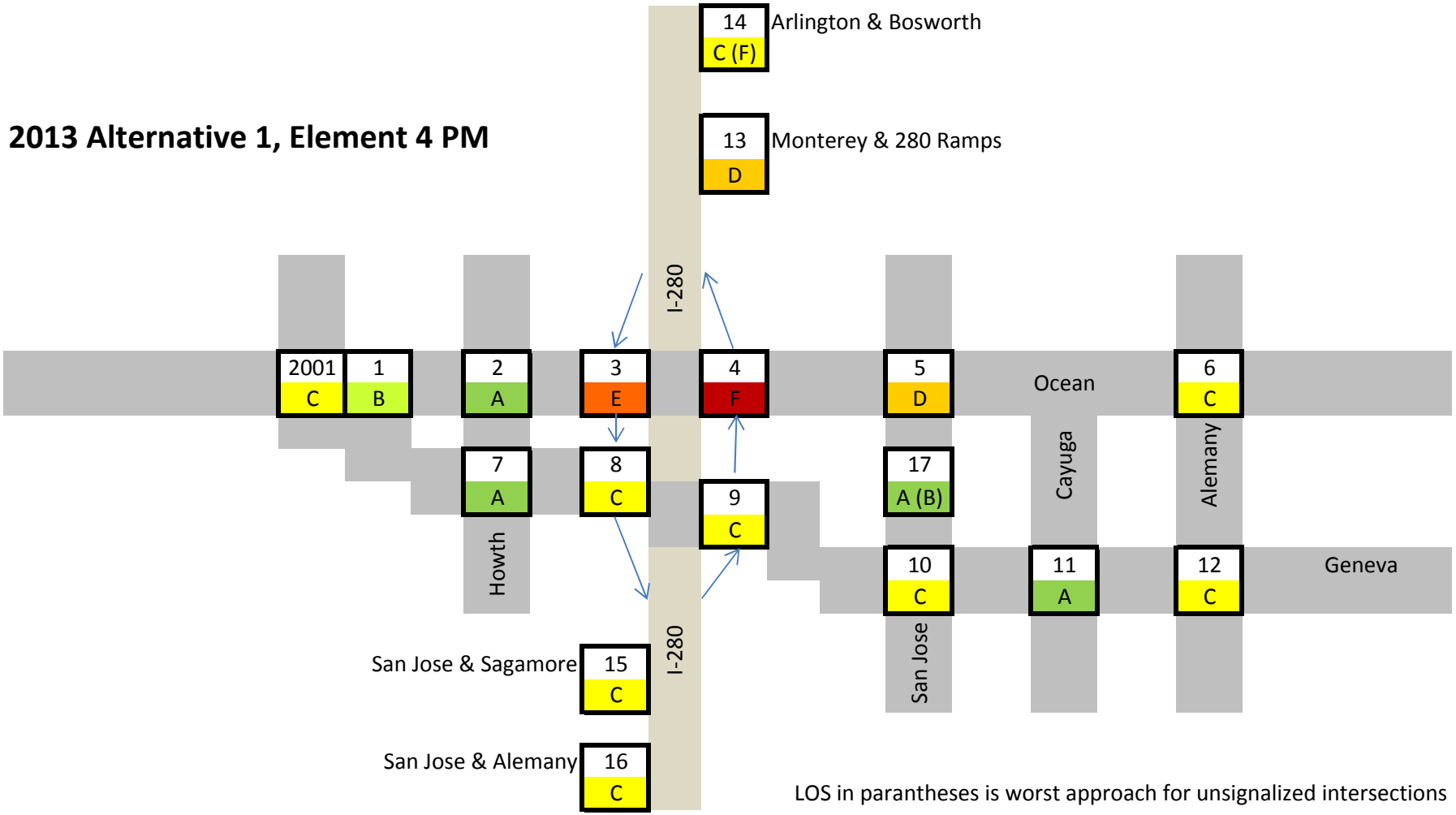
2013 Alternative 1, Element 2 PM



LOS in parantheses is worst approach for unsignalized intersections

11/19/2013

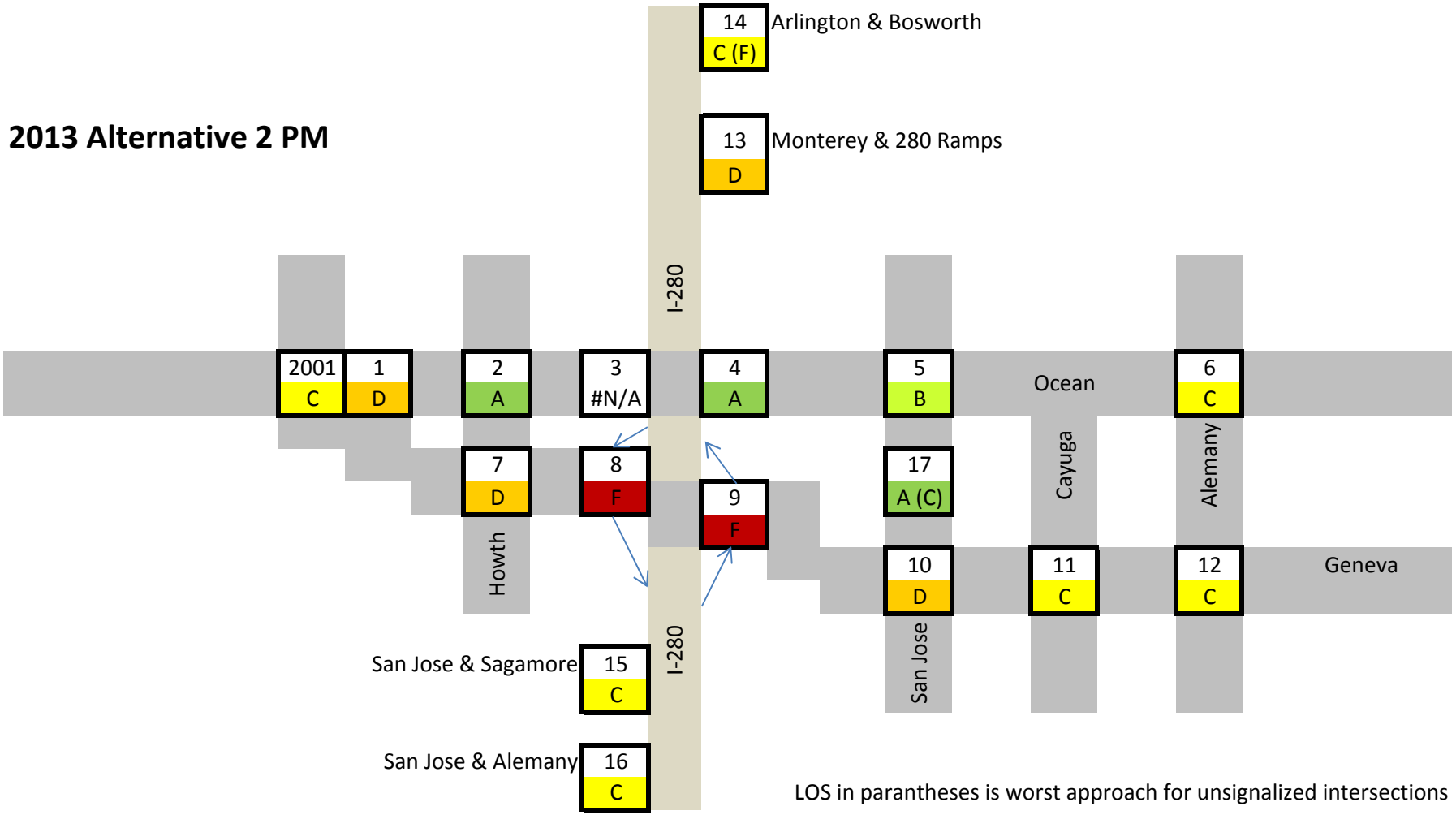
2013 Alternative 1, Element 4 PM



LOS in parantheses is worst approach for unsignalized intersections

11/19/2013

2013 Alternative 2 PM



LOS in parantheses is worst approach for unsignalized intersections

HCM Signalized Intersection Capacity Analysis
1: Ocean & Geneva Ave

1/23/2014

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	985	0	0	970	462	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	5%			5%	0%	
Total Lost time (s)	4.0			4.0	4.0	
Lane Util. Factor	0.95			0.95	0.97	
Frpb, ped/bikes	1.00			1.00	1.00	
Flpb, ped/bikes	1.00			1.00	1.00	
Frt	1.00			1.00	1.00	
Flt Protected	1.00			1.00	0.95	
Satd. Flow (prot)	3336			3336	3310	
Flt Permitted	1.00			1.00	0.95	
Satd. Flow (perm)	3336			3336	3310	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	1048	0	0	1032	491	4
RTOR Reduction (vph)	0	0	0	0	1	0
Lane Group Flow (vph)	1048	0	0	1032	494	0
Confl. Peds. (#/hr)		400	100		100	400
Turn Type						
Protected Phases	13			1	8	
Permitted Phases						
Actuated Green, G (s)	46.0			46.0	26.0	
Effective Green, g (s)	46.0			46.0	26.0	
Actuated g/C Ratio	0.58			0.58	0.32	
Clearance Time (s)	4.0			4.0	4.0	
Vehicle Extension (s)	3.0			3.0	3.0	
Lane Grp Cap (vph)	1918			1918	1076	
v/s Ratio Prot	c0.31			0.31	c0.15	
v/s Ratio Perm						
v/c Ratio	0.55			0.54	0.46	
Uniform Delay, d1	10.5			10.5	21.4	
Progression Factor	0.50			1.71	1.00	
Incremental Delay, d2	0.8			0.9	0.3	
Delay (s)	6.1			18.8	21.7	
Level of Service	A			B	C	
Approach Delay (s)	6.1			18.8	21.7	
Approach LOS	A			B	C	

Intersection Summary			
HCM Average Control Delay	14.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	64.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	107	833	396	0	1165	469	0	0	0	152	304	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		5%			0%			0%			0%	
Total Lost time (s)	3.5	4.0			4.0						4.0	
Lane Util. Factor	1.00	0.95			0.91						0.95	
Frt	1.00	0.95			0.96						0.97	
Flt Protected	0.95	1.00			1.00						0.99	
Satd. Flow (prot)	1668	3175			4704						3277	
Flt Permitted	0.95	1.00			1.00						0.99	
Satd. Flow (perm)	1668	3175			4704						3277	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	114	886	421	0	1239	499	0	0	0	162	323	117
RTOR Reduction (vph)	0	71	0	0	86	0	0	0	0	0	26	0
Lane Group Flow (vph)	114	1236	0	0	1652	0	0	0	0	0	576	0
Turn Type	Prot									Perm		
Protected Phases	5	2			6						4	
Permitted Phases										4		
Actuated Green, G (s)	10.4	46.0			32.1						26.0	
Effective Green, g (s)	10.4	46.0			32.1						26.0	
Actuated g/C Ratio	0.13	0.58			0.40						0.32	
Clearance Time (s)	3.5	4.0			4.0						4.0	
Vehicle Extension (s)	3.0	3.0			3.0						3.0	
Lane Grp Cap (vph)	217	1826			1887						1065	
v/s Ratio Prot	0.07	c0.39			c0.35							
v/s Ratio Perm											0.18	
v/c Ratio	0.53	0.68			0.88						0.54	
Uniform Delay, d1	32.5	11.8			22.1						22.1	
Progression Factor	1.00	1.00			1.12						1.00	
Incremental Delay, d2	2.3	2.0			5.5						0.6	
Delay (s)	34.8	13.9			30.4						22.7	
Level of Service	C	B			C						C	
Approach Delay (s)		15.5			30.4			0.0			22.7	
Approach LOS		B			C			A			C	

Intersection Summary			
HCM Average Control Delay	23.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	75.5%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	760	0	0	976	50	48	10	61	50	0	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0			4.0			4.0	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frt		1.00			0.99			0.93			0.98	
Flt Protected		1.00			1.00			0.98			0.96	
Satd. Flow (prot)		3421			3396			1643			1689	
Flt Permitted		1.00			1.00			0.88			0.75	
Satd. Flow (perm)		3421			3396			1473			1324	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	0	809	0	0	1038	53	51	11	65	53	0	11
RTOR Reduction (vph)	0	0	0	0	4	0	0	44	0	0	7	0
Lane Group Flow (vph)	0	809	0	0	1087	0	0	83	0	0	57	0
Turn Type							Perm			Perm		
Protected Phases		6			6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)		45.0			45.0			26.0			26.0	
Effective Green, g (s)		45.0			45.0			26.0			26.0	
Actuated g/C Ratio		0.56			0.56			0.32			0.32	
Clearance Time (s)		5.0			5.0			4.0			4.0	
Lane Grp Cap (vph)		1924			1910			479			430	
v/s Ratio Prot		0.24			c0.32							
v/s Ratio Perm								c0.06			0.04	
v/c Ratio		0.42			0.57			0.17			0.13	
Uniform Delay, d1		10.0			11.3			19.3			19.0	
Progression Factor		0.20			1.00			0.98			1.00	
Incremental Delay, d2		0.6			1.2			0.8			0.6	
Delay (s)		2.6			12.5			19.6			19.7	
Level of Service		A			B			B			B	
Approach Delay (s)		2.6			12.5			19.6			19.7	
Approach LOS		A			B			B			B	

Intersection Summary			
HCM Average Control Delay	9.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	66.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	497	416	7	9	532	186	7	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		3.0	5.0			3.0				
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00				
Frpb, ped/bikes	1.00	1.00		1.00	0.90			1.00				
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00				
Frt	1.00	1.00		1.00	0.96			1.00				
Flt Protected	0.95	1.00		0.95	1.00			0.95				
Satd. Flow (prot)	1711	1769		872	1556			872				
Flt Permitted	0.95	1.00		0.95	1.00			0.95				
Satd. Flow (perm)	1711	1769		872	1556			872				
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)	512	429	7	9	548	192	7	0	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	8	0	0	0	0	0	0	0
Lane Group Flow (vph)	512	436	0	9	732	0	0	7	0	0	0	0
Confl. Peds. (#/hr)						100						
Confl. Bikes (#/hr)						10						
Heavy Vehicles (%)	2%	2%	100%	100%	2%	2%	100%	100%	100%	2%	2%	2%
Turn Type	Prot			Prot			Perm					
Protected Phases	5	2		1	6			14				
Permitted Phases							14					
Actuated Green, G (s)	53.0	134.2		5.4	84.6			5.4				
Effective Green, g (s)	53.0	134.2		5.4	84.6			5.4				
Actuated g/C Ratio	0.34	0.86		0.03	0.54			0.03				
Clearance Time (s)	5.0	5.0		3.0	5.0			3.0				
Vehicle Extension (s)	0.2	0.2		0.2	0.2			0.2				
Lane Grp Cap (vph)	581	1522		30	844			30				
v/s Ratio Prot	c0.30	0.25		0.01	c0.47							
v/s Ratio Perm								0.01				
v/c Ratio	0.88	0.29		0.30	0.87			0.23				
Uniform Delay, d1	48.5	2.0		73.5	30.8			73.3				
Progression Factor	1.00	1.00		1.00	1.00			1.00				
Incremental Delay, d2	14.2	0.5		2.0	11.6			1.5				
Delay (s)	62.8	2.5		75.5	42.5			74.7				
Level of Service	E	A		E	D			E				
Approach Delay (s)		35.0			42.9			74.7			0.0	
Approach LOS		D			D			E			A	

Intersection Summary			
HCM Average Control Delay	38.7	HCM Level of Service	D
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	156.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	102.6%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	33	348	40	102	475	48	115	255	86	52	286	109
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			5.0			5.0	
Lane Util. Factor		1.00	1.00	1.00	1.00			0.95			1.00	
Frpb, ped/bikes		1.00	0.87	1.00	0.98			0.98			0.97	
Flpb, ped/bikes		1.00	1.00	0.95	1.00			0.99			0.99	
Frt		1.00	0.85	1.00	0.99			0.97			0.97	
Flt Protected		1.00	1.00	0.95	1.00			0.99			0.99	
Satd. Flow (prot)		1784	1329	1618	1740			3163			1665	
Flt Permitted		0.84	1.00	0.39	1.00			0.70			0.90	
Satd. Flow (perm)		1503	1329	660	1740			2256			1509	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	35	370	43	109	505	51	122	271	91	55	304	116
RTOR Reduction (vph)	0	0	15	0	6	0	0	30	0	0	18	0
Lane Group Flow (vph)	0	405	28	109	550	0	0	454	0	0	457	0
Confl. Peds. (#/hr)	100		100	100		100	100		100	100		100
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		27.0	27.0	27.0	27.0			29.0			29.0	
Effective Green, g (s)		27.0	27.0	27.0	27.0			29.0			29.0	
Actuated g/C Ratio		0.42	0.42	0.42	0.42			0.45			0.45	
Clearance Time (s)		4.0	4.0	4.0	4.0			5.0			5.0	
Lane Grp Cap (vph)		624	552	274	723			1007			673	
v/s Ratio Prot					c0.32							
v/s Ratio Perm		0.27	0.02	0.17				0.20			c0.30	
v/c Ratio		0.65	0.05	0.40	0.76			0.45			0.68	
Uniform Delay, d1		15.2	11.3	13.3	16.2			12.5			14.3	
Progression Factor		1.00	1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2		5.2	0.2	4.3	7.4			1.5			5.5	
Delay (s)		20.4	11.5	17.6	23.7			13.9			19.8	
Level of Service		C	B	B	C			B			B	
Approach Delay (s)		19.5			22.7			13.9			19.8	
Approach LOS		B			C			B			B	

Intersection Summary			
HCM Average Control Delay	19.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	65.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	116.1%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	119	226	42	51	225	75	51	550	52	241	801	215
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95	1.00		0.95	1.00
Frpb, ped/bikes	1.00	0.98		1.00	0.97			1.00	0.88		1.00	0.88
Flpb, ped/bikes	0.95	1.00		0.95	1.00			1.00	1.00		0.99	1.00
Frt	1.00	0.98		1.00	0.96			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00		0.99	1.00
Satd. Flow (prot)	1625	1729		1618	1687			3402	1175		3353	1351
Flt Permitted	0.43	1.00		0.48	1.00			0.77	1.00		0.65	1.00
Satd. Flow (perm)	739	1729		813	1687			2633	1175		2217	1351
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	127	240	45	54	239	80	54	585	55	256	852	229
RTOR Reduction (vph)	0	9	0	0	15	0	0	0	22	0	0	92
Lane Group Flow (vph)	127	276	0	54	304	0	0	639	33	0	1108	137
Confl. Peds. (#/hr)	100		100	100		100	100		100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)									6			
Turn Type	Perm			Perm			Perm		Perm	Perm		Perm
Protected Phases		2			2			6			6	
Permitted Phases	2			2			6		6	6		6
Actuated Green, G (s)	27.0	27.0		27.0	27.0			43.0	43.0		43.0	43.0
Effective Green, g (s)	27.0	27.0		27.0	27.0			43.0	43.0		43.0	43.0
Actuated g/C Ratio	0.34	0.34		0.34	0.34			0.54	0.54		0.54	0.54
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0	5.0		5.0	5.0
Lane Grp Cap (vph)	249	584		274	569			1415	632		1192	726
v/s Ratio Prot		0.16			c0.18							
v/s Ratio Perm	0.17			0.07				0.24	0.03		c0.50	0.10
v/c Ratio	0.51	0.47		0.20	0.53			0.45	0.05		0.93	0.19
Uniform Delay, d1	21.2	20.9		18.8	21.4			11.3	8.8		17.1	9.5
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2	7.3	2.7		1.6	3.6			1.0	0.2		13.9	0.6
Delay (s)	28.5	23.6		20.4	25.0			12.3	9.0		31.0	10.1
Level of Service	C	C		C	C			B	A		C	B
Approach Delay (s)		25.1			24.3			12.1			27.4	
Approach LOS		C			C			B			C	

Intersection Summary			
HCM Average Control Delay	22.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	133.3%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	23	534	38	361	693	130	0	0	0	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		5%			5%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	24	568	40	384	737	138	0	0	0	0	0	0
Pedestrians								100			100	
Lane Width (ft)								0.0			0.0	
Walking Speed (ft/s)								4.0			4.0	
Percent Blockage								0			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		764			563							
pX, platoon unblocked												
vC, conflicting volume	976			709			1874	2481	404	2007	2432	538
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	976			709			1874	2481	404	2007	2432	538
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			57			100	100	100	100	100	100
cM capacity (veh/h)	703			886			28	16	596	22	17	488

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3
Volume Total	309	324	384	491	384
Volume Left	24	0	384	0	0
Volume Right	0	40	0	0	138
cSH	703	1700	886	1700	1700
Volume to Capacity	0.03	0.19	0.43	0.29	0.23
Queue Length 95th (ft)	3	0	55	0	0
Control Delay (s)	1.2	0.0	12.1	0.0	0.0
Lane LOS	A		B		
Approach Delay (s)	0.6		3.7		
Approach LOS					

Intersection Summary			
Average Delay	2.7		
Intersection Capacity Utilization	47.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	336	180	476	713	0	0	0	0	487	1	185
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	11	11	11	11	11	11	12	12	12
Total Lost time (s)		3.5			3.5					3.5	3.5	
Lane Util. Factor		0.95			0.95					0.95	0.95	
Frpb, ped/bikes		0.89			1.00					1.00	0.91	
Flpb, ped/bikes		1.00			0.98					1.00	1.00	
Frt		0.95			1.00					1.00	0.92	
Flt Protected		1.00			0.98					0.95	0.98	
Satd. Flow (prot)		2446			2961					1513	1305	
Flt Permitted		1.00			0.57					0.95	0.98	
Satd. Flow (perm)		2446			1724					1513	1305	
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)	0	350	188	496	743	0	0	0	0	507	1	193
RTOR Reduction (vph)	0	79	0	0	0	0	0	0	0	0	52	0
Lane Group Flow (vph)	0	459	0	0	1239	0	0	0	0	360	289	0
Confl. Peds. (#/hr)			100	100								100
Confl. Bikes (#/hr)			30			30						
Parking (#/hr)		5	5									
Turn Type				pm+pt						Perm		
Protected Phases		2		1	6						4	
Permitted Phases				6						4		
Actuated Green, G (s)		31.5			63.5					19.5	19.5	
Effective Green, g (s)		31.5			63.5					19.5	19.5	
Actuated g/C Ratio		0.35			0.71					0.22	0.22	
Clearance Time (s)		3.5			3.5					3.5	3.5	
Vehicle Extension (s)		4.0			4.0					4.0	4.0	
Lane Grp Cap (vph)		856			1615					328	283	
v/s Ratio Prot		0.19			c0.25							
v/s Ratio Perm					c0.29					c0.24	0.22	
v/c Ratio		0.54			0.77					1.10	1.02	
Uniform Delay, d1		23.4			8.5					35.2	35.2	
Progression Factor		1.00			0.19					1.00	1.00	
Incremental Delay, d2		2.4			2.0					78.5	58.6	
Delay (s)		25.8			3.6					113.7	93.8	
Level of Service		C			A					F	F	
Approach Delay (s)		25.8			3.6			0.0			104.0	
Approach LOS		C			A			A			F	

Intersection Summary			
HCM Average Control Delay	36.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	7.0
Intersection Capacity Utilization	89.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	108	730	0	0	709	195	468	5	616	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	11	11	11	12	12	12	11	11	11
Total Lost time (s)		3.5			3.5	3.5	3.5	3.5				
Lane Util. Factor		0.95			0.95	1.00	0.95	0.95				
Frpb, ped/bikes		1.00			1.00	0.72	1.00	0.87				
Flpb, ped/bikes		1.00			1.00	1.00	1.00	1.00				
Frt		1.00			1.00	0.85	1.00	0.86				
Flt Protected		0.99			1.00	1.00	0.95	1.00				
Satd. Flow (prot)		3059			3042	974	1513	1185				
Flt Permitted		0.55			1.00	1.00	0.95	1.00				
Satd. Flow (perm)		1678			3042	974	1513	1185				
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)	111	753	0	0	731	201	482	5	635	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	41	0	98	0	0	0	0
Lane Group Flow (vph)	0	864	0	0	731	160	434	590	0	0	0	0
Confl. Peds. (#/hr)	100					100			100			
Confl. Bikes (#/hr)			10			10						
Bus Blockages (#/hr)	0	0	0	0	6	6	0	0	0	0	0	0
Turn Type	custom					Perm	Perm					
Protected Phases		2			6			8				
Permitted Phases	5					6	8					
Actuated Green, G (s)		47.0			24.5	24.5	36.0	36.0				
Effective Green, g (s)		47.0			24.5	24.5	36.0	36.0				
Actuated g/C Ratio		0.52			0.27	0.27	0.40	0.40				
Clearance Time (s)		3.5			3.5	3.5	3.5	3.5				
Vehicle Extension (s)		5.0			5.0	5.0	5.0	5.0				
Lane Grp Cap (vph)		876			828	265	605	474				
v/s Ratio Prot					0.24							
v/s Ratio Perm		c0.51				0.16	0.29	0.50				
v/c Ratio		1.54dl			0.88	0.60	0.72	1.24				
Uniform Delay, d1		21.2			31.4	28.5	22.7	27.0				
Progression Factor		0.76			0.77	0.66	1.00	1.00				
Incremental Delay, d2		18.0			9.8	7.0	7.1	126.5				
Delay (s)		34.2			33.8	25.8	29.9	153.5				
Level of Service		C			C	C	C	F				
Approach Delay (s)		34.2			32.1			105.7			0.0	
Approach LOS		C			C			F			A	

Intersection Summary			
HCM Average Control Delay	61.0	HCM Level of Service	E
HCM Volume to Capacity ratio	1.10		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	7.0
Intersection Capacity Utilization	96.6%	ICU Level of Service	F
Analysis Period (min)	15		

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL2	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	186	962	159	23	622	64	83	148	29	33	130	183
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.5			5.5	
Lane Util. Factor	1.00	0.95		1.00	0.95			0.95			0.95	
Frpb, ped/bikes	1.00	0.95		1.00	0.95			0.96			0.82	
Flpb, ped/bikes	0.99	1.00		0.95	1.00			1.00			0.98	
Frt	1.00	0.98		1.00	0.99			0.98			0.92	
Flt Protected	0.95	1.00		0.95	1.00			0.98			1.00	
Satd. Flow (prot)	1520	2870		1463	2842			2825			2096	
Flt Permitted	0.20	1.00		0.16	1.00			0.74			0.90	
Satd. Flow (perm)	320	2870		240	2842			2120			1897	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	198	1023	169	24	662	68	88	157	31	35	138	195
RTOR Reduction (vph)	0	8	0	0	0	0	0	9	0	0	0	0
Lane Group Flow (vph)	198	1184	0	24	730	0	0	267	0	0	368	0
Confl. Peds. (#/hr)	400		400	400		400			400	400		400
Confl. Bikes (#/hr)			30			30			10			10
Bus Blockages (#/hr)	0	0	6	0	6	6	0	6	0	0	6	0
Parking (#/hr)											5	5
Turn Type	pm+pt			Perm						Perm		
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8						6		
Actuated Green, G (s)	41.0	41.0		30.0	30.0			38.5			38.5	
Effective Green, g (s)	41.0	41.0		30.0	30.0			38.5			38.5	
Actuated g/C Ratio	0.46	0.46		0.33	0.33			0.43			0.43	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.5			5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	226	1307		80	947			907			811	
v/s Ratio Prot	0.06	c0.41			0.26							
v/s Ratio Perm	0.34			0.10				0.13			c0.19	
v/c Ratio	0.88	0.91		0.30	0.77			5.87dl			0.45	
Uniform Delay, d1	20.1	22.7		22.2	26.9			16.9			18.3	
Progression Factor	1.01	0.98		1.00	1.00			1.00			1.00	
Incremental Delay, d2	4.7	1.2		9.4	6.0			0.8			1.8	
Delay (s)	25.1	23.5		31.6	33.0			17.7			20.1	
Level of Service	C	C		C	C			B			C	
Approach Delay (s)		23.7			32.9			17.7			20.1	
Approach LOS		C			C			B			C	

Intersection Summary			
HCM Average Control Delay	25.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.5
Intersection Capacity Utilization	122.3%	ICU Level of Service	H
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
dr Defacto Right Lane. Recode with 1 though lane as a right lane.
c Critical Lane Group

Movement	SER
Lane Configurations	
Volume (vph)	0
Ideal Flow (vphpl)	1900
Total Lost time (s)	
Lane Util. Factor	
Frpb, ped/bikes	
Flpb, ped/bikes	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Peak-hour factor, PHF	0.94
Adj. Flow (vph)	0
RTOR Reduction (vph)	0
Lane Group Flow (vph)	0
Confl. Peds. (#/hr)	400
Confl. Bikes (#/hr)	
Bus Blockages (#/hr)	0
Parking (#/hr)	
Turn Type	custom
Protected Phases	
Permitted Phases	13
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s)	
Approach LOS	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	59	767	46	61	643	50	57	39	61	26	64	63
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
Hourly flow rate (vph)	61	799	48	64	670	52	59	41	64	27	67	66

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total (vph)	461	447	398	387	164	159
Volume Left (vph)	61	0	64	0	59	27
Volume Right (vph)	0	48	0	52	64	66
Hadj (s)	0.10	-0.04	0.11	-0.06	-0.13	-0.18
Departure Headway (s)	7.3	7.1	7.4	7.2	7.7	7.6
Degree Utilization, x	0.93	0.88	0.82	0.78	0.35	0.34
Capacity (veh/h)	491	502	478	488	454	453
Control Delay (s)	50.5	42.1	35.0	30.0	14.7	14.5
Approach Delay (s)	46.3		32.5		14.7	14.5
Approach LOS	E		D		B	B

Intersection Summary			
Delay	35.9		
HCM Level of Service	E		
Intersection Capacity Utilization	81.5%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	131	616	83	107	533	267	79	547	247	49	664	102
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	3.5		3.5	3.5		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	0.98		1.00	0.95		1.00	0.95		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1711	3360		1711	3250		1711	3262		1711	3353	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1711	3360		1711	3250		1711	3262		1711	3353	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	139	655	88	114	567	284	84	582	263	52	706	109
RTOR Reduction (vph)	0	7	0	0	45	0	0	45	0	0	11	0
Lane Group Flow (vph)	139	736	0	114	806	0	84	800	0	52	804	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	13.2	31.5		12.1	30.4		8.6	30.3		7.0	28.7	
Effective Green, g (s)	13.2	31.5		12.1	30.4		8.6	30.3		7.0	28.7	
Actuated g/C Ratio	0.14	0.33		0.13	0.32		0.09	0.32		0.07	0.30	
Clearance Time (s)	3.5	3.5		3.5	3.5		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	2.0		3.0	2.0		3.0	2.0		3.0	2.0	
Lane Grp Cap (vph)	236	1104		216	1030		153	1031		125	1003	
v/s Ratio Prot	c0.08	0.22		0.07	c0.25		0.05	c0.25		0.03	c0.24	
v/s Ratio Perm												
v/c Ratio	0.59	0.67		0.53	0.78		0.55	0.78		0.42	0.80	
Uniform Delay, d1	38.8	27.7		39.2	29.7		41.8	29.7		42.5	31.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.7	1.2		2.3	3.6		4.0	3.4		2.2	4.4	
Delay (s)	42.5	28.9		41.5	33.4		45.8	33.1		44.7	35.4	
Level of Service	D	C		D	C		D	C		D	D	
Approach Delay (s)		31.0			34.3			34.3			35.9	
Approach LOS		C			C			C			D	

Intersection Summary			
HCM Average Control Delay	33.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	95.9	Sum of lost time (s)	11.0
Intersection Capacity Utilization	72.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	215	334	6	158	895	284	2	96	94	173	74	284
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			4.0	4.0		4.0	4.0
Lane Util. Factor	0.91	0.91			0.95			1.00	1.00		1.00	1.00
Frpb, ped/bikes	1.00	1.00			1.00			1.00	1.00		1.00	0.87
Flpb, ped/bikes	1.00	1.00			1.00			1.00	1.00		1.00	1.00
Frt	1.00	1.00			0.97			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00			0.99			1.00	1.00		0.97	1.00
Satd. Flow (prot)	1557	3245			3293			1799	1531		1740	1338
Flt Permitted	0.95	1.00			0.99			1.00	1.00		0.97	1.00
Satd. Flow (perm)	1557	3245			3293			1799	1531		1740	1338
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	226	352	6	166	942	299	2	101	99	182	78	299
RTOR Reduction (vph)	0	1	0	0	22	0	0	0	90	0	0	256
Lane Group Flow (vph)	190	393	0	0	1385	0	0	103	9	0	260	43
Confl. Peds. (#/hr)			50	50			50					50
Confl. Bikes (#/hr)			10									10
Turn Type	Split			Split			Split		Perm	Split		Perm
Protected Phases	2	2		6	6		8	8		4	4	
Permitted Phases									8			4
Actuated Green, G (s)	18.0	18.0			50.0			10.0	10.0		16.0	16.0
Effective Green, g (s)	18.0	18.0			50.0			10.0	10.0		16.0	16.0
Actuated g/C Ratio	0.16	0.16			0.45			0.09	0.09		0.15	0.15
Clearance Time (s)	4.0	4.0			4.0			4.0	4.0		4.0	4.0
Lane Grp Cap (vph)	255	531			1497			164	139		253	195
v/s Ratio Prot	c0.12	0.12			c0.42			c0.06			c0.15	
v/s Ratio Perm									0.01			0.03
v/c Ratio	0.75	0.74			0.92			0.63	0.06		1.03	0.22
Uniform Delay, d1	43.8	43.8			28.2			48.2	45.7		47.0	41.5
Progression Factor	1.00	1.00			1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2	17.9	9.0			11.1			16.8	0.9		63.9	2.6
Delay (s)	61.7	52.8			39.4			65.0	46.6		110.9	44.1
Level of Service	E	D			D			E	D		F	D
Approach Delay (s)		55.7			39.4			56.0			75.2	
Approach LOS		E			D			E			E	

Intersection Summary			
HCM Average Control Delay	51.3	HCM Level of Service	D
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	86.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	33	623	944	78	29	75
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	37	692	1049	87	32	83
Pedestrians					50	
Lane Width (ft)					11.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					4	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		364				
pX, platoon unblocked						
vC, conflicting volume	1186				1562	1142
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1186				1562	1142
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	93				65	55
cM capacity (veh/h)	562				92	187

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	SB 1
Volume Total	37	346	346	1136	116
Volume Left	37	0	0	0	32
Volume Right	0	0	0	87	83
cSH	562	1700	1700	1700	145
Volume to Capacity	0.07	0.20	0.20	0.67	0.80
Queue Length 95th (ft)	5	0	0	0	125
Control Delay (s)	11.8	0.0	0.0	0.0	88.7
Lane LOS	B				F
Approach Delay (s)	0.6			0.0	88.7
Approach LOS					F

Intersection Summary			
Average Delay	5.4		
Intersection Capacity Utilization	67.6%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	90	32	0	767	29	140	89	3	357	497	1035
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		11.0	11.0		11.0		6.0	5.0		4.0	5.0	5.0
Lane Util. Factor		1.00	1.00		0.91		0.97	1.00		1.00	0.91	0.91
Frpb, ped/bikes		1.00	0.99		1.00		1.00	1.00		1.00	0.98	0.97
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	1.00
Frt		1.00	0.85		0.99		1.00	1.00		1.00	0.92	0.85
Flt Protected		1.00	1.00		1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1801	1509		4874		3319	1791		1711	2981	1352
Flt Permitted		1.00	1.00		1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)		1801	1509		4874		3319	1791		1711	2981	1352
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	0	96	34	0	816	31	149	95	3	380	529	1101
RTOR Reduction (vph)	0	0	28	0	4	0	0	2	0	0	0	0
Lane Group Flow (vph)	0	96	6	0	843	0	149	96	0	380	1080	550
Confl. Peds. (#/hr)			2	2		57						22
Confl. Bikes (#/hr)						4			1			2
Turn Type			custom				Prot			Prot		custom
Protected Phases					8		5	2		1	6	
Permitted Phases		4	4									15
Actuated Green, G (s)		17.0	17.0		17.0		7.0	21.0		32.0	44.0	57.0
Effective Green, g (s)		17.0	17.0		17.0		7.0	21.0		32.0	44.0	57.0
Actuated g/C Ratio		0.19	0.19		0.19		0.08	0.23		0.36	0.49	0.63
Clearance Time (s)		11.0	11.0		11.0		6.0	5.0		4.0	5.0	5.0
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		340	285		921		258	418		608	1457	856
v/s Ratio Prot					c0.17		0.04	0.05		0.22	c0.36	
v/s Ratio Perm		0.05	0.00									c0.41
v/c Ratio		0.28	0.02		0.92		0.58	0.23		0.62	0.74	0.64
Uniform Delay, d1		31.3	29.7		35.8		40.1	28.0		24.0	18.4	10.2
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		2.1	0.1		15.1		9.1	1.3		4.8	3.4	3.7
Delay (s)		33.3	29.9		50.9		49.2	29.2		28.8	21.9	13.9
Level of Service		C	C		D		D	C		C	C	B
Approach Delay (s)		32.4			50.9			41.3			21.0	
Approach LOS		C			D			D			C	

Intersection Summary			
HCM Average Control Delay	30.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	88.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	EBR2	WBL	WBR2	NBT	NBR	NBR2	SBT	NWR2
Lane Configurations											
Volume (vph)	268	589	3	11	256	164	222	303	12	485	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	5.0		5.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	0.95		1.00	0.97	1.00	0.91	1.00	1.00	0.91	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.98	1.00	1.00	1.00	1.00	0.93
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00		0.85	1.00	0.85	1.00	0.85	0.85	1.00	0.86
Flt Protected	0.95	1.00		1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (prot)	1711	3419		1531	3305	1496	4916	1531	1531	4916	1452
Flt Permitted	0.95	1.00		1.00	0.42	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (perm)	1711	3419		1531	1473	1496	4916	1531	1531	4916	1452
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	273	601	3	11	261	167	227	309	12	495	40
RTOR Reduction (vph)	0	0	0	7	0	115	0	0	0	0	0
Lane Group Flow (vph)	273	604	0	4	261	52	227	309	12	495	40
Confl. Peds. (#/hr)					10						17
Confl. Bikes (#/hr)						2					
Turn Type	custom			Perm	custom	custom		Perm	Perm		custom
Protected Phases		2!					4!				
Permitted Phases	7!			2	3	6		4	4	4!	6!
Actuated Green, G (s)	43.0	26.0		26.0	14.0	25.0	23.0	23.0	23.0	23.0	25.0
Effective Green, g (s)	43.0	26.0		26.0	14.0	25.0	23.0	23.0	23.0	23.0	25.0
Actuated g/C Ratio	0.54	0.32		0.32	0.18	0.31	0.29	0.29	0.29	0.29	0.31
Clearance Time (s)	6.0	5.0		5.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Grp Cap (vph)	920	1111		498	258	468	1413	440	440	1413	454
v/s Ratio Prot		c0.18					0.05				
v/s Ratio Perm	0.16			0.00	c0.18	0.03		c0.20	0.01	0.10	0.03
v/c Ratio	0.30	0.54		0.01	1.01	0.11	0.16	0.70	0.03	0.35	0.09
Uniform Delay, d1	10.2	22.1		18.3	33.0	19.6	21.3	25.4	20.5	22.6	19.4
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.8	1.9		0.0	59.0	0.5	0.2	9.0	0.1	0.7	0.4
Delay (s)	11.0	24.0		18.3	92.0	20.1	21.5	34.5	20.6	23.3	19.8
Level of Service	B	C		B	F	C	C	C	C	C	B
Approach Delay (s)		20.0					28.8			23.3	
Approach LOS		B					C			C	

Intersection Summary			
HCM Average Control Delay	30.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	83.3%	ICU Level of Service	E
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	50	80	270	64	40	296
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	53	85	287	68	43	315
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			373			584
pX, platoon unblocked						
vC, conflicting volume	564	178			355	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	564	178			355	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	88	90			96	
cM capacity (veh/h)	440	835			1200	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	138	191	164	148	210
Volume Left	53	0	0	43	0
Volume Right	85	0	68	0	0
cSH	620	1700	1700	1200	1700
Volume to Capacity	0.22	0.11	0.10	0.04	0.12
Queue Length 95th (ft)	21	0	0	3	0
Control Delay (s)	12.5	0.0	0.0	2.6	0.0
Lane LOS	B			A	
Approach Delay (s)	12.5	0.0		1.1	
Approach LOS	B				

Intersection Summary			
Average Delay	2.5		
Intersection Capacity Utilization	36.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
1: Ocean & Geneva Ave

3/6/2014

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	985	0	0	970	462	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	5%			5%	0%	
Total Lost time (s)	4.0			4.0	4.0	
Lane Util. Factor	0.95			0.95	0.97	
Frpb, ped/bikes	1.00			1.00	1.00	
Flpb, ped/bikes	1.00			1.00	1.00	
Frt	1.00			1.00	1.00	
Flt Protected	1.00			1.00	0.95	
Satd. Flow (prot)	3336			3336	3320	
Flt Permitted	1.00			1.00	0.95	
Satd. Flow (perm)	3336			3336	3320	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	1048	0	0	1032	491	4
RTOR Reduction (vph)	0	0	0	0	1	0
Lane Group Flow (vph)	1048	0	0	1032	494	0
Confl. Peds. (#/hr)			100		100	100
Turn Type						
Protected Phases	13			1	8	
Permitted Phases						
Actuated Green, G (s)	46.0			46.0	26.0	
Effective Green, g (s)	46.0			46.0	26.0	
Actuated g/C Ratio	0.58			0.58	0.32	
Clearance Time (s)	4.0			4.0	4.0	
Vehicle Extension (s)	3.0			3.0	3.0	
Lane Grp Cap (vph)	1918			1918	1079	
v/s Ratio Prot	c0.31			0.31	c0.15	
v/s Ratio Perm						
v/c Ratio	0.55			0.54	0.46	
Uniform Delay, d1	10.5			10.5	21.4	
Progression Factor	0.50			1.70	1.00	
Incremental Delay, d2	0.8			0.9	0.3	
Delay (s)	6.1			18.7	21.7	
Level of Service	A			B	C	
Approach Delay (s)	6.1			18.7	21.7	
Approach LOS	A			B	C	

Intersection Summary			
HCM Average Control Delay	14.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	64.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	107	833	396	0	1165	469	0	0	0	152	304	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		5%			0%			0%			0%	
Total Lost time (s)	3.5	4.0			4.0						4.0	
Lane Util. Factor	1.00	0.95			0.91						0.95	
Frt	1.00	0.95			0.96						0.97	
Flt Protected	0.95	1.00			1.00						0.99	
Satd. Flow (prot)	1668	3175			4704						3277	
Flt Permitted	0.95	1.00			1.00						0.99	
Satd. Flow (perm)	1668	3175			4704						3277	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	114	886	421	0	1239	499	0	0	0	162	323	117
RTOR Reduction (vph)	0	71	0	0	86	0	0	0	0	0	26	0
Lane Group Flow (vph)	114	1236	0	0	1652	0	0	0	0	0	576	0
Turn Type	Prot									Perm		
Protected Phases	5	2			6						4	
Permitted Phases										4		
Actuated Green, G (s)	10.4	46.0			32.1						26.0	
Effective Green, g (s)	10.4	46.0			32.1						26.0	
Actuated g/C Ratio	0.13	0.58			0.40						0.32	
Clearance Time (s)	3.5	4.0			4.0						4.0	
Vehicle Extension (s)	3.0	3.0			3.0						3.0	
Lane Grp Cap (vph)	217	1826			1887						1065	
v/s Ratio Prot	0.07	c0.39			c0.35							
v/s Ratio Perm											0.18	
v/c Ratio	0.53	0.68			0.88						0.54	
Uniform Delay, d1	32.5	11.8			22.1						22.1	
Progression Factor	1.00	1.00			1.12						1.00	
Incremental Delay, d2	2.3	2.0			5.5						0.6	
Delay (s)	34.8	13.9			30.4						22.7	
Level of Service	C	B			C						C	
Approach Delay (s)		15.5			30.4			0.0			22.7	
Approach LOS		B			C			A			C	

Intersection Summary			
HCM Average Control Delay	23.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	75.5%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	760	0	0	976	50	48	44	61	50	0	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0			4.0			4.0	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frt		1.00			0.99			0.95			0.98	
Flt Protected		1.00			1.00			0.98			0.96	
Satd. Flow (prot)		3421			3396			1677			1689	
Flt Permitted		1.00			1.00			0.90			0.74	
Satd. Flow (perm)		3421			3396			1537			1293	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	0	809	0	0	1038	53	51	47	65	53	0	11
RTOR Reduction (vph)	0	0	0	0	4	0	0	30	0	0	7	0
Lane Group Flow (vph)	0	809	0	0	1087	0	0	133	0	0	57	0
Turn Type							Perm			Perm		
Protected Phases		6			6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)		45.0			45.0			26.0			26.0	
Effective Green, g (s)		45.0			45.0			26.0			26.0	
Actuated g/C Ratio		0.56			0.56			0.32			0.32	
Clearance Time (s)		5.0			5.0			4.0			4.0	
Lane Grp Cap (vph)		1924			1910			500			420	
v/s Ratio Prot		0.24			c0.32							
v/s Ratio Perm								c0.09			0.04	
v/c Ratio		0.42			0.57			0.27			0.13	
Uniform Delay, d1		10.0			11.3			20.0			19.1	
Progression Factor		0.20			1.00			1.00			1.00	
Incremental Delay, d2		0.6			1.2			1.3			0.7	
Delay (s)		2.6			12.5			21.3			19.7	
Level of Service		A			B			C			B	
Approach Delay (s)		2.6			12.5			21.3			19.7	
Approach LOS		A			B			C			B	

Intersection Summary			
HCM Average Control Delay	9.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	66.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	497	416	7	9	532	186	7	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		3.0	5.0			3.0				
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00				
Frpb, ped/bikes	1.00	1.00		1.00	0.93			1.00				
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00				
Frt	1.00	1.00		1.00	0.96			1.00				
Flt Protected	0.95	1.00		0.95	1.00			0.95				
Satd. Flow (prot)	1711	1769		872	1614			872				
Flt Permitted	0.95	1.00		0.95	1.00			0.95				
Satd. Flow (perm)	1711	1769		872	1614			872				
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)	512	429	7	9	548	192	7	0	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	10	0	0	0	0	0	0	0
Lane Group Flow (vph)	512	436	0	9	730	0	0	7	0	0	0	0
Confl. Peds. (#/hr)						100						
Confl. Bikes (#/hr)						10						
Heavy Vehicles (%)	2%	2%	100%	100%	2%	2%	100%	100%	100%	2%	2%	2%
Turn Type	Prot			Prot			Perm					
Protected Phases	5	2		1	6			14				
Permitted Phases							14					
Actuated Green, G (s)	32.9	84.2		2.4	51.7			2.4				
Effective Green, g (s)	32.9	84.2		2.4	51.7			2.4				
Actuated g/C Ratio	0.33	0.84		0.02	0.52			0.02				
Clearance Time (s)	5.0	5.0		3.0	5.0			3.0				
Vehicle Extension (s)	0.2	0.2		0.2	0.2			0.2				
Lane Grp Cap (vph)	563	1489		21	834			21				
v/s Ratio Prot	c0.30	0.25		0.01	c0.45							
v/s Ratio Perm								0.01				
v/c Ratio	0.91	0.29		0.43	0.88			0.33				
Uniform Delay, d1	32.1	1.7		48.1	21.3			48.0				
Progression Factor	1.00	1.00		1.00	1.00			1.00				
Incremental Delay, d2	18.2	0.5		5.0	12.4			3.4				
Delay (s)	50.3	2.2		53.2	33.8			51.4				
Level of Service	D	A		D	C			D				
Approach Delay (s)		28.2			34.0			51.4			0.0	
Approach LOS		C			C			D			A	

Intersection Summary			
HCM Average Control Delay	30.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	90.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	33	348	40	102	475	48	115	255	86	52	286	109
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		5.0	5.0			5.0	
Lane Util. Factor		1.00	1.00	1.00	1.00		1.00	1.00			1.00	
Frpb, ped/bikes		1.00	0.75	1.00	0.98		1.00	0.96			0.96	
Flpb, ped/bikes		0.99	1.00	0.90	1.00		0.95	1.00			0.99	
Frt		1.00	0.85	1.00	0.99		1.00	0.96			0.97	
Flt Protected		1.00	1.00	0.95	1.00		0.95	1.00			0.99	
Satd. Flow (prot)		1783	1148	1532	1735		1620	1669			1656	
Flt Permitted		0.93	1.00	0.42	1.00		0.38	1.00			0.91	
Satd. Flow (perm)		1670	1148	685	1735		651	1669			1519	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	35	370	43	109	505	51	122	271	91	55	304	116
RTOR Reduction (vph)	0	0	13	0	5	0	0	16	0	0	15	0
Lane Group Flow (vph)	0	405	30	109	551	0	122	346	0	0	460	0
Confl. Peds. (#/hr)	100		100	100		100	100		100	100		100
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		37.0	37.0	37.0	37.0		29.0	29.0			29.0	
Effective Green, g (s)		37.0	37.0	37.0	37.0		29.0	29.0			29.0	
Actuated g/C Ratio		0.49	0.49	0.49	0.49		0.39	0.39			0.39	
Clearance Time (s)		4.0	4.0	4.0	4.0		5.0	5.0			5.0	
Lane Grp Cap (vph)		824	566	338	856		252	645			587	
v/s Ratio Prot					c0.32			0.21				
v/s Ratio Perm		0.24	0.03	0.16			0.19				c0.30	
v/c Ratio		0.49	0.05	0.32	0.64		0.48	0.54			0.78	
Uniform Delay, d1		12.7	9.9	11.4	14.1		17.4	17.8			20.2	
Progression Factor		1.00	1.00	1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2		2.1	0.2	2.5	3.7		6.5	3.2			10.0	
Delay (s)		14.8	10.1	14.0	17.8		23.9	21.0			30.3	
Level of Service		B	B	B	B		C	C			C	
Approach Delay (s)		14.3			17.2			21.7			30.3	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM Average Control Delay	20.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	116.1%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	119	226	42	51	225	75	51	550	52	241	801	215
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95	1.00		0.95	1.00
Frpb, ped/bikes	1.00	0.98		1.00	0.97			1.00	0.88		1.00	0.88
Flpb, ped/bikes	0.95	1.00		0.95	1.00			1.00	1.00		0.99	1.00
Frt	1.00	0.98		1.00	0.96			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00		0.99	1.00
Satd. Flow (prot)	1625	1729		1618	1687			3402	1175		3353	1351
Flt Permitted	0.43	1.00		0.48	1.00			0.77	1.00		0.65	1.00
Satd. Flow (perm)	739	1729		813	1687			2633	1175		2217	1351
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	127	240	45	54	239	80	54	585	55	256	852	229
RTOR Reduction (vph)	0	9	0	0	15	0	0	0	22	0	0	92
Lane Group Flow (vph)	127	276	0	54	304	0	0	639	33	0	1108	137
Confl. Peds. (#/hr)	100		100	100		100	100		100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)									6			
Turn Type	Perm			Perm			Perm		Perm	Perm		Perm
Protected Phases		2			2			6			6	
Permitted Phases	2			2			6		6	6		6
Actuated Green, G (s)	27.0	27.0		27.0	27.0			43.0	43.0		43.0	43.0
Effective Green, g (s)	27.0	27.0		27.0	27.0			43.0	43.0		43.0	43.0
Actuated g/C Ratio	0.34	0.34		0.34	0.34			0.54	0.54		0.54	0.54
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0	5.0		5.0	5.0
Lane Grp Cap (vph)	249	584		274	569			1415	632		1192	726
v/s Ratio Prot		0.16			c0.18							
v/s Ratio Perm	0.17			0.07				0.24	0.03		c0.50	0.10
v/c Ratio	0.51	0.47		0.20	0.53			0.45	0.05		0.93	0.19
Uniform Delay, d1	21.2	20.9		18.8	21.4			11.3	8.8		17.1	9.5
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2	7.3	2.7		1.6	3.6			1.0	0.2		13.9	0.6
Delay (s)	28.5	23.6		20.4	25.0			12.3	9.0		31.0	10.1
Level of Service	C	C		C	C			B	A		C	B
Approach Delay (s)		25.1			24.3			12.1			27.4	
Approach LOS		C			C			B			C	

Intersection Summary			
HCM Average Control Delay	22.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	133.3%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	23	534	38	361	693	130	0	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		5%			5%			0%			0%	
Total Lost time (s)		4.0		4.0	4.0							
Lane Util. Factor		0.95		1.00	0.95							
Frpb, ped/bikes		0.98		1.00	0.95							
Flpb, ped/bikes		1.00		0.89	1.00							
Frt		0.99		1.00	0.98							
Flt Protected		1.00		0.95	1.00							
Satd. Flow (prot)		3227		1486	3103							
Flt Permitted		0.91		0.40	1.00							
Satd. Flow (perm)		2931		623	3103							
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	24	568	40	384	737	138	0	0	0	0	0	0
RTOR Reduction (vph)	0	4	0	0	14	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	628	0	384	861	0	0	0	0	0	0	0
Confl. Peds. (#/hr)	100		100	100		100						
Confl. Bikes (#/hr)			10			10						
Turn Type	Perm			Perm								
Protected Phases		4			8							
Permitted Phases	4			8								
Actuated Green, G (s)		63.2		63.2	63.2							
Effective Green, g (s)		63.2		63.2	63.2							
Actuated g/C Ratio		0.70		0.70	0.70							
Clearance Time (s)		4.0		4.0	4.0							
Vehicle Extension (s)		3.0		3.0	3.0							
Lane Grp Cap (vph)		2058		437	2179							
v/s Ratio Prot					0.28							
v/s Ratio Perm		0.21		c0.62								
v/c Ratio		0.30		0.88	0.40							
Uniform Delay, d1		5.1		10.4	5.5							
Progression Factor		1.00		0.97	0.77							
Incremental Delay, d2		0.1		17.2	0.1							
Delay (s)		5.2		27.3	4.3							
Level of Service		A		C	A							
Approach Delay (s)		5.2			11.3			0.0			0.0	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	9.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	26.8
Intersection Capacity Utilization	47.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	336	180	476	713	0	0	0	0	487	1	185
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	11	11	11	11	11	11	12	12	12
Total Lost time (s)		3.5	3.5	3.0	3.5					3.5	3.5	
Lane Util. Factor		0.95	1.00	1.00	0.95					0.95	0.95	
Frpb, ped/bikes		1.00	0.69	1.00	1.00					1.00	0.91	
Flpb, ped/bikes		1.00	1.00	1.00	1.00					1.00	1.00	
Frt		1.00	0.85	1.00	1.00					1.00	0.92	
Flt Protected		1.00	1.00	0.95	1.00					0.95	0.98	
Satd. Flow (prot)		2887	832	1540	3079					1513	1305	
Flt Permitted		1.00	1.00	0.95	1.00					0.95	0.98	
Satd. Flow (perm)		2887	832	1540	3079					1513	1305	
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)	0	350	188	496	743	0	0	0	0	507	1	193
RTOR Reduction (vph)	0	0	138	0	0	0	0	0	0	0	53	0
Lane Group Flow (vph)	0	350	50	496	743	0	0	0	0	360	288	0
Confl. Peds. (#/hr)			100	100								100
Confl. Bikes (#/hr)			30			30						
Parking (#/hr)		5	5									
Turn Type			Perm	Prot						Perm		
Protected Phases		2		1	6						4	
Permitted Phases			2							4		
Actuated Green, G (s)		24.1	24.1	32.2	59.3					23.7	23.7	
Effective Green, g (s)		24.1	24.1	32.2	59.3					23.7	23.7	
Actuated g/C Ratio		0.27	0.27	0.36	0.66					0.26	0.26	
Clearance Time (s)		3.5	3.5	3.0	3.5					3.5	3.5	
Vehicle Extension (s)		4.0	4.0	3.0	4.0					4.0	4.0	
Lane Grp Cap (vph)		773	223	551	2029					398	344	
v/s Ratio Prot		c0.12		c0.32	0.24							
v/s Ratio Perm			0.06							c0.24	0.22	
v/c Ratio		0.45	0.23	0.90	0.37					0.90	0.84	
Uniform Delay, d1		27.5	25.7	27.4	6.9					32.1	31.3	
Progression Factor		0.78	1.97	0.91	0.84					1.00	1.00	
Incremental Delay, d2		1.9	2.3	15.4	0.4					23.7	16.7	
Delay (s)		23.2	53.0	40.4	6.2					55.8	48.0	
Level of Service		C	D	D	A					E	D	
Approach Delay (s)		33.6			19.9			0.0			52.0	
Approach LOS		C			B			A			D	

Intersection Summary			
HCM Average Control Delay	32.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	80.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	108	730	0	0	709	195	468	5	616	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	11	11	11	12	12	12	11	11	11
Total Lost time (s)		3.5			3.5	3.5	3.5	3.5				
Lane Util. Factor		0.95			0.95	1.00	0.95	0.95				
Frpb, ped/bikes		1.00			1.00	0.73	1.00	0.87				
Flpb, ped/bikes		0.99			1.00	1.00	1.00	1.00				
Frt		1.00			1.00	0.85	1.00	0.86				
Flt Protected		0.99			1.00	1.00	0.95	1.00				
Satd. Flow (prot)		3033			3079	1005	1513	1185				
Flt Permitted		0.71			1.00	1.00	0.95	1.00				
Satd. Flow (perm)		2167			3079	1005	1513	1185				
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)	111	753	0	0	731	201	482	5	635	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	52	0	96	0	0	0	0
Lane Group Flow (vph)	0	864	0	0	731	149	434	592	0	0	0	0
Confl. Peds. (#/hr)	100					100			100			
Confl. Bikes (#/hr)			10			10						
Turn Type	Prot					Perm	Perm					
Protected Phases	5	2			6			8				
Permitted Phases						6	8					
Actuated Green, G (s)		43.5			43.5	43.5	39.5	39.5				
Effective Green, g (s)		43.5			43.5	43.5	39.5	39.5				
Actuated g/C Ratio		0.48			0.48	0.48	0.44	0.44				
Clearance Time (s)		3.5			3.5	3.5	3.5	3.5				
Vehicle Extension (s)		5.0			5.0	5.0	5.0	5.0				
Lane Grp Cap (vph)		1047			1488	486	664	520				
v/s Ratio Prot					0.24							
v/s Ratio Perm		c0.40				0.15	0.29	0.50				
v/c Ratio		0.83			0.49	0.31	0.65	1.14				
Uniform Delay, d1		20.0			15.8	14.1	19.9	25.2				
Progression Factor		1.53			0.42	0.15	1.00	1.00				
Incremental Delay, d2		4.4			0.7	1.0	3.1	83.6				
Delay (s)		35.0			7.4	3.1	23.0	108.8				
Level of Service		C			A	A	C	F				
Approach Delay (s)		35.0			6.5			75.6			0.0	
Approach LOS		C			A			E			A	

Intersection Summary			
HCM Average Control Delay	41.5	HCM Level of Service	D
HCM Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	7.0
Intersection Capacity Utilization	96.6%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL2	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	186	962	159	23	622	64	83	148	29	33	130	183
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.5		5.5	5.5	
Lane Util. Factor	1.00	0.95		1.00	0.95			0.95		1.00	1.00	
Frpb, ped/bikes	1.00	0.95		1.00	0.95			0.96		1.00	0.80	
Flpb, ped/bikes	0.98	1.00		0.95	1.00			1.00		0.76	1.00	
Frt	1.00	0.98		1.00	0.99			0.98		1.00	0.91	
Flt Protected	0.95	1.00		0.95	1.00			0.98		0.95	1.00	
Satd. Flow (prot)	1512	2870		1462	2842			2825		1168	1013	
Flt Permitted	0.18	1.00		0.16	1.00			0.73		0.58	1.00	
Satd. Flow (perm)	282	2870		239	2842			2093		716	1013	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	198	1023	169	24	662	68	88	157	31	35	138	195
RTOR Reduction (vph)	0	13	0	0	0	0	0	9	0	0	0	0
Lane Group Flow (vph)	198	1179	0	24	730	0	0	267	0	35	333	0
Confl. Peds. (#/hr)	400		400	400		400			400	400		400
Confl. Bikes (#/hr)			30			30			10			10
Bus Blockages (#/hr)	0	0	6	0	6	6	0	6	0	0	6	0
Parking (#/hr)											5	5
Turn Type	pm+pt			Perm			Perm			Perm		
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	39.8	39.8		27.3	27.3			39.7		39.7	39.7	
Effective Green, g (s)	39.8	39.8		27.3	27.3			39.7		39.7	39.7	
Actuated g/C Ratio	0.44	0.44		0.30	0.30			0.44		0.44	0.44	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)	227	1269		72	862			923		316	447	
v/s Ratio Prot	0.07	c0.41			0.26						c0.33	
v/s Ratio Perm	0.31			0.10				0.13		0.05		
v/c Ratio	0.87	0.93		0.33	0.85			0.29		0.11	0.74	
Uniform Delay, d1	18.6	23.8		24.3	29.4			16.1		14.8	20.9	
Progression Factor	1.20	1.19		0.79	0.83			1.00		1.00	1.00	
Incremental Delay, d2	3.6	1.6		10.6	8.9			0.2		0.2	6.6	
Delay (s)	26.1	29.8		29.6	33.2			16.3		14.9	27.6	
Level of Service	C	C		C	C			B		B	C	
Approach Delay (s)		29.3			33.1			16.3			26.4	
Approach LOS		C			C			B			C	

Intersection Summary			
HCM Average Control Delay	28.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.5
Intersection Capacity Utilization	127.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SER
Lane Configurations	
Volume (vph)	0
Ideal Flow (vphpl)	1900
Total Lost time (s)	
Lane Util. Factor	
Frpb, ped/bikes	
Flpb, ped/bikes	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Peak-hour factor, PHF	0.94
Adj. Flow (vph)	0
RTOR Reduction (vph)	0
Lane Group Flow (vph)	0
Confl. Peds. (#/hr)	400
Confl. Bikes (#/hr)	
Bus Blockages (#/hr)	0
Parking (#/hr)	
Turn Type	custom
Protected Phases	
Permitted Phases	13
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s)	
Approach LOS	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	59	767	46	61	643	50	57	39	61	26	64	63
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	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frpb, ped/bikes		0.99			0.99			0.97			0.97	
Flpb, ped/bikes		1.00			1.00			0.99			0.99	
Frt		0.99			0.99			0.95			0.94	
Flt Protected		1.00			1.00			0.98			0.99	
Satd. Flow (prot)		2843			2810			1288			1303	
Flt Permitted		0.84			0.81			0.85			0.94	
Satd. Flow (perm)		2407			2275			1114			1229	
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)	61	799	48	64	670	52	59	41	64	27	67	66
RTOR Reduction (vph)	0	4	0	0	5	0	0	27	0	0	29	0
Lane Group Flow (vph)	0	904	0	0	781	0	0	137	0	0	131	0
Confl. Peds. (#/hr)	50		50	50		50	50		50	50		50
Confl. Bikes (#/hr)			10			10			10			10
Bus Blockages (#/hr)	0	0	0	0	6	6	0	0	0	0	0	0
Parking (#/hr)		2	2		0	0	0	2	2	0	2	2
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		59.7			59.7			22.3			22.3	
Effective Green, g (s)		59.7			59.7			22.3			22.3	
Actuated g/C Ratio		0.66			0.66			0.25			0.25	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1597			1509			276			305	
v/s Ratio Prot												
v/s Ratio Perm		c0.38			0.34			c0.12			0.11	
v/c Ratio		0.57			0.52			0.50			0.43	
Uniform Delay, d1		8.2			7.8			29.0			28.5	
Progression Factor		1.96			1.00			1.00			1.00	
Incremental Delay, d2		0.6			1.3			1.4			1.0	
Delay (s)		16.7			9.0			30.4			29.5	
Level of Service		B			A			C			C	
Approach Delay (s)		16.7			9.0			30.4			29.5	
Approach LOS		B			A			C			C	

Intersection Summary			
HCM Average Control Delay	15.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	82.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	131	616	83	107	533	267	79	547	247	49	664	102
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	3.5		3.5	3.5		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	0.98		1.00	0.95		1.00	0.95		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1711	3360		1711	3250		1711	3262		1711	3353	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1711	3360		1711	3250		1711	3262		1711	3353	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	139	655	88	114	567	284	84	582	263	52	706	109
RTOR Reduction (vph)	0	7	0	0	45	0	0	45	0	0	11	0
Lane Group Flow (vph)	139	736	0	114	806	0	84	800	0	52	804	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	13.2	31.5		12.1	30.4		8.6	30.3		7.0	28.7	
Effective Green, g (s)	13.2	31.5		12.1	30.4		8.6	30.3		7.0	28.7	
Actuated g/C Ratio	0.14	0.33		0.13	0.32		0.09	0.32		0.07	0.30	
Clearance Time (s)	3.5	3.5		3.5	3.5		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	2.0		3.0	2.0		3.0	2.0		3.0	2.0	
Lane Grp Cap (vph)	236	1104		216	1030		153	1031		125	1003	
v/s Ratio Prot	c0.08	0.22		0.07	c0.25		0.05	c0.25		0.03	c0.24	
v/s Ratio Perm												
v/c Ratio	0.59	0.67		0.53	0.78		0.55	0.78		0.42	0.80	
Uniform Delay, d1	38.8	27.7		39.2	29.7		41.8	29.7		42.5	31.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.7	1.2		2.3	3.6		4.0	3.4		2.2	4.4	
Delay (s)	42.5	28.9		41.5	33.4		45.8	33.1		44.7	35.4	
Level of Service	D	C		D	C		D	C		D	D	
Approach Delay (s)		31.0			34.3			34.3			35.9	
Approach LOS		C			C			C			D	

Intersection Summary			
HCM Average Control Delay	33.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	95.9	Sum of lost time (s)	11.0
Intersection Capacity Utilization	72.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	215	334	6	158	895	284	2	96	94	173	74	284
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			4.0	4.0		4.0	4.0
Lane Util. Factor	0.91	0.91			0.95			1.00	1.00		1.00	1.00
Frpb, ped/bikes	1.00	1.00			1.00			1.00	1.00		1.00	0.87
Flpb, ped/bikes	1.00	1.00			1.00			1.00	1.00		1.00	1.00
Frt	1.00	1.00			0.97			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00			0.99			1.00	1.00		0.97	1.00
Satd. Flow (prot)	1557	3245			3293			1799	1531		1740	1338
Flt Permitted	0.95	1.00			0.99			1.00	1.00		0.97	1.00
Satd. Flow (perm)	1557	3245			3293			1799	1531		1740	1338
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	226	352	6	166	942	299	2	101	99	182	78	299
RTOR Reduction (vph)	0	1	0	0	22	0	0	0	90	0	0	256
Lane Group Flow (vph)	190	393	0	0	1385	0	0	103	9	0	260	43
Confl. Peds. (#/hr)			50	50			50					50
Confl. Bikes (#/hr)			10									10
Turn Type	Split			Split			Split		Perm	Split		Perm
Protected Phases	2	2		6	6		8	8		4	4	
Permitted Phases									8			4
Actuated Green, G (s)	18.0	18.0			50.0			10.0	10.0		16.0	16.0
Effective Green, g (s)	18.0	18.0			50.0			10.0	10.0		16.0	16.0
Actuated g/C Ratio	0.16	0.16			0.45			0.09	0.09		0.15	0.15
Clearance Time (s)	4.0	4.0			4.0			4.0	4.0		4.0	4.0
Lane Grp Cap (vph)	255	531			1497			164	139		253	195
v/s Ratio Prot	c0.12	0.12			c0.42			c0.06			c0.15	
v/s Ratio Perm									0.01			0.03
v/c Ratio	0.75	0.74			0.92			0.63	0.06		1.03	0.22
Uniform Delay, d1	43.8	43.8			28.2			48.2	45.7		47.0	41.5
Progression Factor	1.00	1.00			1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2	17.9	9.0			11.1			16.8	0.9		63.9	2.6
Delay (s)	61.7	52.8			39.4			65.0	46.6		110.9	44.1
Level of Service	E	D			D			E	D		F	D
Approach Delay (s)		55.7			39.4			56.0			75.2	
Approach LOS		E			D			E			E	

Intersection Summary			
HCM Average Control Delay	51.3	HCM Level of Service	D
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	86.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	33	623	359	174	944	78	0	0	0	29	0	75
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	37	692	399	193	1049	87	0	0	0	32	0	83
Pedestrians								50			50	
Lane Width (ft)								0.0			11.0	
Walking Speed (ft/s)								4.0			4.0	
Percent Blockage								0			4	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		364										
pX, platoon unblocked												
vC, conflicting volume	1186			1141			2534	2587	596	1948	2743	1142
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1186			1141			2534	2587	596	1948	2743	1142
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	93			68			100	100	100	0	100	55
cM capacity (veh/h)	562			608			5	15	447	26	12	187

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1
Volume Total	37	461	630	193	1136	116
Volume Left	37	0	0	193	0	32
Volume Right	0	0	399	0	87	83
cSH	562	1700	1700	608	1700	69
Volume to Capacity	0.07	0.27	0.37	0.32	0.67	1.69
Queue Length 95th (ft)	5	0	0	34	0	254
Control Delay (s)	11.8	0.0	0.0	13.7	0.0	464.4
Lane LOS	B			B		F
Approach Delay (s)	0.4			2.0		464.4
Approach LOS						F

Intersection Summary			
Average Delay	22.1		
Intersection Capacity Utilization	74.3%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	90	32	0	767	29	140	89	3	357	497	1035
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		11.0	11.0		11.0		6.0	5.0		4.0	5.0	5.0
Lane Util. Factor		1.00	1.00		0.91		0.97	1.00		1.00	0.91	0.91
Frpb, ped/bikes		1.00	0.99		1.00		1.00	1.00		1.00	0.98	0.97
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	1.00
Frt		1.00	0.85		0.99		1.00	1.00		1.00	0.92	0.85
Flt Protected		1.00	1.00		1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1801	1509		4874		3319	1791		1711	2981	1352
Flt Permitted		1.00	1.00		1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)		1801	1509		4874		3319	1791		1711	2981	1352
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	0	96	34	0	816	31	149	95	3	380	529	1101
RTOR Reduction (vph)	0	0	28	0	4	0	0	2	0	0	0	0
Lane Group Flow (vph)	0	96	6	0	843	0	149	96	0	380	1080	550
Confl. Peds. (#/hr)			2	2		57						22
Confl. Bikes (#/hr)						4			1			2
Turn Type			custom				Prot			Prot		custom
Protected Phases					8		5	2		1	6	
Permitted Phases		4	4									15
Actuated Green, G (s)		17.0	17.0		17.0		7.0	21.0		32.0	44.0	57.0
Effective Green, g (s)		17.0	17.0		17.0		7.0	21.0		32.0	44.0	57.0
Actuated g/C Ratio		0.19	0.19		0.19		0.08	0.23		0.36	0.49	0.63
Clearance Time (s)		11.0	11.0		11.0		6.0	5.0		4.0	5.0	5.0
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		340	285		921		258	418		608	1457	856
v/s Ratio Prot					c0.17		0.04	0.05		0.22	c0.36	
v/s Ratio Perm		0.05	0.00									c0.41
v/c Ratio		0.28	0.02		0.92		0.58	0.23		0.62	0.74	0.64
Uniform Delay, d1		31.3	29.7		35.8		40.1	28.0		24.0	18.4	10.2
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		2.1	0.1		15.1		9.1	1.3		4.8	3.4	3.7
Delay (s)		33.3	29.9		50.9		49.2	29.2		28.8	21.9	13.9
Level of Service		C	C		D		D	C		C	C	B
Approach Delay (s)		32.4			50.9			41.3			21.0	
Approach LOS		C			D			D			C	

Intersection Summary			
HCM Average Control Delay	30.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	88.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	EBR2	WBL	WBR2	NBT	NBR	NBR2	SBT	NWR2
Lane Configurations											
Volume (vph)	268	589	3	11	256	164	222	303	12	485	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	5.0		5.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	0.95		1.00	0.97	1.00	0.91	1.00	1.00	0.91	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.98	1.00	1.00	1.00	1.00	0.93
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00		0.85	1.00	0.85	1.00	0.85	0.85	1.00	0.86
Flt Protected	0.95	1.00		1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (prot)	1711	3419		1531	3305	1496	4916	1531	1531	4916	1452
Flt Permitted	0.95	1.00		1.00	0.42	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (perm)	1711	3419		1531	1473	1496	4916	1531	1531	4916	1452
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	273	601	3	11	261	167	227	309	12	495	40
RTOR Reduction (vph)	0	0	0	7	0	115	0	0	0	0	0
Lane Group Flow (vph)	273	604	0	4	261	52	227	309	12	495	40
Confl. Peds. (#/hr)					10						17
Confl. Bikes (#/hr)						2					
Turn Type	custom			Perm	custom	custom		Perm	Perm		custom
Protected Phases		2!					4!				
Permitted Phases	7!			2	3	6		4	4	4!	6!
Actuated Green, G (s)	43.0	26.0		26.0	14.0	25.0	23.0	23.0	23.0	23.0	25.0
Effective Green, g (s)	43.0	26.0		26.0	14.0	25.0	23.0	23.0	23.0	23.0	25.0
Actuated g/C Ratio	0.54	0.32		0.32	0.18	0.31	0.29	0.29	0.29	0.29	0.31
Clearance Time (s)	6.0	5.0		5.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Grp Cap (vph)	920	1111		498	258	468	1413	440	440	1413	454
v/s Ratio Prot		c0.18					0.05				
v/s Ratio Perm	0.16			0.00	c0.18	0.03		c0.20	0.01	0.10	0.03
v/c Ratio	0.30	0.54		0.01	1.01	0.11	0.16	0.70	0.03	0.35	0.09
Uniform Delay, d1	10.2	22.1		18.3	33.0	19.6	21.3	25.4	20.5	22.6	19.4
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.8	1.9		0.0	59.0	0.5	0.2	9.0	0.1	0.7	0.4
Delay (s)	11.0	24.0		18.3	92.0	20.1	21.5	34.5	20.6	23.3	19.8
Level of Service	B	C		B	F	C	C	C	C	C	B
Approach Delay (s)		20.0					28.8			23.3	
Approach LOS		B					C			C	

Intersection Summary			
HCM Average Control Delay	30.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	83.3%	ICU Level of Service	E
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	50	80	270	64	40	296
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	53	85	287	68	43	315
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			373			584
pX, platoon unblocked	0.91	0.91			0.91	
vC, conflicting volume	721	321			355	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	645	206			243	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	86	89			96	
cM capacity (veh/h)	384	760			1205	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	138	355	28	329
Volume Left	53	0	28	14
Volume Right	85	68	0	0
cSH	552	1700	1205	1205
Volume to Capacity	0.25	0.21	0.04	0.04
Queue Length 95th (ft)	25	0	3	3
Control Delay (s)	13.7	0.0	8.1	0.7
Lane LOS	B		A	A
Approach Delay (s)	13.7	0.0	1.3	
Approach LOS	B			

Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	39.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
1: Ocean & Geneva Ave

3/6/2014

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1093	0	0	970	462	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	5%			5%	0%	
Total Lost time (s)	4.0			4.0	4.0	
Lane Util. Factor	0.95			0.95	0.97	
Frpb, ped/bikes	1.00			1.00	1.00	
Flpb, ped/bikes	1.00			1.00	1.00	
Frt	1.00			1.00	1.00	
Flt Protected	1.00			1.00	0.95	
Satd. Flow (prot)	3336			3336	3320	
Flt Permitted	1.00			1.00	0.95	
Satd. Flow (perm)	3336			3336	3320	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	1163	0	0	1032	491	4
RTOR Reduction (vph)	0	0	0	0	1	0
Lane Group Flow (vph)	1163	0	0	1032	494	0
Confl. Peds. (#/hr)			100		100	100
Turn Type						
Protected Phases	13			1	8	
Permitted Phases						
Actuated Green, G (s)	46.0			46.0	26.0	
Effective Green, g (s)	46.0			46.0	26.0	
Actuated g/C Ratio	0.58			0.58	0.32	
Clearance Time (s)	4.0			4.0	4.0	
Vehicle Extension (s)	3.0			3.0	3.0	
Lane Grp Cap (vph)	1918			1918	1079	
v/s Ratio Prot	c0.35			0.31	c0.15	
v/s Ratio Perm						
v/c Ratio	0.61			0.54	0.46	
Uniform Delay, d1	11.1			10.5	21.4	
Progression Factor	0.54			1.70	1.00	
Incremental Delay, d2	1.1			0.9	0.3	
Delay (s)	7.0			18.7	21.7	
Level of Service	A			B	C	
Approach Delay (s)	7.0			18.7	21.7	
Approach LOS	A			B	C	

Intersection Summary			
HCM Average Control Delay	14.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	64.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	107	894	335	0	1165	469	0	0	0	199	257	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		5%			0%			0%			0%	
Total Lost time (s)	3.5	4.0			4.0						4.0	
Lane Util. Factor	1.00	0.95			0.91						0.95	
Frt	1.00	0.96			0.96						0.97	
Flt Protected	0.95	1.00			1.00						0.98	
Satd. Flow (prot)	1668	3199			4704						3264	
Flt Permitted	0.95	1.00			1.00						0.98	
Satd. Flow (perm)	1668	3199			4704						3264	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	114	951	356	0	1239	499	0	0	0	212	273	117
RTOR Reduction (vph)	0	48	0	0	86	0	0	0	0	0	26	0
Lane Group Flow (vph)	114	1259	0	0	1652	0	0	0	0	0	576	0
Turn Type	Prot									Perm		
Protected Phases	5	2			6						4	
Permitted Phases										4		
Actuated Green, G (s)	10.4	46.0			32.1						26.0	
Effective Green, g (s)	10.4	46.0			32.1						26.0	
Actuated g/C Ratio	0.13	0.58			0.40						0.32	
Clearance Time (s)	3.5	4.0			4.0						4.0	
Vehicle Extension (s)	3.0	3.0			3.0						3.0	
Lane Grp Cap (vph)	217	1839			1887						1061	
v/s Ratio Prot	0.07	c0.39			c0.35							
v/s Ratio Perm											0.18	
v/c Ratio	0.53	0.68			0.88						0.54	
Uniform Delay, d1	32.5	11.9			22.1						22.1	
Progression Factor	1.00	1.00			1.12						1.00	
Incremental Delay, d2	2.3	2.1			5.5						0.6	
Delay (s)	34.8	14.0			30.4						22.7	
Level of Service	C	B			C						C	
Approach Delay (s)		15.7			30.4			0.0			22.7	
Approach LOS		B			C			A			C	

Intersection Summary			
HCM Average Control Delay	23.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	75.5%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	868	0	0	976	50	48	44	61	50	0	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0			4.0			4.0	
Lane Util. Factor		1.00			0.95			1.00			1.00	
Frt		1.00			0.99			0.95			0.98	
Flt Protected		1.00			1.00			0.98			0.96	
Satd. Flow (prot)		1801			3396			1677			1689	
Flt Permitted		1.00			1.00			0.90			0.74	
Satd. Flow (perm)		1801			3396			1537			1293	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	0	923	0	0	1038	53	51	47	65	53	0	11
RTOR Reduction (vph)	0	0	0	0	4	0	0	30	0	0	7	0
Lane Group Flow (vph)	0	923	0	0	1087	0	0	133	0	0	57	0
Turn Type							Perm			Perm		
Protected Phases		6			6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)		45.0			45.0			26.0			26.0	
Effective Green, g (s)		45.0			45.0			26.0			26.0	
Actuated g/C Ratio		0.56			0.56			0.32			0.32	
Clearance Time (s)		5.0			5.0			4.0			4.0	
Lane Grp Cap (vph)		1013			1910			500			420	
v/s Ratio Prot		c0.51			0.32							
v/s Ratio Perm								c0.09			0.04	
v/c Ratio		0.91			0.57			0.27			0.13	
Uniform Delay, d1		15.7			11.3			20.0			19.1	
Progression Factor		0.57			1.00			1.00			1.00	
Incremental Delay, d2		11.3			1.2			1.3			0.7	
Delay (s)		20.3			12.5			21.3			19.7	
Level of Service		C			B			C			B	
Approach Delay (s)		20.3			12.5			21.3			19.7	
Approach LOS		C			B			C			B	

Intersection Summary			
HCM Average Control Delay	16.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	74.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	605	416	7	9	532	362	7	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		3.0	5.0	5.0		3.0				
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		1.00				
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.61		1.00				
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00				
Frt	1.00	1.00		1.00	1.00	0.85		1.00				
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.95				
Satd. Flow (prot)	1711	1769		872	1801	936		1711				
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.95				
Satd. Flow (perm)	1711	1769		872	1801	936		1711				
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)	624	429	7	9	548	373	7	0	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	40	0	0	0	0	0	0
Lane Group Flow (vph)	624	436	0	9	548	333	0	7	0	0	0	0
Confl. Peds. (#/hr)						100						
Confl. Bikes (#/hr)						10						
Heavy Vehicles (%)	2%	2%	100%	100%	2%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Prot			Prot		Perm	Perm					
Protected Phases	5	2		1	6			14				
Permitted Phases						6	14					
Actuated Green, G (s)	59.8	140.2		2.4	80.8	80.8		2.4				
Effective Green, g (s)	59.8	140.2		2.4	80.8	80.8		2.4				
Actuated g/C Ratio	0.38	0.90		0.02	0.52	0.52		0.02				
Clearance Time (s)	5.0	5.0		3.0	5.0	5.0		3.0				
Vehicle Extension (s)	0.2	0.2		0.2	0.2	0.2		0.2				
Lane Grp Cap (vph)	656	1590		13	933	485		26				
v/s Ratio Prot	c0.36	0.25		0.01	0.30							
v/s Ratio Perm						c0.36		0.00				
v/c Ratio	0.95	0.27		0.69	0.59	0.69		0.27				
Uniform Delay, d1	46.7	1.1		76.4	26.1	28.1		75.9				
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00				
Incremental Delay, d2	23.5	0.4		82.4	2.7	7.7		2.0				
Delay (s)	70.2	1.5		158.8	28.8	35.8		78.0				
Level of Service	E	A		F	C	D		E				
Approach Delay (s)		41.9			32.9			78.0			0.0	
Approach LOS		D			C			E			A	

Intersection Summary			
HCM Average Control Delay	37.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	156.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	83.6%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	33	348	40	102	475	48	291	255	86	52	286	109
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		5.0	5.0			5.0	
Lane Util. Factor		1.00	1.00	1.00	1.00		1.00	1.00			1.00	
Frpb, ped/bikes		1.00	0.78	1.00	0.98		1.00	0.97			0.97	
Flpb, ped/bikes		1.00	1.00	0.91	1.00		0.95	1.00			0.99	
Frt		1.00	0.85	1.00	0.99		1.00	0.96			0.97	
Flt Protected		1.00	1.00	0.95	1.00		0.95	1.00			0.99	
Satd. Flow (prot)		1784	1195	1556	1740		1626	1676			1664	
Flt Permitted		0.84	1.00	0.39	1.00		0.43	1.00			0.92	
Satd. Flow (perm)		1503	1195	635	1740		735	1676			1544	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	35	370	43	109	505	51	310	271	91	55	304	116
RTOR Reduction (vph)	0	0	15	0	6	0	0	19	0	0	18	0
Lane Group Flow (vph)	0	405	28	109	550	0	310	343	0	0	457	0
Confl. Peds. (#/hr)	100		100	100		100	100		100	100		100
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		27.0	27.0	27.0	27.0		29.0	29.0			29.0	
Effective Green, g (s)		27.0	27.0	27.0	27.0		29.0	29.0			29.0	
Actuated g/C Ratio		0.42	0.42	0.42	0.42		0.45	0.45			0.45	
Clearance Time (s)		4.0	4.0	4.0	4.0		5.0	5.0			5.0	
Lane Grp Cap (vph)		624	496	264	723		328	748			689	
v/s Ratio Prot					c0.32			0.20				
v/s Ratio Perm		0.27	0.02	0.17			c0.42				0.30	
v/c Ratio		0.65	0.06	0.41	0.76		0.95	0.46			0.66	
Uniform Delay, d1		15.2	11.4	13.4	16.2		17.2	12.5			14.2	
Progression Factor		1.00	1.00	1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2		5.2	0.2	4.7	7.4		37.5	2.0			5.0	
Delay (s)		20.4	11.6	18.1	23.7		54.8	14.6			19.2	
Level of Service		C	B	B	C		D	B			B	
Approach Delay (s)		19.5			22.7			33.1			19.2	
Approach LOS		B			C			C			B	

Intersection Summary			
HCM Average Control Delay	24.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	65.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	116.1%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	119	226	42	51	225	75	51	569	52	241	801	215
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95	1.00		0.95	1.00
Frpb, ped/bikes	1.00	0.98		1.00	0.97			1.00	0.88		1.00	0.88
Flpb, ped/bikes	0.95	1.00		0.95	1.00			1.00	1.00		0.99	1.00
Frt	1.00	0.98		1.00	0.96			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00		0.99	1.00
Satd. Flow (prot)	1625	1729		1618	1687			3403	1175		3354	1351
Flt Permitted	0.43	1.00		0.48	1.00			0.77	1.00		0.65	1.00
Satd. Flow (perm)	739	1729		813	1687			2642	1175		2194	1351
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	127	240	45	54	239	80	54	605	55	256	852	229
RTOR Reduction (vph)	0	9	0	0	15	0	0	0	21	0	0	92
Lane Group Flow (vph)	127	276	0	54	304	0	0	659	34	0	1108	137
Confl. Peds. (#/hr)	100		100	100		100	100		100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)									6			
Turn Type	Perm			Perm			Perm		Perm	Perm		Perm
Protected Phases		2			2			6			6	
Permitted Phases	2			2			6		6	6		6
Actuated Green, G (s)	27.0	27.0		27.0	27.0			43.0	43.0		43.0	43.0
Effective Green, g (s)	27.0	27.0		27.0	27.0			43.0	43.0		43.0	43.0
Actuated g/C Ratio	0.34	0.34		0.34	0.34			0.54	0.54		0.54	0.54
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0	5.0		5.0	5.0
Lane Grp Cap (vph)	249	584		274	569			1420	632		1179	726
v/s Ratio Prot		0.16			c0.18							
v/s Ratio Perm	0.17			0.07				0.25	0.03		c0.50	0.10
v/c Ratio	0.51	0.47		0.20	0.53			0.46	0.05		0.94	0.19
Uniform Delay, d1	21.2	20.9		18.8	21.4			11.4	8.8		17.3	9.5
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2	7.3	2.7		1.6	3.6			1.1	0.2		15.2	0.6
Delay (s)	28.5	23.6		20.4	25.0			12.5	9.0		32.5	10.1
Level of Service	C	C		C	C			B	A		C	B
Approach Delay (s)		25.1			24.3			12.2			28.7	
Approach LOS		C			C			B			C	

Intersection Summary			
HCM Average Control Delay	23.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	133.3%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	23	426	38	361	693	130	0	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		5%			5%			0%			0%	
Total Lost time (s)		4.0		4.0	4.0							
Lane Util. Factor		0.95		1.00	0.95							
Frpb, ped/bikes		0.98		1.00	0.95							
Flpb, ped/bikes		1.00		0.87	1.00							
Frt		0.99		1.00	0.98							
Flt Protected		1.00		0.95	1.00							
Satd. Flow (prot)		3203		1445	3103							
Flt Permitted		0.90		0.46	1.00							
Satd. Flow (perm)		2884		692	3103							
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	24	453	40	384	737	138	0	0	0	0	0	0
RTOR Reduction (vph)	0	6	0	0	14	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	511	0	384	861	0	0	0	0	0	0	0
Confl. Peds. (#/hr)	100		100	100		100						
Confl. Bikes (#/hr)			10			10						
Turn Type	Perm			Perm								
Protected Phases		4			8							
Permitted Phases	4			8								
Actuated Green, G (s)		63.2		63.2	63.2							
Effective Green, g (s)		63.2		63.2	63.2							
Actuated g/C Ratio		0.70		0.70	0.70							
Clearance Time (s)		4.0		4.0	4.0							
Vehicle Extension (s)		3.0		3.0	3.0							
Lane Grp Cap (vph)		2025		486	2179							
v/s Ratio Prot					0.28							
v/s Ratio Perm		0.18		c0.55								
v/c Ratio		0.25		0.79	0.40							
Uniform Delay, d1		4.9		9.0	5.5							
Progression Factor		1.00		0.81	0.76							
Incremental Delay, d2		0.1		8.2	0.1							
Delay (s)		4.9		15.4	4.3							
Level of Service		A		B	A							
Approach Delay (s)		4.9			7.7			0.0			0.0	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM Average Control Delay	6.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	26.8
Intersection Capacity Utilization	45.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	228	180	476	713	0	0	0	0	487	1	185
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	11	11	11	11	11	11	12	12	12
Total Lost time (s)		3.5	3.5	3.0	3.5					3.5	3.5	
Lane Util. Factor		0.95	1.00	1.00	0.95					0.95	0.95	
Frpb, ped/bikes		1.00	0.68	1.00	1.00					1.00	0.91	
Flpb, ped/bikes		1.00	1.00	1.00	1.00					1.00	1.00	
Frt		1.00	0.85	1.00	1.00					1.00	0.92	
Flt Protected		1.00	1.00	0.95	1.00					0.95	0.98	
Satd. Flow (prot)		2887	820	1540	3079					1513	1305	
Flt Permitted		1.00	1.00	0.95	1.00					0.95	0.98	
Satd. Flow (perm)		2887	820	1540	3079					1513	1305	
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)	0	238	188	496	743	0	0	0	0	507	1	193
RTOR Reduction (vph)	0	0	150	0	0	0	0	0	0	0	52	0
Lane Group Flow (vph)	0	238	38	496	743	0	0	0	0	360	289	0
Confl. Peds. (#/hr)			100	100								100
Confl. Bikes (#/hr)			30			30						
Parking (#/hr)		5	5									
Turn Type			Perm	Prot						Perm		
Protected Phases		2		1	6						4	
Permitted Phases			2							4		
Actuated Green, G (s)		18.3	18.3	35.0	56.3					26.7	26.7	
Effective Green, g (s)		18.3	18.3	35.0	56.3					26.7	26.7	
Actuated g/C Ratio		0.20	0.20	0.39	0.63					0.30	0.30	
Clearance Time (s)		3.5	3.5	3.0	3.5					3.5	3.5	
Vehicle Extension (s)		4.0	4.0	3.0	4.0					4.0	4.0	
Lane Grp Cap (vph)		587	167	599	1926					449	387	
v/s Ratio Prot		0.08		c0.32	c0.24							
v/s Ratio Perm			0.05							c0.24	0.22	
v/c Ratio		0.41	0.23	0.83	0.39					0.80	0.75	
Uniform Delay, d1		31.1	30.0	24.8	8.3					29.2	28.6	
Progression Factor		0.87	2.12	0.72	0.38					1.00	1.00	
Incremental Delay, d2		2.0	3.1	9.9	0.5					14.0	12.4	
Delay (s)		29.3	66.5	27.8	3.6					43.2	41.0	
Level of Service		C	E	C	A					D	D	
Approach Delay (s)		45.7			13.3			0.0			42.1	
Approach LOS		D			B			A			D	

Intersection Summary			
HCM Average Control Delay	27.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	6.5
Intersection Capacity Utilization	116.4%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	730	0	0	709	468	616
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	11	12	12
Total Lost time (s)	3.5			3.5	3.5	3.5
Lane Util. Factor	0.95			0.95	1.00	1.00
Frpb, ped/bikes	1.00			1.00	1.00	0.86
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	1.00			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	3079			3079	1593	1219
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	3079			3079	1593	1219
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	753	0	0	731	482	635
RTOR Reduction (vph)	0	0	0	0	0	18
Lane Group Flow (vph)	753	0	0	731	482	617
Confl. Peds. (#/hr)						100
Confl. Bikes (#/hr)		10				
Turn Type						custom
Protected Phases	2			6		
Permitted Phases					8	8
Actuated Green, G (s)	28.5			28.5	54.5	54.5
Effective Green, g (s)	28.5			28.5	54.5	54.5
Actuated g/C Ratio	0.32			0.32	0.61	0.61
Clearance Time (s)	3.5			3.5	3.5	3.5
Vehicle Extension (s)	5.0			5.0	5.0	5.0
Lane Grp Cap (vph)	975			975	965	738
v/s Ratio Prot	c0.24			0.24		
v/s Ratio Perm					0.30	c0.51
v/c Ratio	0.77			0.75	0.50	0.84
Uniform Delay, d1	27.8			27.6	10.0	14.2
Progression Factor	1.23			0.83	1.00	1.00
Incremental Delay, d2	4.5			3.1	1.8	10.9
Delay (s)	38.6			26.0	11.9	25.1
Level of Service	D			C	B	C
Approach Delay (s)	38.6			26.0	19.4	
Approach LOS	D			C	B	

Intersection Summary			
HCM Average Control Delay	26.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	7.0
Intersection Capacity Utilization	116.4%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR2	NBL2	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	186	962	159	23	452	215	58	173	29	33	130	183
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.5		5.5	5.5	
Lane Util. Factor	1.00	0.95		1.00	0.95			0.95		1.00	1.00	
Frpb, ped/bikes	1.00	0.95		1.00	0.82			0.96		1.00	0.80	
Flpb, ped/bikes	0.98	1.00		0.95	1.00			1.00		0.76	1.00	
Frt	1.00	0.98		1.00	0.95			0.98		1.00	0.91	
Flt Protected	0.95	1.00		0.95	1.00			0.99		0.95	1.00	
Satd. Flow (prot)	1503	2870		1463	2369			2839		1169	1013	
Flt Permitted	0.21	1.00		0.16	1.00			0.81		0.58	1.00	
Satd. Flow (perm)	333	2870		240	2369			2325		716	1013	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	198	1023	169	24	481	229	62	184	31	35	138	195
RTOR Reduction (vph)	0	8	0	0	63	0	0	9	0	0	0	0
Lane Group Flow (vph)	198	1184	0	24	647	0	0	268	0	35	333	0
Confl. Peds. (#/hr)	400		400	400		400			400	400		400
Confl. Bikes (#/hr)			30			30			10			10
Bus Blockages (#/hr)	0	0	6	0	6	0	0	6	0	0	6	0
Parking (#/hr)											5	5
Turn Type	pm+pt			Perm						Perm		
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8						6		
Actuated Green, G (s)	41.0	41.0		30.0	30.0			38.5		38.5	38.5	
Effective Green, g (s)	41.0	41.0		30.0	30.0			38.5		38.5	38.5	
Actuated g/C Ratio	0.46	0.46		0.33	0.33			0.43		0.43	0.43	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)	230	1307		80	790			995		306	433	
v/s Ratio Prot	0.06	c0.41			0.27						c0.33	
v/s Ratio Perm	0.34			0.10				0.12		0.05		
v/c Ratio	0.86	0.91		0.30	0.82			4.13dl		0.11	0.77	
Uniform Delay, d1	20.0	22.7		22.2	27.5			16.7		15.5	22.0	
Progression Factor	1.68	1.56		1.39	1.25			1.00		1.00	1.00	
Incremental Delay, d2	20.7	6.5		8.3	8.2			0.7		0.8	12.4	
Delay (s)	54.3	41.9		39.2	42.6			17.3		16.3	34.3	
Level of Service	D	D		D	D			B		B	C	
Approach Delay (s)		43.6			42.5			17.3			32.6	
Approach LOS		D			D			B			C	

Intersection Summary			
HCM Average Control Delay	39.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.5
Intersection Capacity Utilization	127.8%	ICU Level of Service	H
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
dr Defacto Right Lane. Recode with 1 though lane as a right lane.
c Critical Lane Group

Movement	SER
Lane Configurations	
Volume (vph)	0
Ideal Flow (vphpl)	1900
Total Lost time (s)	
Lane Util. Factor	
Frpb, ped/bikes	
Flpb, ped/bikes	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Peak-hour factor, PHF	0.94
Adj. Flow (vph)	0
RTOR Reduction (vph)	0
Lane Group Flow (vph)	0
Confl. Peds. (#/hr)	400
Confl. Bikes (#/hr)	
Bus Blockages (#/hr)	0
Parking (#/hr)	
Turn Type	custom
Protected Phases	
Permitted Phases	13
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s)	
Approach LOS	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	59	767	46	61	624	50	57	39	61	26	64	63
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	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frpb, ped/bikes		0.99			0.99			0.97			0.97	
Flpb, ped/bikes		1.00			1.00			0.99			0.99	
Frt		0.99			0.99			0.95			0.94	
Flt Protected		1.00			1.00			0.98			0.99	
Satd. Flow (prot)		2843			2808			1288			1303	
Flt Permitted		0.85			0.80			0.85			0.94	
Satd. Flow (perm)		2415			2267			1114			1229	
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)	61	799	48	64	650	52	59	41	64	27	67	66
RTOR Reduction (vph)	0	4	0	0	5	0	0	27	0	0	29	0
Lane Group Flow (vph)	0	904	0	0	761	0	0	137	0	0	131	0
Confl. Peds. (#/hr)	50		50	50		50	50		50	50		50
Confl. Bikes (#/hr)			10			10			10			10
Bus Blockages (#/hr)	0	0	0	0	6	6	0	0	0	0	0	0
Parking (#/hr)		2	2		0	0	0	2	2	0	2	2
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		59.7			59.7			22.3			22.3	
Effective Green, g (s)		59.7			59.7			22.3			22.3	
Actuated g/C Ratio		0.66			0.66			0.25			0.25	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1602			1504			276			305	
v/s Ratio Prot												
v/s Ratio Perm		c0.37			0.34			c0.12			0.11	
v/c Ratio		0.56			0.51			0.50			0.43	
Uniform Delay, d1		8.2			7.7			29.0			28.5	
Progression Factor		0.14			1.00			1.00			1.00	
Incremental Delay, d2		0.7			1.2			1.4			1.0	
Delay (s)		1.8			8.9			30.4			29.5	
Level of Service		A			A			C			C	
Approach Delay (s)		1.8			8.9			30.4			29.5	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM Average Control Delay	9.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	81.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	131	616	83	107	520	261	73	553	247	49	664	102
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	3.5		3.5	3.5		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	0.98		1.00	0.95		1.00	0.95		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1711	3360		1711	3250		1711	3263		1711	3353	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1711	3360		1711	3250		1711	3263		1711	3353	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	139	655	88	114	553	278	78	588	263	52	706	109
RTOR Reduction (vph)	0	7	0	0	45	0	0	45	0	0	11	0
Lane Group Flow (vph)	139	736	0	114	786	0	78	806	0	52	804	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	13.2	31.4		12.0	30.2		8.2	29.9		6.9	28.6	
Effective Green, g (s)	13.2	31.4		12.0	30.2		8.2	29.9		6.9	28.6	
Actuated g/C Ratio	0.14	0.33		0.13	0.32		0.09	0.31		0.07	0.30	
Clearance Time (s)	3.5	3.5		3.5	3.5		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	2.0		3.0	2.0		3.0	2.0		3.0	2.0	
Lane Grp Cap (vph)	237	1108		216	1031		147	1025		124	1007	
v/s Ratio Prot	c0.08	0.22		0.07	c0.24		0.05	c0.25		0.03	c0.24	
v/s Ratio Perm												
v/c Ratio	0.59	0.66		0.53	0.76		0.53	0.79		0.42	0.80	
Uniform Delay, d1	38.4	27.4		38.9	29.3		41.7	29.7		42.2	30.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.7	1.2		2.3	3.0		3.6	3.7		2.3	4.2	
Delay (s)	42.1	28.5		41.3	32.3		45.3	33.5		44.5	34.8	
Level of Service	D	C		D	C		D	C		D	C	
Approach Delay (s)		30.7			33.4			34.5			35.4	
Approach LOS		C			C			C			D	

Intersection Summary			
HCM Average Control Delay	33.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	95.2	Sum of lost time (s)	11.0
Intersection Capacity Utilization	72.3%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	215	334	6	158	895	284	2	96	94	173	74	284
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			4.0	4.0		4.0	4.0
Lane Util. Factor	0.91	0.91			0.95			1.00	1.00		1.00	1.00
Frpb, ped/bikes	1.00	1.00			1.00			1.00	1.00		1.00	0.87
Flpb, ped/bikes	1.00	1.00			1.00			1.00	1.00		1.00	1.00
Frt	1.00	1.00			0.97			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00			0.99			1.00	1.00		0.97	1.00
Satd. Flow (prot)	1557	3245			3293			1799	1531		1740	1338
Flt Permitted	0.95	1.00			0.99			1.00	1.00		0.97	1.00
Satd. Flow (perm)	1557	3245			3293			1799	1531		1740	1338
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	226	352	6	166	942	299	2	101	99	182	78	299
RTOR Reduction (vph)	0	1	0	0	22	0	0	0	90	0	0	256
Lane Group Flow (vph)	190	393	0	0	1385	0	0	103	9	0	260	43
Confl. Peds. (#/hr)			50	50			50					50
Confl. Bikes (#/hr)			10									10
Turn Type	Split			Split			Split		Perm	Split		Perm
Protected Phases	2	2		6	6		8	8		4	4	
Permitted Phases									8			4
Actuated Green, G (s)	18.0	18.0			50.0			10.0	10.0		16.0	16.0
Effective Green, g (s)	18.0	18.0			50.0			10.0	10.0		16.0	16.0
Actuated g/C Ratio	0.16	0.16			0.45			0.09	0.09		0.15	0.15
Clearance Time (s)	4.0	4.0			4.0			4.0	4.0		4.0	4.0
Lane Grp Cap (vph)	255	531			1497			164	139		253	195
v/s Ratio Prot	c0.12	0.12			c0.42			c0.06			c0.15	
v/s Ratio Perm									0.01			0.03
v/c Ratio	0.75	0.74			0.92			0.63	0.06		1.03	0.22
Uniform Delay, d1	43.8	43.8			28.2			48.2	45.7		47.0	41.5
Progression Factor	1.00	1.00			1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2	17.9	9.0			11.1			16.8	0.9		63.9	2.6
Delay (s)	61.7	52.8			39.4			65.0	46.6		110.9	44.1
Level of Service	E	D			D			E	D		F	D
Approach Delay (s)		55.7			39.4			56.0			75.2	
Approach LOS		E			D			E			E	

Intersection Summary			
HCM Average Control Delay	51.3	HCM Level of Service	D
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	86.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	33	623	359	174	944	78	0	0	0	29	0	75
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	37	692	399	193	1049	87	0	0	0	32	0	83
Pedestrians								50			50	
Lane Width (ft)								0.0			11.0	
Walking Speed (ft/s)								4.0			4.0	
Percent Blockage								0			4	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		364										
pX, platoon unblocked												
vC, conflicting volume	1186			1141			2534	2587	596	1948	2743	1142
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1186			1141			2534	2587	596	1948	2743	1142
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	93			68			100	100	100	0	100	55
cM capacity (veh/h)	562			608			5	15	447	26	12	187

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1
Volume Total	37	461	630	193	1136	116
Volume Left	37	0	0	193	0	32
Volume Right	0	0	399	0	87	83
cSH	562	1700	1700	608	1700	69
Volume to Capacity	0.07	0.27	0.37	0.32	0.67	1.69
Queue Length 95th (ft)	5	0	0	34	0	254
Control Delay (s)	11.8	0.0	0.0	13.7	0.0	464.4
Lane LOS	B			B		F
Approach Delay (s)	0.4			2.0		464.4
Approach LOS						F

Intersection Summary			
Average Delay	22.1		
Intersection Capacity Utilization	74.3%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	90	32	0	767	29	140	89	3	357	497	1035
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		11.0	11.0		11.0		6.0	5.0		4.0	5.0	5.0
Lane Util. Factor		1.00	1.00		0.91		0.97	1.00		1.00	0.91	0.91
Frpb, ped/bikes		1.00	0.99		1.00		1.00	1.00		1.00	0.98	0.97
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	1.00
Frt		1.00	0.85		0.99		1.00	1.00		1.00	0.92	0.85
Flt Protected		1.00	1.00		1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1801	1509		4874		3319	1791		1711	2981	1352
Flt Permitted		1.00	1.00		1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)		1801	1509		4874		3319	1791		1711	2981	1352
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	0	96	34	0	816	31	149	95	3	380	529	1101
RTOR Reduction (vph)	0	0	28	0	4	0	0	2	0	0	0	0
Lane Group Flow (vph)	0	96	6	0	843	0	149	96	0	380	1080	550
Confl. Peds. (#/hr)			2	2		57						22
Confl. Bikes (#/hr)						4			1			2
Turn Type			custom				Prot			Prot		custom
Protected Phases					8		5	2		1	6	
Permitted Phases		4	4									15
Actuated Green, G (s)		17.0	17.0		17.0		7.0	21.0		32.0	44.0	57.0
Effective Green, g (s)		17.0	17.0		17.0		7.0	21.0		32.0	44.0	57.0
Actuated g/C Ratio		0.19	0.19		0.19		0.08	0.23		0.36	0.49	0.63
Clearance Time (s)		11.0	11.0		11.0		6.0	5.0		4.0	5.0	5.0
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		340	285		921		258	418		608	1457	856
v/s Ratio Prot					c0.17		0.04	0.05		0.22	c0.36	
v/s Ratio Perm		0.05	0.00									c0.41
v/c Ratio		0.28	0.02		0.92		0.58	0.23		0.62	0.74	0.64
Uniform Delay, d1		31.3	29.7		35.8		40.1	28.0		24.0	18.4	10.2
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		2.1	0.1		15.1		9.1	1.3		4.8	3.4	3.7
Delay (s)		33.3	29.9		50.9		49.2	29.2		28.8	21.9	13.9
Level of Service		C	C		D		D	C		C	C	B
Approach Delay (s)		32.4			50.9			41.3			21.0	
Approach LOS		C			D			D			C	

Intersection Summary			
HCM Average Control Delay	30.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	88.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	EBR2	WBL	WBR2	NBT	NBR	NBR2	SBT	NWR2
Lane Configurations											
Volume (vph)	268	589	3	11	256	164	222	303	12	485	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	5.0		5.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	0.95		1.00	0.97	1.00	0.91	1.00	1.00	0.91	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.98	1.00	1.00	1.00	1.00	0.93
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00		0.85	1.00	0.85	1.00	0.85	0.85	1.00	0.86
Flt Protected	0.95	1.00		1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (prot)	1711	3419		1531	3305	1496	4916	1531	1531	4916	1452
Flt Permitted	0.95	1.00		1.00	0.42	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (perm)	1711	3419		1531	1473	1496	4916	1531	1531	4916	1452
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	273	601	3	11	261	167	227	309	12	495	40
RTOR Reduction (vph)	0	0	0	7	0	115	0	0	0	0	0
Lane Group Flow (vph)	273	604	0	4	261	52	227	309	12	495	40
Confl. Peds. (#/hr)					10						17
Confl. Bikes (#/hr)						2					
Turn Type	custom			Perm	custom	custom		Perm	Perm		custom
Protected Phases		2!					4!				
Permitted Phases	7!			2	3	6		4	4	4!	6!
Actuated Green, G (s)	43.0	26.0		26.0	14.0	25.0	23.0	23.0	23.0	23.0	25.0
Effective Green, g (s)	43.0	26.0		26.0	14.0	25.0	23.0	23.0	23.0	23.0	25.0
Actuated g/C Ratio	0.54	0.32		0.32	0.18	0.31	0.29	0.29	0.29	0.29	0.31
Clearance Time (s)	6.0	5.0		5.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Grp Cap (vph)	920	1111		498	258	468	1413	440	440	1413	454
v/s Ratio Prot		c0.18					0.05				
v/s Ratio Perm	0.16			0.00	c0.18	0.03		c0.20	0.01	0.10	0.03
v/c Ratio	0.30	0.54		0.01	1.01	0.11	0.16	0.70	0.03	0.35	0.09
Uniform Delay, d1	10.2	22.1		18.3	33.0	19.6	21.3	25.4	20.5	22.6	19.4
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.8	1.9		0.0	59.0	0.5	0.2	9.0	0.1	0.7	0.4
Delay (s)	11.0	24.0		18.3	92.0	20.1	21.5	34.5	20.6	23.3	19.8
Level of Service	B	C		B	F	C	C	C	C	C	B
Approach Delay (s)		20.0					28.8			23.3	
Approach LOS		B					C			C	

Intersection Summary			
HCM Average Control Delay	30.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	83.3%	ICU Level of Service	E
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	50	80	446	64	40	296
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	53	85	474	68	43	315
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			373			584
pX, platoon unblocked	0.92	0.92			0.92	
vC, conflicting volume	909	509			543	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	859	426			463	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	82	85			96	
cM capacity (veh/h)	289	580			1014	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	138	543	28	329
Volume Left	53	0	28	14
Volume Right	85	68	0	0
cSH	418	1700	1014	1014
Volume to Capacity	0.33	0.32	0.04	0.04
Queue Length 95th (ft)	36	0	3	3
Control Delay (s)	17.8	0.0	8.7	0.8
Lane LOS	C		A	A
Approach Delay (s)	17.8	0.0	1.4	
Approach LOS	C			

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	41.7%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
1: Ocean & Geneva Ave

3/6/2014

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	985	0	0	970	462	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	5%			5%	0%	
Total Lost time (s)	4.0			4.0	4.0	
Lane Util. Factor	0.95			0.95	0.97	
Frpb, ped/bikes	1.00			1.00	1.00	
Flpb, ped/bikes	1.00			1.00	1.00	
Frt	1.00			1.00	1.00	
Flt Protected	1.00			1.00	0.95	
Satd. Flow (prot)	3336			3336	3310	
Flt Permitted	1.00			1.00	0.95	
Satd. Flow (perm)	3336			3336	3310	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	1048	0	0	1032	491	4
RTOR Reduction (vph)	0	0	0	0	1	0
Lane Group Flow (vph)	1048	0	0	1032	494	0
Confl. Peds. (#/hr)		400	100		100	400
Turn Type						
Protected Phases	13			1	8	
Permitted Phases						
Actuated Green, G (s)	46.0			46.0	26.0	
Effective Green, g (s)	46.0			46.0	26.0	
Actuated g/C Ratio	0.58			0.58	0.32	
Clearance Time (s)	4.0			4.0	4.0	
Vehicle Extension (s)	3.0			3.0	3.0	
Lane Grp Cap (vph)	1918			1918	1076	
v/s Ratio Prot	c0.31			0.31	c0.15	
v/s Ratio Perm						
v/c Ratio	0.55			0.54	0.46	
Uniform Delay, d1	10.5			10.5	21.4	
Progression Factor	0.50			1.70	1.00	
Incremental Delay, d2	0.8			0.9	0.3	
Delay (s)	6.1			18.7	21.7	
Level of Service	A			B	C	
Approach Delay (s)	6.1			18.7	21.7	
Approach LOS	A			B	C	

Intersection Summary			
HCM Average Control Delay	14.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	64.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	107	833	396	0	1165	469	0	0	0	152	304	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		5%			0%			0%			0%	
Total Lost time (s)	3.5	4.0			4.0						4.0	
Lane Util. Factor	1.00	0.95			0.91						0.95	
Frt	1.00	0.95			0.96						0.97	
Flt Protected	0.95	1.00			1.00						0.99	
Satd. Flow (prot)	1668	3175			4704						3277	
Flt Permitted	0.95	1.00			1.00						0.99	
Satd. Flow (perm)	1668	3175			4704						3277	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	114	886	421	0	1239	499	0	0	0	162	323	117
RTOR Reduction (vph)	0	71	0	0	86	0	0	0	0	0	26	0
Lane Group Flow (vph)	114	1236	0	0	1652	0	0	0	0	0	576	0
Turn Type	Prot									Perm		
Protected Phases	5	2			6						4	
Permitted Phases										4		
Actuated Green, G (s)	10.4	46.0			32.1						26.0	
Effective Green, g (s)	10.4	46.0			32.1						26.0	
Actuated g/C Ratio	0.13	0.58			0.40						0.32	
Clearance Time (s)	3.5	4.0			4.0						4.0	
Vehicle Extension (s)	3.0	3.0			3.0						3.0	
Lane Grp Cap (vph)	217	1826			1887						1065	
v/s Ratio Prot	0.07	c0.39			c0.35							
v/s Ratio Perm											0.18	
v/c Ratio	0.53	0.68			0.88						0.54	
Uniform Delay, d1	32.5	11.8			22.1						22.1	
Progression Factor	1.00	1.00			1.12						1.00	
Incremental Delay, d2	2.3	2.0			5.5						0.6	
Delay (s)	34.8	13.9			30.4						22.7	
Level of Service	C	B			C						C	
Approach Delay (s)		15.5			30.4			0.0			22.7	
Approach LOS		B			C			A			C	

Intersection Summary			
HCM Average Control Delay	23.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	75.5%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	760	0	0	976	50	48	44	61	50	0	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0			4.0			4.0	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frt		1.00			0.99			0.95			0.98	
Flt Protected		1.00			1.00			0.98			0.96	
Satd. Flow (prot)		3421			3396			1677			1689	
Flt Permitted		1.00			1.00			0.90			0.74	
Satd. Flow (perm)		3421			3396			1537			1293	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	0	809	0	0	1038	53	51	47	65	53	0	11
RTOR Reduction (vph)	0	0	0	0	4	0	0	30	0	0	7	0
Lane Group Flow (vph)	0	809	0	0	1087	0	0	133	0	0	57	0
Turn Type							Perm			Perm		
Protected Phases		6			6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)		45.0			45.0			26.0			26.0	
Effective Green, g (s)		45.0			45.0			26.0			26.0	
Actuated g/C Ratio		0.56			0.56			0.32			0.32	
Clearance Time (s)		5.0			5.0			4.0			4.0	
Lane Grp Cap (vph)		1924			1910			500			420	
v/s Ratio Prot		0.24			c0.32							
v/s Ratio Perm								c0.09			0.04	
v/c Ratio		0.42			0.57			0.27			0.13	
Uniform Delay, d1		10.0			11.3			20.0			19.1	
Progression Factor		0.20			1.00			1.00			1.00	
Incremental Delay, d2		0.6			1.2			1.3			0.7	
Delay (s)		2.6			12.5			21.3			19.7	
Level of Service		A			B			C			B	
Approach Delay (s)		2.6			12.5			21.3			19.7	
Approach LOS		A			B			C			B	

Intersection Summary			
HCM Average Control Delay	9.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	66.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	0	871	539	0	105	487
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0
Lane Util. Factor		0.95	1.00		1.00	1.00
Frt		1.00	1.00		1.00	0.85
Flt Protected		1.00	1.00		0.95	1.00
Satd. Flow (prot)		3421	1801		1711	1531
Flt Permitted		1.00	1.00		0.95	1.00
Satd. Flow (perm)		3421	1801		1711	1531
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	0	927	573	0	112	518
RTOR Reduction (vph)	0	0	0	0	0	106
Lane Group Flow (vph)	0	927	573	0	112	412
Turn Type						Perm
Protected Phases		4	8		6	
Permitted Phases						6
Actuated Green, G (s)		42.4	42.4		59.6	59.6
Effective Green, g (s)		42.4	42.4		59.6	59.6
Actuated g/C Ratio		0.39	0.39		0.54	0.54
Clearance Time (s)		4.0	4.0		4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		1319	694		927	830
v/s Ratio Prot		0.27	c0.32		0.07	
v/s Ratio Perm						c0.27
v/c Ratio		0.70	0.83		0.12	0.50
Uniform Delay, d1		28.5	30.5		12.4	15.8
Progression Factor		1.00	1.00		1.00	1.00
Incremental Delay, d2		1.7	7.9		0.3	2.1
Delay (s)		30.2	38.4		12.6	17.9
Level of Service		C	D		B	B
Approach Delay (s)		30.2	38.4		17.0	
Approach LOS		C	D		B	

Intersection Summary			
HCM Average Control Delay	28.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	65.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	497	521	7	9	532	186	7	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		3.0	5.0			3.0				
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00				
Frpb, ped/bikes	1.00	1.00		1.00	0.91			1.00				
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00				
Frt	1.00	1.00		1.00	0.96			1.00				
Flt Protected	0.95	1.00		0.95	1.00			0.95				
Satd. Flow (prot)	1711	1775		872	1568			872				
Flt Permitted	0.95	1.00		0.95	1.00			0.95				
Satd. Flow (perm)	1711	1775		872	1568			872				
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)	512	537	7	9	548	192	7	0	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	7	0	0	0	0	0	0	0
Lane Group Flow (vph)	512	544	0	9	733	0	0	7	0	0	0	0
Confl. Peds. (#/hr)						100						
Confl. Bikes (#/hr)						10						
Heavy Vehicles (%)	2%	2%	100%	100%	2%	2%	100%	100%	100%	2%	2%	2%
Turn Type	Prot			Prot			Perm					
Protected Phases	5	2		1	6			14				
Permitted Phases							14					
Actuated Green, G (s)	49.0	126.2		2.4	77.6			5.4				
Effective Green, g (s)	49.0	126.2		2.4	77.6			5.4				
Actuated g/C Ratio	0.34	0.87		0.02	0.54			0.04				
Clearance Time (s)	5.0	5.0		3.0	5.0			3.0				
Vehicle Extension (s)	0.2	0.2		0.2	0.2			0.2				
Lane Grp Cap (vph)	578	1545		14	839			32				
v/s Ratio Prot	c0.30	0.31		0.01	c0.47							
v/s Ratio Perm								0.01				
v/c Ratio	0.89	0.35		0.64	0.87			0.22				
Uniform Delay, d1	45.4	1.8		70.9	29.4			67.8				
Progression Factor	1.00	1.00		1.00	1.00			1.00				
Incremental Delay, d2	14.7	0.6		56.8	12.2			1.3				
Delay (s)	60.1	2.4		127.7	41.6			69.0				
Level of Service	E	A		F	D			E				
Approach Delay (s)		30.4			42.7			69.0			0.0	
Approach LOS		C			D			E			A	

Intersection Summary			
HCM Average Control Delay	35.6	HCM Level of Service	D
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	102.6%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	109	363	55	102	475	48	115	211	71	52	286	109
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			5.0			5.0	
Lane Util. Factor		1.00	1.00	1.00	1.00			0.95			1.00	
Frpb, ped/bikes		1.00	0.85	1.00	0.98			0.97			0.96	
Flpb, ped/bikes		0.99	1.00	0.95	1.00			0.98			0.99	
Frt		1.00	0.85	1.00	0.99			0.97			0.97	
Flt Protected		0.99	1.00	0.95	1.00			0.99			0.99	
Satd. Flow (prot)		1754	1301	1631	1735			3146			1656	
Flt Permitted		0.60	1.00	0.34	1.00			0.64			0.91	
Satd. Flow (perm)		1070	1301	585	1735			2033			1510	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	116	386	59	109	505	51	122	224	76	55	304	116
RTOR Reduction (vph)	0	0	15	0	5	0	0	25	0	0	15	0
Lane Group Flow (vph)	0	502	44	109	551	0	0	397	0	0	460	0
Confl. Peds. (#/hr)	100		100	100		100	100		100	100		100
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		37.0	37.0	37.0	37.0			29.0			29.0	
Effective Green, g (s)		37.0	37.0	37.0	37.0			29.0			29.0	
Actuated g/C Ratio		0.49	0.49	0.49	0.49			0.39			0.39	
Clearance Time (s)		4.0	4.0	4.0	4.0			5.0			5.0	
Lane Grp Cap (vph)		528	642	289	856			786			584	
v/s Ratio Prot					0.32							
v/s Ratio Perm		c0.47	0.03	0.19				0.20			c0.30	
v/c Ratio		0.95	0.07	0.38	0.64			0.50			0.79	
Uniform Delay, d1		18.1	10.0	11.8	14.1			17.5			20.3	
Progression Factor		1.00	1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2		28.7	0.2	3.7	3.7			2.3			10.3	
Delay (s)		46.8	10.2	15.5	17.8			19.8			30.6	
Level of Service		D	B	B	B			B			C	
Approach Delay (s)		43.0			17.4			19.8			30.6	
Approach LOS		D			B			B			C	

Intersection Summary			
HCM Average Control Delay	27.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	118.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	119	226	42	51	225	75	51	550	52	241	801	215
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95	1.00		0.95	1.00
Frpb, ped/bikes	1.00	0.98		1.00	0.97			1.00	0.88		1.00	0.88
Flpb, ped/bikes	0.95	1.00		0.95	1.00			1.00	1.00		0.99	1.00
Frt	1.00	0.98		1.00	0.96			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00		0.99	1.00
Satd. Flow (prot)	1625	1729		1618	1687			3402	1175		3353	1351
Flt Permitted	0.43	1.00		0.48	1.00			0.77	1.00		0.65	1.00
Satd. Flow (perm)	739	1729		813	1687			2633	1175		2217	1351
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	127	240	45	54	239	80	54	585	55	256	852	229
RTOR Reduction (vph)	0	9	0	0	15	0	0	0	22	0	0	92
Lane Group Flow (vph)	127	276	0	54	304	0	0	639	33	0	1108	137
Confl. Peds. (#/hr)	100		100	100		100	100		100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)									6			
Turn Type	Perm			Perm			Perm		Perm	Perm		Perm
Protected Phases		2			2			6			6	
Permitted Phases	2			2			6		6	6		6
Actuated Green, G (s)	27.0	27.0		27.0	27.0			43.0	43.0		43.0	43.0
Effective Green, g (s)	27.0	27.0		27.0	27.0			43.0	43.0		43.0	43.0
Actuated g/C Ratio	0.34	0.34		0.34	0.34			0.54	0.54		0.54	0.54
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0	5.0		5.0	5.0
Lane Grp Cap (vph)	249	584		274	569			1415	632		1192	726
v/s Ratio Prot		0.16			c0.18							
v/s Ratio Perm	0.17			0.07				0.24	0.03		c0.50	0.10
v/c Ratio	0.51	0.47		0.20	0.53			0.45	0.05		0.93	0.19
Uniform Delay, d1	21.2	20.9		18.8	21.4			11.3	8.8		17.1	9.5
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2	7.3	2.7		1.6	3.6			1.0	0.2		13.9	0.6
Delay (s)	28.5	23.6		20.4	25.0			12.3	9.0		31.0	10.1
Level of Service	C	C		C	C			B	A		C	B
Approach Delay (s)		25.1			24.3			12.1			27.4	
Approach LOS		C			C			B			C	

Intersection Summary			
HCM Average Control Delay	22.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	133.3%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	23	534	38	361	693	130	0	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		5%			5%			0%			0%	
Total Lost time (s)		4.0		4.0	4.0							
Lane Util. Factor		0.95		1.00	0.95							
Frpb, ped/bikes		0.98		1.00	0.95							
Flpb, ped/bikes		1.00		0.88	1.00							
Frt		0.99		1.00	0.98							
Flt Protected		1.00		0.95	1.00							
Satd. Flow (prot)		3225		1473	3104							
Flt Permitted		0.91		0.41	1.00							
Satd. Flow (perm)		2935		639	3104							
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	24	568	40	384	737	138	0	0	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	632	0	384	875	0	0	0	0	0	0	0
Confl. Peds. (#/hr)	100		100	100		100						
Confl. Bikes (#/hr)			10			10						
Turn Type	Perm			Perm								
Protected Phases		4			8							
Permitted Phases	4			8								
Actuated Green, G (s)		90.0		90.0	90.0							
Effective Green, g (s)		90.0		90.0	90.0							
Actuated g/C Ratio		1.00		1.00	1.00							
Clearance Time (s)		4.0		4.0	4.0							
Vehicle Extension (s)		3.0		3.0	3.0							
Lane Grp Cap (vph)		2935		639	3104							
v/s Ratio Prot					0.28							
v/s Ratio Perm		0.22		c0.60								
v/c Ratio		0.22		0.60	0.28							
Uniform Delay, d1		0.0		0.0	0.0							
Progression Factor		1.00		1.00	1.00							
Incremental Delay, d2		0.0		1.3	0.0							
Delay (s)		0.0		1.3	0.0							
Level of Service		A		A	A							
Approach Delay (s)		0.0			0.4			0.0			0.0	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM Average Control Delay	0.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	47.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	336	180	476	713	0	0	0	0	414	1	185
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	11	11	11	11	11	11	12	12	12
Total Lost time (s)		3.5			3.5					3.5	3.5	
Lane Util. Factor		0.95			0.95					0.95	0.95	
Frpb, ped/bikes		0.89			1.00					1.00	0.90	
Flpb, ped/bikes		1.00			0.98					1.00	1.00	
Frt		0.95			1.00					1.00	0.90	
Flt Protected		1.00			0.98					0.95	0.98	
Satd. Flow (prot)		2446			2961					1513	1278	
Flt Permitted		1.00			0.57					0.95	0.98	
Satd. Flow (perm)		2446			1724					1513	1278	
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)	0	350	188	496	743	0	0	0	0	431	1	193
RTOR Reduction (vph)	0	79	0	0	0	0	0	0	0	0	71	0
Lane Group Flow (vph)	0	459	0	0	1239	0	0	0	0	323	232	0
Confl. Peds. (#/hr)			100	100								100
Confl. Bikes (#/hr)			30			30						
Parking (#/hr)		5	5									
Turn Type				pm+pt						Perm		
Protected Phases		2		1	6						4	
Permitted Phases				6						4		
Actuated Green, G (s)		31.5			63.5					19.5	19.5	
Effective Green, g (s)		31.5			63.5					19.5	19.5	
Actuated g/C Ratio		0.35			0.71					0.22	0.22	
Clearance Time (s)		3.5			3.5					3.5	3.5	
Vehicle Extension (s)		4.0			4.0					4.0	4.0	
Lane Grp Cap (vph)		856			1615					328	277	
v/s Ratio Prot		0.19			c0.25							
v/s Ratio Perm					c0.29					c0.21	0.18	
v/c Ratio		0.54			0.77					0.98	0.84	
Uniform Delay, d1		23.4			8.5					35.1	33.7	
Progression Factor		1.00			0.20					1.00	1.00	
Incremental Delay, d2		2.4			2.0					46.0	24.8	
Delay (s)		25.8			3.6					81.1	58.5	
Level of Service		C			A					F	E	
Approach Delay (s)		25.8			3.6			0.0			70.2	
Approach LOS		C			A			A			E	

Intersection Summary			
HCM Average Control Delay	25.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	7.0
Intersection Capacity Utilization	87.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	108	657	0	0	709	195	468	5	616	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	11	11	11	12	12	12	11	11	11
Total Lost time (s)		3.5			3.5	3.5	3.5	3.5				
Lane Util. Factor		0.95			0.95	1.00	0.95	0.95				
Frpb, ped/bikes		1.00			1.00	0.72	1.00	0.87				
Flpb, ped/bikes		1.00			1.00	1.00	1.00	1.00				
Frt		1.00			1.00	0.85	1.00	0.86				
Flt Protected		0.99			1.00	1.00	0.95	1.00				
Satd. Flow (prot)		3058			3042	974	1513	1185				
Flt Permitted		0.54			1.00	1.00	0.95	1.00				
Satd. Flow (perm)		1671			3042	974	1513	1185				
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)	111	677	0	0	731	201	482	5	635	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	41	0	120	0	0	0	0
Lane Group Flow (vph)	0	788	0	0	731	160	434	568	0	0	0	0
Confl. Peds. (#/hr)	100					100			100			
Confl. Bikes (#/hr)			10			10						
Bus Blockages (#/hr)	0	0	0	0	6	6	0	0	0	0	0	0
Turn Type	custom					Perm	Perm					
Protected Phases		2			6			8				
Permitted Phases	5					6	8					
Actuated Green, G (s)		47.0			24.5	24.5	36.0	36.0				
Effective Green, g (s)		47.0			24.5	24.5	36.0	36.0				
Actuated g/C Ratio		0.52			0.27	0.27	0.40	0.40				
Clearance Time (s)		3.5			3.5	3.5	3.5	3.5				
Vehicle Extension (s)		5.0			5.0	5.0	5.0	5.0				
Lane Grp Cap (vph)		873			828	265	605	474				
v/s Ratio Prot					0.24							
v/s Ratio Perm		c0.47				0.16	0.29	0.48				
v/c Ratio		1.54dl			0.88	0.60	0.72	1.20				
Uniform Delay, d1		19.4			31.4	28.5	22.7	27.0				
Progression Factor		0.82			0.77	0.66	1.00	1.00				
Incremental Delay, d2		9.5			9.8	7.0	7.1	108.2				
Delay (s)		25.4			33.8	25.8	29.9	135.2				
Level of Service		C			C	C	C	F				
Approach Delay (s)		25.4			32.1			94.4			0.0	
Approach LOS		C			C			F			A	

Intersection Summary			
HCM Average Control Delay	54.9	HCM Level of Service	D
HCM Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	7.0
Intersection Capacity Utilization	94.4%	ICU Level of Service	F
Analysis Period (min)	15		

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL2	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	113	962	159	23	622	64	83	148	29	33	130	183
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.5			5.5	
Lane Util. Factor	1.00	0.95		1.00	0.95			0.95			0.95	
Frpb, ped/bikes	1.00	0.95		1.00	0.95			0.96			0.82	
Flpb, ped/bikes	0.99	1.00		0.95	1.00			1.00			0.98	
Frt	1.00	0.98		1.00	0.99			0.98			0.92	
Flt Protected	0.95	1.00		0.95	1.00			0.98			1.00	
Satd. Flow (prot)	1520	2870		1463	2842			2825			2096	
Flt Permitted	0.20	1.00		0.16	1.00			0.74			0.90	
Satd. Flow (perm)	320	2870		240	2842			2120			1897	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	120	1023	169	24	662	68	88	157	31	35	138	195
RTOR Reduction (vph)	0	8	0	0	0	0	0	9	0	0	0	0
Lane Group Flow (vph)	120	1184	0	24	730	0	0	267	0	0	368	0
Confl. Peds. (#/hr)	400		400	400		400			400	400		400
Confl. Bikes (#/hr)			30			30			10			10
Bus Blockages (#/hr)	0	0	6	0	6	6	0	6	0	0	6	0
Parking (#/hr)											5	5
Turn Type	pm+pt			Perm						Perm		
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8						6		
Actuated Green, G (s)	41.0	41.0		30.0	30.0			38.5			38.5	
Effective Green, g (s)	41.0	41.0		30.0	30.0			38.5			38.5	
Actuated g/C Ratio	0.46	0.46		0.33	0.33			0.43			0.43	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.5			5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	226	1307		80	947			907			811	
v/s Ratio Prot	0.04	c0.41			0.26							
v/s Ratio Perm	0.21			0.10				0.13			c0.19	
v/c Ratio	0.53	0.91		0.30	0.77			5.87dl			0.45	
Uniform Delay, d1	16.3	22.7		22.2	26.9			16.9			18.3	
Progression Factor	1.01	0.95		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.8	1.2		9.4	6.0			0.8			1.8	
Delay (s)	17.4	22.7		31.6	33.0			17.7			20.1	
Level of Service	B	C		C	C			B			C	
Approach Delay (s)		22.2			32.9			17.7			20.1	
Approach LOS		C			C			B			C	

Intersection Summary			
HCM Average Control Delay	24.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.5
Intersection Capacity Utilization	122.3%	ICU Level of Service	H
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
dr Defacto Right Lane. Recode with 1 though lane as a right lane.
c Critical Lane Group

Movement	SER
Lane Configurations	
Volume (vph)	0
Ideal Flow (vphpl)	1900
Total Lost time (s)	
Lane Util. Factor	
Frpb, ped/bikes	
Flpb, ped/bikes	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Peak-hour factor, PHF	0.94
Adj. Flow (vph)	0
RTOR Reduction (vph)	0
Lane Group Flow (vph)	0
Confl. Peds. (#/hr)	400
Confl. Bikes (#/hr)	
Bus Blockages (#/hr)	0
Parking (#/hr)	
Turn Type	custom
Protected Phases	
Permitted Phases	13
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s)	
Approach LOS	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	59	767	46	61	643	50	57	39	61	26	64	63
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	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frpb, ped/bikes		0.99			0.99			0.98			0.98	
Flpb, ped/bikes		1.00			1.00			0.99			1.00	
Frt		0.99			0.99			0.95			0.94	
Flt Protected		1.00			1.00			0.98			0.99	
Satd. Flow (prot)		2853			2821			1303			1316	
Flt Permitted		0.85			0.78			0.87			0.95	
Satd. Flow (perm)		2440			2220			1150			1256	
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)	61	799	48	64	670	52	59	41	64	27	67	66
RTOR Reduction (vph)	0	7	0	0	9	0	0	35	0	0	36	0
Lane Group Flow (vph)	0	901	0	0	777	0	0	129	0	0	124	0
Confl. Peds. (#/hr)	50		50	50		50	50		50	50		50
Confl. Bikes (#/hr)			10			10			10			10
Bus Blockages (#/hr)	0	0	0	0	6	6	0	0	0	0	0	0
Parking (#/hr)		2	2		0	0	0	2	2	0	2	2
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		25.1			25.1			26.9			26.9	
Effective Green, g (s)		25.1			25.1			26.9			26.9	
Actuated g/C Ratio		0.42			0.42			0.45			0.45	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1021			929			516			563	
v/s Ratio Prot												
v/s Ratio Perm		c0.37			0.35			c0.11			0.10	
v/c Ratio		0.88			0.84			0.25			0.22	
Uniform Delay, d1		16.1			15.6			10.3			10.1	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		9.1			6.6			1.2			0.9	
Delay (s)		25.2			22.2			11.4			11.0	
Level of Service		C			C			B			B	
Approach Delay (s)		25.2			22.2			11.4			11.0	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	21.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	82.7%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	131	616	83	107	533	267	79	547	247	49	664	102
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	3.5		3.5	3.5		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	0.98		1.00	0.95		1.00	0.95		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1711	3360		1711	3250		1711	3262		1711	3353	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1711	3360		1711	3250		1711	3262		1711	3353	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	139	655	88	114	567	284	84	582	263	52	706	109
RTOR Reduction (vph)	0	7	0	0	45	0	0	45	0	0	11	0
Lane Group Flow (vph)	139	736	0	114	806	0	84	800	0	52	804	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	13.2	31.5		12.1	30.4		8.6	30.3		7.0	28.7	
Effective Green, g (s)	13.2	31.5		12.1	30.4		8.6	30.3		7.0	28.7	
Actuated g/C Ratio	0.14	0.33		0.13	0.32		0.09	0.32		0.07	0.30	
Clearance Time (s)	3.5	3.5		3.5	3.5		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	2.0		3.0	2.0		3.0	2.0		3.0	2.0	
Lane Grp Cap (vph)	236	1104		216	1030		153	1031		125	1003	
v/s Ratio Prot	c0.08	0.22		0.07	c0.25		0.05	c0.25		0.03	c0.24	
v/s Ratio Perm												
v/c Ratio	0.59	0.67		0.53	0.78		0.55	0.78		0.42	0.80	
Uniform Delay, d1	38.8	27.7		39.2	29.7		41.8	29.7		42.5	31.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.7	1.2		2.3	3.6		4.0	3.4		2.2	4.4	
Delay (s)	42.5	28.9		41.5	33.4		45.8	33.1		44.7	35.4	
Level of Service	D	C		D	C		D	C		D	D	
Approach Delay (s)		31.0			34.3			34.3			35.9	
Approach LOS		C			C			C			D	

Intersection Summary			
HCM Average Control Delay	33.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	95.9	Sum of lost time (s)	11.0
Intersection Capacity Utilization	72.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	215	334	6	126	895	284	2	96	94	173	74	284
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			4.0	4.0		4.0	4.0
Lane Util. Factor	0.91	0.91			0.95			1.00	1.00		1.00	1.00
Frpb, ped/bikes	1.00	1.00			1.00			1.00	1.00		1.00	0.87
Flpb, ped/bikes	1.00	1.00			1.00			1.00	1.00		1.00	1.00
Frt	1.00	1.00			0.97			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00			1.00			1.00	1.00		0.97	1.00
Satd. Flow (prot)	1557	3245			3294			1799	1531		1740	1338
Flt Permitted	0.95	1.00			1.00			1.00	1.00		0.97	1.00
Satd. Flow (perm)	1557	3245			3294			1799	1531		1740	1338
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	226	352	6	133	942	299	2	101	99	182	78	299
RTOR Reduction (vph)	0	1	0	0	23	0	0	0	90	0	0	256
Lane Group Flow (vph)	190	393	0	0	1351	0	0	103	9	0	260	43
Confl. Peds. (#/hr)			50	50			50					50
Confl. Bikes (#/hr)			10									10
Turn Type	Split			Split			Split		Perm	Split		Perm
Protected Phases	2	2		6	6		8	8		4	4	
Permitted Phases									8			4
Actuated Green, G (s)	18.0	18.0			50.0			10.0	10.0		16.0	16.0
Effective Green, g (s)	18.0	18.0			50.0			10.0	10.0		16.0	16.0
Actuated g/C Ratio	0.16	0.16			0.45			0.09	0.09		0.15	0.15
Clearance Time (s)	4.0	4.0			4.0			4.0	4.0		4.0	4.0
Lane Grp Cap (vph)	255	531			1497			164	139		253	195
v/s Ratio Prot	c0.12	0.12			c0.41			c0.06			c0.15	
v/s Ratio Perm									0.01			0.03
v/c Ratio	0.75	0.74			0.90			0.63	0.06		1.03	0.22
Uniform Delay, d1	43.8	43.8			27.7			48.2	45.7		47.0	41.5
Progression Factor	1.00	1.00			1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2	17.9	9.0			9.2			16.8	0.9		63.9	2.6
Delay (s)	61.7	52.8			36.9			65.0	46.6		110.9	44.1
Level of Service	E	D			D			E	D		F	D
Approach Delay (s)		55.7			36.9			56.0			75.2	
Approach LOS		E			D			E			E	

Intersection Summary			
HCM Average Control Delay	50.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	86.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	33	623	359	174	944	78	0	0	0	29	0	75
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.94	0.94	0.90	0.90	0.94	0.94	0.94	0.90	0.94	0.90
Hourly flow rate (vph)	37	692	382	185	1049	87	0	0	0	32	0	83
Pedestrians											50	
Lane Width (ft)											11.0	
Walking Speed (ft/s)											4.0	
Percent Blockage											4	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		364										
pX, platoon unblocked												
vC, conflicting volume	1186			1074			2502	2512	537	1932	2660	1142
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1186			1074			2502	2512	537	1932	2660	1142
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	93			71			100	100	100	0	100	55
cM capacity (veh/h)	562			645			6	18	488	28	14	187

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	SB 1
Volume Total	37	461	613	1321	116
Volume Left	37	0	0	185	32
Volume Right	0	0	382	87	83
cSH	562	1700	1700	645	72
Volume to Capacity	0.07	0.27	0.36	0.29	1.61
Queue Length 95th (ft)	5	0	0	30	247
Control Delay (s)	11.8	0.0	0.0	11.3	429.3
Lane LOS	B			B	F
Approach Delay (s)	0.4			11.3	429.3
Approach LOS					F

Intersection Summary			
Average Delay	25.5		
Intersection Capacity Utilization	Err%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	90	32	0	767	29	140	89	3	357	497	1035
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		11.0	11.0		11.0		6.0	5.0		4.0	5.0	5.0
Lane Util. Factor		1.00	1.00		0.91		0.97	1.00		1.00	0.91	0.91
Frpb, ped/bikes		1.00	0.99		1.00		1.00	1.00		1.00	0.98	0.97
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	1.00
Frt		1.00	0.85		0.99		1.00	1.00		1.00	0.92	0.85
Flt Protected		1.00	1.00		1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1801	1509		4874		3319	1791		1711	2981	1352
Flt Permitted		1.00	1.00		1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)		1801	1509		4874		3319	1791		1711	2981	1352
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	0	96	34	0	816	31	149	95	3	380	529	1101
RTOR Reduction (vph)	0	0	28	0	4	0	0	2	0	0	0	0
Lane Group Flow (vph)	0	96	6	0	843	0	149	96	0	380	1080	550
Confl. Peds. (#/hr)			2	2		57						22
Confl. Bikes (#/hr)						4			1			2
Turn Type			custom				Prot			Prot		custom
Protected Phases					8		5	2		1	6	
Permitted Phases		4	4									15
Actuated Green, G (s)		17.0	17.0		17.0		7.0	21.0		32.0	44.0	57.0
Effective Green, g (s)		17.0	17.0		17.0		7.0	21.0		32.0	44.0	57.0
Actuated g/C Ratio		0.19	0.19		0.19		0.08	0.23		0.36	0.49	0.63
Clearance Time (s)		11.0	11.0		11.0		6.0	5.0		4.0	5.0	5.0
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		340	285		921		258	418		608	1457	856
v/s Ratio Prot					c0.17		0.04	0.05		0.22	c0.36	
v/s Ratio Perm		0.05	0.00									c0.41
v/c Ratio		0.28	0.02		0.92		0.58	0.23		0.62	0.74	0.64
Uniform Delay, d1		31.3	29.7		35.8		40.1	28.0		24.0	18.4	10.2
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		2.1	0.1		15.1		9.1	1.3		4.8	3.4	3.7
Delay (s)		33.3	29.9		50.9		49.2	29.2		28.8	21.9	13.9
Level of Service		C	C		D		D	C		C	C	B
Approach Delay (s)		32.4			50.9			41.3			21.0	
Approach LOS		C			D			D			C	

Intersection Summary			
HCM Average Control Delay	30.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	88.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	EBR2	WBL	WBR2	NBT	NBR	NBR2	SBT	NWR2
Lane Configurations											
Volume (vph)	268	589	3	11	256	164	222	303	12	485	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	5.0		5.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	0.95		1.00	0.97	1.00	0.91	1.00	1.00	0.91	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.98	1.00	1.00	1.00	1.00	0.93
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00		0.85	1.00	0.85	1.00	0.85	0.85	1.00	0.86
Flt Protected	0.95	1.00		1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (prot)	1711	3419		1531	3305	1496	4916	1531	1531	4916	1452
Flt Permitted	0.95	1.00		1.00	0.42	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (perm)	1711	3419		1531	1473	1496	4916	1531	1531	4916	1452
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	273	601	3	11	261	167	227	309	12	495	40
RTOR Reduction (vph)	0	0	0	7	0	115	0	0	0	0	0
Lane Group Flow (vph)	273	604	0	4	261	52	227	309	12	495	40
Confl. Peds. (#/hr)					10						17
Confl. Bikes (#/hr)						2					
Turn Type	custom			Perm	custom	custom		Perm	Perm		custom
Protected Phases		2!					4!				
Permitted Phases	7!			2	3	6		4	4	4!	6!
Actuated Green, G (s)	43.0	26.0		26.0	14.0	25.0	23.0	23.0	23.0	23.0	25.0
Effective Green, g (s)	43.0	26.0		26.0	14.0	25.0	23.0	23.0	23.0	23.0	25.0
Actuated g/C Ratio	0.54	0.32		0.32	0.18	0.31	0.29	0.29	0.29	0.29	0.31
Clearance Time (s)	6.0	5.0		5.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Grp Cap (vph)	920	1111		498	258	468	1413	440	440	1413	454
v/s Ratio Prot		c0.18					0.05				
v/s Ratio Perm	0.16			0.00	c0.18	0.03		c0.20	0.01	0.10	0.03
v/c Ratio	0.30	0.54		0.01	1.01	0.11	0.16	0.70	0.03	0.35	0.09
Uniform Delay, d1	10.2	22.1		18.3	33.0	19.6	21.3	25.4	20.5	22.6	19.4
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.8	1.9		0.0	59.0	0.5	0.2	9.0	0.1	0.7	0.4
Delay (s)	11.0	24.0		18.3	92.0	20.1	21.5	34.5	20.6	23.3	19.8
Level of Service	B	C		B	F	C	C	C	C	C	B
Approach Delay (s)		20.0					28.8			23.3	
Approach LOS		B					C			C	

Intersection Summary			
HCM Average Control Delay	30.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	83.3%	ICU Level of Service	E
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	50	80	211	49	55	296
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	53	85	224	52	59	315
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			373			584
pX, platoon unblocked						
vC, conflicting volume	525	138			277	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	525	138			277	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	88	90			95	
cM capacity (veh/h)	460	885			1283	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	138	150	127	163	210
Volume Left	53	0	0	59	0
Volume Right	85	0	52	0	0
cSH	653	1700	1700	1283	1700
Volume to Capacity	0.21	0.09	0.07	0.05	0.12
Queue Length 95th (ft)	20	0	0	4	0
Control Delay (s)	12.0	0.0	0.0	3.1	0.0
Lane LOS	B			A	
Approach Delay (s)	12.0	0.0		1.4	
Approach LOS	B				

Intersection Summary			
Average Delay	2.7		
Intersection Capacity Utilization	34.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1071	0	0	1017	415	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	5%			5%	0%	
Total Lost time (s)	4.0			4.0	4.0	
Lane Util. Factor	0.95			0.95	0.97	
Frpb, ped/bikes	1.00			1.00	1.00	
Flpb, ped/bikes	1.00			1.00	1.00	
Frt	1.00			1.00	1.00	
Flt Protected	1.00			1.00	0.95	
Satd. Flow (prot)	3336			3336	3319	
Flt Permitted	1.00			1.00	0.95	
Satd. Flow (perm)	3336			3336	3319	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	1139	0	0	1082	441	4
RTOR Reduction (vph)	0	0	0	0	1	0
Lane Group Flow (vph)	1139	0	0	1082	444	0
Confl. Peds. (#/hr)			100		100	100
Turn Type						
Protected Phases	13			1	8	
Permitted Phases						
Actuated Green, G (s)	46.0			46.0	26.0	
Effective Green, g (s)	46.0			46.0	26.0	
Actuated g/C Ratio	0.58			0.58	0.32	
Clearance Time (s)	4.0			4.0	4.0	
Vehicle Extension (s)	3.0			3.0	3.0	
Lane Grp Cap (vph)	1918			1918	1079	
v/s Ratio Prot	c0.34			0.32	c0.13	
v/s Ratio Perm						
v/c Ratio	0.59			0.56	0.41	
Uniform Delay, d1	11.0			10.7	21.0	
Progression Factor	0.53			1.78	1.00	
Incremental Delay, d2	1.0			1.0	0.3	
Delay (s)	6.8			20.0	21.3	
Level of Service	A			B	C	
Approach Delay (s)	6.8			20.0	21.3	
Approach LOS	A			B	C	

Intersection Summary			
HCM Average Control Delay	14.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	64.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	107	882	347	0	1165	469	0	0	0	189	267	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		5%			0%			0%			0%	
Total Lost time (s)	3.5	4.0			4.0						4.0	
Lane Util. Factor	1.00	0.95			0.91						0.95	
Frt	1.00	0.96			0.96						0.97	
Flt Protected	0.95	1.00			1.00						0.98	
Satd. Flow (prot)	1668	3194			4704						3267	
Flt Permitted	0.95	1.00			1.00						0.98	
Satd. Flow (perm)	1668	3194			4704						3267	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	114	938	369	0	1239	499	0	0	0	201	284	117
RTOR Reduction (vph)	0	52	0	0	86	0	0	0	0	0	26	0
Lane Group Flow (vph)	114	1255	0	0	1652	0	0	0	0	0	576	0
Turn Type	Prot									Perm		
Protected Phases	5	2			6						4	
Permitted Phases										4		
Actuated Green, G (s)	10.4	46.0			32.1						26.0	
Effective Green, g (s)	10.4	46.0			32.1						26.0	
Actuated g/C Ratio	0.13	0.58			0.40						0.32	
Clearance Time (s)	3.5	4.0			4.0						4.0	
Vehicle Extension (s)	3.0	3.0			3.0						3.0	
Lane Grp Cap (vph)	217	1837			1887						1062	
v/s Ratio Prot	0.07	c0.39			c0.35							
v/s Ratio Perm											0.18	
v/c Ratio	0.53	0.68			0.88						0.54	
Uniform Delay, d1	32.5	11.9			22.1						22.1	
Progression Factor	1.00	1.00			1.07						1.00	
Incremental Delay, d2	2.3	2.1			5.5						0.6	
Delay (s)	34.8	14.0			29.2						22.7	
Level of Service	C	B			C						C	
Approach Delay (s)		15.7			29.2			0.0			22.7	
Approach LOS		B			C			A			C	

Intersection Summary			
HCM Average Control Delay	23.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	75.5%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	846	0	0	1023	85	48	9	61	50	0	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0			4.0			4.0	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frt		1.00			0.99			0.93			0.98	
Flt Protected		1.00			1.00			0.98			0.96	
Satd. Flow (prot)		3421			3382			1642			1689	
Flt Permitted		1.00			1.00			0.88			0.75	
Satd. Flow (perm)		3421			3382			1471			1324	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	0	900	0	0	1088	90	51	10	65	53	0	11
RTOR Reduction (vph)	0	0	0	0	7	0	0	44	0	0	7	0
Lane Group Flow (vph)	0	900	0	0	1171	0	0	82	0	0	57	0
Turn Type							Perm			Perm		
Protected Phases		6			6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)		45.0			45.0			26.0			26.0	
Effective Green, g (s)		45.0			45.0			26.0			26.0	
Actuated g/C Ratio		0.56			0.56			0.32			0.32	
Clearance Time (s)		5.0			5.0			4.0			4.0	
Lane Grp Cap (vph)		1924			1902			478			430	
v/s Ratio Prot		0.26			c0.35							
v/s Ratio Perm								c0.06			0.04	
v/c Ratio		0.47			0.62			0.17			0.13	
Uniform Delay, d1		10.4			11.7			19.3			19.0	
Progression Factor		0.21			1.00			1.00			1.00	
Incremental Delay, d2		0.7			1.5			0.8			0.6	
Delay (s)		2.8			13.2			20.1			19.7	
Level of Service		A			B			C			B	
Approach Delay (s)		2.8			13.2			20.1			19.7	
Approach LOS		A			B			C			B	

Intersection Summary			
HCM Average Control Delay	9.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	66.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	957	10	0	621	0	0	0	0	105	600	487
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	
Lane Util. Factor		0.95			1.00					1.00	1.00	
Frt		1.00			1.00					1.00	0.93	
Flt Protected		1.00			1.00					0.95	1.00	
Satd. Flow (prot)		3416			1801					1711	1680	
Flt Permitted		1.00			1.00					0.95	1.00	
Satd. Flow (perm)		3416			1801					1711	1680	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	0	1018	11	0	661	0	0	0	0	112	638	518
RTOR Reduction (vph)	0	1	0	0	0	0	0	0	0	0	27	0
Lane Group Flow (vph)	0	1028	0	0	661	0	0	0	0	112	1129	0
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	100
Turn Type										Split		
Protected Phases		4			8					6	6	
Permitted Phases												
Actuated Green, G (s)		37.0			37.0					65.0	65.0	
Effective Green, g (s)		37.0			37.0					65.0	65.0	
Actuated g/C Ratio		0.34			0.34					0.59	0.59	
Clearance Time (s)		4.0			4.0					4.0	4.0	
Vehicle Extension (s)		3.0			3.0					3.0	3.0	
Lane Grp Cap (vph)		1149			606					1011	993	
v/s Ratio Prot		0.30			c0.37					0.07	c0.67	
v/s Ratio Perm												
v/c Ratio		0.89			1.09					0.11	1.14	
Uniform Delay, d1		34.7			36.5					9.8	22.5	
Progression Factor		1.00			1.63					1.00	1.00	
Incremental Delay, d2		9.2			43.8					0.2	74.3	
Delay (s)		43.9			103.4					10.1	96.8	
Level of Service		D			F					B	F	
Approach Delay (s)		43.9			103.4			0.0			89.1	
Approach LOS		D			F			A			F	

Intersection Summary			
HCM Average Control Delay	76.6	HCM Level of Service	E
HCM Volume to Capacity ratio	1.12		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	100.7%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	583	521	7	9	532	186	89	222	92	5	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		3.0	5.0	5.0		3.0	3.0	4.0		
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.71		1.00	1.00	1.00		
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		
Frt	1.00	1.00		1.00	1.00	0.85		1.00	0.85	1.00		
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.99	1.00	0.95		
Satd. Flow (prot)	1711	1775		872	1801	1093		905	781	1711		
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.99	1.00	0.95		
Satd. Flow (perm)	1711	1775		872	1801	1093		905	781	1711		
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)	601	537	7	9	548	192	92	229	95	5	0	0
RTOR Reduction (vph)	0	0	0	0	0	36	0	0	68	0	0	0
Lane Group Flow (vph)	601	544	0	9	548	156	0	321	27	5	0	0
Confl. Peds. (#/hr)						100						
Confl. Bikes (#/hr)						10						
Heavy Vehicles (%)	2%	2%	100%	100%	2%	2%	100%	100%	100%	2%	2%	2%
Turn Type	Prot			Prot		Perm	Perm		Perm	Prot		
Protected Phases	5	2		1	6			3		14		
Permitted Phases						6	3		3			
Actuated Green, G (s)	43.8	77.2		2.4	33.8	33.8		14.0	14.0	1.4		
Effective Green, g (s)	43.8	77.2		2.4	33.8	33.8		14.0	14.0	1.4		
Actuated g/C Ratio	0.40	0.70		0.02	0.31	0.31		0.13	0.13	0.01		
Clearance Time (s)	5.0	5.0		3.0	5.0	5.0		3.0	3.0	4.0		
Vehicle Extension (s)	0.2	0.2		0.2	0.2	0.2		0.2	0.2	3.0		
Lane Grp Cap (vph)	681	1246		19	553	336		115	99	22		
v/s Ratio Prot	c0.35	0.31		0.01	c0.30					c0.00		
v/s Ratio Perm						0.14		0.35	0.03			
v/c Ratio	0.88	0.44		0.47	0.99	0.46		2.79	0.27	0.23		
Uniform Delay, d1	30.7	7.0		53.2	37.9	30.8		48.0	43.4	53.8		
Progression Factor	0.47	0.12		1.07	1.08	1.17		1.00	1.00	1.00		
Incremental Delay, d2	7.7	0.6		5.1	31.5	3.5		829.8	0.5	5.2		
Delay (s)	22.2	1.5		62.1	72.4	39.5		877.8	43.9	59.0		
Level of Service	C	A		E	E	D		F	D	E		
Approach Delay (s)		12.3			63.8			687.4			59.0	
Approach LOS		B			E			F			E	

Intersection Summary			
HCM Average Control Delay	150.4	HCM Level of Service	F
HCM Volume to Capacity ratio	1.20		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	87.0%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	164	382	55	102	475	48	115	156	52	52	286	109
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		5.0	5.0			5.0	
Lane Util. Factor		1.00	1.00	1.00	1.00		1.00	1.00			1.00	
Frpb, ped/bikes		1.00	0.64	1.00	0.97		1.00	0.95			0.95	
Flpb, ped/bikes		0.98	1.00	1.00	1.00		0.94	1.00			0.99	
Frt		1.00	0.85	1.00	0.99		1.00	0.96			0.97	
Flt Protected		0.99	1.00	0.95	1.00		0.95	1.00			0.99	
Satd. Flow (prot)		1731	984	1711	1718		1601	1645			1620	
Flt Permitted		0.56	1.00	0.33	1.00		0.30	1.00			0.93	
Satd. Flow (perm)		980	984	596	1718		509	1645			1522	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	174	406	59	109	505	51	122	166	55	55	304	116
RTOR Reduction (vph)	0	0	9	0	3	0	0	11	0	0	11	0
Lane Group Flow (vph)	0	580	50	109	553	0	122	210	0	0	464	0
Confl. Peds. (#/hr)	100		100	100		100	100		100	100		100
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		65.9	65.9	65.9	65.9		35.1	35.1			35.1	
Effective Green, g (s)		65.9	65.9	65.9	65.9		35.1	35.1			35.1	
Actuated g/C Ratio		0.60	0.60	0.60	0.60		0.32	0.32			0.32	
Clearance Time (s)		4.0	4.0	4.0	4.0		5.0	5.0			5.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		587	590	357	1029		162	525			486	
v/s Ratio Prot					0.32			0.13				
v/s Ratio Perm		c0.59	0.05	0.18			0.24				c0.30	
v/c Ratio		0.99	0.09	0.31	0.54		0.75	0.40			0.95	
Uniform Delay, d1		21.7	9.3	10.8	13.0		33.6	29.2			36.7	
Progression Factor		1.74	2.17	1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2		32.3	0.1	0.5	0.5		27.2	2.3			31.0	
Delay (s)		70.0	20.2	11.3	13.6		60.8	31.5			67.7	
Level of Service		E	C	B	B		E	C			E	
Approach Delay (s)		65.4			13.2			41.9			67.7	
Approach LOS		E			B			D			E	

Intersection Summary			
HCM Average Control Delay	45.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	122.8%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	119	226	42	51	225	75	51	550	52	241	801	215
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95	1.00		0.95	1.00
Frpb, ped/bikes	1.00	0.98		1.00	0.97			1.00	0.88		1.00	0.88
Flpb, ped/bikes	0.95	1.00		0.95	1.00			1.00	1.00		0.99	1.00
Frt	1.00	0.98		1.00	0.96			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00		0.99	1.00
Satd. Flow (prot)	1625	1729		1618	1687			3402	1175		3353	1351
Flt Permitted	0.43	1.00		0.48	1.00			0.77	1.00		0.65	1.00
Satd. Flow (perm)	739	1729		813	1687			2633	1175		2217	1351
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	127	240	45	54	239	80	54	585	55	256	852	229
RTOR Reduction (vph)	0	9	0	0	15	0	0	0	22	0	0	92
Lane Group Flow (vph)	127	276	0	54	304	0	0	639	33	0	1108	137
Confl. Peds. (#/hr)	100		100	100		100	100		100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)									6			
Turn Type	Perm			Perm			Perm		Perm	Perm		Perm
Protected Phases		2			2			6			6	
Permitted Phases	2			2			6		6	6		6
Actuated Green, G (s)	27.0	27.0		27.0	27.0			43.0	43.0		43.0	43.0
Effective Green, g (s)	27.0	27.0		27.0	27.0			43.0	43.0		43.0	43.0
Actuated g/C Ratio	0.34	0.34		0.34	0.34			0.54	0.54		0.54	0.54
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0	5.0		5.0	5.0
Lane Grp Cap (vph)	249	584		274	569			1415	632		1192	726
v/s Ratio Prot		0.16			c0.18							
v/s Ratio Perm	0.17			0.07				0.24	0.03		c0.50	0.10
v/c Ratio	0.51	0.47		0.20	0.53			0.45	0.05		0.93	0.19
Uniform Delay, d1	21.2	20.9		18.8	21.4			11.3	8.8		17.1	9.5
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2	7.3	2.7		1.6	3.6			1.0	0.2		13.9	0.6
Delay (s)	28.5	23.6		20.4	25.0			12.3	9.0		31.0	10.1
Level of Service	C	C		C	C			B	A		C	B
Approach Delay (s)		25.1			24.3			12.1			27.4	
Approach LOS		C			C			B			C	

Intersection Summary			
HCM Average Control Delay	22.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	133.3%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	23	448	38	361	646	95	0	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		5%			5%			0%			0%	
Total Lost time (s)		4.0		4.0	4.0							
Lane Util. Factor		0.95		1.00	0.95							
Frpb, ped/bikes		0.98		1.00	0.96							
Flpb, ped/bikes		1.00		0.87	1.00							
Frt		0.99		1.00	0.98							
Flt Protected		1.00		0.95	1.00							
Satd. Flow (prot)		3207		1454	3146							
Flt Permitted		0.91		0.44	1.00							
Satd. Flow (perm)		2912		678	3146							
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	24	477	40	384	687	101	0	0	0	0	0	0
RTOR Reduction (vph)	0	5	0	0	11	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	536	0	384	777	0	0	0	0	0	0	0
Confl. Peds. (#/hr)	100		100	100		100						
Confl. Bikes (#/hr)			10			10						
Turn Type	Perm			Perm								
Protected Phases		4			8							
Permitted Phases	4			8								
Actuated Green, G (s)		63.2		63.2	63.2							
Effective Green, g (s)		63.2		63.2	63.2							
Actuated g/C Ratio		0.70		0.70	0.70							
Clearance Time (s)		4.0		4.0	4.0							
Vehicle Extension (s)		3.0		3.0	3.0							
Lane Grp Cap (vph)		2045		476	2209							
v/s Ratio Prot					0.25							
v/s Ratio Perm		0.18		c0.57								
v/c Ratio		0.26		0.81	0.35							
Uniform Delay, d1		4.9		9.2	5.3							
Progression Factor		1.00		0.83	0.68							
Incremental Delay, d2		0.1		9.5	0.1							
Delay (s)		5.0		17.1	3.7							
Level of Service		A		B	A							
Approach Delay (s)		5.0			8.1			0.0			0.0	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM Average Control Delay	7.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	26.8
Intersection Capacity Utilization	43.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	250	180	476	631	0	0	0	0	414	11	185
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	11	11	11	11	11	11	12	12	12
Total Lost time (s)		3.5	3.5	3.0	3.5					3.5	3.5	
Lane Util. Factor		0.95	1.00	1.00	0.95					1.00	1.00	
Frpb, ped/bikes		1.00	0.69	1.00	1.00					1.00	0.86	
Flpb, ped/bikes		1.00	1.00	1.00	1.00					1.00	1.00	
Frt		1.00	0.85	1.00	1.00					1.00	0.86	
Flt Protected		1.00	1.00	0.95	1.00					0.95	1.00	
Satd. Flow (prot)		2887	827	1540	3079					1593	1233	
Flt Permitted		1.00	1.00	0.95	1.00					0.95	1.00	
Satd. Flow (perm)		2887	827	1540	3079					1593	1233	
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)	0	260	188	496	657	0	0	0	0	431	11	193
RTOR Reduction (vph)	0	0	144	0	0	0	0	0	0	0	134	0
Lane Group Flow (vph)	0	260	44	496	657	0	0	0	0	431	70	0
Confl. Peds. (#/hr)			100	100								100
Confl. Bikes (#/hr)			30			30						
Parking (#/hr)		5	5									
Turn Type			Perm	Prot						Perm		
Protected Phases		2		1	6						4	
Permitted Phases			2							4		
Actuated Green, G (s)		21.3	21.3	31.4	55.7					27.3	27.3	
Effective Green, g (s)		21.3	21.3	31.4	55.7					27.3	27.3	
Actuated g/C Ratio		0.24	0.24	0.35	0.62					0.30	0.30	
Clearance Time (s)		3.5	3.5	3.0	3.5					3.5	3.5	
Vehicle Extension (s)		4.0	4.0	3.0	4.0					4.0	4.0	
Lane Grp Cap (vph)		683	196	537	1906					483	374	
v/s Ratio Prot		0.09		c0.32	c0.21						0.06	
v/s Ratio Perm			0.05							c0.27		
v/c Ratio		0.38	0.23	0.92	0.34					0.89	0.19	
Uniform Delay, d1		28.8	27.7	28.1	8.3					29.9	23.1	
Progression Factor		0.87	2.10	0.90	0.84					1.00	1.00	
Incremental Delay, d2		1.6	2.6	18.8	0.4					18.8	0.3	
Delay (s)		26.5	60.9	44.2	7.4					48.8	23.5	
Level of Service		C	E	D	A					D	C	
Approach Delay (s)		41.0			23.2			0.0			40.6	
Approach LOS		D			C			A			D	

Intersection Summary			
HCM Average Control Delay	31.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	6.5
Intersection Capacity Utilization	79.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	22	657	0	0	709	195	386	179	524	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	11	11	11	12	12	12	11	11	11
Total Lost time (s)		3.5			3.5	3.5		3.5	3.5			
Lane Util. Factor		0.95			0.95	1.00		1.00	1.00			
Frpb, ped/bikes		1.00			1.00	0.73		1.00	0.86			
Flpb, ped/bikes		1.00			1.00	1.00		1.00	1.00			
Frt		1.00			1.00	0.85		1.00	0.85			
Flt Protected		1.00			1.00	1.00		0.97	1.00			
Satd. Flow (prot)		3067			3079	1004		1621	1219			
Flt Permitted		0.92			1.00	1.00		0.97	1.00			
Satd. Flow (perm)		2826			3079	1004		1621	1219			
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)	23	677	0	0	731	201	398	185	540	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	50	0	0	68	0	0	0
Lane Group Flow (vph)	0	700	0	0	731	151	0	583	472	0	0	0
Confl. Peds. (#/hr)	100					100			100			
Confl. Bikes (#/hr)			10			10						
Turn Type	custom					Perm	Perm		Perm			
Protected Phases		2			6			8				
Permitted Phases	5					6	8		8			
Actuated Green, G (s)		40.8			40.8	40.8		42.2	42.2			
Effective Green, g (s)		40.8			40.8	40.8		42.2	42.2			
Actuated g/C Ratio		0.45			0.45	0.45		0.47	0.47			
Clearance Time (s)		3.5			3.5	3.5		3.5	3.5			
Vehicle Extension (s)		5.0			5.0	5.0		5.0	5.0			
Lane Grp Cap (vph)		1281			1396	455		760	572			
v/s Ratio Prot					0.24							
v/s Ratio Perm		c0.25				0.15		0.36	c0.39			
v/c Ratio		0.55			0.52	0.33		0.77	0.83			
Uniform Delay, d1		17.9			17.6	15.8		19.8	20.7			
Progression Factor		1.25			0.68	0.44		1.00	1.00			
Incremental Delay, d2		1.2			1.1	1.5		5.5	10.5			
Delay (s)		23.5			13.0	8.4		25.3	31.2			
Level of Service		C			B	A		C	C			
Approach Delay (s)		23.5			12.0			28.2			0.0	
Approach LOS		C			B			C			A	

Intersection Summary			
HCM Average Control Delay	21.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	7.0
Intersection Capacity Utilization	84.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR2	NBL2	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	21	962	159	23	622	64	83	148	29	33	130	183
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.5		5.5	5.5	
Lane Util. Factor	1.00	0.95		1.00	0.95			0.95		1.00	1.00	
Frpb, ped/bikes	1.00	0.95		1.00	0.95			0.96		1.00	0.80	
Flpb, ped/bikes	0.97	1.00		0.95	1.00			1.00		0.76	1.00	
Frt	1.00	0.98		1.00	0.99			0.98		1.00	0.91	
Flt Protected	0.95	1.00		0.95	1.00			0.98		0.95	1.00	
Satd. Flow (prot)	1500	2870		1470	2843			2825		1168	1013	
Flt Permitted	0.23	1.00		0.14	1.00			0.72		0.58	1.00	
Satd. Flow (perm)	357	2870		216	2843			2075		716	1013	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	22	1023	169	24	662	68	88	157	31	35	138	195
RTOR Reduction (vph)	0	8	0	0	8	0	0	9	0	0	0	0
Lane Group Flow (vph)	22	1184	0	24	722	0	0	267	0	35	333	0
Confl. Peds. (#/hr)	400		400	400		400			400	400		400
Confl. Bikes (#/hr)			30			30			10			10
Bus Blockages (#/hr)	0	0	6	0	6	0	0	6	0	0	6	0
Parking (#/hr)											5	5
Turn Type	pm+pt			Perm			Perm			Perm		
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	41.0	41.0		33.6	33.6			38.5		38.5	38.5	
Effective Green, g (s)	41.0	41.0		33.6	33.6			38.5		38.5	38.5	
Actuated g/C Ratio	0.46	0.46		0.37	0.37			0.43		0.43	0.43	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)	193	1307		81	1061			888		306	433	
v/s Ratio Prot	0.00	c0.41			0.25						c0.33	
v/s Ratio Perm	0.05			0.11				0.13		0.05		
v/c Ratio	0.11	0.91		0.30	0.68			0.30		0.11	0.77	
Uniform Delay, d1	14.9	22.7		19.9	23.7			16.9		15.5	22.0	
Progression Factor	1.26	0.97		1.40	1.30			1.00		1.00	1.00	
Incremental Delay, d2	0.2	8.3		8.0	3.1			0.2		0.2	8.0	
Delay (s)	19.0	30.2		35.9	34.0			17.1		15.7	30.0	
Level of Service	B	C		D	C			B		B	C	
Approach Delay (s)		30.0			34.0			17.1			28.6	
Approach LOS		C			C			B			C	

Intersection Summary			
HCM Average Control Delay	29.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.5
Intersection Capacity Utilization	107.8%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SER
Lane Configurations	
Volume (vph)	0
Ideal Flow (vphpl)	1900
Total Lost time (s)	
Lane Util. Factor	
Frpb, ped/bikes	
Flpb, ped/bikes	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Peak-hour factor, PHF	0.94
Adj. Flow (vph)	0
RTOR Reduction (vph)	0
Lane Group Flow (vph)	0
Confl. Peds. (#/hr)	400
Confl. Bikes (#/hr)	
Bus Blockages (#/hr)	0
Parking (#/hr)	
Turn Type	custom
Protected Phases	
Permitted Phases	13
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s)	
Approach LOS	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	59	767	46	61	643	50	57	39	61	26	64	63
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	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frpb, ped/bikes		0.99			0.99			0.97			0.97	
Flpb, ped/bikes		1.00			1.00			0.99			0.99	
Frt		0.99			0.99			0.95			0.94	
Flt Protected		1.00			1.00			0.98			0.99	
Satd. Flow (prot)		2843			2810			1288			1303	
Flt Permitted		0.84			0.81			0.85			0.94	
Satd. Flow (perm)		2407			2275			1114			1229	
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)	61	799	48	64	670	52	59	41	64	27	67	66
RTOR Reduction (vph)	0	4	0	0	5	0	0	27	0	0	29	0
Lane Group Flow (vph)	0	904	0	0	781	0	0	137	0	0	131	0
Confl. Peds. (#/hr)	50		50	50		50	50		50	50		50
Confl. Bikes (#/hr)			10			10			10			10
Bus Blockages (#/hr)	0	0	0	0	6	6	0	0	0	0	0	0
Parking (#/hr)		2	2		0	0	0	2	2	0	2	2
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		59.7			59.7			22.3			22.3	
Effective Green, g (s)		59.7			59.7			22.3			22.3	
Actuated g/C Ratio		0.66			0.66			0.25			0.25	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1597			1509			276			305	
v/s Ratio Prot												
v/s Ratio Perm		c0.38			0.34			c0.12			0.11	
v/c Ratio		0.57			0.52			0.50			0.43	
Uniform Delay, d1		8.2			7.8			29.0			28.5	
Progression Factor		0.33			1.00			1.00			1.00	
Incremental Delay, d2		0.7			1.3			1.4			1.0	
Delay (s)		3.4			9.0			30.4			29.5	
Level of Service		A			A			C			C	
Approach Delay (s)		3.4			9.0			30.4			29.5	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM Average Control Delay	9.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	82.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	131	616	83	107	533	267	79	547	247	49	664	102
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	3.5		3.5	3.5		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	0.98		1.00	0.95		1.00	0.95		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1711	3360		1711	3250		1711	3262		1711	3353	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1711	3360		1711	3250		1711	3262		1711	3353	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	139	655	88	114	567	284	84	582	263	52	706	109
RTOR Reduction (vph)	0	7	0	0	45	0	0	45	0	0	11	0
Lane Group Flow (vph)	139	736	0	114	806	0	84	800	0	52	804	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	13.2	31.5		12.1	30.4		8.6	30.3		7.0	28.7	
Effective Green, g (s)	13.2	31.5		12.1	30.4		8.6	30.3		7.0	28.7	
Actuated g/C Ratio	0.14	0.33		0.13	0.32		0.09	0.32		0.07	0.30	
Clearance Time (s)	3.5	3.5		3.5	3.5		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	2.0		3.0	2.0		3.0	2.0		3.0	2.0	
Lane Grp Cap (vph)	236	1104		216	1030		153	1031		125	1003	
v/s Ratio Prot	c0.08	0.22		0.07	c0.25		0.05	c0.25		0.03	c0.24	
v/s Ratio Perm												
v/c Ratio	0.59	0.67		0.53	0.78		0.55	0.78		0.42	0.80	
Uniform Delay, d1	38.8	27.7		39.2	29.7		41.8	29.7		42.5	31.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.7	1.2		2.3	3.6		4.0	3.4		2.2	4.4	
Delay (s)	42.5	28.9		41.5	33.4		45.8	33.1		44.7	35.4	
Level of Service	D	C		D	C		D	C		D	D	
Approach Delay (s)		31.0			34.3			34.3			35.9	
Approach LOS		C			C			C			D	

Intersection Summary			
HCM Average Control Delay	33.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	95.9	Sum of lost time (s)	11.0
Intersection Capacity Utilization	72.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	215	334	6	126	895	284	2	96	94	173	74	284
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			4.0	4.0		4.0	4.0
Lane Util. Factor	0.91	0.91			0.95			1.00	1.00		1.00	1.00
Frpb, ped/bikes	1.00	1.00			1.00			1.00	1.00		1.00	0.87
Flpb, ped/bikes	1.00	1.00			1.00			1.00	1.00		1.00	1.00
Frt	1.00	1.00			0.97			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00			1.00			1.00	1.00		0.97	1.00
Satd. Flow (prot)	1557	3245			3294			1799	1531		1740	1338
Flt Permitted	0.95	1.00			1.00			1.00	1.00		0.97	1.00
Satd. Flow (perm)	1557	3245			3294			1799	1531		1740	1338
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	226	352	6	133	942	299	2	101	99	182	78	299
RTOR Reduction (vph)	0	1	0	0	23	0	0	0	90	0	0	256
Lane Group Flow (vph)	190	393	0	0	1351	0	0	103	9	0	260	43
Confl. Peds. (#/hr)			50	50			50					50
Confl. Bikes (#/hr)			10									10
Turn Type	Split			Split			Split		Perm	Split		Perm
Protected Phases	2	2		6	6		8	8		4	4	
Permitted Phases									8			4
Actuated Green, G (s)	18.0	18.0			50.0			10.0	10.0		16.0	16.0
Effective Green, g (s)	18.0	18.0			50.0			10.0	10.0		16.0	16.0
Actuated g/C Ratio	0.16	0.16			0.45			0.09	0.09		0.15	0.15
Clearance Time (s)	4.0	4.0			4.0			4.0	4.0		4.0	4.0
Lane Grp Cap (vph)	255	531			1497			164	139		253	195
v/s Ratio Prot	c0.12	0.12			c0.41			c0.06			c0.15	
v/s Ratio Perm									0.01			0.03
v/c Ratio	0.75	0.74			0.90			0.63	0.06		1.03	0.22
Uniform Delay, d1	43.8	43.8			27.7			48.2	45.7		47.0	41.5
Progression Factor	1.00	1.00			1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2	17.9	9.0			9.2			16.8	0.9		63.9	2.6
Delay (s)	61.7	52.8			36.9			65.0	46.6		110.9	44.1
Level of Service	E	D			D			E	D		F	D
Approach Delay (s)		55.7			36.9			56.0			75.2	
Approach LOS		E			D			E			E	

Intersection Summary			
HCM Average Control Delay	50.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	86.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	33	623	359	174	944	78	0	0	0	29	0	75
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	37	692	399	193	1049	87	0	0	0	32	0	83
Pedestrians								50			50	
Lane Width (ft)								0.0			11.0	
Walking Speed (ft/s)								4.0			4.0	
Percent Blockage								0			4	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		364										
pX, platoon unblocked												
vC, conflicting volume	1186			1141			2534	2587	596	1948	2743	1142
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1186			1141			2534	2587	596	1948	2743	1142
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	93			68			100	100	100	0	100	55
cM capacity (veh/h)	562			608			5	15	447	26	12	187

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1
Volume Total	37	461	630	193	1136	116
Volume Left	37	0	0	193	0	32
Volume Right	0	0	399	0	87	83
cSH	562	1700	1700	608	1700	69
Volume to Capacity	0.07	0.27	0.37	0.32	0.67	1.69
Queue Length 95th (ft)	5	0	0	34	0	254
Control Delay (s)	11.8	0.0	0.0	13.7	0.0	464.4
Lane LOS	B			B		F
Approach Delay (s)	0.4			2.0		464.4
Approach LOS						F

Intersection Summary			
Average Delay	22.1		
Intersection Capacity Utilization	74.3%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	90	32	0	767	29	140	89	3	357	497	1035
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		11.0	11.0		11.0		6.0	5.0		4.0	5.0	5.0
Lane Util. Factor		1.00	1.00		0.91		0.97	1.00		1.00	0.91	0.91
Frpb, ped/bikes		1.00	0.99		1.00		1.00	1.00		1.00	0.98	0.97
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	1.00
Frt		1.00	0.85		0.99		1.00	1.00		1.00	0.92	0.85
Flt Protected		1.00	1.00		1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1801	1509		4874		3319	1791		1711	2981	1352
Flt Permitted		1.00	1.00		1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)		1801	1509		4874		3319	1791		1711	2981	1352
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	0	96	34	0	816	31	149	95	3	380	529	1101
RTOR Reduction (vph)	0	0	28	0	4	0	0	2	0	0	0	0
Lane Group Flow (vph)	0	96	6	0	843	0	149	96	0	380	1080	550
Confl. Peds. (#/hr)			2	2		57						22
Confl. Bikes (#/hr)						4			1			2
Turn Type			custom				Prot			Prot		custom
Protected Phases					8		5	2		1	6	
Permitted Phases		4	4									15
Actuated Green, G (s)		17.0	17.0		17.0		7.0	21.0		32.0	44.0	57.0
Effective Green, g (s)		17.0	17.0		17.0		7.0	21.0		32.0	44.0	57.0
Actuated g/C Ratio		0.19	0.19		0.19		0.08	0.23		0.36	0.49	0.63
Clearance Time (s)		11.0	11.0		11.0		6.0	5.0		4.0	5.0	5.0
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		340	285		921		258	418		608	1457	856
v/s Ratio Prot					c0.17		0.04	0.05		0.22	c0.36	
v/s Ratio Perm		0.05	0.00									c0.41
v/c Ratio		0.28	0.02		0.92		0.58	0.23		0.62	0.74	0.64
Uniform Delay, d1		31.3	29.7		35.8		40.1	28.0		24.0	18.4	10.2
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		2.1	0.1		15.1		9.1	1.3		4.8	3.4	3.7
Delay (s)		33.3	29.9		50.9		49.2	29.2		28.8	21.9	13.9
Level of Service		C	C		D		D	C		C	C	B
Approach Delay (s)		32.4			50.9			41.3			21.0	
Approach LOS		C			D			D			C	

Intersection Summary			
HCM Average Control Delay	30.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	88.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	EBR2	WBL	WBR2	NBT	NBR	NBR2	SBT	NWR2
Lane Configurations											
Volume (vph)	268	589	3	11	256	164	222	303	12	485	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	5.0		5.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	0.95		1.00	0.97	1.00	0.91	1.00	1.00	0.91	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.98	1.00	1.00	1.00	1.00	0.93
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00		0.85	1.00	0.85	1.00	0.85	0.85	1.00	0.86
Flt Protected	0.95	1.00		1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (prot)	1711	3419		1531	3305	1496	4916	1531	1531	4916	1452
Flt Permitted	0.95	1.00		1.00	0.42	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (perm)	1711	3419		1531	1473	1496	4916	1531	1531	4916	1452
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	273	601	3	11	261	167	227	309	12	495	40
RTOR Reduction (vph)	0	0	0	7	0	115	0	0	0	0	0
Lane Group Flow (vph)	273	604	0	4	261	52	227	309	12	495	40
Confl. Peds. (#/hr)					10						17
Confl. Bikes (#/hr)						2					
Turn Type	custom			Perm	custom	custom		Perm	Perm		custom
Protected Phases		2!					4!				
Permitted Phases	7!			2	3	6		4	4	4!	6!
Actuated Green, G (s)	43.0	26.0		26.0	14.0	25.0	23.0	23.0	23.0	23.0	25.0
Effective Green, g (s)	43.0	26.0		26.0	14.0	25.0	23.0	23.0	23.0	23.0	25.0
Actuated g/C Ratio	0.54	0.32		0.32	0.18	0.31	0.29	0.29	0.29	0.29	0.31
Clearance Time (s)	6.0	5.0		5.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Grp Cap (vph)	920	1111		498	258	468	1413	440	440	1413	454
v/s Ratio Prot		c0.18					0.05				
v/s Ratio Perm	0.16			0.00	c0.18	0.03		c0.20	0.01	0.10	0.03
v/c Ratio	0.30	0.54		0.01	1.01	0.11	0.16	0.70	0.03	0.35	0.09
Uniform Delay, d1	10.2	22.1		18.3	33.0	19.6	21.3	25.4	20.5	22.6	19.4
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.8	1.9		0.0	59.0	0.5	0.2	9.0	0.1	0.7	0.4
Delay (s)	11.0	24.0		18.3	92.0	20.1	21.5	34.5	20.6	23.3	19.8
Level of Service	B	C		B	F	C	C	C	C	C	B
Approach Delay (s)		20.0					28.8			23.3	
Approach LOS		B					C			C	

Intersection Summary			
HCM Average Control Delay	30.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	83.3%	ICU Level of Service	E
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	50	80	119	49	55	296
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	53	85	127	52	59	315
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			373			584
pX, platoon unblocked						
vC, conflicting volume	585	153			179	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	585	153			179	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	88	90			96	
cM capacity (veh/h)	454	893			1397	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	138	179	39	334
Volume Left	53	0	39	20
Volume Right	85	52	0	0
cSH	651	1700	1397	1397
Volume to Capacity	0.21	0.11	0.04	0.04
Queue Length 95th (ft)	20	0	3	3
Control Delay (s)	12.0	0.0	7.7	0.8
Lane LOS	B		A	A
Approach Delay (s)	12.0	0.0	1.5	
Approach LOS	B			

Intersection Summary			
Average Delay	3.2		
Intersection Capacity Utilization	42.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
1: Ocean & Geneva Ave

1/23/2014

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	488	0	0	392	1040	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	5%			5%	0%	
Total Lost time (s)	4.0			4.0	4.0	
Lane Util. Factor	0.95			0.95	0.97	
Frpb, ped/bikes	1.00			1.00	1.00	
Flpb, ped/bikes	1.00			1.00	1.00	
Frt	1.00			1.00	1.00	
Flt Protected	1.00			1.00	0.95	
Satd. Flow (prot)	3336			3336	3324	
Flt Permitted	1.00			1.00	0.95	
Satd. Flow (perm)	3336			3336	3324	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	519	0	0	417	1106	4
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	519	0	0	417	1110	0
Confl. Peds. (#/hr)			100		100	100
Turn Type						
Protected Phases	13			1	8	
Permitted Phases						
Actuated Green, G (s)	47.0			47.0	25.0	
Effective Green, g (s)	47.0			47.0	25.0	
Actuated g/C Ratio	0.59			0.59	0.31	
Clearance Time (s)	4.0			4.0	4.0	
Vehicle Extension (s)	3.0			3.0	3.0	
Lane Grp Cap (vph)	1960			1960	1039	
v/s Ratio Prot	c0.16			0.13	c0.33	
v/s Ratio Perm						
v/c Ratio	0.26			0.21	1.07	
Uniform Delay, d1	8.1			7.8	27.5	
Progression Factor	0.57			0.88	1.00	
Incremental Delay, d2	0.2			0.2	48.1	
Delay (s)	4.8			7.1	75.6	
Level of Service	A			A	E	
Approach Delay (s)	4.8			7.1	75.6	
Approach LOS	A			A	E	

Intersection Summary			
HCM Average Control Delay	43.7	HCM Level of Service	D
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	72.3%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	107	413	816	0	1165	469	0	0	0	75	381	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		5%			0%			0%			0%	
Total Lost time (s)	3.5	4.0			4.0						4.0	
Lane Util. Factor	1.00	0.95			0.91						0.95	
Frt	1.00	0.90			0.96						0.97	
Flt Protected	0.95	1.00			1.00						0.99	
Satd. Flow (prot)	1668	3003			4704						3300	
Flt Permitted	0.95	1.00			1.00						0.99	
Satd. Flow (perm)	1668	3003			4704						3300	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	114	439	868	0	1239	499	0	0	0	80	405	117
RTOR Reduction (vph)	0	83	0	0	86	0	0	0	0	0	26	0
Lane Group Flow (vph)	114	1225	0	0	1652	0	0	0	0	0	576	0
Turn Type	Prot									Perm		
Protected Phases	5	2			6						4	
Permitted Phases										4		
Actuated Green, G (s)	9.6	47.0			33.9						25.0	
Effective Green, g (s)	9.6	47.0			33.9						25.0	
Actuated g/C Ratio	0.12	0.59			0.42						0.31	
Clearance Time (s)	3.5	4.0			4.0						4.0	
Vehicle Extension (s)	3.0	3.0			3.0						3.0	
Lane Grp Cap (vph)	200	1764			1993						1031	
v/s Ratio Prot	0.07	c0.41			c0.35							
v/s Ratio Perm											0.17	
v/c Ratio	0.57	0.91dr			0.83						0.56	
Uniform Delay, d1	33.3	11.5			20.5						22.9	
Progression Factor	1.00	1.00			1.49						1.00	
Incremental Delay, d2	3.7	2.3			2.8						0.7	
Delay (s)	36.9	13.8			33.4						23.6	
Level of Service	D	B			C						C	
Approach Delay (s)		15.6			33.4			0.0			23.6	
Approach LOS		B			C			A			C	

Intersection Summary			
HCM Average Control Delay	25.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	75.5%	ICU Level of Service	D
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	263	0	0	398	26	48	68	61	50	0	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0			4.0			4.0	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frt		1.00			0.99			0.95			0.98	
Flt Protected		1.00			1.00			0.99			0.96	
Satd. Flow (prot)		3421			3389			1694			1689	
Flt Permitted		1.00			1.00			0.91			0.72	
Satd. Flow (perm)		3421			3389			1568			1273	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	0	280	0	0	423	28	51	72	65	53	0	11
RTOR Reduction (vph)	0	0	0	0	6	0	0	24	0	0	7	0
Lane Group Flow (vph)	0	280	0	0	445	0	0	164	0	0	57	0
Turn Type							Perm			Perm		
Protected Phases		6			6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)		45.0			45.0			26.0			26.0	
Effective Green, g (s)		45.0			45.0			26.0			26.0	
Actuated g/C Ratio		0.56			0.56			0.32			0.32	
Clearance Time (s)		5.0			5.0			4.0			4.0	
Lane Grp Cap (vph)		1924			1906			510			414	
v/s Ratio Prot		0.08			c0.13							
v/s Ratio Perm								c0.10			0.04	
v/c Ratio		0.15			0.23			0.32			0.14	
Uniform Delay, d1		8.3			8.8			20.4			19.1	
Progression Factor		0.13			1.00			1.00			1.00	
Incremental Delay, d2		0.2			0.3			1.7			0.7	
Delay (s)		1.2			9.1			22.0			19.8	
Level of Service		A			A			C			B	
Approach Delay (s)		1.2			9.1			22.0			19.8	
Approach LOS		A			A			C			B	

Intersection Summary			
HCM Average Control Delay	10.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.27		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	66.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	416	7	9	417	7	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		3.0	5.0	3.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	1.00		1.00	1.00	1.00	
Flt Protected	1.00		0.95	1.00	0.95	
Satd. Flow (prot)	1769		872	1801	872	
Flt Permitted	1.00		0.95	1.00	0.95	
Satd. Flow (perm)	1769		872	1801	872	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	429	7	9	430	7	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	436	0	9	430	7	0
Heavy Vehicles (%)	2%	100%	100%	2%	100%	100%
Turn Type			Prot			
Protected Phases	2		1	6		
Permitted Phases					14	
Actuated Green, G (s)	74.2		2.4	79.6	2.4	
Effective Green, g (s)	74.2		2.4	79.6	2.4	
Actuated g/C Ratio	0.82		0.03	0.88	0.03	
Clearance Time (s)	5.0		3.0	5.0	3.0	
Vehicle Extension (s)	0.2		0.2	0.2	0.2	
Lane Grp Cap (vph)	1458		23	1593	23	
v/s Ratio Prot	c0.25		c0.01	0.24		
v/s Ratio Perm					c0.01	
v/c Ratio	0.30		0.39	0.27	0.30	
Uniform Delay, d1	1.8		43.1	0.8	43.0	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	0.5		4.0	0.4	2.7	
Delay (s)	2.4		47.0	1.2	45.7	
Level of Service	A		D	A	D	
Approach Delay (s)	2.4			2.1	45.7	
Approach LOS	A			A	D	

Intersection Summary			
HCM Average Control Delay	2.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	60.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	33	348	40	205	323	77	0	255	86	52	297	75
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			5.0			5.0	
Lane Util. Factor		1.00	1.00	1.00	1.00			1.00			1.00	
Frpb, ped/bikes		1.00	0.78	1.00	0.96			0.97			0.98	
Flpb, ped/bikes		0.99	1.00	0.91	1.00			1.00			0.99	
Frt		1.00	0.85	1.00	0.97			0.97			0.98	
Flt Protected		1.00	1.00	0.95	1.00			1.00			0.99	
Satd. Flow (prot)		1780	1195	1556	1675			1683			1694	
Flt Permitted		0.94	1.00	0.39	1.00			1.00			0.92	
Satd. Flow (perm)		1688	1195	635	1675			1683			1565	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	35	370	43	218	344	82	0	271	91	55	316	80
RTOR Reduction (vph)	0	0	15	0	13	0	0	19	0	0	12	0
Lane Group Flow (vph)	0	405	28	218	413	0	0	343	0	0	439	0
Confl. Peds. (#/hr)	100		100	100		100	100		100	100		100
Turn Type	Perm		Perm	Perm						Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8						6		
Actuated Green, G (s)		27.0	27.0	27.0	27.0			29.0			29.0	
Effective Green, g (s)		27.0	27.0	27.0	27.0			29.0			29.0	
Actuated g/C Ratio		0.42	0.42	0.42	0.42			0.45			0.45	
Clearance Time (s)		4.0	4.0	4.0	4.0			5.0			5.0	
Lane Grp Cap (vph)		701	496	264	696			751			698	
v/s Ratio Prot					0.25			0.20				
v/s Ratio Perm		0.24	0.02	c0.34							c0.28	
v/c Ratio		0.58	0.06	0.83	0.59			0.46			0.63	
Uniform Delay, d1		14.6	11.4	16.9	14.7			12.5			13.9	
Progression Factor		1.00	1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2		3.5	0.2	24.6	3.7			2.0			4.3	
Delay (s)		18.1	11.6	41.5	18.4			14.5			18.1	
Level of Service		B	B	D	B			B			B	
Approach Delay (s)		17.4			26.2			14.5			18.1	
Approach LOS		B			C			B			B	

Intersection Summary			
HCM Average Control Delay	20.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	65.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	108.7%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	134	226	42	51	225	75	46	555	52	241	801	215
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95	1.00		0.95	1.00
Frpb, ped/bikes	1.00	0.98		1.00	0.97			1.00	0.88		1.00	0.88
Flpb, ped/bikes	0.95	1.00		0.95	1.00			1.00	1.00		0.99	1.00
Frt	1.00	0.98		1.00	0.96			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00		0.99	1.00
Satd. Flow (prot)	1625	1729		1618	1687			3404	1175		3353	1351
Flt Permitted	0.43	1.00		0.48	1.00			0.79	1.00		0.65	1.00
Satd. Flow (perm)	739	1729		813	1687			2715	1175		2217	1351
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	143	240	45	54	239	80	49	590	55	256	852	229
RTOR Reduction (vph)	0	9	0	0	15	0	0	0	22	0	0	92
Lane Group Flow (vph)	143	276	0	54	304	0	0	639	33	0	1108	137
Confl. Peds. (#/hr)	100		100	100		100	100		100	100		100
Confl. Bikes (#/hr)			10			10			10			10
Parking (#/hr)									6			
Turn Type	Perm			Perm			Perm		Perm	Perm		Perm
Protected Phases		2			2			6			6	
Permitted Phases	2			2			6		6	6		6
Actuated Green, G (s)	27.0	27.0		27.0	27.0			43.0	43.0		43.0	43.0
Effective Green, g (s)	27.0	27.0		27.0	27.0			43.0	43.0		43.0	43.0
Actuated g/C Ratio	0.34	0.34		0.34	0.34			0.54	0.54		0.54	0.54
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0	5.0		5.0	5.0
Lane Grp Cap (vph)	249	584		274	569			1459	632		1192	726
v/s Ratio Prot		0.16			0.18							
v/s Ratio Perm	c0.19			0.07				0.24	0.03		c0.50	0.10
v/c Ratio	0.57	0.47		0.20	0.53			0.44	0.05		0.93	0.19
Uniform Delay, d1	21.8	20.9		18.8	21.4			11.2	8.8		17.1	9.5
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2	9.3	2.7		1.6	3.6			1.0	0.2		13.9	0.6
Delay (s)	31.1	23.6		20.4	25.0			12.1	9.0		31.0	10.1
Level of Service	C	C		C	C			B	A		C	B
Approach Delay (s)		26.1			24.3			11.9			27.4	
Approach LOS		C			C			B			C	

Intersection Summary			
HCM Average Control Delay	23.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	133.3%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	23	1031	38	361	1271	154	0	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		5%			5%			0%			0%	
Total Lost time (s)		4.0		4.0	4.0							
Lane Util. Factor		0.95		1.00	0.95							
Frpb, ped/bikes		0.99		1.00	0.97							
Flpb, ped/bikes		1.00		0.96	1.00							
Frt		0.99		1.00	0.98							
Flt Protected		1.00		0.95	1.00							
Satd. Flow (prot)		3281		1603	3175							
Flt Permitted		0.90		0.21	1.00							
Satd. Flow (perm)		2940		348	3175							
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	24	1097	40	384	1352	164	0	0	0	0	0	0
RTOR Reduction (vph)	0	2	0	0	9	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1159	0	384	1507	0	0	0	0	0	0	0
Confl. Peds. (#/hr)	100		100	100		100						
Confl. Bikes (#/hr)			10			10						
Turn Type	Perm			Perm								
Protected Phases		4			8							
Permitted Phases	4			8								
Actuated Green, G (s)		63.2		63.2	63.2							
Effective Green, g (s)		63.2		63.2	63.2							
Actuated g/C Ratio		0.70		0.70	0.70							
Clearance Time (s)		4.0		4.0	4.0							
Vehicle Extension (s)		3.0		3.0	3.0							
Lane Grp Cap (vph)		2065		244	2230							
v/s Ratio Prot					0.47							
v/s Ratio Perm		0.39		c1.10								
v/c Ratio		0.56		1.57	0.68							
Uniform Delay, d1		6.6		13.4	7.6							
Progression Factor		1.00		0.62	0.50							
Incremental Delay, d2		0.4		270.5	0.5							
Delay (s)		6.9		278.8	4.3							
Level of Service		A		F	A							
Approach Delay (s)		6.9			59.8			0.0			0.0	
Approach LOS		A			E			A			A	

Intersection Summary			
HCM Average Control Delay	39.8	HCM Level of Service	D
HCM Volume to Capacity ratio	1.57		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	26.8
Intersection Capacity Utilization	77.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	833	180	476	828	0	0	0	0	487	1	672
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	11	11	11	11	11	11	12	12	12
Total Lost time (s)		3.5	3.5	3.0	3.5					3.5	3.5	
Lane Util. Factor		0.95	1.00	1.00	0.95					0.95	0.95	
Frpb, ped/bikes		1.00	0.69	1.00	1.00					1.00	0.86	
Flpb, ped/bikes		1.00	1.00	1.00	1.00					1.00	1.00	
Frt		1.00	0.85	1.00	1.00					1.00	0.86	
Flt Protected		1.00	1.00	0.95	1.00					0.95	1.00	
Satd. Flow (prot)		2887	831	1540	3079					1513	1173	
Flt Permitted		1.00	1.00	0.95	1.00					0.95	1.00	
Satd. Flow (perm)		2887	831	1540	3079					1513	1173	
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)	0	868	188	496	862	0	0	0	0	507	1	700
RTOR Reduction (vph)	0	0	66	0	0	0	0	0	0	0	76	0
Lane Group Flow (vph)	0	868	122	496	862	0	0	0	0	456	676	0
Confl. Peds. (#/hr)			100	100								100
Confl. Bikes (#/hr)			30			30						
Parking (#/hr)		5	5									
Turn Type			Perm	Prot						Perm		
Protected Phases		2		1	6						4	
Permitted Phases			2							4		
Actuated Green, G (s)		23.5	23.5	21.0	47.5					35.5	35.5	
Effective Green, g (s)		23.5	23.5	21.0	47.5					35.5	35.5	
Actuated g/C Ratio		0.26	0.26	0.23	0.53					0.39	0.39	
Clearance Time (s)		3.5	3.5	3.0	3.5					3.5	3.5	
Vehicle Extension (s)		4.0	4.0	3.0	4.0					4.0	4.0	
Lane Grp Cap (vph)		754	217	359	1625					597	463	
v/s Ratio Prot		c0.30		c0.32	0.28							
v/s Ratio Perm			0.15							0.30	0.58	
v/c Ratio		1.15	0.56	1.38	0.53					0.76	1.46	
Uniform Delay, d1		33.2	28.8	34.5	13.9					23.6	27.2	
Progression Factor		0.75	0.70	0.98	1.50					1.00	1.00	
Incremental Delay, d2		80.9	8.6	184.0	0.9					6.1	218.4	
Delay (s)		106.0	28.9	217.9	21.9					29.7	245.7	
Level of Service		F	C	F	C					C	F	
Approach Delay (s)		92.3			93.5			0.0			164.2	
Approach LOS		F			F			A			F	

Intersection Summary			
HCM Average Control Delay	116.7	HCM Level of Service	F
HCM Volume to Capacity ratio	1.35		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	106.3%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	605	730	0	0	824	309	468	5	616	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	11	11	11	12	12	12	11	11	11
Total Lost time (s)		3.5			3.5			3.5	3.5			
Lane Util. Factor		0.95			0.91			1.00	1.00			
Frpb, ped/bikes		1.00			0.93			1.00	0.86			
Flpb, ped/bikes		0.98			1.00			1.00	1.00			
Frt		1.00			0.96			1.00	0.85			
Flt Protected		0.98			1.00			0.95	1.00			
Satd. Flow (prot)		2955			3931			1597	1219			
Flt Permitted		0.51			1.00			0.95	1.00			
Satd. Flow (perm)		1542			3931			1597	1219			
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)	624	753	0	0	849	319	482	5	635	0	0	0
RTOR Reduction (vph)	0	0	0	0	59	0	0	0	195	0	0	0
Lane Group Flow (vph)	0	1377	0	0	1109	0	0	487	440	0	0	0
Confl. Peds. (#/hr)	100					100			100			
Confl. Bikes (#/hr)			10			10						
Turn Type	Prot						Perm		Perm			
Protected Phases	5	2			6			8				
Permitted Phases							8		8			
Actuated Green, G (s)		58.5			58.5			24.5	24.5			
Effective Green, g (s)		58.5			58.5			24.5	24.5			
Actuated g/C Ratio		0.65			0.65			0.27	0.27			
Clearance Time (s)		3.5			3.5			3.5	3.5			
Vehicle Extension (s)		5.0			5.0			5.0	5.0			
Lane Grp Cap (vph)		1002			2555			435	332			
v/s Ratio Prot					0.28							
v/s Ratio Perm		c0.89						0.30	c0.36			
v/c Ratio		1.37			0.43			1.12	1.33			
Uniform Delay, d1		15.8			7.7			32.8	32.8			
Progression Factor		2.20			0.44			1.00	1.00			
Incremental Delay, d2		169.0			0.3			79.9	165.8			
Delay (s)		203.7			3.6			112.6	198.6			
Level of Service		F			A			F	F			
Approach Delay (s)		203.7			3.6			161.3			0.0	
Approach LOS		F			A			F			A	

Intersection Summary			
HCM Average Control Delay	127.0	HCM Level of Service	F
HCM Volume to Capacity ratio	1.36		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	7.0
Intersection Capacity Utilization	108.0%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR2	NBL2	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	186	962	159	23	649	37	145	86	29	33	130	323
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.5		5.5	5.5	
Lane Util. Factor	1.00	0.95		1.00	0.95			0.95		1.00	1.00	
Frpb, ped/bikes	1.00	0.95		1.00	0.97			0.96		1.00	0.76	
Flpb, ped/bikes	0.98	1.00		0.95	1.00			1.00		0.76	1.00	
Frt	1.00	0.98		1.00	0.99			0.98		1.00	0.89	
Flt Protected	0.95	1.00		0.95	1.00			0.97		0.95	1.00	
Satd. Flow (prot)	1507	2870		1463	2927			2792		1168	938	
Flt Permitted	0.20	1.00		0.16	1.00			0.55		0.58	1.00	
Satd. Flow (perm)	318	2870		240	2927			1577		716	938	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	198	1023	169	24	690	39	154	91	31	35	138	344
RTOR Reduction (vph)	0	8	0	0	5	0	0	9	0	0	0	0
Lane Group Flow (vph)	198	1184	0	24	724	0	0	267	0	35	482	0
Confl. Peds. (#/hr)	400		400	400		400			400	400		400
Confl. Bikes (#/hr)			30			30			10			10
Bus Blockages (#/hr)	0	0	6	0	6	0	0	6	0	0	6	0
Parking (#/hr)											5	5
Turn Type	pm+pt			Perm			Perm			Perm		
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	41.0	41.0		30.0	30.0			38.5		38.5	38.5	
Effective Green, g (s)	41.0	41.0		30.0	30.0			38.5		38.5	38.5	
Actuated g/C Ratio	0.46	0.46		0.33	0.33			0.43		0.43	0.43	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)	224	1307		80	976			675		306	401	
v/s Ratio Prot	0.06	c0.41			0.25						c0.51	
v/s Ratio Perm	0.34			0.10				0.17		0.05		
v/c Ratio	0.88	0.91		0.30	0.74			0.40		0.11	1.20	
Uniform Delay, d1	20.3	22.7		22.2	26.6			17.7		15.5	25.8	
Progression Factor	1.08	1.08		0.62	0.60			1.00		1.00	1.00	
Incremental Delay, d2	4.1	1.2		7.9	4.3			0.4		0.2	112.5	
Delay (s)	26.1	25.6		21.6	20.2			18.1		15.7	138.2	
Level of Service	C	C		C	C			B		B	F	
Approach Delay (s)		25.7			20.2			18.1			129.9	
Approach LOS		C			C			B			F	

Intersection Summary			
HCM Average Control Delay	41.9	HCM Level of Service	D
HCM Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.5
Intersection Capacity Utilization	138.6%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	SER
Lane Configurations	
Volume (vph)	0
Ideal Flow (vphpl)	1900
Total Lost time (s)	
Lane Util. Factor	
Frpb, ped/bikes	
Flpb, ped/bikes	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Peak-hour factor, PHF	0.94
Adj. Flow (vph)	0
RTOR Reduction (vph)	0
Lane Group Flow (vph)	0
Confl. Peds. (#/hr)	400
Confl. Bikes (#/hr)	
Bus Blockages (#/hr)	0
Parking (#/hr)	
Turn Type	custom
Protected Phases	
Permitted Phases	13
Actuated Green, G (s)	
Effective Green, g (s)	
Actuated g/C Ratio	
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	
v/s Ratio Prot	
v/s Ratio Perm	
v/c Ratio	
Uniform Delay, d1	
Progression Factor	
Incremental Delay, d2	
Delay (s)	
Level of Service	
Approach Delay (s)	
Approach LOS	

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	59	767	46	61	643	50	57	39	61	26	64	63
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	
Lane Util. Factor		0.95			0.95			1.00			1.00	
Frpb, ped/bikes		0.99			0.99			0.96			0.96	
Flpb, ped/bikes		1.00			1.00			0.98			0.99	
Frt		0.99			0.99			0.95			0.94	
Flt Protected		1.00			1.00			0.98			0.99	
Satd. Flow (prot)		2846			2813			1263			1283	
Flt Permitted		0.84			0.78			0.86			0.94	
Satd. Flow (perm)		2402			2194			1102			1219	
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)	61	799	48	64	670	52	59	41	64	27	67	66
RTOR Reduction (vph)	0	6	0	0	7	0	0	22	0	0	24	0
Lane Group Flow (vph)	0	902	0	0	779	0	0	142	0	0	136	0
Confl. Peds. (#/hr)	50		50	50		50	50		50	50		50
Confl. Bikes (#/hr)			10			10			10			10
Bus Blockages (#/hr)	0	0	0	0	6	6	0	0	0	0	0	0
Parking (#/hr)		2	2		0	0	0	2	2	0	2	2
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		44.6			44.6			37.4			37.4	
Effective Green, g (s)		44.6			44.6			37.4			37.4	
Actuated g/C Ratio		0.50			0.50			0.42			0.42	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1190			1087			458			507	
v/s Ratio Prot												
v/s Ratio Perm		c0.38			0.36			c0.13			0.11	
v/c Ratio		0.76			0.72			0.31			0.27	
Uniform Delay, d1		18.3			17.8			17.7			17.3	
Progression Factor		1.99			1.00			1.00			1.00	
Incremental Delay, d2		1.3			2.3			1.8			1.3	
Delay (s)		37.9			20.0			19.4			18.6	
Level of Service		D			C			B			B	
Approach Delay (s)		37.9			20.0			19.4			18.6	
Approach LOS		D			C			B			B	

Intersection Summary			
HCM Average Control Delay	27.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	81.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	131	616	83	107	533	267	79	547	247	49	664	102
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	3.5		3.5	3.5		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	0.98		1.00	0.95		1.00	0.95		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1711	3360		1711	3250		1711	3262		1711	3353	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1711	3360		1711	3250		1711	3262		1711	3353	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	139	655	88	114	567	284	84	582	263	52	706	109
RTOR Reduction (vph)	0	7	0	0	45	0	0	45	0	0	11	0
Lane Group Flow (vph)	139	736	0	114	806	0	84	800	0	52	804	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	13.2	31.5		12.1	30.4		8.6	30.3		7.0	28.7	
Effective Green, g (s)	13.2	31.5		12.1	30.4		8.6	30.3		7.0	28.7	
Actuated g/C Ratio	0.14	0.33		0.13	0.32		0.09	0.32		0.07	0.30	
Clearance Time (s)	3.5	3.5		3.5	3.5		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	2.0		3.0	2.0		3.0	2.0		3.0	2.0	
Lane Grp Cap (vph)	236	1104		216	1030		153	1031		125	1003	
v/s Ratio Prot	c0.08	0.22		0.07	c0.25		0.05	c0.25		0.03	c0.24	
v/s Ratio Perm												
v/c Ratio	0.59	0.67		0.53	0.78		0.55	0.78		0.42	0.80	
Uniform Delay, d1	38.8	27.7		39.2	29.7		41.8	29.7		42.5	31.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.7	1.2		2.3	3.6		4.0	3.4		2.2	4.4	
Delay (s)	42.5	28.9		41.5	33.4		45.8	33.1		44.7	35.4	
Level of Service	D	C		D	C		D	C		D	D	
Approach Delay (s)		31.0			34.3			34.3			35.9	
Approach LOS		C			C			C			D	

Intersection Summary			
HCM Average Control Delay	33.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	95.9	Sum of lost time (s)	11.0
Intersection Capacity Utilization	72.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	215	334	6	158	895	284	2	96	146	173	74	284
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			4.0	4.0		4.0	4.0
Lane Util. Factor	0.91	0.91			0.95			1.00	1.00		1.00	1.00
Frpb, ped/bikes	1.00	1.00			1.00			1.00	1.00		1.00	0.87
Flpb, ped/bikes	1.00	1.00			1.00			1.00	1.00		1.00	1.00
Frt	1.00	1.00			0.97			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00			0.99			1.00	1.00		0.97	1.00
Satd. Flow (prot)	1557	3245			3293			1799	1531		1740	1338
Flt Permitted	0.95	1.00			0.99			1.00	1.00		0.97	1.00
Satd. Flow (perm)	1557	3245			3293			1799	1531		1740	1338
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	226	352	6	166	942	299	2	101	154	182	78	299
RTOR Reduction (vph)	0	1	0	0	22	0	0	0	140	0	0	256
Lane Group Flow (vph)	190	393	0	0	1385	0	0	103	14	0	260	43
Confl. Peds. (#/hr)			50	50			50					50
Confl. Bikes (#/hr)			10									10
Turn Type	Split			Split			Split		Perm	Split		Perm
Protected Phases	2	2		6	6		8	8		4	4	
Permitted Phases									8			4
Actuated Green, G (s)	18.0	18.0			50.0			10.0	10.0		16.0	16.0
Effective Green, g (s)	18.0	18.0			50.0			10.0	10.0		16.0	16.0
Actuated g/C Ratio	0.16	0.16			0.45			0.09	0.09		0.15	0.15
Clearance Time (s)	4.0	4.0			4.0			4.0	4.0		4.0	4.0
Lane Grp Cap (vph)	255	531			1497			164	139		253	195
v/s Ratio Prot	c0.12	0.12			c0.42			c0.06			c0.15	
v/s Ratio Perm									0.01			0.03
v/c Ratio	0.75	0.74			0.92			0.63	0.10		1.03	0.22
Uniform Delay, d1	43.8	43.8			28.2			48.2	45.9		47.0	41.5
Progression Factor	1.00	1.00			1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2	17.9	9.0			11.1			16.8	1.4		63.9	2.6
Delay (s)	61.7	52.8			39.4			65.0	47.3		110.9	44.1
Level of Service	E	D			D			E	D		F	D
Approach Delay (s)		55.7			39.4			54.4			75.2	
Approach LOS		E			D			D			E	

Intersection Summary			
HCM Average Control Delay	51.3	HCM Level of Service	D
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	86.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	33	623	359	174	944	78	0	0	0	29	0	75
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	37	692	399	193	1049	87	0	0	0	32	0	83
Pedestrians								50			50	
Lane Width (ft)								0.0			11.0	
Walking Speed (ft/s)								4.0			4.0	
Percent Blockage								0			4	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		364										
pX, platoon unblocked												
vC, conflicting volume	1186			1141			2534	2587	596	1948	2743	1142
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1186			1141			2534	2587	596	1948	2743	1142
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	93			68			100	100	100	0	100	55
cM capacity (veh/h)	562			608			5	15	447	26	12	187

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1
Volume Total	37	461	630	193	1136	116
Volume Left	37	0	0	193	0	32
Volume Right	0	0	399	0	87	83
cSH	562	1700	1700	608	1700	69
Volume to Capacity	0.07	0.27	0.37	0.32	0.67	1.69
Queue Length 95th (ft)	5	0	0	34	0	254
Control Delay (s)	11.8	0.0	0.0	13.7	0.0	464.4
Lane LOS	B			B		F
Approach Delay (s)	0.4			2.0		464.4
Approach LOS						F

Intersection Summary			
Average Delay	22.1		
Intersection Capacity Utilization	74.3%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	90	32	0	767	29	140	89	3	357	497	1035
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		11.0	11.0		11.0		6.0	5.0		4.0	5.0	5.0
Lane Util. Factor		1.00	1.00		0.91		0.97	1.00		1.00	0.91	0.91
Frpb, ped/bikes		1.00	0.99		1.00		1.00	1.00		1.00	0.98	0.97
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	1.00
Frt		1.00	0.85		0.99		1.00	1.00		1.00	0.92	0.85
Flt Protected		1.00	1.00		1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1801	1509		4874		3319	1791		1711	2981	1352
Flt Permitted		1.00	1.00		1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)		1801	1509		4874		3319	1791		1711	2981	1352
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	0	96	34	0	816	31	149	95	3	380	529	1101
RTOR Reduction (vph)	0	0	28	0	4	0	0	2	0	0	0	0
Lane Group Flow (vph)	0	96	6	0	843	0	149	96	0	380	1080	550
Confl. Peds. (#/hr)			2	2		57						22
Confl. Bikes (#/hr)						4			1			2
Turn Type			custom				Prot			Prot		custom
Protected Phases					8		5	2		1	6	
Permitted Phases		4	4									15
Actuated Green, G (s)		17.0	17.0		17.0		7.0	21.0		32.0	44.0	57.0
Effective Green, g (s)		17.0	17.0		17.0		7.0	21.0		32.0	44.0	57.0
Actuated g/C Ratio		0.19	0.19		0.19		0.08	0.23		0.36	0.49	0.63
Clearance Time (s)		11.0	11.0		11.0		6.0	5.0		4.0	5.0	5.0
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		340	285		921		258	418		608	1457	856
v/s Ratio Prot					c0.17		0.04	0.05		0.22	c0.36	
v/s Ratio Perm		0.05	0.00									c0.41
v/c Ratio		0.28	0.02		0.92		0.58	0.23		0.62	0.74	0.64
Uniform Delay, d1		31.3	29.7		35.8		40.1	28.0		24.0	18.4	10.2
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		2.1	0.1		15.1		9.1	1.3		4.8	3.4	3.7
Delay (s)		33.3	29.9		50.9		49.2	29.2		28.8	21.9	13.9
Level of Service		C	C		D		D	C		C	C	B
Approach Delay (s)		32.4			50.9			41.3			21.0	
Approach LOS		C			D			D			C	

Intersection Summary			
HCM Average Control Delay	30.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	88.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	EBR2	WBL	WBR2	NBT	NBR	NBR2	SBT	NWR2
Lane Configurations											
Volume (vph)	268	589	3	11	256	164	222	303	12	485	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	5.0		5.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	0.95		1.00	0.97	1.00	0.91	1.00	1.00	0.91	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.98	1.00	1.00	1.00	1.00	0.93
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00		0.85	1.00	0.85	1.00	0.85	0.85	1.00	0.86
Flt Protected	0.95	1.00		1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (prot)	1711	3419		1531	3305	1496	4916	1531	1531	4916	1452
Flt Permitted	0.95	1.00		1.00	0.42	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (perm)	1711	3419		1531	1473	1496	4916	1531	1531	4916	1452
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	273	601	3	11	261	167	227	309	12	495	40
RTOR Reduction (vph)	0	0	0	7	0	115	0	0	0	0	0
Lane Group Flow (vph)	273	604	0	4	261	52	227	309	12	495	40
Confl. Peds. (#/hr)					10						17
Confl. Bikes (#/hr)						2					
Turn Type	custom			Perm	custom	custom		Perm	Perm		custom
Protected Phases		2!					4!				
Permitted Phases	7!			2	3	6		4	4	4!	6!
Actuated Green, G (s)	43.0	26.0		26.0	14.0	25.0	23.0	23.0	23.0	23.0	25.0
Effective Green, g (s)	43.0	26.0		26.0	14.0	25.0	23.0	23.0	23.0	23.0	25.0
Actuated g/C Ratio	0.54	0.32		0.32	0.18	0.31	0.29	0.29	0.29	0.29	0.31
Clearance Time (s)	6.0	5.0		5.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Grp Cap (vph)	920	1111		498	258	468	1413	440	440	1413	454
v/s Ratio Prot		c0.18					0.05				
v/s Ratio Perm	0.16			0.00	c0.18	0.03		c0.20	0.01	0.10	0.03
v/c Ratio	0.30	0.54		0.01	1.01	0.11	0.16	0.70	0.03	0.35	0.09
Uniform Delay, d1	10.2	22.1		18.3	33.0	19.6	21.3	25.4	20.5	22.6	19.4
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.8	1.9		0.0	59.0	0.5	0.2	9.0	0.1	0.7	0.4
Delay (s)	11.0	24.0		18.3	92.0	20.1	21.5	34.5	20.6	23.3	19.8
Level of Service	B	C		B	F	C	C	C	C	C	B
Approach Delay (s)		20.0					28.8			23.3	
Approach LOS		B					C			C	

Intersection Summary			
HCM Average Control Delay	30.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	83.3%	ICU Level of Service	E
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	76	54	181	64	40	410
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	81	57	193	68	43	436
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			373			584
pX, platoon unblocked	0.98	0.98			0.98	
vC, conflicting volume	748	227			261	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	734	204			238	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	78	93			97	
cM capacity (veh/h)	368	822			1305	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	138	261	28	450
Volume Left	81	0	28	14
Volume Right	57	68	0	0
cSH	477	1700	1305	1305
Volume to Capacity	0.29	0.15	0.03	0.03
Queue Length 95th (ft)	30	0	3	3
Control Delay (s)	15.6	0.0	7.9	0.6
Lane LOS	C		A	A
Approach Delay (s)	15.6	0.0	1.0	
Approach LOS	C			

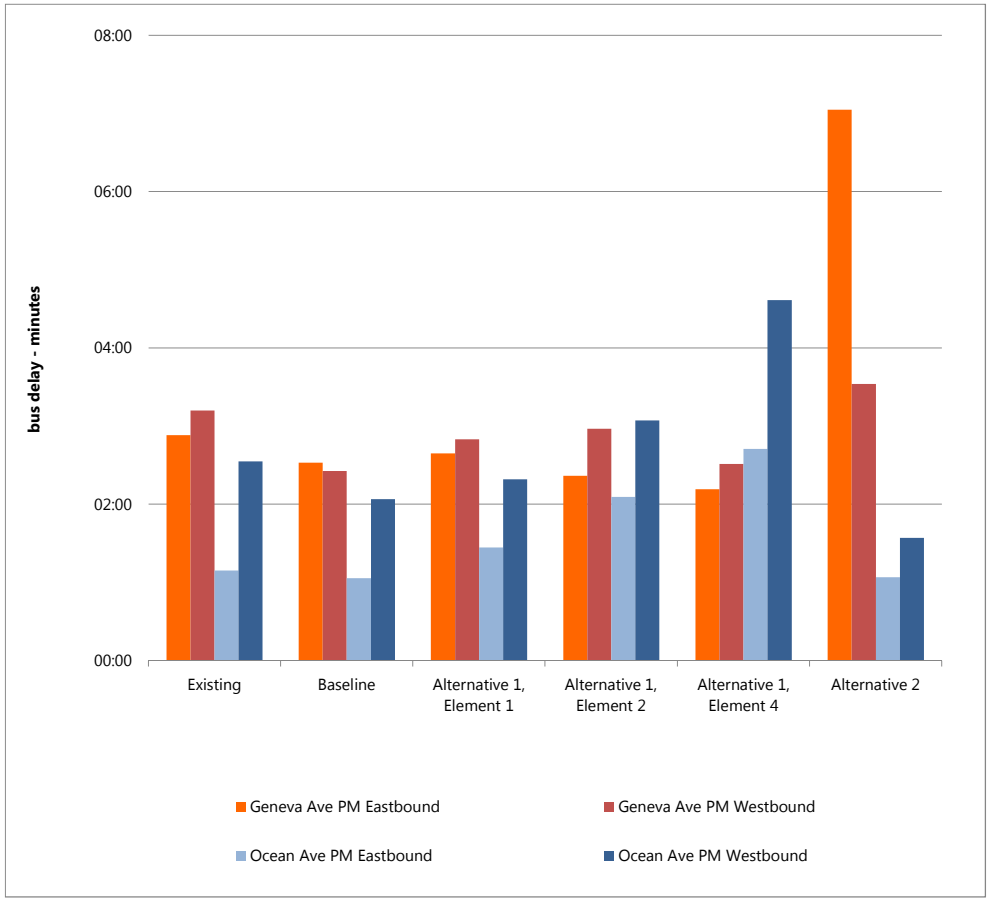
Intersection Summary			
Average Delay	3.0		
Intersection Capacity Utilization	41.6%	ICU Level of Service	A
Analysis Period (min)	15		

Transit Delay

Geneva Ave PM Eastbound				Existing			Baseline			Alternative 1, Element 1			Alternative 1, Element 2			Alternative 1, Element 4			Alternative 2		
Study node	Signalization	Intersection	Approach	Int. average LOS	Int. average V/C	Transit travel delay (s)	Int. average LOS	Int. average V/C	Transit travel delay (s)	Int. average LOS	Int. average V/C	Transit travel delay (s)	Int. average LOS	Int. average V/C	Transit travel delay (s)	Int. average LOS	Int. average V/C	Transit travel delay (s)	Int. average LOS	Int. average V/C	Transit travel delay (s)
2001	signalized	Geneva / Phelan	EBT	C	0.73	14	C	0.73	14	C	0.74	14	C	0.73	14	C	0.73	14	C	0.73	14
7	AWS	Geneva / Howth	EBT	0	0	1	A	0.88	5	A	0.79	5	A	0.6	0	A	0.81	5	D	1.57	7
8	signalized	Geneva / I-280 SB Off Ramp	EBT	D	0.84	26	C	0.77	23	C	0.7	29	C	0.82	26	C	0.74	27	F	1.35	106
9	signalized	Geneva / I-280 NB Off Ramp	EBT	E	1.1	34	D	0.97	35	C	0.81	39	D	1.03	25	C	0.69	24	F	1.36	204
10	signalized	Geneva / San Jose	EBT	C	0.69	24	C	0.84	30	D	0.84	42	C	0.69	23	C	0.84	30	D	1.05	26
11	AWS	Geneva / Cayuga	EBT	0	0	46	B	0.55	16	A	0.55	2	C	0.56	25	A	0.55	3	C	0.55	38
12	signalized	Geneva / Alemany	EBT	C	0.74	29	C	0.74	29	C	0.73	29	C	0.74	29	C	0.74	29	C	0.74	29
TOTAL						**173**			**152**			**159**			**142**			**132**			**423**
Geneva Ave PM Westbound				Existing			Baseline			Alternative 1, Element 1			Alternative 1, Element 2			Alternative 1, Element 4			Alternative 2		
2001	signalized	Geneva / Phelan	WBT	C	0.73	30	C	0.73	30	C	0.74	30	C	0.73	30	C	0.73	29	C	0.73	33
1	signalized	Geneva / Ocean	NBL	B	0.51	22	B	0.51	22	B	0.55	22	B	0.51	22	B	0.53	21	D	0.54	76
7	AWS	Geneva / Howth	WBT	0	0	4	A	0.88	4	A	0.79	4	A	0.6	0	A	0.81	4	D	1.57	4
8	signalized	Geneva / I-280 SB Off Ramp	WBT	D	0.84	4	C	0.77	6	C	0.7	4	C	0.82	4	C	0.74	7	F	1.35	22
9	signalized	Geneva / I-280 NB Off Ramp	WBT	E	1.1	34	D	0.97	7	C	0.81	26	D	1.03	34	C	0.69	13	F	1.36	4
10	signalized	Geneva / San Jose	WBT	C	0.69	33	C	0.84	33	D	0.84	43	C	0.69	33	C	0.84	34	D	1.05	20
11	AWS	Geneva / Cayuga	WBT	0	0	33	B	0.55	9	A	0.55	9	C	0.56	22	A	0.55	9	C	0.55	20
12	signalized	Geneva / Alemany	WBT	C	0.74	33	C	0.74	33	C	0.73	32	C	0.74	33	C	0.74	33	C	0.74	33
TOTAL						**192**			**146**			**170**			**178**			**151**			**212**
Ocean Ave PM Eastbound				Existing			Baseline			Alternative 1, Element 1			Alternative 1, Element 2			Alternative 1, Element 4			Alternative 2		
2001	signalized	Ocean / Phelan	EBT	C	0.73	14	C	0.73	14	C	0.74	14	C	0.73	14	C	0.73	14	C	0.73	14
1	signalized	Ocean / Geneva	EBT	B	0.51	6	B	0.51	6	B	0.55	7	B	0.51	6	B	0.53	7	D	0.54	5
2	signalized	Ocean / Howth	EBT	A	0.42	3	A	0.46	3	B	0.68	20	A	0.46	3	A	0.45	3	B	0.27	1
3		Ocean / I-280 SB Off Ramp	EBT										C	0.63	30	E	1.12	44			
4	signalized	Ocean / I-280 NB On Ramp	EBT	D	0.85	3	C	0.7	2	D	0.79	2	D	0.85	2	F	1.2	2	A	0.3	2
5	signalized	Ocean / San Jose	EBT	B	0.72	20	C	0.7	15	C	0.86	20	C	0.88	47	D	0.98	70	C	0.72	18
6	signalized	Ocean / Alemany	EBT	C	0.78	24	C	0.78	24	C	0.78	24	C	0.78	24	C	0.78	24	C	0.79	24
TOTAL						**69**			**63**			**87**			**126**			**163**			**64**
Ocean Ave PM Westbound				Existing			Baseline			Alternative 1, Element 1			Alternative 1, Element 2			Alternative 1, Element 4			Alternative 2		
2001	signalized	Ocean / Phelan	WBT	C	0.73	30	C	0.73	30	C	0.74	30	C	0.73	30	C	0.73	29	C	0.73	33
1	signalized	Ocean / Geneva	WBT	B	0.51	19	B	0.51	19	B	0.55	19	B	0.51	19	B	0.53	20	D	0.54	7
2	signalized	Ocean / Howth	WBT	A	0.42	13	A	0.46	13	B	0.68	13	A	0.46	13	A	0.45	13	B	0.27	9
4	signalized	Ocean / I-280 NB On Ramp	WBT	D	0.85	43	C	0.7	20	D	0.79	29	D	0.85	42	F	1.2	72	A	0.3	1
3		Ocean / I-280 SB Off Ramp	WBT										C	0.63	38	E	1.12	103			
5	signalized	Ocean / San Jose	WBT	B	0.72	24	C	0.7	18	C	0.86	24	C	0.88	18	D	0.98	14	C	0.72	18
6	signalized	Ocean / Alemany	WBT	C	0.78	25	C	0.78	25	C	0.78	25	C	0.78	25	C	0.78	25	C	0.79	25
TOTAL						**153**			**124**			**139**			**184**			**277**			**94**
K Ingleside PM Eastbound				Existing			Baseline			Alternative 1, Element 1			Alternative 1, Element 2			Alternative 1, Element 4			Alternative 2		
2001	signalized	Ocean / Phelan	EBT	C	0.73	14	C	0.73	14	C	0.74	14	C	0.73	14	C	0.73	14	C	0.73	14
1	signalized	Ocean / Geneva	EBT	B	0.51	6	B	0.51	6	B	0.55	7	B	0.51	6	B	0.53	7	D	0.54	5
2	signalized	Ocean / Howth	EBT	A	0.42	3	A	0.46	3	B	0.68	20	A	0.46	3	A	0.45	3	B	0.27	1
3	signalized	Ocean / I-280 SB Off Ramp	EBT										C	0.63	30	E	1.12	44			
4	signalized	Ocean / I-280 NB On Ramp	EBR	D	0.85	0	C	0.7	0	D	0.79	0	D	0.85	0	F	1.2	0	A	0.3	0
TOTAL						**23**			**23**			**41**			**53**			**68**			**20**
K Ingleside PM Westbound				Existing			Baseline			Alternative 1, Element 1			Alternative 1, Element 2			Alternative 1, Element 4			Alternative 2		
2001	signalized	Ocean / Phelan	WBT	C	0.73	30	C	0.73	30	C	0.74	30	C	0.73	30	C	0.73	29	C	0.73	33
1	signalized	Ocean / Geneva	WBT	B	0.51	19	B	0.51	19	B	0.55	19	B	0.51	19	B	0.53	20	D	0.54	7
2	signalized	Ocean / Howth	WBT	A	0.42	13	A	0.46	13	B	0.68	13	A	0.46	13	A	0.45	13	B	0.27	9
3	signalized	Ocean / I-280 SB Off Ramp	WBT										C	0.63	38	E	1.12	103			
4	signalized	Ocean / I-280 NB On Ramp	NBT	D	0.85	75	C	0.7	51	D	0.79	78	D	0.85	53	F	1.2	59	A	0.3	46
TOTAL						**136**			**113**			**140**			**153**			**225**			**96**
J Church PM Northbound				Existing			Baseline			Alternative 1, Element 1			Alternative 1, Element 2			Alternative 1, Element 4			Alternative 2		
5	signalized	Ocean / San Jose	NBT	B	0.72	14	C	0.7	21	C	0.86	15	C	0.88	20	D	0.98	32	C	0.72	15
TOTAL						**14**			**21**			**15**			**20**			**32**			**15**
J Church PM Southbound				Existing			Baseline			Alternative 1, Element 1			Alternative 1, Element 2			Alternative 1, Element 4			Alternative 2		
5	signalized	Ocean / San Jose	SBT	B	0.72	20	C	0.7	30	C	0.86	19	C	0.88	31	D	0.98	68	C	0.72	18
TOTAL						**20**			**30**			**19**			**31**			**68**			**18**

Transit Delay

Transit Delay Summary Table								
	Geneva Ave PM Eastbound	Geneva Ave PM Westbound	Ocean Ave PM Eastbound	Ocean Ave PM Westbound	K Ingleside PM Eastbound	K Ingleside PM Westbound	J Church PM Northbound	J Church PM Southbound
Existing	02:53	03:12	01:09	02:33	00:23	02:16	00:14	00:20
Baseline	02:32	02:25	01:03	02:04	00:23	01:53	00:21	00:30
Alternative 1, Element 1	02:39	02:50	01:27	02:19	00:41	02:20	00:15	00:19
Alternative 1, Element 2	02:22	02:58	02:06	03:04	00:53	02:33	00:20	00:31
Alternative 1, Element 4	02:12	02:31	02:43	04:37	01:07	03:45	00:32	01:08
Alternative 2	07:03	03:32	01:04	01:34	00:20	01:36	00:14	00:18



Intersection: 2: Ocean & Howth

Movement	EB	EB	WB	WB	NB	SB
Directions Served	T	T	T	TR	LTR	LR
Maximum Queue (ft)	415	444	112	115	119	139
Average Queue (ft)	380	377	56	68	70	45
95th Queue (ft)	469	503	99	118	124	102
Link Distance (ft)	381	381	394	394	104	201
Upstream Blk Time (%)	72	59			4	
Queuing Penalty (veh)	0	0			0	
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 3: Ocean &

Movement	EB	EB	WB	SB	SB
Directions Served	T	TR	T	L	TR
Maximum Queue (ft)	424	466	250	375	2700
Average Queue (ft)	411	316	232	349	2537
95th Queue (ft)	424	479	243	418	3053
Link Distance (ft)	394	394	212		2671
Upstream Blk Time (%)	51	9	59		60
Queuing Penalty (veh)	242	42	368		0
Storage Bay Dist (ft)				350	
Storage Blk Time (%)				74	11
Queuing Penalty (veh)				808	11

Intersection: 4: Ocean & I-280 On Ramp

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	LT	L
Maximum Queue (ft)	231	27	65	329	287	30
Average Queue (ft)	220	1	8	312	287	6
95th Queue (ft)	228	9	39	320	287	24
Link Distance (ft)	212	212		295	294	427
Upstream Blk Time (%)	70			70	100	
Queuing Penalty (veh)	371			0	0	
Storage Bay Dist (ft)			100			
Storage Blk Time (%)				68	100	
Queuing Penalty (veh)				6	92	

Network Summary

Network wide Queuing Penalty: 1941

APPENDIX B:

DETAILED ALTERNATIVE ANALYSIS RESULTS

DESCRIPTION

This appendix contains a summary of findings from the evaluation of alternatives. The analysis is based on the scoring of metrics, which are each associated with the project Goals and Objectives.

Element 3 of Alternative 1 was not under consideration as a standalone element at the time that this evaluation took place, and is therefore not assessed in this document. As part of the iterative process, the inception of Element 3 occurred after the detailed analysis stage. While the exact configuration of this element was not part of the detailed analysis, it is a subset of Alternative 1, Element 4, which was analyzed in detail. As such, the findings from detailed analysis of Alternative 1, Element 4 informed the decision to include Element 3 as a viable concept.

Similarly, the potential Element 3 of Alternative 2 was not under consideration at the time that this evaluation took place. Moreover, Elements 1 and 2 of Alternative 2 were evaluated as a single element and is presented as such in this appendix.

CONTENTS

- Findings by Metric and Alternative
- Evaluation Criteria/Evaluation
- Categories of Evaluation:
    - Prioritize Transit Operations
    - Enhance Intermodal Connectivity
    - Minimize Potential Effects to I-280
    - Develop Feasible Solutions

This appendix summarizes findings from the evaluation of alternatives conducted for the Balboa Park Circulation Study.

Note that for purposes of evaluation, the Baseline alternative (which includes a package of transportation improvements, but does not include any closure of Interstate 280 ramps) has been compared to existing conditions, while the other alternatives have been compared to the Baseline alternative. The other alternatives are:

ALTERNATIVE 1: SPLIT INTERCHANGE	
Element 1	Closure of the Geneva Avenue northbound on-ramp
Element 2	Realign Ocean Avenue southbound off-ramp into a "T" intersection
Element 3 (not studied here)	Construct a kiss-and-ride drop-off area on a new northbound frontage road between freeway ramps
Element 4	Closure of the Geneva Avenue southbound off-ramp and construction of a southbound frontage road between freeway ramps
ALTERNATIVE 2: CONSOLIDATED INTERCHANGE ON GENEVA AVE	
Element 1	Closure of both freeway ramps on Ocean Avenue

Element 3 of Alternative 1 was not under consideration as a standalone element at the time that this evaluation took place, and is therefore not assessed in this document. As part of the iterative process, the inception of Element 3 occurred after the detailed analysis stage. While the exact configuration of this element was not part of the detailed analysis, it is a subset of Alternative 1, Element 4, which was analyzed in detail. As such, the findings from detailed analysis of Alternative 1, Element 4 informed the decision to include Element 3 as a viable concept.

Findings for each metric and criterion are shown in Table B-1 on the following page. Note that the metrics and criteria are associated with project Goals and Objectives, which can be found at the start of each sub-section in the Evaluation section of this document.

The evaluation scores for each metric are composite scores for the station area as a whole and may not reflect that some proposed elements have significant benefits to one of Ocean Avenue or Geneva Avenue while simultaneously creating a disbenefit to the other roadway. The descriptions of effects included in the metric tables serve to justify the score further.

Table B-1: Findings by Metric and Alternative

SUMMARY EVALUATION							
METRIC		CRITERIA	BASELINE	ALTERNATIVE 1			ALTERNATIVE 2
				ELEMENT 1	ELEMENT 2	ELEMENT 4	
1.1.1	Intersection configuration/geometry	Potential increase/decrease in intermodal conflicts (at each location)	1	2	2	1	2
1.1.2	Volume of conflicting users (e.g., pedestrian-vehicle volumes)	Numbers of users benefitting/impacted	1	2	2	1	2
1.1.3	Intersection operations, including delay to transit	Increase/decrease in transit travel time (select routes/segments)	1	0	-1	-1	-2
1.2.1	Existing and Future Intersection vehicle operations (v/c, average delay) that account for other development in the area	Increase/decrease in intersection LOS (various intersections)	1	0	0	-1	-2
1.3.1	On- and off-ramp peak-hour volumes	Increase/decrease in vehicle volumes (at each ramp)	0	0	0	0	0
1.3.2	Ramp intersection operations	Increase/decrease in intersection LOS (at each ramp)	1	0	0	-1	-2
1.3.3	Ramp queuing lengths	Increase/decrease in queue lengths	0	0	-1	-1	-1
1.5.1	Kiss-and-ride design	Potential increase/decrease in intermodal conflicts (at each location)	0	0	0	2	1
2.1.1	Number of types & character of conflicts, volume of conflicting movements involving buses	Peak transit/private vehicles per hour (at each location)	1	0	-1	0	-2
2.1.2	Traffic operational delay for bus movements / pace	Increase/decrease in transit travel time (select routes/segments)	1	0	-1	-1	-2
2.1.3	Maximize opportunities to support goals of near- and long-term improvements	Level of support for/consistency with Transit Effectiveness Project recommendations	2	1	-1	-2	-1
2.2.1	Number of types & character of conflicts, volume of conflicting movements involving LRT	Increase/decrease in intersection LOS (at each location)	0	-1	-1	-2	2
2.2.2	Traffic operational delay for LRT movements	Increase/decrease in intersection LOS (at each location); increase in the number of conflicts for LRVs exiting Green Yard	0	-1	-1	-2	2
3.1.1	Alternative supports pedestrian demand/patterns (informed by pedestrian volumes, key institutions near the station, and transit ridership volumes)	Potential increase/decrease in intermodal conflicts (at each location)	1	2	2	-1	0
3.1.2	Number of types & character of vehicle-pedestrian conflicts, volume of motorized movements conflicting with pedestrian crossings	Numbers of pedestrians benefitting (e.g., in crosswalk where vehicle traffic eliminated)	1	2	2	-1	2
3.3.1	Supports bicycle activity (informed by bicycle volumes)	Increase/decrease in vehicle volumes on bicycle routes	0	-2	-1	-1	2
3.3.2	Number of types & character of vehicle-bicycle conflicts, volume of motorized movements conflicting with bike routes	Increase/decrease in vehicle volumes on bicycle routes	0	-1	2	0	2
4.1.1	On- and off-ramp peak-hour volumes	Increase/decrease in vehicle volumes (at each ramp)	0	0	0	0	0
4.1.2	Ramp queuing lengths	Increase/decrease in queue lengths	0	0	-1	-2	-1
5.1.1	Ability to get through Caltrans PSR process	Qualitative assessment	0	-1	-1	-2	-1
5.1.2	Relative cost	Order-of-magnitude cost estimates	N/A	2	1	-2	2
5.1.3	Engineering feasibility	Qualitative assessment	2	2	2	2	2
5.2.1	Alternatives are cost effective ways to address identified issues	Qualitative assessment	2	1	1	1	1
5.2.2	Alternatives do not result in substantial rerouting of transit or vehicles to other ramps	Qualitative assessment	2	-1	0	0	-2
5.3.1	Ability to integrate improvements into programmed routine maintenance/construction.	Qualitative assessment	1	-1	-1	-1	-1

1 EVALUATION CRITERIA

Table B-2 below shows primary data used in the evaluation for each metric and criterion.

Table B-2: Evaluation Metrics, Criteria and Data

EVALUATION FRAMEWORK (REVISED)			
METRIC		CRITERIA	DATA
1.1.1	Intersection configuration/geometry	Potential increase/decrease in intermodal conflicts (at each location)	Conceptual configurations, projected vehicle and existing pedestrian, bicycle and transit vehicle volumes (under TEP recommendations)
1.1.2	Volume of conflicting users (e.g., pedestrian-vehicle volumes)	Numbers of users benefitting/impacted	Projected vehicle and existing pedestrian, bicycle and transit vehicle volumes (under TEP recommendations)
1.1.3	Intersection operations, including delay to transit	Increase/decrease in transit travel time (select routes/segments)	Projected intersection LOS, projected transit delay
1.2.1	Existing and Future Intersection vehicle operations (v/c, average delay) that account for other development in the area	Increase/decrease in intersection LOS (various intersections)	Projected intersection LOS
1.3.1	On- and off-ramp peak-hour volumes	Increase/decrease in vehicle volumes (at each ramp)	Projected vehicle volumes
1.3.2	Ramp intersection operations	Increase/decrease in intersection LOS (at each ramp)	Projected intersection LOS
1.3.3	Ramp queuing lengths	Increase/decrease in queue lengths	Projected queue lengths
1.5.1	Kiss-and-ride design	Potential increase/decrease in intermodal conflicts (at each location)	Conceptual configurations
2.1.1	Number of types & character of conflicts, volume of conflicting movements involving buses	Peak transit/private vehicles per hour (at each location)	Transit vehicle volumes under TEP recommendations
2.1.2	Traffic operational delay for bus movements / pace	Increase/decrease in transit travel time (select routes/segments)	Projected intersection LOS, existing transit delay
2.1.3	Maximize opportunities to support goals of near- and long-term improvements	Level of support for/consistency with Transit Effectiveness Project recommendations	Transit vehicle volumes under TEP recommendations
2.2.1	Number of types & character of conflicts, volume of conflicting movements involving LRT	Increase/decrease in intersection LOS (at each location)	Projected intersection LOS
2.2.2	Traffic operational delay for LRT movements	Increase/decrease in intersection LOS (at each location); increase in the number of conflicts for LRVs exiting Green Yard	Projected intersection LOS (relevant intersections), conceptual configurations
3.1.1	Alternative supports pedestrian demand/patterns (informed by pedestrian volumes, key institutions near the station, and transit ridership volumes)	Potential increase/decrease in intermodal conflicts (at each location)	Existing pedestrian volumes
3.1.2	Number of types & character of vehicle-pedestrian conflicts, volume of motorized movements conflicting with pedestrian crossings	Numbers of pedestrians benefitting (e.g., in crosswalk where vehicle traffic eliminated)	Projected vehicle and existing pedestrian volumes
3.3.1	Supports bicycle activity (informed by bicycle volumes)	Increase/decrease in vehicle volumes on bicycle routes	Projected vehicle and existing bicycle volumes
3.3.2	Number of types & character of vehicle-bicycle conflicts, volume of motorized movements conflicting with bike routes	Increase/decrease in vehicle volumes on bicycle routes	Projected vehicle and existing bicycle volumes
4.1.1	On- and off-ramp peak-hour volumes	Increase/decrease in vehicle volumes (at each ramp)	Projected vehicle volumes
4.1.2	Ramp queuing lengths	Increase/decrease in queue lengths	Projected queue lengths
5.1.1	Ability to get through Caltrans PSR process	Qualitative assessment	n/a
5.1.2	Relative cost	Order-of-magnitude cost estimates	Cost estimates
5.1.3	Engineering feasibility	Qualitative assessment	n/a
5.2.1	Alternatives are cost effective ways to address identified issues	Qualitative assessment	Cost estimates
5.2.2	Alternatives do not result in substantial rerouting of transit or vehicles to other ramps	Qualitative assessment	Projected vehicle volumes
5.3.1	Ability to integrate improvements into programmed routine maintenance/construction.	Qualitative assessment	n/a

2 EVALUATION

2.1 | Reduce negative impacts on the local community resulting from vehicles accessing the regional road network

2.1.1 | REDUCE MULTIMODAL CONFLICTS AT I-280 INTERCHANGE RAMP INTERSECTIONS

2.1.1.1 INTERSECTION CONFIGURATION/GEOMETRY

Table B-3: Potential increase/decrease in intermodal conflicts (at each location)

CONCEPT	FINDINGS	RATING
Baseline	Because no ramp closures, no change in traffic volumes. However, EB bike lane and signalization of SB off-ramp on Ocean will reduce conflicts between vehicles, cyclists and pedestrians, and WB transit lane on Geneva will reduce conflicts between private and transit vehicles. (Conflicts on WB Ocean would be further reduced if the LRT lane were made transit-only and could be used by buses.)	1
Alternative 1, Element 1	Elimination of conflicts between pedestrians and automobiles at the location of the current Geneva Avenue NB off-ramp.	2
Alternative 1, Element 2	Squaring of Ocean SB off-ramp reduces severity of pedestrian and bicycle conflicts with vehicles exiting freeway.	2
Alternative 1, Element 4	Adding space for kiss-and-ride on the northbound frontage road would reduce instance of kiss-and-ride in locations that place pedestrians in conflict with vehicles.	1
Alternative 2	This option would eliminate conflicts between freeway-accessing vehicles and bicycles/pedestrians/transit on Ocean Avenue. This option would increase conflicts of this kind at the Geneva ramps where turning movement volumes would increase substantially, although the benefits of eliminating conflicts on Ocean Avenue outweigh this.	2

2.1.2 | VOLUME OF CONFLICTING USERS (E.G., PEDESTRIAN-VEHICLE VOLUMES)

Table B-4: Numbers of users benefitting/impacted

CONCEPT	FINDINGS	RATING
Baseline	Because no ramp closures, no change in traffic volumes. However, EB bike lane will reduce conflicts between vehicles and cyclists, and WB transit lane on Geneva will reduce conflicts between private and transit vehicles. (Conflicts on WB Ocean would be further reduced if the LRT lane were made transit-only and could be used by buses.)	1
Alternative 1, Element 1	Moderate decrease in traffic volumes on Geneva, moderate increase on Ocean would result in major benefits for pedestrians, minor impact on transit.	2
Alternative 1, Element 2	WB pedestrian and cyclist numbers on Ocean Avenue are moderate and these travelers would benefit from elimination of the freeway-ramp/Ocean Avenue merge.	2
Alternative 1, Element 4	Addition of frontage roads will add a moderate amount of vehicles turning in and out of them, but there would be a decrease in kiss-and-ride activity on surrounding streets, often in non-designated areas.	1
Alternative 2	Many transit vehicles/pedestrians/cyclists travel along Ocean Avenue and elimination of all ramp-movements will reduce conflicts for a high amount of travelers. This is somewhat offset by increase in conflicts along Geneva Avenue.	2

2.1.3 | INTERSECTION OPERATIONS, INCLUDING DELAY TO TRANSIT

Table B-5: Increase/decrease in transit travel time (select routes/segments)

CONCEPT	FINDINGS	RATING
Baseline	Reduction in average PM peak period delay of about 1 ½ mins for transit vehicles traveling WB on Geneva, including Rapid Network Line 8BX.	1
Alternative 1, Element 1	Minor impact on transit vehicles on Ocean and Geneva, compared to Baseline (less than 30 seconds on Ocean and Geneva in both directions).	0
Alternative 1, Element 2	Moderate impact on transit vehicles on Ocean, where there would be roughly twice as many vehicles as on Geneva during peak periods under TEP recommendations (around 1 mins EB, and about 1 mins WB).	-1
Alternative 1, Element 4	Major impact on transit vehicles on Ocean, where there would be roughly twice as many vehicles as on Geneva during peak periods under TEP recommendations (about 1 ½ mins EB, and around 1 minute WB).	-1
Alternative 2	Major impact on transit vehicles on EB Geneva (about 4 mins).	-2

2.2 | Do not substantially degrade operations at other key intersections in the study area

2.2.1 | EXISTING AND FUTURE INTERSECTION VEHICLE OPERATIONS (V/C, AVERAGE DELAY) THAT ACCOUNT FOR OTHER DEVELOPMENT IN THE AREA

Table B-6: Increase/decrease in intersection LOS (various intersections)

CONCEPT	FINDINGS	RATING
Baseline	3 intersections will improve slightly, 1 intersection will improve slightly, and one will worsen slightly.	1
Alternative 1, Element 1	2 intersections will degrade slightly, and 2 intersections will improve slightly.	0
Alternative 1, Element 2	2 intersections will degrade slightly, 1 intersection will improve slightly .	0
Alternative 1, Element 4	Mixed outcome expected compared to baseline with possible major impacts at Ocean Avenue/northbound frontage road, that requires further study.	-1
Alternative 2	2 intersections will degrade slightly, 4 intersections will degrade significantly, 1 intersection will improve greatly, and 1 intersection will improve slightly.	-2

2.3 | Do not substantially degrade operations at adjacent I-280 interchanges

2.3.1 | ON- AND OFF-RAMP PEAK-HOUR VOLUMES

The following five intersections were reviewed as part of this analysis:

- Ocean/I-280 on-ramp
- Geneva Ave/I-280 SB Off
- Geneva Ave/I-280 NB On
- Monterey/I-280 Ramps
- Alemany/I-280 On-Ramp

Table B- 7: Increase/decrease in vehicle volumes (at each ramp)

CONCEPT	FINDINGS	RATING
Baseline	No change from existing conditions.	0
Alternative 1, Element 1	There is a moderate increase in traffic volumes at Ocean/I-280 NB on-ramp. There is a moderate decrease in traffic volumes at the Geneva Ave/I-280 NB ramp.	0
Alternative 1, Element 2	There is a minor increase in traffic volumes at Ocean/I-280 SB off-ramp. There is a minor decrease in traffic volumes at the Geneva Ave/I-280 SB ramp.	0
Alternative 1, Element 4	Ramp volumes would remain largely unchanged.	0
Alternative 2	There is a significant decrease in traffic volumes at Ocean/I-280 SB off-ramp & NB on-ramp. There is a significant increase in traffic volumes at the Geneva Ave/I-280 SB and NB ramps.	0

2.3.2 | RAMP INTERSECTION OPERATIONS

The following five intersections were reviewed as part of this analysis:

- Ocean/I-280 on-ramp
- Geneva Ave/I-280 SB Off
- Geneva Ave/I-280 NB On
- Monterey/I-280 Ramps
- Alemany/I-280 On-Ramp

Table B-8: Increase/decrease in intersection LOS (at each ramp)

CONCEPT	FINDINGS	RATING
Baseline	Of the existing on and off-ramps, LOS conditions would improve slightly at 3 intersections and remain unchanged at 2 intersections.	1
Alternative 1, Element 1	Compared to baseline, one ramp would improve slightly and one would degrade slightly.	0
Alternative 1, Element 2	Compared to baseline, one ramp would degrade slightly.	0
Alternative 1, Element 4	Mixed outcome expected compared to baseline with possible major impacts at Ocean Avenue/northbound frontage road, that requires further study and a moderate impact at the Ocean Avenue/southbound frontage road .	-1
Alternative 2, Element 1	LOS would degrade significantly at Geneva ramps but improve significantly at Ocean ramps.	-2

2.3.3 | RAMP QUEUING LENGTHS

For Metric 1.3.3 the intersections of Geneva Ave/I-280 SB and Geneva Ave/I-280 NB were examined for all alternatives. For Alternative 1, Elements 2 and 4, the T-intersection at Ocean Avenue was also examined.

Table B-9: Increase/decrease in queue lengths

CONCEPT	FINDINGS	RATING
Baseline	Little change to queue lengths.	0
Alternative 1, Element 1	Little change to queue lengths.	0
Alternative 1, Element 2	Ocean SB off-ramp queue length increases.	-1
Alternative 1, Element 4	Queue lengths remain similar on Geneva but Ocean SB off-ramp queue length increases significantly.	-2
Alternative 2	Queue lengths increase substantially on Geneva SB off-ramp and remain similar on Geneva NB off-ramp. Ramps eliminated on Ocean	-1

2.4 | Reduce kiss-and-ride conflicts with other modes

2.4.1 | KISS-AND-RIDE DESIGN

Table B-10: Potential increase/decrease in intermodal conflicts (at each location)

CONCEPT	FINDINGS	RATING
Baseline	No change from existing conditions.	0
Alternative 1, Element 1	No change from existing conditions.	0
Alternative 1, Element 2	No change from existing conditions.	0
Alternative 1, Element 4	New Kiss & Ride area on the northbound frontage road adjacent to BART Entrance providing convenient access and reducing need for Kiss & Ride vehicles to block other traffic.	2
Alternative 2	Potential new Kiss & Rides areas on Ocean Avenue west of San Jose Avenue and on San Jose Avenue north and south of Geneva Avenue, reducing need for Kiss & Ride vehicles to block traffic near the freeway ramps.	1

3 Prioritize transit operations

3.1 | Provide efficient routing for transit service as feasible, with particular attention to conflicts at intersections and stops. Maintain consistency with goals of near- and long-term improvements (e.g. Geneva TTRP, TEP, Geneva-Harney BRT)

3.1.1 | NUMBER OF TYPES & CHARACTER OF CONFLICTS, VOLUME OF CONFLICTING MOVEMENTS INVOLVING BUSES

Table B- 11: Peak transit/private vehicles per hour (at each location)

CONCEPT	FINDINGS	RATING
Baseline	The analysis assumes the same vehicle volumes as existing conditions. There is currently less traffic on Ocean than Geneva, so shifting some bus service from Geneva to Ocean, as recommended by the TEP, would benefit transit.	1
Alternative 1, Element 1	Traffic volumes would increase moderately on Ocean and decrease on Geneva.	-1
Alternative 1, Element 2	Traffic volumes would increase slightly on Ocean under this element compared to Baseline, impacting the greater numbers of transit vehicles on Ocean.	0
Alternative 1, Element 4	Traffic volumes would increase somewhat on Ocean under this element compared to Baseline, impacting the greater numbers of transit vehicles on Ocean. Optional transit usage of northbound frontage could reduce transit conflicts.	0
Alternative 2	Traffic volumes would slightly decrease on Ocean but significantly increase on Geneva, where Rapid Network Line 8X would continue to operate.	-2

3.1.2 | TRAFFIC OPERATIONAL DELAY FOR BUS MOVEMENTS / PACE

Table B- 12: Increase/decrease in transit travel time (select routes/segments)

CONCEPT	FINDINGS	RATING
Baseline	Reduction in average PM peak period delay of about 1 ½ mins for transit vehicles traveling WB on Geneva, including Rapid Network Line 8BX.	1
Alternative 1, Element 1	Minor impact on transit vehicles on Geneva and Ocean.	0
Alternative 1, Element 2	Moderate impact on transit vehicles on Ocean, where there would be roughly twice as many vehicles as on Geneva during peak periods under TEP recommendations (around 1 minute EB and WB). New signal is partly responsible for increased travel time.	-1
Alternative 1, Element 4	Major impact on transit vehicles on Ocean, where there would be roughly twice as many vehicles as on Geneva during peak periods under TEP recommendations (about 1 ½ mins EB, and about 1 mins WB).	-1
Alternative 2	Major impact on transit vehicles on EB Geneva (about 4 ½ mins). Transit on Ocean would quicken (½ minute in the westbound and no change in the eastbound direction).	-2

3.1.3 | MAXIMIZE OPPORTUNITIES TO SUPPORT GOALS OF NEAR- AND LONG-TERM IMPROVEMENTS

Table B- 13: Level of support for/consistency with Transit Effectiveness Project recommendations

CONCEPT	FINDINGS	RATING
Baseline	TEP/TTRP improvements are included in Baseline package.	2
Alternative 1, Element 1	There is a moderate shift of traffic from Geneva onto Ocean. Closing ramp will boost effectiveness of bus only lane on Geneva.	1
Alternative 1, Element 2	Shifting traffic from EB Geneva to EB Ocean conflicts with TEP rerouting of lines from Geneva onto Ocean.	-1
Alternative 1, Element 4	While less traffic is shifted from Geneva onto Ocean, LOS on Ocean is nonetheless degraded, with similar impacts on transit.	-1
Alternative 2	Traffic is shifted from Ocean onto Geneva; however, increased traffic on Geneva would increase delay for TEP Rapid Network Line 8X.	-1

3.2 | Do not increase conflicts involving LRT at key intersections

3.2.1 | NUMBER OF TYPES & CHARACTER OF CONFLICTS, VOLUME OF CONFLICTING MOVEMENTS INVOLVING LRT

For Metric 2.2.1, LOS was examined at the following intersections:

- Ocean/I-280 on-ramp
- Ocean and San Jose
- Seneca and San Jose
- Ocean and Phelan

Table B- 14: Increase/decrease in intersection LOS (at each location)

CONCEPT	FINDINGS	RATING
Baseline	There is minimal difference in intersection LOS between the Baseline and existing conditions.	0
Alternative 1, Element 1	There is a slight worsening of LOS at Ocean/I-280 NB-on ramp where Muni vehicles access the Yard.	-1
Alternative 1, Element 2	There is a slight worsening of LOS at Ocean/I-280 NB-on ramp where Muni vehicles access the Yard.	-1
Alternative 1, Element 4	The northbound frontage road would lead to a further deterioration of LOS at Ocean/I-280 NB-on ramp where Muni vehicles access the Yard.	-2
Alternative 2	There is a significant improvement in LOS at Ocean/I-280. There is no change is LOS at the other intersections.	2

3.2.2 | TRAFFIC OPERATIONAL DELAY FOR LRT MOVEMENTS

For Metric 2.2.2 , LOS was examined at the following intersections:

- Ocean/I-280 on-ramp
- Ocean and San Jose
- Seneca and San Jose
- Ocean and Phelan

Table B- 15: Increase/decrease in intersection LOS (at each location); increase in the number of conflicts for LRVs exiting Green Yard

CONCEPT	FINDINGS	RATING
Baseline	There is minimal difference in intersection LOS between the Baseline and existing conditions.	0
Alternative 1, Element 1	There is a slight worsening of LOS at Ocean/I-280 NB-on ramp where Muni vehicles access the Yard. LOS worsens at San Jose/Geneva, increasing conflicts for LRVs accessing the yard at this location.	-1
Alternative 1, Element 2	There is a slight worsening of LOS at Ocean/I-280 NB-on ramp where Muni vehicles access the yard.	-1
Alternative 1, Element 4	The northbound frontage road would lead to a further deterioration of LOS at Ocean/I-280 NB-on ramp where Muni vehicles access the Yard.	-2
Alternative 2	There is a significant improvement in LOS at Ocean/I-280. There is no change is LOS at the other intersections.	2

4 Enhance intermodal connectivity, particularly for pedestrians and bicyclists

4.1 | Provide safe & accessible pedestrian facilities

4.1.1 | ALTERNATIVE SUPPORTS PEDESTRIAN DEMAND/PATTERNS (INFORMED BY PEDESTRIAN VOLUMES, KEY INSTITUTIONS NEAR THE STATION, AND TRANSIT RIDERSHIP VOLUMES)

Table B- 16: Potential increase/decrease in intermodal conflicts (at each location)

CONCEPT	FINDINGS	RATING
Baseline	Because no ramp closures, no change in traffic volumes.	1
Alternative 1, Element 1	Decrease in traffic volumes on Geneva would result in minor benefits for pedestrians. Closure of NB-on ramp on Geneva removes a major pedestrian conflict. Slight increase of conflicts at Ocean NB on-ramp.	2
Alternative 1, Element 2	Elimination of high speed merge across crosswalk at Ocean SB off-ramp intersection.	2
Alternative 1, Element 4	Generally little change in traffic volumes from Baseline. Some increases in intermodal conflicts at the ends of the new frontage roads due to introduction of new turning movements.	-1
Alternative 2	Increase in conflicts along Geneva Avenue but decrease along Ocean Avenue, providing a clear option for people walking to/from the City College from the station .	2

4.1.2 | NUMBER OF TYPES & CHARACTER OF VEHICLE-PEDESTRIAN CONFLICTS, VOLUME OF MOTORIZED MOVEMENTS CONFLICTING WITH PEDESTRIAN CROSSINGS

For Metric 3.1.2 the following intersections were examined as they have pedestrian crossing facilities:

- Ocean/1-280 On-Ramp
- Ocean/San Jose
- Geneva/San Jose
- Geneva Ave/I280 NB
- Ocean/Howth

Table B- 17: Numbers of pedestrians benefitting (e.g., in crosswalk where vehicle traffic eliminated)

CONCEPT	FINDINGS	RATING
Baseline	Because no ramp closures, no change in traffic volumes.	1
Alternative 1, Element 1	Decrease in traffic volumes on Geneva would result in minor benefits for pedestrians. Closure of NB-on ramp on Geneva removes a major pedestrian conflict. Slight increase of conflicts at Ocean NB on-ramp.	2
Alternative 1, Element 2	Elimination of high speed merge across crosswalk at Ocean SB off-ramp intersection.	2
Alternative 1, Element 4	Generally little change in traffic volumes from Baseline. Some increases in intermodal conflicts at the ends of the new frontage roads due to introduction of new turning movements.	-1
Alternative 2	Increase in conflicts along Geneva Avenue but decrease along Ocean Avenue, providing a clear option for people walking to/from the City College from the station .	0

4.2 | Avoid adding/exacerbating conflicts to key streets serving as bike routes

4.2.1 | SUPPORTS BICYCLE ACTIVITY (INFORMED BY BICYCLE VOLUMES)

Table B- 18: Increase/decrease in vehicle volumes on bicycle routes

CONCEPT	FINDINGS	RATING
Baseline	Because no ramp closures, no change in traffic volumes.	0
Alternative 1, Element 1	Moderate increase in traffic volumes on Ocean, which is the primary bike route.	-2
Alternative 1, Element 2	Minor shift of traffic from Geneva onto Ocean, which is the primary bike route.	-1
Alternative 1, Element 4	Minor shift of traffic from Geneva onto Ocean, which is the primary bike route.	-1
Alternative 2	Major shift of traffic away from Ocean to Geneva.	2

4.2.2 | NUMBER OF TYPES & CHARACTER OF VEHICLE-BICYCLE CONFLICTS, VOLUME OF MOTORIZED MOVEMENTS CONFLICTING WITH BIKE ROUTES

Table B- 19: Increase/decrease in conflicts on bicycle routes

CONCEPT	FINDINGS	RATING
Baseline	Because no ramp closures, no change in traffic volumes.	0
Alternative 1, Element 1	Moderate increase in traffic volumes on Ocean, namely conflicting vehicles turning to enter the NB on-ramp.	-1
Alternative 1, Element 2	Elimination of conflict with high-speed merging vehicles from the SB off-ramp.	2
Alternative 1, Element 4	Little change in the presence of conflicts.	0
Alternative 2	Major shift of traffic away from Ocean to Geneva.	2

5 Minimize potential effects to I-280 freeway mainline operations

5.1 | Avoid changes to ramp volumes that would impact mainline operations

5.1.1 | ON- AND OFF-RAMP PEAK-HOUR VOLUMES

For Metric 4.1.1 the projected intersection PM volumes at on and off-ramp intersection locations were evaluated. The following five intersections were reviewed as part of this analysis:

- Ocean/I-280 on-ramp
- Geneva Ave/I-280 SB Off
- Geneva Ave/I-280 NB On
- Monterey/I-280 Ramps
- Alemany/I-280 On-Ramp

Table B- 20: Increase/decrease in vehicle volumes (at each ramp)

CONCEPT	FINDINGS	RATING
Baseline	No change compared to Existing conditions.	0
Alternative 1, Element 1	Moderate increase in volume on Ocean NB on-ramp and elimination of traffic on Geneva NB on-ramp.	0
Alternative 1, Element 2	Minor increase in volume on Ocean SB off-ramp and commensurate decrease in volume on Geneva SB off-ramp.	0
Alternative 1, Element 4	Little change in volumes.	0
Alternative 2	There is a significant decrease in traffic volumes at Ocean/I-280 SB off-ramp & NB on-ramp. There is a significant increase in traffic volumes at the Geneva Ave/I-280 SB and NB ramps.	0

5.1.2 | RAMP QUEUING LENGTHS

For Metric 4.1.2 the intersections of Geneva Ave/I-280 SB and Geneva Ave/I-280 NB were examined for all alternatives. For Alternative 1, Elements 2 and 4, the t-intersection at Ocean Ave was also examined.

Table B- 21: Increase/decrease in queue lengths

CONCEPT	FINDINGS	RATING
Baseline	Little change to queue lengths.	0
Alternative 1, Element 1	Little change to queue lengths.	0
Alternative 1, Element 2	Ocean SB off-ramp queue length increases.	-1
Alternative 1, Element 4	Queue lengths remain similar on Geneva but major increase in Ocean NB off-ramp queue length.	-2
Alternative 2	Queue lengths increase substantially on Geneva SB off-ramp and remain similar on Geneva NB off-ramp. Ramps eliminated on Ocean	-1

6 Develop feasible solutions that can be implemented within ten years

6.1 | Develop solutions that will be feasible both in engineering and cost

6.1.1 | ABILITY TO GET THROUGH CALTRANS PSR PROCESS

For this metric, any alterations to the Caltrans right-of-way (ROW) may require preparation of a Caltrans Project Initiation Document (PID). Typically, the PID used for this type of project could be a Permit Engineering Evaluation Report (PEER), Project Study Report (PSR), or a combined Project Study Report/Project Report (PSR/PR). Environmental analysis and documentation would need to be conducted, prepared, and approved prior to moving the project into the project development phase where plans, specifications, and estimates (PS&E) are developed. The ease of this process for each Alternative is considered in this metric.

Table B- 22: Qualitative assessment

CONCEPT	FINDINGS	RATING
Baseline	No PSR required	0
Alternative 1, Element 1	Coordination with Caltrans will be required for implementing the work, utility relocations within their ROW, and for addressing concerns with negative impacts to the freeway system.	-1
Alternative 1, Element 2	Coordination with Caltrans will be required for implementing the work, utility relocations within their ROW, and for addressing concerns with negative impacts to the freeway system.	-1
Alternative 1, Element 4	Coordination with Caltrans will be required for implementing the work, utility relocations within their ROW, and for addressing concerns with negative impacts to the freeway system. Replacing the Ocean Avenue bridge will be an extensive project, an order of magnitude larger than the other elements, and will require a large amount of careful coordination with Caltrans.	-2
Alternative 2	Coordination with Caltrans will be required for implementing the work and for addressing concerns with negative impacts to the freeway system.	-1

6.1.2 | RELATIVE COST

For this metric, the relative cost of the alternatives and elements is considered.

Table B- 23: Metric 5.1.2: Relative Cost

CONCEPT	FINDINGS	RATING
Baseline	Cost has not been calculated	N/A
Alternative 1, Element 1	Cost is around $2.5M	2
Alternative 1, Element 2	Cost is around $5.5M	1
Alternative 1, Element 4	Cost is around $50M	-2
Alternative 2	Cost is around $4.0M	2

6.1.3 |ENGINEERING FEASIBILITY

For this metric, the relative engineering feasibility of the alternatives and elements is considered.

Table B- 24: Qualitative assessment

CONCEPT	FINDINGS	RATING
Baseline	This improvement is feasible from a civil engineering standpoint and does not present any significant engineering challenges.	2
Alternative 1, Element 1	This improvement is feasible from a civil engineering standpoint and does not present any significant engineering challenges.	2
Alternative 1, Element 2	This improvement is feasible from a civil engineering standpoint and does not present any significant engineering challenges.	2
Alternative 1, Element 4	This improvement is feasible from a civil engineering standpoint and does not present any significant engineering challenges.	2
Alternative 2	This improvement is feasible from a civil engineering standpoint and does not present any significant engineering challenges.	2

6.2 | Develop alternative that can be constructed without substantial construction-related impacts

6.2.1 | ALTERNATIVES ARE COST EFFECTIVE WAYS TO ADDRESS IDENTIFIED ISSUES

Table B- 25: Qualitative assessment

CONCEPT	FINDINGS	RATING
Baseline	Many issues are addressed in a very cost-effective manner.	2
Alternative 1, Element 1	Many issues are addressed in a cost-effective manner.	1
Alternative 1, Element 2	Many issues are addressed in a cost-effective manner.	1
Alternative 1, Element 4	Many issues are addressed in a cost-effective manner.	1
Alternative 2	Many issues are addressed in a cost-effective manner.	1

6.2.2 | ALTERNATIVES DO NOT RESULT IN SUBSTANTIAL REROUTING OF TRANSIT OR VEHICLES TO OTHER RAMPS

Table B- 26: Increase/decrease in vehicle volumes (at each ramp)

CONCEPT	FINDINGS	RATING
Baseline	No change to existing conditions.	2
Alternative 1, Element 1	Reroute of vehicles from Geneva NB on-ramp to Ocean NB on-ramp.	-1
Alternative 1, Element 2	Minor reroute of vehicles from Geneva SB on-ramp to Ocean SB on-ramp.	0
Alternative 1, Element 4	Minor reroute of vehicles from Geneva Avenue southbound off-ramp to Ocean Avenue off-southbound ramp.	0
Alternative 2	Major rerouting of vehicles from Ocean ramps to Geneva ramps.	-2

6.3 | Consider State of Good Repair

6.3.1 | ABILITY TO INTEGRATE IMPROVEMENTS INTO PROGRAMMED ROUTINE MAINTENANCE/CONSTRUCTION.

Table B- 27: Qualitative Assessment

CONCEPT	FINDINGS	RATING
Baseline	No substantial construction-related impacts expected.	1
Alternative 1, Element 1	Minor construction-related impacts expected.	-1
Alternative 1, Element 2	Reconstruction of southbound ramp connection to Ocean Avenue will have major effect on traffic along Ocean Avenue during construction.	-1
Alternative 1, Element 4	Reconstruction of BART Station westside walkway will disrupt BART patrons.	-1
Alternative 2	Minor construction-related impacts expected.	-1

APPENDIX C:

ENGINEERING FEASIBILITY & COST ESTIMATES

DESCRIPTION

This appendix contains an assessment of engineering feasibility and order of magnitude costs for both alternatives.

CONTENTS

- Engineering Feasibility by Alternative and Element
- Cost Estimates by Alternative and Element
- Figures of Each Alternative and Element

1 Introduction

1.1 | Purpose

Appendix C addresses the engineering feasibility and order of magnitude costs for improvement Alternatives 1 and 2 studied as part of the Balboa Park Station Area Circulation Study. The two alternatives include improvements to the Geneva and Ocean Avenue highway on- and off-ramps comprising of realignments, intersection modifications, and considerations for new connecting frontage roads. Order of Magnitude Costs are included for each of the major improvement works for the two alternatives.

1.2 | Organization of Appendix Item

This engineering feasibilities and Order of Magnitude Costs discussed in this Appendix Item are organized by the alternatives and their elements of major improvement works. Alternative 1 is divided into 4 elements while Alternative 2 has one element. The alternatives and elements are summarized in Table 1.2-1.

Table 1.2-1: Studied Alternatives and Improvement Components

IMPROVEMENT WORKS LOCATION	ALTERNATIVE 1: SPLIT INTERCHANGE				ALTERNATIVE 2: CONSOLIDATED INTERCHANGE
	ELEMENT 1	ELEMENT 2	ELEMENT 3	ELEMENT 4	
NB I-280 Geneva On-ramp	Pilot Closure	-	Close & Remove	-	-
NB I-280 Ocean On-ramp	Right-Turn Pocket	-	-	-	Close & Remove
SB I-280 Geneva Off-ramp	-	-	-	Close & Remove	-
SB I-280 Ocean Off-ramp	-	Realign to T-Intersection	-	Realign to 4-way Intersection	Close & Remove
Frontage Road	-	-	Northbound Frontage Road	Southbound Frontage Road	-
Ocean Ave Bridge	-	-	-	Replace Bridge	-

Alternative 1, Split Interchange, proposes a split diamond interchange design with on- and off-ramps with I-280 on Geneva and Ocean Avenue, and frontage roads connecting between Geneva and Ocean Avenue.

Alternative 2, Consolidated Interchange, proposes a consolidated interchange with on- and off-ramp access from Geneva Avenue only. The on- and off-ramps with Ocean Avenue are proposed to be permanently closed.

1.3 | Basis and Assumptions

1.3.1| ENGINEERING

The conceptual engineering prepared for this study is based on currently available information provided by the San Francisco County Transportation Authority and previous studies prepared for this area. The

purpose of the engineering assessment is to evaluate the concepts for fatal flaws and feasibility. The following documents form the information basis for this engineering study:

- San Francisco County Transportation Authority's 2010 LiDAR dataset, which includes GIS datasets for sewer, aerial imagery, and 2-foot contours.
- BART Contract 11OG-110 "Balboa Park Station - Westside Entrance and Walkway" Plans (Demolition Plan, Layout Control Plan, Layout Plan Detail 1, Standard Concrete Sidewalk/Walkway Details, and Grading and Drainage Plan), dated July 2008
- Caltrans, Bridge Inspection Records Information Sheet (BIRIS) for Ocean Avenue Overcrossing Bridge No 34 0094 dated April 10, 2012)
- Caltrans, Bridge Inspection Records Information Sheet (BIRIS) for Geneva Avenue Overcrossing – Bridge No 34 0095, dated April 20, 2010
- Balboa Park Station Capacity and Conceptual Engineering Study prepared for the San Francisco Municipal Transportation Agency (SFMTA), dated November 8, 2011.
- Highway design is based on the Caltrans Highway Design Manual (HDM), 2012 edition.
- The City's GIS files including: 2-foot contours and sewer line information.

Information regarding existing utilities in this area is not complete and needs to be confirmed during subsequent engineering phases. The sewer information available illustrates horizontal locations of the utility but does not include depths of pipe or manhole locations. Consequently, undocumented utilities could present risks and cause unexpected challenges during detailed design or construction. Existing geological and geotechnical information are not assessed; however, anticipated geotechnical conditions have been considered for purposes of costing and feasibility of retaining walls. Existing pavement conditions are not assessed and resurfacing may be required when improvements are made to existing roads and ramps.

1.3.2| COST ESTIMATING

The purpose of this cost estimate is to provide a Level 5 or Rough Order of Magnitude (ROM) estimate for the proposed alternatives and elements of work for this study. The cost estimate for each alternative and element is developed by each of its major components of work. This includes ramp modifications to and from I-280, new frontage roads along I-280, and other improvements identified herein on Ocean and Geneva Avenues.

The Level 5 ROM is typically used for schematic or conceptual level design. The estimated cost is prepared using factored historical costs in accordance with accepted professional standard and procedures agreed by organizations including the Association for the Advancement of Cost Engineers (AACE), American Society of Professional Estimators (ASPE), and the Royal Institute of Chartered Surveyors (RICS).

Pricing information is based on current rates provided from Arup's internal sources of cost data as well as Caltrans District 4 online cost database. This cost estimate is based on the following assumptions:

- Quarter 4, 2013 pricing.
- Contractor indirects, overhead and profit are included.
- Mobilization estimated at 10% of the bid cost.
- Construction contingency estimated at 15% of the bid cost.

- Relocation or demolition of existing utilities estimated at as lump sum allowance due to the limited information currently available.
- Traffic management is estimated at 15% for Alternative 1 and 8% for Alternatives 2 based on the complexity of work to be executed.
- Soft costs are estimated at a total of 30% for items such as: preliminary engineering including environmental documentation work, final design, project management for design and construction, construction administration and management, professional liability and other non-construction insurance, legal, permits, review fees, surveys, testing, and inspection.
- Quantities for the designed scope of work were estimated from available conceptual design documents, including the Figures attached to this Appendix Item.
- Each cost estimate is presented as a range between -20%, as an optimistic value, and +30%, as a pessimistic value, appropriate for a Level 5 estimate.
- Escalation is excluded from this cost estimate.
- A conceptual level of design completeness and level of cost estimate classification.

2 Engineering Feasibility

The engineering feasibility of Alternative 1, Split Interchange, and 2, Consolidated Interchange, are discussed in this section. Each major element of improvement work is discussed. The conceptual plans for Alternative 1 and 2 are presented in the Main Report. The conceptual plan for the fourth element of Alternative 1 is presented in Figure C1.

2.1 | Alternative 1, Element 1: Geneva Northbound On-ramp Pilot Closure and Ocean Avenue to Northbound I-280 Right-turn Pocket

2.1.1| GENEVA NORTHBOUND ON-RAMP PILOT CLOSURE

COMPONENT DESCRIPTION

Alternative 1, Element 1 proposes a pilot project to assess the effects of closing the NB I-280 Geneva On-ramp to improve safety and access around the BART Station. The NB I-280 Ocean On-ramp will be the remaining entry point to NB I-280 in this area. Temporary traffic control and ramp closure measures will be used for this closure. Temporary K-Rail barriers are proposed at the on-ramp entrance at Geneva Avenue and at the merge with the NB I-280 Ocean Avenue On-ramp. Temporary striping will be used at the merge with the NB I-280 Ocean On-ramp to delineate the closed ramp. Temporary signage for detouring traffic should be placed in the vicinity of the closure for redirecting local traffic to the NB I-280 Ocean On-ramp.

COMPONENT FEASIBILITY

This improvement is feasible from an engineering standpoint and does not present any significant engineering challenges. The following are concerns identified at this stage that will require further investigation and evaluation.

- **COORDINATION OF PILOT CLOSURE –** Closures of Caltrans facilities will require coordination with and approval from Caltrans. Detailed analysis of the closure and development of Traffic Management Plans may be required.
- **CALTRANS INTERACTIONS –** This improvement is situated within Caltrans ROW and may require preparation of Caltrans Project Initiation Document (PID). Typically, the PID used for this type of project could be a Permit Engineering Evaluation Report (PEER), Project Study Report (PSR), or a combined Project Study Report/Project Report (PSR/PR). Environmental analysis and documentation will need to be conducted, prepared, and approved prior to moving the project into the project development phase where plans, specifications, and estimates (PS&E) are developed.

2.1.2| OCEAN AVENUE TO NB I-280 RIGHT-TURN POCKET

COMPONENT DESCRIPTION

A 100-foot long right-turn pocket is proposed for accommodating right-turning vehicles from Ocean Avenue onto the I-280 NB on-ramp. The right-turn pocket will shift the north side Ocean Avenue sidewalk to the north into the corner cut slope bordering on Balboa Park. The turn pocket will lead into its own lane on the on-ramp for approximately 300 feet. A new crosswalk island will be constructed for pedestrian refugee and right-turn channelization. Figure C2 presents the conceptual plan, profile and cross section for this improvement.

The ramp widening is conceptually designed to tie into existing sidewalk and pavement grades. The widening along the ramp will maintain the left shoulder and widen to the right to accommodate two 12-foot lanes, 8-foot right and 4-foot left shoulders. This will require reconstructing a drainage dike along the right side of the on-ramp, new pavement, and re-grading of side slopes beyond the shoulder. There is one light pole and a utility box within the existing shoulder that will require relocation for accommodating the widening.

The new turn pocket on Ocean Avenue will shift the north sidewalk along Balboa Park approximately 12 feet to the north, which will require constructing a 160-foot long retaining wall of approximately five feet in height with safety railing and fencing between Ocean Avenue and the Balboa Park. This will maintain the existing bike lane and create a 12-foot wide turning lane. The bike lane will need to be restriped to provide a crossover zone to the westbound travel lane in advance of the right-turn pocket. The pedestrian island is designed to meet Caltrans standards and ADA requirements. There are several utilities that will require relocation and modifications, such as: traffic signal, MUNI OCS, street lights, and pedestrian crossing devices.

COMPONENT FEASIBILITY

This improvement is feasible from an engineering standpoint and does not present engineering challenges.

- **UNDERGROUND UTILITES -** The City's GIS files indicate that there is an existing 30-inch and 48-inch diameter sewer line within Ocean Avenue. The 30-inch is shown to be near the southern curb and the 48-inch is near northern curb. Based on the nature of the grading that would be involved in this work, this line should not be significantly impacted by these closure and restoration activities. However, these potential impacts should be confirmed during advanced design stages. Approvals for utility relocations may require long lead time for their coordination and relocation.
- **AUXILIARY WATER SUYPPLY SYSTEM (AWSS) -** The Ocean Avenue Overcrossing BIRIS shows an AWSS line running within the Ocean Avenue Bridge. The modifications needed for this improvement should not impact this utility.
- **OTHER UTILITIES -** There are multiple utilities such as traffic signals, MUNI OCS, street lights, and pedestrian crossing push buttons that will require relocation. Relocating utilities will require coordination with the respective agencies and may have considerable lead times.
- **ROW AND BALBOA PARK -** This work will impact approximately 0.05 acres of vegetated area at the corner of Balboa Park. Discussions with the Parks and Recreation Department should be held prior to any advancement of these concepts.
- **CALTRANS INTERACTIONS -** This improvement is situated within Caltrans ROW and may require preparation of Caltrans Project Initiation Document (PID). Typically, the PID used for this type of project could be a Permit Engineering Evaluation Report (PEER), Project Study Report (PSR), or a combined Project Study Report/Project Report (PSR/PR). Environmental analysis and documentation will need to be conducted, prepared, and approved prior to moving the project into the project development phase where plans, specifications, and estimates (PS&E) are developed. Coordination with Caltrans will be required for implementing the work, utility relocations within their ROW, and for addressing concerns with negative impacts to the freeway system.

2.2 | Alternative 1, Element 2: SB I-280 Ocean Ave Off-ramp Realignment

COMPONENT DESCRIPTION

Alternative 1, Element 2 proposes the permanent realignment of the SB I-280 Ocean Off-ramp to a T-intersection just west of the west abutment for the Ocean Avenue. The realigned ramp will be expanded to two lanes for approximately 380 feet before the intersection, with one lane each dedicated to right-only and left-only. The intersection is located west of the Ocean Avenue Bridge west abutment to avoid impacts to the bridge. The new intersection will add a 12-foot wide shared vehicle/bike lane and sidewalks to connect with the existing. A retaining wall will be constructed along the east side of the realigned ramp. A new traffic signal at this intersection will be required. Figure C3 illustrates the conceptual plan, profile and cross section for this improvement.

The realignment will be approximately 520 feet long. The ramp will shift easterly and rise at approximately 5% grade to tie-in with Ocean Avenue. There will be some restriping beyond the tie-in point at both ends of the new ramp. A new 200-foot long retaining wall will be required, as well as re-grading of the area near the ramp. The retaining wall will rise along with the ramp and be approximately 20 feet at its highest point near Ocean Avenue.

The existing SB I-280 Ocean Off-ramp will be removed assuming limited re-grading for erosion control. Along Ocean Avenue, the existing westbound bike lane crossing the overpass will change to a 12-foot wide shared vehicle/bike lane after crossing through the new intersection, tying into the existing shared lane 150 feet away. New sidewalk and crosswalk will be constructed to create a continuous pedestrian pathway from the Ocean Avenue/I-280 off-ramp intersection and City College.

The raised median in Ocean Avenue will need to be adjusted to match street level to permit the left turn from the realigned ramp onto Ocean Avenue. The median modification is approximately 80 feet long and is partially situated within the street, the bridge approach slab, and the Ocean Avenue Bridge.

COMPONENT FEASIBILITY

This improvement is feasible from an engineering standpoint and does not present any significant engineering challenges. The following are concerns identified at this stage that will require further investigation and evaluation.

- **UNDERGROUND UTILITES -** The City's GIS files indicate that there is an existing 24-inch sewer line running under I-280 about 100-feet south of the Ocean Avenue Overcrossing. This line should not be significantly impacted by the frontage road; however, this should be confirmed during advanced design stages.
- **AUXILIARY WATER SUYPPLY SYSTEM (AWSS) -** The Ocean Avenue Overcrossing BIRIS shows an AWSS line running within the Ocean Avenue Bridge. The modifications needed for this improvement should not impact this utility.
- **OTHER UTILITIES -** Existing Overhead Contact System (OCS) supports for MUNI and light poles will most likely need to be relocated as well as street lighting in along the north side of Ocean. Several utility cabinets are near the new Ocean Avenue/ SB I-280 off-ramp intersection, which may require relocations. There may be utilities under the raised median covers on Ocean Avenue Bridge that require modification to allow clearances for turns across the median.
- **RETAINING WALL FOUNDATIONS -** The existing geotechnical conditions need to be evaluated in more detail in advanced engineering design phases; however, it is assumed that a spread footing

"U-type" or "L-type" wall will be used along the frontage wall edges. Localized soil conditions could require the use of piles to support the retaining walls, which will result in an increased cost and longer construction schedule.

- **RESTORATION –** All design for restoration and re-vegetation of the former ramp areas will need to be coordinated with local drainage conditions to ensure that no ponding or other adverse drainage impacts are created.
- **RIGHT-OF WAY AND MAINTENANCE –** Most of the existing ramp area is currently within Caltrans ROW. There could be maintenance cost and ROW issues associated with the realignment of this ramp.
- **RAMP GEOMETRY AND CAPACITY –** The concept design presented demonstrates a feasible horizontal and vertical ramp re-alignment. The horizontal curvature is based on the HDM assuming an interpolated design speed from 50 mph at the nose to 25 mph at the ramp terminus, which is typical for this type of ramp. Lane widths and shoulder widths are also consistent with the HDM. Coordination with Caltrans will be required for advancing the work and staging the construction. The realigned ramp and lane layouts described here were used in the SimTraffic analyses (work performed by Fehr & Peers), which resulted in acceptable peak hour queue lengths and no significant impact on mainline operations on I-280. These changes will need to be reviewed and approved by Caltrans prior to advancement of the design beyond conceptual design.
- **OCEAN AVENUE BRIDGE MEDIAN MODIFICATION –** The median with MUNI tracks in the Ocean Avenue Bridge will require modifications to accommodate the new intersection with Ocean Avenue. From reviewing the Ocean Avenue Bridge BIRIS, the median is not integral with the bridge structure and should be modifiable. This will require coordination, review and approval from Caltrans.
- **MUNI TRACKS IN MEDIAN –** The MUNI tracks in the modified median will require adjustments to set them flush with the surface of Ocean Avenue Bridge in the vicinity of the frontage road intersection. This median work will likely require MUNI to be temporarily reconstructed on a detour in order to allow their operations to continue to function. Further discussions with MUNI would be needed to determine the impact.
- **CALTRANS INTERACTIONS –** This improvement is situated within Caltrans ROW and may require preparation of Caltrans Project Initiation Document (PID). Typically, the PID used for this type of project is a Project Study Report (PSR), or a combined Project Study Report/Project Report (PSR/PR). Environmental analysis and documentation will need to be conducted, prepared, and approved prior to moving the project into the project development phase where plans, specifications, and estimates (PS&E) are developed. Coordination with Caltrans will be required for implementing the work, utility relocations within their ROW, and for addressing concerns with negative impacts to the freeway system.

2.3 | Alternative 1, Element 3: Northbound Frontage Road

Alternative 1, Element 3 proposes a one-way NB Frontage Road connecting from Geneva Avenue to Ocean Avenue over the existing NB I-280 Geneva On-ramp. The proposed frontage road is 1 lane with a passenger loading and unloading zone near the Balboa Park Bart Station Plaza. This frontage road intersects Geneva Avenue at the existing intersection of the NB I-280 Geneva On-ramp and Geneva Avenue, and requires realigning the Westside Walkway. Figure C4 presents the plan, profile and cross section for this improvement.

2.3.1| NORTHBOUND FRONTAGE ROAD (GENEVA TO OCEAN AVE)

COMPONENT DESCRIPTION

The NB Frontage Road is an intermediate term improvement that proposes a one-lane, one-way frontage road from Geneva Avenue to Ocean Avenue in place of the closed NB I-280 Geneva Avenue on-ramp. The movements allowed at the intersection with Ocean Avenue are subject to further study. The frontage road is planned to be 20 feet wide to accommodate a 12-foot wide lane with four-foot buffers. The provision for a 20-foot wide road is also to allow for passing of broken-down vehicles. The Westside Walkway to the BART Station will be reconstructed adjacent to the frontage roadway. A retaining wall will run alongside the west side of the frontage road, vertically separating the roadway from NB I-280. A 110-foot long passenger loading area is proposed to be placed just north of the BART entrance plaza.

The frontage road will be similar to the horizontal and vertical alignment of the closed NB I-280 Geneva on-ramp starting from Geneva Ave. The lane to the loading area will separate from the two-lane roadway near the south side of the plaza, and will merge back before reaching Ocean Avenue.

Horizontally, the frontage road will be situated atop the closed ramp and will slightly encroach onto the existing vegetated slope adjacent to NB I-280. The roadway will curve easterly near the north side of the passenger loading area to meet Ocean Avenue. This forms a skewed intersection angle with Ocean Avenue to avoid impacting the bridge structure and to align with the NB I-280 on-ramp.

Vertically, the new frontage road will begin with similar gradients, at approximately 8.5%, as the closed NB I-280 Geneva on-ramp. This gradient is maintained until the south side of the plaza where the frontage will begin to flatten such that the passenger loading area can closely match the elevation of the plaza. The passenger area and the frontage will remain generally flat. The roadway will rise to meet Ocean Avenue at a grade of approximately 5%. A retaining wall will be constructed alongside the west edge of the frontage road. The wall will be approximately 550 feet in length, running the entire length of the frontage road, and will change in height from approximately 3 feet at Geneva Ave, to 7 feet near the passenger loading area, and to 22 feet at Ocean Avenue.

The Westside Walkway will need to be reconstructed to connect with the passenger loading area and to realign with the frontage road. The reconstructed walkway will be at least 10 feet wide and maintain a grade of 5% between the loading area and Ocean Avenue.

To allow for left turns from the frontage road onto Ocean Avenue, approximately 80 feet of the raised median on the Ocean Avenue Bridge will need to be modified and lower to street level. The median contains two sets of MUNI LRT tracks, which will be modified to be flush with street level along with the median.

COMPONENT FEASIBILITY

This improvement is feasible from an engineering standpoint and does not present any significant engineering challenges. The following are concerns identified at this stage that will require further investigation and evaluation.

- **UNDERGROUND UTILITES –** The City's GIS files indicates that there is an existing 24-inch and 36-inch sewer line in this vicinity. The 24-inch line is running under I-280 about 100-feet south of the Ocean Avenue Overcrossing. The 36-inch line is running between the Westside Walkway

and the Bart Station. These lines should not be significantly impacted by the frontage road; however, this should be confirmed during advanced design stages.

- **UNDERGROUND HIGH VOLTAGE LINE –** The Westside Walkway drawings indicates a relocated 12kv line running west of the walkway. The passenger loading area is proposed in this area and may impact this utility. The depth and precise location of this utility will need to be determined during advanced design stages to accurate assess impacts and needs for relocations.
- **OTHER UTILITIES –** There is a set of Verizon cell tower utilities adjacent to the entrance to the NB I-280 Geneva on-ramp. The frontage road should not impact these utilities. There are existing Overhead Contact System (OCS) supports for MUNI, light poles, utility cabinets, and signals at the intersections with Geneva and Ocean Ave. These utilities may need to be relocated. The utilities and lighting along the Westside Walkway will need to be removed.
- **RETAINING WALL FOUNDATIONS –** The existing geotechnical conditions need to be evaluated in more detail in advanced engineering design phases; however, it is assumed that a spread footing "U-type" or "L-type" wall will be used along the frontage road wall edges. Localized soil conditions could require the use of piles to support the retaining walls, which will result in an increased cost and longer construction schedule.
- **MATCHING TO PLAZA ELEVATION –** Based on the limited topographic information, the elevation difference between Geneva Avenue and the plaza is approximately 22 feet. The frontage road must descend from Geneva Avenue over 300 feet with vertical curve transitions between grade breaks. This results in a descending grade of 8.5% with short vertical curve transitions. This could be acceptable depending on the speed limit of this roadway. This may also be alleviated by slightly lifting the passenger loading area and using a gentle ramp down to the plaza. The concept design will support a posted speed of approximately 15 mph.
- **RIGHT-OF WAY AND MAINTENANCE –** The frontage road is largely situated within Caltrans ROW. There could be cost and jurisdictional issues associated with the design, design approval, and construction of the frontage road, especially with the areas adjacent to NB I-280. Measures such as additional fencing or other access control may be needed to keep these areas from becoming adversely impacted.
- **OCEAN AVENUE INTERSECTION, MEDIAN, AND MUNI LRT TRACKS -** The Ocean Avenue intersection with median and LRT tracks will be reconstructed to street level. This work will require MUNI to be temporarily reconstructed on a detour in order to allow their operations to continue to function. Further discussions with MUNI would be needed to determine the impact. There may be utilities under the raised median covers on Ocean Avenue Bridge that require modification to allow clearances for turns across the median.
- **GENEVA AVENUE INTERSECTION -** The frontage road will tie into Geneva Avenue at the existing intersection of the removed SB I-280 Geneva Off-ramp. Matching into this intersection with the frontage road should not present major challenges.
- **CALTRANS INTERACTIONS –** This improvement is situated within Caltrans ROW and may require preparation of Caltrans Project Initiation Document (PID). Typically, the PID used for this type of project is a Project Study Report (PSR), or a combined Project Study Report/Project Report (PSR/PR). Environmental analysis and documentation will need to be conducted, prepared, and approved prior to moving the project into the project development phase where plans, specifications, and estimates (PS&E) are developed. Coordination with Caltrans will be required for implementing the work, utility relocations within their ROW, and for addressing concerns with negative impacts to the freeway system.

2.4 | Alternative 1, Element 4 – Southbound Frontage Road

2.4.1| SOUTHBOUND FRONTAGE ROAD (OCEAN TO GENEVA AVE)

COMPONENT DESCRIPTION

The SB Frontage Road adjacent to Lick Wilmerding High School proposes a two-lane, one-way frontage road from Ocean Avenue to Geneva Avenue in place of the closed SB I-280 Geneva off-ramp. The roadway will have one left and one through-left-right lane at its intersection with Geneva Avenue. Lane widths are 12 feet with two-foot buffer to the barrier atop the retaining wall. The pedestrian pathway between the frontage and Lick Wilmerding High School will be reconstructed. Figure C1 presents the conceptual plan of this element and Figures C5 and C6 presents the conceptual plan, profile and cross section for this improvement.

The horizontal alignment of this frontage road will follow the closed SB I-280 Geneva Off-ramp. The vertical geometry will connect from Ocean Avenue to Geneva Avenue, which ascends in elevation by approximately 10 feet. This results in a gentle down slope of approximately four percent. A 480-foot long retaining wall will run alongside the east edge of the frontage road, vertically separating the frontage road from SB I-280. The height of the retaining wall is approximately 20 feet near Ocean Avenue and 21 feet near Geneva Avenue.

The frontage road will receive traffic from east and westbound Ocean Avenue, and the SB I-280 Ocean Off-ramp. The median of Ocean Avenue in the area of the intersection will need to be removed and adjusted to street level to permit left turn movements from westbound Ocean Avenue and through movement from the off-ramp onto the frontage road. The MUNI LRT tracks within the median will need to be adjusted to street level as well. The frontage road will tie into the existing intersection of the removed SB I-280 Geneva Off-ramp and Geneva Avenue.

To allow for left and through movements onto the frontage road from Ocean Avenue, approximately 120 feet of the raised median on the Ocean Avenue Bridge will need to be modified and lower to street level. The median contains two sets of MUNI LRT tracks, which will be modified to be flush with street level along with the median.

This improvement will likely require the reconstruction of the Ocean Avenue Bridge due to anticipated concerns from Caltrans regarding structural and seismic performance impacted by the closeness of the frontage road. Alternatives to replacing the bridge could be considered and studied; however, obtaining Caltrans approval for an unconventional design could require a long process with multiple structural analyses and reviews and with an uncertain outcome. Refer to Section 2.4.2 for the engineering feasibility discussion of the bridge replacement improvement.

The realignment of the SB I-280 Ocean Off-ramp presented in Alternative 1, Element 2 should be further realigned to the east such that its intersection with Ocean Avenue lines up with the frontage road. In Alternative 1, Element 2, this improvement is proposed to intersect Ocean Avenue to the west of the western Ocean Avenue Bridge abutment to avoid impacting the bridge. Refer to Section 2.4.3 for the engineering feasibility discussion of this further realignment.

There is an existing walkway that connects between the western Ocean Avenue Bridge abutment and Geneva Avenue. Portions of the walkway will be eliminated with the demolition of the bridge and construction of the frontage road. A new walkway will be constructed alongside the west edge of the frontage road. Options for keeping the southern portions of this walkway can be considered in future design phases.

COMPONENT FEASIBILITY

This improvement is feasible from an engineering standpoint and does not present any significant engineering challenges. The following are concerns identified at this stage that will require further investigation and evaluation.

- **UNDERGROUND UTILITIES -** The City's GIS files indicates that there is an existing 24-inch and an 18-inch sewer line in this vicinity. The 24-inch line is running under I-280 about 100-feet south of the Ocean Avenue Bridge. The 18-inch line is running in the SB I-280 Geneva Off-ramp area. These lines should not be significantly impacted by the frontage road; however, this should be confirmed during advanced design stages.
- **AUXILIARY WATER SUYPPLY SYSTEM (AWSS) -** The Ocean Avenue Overcrossing BIRIS shows an AWSS line running within the Ocean Avenue Bridge. The bridge replacement will require relocation of this utility.
- **OTHER UTILITIES -** There are existing Overhead Contact System (OCS) supports for MUNI, light poles, utility cabinets, and signals at the intersections with Geneva and Ocean Avenue. These utilities may need to be relocated.
- **RETAINING WALL FOUNDATIONS -** The existing geotechnical conditions need to be evaluated in more detail in advanced engineering design phases; however, it is assumed that a spread footing "U-type" or "L-type" wall will be used along the frontage road wall edges. Localized soil conditions could require the use of piles to support the retaining walls, which will result in an increased cost and longer construction schedule.
- **RECONSTRUCT OCEAN AVENUE OVERCROSSING -** The Ocean Avenue Bridge will likely require reconstruction to accommodate the Southbound Frontage Road. Replacing the bridge will require coordination and approval from Caltrans.
- **FURTHER REALIGN SB I-280 OCEAN OFF-RAMP -** This off-ramp should be reconstructed from its Alternative 1, Element 2 alignment to align vehicular movements with the SB Frontage Road.
- **RIGHT-OF-WAY AND MAINTENANCE -** The frontage road is situated within Caltrans ROW. There could be cost and jurisdictional issues associated with the design, design approval, and construction of the frontage road, especially with the areas adjacent to SB I-280. Measures such as additional fencing or other access control may be needed to keep these areas from becoming adversely impacted.
- **OCEAN AVENUE INTERSECTION, MEDIAN, AND MUNI LRT TRACKS -** The Ocean Avenue intersection with median and LRT tracks will be reconstructed to street level. This work will require MUNI to be temporarily reconstructed on a detour in order to allow their operations to continue to function. Further discussions with MUNI would be needed to determine the impact.
- **GENEVA AVENUE INTERSECTION -** The frontage road will tie into Geneva Avenue at the existing intersection of the removed SB I-280 Geneva Off-ramp. Matching into this intersection with the frontage road should not present major challenges.
- **CALTRANS INTERACTIONS -** This improvement is situated within Caltrans ROW and may require preparation of Caltrans Project Initiation Document (PID). Typically, the PID used for this type of project is a Project Study Report (PSR), or a combined Project Study Report/Project Report (PSR/PR). Environmental analysis and documentation will need to be conducted, prepared, and approved prior to moving the project into the project development phase where plans, specifications, and estimates (PS&E) are developed. Coordination with Caltrans will be

required for implementing the work, utility relocations within their ROW, and for addressing concerns with negative impacts to the freeway system.

2.4.2| OCEAN AVENUE BRIDGE REPLACEMENT

COMPONENT DESCRIPTION

The replacement bridge proposes to span I-280 with two spans rather than the existing four. The new bridge will be supported by abutments located outside of the northbound and southbound outside shoulders with center supports in median of I-280. Retaining walls will extend from behind the eastern abutment to the NB Frontage Road and the NB I-280 Ocean Avenue On-ramp.

The replacement bridge will need to be constructed at a higher elevation to provide for adequate vertical clearance between I-280 and the bridge soffit. The minimum vertical clearance required is 16 feet-6 inches. An alternative to elevating the bridge is to lower I-280. Raising the elevation and profile of the Ocean Avenue Bridge was explored as part of the engineering feasibility for this improvement. The alternative to lower I-280 was studied previously and estimated to be higher cost than bridge replacement and approach modifications. This should be studied further in future studies.

To elevate the Ocean Avenue bridge profile over I-280, the street elevation to the east of the bridge must also be modified and would start just east of the NB I-280 Ocean On-ramp intersection. At this location, the street grade is approximately 9%. The concept is to maintain this 9% grade to the edge of highway because this will allow the elevation of the street to climb higher in elevation. This configuration will add approximately 1.5 feet to the bridge elevation and compensate for the current insufficient vertical clearance. The existing vertical clearance at the eastern edge of I-280 mainline is 15 feet-4 inches per the Caltrans BIRIS.

The depth of the bridge structure is preliminary shown to be approximately 4 feet for spanning the mainline of I-280 with abutments at the edges of the mainline outside shoulders and a bent in the median. Therefore, this bridge will be shorter than the existing, because the existing ramps traveling under the existing Ocean Avenue Bridge will be eliminated by the NB and SB Frontage Roads. Considerations are also given to falsework requirements when constructing over a live freeway, which lead the concept to only consider precast bridge designs for eliminating the need for falsework.

The increase in street grade will require modification to the MUNI LRT tracks along Ocean Avenue and potentially, within the MUNI yard. The longer steep grade is operable for MUNI, but it is likely not preferable for operations and maintenance concerns. Further re-grading of Ocean Avenue from the on-ramp intersection down to San Jose Avenue can be considered in future design phases to help lower the length of maximum grades.

COMPONENT FEASIBILITY

This improvement is feasible from an engineering standpoint and does not present any significant engineering challenges other than the acceptance of the potential grades created by the final configuration with respect to ADA and LRT operations. The following are concerns identified at this stage that will require investigation and evaluation.

- **UNDERGROUND UTILITES –** The City's GIS files indicate that there is an existing 30-inch and 48-inch diameter sewer line within Ocean Avenue. The 30-inch is shown to be near the southern curb and the 48-inch is near northern curb. Based on the nature of the grading that would be involved in this work, this line should not be significantly impacted by these closure and

restoration activities. However, these potential impacts should be confirmed during advanced design stages. Approvals for utility relocations may require long lead time for their coordination and relocation.

- **AUXILIARY WATER SUYPPLY SYSTEM (AWSS) -** The Ocean Avenue Overcrossing BIRIS shows an AWSS line running within the Ocean Avenue Bridge. The bridge replacement will require relocation of this utility.
- **OTHER UTILITIES -** There are existing Overhead Contact System (OCS) supports for MUNI, light poles, utility cabinets, and signals at the intersections with Geneva and Ocean Avenue. These utilities may need to be relocated. There are other utilities within the bridge deck that may need to be replaced and temporarily relocated, including gas and domestic water.
- **INTERSECTION MODIFICATIONS -** The intersection at the east end of the bridge will be elevated with the bridge replacement. This will cause re-grading work for a portion of the NB Frontage Road and the NB I-280 Ocean On-ramp. The intersection on the west end of the bridge would receive minor re-grading, which could be completed with the SB Frontage Road and SB I-280 Ocean Off-ramp improvement works proposed in this element.
- **CALTRANS INTERACTIONS -** This improvement is situated within Caltrans ROW and may require preparation of Caltrans Project Initiation Document (PID). Typically, the PID used for this type of project is a Project Study Report (PSR), or a combined Project Study Report/Project Report (PSR/PR). Environmental analysis and documentation will need to be conducted, prepared, and approved prior to moving the project into the project development phase where plans, specifications, and estimates (PS&E) are developed. Coordination with Caltrans will be required for implementing the work, utility relocations within their ROW, and for addressing concerns with negative impacts to the freeway system and potential limitations on future widening of I-280.
- **MUNI LRT OPERATIONS -** Approvals or concurrence will likely be required from MUNI for imposing extend running grade of 9% on Ocean Avenue.
- **ADA LIMITATIONS -** The reconstruction of Ocean Avenue will place sidewalk grades at 9%, which may not be acceptable for ADA requirements.

2.4.3| SB I-280 OCEAN OFF-RAMP RALIGNMENT (FOR ALTERNATIVE 1, ELEMENT 4)

COMPONENT DESCRIPTION

For Alternative 1, Element 4, the SB I-280 Ocean Avenue Off-ramp realignment proposed in Alternative 1, Element 2, should be further re-aligned to the east to be in-line with the Southbound Frontage Road at their intersection on Ocean Avenue. This realignment is possible in this Element because the Ocean Avenue Bridge is required to be replaced. This further realignment will place the SB I-280 Ocean Avenue Off-ramp nearly on top of the existing SB I-280 Geneva Off-ramp, which will be removed as part of this element.

The lane configuration for the realignment in this element is identical to the one described for Alternative 1, Element 2. Two lanes are proposed for this off-ramp with one lane for right-only and one for through-left-only. Figures C5 and C6 present the conceptual plan, profile and cross section for this component.

COMPONENT FEASIBILITY

This improvement is feasible from an engineering standpoint and does not present any significant engineering challenges. Concerns requiring further investigations and evaluations are identical to those discussed in Section 2.2 for Alternative 1, Element 2.

2.5 | Alternative 2 – Consolidated Interchange on Geneva Avenue

2.5.1| NB I-280 OCEAN ON-RAMP AND SB I-280 OCEAN OFF-RAMP PERMANENT CLOSURES

COMPONENT DESCRIPTION

Alternative 2 proposes the permanent closure of the NB I-280 Ocean Avenue On-ramp and the SB I-280 Ocean Avenue Off-ramp. The ramp closures will require removing the existing ramp pavement, guardrail, and utilities associated with the ramps. Sidewalks will be extended across the closed ramp intersections creating a continuous path between Balboa Park and the City College of San Francisco. Some traffic signals may be modified for this improvement. Minor re-grading, without extensive re-vegetation, is assumed for erosion control.

COMPONENT FEASIBILITY

This improvement is feasible from an engineering standpoint and does not present any significant engineering challenges. Coordination with Caltrans will be required for implementing the work and for addressing concerns with negative impacts to the freeway system, in particular, at the freeway exits.

- **UNDERGROUND UTILITES –** The City's GIS files indicate that there is an existing 30-inch and 48-inch diameter sewer line within Ocean Avenue. The 30-inch is shown to be near the southern curb and the 48-inch is near northern curb. Based on the nature of the grading that would be involved in this work, this line should not be significantly impacted by these closure and restoration activities. However, these potential impacts should be confirmed during advanced design stages. Approvals for utility relocations may require long lead time for their coordination and relocation.
- **OTHER UTILITIES -** There are some utilities such as light poles and utility boxes associated with the ramp that may require removal. There are also utility cabinets at the intersections of the on- and off-ramp with Ocean Ave. These cabinets may need to be relocated with the ramp removal.
- **RESTORATION –** All design for restoration and re-vegetation will need to be coordinated with local drainage conditions to ensure that no ponding or other adverse drainage impacts are created.
- **RIGHT-OF WAY AND MAINTENANCE –** These ramp areas are within Caltrans ROW. There could be cost and jurisdictional issues associated with the closure of these ramps. Measures such as additional fencing or other access control might be needed to keep these areas from becoming adversely impacted.
- **MUNI OCS AND TRACKS –** The closure of these ramps should not negatively impact these MUNI facilities.

3 Cost Estimates

3.1 | Cost Estimate Summary

Table 3.1-1 summarizes the Rough Order of Magnitude (ROM) costs estimates for each of the major improvement works by alternative and element. The total estimated cost for each major improvement works, which is also the Total Expected Price, is presented along with a -20% Total Optimistic Price and +30% Total Pessimistic Price. The Optimistic and Pessimistic Price forms an accuracy range, typical for a level 5 estimate.

Table 3.1-1: Cost Estimate Summary of Alternatives

IMPROVEMENT WORKS LOCATION	ALTERNATIVE 1: SPLIT INTERCHANGE				ALTERNATIVE 2: CONSOLIDATED INTERCHANGE
	ELEMENT 1	ELEMENT 2	ELEMENT 3	ELEMENT 4	
NB I-280 Geneva On-ramp	Pilot Closure $ 81 K	-	Close & Remove $ 1,641 K	-	-
NB I-280 Ocean On-ramp	Right-Turn Pocket $ 2,373 K	-	-	-	Close & Remove $ 1,024 K
SB I-280 Geneva Off-ramp	-	-	-	Close & Remove $ 1,365 K	-
SB I-280 Ocean Off-ramp	-	T-Intersection $ 5,623 K	-	4-way Intersection $ 5,671 K	Close & Remove $ 2,064 K
Frontage Road	-	-	NB Frontage Road $ 8,483 K	SB Frontage Road $ 9,198 K	-
Ocean Ave Bridge	-	-	-	Replace Bridge $ 34,223 K	-
Total	$ 2,454 K	$ 5,623 K	$ 10,124 K	$ 50,456 K	$ 3,088 K
Total Optimistic Price -20%	$ 1,963 K	$ 4,498 K	$ 8,099 K	$ 40,365 K	$ 2,470 K
Total Expected Price	$ 2,454 K	$ 5,623 K	$ 10,124 K	$ 50,456 K	$ 3,088 K
Total Pessimistic Price +30%	$ 3,190 K	$ 7,309 K	$ 13,161 K	$ 65,593 K	$ 4,014 K

Breakdowns of the Total Expected Price for each of the improvement work are discussed in the subsequent sections.

3.2 | Alternative 1, Element 1: Geneva NB On-ramp Pilot Closure & Ocean Avenue to NB I-280 Right-Turn Pocket

Table 3.2-1 presents the Total Expected Price breakdown for improvements in Alternative 1, Element 1. The estimates are based on conceptual designs for this element, which are presented in Figure C2, and generally include the following elements of work:

- **CLOSE GENEVA NB ON-RAMP (PILOT) –** The cost estimate for the temporary closure includes K-rails, temporary signage and traffic management. Utility relocations, removal of the existing highway ramps, and reconstruction of street facilities are assumed to be excluded.
- **OCEAN AVENUE TO NB I-280 RIGHT-TURN POCKET** - The cost estimate for the right-turn pocket improvement include costs for demolition of the existing on-ramp with curb, gutter and sidewalk. Allowances for existing utility relocation or demolition are allocated as appropriate. New pavement and sidewalk were estimated, including retaining wall and new guardrail and fence.

Table 3.2-1: Alternative 1, Element 1 Total Expected Price Breakdown Summary

	DIRECT COST	TRAFFIC MANAGEMENT	MOBILIZATION	CONTINGENCY	TOTAL ESTIMATED JOB VALUE	SOFT COSTS	OWNER CONTINGENCY	TOTAL EXPECTED PRICE
		15%	10%	15%		30%	25%	
NB Geneva On-ramp Pilot Closure	$ 35 K	$ 5 K	$ 4 K	$ 7 K	$ 50 K	$ 15 K	$ 16 K	$ 81 K
Ocean to NB I-280 Right-Turn Pocket	$ 1,002 K	$ 150 K	$ 115 K	$ 190 K	$ 1,460 K	$ 438 K	$ 475 K	$ 2,373 K
Total	$ 1,036 K	$ 155 K	$ 119 K	$ 197 K	$ 1,510 K	$ 453 K	$ 491 K	$ 2,454 K

3.3 | Alternative 1, Element 2: SB I-280 Ocean Avenue Off-ramp Realignment

Table 3.3-1 summarizes the Total Expected Price breakdown for components in Alternative 1, Element 2. The estimates are based on conceptual designs for this element, which are presented in Figure C3, and generally include the following elements of work:

- **SB I-280 OCEAN AVENUE OFF-RAMP REALIGNMENT –** The cost estimate for this realignment include costs for demolition of existing pavement, curb, gutter, and sidewalk, and construction of the new, realigned ramp and traffic signal.

Table 3.3-1: Alternative 1, Element 2 Total Expected Price Breakdown Summary

	DIRECT COST	TRAFFIC MANAGEMENT	MOBILIZATION	CONTINGENCY	TOTAL ESTIMATED JOB VALUE	SOFT COSTS	OWNER CONTINGENCY	TOTAL EXPECTED PRICE
		15%	10%	15%		30%	25%	
SB I-280 Ocean Off-ramp	$ 2,381 K	$ 357 K	$ 274 K	$ 452 K	$ 3,460 K	$ 1,038 K	$ 1,125 K	$ 5,623 K
Total	$ 2,381 K	$ 357 K	$ 274 K	$ 452 K	$ 3,460 K	$ 1,038 K	$ 1,125 K	$ 5,623 K

3.4 | Alternative 1, Element 3: Northbound Frontage Road

Table 3.4-1 presents the Total Expected Price breakdown for improvements in Alternative 1, Element 1. The estimates are based on conceptual designs for this element, which are presented in Figure C4, and generally include the following elements of work:

- **NB FRONTAGE ROAD** – The cost estimate for this improvement includes construction of a frontage road between Geneva Avenue and Ocean Avenue with a passenger loading area and a reconstructed West Walkway. The frontage road construction includes a retaining wall along its western edge with barrier and fencing. Traffic signal modification work is included as well. The existing NB I-280 Geneva On-ramp will be permanently removed as part of this work. Portions of the Ocean Avenue median will be modified.
  - **NB I-280 GENEVA ON-RAMP REMOVAL -** Costs for removing this existing ramp include rough grading of the remaining demolished areas not reconstructed by the frontage road. Extensive landscaping is not included.
  - **OCEAN AVENUE MEDIAN AND MUNI TRACKS -** Costs for modifying the Ocean Avenue median and MUNI tracks on the east side of the Ocean Ave Bridge are included this element of work. However, costs related to temporary relocations of tracks as required to allow for MUNI's continuous operations are not included in the estimate. Further discussion with MUNI will be needed to determine exact costs associated with temporary operations based on final project sequencing.

Table 3.4-1: Alternative 1, Element 3 Total Expected Price Breakdown Summary

	DIRECT COST	TRAFFIC MANAGEMENT	MOBILIZATION	CONTINGENCY	TOTAL ESTIMATED JOB VALUE	SOFT COSTS	OWNER CONTINGENCY	TOTAL EXPECTED PRICE
		15%	10%	15%		30%	25%	
NB Geneva On-ramp Removal	$ 694 K	$ 104 K	$ 80 K	$ 132 K	$ 1,010 K	$ 303 K	$ 328 K	$ 1,641 K
NB Connector Road	$ 3,589 K	$ 538 K	$ 413 K	$ 681 K	$ 5,220 K	$ 1,566 K	$ 1,697 K	$ 8,483 K
Total	$ 4,283 K	$ 642 K	$ 493 K	$ 813 K	$ 6,230 K	$ 1,869 K	$ 2,025 K	$ 10,124 K

3.5 | Alternative 1, Element 4: Southbound Frontage Road

Table 3.5-1 presents the Total Expected Price breakdown for improvements in Alternative 1, Element 4. The estimates are based on conceptual designs for this element, which are presented in Figure C5 and Figure C6, and generally include the following elements of work:

- **SB FRONTAGE ROAD** – The cost estimate for this improvement includes construction on a frontage road from Ocean Avenue to Geneva Avenue west of SB I-280 and the reconstruction of a pathway along the west side of the frontage road. The frontage road will require a retaining wall along its eastern edge with barrier and fencing. Traffic signal modification work is included as well. The existing SB I-280 Geneva Off-ramp will be permanently removed as part of this work. Portions of the Ocean Avenue median will be modified.
  - **SB I-280 GENEVA ON-RAMP REMOVAL -** Costs for removing this existing ramp is included in the frontage road.
  - **OCEAN AVENUE MEDIAN AND MUNI TRACKS -** Costs for modifying the Ocean Avenue median and MUNI tracks on the west side of the Ocean Ave Bridge are included this element of work. However, costs related to temporary relocations of tracks as required to allow for MUNI's continuous operations are not included in the estimate. Further

discussion with MUNI will be needed to determine exact costs associated with temporary operations based on final project sequencing.

- **SB I-280 OCEAN AVENUE OFF-RAMP REALIGNMENT –** The cost estimate for this realignment include costs for demolishing the realigned ramp proposed in Alternative 1, Element 2, and reconstructing sidewalks and portions of Ocean Avenue.
- **OCEAN AVENUE BRIDGE REPLACEMENT –** The cost estimate for this bridge replacement includes demolition of the entire existing overcrossing structure, including deck, columns, abutments, walls and foundations. The new overcrossing will be constructed in place with a shorter overcrossing structure spanning north and southbound I-280. The estimate and quantities are based on the Caltrans Ocean Avenue Overcrossing BIRIS. Bridge replacement costs include MUNI track modifications, but exclude costs related to temporary track relocations required for MUNI's continuous operations. Further discussion with MUNI will be needed to determine exact costs associated with temporary operations based on final project sequencing

Table 3.5-1: Alternative 1, Element 4 Cost Breakdown Summary

	DIRECT COST	TRAFFIC MANAGEMENT	MOBILIZATION	CONTINGENCY	TOTAL ESTIMATED JOB VALUE	SOFT COSTS	OWNER CONTINGENCY	TOTAL EXPECTED PRICE
		15%	10%	15%		30%	25%	
SB Frontage Road	$ 3,894 K	$ 584 K	$ 448 K	$ 739 K	$ 5,660 K	$ 1,698 K	$ 1,840 K	$ 9,198 K
SB I-280 Geneva Off-ramp Removal	$ 574 K	$ 86 K	$ 66 K	$ 109 K	$ 840 K	$ 252 K	$ 273 K	$ 1,365 K
SB I-280 Ocean Off-ramp Realignment	$ 2,398 K	$ 360 K	$ 276 K	$ 455 K	$ 3,490 K	$ 1,047 K	$ 1,134 K	$ 5,671 K
Ocean Avenue Bridge Replacement	$ 14,480 K	$ 2,172 K	$ 1,665 K	$ 2,748 K	$ 21,060 K	$ 6,318 K	$ 6,845 K	$ 34,223 K
Total	$ 21,346 K	$ 3,202 K	$ 2,455 K	$ 4,050 K	$ 31,050 K	$ 9,315 K	$ 10,091 K	$ 50,456 K

3.6 | Alternative 2 – Consolidated Interchange on Geneva Avenue (Short Term)

Table 3.6-1 presents the Total Expected Price breakdown for improvements in Alternative 2. The estimates are based on conceptual designs for this element, which generally include the following elements of work:

- **NB I-280 AND SB I-280 OCEAN ON- AND OFF-RAMP PERMANENT CLOSURES –** The cost estimate includes demolition work, limited landscaping and erosion prevention, permanent signage and utility relocation, and guard rail and fence limiting access to I-280.

Table 3.6-1: Alternative 2 Cost Breakdown Summary

	DIRECT COST	TRAFFIC MANAGEMENT	MOBILIZATION	CONTINGENCY	TOTAL ESTIMATED JOB VALUE	SOFT COSTS	OWNER CONTINGENCY	TOTAL EXPECTED PRICE
		8%	10%	15%		30%	25%	
NB I-280 Ocean On-ramp	$ 431 K	$ 65 K	$ 50 K	$ 82 K	$ 630 K	$ 189 K	$ 205 K	$ 1,024 K
SB I-280 Ocean Off-ramp	$ 876 K	$ 131 K	$ 101 K	$ 166 K	$ 1,270 K	$ 381 K	$ 413 K	$ 2,064 K
Total	$ 1,306 K	$ 196 K	$ 150 K	$ 248 K	$ 1,900 K	$ 570 K	$ 618 K	$ 3,088 K

LIST OF FIGURES

Figure C1 - Alternative 1, Element 4: Southbound Frontage Road

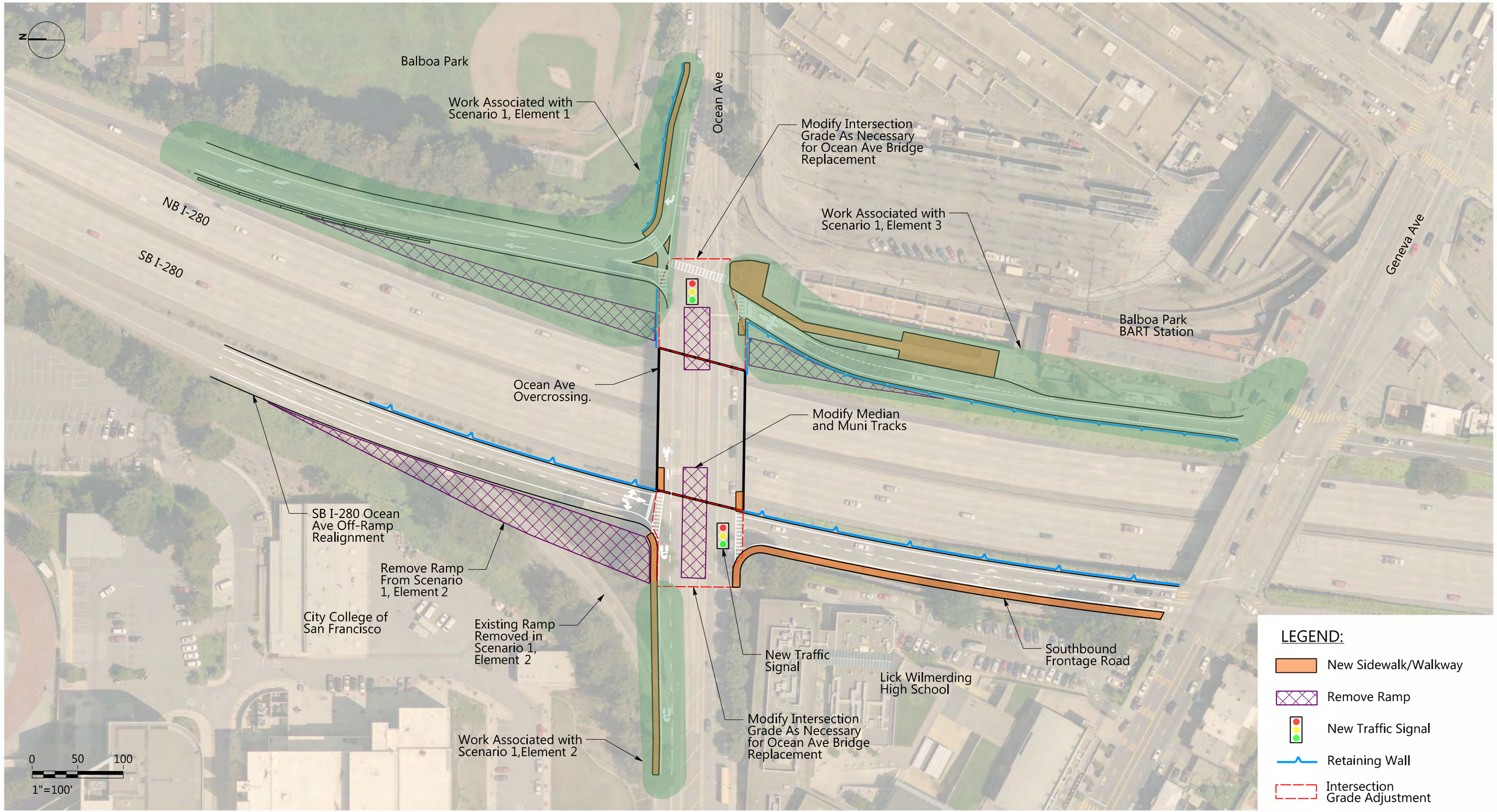
Figure C2 - Plan and Cross Section – Ocean Avenue to Northbound I-280 Right-turn Pocket for Alternative 1, Element 1

Figure C3 - Plan, Profile and Cross Section – Southbound I-280 Ocean Avenue Off-ramp Realignment for Alternative 1, Element 2

Figure C4 - Plan, Profile and Cross Section – Northbound Frontage Road for Alternative 1, Element 3

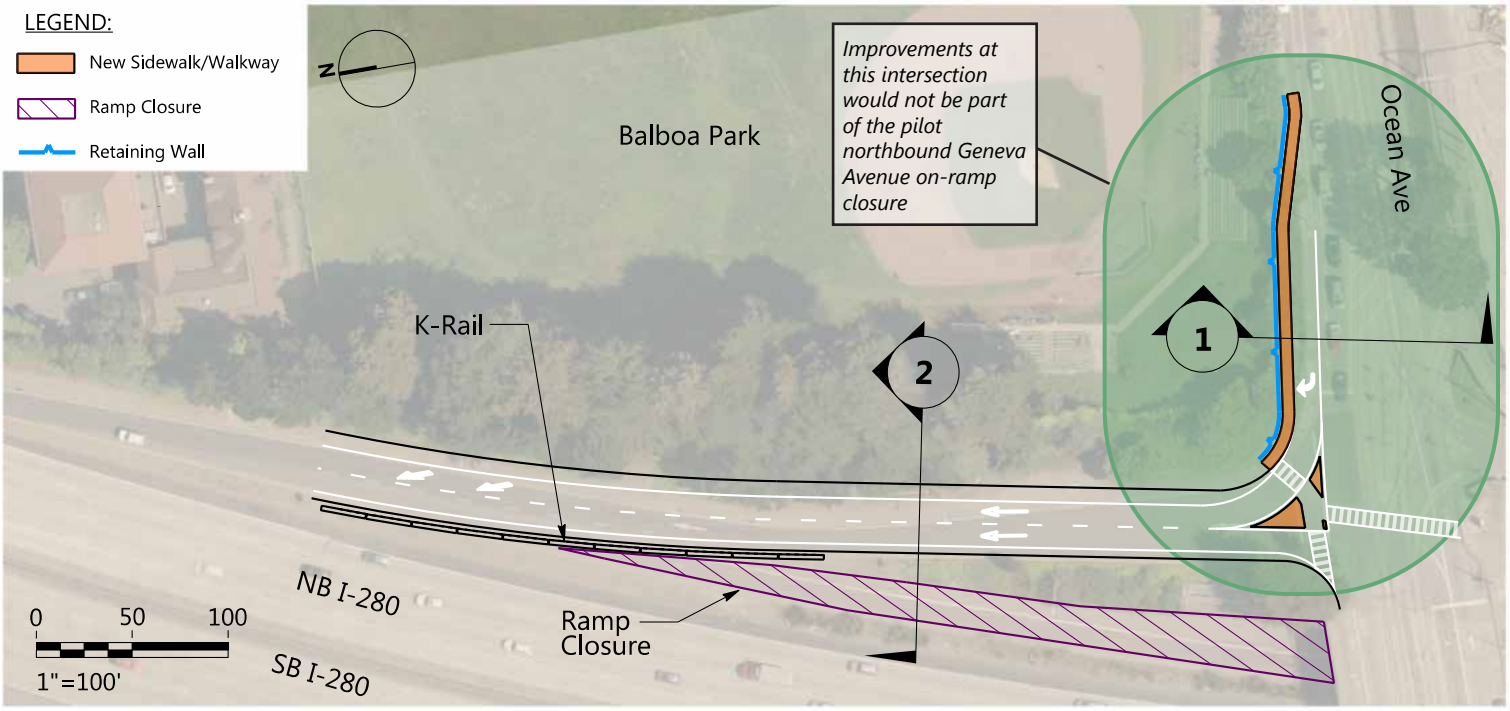
Figure C5 - Plan, Profile and Cross Section – Southbound Frontage Road for Alternative 1, Element 4

Figure C6 - Plan, Profile and Cross Section – Southbound I-280 Ocean Avenue Off-ramp Realignment for Alternative 1, Element 4

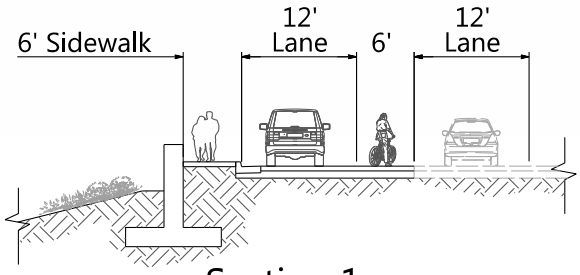


SCENARIO 1, ELEMENT 4:
SOUTHBOUND FRONTAGE ROAD

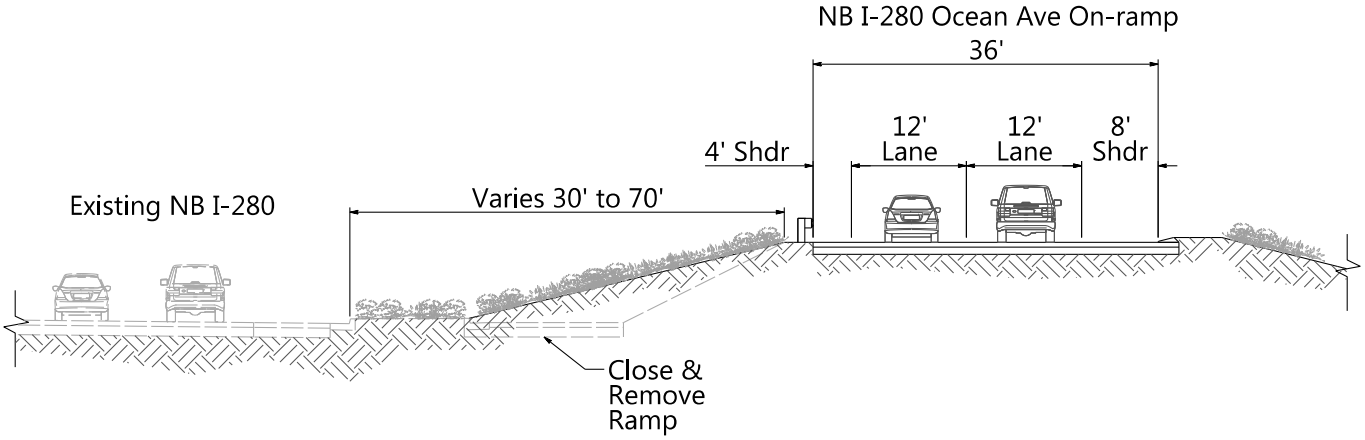
FIGURE C1



Ocean Ave to NB I-280 Turn Pocket



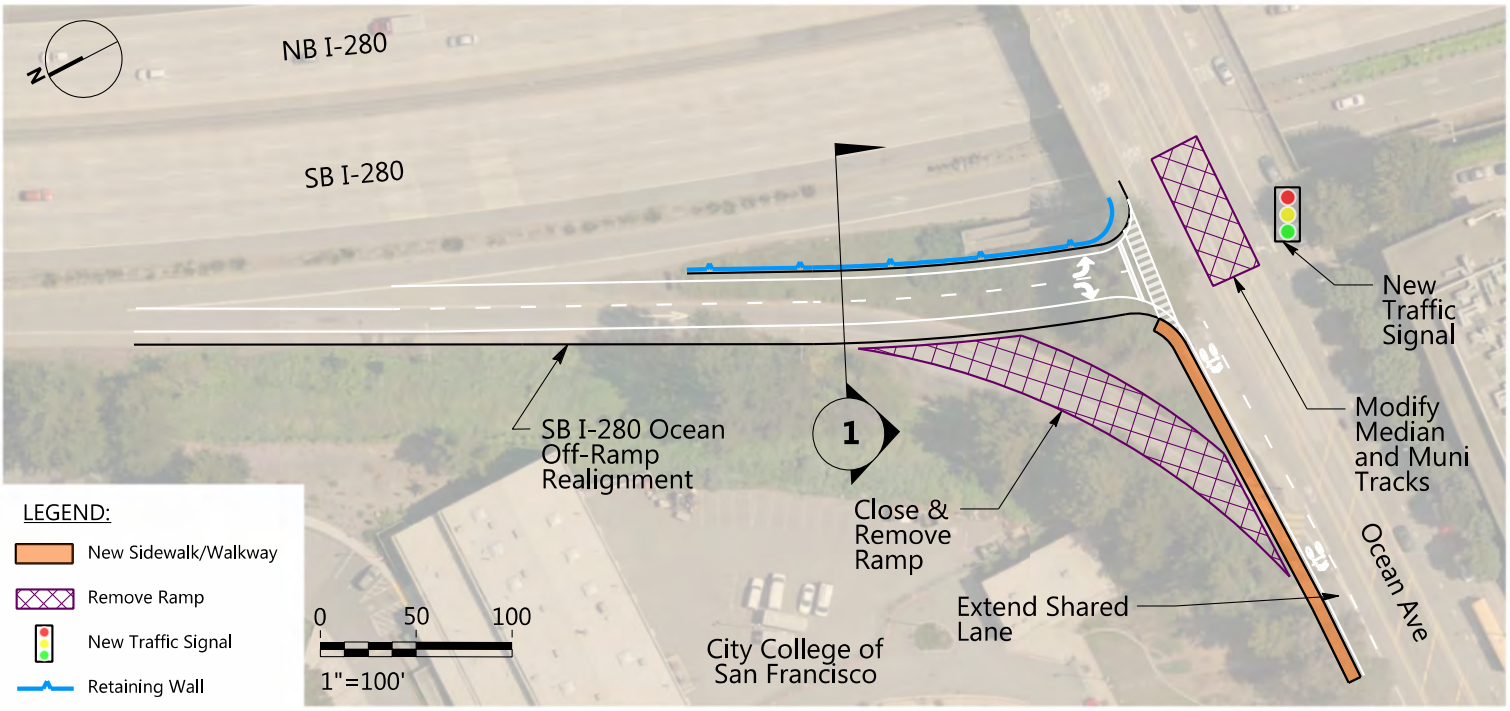
Section 1

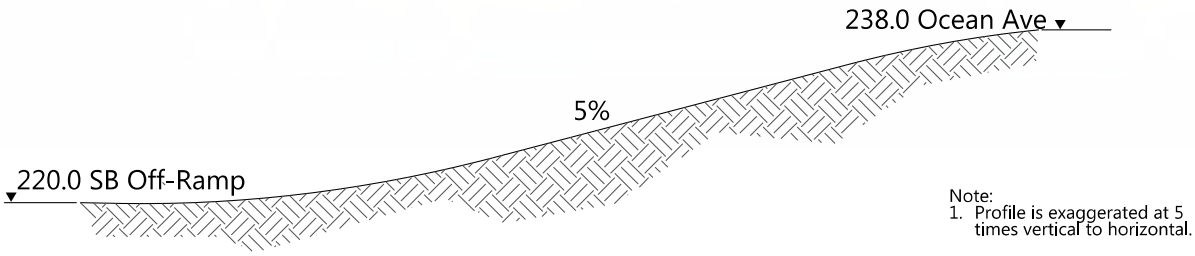


Section 2

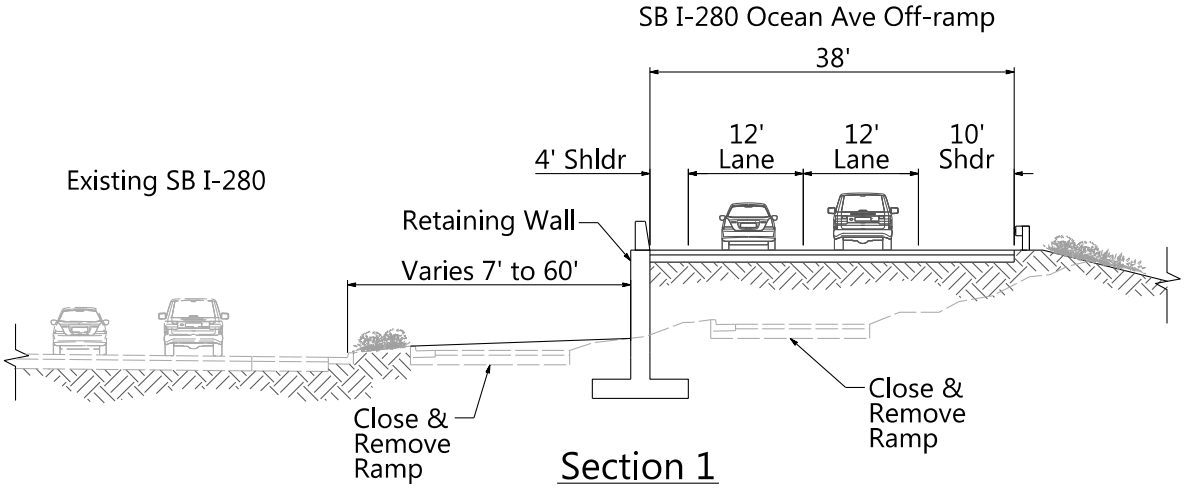
PLAN & CROSS-SECTION: OCEAN AVE TO NORTHBOUND I-280 RIGHT-TURN POCKET FOR SCENARIO 1, ELEMENT 1

FIGURE C2





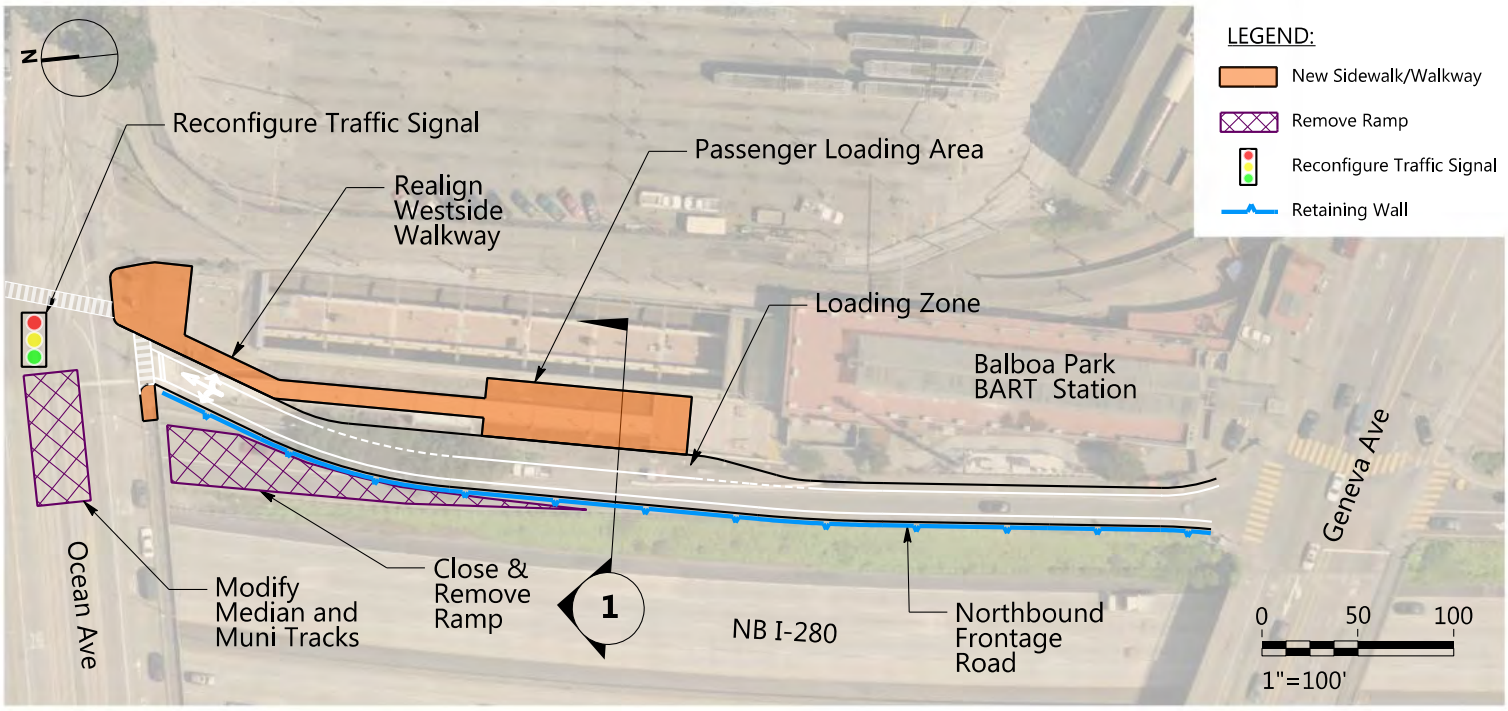
Realigned Ocean Ave Off-Ramp Profile

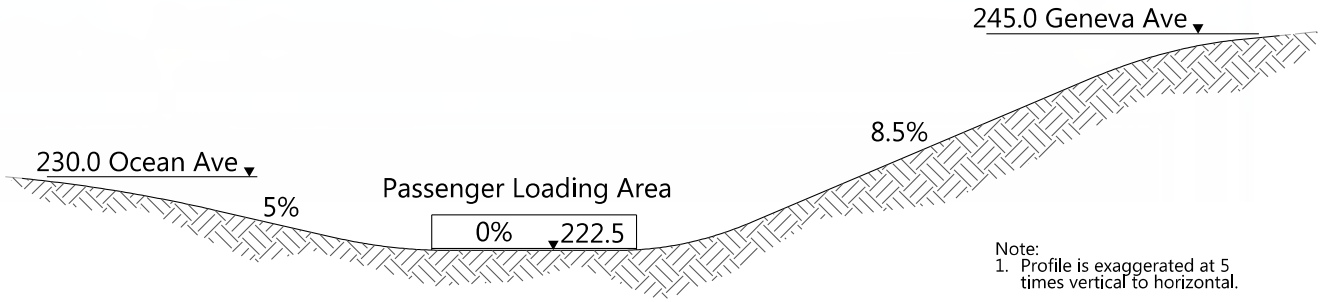


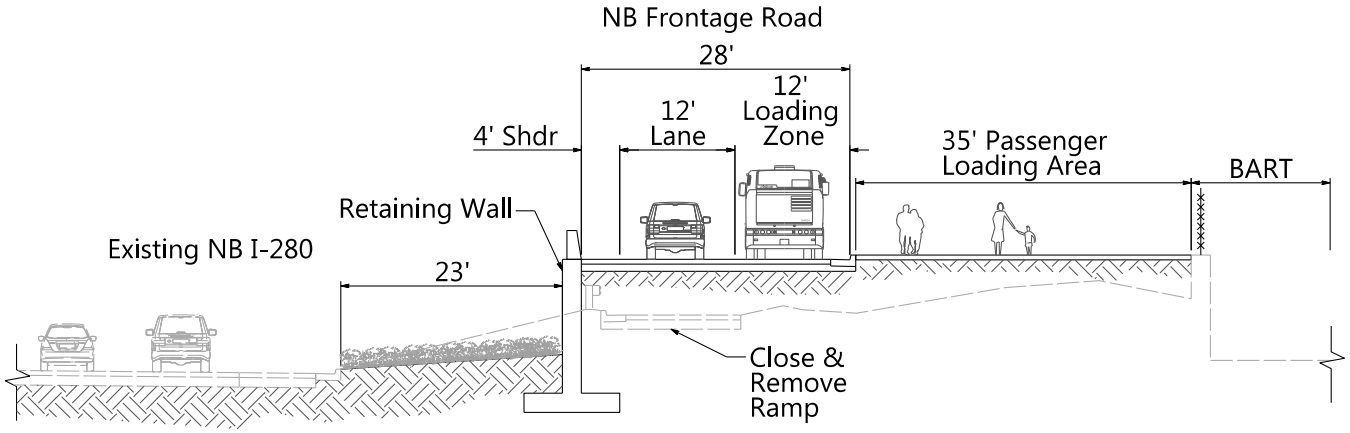
Section 1

PLAN, PROFILE, & CROSS-SECTION: SOUTHBOUND I-280 OCEAN AVE OFF-RAMP REALIGNMENT FOR SCENARIO 1, ELEMENT 2

FIGURE C3



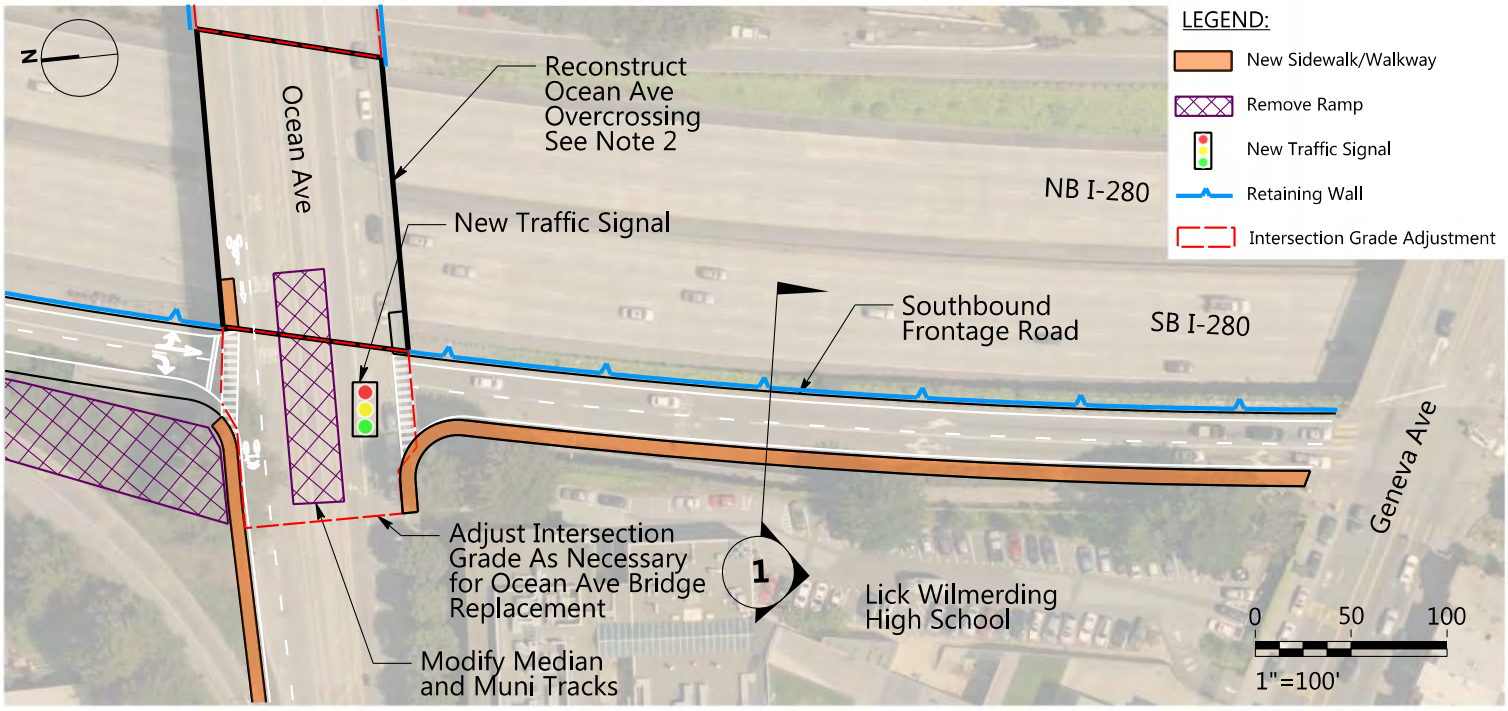


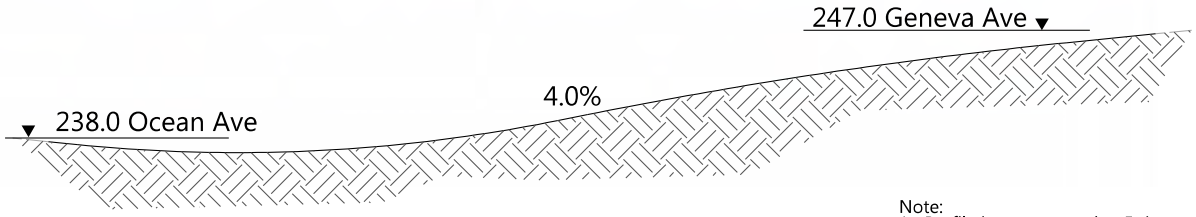


Section 1

PLAN, PROFILE, & CROSS-SECTION: NORTHBOUND FRONTAGE ROAD FOR SCENARIO 1, ELEMENT 3

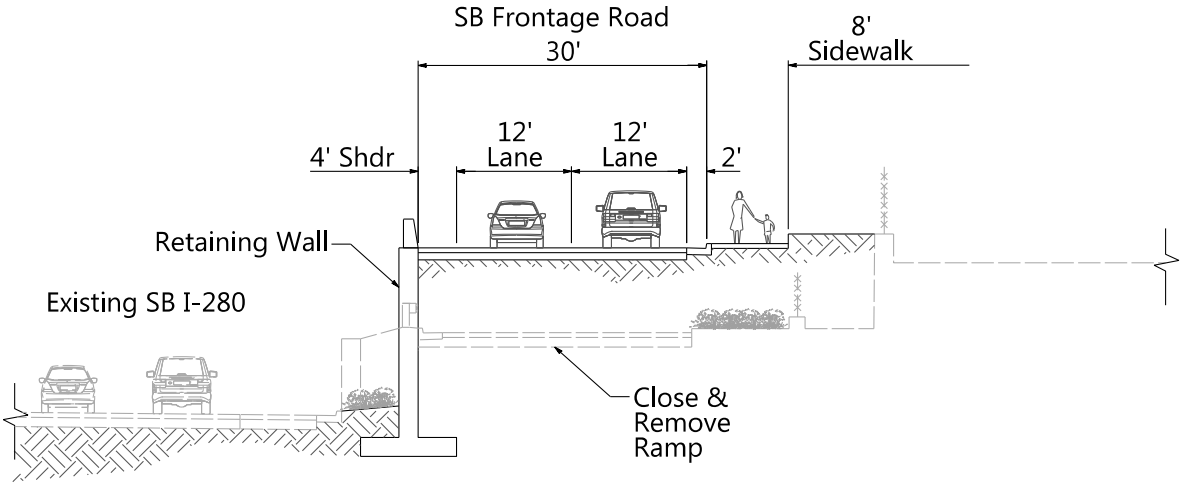
FIGURE C4





Note:
1. Profile is exaggerated at 5 times vertical to horizontal.
2. Ocean Ave bridge reconstruction and associated retaining walls are only required in conjunction with Southbound Connector Road.

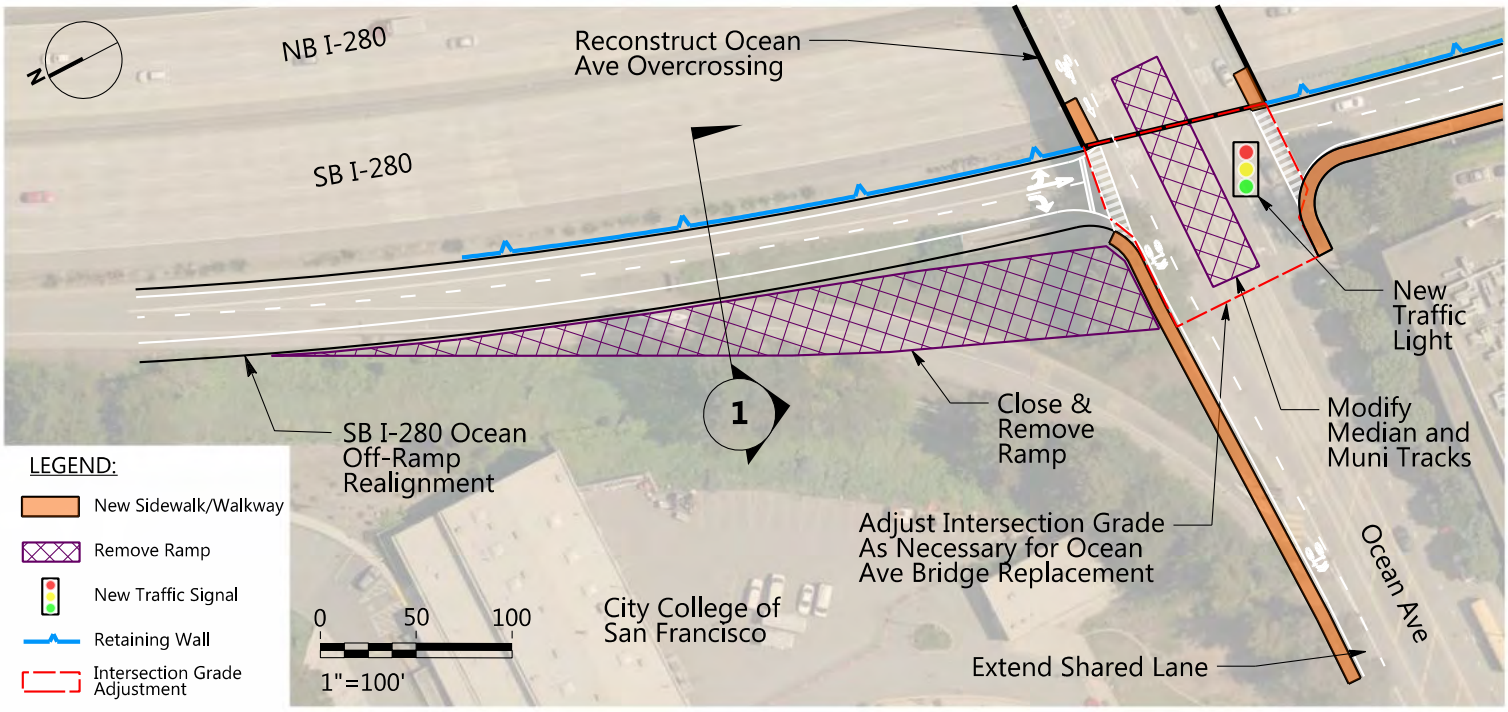
Southbound Frontage Road Profile

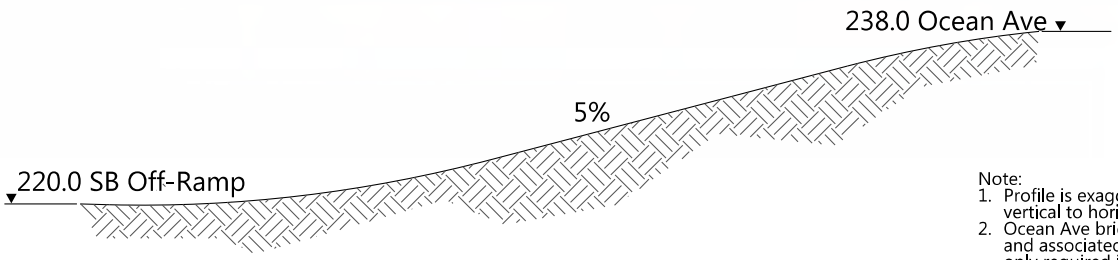


Section 1

PLAN, PROFILE, & CROSS-SECTION: SOUTHBOUND FRONTAGE ROAD FOR SCENARIO 1, ELEMENT 4

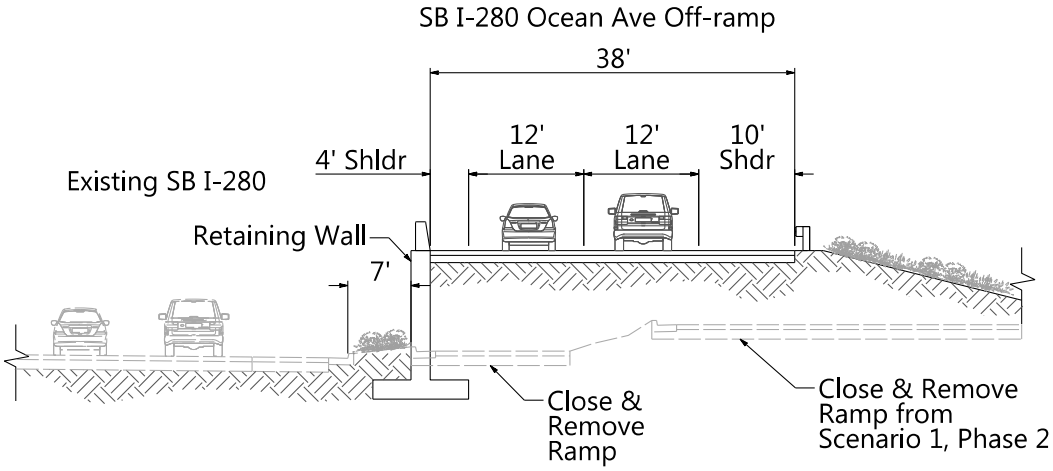
FIGURE C5





Realigned Ocean Ave Off-Ramp Profile

Note:
1. Profile is exaggerated at 5 times vertical to horizontal.
2. Ocean Ave bridge reconstruction and associated retaining walls are only required in conjunction with Southbound Connector Road.



Section 1

PLAN, PROFILE, & CROSS-SECTION: SOUTHBOUND I-280 OCEAN AVE OFF-RAMP REALIGNMENT FOR SCENARIO 1, ELEMENT4

FIGURE C6

APPENDIX D:

ROUND 1 OUTREACH SUMMARY REPORT

DESCRIPTION

This appendix contains a summary of the first community meeting for the project, which was held at City College of San Francisco's Phelan campus on September 30, 2013. It includes a summary of outreach activities and public comments received during the meeting.

Balboa Park Circulation Study

Round 1 Outreach Summary Report

September 2013

Prepared by: Circlepoint

This document is a summary of public outreach conducted for the September 30, 2013 community meeting. The report includes a summary of outreach activities and public comments received during the first community meeting for the project.

I. Background

The Balboa Park BART/Muni Station is one of the busiest intermodal transit facilities in the region. As the major hub for the southern part of San Francisco, the station serves more than 24,000 passengers daily with its four BART lines, multiple major local bus routes, and three light rail transit (LRT) lines. But access to the station, particularly for non-auto modes, is complicated by tightly squeezed station functions and its location adjacent to the I-280 Geneva-Ocean Avenue interchange system, whose multiple on- and off-ramps deliver heavy auto traffic to the station and its surrounding neighborhoods, causing multimodal conflicts with transit and pedestrians.

The Balboa Park BART Circulation Study focuses on potential modifications to the Balboa Park Station and adjacent I-280 interchanges at Geneva Avenue and Ocean Avenue. The main goals of the Study are to:

- Reduce multimodal conflicts (vehicles, transit, pedestrians) at the I-280 freeway ramps while not substantially degrading vehicle operations in the area, including the I-280 freeway mainline
- Provide safe, accessible, and convenient connections for pedestrians, bicycle, and intermodal travelers
- Develop cost-effective solutions that support the community values and goals, without substantial construction-related impacts, that can be implemented in 2–10 years

Three conceptual alternatives are currently being considered to accomplish the Study's goals:

- Alternative 1A: Balanced Traffic Network without Frontage Roads
- Alternative 1B: Balanced Traffic Network with Frontage Roads
- Alternative 2: Interchange Consolidation at Geneva Avenue

II. Public Outreach Activities Report

A. Meeting Purpose/Objective

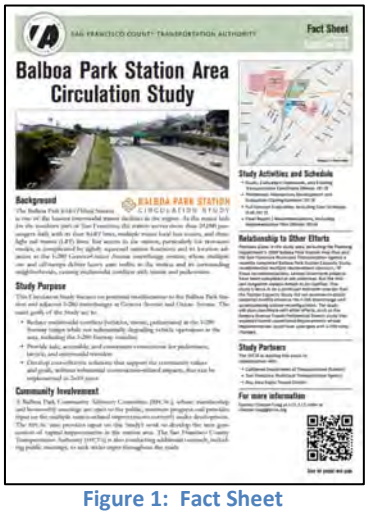
- Present preliminary findings of the Circulation Study
- Demonstrate how the Study will address community values and issues raised during previous studies as they relate to auto operations at or near the station
- Build understanding of feasible concepts and introduce trade-offs and constraints of circulation options
- Provide explanation of implementation process and how to follow and provide feedback on the Study
- Solicit community feedback on circulation options and incorporate into next phase

B. Desired Input from the Public

- Identify community goals and issues to address in the Study
- Identify the community's priorities for improving the circulation of the station and their priorities evaluating the three options
- Gather public comments on Study products, including community preferred circulation options and preferred Kiss & Ride locations

C. Outreach and Noticing

The team conducted the following outreach and noticing activities to promote the community meeting as well as the overall project:


Fact Sheet

Balboa Park Station Area Circulation Study

Background

Study Purpose

Community Involvement

Study Activities and Schedule

Relationship to Other Efforts

Study Partners

For more information

Figure 1: Fact Sheet

- Posted announcements and updates on the Balboa Park Station Area Circulation Study website: www.sfcta.org/balboa
- Emailed invitation to San Francisco County Transportation Authority's Balboa Park email group, which included community groups and local stakeholders, on the following dates (see Appendix A):
  - 9/12/13
  - 9/18/13
  - 9/26/13
- Outreach to partners/stakeholders who committed to forward the above email blast notification to their email lists
- Reached out to over 30 community based organizations to inform them about the community meeting time and date:

  - Balboa High School and PTSA
  - Bernal Heights Neighborhood Center
  - BPCAC
  - Cayuga Improvement Assoc.
  - Center for Arts Education
  - City College of San Francisco
  - Civic Center Secondary School
  - Coleman Advocates for Children and Youth
  - Communities United for Health and Justice (CUHJ)
  - District 11 Council
  - District 7 Council
  - Excelsior Action Group (EAG)
  - Excelsior District Improvement Association (EDIA)
  - Excelsior Planning Collaborative
  - Filipino Community Center (FCC)
  - Friends of Balboa Playground
  - Geneva Car and Barn Power House
  - Glen Park Association
  - James Denman Middle School and PTSA
  - Lick Wilmerding High School
  - Miraloma Park Improvement Club
  - New Mission Terrace Improvement Association
  - Ocean Avenue Association
  - OMI Community Collaborative (OMI CC)
  - OMI Neighbors in Action (OMI-NIA)
  - OMI/Excelsior Beacon Center
  - Outer Mission Merchants and Residents Association (OMMRA)
  - People Organizing to Demand Environmental & Economic Rights (PODER)
  - Rebuilding Together
  - Rec and Park
  - Riordan High School
  - Seventh Day Adventist Elementary School

- Distributed 500 meeting announcement flyers to the Balboa Park Station area's surrounding businesses, grocery stores/corner markets, libraries, schools, community centers, gathering places, and transit shelters (see Appendix B)
- Displayed Muni bus banner ads on the 8X, 8BX, 29, 43, 49, and 54 lines to promote the project and notify about the meeting (see Appendix C)
- Sent a mailer notification to all addresses within a 300-foot radius of the primary project area (mailer notification same as flyer)

- ❖ Distributed a media advisory to various media outlets in advance of the meeting

D. Community Outreach

As part of the outreach in advance of the meeting, the Project Team met with several key stakeholders and elected officials:

- District 7 Supervisor Norman Yee on 9/11/13
- District 11 Supervisor John Avalos on 9/13/13
- District 11 Council on 9/14/13
- Balboa Park Community Advisory Committee on 9/11/13

E. Public Community Meeting

The first public community meeting for the Balboa Park Station Circulation Study was held in the Mult-Use Building, Room 140, on City College of San Francisco's Phelan campus on September 30, 2013 from 6:00 to 8:00 p.m. Upon arrival, attendees were given an agenda, a project fact sheet, and a comment card. Before the presentation, a short open house provided attendees with an opportunity to review several project exhibits, speak with the project team, and discuss the SFMTA's current projects in the Balboa Park area with SFMTA staff. The presentation, given by the consultant Project Manager Camille Tsao of HNTB, reviewed the project purpose and goals, gave an overview of project alternatives, and described the breakout exercise to follow the presentation. A brief question and answer period was also provided.

Following the presentation, attendees split up into small breakout groups of approximately five to six people at stations set up around the room. All stations were identical with large maps of the three project alternatives. A project team member led each group through the alternatives, answered questions, and gathered input.

The attendees were encouraged to ask questions, provide comments, and post their comments and ideas directly to the maps. Following the group breakout sessions, all attendees reconvened as a large group for a recap of each discussion. The meeting concluded with a brief discussion of the project next steps, where to submit comments, and how to follow the project's progress.

A total of 29 attendees signed in at the meeting. Attendees turned in seven comment cards at the community meeting and an additional seven comment cards were submitted by mail or online between the community meeting and October 7.

F. Media Coverage

Following the meeting, Streetsblog SF ran a story on October 3 of the three Balboa Park project alternatives. The article was largely factual in nature, and provided several quotes from SFCTA's Chester Fung and a member of Balboa Park Community Advisory Committee. The article discussed the three alternatives, including maps of the proposed changes.

III. Summary of Comments

Comments were gathered at the meeting through informal discussions, breakout groups, notes written on alternative maps and comment cards. Copies of the comment cards submitted at the meeting can be found in the appendix. Below is a summary of issues and concerns raised in the comments received to date (note: An asterisk * indicates comment was made by more than participant and/or breakout group.

A double asterisk ** indicates that the same comment was frequently mentioned by participants and/or breakout groups):

General Comments:

- Kiss-n-Ride is currently not at a good location with limited signage**
- Many Kiss-n-Ride users are being dropped off around Geneva Avenue, Delano Street, and San Jose Avenue instead of at the Kiss-n-Ride location
- Area is not bicycle friendly**
- Improving transit and pedestrian access around BART should be a major focus*
- Area is difficult for drivers with many transit riders/pedestrians in area
- Desire for pedestrian improvements along Geneva Avenue or San Jose Street
- Existing Geneva Avenue/Interstate 280 configuration is a problem
- Need more data on who uses the Kiss-n-Ride area, where people are going, and what routes and services are most used*
- Phelan Avenue usually very congested with traffic
- Need transit only lanes*
- Need more pedestrian crossings and lighting on Ocean Avenue
- Many local residents walk to BART from the northeast of the station
- Pedestrian use of south side of Ocean Avenue is heavy, in comparison to north side
- Parking spaces (~7) near BART along San Jose Avenue are unregulated
- Would like a flashing red light to help pedestrian cross Ocean Avenue at on-ramp

<u>Alternative 1A:</u>

General Comments:

- Closing ramps will lead to additional traffic and congestion in neighborhood**
- Plan will increase traffic on Ocean
- Does not address Ocean Avenue*
- Remove traffic on Ocean Avenue
- Concern that existing traffic on Geneva Avenue will instead shift to Ocean Avenue*
- Agree highest congestion is on Geneva Avenue
- Closing Geneva Avenue off-ramp could increase gridlock, especially during morning commute hours; Plan doesn't address traffic on Geneva Avenue
- Maintains access and removes redundancy
- Alternative will be a big improvement
- Looks like option with least impact that closes on/off ramps to more traffic
- Turn parking at the station to Kiss-n-Ride (what does this mean?)
- People already travel both ways on Howth Street
- Prefer to start as a pilot*
- Seems less costly

Off Ramp/T-intersection:

- Would prefer signal instead of free right so that cars can switch lanes
- Hard merge is a major safety issue at Ocean Avenue and 280 – like the T for off-ramp
- Signal at Ocean Avenue would cause backup on the freeway*
- Option with least impact that closes on/off-ramps to more traffic

- Closing ramps lead to additional traffic in neighborhood*
- Removing ramps would force people to use alternate ramps and create more pedestrian-friendly area

Bike/Pedestrian:

- Removing ramps would force people to use alternate ramps and would create a better area for pedestrians
- This plan would improve bike and pedestrian movement
- Focus is on pedestrian accessibility
- Most readily addresses the needs of transit and pedestrian accessibility because removes excessive vehicular traffic off of Geneva Avenue

Alternative 1B:

General Comments:

- Offers potential to transition from Alternative 1A to 1B*
- Probably the best alternative, long term solution*
- Preferred alternative – allows better car flow
- Keeps traffic off neighborhood streets
- Can get people to stop dropping people off at ramps and improves circulation around station
- Does not properly address pedestrian safety and accessibility issues
- Eliminates a dangerous off-ramp at southbound 280 to Ocean Avenue
- Provides a circulatory pattern for traffic that restricts it to an existing car-heavy area
- Move a lot of congestion away from the ramps and pedestrian areas on Geneva

Frontage Road:

- Frontage road would be useful, especially for Lick Wilmerding High School*
- Eastside frontage road would still function as an off ramp
- Frontage road with Kiss-n-Ride would give safe place to drop off versus dropping off at off ramps
- Allowing freeway entrance from frontage roads to Ocean Avenue may be a challenge
- Frontage road to southbound ramp would improve traffic and safety on Geneva Avenue
- New frontage road means more drop off area and increased circulation
- Time the lights for all cars to clear the frontage roads
- Include wide sidewalks along frontage road
- Task would be to make sure the frontage road doesn't become a local road

Bike/Pedestrian:

- Alternative is too auto-focused and not bicycle/pedestrian friendly*
- Concern about bike/pedestrian safety along frontage road*

Alternative 2:

General Comments:

- Option will make the area worse, concerns for alternative*
- Eliminating on and off ramps doesn't eliminate traffic from the area but shifts it to other streets**

- Traffic will be routed through neighborhood*
- Make Howth Street a two-way street
- Would create long area for cars to queue up from ramps
- Geneva Avenue is a short ramp and would make existing scenario much worse
- Ocean Ave would not be able to handle all traffic
- Improves Ocean as a multi-modal corridor
- More traffic will become focused on Geneva
- Does not solve the Kiss-n-Ride problem

Transit:

- Too many Muni lines running on Geneva
- Move transit to Ocean so Geneva is only for vehicles and pedestrians
- Eliminating on and off ramps on Ocean will improve transit times because there would be no delay due to cars
- Take Muni off Geneva from San Jose Street to Phelan Avenue and allow cars to use whole street
- Focus car traffic on one road and perhaps bus on another
- Likes idea of focusing traffic on Geneva, as long as there is a transit only lane

Bike/Pedestrian:

- Does not address pedestrian safety and accessibility issues
- Create pedestrian plaza on Geneva and San Jose and move transit to Ocean
- Provides for a safer environment for bicyclists

Miscellaneous:

- Muni 49 has to fight traffic to get back to Phelan Avenue
- Balboa Park BART station's use as a transfer station for the SFO BART train needs to be considered for luggage reasons
- Long walk from current BART entrance to Balboa Park/Ocean Avenue area
- Create a pedestrian plaza at Geneva and San Jose extending to BART station
- Allow pedestrians to enter BART station near the Muni light rail area rather than by the freeway
- No signage on the south side for BART
- More data on pedestrian safety in the area would be helpful
- Request to put bicycle signage at Phelan Avenue, Geneva Avenue, and Ocean Avenue**
- General sidewalk concerns
- Convert the empty lot on Geneva Avenue, west of San Jose Street into a dog park
- Transform the Balboa Park BART station from an industrial exterior to one that is cleaner and newer
- Empty Muni lot is not a good location for local affordable housing
- Cayuga Improvement Association opposes the proposal to install a traffic light on the corner of Cayuga Avenue and Geneva Avenue due to potential traffic backups and safety issues

IV. Next Steps

SFCTA has posted project information, including the exhibits, handouts, comment card/survey and the presentation on the SFCTA project website at [www.sfcta.org/balboa]. The project team will review

comments submitted and consider public input to help refine the preliminary alternative concepts. Additional technical information will be gathered over the next few months, including vehicle-related impacts in the project area, transit operations, pedestrian connectivity and safety, and any potential implementation issue. There may be additional technical studies conducted to explore recommendations made by the public. An update will be provided to the Balboa CAC in November and a second community meeting is anticipated in January 2014.

Appendix: [Available upon request]

Appendix A: Email Notification
Appendix B: Meeting Flyer/Mailer
Appendix C: Meeting Bus Advertisement
Appendix D: Three Project Alternatives Maps
Appendix E: Additional Project Maps Presented at Meeting
Appendix F: Project Fact Sheet
Appendix G: Meeting Presentation
Appendix H: Meeting Sign-In Sheets
Appendix I: Meeting Comment Cards
Appendix J: Media Article

APPENDIX E:

ROUND 2 OUTREACH SUMMARY REPORT

DESCRIPTION

This appendix contains a summary of the second community meeting for the project, which was held at City College of San Francisco's Phelan campus on January 30, 2014. It includes a summary of outreach activities and public comments received during the meeting.

Balboa Park Circulation Study

Round 2 Outreach Summary Report

January 2014

Prepared by: Circlepoint

This document is a summary of public outreach conducted for the January 30, 2014 community meeting. The report includes a summary of outreach activities and public comments received at the second community meeting for the project.

I. Background

The Balboa Park BART/Muni Station is one of the busiest intermodal transit facilities in the region. As the major hub for the southern part of San Francisco, the station serves more than 24,000 passengers daily with its four BART lines, multiple major local bus routes, and three light rail transit (LRT) lines. Access to the station, particularly for non-auto modes, is complicated by tightly squeezed station functions and its location adjacent to the I-280 Geneva-Ocean Avenue interchange system, whose multiple on- and off-ramps deliver heavy auto traffic to the station and its surrounding neighborhoods, causing multimodal conflicts with transit and pedestrians.

The Balboa Park Station Area Circulation Study focuses on potential modifications to the Balboa Park Station and adjacent I-280 interchanges at Geneva Avenue and Ocean Avenue. The main goals of the Study are to:

- Reduce multimodal conflicts (vehicles, transit, pedestrians) at the I-280 freeway ramps while not substantially degrading vehicle operations in the area, including the I-280 freeway mainline
- Provide safe, accessible, and convenient connections for pedestrians, bicycle, and intermodal travelers
- Develop cost-effective solutions that support the community values and goals, without substantial construction-related impacts, that can be implemented in 2–10 years

Two conceptual alternatives are currently being considered to accomplish the Study's goals:

- Alternative 1: Split Interchange
- Alternative 2: Consolidated Interchange

This meeting is the second of two public outreach meetings. Since the first meeting, which was held in September 2013, the Project Team reviewed community feedback on transit priorities and circulation options and collected additional technical data on vehicle related impacts to the area and pedestrian connectivity and safety. Additional technical studies were performed to explore recommendations submitted during the September public meeting. As a result of these additional studies, the Project Team eliminated one of the three alternatives presented at the first meeting and refined the elements defining the remaining alternatives. The purpose of the second meeting is to present the refined alternatives and solicit feedback from the community.

II. Public Outreach Activities Report

A. Meeting Purpose/Objective

- Present preliminary findings of the Circulation Study
- Build understanding of feasible concepts and introduce trade-offs and constraints of circulation options
- Provide explanation of project process and timeline, next steps and possibility of pilot projects
- Solicit community feedback on circulation priorities for transit modes and study areas
- Gather community input on Study products, including potential for pilot projects, to incorporate into next phase

B. Desired Input from the Public

- Identify community goals and issues to address in the Study
- Identify the community's priorities for improving transit modes and study areas

- Gather public comments on Study products, including preferred alternative and potential for pilot projects

C. Outreach and Noticing

The team conducted the following outreach and noticing activities to promote the community meeting as well as the overall project:

- Posted announcements and updates on the Balboa Park Station Area Circulation Study website: www.sfcta.org/balboa
- Emailed invitation to San Francisco County Transportation Authority's Balboa Park email list, which included community groups and local stakeholders, on the following dates (see Appendix A):
  - 1/13/14
  - 1/21/14
  - 1/27/14
- Reached out to over 30 community based organizations, stakeholder groups and partner to inform them about the meeting time and date and to forward the email invitation to their email lists:

  - Balboa High School and PTSA
  - Bernal Heights Neighborhood Center
  - Balboa Park Community Advisory Committee (BPCAC)
  - Cayuga Improvement Association
  - Out of Site: Center for Arts Education
  - City College of San Francisco
  - Civic Center Secondary School
  - Coleman Advocates for Children and Youth
  - Communities United for Health and Justice (CUHJ)
  - District 7 Council
  - District 11 Council
  - Excelsior Action Group (EAG)
  - Excelsior District Improvement Association (EDIA)
  - Excelsior Planning Collaborative
  - Filipino Community Center (FCC)
  - Friends of Balboa Playground
  - Geneva Car and Barn Power House
  - Glen Park Association
  - James Denman Middle School and PTSA
  - Lick Wilmerding High School
  - Miraloma Park Improvement Club
  - New Mission Terrace Improvement Association
  - Ocean Avenue Association
  - OMI Community Collaborative (OMI-CC)
  - OMI Neighbors in Action (OMI-NIA)
  - OMI/Excelsior Beacon Center
  - Outer Mission Merchants and Residents Association (OMMRA)
  - People Organizing to Demand Environmental & Economic Rights (PODER)
  - Rebuilding Together
  - Ridge Lane Neighbors
  - Riordan High School
  - San Francisco Recreation and Park
  - Sunnyside Neighborhood Association
  - Seventh Day Adventist Elementary School
  - Westwood Park Association

- Distributed 600 meeting announcement flyers to the Balboa Park Station area's surrounding businesses, grocery stores/corner markets, libraries, schools, community centers, churches, gathering places and transit shelters; flyering areas included Ocean Avenue business district, Mission Street business district and Glen Park business district (see Appendix B)
- Delivered 100 flyers to the Balboa Park Community Advisory Committee, Supervisor Yee's office and Supervisor Avalos's office to share with their communities

- ❖ Displayed Muni bus shelters ads at the bus stops of 8X, 8BX, 29, 43, 49, and 54 lines in the Study area to promote the project and notify about the meeting (see Appendix C)

D. Community Outreach

As part of the outreach in advance of the meeting, the Project Team met with several key stakeholders and elected officials:

- District 11 Supervisor John Avalos on 9/8/14
- Balboa Park Community Advisory Committee on 11/14/13

District 7 Supervisor Norman Yee and the District 11 Council were informed of the meeting by email; meetings with each were scheduled for February 2014.

E. Public Community Meeting

The second public community meeting for the Balboa Park Station Area Circulation Study was held at City College of San Francisco's Phelan Campus in Multi-Use Building (MUB), room 140, on January 30, 2014 from 5:30 to 8:30 p.m. This meeting was held in conjunction with Balboa Park Community Advisory Committee's (BPCAC) monthly meeting. Upon arrival, attendees were asked to sign-in and were given an agenda, a project fact sheet and a survey (Appendix D-G). Before the presentation, a short open house provided attendees with an opportunity to speak with the project team and the BPCAC and discuss the SFMTA's current projects in the Balboa Park area with SFMTA staff. The BPCAC opened the meeting with administrative business and a public comment period, as per BPCAC meeting guidelines, before the Study presentation. The presentation, given by Chester Fung, SFCTA Senior Transportation Planner, reviewed the project purpose and goals, gave an overview of the current two project alternatives, and outlined project process, timeline and next steps. A question and answer period immediately followed. The full presentation is available on the project website at www.sfcta.org/balboa.

A total of 51 attendees signed in at the meeting. Attendees turned in 24 surveys at the meeting and an additional five surveys were submitted by mail or online between the community meeting and February 7th. Six additional comments were submitted via mail and are included in the comment summary below..

III. Summary of Comments

Comments were gathered at the meeting through the Q & A, returned surveys and emails submitted to the project team. Copies of the submitted surveys can be found in the appendix. Below is a summary of comments received, including meeting discussion, emails and surveys, to date (note: An asterisk * indicates comment was made by more than one person; a double asterisk ** indicates that the same comment was made by several people):

Alternative 1:

- This alternative is preferable**
- This alternative is not preferable
- This alternative does not address the circulation issues in the whole area

Alternative 2:

- This alternative is preferable**
- This alternative is not preferable
- Alternative does not significantly reduce pedestrian and bicycle conflict with off-ramp

Bus & Light Rail Access:

- Improve bus access to BART station
- Add a bus stop on Ocean Ave. by entry to northbound 280 to access the BART station on Ocean Ave.
- The 49 bus stop at the BART station should be moved to station entrance
- Provide better unloading area, especially for ADA

BART Access:

- Install an elevator at the Kiss & Ride to access the BART station

Bicycle Access:

- Improve bicycle conditions in the area **
- Add protected bicycle lanes on Geneva and Ocean Aves.**
- Enhance BART access from the eastbound Ocean Ave. bike lane
- The proposed alternatives do not increase safety for bicyclists.

Pedestrian Access:

- Improve pedestrian access to the BART station**
- Reconfigure northbound off-ramp at Geneva Ave. so that it is more pedestrian friendly
- Block pedestrian access at Geneva Ave.
- Do not create pedestrian barriers
- Current pedestrian path is under-utilized and scary
- Add a curb cut or pedestrian walkway to cross Ocean Ave. at the BART station
- Encourage people to use the pedestrian tunnel at the BART station

Car Access:

- Closing freeway ramps is premature**
- Traffic calming measures are needed
- Create a drop-off area in the southbound San Jose Ave. lane, adjacent to the MUNI area
- Removing freeway ramps will lead to an increase in traffic on neighborhood streets**
- Freeway ramps are valuable infrastructure

Ocean Avenue:

- Install a stop light at southbound 280 Ocean Ave. off-ramp**
- Remove BART parking on Ocean Ave.*
- Ocean Ave. is used as a bicycle and pedestrian corridor*
- Consider adding a pedestrian/bicycle overpass at the Ocean Ave./southbound 280 intersection
- Re-route the 29 bus line on Ocean Ave.
- Prioritize bicycles and pedestrians on Ocean Ave. and move cars to Geneva Ave.
- Move bicycles and pedestrians to the south side of the southbound off-ramp at Ocean Ave.
- Add a second lane to the southbound 280 off-ramp at Ocean Ave.
- Do not remove parking on Ocean Ave.

Geneva Avenue:

- Add a third lane on northbound Geneva off-ramp*
- Area between San Jose Ave. and 280 is too dangerous for bicycles
- Encourage closing Geneva Ave./northbound 280 on ramp
- Keep existing northbound 280 off ramp below Geneva Ave. level
- The 280 Geneva off-ramp is needed for cars accessing Ingleside neighborhood
- Geneva Ave. is too busy
- Add a right-turn signal at Geneva Ave. for southbound San Jose Ave. traffic
- Add a right-turn signal on southbound San Jose Ave. to coincide with left-turn signal on eastbound Geneva Ave. at San Jose Ave.
- Increase capacity for cars to turn towards CCSF at both northbound and southbound Geneva Ave. off-ramps
- Create a bus-only lane at Geneva Ave. ramps
- Stripe southbound off-ramp at Geneva Ave. as two right-turn lanes and one left-turn lane
- Keep Geneva Ave./280 interchange the same

Miscellaneous:

- Make Howth St. a two-way street**
- Start with a pilot project*
- Develop an integrated solution*
- West frontage road along Lick Wilmerding High School needs better lighting
- Frontage Road would create dead space and would be unsafe for pedestrians
- Consider adding a regional shuttle bus that drops off at BART
- Additional studies and simulations of this Study are requested
- Add a median fence to Geneva Ave.
- Study area should include surrounding streets, such as Niagra
- Restrict parking on Phelan Ave., Ocean Ave. and Geneva Ave. during peak commute hours
- Monterey Blvd. is too wide
- Reduce the number of lanes west of Forester to reduce the freeway speeds
- Area requires a full overhaul to drastically improve circulation
- Implement only basic improvements
- Enhance lighting, signage and pathway marking in and around the BART station
- Do not install a traffic signal at the corner of Geneva Ave. and Cayuga Ave.
- Make the s-curve on Ridge Street a red zone
- Make Lakeview St. a red zone

IV. Next Steps

SFCTA has posted project information, including fact sheet, survey and the presentation on the SFCTA project website at www.sfcta.org/balboa. The project team will review comments submitted and will draft a final report that will include study findings, community input, and staff recommendations. This report is expected to be complete in March 2014 and will be presented to the Transportation Authority Board for approval in April 2014. To advance a recommended alternative, additional project development would be completed along with an environmental review and continued coordination and support from local agencies.

Appendix:

Appendix A - Email Notification

Appendix B - Flyer/Mailer

Appendix C - Bus Shelter Advertisement

Appendix D - Sign-In Sheets

Appendix E – Agenda

Appendix F – Project Fact Sheet

Appendix G - Survey

Appendix H – Submitted Surveys

Appendix I – Survey Results

Appendix J – Emailed Comments

Appendix A – Email Notification

BALBOA PARK STATION CIRCULATION STUDY

Project Update

FINAL REMINDER: WE WANT YOUR INPUT!

Balboa Park Station Circulation Study Community Meeting

WITH THE BALBOA PARK COMMUNITY ADVISORY COMMITTEE

THURSDAY, JANUARY 30, 5:30–8:30 PM, CITY COLLEGE OF SAN FRANCISCO
50 PHELAN AVE., MULTI-USE BUILDING (MUB) 140

Please join us for a community meeting to learn about the improvement concepts and anticipated benefits of the Circulation Study. The main goals of the Study are to:

- Reduce multimodal conflicts near I-280 freeway ramps
- Support efficient and reliable bus and light rail operations
- Enhance safety, accessibility, and convenience for pedestrians and bicyclists
- Minimize impacts to traffic going to/coming from I-280

At the meeting, the study team will share the results of the traffic analysis and pedestrian, bicycle, transit, and auto evaluation for improvement scenarios and discuss the next steps toward improving circulation in the area.

The community will have the opportunity to provide feedback and ask questions of the study team.

Agenda:

5:30-6:00: Open House

6:00-6:15: Citizen Advisory Committee (CAC) Business
6:15-6:45: Presentation on Balboa Bart Station Circulation Study (SFCTA)
6:45-7:30: Q & A (SFCTA)
7:30-8:00: CAC Discussion
8:00-8:30: Open House

A note on parking: It is not necessary to purchase an hourly parking permit for the MUB parking lot. CCSF Parking has agreed to not ticket non-permitted cars during this Balboa Park CAC meeting (5:30-8:30PM).

For more information, visit www.sfcta.org/balboa.

For special accommodations or language assistance, please call 415.593.1655 at least 72 hours in advance. Para adaptaciones especiales o asistencia con el idioma, por favor llame al 415-593-1655 al menos 72 horas por adelantado. 如有特別需求或語言協助，請至少提前72小時致電415.593.1655。

CONTACT US

Visit www.sfcta.org/balboa for more information on the project, or contact Chester Fung, Principal Transportation Planner at the SF County Transportation Authority, via email or at 415.593.1655.

Vengan a una reunión comunitaria el jueves 30 de enero para discutir acerca de las mejoras de circulación vehicular, de tránsito, peatones, y bicicletas en el Parque Balboa en el área de la estación del BART. El equipo de Estudio de Circulación del Parque Balboa (Balboa Park) compartirá una evaluación de las condiciones existentes y los conceptos iniciales de mejora para considerar comentarios de la comunidad. Llame al 415.593.1655 para más información.

請來參加1月30日星期四舉行的社區會議，來討論改善Balboa Park BART車站區域與車輛、公交車、行人和自行車相關的交通循環。Balboa Park車站循環研究小組將分享現存狀況評估和初步改善概念，來尋求社區的反饋意見。請致電415.593.1655 獲得更多資訊。

The San Francisco County Transportation Authority (SFCTA) is leading this study in collaboration with the San Francisco Municipal Transportation Agency (SFMTA), the Bay Area Rapid Transit District (BART), and the

SAN FRANCISCO COUNTY TRANSPORTATION AUTHORITY | CALTRANS

You are receiving this email because of your interest or involvement in a San Francisco County Transportation Authority project/study.
UNSUBSCRIBE | CHANGE YOUR SUBSCRIPTION PREFERENCES | FORWARD THIS EMAIL
SFCTA
1455 Market Street
22nd Floor
San Francisco, CA 94103

Add us to your address book

Appendix B – Flyer/Mailer

BALBOA PARK STATION CIRCULATION STUDY

COMMUNITY MEETING 2

THURSDAY, JANUARY 30th
5:30 – 8:30 P.M.

CITY COLLEGE OF SAN FRANCISCO,
55 PHELAN AVE., MULTI-USE BUILDING (MUB) 140

We want your input!

Please join us for a community meeting to learn about the improvement concepts and anticipated benefits.

The main goals of the Study are to:

- **Reduce multimodal conflicts near I-280 freeway ramps**
- **Support efficient and reliable bus and light rail operations**
- **Enhance safety, accessibility, and convenience for pedestrians and bicyclists**
- **Minimize impacts to traffic going to/coming from I-280**

At the meeting, the study team will share the results of the traffic analysis and pedestrian, bicycle, transit, and auto evaluation for improvement scenarios and discuss the next steps toward effecting change in the area circulation. The community will have the opportunity to provide feedback and ask questions of the study team.

The San Francisco County Transportation Authority (SFCTA) is leading this study in collaboration with the San Francisco Municipal Transportation Agency (SFMTA), the Bay Area Rapid Transit District (BART), and the California Department of Transportation (Caltrans).

For more info visit:
http://www.sfcta.org/balboa

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如有特別需求或語言協助，請至少提前 72 小時致電 415.593.1655。

We want your input!

Please join us for a community meeting to discuss access and circulation improvements to the Balboa Park BART Station Area.

Your feedback will help guide the next steps in improving circulation in the Balboa Park BART Station Area. Comments received at the meeting will be included in the Final Study Report submitted to the Transportation Authority Board and Caltrans.

For more info visit:

http://www.sfcta.org/balboa

MEETING LOCATION

PUBLIC TRANSPORTATION TO CCSF:

J-Church, K-Ingleside, M-Ocean View, 8X/8BX Bayshore Express, 29 Sunset, 43 Masonic, 49 Van Ness/Mission, 54 Felton, 88 BART Shuttle

COMMUNITY MEETING:

We want your input!

THURSDAY, JANUARY 30th

5:30 – 8:30 P.M.

BALBOA PARK STATION CIRCULATION STUDY

PRSRT STD
U.S. POSTAGE
PAID
SAN FRANCISCO CA
PERMIT NO. 925

Appendix C - Bus Shelter Advertisement

BALBOA PARK STATION CIRCULATION STUDY

COMMUNITY MEETING 2

THURSDAY, JANUARY 30th, 5:30 – 8:30 P.M.
CITY COLLEGE OF SAN FRANCISCO, 55 PHELAN AVE., ROOM MUB 140

We want your input!

Please join us for a community meeting to learn about the improvement concepts and anticipated benefits.

The main goals of the Study are to:

- **Reduce multimodal conflicts near I-280 freeway ramps**
- **Support efficient and reliable bus and light rail operations**
- **Enhance safety, accessibility, and convenience for pedestrians and bicyclists**
- **Minimize impacts to traffic going to/coming from I-280**

At the meeting, the study team will share the results of the traffic analysis and pedestrian, bicycle, transit, and auto evaluation for improvement scenarios and discuss the next steps toward effecting change in the area circulation. The community will have the opportunity to provide feedback and ask questions of the study team.

The San Francisco County Transportation Authority (SFCTA) is leading this study in collaboration with the San Francisco Municipal Transportation Agency (SFMTA), the Bay Area Rapid Transit District (BART), and the California Department of Transportation (Caltrans).

For more information, visit www.sfcta.org/balboapark

Vengan a una reunión comunitaria el jueves 30 de enero para discutir acerca de las mejoras de circulación vehicular, de tránsito, peatones, y bicicletas en el Parque Balboa en el área de la estación del BART. El equipo de Estudio de Circulación del Parque Balboa (Balboa Park) compartirá una evaluación de las condiciones existentes y los conceptos iniciales de mejora para considerar comentarios de la comunidad. Llame al 415.593.1655 para más información.

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Para adaptaciones especiales o ayuda con el idioma, por favor llame al 415.593.1655 con por lo menos 72 horas de anticipación.

Appendix D – Sign-in Sheets

BALBOA PARK STATION CIRCULATION STUDY

COMMUNITY MEETING

Balboa Park Circulation Study – January 30, 2014

PLEASE PRINT

NAME & AFFILIATION	MAILING ADDRESS	PHONE NUMBER	E-MAIL* (BY SHARING YOUR EMAIL, YOU GIVE THE STUDY TEAM PERMISSION TO ADD YOU TO THE STUDY & CAC EMAIL LIST)	HOW DID YOU HEAR ABOUT THIS MEETING?
Judy Reuther	92 Bellevue Ave	415-239-1046	jreuther3@gmail	EMAIL ☒ AD ON TRANSIT ☐ FLYER ☐ WEBSITE ☐ NEWSPAPER AD ☐ OTHER
Patty DeVlieg	679 Madrid St.	415-334-7119	pgdc@sonic.net	EMAIL ☒ AD ON TRANSIT ☐ FLYER ☐ WEBSITE ☐ NEWSPAPER AD ☐ OTHER
Jon Winston	518 Joost Ave	415 935 ~~#~~ 1422	jwinstonsf@gmail.com	EMAIL ☒ AD ON TRANSIT ☐ FLYER ☐ WEBSITE ☐ NEWSPAPER AD ☐ OTHER
Christopher Campbell	59 Hazelwood Ave	415-601-8434	christopherpc@mac.com	EMAIL ☒ AD ON TRANSIT ☐ FLYER ☐ WEBSITE ☐ NEWSPAPER AD ☐ OTHER Nextdoor
Eric Mayer	6 Majestic Ave	415.902.0207	steric@me.com	EMAIL ☒ AD ON TRANSIT ☐ FLYER ☐ WEBSITE ☐ NEWSPAPER AD ☐ OTHER
Ross DeWeese	"	9020287	strusse@me.com	EMAIL ☒ AD ON TRANSIT ☐ FLYER ☐ WEBSITE ☐ NEWSPAPER AD ☐ OTHER
DAVID HOOPER	201 DELANO AVE	(415) 585-0472	vpalgus@yahoo.com	EMAIL ☒ AD ON TRANSIT ☐ FLYER ☐ WEBSITE ☐ NEWSPAPER AD ☐ OTHER
Lilia Scott	4 Foerster	415-290-8510	liliacarol@yahoo.com	EMAIL ☒ AD ON TRANSIT ☐ FLYER ☐ WEBSITE ☐ NEWSPAPER AD ☐ OTHER
Glynn Mackellen	35 San Juan Ave SF 94112	415-585-0110	gmackellen@eagsf.org	EMAIL ☐ AD ON TRANSIT ☐ FLYER ☐ WEBSITE ☐ NEWSPAPER AD ☐ OTHER ☒
Tracey McCormick	466 Staples	415.538.2324	meeyowsa@yahoo.com	EMAIL ☒ AD ON TRANSIT ☐ FLYER ☐ WEBSITE ☐ NEWSPAPER AD ☐ OTHER

*Email is the best way to stay notified about project updates and events. Your contact information will not be shared with a third party.

BALBOA PARK STATION CIRCULATION STUDY

COMMUNITY MEETING

Balboa Park Circulation Study – January 30, 2014

PLEASE PRINT

NAME & AFFILIATION	MAILING ADDRESS	PHONE NUMBER	E-MAIL* (BY SHARING YOUR EMAIL, YOU GIVE THE STUDY TEAM PERMISSION TO ADD YOU TO THE STUDY & CAC EMAIL LIST)	HOW DID YOU HEAR ABOUT THIS MEETING?
MAY WONG Excelsior District Imp. Assn.	—	—	myapplegroupstuff@gmail.com	EMAIL ☑ AD ON TRANSIT ☐ FLYER ☐ WEBSITE ☐ NEWSPAPER AD ☐ OTHER ____
MARK KRESS MISSION TERR IMP. ASSN			MTKRESS@SBCGLOBAL.NET	EMAIL ☐ AD ON TRANSIT ☐ FLYER ☑ WEBSITE ☑ NEWSPAPER AD ☐ OTHER ____
Bill Wilson	215 EDNA ST SF CA 94112	(415) 239.8203	wfwilson@sbcglobal.net	EMAIL ☒ AD ON TRANSIT ☐ FLYER ☐ WEBSITE ☐ NEWSPAPER AD ☐ OTHER ____
GORDON ROWE	139 CAINE APT A ST 94112	415 841-0141	BERTOLLI1@COMCAST.NET	EMAIL ☐ AD ON TRANSIT ☐ FLYER ☑ WEBSITE ☐ NEWSPAPER AD ☐ OTHER ____
Lisa Partida	247 London St 94112	415-585-8745	lisa.kmetz@hotmail.com	EMAIL ☐ AD ON TRANSIT ☐ FLYER ☑ WEBSITE ☐ NEWSPAPER AD ☐ OTHER ____
Eva Chu	250 Tara St. 94112		eva.chu250@gmail.com	EMAIL ☒ AD ON TRANSIT ☐ FLYER ☐ WEBSITE ☐ NEWSPAPER AD ☐ OTHER ____
SUSAN SULLIVAN MAHNARD			RUMAHNARD@SBCGLOBAL.NET	EMAIL ☐ AD ON TRANSIT ☐ FLYER ☐ WEBSITE ☐ NEWSPAPER AD ☐ OTHER ____
KEN REUTHER	92 BELLEVUE AVE. SF 94117		LAGNIAPPE92@GMAIL.COM	EMAIL ☑ AD ON TRANSIT ☐ FLYER ☐ WEBSITE ☐ NEWSPAPER AD ☐ OTHER ____
Rita Evans				EMAIL ☐ AD ON TRANSIT ☐ FLYER ☐ WEBSITE ☐ NEWSPAPER AD ☐ OTHER ____
Ina Gerhard	Caltrans	510.286.5598		EMAIL ☐ AD ON TRANSIT ☐ FLYER ☐ WEBSITE ☐ NEWSPAPER AD ☐ OTHER ____

*Email is the best way to stay notified about project updates and events. Your contact information will not be shared with a third party.

BALBOA PARK STATION CIRCULATION STUDY

COMMUNITY MEETING

Balboa Park Circulation Study – January 30, 2014

PLEASE PRINT

NAME & AFFILIATION	MAILING ADDRESS	PHONE NUMBER	E-MAIL* (BY SHARING YOUR EMAIL, YOU GIVE THE STUDY TEAM PERMISSION TO ADD YOU TO THE STUDY & CAC EMAIL LIST)	HOW DID YOU HEAR ABOUT THIS MEETING?
GEORGE PAPPAS RESIDENT	760 DELANO AVE SFCA 94112	650.906.6755	georgepappas2004 @hotmail.com	EMAIL ☐ FLYER ☒ NEWSPAPER AD ☐ AD ON TRANSIT ☐ WEBSITE ☐ OTHER
JOELLE KENEALEY Outer Mission Merchants and Residents Assoc	84 BELLEVUE AVE SF CA 94112	415-305-6065	sfommva@gmail.com	EMAIL ☒ FLYER ☐ NEWSPAPER AD ☐ AD ON TRANSIT ☐ WEBSITE ☐ OTHER
				EMAIL ☐ FLYER ☐ NEWSPAPER AD ☐ AD ON TRANSIT ☐ WEBSITE ☐ OTHER
C.L. HORTON C.I.A.	273 NIAGARA AVE, S.F. CA. 94112	415-255-4436	catleshorton @sbcglobal.net	EMAIL ☐ FLYER ☐ NEWSPAPER AD ☐ AD ON TRANSIT ☐ WEBSITE ☐ OTHER MAILER
Tom Radulovich	995 market Ste 1450 SF CA 94103	415 344.0489	tom@livablecity.org	EMAIL ☒ FLYER ☐ NEWSPAPER AD ☐ AD ON TRANSIT ☐ WEBSITE ☐ OTHER
Carola Hamann CIA	119 Shawnee Ave SF 94112	510 435 0066	carola_hamann@yahoo.com	EMAIL ☒ FLYER ☐ NEWSPAPER AD ☐ AD ON TRANSIT ☐ WEBSITE ☐ OTHER
CHRIS WONG	248 Harold Ave	503-7629	Dragonflysfo@AOL.com	EMAIL ☐ FLYER ☐ NEWSPAPER AD ☐ AD ON TRANSIT ☐ WEBSITE ☐ OTHER
Chuck Burnell	731 Cayuga Ave	415 333 7660	igotletters@gmail.com	EMAIL ☐ FLYER ☐ NEWSPAPER AD ☐ AD ON TRANSIT ☐ WEBSITE ☐ OTHER
DANA MASARO	20 EDGAR PL 94112	314-420-5444	DMASARO@GMAIL	EMAIL ☐ FLYER ☒ NEWSPAPER AD ☐ AD ON TRANSIT ☐ WEBSITE ☐ OTHER
Henry Scholz	169 Otsego Ave SF 94112	415.584.4276	henryscholz@att.net	EMAIL ☐ FLYER ☐ NEWSPAPER AD ☐ AD ON TRANSIT ☐ WEBSITE ☐ OTHER VS MAIL

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BALBOA PARK STATION CIRCULATION STUDY

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Janice Li SF Bicycle Coalition	–	–	janice@sfbike.org	EMAIL ☑ AD ON TRANSIT ☐ FLYER ☐ WEBSITE ☐ NEWSPAPER AD ☐ OTHER BP CAC
Bill MAKARENKA	124 MAINSTON AVE.		JonFARM@AOL.com	EMAIL ☐ AD ON TRANSIT ☐ FLYER ☐ WEBSITE ☐ NEWSPAPER AD ☐ OTHER
Vicki Engel DAN JUNING	46 STAPLES AVENUE		vickieng@umich.edu	EMAIL ☑ AD ON TRANSIT ☐ FLYER ☐ WEBSITE ☐ NEWSPAPER AD ☐ OTHER
CONSTANCE ADAMOPOULOS	25 TOSI ALL	415.203.2138	MADAMOPOULOS@me.c	EMAIL ☒ AD ON TRANSIT ☐ FLYER ☐ WEBSITE ☐ NEWSPAPER AD ☐ OTHER
NEIL BALLARD THE INGLESIDE LIGHT			NG BALLARD@HOTMAIL.COM	EMAIL ☐ AD ON TRANSIT ☐ FLYER ☐ WEBSITE ☐ NEWSPAPER AD ☐ OTHER ✓
Samuel Santos CCSF		239-3211	ssantos@ccsf.edu	EMAIL ☐ AD ON TRANSIT ☐ FLYER ☑ WEBSITE ☐ NEWSPAPER AD ☐ OTHER William Wallace
SCOTT CATAFFA NEIGHBOR	107 SAN JUAN AVE		SCOTT.CATAFFA@GMAIL.COM	EMAIL ☒ AD ON TRANSIT ☐ FLYER ☒ WEBSITE ☐ NEWSPAPER AD ☐ OTHER
Tim Chan	BART			EMAIL ☐ AD ON TRANSIT ☐ FLYER ☐ WEBSITE ☐ NEWSPAPER AD ☐ OTHER
Jim McCormick	466 Staples	8103332	jheem.ppc@yahoo.com	EMAIL ☐ AD ON TRANSIT ☐ FLYER ☐ WEBSITE ☒ NEWSPAPER AD ☐ OTHER
Henry Pan	–	–	henrypan93@gmail.com	EMAIL ☐ AD ON TRANSIT ☐ FLYER ☐ WEBSITE ☐ NEWSPAPER AD ☐ OTHER

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BALBOA PARK STATION CIRCULATION STUDY

COMMUNITY MEETING

Balboa Park Circulation Study – January 30, 2014

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Dan Weaver OAA	148 Jules SF			EMAIL ☐ AD ON TRANSIT ☐ FLYER ☐ WEBSITE ☐ NEWSPAPER AD ☐ OTHER _____
Ruth Miranda		(415)585-1070	romisf@sbcglobal.net	EMAIL ☐ AD ON TRANSIT ☐ FLYER ☒ WEBSITE ☐ NEWSPAPER AD ☐ OTHER _____
Rosa Bourdon		(415)585-1070		EMAIL ☐ AD ON TRANSIT ☐ FLYER ☒ WEBSITE ☐ NEWSPAPER AD ☐ OTHER _____
John Peters	121 Santa Rosa	415239-5323	Japeters@pacbell.net	EMAIL ☐ AD ON TRANSIT ☐ FLYER ☑ WEBSITE ☐ NEWSPAPER AD ☐ OTHER _____
Alex Mullaney	855 Head St.	415-215-4246	amullaney@gmail.com	EMAIL ☑ AD ON TRANSIT ☐ FLYER ☐ WEBSITE ☐ NEWSPAPER AD ☐ OTHER _____
Lauren DeRosas			ldenosas09@Gmail.com	EMAIL ☑ AD ON TRANSIT ☐ FLYER ☐ WEBSITE ☐ NEWSPAPER AD ☐ OTHER _____
David Mauroff	46 Delano	341.4637	dmauroff@comcast.net	EMAIL ☑ AD ON TRANSIT ☐ FLYER ☐ WEBSITE ☐ NEWSPAPER AD ☐ OTHER _____
Lily Langlois			lily.langlois@sfgov.org	EMAIL ☐ AD ON TRANSIT ☐ FLYER ☐ WEBSITE ☐ NEWSPAPER AD ☐ OTHER city
Ray Kutz	532 Flood			EMAIL ☐ AD ON TRANSIT ☐ FLYER ☐ WEBSITE ☐ NEWSPAPER AD ☐ OTHER _____
Patricia Ris	24 Josiah Ak	4153097963	patriciaris@mac.com	EMAIL ☐ AD ON TRANSIT ☐ FLYER ☐ WEBSITE ☐ NEWSPAPER AD ☐ OTHER _____

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BALBOA PARK STATION
CIRCULATION STUDY

COMMUNITY MEETING

Balboa Park Circulation Study – January 30, 2014

PLEASE PRINT

NAME & AFFILIATION	MAILING ADDRESS	PHONE NUMBER	E-MAIL* (BY SHARING YOUR EMAIL, YOU GIVE THE STUDY TEAM PERMISSION TO ADD YOU TO THE STUDY & CAC EMAIL LIST)	HOW DID YOU HEAR ABOUT THIS MEETING?
Vivian Wong	1592 28th Ave	4158167349		EMAIL ☐ AD ON TRANSIT ☐ FLYER ☐ WEBSITE ☐ NEWSPAPER AD ☐ OTHER _____
				EMAIL ☐ AD ON TRANSIT ☐ FLYER ☐ WEBSITE ☐ NEWSPAPER AD ☐ OTHER _____
				EMAIL ☐ AD ON TRANSIT ☐ FLYER ☐ WEBSITE ☐ NEWSPAPER AD ☐ OTHER _____
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				EMAIL ☐ AD ON TRANSIT ☐ FLYER ☐ WEBSITE ☐ NEWSPAPER AD ☐ OTHER _____

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Appendix E - Agenda

SFMTA
Municipal Transportation Agency

BALBOA PARK STATION CITIZEN ADVISORY COMMITTEE
&
BALBOA PARK CIRCULATION STUDY COMMUNITY MEETING
AGENDA

Thursday, January 30, 2014, 5:30-8:30pm
****Doors open at 5:30pm****
City College (50 Phelan Ave), Multi-Use Building on the first floor, Room 140.

5:30 – 6:00 **Open House (SFCTA)**
View display boards and discuss your questions with the project team

6:00 – 6:15 **Citizen Advisory Committee Business (CAC)**
Introductions & CAC Administration (15 minutes)
- Approve January agenda
- Approve minutes from November meeting
- Public Comment (Members of the public may address the Balboa Park Station Community Advisory Committee on matters that are within the Board's jurisdiction and are not on today's calendar)

6:15 – 6:45 **Presentation on Balboa Bart Station Circulation Study (SFCTA)**

6:45 – 7:30 **Question and Answer (SFCTA)**

7:30 – 8:00 **CAC Discussion, Chair Report, Adjourn CAC Meeting (CAC)**
Next CAC meeting will be in March, date to be determined, check SFMTA website for update or you may receive an email if requested
- Potential agenda items for March meeting
  - Station area and environs maintenance/clean-up update
  - BART projects update
  - TEP presentation
  - Priorities for station area plans and projects

8:00 – 8:30 **Open House & Adjourn Community Meeting (SFCTA)**
View display boards and discuss questions with the project team

Directions to City College:
Transit: 511.org
- BART or MUNI (J/K) to Balboa Park Station
- Muni Routes 8X, 8BX, 29, 43, 49, 54

Parking: Permits are required to park in any lot, day or evening. For more information, contact Campus Police, Cloud Hall 119, (415) 239-3200.

BP CAC Members: William Walker, Dan Weaver, Nicole Agbayani, Rita Evans, Scott Falcone, Veronica Garcia, David Mauroff, Robert Muehlbauer

MUNI 1912~2012

Appendix F - Project Fact Sheet

SAN FRANCISCO COUNTY TRANSPORTATION AUTHORITY

Fact Sheet
LAST UPDATED
September 2013

Balboa Park Station Area Circulation Study

Background

BALBOA PARK STATION CIRCULATION STUDY

The Balboa Park BART/Muni Station is one of the busiest intermodal transit facilities in the region. As the major hub for the southern part of San Francisco, the station serves more than 24,000 passengers daily with its four BART lines, multiple major local bus routes, and three light rail transit (LRT) lines. But access to the station, particularly for non-auto modes, is complicated by tightly squeezed station functions and its location adjacent to the I-280 Geneva-Ocean Avenue interchange system, whose multiple on- and off-ramps deliver heavy auto traffic to the station and its surrounding neighborhoods, causing multimodal conflicts with transit and pedestrians.

Study Purpose

This Circulation Study focuses on potential modifications to the Balboa Park Station and adjacent I-280 interchanges at Geneva Avenue and Ocean Avenue. The main goals of the Study are to:

- Reduce multimodal conflicts (vehicles, transit, pedestrians) at the I-280 freeway ramps while not substantially degrading vehicle operations in the area, including the I-280 freeway mainline
- Provide safe, accessible, and convenient connections for pedestrians, bicycle, and intermodal travelers
- Develop cost-effective solutions that support the community values and goals, without substantial construction-related impacts, that can be implemented in 2–10 years

Community Involvement

A Balboa Park Community Advisory Committee (BPCAC), whose membership and bi-monthly meetings are open to the public, monitors progress and provides input on the multiple station-related improvements currently under development. The BPCAC also provides input on this Study's work to develop the next generation of capital improvements in the station area. The San Francisco County Transportation Authority (SFCTA) is also conducting additional outreach, including public meetings, to seek wider input throughout the study.

Study Activities and Schedule

- Goals, Evaluation Framework, and Existing Transportation Conditions (Winter 2013)
- Preliminary Alternatives Development and Evaluation (Spring-Summer 2013)
- Full Concept Evaluation, including Cost Estimates (Fall 2013)
- Final Report / Recommendations, including Implementation Plan (Winter 2014)

Relationship to Other Efforts

Previous plans in the study area, including the Planning Department's 2009 Balboa Park Station Area Plan and the San Francisco Municipal Transportation Agency's recently completed Balboa Park Station Capacity Study, recommended multiple improvement concepts. Of those recommendations, several short-term projects have been completed or are underway. But the mid- and long-term visions remain to be clarified. This study's focus is on a particular mid-term concept that the Station Capacity Study did not examine in detail: potential modifications to the I-280 interchange and accompanying station reconfiguration. The study will also coordinate with other efforts, such as the Geneva Avenue Transit Preferential Streets study that explored transit operational improvements whose implementation could have synergies with I-280 ramp changes.

Study Partners

The SFCTA is leading this study in collaboration with:

- California Department of Transportation (funder)
- San Francisco Municipal Transportation Agency
- Bay Area Rapid Transit District

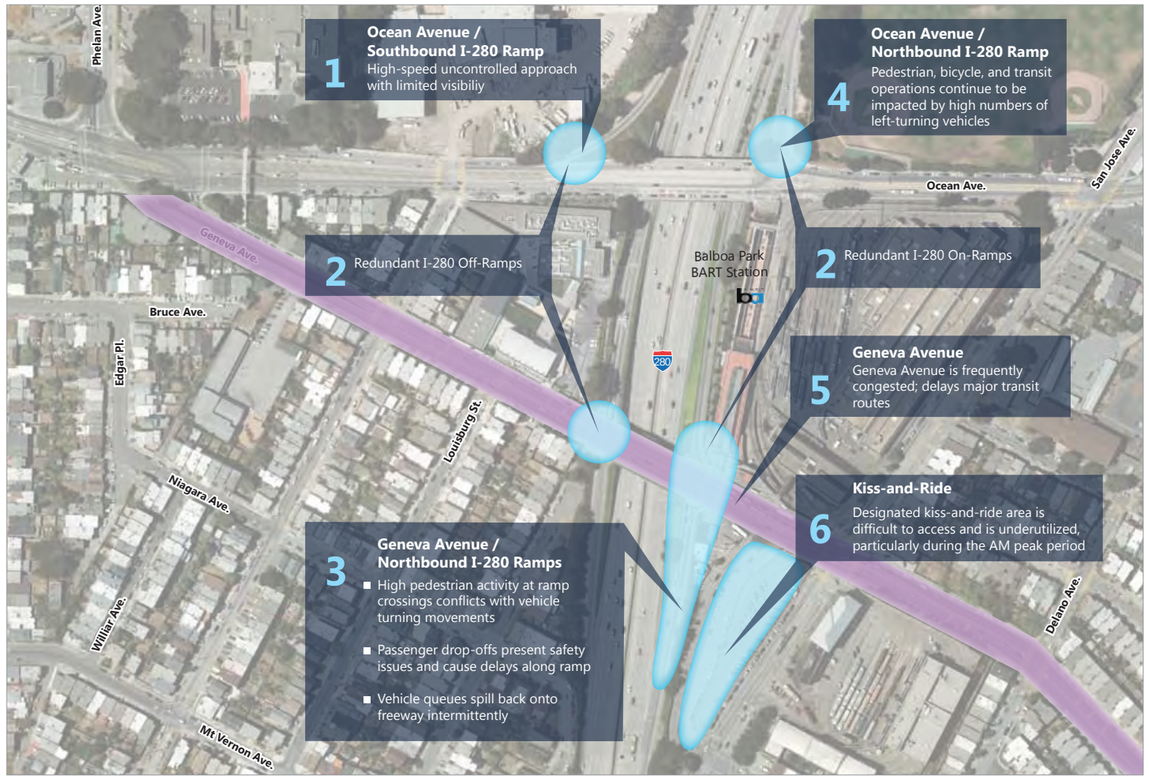
For more information

Contact Chester Fung at 415.522.4804 or chester.fung@sfcta.org

Scan for project web page

SAN FRANCISCO COUNTY TRANSPORTATION AUTHORITY

1455 Market Street, 22nd Floor
San Francisco, CA 94103
PROJECT PHONE: 415.593.1655



Identified Circulation and Access Issues

- **1.** The southbound freeway exit onto Ocean Avenue is a high-speed, uncontrolled ramp limited visibility with high pedestrian and bicycle conflicts.
- **2.** Collectively, the I-280 interchange has redundant southbound off- and northbound on-ramps.
- **3.** The northbound ramps on Geneva Avenue conflict with high volumes of pedestrian activity, including those dropped off along the ramps, creating a safety issue and contributing to queues along the off-ramp. Users during peak hours include:
  - » 1,000+ pedestrians
  - » 2,000+ vehicles utilizing I-280 ramps
  - » Multiple bus lines, with 1-2 arriving every minute
- **4.** Northbound freeway access from Ocean Avenue experiences high pedestrian, bicycle, and transit conflicts. Users during peak hours include:
  - » Heavy pedestrian flows, including to City College, Lick Wilmerding High School
  - » 1,500 vehicles utilizing the ramps
  - » Multiple bus and light rail lines
- **5.** Geneva Avenue is heavily used by vehicles (25,000 per day), pedestrians, and buses (with 9,000 passenger boardings per day); delays for transit caused by congestion are common.
- **6.** The designated Kiss-and-Ride area is difficult to access and is underutilized, particularly during the AM peak period
  - » Only 58% of the morning peak drop-offs occur in the designated kiss and ride area.
  - » Majority of drivers with kiss and ride passengers arrive from the south side (I-280 or San Jose Avenue) and depart to the south along San Jose Avenue.

Conceptual Alternatives

Alternative 1A

BALANCED NETWORK WITHOUT FRONTAGE ROADS

Alternative 1A would close the I-280 southbound off-ramp to and northbound on-ramp from Geneva Avenue while preserving the I-280 ramps at Ocean Avenue. It is considered a short-term alternative.

Alternative 1B

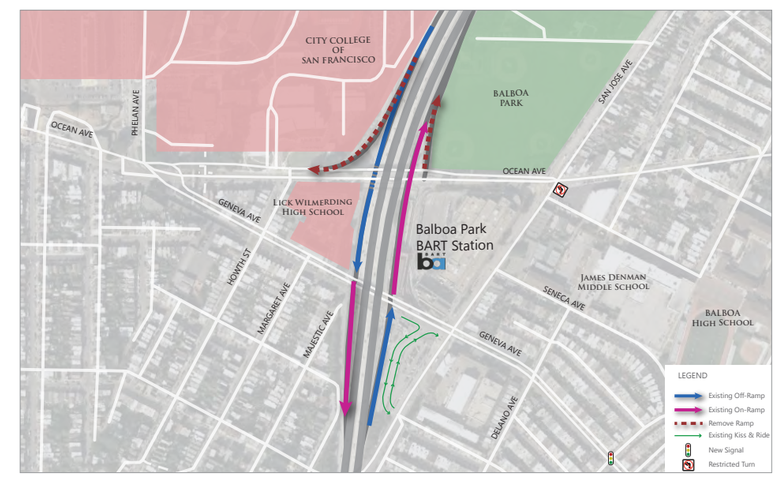
BALANCED NETWORK WITH FRONTAGE ROADS

Alternative 1B would include the changes in 1A, as well as new frontage roads between Geneva and Ocean in the space currently occupied by the Geneva ramps that would be closed. The frontage roads require reconstruction of the Ocean Avenue Bridge over I-280. It is considered a long-term alternative.

Alternative 2

INTERCHANGE CONSOLIDATION AT GENEVA AVENUE

Alternative 2 would close the I-280 on- and off-ramps at Ocean Avenue, creating a single, consolidated interchange at Geneva Avenue.



Appendix G - Survey

BALBOA PARK STATION CIRCULATION STUDY

COMMENT CARD

Please submit comments today or mail by <u>February 7, 2014</u> to:

San Francisco County Transportation Authority
Attention: Liz Rutman, Principal Transportation Planner
1455 Market Street, 22nd Floor
San Francisco, CA 94103

Email: balboa@sfcta.org
Website: www.sfcta.org/balboa

<u>Questionnaire & General Comments:</u>

1) How did you hear about this meeting? Circle all that apply:
   a. Email b. Flyer c. Website d. Transit Shelter Ad
   e. Other (please specify):

_____

2) How do you travel through the Balboa Park BART station area? Circle all that apply:
   a. BART b. Bus c. Light rail c. Bicycle d. Pedestrian d. Car
   e. Other (please specify):

_____

_____

3) On a scale of 1 to 5, how should each mode of transportation be prioritized on Ocean Avenue?

	Least Important		Somewhat Important		Most Important
Cars	1	2	3	4	5
Transit	1	2	3	4	5
Pedestrians	1	2	3	4	5
Bicycles	1	2	3	4	5

Please see the reverse for additional comments

4) On a scale of 1 to 5, how should each mode of transportation be prioritized on Geneva Avenue?

	Least Important		Somewhat Important		Most Important
Cars	1	2	3	4	5
Transit	1	2	3	4	5
Pedestrians	1	2	3	4	5
Bicycles	1	2	3	4	5

Additional comments:

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Appendix H – Submitted Surveys

BALBOA PARK STATION CIRCULATION STUDY

COMMENT CARD

Please submit comments today or mail by February 7, 2014 to:

San Francisco County Transportation Authority
Attention: Liz Rutman, Principal Transportation Planner
1455 Market Street, 22nd Floor
San Francisco, CA 94103

Email: balboa@sfcta.org
Website: www.sfcta.org/balboa

Questionnaire & General Comments:

1) How did you hear about this meeting? Circle all that apply:
   a. Email b. Flyer c. Website d. Transit Shelter Ad
   e. Other (please specify):

   Ocean Ave CBD

2) How do you travel through the Balboa Park BART station area? Circle all that apply:
   a. BART b. Bus c. Light rail c. Bicycle d. Pedestrian d. Car
   e. Other (please specify):

   Usually BART → bike or bus → bike

3) On a scale of 1 to 5, how should each mode of transportation be prioritized on Ocean Avenue?

	Least Important		Somewhat Important		Most Important
Cars	1	2	3	4	5
Transit	1	2	3	4	5
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Please see the reverse for additional comments

4) On a scale of 1 to 5, how should each mode of transportation be prioritized on Geneva Avenue?

	Least Important		Somewhat Important		Most Important
Cars	1	2	3	4	5
Transit	1	2	3	4	5
Pedestrians	1	2	3	4	5
Bicycles	1	2	3	4	5

Additional comments:

Ocean Ave is used as main bicycle corridor & major ped traffic (businesses, City College, BART exit, etc.). Alt #1 does not significantly reduce conflict w/ ramp still existent, makes more sense to FULLY prioritize bike/ped on Ocean & move cars to Geneva, not a compromise. In this case, compromise = conflict between modes.

BALBOA PARK STATION CIRCULATION STUDY

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San Francisco, CA 94103

Email: balboa@sfcta.org
Website: www.sfcta.org/balboa

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   e. Other (please specify):

3) On a scale of 1 to 5, how should each mode of transportation be prioritized on Ocean Avenue?

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Cars	1	2	3	4	5
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Bicycles	1	2	3	4	5

Please see the reverse for additional comments

4) On a scale of 1 to 5, how should each mode of transportation be prioritized on Geneva Avenue?

	Least Important		Somewhat Important		Most Important
Cars	1	2	3	4	5
Transit	1	2	3	4	5
Pedestrians	1	2	3	4	5
Bicycles	1	2	3	4	5

Additional comments:

The Balboa area is in immediate need of pedestrian and bicycle improvements. There are too many automobile lanes. It is very dangerous to cross the road from the BART station to any of the neighboring areas. Auto mobiles travel too fast, especially drivers exiting from 280. There need to be traffic calming measures to reduce speeds of autos and improve safety of pedestrians. Additionally, bicycle lanes need to be better established to ensure our safety and encourage more people to bicycle.

There also needs to be traffic calming on the Ocean ave 280 on/off ramps.

Monterey Blvd is too wide. Crossing it is hazardous, auto drivers perceive pedestrians and cyclists as obstacles. Reduce the # of lanes west of Forester to reduce the "freeway" speeds.

BALBOA PARK STATION CIRCULATION STUDY

COMMENT CARD

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1455 Market Street, 22nd Floor
San Francisco, CA 94103

Email: balboa@sfcta.org
Website: www.sfcta.org/balboa

Questionnaire & General Comments:

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Cars	1	2	3	4	5
Transit	1	2	3	4	5
Pedestrians	1	2	3	4	5
Bicycles	1	2	3	4	5

Additional comments:

- Please consider Parking restrictions during Prime Rush hour times on Phelan/Ocean/Geneva/to free up another Traffic Lane (Quick Fix)!!
- Consider Lee Ave for Exit/Entrance to CC Parking lot or roadway as secondary Exit/entrance
- Please consider Live streaming + electronic media communications to Public Meetings (Not everyone can show up "Live" and more will participate if given modern way to connect!!
- Please "clean up" and "deter" Pigeon nesting crapping everywhere in and out of Balboa Station!
- Don't ping pong ball the freeway ramps by cutting this exit or that entrance... to burden the other main road with more Traffic!

BALBOA PARK STATION CIRCULATION STUDY

COMMENT CARD

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   a. Email b. Flyer c. Website d. Transit Shelter Ad
   e. Other (please specify):

   Neighborhood Association E-mail (CIA)

2) How do you travel through the Balboa Park BART station area? Circle all that apply:
   a. BART b. Bus c. Light rail c. Bicycle d. Pedestrian d. Car
   e. Other (please specify):

   3% 2% 95%

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Cars	1	2	3	4	5
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Additional comments:

Pedestrian car conflicts by station on Geneva + San Jose ave need to be addressed - A fence in median of Geneva would be nice.

There should be better loading unloading area on San Jose Ave M Line. Saw wheelchair being carried off one day while Muni blocking street.

Study area should have included streets like Niagra which will be impacted by traffic changes along Geneva Ave

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Additional comments:

We need better pedestrian access between the BART station & the pedestrian overpass behind the police station.

We need better pedestrian access thru City College, just west of 280.

Thru the field is not ideal

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   SNA email / Next door Sunnyside

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Additional comments:

The Bus/BART pedestrian access needs improved crossing and shelter/bus stops (Geneva @ 280/San Jose)

If nothing else, please add a right turn arrow on southbound San Jose to coincide w/ the left arrow on East bound Geneva @ San Jose.

Can there be a subway or protected overpass added for pedestrians?

Pedestrians crossing traffic exiting ~~280 S~~ 280 North onto Geneva need a better crosswalk w/ higher visibility and protection. Cars can't see them coming - it's a blind intersection.

P.S./ I don't support the New one way frontage road & kiss/ride suggestion on ALT. 1. It will bring more cars through the already congested Geneva/280 intersection.

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Additional comments:

I PREFER ALTERNATIVE #2, BUT I SEE THE MERITS OF #1. CAN BALBOA STATION / BART LAND BECOME A HIGHER-DENSITY, MIXED-USE DEVELOPMENT? THIS IS A GREAT LOCATION FOR A T.O.D. W/ INCREASED HOUSING DENSITY. COULD A PUBLIC/PRIVATE PARTNERSHIP BRING ADDITIONAL RESOURCES TO THE ISSUES — LIKE UNDERGROUNDING THE K LINE.

THANK YOU FOR BALANCING + IMPROVING PED + BIKE INTERESTS. I EMPHATICALLY DISAGREE W/ PUBLIC COMMENTS THAT SENSITIVE PED CIRCULATION IS HAMSTER RUNS!

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Additional comments:

1 PROVE THAT IT IS NECESSARY TO REMOVE OUR INFRASTRUCTURE

2 What will be built on the land if a ramp is removed?

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Additional comments:

1) I ride the 49 bus to Balboa Park BART. It would be really nice if the bus would stop by the entrance to the station, rather than at San Jose or City College!

2) Maybe we could encourage people to use the pedestrian tunnel at the BART station (under Geneva) by combining it w/ one gentleman's idea of adding art to the station. Put art in the tunnel to make it more appealing (→ more used → safer).

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Additional comments:

The I-280 S ~~Ocean~~ Geneva off ramp is needed for cars going to Ingleside neighborhood. If only Ocean Ave. offramp is available, there is no left turn until Plymouth Ave. Ocean Ave is already too congested.

or are there plans to make Howth a 2-way street?

Alt #2 is Not good. Geneva is already too busy, whereas, Ocean Ave is more of a thoroughfare. Vehicles from Lowsburg will never be able to get onto Geneva

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Additional comments:

Hard to prioritize - every mode needs to work well w/ each other. They are all here and all have to work together. Needs an integrated solution. Cars will not go away, as this is one of only a few exits from 280. Peds + bikes need to be able to transit quickly + efficiently. BART and MUNI look like afterthoughts - they are horribly designed. But I am glad to see this meeting and find out the city wants to improve this area. Wish you all good luck and successful program.

Also an open + well-lit BART/MUNI will improve security and reduce the homeless encampments that are becoming more common.

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   MAILER

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Additional comments:

WHICHEVER MODE OF TRANSPT ONE USES WILL BE FAVORED.

AS BICYCLISTS & VEHICLE DRIVERS ARE EQUALLY CALOUS TO THE NEEDS OF PEDESTRIANS, THE SAFETY OF THESE FOLKS SHOULD BE ADDRESSED.

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   Bicycle

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Additional comments:

From 19th Avenue riding eastbound on Ocean, when riding a bike there is no way to go from the road to the sidewalk and onto the pedestrian ramp leading to BART. A simple curb cut would solve the problem and make the sidewalk and BART pedestrian ramp accessible.

Coming off the BART pedestrian ramp and on to Ocean, there isn't a curb cut or pedestrian walkway across Ocean until further up the block. It is possible to ride against traffic or on the sidewalk going westbound on Ocean, but it is unsafe and illegal.

Ramon Solis
290.6683
ramon.s.solis@gmail.com

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   BRISBANE SHUTTLE BUS

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Additional comments:

NEED TO CONSIDER REGIONAL SHUTTLE BUS THAT BRING/DROPOFF PEOPLE TO BART. SEE COMMUTE.ORG FOR SOME SERVING BRISBANE + SOUTH SF.

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Additional comments:

- Make a Bus stop on Ocean Ave next to the Ocean Ave North entry to N280 to access the Bart Station on Ocean Ave —
- Just re-route the 29 Bus line on Ocean Ave —

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Additional comments:

GENEVA AVE between San JOSE AVE and 280 IS TOO DANGEROUS for Bicycles to even be there. There should be a BIKE bypass That is Isolated from CARS. until then, Bikes should be encourage to Avoid or walk their Bikes on That Block

How about a Gentle Rising pedestrian/Bike overpass at the Ocean Avenue/SB 280 intersection? cars are coming up from below The Road/School Level already.

I definetly encourage closing Geneva/NB 280 onRAMP How about keeping EXISTING NB 280 offRAMP below Geneva Road Level, ~~and connecting to~~ (with tunnel) That would bring That NB 280 traffic to Street level at Ocean

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Additional comments:

Don't create ped barriers like was suggested in today's meeting.

Please turn all signals into automatic (for ped), not beg buttons. No one wants to "beg" a machine to safely cross their own street! That doesn't encourage walking, its very disrespectful!

I imagine the frontage road as another dead space. The current ped path is scary + unused, but we don't need to create a bigger version. The frontage road would be sandwiched between a highway + the BART stop. Even well-lit, I imagine it to be scary at night, few people, similar to the scary drop off/pick up area at MacArthur.

I prefer alternative 2: simpler + cheaper. But Geneva is already too unsafe for ped, too much speeding.

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	Least Important		Somewhat Important		Most Important
Cars	1	2	3	4	5
Transit	1	2	3	4	5
Pedestrians	1	2	3	4	5
Bicycles	1	2	3	4	5

Additional comments:

BALBOA PARK STATION CIRCULATION STUDY

COMMENT CARD

Please submit comments today or mail by February 7, 2014 to:

San Francisco County Transportation Authority
Attention: Liz Rutman, Principal Transportation Planner
1455 Market Street, 22nd Floor
San Francisco, CA 94103

Email: balboa@sfcta.org
Website: www.sfcta.org/balboa

Questionnaire & General Comments:

1) How did you hear about this meeting? Circle all that apply:
   a. Email b. Flyer c. Website d. Transit Shelter Ad
   e. Other (please specify):
   Direct mail

2) How do you travel through the Balboa Park BART station area? Circle all that apply:
   a. BART b. Bus c. Light rail c. Bicycle d. Pedestrian d. Car
   e. Other (please specify):

3) On a scale of 1 to 5, how should each mode of transportation be prioritized on Ocean Avenue?

	Least Important		Somewhat Important		Most Important
Cars	1	2	3	4	5
Transit	1	2	3	4	5
Pedestrians	1	2	3	4	5
Bicycles	1	2	3	4	5

Please see the reverse for additional comments

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	Least Important		Somewhat Important		Most Important
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Transit	1	2	3	4	5
Pedestrians	1	2	3	4	5
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Additional comments:

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Questionnaire & General Comments:

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   a. Email b. Flyer c. Website d. Transit Shelter Ad
   e. Other (please specify):

2) How do you travel through the Balboa Park BART station area? Circle all that apply:
   a. BART b. Bus c. Light rail c. Bicycle d. Pedestrian d. Car
   e. Other (please specify):

3) On a scale of 1 to 5, how should each mode of transportation be prioritized on Ocean Avenue?

	Least Important		Somewhat Important		Most Important
Cars	1	2	3	4	5
Transit	1	2	3	4	5
Pedestrians	1	2	3	4	5
Bicycles	1	2	3	4	5

Please see the reverse for additional comments

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	Least Important		Somewhat Important		Most Important
Cars	1	2	3	4	5
Transit	1	2	3	4	5
Pedestrians	1	2	3	4	5
Bicycles	1	2	3	4	5

Additional comments:

prefer alt. 1

BALBOA PARK STATION CIRCULATION STUDY

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Email: balboa@sfcta.org
Website: www.sfcta.org/balboa

Questionnaire & General Comments:

1) How did you hear about this meeting? Circle all that apply:
   a. Email b. Flyer c. Website d. Transit Shelter Ad
   e. Other (please specify):

   Robert Muehlbauer, neighbor

2) How do you travel through the Balboa Park BART station area? Circle all that apply:
   a. BART b. Bus c. Light rail c. Bicycle d. Pedestrian d. Car
   e. Other (please specify):

3) On a scale of 1 to 5, how should each mode of transportation be prioritized on Ocean Avenue?

	Least Important		Somewhat Important		Most Important
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Transit	1	2	3	4	5
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Please see the reverse for additional comments

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Cars	1	2	3	4	5
Transit	1	2	3	4	5
Pedestrians	1	2	3	4	5
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Additional comments:

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Email: balboa@sfcta.org
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Questionnaire & General Comments:

1) How did you hear about this meeting? Circle all that apply:
   a. Email b. Flyer c. Website d. Transit Shelter Ad
   e. Other (please specify):

2) How do you travel through the Balboa Park BART station area? Circle all that apply:
   a. BART b. Bus c. Light rail c. Bicycle d. Pedestrian d. Car
   e. Other (please specify):

3) On a scale of 1 to 5, how should each mode of transportation be prioritized on Ocean Avenue?

	Least Important		Somewhat Important		Most Important
Cars	1	2	3	4	5
Transit	1	2	3	4	5
Pedestrians	1	2	3	4	5
Bicycles	1	2	3	4	5

Please see the reverse for additional comments

4) On a scale of 1 to 5, how should each mode of transportation be prioritized on Geneva Avenue?

	Least Important		Somewhat Important		Most Important
Cars	1	2	3	4	5
Transit	1	2	3	4	5
Pedestrians	1	2	3	4	5
Bicycles	1	2	3	4	5

Additional comments:

BALBOA PARK STATION CIRCULATION STUDY

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Email: balboa@sfcta.org
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Questionnaire & General Comments:

1) How did you hear about this meeting? Circle all that apply:
   a. Email b. Flyer c. Website d. Transit Shelter Ad
   e. Other (please specify):

2) How do you travel through the Balboa Park BART station area? Circle all that apply:
   a. BART b. Bus c. Light rail c. Bicycle d. Pedestrian d. Car
   e. Other (please specify):

3) On a scale of 1 to 5, how should each mode of transportation be prioritized on Ocean Avenue?

	Least Important		Somewhat Important		Most Important
Cars	1	2	3	4	5
Transit	1	2	3	4	5
Pedestrians	1	2	3	4	5
Bicycles	1	2	3	4	5

Please see the reverse for additional comments

4) On a scale of 1 to 5, how should each mode of transportation be prioritized on Geneva Avenue?

	Least Important		Somewhat Important		Most Important
Cars	1	2	3	4	5
Transit	1	2	3	4	5
Pedestrians	1	2	3	4	5
Bicycles	1	2	3	4	5

Additional comments:

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COMMENT CARD

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San Francisco County Transportation Authority
Attention: Liz Rutman, Principal Transportation Planner
1455 Market Street, 22nd Floor
San Francisco, CA 94103

Email: balboa@sfcta.org
Website: www.sfcta.org/balboa

RECEIVED FEB 06 2014

Questionnaire & General Comments:

1) How did you hear about this meeting? Circle all that apply:
   a. Email b. Flyer c. Website d. Transit Shelter Ad
   e. Other (please specify):

US MAIL (MAILING LIST)

2) How do you travel through the Balboa Park BART station area? Circle all that apply:
   a. BART b. Bus c. Light rail c. Bicycle d. Pedestrian d. Car
   e. Other (please specify):

3) On a scale of 1 to 5, how should each mode of transportation be prioritized on Ocean Avenue?

	Least Important		Somewhat Important		Most Important
Cars	1	2	3	4	5
Transit	1	2	3	4	5
Pedestrians	1	2	3	4	5
Bicycles	1	2	3	4	5

Please see the reverse for additional comments

4) On a scale of 1 to 5, how should each mode of transportation be prioritized on Geneva Avenue?

	Least Important		Somewhat Important		Most Important
Cars	1	2	3	4	(5)
Transit	1	2	3	4	(5)
Pedestrians	1	2	3	4	(5)
Bicycles	(1)	2	3	4	5

Additional comments: NONE OF THE RAMPS ARE REDUNDANT. OCEAN OR GENEVA.

I AM A LONG TIME RESIDENT OF THE AREA AND I WORK IN THE TRANSIT INDUSTRY.

THE PROPOSED I280 CLOSURES OF THE OCEAN AVE ON-RAMP (NORTH) AND OFF-RAMP (SOUTH) MUST NOT BE PERMITTED. WHEN I HEARD MR FUNG STATE THAT THE TWO RAMPS WERE "REDUNDANT" BUT HEAVILY USED AT THE SAME TIME RAISED "FLAGS." I DONOT BELEIVE THAT CALTRANS WOULD ALLOW THE CLOSURES. BESIDES, GENEVA AVE AND THE SURROUNDIN STREETS WOULD NOT BE ABLE TO ACCOMODATE HAVING THE ONLY ON-RAMP AND ~~OF~~ OFF RAMP FOR I280. FOR THE SAFETY OF PEDESTRIANS AND BYCYLES, A STOPLIGHT SHOULD BE INSTALLED @ THE I280 OFF RAMP ON OCEAN.

ALSO, NO FRONTAGE ROAD SHOULD EVER BE BUILT. IF BART IS ALLOWED TO ABANDON THEIR "KISS AND RIDE" AREA, BART SHOULD BE COMPELLED TO REPLACE IT AT THEIR COSTS.

BALBOA PARK STATION CIRCULATION STUDY

COMMENT CARD

Please submit comments today or mail by February 7, 2014 to:
San Francisco County Transportation Authority
Attention: Liz Rutman, Principal Transportation Planner
1455 Market Street, 22nd Floor
San Francisco, CA 94103

Email: balboa@sfcta.org
Website: www.sfcta.org/balboa

Questionnaire & General Comments:

1) How did you hear about this meeting? Circle all that apply:
   a. Email b. Flyer c. Website d. Transit Shelter Ad
   e. Other (please specify):

   Nextdoor Sunnyside

2) How do you travel through the Balboa Park BART station area? Circle all that apply:
   a. BART b. Bus c. Light rail c. Bicycle d. Pedestrian d. Car
   e. Other (please specify):

3) On a scale of 1 to 5, how should each mode of transportation be prioritized on Ocean Avenue?

	Least Important		Somewhat Important		Most Important
Cars	1	2	3	4	5
Transit	1	2	3	4	5
Pedestrians	1	2	3	4	5
Bicycles	1	2	3	4	5

Please see the reverse for additional comments

4) On a scale of 1 to 5, how should each mode of transportation be prioritized on Geneva Avenue?

	Least Important		Somewhat Important		Most Important
Cars	1	2	3	4	5
Transit	1	2	3	4	5
Pedestrians	1	2	3	4	5
Bicycles	1	2	3	4	5

Additional comments:

I think that closing any freeway on/off ramps is premature. Why not try a pilot closure first. Also, why not also try adding protected bike lanes to both Geneva and Ocean Avenue? Adding safe + protected bikeways, along with better walking and transit options, is the only way to reduce the number of City College cars that drive recklessly + clog transit and other street passage. Even with the proposed alternatives, it is not a safe bikeway. Both Ocean + Geneva are terrifying as a cyclist and inhibit (rightfully) most from using this mode of transport. Please take out the BART parking on Ocean (north) + make that lane 2 way protected bike lane at least as a pilot project to at least Howth from BART.

BALBOA PARK STATION CIRCULATION STUDY

COMMENT CARD

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1455 Market Street, 22nd Floor
San Francisco, CA 94103

Email: balboa@sfcta.org
Website: www.sfcta.org/balboa

Questionnaire & General Comments:

1) How did you hear about this meeting? Circle all that apply:
   a. Email b. Flyer c. Website d. Transit Shelter Ad
   e. Other (please specify):

   NextDoor Sunnyside (website)

2) How do you travel through the Balboa Park BART station area? Circle all that apply:
   a. BART b. Bus c. Light rail c. Bicycle d. Pedestrian d. Car
   e. Other (please specify):

3) On a scale of 1 to 5, how should each mode of transportation be prioritized on Ocean Avenue?

	Least Important		Somewhat Important		Most Important
Cars	1	2	3	4	5
Transit	1	2	3	4	5
Pedestrians	1	2	3	4	5
Bicycles	1	2	3	4	5

Please see the reverse for additional comments

4) On a scale of 1 to 5, how should each mode of transportation be prioritized on Geneva Avenue?

	Least Important		Somewhat Important		Most Important
Cars	1	2	3	(4)	5
Transit	1	2	3	4	(5)
Pedestrians	1	2	(3)	4	5
Bicycles	1	2	(3)	4	5

Additional comments:

I prefer that the South bound 280 exit lane at Ocean Ave be reconfigured to two lanes if possible so that traffic exiting 280 must stop at a stop sign or signal light. A 90-degree turn is prefered so that bikes can travel east on Ocean with a higher safety degree.

I prefer that existing conditions at the Geneva/280 interchange remain the same.

BALBOA PARK STATION CIRCULATION STUDY

RECEIVED FEB 07 2014

COMMENT CARD

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Attention: Liz Rutman, Principal Transportation Planner
1455 Market Street, 22nd Floor
San Francisco, CA 94103

Email: balboa@sfcta.org
Website: www.sfcta.org/balboa

Questionnaire & General Comments:

1) How did you hear about this meeting? Circle all that apply:
   a. Email b. Flyer c. Website d. Transit Shelter Ad
   e. Other (please specify):

   Neighborhood association (NMTIA)

2) How do you travel through the Balboa Park BART station area? Circle all that apply:
   a. BART b. Bus c. Light rail c. Bicycle d. Pedestrian d. Car
   e. Other (please specify):

3) On a scale of 1 to 5, how should each mode of transportation be prioritized on Ocean Avenue?

	Least Important		Somewhat Important		Most Important
Cars	1	2	3	4	5
Transit	1	2	3	4	5
Pedestrians	1	2	3	4	5
Bicycles	1	2	3	4	5

Please see the reverse for additional comments

4) On a scale of 1 to 5, how should each mode of transportation be prioritized on Geneva Avenue?

	Least Important		Somewhat Important		Most Important
Cars	1	2	3	4	5
Transit	1	2	3	4	5
Pedestrians	1	2	3	4	5
Bicycles	1	2	3	4	5

Additional comments:

I'm opposed to the loss of any ~~addition~~ parking on Ocean. It is often used by visitors to the adjacent Balboa Park

BALBOA PARK STATION CIRCULATION STUDY

COMMENT CARD

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Attention: Liz Rutman, Principal Transportation Planner
1455 Market Street, 22nd Floor
San Francisco, CA 94103

Email: balboa@sfcta.org
Website: www.sfcta.org/balboa

Questionnaire & General Comments:

1) How did you hear about this meeting? Circle all that apply:
   a. Email b. Flyer c. Website d. Transit Shelter Ad
   e. Other (please specify):

2) How do you travel through the Balboa Park BART station area? Circle all that apply:
   a. BART b. Bus c. Light rail c. Bicycle d. Pedestrian d. Car
   e. Other (please specify):

3) On a scale of 1 to 5, how should each mode of transportation be prioritized on Ocean Avenue?

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Cars	1	2	3	4	5
Transit	1	2	3	4	5
Pedestrians	1	2	3	4	5
Bicycles	1	2	3	4	5

Please see the reverse for additional comments

4) On a scale of 1 to 5, how should each mode of transportation be prioritized on Geneva Avenue?

	Least Important		Somewhat Important		Most Important
Cars	1	2	3	4	5
Transit	1	2	3	4	5
Pedestrians	1	2	3	4	5
Bicycles	1	2	3	4	5

Additional comments:

Please see Attached

Monday, February 3, 2014

Chester Fung
Liz Rutman
Principal Transportation Planner

RECEIVED FEB 05 2014

Dear Chester and Liz,

Recently I attended your transportation meeting regarding the study of Geneva Ave. Thank you for hosting it, it was quite informative.

As requested, I have the following suggestion to go along with your plan considerations: (Please refer to the enclosed map)

1. Geneva / 280 exits both northbound and southbound need 2 arrows toward City College and 1 arrow toward BART. Traffic backs up into the freeway during peak class time. Not as much traffic goes to BART all at once.

2. Make Howth Street a two-way street. This will alleviate traffic congestion on Ocean as well as Geneva. This will give an alternate access from the Ocean exit. Howth / Geneva needs to be a 4-way intersection with a left turn arrow going both ways.

3. Red zone at the steep S-curve on Ridge Street 3 streets (Howth / Josiah, Louisburg / Margaret & Tara / Majestic). This is a blind turn, very difficult to see both directions. Cars park right on the curve and it is impossible to see over the hill. Also, cars go thru there at a very high speed. A motorcycle landed under my bumper recently. I could have killed him! Speed bump would also help greatly.

4. Red zone on Lakeview at Josiah. This is also a steep blind turn. There is a large truck that is always parked at the corner making it impossible to see.

If you have any questions or need clarification, I can be reached at 415-203-2138

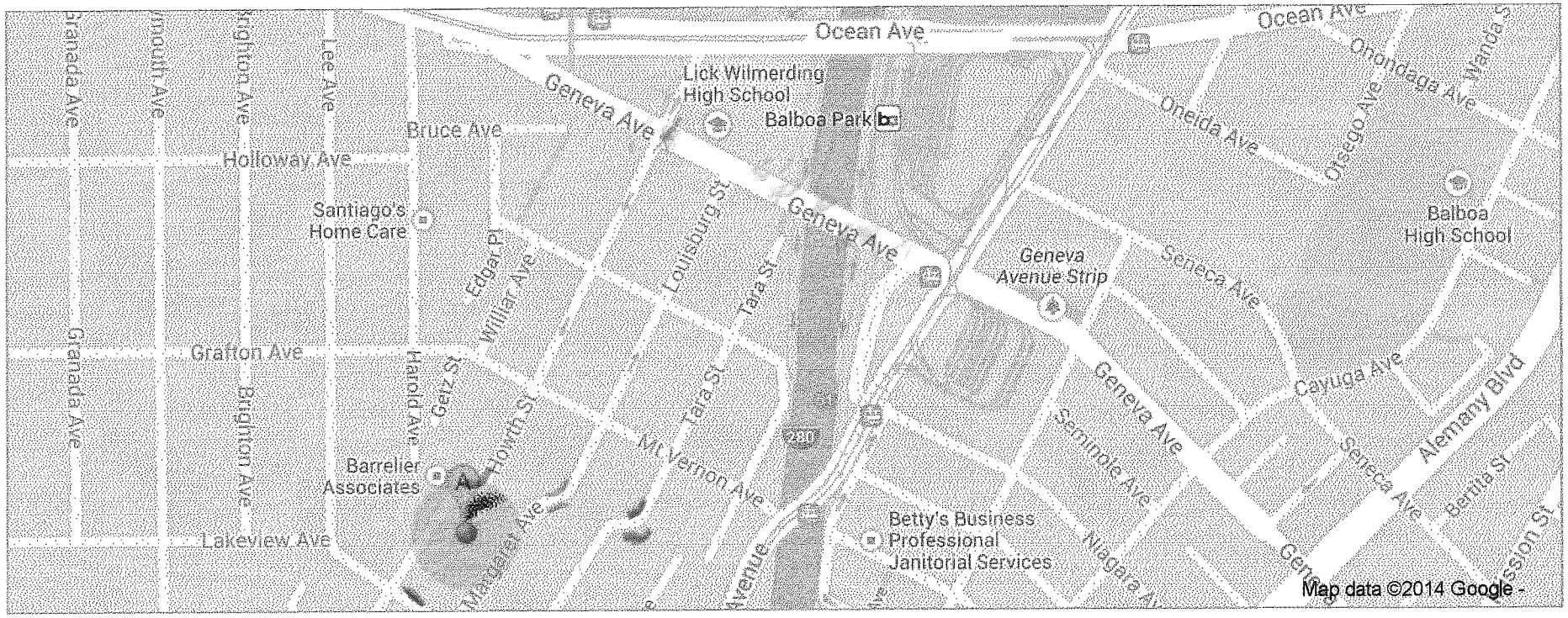
Thank you for your consideration.

Constance Adamopoulos (homeowner 14 years)
25 Josiah Avenue
94112

Pls forward a copy to Chester Fung.

To see all the details that are visible on the screen, use the "Print" link next to the map.

Google



SFMTA | Municipal Transportation Agency

Sustainable Streets Division
Transportation Engineering

COLOR CURB APPLICATION FORM

NOTE: Please Allow a Minimum of 1 to 2 Months to Process New Requests

INSTRUCTIONS TO THE APPLICANT: Fill out this application form completely. Sign, date and return this form to begin processing. Please include the non-refundable processing fee for all white, green and driveway red zone requests. If you have general questions regarding the Color Curb Program or regarding the required processing fees, please refer to the attached brochure.

SECTION 1: APPLICANT INFORMATION

Name of Applicant: Constance Adamopoulos	Title: homeowner
Business Name (if applicable):	Phone: 415.203.2138
Address of Requested Zone: See Attached	Fax:
Billing Address (if different from above):	
San Francisco, CA 941	

SECTION 2: ZONE REQUEST INFORMATION

1. Type of Zone You Are Applying For (check one): ☐Yellow ☐Green ☐White ☐Blue ☒Red
   (NOTE: If applying for a driveway red zone, skip to Section 4)
2. Is Requested Zone Completely Within Your Frontage? (check one) ☐Yes ☒No
   If Yes, is it on the (check one) ☐Front ☐Side ☐Rear of Building

SECTION 3: ADDITIONAL INFORMATION FOR YELLOW, GREEN WHITE OR BLUE ZONES

3. Length of Zone Requested (or number of parking spaces): _____
4. Type of Business (check one): ☐Wholesale/Warehouse ☐Hotel/Apartment ☐Restaurant ☐Retail ☐Medical Office ☐Office ☐Other: _____
5. Size of Business (provide as applicable): Number of: _____sq. ft. _____seats _____rooms/units
6. Business Hours and Days: _____
7. FOR **YELLOW** ZONES:
   a. Number of pick-ups/deliveries daily _____
   b. Typical size and type of truck _____
   c. Estimated times of highest usage _____

   FOR **WHITE** OR **GREEN** ZONES:
   a. Estimated Number of customers/visitors daily _____
   b. Estimated times of highest usage _____

   FOR **BLUE** ZONES:
   a. Estimated Number of disabled persons visiting premises daily _____
   b. Estimated times of highest usage _____

SECTION 4: PURPOSE AND SIGNATURE

PLEASE DESCRIBE THE PURPOSE AND INTENDED USE OF THIS ZONE:
See Attached

Signature: _____ Date: 2-3-14

Appendix I – Survey Results

Balboa Park Circulation Study Survey

29 surveys submitted as of 2/17/14

1. How did you hear about this meeting? Circle all that apply:

Answer Options		Response Count	Response Percent
	Email	15	42%
	Flyer	13	36%
	Website	1	3%
	Transit Shelter Ad	0	0%
	Other (please specify)	6	17%
	Question skipped	1	3%
	Total	36	

Other included:Ocean Avenue CBD, Sunnyside group on Next Door, word of mouth

2. How do you travel through the Balboa Park BART station area? Circle all that apply:

Answer Options:		Response Count	Response Percent
	BART	26	23%
	Bus	15	13%
	Light Rail	14	12%
	Bicycle	14	12%
	Pedestrian	23	20%
	Car	21	18%
	Other (please specify)	1	1%
	Question skipped	0	0
	Total	114	

Other included:Brisbane Shuttle Bus

3. On a scale of 1 to 5, how should each mode of transportation be prioritized on Ocean Avenue?

Answer Options		Least Important	2	3	4	Most Important	Response Count	Rating Average
	Cars	9	4	4	7	3	27	2.67
	Transit	0	0	2	10	15	27	4.48
	Pedestrians	0	0	3	9	15	27	4.44
	Bicycles	1	2	5	8	10	26	3.92

4. On a scale of 1 to 5, how should each mode of transportation be prioritized on Geneva Avenue?

Answer Options		Least Important	2	3	4	Most Important	Response Count	Rating Average
	Cars	6	2	6	8	5	27	3.15
	Transit	0	0	3	7	16	26	4.5
	Pedestrians	0	1	5	7	13	26	4.23
	Bicycles	2	5	11	3	6	27	3.4

Appendix J - Emailed Comments

From: **Lisa Dunseth** <dunsethl@hotmail.com>
Date: Fri, Jan 31, 2014 at 9:26 PM
Subject: [balboa] BALBOA BART CIRCULATION STUDY
To: "balboa@sfcta.org" <balboa@sfcta.org>, "chester.fung@sfcta.org" <chester.fung@sfcta.org>, "nmtiasf@gmail.com" <nmtiasf@gmail.com>, dunsethl <dunsethl@hotmail.com>

Dear Mr. Fung:

I am writing as a Mission Terrace neighbor and member of the New Mission Terrace Improvement Association to comment on the plans for the Balboa Park BART area circulation study which attempts to address the problems related to the Balboa BART/MUNI/and CALTRANS freeway ramp tangle in the Ocean/San Jose/Geneva area.

It is a perfect example of what I call BAD DESIGN. It is a result of a process of growth over time and what happens when there is no 'big picture' collaborative planning between the multiple jurisdictions which have a vested interest in it.

There will be no sensible solution to it until "The Big One" takes it all down and we can start over from scratch. Any real fundamental 'fix' would require a huge monetary investment to completely change the infrastructure and would require both state and federal monies.

Because of that, and because of the inevitable unintended consequences which arise when you start 'squeezing the balloon' of traffic, I recommend that you implement only the basic improvements which the locals have been asking for for years and which would not cost much money.

For example:

- creating a right turn arrow at Geneva for southbound San Jose automobile traffic;

- creating three lanes at Geneva for the northbound 280 exit ramp (left turn, straight ahead to freeway, and right turn);

- installing a BART elevator at the 'kiss and ride' on the south side of Geneva;
- installing a red flashing stop light at the southbound 280 off ramp at Ocean
- creating a drop off area in the southbound San Jose lane adjacent to the MUNI complex; creating another drop off lane along the eastbound Ocean lane adjacent to the MUNI complex
- better lighting, signage, pathway markings in and around the stations
- finish the walkway from the Tony Sacco Bridge across the BART station to MUNI
- maintain the landscaping around the MUNI/BART area (PLEASE!)
- get rid of the pigeons

Messing around with closing freeway ramps will 'drive' more traffic into our residential neighborhood as drivers jockey for shortcuts to the next nearest freeway ramp. It will also 'squeeze the balloon' of traffic onto nearby neighborhood streets in the Monterey/Glen Park/Bosworth area--I'm sure those communities would like to have input about this too.

I appreciate your efforts, but I fear you will only make things worse for those of us who have to suffer the indignity of living near this tangle of a transit hub. The ideas you are toying with will only make the congestion worse, especially at the Ocean/San Jose intersection, and will likely make it more dangerous for the cars, bikes, pedestrians, and public transit which must share the space.

Thank you for your consideration.

Lisa Dunseth
585-0472
201 Delano Avenue

From: **david hooper** <vpulgas@yahoo.com>
Date: Fri, Feb 7, 2014 at 4:38 PM
Subject: [balboa] Comments regarding changes proposed in the Balboa Park Station Area Circulation Study
To: "balboa@sfcta.org" <balboa@sfcta.org>

I wish to comment on the changes proposed in the balboa park station Area Circulation Study as presented at the Balboa Park Citizens Advisory Committee on Thursday, January 30, 2014, By Chester Fung on behalf of the SFCTA.
Due to the time restraint on public comment imposed bt the SFCTA, I wish to reserve the right to submit further public comment in the future after analyzing the data in the study and observing the areas included in the study.

Specifically, the proposal to close the I-280 northbound on-ramp at Geneva Ave and to close the I-280 off-ramp at Geneva Ave in an effort to ameliorate the traffic problems on Geneva Ave and in the area of the study is flawed and will result in an unendurable increase to the traffic on Ocean Ave at the I-280 northbound on-ramp and in the vicinity of the on-ramp both to the east and to the west of the on-ramp area.

Additionally, the increase in traffic on Ocean Ave due to the proposed closure of the southbound off-ramp at Geneva Ave will contribute to this unendurable situation.

Some of information that I wish to draw to your attention is on Table 9 of the study (Intersection Delay and Level of Service):
Item 4: Ocean/I-280 NB on-ramp with an AM Peak Hour delay of 60.7 seconds (with an LOS rating of E (unacceptable).
Item 9: Geneva/I-280 NB on-ramp with an AM peak Hour delay of 73.7 and with an LOS of F (unacceptable) and with a PM Peak Hour Delay of (80) and an LOS of F (unacceptable).
Item 13: Monterey Ave/I-280 NB on-ramp with an AM Peak Hour delay of 59.9 and an LOS rating of E (unacceptable).
Item 16: Alemany/I-280 NB on-ramp with an AM Peak Hour delay of 48.4 and an LOS of D (barely acceptable).

Clearly, the proposed closure of the Geneva NB on-ramp and the Geneva SB on-ramp would increase the traffic delays at the Ocean Ave on-ramp past the present E rating and would also diminish the ratings at both the Alemany and Monterey ramps .
Please note that while Geneva Ave is a four-lane street, Ocean Ave is a two-lane street with an active bike lane, a newly installed pedestrian crossing and a newly renovated and very popular park.

The SFMTA proposal (accepted as a given by the CTA study) would also move the 54 and 29 lines to Ocean Ave, increasing the traffic on two-lane Ocean Ave.
Additionally, Ocean Ave traffic immediately east of the intersection of San Jose Ave is controlled by stop signs, not traffic lights, and that these signs were installed in order to ensure pedestrian safety for the students at Balboa High School, James Denman Middle School and the renovated San Miguel Elementary School.

I object to the proposal to close the Geneva NB on-ramp and geneva SB off-ramp because the data shows the Ocean Ave is not capable of absorbing the increase in traffic and because the situation will create unsafe conditions for pedestrians, bicyclists and motorist.
Thank you, David Hooper

From: **Eva** <eva.chu250@gmail.com>
Date: Tue, Feb 11, 2014 at 2:36 PM
Subject: Balboa Park Station study
To: "chester.fung@sfcta.org" <chester.fung@sfcta.org>

Hi Chester,
I was at the Jan. 30th community meeting and forgot to recommend/suggest more lighting along the west frontage road.
My husband and I walk daily along the west frontage road (along Lick Wilmerding) between Ocean and Geneva. At nights, it is really dark on the half of the walkway beginning from the Geneva Ave. end for about 300 yards (or about half way along the frontage road). More lighting is needed for safety reasons. Please include this request as feedback from the community meeting.
Thanks.
-eva
250 Tara St.
SF (415) 469-4909

On Thu, Jan 30, 2014 at 9:24 PM, Samuel Santos <ssantos@ccsf.edu> wrote:
Good Evening Mari and Chester:

I wanted share a few thoughts regarding tonight's meeting at CCSF.

First, I wanted to give a big thank you to William Walker for his excellent outreach efforts. I saw signs for the meeting all over campus, with a particular focus on high traffic student areas - the cafeteria and student union.

Second, I wanted to reach out to express my willingness, on behalf of the college, to work with you all in supporting our neighbors in having a better experience with our CCSF students. There are number of ways we can reach out to the student community to convey messages that can drastically improve our relationship with our neighbors.

Third, I am very interested in exploring ways to improve the safety of our students in the highly utilized areas discussed tonight.

Moving forward, please add me to the email list. I'm also happy to meet with one or both of you to explore ways we can work together in the future.

Thank you,

Samuel Santos
City College San Francisco
Dean, Student Affairs & Wellness
Conlan Hall, Room 106
50 Phelan Avenue
San Francisco, CA 94112
415-239-3211
ssantos@ccsf.edu

From: Barbara Fugate [mailto:mousecollector@msn.com]
Sent: Tuesday, January 14, 2014 10:16 PM
To: Emily Marsh
Subject: January 30th Balboa Park Community Meeting

Hello Emily,

Those CIA members who are available electronically will receive this email from Secretary Dillon. (approx. 90 households). We have just been discussing the best time to sent it. Unfortunately we did not have this in time to include in our January newsletter thus we will not be able to reach our entire membership of 130+ households.

A CIA representative attended your last meeting and a report was published in our newsletter. The only issue we have is with any plan to install a traffic signal on the corner of Geneva at Cayuga. We are adamantly opposed to this now as we have the last three or four times in the last fifteen years.. We already have serious safety issues in the neighborhood now, vehicles speed through our crowded streets trying to bypass Mission and Geneva, or Geneva and San Jose. intersections. We have been unable get get speed bumps installed however we have been promised this could happen when funds are available. A signal light at Geneva and Cayuga would be catastrophic.

Thank you for keeping us on the email list. We would appreciate being advised of any future meetings.
Regards
Barbara
CIA President

On Tue, Feb 4, 2014 at 10:10 PM, Martha Arnaud <martha.b.arnaud@gmail.com> wrote:
Dear Mr. Fung:

I hear that you are the person to whom commentary should be directed regarding the proposed closing of the Geneva ramp(s) onto 280 and directing more traffic onto Ocean Avenue, moving the BART "kiss-and-ride" to Ocean, and/or re-routing MUNI bus traffic onto Ocean.

By way of context, I have lived in Mission Terrace since 1999. I live on Cayuga between San Juan and Santa Rosa; I am not on or directly adjacent to either of the routes in question, so I have no stake in the issue as an immediate neighbor. I am, however, both a pedestrian and an auto driver who knows these streets very well from both perspectives. I am all for sensible changes to traffic flow and infrastructure. However, I think these items being proposed are terrible ideas that will be entirely regrettable if implemented.

- For one thing, Geneva is a two-lane street in each direction and much better able to handle higher traffic than Ocean, which is a much smaller, lower-throughput street, and only one lane in each direction in the vicinity of San Joes Ave/280.

- Ocean is not only a smaller street, but it has much more pedestrian foot traffic crossing it. In addition, because of its proximity to multiple schools (Little Bear, Balboa High, Denman, Lick-Wilmerding, etc.) AND the fact that it is directly adjacent to the park, a significant amount of the pedestrians are children and not exactly the most road-savvy. Increasing auto and bus traffic on Ocean is more dangerous than keeping it on Geneva.

- Traffic flow on Ocean at San Jose and onto northbound 280 is already a mess even at relatively low-volume traffic flow, because of the LRVs turning into the big building MUNI here. Additionally, there is the frequent MUNI maintenance of the overhead wires, which involves a truck with aerial workers that's smack in the middle of the roadway, and which gums up traffic horribly. Making this the only on-ramp to northbound 280 is going to be a traffic disaster.

- Regarding moving the Kiss-and-Ride: While it is nice that there is now a way to access the BART station from Ocean, it is not exactly a station entrance -- rather, it is an entrance to a block-long pathway to the station entrance. To move the kiss-and-ride to the end of this pathway is a poor alternative. It is not actually close to the station. Consequently, I predict that autos will be bypassing the kiss-and-ride entirely, and dropping pedestrians in front of the station directly on Geneva, rather than dropping them a several-minute walk away on Ocean.

- Directing more traffic onto Ocean is also impractical because it is already extraordinarily congested up on the other (Phelan) side of the freeway. The stretch that is two lanes in each direction is subject to chronic double-parking, as well as the MUNI light rail. Congestion has become much worse with the addition in recent years of several more traffic lights, plus increased traffic from the new development (and Whole Foods). It was always slow, but now it's chronically backed up. I avoid it entirely whenever possible. Diverting freeway traffic to Ocean is a bad move.

- It seems to me, as a commuter well-accustomed to the rush-hour issues around the Balboa BART Station, that simply putting some thought into the timing of the traffic signals in the station vicinity would bring significant improvement to the traffic flow.

For these reason, I most strongly oppose this proposal.

Best regards,

Martha Arnaud
783 Cayuga Avenue
San Francisco, CA 94112
martha.b.arnaud@gmail.com