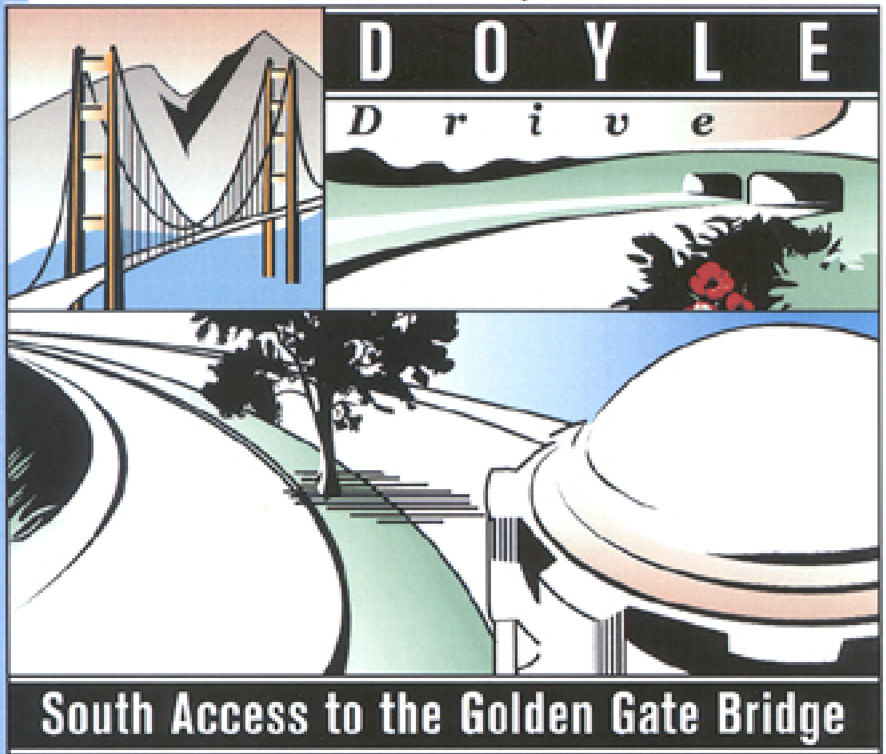
SFCTA Contract Number 99/00-7



FINAL TRAFFIC AND TRANSIT OPERATIONS REPORT
December 2004

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1.0 INTRODUCTION

This report summarizes the traffic and transit operations analyses for the South Access to the Golden Gate Bridge - Doyle Drive Project. The project alternatives were analyzed to determine how well they accommodate future traffic operations or affect transportation circulation using state of the practice methods and criteria.

This report describes the methodologies used, the existing condition in Year 2000, and the future operations in the design year (2030/2032) for each project alternative for the following four types of transportation elements:

- Traffic
- Transit
- Pedestrians and Bicycles
- Construction Period Traffic

1.1 PROJECT DESCRIPTION

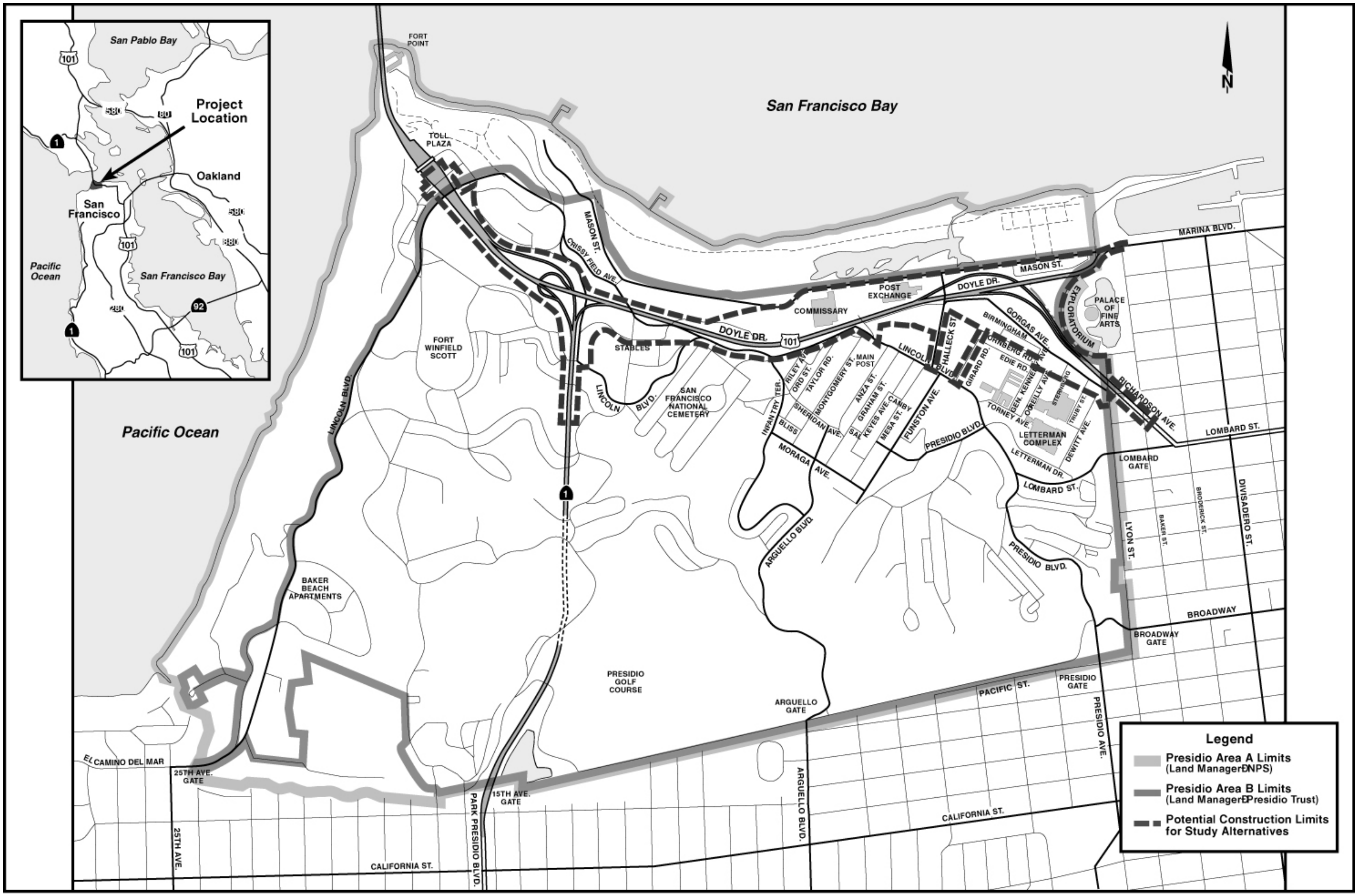
Doyle Drive is located in the Presidio of San Francisco (the Presidio), in the northern part of the City of San Francisco at the southern approach to the Golden Gate Bridge (see Figure 1.1-1). In 1994, when the US Army transferred jurisdiction of the Presidio to the National Park Service (NPS), it became part of the National Park system and Golden Gate National Recreation Area (GGNRA). In 1998, management of the Presidio was divided between two federal agencies: The Presidio Trust (the Trust), the agency responsible for oversight of 80 percent of the Presidio delineated as Area B; and the NPS, which is responsible for management of the coastal portions of the park (the remaining 20 percent) that are delineated as Area A. Doyle Drive lies predominately within the Area B lands managed by the Trust with a small portion at the western end located in Area A on land operated by the Golden Gate Bridge, Highway and Transportation District (GGBHTD). The Presidio has also been designated a National Historic Landmark District (NHLD) since 1962 with the Doyle Drive roadway determined to be a contributing element to that landmark.

Doyle Drive, the southern approach of US 101 to the Golden Gate Bridge, is 2.4 kilometers (1.5 miles) long with six traffic lanes. There are three San Francisco approach ramps which connect to Doyle Drive: one beginning at the intersection of Marina Boulevard and Lyon Street; one at the intersection of Richardson Avenue and Lyon Street; and one where Park Presidio Boulevard (State Route 1) merges into Doyle Drive approximately 1.6 kilometers (one mile) west of the Marina Boulevard approach (see Figure 1.1-1). Doyle Drive passes through the Presidio on an elevated concrete viaduct (low-viaduct) and transitions to a high steel truss viaduct (high-viaduct) as it approaches the Golden Gate Bridge Toll Plaza.

Doyle Drive is nearly 70 years old and it is approaching the end of its useful life, although regular maintenance, seismic retrofit, and partial rehabilitation activities are keeping the structure safe in the short term. However, further structural degradation caused by age and the effects of heavy traffic and exposure to salt air will cause the structures to become seismically and structurally unsafe in the coming years. In addition, the eastern portion of the aging facility is located in a potential liquefaction zone identified on the State of California Seismic Hazard Zones map dated August 2000.

Currently, Doyle Drive has nonstandard design elements, including travel lanes from 2.9 to 3.0 meters (9.5 to 10.0 feet) in width, no fixed median barrier, no shoulders and exit ramps that have tight turning radii. During peak traffic hours, plastic pylons are manually moved to provide a median lane as well as to reverse the direction of traffic flow of several lanes (Project Study Report: Doyle Drive Reconstruction, 1993).

FIGURE 1.1-1
PROJECT LOCATION



1.1.1 Project Purpose

The purpose of the South Access to the Golden Gate Bridge - Doyle Drive Project is to replace Doyle Drive in order to improve the seismic, structural, and traffic safety of the roadway within the setting and context of the Presidio of San Francisco and its purpose as a National Park.

1.2 ALTERNATIVES THAT ARE BEING CONSIDERED

The build alternatives for the Doyle Drive Project were developed with input from public scoping and reflected the parkway concept that evolved from previous studies. Through the screening analysis, six alternatives were selected for consideration in the Administrative DEIS/DEIR: Alternative 1, No-Build; Alternative 2, Replace and Widen; Alternatives 3a and 3b, Long Tunnels; and Alternatives 4a and 4b, Short Tunnels.

Subsequent to the Administrative DEIS/DEIR in 2002, a fifth alternative, the Presidio Parkway, was added to the list of alternatives for more detailed study. In comparison to the tunnel alternatives it was determined that Alternative 5, Presidio Parkway, would provide all the benefits and functions of Alternatives 3a, 3b, 4a, and 4b with less cost, construction duration and environmental impact. Hence, in November 2003 the four tunnel alternatives were recommended to be removed from further consideration and analysis in the DEIS/DEIR.

At a public meeting held in February 2004, the public agreed with the decision to drop Alternatives 3a, 3b, 4a, and 4b and retain Alternative 1, No-Build, Alternative 2, Replace and Widen, and Alternative 5, Presidio Parkway for consideration in the DEIS/DEIR.

This section describes the build alternatives in terms of physical and operating characteristics and a No-Build Alternative. As shown in Figure 1.1-1, the project limits are from Merchant Road, just south of the Golden Gate Bridge Toll Plaza, to the intersection of Richardson Avenue/Francisco Street and Marina Boulevard/Lyon Street. During the screening process, all alternatives were evaluated for their ability to meet the project's Purpose and Need. Detailed drawings showing the plan and profile of each alternative in addition to the various design options can be found in Appendix A.

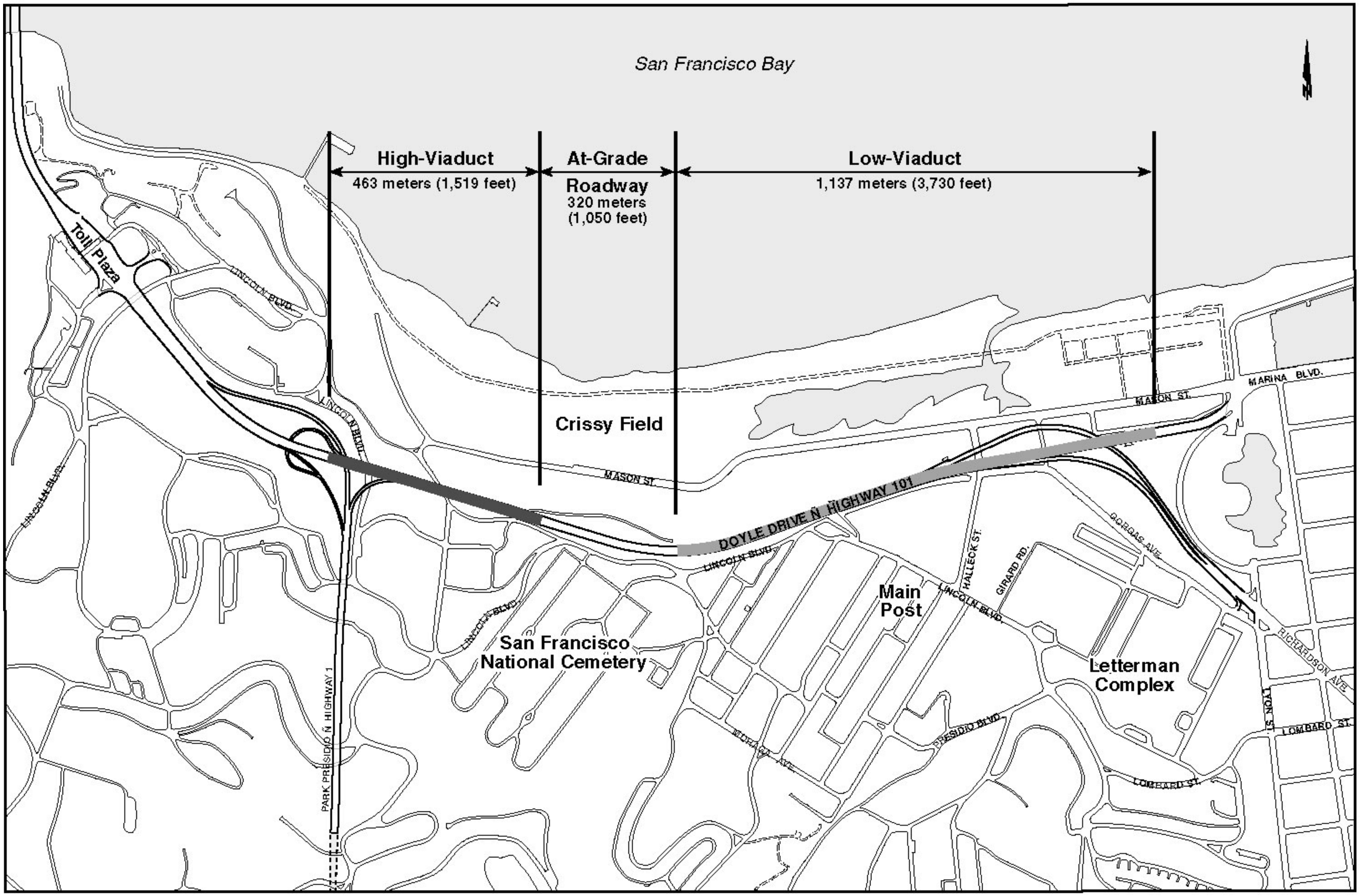
1.2.1 Alternative 1: No-Build Alternative

The No-Build Alternative represents the future year conditions if no other actions are taken in the study area beyond what is already programmed by the year 2020. The No-Build Alternative provides the baseline for existing environmental conditions and future travel conditions against which all other alternatives are compared.

Doyle Drive would remain in its current configuration, with six traffic lanes ranging in width from 2.9 to 3.0 meters (9.5 to 10 feet) and an overall facility width of 20.4 meters (67 feet) (see Figure 1.2.1-1). There are no fixed median barriers or shoulders. The lane configuration is changed by manually moving plastic pylons to increase the number of lanes in the peak direction of traffic. The facility passes through the Presidio on a high steel truss viaduct and a low elevated concrete viaduct with lengths of 463 meters (1,519 feet) and 1,137 meters (3,730 feet), respectively. This alternative does not improve the seismic, structural, or traffic safety of the roadway.

Vehicular access to the Presidio is available from Doyle Drive via the off-ramp to Merchant Road at the Golden Gate Bridge Toll Plaza. Presidio access at the east end of the project will be provided for southbound traffic via a right turn from Richardson Avenue to Gorgas Avenue. Presidio access for northbound traffic will be provided by a slip ramp from Richardson Avenue to Gorgas Avenue, which is currently under construction.

FIGURE 1.2.1-1
ALTERNATIVE 1: NO-BUILD



1.2.2 Alternative 2: Replace and Widen

The Replace and Widen Alternative would replace the 463-meter (1,519-foot) high-viaduct and the 1,137-meter (3,730-foot) low-viaduct with wider structures that meet the most current seismic and structural design standards (see Figure 1.2.2-1). The new facility would be replaced on the existing alignment and widened to incorporate improvements for increased traffic safety.

This alternative would include either six 3.6-meter (12-foot) lanes and a 3.6-meter (12-foot) eastbound auxiliary lane with a fixed median barrier or six 3.6-meter (12-foot) lanes with a moveable median barrier. The new facility would have an overall width of 38.0 meters (124 feet). The fixed median barrier option would require localized lane width reduction to 3.3 meters (11 feet) to avoid impacts to the historic batteries and Lincoln Boulevard, reducing the facility width to 32.4 meters (106 feet). Both options would include continuous outside shoulders along the facility. At the Park Presidio interchange, the two ramps connecting eastbound Doyle Drive to Park Presidio Boulevard and the ramp connecting westbound Doyle Drive to southbound Park Presidio Boulevard would be reconfigured to accommodate the wider facility. The Replace and Widen Alternative would operate similar to the existing facility except that there would be a median barrier and shoulders to accommodate disabled vehicles.

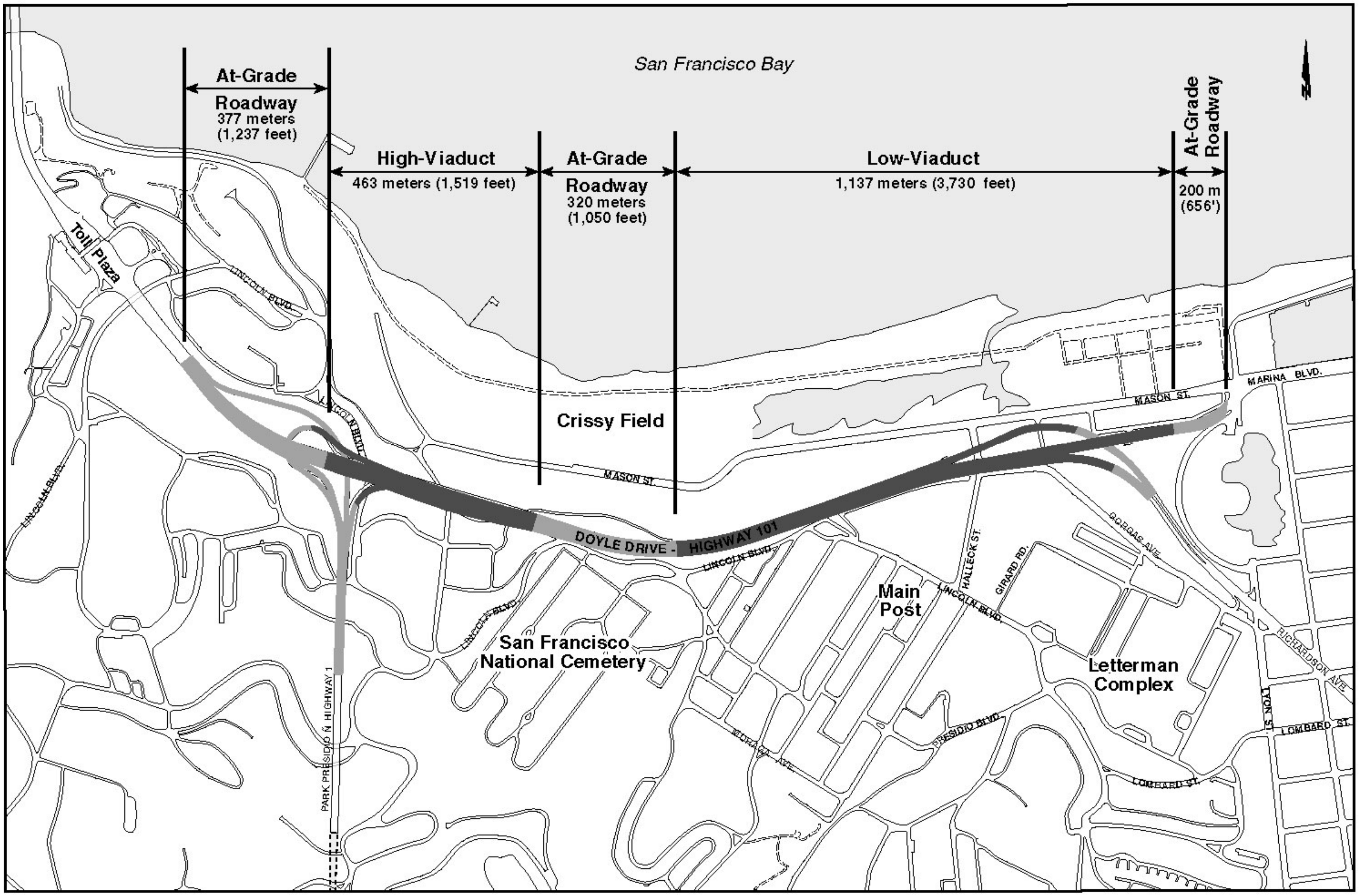
The Replace and Widen Alternative includes two options for the construction staging:

No Detour Option – The widened portion of the new facility would be constructed on both sides and above the existing low-viaduct and would maintain traffic on the existing structure. Traffic would be incrementally shifted to the new facility as it is widened over the top of the existing structure. Once all traffic is on the new structure, the existing structure would be demolished and the new portions of the facility would be connected. To allow for the construction staging using the existing facility, the new low-viaduct would be constructed two meters (six feet) higher than the existing low-viaduct structure.

With Detour Option - A 20.4-meter (67-foot) wide temporary detour facility would be constructed to the north of the existing Doyle Drive to maintain traffic through the construction period. Access to Marina Boulevard during construction would be maintained on an elevated temporary structure south of Mason Street. On and off ramps to the mainline detour facility would be located near the Post Exchange (PX) building.

Vehicular access to the Presidio is available from Doyle Drive via the off-ramp to Merchant Road at the Golden Gate Bridge Toll Plaza. Presidio access at the east end of the project will be provided for southbound traffic via a right turn from Richardson Avenue to Gorgas Avenue. There would be no Presidio access for northbound traffic at the east end of Doyle Drive due to geometric constraints and concerns for traffic safety.

FIGURE 1.2.2-1
ALTERNATIVE 2: REPLACE AND WIDEN



1.2.3 Alternative 5: Presidio Parkway Alternative

The Presidio Parkway Alternative would replace the existing facility with a new six-lane facility and an eastbound auxiliary lane between the Park Presidio interchange and the new Presidio access at Girard Road (see Figure 1.2.3-1). The new facility would have an overall width of up to 45 meters (148 feet), and would incorporate wide landscaped medians and continuous shoulders. To minimize impacts to the park, the footprint of the new facility would include a large portion of the existing facility's footprint east of the Park Presidio interchange. A 450-meter (1,476-foot) high-viaduct would be constructed between the Park Presidio interchange and the San Francisco National Cemetery. Shallow cut-and-cover tunnels would extend 240 meters (787 feet) past the cemetery to east of Battery Blaney. The facility would then continue towards the Main Post in an open depressed roadway with a wide, heavily landscaped median. From Building 106 (Band Barracks) cut-and-cover tunnels up to 310 meters long (984 feet) would extend to east of Halleck Street. The facility would then rise slightly on a low level causeway 160 meters (525 feet) long over the site of the proposed Tennessee Hollow restoration and a depressed Girard Road. East of Girard Road the facility would return to existing grade north of the Gorgas warehouses and connect to Richardson Avenue.

The Presidio Parkway Alternative would include an underground parking facility at the eastern end of the project corridor between the Mason Street Warehouses, Gorgas Street Warehouses and Palace of Fine Arts. The parking garage would supply approximately 500 spaces to maintain the existing parking supply in the area and improve pedestrian and vehicular access between the Presidio and the Palace of Fine Arts.

At the intersection with Merchant Road, just east of the toll plaza, a design option has been developed for a Merchant Road slip ramp. This option would provide an additional new connection from westbound Doyle Drive to Merchant Road. This ramp would provide direct access to the Golden Gate Visitors' Center and alleviate the congested weaving section where northbound Park Presidio Boulevard merges into Doyle Drive.

The Park Presidio interchange would be reconfigured due to the realignment of Doyle Drive to the south. The exit ramp from eastbound Doyle Drive to southbound Park Presidio Boulevard would be replaced with standard exit ramp geometry and widened to two lanes. The loop of the westbound Doyle Drive exit ramp to southbound Park Presidio Boulevard would be improved to provide standard exit ramp geometry. The northbound Park Presidio Boulevard connection to westbound Doyle Drive would be realigned to provide standard entrance ramp geometry. There are two options for the northbound Park Presidio Boulevard ramp to an eastbound Doyle Drive connection:

Option 1: Loop Ramp - Replace the existing ramp with a loop ramp to the left to reduce construction close to the Calvary Stables and provide standard entrance and exit ramp geometry.

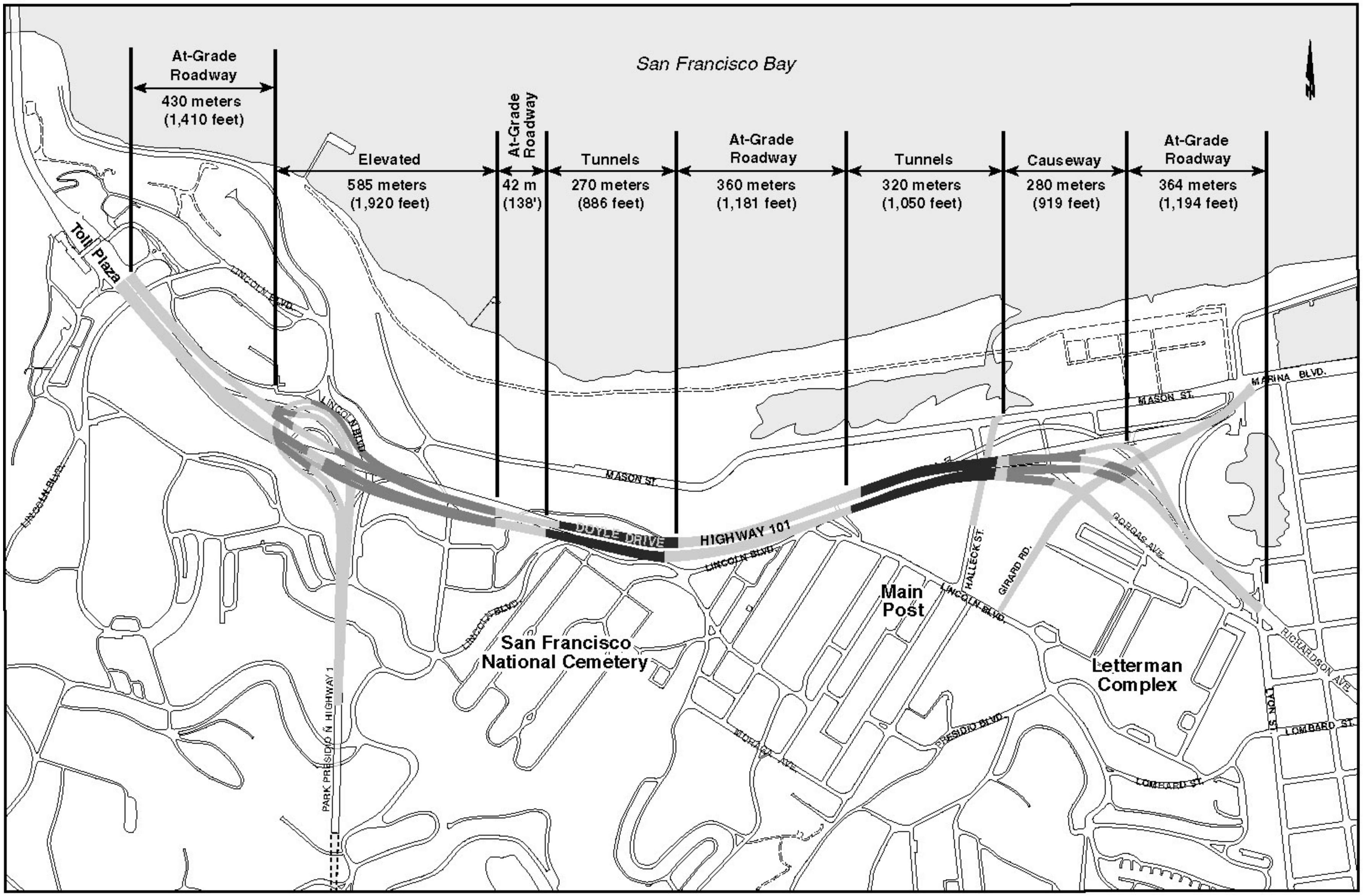
Option 2: Hook Ramp - Rebuild the ramp with a similar configuration as the existing ramp with a curve to the right and improved exit and entrance geometry.

The Presidio Parkway Alternative includes two options for direct access to the Presidio and Marina Boulevard at the eastern end of the project:

Diamond Option – Direct access to the Presidio and Marina Boulevard in both directions is provided by the access ramps from Doyle Drive connecting to a grade-separated interchange at Girard Road. East of the new Letterman garage, Gorgas Avenue is a one-way street and connects to Richardson Avenue with access to Palace Drive via a signalized intersection at Lyon Street.

Circle Drive Option – The Circle Drive Option provides direct access to the Presidio and Marina Boulevard for eastbound traffic by access ramps connecting to a grade-separated interchange of Girard Road. Westbound traffic from Richardson Avenue would access the Presidio and Palace Drive through a jug handle intersection with Gorgas Avenue.

FIGURE 1.2.3-1
ALTERNATIVE 5: PRESIDIO PARKWAY



1.3 DOCUMENT ORGANIZATION

This report presents the traffic and transit operations analyses used to evaluate how well the project alternatives operate currently and in the future with each of the project alternatives. Section 2.0 in this report describes the methodology used to analyze the alternatives. Section 3.0 describes the existing conditions for the Base Year. Section 4.0 discusses the future traffic operations and transportation circulation in the Design Year, while Section 5.0 summarizes the additional analysis for the Merchant Drive ramp option and the Park Presidio interchange ramp option. Section 6.0 concludes the report by providing highlights.

2.0 METHODOLOGY

This section details the specific methodologies used to analyze the project alternatives. These methods were developed for this project in coordination with FHWA and the cooperating/responsible agencies, Caltrans, National Park Service, Presidio Trust, and Golden Gate Bridge, Highway and Transportation District (GGBHTD).

The study area is, and will continue to be, changed by on-going efforts to implement improvements throughout the Presidio. Therefore, to accurately reflect changes resulting from the project alternatives, the planned improvements have been incorporated into the existing and future year analyses using published documents such as the Draft Environmental Impact Statement (EIS) and Presidio Trust Management Plan (PTMP), NPS' General Management Plan Amendment (GMPA), the Letterman Access EIS, and design plans.

The study area is evaluated for four different networks: The Alternative 1 - No-Build (which includes the slip ramp from northbound Richardson Avenue to Gorgas Street); Alternative 2 - Replace and Widen (which has the Richardson Avenue northbound slip ramp removed but is otherwise similar to Alternative 1). The Parkway Alternative (Alternative 5) is evaluated as two separate networks: the Diamond Option network and the Circle Drive network. Parkway Alternative (Alternative 5) design options to provide a Merchant Drive slip ramp and a hook ramp configuration from northbound Park Presidio to southbound Doyle Drive were analyzed independently of the four networks analyzed. Both design options could be integrated into the four networks analyzed.

2.1 BASE YEAR DEFINITION

Economic conditions and employment destinations have resulted in variations in traffic volumes in the project study area since the initial data was collected in 2000. Since that time, regularly assembled data at the Golden Gate Bridge have suggested that both daily and highest hourly traffic volumes have actually decreased for the same time periods between 2000 and 2003. The decrease seems to primarily be a result of economic conditions, as no major decrease occurred with the 2002 toll increase. As illustrated in Table 2.1-1, the bridge volumes have dropped on an average representative weekday in October between these two time periods. A traffic analysis based on the higher Year 2000 volumes represents a more conservative approach, as a key aspect of this study is to evaluate how alternatives would accommodate future traffic.

TABLE 2.1-1
COMPARISON OF SOUTHBOUND GOLDEN GATE BRIDGE TRAFFIC VOLUMES

Day of Week	AM Peak Hour				Daily			
	Oct-00	Oct-03	Change	Percent Change	Oct-00	Oct-03	Change	Percent Change
Monday	6000	5469	-532	-8.9%	57263	53330	-3933	-6.9%
Tuesday	6498	5638	-860	-13.2%	59194	55375	-3819	-6.5%
Wednesday	6304	5537	-767	-12.2%	60175	55806	-4369	-7.3%
Thursday	6214	5658	-556	-8.9%	61334	57131	-4203	-6.9%
Friday	5770	5184	-586	-10.1%	62586	57423	-5163	-8.2%
Midweek Average (Tuesday-Thursday)	6339	5611	-728	-11.5%	60234	56104	-4130	-6.9%

Source: Golden Gate Bridge Highway and Transportation District; DKS Associates, 2004

2.2 BASE YEAR DATA COLLECTION

Data used in the analysis was obtained through a variety of sources. These included traffic volume counts, travel speed/delay runs, and transit stop surveys conducted in May 2000; data from the Draft EIS for the Presidio Trust's Implementation Plan - *Background Transportation Report*; earlier surveys obtained for the development of the San Francisco Travel Demand Model (SF-TDM); and southbound Golden Gate Bridge data. Golden Gate Transit and MUNI supplied their transit route data. For a limited number of minor segments and intersections where no current counts were available, the volumes were obtained from the SF-TDM. The source, type, and date of data used are described below.

TABLE 2.2-1
DATA SOURCES FOR ANALYSIS

Data Source	Data Type	Collection Date
Transit Field Survey	a. Bus Alighting and Boarding volumes b. Segment Travel Times	May 2000
Traffic Counts	a. Turning Movements b. Segment Volumes	May and October 2000
SFCTA Traffic Count Database	a. Segment Volumes	Various
Caltrans	a. Segment Volumes	Various
GGBHTD	a. Traffic Volumes - Southbound/Northbound Golden Gate Bridge Volumes b. Transit - Transit Routes - Bus Volumes/Frequency - Passenger Volumes	Various
MUNI	a. Routes b. Bus Volumes/Frequency c. Passenger Volumes	Past three years
SFCTA Travel Demand Model	a. Segment Volumes b. Future Turning Movements c. Travel Times	Various
TransitInfo.org (511.org)	a. Route Schedules	N/A

2.3 DEFINITION OF DESIGN YEAR

The defined design year of a traffic project is generally targeted at 20 years of completion of the project. As the current construction plan estimates completion in 2012, the project design year would be defined as 2032.

The Association of Bay Area Governments (ABAG) prepares bi-annual population projections. The last adopted update to these at the commencement of the revised Doyle project is Projections 2002. As documented in subsequent sections, the most distant horizon year for Projections 2002 is 2025. Thus, a projection of the design year to an assumed 2030 condition was developed by extending the growth from 2020 to 2025 an additional five years. As this growth rate was developed for trip tables, the projections for population and employment shown in Table 1 are representative of the trip table growth.

Another set of available forecasts are available from the State of California Department of Finance. Unlike the Association of Bay Area Governments, these forecasts are for population only. The projections for the two counties most related to study area traffic from the Department of Finance are also found in 2.3-1.

Because the population and employment are not projected to increase according to any government agency between 2030 and 2032, the design year forecasts were assumed to be most appropriate using the design year methodology documented in this chapter.

TABLE 2.3-1
COMPARISON OF POPULATION AND EMPLOYMENT PROJECTIONS

County	Year	Population	Employment
Source: ABAG Projections 2002			
San Francisco	2020	811,100	745,600
	2025	815,200	770,500
	Design Year[1]	*819,300*	*795,400*
Marin	2020	275,500	155,160
	2025	281,400	163,270
	Design Year[1]	*287,300*	*171,380*
Source: Department of Finance			
San Francisco	2020	820,545	Not Available
	2025	810,595	Not Available
	2030	796,208	Not Available
	2032	789,236	Not Available
Marin	2020	251,260	Not Available
	2025	250,273	Not Available
	2030	248,684	Not Available
	2032	246,793	Not Available

[1] The design year is developed by applying an additional five-year growth rate for trip tables based on the 2020 to 2025 rate; population and employment growth is shown for illustrative purposes in this table

As documented in Chapter 3, the peak hour peak direction volumes are projected to grow by less than seven percent from 2000 to the design year, so that further adjustments to the design year volumes seem insignificant.

2.4 TRAVEL DEMAND MODEL DEVELOPMENT

The San Francisco County Travel Demand Forecasting Model (SF-TDM) was developed for the San Francisco County Transportation Authority (SFCTA) to provide detailed forecasts of travel demand (including both vehicles and for transit riders) for the Doyle Drive Environmental and Design Study. The objective was to accurately represent the complexity of the destination, temporal and modal options and provide detailed information on travelers making discrete choices. These objectives led to the development of an activity-based model that uses synthesized population as the basis for decision-making rather than zonal-level aggregate data sources.

The SF-TDM predicts the activity patterns of San Francisco travelers across the entire day in order to capture the interrelationships between trips, modes, and destinations found in “tours” or chains of trips. In order to capture these relationships it is necessary to represent the entire day. Typical “4-step” travel models may represent only a single peak period or an overall daily period. Instead, the SF-TDM divides the weekday into 5 broad time periods:

- Early AM (3am-6am)
- AM Peak (6am-9am)
- Midday (9am-3:30pm)
- PM Peak (3:30pm-6:30pm)
- Evening (6:30pm-3am)

Most of the components were estimated using household survey data collected by the Metropolitan Transportation Commission (MTC) for San Francisco residents only. The model is applied as a focused model, which combines trip-making from the entire Bay Area (derived from MTC’s BAYCAST trip tables) with the travel demand from San Francisco residents produced by the activity model.

The highest weekday volumes were observed during the AM peak period between 6:00AM and 9:00AM and the PM peak period between 3:30PM and 6:30PM. The highest weekend volumes were observed on a Saturday between 3:30 and 6:30PM. These periods were used for the analyses described below.

Until recently, the only available tool to forecast the future traffic demand for the City of San Francisco and vicinity was the regional travel model maintained by the MTC for the nine-county San Francisco Bay area, which was not able to effectively forecast local street demands. Therefore, SFCTA developed a travel demand model, the SF-TDM, between 1998 and 2001, to be consistent with overall regional demand and to be specifically enhanced to deal with local conditions including traffic and transit patterns. The SF-TDM was approved by the SFCTA Board, acting as the congestion management agency, to project future traffic and transit volumes for projects in San Francisco.

SF-TDM uses TP+ software to simulate the daily movement of people within and through San Francisco. Several unique features allow for a variety of trip behaviors. For example, a customized travel path methodology accounts for San Francisco residents’ tendency to “chain” several trips together. This path, called a “tour”, provides a more accurate forecast of San Francisco residents’ travel patterns. Customized equations also allow for allocating trips among the many different travel mode options, including transit, available.

A version of the model that was validated to the traffic characteristics of the study area was developed according to the Base Year conditions. This included review of traffic counts at a variety of locations in the study area.

To develop the Design Year baseline conditions, the SF-TDM incorporated the *Projections 2002* series of demographic assumptions for region, including out-of-county trips produced by MTC for the Draft *2001 Regional Transportation Plan*, and the *Draft Presidio Trust Management Plan* (PTMP) proposed improvements and projects. These assumptions provide a cumulative analysis that incorporates other land use growth and local transportation projects within San Francisco. The Year 2025 MTC trip table was expanded to this project's Design Year horizon using a purpose-specific methodology developed with MTC and Caltrans. Appendix B includes the technical memoranda with additional details about the Year 2025 expansion to the Design Year.

A 2010 analysis was prepared to assess impacts to the transportation system during the construction period. As the construction is scheduled for 2008 to 2012, the 2010 represents a mid-point in the construction of the facility. Because no Year 2010 network or land use scenarios are available for this project, a special set of scenarios was created by using the base 2020 roadway network and tables, then assuming that one-third of the land uses assumed to be in place by the Design Year would occur by 2010. Note that this method is not applicable for all the evaluation criteria. Further details about the SF-TDM can be found in the *San Francisco Travel Model Development—Model Validation Report*, issued in 2001.

2.4.1 Weekend Model Development

Because this corridor can be as, or even more, heavily traveled on the weekends, a project-specific weekend travel demand model was developed to analyze existing and future conditions. Existing conditions were identified based on travel survey data and actual weekend traffic counts. Travel behavior during a peak weekend period was developed by adjusting weekday demand by trip purpose to reflect weekend conditions. Appendix B includes the technical memorandum that details the methodology used to develop this model, identify the typical peak period, validate with current counts, and forecast future demand.

2.4.2 Peak Period to Peak Hour Conversion

As noted previously, the SF-TDM estimates weekday traveler behavior in five time periods based on daily activity patterns. Because the Bay Area commute extends for more than one hour, it is not reasonable to develop regional traffic forecasts on the hourly basis that is used for most traffic analyses; a three-hour peak period is used. In order to determine a peak-hour demand for use in operations studies, the peak-period volumes from the model were multiplied by a peak-period to peak-hour ratio.

The peak-period to peak-hour ratio plays a large role in identifying the potential effects of traffic in the project area. A ratio that is too large would assign an unrealistically high volume amount of traffic to the roadways, while a ratio that is too small would not assign enough volume to the roadways leading to an incorrect assessment of the effects. To provide consistent comparisons, a single overall ratio was developed for the project area for each peak period by calculating the percentage of the peak period traffic that occurs during the peak hour. The ratios were based on a variety of data listed above to increase reliability.

The derivation of the peak-period to peak-hour conversion factor used for this report is summarized in Tables 2.4.2-1 and 2.4.2-2. As these tables show, this ratio varies widely from one day to another, particularly in the PM peak; depending on proximity to the Golden Gate Bridge; and whether the peak direction or both directions are analyzed. The data in these two tables follow implementation of FasTrak on the Golden Gate Bridge and stop signs on Marina Boulevard. October data was used as it represents typical conditions at the GGB when compared to the daily volumes over a year.

Based on these and other counts, peak period to peak hour conversion factors were developed to be representative in the study area. Those used are:

- AM Peak Hour
  - 38% of the AM Peak Period for all roads except the Golden Gate Bridge
  - 35% of the AM Peak Period for the Golden Gate Bridge
- PM Peak Hour = 35% of the PM Peak Period

TABLE 2.4.2-1
AM PEAK PERIOD TO PEAK HOUR DATA

Time Period	Southbound Volumes			Northbound Volumes			Both Direction Volumes		
	Hour	Period	Percent	Hour	Period	Percent	Hour	Period	Percent
Golden Gate Bridge									
Year Median	-	-	36.8%	-	-	-	-	-	-
Year Average	-	-	37.0%	-	-	-	-	-	-
Mon: 16-Oct-00	6,287	16,814	37.4%	3,337	8,645	38.6%	9,624	25,459	37.8%
Tue: 17-Oct-00	6,371	17,347	36.7%	3,413	8,794	38.8%	9,784	26,141	37.4%
Wed: 18-Oct-00	6,212	17,027	36.5%	3,414	9,015	37.9%	9,626	26,042	37.0%
Thur: 19-Oct-00	6,280	16,894	37.2%	3,326	8,880	37.5%	9,606	25,774	37.3%
Fri: 20-Oct-00	5,692	15,713	36.2%	3,472	9,183	37.8%	9,164	24,896	36.8%
Marina									
Mon: 16-Oct-00	1,562	4,081	38.3%	461	1,247	37.0%	2,023	5,328	38.0%
Tue: 17-Oct-00	1,711	4,281	40.0%	475	842	56.4%	2,186	5,123	42.7%
Wed: 18-Oct-00	1,775	4,438	40.0%	415	878	47.3%	2,190	5,316	41.2%
Thur: 19-Oct-00	1,804	4,524	39.9%	420	1,019	41.2%	2,224	5,543	40.1%
Fri: 20-Oct-00	1,665	4,150	40.1%	481	1,210	39.8%	2,146	5,360	40.0%
Richardson									
Mon: 16-Oct-00	2,659	6,917	38.4%	1,195	3,380	35.4%	3,854	10,297	37.4%
Tue: 17-Oct-00	2,740	7,345	37.3%	1,242	2,703	45.9%	3,982	10,048	39.6%
Wed: 18-Oct-00	3,037	7,981	38.1%	1,229	2,703	45.5%	4,266	10,684	39.9%
Thur: 19-Oct-00	3,035	8,205	37.0%	1,280	3,229	39.6%	4,315	11,434	37.7%
Fri: 20-Oct-00	3,056	8,137	37.6%	1,260	3,327	37.9%	4,316	11,464	37.6%
Marina and Richardson									
Mon: 16-Oct-00	4,221	10,998	38.4%	1,656	4,627	35.8%	5,877	15,625	37.6%
Tue: 17-Oct-00	4,451	11,626	38.3%	1,717	3,545	48.4%	6,168	15,171	40.7%
Wed: 18-Oct-00	4,812	12,419	38.7%	1,644	3,581	45.9%	6,456	16,000	40.4%
Thur: 19-Oct-00	4,839	12,729	38.0%	1,700	4,248	40.0%	6,539	16,977	38.5%
Fri: 20-Oct-00	4,721	12,287	38.4%	1,741	4,537	38.4%	6,462	16,824	38.4%

Source: Caltrans; Golden Gate Bridge, Highway and Transportation District; DKS Associates, 2004

TABLE 2.4.2-2
PM PEAK PERIOD TO PEAK HOUR DATA

Time Period	Southbound Volumes			Northbound Volumes			Both Direction Volumes		
	Hour	Period	Percent	Hour	Period	Percent	Hour	Period	Percent
Golden Gate Bridge									
Year Median	-	-	35.1%	-	-	-	-	-	-
Year Average	-	-	35.3%	-	-	-	-	-	-
Mon: 16-Oct-00	3,301	9,473	34.8%	5,794	16,941	34.2%	9,095	26,414	34.4%
Tue: 17-Oct-00	3,431	9,839	34.9%	5,860	17,142	34.2%	9,291	26,981	34.4%
Wed: 18-Oct-00	3,252	9,725	33.4%	5,888	16,774	35.1%	9,140	26,499	34.5%
Thur: 19-Oct-00	3,422	9,695	35.3%	5,772	16,884	34.2%	9,194	26,579	34.6%
Fri: 20-Oct-00	3,790	10,628	35.7%	5,662	15,521	36.5%	9,452	26,149	36.1%
Marina									
Mon: 16-Oct-00	686	1,927	35.6%	1,012	2,116	47.8%	1,698	4,043	42.0%
Tue: 17-Oct-00	641	1,850	34.6%	1,031	3,018	34.2%	1,672	4,868	34.3%
Wed: 18-Oct-00	707	2,055	34.4%	1,255	3,384	37.1%	1,962	5,439	36.1%
Thur: 19-Oct-00	729	2,073	35.2%	1,257	3,520	35.7%	1,986	5,593	35.5%
Fri: 20-Oct-00	855	2,215	38.6%	1,158	2,802	41.3%	2,013	5,017	40.1%
Richardson									
Mon: 16-Oct-00	1,546	4,193	36.9%	2,649	7,525	35.2%	4,195	11,718	35.8%
Tue: 17-Oct-00	1,508	4,401	34.3%	2,628	7,481	35.1%	4,136	11,882	34.8%
Wed: 18-Oct-00	1,421	4,120	34.5%	2,472	7,089	34.9%	3,893	11,209	34.7%
Thur: 19-Oct-00	1,567	4,616	33.9%	2,530	6,973	36.3%	4,097	11,589	35.4%
Fri: 20-Oct-00	1,632	4,320	37.8%	2,460	5,819	42.3%	4,092	10,139	40.4%
Marina and Richardson									
Mon: 16-Oct-00	2,232	6,120	36.5%	3,661	9,641	38.0%	5,893	15,761	37.4%
Tue: 17-Oct-00	2,149	6,251	34.4%	3,659	10,499	34.9%	5,808	16,750	34.7%
Wed: 18-Oct-00	2,128	6,175	34.5%	3,727	10,473	35.6%	5,855	16,648	35.2%
Thur: 19-Oct-00	2,296	6,689	34.3%	3,787	10,493	36.1%	6,083	17,182	35.4%
Fri: 20-Oct-00	2,487	6,535	38.1%	3,618	8,621	42.0%	6,105	15,156	40.3%

Source: Caltrans, Golden Gate Bridge, Highway and Transportation District (GGBHTD), and DKS Associates, 2004

2.4.3 Peak Period to Daily Conversion

Although not used in traffic analyses, daily volumes are often needed as input to other portions of this project's environmental studies. Because the number of lanes in each direction varies during an average weekday on the Golden Gate Bridge (GGB), Doyle Drive, Richardson on-ramp, and Marina on-and off-ramps, the daily traffic forecasts from a single travel model network assignment cannot be used. Because the SF-TDM captures traveler behavior at the two busiest periods of three hours each, the busiest times of day were already known. Because the peak-periods are assumed to be a significant portion of the total daily traffic, normally the daily traffic can be estimated from these.

Using the same data as above, a peak- period to daily volume ratio was developed by calculating the percentage of the daily traffic that occurs during the peak periods. A sum of the two peak periods demonstrated that 40 percent of the daily traffic volume occurs in the two peak periods, which is consistent with typical traffic analysis assumptions. Table 2.4.3-1 summarizes the derivation of the peak-period to daily conversion factor.

TABLE 2.4.3-1
PEAK PERIOD TO AVERAGE DAY DATA

Day	Southbound			Northbound			Both Directions		
	Combined Peak Periods	Day	Percent	Combined Peak Periods	Day	Percent	Combined Peak Periods	Day	Percent
Golden Gate Bridge									
16-Oct-00	26,287	57,388	45.8%	25,586	60,949	42.0%	51,873	118,337	43.8%
17-Oct-00	27,186	57,676	47.1%	25,936	62,604	41.4%	53,122	120,280	44.2%
18-Oct-00	26,752	58,407	45.8%	25,789	64,014	40.3%	52,541	122,421	42.9%
19-Oct-00	26,589	59,287	44.8%	25,764	65,571	39.3%	52,353	124,858	41.9%
20-Oct-00	26,341	58,791	44.8%	24,704	67,334	36.7%	51,045	126,125	40.5%
Marina									
16-Oct-00	3,363	11,279	29.8%	6,008	13,102	45.9%	9,371	24,381	38.4%
17-Oct-00	3,860	11,226	34.4%	6,131	13,210	46.4%	9,991	24,436	40.9%
18-Oct-00	4,262	11,852	36.0%	6,493	13,932	46.6%	10,755	25,784	41.7%
19-Oct-00	4,539	12,436	36.5%	6,597	14,042	47.0%	11,136	26,478	42.1%
20-Oct-00	4,012	12,555	32.0%	6,365	13,318	47.8%	10,377	25,873	40.1%
Richardson									
16-Oct-00	11,110	26,114	42.5%	10,905	28,925	37.7%	22,015	55,039	40.0%
17-Oct-00	11,746	27,072	43.4%	10,184	27,716	36.7%	21,930	54,788	40.0%
18-Oct-00	12,101	27,944	43.3%	9,792	27,365	35.8%	21,893	55,309	39.6%
19-Oct-00	12,821	28,552	44.9%	10,202	28,387	35.9%	23,023	56,939	40.4%
20-Oct-00	12,457	29,375	42.4%	9,146	27,901	32.8%	21,603	57,276	37.7%
Marina and Richardson									
16-Oct-00	14,473	37,393	38.7%	16,913	42,027	40.2%	31,386	79,420	39.5%
17-Oct-00	15,606	38,298	40.7%	16,315	40,926	39.9%	31,921	79,224	40.3%
18-Oct-00	16,363	39,796	41.1%	16,285	41,297	39.4%	32,648	81,093	40.3%
19-Oct-00	17,360	40,988	42.4%	16,799	42,429	39.6%	34,159	83,417	40.9%
20-Oct-00	16,469	41,930	39.3%	15,511	41,219	37.6%	31,980	83,149	38.5%
								Median:	**40.4%**
								Average:	**40.7%**

Source: Caltrans, Golden Gate Bridge, Highway and Transportation District (GGBHTD), and DKS Associates, 2004

2.5 GOLDEN GATE BRIDGE OPERATIONS

Doyle Drive (the southern approach to the Golden Gate Bridge) traffic is directly affected by bridge operations. Because the Golden Gate Bridge is a six-lane facility with moveable lane designations, there may be from two to four lanes in one direction or another at different times of the day. In the base year for this study, the bridge configurations are four lanes southbound and two lanes northbound in the AM peak period, and three lanes in each direction for the other two study periods – PM peak period and weekend peak period.

When design year forecasts were developed, the new travel patterns for the region showed significant growth in projected outbound traffic from San Francisco in the AM peak hour. This has resulted in an observation that there could be significant delays at the Golden Gate Bridge if the current lane configuration is kept in place for the design year. To examine this issue more closely, a detailed operations analysis for the AM peak hour was performed to quantify the impacts of various lane configurations.

2.5.1 Detailed Bridge Traffic Operations Analysis (FREQ)

The main tool used in the detailed operations analysis of the Golden Gate Bridge was an operational analysis program called FREQ (pronounced free-q). FREQ is a macroscopic model for the analysis of freeway and highway systems: it uses the *Highway Capacity Manual* relationships and other traffic flow theory concepts to predict traffic performance. FREQ is designed for evaluating traffic management and traffic control alternatives (such as incident management, ramp metering, mainline HOV lanes and HOV bypass lanes at ramp meters). FREQ is particularly well-suited for analyzing the lengths of queues. Outputs include traffic performance tables, contour diagrams of traffic performance and highway summary tables.

The operations analysis inputs are more extensive that those in a travel demand model. Inputs include flow rates for bridge lanes and the toll booths, distribution of traffic within the peak period, and lanes, distances and free flow speeds for each segment.

The findings of the traffic operations analysis are documented in the base and future year sections of this report. Detailed parameters and testing to confirm the data inputs, calibration and findings is provided in a separate Traffic Forecasting Report.

2.6 TRAFFIC EVALUATION CRITERIA

The National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA) require that the combined environmental document identify and disclose the effects resulting from the project alternatives. This report addresses those directly related to traffic operations and circulation.

The following guidance documents were reviewed and used to identify appropriate specific methodology or evaluation criteria needed for evaluation.

- Caltrans Highway Design Manual (HDM), November 2001
- Highway Capacity Manual (HCM), 2000
- City of San Francisco Guidelines for Environmental Review (OER), October 2002
- State of the practice traffic analysis methodologies

In addition, the Park Road Standards Memorandum prepared by the U.S. Department of Interior, July 1994 was reviewed. It was determined that this memorandum described standards that are consistent with standards published in Caltrans Highway Design Manual (HDM) and the Highway Capacity Manual (HCM), as well as design standards recommended by the American Association of State Highway and Transportation Officials (AASHTO).

Doyle Drive is a roadway segment on the Strategic Highway Network (STRAHNET) as defined and designated by the Federal Highway Administration (FHWA). This is a network of highways which are important to the United States' strategic defense policy and which provide defense access, continuity and emergency capabilities for defense purposes. Although the Golden Gate Bridge Highway and Transportation District operates Doyle Drive, Caltrans owns and maintains Doyle Drive, and is responsible for administering the Strategic Highway Network within California. Whenever possible the methodology and criteria described in their *Highway Design Manual* (HDM) were used. When the HDM did not define a specific methodology or evaluation criteria needed for evaluation, others were used based on the above guidance. Because this project is a transportation improvement, the methodology and criteria defined in the HDM were used whenever there were conflicting directions in various documents. For instance, the intersection methodologies are slightly different from those described by OER; such as, the peak hour factors used in the study reflect a full capacity condition (peak hour factors at intersections = 1.0).

To evaluate the traffic-related effects of the project alternatives, the analyses were separated into two groups – those related to intersections and those related to roadway segments. The effects were identified using the following six measures of effectiveness.

At intersections

- **Level of Service (LOS)** – measured in peak hour delay per vehicle
- **Queues** – measured in meters

On roadway segments

- **LOS** – measured in peak hour delay per vehicle
- **Travel Time** – measured in minutes to travel a given distance
- **Merge/Diverge** – measured by following appropriate Caltrans' standards
- **Weaving** – measured by following appropriate Caltrans' standards

2.6.1 Intersection Level of Service

Because intersections often act as bottlenecks during congested conditions, measuring the change in average delay per vehicle is a common way to measure effects of project alternatives on nearby streets. This analysis is known as Level of Service (LOS) and describes the effectiveness of intersection operations using delay.

Caltrans' HDM, Chapter 400 – Intersections at Grade specifies design and evaluation requirements for at-grade intersections. The intersection's "capacity" to handle peak hour traffic is the determining feature of its effectiveness. The capacity analysis methodology for both unsignalized and signalized intersections is described in the HDM as follows:

(1) Unsignalized Intersections. Chapter 10 of the HCM provides a methodology for capacity analysis of unsignalized intersections controlled by stop or yield signs. The assumption is made that the minor street movement does not affect major street traffic. Unsignalized intersections generally become candidates for signalization when traffic queues begin to develop on the cross street. See Chapter 9 of the Traffic Manual for signal warrants. (HDM 2001, Chapter 400)

(2) Signalized Intersections. See Topic 406 or the "District Traffic Branch" for analysis of signalized intersections, including ramps. Section 406, Ramp Intersection Capacity Analysis, states that the "procedure for ramp intersection analysis may be used to estimate the capacity of any signalized intersection where the phasing is relatively simple." The analysis of complex signalized intersections should be referred to the District Traffic Branch. (HDM 2001, Chapter 400). The evaluation criteria must consider the requirement set forth in these design guidelines.

Evaluation Criteria. The degree of congestion was measured by the delay per vehicle. The HCM includes these methods used to determine intersection LOS. The analysis for delay is determined using specific methods identified in the HCM, Chapters 16 (Signalized Intersections) and 17 (Unsignalized Intersections). The software package, Synchro 5.0, was used to apply the HCM methodology for both signalized and unsignalized intersections to determine the LOS and evaluate the degree of delay and congestion that occurs.

LOS can range from “A” representing free-flow conditions, to an “F” representing extremely long delays. LOS B and C signify stable conditions with acceptable delays. LOS D is typically considered acceptable conditions for peak hour traffic in urban areas. LOS E is approaching capacity and LOS F represents conditions at or above capacity. Table 2.6.1-1 contains the correlation between control delay and level of service for signalized and unsignalized intersections. Control delay is the component of delay that results when a traffic control device, traffic signal or stop sign, causes a lane group to reduce speed or to stop.

Using the OER guidelines, a project alternative significantly effects an intersection when the LOS degrades from D, or better, to LOS E or F, or from LOS E to F. For an intersections already operating at LOS E or F, the V/C ratio (Volume/Capacity) was included in parentheses next to the delay to report the LOS. The V/C ratio provides another measure of the effectiveness of intersection operations when already operating above capacity. The guidelines also defined a significant effect as a five percent change in traffic volumes. Therefore, additional intersection improvements for changes of less than five percent were not needed. When significant adverse effects were identified, accompanying mitigation improvements or exceptions were also identified.

The intersections evaluated are listed in Table 2.6.1-2. These intersections are either redesigned or newly constructed as part of the Doyle Drive project, or are potentially influenced by changes in traffic flow associated with project alternatives.

TABLE 2.6.1-1
INTERSECTION LEVEL OF SERVICE THRESHOLDS

Level Of Service	Signalized Control Delay per Vehicle (seconds)	Unsignalized Control Delay per Vehicle (seconds)
A	Delay ≤ 10	Delay ≤ 10
B	10 < Delay ≤ 20	10 < Delay ≤ 15
C	20 < Delay ≤ 35	15 < Delay ≤ 25
D	35 < Delay ≤ 55	25 < Delay ≤ 35
E	55 < Delay ≤ 80	35 < Delay ≤ 50
F	Delay > 80	Delay > 50

Note: At two-way stop controlled (unsignalized) intersections, the LOS is presented for the worst approach.
Source: Highway Capacity Manual, Transportation Research Board, Washington D.C. 2000

TABLE 2.6.1-2
STUDY INTERSECTIONS

Intersection			Alternatives				
				Design Year			
No.	North / South	East / West	Base Year	1 No Build	2 Replace and Widen	5 Parkway: Diamond Option	5 Parkway: Circle Drive Option
Intersections Included in Replacement Project Alternatives							
1	Lyon	Marina	■	■	■	■	■
2	Richardson	Francisco	■	■	■	■	■
3	Lincoln (N)	GGB Viewing Area	■	■	■	■	■
4	Lincoln (S)	Merchant	■	■	■	■	■
5	Girard	Lincoln	■	■	■	■	■
6	Halleck	Mason	■	■	■	■	■
7	Richardson / 101	Gorgas / Lyon	*n/a*	■	■	■ [1]	■ [1]
8	Marina/Girard	Gorgas / 101 SB Ramps	*n/a*	*n/a*	*n/a*	■ [1]	■ [1]
9	Marina/Girard	NB Ramps	*n/a*	*n/a*	*n/a*	■ [1]	[1]
Other Potentially Impacted Intersections							
10	Broderick	Marina	■	■	■	■	■
11	Divisadero	Marina	■	■	■	■	■
12	Richardson	Chestnut	■	■	■	■	■
13	Richardson	Lombard	■	■	■	■	■
14	101 / Lombard	Broderick		■	■	■	■
15	Lyon	Lombard Gate	■	■	■	■	■
16	Presidio	Pacific	■	■	■	■	■
17	Park Presidio	Lake	■	■	■	■	■
18	Merchant	GGB Viewing Area	■	■	■	■	■

Source: DKS Associates, 2004
Notes: n/a = intersection does not exist in this alternative.
[1]New intersection.

2.6.2 Intersection Queue Lengths

The queue length at an intersection includes vehicles that stop or slow down in observance of traffic control devices. The "queue" includes vehicles waiting at the stop line to the vehicles slowing down at the rear of the queue. At intersections, queues can be either over- or under-saturated. For over-saturated queues, the arrival rate of cars is higher than the amount of cars that the intersection can accommodate. For under-saturated queues, the arrival rate is less than the service flow rate and the intersections tend to operate adequately. Intersections with over-saturated queues tend to block upstream intersections, driveways, turning pockets, and restrict vehicle movements. Traffic may also spill over to other time periods

The most notable effect of queues at intersections is that they may influence the geometric requirements of the roadway. When queues are too long and vehicles have excessive delays before crossing through the intersection, accepted engineering practice would add more lanes at either the intersection or on nearby roadway segments to reduce the queue and delay. Because of the extensive number of sensitive resources near this facility, adding more lanes may not always be possible.

The HDM does not specify any methods for analyzing intersection effectiveness based on queues. However, the HCM defines a queue as a line of vehicles, bicycles, or persons waiting to be served by the system in which the flow rate from the front of the queue determines the average speed within the queue. The internal queue dynamics can involve starts and stops. The Synchro program used for this report is capable of calculating and analyzing queue lengths. Queue lengths that exceed the storage length for individual movements will block upstream traffic and access to turning bays. Bay block time percent is a measurement produced by Synchro, which indicates the amount of time (percent) per cycle that a queue blocks upstream traffic or prevents access to turning bays.

Evaluation Criteria. Since there is no explicit definition of when a change in the queue length or bay block time should be considered significant, an increase in queue length that exceeds the turning bay or link length were considered significant. If a significant change was identified, then appropriate designs or operational improvements were examined and the most cost-effective solution recommended mitigating the change.

2.6.3 Segment Level of Service

Roadway segments can become congested even when not regulated by a traffic signal. Analysis of these segments is based on the density of vehicles on that segment. Because of the transitional nature of Doyle Drive, there is a need to apply different measurement tools for different segments. Some segments operate as urban streets with signalized intersections; others operate as highway segments with no interruption. Therefore, uninterrupted segments are best-analyzed using highway LOS methodology while signalized segments are best-analyzed using urban street methodology.

The evaluation contains two distinct methodologies – for uninterrupted highway segments, the HCM, *Chapter 21 – Multilane Highways* methodology was to analyze the capacity and LOS of the highway segments where speeds vary between 45 miles per hour and 60 miles per hour; for urban street segments, the HCM*, Chapter 15 – Urban Streets* methodology was used. These two measurement tools were applied according to the most appropriate method for each segment, as listed in Table 2.6.3-1.

TABLE 2.6.3-1
SEGMENT LEVEL OF SERVICE METHOD

No.	Location	Direction	LOS Method
1	US 101 From the Merchant Road Ramps to Park Presidio Blvd	SB	Highway
2	US 101 From Park Presidio Blvd to the Merchant Road Ramps	NB	Highway
3	US 101 From Park Presidio to the Marina Blvd Access Ramps	SB	Highway
4	US 101 From the Marina Blvd Access Ramps to Park Presidio	NB	Highway
5	Richardson From the Marina Blvd Access Ramps to Lyon St	SB	Urban Street or Highway (depending on Alternatvive)
6	Richardson From Lyon St to the Marina Blvd Access Ramps	NB	Urban Street or Highway (depending on Alternatvive)
7	Marina Blvd From the Doyle Drive Merger to Lyon St	EB	Urban Street or Highway (depending on Alternatvive)
8	Marina Blvd From Lyon St to the Doyle Drive merge	WB	Urban Street or Highway (depending on Alternatvive)
9	Park Presidio From the US 101 Ramps to the Park Presidio Tunnel	SB	Highway
10	Park Presidio from the Park Presidio Tunnel to the US 101 Ramps	NB	Highway
11	US 101 between Park Presidio on and off-ramps	SB	Highway
12	US 101 between Park Presidio off and on-ramps	NB	Highway
13	US 101 between Marin County and Merchant Road (Golden Gate Bridge)	SB	Highway
14	US 101 between Merchant Road and Marin County (Golden Gate Bridge)	NB	Highway

Source: DKS Associates, 2004, Highway Capacity Manual

Highway Segment

A basic highway segment can be characterized by several performance measures, including density in terms of passenger cars per mile per lane, and speed in terms of mean passenger-car speed. These measures are interrelated and density can be calculated using the following equation from the Highway Capacity Manual:

$$d = \frac{V}{N \times S}$$

where, d: density (vehicles per mile per lane, vpmpl)
V: peak hour volume (vehicles per hour, vph)
N: number of travel lanes (lanes)
S: average travel speed (miles per hour, mph)

The peak-period volumes were obtained from the SF-TDM and converted to peak-hour volumes. The peak-hour volumes (*V*) were passenger car equivalents using the observed percent of trucks and buses, and grades ("upgrades" only). The average travel speed, S, was calculated using procedures defined in Chapter 21 (Conventional Highways) of the HCM. The volumes were then used to calculate the density of the highway segments for each project alternative since the number of lanes was also known. Table 2.6.3-2 identifies the density ranges used to define LOS for highway segments; they range from LOS A, or free-flow conditions, to LOS F, or highly congested conditions.

TABLE 2.6.3-2
HIGHWAY SEGMENT LEVEL OF SERVICE THRESHOLDS

Level Of Service	Average Density (vehicles/mile/lane)
A	Density ≤ 11
B	11 < Density ≤ 18
C	18 < Density ≤ 26
D	26 < Density ≤ 35
E	35 < Density ≤ 45
F	Density > 45

Source: Highway Capacity Manual, Transportation Research Board, Washington D.C., 2000

Urban Street Segment

Where segments are slower and traffic flows are interrupted by traffic signals, they are defined as urban streets. For urban streets, the average segment travel speed was used to calculate the LOS for urban streets. Table 2.6.3-3 identifies the speed ranges used to define LOS for urban street segments. The average speed is based on the posted speeds recommended for the roadway, and are adjusted for congested conditions using formulas provided in the HCM.

TABLE 2.6.3-3
URBAN STREET SEGMENT LEVEL OF SERVICE THRESHOLDS

Urban Street Classification	I	II	III	IV
Range of free-flow speeds (FFS)	55 to 45	45 to 35	35 to 30	35 to 25
Typical FFS	50	40	35	30
LOS	**Average Travel Speed**			
A	>42	>35	>30	>25
B	>34-42	>28-35	>24-30	>19-25
C	>27-34	>22-28	>18-24	>13-19
D	>21-27	>17-22	>14-18	>9-13
E	>16-21	>13-17	>10-14	>7-9
F	≤16	≤13	≤10	≤7

Note: All speeds are in MPH (miles per hour)

Source: DKS Associates, 2004

Evaluation Criteria. The Caltrans HDM requires that highways be designed for a LOS D or better according to the *Highway Capacity Manual* definition. And, while it is beyond the requirements of this project to improve segments not affected by the project alternatives, it was noted if a segment operated below standard.

2.6.4 Segment Travel Time

The concept of travel time was also used to evaluate the performance of the segments, as users are quite adept at finding the quickest time path to their destination. This makes travel time analysis particular easy to understand and evaluate. The HCM defines travel time as the average time spent by vehicles traversing a highway segment, including control delays.

To estimate average peak period travel times in the Base Year, travel time is first measured during free-flow and peak period conditions to calibrate the SF-TDM. Then the delay (in terms of time) resulting from each alternative was calculated based on the change from the Base Year and the Design Year No Build condition. Changes in delay can be due to deceleration, movement in queues, and acceleration of vehicle passing through an intersection.

Evaluation Criteria. There are no standard evaluation criteria for travel time. The criterion of travel time was identified as a descriptive measure, and therefore, there is no significance level associated with it. It is assumed that an impact on travel time will be mitigated in the highway or urban street segment LOS section.

The following eight highway segments were evaluated. Note that the segments listed as Golden Gate Bridge begin at, but do not include, the toll plaza.

- Golden Gate Bridge Toll Plaza to Park Presidio/Lake Street
- Park Presidio/Lake Street to Golden Gate Bridge Toll Plaza
- Golden Gate Bridge Toll Plaza to Marina Boulevard/Divisadero Street
- Marina Boulevard/Divisadero Street to Golden Gate Bridge Toll Plaza
- Golden Gate Bridge Toll Plaza to Francisco Street/Richardson Avenue
- Francisco Street/Richardson Avenue to Golden Gate Bridge Toll Plaza
- Park Presidio/Lake Street to Marina/Divisadero Street
- Marina/Divisadero Street to Park Presidio/Lake Street

2.6.5 Segment Merge / Diverge Level of Service

When traffic moves from or to the side of the road to enter (merge) or exit (diverge) the facility; conflicting traffic movements occur. These conflicts vary with the length of merge/diverge areas, traffic volumes and lane density. For example, longer merge and diverge distances are required for ramps with high traffic volumes.

Caltrans' HDM does not contain a method for evaluating the merge and diverge areas on highway segments, but refers to Chapter 25, Ramps and Ramp Junctions in the HCM to evaluate the LOS of merge and diverge influence areas.

The level of service for merging and diverging areas is based on the capacity of the highway sections affected by the merging/diverging, and the capacity of an off-ramp for diverging areas. Three measurements used to calculate the LOS are:

- The traffic flow (volume) on the two outside lanes of the highway immediately upstream of the influence area;
- The capacity of the freeway approaching, entering and departing the influence areas; and,
- The capacity of the ramp and the density of flow on the ramp.

Evaluation Criteria. The *HCM* states, "levels of service in merge and diverge influence areas are defined in terms of density for all cases of stable operation, LOS A through E. LOS F exists when the demand exceeds the capacity of upstream or downstream freeway sections or the capacity of an off-ramp." Caltrans Design Guide defines LOS E and LOS F as deficient levels of service.

The software package, Highway Capacity Software, HCS2000 (version 4.1a), analyzes ramp junction merges and diverges using the HCM methodology. Table 2.6.5-1 includes the density ranges for identifying the LOS for merge and diverge areas. All on and off ramps that are part of the Doyle Drive reconstruction were examined. They are shown in Table 2.6.5-2.

TABLE 2.6.5-1
LEVEL OF SERVICE CRITERIA FOR MERGE AND DIVERGE AREAS

Level Of Service	Average Density (vehicles/mile/lane)
A	Density ≤ 10
B	10 < Density ≤ 20
C	20 < Density ≤ 28
D	28 < Density ≤ 35
E	Density > 35
F	Demand exceeds capacity

Source: Highway Capacity Manual, Transportation Research Board, Washington D.C. 2000

TABLE 2.6.5-2
MERGE/DIVERGE LOCATIONS BY ALTERNATIVE

No.	Location	Base Year	Alternatives – Design Year: 1 No Build	2 Replace and Widen	5 Parkway: Diamond Option	5 Parkway: Circle Drive Option
1	US 101 Southbound exit diverge to Park Presidio	■	■	■	■	■
2	US 101 Southbound entrance merge from Park Presidio	■	■	■	■	■
3	US 101 Northbound entrance merge from Park Presidio	■	■	■	■	■
4	US 101 Northbound exit diverge to Park Presidio	■	■	■	■	■
5	US 101 Southbound diverge to Richardson	■	■	■	[1]	[1]
6	Doyle Drive and Richardson merge into US 101 Northbound	■	■	■	[3]	[3]
7	Park Presidio Southbound merge from US 101 Ramps	■	■	■	■	■
8	Park Presidio Northbound diverge to US 101 Ramps	■	■	■	■ [2]	■ [2]
9	US 101 SB exit diverge to Girard	*n/a*	*n/a*	*n/a*	■ [2]	■ [2]
10	US 101 NB exit diverge to Girard	*n/a*	*n/a*	*n/a*	■ [2]	*n/a*

Notes
n/a = merge/diverge location does not exist in this alternative.
[1] merge/diverge location eliminated in this alternative.
[2] new merge/diverge location.
[3] alternative adds a lane when roadways meet; no merge analysis needed

Source: DKS Associates, 2004

2.6.6 Segment Weaving

When ramps are closely spaced drivers maneuver across lanes of traffic to avoid conflicts. These maneuvers are called "weaving" and lead to safety and delay concerns. Any proposed weaving areas were analyzed if there was no weaving area existing before. Caltrans' HDM defines weaving sections as a length of one-way roadway where, vehicles are crossing paths, changing lanes, or merging with through traffic as they enter or exit a highway or collector-distributor road.

For the analysis of weaving sections, Caltrans' *HDM* accepts two methods, the Leisch method and the LOS D method (*Highway Capacity Manual*, 1965). Both methods utilize an accepted level of service standard for the operation of the weaving sections. The LOS standard used is based on the capacity of the roadway segment and operation of traffic volumes in the weaving section within the segment. The Leisch method involves several look-up charts (Nomographs) and tables depicting acceptable weaving lengths and LOS for the volumes on the weaving section. The LOS D method projects volumes on the weaving section and compares them to capacities along the weaving section. For this analysis, the team used the Leisch method.

The application of the weaving analysis depends on a number of variables. The resulting analysis is summarized in a letter representation of the adequacy of the weaving section. These are described as LOS "A" to "F", with LOS A representing the least congested condition and LOS F representing the most congested condition.

A study of preliminary designs resulted in an identification of all Doyle Drive roadway sections that qualify as weaving sections. These are shown in Table 2.6.6-1.

TABLE 2.6.6-1
WEAVING LOCATIONS BY ALTERNATIVE

		Alternatives				
			Design Year			
No.	**Location**	**Base Year**	**1 No Build**	**2 Replace and Widen**	**5 Parkway: Diamond Option**	**5 Parkway: Circle Drive Option**
1	US 101 Northbound between the Park Presidio entrance ramp and Merchant Road exit ramp	▪	▪	▪	▪	▪
2	US 101 Southbound between the Merchant Road entrance ramp and Park Presidio exit ramp	▪	▪	▪	▪	▪
3	US 101 Northbound between the Park Presidio exit ramp and Richardson/Marina Access merge	▪	▪	▪	▪	▪
4	US 101 Southbound between the Park Presidio exit ramp and Richardson/Marina Access merge	▪	▪	▪	▪	▪

Source: DKS Associates, 2004

Evaluation Criteria. Caltrans' *HDM* standard for weaving sections in urban areas is LOS "D" or better. The *HDM* also states that the accepted length of weaving lanes should not be less than 500 meters (1,640 feet) except where excessive cost or severe environmental constraints would require consideration of a shorter length.

2.6.7 Local Roads Analysis

Representative traffic volumes on a selection of local roads in the study area were taken directly from the San Francisco Travel Demand Model. These volumes were taken for each alternative to determine the impacts on the local community in the future. Under the future conditions, these volumes were then compared to the projected no-build scenario to determine the level of impact.

2.7 TRANSIT EVALUATION CRITERIA

Currently, San Francisco Municipal Railway (MUNI), Golden Gate Bridge, Highway and Transit District (Golden Gate Transit, or GGT), and the Presidio Trust operate transit service within and through the project area. Doyle Drive itself carries MUNI and GGT transit service; and these routes are most directly affected by the project alternatives. This report indicates all transit services that utilize, or are potentially affected, by the Doyle Drive project. Only transit lines that use Doyle Drive are evaluated in this document. Transit analysis prepared in this report is performed only for weekday peak periods, as this is the time that most transit agencies are most concerned about performance of the system.

The Draft PTMP estimates that by the Design Year, there will be additional residents living and working in the Presidio. This report estimates that 70 percent of external trips into the Presidio and 50 percent of all internal trips (within the Presidio) will arrive by automobile.

This report does not propose route restructuring; and route changes are not assumed in this analysis. Subsequent studies will be undertaken by transit operations when they determine the need to study and implement future route changes.

2.7.1 Travel Time Along Segments

Transit vehicles can often travel faster than private vehicles in congested conditions if there is dedicated transit-only or carpool/transit-only right-of-way. However, when transit vehicles do not have their own right-of-way, they are dependent on the general conditions and speeds of the roadway. Transit travel time consists of three time variables, including:

- In-vehicle travel time – the operational time on the roadway
- Acceleration/deceleration travel time – results from buses having to slow down or speed up to access their stops
- Boarding/alighting time –the additional time needed for passengers to enter and exit the bus

All GGT routes that cross the Golden Gate Bridge follow the same segment of roadway between the Golden Gate Bridge and Lombard Street, except GGT Route 50. For purposes of this report, all GGT travel times except for Route 50 are combined. The primary segment analyzed for GGT and MUNI Route 76 begins at, but does not include, the Golden Gate Toll Plaza. The routes and their segments include:

- **GGT Route 50.** Golden Gate Bridge (at toll plaza) and Park Presidio at Lake Street.
- **GGT other routes.** Golden Gate Bridge (at toll plaza) and Richardson Avenue at Francisco Street.
- **MUNI Route 28.** Merchant Interchange (underneath Golden Gate Bridge toll plaza) and Richardson Avenue at Francisco Street; Merchant Interchange and Park Presidio at Lake Street.
- **MUNI Route 76.** Golden Gate Bridge (at toll plaza) and Richardson Avenue at Francisco Street.

Changes in transit travel times are only important when the additional time delays are so significant that they may affect ridership. Unfortunately, there is no specific policy by any operator or planning agency to identify a significant change. Generally, bus scheduling includes variable run times from one day to the next, so that travel time changes of less than two minutes are considered negligible. When travel times increase by five or ten minutes, transit resources and rider disincentives begin to occur.

Evaluation Criteria. No transit agency has defined standards related to transit travel time. GGT staff expressed interest in preventing any significant deterioration of travel times beyond the baseline condition and recommended that a significant travel time change would be an increase of three or more minutes.

The transit travel times were obtained directly from the SF-TDM. The analysis of transit travel time was identified as a descriptive measure, and therefore, there is no significance level is associated with it. It was assumed that any change in travel time was included in the Segment LOS analysis.

2.7.2 Transit Operations (Capacity) Level of Service

The transit LOS describes over/under crowding conditions of the transit routes by estimating the peak hour load factors, or percentage of bus loading. The methodology was developed by OER to determine the effects of development on the system capacity and was used for this report.

In contrast to longer-distance freeway-oriented bus transit operators, MUNI has established a capacity utilization service standard with includes both seating capacity and standing passengers. In assuming standing passengers, MUNI buses can usually accommodate 30 percent to 80 percent more passengers when compared to the number of available seats, depending upon the specific transit vehicle type and configuration.

A number of transit routes operate on Doyle Drive and were evaluated, including:

- **MUNI Routes** – 28 and 76
- **GGT Routes –** 2, 4, 8, 10, 18, 20, 24, 26, 28, 30, 32, 34, 38, 44, 48, 50, 54, 56, 60, 70, 72, 74, 76, 78, 80, 90 and 93 (based on the route structure in 2000)

In addition, an assessment was made for nearby MUNI Routes 82x, 43 and 29 to verify whether or not ridership impacts would occur on these routes. A description of stop activity is also included in some sections of this report. The activity at local transit stops affects the attractiveness of transit routes on Doyle Drive. It is also is important to include appropriate bus stop facilities, amenities and geometric considerations in the project alternatives.

There are no specific evaluation standards for stop activity. However, bus stops should provide enough room for buses to load and unload without blocking traffic and to allow other buses to access the stop as buses loading/unloading clear the stop. The lead and cooperating/responsible agencies that included the transit provider's evaluated transit stop requirements and determined that four-bus bays were needed in each direction to accommodate GGT and MUNI routes on Doyle Drive and Richardson Avenue. Transit stops are identified in Table 2.7.2-1.

TABLE 2.7.2-1
STOP LOCATIONS BY ALTERNATIVE

Transit Stop	Direction	Alternatives				
			Design Year			
		Base Year	1 No Build	2 Replace and Widen	5 Parkway: Diamond Option	5 Parkway: Circle Drive Option
US 101 S. of Toll Plaza	Northbound	■	■	■	■	■
	Southbound	■	■	■	■	■
Merchant, E. of Toll Plaza	Northbound	■	■	■	■	■
	Southbound	■	■	■	■	■
Merchant, W. of Toll Plaza	Northbound	■	■	■	■	■
	Southbound	■	■	■	■	■
Richardson, south or north. of Gorgas	Northbound	■	■	■	■	■
Richardson, South or north of Gorgas	Southbound	■	■	■	■	■

Source: DKS Associates, 2004

Evaluation Criteria. Each operator has a “load factor” calculation that determines if a bus is over/under capacity. A summary of the load factor standards, as described in OER’s *Guidelines for Environmental Review: Transportation Impacts* is illustrated in Table 2.7.2-2. Although there are national guidelines to determine the capacity of transit services, facilities and systems (i.e. TCRP Report 100 – Transit Capacity and Quality of Service Manual) the OER standards were developed to describe when buses are over-crowded – allowing for both seated and standing passengers. GGT routes run primarily on freeway segments for several miles; therefore, standing passengers should be avoided and a load factor of 1.00 passenger per seat these routes should not be exceeded.

TABLE 2.7.2-2
TRANSIT OPERATIONS LEVEL OF SERVICE BY OPERATOR

Transit Operator	TOLOS	Peak Period Load Factor	Peak Hour Load Factor	Ratio: riders/seat	Duration of Peak Period for Load Factor	Peak Hour Capacity Utilization[1]
MUNI [2]	E	0.80	0.96	1.0 - 1.8	2 hours	96%
BART	E	1.00	1.00	1.35	1 hour	135%
AC Transit	E	1.00	1.00	1.00	1 hour	100%
Golden Gate Transit	E	1.00	1.00	1.00	1 hour	100%
Caltrain	E	1.00	1.00	1.00	1 hour	100%
Sam Trans	E	1.00	1.00	1.00	1 hour	100%

Notes:
1. When the "peak hour capacity utilization" noted here is met or exceeded, the relevant portion of the transit system is assumed to be operating at or above the load standard, TOLOS E, which is an unacceptable condition.
2. The riders/seat ratio varies by transit vehicle

Source: *Transportation Impact Analysis Guidelines for Environmental Review, City and County of San Francisco, October 2002.San Francisco Office of Environmental Review*

2.8 PEDESTRIAN AND BICYCLE EVALUATION CRITERIA

Providing for, and improving, pedestrian and bicycle access to and from the Presidio is important. The bicycle and pedestrian assessment addresses whether the project alternatives are consistent with the appropriate design manuals and planning documents.

Preserving these networks is critical to the success of the Presidio and to the project. Summaries of relevant documents, such as the *San Francisco Bicycle Plan*, and various Presidio Trust plans pertaining to pedestrian and bicycle access were reviewed to ensure the project alternatives are consistent with the goals stated in the documents.

2.8.1 Bicycles

Bicycle transportation is an important consideration within the Bay area, and is of particular interest in recreational areas like the Presidio. A great deal of attention to providing for bicyclists has occurred in several planning efforts at the Presidio resulting in the San Francisco Bicycle Plan and Presidio Trails and Bikeways Master Plan. This report identifies any project elements that may preclude the implementation of those plans.

In Caltrans' HDM, Chapter 1000 provides detailed design standards for Class I, II and II bicycle facilities. The definition of each class of bicycle lanes is:

- Class I – separate off-street path
- Class II – dedicated, striped bike lane on roadway edge
- Class III – signed route only, bicyclists share the roadway with vehicles.

Evaluation Criteria. This report examines whether any of the project alternatives preclude, or negatively affect implementation of the above plans by obstructing, rerouting, or requiring a more inconvenient route.

2.8.2 Pedestrians

The location of bridges, tunnels, staircases and surface streets determine where pedestrians can cross or walk along the facility. A substandard pedestrian facility exists on the north side of the Doyle Drive structures. Presidio plans to maintain and expand pedestrian facilities are described in the Presidio Trails and Bikeways Mater Plan.

Caltrans does not have any specific standards related to pedestrian accommodations, although the roadway must include appropriate (ADA compliant) pedestrian treatments where pedestrian/traffic conflicts are expected. In particular, several project alternatives include intersections where pedestrian activities are expected. While the pedestrian facilities on the northern end are substandard, this project does not include a replacement pedestrian facility. As discussed in Chapter 3, pedestrian facilities are usually provided in well occupied areas.

In order to quantitatively describe the pedestrian benefits, travel times between some key connections can be examined. The key connections used in this report are:

- Lincoln Boulevard and Sheridan Avenue (National Cemetery) to Mason Street and Halleck Street (Crissy Field Interpretative Center)
- Lyon and Mason Streets (Exploratorium/Palace of Fine Arts) to Lincoln Boulevard and Halleck Street (Main Post)
- Bay and Baker Streets (Marina neighborhood) to Mason Street and Halleck Street (Crissy Field Interpretative Center)

Evaluation Criteria. Distances, and routing, between key attractions are used to evaluate changes among alternatives. For this document, a brisk 1.2 meters/second (4 feet per second, which is consistent with HCM assumptions) were assumed in calculating what the pedestrian travel time changes would be.

2.8.3 Intersection Crossing Times

Pedestrians can, and will, cross various intersections included in the project alternatives. Therefore, the layout and design of the intersections must provide adequate crossing time for pedestrians. This time allowance was included as part of the intersection LOS analysis.

The San Francisco Department of Parking and Traffic (DPT) provided the following guidelines for pedestrian crossings. Their overall guidance was consistent with the Manual on Uniform Traffic Control Devices for Streets and Highways, 2003 Edition (MUTCD), which states that, "*the pedestrian clearance time should be sufficient to allow a pedestrian crossing in the crosswalk who left the curb or shoulder during the WALKING PERSON (symbolizing WALK) signal indication, to travel at a walking speed of 1.2 meters (4 feet) per second to at least the far side of the traveled way or to a median of sufficient width for pedestrians to wait,"*

DPT requires a walking speed of 0.76 meters per second (2.5 feet per second) if no median exists and 1.2 meters per second (4 feet per second) with medians. DPT follows MUTCD and Caltrans guidance's for a 4 to 7-second "WALK" symbol interval before the clearance interval begins. The resulting minimum clearance time is then applied to the green, yellow and any trailing all-red phases at an intersection for both the WALK and flashing DON'T WALK signals.

DPT's current fixed-time signal timing plans were used to evaluate all existing intersections, except the intersection at Francisco Street and Richardson Avenue. At Francisco Street and Richardson Avenue, the timing plans were changed to account for the introduction of "walk/don't walk" signal heads, as well as to accommodate an increase in pedestrian traffic that will probably result from nearby developments.

2.9 CONSTRUCTION PERIOD TRAFFIC EVALUATION

Because Doyle Drive is heavily used, the construction could easily disrupt traffic flow and increase congestion and travel time for vehicles and buses. Major construction projects such as this will typically last several years and often require road closures and other traffic and transit changes. Detailed construction staging, phasing, transportation management plans are developed. These detailed plans determine the duration, flow, signage and times of day when lane closures and other traffic controls will be needed to create a safe and effective construction environment.

Careful study of construction requirements for the project alternatives resulted in a preliminary staging strategy that does not vary greatly from the current condition or between alternatives. However, some road closures or lane reductions were identified and evaluated for the Year 2010 to identify the potential traffic effects during construction by analyzing the highway segments during these periods. The temporary impacts of construction were analyzed for major highway segments to explain what kinds of traffic shifts may occur.

2.10 SUMMARY OF METHODS

Table 2.10-1 summarizes the issue that was analyzed, the measure of effectiveness, and the associated methodology used.

TABLE 2.10-1
SUMMARY OF METHODS

Issue		Measure	Methodology
Traffic	Intersection	LOS Queue	HCM 2000 HCM 2000
	Segment	LOS Travel Time Merge / Diverge Weave	HCM 2000 SF-TDM (Travel Demand Model) HCM 2000 (HCS2000 version 4.1a) Caltrans Leisch Method
Transit		Travel Time Capacity	SF-TDM (Travel Demand Model) OER Load Factors
Bicycles/Pedestrians		Assessment Minimum Crossing Speed/Time	Consistency with plans HCM 2000
Construction Period Traffic		Segment Volumes	SF-TDM

3.0 EXISTING CONDITIONS

This section describes the operational and circulatory characteristics for traffic, transit, bicycle, and pedestrian facilities in the study area, as they exist in the Base Year.

3.1 GOLDEN GATE BRIDGE OPERATIONS

The Golden Gate Bridge, Highway and Transportation District (GGBHTD) records hourly counts at the Toll Plaza. From these counts an indication of the maximum flow rate per lane can be determined. In October 2003, the GGBHTD recorded data of approximately 4,100 vehicles at peak hour in the southbound direction when two lanes were open, which can be interpreted as 2,050 vehicles per lane per hour as a maximum flow rate for bridge traffic.

DKS analyzed the operations of the bridge using a freeway/highway operations program entitled FREQ. FREQ allows for a more detailed analysis of operations, including the associated impacts of weaving and congestion spillback. The program was chosen as the preferred analysis tool to represent the potential impacts of reducing lanes on the Golden Gate Bridge.

There are eleven toll booths at the south end of the bridge. During the AM peak period in 2004, there are seven "mixed" (FasTrak, and cash lanes) and four FasTrak lanes in the southbound direction. The northbound direction uses the two lanes that do not have toll booths on them. When an additional northbound lane is added, the easternmost toll booth is turned off to allow northbound traffic to use the toll booth lane as a travel lane. During the PM peak period, there are seven "mixed" lanes and two FasTrak lanes in the southbound direction; the two easternmost toll booths carry traffic in the northbound direction.

The Golden Gate Bridge, Highway and Transportation District also records the aggregate fare payment method for the toll booths. Automatic toll collection (FasTrak), introduced in 1999, has quickly become the preferred toll payment method for morning commuters. Data provided from the October 26, 2003 AM peak period commute shows that the toll payment proportions are as follows:

- Automatic Toll Collection (FasTrak) – 69.5 percent
- Carpool (free) – 4.1 percent
- Cash – 25.9 percent
- Other – 0.5 percent

The Golden Gate Bridge, Highway and Transportation District also records hourly counts at each toll booth. The implementation of FasTrak has provided significant toll plaza increases. FasTrak toll booths are shown to be able to carry over 1,100 vehicles per booth per hour. Other toll booths have also seen an increase in flows of up to 400 vehicles per booth per hour with the introduction of FasTrak readers at each booth.

During the AM peak period, using an assumption of four FasTrak lanes (1,100 vehicles per booth per hour) and seven cash lanes (380 vehicles per booth per hour), the total anticipated flow capacity of the toll plaza is estimated at 7,060 vehicles for an eleven toll booth scenario. During the PM peak period, the capacity at the toll plaza (southbound direction) would be 4,860.

Travel time/speed sample runs in the AM peak period were undertaken and no significant delays related to congestion were observed. Some slow-down occurs in the vicinity of the toll plaza, especially southbound, but the results of the delay runs show no significant delay occurring in either direction on the Golden Gate Bridge.

In 2004, the travel time/speed sample speeds that showed no significant delays in either direction were replicated. It was found (through recent speed delay surveys) that there is no congestion-related slow down in either direction (on the Golden Gate Bridge) during the AM peak hour. The surveys also noted that any toll plaza delay was generally created if someone had to wait behind a car getting change, but that this did not extend beyond a few vehicles.

3.2 TRAFFIC CONDITIONS

Doyle Drive is, and will continue to be, classified as a multilane conventional highway with a posted speed of 45 mph for its mainline section and 35 mph for its ramp and weaving sections. Generally, Doyle Drive operates as a transitional roadway. At the west terminus, near the Golden Gate Bridge, it operates like a free-flow roadway, while at the east terminus it operates like an arterial roadway meeting local streets. Within the 2.4-kilometer section (1.5 miles) there are several ramps that carry significant traffic, reversible lane configurations that change throughout the day and access to the local street network. These changes make Doyle Drive difficult to define with a single term, but the differing segments generally operate as a conventional highway. The Doyle Drive operational segments, from west to east, are described below.

- **Park Presidio Boulevard to south of Merchant Road.** Includes approximately seven traffic lanes that generally operate as four lanes in the peak direction and three lanes in the non-peak direction using reversible lanes. Much of this segment requires lane changes and significant weaving associated with the GGB toll plaza, Merchant Road ramps (to/from GGB viewing area), and Park Presidio Boulevard ramps.
- **Park Presidio Boulevard Interchange to Marina Boulevard.** Includes six lanes of traffic that generally operate as three lanes in the peak direction, two lanes in the non-peak direction, and one lane unused as a buffer lane. In the AM peak, four lanes are provided in the peak (eastbound) direction, and two in the non-peak (westbound) direction.
- **Richardson Avenue, Lyon Street to Marina Boulevard Access Ramps.** Includes one roadway that transitions to an urban street with three lanes of traffic in each direction. The portion of this segment closer to Doyle Drive operates with two highway lanes in the northbound direction, and three highway lanes in the southbound direction.
- **Marina Boulevard Access Ramps to Lyon Street (Marina connector).** Includes a single roadway with five traffic lanes. Plastic pylons are used to reverse, reduce, and divide the traffic varying the facility from two lanes near Lyon Street in each direction to one lane near the Richardson Avenue ramp connections. Other lanes are used as buffer zones when not used for traffic.

The measures of effectiveness used to describe the adequacy of existing traffic operations for each alternative were described in Chapter 2.0 Methodology and include Level of Service (LOS) with time of delay, length of queuing, segment LOS, travel time between two points, speed on the segment, length for merging and/or diverging, and length for weaving.

3.2.1 Intersection Level of Service

The methodology described in Section 2.6.1 was used to analyze intersections to determine current operations. However, a series of constraints were needed to account for the high pedestrian, bicycle, and transit activities, as well as for parking restrictions. Specific considerations included adjusting pedestrian crossing times to allow adequate crossing time, and adding bicycle and bus volumes. Additional transit impacts may occur when transit vehicles stop in moving traffic lanes in order to pick-up and drop-off passengers, as is the case with Route 28 on Park Presidio Boulevard. Table 3.2.1-1 provides the existing AM, PM, and Weekend LOS and delay by intersection. These results are also visually displayed on Figure 3.2.1-1. Detailed intersection LOS calculations are provided in Appendix C.

Traffic along Marina Boulevard all-way stop intersections at Divisadero Street and Broderick Street currently operate at a deficient level of service. Intersections operating at LOS E or LOS F are considered to be deficient. These all-way stops were installed in 2000 to create a traffic calming effect on Marina Boulevard. The congestion shown at the two unsignalized intersections along Marina Boulevard are a result of the heavy volumes traveling along Marina Boulevard.

FIGURE 3.2-1
EXISTING INTERSECTION LEVEL OF SERVICE (Base Year)

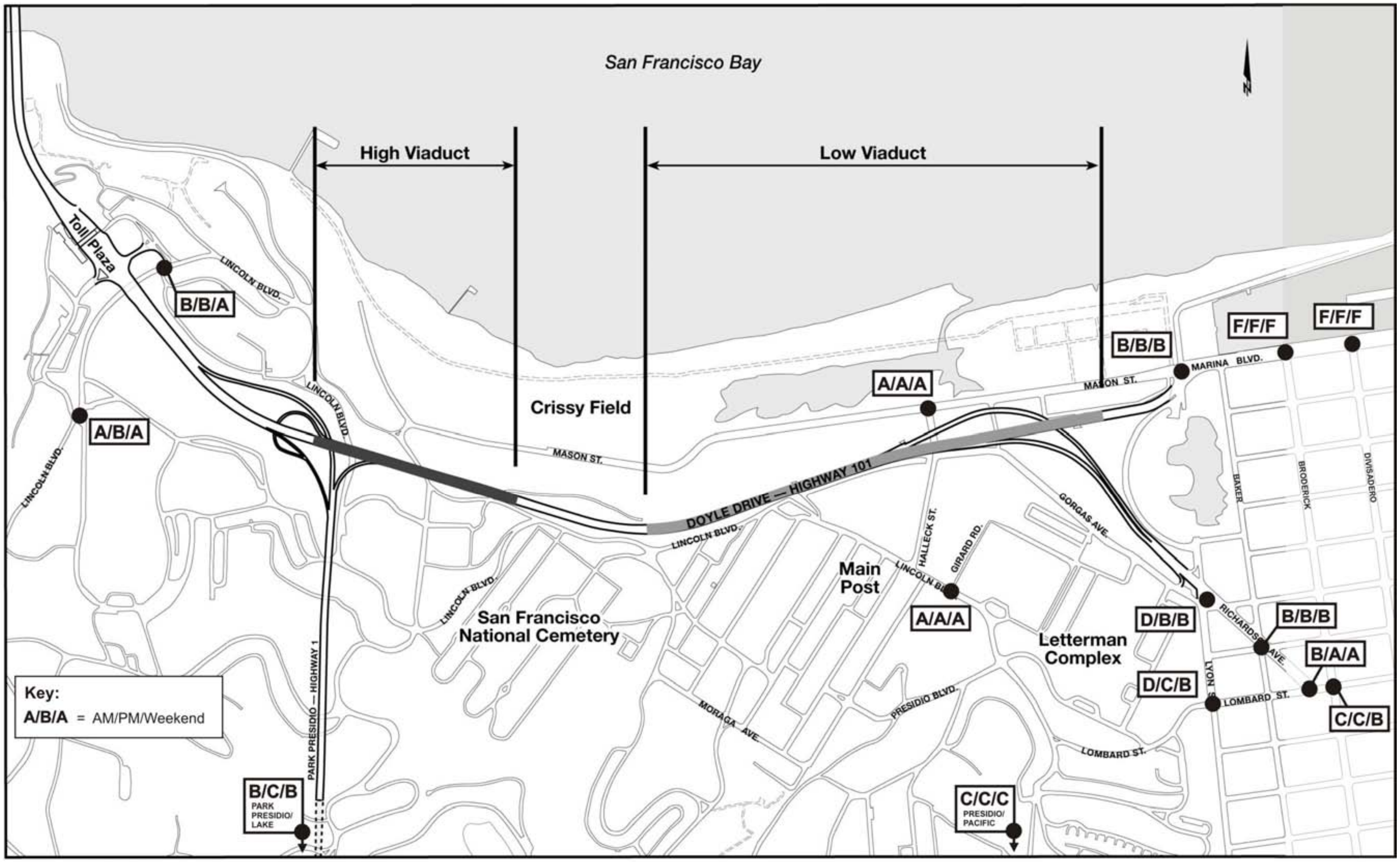


TABLE 3.2.1-1
INTERSECTION LEVEL OF SERVICE FOR EXISTING CONDITIONS

Intersection			AM Peak Hour		PM Peak Hour		Weekend Peak Hour	
No.	**North/South**	**East/West**	**LOS**	**Delay[1]**	**LOS**	**Delay[1]**	**LOS**	**Delay[1]**
1	Lyon	Marina	B	13	B	18	B	20
2	101 / Richardson	Francisco	C	34	A	10	B	11
3	Lincoln (N)	GGB Viewing Area	B	12	B	12	B	11
4	Lincoln (S)	Merchant	A	10	B	11	B	11
5	Girard	Lincoln	A	<1	A	<1	A	<1
6	Halleck	Mason	A	6	A	6	A	6
10[2]	Broderick	Marina	F	59	F	>100	F	>100
11	Divisadero	Marina	F	79	F	>100	F	>100
12	101 / Richardson	Chestnut	B	13	B	15	B	12
13	101 / Richardson	Lombard	B	10	A	5	A	7
14	Broderick	Lombard	C	21	C	25	B	18
15	Lyon	Lombard Gate	D	29	C	18	B	13
16	Presidio	Pacific	C	16	C	19	C	19
17	Park Presidio	Lake	B	17	C	21	B	15
18	Merchant	GGB Viewing Area	A	9	B	13	B[3]	12[3]

Notes:
1. Delay measured in seconds per vehicle
2. Intersections 7 through 9 do not exist today
3. Weekend peak hour congestion varies significantly depending on weather and events

Source: DKS Associates, 2004 from HCM 2000 methodology

3.2.2 Intersection Queue Lengths

When a vehicle reaches a red traffic signal, the vehicle is in a “queue” waiting to proceed through the intersection. The total length of the waiting vehicles, or the queue length, describes how far from a signalized intersection the line of vehicles is located at peak times. Table 3.2.2-1 identifies the existing maximum peak hour queue length for the study intersections. See Appendix D for a complete set of calculated queue lengths for all intersections and movements.

It is recognized that although intersections may operate at a satisfactory level of service, particular approaches may have excessive queue lengths. Examples of this are found at the intersection of Richardson Avenue and Francisco Street.

TABLE 3.2.2-1
MAXIMUM QUEUE LENGTHS FOR EXISTING CONDITIONS

No.	Intersection	Direction	Time Period	Queue Length[1]	Critical Movement	Storage Description
1	Marina / Mason	SB	PM	82	Right	Mason contains overflow storage
		EB	Weekend	99	Shared	440 meters back to the Richardson off-ramp
		WB	PM	105	Left	120 meters back to Baker
2	Richardson / Francisco	NB	PM	40	Shared	140 meters back to Chestnut
		SB	AM	>246[2]	Through	375 meters back onto Marina ramps
		EB	AM	25	Shared	10 meters back to Lyon, Gorgas contains overflow storage
		WB	PM	63	Shared	90 meters back to Baker

Notes: 1. Queue length in meters; queues are averaged across all lanes
2 Queue shown is maximum after two traffic cycles, observed queues may be longer
Source: DKS Associates, 2004

3.2.3 Segment Level of Service

Table 3.2.3-1 contains the existing LOS and vehicle density for the highway segments within the project area. The peak direction of Doyle Drive traffic is near the preferred design standard of LOS D.

For urban street segments (segments containing a signal) identified in this study, the Urban Street Segment methodology was used. This method is based on urban street class and average travel speed. Table 3.2.3-2 identifies the four urban street segments evaluated in the project area including the segment classification and existing LOS. Although particular intersections may operate at high level of congestion, each of the urban street segments is estimated to operate at acceptable levels of service (Level of Service D or better) during peak hours.

TABLE 3.2.3-1
PEAK HOUR HIGHWAY SEGMENT LEVEL OF SERVICE FOR EXISTING CONDITIONS

Segment		AM		PM		Weekend	
		LOS	Density[1]	LOS	Density[1]	LOS	Density[1]
1	US 101 Southbound between the Merchant Road Ramps and Park Presidio	D	31	B	16	C	23
2	US 101 Northbound between Park Presidio and the Merchant Road Ramps	C	20	D	28	C	23
3	US 101 Southbound between Park Presidio and Marina Blvd access ramps	D	26	C	26	C	24
4	US 101 Northbound between Marina Blvd access ramps and Park Presidio	B	14	D	31	B	18
9[2]	Park Presidio Southbound between US 101 and the Park Presidio Tunnel	C	24	C	23	C	22
10	Park Presidio Northbound between the Park Presidio Tunnel and US 101	C	24	D	28	C	20
11	US 101 Southbound between Park Presidio off and on-ramps	D	28	B	13	C	19
12	US 101 Northbound between Park Presidio on and off-ramps	A	11	C	24	B	14
13	US 101 Southbound between Marin County and Merchant Road (Golden Gate Bridge)	D	29	C	20	D	28
14	US 101 Northbound between Merchant Road and Marin County (Golden Gate Bridge)	D	29	E	42	D	20

Notes: 1. Density measured in vehicle per mile per lane
2. Segments 5 through 8 were analyzed as Urban Arterial Segments only (see Table 3.2.3-2)

Source: DKS Associates, 2004

TABLE 3.2.3-2
PEAK HOUR URBAN STREET SEGMENT LEVEL OF SERVICE FOR EXISTING CONDITIONS

Segment		Urban Street Class[1]	AM		PM		Weekend	
			LOS	Speed[2]	LOS	Speed[2]	LOS	Speed[2]
5	Richardson Southbound between Marina Blvd access ramps and Lyon	II	C	19	B	26	B	26
6	Richardson Northbound between Lyon and Marina Blvd access ramps	II	B	26	D	14	B	26
7	Marina Blvd Southbound between Lyon and Doyle Drive merger	III	B	26	B	27	B	27
8	Marina Blvd Northbound between Doyle Drive merger and Lyon	III	B	27	B	25	B	27

Notes:
1. Urban Street Class II have a range of free flow speeds between 35 to 45 mph, while Urban Street Class III have a range of free flow speeds between 30 to 35 mph
2. Speed calculated according to HCM methodology in miles per hour (mph). It is calculated as the average speed on the link. Delays at intersections are included in travel time analysis.

Source: DKS Associates, 2004

3.2.4 Segment Travel Time

Table 3.2.4-1 identifies the travel time for selected highway segments and demonstrates a higher travel time in the peak direction when compared with the non-peak direction. The average PM peak direction travel time is estimated to be up to 1.5 minutes longer when compared to the non-peak direction for the segments between Park Presidio Boulevard at Lake and the Golden Gate Bridge, and up to 1.3 minutes longer from Marina at Divisadero to the Golden Gate Bridge.

TABLE 3.2.4-1
PEAK PERIOD TRAVEL TIME ON ROADWAY SEGMENTS FOR EXISTING CONDITIONS

	Segment	AM [1, 2]	PM [1, 2]	Weekend [1, 2, 3]
1	Golden Gate Bridge toll plaza to Park Presidio and Lake	3.8	3.1	3.0
2	Park Presidio and Lake to Golden Gate Bridge toll plaza	3.4	4.4	2.8
3	Golden Gate Bridge toll plaza to Marina and Divisadero	3.4	2.7	2.7
4	Marina and Divisadero to Golden Gate Bridge toll plaza	2.7	4.0	2.7
5	Golden Gate Bridge toll plaza to Francisco / Richardson	2.9	2.5	2.4
6	Francisco / Richardson to Golden Gate Bridge toll plaza	2.6	4.0	2.6
7	Park Presidio and Lake to Marina and Divisadero	5.6	5.9	4.4
8	Marina and Divisadero to Park Presidio and Lake	5.2	6.4	4.9

Notes:
1. Travel time measured in minutes
2. Travel times based on speed calculated from the SFCTA Travel Demand Model (TDM)
3. Weekend peak hour congestion varies significantly depending on weather and events

Source: DKS Associates, 2004

3.2.5 Segment Merge / Diverge Level of Service

The ability of vehicles to merge and diverge effectively has been defined with a level of service calculation, based on information about geometries and traffic volumes. Table 3.2.5-1 details the LOS results for the merge/diverge of all the on- and off-ramps in the project area. LOS E and LOS F are considered to be deficient based on the Caltrans Design Guide. According to HCM 2000, the *capacity of a merge or diverge area is always controlled by the capacity of its entering and exiting roadways, that is the freeway segments up and downstream of the ramps or by the capacity of the ramp itself. For diverge areas, failure often occurs because of insufficient capacity on the off-ramp.*

TABLE 3.2.5-1
PEAK HOUR MERGE/DIVERGE LEVEL OF SERVICE ANALYSIS FOR EXISTING CONDITIONS

		AM		PM		Weekend	
No.	**Segment Number**	**LOS**	**Density[1]**	**LOS**	**Density[1]**	**LOS**	**Density[1]**
1	US 101 Southbound exit diverge to Park Presidio	F[2]	26	B	13	C	21
2	US 101 Southbound entrance merge from Park Presidio	E	36	C	21	C	27
3	US 101 Northbound entrance merge from Park Presidio	C	28	C	27	B	18
4	US 101 Northbound exit diverge to Park Presidio	B	18	D	34	C	23
5	US 101 Southbound diverge to Doyle Drive and Richardson	E	37	C	22	C	27
6	Doyle Drive and Richardson merge into US 101 Northbound	B	19	E	37	C	23
7	Park Presidio Southbound merge from US 101 Ramps	D	26	D	25	C	22
8	Park Presidio Northbound diverge to US 101 Ramps	C	27	D	30	C	23

Notes: 1. Density measured in vehicles per mile per lane
2. Highway influence area and ramp demand exceed capacity

Source: DKS Associates, 2004

Deficiencies are found during the AM peak at the southbound diverge (exit) to Park Presidio Boulevard, at the southbound entrance merge from Park Presidio Boulevard, and southbound diverge (exit) to Richardson Avenue and Marina Boulevard. During the PM peak, a LOS deficiency is calculated at the westbound merge (on) between Richardson Avenue and Marina Boulevard. See Appendix E for a complete set of calculations of this analysis. The southbound diverge (exit) from US 101 to Park Presidio Boulevard and merge from Park Presidio Boulevard onto US 101 deficiencies during the AM peak hour are due to the capacity at this location being exceeded. The US 101 southbound diverge to Doyle Drive and Richardson is deficient due to capacity issues downstream. During the PM peak period, the Doyle Drive and Richardson merge into US 101 northbound deficiency is due to the high volumes of traffic that are making this merge.

3.2.6 Segment Weaving

Table 3.2.6-1 presents the LOS for highway weaving sections based on the Caltrans-approved Leisch method nomograph. The close spacing of the Merchant Road and Park Presidio Boulevard ramps combined with high traffic volumes on the Golden Gate Bridge result in congestion associated with weaving traffic between these two interchanges, problems as indicated by the deficient level of service.

3.2.7 Local Street Volumes

Representative volumes from the San Francisco Travel Demand Model are shown for the local roads for the existing conditions. The AM conditions are found in Table 3.2.7-1; the PM conditions are in Table 3.2.7-2.

In the AM peak hour, the highest volumes occur at the Presidio and Lombard Gates where there is approximately 1,000 vehicles traveling through these gates in both directions. During the PM peak hour, the highest volumes occur at the Presidio Gate and along Lincoln Boulevard with a lower flow occurring at the Lombard Gate.

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TABLE 3.2.6-1
WEAVING SEGMENT LEVEL OF SERVICE FOR EXISTING CONDITIONS

No.	Location	Level of Service		
		AM	PM	Weekend
1	US 101 Southbound between the Merchant Road entrance ramp and Park Presidio exit ramp	C	C	E
2	US 101 Northbound between the Park Presidio entrance ramp and Merchant Road exit ramp	D	E	F
3	US 101 Southbound between the Park Presidio exit ramp and Richardson/Marina Access merge	C	A	C
4	US 101 Northbound between the Park Presidio exit ramp and Richardson/Marina Access merge	A	A	B

Note: Results interpreted from the nomograph.

Source: DKS Associates, 2004

TABLE 3.2.7-1
AM PEAK HOUR LOCAL STREET VOLUMES

Segment		Direction	Base Year (vehicles)
2	Lincoln--Long Avenue to Crissy Field	Westbound	10
	Lincoln--Crissy Field to Long Avenue	Eastbound	0
3	Lincoln--Sheridan to Crissy Field	Westbound	60
	Lincoln--Crissy Field to Sheridan	Eastbound	80
6	Mason--Zanowiz to Lyon	Westbound	10
	Mason--Lyon to Zanowiz	Eastbound	10
8	Lombard Gate--Lyon to Ruger	Westbound	510
	Lombard Gate--Ruger to Lyon	Eastbound	400
9	Girard--Lincoln to Gorgas	Northbound	20
	Girard--Gorgas to Lincoln	Southbound	10
10	Presidio Gate--Pacific to Broadway	Northbound	500
	Presidio Gate--Broadway to Pacific	Southbound	590
11	Arguello Gate--Pacific to Washington	Northbound	90
	Arguello Gate--Washington to Pacific	Southbound	60
13	15th Ave--Lake to Wedemeyer	Northbound	20
	15th Ave--Wedemeyer to Lake	Southbound	30
14	Lincoln--Brooks to Browley	Northbound	450
	Lincoln--Browley to Brooks	Southbound	10
17	Halleck Street – Lincoln to Mason	Northbound	30
	Halleck Street – Mason to Lincoln	Southbound	20
18	McDowell Street -- Lincoln to Mason	Northbound	20
	McDowell Street -- Mason to Lincoln	Southbound	0

Source: DKS Associates, 2004

TABLE 3.2.7-2
PM PEAK HOUR LOCAL STREET VOLUMES

	Segment	Direction	Base Year (vehicles)
2	Lincoln--Long Avenue to Crissy Field	Westbound	260
	Lincoln--Crissy Field to Long Avenue	Eastbound	30
3	Lincoln--Sheridan to Crissy Field	Westbound	340
	Lincoln--Crissy Field to Sheridan	Eastbound	60
6	Mason--Zanowiz to Lyon	Westbound	10
	Mason--Lyon to Zanowiz	Eastbound	50
8	Lombard Gate--Lyon to Ruger	Westbound	490
	Lombard Gate--Ruger to Lyon	Eastbound	290
9	Girard--Lincoln to Gorgas	Northbound	30
	Girard--Gorgas to Lincoln	Southbound	20
10	Presidio Gate--Pacific to Broadway	Northbound	580
	Presidio Gate--Broadway to Pacific	Southbound	530
11	Arguello Gate--Pacific to Washington	Northbound	150
	Arguello Gate--Washington to Pacific	Southbound	160
13	15th Ave--Lake to Wedemeyer	Northbound	60
	15th Ave--Wedemeyer to Lake	Southbound	40
14	Lincoln--Brooks to Browley	Northbound	530
	Lincoln--Browley to Brooks	Southbound	490
17	Halleck Street – Lincoln to Mason	Northbound	40
	Halleck Street – Mason to Lincoln	Southbound	40
18	McDowell Street -- Lincoln to Mason	Northbound	260
	McDowell Street -- Mason to Lincoln	Southbound	10

Source: DKS Associates, 2004

3.3 TRANSIT CONDITIONS

MUNI, Golden Gate Transit, Presidio Trust and "club" buses operate transit service within and through the study area. MUNI Route 28 is an important crosstown route that connects areas on the western side of San Francisco with the Presidio and Fort Mason.

Golden Gate Transit buses that operate on Doyle Drive provide public transit service between San Francisco and Marin and Sonoma counties. This service falls into two general categories: "Basic" service operates on a near 24-hours / 7-days per week basis, whereas "Commute" routes operate on a peak period / peak directional weekday basis.

Table 3.3-1 lists the number of buses that have some, or part, of their route on Doyle Drive. As shown in this table, Golden Gate Transit is heavily oriented to peak period and peak direction service, resulting in about two-thirds of all buses traveling in the peak direction during each peak period. Figure 3.3-1 contains a visual diagram of these routes, as well as the path of MUNI Routes 43, 29 and 82x.

In response to the low ridership associated with the recent downturn in the Bay Area economy, several Golden Gate Transit (GGT) services were eliminated or revised in November 2003. This report evaluates Base Year transit service levels on Doyle Drive as part of a "worst case" scenario. One example of this service revision is 30-minute GGT Route 50 service has been replaced with hourly GGT Route 10 service. It should be noted that GGT is committed to providing increased bus service in the area once the economy improves. As such, it was requested that the base year GGT routes remain intact under the existing conditions and that these were used for all future scenarios.

In addition, the buses open to the general public discussed here, other buses operate in the corridor. Golden Gate Transit District operates a subscription bus service across the Golden Gate Bridge to Doyle Drive. Also tour buses, private buses that travel to San Francisco, and Airport buses providing service to San Francisco International Airport operate in this corridor. Finally, the Presidio Shuttle services operate in the study area, although they do not use Doyle Drive.

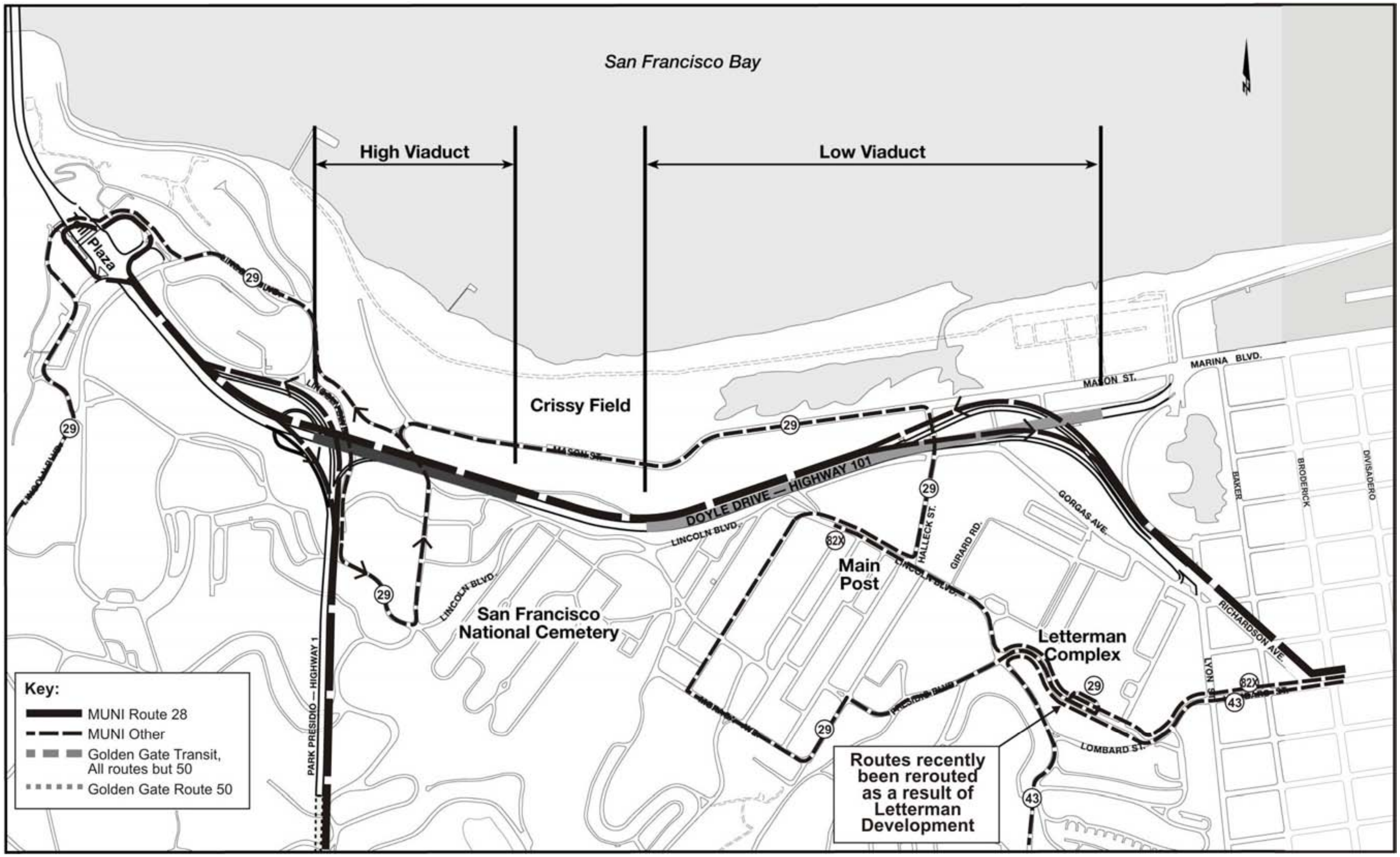
TABLE 3.3-1
EXISTING NUMBER OF BUSES ON DOYLE DRIVE

	All Day				Weekday Peak Period			
	Weekday		Saturday		AM		PM	
Route	**In**	**Out**	**In**	**Out**	**In**	**Out**	**In**	**Out**
San Francisco MUNI								
28	100	100	85	85	20	20	18	18
76[1]	-	-	9	9	-	-	-	-
Total MUNI	100	100	94	94	20	20	18	18
Golden Gate Transit								
2	9	7	-	-	9	-	-	7
4	22	25	-	-	20	-	-	21
8	5	4	-	-	4	-	-	4
10	1	-	13	13	-	-	-	-
18	12	13	-	-	10	-	-	11
20	29	35	33	33	6	7	6	7
24	22	21	-	-	19	-	-	18
26	10	7	-	-	8	-	-	6
28	2	2	-	-	2	-	-	2
30	9	9	-	-	0	1	3	1
32	3	3	-	-	3	-	-	3
34	4	3	-	-	4	-	-	3
38	8	8	-	-	7	-	-	7
44	5	4	-	-	5	-	-	4
48	3	3	-	-	3	-	-	3
50	29	16	16	16	5	1	6	3
54	17	17	-	-	16	-	-	13
56	8	8	-	-	8	-	-	8
60/70/80	35	50	36	38	5	8	8	8
72	10	12	-	-	9	-	-	10
74	16	15	-	-	11	-	-	12
76	13	12	-	-	13	-	-	10
78	3	3	-	-	3	-	-	3
90	3	2	-	-	1	1	-	1
93	6	1	-	-	6	-	-	1
Total GGT	284	280	98	84	177	18	23	166

Notes: 1. Operates on Sundays only

Source: DKS Associates, 2004 from published timetables

FIGURE 3.3-1
BASE YEAR BUS ROUTES



3.3.1 Transit Travel Time

The effective travel time of buses affects the transit riders and the overall productivity of the transit system. The current peak travel times are shown in Table 3.3.1-1. This data is obtained from examining the speeds of traffic on the roadway segments used by each route, and adding additional delay for loading and unloading passengers. Thus, as with the traffic travel times, peak period transit travel times are higher in the peak than in the non-peak direction.

TABLE 3.3.1-1
PEAK HOUR TRAVEL TIME FOR TRANSIT ROUTES FOR EXISTING CONDITION

		AM	PM
	Segment	Travel Time[1, 2]	Travel Time[1, 2]
1	GGT Route 50: Golden Gate Bridge and Park Presidio/Lake Street.	5.0(SB) 4.6(NB)	4.4(SB) 5.6 (NB)
2	GGT other routes: Golden Gate Bridge and Richardson/Francisco	5.5(SB) 5.1(NB)	5.0(SB) 6.7 (NB)
3	MUNI Route 28: Presidio/Lake to/from Richardson/Francisco via the Golden Gate Bridge plaza	10.1(SB) 10.1(NB)	11.1(SB) 10.6 (NB)

Notes: 1. Travel time is measured in minutes
2. Travel time information is derived from the SF-TDM model

Source: DKS Associates, 2004

3.3.2 Transit Operations (Capacity) Level of Service

Table 3.3.2-1 and Table 3.3.2-2 illustrate the northbound and southbound peak hour load factors for the combined Golden Gate Transit routes on Doyle Drive, Golden Gate Transit Route 50 and MUNI Route 28. As the tables show, no overall deficiencies exist, but some deficiencies on individual Golden Gate Transit routes are estimated. These localized deficiencies are monitored by Golden Gate Transit, which periodically adjusts their bus schedules to meet passenger loads.

Table 3.3.2-3 describes the current alighting and boarding activity for each of the bus stop locations in the project area. The greatest activity occurs in the AM peak period at the GGB toll plaza, with 257 total passenger boardings and alightings. During the PM peak period, the greatest activity is on Richardson Avenue at the northbound stop beyond Francisco Street, with 125 combined boardings and alightings between both MUNI and Golden Gate Transit.

TABLE 3.3.2-1
NORTHBOUND PEAK LOAD FACTORS FOR ROUTES ON DOYLE DRIVE IN EXISTING CONDITION (Base Year)

Route	Number of Buses		Peak Hour Capacity[1]		Passengers per Hour[2]		Peak Hour Load Factor	
	AM	PM	AM	PM	AM	PM	AM	PM
MUNI								
28	22	20	567	520	191	466	34%	90%
Golden Gate Transit								
2		4		172		79		46%
4		12		516		286		55%
8		3		129		43		33%
18		5		215		129		60%
20	2	2	86	86	32	50	38%	58%
24		7		301		220		73%
26		4		172		78		45%
28		2		86		10		12%
32		1		43		25		58%
34		1		43		22		51%
38		3		129		104		81%
44		2		86		48		56%
48		2		86		39		46%
50	2	2	86	86	14	44	17%	51%
54		6		258		192		75%
56		4		172		104		61%
72		4		172		165		96%
74		5		215		137		64%
76		5		215		150		70%
78		2		86		26		31%
60/70/80	3	2	129	86	80	48	62%	91%
90		1		43		9		20%
93		1		43		11		26%

Notes:
1. Assumes 43 passengers per bus on Golden Gate Transit Vehicles
2. Maximum Load segment is estimated by the SF-TDM. The load point is found at the Golden Gate Bridge for Golden Gate Transit and on 19th Avenue south of Judah Street for MUNI Route 28.

Source: DKS Associates, 2004

TABLE 3.3.2-2
SOUTHBOUND PEAK HOUR LOAD FACTOR ANALYSIS ON DOYLE DRIVE IN EXISTING CONDITION
(Base Year)

Route	Number of Buses		Peak Hour Capacity[1]		Passengers per Hour[2]		Peak Hour Load Factor	
	AM	PM	AM	PM	AM	PM	AM	PM
MUNI								
28	18	19	378	447	231	370	61%	83%
Golden Gate Transit								
2	5		215		121		56%	
4	7		301		262		87%	
8	2		86		61		71%	
18	6		258		151		58%	
20	2	1	86	43	109	63	100+%	100+%
24	9		387		243		63%	
26	3		129		115		89%	
28	2		86		17		20%	
32	1		43		34		80%	
34	1		43		43		99%	
38	4		172		134		78%	
44	2		86		61		71%	
48	2		86		37		44%	
50	4	3	172	129	33	59	19%	45%
54	6		258		199		77%	
56	4		172		106		62%	
72	3		129		142		100+%	
74	5		215		181		84%	
76	4		172		126		73%	
78	2		86		25		29%	
60/70/80	2	3	86	129	58	65	68%	50%
90	1		43		12		27%	
93	4		172		69		40%	

Notes:

1. Assumes 43 passengers per bus on Golden Gate Transit vehicles
2. Maximum Load segment is estimated by the SF-TDM. The load point is found at the Golden Gate Bridge for Golden Gate Transit and on 19th Avenue south of Judah Street for MUNI Route 28.

Source: DKS Associates, 2004

TABLE 3.3.2-3
STOP ACTIVITY BY LOCATION FOR EXISTING CONDITION (Base Year)

Location	Peak Hour	Inbound		Outbound	
		Boardings	Alightings	Boardings	Alightings
Golden Gate Transit					
Francisco-Richardson NB	AM	-	-	3	0
	PM	-	-	79	40
Francisco-Richardson SB	AM	0	12	-	-
	PM	0	1	-	-
GGB Toll Plaza SB	AM	104	153	-	-
	PM	6	21	-	-
GGB Toll Plaza NB	AM	-	-	21	0
	PM	-	-	58	21
MUNI					
Francisco-Richardson NB	AM	-	-	3	0
	PM	-	-	5	1
Francisco-Richardson SB	AM	4	12	-	-
	PM	5	8	-	-
Merchant Road SB, west of Toll Plaza	AM	-	-	15	3
	PM	-	-	33	1
Merchant Road WB, east of Toll Plaza (by concessions)	AM	0	1	8	31
	PM	0	2	46	32

Source: DKS Associates, 2004 from Field Surveys

3.4 PEDESTRIANS AND BICYCLE CONDITIONS

The general character of pedestrian and bicycle circulation is described as follows (*Presidio Trust Management Plan*, July 2001 & *Presidio Trust Management Plan*, May 2002):

"The Presidio does not have a continuous system of sidewalks, bicycle trails and bicycle lanes. Sidewalks and marked pedestrian crossings are provided sporadically throughout the Presidio. In many cases within the Presidio, pedestrian and bicyclists must mix with vehicles on the street system to move from one area to another.

Sidewalks within the Presidio are generally provided in areas that are currently well occupied, such as the western portion of the Letterman Planning District and along Lincoln Boulevard in the Main Post. Most intersections within the Main Post and along Lincoln Boulevard have marked pedestrian crossings…"

3.4.1 Bicycles

Bicycles are currently prohibited on the Doyle Drive mainline and sidewalk on the north side of the structure. The project is within the Presidio, where the *Presidio Trails and Bikeways Master Plan* and *Presidio Trust Management Plan* have identified an extensive set of bicycle routes and plans:

"Currently, there are several bicycle routes within the Presidio, although bicycles and vehicles share a standard-width roadway along most of these routes… Lombard Street, Presidio Boulevard, Mason Street, Arguello Boulevard, 14 Avenue, and El Camino del Mar are part of the designated San Francisco Citywide Bicycle Routes (Routes #4, #55, #2, #65, #69, and #95, respectively) that continue into the Presidio. Most of these routes are Class III facilities (signed route only – bicycles share the roadway with vehicles), although the travel lanes that vehicles and bicycles share are generally wider in the southwestern portion of the Park.

Mason Street has Class I (separate off-Street path) and Class II facilities (dedicated, striped bike lanes on roadway edge)."

A new multi-use trail along Mason Street (Class I) was constructed as part of the Crissy Marsh restoration and links Fort Point with bicycle trails adjacent to Marina Boulevard and provides a continuous route along the Doyle Drive corridor. The proposed Presidio Promenade trail will also provide a continuous bike route parallel to Doyle Drive.

3.4.2 Pedestrians

There is an existing sidewalk on the north side of Doyle Drive structure. The location of two staircases (adjacent to roadway merges at the Marina and Richardson ramps and the Park Presidio Boulevard interchange) makes this route non-accessible. The sidewalk begins at Lyon and Marina Boulevard, and ends at the Merchant Avenue exit ramps, where the path crosses the off-ramp.

The sidewalk is 1.5 meters (4 feet – 10 inches) clear between barrier and bridge railing with many light and sign poles that further reduce the width by about 0.41 meters (16 inches). The effective width is about 1.09 meters (3 feet – 6 inches) and is ADA deficient because of this narrow width and required staircases. The sidewalk is also prone to minor flooding during rainy conditions.

The Crissy Marsh bicycle trail described above also accommodates pedestrians through this scenic area with direct access available to many Presidio area attractions, including Stillwell Hall, the Crissy Field Interpretive Center, and the Commissary.

For comparative purposes, a number of major attractions and important places where pedestrian connections are useful were identified. Then, these were paired to illustrate potential pedestrian travel times between these locations. The pedestrian travel time between these locations was estimated using a brisk 1.2 meters per second (4 feet per second) walking speed and are as follows:

- Lincoln Boulevard and Sheridan Avenue (National Cemetery) to Mason Street and Halleck Street (Crissy Field Interpretative Center) – approximately 900 meters (2,953 feet) or 12 minutes walking time
- Lyon and Mason Street (Exploratorium/Palace of Fine Arts) to Lincoln Boulevard and Halleck Street (Main Post) – approximately 950 meters (3,117 feet) or 13 minutes walking time
- Bay and Baker Streets (Marina neighborhood) to Mason Street and Halleck Street (Crissy Field Interpretative Center) – approximately 1,000 meters (3,281 feet) or 14 minutes walking time

3.4.3 Pedestrian Crossings at Intersections

Pedestrians are unable to cross the at-grade portion of Doyle Drive today. However, pedestrian crossings are available underneath the Doyle Drive high viaduct, and at Halleck and Marshall Streets. Areas east of Marshall Avenue cannot be crossed because the ramps from Richardson Avenue do not provide adequate vertical clearance until Marshall Avenue.

The signalized intersections of Marina Boulevard and Lyon Street, and Richardson Avenue and Francisco Street provide the standard 1.2 meters per second (4 feet per second) walking speed to cross the major streets. However, these intersections do not have "walk/don't walk" signal heads for the crosswalks resulting in an up-front loss in walking time.

At the Richardson Avenue and Francisco Street intersection, a signal timing change would be required to provide adequate crossing time. The crosswalk for Francisco Street at this intersection is 31.7 meters (104 feet). This is longer than a typical cross section of this roadway, as the crosswalk runs at an angle. Currently, 26 seconds is provided for traffic and pedestrians to cross Richardson Avenue during the AM peak period. The City of San Francisco prefers to provide an additional five seconds crossing time to a "walk" phase when a "walk/don't walk" signal head is installed, which is consistent with 2003 *Manual of Uniform Traffic Control Devices (MUTCD)* guidance. This would increase the needed crossing time to 31 seconds to accommodate pedestrians crossing Francisco Street.

4.0 DESIGN YEAR CONDITIONS

Reconstructing Doyle Drive will be a major investment in both time and resources. The new facility will have a design life between 50 and 100 years and must accommodate the traffic demands placed on it throughout its life. The Design Year, 20 years after it is opened to traffic, is the required analysis period for future conditions.

This chapter describes the forecasted traffic and transit operations for each of the project alternatives – including circulation in and around Doyle Drive in the Design Year. Particular attention was devoted to providing the appropriate level of operations defined in the Caltrans *Highway Design Manual,* or HDM. Other important, but more qualitative, issues such as reducing intrusion into adjacent neighborhoods and park roads are also addressed.

This study quantitatively measured the effect of each alternative on both traffic intersections and roadway segments for the Base Year and the design year (20-year build) horizon. The analysis is conducted for Design Year conditions, except for the existing conditions and the construction impact analysis, which are evaluated for traffic operations only using a 2010 horizon year when construction is estimated to be completed.

As noted in Chapter 2, the Design Year alternatives have been grouped for purposes of analyzing traffic, because differences between the alternatives are minor from a traffic perspective. Within this chapter, a systems evaluation is provided for Alternatives 1 and 2, as well as Alternative 5 Diamond Option and Circle Drive Option. Alternatives 3 and 4 have previously been analyzed and discarded.

4.1 GOLDEN GATE BRIDGE OPERATIONS

For the design year, the Golden Gate Bridge operational assumptions were defined and applied to each alternative. The assumptions were based on forecast changes in traffic volumes. The volumes for the design year come from the San Francisco County Transportation Authority forecast model for Doyle Drive. The conversion of data from AM peak period to peak hour is 35 percent, which is the current ratio of peak period to peak hour that the bridge currently experiences.

Two different operating assumptions for the Golden Gate Bridge AM peak period operations were studied. For the PM Peak Period and the Weekend Peak Period, the 3 lanes in each direction configuration was assumed to be adequate for the design year. They were the existing AM Peak Period Configuration (two lanes northbound and four lanes southbound) and an alternative AM Peak Period configuration that assumed three lanes in each direction.

Existing AM Peak Period Configuration (two lanes northbound and four lanes southbound): Using the current AM peak period configuration, DKS determined that the northbound traffic would greatly exceed the effective capacity of two northbound lanes on the bridge, and estimated that traffic would back up onto Doyle Drive, Park Presidio and Merchant Road. The backup begins to form early in the commute (about 7:15 AM) and is forecast to build up past the 9:00 AM end time. This back-up would extend through the study corridor, reaching Richardson Avenue. Table 4.1-1 below compares the northbound FREQ models results for the current operations and design year operations. The change in average speed from 48.6 miles per hour to 11.9 miles per hour indicates the congestion present in the design year.

TABLE 4.1-1
FREQ ANALYSIS RESULTS SUMMARY NORTHBOUND DIRECTION (Existing Configuration)

Scenario	Travel Time (veh-hr)	Travel Distance (veh-mi)	Average Speed (mph)
Northbound Base Year (2-lanes)	243	11834	48.6
Northbound Design Year (2-lanes)	1548	16340	11.9

Source: DKS Associates, 2004

In the southbound direction, ample flow capacity would exist for commuters coming into San Francisco. No delays would be anticipated in this direction as indicated by the average speed results in Table 4.1-2.

TABLE 4.1-2
FREQ ANALYSIS RESULTS SUMMARY SOUTHBOUND DIRECTION (Existing Configuration)

Scenario	Travel Time (veh-hr)	Travel Distance (veh-mi)	Average Speed (mph)
Southbound Base Year (4-lanes)	723	35791	49.5
Southbound Design Year (4-lanes)	764	37805	49.5

Source: DKS Associates, 2004

Alternative AM Peak Period Configuration (three lanes northbound and three lanes southbound): When a three lane northbound configuration was used, the improvement in carrying capacity of the bridge was forecast to eliminate the congestion problem.

The expansion to three northbound lanes in the AM peak period on the Golden Gate Bridge requires that the southbound traffic also be reduced from the current four to three lanes. This also would require the reduction of one toll booth inbound from the current 11 to 10.

In the southbound direction, a short 15-minute queue would be expected at the decrease of four to three lanes heading onto the Golden Gate Bridge at the point where the lane drop occurs (south of the Sausalito Road exit north of the Golden Gate Bridge). Otherwise, the roadway should be able to adequately carry the heavy traffic load. Table 4.1-3 indicates the improved performance of using three lanes in the northbound direction (average speed of 48.5 miles per hour) compared to the two lanes (average speed of 11.9 miles per hour). The slight drop in performance for the southbound directions is indicated in the table with an average speed of 49.5 miles per hour for four southbound lanes and 47.9 miles per hour for three southbound lanes.

TABLE 4.1-3
FREQ ANALYSIS RESULTS SUMMARY SOUTHBOUND DIRECTION
(Alternative Configuration)

Scenario	Travel Time (veh-hr)	Travel Distance (veh-mi)	Average Speed (mph)
Northbound Design Year (2-lanes)	1548	16340	11.9
Northbound Design Year (3-lanes)	386	18721	48.5
Southbound Design Year (4-lanes)	764	37805	49.5
Southbound Design Year (3-lanes)	790	37852	47.9

Source: DKS Associates, 2004

Configuration Assumption for Design Year Alternatives

By the design year, it is forecast that the current AM peak period lane configurations on the Golden Gate Bridge will produce considerable queuing of vehicles onto Doyle Drive through the project area, as well as onto other streets, such as Park Presidio, Merchant Road and Richardson Avenue. Meanwhile, traffic in the opposing direction on the bridge will easily be able to be accommodated. This imbalance of traffic flows on a facility with changeable lanes will result in a likelihood that bridge crews would need to modify the lane configurations from those in use in the base year.

If the configuration is converted to three lanes in each direction for the AM peak period condition, the northbound queuing would disappear, and the impacts to southbound traffic would be much less minimal. For this reason, this alternative configuration is an assumption made when analyzing the alternatives in this report.

4.2 FUTURE YEAR TRAFFIC

The project alternatives were defined during the scoping and screening activities and further refined through a series of technical studies, agency/citizen coordination, design reviews and operational analyses.

All alternatives were tested using the San Francisco County Transportation Authority's traffic model, detailed in Section 2. Each alternative assumes identified roadway and access changes to the existing condition that are anticipated through the redevelopment of the Presidio. In particular, adjustments were made to reflect the redevelopment of the Letterman Digital Arts Center as described in the *Letterman EIS* and *Letterman Redevelopment Richardson Avenue Access Traffic Operations Analysis (March, 2001)*. The Access Improvements are listed in Table 4.2-1

TABLE 4.2-1
LETTERMAN REDEVELOPMENT ACCESS IMPROVEMENTS

	Intersection/ Street	Change Control	Change Configuration
1	New Off-Ramp	N/A	Add a new off-ramp on US 101 – Richardson Ave North – near Lyon Street to Gorgas Avenue/Marshall Street.
2	Gorgas Avenue	No Change	Add two lanes on Gorgas Avenue approaching new intersection with Richardson Avenue. Convert section of Gorgas Avenue between new intersection with Richardson Avenue and Lyon Street to a one-lane, one-way eastbound roadway.
3	Richardson/ Gorgas/ Lyon	Signalize	A new intersection at Lyon Street and Richardson Ave. This intersection will have a right turn only lane from southbound Richardson (existing) and two approach lanes from the new direct access from Gorgas Avenue.

Source: Letterman Redevelopment Richardson Avenue Access – DRAFT Technical Memorandum – Traffic Operations Analysis – November 1, 2000.

In addition, there are a number of new traffic signalization projects and other traffic changes that were identified to occur as part of the PTMP. This plan (and its accompanying EIS and traffic report) includes a number of improvements to accommodate the increased traffic anticipated for this urban national park. The improvements listed in the PTMP EIS are summarized in Table 4.2-2. In addition to these project-related improvements, other minor roadway improvements are also planned for the Presidio.

TABLE 4.2-2
PRESIDIO TRUST MANAGEMENT PLAN IMPROVEMENTS – TRAFFIC

Action Code	Intersection	Changed Control	Changed Configuration
TR-1	Presidio/Pacific	Signalize	
TR-2	Arguello/Jackson	Signalize	
TR-3	Lincoln/25th/El Camino del Mar	Signalize	Remove parking on east side of 25th Avenue to add one right turn lane in the northbound approach
TR-4	Lombard/ Presidio	Signalize	Addition of a right-turn only lane on the northbound approach.
TR-6	Lincoln/GGB Viewing Area	All-way Stop Sign	Install an eastbound left-turn pocket and a westbound right-turn pocket.
TR-7	Lincoln/ Merchant	Signalize	Realign Merchant and Storey Avenue to create a single intersection. Add a northbound left-turn pocket.
TR-8	Lincoln/Kobbe	Signalize	Realign Washington Blvd to create a perpendicular intersection with Lincoln Blvd and convert Kobbe Avenue to a one-way eastbound roadway
TR-11	14th/Lake		Designate 15th Avenue gate for outbound traffic and open 14th Avenue gate for inbound traffic and restrict northbound and/or southbound approaches to right turn movements.
TR-12	Lyon/Lombard	Signalize	Restripe the eastbound approach to provide an exclusive left-turn lane and shared right-through lane
TR-15	14th/California		Restrict northbound and southbound approaches to right-turn movements.
TR-16	25th/California		Restripe to add a left-turn lane to both the eastbound and westbound approaches. Not expected to require the removal of on-street parking spaces.
TR-17	Presidio/Jackson	Signalize	
TR-18	Presidio/Washington	Signalize	
TR-19	Arguello/Washington	Signalize	
TR-20	Lincoln/Girard	Signalize	

Source: PTMP Draft Plan and EIS

The alternatives evaluated for this report include design elements to accommodate future Design Year traffic needs for the alternative proposed in the PTMP. As the planning process continues for the Presidio Trust plans, specific strategies to address park circulation continue to be developed. Within this document, key intersections within the Presidio are evaluated, although roadway segments within the Presidio itself are not.

4.2.1 Intersection Level of Service

In the Design Year, the No-Build Alternative and the Parkway Alternative options have a new signal on Richardson Avenue at Gorgas Avenue/Lyon Street. Timing plans for those new signals were developed in accordance with the existing signal timing progression used for downstream/upstream signals. Fixed signal timing plans for new signals on other roadways were optimized to provide the least amount of intersection delay.

Since the forecasted volumes were near the useful capacity, the analyses did not need to constrain the Design Year volume forecasts downward to meet the effective capacity of the roadway segments. However, the peak hour factors are constrained to a 1.0 calculation, because the major roadways in the project area are projected to flow at even loads throughout the peak hour. This adjustment is based on a flow rate assessment made specifically for the proposed Design Year traffic volumes on this project, and differs from the normal OER peak hour factor methods used for a development impact study.

The AM Intersection LOS are shown in Table 4.2.1-1 and the PM Intersection LOS in Table 4.2.1-2. Table 4.2.1-3 contains the weekend condition. Although LOS describes the overall measure of effectiveness for an intersection, individual approaches may operate at a better or worse LOS. However, proposed improvements to provide acceptable operations were based on the aggregate LOS as defined in the HCM.

The LOS results on Tables 4.2.1-1 and 4.2.1-2 are also summarized visually in Figures 4.2.1-1 through 4.2.1-3. Detailed technical calculations are provided in Appendix C.

Findings

The analysis shows that the intersections in the study area would continue to operate with acceptable level of service for all alternatives except the two unsignalized intersections along Marina (Marina at Divisidero and Marina at Broderick). Both of these intersections operate at LOS F during the existing conditions with significant delays. With the exception of the Parkway alternatives during the AM and Weekend Peak periods, these intersections would continue to experience significant delays. It should be noted that the delay in most alternatives is less than the delay during the existing conditions and very similar to forecast delay that would occur during the No Build Alternative project condition.

Since both intersections operate as all-way stop controlled intersections, the only feasible mitigation is signalization. This signalization would likely include signal coordination, because of the proximity of these intersections. This would result in acceptable LOS conditions at both intersections.

TABLE 4.2.1-1
AM PEAK HOUR INTERSECTION LEVEL OF SERVICE RESULTS BY ALTERNATIVE

Intersection			Criteria	Alternatives				
					Design Year			
#	North/South	East/West		Base Year	1 No Build	2 Replace and Widen	5a Parkway: Diamond Option	5b Parkway: Circle Drive Option
1	Lyon	Marina	Control	Signal	Signal	Signal	Signal	Signal
			Delay	13	10	10	15	15
			LOS	B	A	A	B	B
2	101 / Richardson	Francisco	Control	Signal	Signal	Signal	Signal	Signal
			Delay [1]	34	35	35	38	39
			LOS	C	C	C	D	D
3	Lincoln (N)	GGB Viewing Area	Control	2-way [2]	All-way	All-way	All-way	All-way
			Delay [1]	13	18	20	17	16
			LOS	B	C	C	C	C
4	Lincoln (S)	Merchant	Control	2-way [2]	Signal	Signal	Signal	Signal
			Delay [1]	10	15	15	14	14
			LOS	A	B	B	B	B
5	Girard	Lincoln	Control	2-way [2]	2-way [2]	2-way [2]	All-way	All-way
			Delay [1]	<1	11	12	13	12
			LOS	A	B	B	B	B
6	Halleck	Mason	Control	All-way	All-way	All-way	All-way	All-way
			Delay [1]	6	7	7	7	7
			LOS	A	A	A	A	A
7	Richardson / 101	Gorgas / Lyon	Control	-	Signal	Signal	Signal	Signal
			Delay [1]	-	17	16	16	16
			LOS	-	B	B	B	B
8	Marina / Girard	Gorgas / 101 SB Ramps	Control	-	-	-	Signal	Signal
			Delay [1]	-	-	-	14	10
			LOS	-	-	-	B	A
9	Marina / Girard	101 NB Ramps	Control	-	-	-	Signal	Signal
			Delay [1]	-	-	-	9	9
			LOS	-	-	-	A	A
10	Broderick	Marina	Control	All-way	All-way	All-way	All-way	All-way
			Delay [1]	59	99	>100	35	33
			LOS	F	F	F	E	D
11	Divisadero	Marina	Control	All-way	All-way	All-way	All-way	All-way
			Delay [1]	79	>100	>100	36	32
			LOS	F	F	F	E	D
12	101 / Richardson	Chestnut	Control	Signal	Signal	Signal	Signal	Signal
			Delay [1]	12	14	14	14	14
			LOS	B	B	B	B	B

TABLE 4.2.1-1
AM PEAK HOUR INTERSECTION LEVEL OF SERVICE RESULTS BY ALTERNATIVE (Continued)

Intersection			Criteria	Alternatives				
					Design Year			
#	North/South	East/West		Base Year	1 No Build	2 Replace and Widen	5a Parkway: Diamond Option	5b Parkway: Circle Drive Option
13[3]	101 / Richardson	Lombard	Control	Signal	Signal	Signal	Signal	Signal
			Delay [1]	10	9	9	3	3
			LOS	B	A	A	A	A
14[3]	101 / Lombard	Broderick	Control	Signal	Signal	Signal	Signal	Signal
			Delay [1]	21	21	21	13	13
			LOS	C	C	C	B	B
15	Lyon	Lombard Gate	Control	All-way	Signal	Signal	Signal	Signal
			Delay [1]	29	26	27	18	16
			LOS	D	C	C	B	B
16	Presidio	Pacific	Control	All-way	Signal	Signal	Signal	Signal
			Delay [1]	16	15	16	13	13
			LOS	C	B	B	B	B
17	Park Presidio	Lake	Control	Signal	Signal	Signal	Signal	Signal
			Delay [1]	17	24	24	24	25
			LOS	B	C	C	C	C
18[4]	Merchant	GGB Viewing Area	Control	All-way	All-way	All-way	All-way	All-way
			Delay [1]	9	12	8	11	11
			LOS	A	B	A	B	B

Notes
1. Delay is measured in seconds per vehicle
2. For two-way stop controlled intersections, the delay and LOS for the worst movement is given
3. Intersection #14, Lombard and Broderick, and #13, Lombard and Richardson are coordinated.
4. The intersection of Merchant Road and GGB Viewing Area has a free northbound left turn and a free eastbound west turn. The delay has been calculated based on an all-way stop

Source: DKS Associates, 2004

TABLE 4.2.1-2
PM PEAK HOUR INTERSECTION LEVEL OF SERVICE RESULTS BY ALTERNATIVE

Intersection			Criteria	Alternatives				
					Design Year			
#	North/South	East/West		Base Year	1 No Build	2 Replace and Widen	5a Parkway: Diamond Option	5b Parkway: Circle Drive Option
1	Lyon	Marina	Control Delay [1] LOS	Signal 18 B	Signal 9 A	Signal 25 C	Signal 14 B	Signal 14 B
2	Richardson	Francisco	Control Delay [1] LOS	Signal 10 A	Signal 14 B	Signal 15 B	Signal 21 C	Signal 22 C
3	Lincoln (N)	GGB Viewing Area	Control Delay [1] LOS	2-way [2] 12 B	2-way [2] 15 C	2-way [2] 16 C	All-way 12 B	All-way 12 B
4	Lincoln (S)	Merchant	Control Delay [1] LOS	2-way 11 B	Signal 17 B	Signal 18 B	Signal 15 B	Signal 16 B
5	Girard	Lincoln	Control Delay [1] LOS	2-way [2] <1 A	2-way [2] 13 B	2-way [2] 2 B	All-way 15 B	All-way 15 B
6	Halleck	Mason	Control Delay [1] LOS	All-way 6 A	All-way 7 A	All-way 6 A	All-way 6 A	All-way 6 A
7	Richardson / 101	Gorgas / Lyon	Control Delay [1] LOS	- - -	Signal 17 B	Signal 17 B	Signal 25 C	Signal 20 C
8	Marina / Girard	Gorgas / 101 SB Ramps	Control Delay [1] LOS	- - -	- - -	- - -	Signal 15 B	Signal 10 B
9	Marina / Girard	101 NB Ramps	Control Delay [1] LOS	- - -	- - -	- - -	Signal 6 A	Signal 6 A
10	Broderick	Marina	Control Delay [1] LOS	All-way >100 F	All-way >100 F	All-way >100 F	All-way >100 F	All-way >100 F
11	Divisadero	Marina	Control Delay [1] LOS	All-way >100 F	All-way >100 F	All-way >100 F	All-way >100 F	All-way >100 F
12	Richardson	Chestnut	Control Delay [1] LOS	Signal 15 B	Signal 17 B	Signal 16 B	Signal 17 B	Signal 16 B

TABLE 4.2.1-2
PM PEAK HOUR INTERSECTION LEVEL OF SERVICE RESULTS BY ALTERNATIVE (continued)

Intersection			Criteria	Alternatives				
					Design Year			
#	North/South	East/West		Base Year	1 No Build	2 Replace and Widen	5a Parkway: Diamond Option	5b Parkway: Circle Drive Option
13[3]	Richardson	Lombard	Control	Signal	Signal	Signal	Signal	Signal
			Delay [1]	5	7	7	3	3
			LOS	A	A	A	A	A
14[3]	101 / Lombard	Broderick	Control	Signal	Signal	Signal	Signal	Signal
			Delay [1]	25	22	21	24	22
			LOS	C	C	C	C	C
15	Lyon	Lombard Gate	Control	All-way	Signal	Signal	Signal	Signal
			Delay [1]	18	20	20	17	17
			LOS	C	C	C	B	B
16	Presidio	Pacific	Control	All-way	Signal	Signal	Signal	Signal
			Delay [1]	19	16	17	14	14
			LOS	C	B	B	B	B
17	Park Presidio	Lake	Control	Signal	Signal	Signal	Signal	Signal
			Delay [1]	21	38	41	40	39
			LOS	C	D	D	D	D
18[4]	Merchant	GGB Viewing Area	Control	All-way	All-way	All-way	All-way	All-way
			Delay [1]	13	11	11	10	10
			LOS	B	B	B	B	B

Notes

1. Delay is measured in seconds per vehicle
2. For two-way stop controlled intersections, the delay and LOS for the worst movement is given
3. Intersection #14, Lombard and Broderick, and #13, Lombard and Richardson are coordinated.
4. The intersection of Merchant Road and GGB Viewing Area has a free northbound left turn and a free eastbound west turn. The delay has been calculated based on an all-way stop

Source: DKS Associates, 2004

TABLE 4.2.1-3
WEEKEND PEAK HOUR INTERSECTION LEVEL OF SERVICE RESULTS BY ALTERNATIVE

Intersection				Alternatives				
					Design Year			
#	North/South	East/West	Criteria	Base Year	1 No Build	2 Replace and Widen	5a Parkway: Diamond Option	5b Parkway: Circle Drive Option
1	Lyon	Marina	Control Delay [1] LOS	Signal 20 B	Signal 8 A	Signal 8 A	Signal 11 B	Signal 11 B
2	101 / Richardson	Francisco	Control Delay [1] LOS	Signal 11 B	Signal 14 B	Signal 14 B	Signal 16 B	Signal 16 B
3	Lincoln (N)	GGB Viewing Area	Control Delay [1] LOS	2-way [2] 11 B	2-way [2] 8 A	2-way [2] 8 A	2-way [2] 8 A	2-way [2] 8 A
4	Lincoln (S)	Merchant	Control Delay [1] LOS	2-way 11 B	Signal 13 B	Signal 13 B	Signal 13 B	Signal 13 B
5	Girard	Lincoln	Control Delay [1] LOS	2-way [2] <1 A	2-way [2] 9 A	2-way [2] 9 A	All-way 12 B	All-way 13 B
6	Halleck	Mason	Control Delay [1] LOS	All-way 6 A	All-way 6 A	All-way 6 A	All-way 6 A	All-way 6 A
7	101 / Richardson	Gorgas / Lyon	Control Delay [1] LOS	- - -	Signal 14 B	Signal 14 B	Signal 14 B	Signal 14 B
8	Marina / Girard	Gorgas / 101 SB Ramps	Control Delay [1] LOS	- - -	- - -	- - -	Signal 12 B	Signal 10 A
9	Marina / Girard	101 NB Ramps	Control Delay [1] LOS	- - -	- - -	- - -	Signal 8 A	Signal 5 A
10	Broderick	Marina	Control Delay [1] LOS	All-way >100 F	All-way >100 F	All-way >100 F	All-way 14 B	All-way 13 B
11	Divisadero	Marina	Control Delay [1] LOS	All-way >100 F	All-way >100 F	All-way >100 F	All-way 14 B	All-way 13 B
12	101 / Richardson	Chestnut	Control Delay [1] LOS	Signal 12 B	Signal 14 B	Signal 14 B	Signal 12 B	Signal 11 B

TABLE 4.2.1-3
WEEKEND PEAK HOUR INTERSECTION LEVEL OF SERVICE RESULTS BY ALTERNATIVE (continued)

Intersection				Alternatives				
					Design Year			
#	North/South	East/West	Criteria	Base Year	1 No Build	2 Replace and Widen	5a Parkway: Diamond Option	5b Parkway: Circle Drive Option
13[3]	101 / Richardson	Lombard	Control Delay [1] LOS	Signal 7 A	Signal 7 A	Signal 7 A	Signal 2 A	Signal 2 A
14[3]	101 / Lombard	Broderick	Control Delay [1] LOS	Signal 18 B	Signal 19 B	Signal 19 B	Signal 11 B	Signal 11 B
15	Lyon	Lombard Gate	Control Delay [1] LOS	All-way 13 B	Signal 32 C	Signal 37 D	Signal 15 B	Signal 15 B
16	Presidio	Pacific	Control Delay [1] LOS	All-way 19 C	Signal 14 B	Signal 14 B	Signal 12 B	Signal 13 B
17	Park Presidio	Lake	Control Delay [1] LOS	Signal 15 B	Signal 17 B	Signal 17 B	Signal 15 B	Signal 16 B
18[4]	Merchant	GGB Viewing Area	Control Delay [1] LOS	All-way 12 B	All-way 10 A	All-way 10 A	All-way 10 B	All-way 10 A

Notes
1. Delay is measured in seconds per vehicle
2. For two-way stop controlled intersections, the delay and LOS for the worst movement is given
3. Intersection #14, Lombard and Broderick, and #13, Lombard and Richardson are coordinated.
4. The intersection of Merchant Road and GGB Viewing Area has a free northbound left turn and a free eastbound west turn. The delay has been calculated based on an all-way stop

Source: DKS Associates, 2004

4.2.2 Intersection Queue Lengths

Results of the intersection queuing analysis are provided in Table 4.2.2-1. The 95th percentile queue length of the critical movement is provided along with the corresponding time when this movement is at its worst. Detailed calculations are provided in Appendix D.

TABLE 4.2.2-1
MAXIMUM QUEUES AT APPROACHES TO INTERSECTIONS

#	Intersection	Movement	Time Period	Queue Length[1]	Critical Movement	Storage Description
Base Year						
1	Marina / Mason	SB	PM	84	Right	Mason contains overflow storage
		EB	PM	75	Thru	440 meters back to the Richardson off-ramp
		WB	PM	166	Thru	120 meters back to Baker
2	Richardson / Francisco	NB	PM	41	Thru	140 meters back to Chestnut
		SB	AM	>248[2]	Thru	375 meters back onto Marina ramps
		EB	AM	14	Shared	10 meters back to Lyon, Gorgas contains overflow storage
		WB	PM	64	Shared	90 meters back to Baker
Design Year Alternative 1 No Build						
1	Marina / Mason	SB	PM	8	Right	Mason contains overflow storage
		EB	AM	95	Thru	440 meters back to the Richardson off-ramp
		WB	PM	69	Thru	120 meters back to Baker
2	Richardson / Francisco	NB	PM	41	Thru	140 meters back to Chestnut
		SB	AM	>242[2]	Thru	90 meters back to Gorgas, signal coordination assumed
		EB	AM	37	Shared	10 meters back to Lyon, left turn, Gorgas contains overflow storage
		WB	PM	55	Shared	90 meters back to Baker
4	Lincoln / Merchant	NB	AM	70	Left	400 meters back to Kobbe
		SB	PM	15	Right	365 meters back to Viewing Area Access
		EB	AM	81	Shared	Over 300 meters back to 101 Ramps
Design Year Alternative 2 Replace and Widen						
1	Marina / Mason	SB*	PM	115	Right	Mason contains overflow storage
		EB	AM	98	Thru	440 meters back to the Richardson off-ramp
		WB	PM	65	Thru	120 meters back to Baker
2	Richardson / Francisco	NB	PM	44	Thru	140 meters back to Chestnut
		SB	AM	>241[2]	Thru	90 meters back to Gorgas, signal coordination assumed
		EB	AM	36	Shared	10 meters back to Lyon, Gorgas contains overflow storage
		WB	PM	57	Shared	90 meters to Baker
4	Lincoln / Merchant	NB	AM	75	Left	400 meters back to Kobbe
		SB	PM	14	Right	365 meters back to Viewing Area Access
		EB	PM	15	Shared	Over 300 meters back to 101 Ramps

Notes:
1. Queue lengths are in meters; queue lengths are averaged across all lanes
2. Queue length shown is maximum after two traffic cycles; observed queues may be longer.

Source DKS Associates, 2004

TABLE 4.2.2-1
MAXIMUM QUEUES AT APPROACHES TO INTERSECTIONS (continued)

#	Intersection	Movement	Time Period	Queue Length[1]	Critical Movement	Storage Description
Design Year Alternative 5 Parkway: Diamond Option						
1	Lyon / Marina / Mason	SB	PM	11	Right	Mason contains overflow storage
		EB	AM	88	Thru	125 meters back to Palace of Fine Arts Parking access; 440 meters to Richardson Ramp
		WB	PM	73	Thru	120 meters back to Baker
2	Richardson / Francisco	NB*	PM	79	Thru	140 meters back to Chestnut (140 meters)
		SB	AM	252	Thru	90 meters back to Gorgas
		EB	AM	34	Shared	130 meters back to Letterman Parking Garage driveway
		WB*	PM	>146[2]	Shared	90 meters back to Baker
4	Lincoln / Merchant	NB	AM	67	Thru	400 meters to back Kobbe
		SB	PM	16	Thru	365 meters back to Viewing Area Access
		EB	PM	14	Shared	Over 300 meters back to 101 Ramps
8	Gorgas/Lyon and 101/Rochardson	NB*	PM	>256[2]	Thru	145 meters to Francisco
		SB	AM	173	Thru	820 meters to the 101 SB off-ramp to Gorgas Avenue
		EB	PM	58	Right	160 meters to the parking lot driveway onto Gorgas
9	Marina/Girard and Gorgas/101 SB Ramp	NB	PM	7	Thru	430 meters to the parking lot driveway onto Gorgas
		SB	AM	87	Left	260 meters to the beginning of the 101 SB off-ramp
		EB	PM	66	Thru	280 meters to Lincoln
		WB	AM	34	Thru	200 meters to 101 NB on-ramp
11	Marina/Girard and 101 NB Ramp	NB	AM	20	left	Storage goes back 120 meters
		EB	AM	68	Thru	205 meters to 101 SB off-ramp
		WB	AM	7	Thru	320 meters to the Marina/Lyon intersection

Notes:

1. Queue lengths are in meters; queue lengths are averaged across all lanes
2. Queue length shown is maximum after two traffic cycles; observed queues may be longer.

Source DKS Associates, 2004

TABLE 4.2.2-1
MAXIMUM QUEUES AT APPROACHES TO INTERSECTIONS (continued)

#	Intersection	Movement	Time Period	Queue Length[1]	Critical Movement	Storage Description
Design Year Alternative 5 Parkway: Circle Drive Option						
1	Lyon / Marina / Mason	SB	PM	11	Right	Mason contains overflow storage
		EB	AM	82	Thru	125 meters back to Palace of Fine Arts Parking access; 440 meters to Richardson Ramp
		WB	PM	78	Thru	120 meters back to Baker
2	Richardson / Francisco	NB	PM	114	Thru	140 meters back to Chestnut (140 meters)
		SB*	AM	>253[2]	Thru	90 meters back to Gorgas
		EB	AM	31	Shared	130 meters back to Letterman Parking Garage driveway
		WB	PM	144	Shared	90 meters back to Baker
4	Lincoln / Merchant	NB	AM	66	Thru	400 meters to back Kobbe
		SB	PM	16	Thru	365 meters back to Viewing Area Access
		EB	PM	14	Shared	Over 300 meters back to 101 Ramps
8	Gorgas/Lyon and 101/Richardson	NB*	PM	>241[2]	Thru	205 meters to Francisco.
		SB	AM	175	Thru	820 meters to the 101 SB off-ramp to Gorgas Avenue
		EB	PM	57	Right	125 meters to the parking lot driveway onto Gorgas
		WB	AM	24	Thru	140 meters to 101/Richardson
9	Marina/Girard and Gorgas/101 SB Ramp	NB	PM	3	Right	430 meters to the parking lot driveway onto Gorgas
		SB	AM	64	Left	260 meters to the beginning of the 101 SB off-ramp
		EB	PM	27	Thru	280 meters to Lincoln
		WB	PM	5	Thru	200 meters to 101 NB on-ramp
11	Marina/Girard and 101 NB Ramp	NB	PM	5	left	Parking lot driveway
		EB	PM	127	Thru	205 meters to 101 SB off-ramp
		WB	PM	2	Thru	320 meters to the Marina/Lyon intersection

Notes:

1. Queue lengths are in meters; queue lengths are averaged across all lanes
2. Queue length shown is maximum after two traffic cycles; observed queues may be longer.

Source DKS Associates, 2004

Findings

As demonstrated, nearly all the movements of the project intersections have adequate storage space for the queues that would be generated in the future. However, the following movements may have storage requirements in the peak hour that exceed available storage capacity and therefore may impact the upstream signal or stop-controlled intersection.

- Westbound at Lyon/Marina/Mason in the Existing Condition, and in Alternatives 1 (note that turn restrictions would prevent blockage of Baker Street intersection)
- Southbound at Richardson/Francisco in all Design Year alternatives (resulting from new Richardson/Gorgas/Lyon intersection for Presidio access)
- Westbound at Richardson/Francisco in all Design Year Alternatives (to Broderick Street)

4.2.3 Segment Level of Service

The segment LOS was based on the density of vehicles and/or average travel speed, depending on whether it was a highway or urban street segment. The AM segment LOS results are provided for highway segments in Table 4.2.3-1, and for urban streets in Table 4.2.3-2, PM LOS results are provided for highway segments in Table 4.2.3-3, and for urban streets in Table 4.2.3-4. The weekend peak highway segment LOS are shown in Table 4.2.3-5 and 4.2.3-6. Some transitional segments are listed in both tables for informational purposes.

Findings

Operational studies have shown that traffic on the Golden Gate Bridge (Segments 13 and 14) and the northbound approach link to this link (Segment 2) would operate at a deficient level of service unless the bridge lanes are operated with three lanes in each direction. This would result in a Level of Service F for Segment 13 during the AM peak hour, although operational studies project that this would result in much less congestion than if the four lane southbound/two lane northbound configuration were used in the design year.

Overall, an acceptable LOS D was achieved for all highway segments except for the Golden Gate Bridge operations, particularly during the PM Peak period for all future design year alternatives. It should be noted that the bridge is forecasted to operate with LOS F under the No-Build Alternative; no alternative is forecast to have any further impacts on the Golden Gate Bridge operations.

Speeds on Richardson Avenue in the northbound direction are anticipated to fall to LOS E conditions in the design year in all alternatives. This estimated design deficiency is indicated for the segment level analysis, although any upstream intersections are projected to operate at a sufficient level of service.

As no new deficiencies would result beyond the No-Build Alternative, no mitigation is required.

TABLE 4.2.3-1
HIGHWAY SEGMENT LEVEL OF SERVICE -- AM PEAK HOUR

No.	Location	Dir	Criteria		Base Year	Design Year: No Build	Design Year: Replace and Widen	Design Year: Parkway Diamond Option	Design Year: Parkway Circle Option
1	US 101 From the Merchant Drive Ramps to Park Presidio Blvd	SB	Hour Volume	pc/h	6150	6441	6414	6550	6556
			Lanes	lanes	4	4	4	4	4
			Flow Rate	*pc/h/lane*	*1537*	*1610*	*1603*	*1638*	*1639*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*50*	*49*	*49*	*49*	*49*
			Density	v/lane/mile	31	33	33	33	34
			LOS		D	D	D	D	D
2[1]	US 101 From Park Presidio Blvd to the Merchant Drive Ramps	NB	Hour Volume	vehicles	2994	5019	5013	5091	5096
			Lanes	number	3	3	3	3	3
			Flow Rate	*pc/h/lane*	*998*	*1255*	*1253*	*1273*	*1274*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
			Density	v/lane/mile	20	25	25	26	26
			LOS		C	C	C	C	C
3	US 101 From Park Presidio to the Marina Blvd Access Ramps	SB	Hour Volume	vehicles	5203	4981	4996	4951	4888
			Lanes	number	4	4	4	4	4
			Flow Rate	*pc/h/lane*	*1301*	*1245*	*1249*	*1238*	*1222*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
			Density	v/lane/mile	26	25	25	25	24
			LOS		D	C	C	C	C
4	US 101 From the Marina Blvd Access Ramps to Park Presidio	NB	Hour Volume	vehicles	2049	2947	2979	2994	2948
			Lanes	number	3	3	3	3	3
			Flow Rate	*pc/h/lane*	*683*	*982*	*993*	*998*	*983*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
			Density	v/lane/mile	14	20	20	20	20
			LOS		B	C	C	C	C
5	Richardson From the Marina Blvd Access Ramps to north of Lyon St	SB	Hour Volume	pc/h	3717	3325	3320	3053	3063
			Lanes	lanes	2	2	2	2	2
			Flow Rate	*pc/h/lane*	*1858*	*1663*	*1660*	*1527*	*1532*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*48*	*49*	*49*	*50*	*50*
			Density	v/lane/mile	39	34	34	31	31
			LOS		E	D	D	D	D
6	Richardson from north of Lyon St to the Marina Blvd Access Ramps	NB	Hour Volume	vehicles	1443	2141	2208	2743	2636
			Lanes	number	2	2	2	2	2
			Flow Rate	*pc/h/lane*	*721*	*1071*	*1104*	*1372*	*1318*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
			Density	v/lane/mile	14	21	22	27	26
			LOS		B	C	C	D	D

TABLE 4.2.3-1
HIGHWAY SEGMENT LEVEL OF SERVICE -- AM PEAK HOUR (continued)

No.	Location	Dir	Criteria		Base Year	Design Year: No Build	Design Year: Replace and Widen	Design Year: Parkway Diamond Option	Design Year: Parkway Circle Option
7	Marina Blvd From the Doyle Drive Merge to Lyon St	EB	Hour Volume	vehicles	1486	1656	1676	n/a [1]	n/a [1]
			Lanes	number	2	2	2	n/a [1]	n/a [1]
			Flow Rate	*pc/h/lane*	*743*	*828*	*838*	*n/a [1]*	*n/a [1]*
			Free Flow Speed	*miles/hour*	*35*	*35*	*35*	*n/a [1]*	*n/a [1]*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a [1]*	*n/a [1]*
			Density	v/lane/mile	21	24	24	n/a [1]	n/a [1]
			LOS		C	C	C	n/a [1]	n/a [1]
8	Marina Blvd From Lyon St to the Doyle Drive merge	WB	Hour Volume	vehicles	606	806	770	n/a [1]	n/a [1]
			Lanes	number	2	2	2	n/a [1]	n/a [1]
			Flow Rate	*pc/h/lane*	*303*	*403*	*385*	*n/a [1]*	*n/a [1]*
			Free Flow Speed	*miles/hour*	*35*	*35*	*35*	*n/a [1]*	*n/a [1]*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a [1]*	*n/a [1]*
			Density	v/lane/mile	9	12	11	n/a [1]	n/a [1]
			LOS		A	B	B	n/a [1]	n/a [1]
9	Park Presidio From the US 101 Ramps to the Park Presidio Tunnel	SB	Hour Volume	vehicles	2380	2480	2485	2576	2592
			Lanes	number	2	2	2	2	2
			Flow Rate	*pc/h/lane*	*1190*	*1240*	*1243*	*1288*	*1296*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
			Density	v/lane/mile	24	25	25	26	26
			LOS		C	C	C	C	C
10	Park Presidio From the Park Presidio Tunnel to the US 101 Ramps	NB	Hour Volume	vehicles	2379	3092	3101	3073	3072
			Lanes	number	2	2	2	2	2
			Flow Rate	*pc/h/lane*	*1190*	*1546*	*1551*	*1537*	*1536*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*50*	*49*	*50*	*50*
			Density	v/lane/mile	24	31	31	31	31
			LOS		C	D	D	D	D
11	US 101 between Park Presidio on and off-ramps	SB	Hour Volume	vehicles	4217	4345	4314	4328	4295
			Lanes	number	3	3	3	3	3
			Flow Rate	*pc/h/lane*	*1406*	*1448*	*1438*	*1443*	*1432*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Density	v/lane/mile	28	29	29	29	29
			LOS		D	D	D	D	D
12	US 101 between Park Presidio off and on-ramps	NB	Hour Volume	vehicles	1601	2564	2593	2641	2617
			Lanes	number	3	3	3	3	3
			Flow Rate	*pc/h/lane*	*534*	*855*	*864*	*880*	*872*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
			Density	v/lane/mile	11	17	17	18	17
			LOS		A	B	B	B	B

Notes
1. This segment is coded as an Urban Street Segment under the two Parkway alternatives.

TABLE 4.2.3-1
HIGHWAY SEGMENT LEVEL OF SERVICE -- AM PEAK HOUR (continued)

No.	Location	Dir	Criteria		Base Year	Design Year: No Build	Design Year: Replace and Widen	Design Year: Parkway Diamond Option	Design Year: Parkway Circle Option
13	US 101 between Marin County and Merchant Road (Golden Gate Bridge)	SB	Hour Volume	vehicles	5780	6098	6102	6105	6123
			Lanes	number	4	3	3	3	3
			Flow Rate	*pc/h/lane*	*1445*	*2033*	*2034*	*2035*	*2041*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*50*	*46*	*46*	*46*	*46*
			Density	v/lane/mile	29	44	44	44	44
			LOS		D	F[2]	F[2]	F[2]	F[2]
14	US 101 between Merchant Road and Marin County (Golden Gate Bridge)	NB	Hour Volume	vehicles	2862	4990	4990	4991	4989
			Lanes	number	2	3	3	3	3
			Flow Rate	*pc/h/lane*	*1431*	*1663*	*1663*	*1664*	*1663*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*50*	*49*	*49*	*49*	*49*
			Density	v/lane/mile	29	34	34	34	34
			LOS		D	D[3]	D[3]	D[3]	D[3]

Notes
1. This segment is coded as an Urban Street Segment under the two Parkway alternatives.
2. If Golden Gate Bridge southbound configuration remains at the current four lanes, this segment would operate at LOS D for all future design year scenarios. However, because related analysis also shows that queuing would be significant on Doyle Drive if this configuration is used, and that queuing on the bridge would be minimal in this configuration, three lanes are assumed for the Golden Gate Bridge in all design year scenarios.
3. If Golden Gate Bridge northbound configuration remains at the current two lanes, this segment would operate at LOS F for all future design year scenarios.

Source: DKS Associates, 2004

TABLE 4.2.3-2
URBAN STREET SEGMENT LEVEL OF SERVICE -- AM PEAK HOUR

No.	Location	Dir	Criteria		Base Year	Design Year			
						No Build	Replace and Widen	Parkway Diamond Option	Parkway Circle Option
5	Richardson Street from Francisco to north of Lyon Street	SB	Urban Street Classification		III	III	III	III	III
			Hour Volume	Vehicles	3717	3094	3087	3130	3138
			Speed	FFS	35	35	35	35	35
				Calculated	19	23	23	23	23
			LOS		C	C	C	C	C
6	Richardson Street from north of Lyon Street to Francisco Street.	NB	Urban Street Classification		III	III	III	III	III
			Hour Volume	Vehicles	1443	2259	2161	2817	2851
			Speed	FFS	35	35	35	35	35
				Calculated	26	22	23	18	17
			LOS		B	C	C	D	D
7	Marina Blvd From the Doyle Drive Merge to Lyon St	EB	Urban Street Classification		III	III	III	IV	IV
			Hour Volume	Vehicles	1486	1656	1676	1271	1203
			Speed	FFS	35	35	35	30	30
				Calculated	26	26	26	16	16
			LOS		B	B	B	C	C
8	Marina Blvd From Lyon St to the Doyle Drive merge	WB	Urban Street Classification		III	III	III	IV	IV
			Hour Volume	Vehicles	606	806	770	236	196
			Speed	FFS	35	35	35	30	30
				Calculated	27	27	27	23	23
			LOS		B	B	B	B	B

Source: DKS Associates, 2004

TABLE 4.2.3-3
HIGHWAY SEGMENT LEVEL OF SERVICE -- PM PEAK HOUR

No.	Location	Dir	Criteria		Base Year	Design Year			
						No Build	Replace and Widen	Parkway Diamond Option	Parkway Circle Option
1	US 101 From the Merchant Drive Ramps to Park Presidio Blvd	SB	Hour Volume	pc/h	3120	5074	5437	5612	5572
			Lanes	lanes	3	4	4	4	4
			Flow Rate	*pc/h/lane*	*1040*	*1268*	*1359*	*1403*	*1393*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*50.0*	*n/a*
			Density	v/lane/mile	21	25	27	28	28
			LOS		C	C	D	D	D
2	US 101 From Park Presidio Blvd to the Merchant Drive Ramps	NB	Hour Volume	vehicles	5649	6219	6263	6448	6431
			Lanes	number	4	4	4	4	4
			Flow Rate	*pc/h/lane*	*1412*	*1555*	*1566*	*1612*	*1608*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*50*	*49*	*49*	*49*	*49*
			Density	v/lane/mile	28	32	32	33	33
			LOS		D	D	D	D	D
3	US 101 From Park Presidio to the Marina Blvd Access Ramps	SB	Hour Volume	vehicles	2608	3590	3838	3785	3752
			Lanes	number	2	4	4	4	4
			Flow Rate	*pc/h/lane*	*1304*	*897*	*960*	*946*	*938*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
			Density	v/lane/mile	26	18	19	19	19
			LOS		D	B	C	C	C
4	US 101 From the Marina Blvd Access Ramps to Park Presidio	NB	Hour Volume	vehicles	4619	4806	4795	4924	4902
			Lanes	number	3	3	3	3	3
			Flow Rate	*pc/h/lane*	*1540*	*1602*	*1598*	*1641*	*1634*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*50*	*49*	*49*	*49*	*49*
			Density	v/lane/mile	31	33	33	34	33
			LOS		D	D	D	D	D
5	Richardson From the Marina Blvd Access Ramps to north of Lyon St	SB	Hour Volume	pc/h	1734	2543	2660	2398	2431
			Lanes	lanes	2	2	2	2	2
			Flow Rate	*pc/h/lane*	*867*	*1271*	*1330*	*1199*	*1216*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
			Density	v/lane/mile	17	25	27	24	24
			LOS		B	C	D	C	C
6	Richardson from north of Lyon St to the Marina Blvd Access Ramps	NB	Hour Volume	vehicles	2802	2931	3008	3355	3291
			Lanes	number	2	2	2	2	2
			Flow Rate	*pc/h/lane*	*1401*	*1466*	*1504*	*1678*	*1646*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*50*	*50*	*50*	*49*	*49*
			Density	v/lane/mile	28	29	30	34	34
			LOS		D	D	D	D	D

TABLE 4.2.3-3
HIGHWAY SEGMENT LEVEL OF SERVICE – PM PEAK HOUR (continued)

No.	Location	Dir	Criteria		Base Year	Design Year: No Build	Design Year: Replace and Widen	Design Year: Parkway Diamond Option	Design Year: Parkway Circle Option
7	Marina Boulevard From the Doyle Drive Merge to Lyon St	EB	Hour Volume	vehicles	873	1047	1178	n/a [1]	n/a [1]
			Lanes	number	2	2	2	n/a [1]	n/a [1]
			Flow Rate	*pc/h/lane*	*437*	*523*	*589*	*n/a [1]*	*n/a [1]*
			Free Flow Speed	*miles/hour*	*35*	*35*	*35*	*n/a [1]*	*n/a [1]*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a [1]*	*n/a [1]*
			Density	v/lane/mile	13	15	17	n/a [1]	n/a [1]
			LOS		B	B	B	n/a [1]	n/a [1]
8	Marina Blvd From Lyon St to the Doyle Drive merge	WB	Hour Volume	vehicles	1817	1875	1787	n/a [1]	n/a [1]
			Lanes	number	2	2	2	n/a [1]	n/a [1]
			Flow Rate	*pc/h/lane*	*909*	*937*	*893*	*n/a [1]*	*n/a [1]*
			Free Flow Speed	*miles/hour*	*35*	*35*	*35*	*n/a [1]*	*n/a [1]*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a [1]*	*n/a [1]*
			Density	v/lane/mile	26	27	26	n/a [1]	n/a [1]
			LOS		C	D	C	n/a [1]	n/a [1]
9	Park Presidio From the US 101 Ramps to the Park Presidio Tunnel	SB	Hour Volume	vehicles	2251	2935	2984	3094	3080
			Lanes	number	2	2	2	2	2
			Flow Rate	*pc/h/lane*	*1125*	*1468*	*1492*	*1547*	*1540*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*50*	*50*	*49*	*50*
			Density	v/lane/mile	23	30	30	31	31
			LOS		C	D	D	D	D
10	Park Presidio From the Park Presidio Tunnel to the US 101 Ramps	NB	Hour Volume	vehicles	2768	2864	2853	2792	2790
			Lanes	number	2	2	2	2	2
			Flow Rate	*pc/h/lane*	*1384*	*1432*	*1426*	*1396*	*1395*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*50*	*50*	*n/a*	*n/a*
			Density	v/lane/mile	28	29	29	28	28
			LOS		D	D	D	D	D
11	US 101 between Park Presidio on and off-ramps	SB	Hour Volume	vehicles	1884	2929	3180	3190	3163
			Lanes	number	3	3	3	3	3
			Flow Rate	*pc/h/lane*	*628*	*976*	*1060*	*1063*	*1054*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
			Density	v/lane/mile	13	20	21	21	21
			LOS		B	C	C	C	C
12	US 101 between Park Presidio off and on-ramps	NB	Hour Volume	vehicles	3605	4016	4068	4252	4230
			Lanes	number	3	3	3	3	3
			Flow Rate	*pc/h/lane*	*1202*	*1339*	*1356*	*1417*	*1410*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*50*	*50*
			Density	v/lane/mile	24	27	27	28	28
			LOS		C	D	D	D	D

Notes:
1. This segment is coded as an Urban Street Segment under the two Parkway alternatives
2. Golden Gate Bridge segments are projected to operate at a deficient level of service in all scenarios in the design year in both directions

TABLE 4.2.3-3
HIGHWAY SEGMENT LEVEL OF –SERVICE -- PM PEAK HOUR (continued)

No.	Location	Dir	Criteria		Base Year	Design Year: No Build	Design Year: Replace and Widen	Design Year: Parkway Diamond Option	Design Year: Parkway Circle Option
13	US 101 between Marin County and Merchant Road (Golden Gate Bridge)	SB	Hour Volume	vehicles	2987	5275	5732	5734	5723
			Lanes	number	3	3	3	3	3
			Flow Rate	pc/h/lane	996	1758	1911	1911	1908
			Free Flow Speed	miles/hour	50	50	50	50	50
			Congested Speed	miles/hour	N/A	48	47	47	47
			Density	v/lane/mile	20	37	41	41	40
			LOS		C	E[2]	E[2]	E[2]	E[2]
14	US 101 between Merchant Road and Marin County (Golden Gate Bridge)	NB	Hour Volume	vehicles	5890	6450	6491	6500	6492
			Lanes	number	3	3	3	3	3
			Flow Rate	pc/h/lane	1963	2150	2164	2167	2164
			Free Flow Speed	miles/hour	50	50	50	50	50
			Congested Speed	miles/hour	47	45	45	45	45
			Density	v/lane/mile	42	47	48	48	48
			LOS		E	F[2]	F[2]	F[2]	F[2]

Notes:
1. This segment is coded as an Urban Street Segment under the two Parkway alternatives
2. Golden Gate Bridge segments are projected to operate at a deficient level of service in all scenarios in the design year in both directions

Source: DKS Associates, 2004

TABLE 4.2.3-4
URBAN STREET SEGMENT LEVEL OF SERVICE -- PM PEAK HOUR

No.	Location	Dir	Criteria		Base Year	Design Year			
						No Build	Replace and Widen	Parkway Diamond Option	Parkway Circle Option
5	Richardson Street from Francisco to north of Lyon Street	SB	Urban Street Classification		III	III	III	III	III
			Hour Volume	Vehicles	1734	2439	2560	2633	2665
			Speed	FFS	35	35	35	35	35
				Calculated	26	26	26	25	25
			LOS		B	B	B	B	B
6	Richardson Street from north of Lyon Street to Francisco Street.	NB	Urban Street Classification		III	III	III	III	III
			Hour Volume	Vehicles	2776	2772	2784	3402	3418
			Speed	FFS	35	35	35	35	35
				Calculated	14	13	13	11	10
			LOS		D	E[1]	E[1]	E[1]	E[1]
7	Marina Blvd from the Doyle Drive merge to Lyon St	EB	Urban Street Classification		III	III	III	IV	IV
			Hour Volume	Vehicles	873	1047	1178	887	820
			Speed	FFS	35	35	35	30	30
				Calculated	27	27	27	24	22
			LOS		B	B	B	B	B
8	Marina Blvd from Lyon St to the Doyle Drive merge	WB	Urban Street Classification		III	III	III	IV	IV
			Hour Volume	Vehicles	1817	1875	1787	1276	1233
			Speed	FFS	35	35	35	30	30
				Calculated	25	25	26	28	29
			LOS		B	B	B	A	A

Notes:

1. The Forecast design years for this segment are projected to deteriorate to lower speeds. Signalized operations would be required to assure overall adequate traffic flow

Source: DKS Associates, 2004

TABLE 4.2.3-5
HIGHWAY SEGMENT LEVEL OF SERVICE -- WEEKEND PEAK HOUR

No.	Location	Dir	Criteria		Base Year	Design Year: No Build	Design Year: Replace and Widen	Design Year: Parkway Diamond Option	Design Year: Parkway Circle Option
1	US 101 From the Merchant Drive Ramps to Park Presidio Blvd	SB	Hour Volume	pc/h	4583	5430	5446	5471	5466
			Lanes	lanes	4	4	4	4	4
			Flow Rate	*pc/h/lane*	*1146*	*1358*	*1362*	*1368*	*1367*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
			Density	v/lane/mile	23	27	27	27	27
			LOS		C	D	D	D	D
2	US 101 From Park Presidio Blvd to the Merchant Drive Ramps	NB	Hour Volume	vehicles	3377	5277	5271	5304	5299
			Lanes	number	3	4	4	4	4
			Flow Rate	*pc/h/lane*	*1126*	*1319*	*1318*	*1326*	*1325*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
			Density	v/lane/mile	23	26	26	27	27
			LOS		C	D	D	D	D
3	US 101 From Park Presidio to the Marina Blvd Access Ramps	SB	Hour Volume	vehicles	3596	3493	3501	3397	3389
			Lanes	number	3	4	4	4	4
			Flow Rate	*pc/h/lane*	*1199*	*873*	*875*	*849*	*847*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
			Density	v/lane/mile	24	18	18	17	17
			LOS		C	B	B	B	B
4	US 101 From the Marina Blvd Access Ramps to Park Presidio	NB	Hour Volume	vehicles	2624	3550	3533	3633	3612
			Lanes	number	3	3	3	3	3
			Flow Rate	*pc/h/lane*	*875*	*1183*	*1178*	*1211*	*1204*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
			Density	v/lane/mile	18	24	24	24	24
			LOS		B	C	C	C	C
5	Richardson From the Marina Blvd Access Ramps to north of Lyon St	SB	Hour Volume	pc/h	2520	2532	2516	2271	2306
			Lanes	lanes	2	2	2	2	2
			Flow Rate	*pc/h/lane*	*1260*	*1266*	*1258*	*1136*	*1153*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
			Density	v/lane/mile	25	25	25	23	23
			LOS		C	C	C	C	C
6	Richardson from north of Lyon St to the Marina Blvd Access Ramps	NB	Hour Volume	vehicles	1683	2407	2455	2960	2907
			Lanes	number	2	2	2	2	2
			Flow Rate	*pc/h/lane*	*842*	*1204*	*1228*	*1480*	*1453*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*50*	*50*
			Density	v/lane/mile	17	24	25	30	29
			LOS		B	C	C	D	D

TABLE 4.2.3-5
HIGHWAY SEGMENT LEVEL OF SERVICE -- WEEKEND PEAK HOUR (continued)

No.	Location	Dir	Criteria		Base Year	Design Year: No Build	Design Year: Replace and Widen	Design Year: Parkway Diamond Option	Design Year: Parkway Circle Option
7	Marina Blvd from the Doyle Drive merge to Lyon St	EB	Hour Volume	vehicles	1076	960	986	n/a [1]	n/a [1]
			Lanes	number	2	2	2	n/a [1]	n/a [1]
			Flow Rate	*pc/h/lane*	*538*	*480*	*493*	*n/a [1]*	*n/a [1]*
			Free Flow Speed	*miles/hour*	*35*	*35*	*35*	*n/a [1]*	*n/a [1]*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a [1]*	*n/a [1]*
			Density	v/lane/mile	15	14	14	n/a [1]	n/a [1]
			LOS		B	B	B	n/a [1]	n/a [1]
8	Marina Blvd from Lyon St to the Doyle Drive merge	WB	Hour Volume	vehicles	941	1142	1078	n/a [1]	n/a [1]
			Lanes	number	2	2	2	n/a [1]	n/a [1]
			Flow Rate	*pc/h/lane*	*471*	*571*	*539*	*n/a [1]*	*n/a [1]*
			Free Flow Speed	*miles/hour*	*35*	*35*	*35*	*n/a [1]*	*n/a [1]*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a [1]*	*n/a [1]*
			Density	v/lane/mile	13	16	15	n/a [1]	n/a [1]
			LOS		B	B	B	n/a [1]	n/a [1]
9	Park Presidio From the US 101 Ramps to the Park Presidio Tunnel	SB	Hour Volume	vehicles	2213	2165	2182	2278	2283
			Lanes	number	2	2	2	2	2
			Flow Rate	*pc/h/lane*	*1107*	*1082*	*1091*	*1139*	*1141*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
			Density	v/lane/mile	22	22	22	23	23
			LOS		C	C	C	C	C
10	Park Presidio From the Park Presidio Tunnel to the US 101 Ramps	NB	Hour Volume	vehicles	1980	1955	1975	1875	1892
			Lanes	number	2	2	2	2	2
			Flow Rate	*pc/h/lane*	*990*	*978*	*987*	*937*	*946*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
			Density	v/lane/mile	20	20	20	19	19
			LOS		C	C	C	C	C
11	US 101 between Park Presidio on and off-ramps	SB	Hour Volume	vehicles	2892	3376	3376	3292	3285
			Lanes	number	3	3	3	3	3
			Flow Rate	*pc/h/lane*	*964*	*1125*	*1125*	*1097*	*1095*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
			Density	v/lane/mile	19.3	22.5	22.5	21.9	21.9
			LOS		C	C	C	C	C
12	US 101 between Park Presidio off and on-ramps	NB	Hour Volume	vehicles	2102	3439	3421	3535	3510
			Lanes	number	3	3	3	3	3
			Flow Rate	*pc/h/lane*	*701*	*1146*	*1140*	*1178*	*1170*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
			Density	v/lane/mile	14	23	23	24	23
			LOS		B	C	C	C	C

Notes:
1. This segment is coded as an Urban Street Segment under the two Parkway alternatives
2. Golden Gate Bridge segments are projected to operate at a deficient level of service in all scenarios in the design year in both directions

TABLE 4.2.3-5
HIGHWAY SEGMENT LEVEL OF SERVICE -- WEEKEND PEAK HOUR (continued)

No.	Location	Dir	Criteria		Base Year	Design Year			
						No Build	Replace and Widen	Parkway Diamond Option	Parkway Circle Option
13	US 101 between Marin County and Merchant Road (Golden Gate Bridge)	SB	Hour Volume	vehicles	4153	5556	5559	5561	5560
			Lanes	number	3	3	3	3	3
			Flow Rate	*pc/h/lane*	*1384*	*1852*	*1853*	*1854*	*1853*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*N/A*	*48*	*48*	*48*	*48*
			Density	v/lane/mile	28	39	39	39	39
			LOS		D	E[2]	E[2]	E[2]	E[2]
14	US 101 between Merchant Road and Marin County (Golden Gate Bridge)	NB	Hour Volume	vehicles	3000	5226	5219	5230	5226
			Lanes	number	3	3	3	3	3
			Flow Rate	*pc/h/lane*	*1000*	*1742*	*1740*	*1743*	*1742*
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*48*	*48*	*48*	*48*
			Density	v/lane/mile	20	36	36	36	36
			LOS		C	E[2]	E[2]	E[2]	E[2]

Notes:
1. This segment is coded as an Urban Street Segment under the two Parkway alternatives
2. Golden Gate Bridge segments are projected to operate at a deficient level of service in all scenarios in the design year in both directions

Source: DKS Associates, 2004

TABLE 4.2.3-6
URBAN STREET SEGMENT LEVEL OF SERVICE -- WEEKEND PEAK HOUR

No.	Location	Dir	Criteria		Base Year	Design Year: No Build	Design Year: Replace and Widen	Design Year: Parkway Diamond Option	Design Year: Parkway Circle Option
5	Richardson Street from Francisco to north of Lyon Street	SB	Urban Street Classification		III	III	III	III	III
			Hour Volume	Vehicles	2520	2441	2434	2361	2388
			Speed	FFS	35	35	35	35	35
				Calculated	26	26	26	27	27
			LOS		B	B	B	B	B
6	Richardson Street from north of Lyon Street to Francisco Street.	NB	Urban Street Classification		III	III	III	III	III
			Hour Volume	Vehicles	1683	2363	2373	2978	2979
			Speed	FFS	35	35	35	35	35
				Calculated	26	21	20	16	16
			LOS		B	C	C	D	D
7	Marina Blvd From the Doyle Drive Merge to Lyon St	EB	Urban Street Classification		III	III	III	IV	IV
			Hour Volume	Vehicles	1076	960	986	589	525
			Speed	FFS	35	35	35	30	30
				Calculated	27	27	27	26	29
			LOS		B	B	B	A	A
8	Marina Blvd From Lyon St to the Doyle Drive merge	WB	Urban Street Classification		III	III	III	IV	IV
			Hour Volume	Vehicles	941	1142	1078	514	498
			Speed	FFS	35	35	35	30	30
				Calculated	27	27	27	28	29
			LOS		B	B	B	A	A

Source: DKS Associates, 2004

4.2.4 Segment Travel Time

In addition to LOS, travel time was used to evaluate the performance of several highway segments for each alternative. The results are presented in Table 4.2.4-1.

TABLE 4.2.4-1
PEAK PERIOD TRAVEL TIME ON ROADWAY SEGMENTS (in minutes)

No.	Location	Dir	Base Year	Design Year Alternative: No Build	Design Year Alternative: Replace and Widen	Design Year Alternative: Parkway: Diamond Option	Design Year Alternative: Parkway: Circle Drive Option
AM Peak Period							
1	GGB to Park Presidio and Lake	SB	3.8	3.9	3.9	3.6	3.6
2	Park Presidio and Lake to GGB	NB	3.4	5.3	5.5	5.5	5.5
3	GGB to Marina and Divisadero	EB	3.4	3.2	3.1	3.7	4.0
4	Marina and Divisadero to GGB	WB	2.7	2.7	2.7	3.2	3.2
5	GGB to Francisco and Richardson	EB	2.9	3.0	2.2	2.9	3.0
6	Francisco and Richardson to GGB	WB	2.6	2.8	2.8	2.5	2.7
7	Park Presidio and Lake to Marina and Divisadero	EB	5.6	7.1	7.1	8.0	8.2
8	Marina and Divisadero to Park Presidio and Lake	WB	5.2	5.0	5.1	5.6	5.7
PM Peak Period							
1	GGB to Park Presidio and Lake	SB	3.1	5.2	5.7	5.1	4.7
2	Park Presidio and Lake to GGB	NB	4.4	4.5	4.5	4.2	4.2
3	GGB to Marina and Divisadero	EB	2.7	2.8	2.7	3.4	3.4
4	Marina and Divisadero to GGB	WB	3.9	3.7	3.7	3.6	3.5
5	GGB to Francisco and Richardson	EB	2.5	2.6	1.8	2.6	2.5
6	Francisco and Richardson to GGB	WB	4.2	3.9	3.9	3.1	3.2
7	Park Presidio and Lake to Marina and Divisadero	EB	5.9	5.8	5.8	6.6	6.7
8	Marina and Divisadero to Park Presidio and Lake	WB	6.3	7.2	7.4	7.7	7.4

Source: DKS Associates, 2004

Findings

Travel times in general would become longer in the design year because of increased regional traffic. The introduction of additional signals on Richardson Avenue and Marina Boulevard results in longer travel time to both streets in Presidio Parkway Alternative options.

4.2.5 Segment Merge / Diverge Level of Service

The LOS analysis for the merge/diverge locations for all on- and off-ramps in the project area are shown in Table 4.2.5-1 for the AM peak hour, and Table 4.2.5-2 for the PM peak hour. Table 4.2.5-3 contains a forecast of performance during the weekend peak hour. Detailed calculations are provided in Appendix E.

TABLE 4.2.5-1
AM PEAK HOUR MERGE/DIVERGE ANALYSIS

No.	Ramp	Criteria	Base Year	Design Year Alternative			
				No Build	Replace and Widen	Parkway: Diamond Option	Parkway: Circle Drive Option
1	US 101 Southbound diverge ramp to Park Presidio	LOS	F[2]	F[2]	F[2]	D	D
		Density[1]	26	29	29	32	32
2	US 101 Southbound merge ramp from Park Presidio	LOS	E[2]	E[2]	D	D	D
		Density[1]	36	32	32	31	31
3	US 101 Northbound merge ramp from Park Presidio	LOS	C	C	C	C	C
		Density[1]	28	42	27	28	28
4	US 101 Northbound diverge ramp to Park Presidio	LOS	B	B	B	B	B
		Density[1]	18	24	20	20	20
5	US 101 Southbound diverge ramp to Marina/Richardson	LOS	E	F	F	-	-
		Density[1]	37	46	45	-	-
6	US 101 Northbound merge ramp from Marina/Richardson	LOS	B	B	C	-	-
		Density[1]	19	27	28	-	-
7	Park Presidio merge ramp from US 101	LOS	C	C	C	C	C
		Density[1]	26	29	24	25	25
8	Park Presidio diverge ramp from US 101	LOS	C	C	D	D	D
		Density[1]	27	34	30	29	29
9	US 101 SB exit diverge to Girard	LOS	-	-	-	D	C
		Density[1]	-	-	-	28	28
10	US 101 NB exit diverge to Girard	LOS	-	-	-	C	-
		Density[1]	-	-	-	21	-

Notes:

1. Density is measured in vehicles per mile per lane
2. Density is not considered in LOS calculation where highway Influence area or ramps are over capacity,

Source: DKS Associates, 2004

TABLE 4.2.5-2
PM PEAK HOUR MERGE/DIVERGE ANALYSIS

No.	Ramp	Criteria	Base Year	Design Year Alternative: No Build	Design Year Alternative: Replace and Widen	Design Year Alternative: Parkway: Diamond Option	Design Year Alternative: Parkway: Circle Drive Option
1	US 101 Southbound diverge ramp to Park Presidio	LOS	B	F[2]	F[2]	D	D
		Density[1]	13	24	26	31	31
2	US 101 Southbound merge ramp from Park Presidio	LOS	C	C	C	C	C
		Density[1]	21	26	26	25	25
3	US 101 Northbound merge ramp from Park Presidio	LOS	C	D	D	D	D
		Density[1]	27	28	28	29	29
4	US 101 Northbound diverge ramp to Park Presidio	LOS	D	D	D	D	D
		Density[1]	34	34	30	30	30
5	US 101 Southbound diverge ramp to Marina/Richardson	LOS	C	E	E	-	-
		Density[1]	22	35	36	-	-
6	US 101 Northbound merge ramp from Marina/Richardson	LOS	E	F	F	-	-
		Density[1]	37	39	40	-	-
7	Park Presidio merge ramp from US 101	LOS	C	D	D	D	D
		Density[1]	25	31	28	29	29
8	Park Presidio diverge ramp from US 101	LOS	D	D	C	C	C
		Density[1]	30	31	27	27	27
9	US 101 SB exit diverge to Girard	LOS	-	-	-	C	C
		Density[1]	-	-	-	22	21
10	US 101 NB exit diverge to Girard	LOS	-	-	-	C	-
		Density[1]	-	-	-	25	-

Notes:

1. Density is measured in vehicles per mile per lane
2. Density is not considered in LOS calculation where highway Influence area or ramps are over capacity,

Source: DKS Associates, 2004

Findings

Less than adequate service levels were projected for Alternatives 1 and 2 in the design year for southbound Doyle Drive diverge at Park Presidio Boulevard. The addition of a second exit lane from southbound US 101 to Park Presidio Boulevard in the Parkway Alternative (Alternative 5) improves the LOS to an acceptable level (LOS D). Also, the reconfiguration of lanes between Richardson and Marina (assigning a lane specifically for Marina Boulevard, results in no merge/diverge being required in the Parkway Alternatives.

TABLE 4.2.5-3
WEEKEND PEAK HOUR MERGE/DIVERGE ANALYSIS

No.	Ramp	Criteria	Base Year	Design Year Alternative: No Build	Design Year Alternative: Replace and Widen	Design Year Alternative: Parkway: Diamond Option	Design Year Alternative: Parkway: Circle Drive Option
1	US 101 Southbound diverge ramp to Park Presidio	LOS	B	F[2]	F[2]	D	D
		Density[1]	13	24	26	31	31
2	US 101 Southbound merge ramp from Park Presidio	LOS	C	C	C	C	C
		Density[1]	21	26	26	25	25
3	US 101 Northbound merge ramp from Park Presidio	LOS	C	D	D	D	D
		Density[1]	27	28	28	29	29
4	US 101 Northbound diverge ramp to Park Presidio	LOS	D	D	D	D	D
		Density[1]	34	34	30	30	30
5	US 101 Southbound diverge ramp to Marina/Richardson	LOS	C	E	E	-	-
		Density[1]	22	35	36	-	-
6	US 101 Northbound merge ramp from Marina/Richardson	LOS	E	F	F	-	-
		Density[1]	37	39	40	-	-
7	Park Presidio merge ramp from US 101	LOS	C	D	D	D	D
		Density[1]	25	31	28	29	29
8	Park Presidio diverge ramp from US 101	LOS	D	D	C	C	C
		Density[1]	30	31	27	27	27
9	US 101 SB exit diverge to Girard	LOS	-	-	-	C	C
		Density[1]	-	-	-	22	21
10	US 101 NB exit diverge to Girard	LOS	-	-	-	C	-
		Density[1]	-	-	-	25	-

Notes:

1. Density is measured in vehicles per mile per lane
2. Density is not considered in LOS calculation where highway Influence area or ramps are over capacity,

Source: DKS Associates, 2004

4.2.6 Segment Weaving

The LOS for the weaving areas were calculated using Caltrans'-approved methodologies or the Leisch method (nomograph). The results are shown in Table 4.2.6-1.

Findings

A less than adequate weave condition (Level of Service E) was identified on northbound US 101 between the Park Presidio on-ramp and Merchant Road exit-ramp. To eliminate this potential problem, a Merchant Road slip ramp option is carried forth.

The findings also identified a southbound weaving section between the Merchant Road on-ramp and the Park Presidio off-ramp in the AM and PM peak hour (Level of Service E) in the No Project and Replace and Widen Alternatives. The southbound weave condition at this location was improved by adding a second lane to the exit ramp at Park Presidio in the Parkway Alternatives.

The traffic forecasts also indicate that the northbound segment of Doyle Drive between merge point from Richardson Avenue and Marina Boulevard to the off-ramp at Park Presidio is projected to deteriorate to Level of Service E during the Design Year in all alternatives. This occurs because traffic increases result in this new deficiency. As this operates at Level of Service E in all alternatives, there are no additional impacts associated with design alternatives and options.

There are no impacts identified in the segment weaving analysis, since the No-Build Alternative is anticipated to operate at unacceptable levels of service for three of the four segments during at least one time period.

As no new deficiencies would result beyond the No-Build Alternative, no mitigation is required. It is noted that design options found in various alternatives eliminate projected weaving deficiencies for northbound Doyle Drive between Park Presidio and Merchant Road ramps, and southbound Doyle Drive between Merchant Road and Park Presidio ramps.

TABLE 4.2.6-1
WEAVING ANAYSIS

Location		Level of Service AM	PM	Weekend
Base Year				
1	US 101 Southbound between the Merchant Road entrance ramp and Park Presidio exit ramp	C	C	N/A
2	US 101 Northbound between the Park Presidio entrance ramp and Merchant Road exit ramp	D	E[1]	N/A
3	US 101 Southbound between the Park Presidio merge and Richardson/Marina Access exit ramp	C	A	N/A
4	US 101 Northbound between Richardson/Marina Access merge and the Park Presidio exit ramp	A	A	N/A
Design Year -- No-Build Alternative				
1	US 101 Southbound between the Merchant Road entrance ramp and Park Presidio exit ramp	E[1]	E[1]	D
2	US 101 Northbound between the Park Presidio entrance ramp and Merchant Road exit ramp	D	E[1]	D
3	US 101 Southbound between the Park Presidio merge and Richardson/Marina Access exit ramp	D	C	C
4	US 101 Northbound between Richardson/Marina Access merge and the Park Presidio exit ramp	B	E[1]	C
Design Year -- Replace and Widen Alternative				
1	US 101 Southbound between the Merchant Road entrance ramp and Park Presidio exit ramp	E[1]	E[1]	D
2	US 101 Northbound between the Park Presidio entrance ramp and Merchant Road exit ramp	D	E[1]	D
3	US 101 Southbound between the Park Presidio merge and Richardson/Marina Access exit ramp	D	B	B
4	US 101 Northbound between Richardson/Marina Access merge and the Park Presidio exit ramp	C	E[1]	C

Note: Results interpreted from nomograph
1. Deficient Weaving segment would be remedied with new northbound slip ramp.
2. Design Year level of service deficiencies are projected in the No-Build Alternatives, so no additional impacts would occur

TABLE 4.2.6-1
WEAVING ANALYSIS (continued)

Location		Level of Service		
		AM	PM	Weekend
Design Year – Parkway Alternative: Diamond Option				
2	US 101 Southbound between the Merchant Road entrance ramp and Park Presidio exit ramp	D/E	D	D
1	US 101 Northbound between the Park Presidio entrance ramp and Merchant Road exit ramp	B	E[1]	D
4	US 101 Southbound between the Park Presidio merge and Richardson/Marina Access exit ramp	C	B	B
3	US 101 Northbound between Richardson/Marina Access merge and the Park Presidio exit ramp	B	E[2]	C
Design Year -- Parkway Alternative: Circle Drive Option				
2	US 101 Southbound between the Merchant Road entrance ramp and Park Presidio exit ramp	D/E	D	C
1	US 101 Northbound between the Park Presidio entrance ramp and Merchant Road exit ramp	B	E[1]	C
4	US 101 Southbound between the Park Presidio merge and Richardson/Marina Access exit ramp	C	B	B
3	US 101 Northbound between Richardson/Marina Access merge and the Park Presidio exit ramp	B	E[2]	C

Note: Results interpreted from nomograph
1. Deficient Weaving segment would be remedied with new northbound slip ramp.
2. Design Year level of service deficiencies are projected in the No-Build Alternatives, so no additional impacts would occur

Source: DKS Associates, 2004

4.2.7 Local Street Volumes

While no traffic volumes on local streets within the Presidio are forecast to reach congested traffic conditions, changes in overall traffic volumes by alternative may influence the overall quality of the park experience, as each vehicle adds some noise and safety concerns to persons using the park. To summarize the various changes in volumes associated with each alternative, a general table of traffic on local roads has been prepared.

It should be noted that these are representative volumes from the San Francisco Travel Demand Model. Thus, these volumes are best understood in terms of the aggregate change in traffic volumes between alternatives.

A set of representative roadway segments within the Presidio are summarized in tabular form to illustrate these differences. The AM conditions are found in Table 4.2.7-1; the PM conditions are in Table 4.2.7-2.

In the AM peak hour, the highest volumes are expected at the Presidio and Lombard Gates. The volumes of Lombard Gate are forecast to be similar to the existing conditions by the design year in Alternatives 1 and 2, while the new access provided the Alternative 5 options will result in less traffic through the Lombard Gate for morning traffic going into the Presidio. The Presidio Gate volumes vary by less than 50 vehicles between any alternative in the design year.

Another area of increased traffic demand is Halleck Street, where Alternatives 1 and 2 forecast increased traffic. This additional traffic will be ameliorated when direct access is provided between the Main Post area and Doyle Drive in the Alternative 5 options. Mason Street traffic increases in Alternative 2, once the Letterman access ramp from Richardson Avenue is eliminated in this alternative. Finally, Girard Road volumes will increase once the connection to Doyle Drive is made, as shown in Alternative 5 options.

The PM conditions generally show comparable results, with westbound Lombard Gate traffic decreasing with the Alternative 5 options, as well as the Alternative 5 options reducing traffic volumes on Halleck Street and Mason Street. Generally the changes are attributable to the introduction of the direct access between the Main Post area and Doyle Drive in the Alternative 5 options.

TABLE 4.2.7-1
AM PEAK HOUR LOCAL STREET VOLUMES

				Design Year				Difference to Design Year No Build		
		Dir.	Base Year (veh)	No Build (veh)	Replace and Widen (veh)	Parkway: Diamond Option (veh)	Parkway: Circle Drive Option (veh)	Replace and Widen (veh)	Parkway: Diamond Option (veh)	Parkway: Circle Drive Option (veh)
2	Lincoln--Long Avenue to Crissy Field	WB	10	80	60	60	60	-20	-20	-20
	Lincoln--Crissy Field to Long Avenue	EB	0	60	60	50	50	0	-10	-10
3	Lincoln--Sheridan to Crissy Field	WB	60	140	120	120	130	-20	-20	-10
	Lincoln--Crissy Field to Sheridan	EB	80	100	100	70	70	0	-30	-30
6	Mason--Zanowiz to Lyon	WB	10	10	70	10	10	60	0	0
	Mason--Lyon to Zanowiz	EB	10	20	10	10	10	-10	-10	-10
8	Lombard Gate--Lyon to Ruger	WB	510	530	540	220	190	10	-310	-340
	Lombard Gate--Ruger to Lyon	EB	400	500	470	500	490	-30	0	-10
9	Girard--Lincoln to Gorgas	NB	20	90	90	140	100	0	50	10
	Girard--Gorgas to Lincoln	SB	10	50	50	470	440	0	420	390
10	Presidio Gate--Pacific to Broadway	NB	500	640	660	610	600	20	-30	-40
	Presidio Gate--Broadway to Pacific	SB	590	650	650	630	640	0	-20	-10
11	Arguello Gate--Pacific to Washington	NB	90	240	260	260	260	20	20	20
	Arguello Gate--Washington to Pacific	SB	60	90	90	120	120	0	30	30
13	15th Ave--Lake to Wedemeyer	NB	20	80	90	90	90	10	10	10
	15th Ave--Wedemeyer to Lake	SB	30	110	110	110	110	0	0	0
14	Lincoln--Brooks to Browley	NB	450	660	650	610	610	-10	-50	-50
	Lincoln--Browley to Brooks	SB	10	450	460	400	410	10	-50	-40
17	Halleck Street – Lincoln to Mason	NB	30	70	150	30	40	80	-40	-30
	Halleck Street – Mason to Lincoln	SB	20	30	20	10	10	-10	-20	-20
18	McDowell Street -- Lincoln to Mason	NB	20	90	70	70	70	-20	-20	-20
	McDowell Street -- Mason to Lincoln	SB	0	10	10	10	10	0	0	0

Source: DKS Associates, 2004

TABLE 4.2.7-2
PM PEAK HOUR LOCAL STREET VOLUMES

		Dir.	Base Year (veh)	Design Year: No Build (veh)	Design Year: Replace and Widen (veh)	Design Year: Parkway: Diamond Option (veh)	Design Year: Parkway: Circle Drive Option (veh)	Difference to Design Year No Build: Replace and Widen (veh)	Difference to Design Year No Build: Parkway: Diamond Option (veh)	Difference to Design Year No Build: Parkway: Circle Drive Option (veh)
2	Lincoln--Long Avenue to Crissy Field	WB	260	170	150	50	40	-20	-120	-130
	Lincoln--Crissy Field to Long Avenue	EB	30	70	110	50	50	40	-20	-20
3	Lincoln--Sheridan to Crissy Field	WB	340	300	290	170	190	-10	-130	-110
	Lincoln--Crissy Field to Sheridan	EB	60	130	170	110	110	40	-20	-20
6	Mason--Zanowiz to Lyon	WB	10	20	30	10	10	10	-10	-10
	Mason--Lyon to Zanowiz	EB	50	140	50	30	30	-90	-110	-110
8	Lombard Gate--Lyon to Ruger	WB	490	620	620	340	340	0	-280	-280
	Lombard Gate--Ruger to Lyon	EB	290	300	330	330	310	30	30	10
9	Girard--Lincoln to Gorgas	NB	30	90	90	290	250	0	200	160
	Girard--Gorgas to Lincoln	SB	20	90	100	470	450	10	380	360
10	Presidio Gate--Pacific to Broadway	NB	580	650	660	620	610	10	-30	-40
	Presidio Gate--Broadway to Pacific	SB	530	660	670	630	630	10	-30	-30
11	Arguello Gate--Pacific to Washington	NB	150	180	160	180	180	-20	0	0
	Arguello Gate--Washington to Pacific	SB	160	310	350	390	390	40	80	80
13	15th Ave--Lake to Wedemeyer	NB	60	130	130	130	130	0	0	0
	15th Ave--Wedemeyer to Lake	SB	40	130	150	160	160	20	30	30
14	Lincoln--Brooks to Browley	NB	530	550	540	520	510	-10	-30	-40
	Lincoln--Browley to Brooks	SB	490	850	670	610	620	-180	-240	-230
17	Halleck Street – Lincoln to Mason	NB	40	150	110	20	30	-40	-130	-120
	Halleck Street – Mason to Lincoln	SB	40	70	50	40	40	-20	-30	-30
18	McDowell Street -- Lincoln to Mason	NB	260	190	10	50	50	-180	-140	-140
	McDowell Street -- Mason to Lincoln	SB	10	10	10	10	10	0	0	0

Source: DKS Associates, 2004

4.3 FUTURE YEAR TRANSIT

For this study, the same frequency of transit services that use Doyle Drive was assumed for all alternatives. Table 4.3-1 lists the number of buses that have some or part of their route on Doyle Drive for all alternatives.

The number of peak period buses on Doyle Drive would continue to be heavily oriented in one direction. About two-thirds of all the buses on Doyle Drive occur during the peak period.

An evaluation of the overall transit ridership at the southern edge of the Presidio (MUNI Route 28, 29, 43; Golden Gate Transit Route 50) and eastern edge of the Presidio (MUNI Route 28, 43, 82X; Golden Gate Transit Routes into San Francisco except Route 50) was made. None of the build alternatives increased ridership by more than one percent in either the AM or PM peak hour. Thus, no impacts on the capacity of these routes are anticipated.

TABLE 4.3-1
NUMBER OF BUSES ON DOYLE DRIVE – ALL ALTERNATIVES

	All Day				Weekday Peak Period			
	Weekday		Saturday		AM		PM	
Route	In	Out	In	Out	In	Out	In	Out
San Francisco MUNI								
28	100	100	85	85	20	20	18	18
76[1]	-	-	9	9	-	-	-	-
Total MUNI	100	100	94	94	20	20	18	18
Golden Gate Transit (GGT)								
2	9	7	-	-	9	-	-	7
4	22	25	-	-	20	-	-	21
8	5	4	-	-	4	-	-	4
10	1	-	13	13	-	-	-	-
18	12	13	-	-	10	-	-	11
20	29	35	33	33	6	7	6	7
24	22	21	-	-	19	-	-	18
26	10	7	-	-	8	-	-	6
28	2	2	-	-	2	-	-	2
30	9	9	-	-	0	1	3	1
32	3	3	-	-	3	-	-	3
34	4	3	-	-	4	-	-	3
38	8	8	-	-	7	-	-	7
44	5	4	-	-	5	-	-	4
48	3	3	-	-	3	-	-	3
50	29	16	16	16	5	1	6	3
54	17	17	-	-	16	-	-	13
56	8	8	-	-	8	-	-	8
60/70/80	35	50	36	38	5	8	8	8
72	10	12	-	-	9	-	-	10
74	16	15	-	-	11	-	-	12
76	13	12	-	-	13	-	-	10
78	3	3	-	-	3	-	-	3
90	3	2	-	-	1	1	-	1
93	6	1	-	-	6	-	-	1
Total GGT	284	280	98	84	177	18	23	166

Notes: 1. Operates on Sundays only

Source: DKS Associates, 2004 from SF-TDM

4.3.1 Transit Travel Time

Table 4.3.1-1 summarizes the peak hour transit travel times by segment for each alternative.

Findings

By the Design Year, increased regional traffic results in reduced travel speeds for the local transit operators. Travel times are expected to increase about one minute on all transit routes in peak directions in the Design Year when compared to 2000, with less significant growth in off-peak directions.

When comparing the Design Year conditions for each alternative, the effect of each of the alternatives on travel times varies depending on the route. The majority of riders are carried on GGT routes, which would increase from the current 2.9-minute trip in the AM peak to a 5.5-minute trip by the Design Year. In the PM peak, the projected travel time is expected to increase from 4.0 minutes to 6.4 minutes by the Design Year.

The Parkway Alternative options do not substantially change travel times from the Replace and Widen alternative, as the routing and stop locations are similar.

Because this corridor mainly affects much longer GGT and MUNI routes, the impacts to overall transit travel time of about one minute or less per trip is less than 5 percent of the 45 to 120 minute one-way trip time on these routes. The impact in terms of transit travel time (one component of overall travel time) to individual riders on the system would be greater, and this would vary depending on the amount of time spent on a bus.

4.3.2 Transit Operations (Capacity) Level of Service

The peak hour load factors are shown in Table 4.3.2-1. These factors describe whether the current buses have enough seating capacity to carry all passengers, or whether more is needed. In addition, an examination of total passenger loads crossing the southern edge of the Presidio was made.

Findings

The results of the analysis are provided on a route-by-route basis. While some individual GGT routes are forecast to have load factors over 100 percent, It should be noted that GGT frequently balances route service between over-productive service and under-productive services in an area where many routes serve the same corridor. Assuming that route service is reallocated by the Design Year to serve more productive routes, the assumed level of transit service for the design year should be adequate in handling passenger loads. The combined load factor on GGT routes does not exceed 82 percent for any the Design Year alternative.

While alternatives show different loads on different routes, total GGT ridership in this corridor is forecast to be approximately 11,700 two-way average weekday riders in the Design Year, and should not vary by more than 100 riders in any alternative.

MUNI Route 28 is projected to see a leveling of demand by the Design Year. No alternative changes the overall anticipated ridership of this route on Doyle Drive by more than 30 riders, although it should be noted that this route is expected to carry its maximum available capacity on Route 28 for the Doyle Drive route segment by the Design Year.

An evaluation of routes that cross into the Richmond neighborhoods from the project project area was also conducted. These included MUNI routes 28, 29, 43 and Golden Gate Transit Route 50. This evaluation indicated a less than one percent change in bus passenger loads on the routes that cross the southern border of the Presidio.

In sum, no alternative is anticipated to induce additional bus demand above the design year no-build (Alternative 1) condition.

TABLE 4.3.1-1
PEAK HOUR TRAVEL TIME FOR TRANSIT SERVICES

Path	Segment	AM Travel Time[1]	PM Travel Time[1]
Base Year			
1	Golden Gate Transit Route 50: Golden Gate Bridge and Park Presidio/Lake Street.	5.0 (SB) 4.6 (NB)	4.4 (SB) 5.6 (NB)
2	Golden Gate Transit other routes: Golden Gate Bridge and Richardson/Francisco	5.5 (SB) 5.1 (NB)	5.0 (SB) 6.7 (NB)
3	MUNI Route 28: Merchant Interchange and Richardson/Francisco; Merchant Interchange and Park Presidio/Lake Street.	10.1 (SB) 10.1 (NB)	11.1 (SB) 10.6 (NB)
Design Year – Alternative 1 No Build			
1	Golden Gate Transit Route 50: Golden Gate Bridge and Park Presidio/Lake Street.	5.2 (SB) 6.6 (NB)	6.5 (SB) 5.8 (NB)
2	Golden Gate Transit other routes: Golden Gate Bridge and Richardson/Francisco	5.5 (SB) 5.3 (NB)	5.1 (SB) 6.4 (NB)
3	MUNI Route 28: Merchant Interchange and Richardson/Francisco; Merchant Interchange and Park Presidio/Lake Street.	10.7 (SB) 11.9 (NB)	11.5 (SB) 12.2 (NB)
Design Year – Alternative 2 Replace and Widen			
1	Golden Gate Transit Route 50: Golden Gate Bridge and Park Presidio/Lake Street.	5.2 (SB) 6.8 (NB)	7.0 (SB) 5.8 (NB)
2	Golden Gate Transit other routes: Golden Gate Bridge and Richardson/Francisco	4.7 SB) 5.3 (NB)	4.3 (SB) 6.4 (NB)
3	MUNI Route 28: Merchant Interchange and Richardson/Francisco; Merchant Interchange and Park Presidio/Lake Street.	9.9 (SB) 12.1 (NB)	11.3 (SB) 12.2 (NB)
Design Year – Alternative 5 Parkway: Diamond Option			
1	Golden Gate Transit Route 50: Golden Gate Bridge and Park Presidio/Lake Street.	4.9 (SB) 6.8 (NB)	6.4 (SB) 5.5 (NB)
2	Golden Gate Transit other routes: Golden Gate Bridge and Richardson/Francisco	5.4 (SB) 5.0 (NB)	5.1 (SB) 5.6 (NB)
3	MUNI Route 28: Merchant Interchange and Richardson/Francisco; Merchant Interchange and Park Presidio/Lake Street.	10.3 (SB) 11.8 (NB)	11.4 (SB) 11.1 (NB)
Design Year – Alternative 5 Parkway: Circle Drive Option			
1	Golden Gate Transit Route 50: Golden Gate Bridge and Park Presidio/Lake Street.	4.9 (SB) 6.8 (NB)	6.0 (SB) 5.5 (NB)
2	Golden Gate Transit other routes: Golden Gate Bridge and Richardson/Francisco	5.5 (SB) 5.2 (NB)	5.7 (SB) 5.7 (NB)
3	MUNI Route 28: Merchant Interchange and Richardson/Francisco; Merchant Interchange and Park Presidio/Lake Street.	10.4 (SB) 12.0 (NB)	11.7 (SB) 11.2 (NB)

Notes:

1. Travel time is measured in minutes includes time for passenger loading and disembarking .

Source: DKS Associates, 2004 from SF- TDM

TABLE 4.3.2-1
NORTHBOUND PEAK HOUR LOAD FACTORS ON DOYLE DRIVE

Route	Number of Buses		Peak Hour Capacity[1]		Passengers per Hour[2]		Peak Hour Load Factor	
	AM	PM	AM	PM	AM	PM	AM	PM
Base Year (Existing Conditions)								
MUNI								
28	22	20	567	520	191	466	34%	90%
Golden Gate Transit								
2		4		172		79		46%
4		12		516		286		55%
8		3		129		43		33%
18		5		215		129		60%
20	2	2	86	86	32	50	38%	58%
24		7		301		220		73%
26		4		172		78		45%
28		2		86		10		12%
32		1		43		25		58%
34		1		43		22		51%
38		3		129		104		81%
44		2		86		48		56%
48		2		86		39		46%
50	2	2	86	86	14	44	17%	51%
54		6		258		192		75%
56		4		172		104		61%
72		4		172		165		96%
74		5		215		137		64%
76		5		215		150		70%
78		2		86		26		31%
60/70/80	3	2	129	86	80	48	62%	91%
90		1		43		9		20%
93		1		43		11		26%

Notes: 1. Assumes 43 passengers per bus on Golden Gate Transit Vehicles
2. Maximum Load segment is estimated by the SF-TDM. The load point is found at the Golden Gate Bridge for Golden Gate Transit and on 19th Avenue south of Judah Street for MUNI Route 28.

Source: DKS Associates, 2004 fromSF-TDM

TABLE 4.3.2-1
NORTHBOUND PEAK HOUR LOAD FACTORS ON DOYLE DRIVE (continued)

Route	Number of Buses		Peak Hour Capacity[1]		Passengers per Hour[2]		Peak Hour Load Factor	
	AM	PM	AM	PM	AM	PM	AM	PM
Design Year Alternatives 1 (No Build) and 2 (Replace and Widen)								
MUNI								
28	5	5	215	215	82	211	38%	98%
GGT								
2		4		172		139		81%
4		12		516		396		77%
8		3		129		74		57%
10	2	5	86	215	6	6	7%	3%
18		5		215		111		52%
20	2	2	86	86	8	47	9%	55%
24		7		301		204		68%
26		4		172		172		100%
28		2		86		9		11%
32		1		43		23		54%
34		1		43		20		47%
38		3		129		118		91%
44		2		86		74		86%
48		2		86		86		100%
50	2	2	86	86	14	81	16%	94%
54		6		258		248		96%
56		4		172		166		96%
70	1	1	43	43	33	41	77%	95%
71		4		172		151		88%
72		4		172		167		97%
74		5		215		214		100%
75		5		215		196		91%
76		5		215		204		95%
78		2		86		8		9%
80	2	1	86	43	8	41	9%	95%
90		1		43		40		93%
93		1		43		40		93%

Notes:
1. Assumes 43 passengers per bus on Golden Gate Transit Vehicles
2. Maximum Load segment is estimated by the SF-TDM. The load point is found at the Golden Gate Bridge for Golden Gate Transit and on 19th Avenue south of Judah Street for MUNI Route 28.

Source: DKS Associates, 2004 from SF-TDM

TABLE 4.3.2-1
NORTHBOUND PEAK HOUR LOAD FACTORS ON DOYLE DRIVE (continued)

Route	Number of Buses		Peak Hour Capacity[1]		Passengers per Hour[2]		Peak Hour Load Factor	
	AM	PM	AM	PM	AM	PM	AM	PM
Design Year Alternative 5 Parkway: Diamond Option								
MUNI								
28	5	5	215	215	82	226	38%	105%
GGT								
2		4		172		145		84%
4		12		516		396		77%
8		3		129		75		58%
10	2	5	86	215	6	6	7%	3%
18		5		215		110		51%
20	2	2	86	86	8	47	9%	55%
24		7		301		204		68%
26		4		172		172		100%
28		2		86		9		11%
32		1		43		23		54%
34		1		43		20		47%
38		3		129		115		89%
44		2		86		74		86%
48		2		86		86		100%
50	2	2	86	86	14	81	16%	94%
54		6		258		245		95%
56		4		172		166		96%
70	1	1	43	43	33	41	77%	95%
71		4		172		151		88%
72		4		172		167		97%
74		5		215		215		100%
75		5		215		196		91%
76		5		215		204		95%
78		2		86		11		13%
80	2	1	86	43	8	41	9%	95%
90		1		43		40		93%
93		1		43		40		93%

Notes: 1. Assumes 43 passengers per bus on Golden Gate Transit Vehicles
2. Maximum Load segment is estimated by the SF-TDM. The load point is found at the Golden Gate Bridge for Golden Gate Transit and on 19th Avenue south of Judah Street for MUNI Route 28.

Source: DKS Associates, 2004 from SF-TDM

TABLE 4.3.2-1
NORTHBOUND PEAK HOUR LOAD FACTORS ON DOYLE DRIVE (continued)

Route	Number of Buses		Peak Hour Capacity[1]		Passengers per Hour[2]		Peak Hour Load Factor	
	AM	PM	AM	PM	AM	PM	AM	PM
Design Year Alternative 5 Parkway: Circle Drive Option								
MUNI								
28	5	5	215	215	82	226	38%	105%
GGT								
2		4		172		145		84%
4		12		516		397		77%
8		3		129		80		62%
10	2	5	86	215	6	6	7%	3%
18		5		215		110		51%
20	2	2	86	86	8	47	9%	55%
24		7		301		204		68%
26		4		172		172		100%
28		2		86		9		11%
32		1		43		23		54%
34		1		43		20		47%
38		3		129		109		85%
44		2		86		74		86%
48		2		86		86		100%
50	2	2	86	86	14	81	16%	94%
54		6		258		243		94%
56		4		172		166		96%
60	1	1	43	43	33	41	77%	95%
70		4		172		151		88%
71		4		172		167		97%
72		5		215		217		101%
74		5		215		196		91%
75		5		215		204		95%
76		2		86		10		12%
78	2	1	86	43	8	41	9%	95%
80		1		43		40		93%
90		1		43		40		93%
93		1		43		40		93%

Notes: 1. Assumes 43 passengers per bus on Golden Gate Transit Vehicles
2. Maximum Load segment is estimated by the SF-TDM. The load point is found at the Golden Gate Bridge for Golden Gate Transit and on 19th Avenue south of Judah Street for MUNI Route 28.

Source: DKS Associates, 2004 from SF-TDM

TABLE 4.3.2-2
SOUTHBOUND PEAK HOUR LOAD FACTORS ON DOYLE DRIVE

Route	Number of Buses		Peak Hour Capacity[1]		Passengers per Hour[2]		Peak Hour Load Factor	
	AM	PM	AM	PM	AM	PM	AM	PM
Base Year								
MUNI								
28	18	19	378	447	231	370	61%	83%
Golden Gate Transit								
2	5		215		121		56%	
4	7		301		262		87%	
8	2		86		61		71%	
18	6		258		151		58%	
20	2	1	86	43	109	63	100+%	100+%
24	9		387		243		63%	
26	3		129		115		89%	
28	2		86		17		20%	
32	1		43		34		80%	
34	1		43		43		99%	
38	4		172		134		78%	
44	2		86		61		71%	
48	2		86		37		44%	
50	4	3	172	129	33	59	19%	45%
54	6		258		199		77%	
56	4		172		106		62%	
72	3		129		142		100+%	
74	5		215		181		84%	
76	4		172		126		73%	
78	2		86		25		29%	
60/70/80	2	3	86	129	58	65	68%	50%
90	1		43		12		27%	
93	4		172		69		40%	

Notes:

1. Assumes 43 passengers per bus on Golden Gate Transit vehicles
2. Maximum Load segment is estimated by the SF-TDM. The load point is found at the Golden Gate Bridge for Golden Gate Transit and on 19th Avenue south of Judah Street for MUNI Route 28.

Source: DKS Associates, 2004 from SF-TDM

TABLE 4.3.2-2
SOUTHBOUND PEAK HOUR LOAD FACTORS ON DOYLE DRIVE (continued)

Route	Number of Buses		Peak Hour Capacity[1]		Passengers per Hour[2]		Peak Hour Load Factor	
	AM	PM	AM	PM	AM	PM	AM	PM
Design Year Alternatives 1 (No Build) and 2 (Replace and Widen)								
MUNI								
28	6	6	258	258	242	358	94%	139%
GGT								
2	5		215		216		100%	
4	7		301		297		99%	
8	2		86		72		84%	
18	6		258		239		93%	
20	2	1	86	43	85	39	99%	91%
24	9		387		355		92%	
26	3		129		99		77%	
28	2		86		77		90%	
32	1		43		32		74%	
34	1		43		37		86%	
38	4		172		157		91%	
44	2		86		50		58%	
48	2		86		82		95%	
50	4	3	172	129	163	109	95%	84%
54	6		258		251		97%	
56	4		172		165		96%	
72	3		129		127		98%	
74	5		215		208		97%	
76	4		172		156		91%	
78	2		86		75		87%	
80	2	3	86	129	66	174	77%	135%
90	1		43		42		98%	
93	4		172		169		98%	

Notes:
1. Assumes 43 passengers per bus on Golden Gate Transit vehicles
2. Maximum Load segment is estimated by the SF-TDM. The load point is found at the Golden Gate Bridge for Golden Gate Transit and on 19th Avenue south of Judah Street for MUNI Route 28.

Source: DKS Associates, 2004 from SF-TDM

TABLE 4.3.2-2
SOUTHBOUND PEAK HOUR LOAD FACTORS ON DOYLE DRIVE *(continued)*

Route	Number of Buses		Peak Hour Capacity[1]		Passengers per Hour[2]		Peak Hour Load Factor	
	AM	PM	AM	PM	AM	PM	AM	PM
Design Year Alternative 5 Parkway: Diamond Option								
MUNI								
28	6	6	258	258	247	359	96%	139%
GGT								
2	5		215		216		100%	
4	7		301		297		99%	
8	2		86		73		85%	
18	6		258		239		93%	
20	2	1	86	43	85	40	99%	93%
24	9		387		355		92%	
26	3		129		99		77%	
28	2		86		77		90%	
32	1		43		32		74%	
34	1		43		37		86%	
38	4		172		157		91%	
44	2		86		50		58%	
48	2		86		82		95%	
50	4	3	172	129	163	109	95%	84%
54	6		258		252		98%	
56	4		172		165		96%	
72	3		129		127		98%	
74	5		215		209		97%	
76	4		172		156		91%	
78	2		86		75		87%	
80	2	3	86	129	67	171	78%	133%
90	1		43		40		93%	
93	4		172		169		98%	

Notes:

1. Assumes 43 passengers per bus on Golden Gate Transit vehicles
2. Maximum Load segment is estimated by the SF-TDM. The load point is found at the Golden Gate Bridge for Golden Gate Transit and on 19th Avenue south of Judah Street for MUNI Route 28.

Source: DKS Associates, 2004 from SF-TDM

TABLE 4.3.2-2
SOUTHBOUND PEAK HOUR LOAD FACTORS ON DOYLE DRIVE (continued)

Route	Number of Buses		Peak Hour Capacity[1]		Passengers per Hour[2]		Peak Hour Load Factor	
	AM	PM	AM	PM	AM	PM	AM	PM
Design Year Alternative 5 Parkway: Circle Drive Option								
MUNI								
28	6	6	258	258	246	359	95%	139%
GGT								
2	5		215		215		100%	
4	7		301		297		99%	
8	2		86		72		84%	
18	6		258		239		93%	
20	2	1	86	43	86	39	100%	91%
24	9		387		355		92%	
26	3		129		99		77%	
28	2		86		77		90%	
32	1		43		32		74%	
34	1		43		37		86%	
38	4		172		157		91%	
44	2		86		50		58%	
48	2		86		82		95%	
50	4	3	172	129	163	109	95%	84%
54	6		258		250		97%	
56	4		172		163		95%	
72	3		129		127		98%	
74	5		215		207		96%	
76	4		172		156		91%	
78	2		86		75		87%	
80	2	3	86	129	70	174	81%	135%
90	1		43		42		98%	
93	4		172		169		98%	

Notes:

1. Assumes 43 passengers per bus on Golden Gate Transit vehicles
2. Maximum Load segment is estimated by the SF-TDM. The load point is found at the Golden Gate Bridge for Golden Gate Transit and on 19th Avenue south of Judah Street for MUNI Route 28.

Source: DKS Associates, 2004 from SF-TDM

4.4 FUTURE YEAR PEDESTRIANS AND BICYCLES

4.4.1 Bicycles

Bicycles would continue to be prohibited on Doyle Drive. Bicycle activity in the Doyle Drive corridor is accommodated by already designated bicycle paths and routes on either side of the Project area on routes described in the *Presidio Trails and Bikeways Master Plan*.

The project alternatives that elevate Doyle Drive or place it in a tunnel would continue to allow bicyclists to cross over or under the facility, and may introduce new locations where crossing can occur. However, the two access options facilitate bicyclists in different ways. The Parkway Alternatives provide crossings at two signalized intersections on Richardson—at Girard and at Gorgas Avenue intersection.

4.4.2 Pedestrians

The No-Build Alternative preserves the pedestrian sidewalk along Doyle Drive. This sidewalk is not ADA accessible. The sidewalk is removed in the Replace and Widen and the two Parkway Alternatives. New trails that parallel Doyle Drive are in place or planned on both sides of the facility that should accommodate pedestrians including portions of the Bay Trail, Presidio Promenade and the Golden Gate Promenade, as designated in the *Presidio Trails and Bikeways Master Plan.* In the Parkway Alternatives, the tunnel design will allow for easier access for pedestrians west of the Main Post area. Also in the Parkway Alternatives, the street treatments on Richardson Avenue will allow for shorter and more direct pedestrian movements between the Main Post area and the Palace of Fine Arts.

All project alternatives would continue to allow pedestrians to cross over or under the facility at numerous locations. However, the two different access options in Alternative 5 facilitate pedestrians in different ways. This alternative includes pedestrian crossings on Girard Road from between the Palace of Fine Arts and Girard Road, as well as a crossing for Richardson Avenue at the Gorgas Avenue. intersection. Tunnels that would be provided in Alternative 5 would also allow for new pedestrian connections (e.g., Batteries to Cemetery).

4.4.3 Pedestrian Crossings

The resulting pedestrian walk times are summarized in Table 4.4.1. This table illustrates the walking travel time changes of providing the pedestrian walk paths (in Alternative 5options) over the proposed Doyle Drive Tunnel (path 1), as well as the ease of negotiating the area between the Main Post, Exploratorium, Crissy Field Interpretative Center and the Marina Neighborhood (in paths 2 and 3). The resulting travel time-saving is between 15 and 25 percent.

The time needed for a person to walk between different Presidio attractions would be different for each alternative. Today, Doyle Drive blocks easy pedestrian connectivity between many locations on opposite sides of the road. In the future, the installation of the new signalized intersection for the Digital Arts Center parking garage would reduce some walk distances and time by providing a shorter access route. Using a brisk 1.2 meters per second (4 feet per second) average walk speed, a quantitative assessment of pedestrian crossings is included in this report.

TABLE 4.4.1
PEDESTRIAN WALK TIMES BY ALTERNATIVE (in minutes)

Path	Base Year	Design Year		
		Alternative 1 No Build	Alternative 2 Replace and Widen	Alternative 5 Parkway (all options)
1. Cemetery area to Crissy Field Interpretative Center area	12	12	12	9
2. Exploratorium/Palace of Fine Arts area to the Main Post area	13	12	12	11
3. Marina neighborhood to Crissy Field Interpretative Center area	14	14	14	12

Source: DKS Associates, 2004

4.5 CONSTRUCTION PERIOD

Review of the detour plans indicated that the construction period for the Doyle Drive replacement would be approximately four to five years. During this length of time, a series of construction phases would occur and construction vehicles, equipment and workers would be traversing the project area.

This section identifies the potential impacts that may occur during construction and that may affect selection of a preferred alternative. Once a preferred alternative is selected, and during final design, a formal *Transportation Management Plan* will develop strategies to address construction equipment, signage, time-of-day and general area-wide traffic reduction and management. Specifically, this chapter contains a discussion of these construction impacts:

- Construction vehicles
- Area-wide traffic reduction
- Ramp/road closures (greater than one month)

4.5.1 Construction Vehicles

The movement of construction vehicles may be a sensitive issue, given Doyle Drive's location within the Golden Gate National Recreation Area. Construction will involve demolition; excavation; and installation of new tunnel, bridge, and roadway structures; as well as landscaping and signing. Vehicles would include trucks hauling debris and delivering construction materials and supplies, as well as commuter vehicles driven by construction workers. Some of these vehicles will include graders and heavy earthmoving and paving equipment. The volume of these vehicles would vary through the project, depending on the specific construction activity and the schedules of the various building elements for each alternative.

Construction traffic is expected to access the project site from Park Presidio and the Golden Gate Bridge as was required during demolition and construction of the Letterman Digital Arts Complex. This traffic would enter the Presidio from eastbound Richardson Avenue while exiting traffic would use Mason Street to Lyon Street to westbound Doyle Drive. Depending on type of construction vehicle and time of arrival, some occasional access may require use of local streets in the Presidio. During final design, the Authority would work carefully with the Presidio Trust, the National Park Service, and the Golden Gate Bridge, Highway, and Transportation District, as well as other affected agencies to define specific construction procedures and routes and implementation of the Transportation Management Plan.

4.5.2 Area-wide Traffic Reduction Strategies

Area roadways would continue to serve a high volume of traffic during construction. Although the number of current travel lanes would not be eliminated, some geometric restrictions (such as narrower lanes, alignment adjustments or more restrictive turning radii) and pavement conditions may relieve available capacity or other situations where driver speeds will need to be reduced. Therefore, the *Transportation Management Plan* would include area-wide traffic reduction strategies aimed at reducing traffic in the construction area, and minimizing both Doyle Drive traffic and diversions to low-speed park roads during construction. An over-arching strategy for construction zones begins with encouraging traffic to use alternate routes and reducing the area-wide traffic demand. In this situation, a reduction of five or ten percent in traffic would help to minimize additional traffic congestion. Sample strategies include:

- Traffic between Golden Gate Bridge and Park Presidio/Richardson Avenue/Marina Boulevard:
  - Public awareness campaign for both commuters and tourists
  - Advance notice of major ramp closures
  - Strategies to increase mode share of travel on Golden Gate Transit buses and ferries (including consideration of fare subsidies and increased service)
- Traffic between Park Presidio and Richardson Avenue/Marina Boulevard:
  - Public awareness campaign for both commuters and tourists
  - Advance notice of major ramp closures
  - Redirecting traffic away from this movement and onto other San Francisco streets
- Traffic with one trip end at the Presidio:
  - Public awareness campaign for both commuters and tourists
  - Advance notice of major ramp closures
  - Strategies to increase the mode share of travel for local trip makers
  - Redirecting traffic away from this movement and onto other San Francisco streets

4.5.3 Transit Operations

Transit services would continue to operate as the project moves forward. The closure of Lincoln Boulevard would require rerouting of the PresidiGo shuttles and Muni Route 29.

4.5.4 Pedestrian and Bicycle Operations

The existing (but difficult to use and ADA non-compliant) adjacent sidewalk along the north side of Doyle Drive would be closed during the duration of construction. New trails that parallel Doyle Drive are in place or planned on both sides of the facility that should accommodate pedestrians including portions of the Bay Trail, Presidio Promenade and the Golden Gate Promenade, as designated in the *Presidio Trails and Bikeways Master Plan*.

Bicycles will be routed to already-designated bicycle paths and routes on either side of the Project area on routes described in the *Presidio Trails and Bikeways Master Plan*.

4.5.5 Ramp/Road Closures and Operational Changes

The construction staging concept for the Replace and Widen alternative and the two Parkway alternatives is shown in Appendix F. During various construction stages in the project, some ramps or roadways would need to be closed for a periods of time over one month. Most of the closures are anticipated to take between four to six months. The preliminary construction phasing has determined a number of instances where roadway lane capacity would be reduced. In order to assess the effects of this reduction, the SF-TDM was used to determine the traffic flows and volumes and identify impacts. Using the travel model, a construction year (2010 as the midpoint of construction) scenario was created by interpolating year 2000 and 2030 results. Once completed, the effects from various closures were identified.

Because each closure affects traffic in a different corridor at different times of day, each of these projected traffic conditions were examined individually. The AM and PM peak hour forecasted traffic volumes on major facilities for each major closure scenario are presented in Tables 4.5.5-1 through Table 4.5.5-4. Traffic and transportation impacts will be different throughout the corridor. This section describes potential impacts based on specific locations within the project study area.

General 2010 Traffic Conditions

By 2010, traffic on major facilities is expected to grow, with most growth occurring mainly in the non-peak commute direction. Generally, mainline Doyle Drive volumes are not projected to change by more than 200 vehicles.

Alternative 2: Replace and Widen

Park Presidio/Doyle Drive Ramp Closures

For the Replace and Widen Alternative, there are two major situations anticipated that could affect traffic.

For both the Detour and No Detour option, ramp closures are required in the initial stages of the project. This situation is analyzed as network 2A. The two ramps proposed for closure are those that connect Park Presidio northbound to Doyle Drive southbound, and Doyle Drive northbound to Park Presidio southbound. It is anticipated that this closure could be as long as six months. While the Doyle Drive northbound to Park Presidio southbound ramp may be closed for a longer duration, this particular situation represents the early critical “worst case” traffic diversion scenario.

At a peak hour basis, the Park Presidio northbound to Doyle Drive southbound ramp is projected to carry 930 vehicles in the AM peak hour and 730 vehicles in the PM peak hour. The Doyle Drive northbound to Park Presidio southbound ramp is projected to carry 430 vehicles in the AM peak hour and 910 in the PM peak hour. The removal of these vehicles means that a total of 1160 vehicles would be diverted in the AM peak hour and 1640 in the PM peak hour.

The SF-TDM indicates that these ramp closures would result in traffic moving to other ramps and streets. The general impact of this closure is projected to be that most drivers (over 60 percent in each time period) would not use either Park Presidio or Doyle Drive; these drivers would make their trips on other local streets through the Richmond District. The remaining 40 percent (about 460 in the AM peak hour and 660 in the PM peak hour) would travel up Park Presidio and cut through the Toll Plaza Visitor’s area to continue their trip. These trips would distribute evenly; half (or 20 percent overall) would cut underneath the toll plaza, and the other half would use Lincoln Boulevard to cross underneath Doyle Drive to cross between one side to the other. This is forecasted to result in 350 AM peak hour vehicles and 100 PM peak hour vehicles traveling underneath the Toll Plaza in the peak direction, through this narrow roadway segment. Except for this localized increase in traffic in the toll plaza area, no other substantial change in local Presidio traffic volumes is forecast to occur. Thus, other local roadways are not expected to have deterioration in traffic speeds, or resulting levels of service.

Appropriate actions would be to discourage traffic in the toll plaza area by warning motorists of the lane closure and encouraging alternate routes, as well as coordinating an overall trip reduction strategy as part of the Transportation Management Plan. The results are shown in Tables 4.5.5-1 and 4.5.5-2.

Lincoln Boulevard Closure

Rerouting of local Presidio traffic would occur during the three month period while the 2A construction scenario (Park Presidio / Doyle Drive ramp closures) is in place, early in the project. During this time, Lincoln Boulevard near the National Cemetery is proposed for closure for a three month period. Local traffic would be diverted to Halleck, Mason and McDowell. This would occur during a period while the northbound Park Presidio ramp to southbound Doyle Drive would also be closed. (Note: Halleck would be required to be opened when Lincoln would be closed.) The most critical time period for this closure would be the PM, when 230 vehicles would be expected to use this diverted route westbound (Location 3 on Tables 4.4.1-1 and 4.4.1-2). As the detour roads have fewer than 50 vehicles forecast on them at peak hour, the additional traffic should not result in any adverse congestion.

Marina/Richardson Merge and Diverge Relocation

Following completion of the previous two scenarios, under the *No Detour Option*, a diversion of the Marina and Richardson merge (northbound) and diverge (southbound) points would be required. As traffic speeds and capacities would be reduced for this period, an overall drop of 80 vehicles northbound and 340 vehicles southbound would occur on Doyle Drive in the AM. The PM volumes would drop by 160 vehicles northbound and 250 vehicles southbound. These vehicles would relocate to a variety of other streets, with no other local streets showing more than 100 vehicles increase in traffic.

There results are also shown in Tables 4.5.5-1 and 4.5.5-2 as Network 2B. The analysis suggests that no major efforts are needed to reduce regional traffic volumes as a result of this shift beyond a general project-related traffic reduction strategy.

Marina Boulevard Access

During the final construction stage of the *No Detour option*, the replacement of Marina Boulevard access would require a temporary rerouting of traffic south of the facility. This traffic would need to cross the northbound Richardson Avenue roadway at an at-grade temporary signalized intersection. As there is also a temporary ramp proposed for much of the construction period to run from Doyle Drive northbound to Park Presidio southbound which may attract more traffic through the project site, this situation was tested with and without this temporary ramp in place.

In the AM condition, the northbound Doyle Drive volumes would drop by 60 vehicles and the southbound by 220 vehicles. In the PM condition, the roadway is projected to have a drop of 160 vehicles in the northbound direction, and less than 10 vehicles in the southbound direction. The traffic is anticipated to disperse to a variety of other streets, with no other street showing traffic changes of more than 100 vehicles in any direction.

The new intersection created in this situation should operate satisfactorily, assuming that three outbound lanes are available on Richardson through this intersection, and that two left-turn travel lanes are available for traffic wishing to travel to Marina. The high volume of PM peak hour right-turning traffic from the Marina detour (in addition to concerns about site distance) may also necessitate a signal control.

Assuming that all design constraints are met, no additional actions beyond the normal traffic reduction strategy for the project would seem to be needed.

There results are also shown in Tables 4.5.5-1 and 4.5.5-2 as network 2C.

Parkway Alternatives: Diamond Option and Circle Drive Option

Lincoln Boulevard Closure

Early in the project, one traffic detour would involve the rerouting of internal Presidio traffic. During the initial stages of construction, Lincoln Boulevard near the National Cemetery is proposed for closure for a three month period. During this time, local traffic will be diverted to Halleck, Mason and McDowell. This would occur during a period while the Northbound Park Presidio hook ramp to Southbound Doyle Drive would also be closed. (Note: Halleck would be required to be opened when Lincoln would be closed.) The most critical time period for this closure would be the PM, when 290 vehicles would be expected to use this diverted route westbound (Location 3 on Tables 4.5.5-3 and 4.5.5-4). As the detour roads have fewer than 50 vehicles forecast on them at peak hour, the additional traffic should not result in any adverse congestion.

Marina Boulevard Access without Doyle Drive to Park Presidio Ramp Closure

For the Parkway alternative, the “worst case” scenario is the point in the construction staging where traffic to and from Marina Boulevard would need to cross a temporary northbound Richardson Avenue traffic flow. As traffic flow varies between the Diamond Option and the Circle Drive option, both of these situations have been analyzed but the results were not appreciably different.

In this scenario, the substantially constrained outbound traffic on Richardson was tested at two lanes. In this instance, outbound Doyle Drive operated adequately in the AM peak hour, with less than 100 vehicles change on Doyle Drive. However, in the PM condition, the lack of three through lanes posed a substantial barrier to traffic, and over 1,000 vehicles shifted to other streets. About 250 vehicles would shift to Lincoln, another 250 vehicles would use Park Presidio to reach the bridge, and another 300 vehicles would choose other routes instead of using the Doyle Drive to Park Presidio southbound ramp. In the case where this ramp is closed, the traffic would divert to the toll plaza routing discussed above in Alternative 2. The remaining vehicles would disperse to other local streets. Except for this localized increase in traffic in the toll plaza area, no other significant change in local Presidio traffic volumes is forecast to occur. Thus, other local roadways are not expected to have deterioration in traffic speeds, or resulting levels of service.

For the above reason, a full three lanes would be needed to carry the volumes coming from Richardson Avenue. With three lanes, the new intersection created in this situation should operate satisfactorily and traffic diversion would not occur. Similar to Alternative 2, two left-turn travel lanes would be available for traffic wishing to travel to Marina Boulevard. The high volume of PM peak hour right-turning traffic from the Marina detour (in addition to concerns about site distance) may also necessitate a signal control.

No substantial congestion is anticipated on roadways within the Presidio during this phase. Generally, all of these local roadways are forecast to have stable or slightly lower traffic volumes, even with the closure of Halleck Street. Once the extension of Girard Road to Marina Boulevard is opened, it will experience increased traffic, but this is expected as part of the implementing of either of the Parkway Alternatives.

These strategies would need additional investigation as part of the *Transportation Management Plan*, and implementation monitoring with interactive traffic management would be required to alleviate this upcoming bottleneck.

Results are also shown in Tables 4.5.5-3 and 4.5.5-4. For the Diamond option construction, the traffic is shown to operate as to 5aB (with the Doyle Drive to Park Presidio Ramp opened). Traffic forecasted during a Circle Drive option construction are shown as 5bB (with the Doyle Drive to Park Presidio Ramp opened).

Marina Boulevard Access with Doyle Drive to Park Presidio Ramp Closure

One possible variation of the previously-mentioned phase is for the Doyle Drive northbound to Park Presidio southbound ramp to remain closed, rather than to have a temporary ramp for a portion of the construction period. In the case where this ramp is kept closed during construction, the traffic would divert to the toll plaza routing discussed above in Alternative 2. The remaining vehicles would disperse to other local streets.

Similar to the previously mentioned phase, a full three lanes would be needed to carry the anticipated volumes coming from Richardson Avenue. With three lanes, the signalized intersection created in this situation should operate satisfactorily and traffic diversion would not occur. Similar to alternative 2, 2 lanes would be available on Girard Road for traffic wishing to travel to Marina Boulevard.

No substantial congestion is anticipated on roadways within the Presidio during this phase. Generally, all of these local roadways are forecast to have stable or slightly lower traffic volumes, even with the closure of Halleck Street. Once the extension of Girard Road to Marina Boulevard is opened, it will experience increased traffic, but this is expected as part of the implementing of either of the Parkway Alternatives.

These strategies would need additional investigation as part of the Transportation Management Plan, and implementation monitoring with interactive traffic management would be required to alleviate this upcoming bottleneck.

Results are also shown in Tables 4.5.5-3 and 4.5.5-4. For the Diamond option construction, the traffic is shown to operate as to 5aA (with the Doyle Drive to Park Presidio Ramp closed). Traffic forecasted during a Circle Drive option construction are shown as 5bA (with the Doyle Drive to Park Presidio Ramp closed).

TABLE 4.5.5-1
2010 ALTERNATIVE 2 CONSTRUCTION PERIOD TRAFFIC VOLUME CHANGES – AM PEAK HOUR

Location		Dir.	2010				Change (from 2010 base)		
			No Build (veh)	2A (veh)	2B (veh)	2C (veh)	2A (veh)	2B (veh)	2C (veh)
1	US 101--Park Presidio On to Merchant Off	WB	3,470	4,260	3,470	3,470	790	0	0
	US 101--Merchant On to Park Presidio Off	EB	5,950	6,590	5,840	5,870	640	-110	-80
2	Lincoln--Long Avenue to Crissy Field	WB	40	50	70	50	10	30	10
	Lincoln--Crissy Field to Long Avenue	EB	20	20	20	20	0	0	0
3	Lincoln--Sheridan to Crissy Field	WB	70	70	70	70	0	0	0
	Lincoln--Crissy Field to Sheridan	EB	70	80	120	90	10	50	20
4	US 101--Marina On to Park Presidio Off	WB	2,240	2,000	2,160	2,180	-240	-80	-60
	US 101--Park Presidio On to Marina Off	EB	5,030	4,640	4,680	4,800	-390	-350	-230
5	Marina--US 101 to Lyon	WB	580	500	560	610	-80	-20	30
	Marina--Lyon to US 101	EB	1,450	1,360	1,410	1,400	-90	-40	-50
6	Mason--Zanowiz to Lyon	WB	30	10	10	10	-20	-20	-20
	Mason--Lyon to Zanowiz	EB	-	-	10	10	0	10	10
7	Richardson--Lyon to Marina On	WB	1,660	1,490	1,600	1,560	-170	-60	-100
	Richardson--Marina Off to Francisco	EB	3,580	3,280	3,270	3,410	-300	-310	-170
8	Lombard Gate--Lyon to Ruger	WB	560	560	530	550	0	-30	-10
	Lombard Gate--Ruger to Lyon	EB	470	470	470	460	0	0	-10
9	Girard--Lincoln to Gorgas	NB	40	60	60	60	20	20	20
	Girard--Gorgas to Lincoln	SB	20	20	20	20	0	0	0
10	Presidio Gate--Pacific to Broadway	NB	570	550	560	560	-20	-10	-10
	Presidio Gate--Broadway to Pacific	SB	630	640	630	630	10	0	0
11	Arguello Gate--Pacific to Washington	NB	120	130	120	120	10	0	0
	Arguello Gate--Washington to Pacific	SB	60	70	60	60	10	0	0
12	Park Presidio--Lake Street to US 101 Off	NB	2,590	2,270	2,490	2,530	-320	-100	-60
	Park Presidio--US 101 On to Lake Street	SB	2,290	1,950	2,340	2,310	-340	50	20
13	15th Ave--Lake to Wedemeyer	NB	30	30	30	30	0	0	0
	15th Ave--Wedemeyer to Lake	SB	60	60	60	60	0	0	0
14	Lincoln--Brooks to Browley	NB	540	550	530	530	10	-10	-10
	Lincoln--Browley to Brooks	SB	240	410	280	280	170	40	40
15	Lombard--Divisadero to Broderick	WB	1,520	1,450	1,530	1,480	-70	10	-40
	Lombard--Broderick to Divisadero	EB	2,190	2,220	2,170	2,220	30	-20	30
16	Marina--Divisadero to Broderick	WB	570	500	550	600	-70	-20	30
	Marina--Broderick to Divisadero	EB	1,210	1,240	1,210	1,180	30	0	-30
17	Halleck --Lincoln to Mason	NB	10	20	30	30	10	20	20
	Halleck--Mason to Lincoln	SB	20	20	10	20	0	-10	0
18	McDowell Street--Lincoln to Mason	NB	20	20	20	20	0	0	0
	McDowell Street-- Mason to Lincoln	SB	10	10	10	10	0	0	0

Source: DKS Associates, 2004

TABLE 4.5.5-2
2010 ALTERNATIVE 2 CONSTRUCTION PERIOD TRAFFIC VOLUME CHANGES – PM PEAK HOUR

Location		Dir.	2010				Change (from 2010 base)		
			No Build (veh)	2A (veh)	2B (veh)	2C (veh)	2A (veh)	2B (veh)	2C (veh)
1	US 101--Park Presidio On to Merchant Off	WB	5,710	6,460	5,670	5,620	750	-40	-90
	US 101--Merchant On to Park Presidio Off	EB	3,920	4,660	3,860	3,930	740	-60	10
2	Lincoln--Long Avenue to Crissy Field	WB	200	100	210	270	-100	10	70
	Lincoln--Crissy Field to Long Avenue	EB	20	30	30	20	10	10	0
3	Lincoln--Sheridan to Crissy Field	WB	290	230	310	370	-60	20	80
	Lincoln--Crissy Field to Sheridan	EB	80	80	100	90	0	20	10
4	US 101--Marina On to Park Presidio Off	WB	4,720	4,260	4,580	4,560	-460	-140	-160
	US 101--Park Presidio On to Marina Off	EB	3,070	2,630	2,820	3,070	-440	-250	0
5	Marina--US 101 to Lyon	WB	1,850	1,550	1,770	1,760	-300	-80	-90
	Marina--Lyon to US 101	EB	960	820	900	910	-140	-60	-50
6	Mason--Zanowiz to Lyon	WB	10	10	-	-	0	-10	-10
	Mason--Lyon to Zanowiz	EB	30	20	30	30	-10	0	0
7	Richardson--Lyon to Marina On	WB	2,880	2,700	2,810	2,810	-180	-70	-70
	Richardson--Marina Off to Francisco	EB	2,110	1,800	1,920	2,160	-310	-190	50
8	Lombard Gate--Lyon to Ruger	WB	550	550	530	550	0	-20	0
	Lombard Gate--Ruger to Lyon	EB	380	450	350	310	70	-30	-70
9	Girard--Lincoln to Gorgas	NB	40	60	50	50	20	10	10
	Girard--Gorgas to Lincoln	SB	50	90	60	60	40	10	10
10	Presidio Gate--Pacific to Broadway	NB	640	620	640	640	-20	0	0
	Presidio Gate--Broadway to Pacific	SB	630	600	610	620	-30	-20	-10
11	Arguello Gate--Pacific to Washington	NB	110	140	120	120	30	10	10
	Arguello Gate--Washington to Pacific	SB	180	200	170	170	20	-10	-10
12	Park Presidio--Lake Street to US 101 Off	NB	2,640	2,200	2,600	2,670	-440	-40	30
	Park Presidio--US 101 On to Lake Street	SB	2,510	2,040	2,550	2,470	-470	40	-40
13	15th Ave--Lake to Wedemeyer	NB	70	70	70	70	0	0	0
	15th Ave--Wedemeyer to Lake	SB	50	60	60	50	10	10	0
14	Lincoln--Brooks to Browley	NB	440	540	420	440	100	-20	0
	Lincoln--Browley to Brooks	SB	530	570	540	530	40	10	0
15	Lombard--Divisadero to Broderick	WB	2,160	2,150	2,170	2,160	-10	10	0
	Lombard--Broderick to Divisadero	EB	1,650	1,480	1,550	1,620	-170	-100	-30
16	Marina--Divisadero to Broderick	WB	1,260	1,230	1,270	1,240	-30	10	-20
	Marina--Broderick to Divisadero	EB	930	810	890	890	-120	-40	-40
17	Halleck --Lincoln to Mason	NB	20	20	30	20	0	10	0
	Halleck--Mason to Lincoln	SB	40	40	30	40	0	-10	0
18	McDowell Street--Lincoln to Mason	NB	200	90	210	260	-110	10	60
	McDowell Street-- Mason to Lincoln	SB	10	10	10	10	0	0	0

Source: DKS Associates, 2004

TABLE 4.5.5-3
2010 ALTERNATIVE 5 CONSTRUCTION PERIOD TRAFFIC VOLUME CHANGES – AM PEAK HOUR

Location		Dir.	2010					Change from 2010 Base			
			No Build (veh)	5aA (veh)	5aB (veh)	5bA (veh)	5bB (veh)	5aA (veh)	5aB (veh)	5bA (veh)	5bB (veh)
1	US 101--Park Presidio On to Merchant Off	WB	3,470	3,700	3,200	3,710	3,210	230	-270	240	-260
	US 101--Merchant On to Park Presidio Off	EB	5,950	6,080	5,530	6,070	5,530	130	-420	120	-420
2	Lincoln--Long Avenue to Crissy Field	WB	40	20	20	20	20	-20	-20	-20	-20
	Lincoln--Crissy Field to Long Avenue	EB	20	20	20	20	20	0	0	0	0
3	Lincoln--Sheridan to Crissy Field	WB	70	80	70	80	70	10	0	10	0
	Lincoln--Crissy Field to Sheridan	EB	70	50	40	50	40	-20	-30	-20	-30
4	US 101--Marina On to Park Presidio Off	WB	2,240	1,990	1,950	1,980	1,940	-250	-290	-260	-300
	US 101--Park Presidio On to Marina Off	EB	5,030	4,820	4,500	4,800	4,470	-210	-530	-230	-560
5	Marina--US 101 to Lyon	WB	580	460	470	440	440	-120	-110	-140	-140
	Marina--Lyon to US 101	EB	1,450	1,250	1,180	1,230	1,120	-200	-270	-220	-330
6	Mason--Zanowiz to Lyon	WB	30	20	20	20	20	-10	-10	-10	-10
	Mason--Lyon to Zanowiz	EB	-	10	10	10	10	10	10	10	10
7	Richardson--Lyon to Marina On	WB	1,660	1,550	1,510	1,530	1,470	-110	-150	-130	-190
	Richardson--Marina Off to Francisco	EB	3,580	3,000	2,840	3,010	2,850	-580	-740	-570	-730
8	Lombard Gate--Lyon to Ruger	WB	560	240	210	220	190	-320	-350	-340	-370
	Lombard Gate--Ruger to Lyon	EB	470	400	370	430	410	-70	-100	-40	-60
9	Girard--Lincoln to Gorgas	NB	40	70	60	20	20	30	20	-20	-20
	Girard--Gorgas to Lincoln	SB	20	480	430	470	430	460	410	450	410
10	Presidio Gate--Pacific to Broadway	NB	570	530	490	520	480	-40	-80	-50	-90
	Presidio Gate--Broadway to Pacific	SB	630	650	580	630	570	20	-50	0	-60
11	Arguello Gate--Pacific to Washington	NB	120	100	90	90	90	-20	-30	-30	-30
	Arguello Gate--Washington to Pacific	SB	60	80	70	80	70	20	10	20	10
12	Park Presidio--Lake Street to US 101 Off	NB	2,590	2,560	2,350	2,550	2,350	-30	-240	-40	-240
	Park Presidio--US 101 On to Lake Street	SB	2,290	2,100	2,130	2,090	2,150	-190	-160	-200	-140
13	15th Ave--Lake to Wedemeyer	NB	30	40	30	40	30	10	0	10	0
	15th Ave--Wedemeyer to Lake	SB	60	60	50	60	50	0	-10	0	-10
14	Lincoln--Brooks to Browley	NB	540	520	480	520	480	-20	-60	-20	-60
	Lincoln--Browley to Brooks	SB	240	380	200	390	210	140	-40	150	-30
15	Lombard--Divisadero to Broderick	WB	1,520	1,390	1,330	1,420	1,310	-130	-190	-100	-210
	Lombard--Broderick to Divisadero	EB	2,190	2,230	2,070	2,250	2,070	40	-120	60	-120
16	Marina--Divisadero to Broderick	WB	570	450	440	440	430	-120	-130	-130	-140
	Marina--Broderick to Divisadero	EB	1,210	1,180	1,090	1,170	1,060	-30	-120	-40	-150
17	Halleck --Lincoln to Mason	NB	10	0	0	0	0	-10	-10	-10	-10
	Halleck--Mason to Lincoln	SB	20	0	0	0	0	-20	-20	-20	-20
18	McDowell Street--Lincoln to Mason	NB	20	20	20	20	20	0	0	0	0
	McDowell Street-- Mason to Lincoln	SB	10	30	30	20	20	20	20	10	10

Source: DKS Associates, 2004

TABLE 4.5.5-4
2010 ALTERNATIVE 5 CONSTRUCTION PERIOD TRAFFIC VOLUME CHANGES – PM PEAK HOUR

Location		Dir.	2010					Change from 2010 Base			
			No Build (veh)	5aA (veh)	5aB (veh)	5bA (veh)	5bB (veh)	5aA (veh)	5aB (veh)	5bA (veh)	5bB (veh)
1	US 101--Park Presidio On to Merchant Off	WB	5710	5850	5470	5850	5470	140	-240	140	-240
	US 101--Merchant On to Park Presidio Off	EB	3920	4440	4110	4310	3960	520	190	390	40
2	Lincoln--Long Avenue to Crissy Field	WB	200	460	440	350	450	260	240	150	250
	Lincoln--Crissy Field to Long Avenue	EB	20	30	30	20	30	10	10	0	10
3	Lincoln--Sheridan to Crissy Field	WB	290	540	530	510	530	250	240	220	240
	Lincoln--Crissy Field to Sheridan	EB	80	90	90	80	90	10	10	0	10
4	US 101--Marina On to Park Presidio Off	WB	4720	3670	3750	3680	3790	-1050	-970	-1040	-930
	US 101--Park Presidio On to Marina Off	EB	3070	2900	2890	2810	2830	-170	-180	-260	-240
5	Marina--US 101 to Lyon	WB	1850	1130	1190	1090	1100	-720	-660	-760	-750
	Marina--Lyon to US 101	EB	960	710	710	580	600	-250	-250	-380	-360
6	Mason--Zanowiz to Lyon	WB	20	30	30	20	30	10	10	0	10
	Mason--Lyon to Zanowiz	EB	20	20	20	20	20	0	0	0	0
7	Richardson--Lyon to Marina On	WB	2880	2650	2660	2530	2580	-230	-220	-350	-300
	Richardson--Marina Off to Francisco	EB	2110	1960	1950	2120	2110	-150	-160	10	0
8	Lombard Gate--Lyon to Ruger	WB	550	510	460	480	480	-40	-90	-70	-70
	Lombard Gate--Ruger to Lyon	EB	380	300	270	240	290	-80	-110	-140	-90
9	Girard--Lincoln to Gorgas	NB	50	360	330	260	300	310	280	210	250
	Girard--Gorgas to Lincoln	SB	40	70	70	50	70	30	30	10	30
10	Presidio Gate--Pacific to Broadway	NB	640	580	590	590	590	-60	-50	-50	-50
	Presidio Gate--Broadway to Pacific	SB	630	570	580	560	580	-60	-50	-70	-50
11	Arguello Gate--Pacific to Washington	NB	110	180	170	140	180	70	60	30	70
	Arguello Gate--Washington to Pacific	SB	180	240	220	210	200	60	40	30	20
12	Park Presidio--Lake Street to US 101 Off	NB	2640	2690	2760	2720	2810	50	120	80	170
	Park Presidio--US 101 On to Lake Street	SB	2510	2050	2260	2050	2260	-460	-250	-460	-250
13	15th Ave--Lake to Wedemeyer	NB	70	70	70	70	80	0	0	0	10
	15th Ave--Wedemeyer to Lake	SB	60	60	60	60	60	0	0	0	0
14	Lincoln--Brooks to Browley	NB	440	440	480	480	470	0	40	40	30
	Lincoln--Browley to Brooks	SB	530	490	480	490	480	-40	-50	-40	-50
15	Lombard--Divisadero to Broderick	WB	2160	2180	2130	2150	2150	20	-30	-10	-10
	Lombard--Broderick to Divisadero	EB	1650	1670	1670	1680	1680	20	20	30	30
16	Marina--Divisadero to Broderick	WB	1260	1110	1140	1090	1090	-150	-120	-170	-170
	Marina--Broderick to Divisadero	EB	930	690	680	560	580	-240	-250	-370	-350
17	Halleck --Lincoln to Mason	NB	20	0	0	0	0	-20	-20	-20	-20
	Halleck--Mason to Lincoln	SB	40	0	0	0	0	-40	-40	-40	-40
18	McDowell Street--Lincoln to Mason	NB	200	410	330	310	380	210	130	110	180
	McDowell Street-- Mason to Lincoln	SB	10	50	50	50	50	40	40	40	40

Source: DKS Associates, 2004

5.0 TRAFFIC IMPACTS OF DESIGN OPTIONS

Two design options have been identified that would result in different roadway configurations near the GGB Toll Plaza and the Park Presidio Interchange, but these options are not expected to adversely affect the corridor's traffic demands. As a result, a summary of the analyzed traffic volumes and results on expected traffic circulations for these options are provided in this chapter.

5.1 THE MERCHANT ROAD SLIP RAMP

It is documented that Doyle Drive under existing conditions has a continued weaving deficiency for northbound traffic between Park Presidio on-ramp and Merchant Road off-ramp. This weaving deficiency is a daily occurrence and often will impact mainline traffic circulation on Doyle Drive. This can be eliminated by the Merchant Road Slip Ramp option which proposes to eliminate this severe weaving problem by providing a slip ramp to Merchant Road. This design option basically allows traffic to access the toll plaza area and Merchant Road from Doyle Drive without weaving with through traffic on the mainline, eliminating the weaving deficiency.

In testing this option in the San Francisco County travel model, the effect of this alternative is less than 20 vehicles on any link. A demonstration of traffic changes on potentially affected links is provided as Table 5.1-1 for AM peak hour conditions, and Table 5.1-2 for PM peak hour conditions. As these tables show, the result of adding the slip ramp would not significantly affect other traffic volumes in the area. The expected traffic demand is distributed to specific ramps that eliminates the weaving activity and mainline traffic impacts. The one segment with a substantial reduction in volumes would be the mainline segment between Park Presidio and the Merchant Road on-ramp, as the off-ramp traffic would no longer be traveling on this segment. Otherwise, the traffic volumes would change by less than 80 vehicles or 1.3 percent for surrounding segments for the AM or PM peak hours. This variation is well within the margin of error of a travel model assignment process.

TABLE 5.1-1
AM PEAK HOUR VOLUMES FOR MERCHANT ROAD SLIP RAMP DESIGN OPTIONS

Segment	Direction	Base Year	Design Year			
			Parkway Diamond Option (current design)	Merchant Road Ramp Option	Difference	Percent Difference
Doyle Drive from Marina Boulevard to Park Presidio	NB	2049	2994	2980	-14	-0.5%
Doyle Drive from Park Presidio to Merchant Road	NB	2994	5091	4858	-233	-4.6%
Golden Gate Bridge	NB	3108	5479	5417	-62	-1.1%
Ramp from Doyle Drive NB to Park Presidio SB	NB	448	354	387	33	9.3%
Ramp from Doyle Drive NB to Merchant Road	NB	220	242	197	-45	-18.6%
Merchant Road from Overlook to Lincoln	SB	203	141	95	-46	-32.6%
Lincoln from Merchant Road to Merchant Road	WB	68	105	66	-39	-37.1%

Source: DKS Associates, July 2004.

TABLE 5.1-2
PM PEAK HOUR VOLUMES FOR MERCHANT ROAD SLIP RAMP DESIGN OPTIONS

Segment	Direction	Base Year	Design Year			
			Parkway Diamond Option (current design)	Merchant Road Ramp Option	Difference	Percent Difference
Doyle Drive from Marina Boulevard to Park Presidio	NB	4619	4924	4915	-9	-0.2%
Doyle Drive from Park Presidio to Merchant Road	NB	5649	6448	6104	-344	-5.3%
Golden Gate Bridge	NB	5890	6500	6501	1	0.0%
Ramp from Doyle Drive NB to Park Presidio SB	NB	1014	671	685	14	2.1%
Ramp from Doyle Drive NB to Merchant Road	NB	306	363	313	-50	-13.8%
Merchant Road from Overlook to Lincoln	SB	102	172	126	-46	-26.7%
Lincoln from Merchant Road to Merchant Road	WB	108	144	107	-37	-25.7%

Source: DKS Associates, July 2004.

5.2 THE PARK PRESIDIO NORTHBOUND TO DOYLE DRIVE SOUTHBOUND HOOK RAMP OPTION

The loop ramp configuration carried forth in Alternative 5 can be shortened to a hook ramp configuration for cost savings. This ramp configuration would change traffic volumes slightly, and this change is documented.

While the ramp change to a hook ramp would not introduce any additional traffic movements, the slightly shorter distance would result in slight increases to ramp traffic on this segment. It would also create minor changes to traffic on surrounding streets, but these changes are not more than 75 vehicles or greater than 1.7 percent of the mainline Doyle Drive traffic. A demonstration of traffic changes on potentially affected links is provided as Table 5.2-1 for AM peak hour conditions, and Table 5.2-2 for PM peak hour conditions.

TABLE 5.2-1
AM PEAK HOUR VOLUMES FOR PARK PRESIDIO TO DOYLE RAMP DESIGN OPTIONS

Segment	Direction	Base Year	Design Year			
			Loop Ramp Option (Diamond)	Park Presidio to Doyle Drive Hook Ramp Option	Difference	Percent Difference
Doyle Drive from Park Presidio to Marina Boulevard	SB	5203	4951	4972	21	0.4%
Doyle Drive from Golden Gate Bridge to Park Presidio	SB	6149	6550	6497	-53	-0.8%
Golden Gate Bridge	SB	6276	6629	6612	-17	-0.3%
Ramp from Park Presidio NB to Doyle Drive SB	NB	986	623	677	54	8.7%
Lincoln from Merchant Road to Merchant Road	EB	409	613	621	8	1.3%
Park Presidio from Lake Street to Doyle Drive	NB	2379	3073	3097	24	0.8%

Source: DKS Associates, July 2004.

TABLE 5.2-2
PM PEAK HOUR VOLUMES FOR PARK PRESIDIO TO DOYLE RAMP DESIGN OPTIONS

Segment	Direction	Base Year	Design Year			
			Loop Ramp Option (Diamond)	Park Presidio to Doyle Drive Hook Ramp Option	Difference	Percent Difference
Doyle Drive from Park Presidio to Marina Boulevard	SB	2607	3785	3849	64	1.7%
Doyle Drive from Golden Gate Bridge to Park Presidio	SB	3120	5612	5602	-10	-0.2%
Golden Gate Bridge	SB	2987	5734	5736	2	0.0%
Ramp from Park Presidio NB to Doyle Drive SB	NB	724	596	671	75	12.6%
Lincoln from Merchant Road to Merchant Road	EB	449	504	503	-1	-0.2%
Park Presidio from Lake Street to Doyle Drive	NB	2768	2792	2838	46	1.6%

Source: DKS Associates, July 2004.

6.0 TRAFFIC AND TRANSIT OPERATIONS HIGHLIGHTS

In comparison to the base year condition, traffic conditions and congestion changes are related primarily to an increase in regional growth and the implementation of the Presidio Trust's management plan to become self-sufficient by Year 2013.

Traffic operations for all alternatives would operate generally as well or slightly better, when compared with the Design Year No-Build condition. The differences in traffic volumes between alternatives would vary by only eight percent and result from the access option used.

In Alternative 5 options, traffic volumes would decrease slightly on both Richardson Avenue and Marina Boulevard due to slower roadway speeds on the segments east of Lyon Street, when compared to current traffic conditions. In addition, new traffic signals would be installed on these roadways, further encouraging slower speeds. The reduction in traffic would also be a result of less vehicles using Doyle Drive to go between the Richmond and Sunset areas and slightly more Golden Gate Bridge traffic using Park Presidio (due to encouraged use in the southbound direction with the widened ramp from SB 101 off of the Golden Gate Bridge and onto Park Presidio).

By the Design Year, traffic increases will be expected, primarily in the off-peak direction. In addition, additional travel to and from the Presidio will occur as a result of development activity underway there.

Expected Design Year traffic demands for Alternative 5, show an increase on Richardson Avenue and decrease demands on Marina Boulevard. This would occur because Marina Boulevard traffic would utilize a newly created Girard/Marina interchange with multiple signals, and travel on slower speed, urban street segments between Lyon Street and Doyle Drive. This would encourage less traffic to utilize Doyle Drive / Marina Boulevard via the connection.

In the Merchant Road Slip Ramp option, Doyle Drive northbound traffic approaching the Golden Gate Bridge would be able to exit before the Toll Plaza area without having to weave across traffic coming from northbound Park Presidio, which would improve roadway operations. It is not expected to create any notable shifts in traffic of more than 20 vehicles except for traffic directly on this ramp.

The Hook Ramp option for the Park Presidio northbound to Doyle Drive southbound would have slight increases on Doyle Drive and Park Presidio traffic, but this increase would be less than 80 vehicles.

A tabular summary of traffic and transit changes is also provided below with more details of the differences between the project alternatives.

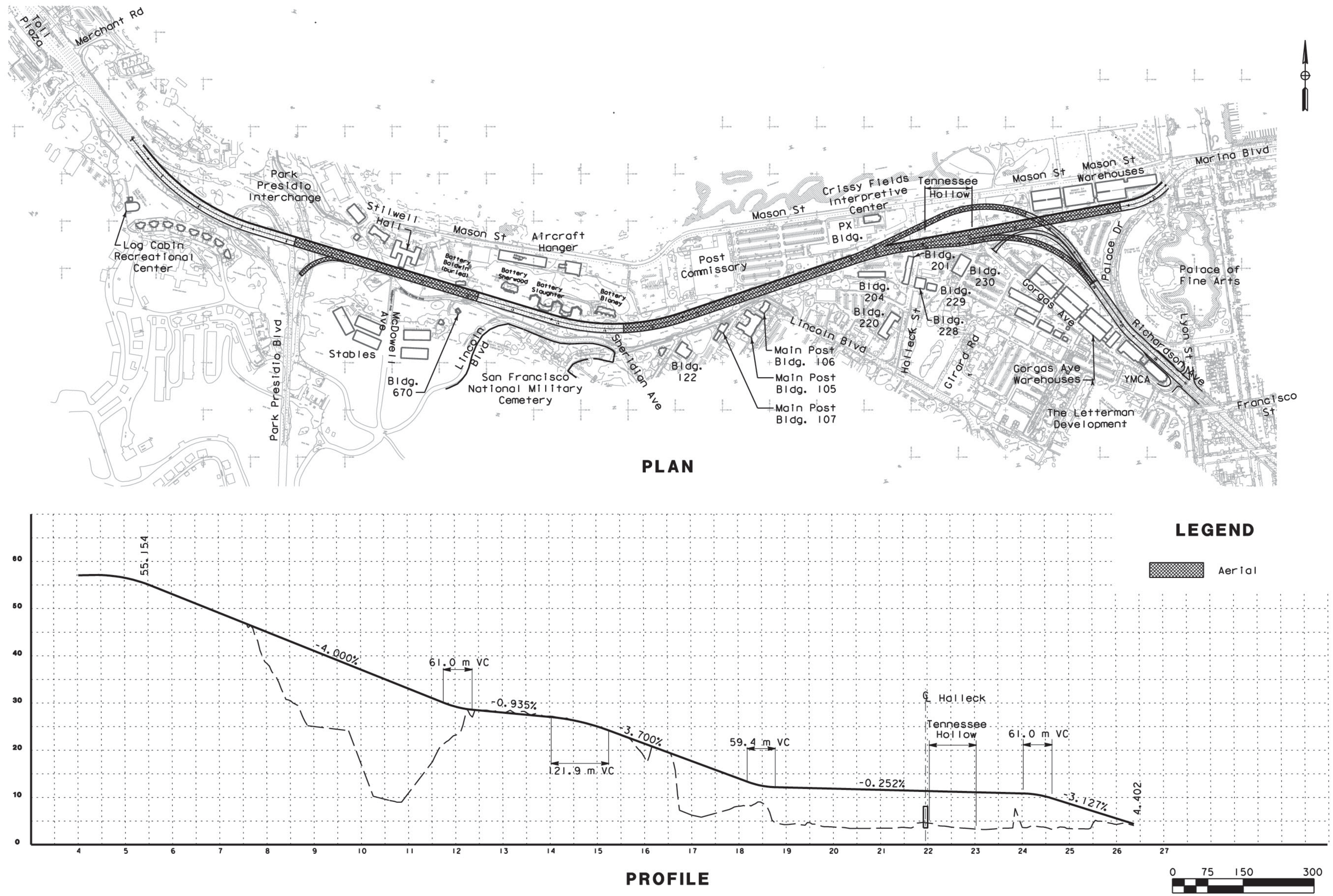
TABLE 6-1
SUMMARY OF FINDINGS

Transportation Effect	Alternative 1	Alternative 2 Replace and Widen	Alternative 5 Diamond Option	Alternative 5 Circle Drive Option
Effect on Marina Boulevard/Lyon Street interesection traffic	Highest estimated intersection delay of 9seconds	Highest estimated intersection delay of over 25 seconds at	Highest estimated intersection delay of 14 seconds	Highest estimated intersection delay of 14 seconds
Effect on Mainline Doyle Drive traffic flow	Less than 10% increase in peak traffic from base year	Less than 10% increase in peak traffic from base year	Less than 10% increase in peak traffic from base year	Less than 10% increase in peak traffic from base year
			2% increase in peak traffic from 2030 No-build	2% increase in peak traffic from 2030 No-build
	63% to 68% increase in non-peak traffic from base year	67% to 74% increase in non-peak traffic from base year	70% to 80% increase in non-peak traffic from base year	70% to 80% increase in non-peak traffic from base year
			Less than 2% increase in non-peak traffic from 2030 No-build	Less than 2% increase in non-peak traffic from 2030 No-build
Effect on Park Presidio/Merchant Road area	Weaving deficiency NB between Park Presidio and Merchant	Weaving deficiency NB between Park Presidio and Merchant	Weaving deficiency NB between Park Presidio and Merchant (eliminated by Merchant Rd slip ramp option)	Weaving deficiency NB between Park Presidio and Merchant (eliminated by Merchant Rd slip ramp option)
	Ramp deficiency from US 101 SB to Park Presidio SB	Ramp deficiency from US 101 SB to Park Presidio SB	Ramp deficiency eliminated by 2-lane exit ramp	Ramp deficiency eliminated by 2-lane exit ramp
Effect on transit travel times	Adds 0.4 (AM)/0.7 (PM) minutes to Doyle routes compared to base year	Adds 0.4 (AM)/0.7 (PM) minutes to Doyle routes compared to base year	Adds 1.3 (AM)/2.3 (PM) minutes to Doyle routes compared to base year	Adds 0.1 (AM)/ 1.7 (PM) minutes on Doyle routes compared to base year
			Adds 0.9 (AM)/1.6 (PM) minutes to Doyle routes compared to 2030 No-build	Adds -0.3 (AM)/ 1.0 (PM) minutes on Doyle routes compared to 2030 No-build
Greatest effect from construction phasing		Closure of Park Presidio to Doyle Ramps; traffic would divert to Toll Plaza area and Richmond streets Temporary detour of Marina Boulevard adequate if three lanes outbound available on Richardson	Temporary detour of Marina Boulevard adequate if three lanes outbound available on Richardson	Temporary detour of Marina Boulevard adequate if three lanes outbound available on Richardson
Effects on Presidio traffic	Indirect entrance at Letterman Digital Arts Complex and Main Post from the east (temporary slip ramp)	Indirect entrance at Letterman Digital Arts Complex and Main Post from the east (no temporary slip ramp)	Direct access into Letterman Digital Arts Complex and Main Post area	Direct access into Letterman Digital Arts Complex and Main Post area
	Indirect egress for Main Post in all directions	Indirect egress for Main Post in all directions	Direct egress for Letterman Digital Arts Complex and Main Post area, except out-of-direction for northbound Doyle traffic	Direct egress for Letterman Digital Arts Complex and Main Post area
	1030 peak hour vehicles through Lombard Gate	1010 peak hour vehicles through Lombard Gate	720 AM peak hour vehicles through Lombard Gate	680 AM peak hour vehicles through Lombard Gate
Effect on pedestrian walk times	No change from base year	No change from base year	25% reduction from base year/no-build for trips crossing Doyle	25% reduction from base yearno-build for trips crossing Doyle

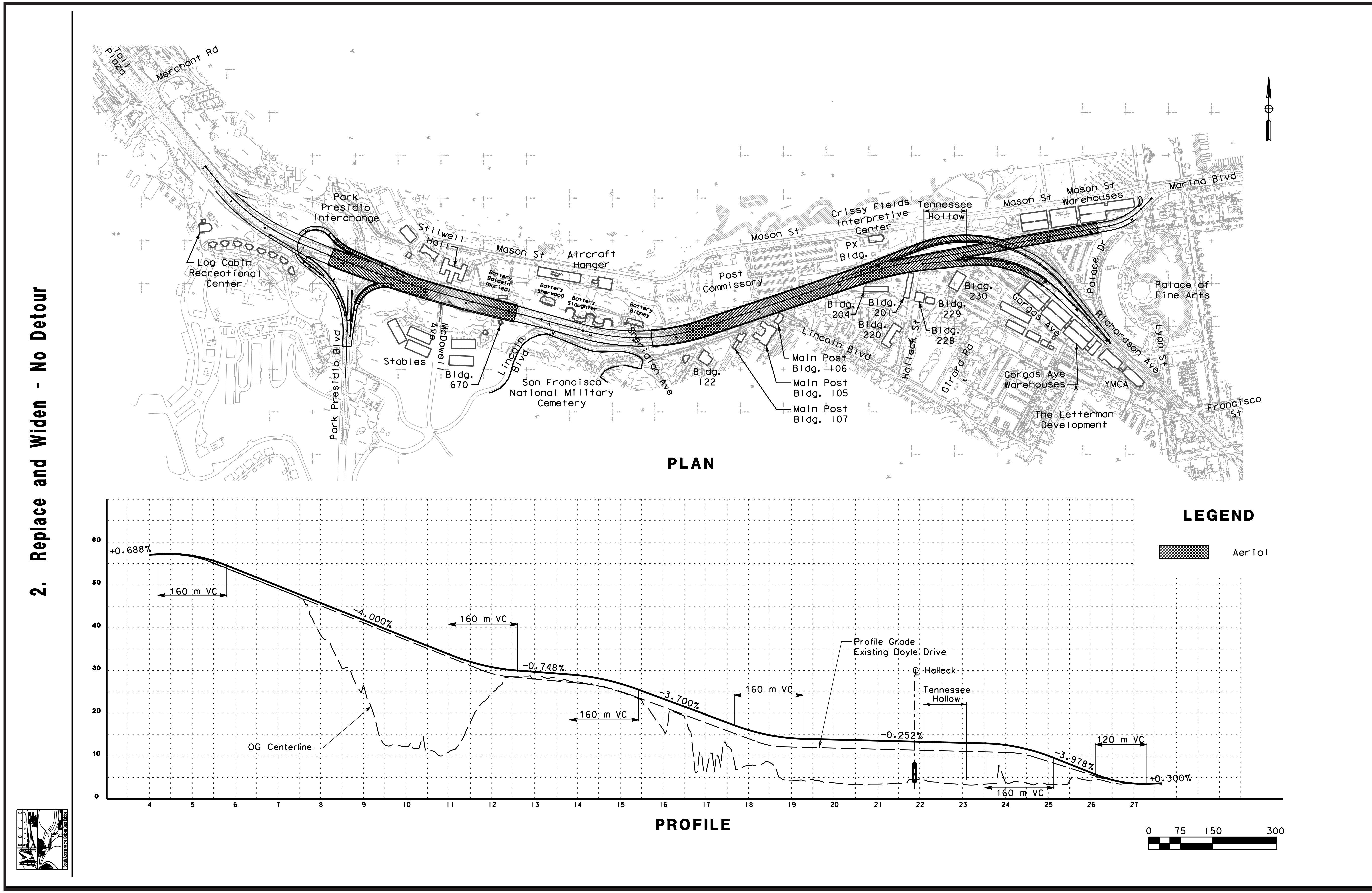
APPENDIX A

DETAILED DRAWINGS

1. No Build



No Build Alternative



04548.04

Alternative 2—Replace and Widen – No Detour

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

DESIGN OVERSIGHT	CALCULATED/ DESIGNED BY	CHECKED BY	REVISED BY	DATE REVISED

04548.04

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
.	.	.	.		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. STATE OF CALIFORNIA

PARSONS BRINCKERHOFF QUADE & DOUGLAS, INC.
303 SECOND STREET, SUITE 700 N
SAN FRANCISCO, CA 94107

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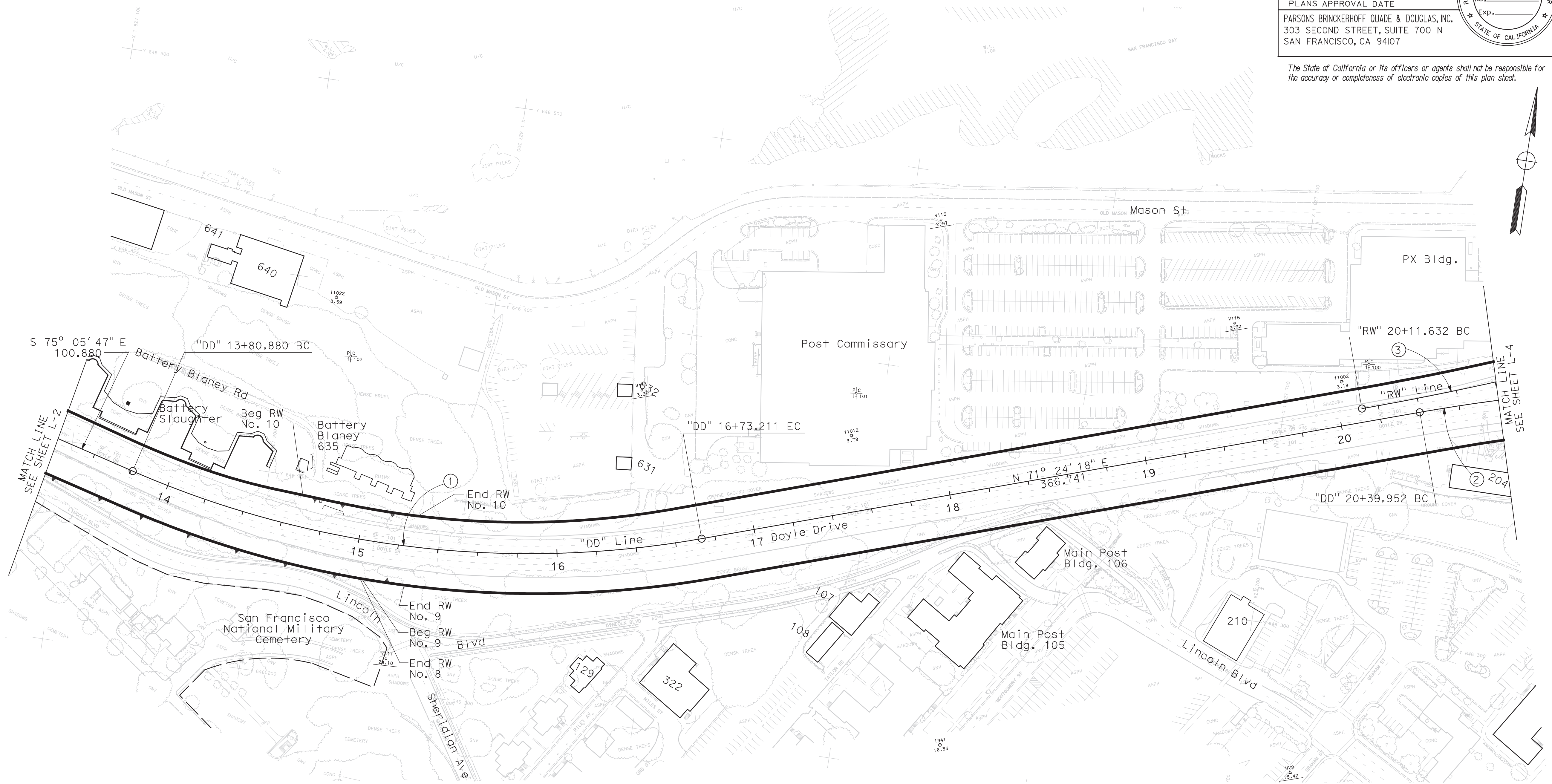
Doyle Drive Implementing The Vision

Caltrans Metric



CURVE DATA

NO.	R	△	T	L	X	Y
1	500.000	33°29'55"	150.477	292.332	1,827,277.534	646,251.466
2	900.000	8°08'31"	64.055	127.893	1,827,828.462	646,436.821
3	1,510.200	2°41'50"	35.555	71.097	1,827,772.407	646,425.242

ALTERNATIVE 2
REPLACE AND WIDEN - NO DETOUR
LAYOUT

SCALE: 1:1000

L-3

Alternative 2—Replace and Widen – No Detour
Detail Near Batteries and Building 106

CURVE DATA

NO.	R	△	T	L	X	Y
1	900.000	8°08′31″	64.055	127.893	1,827,828.462	646,436.821
2	138.378	34°58′40″	43.601	84.477	1,828,404.981	646,543.185
3	301.200	71°48′12″	218.046	377.465	1,828,119.220	646,560.406
4	272.667	49°10′19″	124.756	234.006	1,828,154.183	646,468.179
5	1000.000	2°41′50″	35.555	71.097	1,827,772.407	646,425.242

Doyle Drive — Implementing The Vision

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
.	.	.	.		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. STATE OF CALIFORNIA

PARSONS BRINCKERHOFF QUADE & DOUGLAS, INC.
303 SECOND STREET, SUITE 700 N
SAN FRANCISCO, CA 94107

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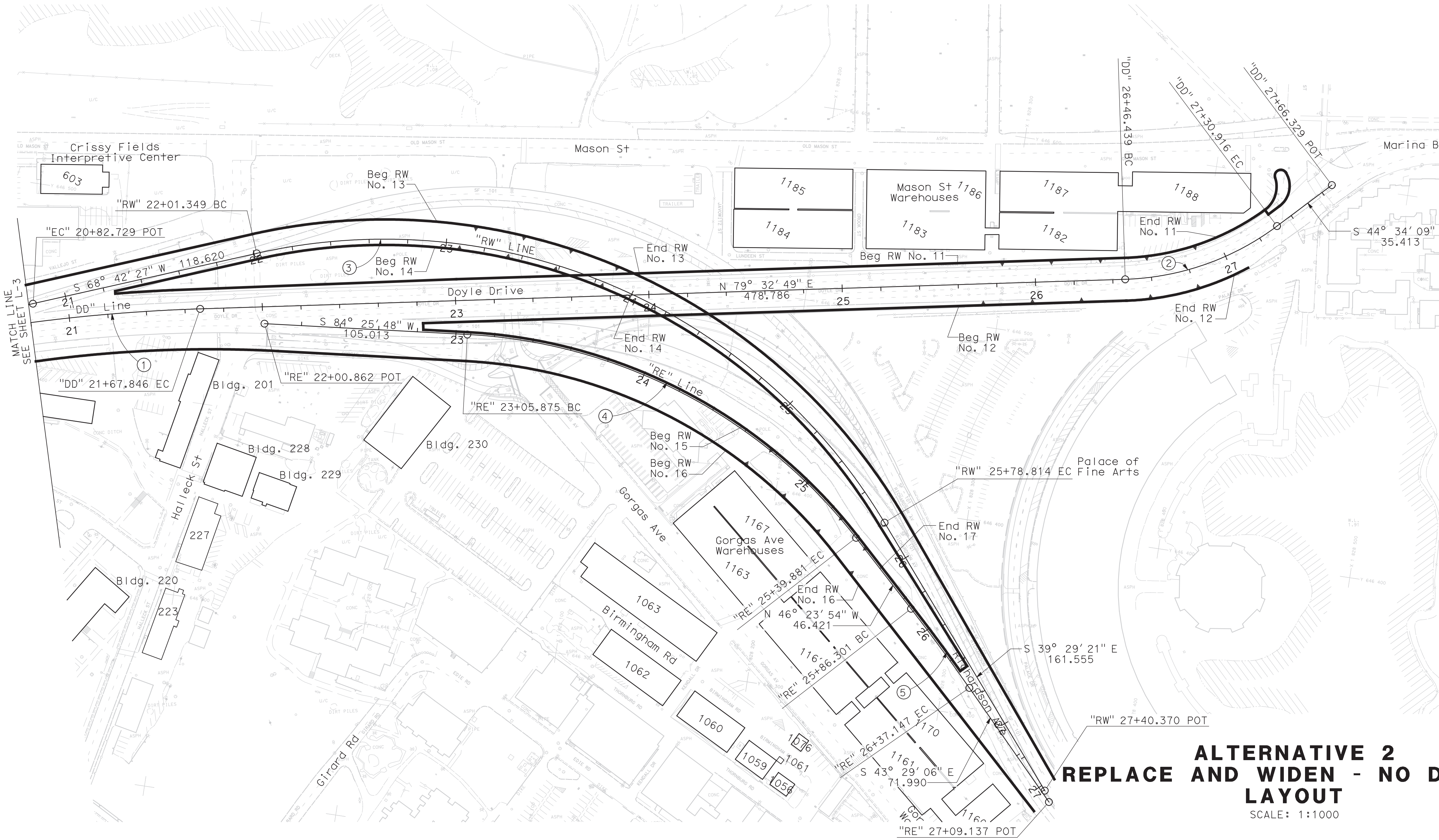


ALTERNATIVE 2
REPLACE AND WIDEN - NO DETOUR
LAYOUT

SCALE: 1:1000

L-4

DATE | REVISED BY | DATE REVISED

CALCULATED/DESIGNED BY | CHECKED BY

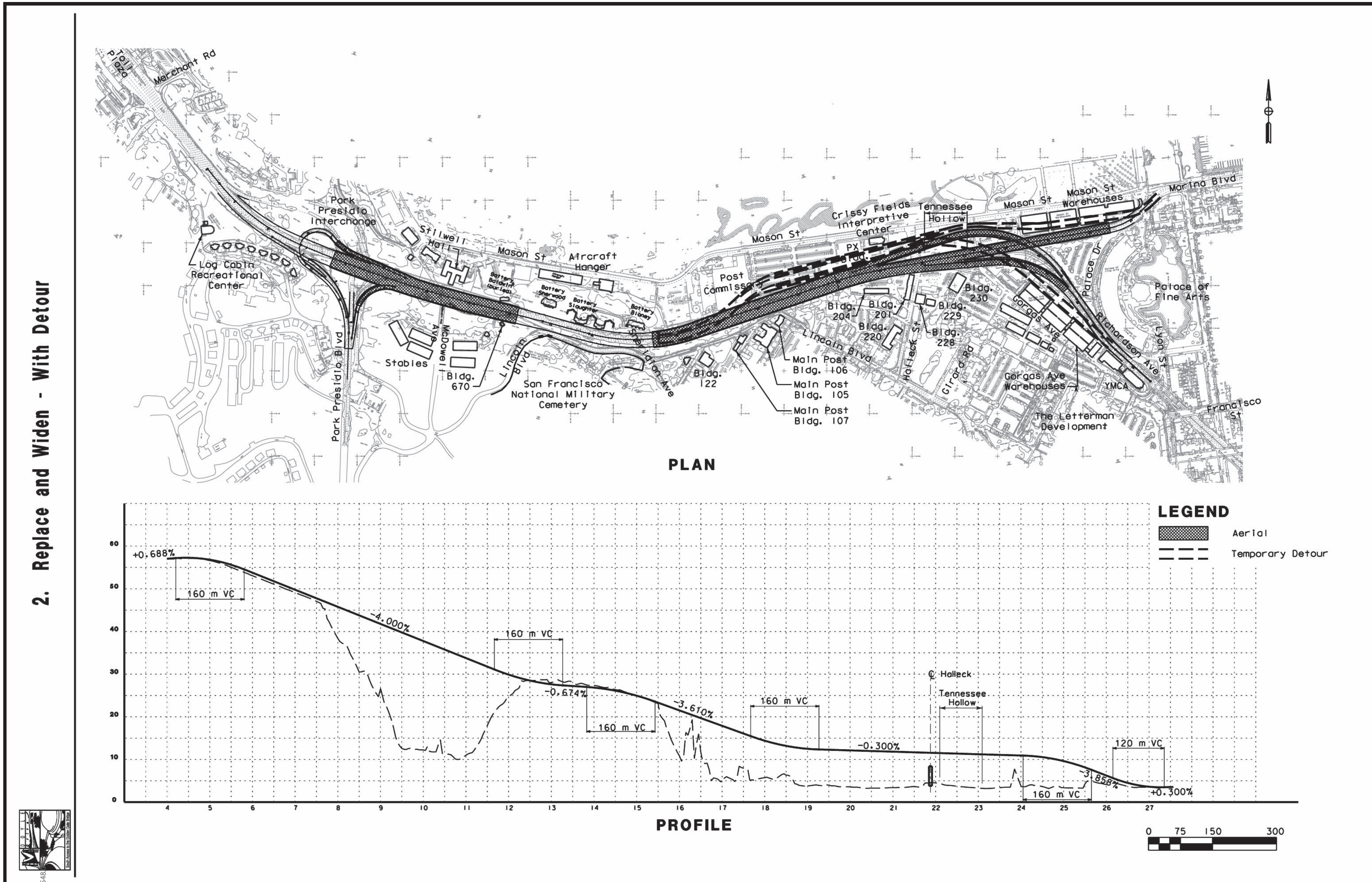
DESIGN OVERSIGHT

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

04548.04

Alternative 2—Replace and Widen – No Detour
Detail of Gorgas Avenue and Mason Street



Alternative 2—Replace and Widen – with Detour

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
.	.	.	.		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. STATE OF CALIFORNIA

PARSONS BRINCKERHOFF QUADE & DOUGLAS, INC.
303 SECOND STREET, SUITE 700 N
SAN FRANCISCO, CA 94107

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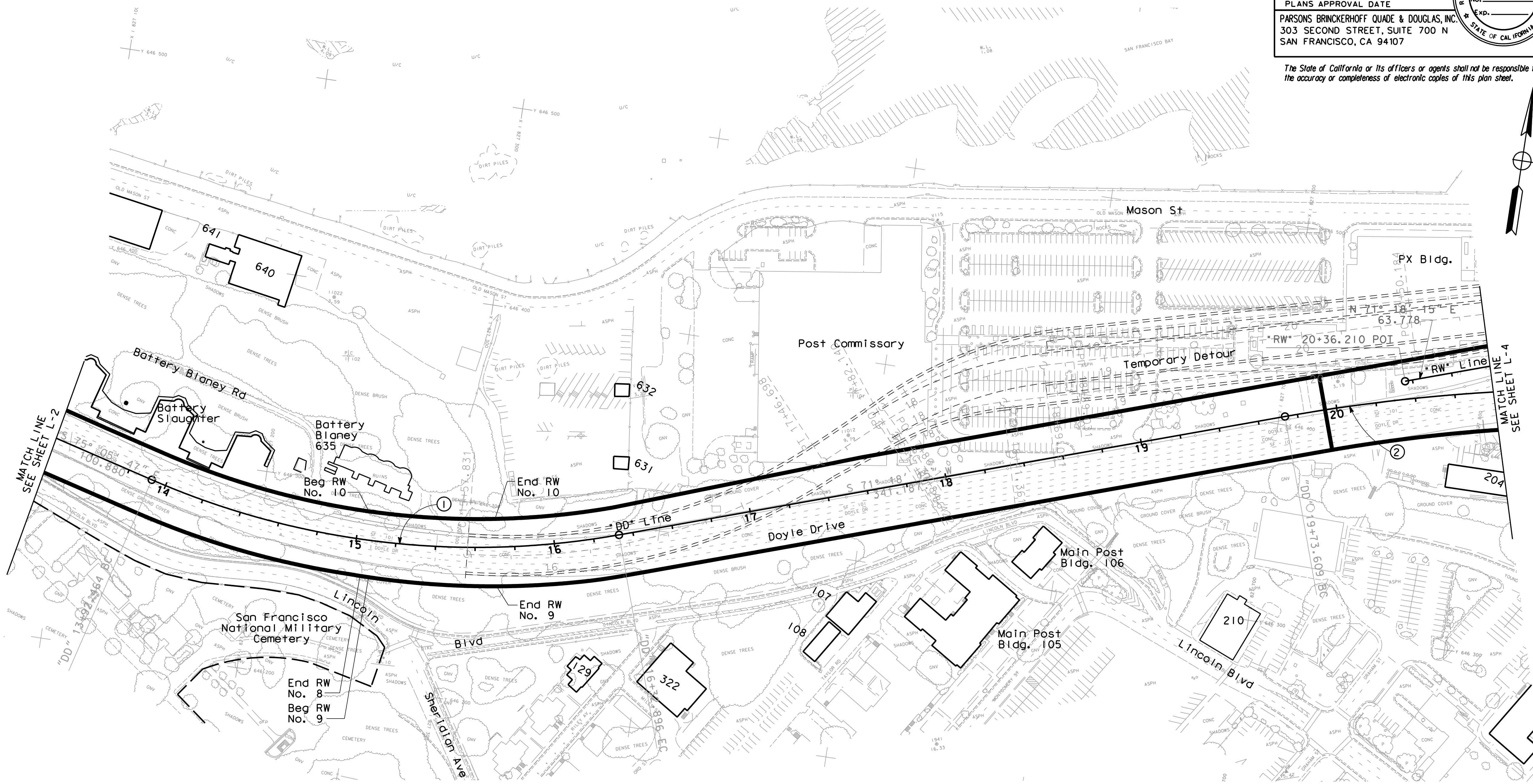

CURVE DATA

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2	900.000	8° 45′ 34″	68.931	137.594	1,827,768.215	646,426.338

ALTERNATIVE 2
REPLACE AND WIDEN - WITH DETOUR
LAYOUT

SCALE: 1:1000

L-3

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

DESIGN OVERSIGHT | CALCULATED/DESIGNED BY | CHECKED BY | DATE | REVISED BY | DATE REVISED

04548.04

Alternative 2—Replace and Widen – with Detour
Detail Near Batteries and Building 106

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
.	.	.	.		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
No.
Exp.
STATE OF CALIFORNIA

PARSONS BRINCKERHOFF QUADE & DOUGLAS, INC.
303 SECOND STREET, SUITE 700 N
SAN FRANCISCO, CA 94107

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CURVE DATA

NO.	R	△	T	L	X	Y
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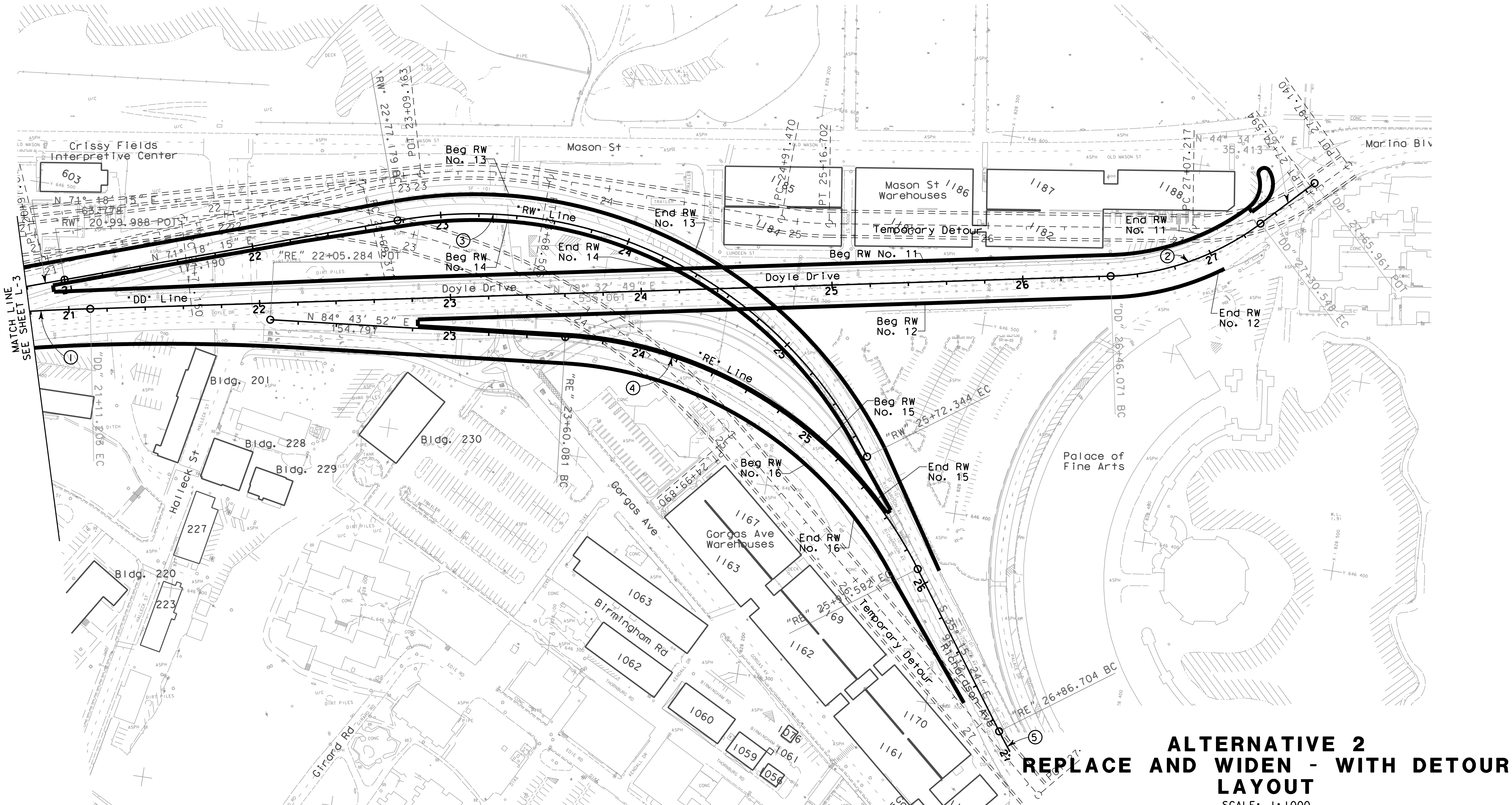
2	138.378	34° 58′ 40″	43.601	84.477	1,828,404.981	646,543.185
3	230.000	73° 31′ 46″	171.841	295.166	1,828,151.123	646,563.198
4	221.032	60° 00′ 44″	127.644	231.511	1,828,211.458	646,472.683
5	248.000	12° 37′ 27″	27.433	54.643	1,828,355.877	646,268.385



ALTERNATIVE 2
REPLACE AND WIDEN - WITH DETOUR
LAYOUT
SCALE: 1:1000

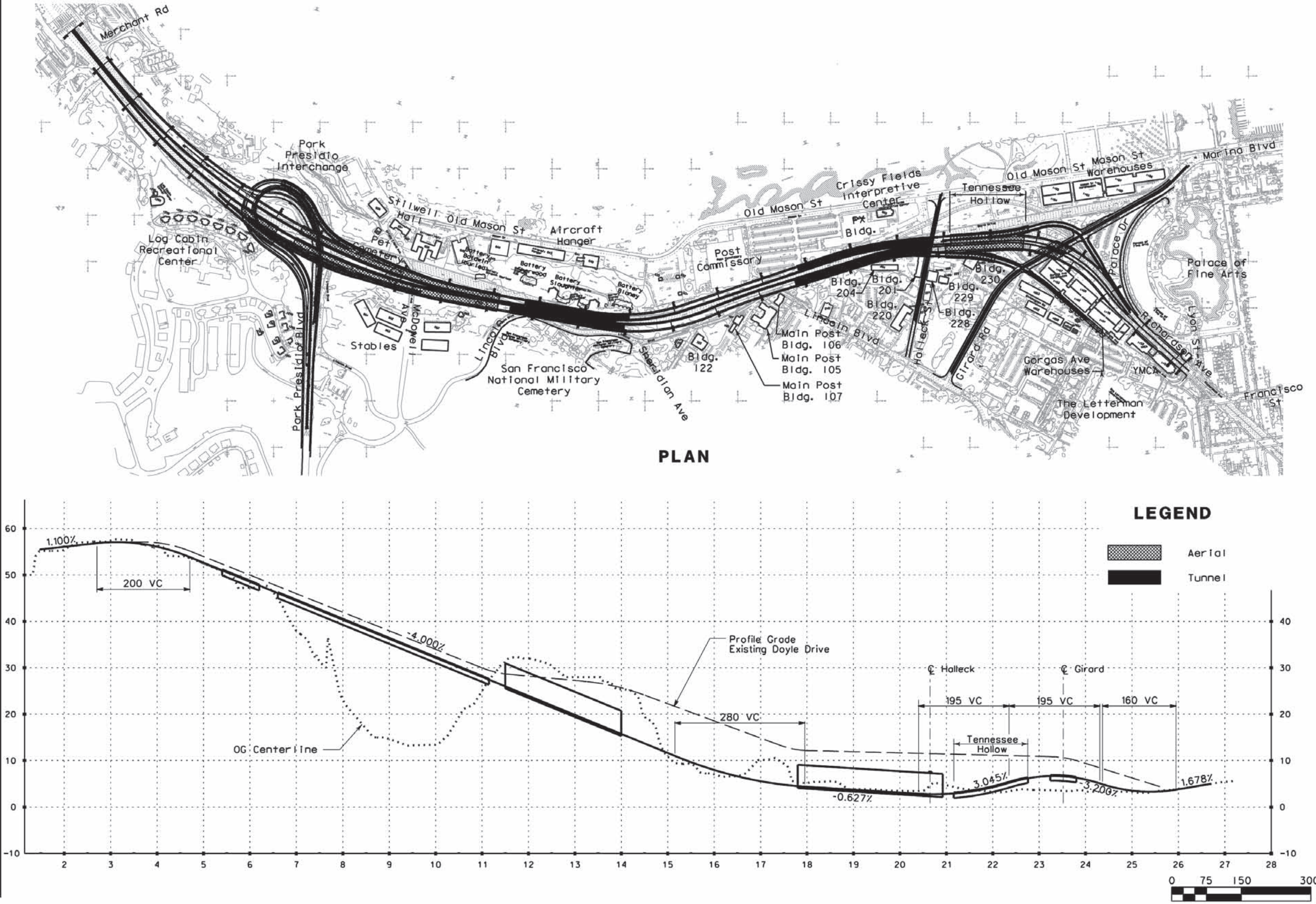
L-4

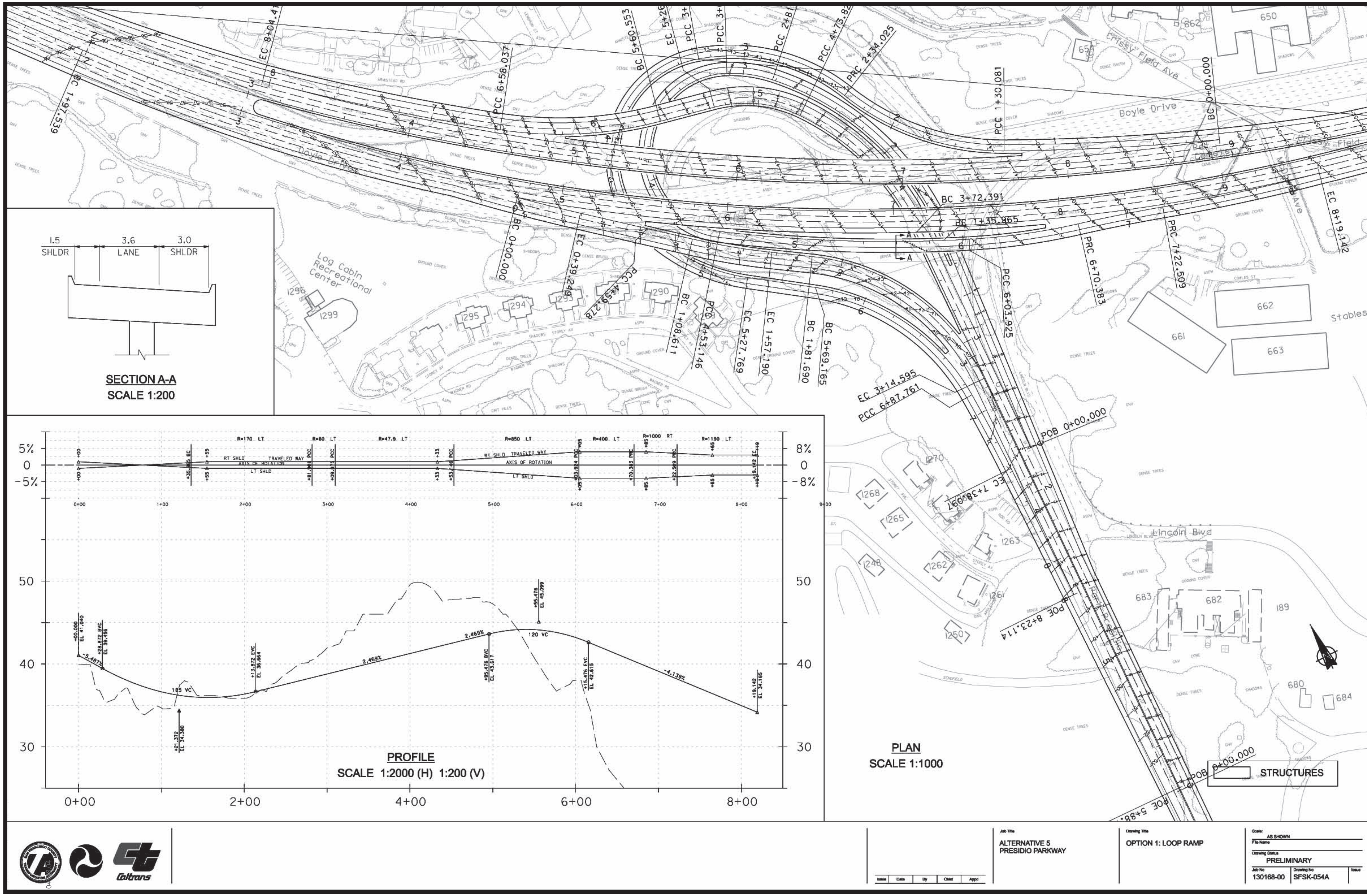
DATE | REVISED BY | DATE REVISED
CALCULATED/DESIGNED BY | CHECKED BY
DESIGN OVERSIGHT
STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

04548.04

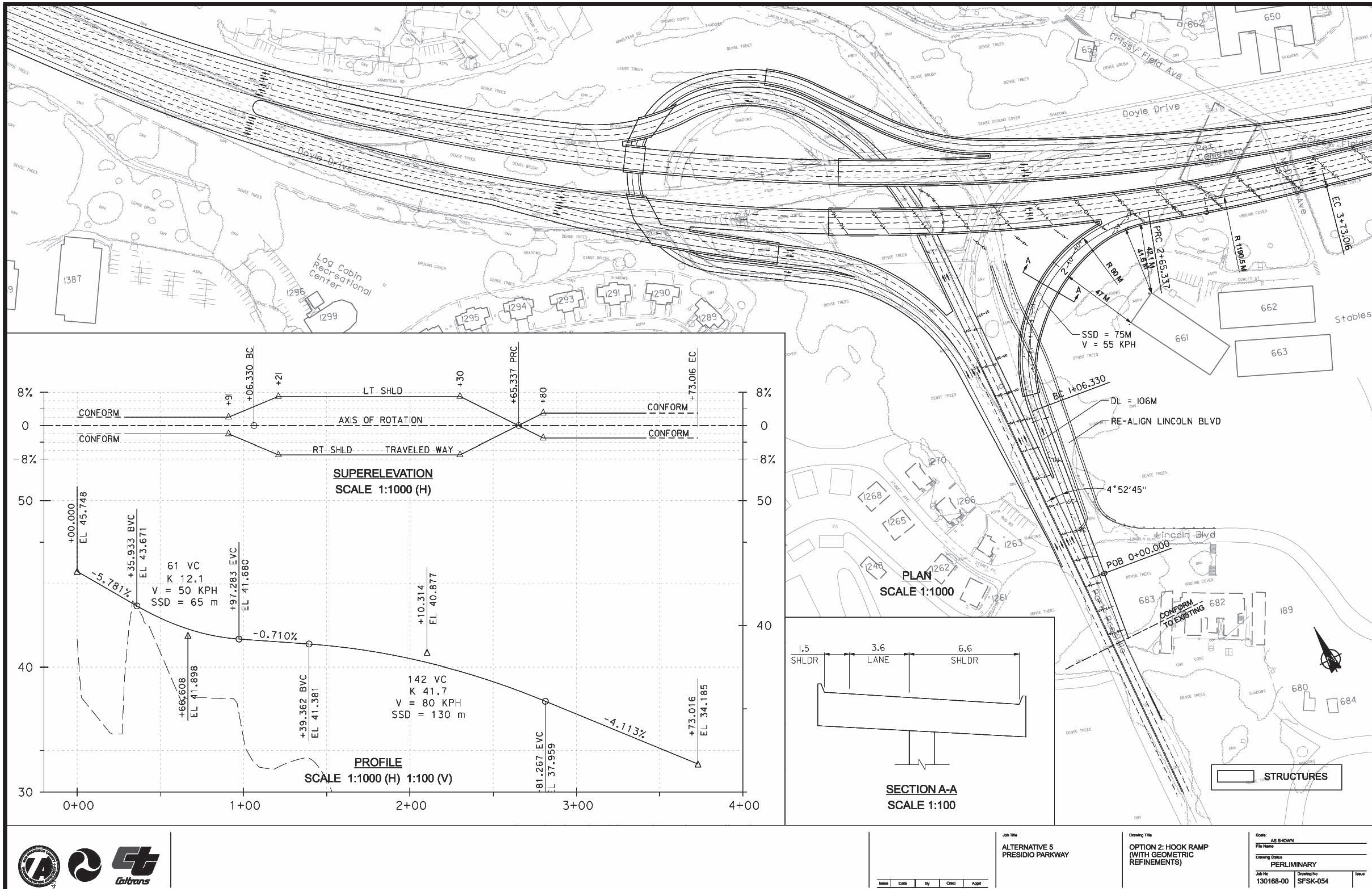
Alternative 2—Replace and Widen – with Detour
Detail of Gorgas Avenue and Mason Street

5. Presidio Parkway

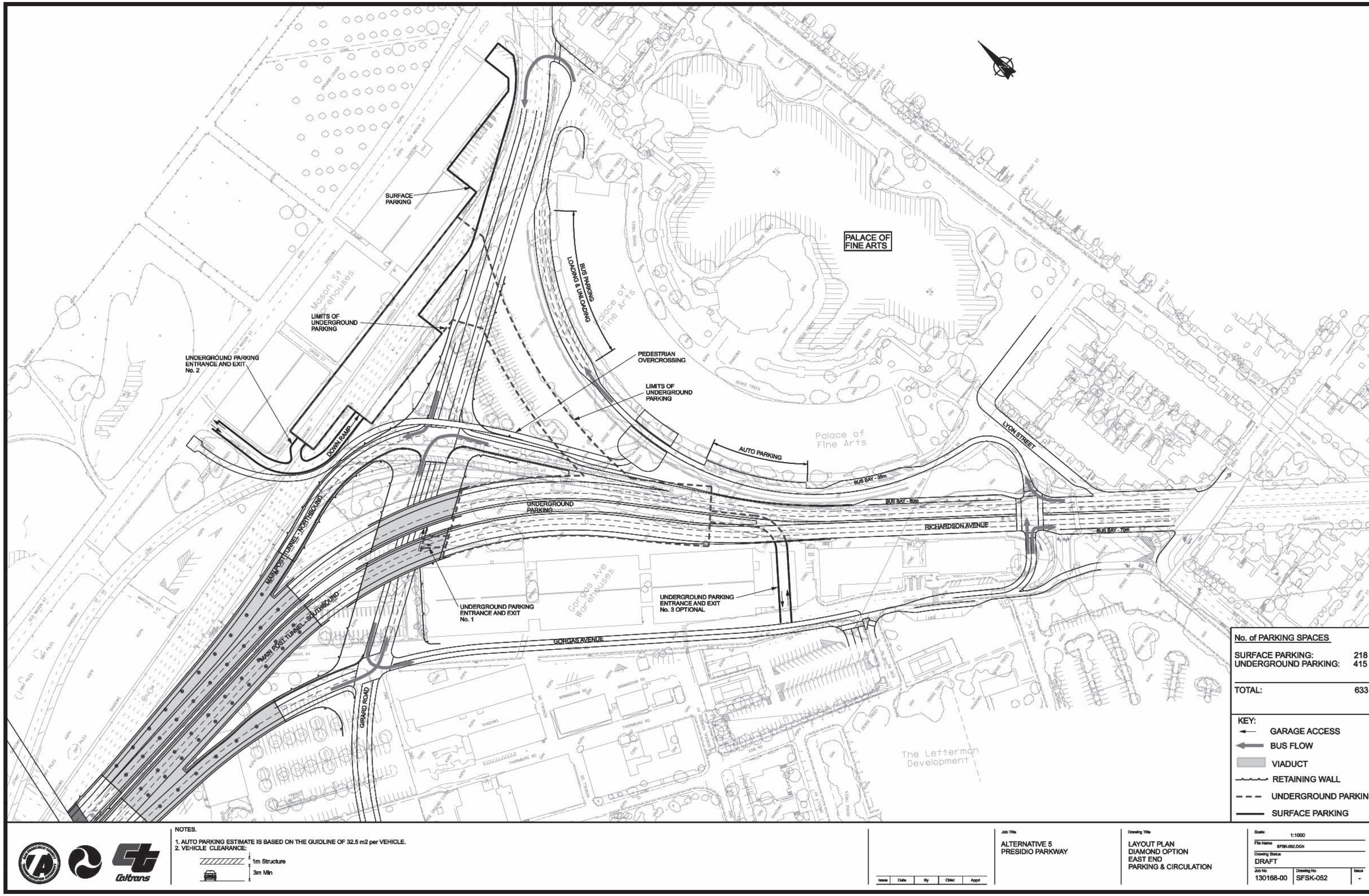




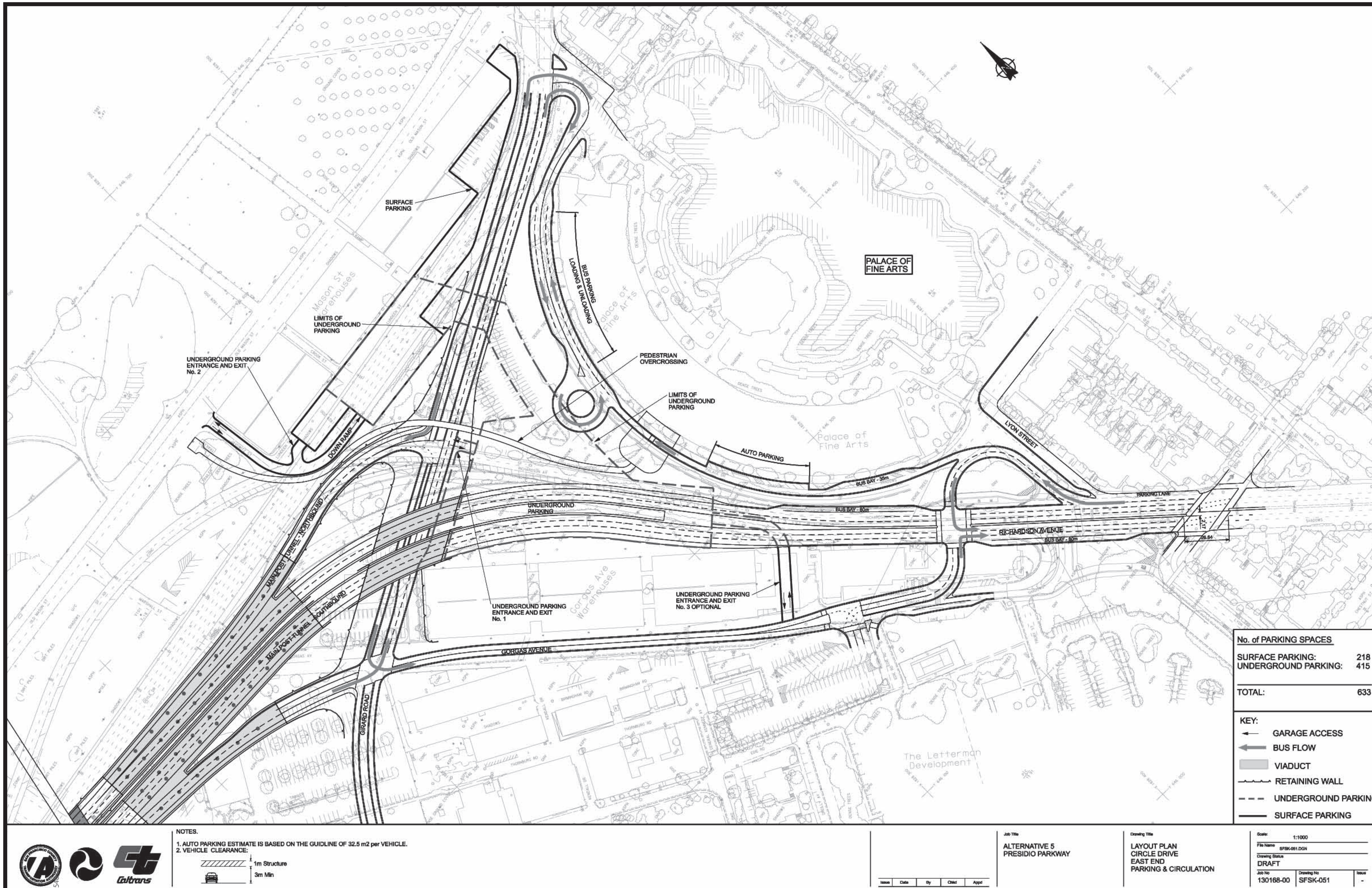
Alternative 5—Presidio Parkway with Loop Ramp Option



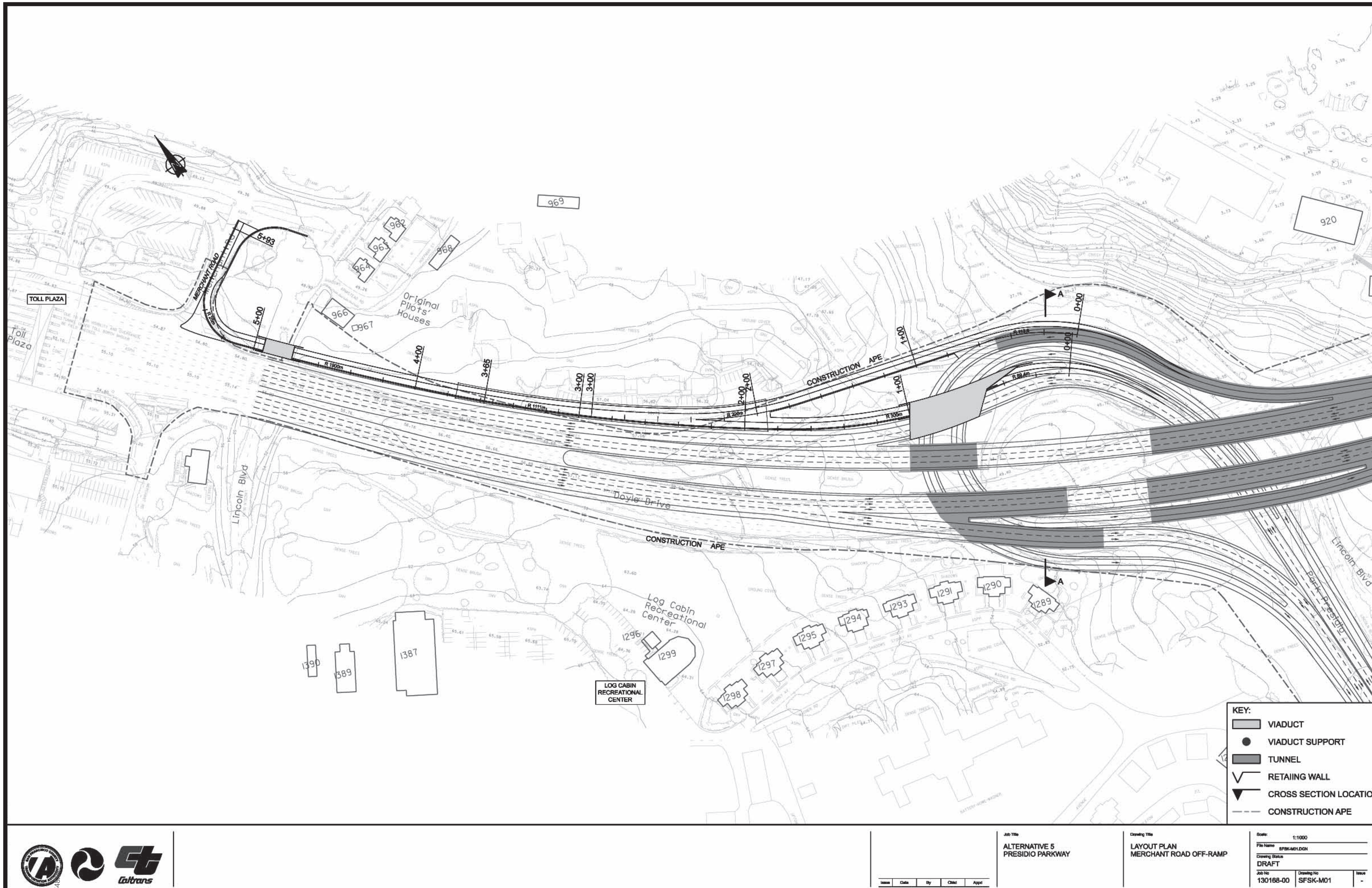
Alternative 5—Presidio Parkway with Hook Ramp Option



Alternative 5—Presidio Parkway with Diamond Option



Alternative 5—Presidio Parkway with Circle Drive Option



Alternative 5—Presidio Parkway with Merchant Road Slip-Ramp

APPENDIX B

TECHNICAL MEMORANDA

Memorandum

San Francisco County Transportation Authority

100 Van Ness Avenue 25TH Floor
San Francisco, California 94102
415.522.4800 FAX 415.522.4829
info@sfcta.org www.sfcta.org

Date: 6.3.04

To: Gary Kennerley, PB

From: Joe Castiglione, SFCTA

Subject: Doyle Drive 2030 Forecast Update

The purpose of this memo is to describe the methodology used to update the forecasts of regional travel demand in order to support the analysis requirements of the Doyle Drive Environmental & Design Study. This effort involved updating all land use, socioeconomic and transportation network inputs to the San Francisco Model to reflect revised assumptions about regional and local growth as described in ABAG's (Association of Bay Area Government) "Projections 2002" publication. The inputs used for the original Doyle Drive alternative model runs were based on ABAG's "Projections 2000" forecasts.

The San Francisco Travel Demand Model was developed to support the Doyle Drive Environmental & Design Study and other transportation and land use planning analyses in San Francisco. The San Francisco Model provides detailed forecasts of San Francisco residents' travel behavior, which is then integrated with forecasts of regional travel produced by the Metropolitan Transportation Commission's (MTC) 9-county "Baycast" model. This integrated demand is then assigned to regional highway and transit networks to provide forecast volumes. The current horizon year for the San Francisco model is 2025. The selection of this horizon year was based on the desire to maintain consistency with MTC's 2001 RTP assumptions, which use a 2025 horizon year.

To satisfy the analysis needs of the Doyle Drive Environmental & Design Study, it was necessary to develop new 2030 horizon year travel demand forecasts, beyond the time frame of the latest available regional travel demand forecasts from MTC 2001RTP. This memo describes the methodology used to develop these 2030 travel demand forecasts, based the regional land use forecasts found in ABAG's "Projections2002" and MTC's 2001 RTP travel demand forecasts. The approach involved two primary steps: 1) developing 2030 inputs for the San Francisco travel demand forecast model, and 2) developing 2030 regional travel demand "trip tables." Each step is described below.

In order to develop 2030 forecasts of San Francisco resident travel demand, it was necessary to develop 2030 inputs to the San Francisco travel demand forecast model. MTC's Projections2002-based 2020 and 2025 forecasts of households, population, employed residents and employment were used to accomplish this goal. MTC has developed Projections2002-based 2025 land use forecasts using information from ABAG's regional economic models. MTC's 2020 and 2025 land use forecasts were compared by MTAZ (MTC Travel Analysis Zone) to calculate growth rates for households, household population, employed residents and employees. The more detailed San Francisco model zones nest within the MTAZ system, so the calculated MTAZ growth rates were applied to the SFTAZs within each given MTAZ. Separate growth rates were calculated for changes in households, household population, employed residents and employment. A single employment growth rate was applied to all the various employment sectors because more detailed, sector-specific information was not available. These 2020-2025 growth rates were applied to the existing San Francisco model Projections2002-based 2025 land use inputs developed by the San Francisco Planning Department in order to develop 2030 forecasts.

This approach was identical to the approach used to develop the inputs for the original Doyle analysis, with one distinction. In developing the inputs used in the original analysis, it was necessary to extrapolate Projections2000-based growth from 2020 to 2030, due to the information available at that time. In the update described in this memo it was only necessary to extrapolate growth from 2025 to 2030, due to the availability of information for a further horizon year.

Table 2.1 Distribution of Full-Day Activity Patterns (continued)

BATS Survey	**1996**			**1996**		
Day of week	**SAT**			**SUN**		
Segment	**Worker**	**Student**	**Other**	**Worker**	**Student**	**Other**
N. Obs	79	14	25	92	16	24
Type of Primary Tour	%	%	%	%	%	%
None – No travel	**11.4**	**7.1**	**24.0**	**6.5**	**6.3**	**25.0**
Work – Total	**53.2**			**41.3**		
No stops	20.3			17.4		
Stop before	12.7			4.3		
Stop after	10.1			8.7		
Stops both ways	8.9			9.8		
Subtour	0.0			1.1		
Subtour+before	0.0			0.0		
Subtour+after	1.3			0.0		
Subtour+bothways	0.0			0.0		
Education – Total		**28.5**			**25.0**	
No stops		14.3			18.8	
Stop before		7.1			0.0	
Stop after		0.0			0.0	
Stops both ways		7.1			6.3	
Other	**35.4**	**64.3**	**76.0**	**52.2**	**68.7**	**75.0**
No stops	22.8	50.0	36.0	28.3	62.5	54.2
Stop before	3.8		8.0	9.8	6.3	12.5
Stop after	3.8		20.0	6.5		4.2
Stops both ways	5.1	14.3	12.0	7.6		4.2
Number of Secondary Tours	%	%	%	%	%	%
None	53.2	42.9	56.0	64.1	62.5	62.5
One	29.1	42.9	32.0	22.8	37.5	29.2
Two or more	17.7	14.3	12.0	13.0	0.0	8.3

Compared to the weekday patterns from the 1996 survey, the Saturday and Sunday patterns are very different. Workers are a bit more likely to stay home on Saturdays, but non-working adults are less likely to stay home on weekends than on weekdays. The percent of workers making work tours is much lower than on weekdays, but still surprisingly high (52 percent on Saturday, 41 percent on Sunday). It could be that these are sometimes different sorts of "work" activities than those reported on weekdays. There are very few work-based sub-tours on weekends, for example. The percentage of students making education tours is also much lower than on weekdays (28 percent on Saturday, 25 percent on Sundays).

Another noticeable difference is that all person types make more secondary home-based tours on weekends, particularly on Saturday, but also on Sunday. Table 2.2 is similar in structure to Table 2.1, but this one shows the time-of-day distribution for all primary tours. Again, the sample sizes are very small for the weekend days, particularly for education tours (four cases on each day). The TOD distributions for weekday (M-F) tours are very similar in 1990 and 1996. The most noticeable difference is a shift out of the AM peak-PM peak combination for work and education tours. This might indicate some peak-spreading occurring between the two years.

Table 2.2 Time-of-Day Distribution of Primary Tours

BATS Survey	**1990**			**1996**		
Day of week	**M-F**			**M-F**		
Segment	**Work**	**Education**	**Other**	**Work**	**Education**	**Other**
N.Obs	1,786	247	819	712	105	290
Primary Tour Times of Day (%)						
Early – Early	0.1					
Early – AM peak	0.1					0.6
Early – Mid-day	3.0		0.2	5.2		0.3
Early – PM peak	1.2			2.1	1.9	0.7
Early – Late	0.1			0.3		
AM peak – AM peak	0.2	0.4	2.6			2.1
AM peak – Mid-day	9.6	69.6	16.6	9.6	74.3	11.0
AM peak – PM peak	55.5	24.3	6.8	41.2	17.1	5.2
AM peak – Late	9.5	0.8	1.5	12.4		3.4
Mid-day – Mid-day	3.2	2.4	39.7	4.1	3.8	37.9
Mid-day – PM peak	8.6	2.4	14.0	10.3	2.9	16.6
Mid-day – Late	6.4		3.8	10.8		4.5
PM peak – PM peak			5.5	0.7		4.5
PM peak – Late	1.5		4.6	2.1		7.6
Late – Late	1.0		4.6	1.3		5.5

Table 2.2 Time-of-Day Distribution of Primary Tours (continued)

BATS Survey	**1996**			**1996**		
Day of week	**SAT**			**SUN**		
Segment	**Work**	**Education**	**Other**	**Work**	**Education**	**Other**
N.Obs	42	4	56	38	4	77
Primary Tour Times of Day (%)						
Early – Early						
Early – AM peak	2.4					
Early – Mid-day	2.4		1.8	2.6		
Early – PM peak				5.2		
Early – Late						
AM peak – AM peak						5.2
AM peak – Mid-day	11.9	75.0	8.9	10.5	50.0	2.6
AM peak – PM peak	21.4			28.9	50.0	2.6
AM peak – Late	4.8			5.3		
Mid-day – Mid-day	4.8	25.0	46.4	2.6		49.4
Mid-day – PM peak	31.0		21.4	21.1		18.2
Mid-day – Late	9.5		5.4	10.5		1.3
PM peak – PM peak	4.8		3.6	2.6		10.4
PM peak – Late	7.1		1.8	7.9		5.2
Late – Late	2.6		10.7	2.6		5.2

Between weekdays and weekends, there are a number of differences. Work tours are less likely to be AM peak-PM peak on weekends, and more likely to be Mid-day-PM peak. Weekend work tours are also more likely to begin in the PM peak or late periods.

Based on the very small sample, education tours on weekends are still most likely to be AM peak-Mid-day. Other primary tours appear to happen later on the weekends, with AM peak starts decreasing and Mid-day starts increasing. Also, the number of Late-Late tours is higher on Saturday and the number of PM peak-PM peak tours is higher on Sundays.

2.2 Model Specification and Implementation

Given the available numbers of weekend person-days and tours in the 1996 SF county sample, it is not possible to estimate a sophisticated choice model as was done for the 1990 data. Therefore, the most useful and efficient approach was to specific classification models to replace the logit choice models used for weekdays. This was done as follows:

- **Tour Pattern Model.** This model is a classification table giving the probability of choosing each of the 49 possible alternatives in the day pattern model as a function of the person type (working adult, student, other adult). The 49 alternatives are the 16 primary tour types times the three secondary tour frequencies in Table 2.1, plus the no travel alternative. Thus, the "model" is the joint distribution of the two distributions shown in Table 2.1, and is applied stochastically to assign to a single pattern to each person.
- **Primary Tour Time-of-Day Model.** This model is a classification table giving the probability of choosing each of the 15 possible time period combinations as a function of the primary tour type (work, education, other). This table is the one shown in Table 2.2. It is applied stochastically to assign a single time period combination to each primary tour.
- **Other Classification Models.** Other models in the system predict additional details, such as the exact number of secondary and work-based tours and stops in cases where the pattern model predicts 1+ or 2+, or predict the trip chain types and times of day for secondary and work-based tours conditional on the choices for the primary tour. There were not enough cases in the data to derive new tables for these distributions for weekend tours. In any case, given that these are secondary distributions conditional on the primary features of the day pattern, they are relatively transferable across days of the week. So the existing classification models were used, instead of deriving new ones for weekend travel.

By substituting the new classification models for the existing pattern and time-of-day choice models, three new versions of the tour/trip generation program were created:

1. **SATTGEN1.CPP.** To predict Saturday tours and trips;
2. **SUNTGEN1.CPP.** To predict Sunday tours and trips; and
3. **WKDTGEN1.CPP.** To predict weekday tours and trips based on the 1996 data.

This last version was created for comparison purpose only. It was used to see how much of the change in forecasts comes from switching from the 1990 to the 1996 survey, versus switching from weekdays to the weekend. It is not meant as a replacement for the existing weekday model, since the existing model contains many policy-sensitive variables that this one does not.

Table 2.3 shows the tour/trip generation results from the original model, both uncalibrated and the latest calibration, alongside the results from the three new versions. The new weekday model gives 2.94 million total trips, which is about halfway between the old uncalibrated (2.27 million) and calibrated (3.56 million) results. There are about the same number of trips on Sunday (2.93 million) as weekdays, but many more trips on Saturday (3.5 million). These additional Saturday trips are mainly due to more secondary home-based tours, so they may be shorter in length than weekday trips on average.

Table 2.4 presents these same results in terms of tours and trips per person and trips per tour. If the "Weekday 96" results were viewed as a target, it would indicate that the calibration of the original model did a good job at getting the right number of trips per tour, but may have gone too far in increasing the number of tours – particularly home-based other tours made by workers and other adults. Of course, although the 1996 survey did a good job at capturing more trips, it may still be under-representing some types of trips, so it may still be too low as a target. In terms of the contrast between Saturday, Sunday and Monday through Friday, Table 2.4 shows the same pattern as Table 2.3.

Tables 2.5 and 2.6 show trip time-of-day distributions in terms of absolute numbers and percentages. The results for the new weekday model are once again between the old uncalibrated and calibrated results for each time period. The main difference between weekdays and weekends is a shift from AM peak to Mid-day trips on both Saturday and Sunday. The fractions of trips in the PM peak and Late periods stay relatively constant.

■ 2.3 Weekend Period Choice

This section describes the efforts CS took to determine the optimal weekend period to model for the Doyle Drive study. For consistency, the period selected must match up with one of the time five periods in the SFCTA travel model.

Analysis

CS had previously selected Saturday as the appropriate day for measuring maximum weekend peak volumes. CS determined that overall volumes city-wide and in the Doyle Drive area were about 20 percent higher on Saturdays than on Sundays (note Figure 2.1). The Doyle Drive area was defined for the study as all links within the micro-simulation area. The following chart provided evidence that volumes are higher during every time period on Saturday compared to Sunday. It should be noted, however, that this does not provide guidance as to what time period to choose to model. While mid-day peaks seem to have the highest volumes, this may be due to the fact that the mid-day time periods are about twice as long as any other time period. To determine where peaking occurs, we have undertaken an hourly analysis of data on Doyle Drive alone, excluding any other count data from other. The data source for our analysis includes the traffic counts taken by CS for the study, traffic counts from Caltrans, and traffic counts from the Golden Gate Bridge district.

Table 2.3 Tour Results from the Original Model

Person type	Tour type	People	Tours	% of Tours	Trips	% of Trips
SF Model	**Uncalibrated**					
Worker	HBWork	392,186	323,113	36.6%	867,635	38.2%
Worker	HBOther	392,186	139,701	15.8%	342,884	15.1%
Worker	Wbased	392,186	110,060	12.5%	262,168	11.6%
Student	HBEduc	113,276	69,945	7.9%	176,252	7.8%
Student	HBOther	113,276	51,290	5.8%	126,973	5.6%
Other	HBOther	232,852	189,478	21.4%	493,829	21.8%
Total	Total	738,314	883,587	100.0%	2,269,741	100.0%
SF Model	**Calibrated**					
Worker	HBWork	392,186	321,353	25.6%	990,847	29.5%
Worker	HBOther	392,186	328,935	26.2%	816,403	24.3%
Worker	Wbased	392,186	158,520	12.6%	376,364	11.2%
Student	HBEduc	113,276	69,514	5.5%	174,639	5.2%
Student	HBOther	113,276	51,446	4.1%	127,797	3.8%
Other	HBOther	232,852	326,651	26.0%	869,213	25.9%
Total	Total	738,314	1,256,419	100.0%	3,355,263	100.0%
SF Model	**Weekday 96**					
Worker	HBWork	392,186	323,725	29.7%	995,642	33.9%
Worker	HBOther	392,186	242,235	22.2%	619,526	21.1%
Worker	Wbased	392,186	118,198	10.8%	281,805	9.6%
Student	HBEduc	113,276	77,052	7.1%	187,420	6.4%
Student	HBOther	113,276	68,421	6.3%	169,474	5.8%
Other	HBOther	232,852	261,888	24.0%	684,956	23.3%
Total	Total	738,314	1,091,519	100.0%	2,938,823	100.0%
SF Model	**Saturday 96**					
Worker	HBWork	392,186	208,408	16.1%	650,483	18.6%
Worker	HBOther	392,186	504,800	39.0%	1,273,414	36.4%
Worker	Wbased	392,186	10,164	0.8%	26,071	0.7%
Student	HBEduc	113,276	32,240	2.5%	96,097	2.7%
Student	HBOther	113,276	184,520	14.3%	476,461	13.6%
Other	HBOther	232,852	352,954	27.3%	980,105	28.0%
Total	Total	738,314	1,293,086	100.0%	3,502,631	100.0%
SF Model	**Sunday 96**					
Worker	HBWork	392,186	162,223	14.7%	507,134	17.3%
Worker	HBOther	392,186	477,700	43.3%	1,278,315	43.6%
Worker	Wbased	392,186	4,295	0.4%	9,782	0.3%
Student	HBEduc	113,276	28,459	2.6%	74,483	2.5%
Student	HBOther	113,276	120,377	10.9%	269,365	9.2%
Other	HBOther	232,852	310,478	28.1%	790,247	27.0%
Total	Total	738,314	1,103,532	100.0%	2,929,326	100.0%

Table 2.4 Tours per Person Results from the Original Model

Person Type	Tour Type	Tours/Person	Trips/Person	Trips/tour	% Stops Before	% Stops After
SF Model	**Uncalibrated**					
Worker	HBWork	0.82	2.21	2.69	18.3%	29.5%
Worker	HBOther	0.36	0.87	2.45	14.4%	17.5%
Worker	WkBased	0.28	0.67	2.38	11.3%	17.0%
Student	HBEduc	0.62	1.56	2.52	13.7%	21.2%
Student	HBOther	0.45	1.12	2.48	14.4%	18.7%
Other	HBOther	0.81	2.12	2.61	20.6%	19.2%
Total	Total	1.20	3.07	2.57	16.7%	22.6%
SF Model	**Calibrated**					
Worker	HBWork	0.82	2.53	3.08	30.9%	44.9%
Worker	HBOther	0.84	2.08	2.48	15.1%	18.9%
Worker	WkBased	0.40	0.96	2.37	11.5%	16.1%
Student	HBEduc	0.61	1.54	2.51	13.4%	21.0%
Student	HBOther	0.45	1.13	2.48	14.5%	19.1%
Other	HBOther	1.40	3.73	2.66	22.4%	20.9%
Total	Total	1.70	4.54	2.67	20.5%	25.8%
SF Model	**Weekday 96**					
Worker	HBWork	0.83	2.54	3.08	32.0%	43.3%
Worker	HBOther	0.62	1.58	2.56	17.2%	20.6%
Worker	WkBased	0.30	0.72	2.38	12.0%	16.4%
Student	HBEduc	0.68	1.65	2.43	9.4%	20.0%
Student	HBOther	0.60	1.50	2.48	17.5%	16.6%
Other	HBOther	1.12	2.94	2.62	17.4%	22.8%
Total	Total	1.48	3.98	2.69	20.5%	27.1%
SF Model	**Saturday 96**					
Worker	HBWork	0.53	1.66	3.12	40.4%	38.2%
Worker	HBOther	1.29	3.25	2.52	17.0%	18.0%
Worker	WkBased	0.03	0.07	2.57	15.2%	26.9%
Student	HBEduc	0.28	0.85	2.98	49.7%	25.0%
Student	HBOther	1.63	4.21	2.58	17.3%	20.2%
Other	HBOther	1.52	4.21	2.78	20.9%	29.5%
Total	Total	1.75	4.74	2.71	22.7%	24.9%
SF Model	**Sunday 96**					
Worker	HBWork	0.41	1.29	3.13	34.3%	44.5%
Worker	HBOther	1.22	3.26	2.68	22.8%	21.4%
Worker	WkBased	0.01	0.02	2.28	7.6%	13.7%
Student	HBEduc	0.25	0.66	2.62	25.2%	25.2%
Student	HBOther	1.06	2.38	2.24	10.1%	6.3%
Other	HBOther	1.33	3.39	2.55	21.4%	14.7%
Total	Total	1.49	3.97	2.65	22.7%	21.3%

Table 2.5 Time-of-Day Distribution of Tours (Absolute)

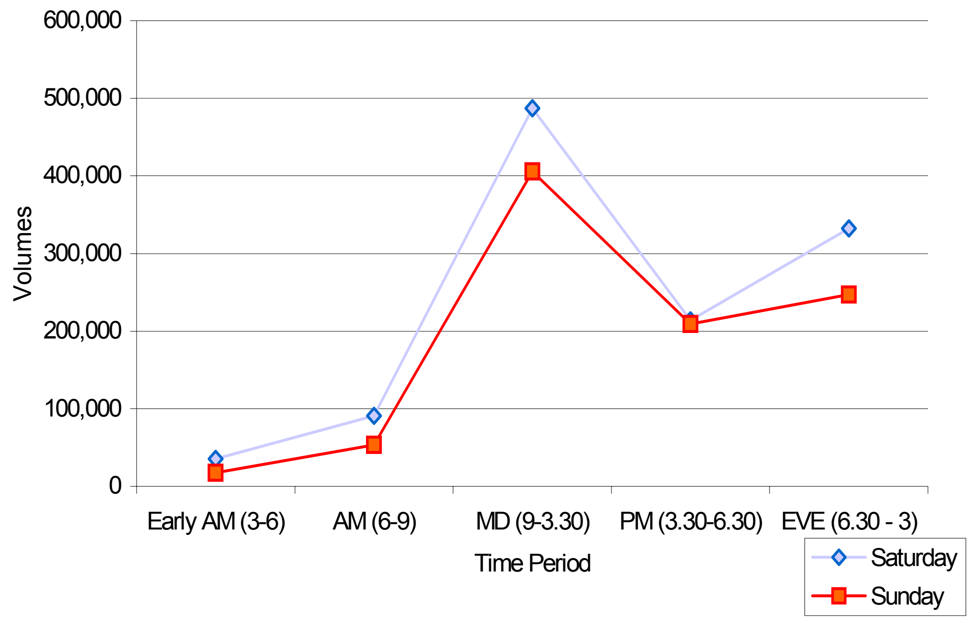
Person Type	Tour Type	Early	AM Peak	Mid-Day	PM Peak	Late	Total Trips
SF Model	**Calibrated**						
Worker	HBWork	15,011	287,023	160,336	278,519	126,746	867,635
Worker	HBOther	448	31,700	84,461	77,885	148,390	342,884
Worker	WkBased	103	5,528	222,920	25,279	8,338	262,168
Student	HBEduc	163	73,748	65,562	29,773	7,006	176,252
Student	HBOther	25	19,242	41,717	33,624	32,365	126,973
Other	HBOther	197	46,191	280,692	91,815	74,934	493,829
Total	Total	15,947	463,432	855,688	536,895	397,779	2,269,741
SF Model	**Calibrated**						
Worker	HBWork	41,862	318,568	424,054	165,795	40,568	990,847
Worker	HBOther	155	37,863	153,569	289,382	335,434	816,403
Worker	WkBased	17	8,066	348,339	15,099	4,843	376,364
Student	HBEduc	18	71,473	71,505	26,330	5,313	174,639
Student	HBOther	1	12,559	31,773	28,460	55,004	127,797
Other	HBOther	40	66,306	262,982	139,468	400,417	869,213
Total	Total	42,093	514,835	1,292,222	664,534	841,579	3,355,263
SF Model	**Weekday 96**						
Worker	HBWork	25,804	271,795	224,231	279,366	194,446	995,642
Worker	HBOther	1,589	65,930	162,559	124,763	264,685	619,526
Worker	WkBased	-	5,372	230,630	32,883	12,920	281,805
Student	HBEduc	1,464	76,155	78,813	27,557	3,431	187,420
Student	HBOther	446	11,448	62,516	45,189	49,875	169,474
Other	HBOther	2,832	71,816	330,106	136,742	143,460	684,956
Total	Total	32,135	502,516	1,088,855	646,500	668,817	2,938,823
SF Model	**Saturday 96**						
Worker	HBWork	11,757	118,506	208,023	213,615	98,582	650,483
Worker	HBOther	3,928	126,818	537,476	232,454	372,738	1,273,414
Worker	WkBased	-	914	18,764	4,970	1,423	26,071
Student	HBEduc	-	34,252	56,931	4,069	845	96,097
Student	HBOther	1,331	31,605	232,151	103,786	107,588	476,461
Other	HBOther	3,376	64,657	527,639	182,328	202,105	980,105
Total	Total	20,392	376,752	1,580,984	741,222	783,281	3,502,631
SF Model	**Sunday 96**						
Worker	HBWork	12,914	100,094	123,815	166,491	103,820	507,134
Worker	HBOther	759	122,737	601,602	275,729	277,488	1,278,315
Worker	WkBased	-	125	7,358	1,480	819	9,782
Student	HBEduc	-	34,242	18,450	19,474	2,317	74,483
Student	HBOther	-	22,860	141,970	59,154	45,381	269,365
Other	HBOther	-	73,778	420,633	167,742	128,094	790,247
Total	Total	13,673	353,836	1,313,828	690,070	557,919	2,929,326

Table 2.6 Time-of-Day Distribution of Tours (Percentage)

SF Model	Uncalibrated					
Person type	Tour type	Early	AM peak	Mid-day	PM peak	Late
Worker	HBWork	1.7%	33.1%	18.5%	32.1%	14.6%
Worker	HBOther	0.1%	9.2%	24.6%	22.7%	43.3%
Worker	WkBased	0.0%	2.1%	85.0%	9.6%	3.2%
Student	HBEduc	0.1%	41.8%	37.2%	16.9%	4.0%
Student	HBOther	0.0%	15.2%	32.9%	26.5%	25.5%
Other	HBOther	0.0%	9.4%	56.8%	18.6%	15.2%
Total	Total	0.7%	20.4%	37.7%	23.7%	17.5%
SF Model	Calibrated					
Person type	Tour type	Early	AM peak	Mid-day	PM peak	Late
Worker	HBWork	4.2%	32.2%	42.8%	16.7%	4.1%
Worker	HBOther	0.0%	4.6%	18.8%	35.4%	41.1%
Worker	WkBased	0.0%	2.1%	92.6%	4.0%	1.3%
Student	HBEduc	0.0%	40.9%	40.9%	15.1%	3.0%
Student	HBOther	0.0%	9.8%	24.9%	22.3%	43.0%
Other	HBOther	0.0%	7.6%	30.3%	16.0%	46.1%
Total	Total	1.3%	15.3%	38.5%	19.8%	25.1%
SF Model	Weekday 96					
Person type	Tour type	Early	AM peak	Mid-day	PM peak	Late
Worker	HBWork	2.6%	27.3%	22.5%	28.1%	19.5%
Worker	HBOther	0.3%	10.6%	26.2%	20.1%	42.7%
Worker	WkBased	0.0%	1.9%	81.8%	11.7%	4.6%
Student	HBEduc	0.8%	40.6%	42.1%	14.7%	1.8%
Student	HBOther	0.3%	6.8%	36.9%	26.7%	29.4%
Other	HBOther	0.4%	10.5%	48.2%	20.0%	20.9%
Total	Total	1.1%	17.1%	37.1%	22.0%	22.8%
SF Model	Saturday 96					
Person type	Tour type	Early	AM peak	Mid-day	PM peak	Late
Worker	HBWork	1.8%	18.2%	32.0%	32.8%	15.2%
Worker	HBOther	0.3%	10.0%	42.2%	18.3%	29.3%
Worker	WkBased	0.0%	3.5%	72.0%	19.1%	5.5%
Student	HBEduc	0.0%	35.6%	59.2%	4.2%	0.9%
Student	HBOther	0.3%	6.6%	48.7%	21.8%	22.6%
Other	HBOther	0.3%	6.6%	53.8%	18.6%	20.6%
Total	Total	0.6%	10.8%	45.1%	21.2%	22.4%
SF Model	Sunday 96					
Person type	Tour type	Early	AM peak	Mid-day	PM peak	Late
Worker	HBWork	2.5%	19.7%	24.4%	32.8%	20.5%
Worker	HBOther	0.1%	9.6%	47.1%	21.6%	21.7%
Worker	WkBased	0.0%	1.3%	75.2%	15.1%	8.4%
Student	HBEduc	0.0%	46.0%	24.8%	26.1%	3.1%
Student	HBOther	0.0%	8.5%	52.7%	22.0%	16.8%

Other	HBOther	0.0%	9.3%	53.2%	21.2%	16.2%
Total	Total	0.5%	12.1%	44.9%	23.6%	19.0%

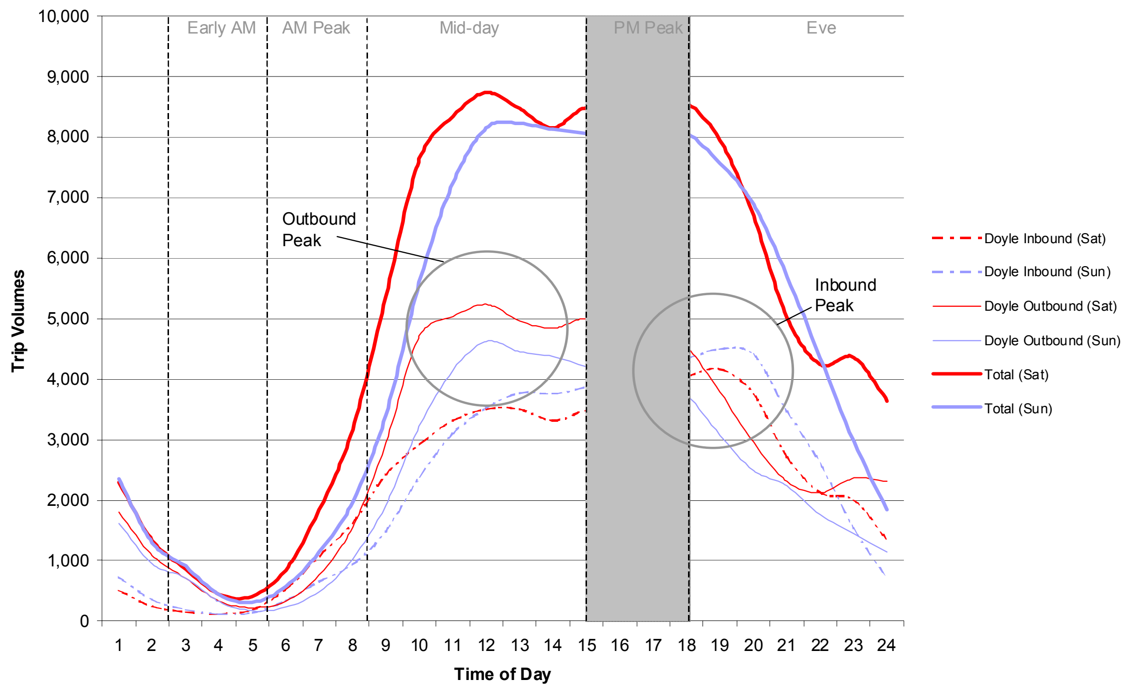
Figure 2.1 Saturday Versus Sunday Traffic Volumes (Entire City)



For the purposes of this analysis, CS chose the volumes on Doyle Drive as those at the Tolls. CS's results showed that for Doyle Drive, as well as the area at large, Saturday experiences higher volumes throughout the day. On Doyle Drive itself, however, there are two important notes that are not true of the entire area. First, the differences between Saturday and Sunday on Doyle are much tighter than the rest of the area, with around eight percent higher overall Saturday volumes (compared to 20 percent area-wide).

Second, there are separate peaks on Doyle Drive for the inbound and outbound directions. These peaks are symmetrical to weekday peaks, flipped and shifted to later in the day. The inbound peak occurs at around 7:00 p.m., while the outbound peak occurs at around 11:00 a.m. More importantly, the inbound peak is higher on Sunday, while the outbound peak is higher on Saturday (see Figure 2.2). Overall, Saturday peaks remain higher.

Figure 2.2 Hourly Volumes



The two clear candidates for peak time period are Mid-day and PM Peak. While mid-day peak has a slightly higher maximum, the sustained peak is greater for the PM Peak time period. This is due to the fact that the PM Peak catches the end of the outbound peak and the beginning of the inbound peak.

Recommendation

CS selected the Saturday PM Peak as the appropriate time period for the weekend model. A careful study of the previous figure will reveal an outbound peak that builds quickly and tails off slowly, and an inbound peak that builds slowly and tails off quickly. Because of this, the PM Peak time period will best capture changes in both of these peaks better than the Mid-day Peak, which derives the majority of its volume from the outbound peak.

One additional issue raised by this analysis is the likely effect of Electronic Toll Collection (ETC) on the choice of weekend day selection. Current estimates of inbound capacities for weekdays hover around 6,000 cars per hour. While the inbound peak is lower for the weekend (around 4,500), some of this can be explained by the efficiency difference of commuters and weekend travelers. It is possible that increased ETC facilities on the bridge will increase the throughput of the toll and increase the importance of the inbound peak. This, in turn, could lead to a higher Sunday peak. Despite this possibility, our recommendation of a Saturday peak stands. It is difficult to predict the penetration of ETC use among weekend travelers, and even more difficult to predict the effects on bridge throughput due to this penetration.

2.4 Model Calibration

The weekend model was calibrated using techniques identical to those used by CS, while calibrating the weekday city-wide model. Note that calibration was performed for the PM weekend (Saturday) peak period only, due to its selection (above) as the appropriate weekend time period. Table 2.7 shows the calibration targets and results for all Saturday periods for the Golden Gate Bridge. Table 2.8 shows calibration targets and results for all links by functional class. The 'OBS' column gives observed counts, while the 'EST' column gives model estimated counts. The final column shows the percentage difference between the observed and estimated counts.

Table 2.7 Travel Demand Model Calibration Results for Golden Gate Bridge

Early AM Period (3:00 am to 6:00 am) Highway Assignment Results

A	B	BRIDGE	DIRECT	Obs	Est	(Est-Obs)/Obs
52426	52268	Golden Gate	N	796	120	-84.9%
52267	52425	Golden Gate	S	840	379	-54.9%

AM Period (6:00 am to 9:00 am) Highway Assignment Results

A	B	BRIDGE	DIRECT	Obs	Est	(Est-Obs)/Obs
52426	52268	Golden Gate	N	5350	3147	-41.2%
52267	52425	Golden Gate	S	5192	2665	-48.7%

Mid-day Period (9:00 am to 3:30 pm) Highway Assignment Results

A	B	BRIDGE	DIRECT	Obs	Est	(Est-Obs)/Obs
52426	52268	Golden Gate	N	29658	22153	-25.3%
52267	52425	Golden Gate	S	13053	22369	71.4%

PM Peak Period (3:30 pm to 6:30 pm) Highway Assignment Results

A	B	BRIDGE	DIRECT	Obs	Est	(Est-Obs)/Obs
52426	52268	Golden Gate	N	7000	7584	8.3%
52267	52425	Golden Gate	S	9899	10021	1.2%

Evening Period (6:30 pm to 3:00 am) Highway Assignment Results

A	B	BRIDGE	DIRECT	Obs	Est	(Est-Obs)/Obs
52426	52268	Golden Gate	N	17204	10339	-39.9%
52267	52425	Golden Gate	S	13020	6284	-51.7%

Table 2.8 Travel Demand Model Results by Facility Type

Facility Type	Data	Total

Collector	Sum of PM-EST	26783
	Sum of PM-OBS	22065
	Sum of PM Diff (EST-OBS)	4718
Freeway	Sum of PM-EST	17605
	Sum of PM-OBS	16899
	Sum of PM Diff (EST-OBS)	706
Freeway Ramp	Sum of PM-EST	1604
	Sum of PM-OBS	3828
	Sum of PM Diff (EST-OBS)	-2224
Fwy-Fwy Conn	Sum of PM-EST	15131
	Sum of PM-OBS	11632
	Sum of PM Diff (EST-OBS)	3499
Local Street	Sum of PM-EST	18011
	Sum of PM-OBS	34099
	Sum of PM Diff (EST-OBS)	-16088
Major Arterial	Sum of PM-EST	114683
	Sum of PM-OBS	117133
	Sum of PM Diff (EST-OBS)	-2450
Minor Arterial	Sum of PM-EST	64417
	Sum of PM-OBS	52731
	Sum of PM Diff (EST-OBS)	11686
Total Sum of PM-EST		258234
Total Sum of PM-OBS		258387
Total Sum of PM Diff (EST-OBS)		-153

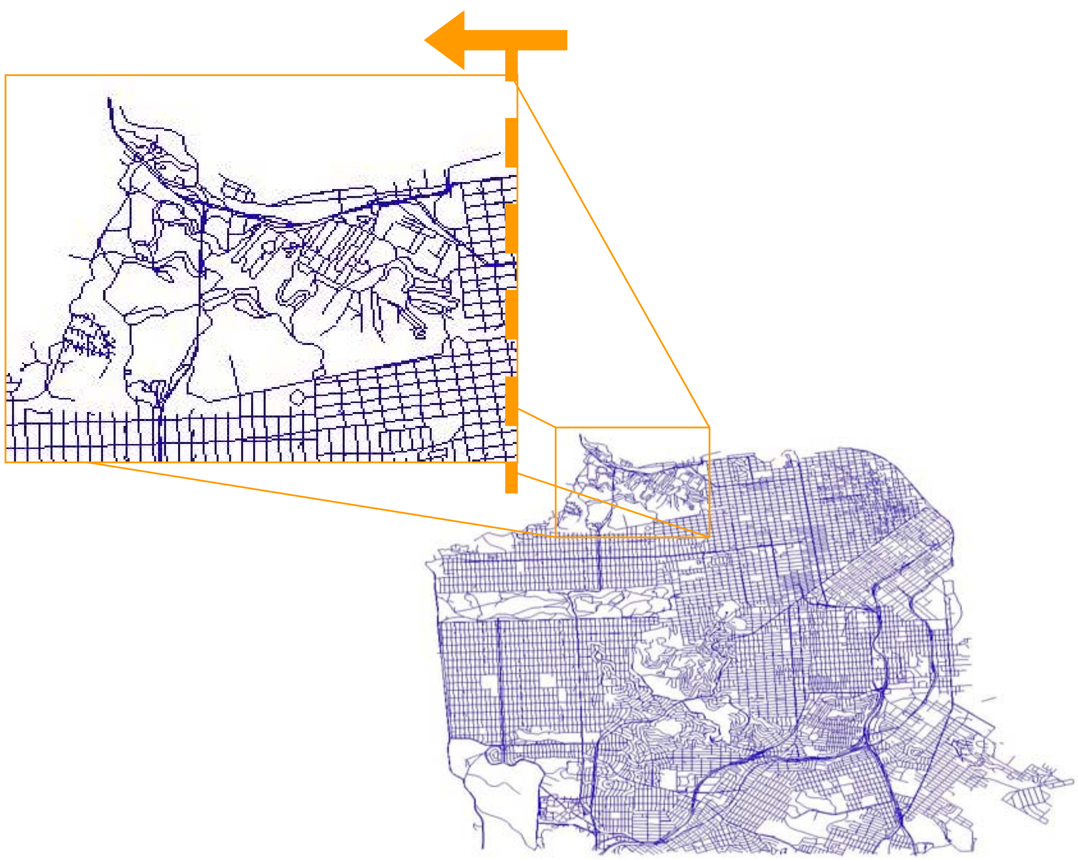
Legend: EST – Estimated
OBS – Observed
Diff Difference

3.0 Travel Model Integration

3.1 Demand Adjustment Methodology

The first step in model calibration is the translation of demand from the travel demand model into the simulation model. As illustrated below, CS must extract demand from the city-wide travel demand model for the simulation model area. Once CS constructs a new subset of origin and destination pair flows, CS adjusts these flows as described in the next section.

Figure 3.1 Micro-Simulation Study Area in Context with Screenline



The goal of travel demand model conversion is twofold:

1. Calibrate the simulation model to existing counts as closely as possible; and

2. Preserve the integrity of the travel demand model inputs to the greatest degree possible.

The closer that one comes to (1), the more confidence one has in the simulation model to replicate local conditions accurately. The closer that one comes to (2), the more confidence one has that the travel model will transfer county-wide travel pattern changes accurately to the simulation model. These two goals require certain tradeoffs because they conflict with one another. To perfectly calibrate to local conditions, one would simply use counts as inputs to the simulation model. To perfectly preserve the travel model data, one would not alter the travel model inputs as all.

As expected, however, the travel model does not perfectly represent data at a microscopic scale to the degree required for simulation calibration, particularly in local areas with ill-defined corridors. At a conceptual level, the travel demand model provides the travel demand through the Doyle Drive area via three quantities (two scalars and one vector) for each Transportation Analysis Zone (TAZ):

1. The number of trips entering the study area via the TAZ;
2. The number of trips leaving the study area via the TAZ; and
3. A vector of trip distributions to all other TAZs from this TAZ.

Conceptually, (1) and (3) are independent, but (2) depends on the (1) and (3) of other TAZs in the network (There are other ways to conceptualize this, but in every case, these three basic quantities are related.). Because the most difficult piece of information to acquire is trip distributions, CS attempted to leave this as presented by the travel model. To achieve this, we may only alter (1) or (2), not both. Because they are related, altering both entrance and exit volumes would necessitate altering distributions.

CS has chosen to adjust the travel model data using entrance volume adjustments and then some minor exit (distribution) adjustments for key streets. By keeping The methodology simple and in-line with the capabilities of both models, CS adjusts the demand enough to meet calibration requirements, while ensuring that changes in travel demand model travel patterns are accurately passed along to the simulation model. The methodology is three-fold:

1. **Mainline Adjustment.** For major streets (Lombard, Marina, Park Presidio), adjust volumes to match count data using a multiplier.

2. **Screen-line Adjustment**:

   – Create screen-lines along all major corridors (Marina East, Marina South, Richmond A,B,C,D West, Richmond A,B,C,D South, Richmond A,B,C,D East, Richmod D North);

- Adjust the screen-line model counts to match the screen-line count data, using a multiplier; and
- Distribute the screen-line counts to the links within the screen-line using count data proportions. Note that this distribution excludes the major streets from (1).

3. **Arterial 'Bleed' Adjustment.** For several major exits (Lombard, Marina, Park Presidio, 25th Street), the model places too few trips on the main arterial and too many on minor parallel streets. This is the one instance where CS proposes to adjust the exit volumes (and therefore overall trip distribution vectors), albeit on a very limited basis. For this adjustment, the minor streets are adjusted to match count data using a multiple. Due to the model over-assignment, this multiple is always less than one. The trips that are taken off the local streets by this multiple are then placed on the main arterial, so that no trips are lost.

These adjustments are not invasive enough to invalidate future model run data. Because they define appropriate corridors and apply multipliers to corridor level data only, changes in model travel patterns are detected appropriately. See tables 3.1, 3.2, and 3.3 for a full listing (by time period) of original and modified model volumes for each Paramics TAZ. Original model volumes represent the input from the Travel Demand Model, while modified model volumes represent the final demands input into Paramics after demand adjustment.

Table 3.1 Weekday AM Adjustment

	Entrance Volumes		Exit Volumes	
Paramics TAZ Number	Original Model Volumes	Modified Model Volumes	Original Model Volumes	Modified Model Volumes
7	223	218	342	394
8	326	319	158	251
9	395	388	131	192
10	250	376	180	452
11	500	492	467	488
12	430	424	244	433
16	27	31	136	177
17	19	21	172	231
18	11	11	12	13
19	14	13	24	32
20	8	7	35	41
21	17	20	31	54
22	18	18	44	51
23	13	13	24	32
24	13	11	23	31
25	103	96	79	97
26	190	188	39	67

27	155	127	50	59
28	8	27	22	20
29	11	11	20	99
34	45	42	18	34
35	13	13	53	60
36	25	24	21	20
37	0	0	0	0
38	69	71	26	32
39	27	30	42	59
40	41	40	194	208
41	52	50	85	87
42	159	156	288	265
43	161	153	36	40
44	66	62	22	20
45	13	70	31	35
53	17,350	16,791	8,216	7,364
54	57	57	27	27
55	84	83	95	84
1	1,312	1,580	4,401	5,825
2	0	134	0	430
15	0	66	760	227
46	35	118	445	498
47	15	87	181	214
48	37	429	187	178
49	523	422	1,147	732
50	2,097	2,414	4,478	7,018
51	19	261	545	255
6	0	303	494	501
13	0	177	494	523
14	230	74	520	544
52	1,138	502	1,136	645
56	260	98	232	273
57	6	195	27	79
58	1	393	15	67
59	230	236	492	462
60	1,147	625	1,154	1,029
61	17	180	239	569
62	41	338	10	223
63	0	0	80	134
64	13	168	89	97
65	2	170	288	296

66	4	170	117	156
67	14	340	416	504
68	778	902	2,414	1,650
69	1,828	716	820	809
70	48	352	57	84
71	2,503	1,916	1,447	1,330
72	636	1,021	40	778
75	43	535	430	1,187
76	1,061	417	2,573	1,884
77	134	94	0	0
78	235	103	1	0
79	4,960	8,570	4,346	4,934
80	178	232	710	127
81	89	117	25	200
82	1,537	429	749	946
83	517	1,203	26	641
5	14	494	97	221
30	438	612	865	1,094
84	0	91	0	0
85	0	134	0	0
4	7	774	73	1,535
31	2,018	781	1,643	956
3	158	691	1	2
32	223	512	100	193
33	167	418	139	236

Table 3.2 Weekday PM Adjustment

	Entrance Volumes		Exit Volumes	
Paramics TAZ Number	Original Model Volumes	Modified Model Volumes	Original Model Volumes	Modified Model Volumes
7	356	355	440	372
8	284	274	351	357
9	285	267	305	314
10	252	600	324	285
11	636	643	683	716
12	444	421	402	501
16	127	210	128	160
17	117	206	175	226
18	37	38	35	41
19	46	41	36	47

20	53	46	40	49
21	32	28	30	29
22	60	61	42	44
23	33	30	19	23
24	36	40	24	24
25	121	105	98	137
26	131	119	98	112
27	125	255	107	168
28	46	117	39	78
29	25	26	31	70
34	57	49	53	65
35	49	48	58	66
36	45	44	43	49
37	0	0	0	0
38	69	90	53	73
39	52	49	50	51
40	149	139	190	207
41	110	107	89	91
42	449	441	415	434
43	135	132	89	108
44	68	66	50	64
45	39	122	28	35
53	9,476	11,535	16,503	16,184
54	82	82	60	79
55	113	111	104	134
1	4,413	4,805	2,494	2,417
2	291	142	0	256
15	923	132	0	160
46	121	162	95	95
47	58	155	49	49
48	134	276	66	320
49	1,208	804	917	802
50	4,970	5,833	3,765	4,140
51	215	554	8	559
6	0	243	0	676
13	87	208	1	464
14	879	243	556	636
52	1,548	984	1,420	1,192
56	383	128	422	385
57	30	256	18	95
58	3	509	4	11
59	504	364	296	243
60	1,362	1,425	1,374	1,512
61	56	422	227	600
62	49	369	25	453
63	0	223	121	186
64	105	288	18	31
65	42	270	12	106
66	54	272	15	488
67	172	590	49	446
68	2,613	1,943	1,956	2,442

69	1,588	1,568	1,789	2,116
70	81	919	43	41
71	2,178	2,106	2,840	2,377
72	132	1,075	352	940
75	208	1,178	76	97
76	2,787	1,569	2,088	2,065
77	38	441	56	62
78	299	185	85	106
79	5,865	4,464	5,178	5,597
80	84	1,246	51	183
81	26	277	29	205
82	1,581	592	1,813	1,484
83	128	569	585	875
5	46	1,103	29	792
30	1,171	1,546	793	1,661
84	0	404	0	218
85	0	391	0	218
4	2	313	0	299
31	2,253	1,249	2,265	1,767
3	85	788	31	930
32	211	684	312	711
33	200	686	297	401

Table 3.3 Weekend PM Adjustment

	Entrance Volumes		Exit Volumes	
Paramics TAZ Number	**Original Model Volumes**	**Modified Model Volumes**	**Original Model Volumes**	**Modified Model Volumes**
7	320	341	386	288
8	259	291	307	315
9	257	291	294	274
10	238	258	275	367
11	577	603	641	671
12	422	462	365	484
16	113	112	114	143
17	122	123	145	195
18	31	33	28	38
19	30	31	30	50
20	42	42	38	69
21	22	22	27	57
22	45	48	38	110
23	37	36	28	80
24	31	31	27	28
25	111	119	90	117
26	129	156	93	67
27	123	151	81	245
28	53	55	34	115
29	44	44	38	27

34	55	60	41	69
35	42	42	44	84
36	36	38	35	65
37	0	0	0	0
38	60	68	53	145
39	52	51	42	69
40	138	138	157	206
41	99	100	84	122
42	450	442	414	392
43	103	125	58	54
44	62	71	51	74
45	40	39	30	37
53	10,042	10,340	7,584	8,279
54	84	90	72	86
55	110	115	99	68
1	2,894	2,122	3,008	2,337
2	3	71	0	0
15	231	45	226	88
46	114	61	107	107
47	59	52	52	55
48	99	214	138	266
49	1,081	295	980	611
50	3,098	3,567	4,375	4,311
51	137	151	5	2
6	0	473	0	0
13	0	339	0	0
14	90	230	42	94
52	1,190	1,081	1,290	513
56	125	20	124	304
57	13	39	17	13
58	0	79	6	5
59	77	272	102	21
60	1,451	969	1,813	1,230
61	0	0	136	96
62	20	16	6	83
63	0	4	54	36
64	30	209	24	46
65	10	209	5	28
66	32	209	30	175
67	49	419	83	397
68	2,268	1,342	2,082	1,945
69	1,684	1,179	1,595	1,258
70	84	589	46	32
71	2,224	1,497	2,555	1,656
72	148	873	265	994
75	110	618	106	129
76	2,076	686	2,183	3,425
77	0	0	108	0
78	107	247	279	0
79	5,099	6,077	5,140	5,339
80	19	416	161	21

81	16	572	61	0
82	1,736	529	1,592	1,407
83	196	322	877	662
5	135	679	73	63
30	1,396	852	1,104	942
84	0	71	0	0
85	0	73	0	0
4	0	0	0	808
31	1,634	1,070	1,719	530
3	11	197	34	22
32	261	155	295	409
33	220	141	293	340

4.0 Calibration

■ 4.1 Calibration Methodology

The goals of model calibration are two-fold:

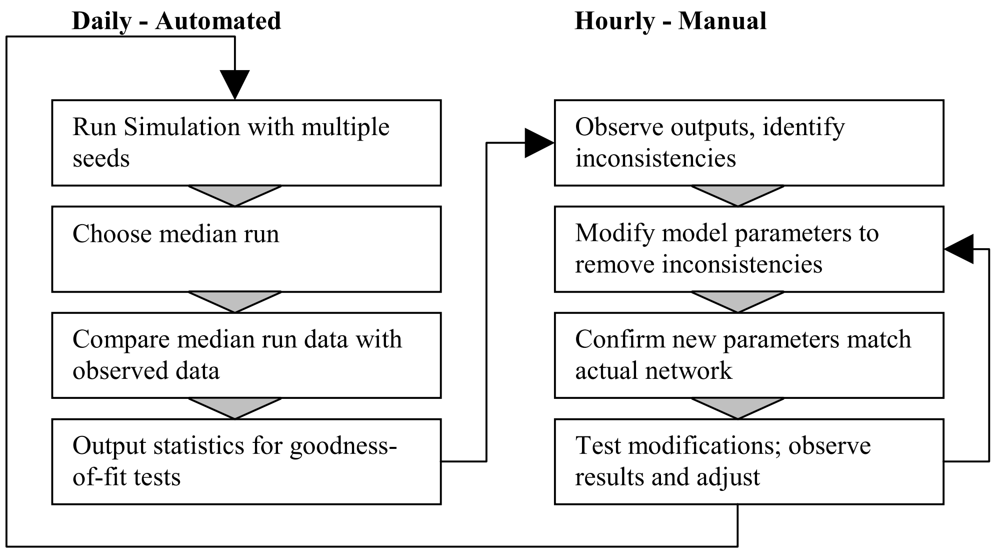
1. Match model behavior and outputs to existing conditions, and
2. Preserve the integrity of the model for future extrapolation.

Few researchers and practitioners have written on the issue of micro-simulation calibration and validation, particularly in regards to the application of micro-simulation models within the context of a larger regional travel model. For this reason, our approach is largely borrowed from travel demand model calibration techniques, supplemented by the existing research on micro-simulation calibration, techniques used in Europe by the simulation creators, and our experience with micro-simulations.

First, a distinction must be made between model calibration and model validation: model calibration is the process adjusting the model to match a given set of observed data; model validation is the process of testing and approving or rejecting this calibration, based on an independent set of observed data. We will use AM Peak period data to calibrate the model, and then validate it for the PM peak and weekend time periods using an independent subset of the observed data. Therefore, our validation targets are composed of a looser subset of the calibration targets. Second, we note that our calibration involves assignment only, due to the dynamic route choice inherent in Paramics.

Calibration of the micro-simulation model itself is an iterative process outlined in Figure 4.1.

Figure 4.1 Micro-Simulation Calibration Process



Due to its iterative nature, model calibration does not lend itself to any larger calibration timeline. Rather, model calibration is always a series of the above steps, repeated until the model is deemed calibrated.

The process of model calibration involves modifying calibration parameters to replicate existing conditions. Calibration parameters can be used to change the overall behavior of the model or for specific behavior at links on lanes or at junctions. Usually, the major adjustments to a model include moving curb and stop-line control points, and coding forced lane changes to override default Paramics lane changing.

The main link, lane, and junction calibration parameters include:

- Changing the hazard warning distance,
- Including link gradients,
- Coding junction visibility,
- Changing link headway factor,
- Coding link end speeds,
- Coding lane end stop time,
- Forced lane changes,
- Forced merges,
- Stay in lane, and
- Lane and turn restrictions.

The overall behavior of the model can be changed by increasing or decreasing the "mean headway"; the "mean reaction time"; or a driver-vehicle-unit (DVU), Paramics notation for a given driver) aggression and awareness distributions. Note the aggression and awareness is set for each vehicle when it is released onto the network with the levels of these falling within a normal distribution. These levels can be adjusted, but only if the user has some background data that suggests they are not consistent with the particular model being built. The default values used by Paramics have been calibrated against site specific headway and speed data extracted from loop detectors in the United Kingdom.

The specific parameters used in ? calibration are presented in Appendix X.

4.2 Summary of Results

4.2.1 AM

The AM Peak period was calibrated according to the rigorous set of criteria listed in Table 4.1. For all intersections (for which CS collected 5-minute turning count data), CS calibrated the model to four values: gross intersection volumes; intersection approach volumes; intersection depart volumes; and intersection turning movements. The full intersection listing is given in Table 4.4. For each of the four values, CS attempted to match a specific relative error to a proposed goal. In some cases, for low volume intersections, a value was considered matched if it met a given volume of counts, noted in Table 4.1 as 'or within this range.' CS met all intersection goals for the AM Weekday Peak Period, both for the period as a whole and for three sub-hour periods within the peak period.

CS also calibrated ten critical links to within a given relative error for the AM Weekday Peak Period for both the period as a whole and for three sub-hour periods within the peak period. These numbers, the percentages within which they were calibrated, as well as the total difference in number of vehicles between the model and counts are given in Table 4.1. The 'subset' at the bottom of the table refers to the number of data points for each type of calibration metric. Grayed values indicate (non-target) reference values.

4.2.2 PM

The PM Peak period was calibrated according to the rigorous set of criteria listed in Table 4.2. For all intersections (for which CS collected 5-minute turning count data), CS calibrated the model to four values: gross intersection volumes; intersection approach volumes; intersection depart volumes; and intersection turning movements. The full intersection listing is given in Table 4.4. For each of the four values, CS attempted to match a specific relative error to a proposed goal. In some cases, for low volume intersections, a value was considered matched if it met a given volume of counts, noted in Table 4.2 as 'or within this range.' CS met all intersection goals for the PM Weekday Peak

Period, both for the period as a whole and for three sub-hour periods within the peak period.

CS also calibrated ten critical links to within a given relative error for the PM Weekday Peak Period for both the period as a whole and for three sub-hour periods within the peak period. These numbers, the percentages within which they were calibrated, as well as the total difference in number of vehicles between the model and counts are given in Table 4.2. The 'subset' at the bottom of the table refers to the number of data points for each type of calibration metric. Grayed values indicate (non-target) reference values.

4.2.2 Weekend

The Weekend Peak period was calibrated according to the rigorous set of criteria listed in Table 4.3. For all intersections (for which CS collected 5-minute turning count data), CS calibrated the model to four values: gross intersection volumes; intersection approach volumes; intersection depart volumes; and intersection turning movements. The full intersection listing is given in Table 4.4. For each of the four values, CS attempted to match a specific relative error to a proposed goal. In some cases, for low volume intersections, a value was considered matched if it met a given volume of counts, noted in Table 4.3 as 'or within this range.' CS met all intersection goals for the Weekend Peak Period, both for the period as a whole and for three sub-hour periods within the peak period.

CS also calibrated ten critical links to within a given relative error for the Weekend Peak Period for both the period as a whole and for three sub-hour periods within the peak period. These numbers, the percentages within which they were calibrated, as well as the total difference in number of vehicles between the model and counts are given in Table 4.3. The 'subset' at the bottom of the table refers to the number of data points for each type of calibration metric. Grayed values indicate (non-target) reference values.

Table 4.1 Weekday AM Calibration Results

		Intersections				Links									
period	**measure**	gross volumes	approach volumes	depart volumes	turn movements	golden gate (EB)	golden gate (WB)	park presidio (NB)	park presidio (SB)	doyle (EB)	doyle (WB)	marina (EB)	marina (WB)	lombard (EB)	lombard (WB)
	goal	80%	70%	65%	60%	1	1	1	1	1	1	1	1	1	1
Entire Peak Period	relative error	10%	20%	20%	30%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
(6:30 AM - 9:00 AM)	or within this range	350	200	200	75										
150 minutes	match	**86%**	**76%**	**69%**	**67%**	**-10%**	**-8%**	**6%**	**3%**	**1%**	**10%**	**-1%**	**-6%**	**-2%**	**8%**
	vehicles off by					-1313	-549	402	152	80	400	-70	-100	-128	192
3 Sub-Peak Periods	goal	80%	70%	70%	60%	67%	67%	67%	67%	67%	67%	67%	67%	67%	67%
50 Min Periods	relative error	20%	30%	30%	40%	15%	15%	15%	15%	10%	15%	15%	15%	15%	15%
(6:30 AM - 7:20 AM)	or within this range	125	75	75	25	500	500	500	500	500	500	500	500	500	500
(7:20 AM - 8:10 AM)	match	**82%**	**78%**	**73%**	**69%**	**100%**	**100%**	**100%**	**100%**	**67%**	**100%**	**100%**	**100%**	**100%**	**100%**
(8:10 AM - 9:00 AM)	vehicles off by (avg)					-438	-183	134	51	27	133	-23	-33	-43	64
	relative error	20%	30%	30%	40%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Peak Hour	or within this range	220	110	110	55										
(7:45 AM - 8:45 AM)	match	86%	78%	73%	76%	1	1	0	1	1	1	0	1	1	1
	vehicles off by					-587	-73	142	372	-511	45	-453	-134	-174	53
summary	subset	42	152	153	404	1	1	1	1	1	1	1	1	1	1

Table 4.2 Weekday PM Calibration Results

period	measure	Intersections				Links									
		gross volumes	approach volumes	depart volumes	turn movements	doyle (EB)	doyle (WB)	golden gate (EB)	golden gate (WB)	lombard (EB)	lombard (WB)	marina (EB)	marina (WB)	park presidio (NB)	park presidio (SB)
	goal	80%	75%	70%	65%	1	1	1	1	1	1	1	1	1	1
Entire Peak Period	relative error	20%	25%	25%	35%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
(4:00 - 6:30 PM)	or within this range	400	300	300	150										
150 minutes	match	**84%**	**79%**	**72%**	**75%**	**-7%**	**2%**	**-15%**	**-2%**	**-12%**	**5%**	**-2%**	**4%**	**11%**	**-2%**
	vehicles off by					-370	140	-1191	-263	-434	276	-32	179	179	179
3 Sub-Peak Periods	goal	75%	70%	65%	60%	67%	67%	67%	67%	67%	67%	67%	67%	67%	67%
50 Min Periods	relative error	20%	30%	30%	40%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
(4:00 - 4:50 PM)	or within this range	150	100	100	50	500	500	500	500	500	500	500	500	500	500
(4:50 - 5:40 PM)	match	**77%**	**79%**	**72%**	**76%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
(5:40 - 6:30 PM)	vehicles off by (avg)					-123	47	-397	-88	-145	92	-11	60	220	-42
	relative error	30%	40%	40%	50%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%
Peak Hour	or within this range	250	150	150	100	500	500	500	500	500	500	500	500	500	500
	match	82%	0%	79%	86%	1	1	1	1	1	1	1	1	1	1
summary	subset	44	155	153	404	1	1	1	1	1	1	1	1	1	1

Table 4.3 Weekday PM Calibration Results

period	measure	Intersections						Links							
		gross volumes	approach volumes	depart volumes	turn movements	golden gate (EB)	golden gate (WB)	doyle (EB)	doyle (WB)	lombard (EB)	lombard (WB)	marina (EB)	marina (WB)	park presidio (NB)	park presidio (SB)
	goal	85%	75%	70%	70%	1	1	1	1	1	1	1	1	1	1
Entire Peak Period	relative error	25%	25%	25%	25%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
(4:00 - 6:30 PM)	or within this range	300	300	100	100										
150 minutes	match	**100%**	**79%**	**71%**	**71%**	**-5%**	**-16%**	**15%**	**2%**	**12%**	**-7%**	**11%**	**-12%**	**-15%**	**5%**
	vehicles off by					-487	-1289	854	133	389	-286	285	-257	-879	299
3 Sub-Peak Periods	goal	70%	60%	60%	50%	67%	67%	67%	67%	67%	67%	67%	67%	67%	67%
50 Min Periods	relative error	30%	40%	40%	50%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%
(4:00 - 4:50 PM)	or within this range	250	150	150	100	500	500	500	500	500	500	500	500	500	500
(4:50 - 5:40 PM)	match	**100%**	**81%**	**74%**	**81%**	**100%**	**33%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
(5:40 - 6:30 PM)	vehicles off by (avg)					-162	-369	285	44	130	-95	95	-86	-293	100
	relative error	30%	40%	40%	50%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%
Peak Hour	or within this range	250	150	150	100	500	500	500	500	500	500	500	500	500	500
	match	100%	86%	71%	82%	1	1	1	1	1	1	1	1	1	1
summary	subset	4	14	14	34	1	1	1	1	1	1	1	1	1	1

Table 4.4 Listing of Intersections Used in Calibration

AREA A	1	Marina	Fillmore
	2	Marina	Scott/Cervantes
	3	Marina	Divisadero
	4	Marina	Broderick
	5	Marina	Baker
	6	Marina	Lyon/Mason
	7	Lombard	Fillmore
	8	Lombard	Scott
	9	Lombard	Divisadero
	10	Lombard	Broderick
	11	Lombard	Baker
	12	Lombard	Richardson
	13	Richardson	Baker
	14	Richardson	Francisco
	15	Divisadero	Jefferson
	16	Divisadero	North Point
	17	Divisadero	Chestnut
	18	Divisadero	Greenwich
	19	Broderick	Beach
	20	Broderick	Bay
	21	Baker	North Point
	22	Mason	near Bank
	23	Crissy Field	McDowell
	24	Lincoln	Hoffman (Armistead)
	25	Lincoln	Kobbe
AREA B	26	Lincoln	Sheridan
	27	Arguello	Moraga
	28	Lombard	Presidio
	29	Lombard	Lyon
AREA C	30	El Camino Del Mar	26th Avenue
	31	El Camino Del Mar	25th Avenue
	32	Lake	25th Avenue
	33	Lake	15th Avenue
	34	Lake	14th Avenue
	35	Lake	12th Avenue
	36	Lake	Arguello
	37	California	26th Avenue
	38	California	25th Avenue

	39	California	15th Avenue
	40	California	14th Avenue
	41	California	Funston
	42	California	Arguello
	43	Sacramento	Arguello
	44	West Pacific	Arguello
	45	Presidio	Pacific
	46	Presidio	Jackson
	47	Presidio	West Broadway
	48	Presidio	West Pacific
	49	Lyon	Jackson

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MEMORANDUM

Date: January 29, 2002

To: Dina Potter, PBQD

Joe Story, DKS Associates

From: Joe Castiglione, SFCTA

Subject: 2030 Doyle Drive Travel Demand Forecasting Methodology

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The purpose of this memo is to describe the methodology used to develop forecasts of regional travel demand in order to support the analysis requirements of the Doyle Drive Environmental & Design Study. A primary feature of this effort is that it involved developing forecasts for the year 2030, which is beyond the horizon year of all current forecasts of population, land use, and transporation system changes. The current San Francisco and MTC model horizon years are 2020. However, using new 2025 travel demand and land use forecasts prepared by MTC and ABAG, it was possible to develop 2030 forecasts. The following paragraphs describe the specific steps involved in developing these 2030 forecasts, based on the structure of the San Francisco Travel Demand Forecast Model and MTC's Baycast Model.

The San Francisco Travel Demand Model was developed to support the Doyle Drive Environmental & Design Study and other transportation and land use planning analyses in San Francisco. The San Francisco Model provides detailed forecasts of San Francisco residents' travel behavior, which is then integrated with forecasts of regional travel produced by the Metropolitan Transportation Commission's (MTC) 9-county "Baycast" model. This integrated demand is then assigned to regional highway and transit networks to provide forecast volumes.

The current horizon year for the San Francisco model is 2020. The selection of this horizon year was influenced by two primary factors. First, until recently, 2020 was the furthest future year for which land use forecasts were available from the Association of Bay Area Governments (ABAG). ABAG's forecasts of households, population and employment are key inputs needed to develop the detailed TAZ-level land use forecasts used in the San Francisco model. ABAG's forecasts also function as critical model constraints – in order to be "consistent" with MTC's regional model, San Francisco must not exceed ABAG's forecasts for total households, population, employed residents, and employment. The second factor influencing the choice of 2020 as a horizon year is that this was the furthest future year for which MTC model outputs were available. Because the San Francisco model relies on the MTC model for forecasts of regional demand, this is also a critical constraint.

To satisfy the analysis needs of the Doyle Drive Environmental & Design Study, it was necessary to develop travel demand forecasts for a 2030 horizon year, which is beyond the time frame of the latest available regional land use and travel demand forecasts. This memo describes the methodology used to develop these 2030 travel demand forecasts, based the best available regional land use and travel demand forecasts. The approach involved two primary steps: 1) developing 2030 inputs for the San Francisco travel demand forecast model, and 2) developing 2030 regional travel demand "trip tables." Each step is described in detail below.

In order to develop 2030 forecasts of San Francisco resident travel demand, it was necessary to develop 2030 inputs to the San Francisco travel demand forecast model. MTC's 2020 and 2025 forecasts of households, population, employed residents and employment were used to accomplish this goal. MTC has developed 2025 land use forecasts using information from ABAG's regional economic models. MTC's 2020 and 2025 land use forecasts were compared by MTAZ (MTC Travel Analysis Zone) to calculate growth rates for households, household population, employed residents and employees. The more detailed San Francisco model zones nest within the MTAZ system, so the calculated MTAZ growth rates were applied to the SFTAZ's within each given MTAZ. Separate growth rates were calculated for changes in households, household population, employed residents and employment. A single employment growth rate was applied to all the various employment sectors because more detailed, sector-specific information was not available. These 2020-2025 growth rates were first applied to the existing San Francisco model 2020 land use inputs in order to develop 2025 forecasts. The 2020-2025 growth rates were then applied a second time, to the new 2025 forecasts, in order to develop 2030 land use inputs.

One important exception to the forecasts of households, household population, employed residents and employment was the Presidio. All 2030 land use assumptions used in the Presidio were consistent with the 2020 land use assumptions of the PTIP New Draft Plan Alternative scenario provided by the Presidio Trust.

At the time the forecasts were prepared, there was no additional information on changes to the regional transportation system beyond 2020, so the input highway and transit networks used in 2030 forecasts were the 2020 networks. The San Francisco Model was then run using the 2030 land use inputs and networks, and produced 2030 forecasts of San Francisco residents' travel.

In order to develop 2030 forecasts of regional traveler demand, forecasts of 2025 travel demand provided to the San Francisco County Transportation Authority (SFCTA) by MTC were extrapolated to 2030. These 2025 forecasts, however, were "pre-mode choice" meaning that specific modes used by travelers (Drive Alone, Shared Ride 2, Shared Ride 3+, Transit-Walk Access, Transit-Drive Access, Bike, and Walk) had not been assigned to the trips. Therefore, there were two steps involved in developing the 2030 forecasts of regional demand. The first involved predicting the total demand for travel in 2030 by pivoting off of the 2025 demand provided by MTC. The second step involved assigning a specific mode for all the trips in this new 2030 demand.

In order to predict the total 2030 regional travel demand, a set of trip purpose-specific growth factors was developed, based on the 2020-2025 land use changes, and were then applied to the

2025 trip tables. For home based work trips, we proposed to use a "fratar" distribution approach. The fratar method modifies a matrix of values based upon a set of production and attraction factors for each of the zones in the matrix. The process is a relatively simple iterative one: In the first iteration, each row in the matrix is factored according to its production factor. At the end of the iteration, the row totals will match the target row values, but the column totals will most likely not match their targets. In the second iteration each column in the modified matrix is factored according its attraction factor. At then end of the iteration, the column totals will match the target column values, but the row totals may not match their targets. This process continues for some number of iterations; the row and column totals should converge towards the target totals. When the criteria for convergence is met, the process is complete. Growth in employed residents was used as the production factor and growth in employment was used as the attraction factor.

To develop 2030 home-based school, shopping, and social and recreation trips a simpler method was used, where the 2020-2025 growth in households was used as a simple factor applied to the production end of these trip purposes using the 2025 trip tables from MTC. A similar, simple method was also used to develop 2030 non-home based trips, but for this purpose growth in employment, rather than households, was used as the production end factor.

Once the forecasts of total demand were estimated using the 2025 trip tables and the 2020-2025 growth rates, it was necessary to assign specific modes to these trips. Purpose- and geographic-specific mode splits were developed from MTC's 2005 forecasts of regional demand. 2005 was selected because it was the furthest year for which MTC has applied and tested their current mode choice model. The mode splits were then applied to the total predicted 2030 regional demand by purpose. The resultant product was a set of 2030 trip tables, disaggregated by MTC's modes.

Upon completing the creation of the 2030 regional travel demand forecasts and the 2030 San Francisco model inputs, the San Francisco model stream was run. The San Francisco model predicted the 2030 behavior of San Francisco residents, and then integrated this demand with the regional 2030 demand which was extrapolated from the 2025 regional trip tables.

Table 1 shows the differences between the original Projections2000-based and updated Projections2002-based 2030 forecasts for San Francisco and Bay Area population, households, and employment. The revised assumptions show slightly more households, population, and jobs in San Francisco, while regional households, population and jobs are virtually unchanged.

Table1. Proj2000-based and Proj2002-based Year 2030 Forecasts

	SF		BAY AREA	
	Proj2000	Proj2002	Proj2000	Proj2002
Households	340,715	350,821	3,067,522	2,998,983
Household Population	778,743	798,203	8,292,292	8,269,932
Jobs	774,474	796,264	5,169,148	5,158,529

An important exception to the methodology of forecasting growth in households, household population, employed residents and employment was the Presidio. All 2030 land use assumptions for the Presidio in this update are consistent with the forecast land use assumptions of the PTMP scenario provided by the Presidio Trust. The PTMP scenario assumptions are slightly different than the Presidio assumptions used in the original Doyle analysis, which were based on the PTIP "preferred" alternative. Table 2 shows the differences between the PTIP and PTMP assumptions in the Presidio.

Table 2. Presidio Population and Employment Assumptions

	PTIP (original)	PTMP (update)
Household Population	3,907	3,986
Jobs	7,408	7,078

In order to develop 2030 forecasts of regional traveler demand, forecasts of 2025 travel demand produced to support MTC's 2001 RTP were provided to the San Francisco County Transportation Authority by MTC, and were extrapolated to 2030. In order to predict the total 2030 regional travel demand, a set of trip purpose-specific growth factors was developed, based on the 2020-2025 land use changes, and were then applied to the 2025 trip tables. For home based work trips, we proposed to use a "fratar" distribution approach. The fratar method modifies a matrix of values based upon a set of production and attraction factors for each of the zones in the matrix. The process is a relatively simple iterative one: In the first iteration, each row in the matrix is factored according to its production factor. At the end of the iteration, the row totals will match the target row values, but the column totals will most likely not match their targets. In the second iteration each column in the modified matrix is factored according its attraction factor. At then end of the iteration, the column totals will match the target column values, but the row totals may not match their targets. This process continues for some number of iterations; the row and column totals should converge towards the target totals. When the criteria for convergence is met, the process is complete. Growth in employed residents was used as the production factor and growth in employment was used as the attraction factor.

To develop 2030 home-based school, shopping, and social and recreation trips a simpler method was used, where the 2020-2025 growth in households was used as a simple factor applied to the production end of these trip purposes using the 2025 trip tables from MTC. A similar, simple method was also used to develop 2030 non-home based trips, but for this purpose growth in employment, rather than households, was used as the production end factor.

The transportation networks used to support the analysis were based on MTC's 2001 RTP 2025 "Project" networks, and include all likely major transportation projects in the region. Additional refinements to the San Francisco networks, such as MUNI service changes, were also incorporated into the future year networks. At the time the forecasts were prepared, there was no additional information on changes to the regional transportation system beyond 2025, so the input highway and transit networks used in 2030 forecasts were the 2025 networks. Upon completing the creation of the 2030 regional travel demand forecasts and the 2030 San Francisco model inputs, the San Francisco model stream was run. The San Francisco model predicted the 2030 behavior of San Francisco residents, and then integrated this demand with the regional 2030 demand which was extrapolated from the 2025 regional trip tables.

APPENDIX C

DETAILED INTERSECTION LEVEL OF SERVICE CALCULATIONS

2000

(Existing Conditions) AM

Movement	WBL	WBR	NBL	NBR	SEL	SER	SER2	NEL	NER	NER2
Lane Configurations										
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0		4.0		4.0	
Lane Util. Factor	0.97	1.00			1.00		1.00		0.88	
Frt	1.00	0.85			1.00		0.85		0.85	
Flt Protected	0.95	1.00			0.95		1.00		1.00	
Satd. Flow (prot)	3433	1583			1770		1583		2787	
Flt Permitted	0.95	1.00			0.95		1.00		1.00	
Satd. Flow (perm)	3433	1583			1770		1583		2787	
Volume (vph)	228	23	0	0	118	0	6	0	557	8
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	228	23	0	0	118	0	6	0	557	8
Lane Group Flow (vph)	228	23	0	0	118	0	6	0	565	0
Turn Type		Free		custom	Prot		custom			
Protected Phases	8				2				8	
Permitted Phases		Free		2			2		8	
Actuated Green, G (s)	35.0	75.0			32.0		32.0		35.0	
Effective Green, g (s)	35.0	75.0			32.0		32.0		35.0	
Actuated g/C Ratio	0.47	1.00			0.43		0.43		0.47	
Clearance Time (s)	4.0				4.0		4.0		4.0	
Lane Grp Cap (vph)	1602	1583			755		675		1301	
v/s Ratio Prot	0.07				c0.07				c0.20	
v/s Ratio Perm		0.01					0.00			
v/c Ratio	0.14	0.01			0.16		0.01		0.43	
Uniform Delay, d1	11.4	0.0			13.2		12.4		13.4	
Progression Factor	1.00	1.00			1.00		1.00		1.00	
Incremental Delay, d2	0.2	0.0			0.4		0.0		1.1	
Delay (s)	11.6	0.0			13.6		12.4		14.4	
Level of Service	B	A			B		B		B	
Approach Delay (s)	10.5		0.0		13.6			14.4		
Approach LOS	B		A		B			B		

Intersection Summary			
HCM Average Control Delay	13.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	39.6%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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	
Lane Util. Factor		0.95			1.00			0.91	1.00		0.91	
Frt		1.00			0.89			1.00	0.85		1.00	
Flt Protected		0.96			1.00			1.00	1.00		1.00	
Satd. Flow (prot)		3409			1663			5085	1583		5085	
Flt Permitted		0.75			1.00			1.00	1.00		1.00	
Satd. Flow (perm)		2659			1663			5085	1583		5085	
Volume (vph)	179	64	3	0	7	27	0	3092	625	0	1237	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	179	64	3	0	7	27	0	3092	625	0	1237	0
Lane Group Flow (vph)	0	246	0	0	34	0	0	3092	625	0	1237	0
Turn Type	Perm			Perm					Free			
Protected Phases		4			8			6			2	
Permitted Phases	4			8					Free			
Actuated Green, G (s)		31.0			31.0			51.0	90.0		51.0	
Effective Green, g (s)		31.0			31.0			51.0	90.0		51.0	
Actuated g/C Ratio		0.34			0.34			0.57	1.00		0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		916			573			2882	1583		2882	
v/s Ratio Prot					0.02			c0.61			0.24	
v/s Ratio Perm		0.09							0.39			
v/c Ratio		0.27			0.06			1.07	0.39		0.43	
Uniform Delay, d1		21.3			19.7			19.5	0.0		11.2	
Progression Factor		1.00			1.00			1.00	1.00		0.12	
Incremental Delay, d2		0.7			0.2			40.3	0.7		0.4	
Delay (s)		22.0			19.9			59.8	0.7		1.7	
Level of Service		C			B			E	A		A	
Approach Delay (s)		22.0			19.9			49.8			1.7	
Approach LOS		C			B			D			A	

Intersection Summary			
HCM Average Control Delay	37.0	HCM Level of Service	D
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	83.0%	ICU Level of Service	D

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	334	4	6	12	41	63
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	334	4	6	12	41	63
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
vC, conflicting volume	18				684	12
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	79				87	94
cM capacity (veh/h)	1599				328	1069

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	338	18	104
Volume Left	334	0	41
Volume Right	0	12	63
cSH	1599	1700	565
Volume to Capacity	0.21	0.01	0.18
Queue Length (ft)	20	0	17
Control Delay (s)	7.8	0.0	12.8
Lane LOS	A		B
Approach Delay (s)	7.8	0.0	12.8
Approach LOS			B

Intersection Summary			
Average Delay	8.6		
Intersection Capacity Utilization	38.2%	ICU Level of Service	A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	1	256	57	352	64	3
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	1	256	57	352	64	3
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
vC, conflicting volume	532	66	67			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	74	96			
cM capacity (veh/h)	490	998	1535			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	257	409	67
Volume Left	1	57	0
Volume Right	256	0	3
cSH	994	1535	1700
Volume to Capacity	0.26	0.04	0.04
Queue Length (ft)	26	3	0
Control Delay (s)	9.9	1.3	0.0
Lane LOS	A	A	
Approach Delay (s)	9.9	1.3	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	4.2		
Intersection Capacity Utilization	50.9%	ICU Level of Service	A

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	82	154	0	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	0	82	154	0	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
vC, conflicting volume	154				195	77
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	100
cM capacity (veh/h)	1424				776	968

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	27	55	103	51	0
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	0
cSH	1424	1700	1700	1700	1700
Volume to Capacity	0.00	0.03	0.06	0.03	0.00
Queue Length (ft)	0	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0
Lane LOS					A
Approach Delay (s)	0.0		0.0		0.0
Approach LOS					A

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	7.6%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	1140	1	0	593	10	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	1140	1	0	593	10	0

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	760	381	198	395	10
Volume Left (vph)	0	0	0	0	10
Volume Right (vph)	0	1	0	0	0
Hadj (s)	0.0	0.0	0.0	0.0	0.2
Departure Headway (s)	5.4	5.4	7.7	7.7	7.0
Degree Utilization, x	1.15	0.58	0.42	0.85	0.02
Capacity (veh/h)	656	653	423	451	501
Control Delay (s)	103.4	14.4	15.1	39.3	10.1
Approach Delay (s)	73.7		31.2		10.1
Approach LOS	F		D		B

Intersection Summary			
Delay	58.9		
HCM Level of Service	F		
Intersection Capacity Utilization	41.5%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	1180	3	0	645	39	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	1180	3	0	645	39	0

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	787	396	215	430	39
Volume Left (vph)	0	0	0	0	39
Volume Right (vph)	0	3	0	0	0
Hadj (s)	0.0	0.0	0.0	0.0	0.2
Departure Headway (s)	5.7	5.7	8.0	8.0	7.1
Degree Utilization, x	1.25	0.63	0.48	0.96	0.08
Capacity (veh/h)	626	613	413	430	501
Control Delay (s)	142.0	16.6	17.0	60.1	10.6
Approach Delay (s)	100.0		45.7		10.6
Approach LOS	F		E		B

Intersection Summary			
Delay	79.4		
HCM Level of Service	F		
Intersection Capacity Utilization	42.7%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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		1.00			1.00			0.91			0.91	
Frt		1.00			0.91			1.00			1.00	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1861			1688			5061			5084	
Flt Permitted		1.00			1.00			1.00			1.00	
Satd. Flow (perm)		1858			1688			5061			5084	
Volume (vph)	7	482	0	0	23	52	0	2421	80	0	1190	2
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	7	482	0	0	23	52	0	2421	80	0	1190	2
Lane Group Flow (vph)	0	489	0	0	75	0	0	2501	0	0	1192	0
Turn Type	Perm			Perm								
Protected Phases		4			8			6			2	
Permitted Phases	4			8								
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		640			581			2868			2881	
v/s Ratio Prot					0.04			c0.49			0.23	
v/s Ratio Perm		c0.26										
v/c Ratio		0.76			0.13			0.87			0.41	
Uniform Delay, d1		26.2			20.2			16.7			11.0	
Progression Factor		1.00			1.00			0.45			1.12	
Incremental Delay, d2		8.4			0.5			0.4			0.4	
Delay (s)		34.7			20.7			7.9			12.8	
Level of Service		C			C			A			B	
Approach Delay (s)		34.7			20.7			7.9			12.8	
Approach LOS		C			C			A			B	

Intersection Summary			
HCM Average Control Delay	12.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	83.9%	ICU Level of Service	D

c Critical Lane Group

Movement	WBL	WBR	NBL	NBR	SEL	SER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.76		1.00	0.94	
Frt	1.00	0.85		0.86	1.00	
Flt Protected	0.95	1.00		1.00	0.95	
Satd. Flow (prot)	1770	3610		1611	4990	
Flt Permitted	0.95	1.00		1.00	0.95	
Satd. Flow (perm)	1770	3610		1611	4990	
Volume (vph)	216	1169	0	208	2391	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	216	1169	0	208	2391	0
Lane Group Flow (vph)	216	1169	0	208	2391	0
Turn Type		custom		custom	Prot	
Protected Phases	8			4	2	
Permitted Phases		8 2		4		
Actuated Green, G (s)	25.0	90.0		25.0	57.0	
Effective Green, g (s)	25.0	90.0		25.0	57.0	
Actuated g/C Ratio	0.28	1.00		0.28	0.63	
Clearance Time (s)	4.0			4.0	4.0	
Lane Grp Cap (vph)	492	3610		448	3160	
v/s Ratio Prot	0.12			c0.13	c0.48	
v/s Ratio Perm		0.32				
v/c Ratio	0.44	0.32		0.46	0.76	
Uniform Delay, d1	26.7	0.0		26.9	11.6	
Progression Factor	0.75	1.00		1.00	0.99	
Incremental Delay, d2	2.6	0.2		3.4	0.8	
Delay (s)	22.5	0.2		30.4	12.3	
Level of Service	C	A		C	B	
Approach Delay (s)	3.7		30.4		12.3	
Approach LOS	A		C		B	

Intersection Summary			
HCM Average Control Delay	10.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	65.0%	ICU Level of Service	B

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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		0.91			0.91			1.00			1.00	
Frt		0.98			1.00			1.00			0.92	
Flt Protected		1.00			1.00			0.95			0.99	
Satd. Flow (prot)		4969			5083			1771			1692	
Flt Permitted		1.00			1.00			0.76			0.96	
Satd. Flow (perm)		4969			5083			1401			1649	
Volume (vph)	0	2283	410	0	1384	4	71	1	2	6	5	17
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	2283	410	0	1384	4	71	1	2	6	5	17
Lane Group Flow (vph)	0	2693	0	0	1388	0	0	74	0	0	28	0
Turn Type							Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)		55.0			55.0			27.0			27.0	
Effective Green, g (s)		55.0			55.0			27.0			27.0	
Actuated g/C Ratio		0.61			0.61			0.30			0.30	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		3037			3106			420			495	
v/s Ratio Prot		c0.54			0.27							
v/s Ratio Perm								c0.05			0.02	
v/c Ratio		0.89			0.45			0.18			0.06	
Uniform Delay, d1		14.9			9.4			23.3			22.4	
Progression Factor		1.65			1.00			1.00			1.00	
Incremental Delay, d2		3.0			0.5			0.9			0.2	
Delay (s)		27.6			9.8			24.2			22.6	
Level of Service		C			A			C			C	
Approach Delay (s)		27.6			9.8			24.2			22.6	
Approach LOS		C			A			C			C	

Intersection Summary			
HCM Average Control Delay	21.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	70.7%	ICU Level of Service	C

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (veh/h)	232	163	94	5	274	6	111	34	8	19	206	236
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	232	163	94	5	274	6	111	34	8	19	206	236

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	489	285	153	461
Volume Left (vph)	232	5	111	19
Volume Right (vph)	94	6	8	236
Hadj (s)	0.0	0.0	0.1	-0.3
Departure Headway (s)	6.5	6.3	7.5	6.3
Degree Utilization, x	0.88	0.50	0.32	0.81
Capacity (veh/h)	547	471	422	461
Control Delay (s)	39.5	15.5	14.0	31.0
Approach Delay (s)	39.5	15.5	14.0	31.0
Approach LOS	E	C	B	D

Intersection Summary			
Delay	29.0		
HCM Level of Service	D		
Intersection Capacity Utilization	90.3%	ICU Level of Service	E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (veh/h)	2	1	0	0	8	8	0	491	8	11	515	60
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	2	1	0	0	8	8	0	491	8	11	515	60

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	3	16	499	586
Volume Left (vph)	2	0	0	11
Volume Right (vph)	0	8	8	60
Hadj (s)	0.2	-0.3	0.0	0.0
Departure Headway (s)	6.3	4.8	4.5	4.4
Degree Utilization, x	0.01	0.02	0.63	0.72
Capacity (veh/h)	507	549	781	804
Control Delay (s)	9.3	7.9	15.0	18.0
Approach Delay (s)	9.3	7.9	15.0	18.0
Approach LOS	A	A	B	C

Intersection Summary			
Delay	16.4		
HCM Level of Service	C		
Intersection Capacity Utilization	47.6%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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	
Lane Util. Factor	1.00	1.00			1.00	1.00		0.91			0.91	
Frt	1.00	0.99			1.00	0.85		1.00			0.98	
Flt Protected	0.95	1.00			1.00	1.00		1.00			1.00	
Satd. Flow (prot)	1770	1847			1863	1583		5085			4974	
Flt Permitted	0.76	1.00			1.00	1.00		1.00			1.00	
Satd. Flow (perm)	1407	1847			1863	1583		5085			4974	
Volume (vph)	308	66	4	0	4	77	0	1994	0	0	2033	347
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	308	66	4	0	4	77	0	1994	0	0	2033	347
Lane Group Flow (vph)	308	70	0	0	4	77	0	1994	0	0	2380	0
Turn Type	Perm			Perm		Perm						
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8						
Actuated Green, G (s)	29.0	29.0			29.0	29.0		53.0			53.0	
Effective Green, g (s)	29.0	29.0			29.0	29.0		53.0			53.0	
Actuated g/C Ratio	0.32	0.32			0.32	0.32		0.59			0.59	
Clearance Time (s)	4.0	4.0			4.0	4.0		4.0			4.0	
Lane Grp Cap (vph)	453	595			600	510		2995			2929	
v/s Ratio Prot		0.04			0.00			0.39			c0.48	
v/s Ratio Perm	c0.22					0.05						
v/c Ratio	0.68	0.12			0.01	0.15		0.67			0.81	
Uniform Delay, d1	26.5	21.5			20.7	21.7		12.5			14.6	
Progression Factor	1.00	1.00			1.00	1.00		1.00			1.00	
Incremental Delay, d2	8.0	0.4			0.0	0.6		1.2			2.6	
Delay (s)	34.5	21.9			20.7	22.4		13.7			17.2	
Level of Service	C	C			C	C		B			B	
Approach Delay (s)		32.1			22.3			13.7			17.2	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	17.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	77.4%	ICU Level of Service	C

c Critical Lane Group

2000

(Existing Conditions) PM

Movement	WBL	WBR	NBL	NBR	SEL	SER	SER2	NEL	NER	NER2
Lane Configurations										
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0		4.0		4.0	
Lane Util. Factor	0.97	1.00			1.00		1.00		0.88	
Frt	1.00	0.85			1.00		0.85		0.85	
Flt Protected	0.95	1.00			0.95		1.00		1.00	
Satd. Flow (prot)	3433	1583			1770		1583		2787	
Flt Permitted	0.95	1.00			0.95		1.00		1.00	
Satd. Flow (perm)	3433	1583			1770		1583		2787	
Volume (vph)	1318	442	0	0	14	0	499	0	873	19
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1318	442	0	0	14	0	499	0	873	19
Lane Group Flow (vph)	1318	442	0	0	14	0	499	0	892	0
Turn Type		Free		custom	Prot		custom			
Protected Phases	8				2				8	
Permitted Phases		Free		2			2		8	
Actuated Green, G (s)	35.0	75.0			32.0		32.0		35.0	
Effective Green, g (s)	35.0	75.0			32.0		32.0		35.0	
Actuated g/C Ratio	0.47	1.00			0.43		0.43		0.47	
Clearance Time (s)	4.0				4.0		4.0		4.0	
Lane Grp Cap (vph)	1602	1583			755		675		1301	
v/s Ratio Prot	c0.38				0.01				0.32	
v/s Ratio Perm		0.28					0.32			
v/c Ratio	0.82	0.28			0.02		0.74		0.69	
Uniform Delay, d1	17.3	0.0			12.4		18.0		15.7	
Progression Factor	1.00	1.00			1.00		1.00		1.00	
Incremental Delay, d2	4.9	0.4			0.0		7.1		3.0	
Delay (s)	22.2	0.4			12.5		25.1		18.6	
Level of Service	C	A			B		C		B	
Approach Delay (s)	16.8		0.0		24.8			18.6		
Approach LOS	B		A		C			B		

Intersection Summary			
HCM Average Control Delay	18.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	75.2%	ICU Level of Service	C

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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	
Lane Util. Factor		0.95			1.00			0.91	1.00		0.91	
Frt		0.95			0.88			1.00	0.85		1.00	
Flt Protected		0.98			1.00			1.00	1.00		1.00	
Satd. Flow (prot)		3267			1637			5085	1583		5085	
Flt Permitted		0.78			1.00			1.00	1.00		1.00	
Satd. Flow (perm)		2611			1637			5085	1583		5085	
Volume (vph)	41	13	31	0	30	262	0	1573	161	0	2472	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	41	13	31	0	30	262	0	1573	161	0	2472	0
Lane Group Flow (vph)	0	85	0	0	292	0	0	1573	161	0	2472	0
Turn Type	Perm			Perm					Free			
Protected Phases		4			8			6			2	
Permitted Phases	4			8					Free			
Actuated Green, G (s)		31.0			31.0			51.0	90.0		51.0	
Effective Green, g (s)		31.0			31.0			51.0	90.0		51.0	
Actuated g/C Ratio		0.34			0.34			0.57	1.00		0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		899			564			2882	1583		2882	
v/s Ratio Prot					c0.18			0.31			c0.49	
v/s Ratio Perm		0.03							0.10			
v/c Ratio		0.09			0.52			0.55	0.10		0.86	
Uniform Delay, d1		20.0			23.5			12.2	0.0		16.4	
Progression Factor		1.00			1.00			1.00	1.00		0.26	
Incremental Delay, d2		0.2			3.4			0.7	0.1		2.3	
Delay (s)		20.2			26.9			13.0	0.1		6.6	
Level of Service		C			C			B	A		A	
Approach Delay (s)		20.2			26.9			11.8			6.6	
Approach LOS		C			C			B			A	

Intersection Summary			
HCM Average Control Delay	10.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	72.2%	ICU Level of Service	C

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	333	4	23	239	17	85
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	333	4	23	239	17	85
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
vC, conflicting volume	262				812	142
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	74				93	91
cM capacity (veh/h)	1302				259	905

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	337	262	102
Volume Left	333	0	17
Volume Right	0	239	85
cSH	1302	1700	639
Volume to Capacity	0.26	0.15	0.16
Queue Length (ft)	26	0	14
Control Delay (s)	8.6	0.0	11.7
Lane LOS	A		B
Approach Delay (s)	8.6	0.0	11.7
Approach LOS			B

Intersection Summary			
Average Delay	5.9		
Intersection Capacity Utilization	50.8%	ICU Level of Service	A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	0	273	99	349	119	19
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	0	273	99	349	119	19
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
vC, conflicting volume	676	128	138			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	70	93			
cM capacity (veh/h)	390	921	1446			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	273	448	138
Volume Left	0	99	0
Volume Right	273	0	19
cSH	921	1446	1700
Volume to Capacity	0.30	0.07	0.08
Queue Length (ft)	31	6	0
Control Delay (s)	10.5	2.2	0.0
Lane LOS	B	A	
Approach Delay (s)	10.5	2.2	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	4.5		
Intersection Capacity Utilization	58.2%	ICU Level of Service	A

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	165	366	0	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	0	165	366	0	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
vC, conflicting volume	366				448	183
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	100
cM capacity (veh/h)	1189				539	828

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	55	110	244	122	0
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	0
cSH	1189	1700	1700	1700	1700
Volume to Capacity	0.00	0.06	0.14	0.07	0.00
Queue Length (ft)	0	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0
Lane LOS					A
Approach Delay (s)	0.0		0.0		0.0
Approach LOS					A

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	13.5%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	854	0	0	1141	80	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	854	0	0	1141	80	0

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	569	285	380	761	80
Volume Left (vph)	0	0	0	0	80
Volume Right (vph)	0	0	0	0	0
Hadj (s)	0.0	0.0	0.0	0.0	0.2
Departure Headway (s)	6.3	6.3	8.4	8.4	7.1
Degree Utilization, x	1.00	0.50	0.89	1.77	0.16
Capacity (veh/h)	565	560	420	434	502
Control Delay (s)	61.6	14.3	47.6	375.2	11.4
Approach Delay (s)	45.9		266.0		11.4
Approach LOS	E		F		B

Intersection Summary			
Delay	165.6		
HCM Level of Service	F		
Intersection Capacity Utilization	42.6%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	927	44	0	1193	2	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	927	44	0	1193	2	0

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	618	353	398	795	2
Volume Left (vph)	0	0	0	0	2
Volume Right (vph)	0	44	0	0	0
Hadj (s)	0.0	0.0	0.0	0.0	0.2
Departure Headway (s)	6.1	6.1	8.3	8.3	7.1
Degree Utilization, x	1.05	0.59	0.92	1.84	0.00
Capacity (veh/h)	583	576	398	437	500
Control Delay (s)	74.8	16.3	53.3	404.6	10.1
Approach Delay (s)	53.5		287.5		10.1
Approach LOS	F		F		B

Intersection Summary			
Delay	182.3		
HCM Level of Service	F		
Intersection Capacity Utilization	43.0%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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		1.00			1.00			0.91			0.91	
Frt		1.00			0.89			1.00			1.00	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1862			1656			5085			5085	
Flt Permitted		1.00			1.00			1.00			1.00	
Satd. Flow (perm)		1860			1653			5085			5085	
Volume (vph)	2	314	0	3	68	324	0	1392	0	0	2184	2
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	2	314	0	3	68	324	0	1392	0	0	2184	2
Lane Group Flow (vph)	0	316	0	0	395	0	0	1392	0	0	2186	0
Turn Type	Perm			Perm								
Protected Phases		4			8			6			2	
Permitted Phases	4			8								
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		641			569			2882			2882	
v/s Ratio Prot								0.27			c0.43	
v/s Ratio Perm		0.17			c0.24							
v/c Ratio		0.49			0.69			0.48			0.76	
Uniform Delay, d1		23.3			25.4			11.6			14.8	
Progression Factor		1.00			1.00			0.38			1.00	
Incremental Delay, d2		2.7			6.8			0.5			1.6	
Delay (s)		26.0			32.3			4.9			16.4	
Level of Service		C			C			A			B	
Approach Delay (s)		26.0			32.3			4.9			16.4	
Approach LOS		C			C			A			B	

Intersection Summary			
HCM Average Control Delay	14.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	73.7%	ICU Level of Service	C

c Critical Lane Group

Movement	WBL	WBR	NBL	NBR	SEL	SER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.76		1.00	0.94	
Frt	1.00	0.85		0.86	1.00	
Flt Protected	0.95	1.00		1.00	0.95	
Satd. Flow (prot)	1770	3610		1611	4990	
Flt Permitted	0.95	1.00		1.00	0.95	
Satd. Flow (perm)	1770	3610		1611	4990	
Volume (vph)	227	2143	0	127	1362	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	227	2143	0	127	1362	0
Lane Group Flow (vph)	227	2143	0	127	1362	0
Turn Type		custom		custom	Prot	
Protected Phases	8			4	2	
Permitted Phases		2 8		4		
Actuated Green, G (s)	33.0	90.0		33.0	49.0	
Effective Green, g (s)	33.0	90.0		33.0	49.0	
Actuated g/C Ratio	0.37	1.00		0.37	0.54	
Clearance Time (s)	4.0			4.0	4.0	
Lane Grp Cap (vph)	649	3610		591	2717	
v/s Ratio Prot	0.13			0.08	0.27	
v/s Ratio Perm		0.59				
v/c Ratio	0.35	0.59		0.21	0.50	
Uniform Delay, d1	20.7	0.0		19.6	12.8	
Progression Factor	0.69	1.00		1.00	0.58	
Incremental Delay, d2	0.8	0.4		0.8	0.6	
Delay (s)	15.0	0.4		20.4	8.1	
Level of Service	B	A		C	A	
Approach Delay (s)	1.8		20.4		8.1	
Approach LOS	A		C		A	

Intersection Summary			
HCM Average Control Delay	4.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	53.3%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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		0.91			0.91			1.00			1.00	
Frt		0.99			1.00			1.00			0.95	
Flt Protected		1.00			1.00			0.95			0.98	
Satd. Flow (prot)		5018			5082			1775			1741	
Flt Permitted		1.00			1.00			0.72			0.88	
Satd. Flow (perm)		5018			5082			1332			1562	
Volume (vph)	0	1463	142	0	2115	8	412	10	3	9	6	8
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1463	142	0	2115	8	412	10	3	9	6	8
Lane Group Flow (vph)	0	1605	0	0	2123	0	0	425	0	0	23	0
Turn Type							Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)		44.0			44.0			38.0			38.0	
Effective Green, g (s)		44.0			44.0			38.0			38.0	
Actuated g/C Ratio		0.49			0.49			0.42			0.42	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		2453			2485			562			660	
v/s Ratio Prot		0.32			c0.42							
v/s Ratio Perm								c0.32			0.01	
v/c Ratio		0.65			0.85			0.76			0.03	
Uniform Delay, d1		17.3			20.2			22.1			15.2	
Progression Factor		1.36			1.00			1.00			1.00	
Incremental Delay, d2		1.3			4.0			9.2			0.1	
Delay (s)		24.7			24.2			31.2			15.3	
Level of Service		C			C			C			B	
Approach Delay (s)		24.7			24.2			31.2			15.3	
Approach LOS		C			C			C			B	

Intersection Summary			
HCM Average Control Delay	25.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	77.9%	ICU Level of Service	C

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (veh/h)	30	258	92	7	352	16	104	52	19	22	127	140
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	30	258	92	7	352	16	104	52	19	22	127	140

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	380	375	175	289
Volume Left (vph)	30	7	104	22
Volume Right (vph)	92	16	19	140
Hadj (s)	-0.1	0.0	0.1	-0.2
Departure Headway (s)	6.0	6.4	6.8	6.2
Degree Utilization, x	0.63	0.66	0.33	0.50
Capacity (veh/h)	573	506	467	547
Control Delay (s)	18.7	21.1	13.2	15.3
Approach Delay (s)	18.7	21.1	13.2	15.3
Approach LOS	C	C	B	C

Intersection Summary			
Delay	17.8		
HCM Level of Service	C		
Intersection Capacity Utilization	74.5%	ICU Level of Service	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (veh/h)	48	10	0	4	79	22	0	504	3	13	491	30
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	48	10	0	4	79	22	0	504	3	13	491	30

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	58	105	507	534
Volume Left (vph)	48	4	0	13
Volume Right (vph)	0	22	3	30
Hadj (s)	0.2	-0.1	0.0	0.0
Departure Headway (s)	6.7	5.5	5.1	5.0
Degree Utilization, x	0.11	0.16	0.71	0.74
Capacity (veh/h)	475	509	691	708
Control Delay (s)	10.5	9.5	19.6	21.1
Approach Delay (s)	10.5	9.5	19.6	21.1
Approach LOS	B	A	C	C

Intersection Summary			
Delay	18.9		
HCM Level of Service	C		
Intersection Capacity Utilization	47.9%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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	1.00	1.00		1.00	1.00	1.00		0.91			0.91	
Frt	1.00	0.94		1.00	1.00	0.85		1.00			0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			1.00	
Satd. Flow (prot)	1770	1758		1770	1863	1583		5085			4969	
Flt Permitted	0.72	1.00		0.75	1.00	1.00		1.00			1.00	
Satd. Flow (perm)	1332	1758		1402	1863	1583		5085			4969	
Volume (vph)	230	5	3	1	64	437	0	2101	1	0	1907	344
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	230	5	3	1	64	437	0	2101	1	0	1907	344
Lane Group Flow (vph)	230	8	0	1	64	437	0	2102	0	0	2251	0
Turn Type	Perm			Perm		Perm						
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8						
Actuated Green, G (s)	34.0	34.0		34.0	34.0	34.0		48.0			48.0	
Effective Green, g (s)	34.0	34.0		34.0	34.0	34.0		48.0			48.0	
Actuated g/C Ratio	0.38	0.38		0.38	0.38	0.38		0.53			0.53	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Grp Cap (vph)	503	664		530	704	598		2712			2650	
v/s Ratio Prot		0.00			0.03			0.41			c0.45	
v/s Ratio Perm	0.17			0.00		0.28						
v/c Ratio	0.46	0.01		0.00	0.09	0.73		0.78			0.85	
Uniform Delay, d1	21.1	17.5		17.4	18.0	24.1		16.7			17.9	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	3.0	0.0		0.0	0.3	7.7		2.2			3.6	
Delay (s)	24.0	17.5		17.4	18.3	31.7		18.9			21.6	
Level of Service	C	B		B	B	C		B			C	
Approach Delay (s)		23.8			30.0			18.9			21.6	
Approach LOS		C			C			B			C	

Intersection Summary			
HCM Average Control Delay	21.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	90.4%	ICU Level of Service	E

c Critical Lane Group

2000

(Existing Conditions) WEEKEND

Movement	WBL	WBR	NBL	NBR	SEL	SER	SER2	NEL	NER
Lane Configurations									
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0				4.0		4.0		4.0
Lane Util. Factor	0.97				1.00		1.00		0.88
Frt	1.00				1.00		0.85		0.85
Flt Protected	0.95				0.95		1.00		1.00
Satd. Flow (prot)	3433				1770		1583		2787
Flt Permitted	0.95				0.95		1.00		1.00
Satd. Flow (perm)	3433				1770		1583		2787
Volume (vph)	922	0	0	0	15	0	19	0	1076
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	922	0	0	0	15	0	19	0	1076
Lane Group Flow (vph)	922	0	0	0	15	0	19	0	1076
Turn Type		Free		custom	Prot		custom		
Protected Phases	8				2				8
Permitted Phases		Free		2			2		8
Actuated Green, G (s)	35.0				32.0		32.0		35.0
Effective Green, g (s)	35.0				32.0		32.0		35.0
Actuated g/C Ratio	0.47				0.43		0.43		0.47
Clearance Time (s)	4.0				4.0		4.0		4.0
Lane Grp Cap (vph)	1602				755		675		1301
v/s Ratio Prot	0.27				0.01				c0.39
v/s Ratio Perm							0.01		
v/c Ratio	0.58				0.02		0.03		0.83
Uniform Delay, d1	14.6				12.4		12.5		17.4
Progression Factor	1.00				1.00		1.00		1.00
Incremental Delay, d2	1.5				0.0		0.1		6.1
Delay (s)	16.1				12.5		12.6		23.5
Level of Service	B				B		B		C
Approach Delay (s)	16.1		0.0		12.5			23.5	
Approach LOS	B		A		B			C	

Intersection Summary			
HCM Average Control Delay	20.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	54.3%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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	
Lane Util. Factor		0.95			1.00			0.91	1.00		0.91	
Frt		0.96			0.90			1.00	0.85		1.00	
Flt Protected		0.99			1.00			1.00	1.00		1.00	
Satd. Flow (prot)		3347			1684			5085	1583		5085	
Flt Permitted		0.89			1.00			1.00	1.00		1.00	
Satd. Flow (perm)		3020			1684			5085	1583		5085	
Volume (vph)	21	36	22	0	33	81	0	2300	220	0	1581	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	21	36	22	0	33	81	0	2300	220	0	1581	0
Lane Group Flow (vph)	0	79	0	0	114	0	0	2300	220	0	1581	0
Turn Type	Perm			Perm					Free			
Protected Phases		4			8			6			2	
Permitted Phases	4			8					Free			
Actuated Green, G (s)		31.0			31.0			51.0	90.0		51.0	
Effective Green, g (s)		31.0			31.0			51.0	90.0		51.0	
Actuated g/C Ratio		0.34			0.34			0.57	1.00		0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		1040			580			2882	1583		2882	
v/s Ratio Prot					c0.07			c0.45			0.31	
v/s Ratio Perm		0.03							0.14			
v/c Ratio		0.08			0.20			0.80	0.14		0.55	
Uniform Delay, d1		19.9			20.7			15.4	0.0		12.3	
Progression Factor		1.00			1.00			1.00	1.00		0.06	
Incremental Delay, d2		0.1			0.8			2.4	0.2		0.7	
Delay (s)		20.0			21.5			17.8	0.2		1.4	
Level of Service		C			C			B	A		A	
Approach Delay (s)		20.0			21.5			16.3			1.4	
Approach LOS		C			C			B			A	

Intersection Summary			
HCM Average Control Delay	11.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	57.8%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	117	5	18	88	43	273
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	117	5	18	88	43	273
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
vC, conflicting volume	106				301	62
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	92				93	73
cM capacity (veh/h)	1485				636	1003

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	122	106	316
Volume Left	117	0	43
Volume Right	0	88	273
cSH	1485	1700	930
Volume to Capacity	0.08	0.06	0.34
Queue Length (ft)	6	0	38
Control Delay (s)	7.3	0.0	10.9
Lane LOS	A		B
Approach Delay (s)	7.3	0.0	10.9
Approach LOS			B

Intersection Summary			
Average Delay	7.9		
Intersection Capacity Utilization	39.3%	ICU Level of Service	A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	1	128	235	134	291	24
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	1	128	235	134	291	24
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
vC, conflicting volume	907	303	315			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	83	81			
cM capacity (veh/h)	248	737	1245			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	129	369	315
Volume Left	1	235	0
Volume Right	128	0	24
cSH	726	1245	1700
Volume to Capacity	0.18	0.19	0.19
Queue Length (ft)	16	17	0
Control Delay (s)	11.0	6.1	0.0
Lane LOS	B	A	
Approach Delay (s)	11.0	6.1	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	4.5		
Intersection Capacity Utilization	54.8%	ICU Level of Service	A

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	165	236	0	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	0	165	236	0	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
vC, conflicting volume	236				318	118
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	100
cM capacity (veh/h)	1328				650	912

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	55	110	157	79	0
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	0
cSH	1328	1700	1700	1700	1700
Volume to Capacity	0.00	0.06	0.09	0.05	0.00
Queue Length (ft)	0	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0
Lane LOS					A
Approach Delay (s)	0.0		0.0		0.0
Approach LOS					A

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	9.9%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	1027	22	0	910	2	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	1027	22	0	910	2	0

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	685	364	303	607	2
Volume Left (vph)	0	0	0	0	2
Volume Right (vph)	0	22	0	0	0
Hadj (s)	0.0	0.0	0.0	0.0	0.2
Departure Headway (s)	5.9	5.8	8.1	8.1	7.1
Degree Utilization, x	1.11	0.59	0.69	1.37	0.00
Capacity (veh/h)	610	612	422	450	500
Control Delay (s)	92.9	15.6	25.9	202.7	10.1
Approach Delay (s)	66.0		143.8		10.1
Approach LOS	F		F		B

Intersection Summary			
Delay	102.0		
HCM Level of Service	F		
Intersection Capacity Utilization	39.1%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	1095	22	0	975	34	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	1095	22	0	975	34	0

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	730	387	325	650	34
Volume Left (vph)	0	0	0	0	34
Volume Right (vph)	0	22	0	0	0
Hadj (s)	0.0	0.0	0.0	0.0	0.2
Departure Headway (s)	6.0	6.0	8.3	8.3	7.1
Degree Utilization, x	1.22	0.65	0.75	1.50	0.07
Capacity (veh/h)	593	585	417	445	501
Control Delay (s)	134.9	18.1	31.2	258.3	10.6
Approach Delay (s)	94.4		182.6		10.6
Approach LOS	F		F		B

Intersection Summary			
Delay	133.5		
HCM Level of Service	F		
Intersection Capacity Utilization	41.0%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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		1.00			1.00			0.91			0.91	
Frt		1.00			0.90			1.00			1.00	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1862			1685			5085			5082	
Flt Permitted		1.00			1.00			1.00			1.00	
Satd. Flow (perm)		1862			1685			5085			5082	
Volume (vph)	2	426	0	0	27	65	0	2054	1	0	1543	6
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	2	426	0	0	27	65	0	2054	1	0	1543	6
Lane Group Flow (vph)	0	428	0	0	92	0	0	2055	0	0	1549	0
Turn Type	Perm			Perm								
Protected Phases		4			8			6			2	
Permitted Phases	4			8								
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		641			580			2882			2880	
v/s Ratio Prot					0.05			c0.40			0.30	
v/s Ratio Perm		0.23										
v/c Ratio		0.67			0.16			0.71			0.54	
Uniform Delay, d1		25.1			20.5			14.2			12.2	
Progression Factor		1.00			1.00			0.33			1.09	
Incremental Delay, d2		5.4			0.6			0.9			0.7	
Delay (s)		30.6			21.0			5.6			13.9	
Level of Service		C			C			A			B	
Approach Delay (s)		30.6			21.0			5.6			13.9	
Approach LOS		C			C			A			B	

Intersection Summary			
HCM Average Control Delay	11.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	69.6%	ICU Level of Service	B

c Critical Lane Group

Movement	WBL	WBR	NBL	NBR	SEL	SER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.76		1.00	0.94	
Frt	1.00	0.85		0.86	1.00	
Flt Protected	0.95	1.00		1.00	0.95	
Satd. Flow (prot)	1770	3610		1611	4990	
Flt Permitted	0.95	1.00		1.00	0.95	
Satd. Flow (perm)	1770	3610		1611	4990	
Volume (vph)	275	1509	0	164	2009	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	275	1509	0	164	2009	0
Lane Group Flow (vph)	275	1509	0	164	2009	0
Turn Type		custom		custom	Prot	
Protected Phases	8			4	2	
Permitted Phases		8 2		4		
Actuated Green, G (s)	25.0	90.0		25.0	57.0	
Effective Green, g (s)	25.0	90.0		25.0	57.0	
Actuated g/C Ratio	0.28	1.00		0.28	0.63	
Clearance Time (s)	4.0			4.0	4.0	
Lane Grp Cap (vph)	492	3610		448	3160	
v/s Ratio Prot	c0.16			0.10	c0.40	
v/s Ratio Perm		0.42				
v/c Ratio	0.56	0.42		0.37	0.64	
Uniform Delay, d1	27.8	0.0		26.1	10.1	
Progression Factor	0.64	1.00		1.00	0.83	
Incremental Delay, d2	3.8	0.3		2.3	0.7	
Delay (s)	21.4	0.3		28.4	9.1	
Level of Service	C	A		C	A	
Approach Delay (s)	3.6		28.4		9.1	
Approach LOS	A		C		A	

Intersection Summary			
HCM Average Control Delay	7.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	60.1%	ICU Level of Service	B

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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				
Lane Util. Factor		0.91			0.91			1.00				
Frt		1.00			1.00			0.86				
Flt Protected		1.00			1.00			1.00				
Satd. Flow (prot)		5085			5085			1611				
Flt Permitted		1.00			1.00			1.00				
Satd. Flow (perm)		5085			5085			1611				
Volume (vph)	0	2009	0	0	1784	0	0	0	164	0	0	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	2009	0	0	1784	0	0	0	164	0	0	0
Lane Group Flow (vph)	0	2009	0	0	1784	0	0	164	0	0	0	0
Turn Type							Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)		55.0			55.0			27.0				
Effective Green, g (s)		55.0			55.0			27.0				
Actuated g/C Ratio		0.61			0.61			0.30				
Clearance Time (s)		4.0			4.0			4.0				
Lane Grp Cap (vph)		3108			3108			483				
v/s Ratio Prot		c0.40			0.35			c0.10				
v/s Ratio Perm												
v/c Ratio		0.65			0.57			0.34				
Uniform Delay, d1		11.2			10.5			24.6				
Progression Factor		1.96			1.00			1.00				
Incremental Delay, d2		0.8			0.8			1.9				
Delay (s)		22.9			11.3			26.5				
Level of Service		C			B			C				
Approach Delay (s)		22.9			11.3			26.5			0.0	
Approach LOS		C			B			C			A	

Intersection Summary			
HCM Average Control Delay	17.8	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	55.6%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (veh/h)	35	354	0	0	332	0	0	0	0	0	0	179
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	35	354	0	0	332	0	0	0	0	0	0	179

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	389	332	0	179
Volume Left (vph)	35	0	0	0
Volume Right (vph)	0	0	0	179
Hadj (s)	0.1	0.0	0.0	-0.6
Departure Headway (s)	4.8	5.3	5.9	5.0
Degree Utilization, x	0.52	0.49	0.00	0.25
Capacity (veh/h)	718	564	527	672
Control Delay (s)	13.0	13.4	8.9	9.7
Approach Delay (s)	13.0	13.4	0.0	9.7
Approach LOS	B	B	A	A

Intersection Summary			
Delay	12.5		
HCM Level of Service	B		
Intersection Capacity Utilization	59.1%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (veh/h)	45	3	0	1	21	3	0	525	4	3	536	46
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	45	3	0	1	21	3	0	525	4	3	536	46

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	48	25	529	585
Volume Left (vph)	45	1	0	3
Volume Right (vph)	0	3	4	46
Hadj (s)	0.2	0.0	0.0	0.0
Departure Headway (s)	6.5	5.3	4.8	4.7
Degree Utilization, x	0.09	0.04	0.70	0.76
Capacity (veh/h)	496	503	733	757
Control Delay (s)	10.1	8.5	18.3	21.1
Approach Delay (s)	10.1	8.5	18.3	21.1
Approach LOS	B	A	C	C

Intersection Summary			
Delay	19.2		
HCM Level of Service	C		
Intersection Capacity Utilization	42.6%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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	1.00	1.00		1.00	1.00	1.00		0.91			0.91	
Frt	1.00	0.90		1.00	1.00	0.85		1.00			0.99	
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			1.00	
Satd. Flow (prot)	1770	1667		1770	1863	1583		5085			5014	
Flt Permitted	0.71	1.00		0.75	1.00	1.00		1.00			1.00	
Satd. Flow (perm)	1318	1667		1399	1863	1583		5085			5014	
Volume (vph)	31	3	7	1	76	35	0	1913	0	0	2006	207
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	31	3	7	1	76	35	0	1913	0	0	2006	207
Lane Group Flow (vph)	31	10	0	1	76	35	0	1913	0	0	2213	0
Turn Type	Perm			Perm		Perm						
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8						
Actuated Green, G (s)	29.0	29.0		29.0	29.0	29.0		53.0			53.0	
Effective Green, g (s)	29.0	29.0		29.0	29.0	29.0		53.0			53.0	
Actuated g/C Ratio	0.32	0.32		0.32	0.32	0.32		0.59			0.59	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Grp Cap (vph)	425	537		451	600	510		2995			2953	
v/s Ratio Prot		0.01			c0.04			0.38			c0.44	
v/s Ratio Perm	0.02			0.00		0.02						
v/c Ratio	0.07	0.02		0.00	0.13	0.07		0.64			0.75	
Uniform Delay, d1	21.2	20.8		20.7	21.6	21.1		12.2			13.6	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	0.3	0.1		0.0	0.4	0.3		1.1			1.8	
Delay (s)	21.5	20.9		20.7	22.0	21.4		13.2			15.4	
Level of Service	C	C		C	C	C		B			B	
Approach Delay (s)		21.3			21.8			13.2			15.4	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	14.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	54.0%	ICU Level of Service	A

c Critical Lane Group

2030 ALTERNATIVE 1

(No Build) AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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
Lane Util. Factor		0.95			0.95	1.00				1.00		1.00
Frt		0.99			1.00	0.85				1.00		0.85
Flt Protected		1.00			1.00	1.00				0.95		1.00
Satd. Flow (prot)		3533			3579	1601				1789		1601
Flt Permitted		1.00			1.00	1.00				0.95		1.00
Satd. Flow (perm)		3533			3579	1601				1789		1601
Volume (vph)	0	1515	141	0	791	11	0	0	0	2	0	3
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1515	141	0	791	11	0	0	0	2	0	3
Lane Group Flow (vph)	0	1656	0	0	791	11	0	0	0	2	0	3
Turn Type						Free			custom	Prot		custom
Protected Phases		8			8					2		
Permitted Phases		8				Free			2			2
Actuated Green, G (s)		48.0			48.0	75.0				19.0		19.0
Effective Green, g (s)		48.0			48.0	75.0				19.0		19.0
Actuated g/C Ratio		0.64			0.64	1.00				0.25		0.25
Clearance Time (s)		4.0			4.0					4.0		4.0
Lane Grp Cap (vph)		2261			2291	1601				453		406
v/s Ratio Prot		c0.47			0.22					0.00		
v/s Ratio Perm						c0.01						0.00
v/c Ratio		0.73			0.35	0.01				0.00		0.01
Uniform Delay, d1		9.1			6.2	0.0				20.9		20.9
Progression Factor		1.00			1.00	1.00				1.00		1.00
Incremental Delay, d2		2.1			0.4	0.0				0.0		0.0
Delay (s)		11.3			6.7	0.0				20.9		21.0
Level of Service		B			A	A				C		C
Approach Delay (s)		11.3			6.6			0.0			21.0	
Approach LOS		B			A			A			C	

Intersection Summary			
HCM Average Control Delay	9.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.50		
Cycle Length (s)	75.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	56.4%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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			0.91			0.91	
Frt		1.00			0.90			1.00			1.00	
Flt Protected		0.96			1.00			1.00			1.00	
Satd. Flow (prot)		3436			1690			5142			5141	
Flt Permitted		0.73			1.00			1.00			1.00	
Satd. Flow (perm)		2627			1690			5142			5141	
Volume (vph)	296	65	2	0	10	32	0	3094	0	0	1930	3
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	296	65	2	0	10	32	0	3094	0	0	1930	3
Lane Group Flow (vph)	0	363	0	0	42	0	0	3094	0	0	1933	0
Turn Type	Perm			Perm					Free			
Protected Phases		4			8			6			2	
Permitted Phases	4			8					Free			
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		905			582			2914			2913	
v/s Ratio Prot					0.02			c0.60			0.38	
v/s Ratio Perm		c0.14										
v/c Ratio		0.40			0.07			1.06			0.66	
Uniform Delay, d1		22.4			19.8			19.5			13.5	
Progression Factor		1.00			1.00			1.23			0.24	
Incremental Delay, d2		1.3			0.2			31.5			1.0	
Delay (s)		23.8			20.1			55.4			4.3	
Level of Service		C			C			E			A	
Approach Delay (s)		23.8			20.1			55.4			4.3	
Approach LOS		C			C			E			A	

Intersection Summary			
HCM Average Control Delay	34.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.81		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	89.5%	ICU Level of Service	D

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (veh/h)	539	5	10	73	55	69
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	539	5	10	73	55	69

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total (vph)	539	5	10	73	124
Volume Left (vph)	539	0	0	0	55
Volume Right (vph)	0	0	0	73	69
Hadj (s)	0.2	0.0	0.0	-0.6	-0.2
Departure Headway (s)	5.1	4.9	5.3	4.7	5.2
Degree Utilization, x	0.77	0.01	0.01	0.10	0.18
Capacity (veh/h)	539	719	643	728	627
Control Delay (s)	21.8	6.8	7.2	7.0	9.4
Approach Delay (s)	21.7		7.0		9.4
Approach LOS	C		A		A

Intersection Summary			
Delay	18.0		
HCM Level of Service	C		
Intersection Capacity Utilization	50.5%	ICU Level of Service	A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.87		1.00	1.00	0.97	
Flt Protected	1.00		0.95	1.00	1.00	
Satd. Flow (prot)	1630		1789	1883	1825	
Flt Permitted	1.00		0.68	1.00	1.00	
Satd. Flow (perm)	1630		1284	1883	1825	
Volume (vph)	2	356	99	554	90	27
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	2	356	99	554	90	27
Lane Group Flow (vph)	358	0	99	554	117	0
Turn Type			Perm			
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	23.0		24.0	24.0	24.0	
Effective Green, g (s)	23.0		24.0	24.0	24.0	
Actuated g/C Ratio	0.42		0.44	0.44	0.44	
Clearance Time (s)	4.0		4.0	4.0	4.0	
Lane Grp Cap (vph)	682		560	822	796	
v/s Ratio Prot	c0.22			c0.29	0.06	
v/s Ratio Perm			0.08			
v/c Ratio	0.52		0.18	0.67	0.15	
Uniform Delay, d1	11.9		9.5	12.4	9.3	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	2.9		0.7	4.4	0.4	
Delay (s)	14.8		10.2	16.8	9.7	
Level of Service	B		B	B	A	
Approach Delay (s)	14.8			15.8	9.7	
Approach LOS	B			B	A	

Intersection Summary			
HCM Average Control Delay	14.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.60		
Cycle Length (s)	55.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	58.0%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (veh/h)	11	111	189	75	43	3
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	11	111	189	75	43	3

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total (vph)	48	74	126	138	46
Volume Left (vph)	11	0	0	0	43
Volume Right (vph)	0	0	0	75	3
Hadj (s)	0.1	0.0	0.0	-0.3	0.2
Departure Headway (s)	4.9	4.8	4.7	4.4	4.9
Degree Utilization, x	0.07	0.10	0.17	0.17	0.06
Capacity (veh/h)	723	725	741	798	689
Control Delay (s)	7.0	7.2	7.5	7.1	8.2
Approach Delay (s)	7.1		7.3		8.2
Approach LOS	A		A		A

Intersection Summary			
Delay	7.3		
HCM Level of Service	A		
Intersection Capacity Utilization	17.6%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (veh/h)	0	4	7	5	3	0	35	0	13	0	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	0	4	7	5	3	0	35	0	13	0	0	0

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	4	7	5	3	35	13	0	0
Volume Left (vph)	0	0	5	0	35	0	0	0
Volume Right (vph)	0	7	0	0	0	13	0	0
Hadj (s)	0.0	-0.6	0.2	0.0	0.2	-0.6	0.0	0.0
Departure Headway (s)	4.7	4.1	4.9	4.7	4.8	4.0	4.6	4.6
Degree Utilization, x	0.01	0.01	0.01	0.00	0.05	0.01	0.00	0.00
Capacity (veh/h)	762	866	732	755	740	898	791	791
Control Delay (s)	6.5	5.9	6.7	6.5	6.8	5.8	6.4	6.4
Approach Delay (s)	6.1		6.6		6.5		0.0	
Approach LOS	A		A		A		A	

Intersection Summary			
Delay	6.5		
HCM Level of Service	A		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A

Movement	SBL	SBR	SBR2	SEL	SET	SER	NWL	NWT	NWR	NEL2	NEL	NER
Lane Configurations												
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
Lane Util. Factor		1.00			0.91	1.00		0.91			1.00	1.00
Frt		0.85			1.00	0.85		1.00			1.00	0.85
Flt Protected		1.00			1.00	1.00		1.00			0.95	1.00
Satd. Flow (prot)		1601			5142	1601		5139			1789	1601
Flt Permitted		1.00			1.00	1.00		1.00			0.77	1.00
Satd. Flow (perm)		1601			5142	1601		5139			1460	1601
Volume (vph)	0	0	5	0	3084	241	0	2252	7	55	1	10
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	0	5	0	3084	241	0	2252	7	55	1	10
Lane Group Flow (vph)	0	5	0	0	3084	241	0	2259	0	0	56	10
Turn Type	Prot					Perm				Perm		Perm
Protected Phases	6!				4			4			6!	
Permitted Phases		6				4				6		6
Actuated Green, G (s)		23.0			59.0	59.0		59.0			23.0	23.0
Effective Green, g (s)		23.0			59.0	59.0		59.0			23.0	23.0
Actuated g/C Ratio		0.26			0.66	0.66		0.66			0.26	0.26
Clearance Time (s)		4.0			4.0	4.0		4.0			4.0	4.0
Lane Grp Cap (vph)		409			3371	1050		3369			373	409
v/s Ratio Prot					c0.60			0.44				
v/s Ratio Perm		0.00				0.15					c0.04	0.01
v/c Ratio		0.01			0.91	0.23		0.67			0.15	0.02
Uniform Delay, d1		25.0			13.3	6.3		9.5			25.9	25.1
Progression Factor		1.00			1.00	1.00		1.53			1.00	1.00
Incremental Delay, d2		0.1			5.1	0.5		0.8			0.9	0.1
Delay (s)		25.1			18.4	6.8		15.4			26.8	25.2
Level of Service		C			B	A		B			C	C
Approach Delay (s)	25.1				17.6			15.4			26.5	
Approach LOS	C				B			B			C	

Intersection Summary			
HCM Average Control Delay	16.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.70		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	76.3%	ICU Level of Service	C

! Phase conflict between lane groups.
c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	1191	3	5	780	1	2
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	1191	3	5	780	1	2

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	794	400	265	520	3
Volume Left (vph)	0	0	5	0	1
Volume Right (vph)	0	3	0	0	2
Hadj (s)	0.0	0.0	0.0	0.0	-0.3
Departure Headway (s)	5.4	5.4	5.7	5.7	6.4
Degree Utilization, x	1.19	0.60	0.42	0.83	0.01
Capacity (veh/h)	663	644	610	617	542
Control Delay (s)	119.0	14.9	11.7	29.3	9.5
Approach Delay (s)	84.1		23.4		9.5
Approach LOS	F		C		A

Intersection Summary			
Delay	59.9		
HCM Level of Service	F		
Intersection Capacity Utilization	43.0%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	1194	2	3	773	15	2
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	1194	2	3	773	15	2

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	796	400	261	515	17
Volume Left (vph)	0	0	3	0	15
Volume Right (vph)	0	2	0	0	2
Hadj (s)	0.0	0.0	0.0	0.0	0.1
Departure Headway (s)	5.5	5.4	5.8	5.8	6.9
Degree Utilization, x	1.21	0.61	0.42	0.83	0.03
Capacity (veh/h)	655	638	605	610	508
Control Delay (s)	124.7	15.2	11.7	29.6	10.1
Approach Delay (s)	88.1		23.6		10.1
Approach LOS	F		C		B

Intersection Summary			
Delay	62.3		
HCM Level of Service	F		
Intersection Capacity Utilization	43.1%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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		1.00			1.00			0.91			0.91	
Frt		1.00			0.89			0.99			1.00	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1880			1674			5109			5142	
Flt Permitted		1.00			1.00			1.00			1.00	
Satd. Flow (perm)		1878			1669			5109			5142	
Volume (vph)	3	448	5	2	33	162	0	2411	106	0	1769	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	3	448	5	2	33	162	0	2411	106	0	1769	0
Lane Group Flow (vph)	0	456	0	0	197	0	0	2517	0	0	1769	0
Turn Type	Perm			Perm								
Protected Phases		4			8			6			2	
Permitted Phases	4			8								
Actuated Green, G (s)		32.0			32.0			50.0			50.0	
Effective Green, g (s)		32.0			32.0			50.0			50.0	
Actuated g/C Ratio		0.36			0.36			0.56			0.56	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		668			593			2838			2857	
v/s Ratio Prot								c0.49			0.34	
v/s Ratio Perm		c0.24			0.12							
v/c Ratio		0.68			0.33			0.89			0.62	
Uniform Delay, d1		24.7			21.2			17.5			13.5	
Progression Factor		1.00			1.00			0.53			0.98	
Incremental Delay, d2		5.6			1.5			0.4			0.9	
Delay (s)		30.3			22.7			9.7			14.2	
Level of Service		C			C			A			B	
Approach Delay (s)		30.3			22.7			9.7			14.2	
Approach LOS		C			C			A			B	

Intersection Summary			
HCM Average Control Delay	13.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.81		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	80.7%	ICU Level of Service	D

c Critical Lane Group

Movement	WBL	WBR	NBL	NBR	SEL	SER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.76		1.00	0.94	
Frt	1.00	0.85		0.86	1.00	
Flt Protected	0.95	1.00		1.00	0.95	
Satd. Flow (prot)	1789	3650		1629	5046	
Flt Permitted	0.95	1.00		1.00	0.95	
Satd. Flow (perm)	1789	3650		1629	5046	
Volume (vph)	222	1748	0	132	2383	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	222	1748	0	132	2383	0
Lane Group Flow (vph)	222	1748	0	132	2383	0
Turn Type	Prot			custom		
Protected Phases	8			4	2	
Permitted Phases		8 2		4		
Actuated Green, G (s)	27.0	90.0		27.0	55.0	
Effective Green, g (s)	27.0	90.0		27.0	55.0	
Actuated g/C Ratio	0.30	1.00		0.30	0.61	
Clearance Time (s)	4.0			4.0	4.0	
Lane Grp Cap (vph)	537	3650		489	3084	
v/s Ratio Prot	0.12			0.08	c0.47	
v/s Ratio Perm		c0.48				
v/c Ratio	0.41	0.48		0.27	0.77	
Uniform Delay, d1	25.2	0.0		24.0	12.9	
Progression Factor	0.73	1.00		0.49	0.98	
Incremental Delay, d2	1.9	0.4		0.1	0.9	
Delay (s)	20.4	0.4		11.9	13.6	
Level of Service	C	A		B	B	
Approach Delay (s)	2.6		11.9		13.6	
Approach LOS	A		B		B	

Intersection Summary			
HCM Average Control Delay	8.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.67		
Cycle Length (s)	90.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	64.3%	ICU Level of Service	B

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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		0.91			0.91			1.00			1.00	
Frt		0.98			1.00			1.00			0.97	
Flt Protected		1.00			1.00			0.95			0.97	
Satd. Flow (prot)		5020			5139			1795			1778	
Flt Permitted		1.00			1.00			0.70			0.84	
Satd. Flow (perm)		5020			5139			1321			1534	
Volume (vph)	0	2184	410	0	1833	6	181	2	0	21	8	8
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	2184	410	0	1833	6	181	2	0	21	8	8
Lane Group Flow (vph)	0	2594	0	0	1839	0	0	183	0	0	37	0
Turn Type							Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases		2					8			4		
Actuated Green, G (s)		55.0			55.0			27.0			27.0	
Effective Green, g (s)		55.0			55.0			27.0			27.0	
Actuated g/C Ratio		0.61			0.61			0.30			0.30	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		3068			3141			396			460	
v/s Ratio Prot		c0.52			0.36							
v/s Ratio Perm								c0.14			0.02	
v/c Ratio		0.85			0.59			0.46			0.08	
Uniform Delay, d1		14.1			10.6			25.6			22.6	
Progression Factor		1.75			1.00			1.00			1.00	
Incremental Delay, d2		2.1			0.8			3.8			0.3	
Delay (s)		26.7			11.4			29.4			22.9	
Level of Service		C			B			C			C	
Approach Delay (s)		26.7			11.4			29.4			22.9	
Approach LOS		C			B			C			C	

Intersection Summary			
HCM Average Control Delay	20.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.72		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	74.8%	ICU Level of Service	C

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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		1.00			1.00			1.00			1.00	
Frt		0.98			1.00			0.99			0.98	
Flt Protected		0.97			1.00			0.97			1.00	
Satd. Flow (prot)		1794			1880			1804			1845	
Flt Permitted		0.49			0.99			0.68			0.99	
Satd. Flow (perm)		907			1870			1265			1825	
Volume (vph)	318	178	95	6	495	5	110	35	9	12	200	33
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	318	178	95	6	495	5	110	35	9	12	200	33
Lane Group Flow (vph)	0	591	0	0	506	0	0	154	0	0	245	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		44.0			44.0			38.0			38.0	
Effective Green, g (s)		44.0			44.0			38.0			38.0	
Actuated g/C Ratio		0.49			0.49			0.42			0.42	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		443			914			534			771	
v/s Ratio Prot												
v/s Ratio Perm		c0.65			0.27			0.12			c0.13	
v/c Ratio		1.33			0.55			0.29			0.32	
Uniform Delay, d1		23.0			16.1			17.1			17.4	
Progression Factor		1.00			1.41			1.00			1.00	
Incremental Delay, d2		165.1			2.4			1.4			1.1	
Delay (s)		188.1			25.1			18.5			18.4	
Level of Service		F			C			B			B	
Approach Delay (s)		188.1			25.1			18.5			18.4	
Approach LOS		F			C			B			B	

Intersection Summary			
HCM Average Control Delay	87.7	HCM Level of Service	F
HCM Volume to Capacity ratio	0.86		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	94.4%	ICU Level of Service	E

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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		1.00			1.00			1.00			1.00	
Frt		0.99			0.91			1.00			0.98	
Flt Protected		0.96			1.00			1.00			1.00	
Satd. Flow (prot)		1786			1714			1882			1854	
Flt Permitted		0.80			1.00			1.00			1.00	
Satd. Flow (perm)		1482			1710			1875			1852	
Volume (vph)	60	5	6	1	6	13	5	563	2	3	574	73
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	60	5	6	1	6	13	5	563	2	3	574	73
Lane Group Flow (vph)	0	71	0	0	20	0	0	570	0	0	650	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		510			589			1063			1049	
v/s Ratio Prot												
v/s Ratio Perm		c0.05			0.01			0.30			c0.35	
v/c Ratio		0.14			0.03			0.54			0.62	
Uniform Delay, d1		20.3			19.6			12.1			13.0	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.6			0.1			1.9			2.8	
Delay (s)		20.9			19.7			14.1			15.8	
Level of Service		C			B			B			B	
Approach Delay (s)		20.9			19.7			14.1			15.8	
Approach LOS		C			B			B			B	

Intersection Summary			
HCM Average Control Delay	15.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.44		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	53.7%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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	1.00	1.00		1.00	1.00	1.00		0.91			0.91	
Frt	1.00	0.98		1.00	1.00	0.85		1.00			0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			1.00	
Satd. Flow (prot)	1789	1838		1789	1883	1601		5141			5043	
Flt Permitted	0.75	1.00		0.72	1.00	1.00		1.00			1.00	
Satd. Flow (perm)	1421	1838		1364	1883	1601		5141			5043	
Volume (vph)	467	42	8	1	5	384	0	2240	1	0	2160	319
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	467	42	8	1	5	384	0	2240	1	0	2160	319
Lane Group Flow (vph)	467	50	0	1	5	384	0	2241	0	0	2479	0
Turn Type	Perm			Perm		Perm						
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8						
Actuated Green, G (s)	32.0	32.0		32.0	32.0	32.0		50.0			50.0	
Effective Green, g (s)	32.0	32.0		32.0	32.0	32.0		50.0			50.0	
Actuated g/C Ratio	0.36	0.36		0.36	0.36	0.36		0.56			0.56	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Grp Cap (vph)	505	654		485	670	569		2856			2802	
v/s Ratio Prot		0.03			0.00			0.44			c0.49	
v/s Ratio Perm	c0.33			0.00		0.24						
v/c Ratio	0.92	0.08		0.00	0.01	0.67		0.78			0.88	
Uniform Delay, d1	27.8	19.2		18.7	18.7	24.6		15.8			17.5	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	25.1	0.2		0.0	0.0	6.3		2.2			4.5	
Delay (s)	53.0	19.4		18.7	18.8	30.9		18.0			22.0	
Level of Service	D	B		B	B	C		B			C	
Approach Delay (s)		49.7			30.7			18.0			22.0	
Approach LOS		D			C			B			C	

Intersection Summary			
HCM Average Control Delay	23.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.90		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	103.0%	ICU Level of Service	F

c Critical Lane Group

2030 ALTERNATIVE 1

(No Build) PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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
Lane Util. Factor		0.95			0.95	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				0.95		1.00
Satd. Flow (prot)		3578			3579	1601				1789		1601
Flt Permitted		1.00			1.00	1.00				0.95		1.00
Satd. Flow (perm)		3578			3579	1601				1789		1601
Volume (vph)	0	1046	1	0	1378	11	0	0	0	9	0	50
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1046	1	0	1378	11	0	0	0	9	0	50
Lane Group Flow (vph)	0	1047	0	0	1378	11	0	0	0	9	0	50
Turn Type						Free			custom	Prot		custom
Protected Phases		8			8					2		
Permitted Phases		8				Free			2			2
Actuated Green, G (s)		48.0			48.0	75.0				19.0		19.0
Effective Green, g (s)		48.0			48.0	75.0				19.0		19.0
Actuated g/C Ratio		0.64			0.64	1.00				0.25		0.25
Clearance Time (s)		4.0			4.0					4.0		4.0
Lane Grp Cap (vph)		2290			2291	1601				453		406
v/s Ratio Prot		0.29			c0.39					0.01		
v/s Ratio Perm						0.01						c0.03
v/c Ratio		0.46			0.60	0.01				0.02		0.12
Uniform Delay, d1		6.9			7.9	0.0				21.0		21.6
Progression Factor		1.00			1.00	1.00				1.00		1.00
Incremental Delay, d2		0.7			1.2	0.0				0.1		0.6
Delay (s)		7.5			9.1	0.0				21.1		22.2
Level of Service		A			A	A				C		C
Approach Delay (s)		7.5			9.0			0.0			22.0	
Approach LOS		A			A			A			C	

Intersection Summary			
HCM Average Control Delay	8.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.47		
Cycle Length (s)	75.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	48.1%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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			0.91			0.91	
Frt		0.94			0.87			1.00			1.00	
Flt Protected		0.99			1.00			1.00			1.00	
Satd. Flow (prot)		3325			1645			5142			5141	
Flt Permitted		0.86			1.00			1.00			1.00	
Satd. Flow (perm)		2882			1645			5142			5141	
Volume (vph)	42	79	84	0	16	238	0	2439	0	0	2491	2
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	42	79	84	0	16	238	0	2439	0	0	2491	2
Lane Group Flow (vph)	0	205	0	0	254	0	0	2439	0	0	2493	0
Turn Type	Perm			Perm					Free			
Protected Phases		4			8			6			2	
Permitted Phases	4			8					Free			
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		993			567			2914			2913	
v/s Ratio Prot					c0.15			0.47			c0.48	
v/s Ratio Perm		0.07										
v/c Ratio		0.21			0.45			0.84			0.86	
Uniform Delay, d1		20.8			22.9			16.1			16.4	
Progression Factor		1.00			1.00			1.10			0.29	
Incremental Delay, d2		0.5			2.6			2.1			2.3	
Delay (s)		21.3			25.4			19.8			7.1	
Level of Service		C			C			B			A	
Approach Delay (s)		21.3			25.4			19.8			7.1	
Approach LOS		C			C			B			A	

Intersection Summary			
HCM Average Control Delay	14.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.70		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	70.4%	ICU Level of Service	C

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (veh/h)	417	6	22	155	66	101
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	417	6	22	155	66	101

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total (vph)	417	6	22	155	167
Volume Left (vph)	417	0	0	0	66
Volume Right (vph)	0	0	0	155	101
Hadj (s)	0.2	0.0	0.0	-0.6	-0.2
Departure Headway (s)	5.3	5.1	5.4	4.8	5.1
Degree Utilization, x	0.62	0.01	0.03	0.20	0.24
Capacity (veh/h)	660	681	639	723	651
Control Delay (s)	15.3	7.0	7.3	7.8	9.7
Approach Delay (s)	15.1		7.7		9.7
Approach LOS	C		A		A

Intersection Summary			
Delay	12.2		
HCM Level of Service	B		
Intersection Capacity Utilization	46.3%	ICU Level of Service	A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.87		1.00	1.00	0.98	
Flt Protected	1.00		0.95	1.00	1.00	
Satd. Flow (prot)	1630		1789	1883	1842	
Flt Permitted	1.00		0.67	1.00	1.00	
Satd. Flow (perm)	1630		1262	1883	1842	
Volume (vph)	3	526	86	447	114	22
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	3	526	86	447	114	22
Lane Group Flow (vph)	529	0	86	447	136	0
Turn Type			Perm			
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	23.0		24.0	24.0	24.0	
Effective Green, g (s)	23.0		24.0	24.0	24.0	
Actuated g/C Ratio	0.42		0.44	0.44	0.44	
Clearance Time (s)	4.0		4.0	4.0	4.0	
Lane Grp Cap (vph)	682		551	822	804	
v/s Ratio Prot	c0.32			c0.24	0.07	
v/s Ratio Perm			0.07			
v/c Ratio	0.78		0.16	0.54	0.17	
Uniform Delay, d1	13.8		9.4	11.5	9.4	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	8.4		0.6	2.6	0.5	
Delay (s)	22.2		10.0	14.0	9.9	
Level of Service	C		A	B	A	
Approach Delay (s)	22.2			13.4	9.9	
Approach LOS	C			B	A	

Intersection Summary			
HCM Average Control Delay	16.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.66		
Cycle Length (s)	55.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	62.9%	ICU Level of Service	B

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (veh/h)	7	175	414	80	64	25
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	7	175	414	80	64	25

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total (vph)	65	117	276	218	89
Volume Left (vph)	7	0	0	0	64
Volume Right (vph)	0	0	0	80	25
Hadj (s)	0.1	0.0	0.0	-0.2	0.0
Departure Headway (s)	5.2	5.2	4.9	4.7	5.3
Degree Utilization, x	0.09	0.17	0.38	0.29	0.13
Capacity (veh/h)	670	669	714	748	634
Control Delay (s)	7.6	8.1	9.7	8.4	9.1
Approach Delay (s)	7.9		9.1		9.1
Approach LOS	A		A		A

Intersection Summary			
Delay	8.8		
HCM Level of Service	A		
Intersection Capacity Utilization	25.7%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (veh/h)	0	17	23	13	3	0	19	0	123	0	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	0	17	23	13	3	0	19	0	123	0	0	0

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	17	23	13	3	19	123	0	0
Volume Left (vph)	0	0	13	0	19	0	0	0
Volume Right (vph)	0	23	0	0	0	123	0	0
Hadj (s)	0.0	-0.6	0.2	0.0	0.2	-0.6	0.0	0.0
Departure Headway (s)	4.8	4.2	5.1	4.9	4.9	4.1	4.7	4.7
Degree Utilization, x	0.02	0.03	0.02	0.00	0.03	0.14	0.00	0.00
Capacity (veh/h)	721	814	682	712	723	865	761	761
Control Delay (s)	6.8	6.2	7.0	6.7	6.8	6.5	6.5	6.5
Approach Delay (s)	6.4		6.9		6.6		0.0	
Approach LOS	A		A		A		A	

Intersection Summary			
Delay	6.6		
HCM Level of Service	A		
Intersection Capacity Utilization	17.6%	ICU Level of Service	A

Movement	SBL	SBR	SBR2	SEL	SET	SER	NWL	NWT	NWR	NEL2	NEL	NER
Lane Configurations												
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	1.00	1.00			0.91	1.00		0.91			1.00	1.00
Frt	1.00	0.85			1.00	0.85		1.00			1.00	0.85
Flt Protected	0.95	1.00			1.00	1.00		1.00			0.95	1.00
Satd. Flow (prot)	1789	1601			5142	1601		5140			1789	1601
Flt Permitted	0.95	1.00			1.00	1.00		1.00			0.66	1.00
Satd. Flow (perm)	1789	1601			5142	1601		5140			1246	1601
Volume (vph)	5	0	97	0	2414	129	0	2764	8	186	5	21
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	5	0	97	0	2414	129	0	2764	8	186	5	21
Lane Group Flow (vph)	5	97	0	0	2414	129	0	2772	0	0	191	21
Turn Type	Prot					Perm				Perm		Perm
Protected Phases	6!				4			4			6!	
Permitted Phases		6				4				6		6
Actuated Green, G (s)	23.0	23.0			59.0	59.0		59.0			23.0	23.0
Effective Green, g (s)	23.0	23.0			59.0	59.0		59.0			23.0	23.0
Actuated g/C Ratio	0.26	0.26			0.66	0.66		0.66			0.26	0.26
Clearance Time (s)	4.0	4.0			4.0	4.0		4.0			4.0	4.0
Lane Grp Cap (vph)	457	409			3371	1050		3370			318	409
v/s Ratio Prot	0.00				0.47			c0.54				
v/s Ratio Perm		0.06				0.08					c0.15	0.01
v/c Ratio	0.01	0.24			0.72	0.12		0.82			0.60	0.05
Uniform Delay, d1	25.0	26.5			10.1	5.8		11.6			29.5	25.3
Progression Factor	1.00	1.00			1.00	1.00		1.63			1.00	1.00
Incremental Delay, d2	0.0	1.4			1.3	0.2		1.4			8.1	0.2
Delay (s)	25.1	27.9			11.4	6.0		20.2			37.6	25.5
Level of Service	C	C			B	A		C			D	C
Approach Delay (s)	27.8				11.1			20.2			36.4	
Approach LOS	C				B			C			D	

Intersection Summary			
HCM Average Control Delay	16.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.76		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	80.2%	ICU Level of Service	D

! Phase conflict between lane groups.
c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	1008	3	6	1223	5	5
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	1008	3	6	1223	5	5

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	672	339	414	815	10
Volume Left (vph)	0	0	6	0	5
Volume Right (vph)	0	3	0	0	5
Hadj (s)	0.0	0.0	0.0	0.0	-0.2
Departure Headway (s)	5.8	5.8	5.7	5.7	6.7
Degree Utilization, x	1.09	0.55	0.66	1.29	0.02
Capacity (veh/h)	611	606	620	640	530
Control Delay (s)	84.9	14.5	17.8	161.2	9.8
Approach Delay (s)	61.3		112.9		9.8
Approach LOS	F		F		A

Intersection Summary			
Delay	89.3		
HCM Level of Service	F		
Intersection Capacity Utilization	45.6%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	977	38	2	1225	5	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	977	38	2	1225	5	1

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	651	364	410	817	6
Volume Left (vph)	0	0	2	0	5
Volume Right (vph)	0	38	0	0	1
Hadj (s)	0.0	0.0	0.0	0.0	0.1
Departure Headway (s)	5.8	5.8	5.7	5.7	6.9
Degree Utilization, x	1.05	0.58	0.65	1.30	0.01
Capacity (veh/h)	612	614	617	638	510
Control Delay (s)	73.2	15.2	17.7	164.4	10.0
Approach Delay (s)	52.4		115.4		10.0
Approach LOS	F		F		B

Intersection Summary			
Delay	86.7		
HCM Level of Service	F		
Intersection Capacity Utilization	44.4%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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		1.00			1.00			0.91			0.91	
Frt		1.00			0.88			1.00			1.00	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1878			1663			5133			5141	
Flt Permitted		1.00			1.00			1.00			1.00	
Satd. Flow (perm)		1873			1656			5133			5141	
Volume (vph)	4	358	6	5	44	308	0	1970	23	0	2207	3
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	4	358	6	5	44	308	0	1970	23	0	2207	3
Lane Group Flow (vph)	0	368	0	0	357	0	0	1993	0	0	2210	0
Turn Type	Perm			Perm								
Protected Phases		4			8			6			2	
Permitted Phases	4			8								
Actuated Green, G (s)		32.0			32.0			50.0			50.0	
Effective Green, g (s)		32.0			32.0			50.0			50.0	
Actuated g/C Ratio		0.36			0.36			0.56			0.56	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		666			589			2852			2856	
v/s Ratio Prot								0.39			c0.43	
v/s Ratio Perm		0.20			c0.22							
v/c Ratio		0.55			0.61			0.70			0.77	
Uniform Delay, d1		23.3			23.8			14.5			15.6	
Progression Factor		1.00			1.00			0.76			1.01	
Incremental Delay, d2		3.3			4.6			0.8			1.7	
Delay (s)		26.5			28.4			11.9			17.5	
Level of Service		C			C			B			B	
Approach Delay (s)		26.5			28.4			11.9			17.5	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	16.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.71		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	72.6%	ICU Level of Service	C

c Critical Lane Group

Movement	WBL	WBR	NBL	NBR	SEL	SER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.76		1.00	0.94	
Frt	1.00	0.85		0.86	1.00	
Flt Protected	0.95	1.00		1.00	0.95	
Satd. Flow (prot)	1789	3650		1629	5046	
Flt Permitted	0.95	1.00		1.00	0.95	
Satd. Flow (perm)	1789	3650		1629	5046	
Volume (vph)	198	2173	0	141	1936	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	198	2173	0	141	1936	0
Lane Group Flow (vph)	198	2173	0	141	1936	0
Turn Type	Prot			custom		
Protected Phases	8			4	2	
Permitted Phases		8 2		4		
Actuated Green, G (s)	27.0	90.0		27.0	55.0	
Effective Green, g (s)	27.0	90.0		27.0	55.0	
Actuated g/C Ratio	0.30	1.00		0.30	0.61	
Clearance Time (s)	4.0			4.0	4.0	
Lane Grp Cap (vph)	537	3650		489	3084	
v/s Ratio Prot	0.11			0.09	0.38	
v/s Ratio Perm		c0.60				
v/c Ratio	0.37	0.60		0.29	0.63	
Uniform Delay, d1	24.8	0.0		24.1	11.0	
Progression Factor	0.74	1.00		0.63	1.06	
Incremental Delay, d2	1.3	0.5		1.3	0.7	
Delay (s)	19.7	0.5		16.7	12.4	
Level of Service	B	A		B	B	
Approach Delay (s)	2.1		16.7		12.4	
Approach LOS	A		B		B	

Intersection Summary			
HCM Average Control Delay	7.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.60		
Cycle Length (s)	90.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	54.5%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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		0.91			0.91			1.00			1.00	
Frt		0.98			1.00			1.00			0.96	
Flt Protected		1.00			1.00			0.95			0.98	
Satd. Flow (prot)		5035			5138			1793			1774	
Flt Permitted		1.00			1.00			0.72			0.86	
Satd. Flow (perm)		5035			5138			1350			1559	
Volume (vph)	0	1848	298	0	2144	11	345	8	6	10	6	6
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1848	298	0	2144	11	345	8	6	10	6	6
Lane Group Flow (vph)	0	2146	0	0	2155	0	0	359	0	0	22	0
Turn Type							Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases		2					8			4		
Actuated Green, G (s)		55.0			55.0			27.0			27.0	
Effective Green, g (s)		55.0			55.0			27.0			27.0	
Actuated g/C Ratio		0.61			0.61			0.30			0.30	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		3077			3140			405			468	
v/s Ratio Prot		c0.43			0.42							
v/s Ratio Perm								c0.27			0.01	
v/c Ratio		0.70			0.69			0.89			0.05	
Uniform Delay, d1		11.9			11.7			30.0			22.4	
Progression Factor		2.01			1.00			1.00			1.00	
Incremental Delay, d2		1.1			1.2			23.7			0.2	
Delay (s)		24.9			13.0			53.7			22.6	
Level of Service		C			B			D			C	
Approach Delay (s)		24.9			13.0			53.7			22.6	
Approach LOS		C			B			D			C	

Intersection Summary			
HCM Average Control Delay	21.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.76		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	75.6%	ICU Level of Service	C

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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		1.00			1.00			1.00			1.00	
Frt		0.97			1.00			0.96			0.94	
Flt Protected		0.99			1.00			1.00			1.00	
Satd. Flow (prot)		1813			1875			1810			1775	
Flt Permitted		0.90			0.99			0.99			1.00	
Satd. Flow (perm)		1637			1866			1800			1770	
Volume (vph)	50	252	90	8	518	15	3	50	20	6	125	93
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	50	252	90	8	518	15	3	50	20	6	125	93
Lane Group Flow (vph)	0	392	0	0	541	0	0	73	0	0	224	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		44.0			44.0			38.0			38.0	
Effective Green, g (s)		44.0			44.0			38.0			38.0	
Actuated g/C Ratio		0.49			0.49			0.42			0.42	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		800			912			760			747	
v/s Ratio Prot												
v/s Ratio Perm		0.24			c0.29			0.04			c0.13	
v/c Ratio		0.49			0.59			0.10			0.30	
Uniform Delay, d1		15.5			16.6			15.7			17.2	
Progression Factor		1.00			1.35			1.00			1.00	
Incremental Delay, d2		2.1			2.8			0.3			1.0	
Delay (s)		17.6			25.2			15.9			18.2	
Level of Service		B			C			B			B	
Approach Delay (s)		17.6			25.2			15.9			18.2	
Approach LOS		B			C			B			B	

Intersection Summary			
HCM Average Control Delay	21.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.46		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	73.7%	ICU Level of Service	C

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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		1.00			1.00			1.00			1.00	
Frt		0.98			0.96			1.00			0.99	
Flt Protected		0.96			1.00			1.00			1.00	
Satd. Flow (prot)		1781			1812			1882			1854	
Flt Permitted		0.80			1.00			1.00			0.98	
Satd. Flow (perm)		1475			1811			1875			1826	
Volume (vph)	43	6	8	1	64	25	5	584	2	16	576	70
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	43	6	8	1	64	25	5	584	2	16	576	70
Lane Group Flow (vph)	0	57	0	0	90	0	0	591	0	0	662	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		508			624			1063			1035	
v/s Ratio Prot												
v/s Ratio Perm		0.04			c0.05			0.32			c0.36	
v/c Ratio		0.11			0.14			0.56			0.64	
Uniform Delay, d1		20.1			20.3			12.3			13.3	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.4			0.5			2.1			3.0	
Delay (s)		20.6			20.8			14.4			16.3	
Level of Service		C			C			B			B	
Approach Delay (s)		20.6			20.8			14.4			16.3	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	16.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.45		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	58.8%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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	1.00	1.00		1.00	1.00	1.00		0.91			0.91	
Frt	1.00	0.96		1.00	1.00	0.85		1.00			0.97	
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			1.00	
Satd. Flow (prot)	1789	1803		1789	1883	1601		5141			5000	
Flt Permitted	0.72	1.00		0.75	1.00	1.00		1.00			1.00	
Satd. Flow (perm)	1364	1803		1410	1883	1601		5141			5000	
Volume (vph)	234	10	4	1	50	426	0	2205	1	0	2397	538
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	234	10	4	1	50	426	0	2205	1	0	2397	538
Lane Group Flow (vph)	234	14	0	1	50	426	0	2206	0	0	2935	0
Turn Type	Perm			Perm		Perm						
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8						
Actuated Green, G (s)	32.0	32.0		32.0	32.0	32.0		50.0			50.0	
Effective Green, g (s)	32.0	32.0		32.0	32.0	32.0		50.0			50.0	
Actuated g/C Ratio	0.36	0.36		0.36	0.36	0.36		0.56			0.56	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Grp Cap (vph)	485	641		501	670	569		2856			2778	
v/s Ratio Prot		0.01			0.03			0.43			c0.59	
v/s Ratio Perm	0.17			0.00		c0.27						
v/c Ratio	0.48	0.02		0.00	0.07	0.75		0.77			1.06	
Uniform Delay, d1	22.6	18.8		18.7	19.2	25.5		15.6			20.0	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	3.4	0.1		0.0	0.2	8.7		2.1			34.4	
Delay (s)	26.0	18.9		18.7	19.4	34.2		17.7			54.4	
Level of Service	C	B		B	B	C		B			D	
Approach Delay (s)		25.6			32.6			17.7			54.4	
Approach LOS		C			C			B			D	

Intersection Summary			
HCM Average Control Delay	37.6	HCM Level of Service	D
HCM Volume to Capacity ratio	0.94		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	92.0%	ICU Level of Service	E

c Critical Lane Group

2030 ALTERNATIVE 1

(No Build) WEEKEND

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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
Lane Util. Factor		0.95			0.95	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				0.95		1.00
Satd. Flow (prot)		3579			3579	1601				1789		1601
Flt Permitted		1.00			1.00	1.00				0.95		1.00
Satd. Flow (perm)		3579			3579	1601				1789		1601
Volume (vph)	0	960	0	0	1130	11	0	0	0	2	0	10
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	960	0	0	1130	11	0	0	0	2	0	10
Lane Group Flow (vph)	0	960	0	0	1130	11	0	0	0	2	0	10
Turn Type						Free			custom	Prot		custom
Protected Phases		8			8					2		
Permitted Phases		8				Free			2			2
Actuated Green, G (s)		48.0			48.0	75.0				19.0		19.0
Effective Green, g (s)		48.0			48.0	75.0				19.0		19.0
Actuated g/C Ratio		0.64			0.64	1.00				0.25		0.25
Clearance Time (s)		4.0			4.0					4.0		4.0
Lane Grp Cap (vph)		2291			2291	1601				453		406
v/s Ratio Prot		0.27			c0.32					0.00		
v/s Ratio Perm						0.01						c0.01
v/c Ratio		0.42			0.49	0.01				0.00		0.02
Uniform Delay, d1		6.6			7.1	0.0				20.9		21.0
Progression Factor		1.00			1.00	1.00				1.00		1.00
Incremental Delay, d2		0.6			0.8	0.0				0.0		0.1
Delay (s)		7.2			7.9	0.0				20.9		21.1
Level of Service		A			A	A				C		C
Approach Delay (s)		7.2			7.8			0.0			21.1	
Approach LOS		A			A			A			C	

Intersection Summary			
HCM Average Control Delay	7.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.36		
Cycle Length (s)	75.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	41.2%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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			0.91			0.91	
Frt		0.99			0.86			1.00			1.00	
Flt Protected		0.95			1.00			1.00			1.00	
Satd. Flow (prot)		3395			1629			5142			5142	
Flt Permitted		0.73			1.00			1.00			1.00	
Satd. Flow (perm)		2603			1629			5142			5142	
Volume (vph)	366	1	15	0	0	9	0	2441	0	0	1987	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	366	1	15	0	0	9	0	2441	0	0	1987	0
Lane Group Flow (vph)	0	382	0	0	9	0	0	2441	0	0	1987	0
Turn Type	Perm			Perm					Free			
Protected Phases		4			8			6			2	
Permitted Phases	4			8					Free			
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		897			561			2914			2914	
v/s Ratio Prot					0.01			c0.47			0.39	
v/s Ratio Perm		c0.15										
v/c Ratio		0.43			0.02			0.84			0.68	
Uniform Delay, d1		22.7			19.4			16.1			13.8	
Progression Factor		1.00			1.00			1.11			0.22	
Incremental Delay, d2		1.5			0.1			2.1			1.1	
Delay (s)		24.1			19.5			20.0			4.1	
Level of Service		C			B			C			A	
Approach Delay (s)		24.1			19.5			20.0			4.1	
Approach LOS		C			B			C			A	

Intersection Summary			
HCM Average Control Delay	13.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.68		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	80.8%	ICU Level of Service	D

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (veh/h)	144	0	4	34	35	10
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	144	0	4	34	35	10

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total (vph)	144	0	4	34	45
Volume Left (vph)	144	0	0	0	35
Volume Right (vph)	0	0	0	34	10
Hadj (s)	0.2	0.0	0.0	-0.6	0.1
Departure Headway (s)	4.9	4.6	4.7	4.1	4.4
Degree Utilization, x	0.19	0.00	0.01	0.04	0.05
Capacity (veh/h)	731	780	748	848	783
Control Delay (s)	7.8	6.4	6.6	6.1	7.6
Approach Delay (s)	7.8		6.2		7.6
Approach LOS	A		A		A

Intersection Summary			
Delay	7.5		
HCM Level of Service	A		
Intersection Capacity Utilization	24.6%	ICU Level of Service	A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.87		1.00	1.00	0.99	
Flt Protected	1.00		0.95	1.00	1.00	
Satd. Flow (prot)	1631		1789	1883	1869	
Flt Permitted	1.00		0.75	1.00	1.00	
Satd. Flow (perm)	1631		1404	1883	1869	
Volume (vph)	4	346	4	145	17	1
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	4	346	4	145	17	1
Lane Group Flow (vph)	350	0	4	145	18	0
Turn Type			Perm			
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	23.0		24.0	24.0	24.0	
Effective Green, g (s)	23.0		24.0	24.0	24.0	
Actuated g/C Ratio	0.42		0.44	0.44	0.44	
Clearance Time (s)	4.0		4.0	4.0	4.0	
Lane Grp Cap (vph)	682		613	822	816	
v/s Ratio Prot	c0.21			c0.08	0.01	
v/s Ratio Perm			0.00			
v/c Ratio	0.51		0.01	0.18	0.02	
Uniform Delay, d1	11.9		8.8	9.5	8.8	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	2.7		0.0	0.5	0.0	
Delay (s)	14.6		8.8	9.9	8.9	
Level of Service	B		A	A	A	
Approach Delay (s)	14.6			9.9	8.9	
Approach LOS	B			A	A	

Intersection Summary			
HCM Average Control Delay	13.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.34		
Cycle Length (s)	55.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	35.9%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (veh/h)	0	36	69	24	22	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	0	36	69	24	22	1

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total (vph)	12	24	46	47	23
Volume Left (vph)	0	0	0	0	22
Volume Right (vph)	0	0	0	24	1
Hadj (s)	0.0	0.0	0.0	-0.3	0.2
Departure Headway (s)	4.6	4.6	4.6	4.3	4.4
Degree Utilization, x	0.02	0.03	0.06	0.06	0.03
Capacity (veh/h)	765	759	774	820	791
Control Delay (s)	6.5	6.6	6.7	6.4	7.5
Approach Delay (s)	6.6		6.5		7.5
Approach LOS	A		A		A

Intersection Summary			
Delay	6.7		
HCM Level of Service	A		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (veh/h)	0	5	6	2	1	0	9	0	6	0	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	0	5	6	2	1	0	9	0	6	0	0	0

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	5	6	2	1	9	6	0	0
Volume Left (vph)	0	0	2	0	9	0	0	0
Volume Right (vph)	0	6	0	0	0	6	0	0
Hadj (s)	0.0	-0.6	0.2	0.0	0.2	-0.6	0.0	0.0
Departure Headway (s)	4.6	4.0	4.8	4.6	4.8	4.0	4.5	4.5
Degree Utilization, x	0.01	0.01	0.00	0.00	0.01	0.01	0.00	0.00
Capacity (veh/h)	780	900	748	772	742	902	797	797
Control Delay (s)	6.4	5.8	6.6	6.4	6.6	5.8	6.3	6.3
Approach Delay (s)	6.1		6.5		6.3		0.0	
Approach LOS	A		A		A		A	

Intersection Summary			
Delay	6.2		
HCM Level of Service	A		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A

Movement	SBL	SBR	SEL	SET	SER	NWL	NWT	NWR	NEL2	NEL	NER
Lane Configurations											
Ideal Flow (vphpl)	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
Lane Util. Factor				0.91	1.00		0.91			1.00	1.00
Frt				1.00	0.85		1.00			1.00	0.85
Flt Protected				1.00	1.00		1.00			0.95	1.00
Satd. Flow (prot)				5142	1601		5141			1789	1601
Flt Permitted				1.00	1.00		1.00			0.75	1.00
Satd. Flow (perm)				5142	1601		5141			1413	1601
Volume (vph)	0	0	0	2433	99	0	2362	1	84	1	7
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	0	0	2433	99	0	2362	1	84	1	7
Lane Group Flow (vph)	0	0	0	2433	99	0	2363	0	0	85	7
Turn Type					Perm				Perm		Perm
Protected Phases				4			4			6	
Permitted Phases		6			4				6		6
Actuated Green, G (s)				59.0	59.0		59.0			23.0	23.0
Effective Green, g (s)				59.0	59.0		59.0			23.0	23.0
Actuated g/C Ratio				0.66	0.66		0.66			0.26	0.26
Clearance Time (s)				4.0	4.0		4.0			4.0	4.0
Lane Grp Cap (vph)				3371	1050		3370			361	409
v/s Ratio Prot				c0.47			0.46				
v/s Ratio Perm					0.06					c0.06	0.00
v/c Ratio				0.72	0.09		0.70			0.24	0.02
Uniform Delay, d1				10.1	5.7		9.9			26.5	25.0
Progression Factor				1.00	1.00		1.56			1.00	1.00
Incremental Delay, d2				1.4	0.2		1.0			1.5	0.1
Delay (s)				11.5	5.9		16.4			28.1	25.1
Level of Service				B	A		B			C	C
Approach Delay (s)	0.0			11.3			16.4			27.8	
Approach LOS	A			B			B			C	

Intersection Summary			
HCM Average Control Delay	14.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.59		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	58.4%	ICU Level of Service	A

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	946	3	3	1109	1	3
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	946	3	3	1109	1	3

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	631	318	373	739	4
Volume Left (vph)	0	0	3	0	1
Volume Right (vph)	0	3	0	0	3
Hadj (s)	0.0	0.0	0.0	0.0	-0.4
Departure Headway (s)	5.7	5.7	5.6	5.6	6.5
Degree Utilization, x	1.01	0.51	0.58	1.16	0.01
Capacity (veh/h)	621	617	626	643	547
Control Delay (s)	59.7	13.3	15.1	108.4	9.5
Approach Delay (s)	44.1		77.1		9.5
Approach LOS	E		F		A

Intersection Summary			
Delay	61.8		
HCM Level of Service	F		
Intersection Capacity Utilization	41.4%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	938	10	2	1106	4	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	938	10	2	1106	4	1

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	625	323	371	737	5
Volume Left (vph)	0	0	2	0	4
Volume Right (vph)	0	10	0	0	1
Hadj (s)	0.0	0.0	0.0	0.0	0.1
Departure Headway (s)	5.7	5.7	5.7	5.7	6.9
Degree Utilization, x	1.00	0.51	0.58	1.16	0.01
Capacity (veh/h)	621	618	625	642	512
Control Delay (s)	57.6	13.4	15.0	107.8	10.0
Approach Delay (s)	42.6		76.7		10.0
Approach LOS	E		F		A

Intersection Summary			
Delay	60.9		
HCM Level of Service	F		
Intersection Capacity Utilization	41.1%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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		1.00			1.00			0.91			0.91	
Frt		1.00			0.87			1.00			1.00	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1883			1630			5117			5139	
Flt Permitted		1.00			1.00			1.00			1.00	
Satd. Flow (perm)		1882			1630			5117			5139	
Volume (vph)	1	218	0	0	1	300	0	1863	62	0	1686	6
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1	218	0	0	1	300	0	1863	62	0	1686	6
Lane Group Flow (vph)	0	219	0	0	301	0	0	1925	0	0	1692	0
Turn Type	Perm			Perm								
Protected Phases		4			8			6			2	
Permitted Phases	4			8								
Actuated Green, G (s)		32.0			32.0			50.0			50.0	
Effective Green, g (s)		32.0			32.0			50.0			50.0	
Actuated g/C Ratio		0.36			0.36			0.56			0.56	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		669			580			2843			2855	
v/s Ratio Prot					c0.18			c0.38			0.33	
v/s Ratio Perm		0.12										
v/c Ratio		0.33			0.52			0.68			0.59	
Uniform Delay, d1		21.2			22.9			14.2			13.3	
Progression Factor		1.00			1.00			0.75			0.99	
Incremental Delay, d2		1.3			3.3			0.7			0.8	
Delay (s)		22.5			26.2			11.3			14.0	
Level of Service		C			C			B			B	
Approach Delay (s)		22.5			26.2			11.3			14.0	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	14.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	62.7%	ICU Level of Service	B

c Critical Lane Group

Movement	WBL	WBR	NBL	NBR	SEL	SER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.76		1.00	0.94	
Frt	1.00	0.85		0.86	1.00	
Flt Protected	0.95	1.00		1.00	0.95	
Satd. Flow (prot)	1789	3650		1629	5046	
Flt Permitted	0.95	1.00		1.00	0.95	
Satd. Flow (perm)	1789	3650		1629	5046	
Volume (vph)	61	1675	0	38	1848	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	61	1675	0	38	1848	0
Lane Group Flow (vph)	61	1675	0	38	1848	0
Turn Type	Prot			custom		
Protected Phases	8			4	2	
Permitted Phases		8 2		4		
Actuated Green, G (s)	27.0	90.0		27.0	55.0	
Effective Green, g (s)	27.0	90.0		27.0	55.0	
Actuated g/C Ratio	0.30	1.00		0.30	0.61	
Clearance Time (s)	4.0			4.0	4.0	
Lane Grp Cap (vph)	537	3650		489	3084	
v/s Ratio Prot	0.03			0.02	c0.37	
v/s Ratio Perm		c0.46				
v/c Ratio	0.11	0.46		0.08	0.60	
Uniform Delay, d1	22.8	0.0		22.6	10.7	
Progression Factor	0.60	1.00		0.59	1.01	
Incremental Delay, d2	0.4	0.4		0.1	0.6	
Delay (s)	14.2	0.4		13.5	11.4	
Level of Service	B	A		B	B	
Approach Delay (s)	0.8		13.5		11.4	
Approach LOS	A		B		B	

Intersection Summary			
HCM Average Control Delay	6.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.55		
Cycle Length (s)	90.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	45.2%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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		0.91			0.91			1.00			1.00	
Frt		0.98			1.00			0.99			0.91	
Flt Protected		1.00			1.00			0.96			1.00	
Satd. Flow (prot)		5014			5137			1792			1714	
Flt Permitted		1.00			1.00			0.79			1.00	
Satd. Flow (perm)		5014			5137			1480			1714	
Volume (vph)	0	1587	315	0	1705	10	60	4	3	0	2	4
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1587	315	0	1705	10	60	4	3	0	2	4
Lane Group Flow (vph)	0	1902	0	0	1715	0	0	67	0	0	6	0
Turn Type							Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases		2					8			4		
Actuated Green, G (s)		55.0			55.0			27.0			27.0	
Effective Green, g (s)		55.0			55.0			27.0			27.0	
Actuated g/C Ratio		0.61			0.61			0.30			0.30	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		3064			3139			444			514	
v/s Ratio Prot		c0.38			0.33						0.00	
v/s Ratio Perm								c0.05				
v/c Ratio		0.62			0.55			0.15			0.01	
Uniform Delay, d1		11.0			10.2			23.1			22.1	
Progression Factor		2.30			1.00			1.00			1.00	
Incremental Delay, d2		0.8			0.7			0.7			0.0	
Delay (s)		26.0			10.9			23.8			22.2	
Level of Service		C			B			C			C	
Approach Delay (s)		26.0			10.9			23.8			22.2	
Approach LOS		C			B			C			C	

Intersection Summary			
HCM Average Control Delay	18.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.47		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	54.7%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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		1.00			1.00			1.00			1.00	
Frt		1.00			0.99			0.99			0.95	
Flt Protected		0.96			1.00			0.97			1.00	
Satd. Flow (prot)		1805			1864			1806			1787	
Flt Permitted		0.40			1.00			0.76			0.99	
Satd. Flow (perm)		761			1858			1410			1779	
Volume (vph)	366	61	3	5	439	35	102	58	18	6	125	76
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	366	61	3	5	439	35	102	58	18	6	125	76
Lane Group Flow (vph)	0	430	0	0	479	0	0	178	0	0	207	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		44.0			44.0			38.0			38.0	
Effective Green, g (s)		44.0			44.0			38.0			38.0	
Actuated g/C Ratio		0.49			0.49			0.42			0.42	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		372			908			595			751	
v/s Ratio Prot												
v/s Ratio Perm		c0.57			0.26			c0.13			0.12	
v/c Ratio		1.16			0.53			0.30			0.28	
Uniform Delay, d1		23.0			15.8			17.2			17.0	
Progression Factor		1.00			1.12			1.00			1.00	
Incremental Delay, d2		96.3			2.2			1.3			0.9	
Delay (s)		119.3			20.0			18.5			17.9	
Level of Service		F			B			B			B	
Approach Delay (s)		119.3			20.0			18.5			17.9	
Approach LOS		F			B			B			B	

Intersection Summary			
HCM Average Control Delay	52.4	HCM Level of Service	D
HCM Volume to Capacity ratio	0.76		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	83.8%	ICU Level of Service	D

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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		1.00			1.00			1.00			1.00	
Frt		0.97			0.89			1.00			0.99	
Flt Protected		0.98			0.99			1.00			1.00	
Satd. Flow (prot)		1797			1669			1880			1872	
Flt Permitted		0.96			0.99			1.00			0.99	
Satd. Flow (perm)		1752			1659			1878			1855	
Volume (vph)	5	6	3	2	1	12	2	528	6	11	566	24
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	5	6	3	2	1	12	2	528	6	11	566	24
Lane Group Flow (vph)	0	14	0	0	15	0	0	536	0	0	601	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		603			571			1064			1051	
v/s Ratio Prot												
v/s Ratio Perm		0.01			c0.01			0.29			c0.32	
v/c Ratio		0.02			0.03			0.50			0.57	
Uniform Delay, d1		19.5			19.5			11.8			12.5	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.1			0.1			1.7			2.3	
Delay (s)		19.6			19.6			13.5			14.8	
Level of Service		B			B			B			B	
Approach Delay (s)		19.6			19.6			13.5			14.8	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	14.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.37		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	48.3%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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	1.00	1.00		1.00	1.00	1.00		0.91			0.91	
Frt	1.00	0.96		1.00	1.00	0.85		1.00			0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			1.00	
Satd. Flow (prot)	1789	1816		1789	1883	1601		5141			5061	
Flt Permitted	0.75	1.00		0.74	1.00	1.00		1.00			1.00	
Satd. Flow (perm)	1418	1816		1396	1883	1601		5141			5061	
Volume (vph)	9	19	6	5	7	52	0	1894	2	0	1937	228
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	9	19	6	5	7	52	0	1894	2	0	1937	228
Lane Group Flow (vph)	9	25	0	5	7	52	0	1896	0	0	2165	0
Turn Type	Perm			Perm		Perm						
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8						
Actuated Green, G (s)	32.0	32.0		32.0	32.0	32.0		50.0			50.0	
Effective Green, g (s)	32.0	32.0		32.0	32.0	32.0		50.0			50.0	
Actuated g/C Ratio	0.36	0.36		0.36	0.36	0.36		0.56			0.56	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Grp Cap (vph)	504	646		496	670	569		2856			2812	
v/s Ratio Prot		0.01			0.00			0.37			c0.43	
v/s Ratio Perm	0.01			0.00		c0.03						
v/c Ratio	0.02	0.04		0.01	0.01	0.09		0.66			0.77	
Uniform Delay, d1	18.8	18.9		18.8	18.8	19.3		14.1			15.5	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	0.1	0.1		0.0	0.0	0.3		1.2			2.1	
Delay (s)	18.9	19.1		18.8	18.8	19.6		15.3			17.6	
Level of Service	B	B		B	B	B		B			B	
Approach Delay (s)		19.0			19.5			15.3			17.6	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	16.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.51		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	53.3%	ICU Level of Service	A

c Critical Lane Group

2030 ALTERNATIVE 2

(Replace and Widen) AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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
Lane Util. Factor		0.95			0.95	1.00			1.00	1.00		1.00
Frt		0.99			1.00	0.85			0.86	1.00		0.85
Flt Protected		1.00			1.00	1.00			1.00	0.95		1.00
Satd. Flow (prot)		3530			3579	1601			1629	1789		1601
Flt Permitted		1.00			1.00	1.00			1.00	0.95		1.00
Satd. Flow (perm)		3530			3579	1601			1629	1789		1601
Volume (vph)	0	1525	151	0	760	12	0	0	3	2	0	10
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1525	151	0	760	12	0	0	3	2	0	10
Lane Group Flow (vph)	0	1676	0	0	760	12	0	0	3	2	0	10
Turn Type						Free			custom	Prot		custom
Protected Phases		8			8					2		
Permitted Phases		8				Free			2			2
Actuated Green, G (s)		48.0			48.0	75.0			19.0	19.0		19.0
Effective Green, g (s)		48.0			48.0	75.0			19.0	19.0		19.0
Actuated g/C Ratio		0.64			0.64	1.00			0.25	0.25		0.25
Clearance Time (s)		4.0			4.0				4.0	4.0		4.0
Lane Grp Cap (vph)		2259			2291	1601			413	453		406
v/s Ratio Prot		c0.47			0.21					0.00		
v/s Ratio Perm						0.01			0.00			c0.01
v/c Ratio		0.74			0.33	0.01			0.01	0.00		0.02
Uniform Delay, d1		9.3			6.2	0.0			20.9	20.9		21.0
Progression Factor		1.00			1.00	1.00			1.00	1.00		1.00
Incremental Delay, d2		2.2			0.4	0.0			0.0	0.0		0.1
Delay (s)		11.5			6.6	0.0			21.0	20.9		21.1
Level of Service		B			A	A			C	C		C
Approach Delay (s)		11.5			6.5			21.0			21.1	
Approach LOS		B			A			C			C	

Intersection Summary			
HCM Average Control Delay	10.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.54		
Cycle Length (s)	75.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	63.6%	ICU Level of Service	B

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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			0.91			0.91	
Frt		1.00			0.90			1.00			1.00	
Flt Protected		0.96			1.00			1.00			1.00	
Satd. Flow (prot)		3437			1693			5142			5142	
Flt Permitted		0.73			1.00			1.00			1.00	
Satd. Flow (perm)		2628			1693			5142			5142	
Volume (vph)	293	62	0	0	10	30	0	3087	0	0	1838	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	293	62	0	0	10	30	0	3087	0	0	1838	0
Lane Group Flow (vph)	0	355	0	0	40	0	0	3087	0	0	1838	0
Turn Type	Perm			Perm					Free			
Protected Phases		4			8			6			2	
Permitted Phases	4			8					Free			
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		905			583			2914			2914	
v/s Ratio Prot					0.02			c0.60			0.36	
v/s Ratio Perm		c0.14										
v/c Ratio		0.39			0.07			1.06			0.63	
Uniform Delay, d1		22.4			19.8			19.5			13.2	
Progression Factor		1.00			1.00			1.23			0.23	
Incremental Delay, d2		1.3			0.2			30.6			0.9	
Delay (s)		23.6			20.0			54.5			3.9	
Level of Service		C			C			D			A	
Approach Delay (s)		23.6			20.0			54.5			3.9	
Approach LOS		C			C			D			A	

Intersection Summary			
HCM Average Control Delay	34.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.81		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	89.2%	ICU Level of Service	D

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (veh/h)	564	4	10	59	59	71
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	564	4	10	59	59	71

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total (vph)	564	4	10	59	130
Volume Left (vph)	564	0	0	0	59
Volume Right (vph)	0	0	0	59	71
Hadj (s)	0.2	0.0	0.0	-0.6	-0.2
Departure Headway (s)	5.1	4.9	5.4	4.8	5.3
Degree Utilization, x	0.81	0.01	0.01	0.08	0.19
Capacity (veh/h)	689	713	637	720	627
Control Delay (s)	24.6	6.8	7.3	7.0	9.5
Approach Delay (s)	24.5		7.0		9.5
Approach LOS	C		A		A

Intersection Summary			
Delay	20.4		
HCM Level of Service	C		
Intersection Capacity Utilization	52.2%	ICU Level of Service	A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.87		1.00	1.00	0.97	
Flt Protected	1.00		0.95	1.00	1.00	
Satd. Flow (prot)	1630		1789	1883	1827	
Flt Permitted	1.00		0.68	1.00	1.00	
Satd. Flow (perm)	1630		1283	1883	1827	
Volume (vph)	2	358	72	578	92	26
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	2	358	72	578	92	26
Lane Group Flow (vph)	360	0	72	578	118	0
Turn Type			Perm			
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	23.0		24.0	24.0	24.0	
Effective Green, g (s)	23.0		24.0	24.0	24.0	
Actuated g/C Ratio	0.42		0.44	0.44	0.44	
Clearance Time (s)	4.0		4.0	4.0	4.0	
Lane Grp Cap (vph)	682		560	822	797	
v/s Ratio Prot	c0.22			c0.31	0.06	
v/s Ratio Perm			0.06			
v/c Ratio	0.53		0.13	0.70	0.15	
Uniform Delay, d1	11.9		9.3	12.6	9.3	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	2.9		0.5	5.0	0.4	
Delay (s)	14.9		9.7	17.6	9.7	
Level of Service	B		A	B	A	
Approach Delay (s)	14.9			16.7	9.7	
Approach LOS	B			B	A	

Intersection Summary			
HCM Average Control Delay	15.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Cycle Length (s)	55.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	59.4%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (veh/h)	13	109	246	73	43	3
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	13	109	246	73	43	3

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total (vph)	49	73	164	155	46
Volume Left (vph)	13	0	0	0	43
Volume Right (vph)	0	0	0	73	3
Hadj (s)	0.1	0.0	0.0	-0.2	0.2
Departure Headway (s)	4.9	4.9	4.7	4.5	5.0
Degree Utilization, x	0.07	0.10	0.22	0.19	0.06
Capacity (veh/h)	714	717	741	791	672
Control Delay (s)	7.1	7.2	7.8	7.3	8.4
Approach Delay (s)	7.2		7.6		8.4
Approach LOS	A		A		A

Intersection Summary			
Delay	7.6		
HCM Level of Service	A		
Intersection Capacity Utilization	19.1%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (veh/h)	0	4	7	6	5	0	33	0	8	0	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	0	4	7	6	5	0	33	0	8	0	0	0

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	4	7	6	5	33	8	0	0
Volume Left (vph)	0	0	6	0	33	0	0	0
Volume Right (vph)	0	7	0	0	0	8	0	0
Hadj (s)	0.0	-0.6	0.2	0.0	0.2	-0.6	0.0	0.0
Departure Headway (s)	4.6	4.0	4.8	4.6	4.8	4.0	4.6	4.6
Degree Utilization, x	0.01	0.01	0.01	0.01	0.04	0.01	0.00	0.00
Capacity (veh/h)	765	870	735	759	739	896	790	790
Control Delay (s)	6.5	5.9	6.7	6.5	6.8	5.8	6.4	6.4
Approach Delay (s)	6.1		6.6		6.6		0.0	
Approach LOS	A		A		A		A	

Intersection Summary			
Delay	6.5		
HCM Level of Service	A		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A

Movement	SBL	SBR	SBR2	SEL	SET	SER	NWL	NWT	NWR	NEL2	NEL	NER
Lane Configurations												
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
Lane Util. Factor		1.00			0.91	1.00		0.91			1.00	1.00
Frt		0.86			1.00	0.85		1.00			1.00	0.85
Flt Protected		1.00			1.00	1.00		1.00			0.95	1.00
Satd. Flow (prot)		1629			5142	1601		5138			1789	1601
Flt Permitted		1.00			1.00	1.00		1.00			0.78	1.00
Satd. Flow (perm)		1629			5142	1601		5138			1461	1601
Volume (vph)	0	0	4	0	3076	244	0	2149	12	55	1	10
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	0	4	0	3076	244	0	2149	12	55	1	10
Lane Group Flow (vph)	0	4	0	0	3076	244	0	2161	0	0	56	10
Turn Type						Perm				Perm		Perm
Protected Phases					4			4			6	
Permitted Phases		6				4				6		6
Actuated Green, G (s)		23.0			59.0	59.0		59.0			23.0	23.0
Effective Green, g (s)		23.0			59.0	59.0		59.0			23.0	23.0
Actuated g/C Ratio		0.26			0.66	0.66		0.66			0.26	0.26
Clearance Time (s)		4.0			4.0	4.0		4.0			4.0	4.0
Lane Grp Cap (vph)		416			3371	1050		3368			373	409
v/s Ratio Prot					c0.60			0.42				
v/s Ratio Perm		0.00				0.15					c0.04	0.01
v/c Ratio		0.01			0.91	0.23		0.64			0.15	0.02
Uniform Delay, d1		25.0			13.3	6.3		9.2			25.9	25.1
Progression Factor		1.00			1.00	1.00		1.50			1.00	1.00
Incremental Delay, d2		0.0			4.9	0.5		0.8			0.9	0.1
Delay (s)		25.0			18.2	6.8		14.6			26.8	25.2
Level of Service		C			B	A		B			C	C
Approach Delay (s)	25.0				17.4			14.6			26.5	
Approach LOS	C				B			B			C	

Intersection Summary			
HCM Average Control Delay	16.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.70		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	76.1%	ICU Level of Service	C

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	1231	3	5	809	14	2
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	1231	3	5	809	14	2

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	821	413	275	539	16
Volume Left (vph)	0	0	5	0	14
Volume Right (vph)	0	3	0	0	2
Hadj (s)	0.0	0.0	0.0	0.0	0.1
Departure Headway (s)	5.5	5.5	5.8	5.8	6.9
Degree Utilization, x	1.26	0.63	0.44	0.87	0.03
Capacity (veh/h)	649	632	602	609	508
Control Delay (s)	144.7	16.2	12.2	34.7	10.1
Approach Delay (s)	101.7		27.1		10.1
Approach LOS	F		D		B

Intersection Summary			
Delay	71.6		
HCM Level of Service	F		
Intersection Capacity Utilization	44.1%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	1234	1	3	800	17	2
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	1234	1	3	800	17	2

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	823	412	270	533	19
Volume Left (vph)	0	0	3	0	17
Volume Right (vph)	0	1	0	0	2
Hadj (s)	0.0	0.0	0.0	0.0	0.1
Departure Headway (s)	5.5	5.5	5.8	5.8	6.9
Degree Utilization, x	1.26	0.63	0.44	0.86	0.04
Capacity (veh/h)	649	632	601	608	507
Control Delay (s)	145.6	16.2	12.1	33.7	10.2
Approach Delay (s)	102.4		26.4		10.2
Approach LOS	F		D		B

Intersection Summary			
Delay	71.9		
HCM Level of Service	F		
Intersection Capacity Utilization	44.1%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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		1.00			1.00			0.91			0.91	
Frt		1.00			0.90			0.99			1.00	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1880			1685			5105			5141	
Flt Permitted		1.00			1.00			1.00			1.00	
Satd. Flow (perm)		1879			1680			5105			5141	
Volume (vph)	3	453	5	2	33	122	0	2406	121	0	1717	1
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	3	453	5	2	33	122	0	2406	121	0	1717	1
Lane Group Flow (vph)	0	461	0	0	157	0	0	2527	0	0	1718	0
Turn Type	Perm			Perm								
Protected Phases		4			8			6			2	
Permitted Phases	4			8				6				
Actuated Green, G (s)		32.0			32.0			50.0			50.0	
Effective Green, g (s)		32.0			32.0			50.0			50.0	
Actuated g/C Ratio		0.36			0.36			0.56			0.56	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		668			597			2836			2856	
v/s Ratio Prot								c0.50			0.33	
v/s Ratio Perm		c0.25			0.09							
v/c Ratio		0.69			0.26			0.89			0.60	
Uniform Delay, d1		24.8			20.6			17.6			13.4	
Progression Factor		1.00			1.00			0.52			0.98	
Incremental Delay, d2		5.8			1.1			0.5			0.9	
Delay (s)		30.5			21.7			9.7			14.0	
Level of Service		C			C			A			B	
Approach Delay (s)		30.5			21.7			9.7			14.0	
Approach LOS		C			C			A			B	

Intersection Summary			
HCM Average Control Delay	13.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.81		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	81.3%	ICU Level of Service	D

c Critical Lane Group

Movement	WBL	WBR	NBL	NBR	SEL	SER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.76		1.00	0.94	
Frt	1.00	0.85		0.86	1.00	
Flt Protected	0.95	1.00		1.00	0.95	
Satd. Flow (prot)	1789	3650		1629	5046	
Flt Permitted	0.95	1.00		1.00	0.95	
Satd. Flow (perm)	1789	3650		1629	5046	
Volume (vph)	240	1695	0	120	2378	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	240	1695	0	120	2378	0
Lane Group Flow (vph)	240	1695	0	120	2378	0
Turn Type	Prot			custom		
Protected Phases	8			4	2	
Permitted Phases		8 2		4		
Actuated Green, G (s)	27.0	90.0		27.0	55.0	
Effective Green, g (s)	27.0	90.0		27.0	55.0	
Actuated g/C Ratio	0.30	1.00		0.30	0.61	
Clearance Time (s)	4.0			4.0	4.0	
Lane Grp Cap (vph)	537	3650		489	3084	
v/s Ratio Prot	0.13			0.07	c0.47	
v/s Ratio Perm		c0.46				
v/c Ratio	0.45	0.46		0.25	0.77	
Uniform Delay, d1	25.5	0.0		23.8	12.9	
Progression Factor	0.74	1.00		0.50	1.01	
Incremental Delay, d2	2.2	0.4		0.1	0.8	
Delay (s)	21.0	0.4		12.0	13.9	
Level of Service	C	A		B	B	
Approach Delay (s)	2.9		12.0		13.9	
Approach LOS	A		B		B	

Intersection Summary			
HCM Average Control Delay	9.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.66		
Cycle Length (s)	90.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	65.2%	ICU Level of Service	B

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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		0.91			0.91			1.00			1.00	
Frt		0.98			1.00			1.00			0.97	
Flt Protected		1.00			1.00			0.95			0.97	
Satd. Flow (prot)		5023			5139			1795			1774	
Flt Permitted		1.00			1.00			0.70			0.84	
Satd. Flow (perm)		5023			5139			1319			1535	
Volume (vph)	0	2184	399	0	1796	6	183	2	0	21	8	9
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	2184	399	0	1796	6	183	2	0	21	8	9
Lane Group Flow (vph)	0	2583	0	0	1802	0	0	185	0	0	38	0
Turn Type							Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)		55.0			55.0			27.0			27.0	
Effective Green, g (s)		55.0			55.0			27.0			27.0	
Actuated g/C Ratio		0.61			0.61			0.30			0.30	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		3070			3141			396			461	
v/s Ratio Prot		c0.51			0.35							
v/s Ratio Perm								c0.14			0.02	
v/c Ratio		0.84			0.57			0.47			0.08	
Uniform Delay, d1		14.0			10.5			25.6			22.6	
Progression Factor		1.72			1.00			1.00			1.00	
Incremental Delay, d2		2.0			0.8			3.9			0.4	
Delay (s)		26.2			11.2			29.6			23.0	
Level of Service		C			B			C			C	
Approach Delay (s)		26.2			11.2			29.6			23.0	
Approach LOS		C			B			C			C	

Intersection Summary			
HCM Average Control Delay	20.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.72		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	74.7%	ICU Level of Service	C

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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		1.00			1.00			1.00			1.00	
Frt		0.98			1.00			0.99			0.98	
Flt Protected		0.97			1.00			0.96			1.00	
Satd. Flow (prot)		1792			1880			1805			1845	
Flt Permitted		0.48			1.00			0.66			0.99	
Satd. Flow (perm)		884			1873			1240			1827	
Volume (vph)	312	161	94	5	506	6	111	34	8	12	209	34
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	312	161	94	5	506	6	111	34	8	12	209	34
Lane Group Flow (vph)	0	567	0	0	517	0	0	153	0	0	255	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		44.0			44.0			38.0			38.0	
Effective Green, g (s)		44.0			44.0			38.0			38.0	
Actuated g/C Ratio		0.49			0.49			0.42			0.42	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		432			916			524			771	
v/s Ratio Prot												
v/s Ratio Perm		c0.64			0.28			0.12			c0.14	
v/c Ratio		1.31			0.56			0.29			0.33	
Uniform Delay, d1		23.0			16.2			17.1			17.5	
Progression Factor		1.00			1.44			1.00			1.00	
Incremental Delay, d2		156.4			2.5			1.4			1.1	
Delay (s)		179.4			25.8			18.5			18.6	
Level of Service		F			C			B			B	
Approach Delay (s)		179.4			25.8			18.5			18.6	
Approach LOS		F			C			B			B	

Intersection Summary			
HCM Average Control Delay	82.2	HCM Level of Service	F
HCM Volume to Capacity ratio	0.86		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	94.2%	ICU Level of Service	E

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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		1.00			1.00			1.00			1.00	
Frt		1.00			0.90			1.00			0.98	
Flt Protected		0.96			1.00			1.00			1.00	
Satd. Flow (prot)		1799			1690			1881			1855	
Flt Permitted		0.79			1.00			0.99			1.00	
Satd. Flow (perm)		1481			1687			1868			1852	
Volume (vph)	60	8	2	1	6	21	8	580	2	3	572	72
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	60	8	2	1	6	21	8	580	2	3	572	72
Lane Group Flow (vph)	0	70	0	0	28	0	0	590	0	0	647	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		510			581			1059			1049	
v/s Ratio Prot												
v/s Ratio Perm		c0.05			0.02			0.32			c0.35	
v/c Ratio		0.14			0.05			0.56			0.62	
Uniform Delay, d1		20.3			19.7			12.3			13.0	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.6			0.2			2.1			2.7	
Delay (s)		20.9			19.8			14.5			15.7	
Level of Service		C			B			B			B	
Approach Delay (s)		20.9			19.8			14.5			15.7	
Approach LOS		C			B			B			B	

Intersection Summary			
HCM Average Control Delay	15.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.44		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	53.5%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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	1.00	1.00		1.00	1.00	1.00		0.91			0.91	
Frt	1.00	0.98		1.00	1.00	0.85		1.00			0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			1.00	
Satd. Flow (prot)	1789	1839		1789	1883	1601		5141			5041	
Flt Permitted	0.75	1.00		0.72	1.00	1.00		1.00			1.00	
Satd. Flow (perm)	1421	1839		1363	1883	1601		5141			5041	
Volume (vph)	475	43	8	1	5	379	0	2248	1	0	2160	325
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	475	43	8	1	5	379	0	2248	1	0	2160	325
Lane Group Flow (vph)	475	51	0	1	5	379	0	2249	0	0	2485	0
Turn Type	Perm			Perm		Perm						
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8						
Actuated Green, G (s)	32.0	32.0		32.0	32.0	32.0		50.0			50.0	
Effective Green, g (s)	32.0	32.0		32.0	32.0	32.0		50.0			50.0	
Actuated g/C Ratio	0.36	0.36		0.36	0.36	0.36		0.56			0.56	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Grp Cap (vph)	505	654		485	670	569		2856			2801	
v/s Ratio Prot		0.03			0.00			0.44			c0.49	
v/s Ratio Perm	c0.33			0.00		0.24						
v/c Ratio	0.94	0.08		0.00	0.01	0.67		0.79			0.89	
Uniform Delay, d1	28.1	19.2		18.7	18.7	24.5		15.8			17.5	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	27.7	0.2		0.0	0.0	6.1		2.3			4.6	
Delay (s)	55.8	19.5		18.7	18.8	30.6		18.1			22.2	
Level of Service	E	B		B	B	C		B			C	
Approach Delay (s)		52.3			30.4			18.1			22.2	
Approach LOS		D			C			B			C	

Intersection Summary			
HCM Average Control Delay	23.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.91		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	103.2%	ICU Level of Service	F

c Critical Lane Group

2030 ALTERNATIVE 2

(Replace and Widen) PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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
Lane Util. Factor		0.95			0.95	1.00			1.00	1.00		1.00
Frt		0.99			1.00	0.85			0.86	1.00		0.85
Flt Protected		1.00			1.00	1.00			1.00	0.95		1.00
Satd. Flow (prot)		3556			3579	1601			1629	1789		1601
Flt Permitted		1.00			1.00	1.00			1.00	0.95		1.00
Satd. Flow (perm)		3556			3579	1601			1629	1789		1601
Volume (vph)	0	1128	50	0	1327	9	0	0	3	6	0	459
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1128	50	0	1327	9	0	0	3	6	0	459
Lane Group Flow (vph)	0	1178	0	0	1327	9	0	0	3	6	0	459
Turn Type						Free			custom	Prot		custom
Protected Phases		8			8					2		
Permitted Phases		8				Free			2			2
Actuated Green, G (s)		48.0			48.0	75.0			19.0	19.0		19.0
Effective Green, g (s)		48.0			48.0	75.0			19.0	19.0		19.0
Actuated g/C Ratio		0.64			0.64	1.00			0.25	0.25		0.25
Clearance Time (s)		4.0			4.0				4.0	4.0		4.0
Lane Grp Cap (vph)		2276			2291	1601			413	453		406
v/s Ratio Prot		0.33			c0.37					0.00		
v/s Ratio Perm						0.01			0.00			c0.29
v/c Ratio		0.52			0.58	0.01			0.01	0.01		1.13
Uniform Delay, d1		7.3			7.7	0.0			20.9	21.0		28.0
Progression Factor		1.00			1.00	1.00			1.00	1.00		1.00
Incremental Delay, d2		0.8			1.1	0.0			0.0	0.1		85.2
Delay (s)		8.1			8.8	0.0			21.0	21.0		113.2
Level of Service		A			A	A			C	C		F
Approach Delay (s)		8.1			8.7			21.0			112.0	
Approach LOS		A			A			C			F	

Intersection Summary			
HCM Average Control Delay	24.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.74		
Cycle Length (s)	75.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	71.8%	ICU Level of Service	C

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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			0.91			0.91	
Frt		0.96			0.88			1.00			1.00	
Flt Protected		0.98			1.00			1.00			1.00	
Satd. Flow (prot)		3388			1649			5142			5142	
Flt Permitted		0.76			1.00			1.00			1.00	
Satd. Flow (perm)		2619			1649			5142			5142	
Volume (vph)	72	85	51	0	21	243	0	2560	0	0	2468	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	72	85	51	0	21	243	0	2560	0	0	2468	0
Lane Group Flow (vph)	0	208	0	0	264	0	0	2560	0	0	2468	0
Turn Type	Perm			Perm					Free			
Protected Phases		4			8			6			2	
Permitted Phases	4			8					Free			
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		902			568			2914			2914	
v/s Ratio Prot					c0.16			c0.50			0.48	
v/s Ratio Perm		0.08										
v/c Ratio		0.23			0.46			0.88			0.85	
Uniform Delay, d1		21.0			23.0			16.8			16.2	
Progression Factor		1.00			1.00			1.14			0.31	
Incremental Delay, d2		0.6			2.7			2.8			2.1	
Delay (s)		21.6			25.7			21.9			7.1	
Level of Service		C			C			C			A	
Approach Delay (s)		21.6			25.7			21.9			7.1	
Approach LOS		C			C			C			A	

Intersection Summary			
HCM Average Control Delay	15.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.72		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	81.7%	ICU Level of Service	D

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (veh/h)	423	7	19	137	105	99
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	423	7	19	137	105	99

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total (vph)	423	7	19	137	204
Volume Left (vph)	423	0	0	0	105
Volume Right (vph)	0	0	0	137	99
Hadj (s)	0.2	0.0	0.0	-0.6	-0.2
Departure Headway (s)	5.4	5.2	5.5	4.9	5.2
Degree Utilization, x	0.64	0.01	0.03	0.19	0.29
Capacity (veh/h)	647	667	619	698	644
Control Delay (s)	16.2	7.1	7.5	7.8	10.4
Approach Delay (s)	16.0		7.8		10.4
Approach LOS	C		A		B

Intersection Summary			
Delay	12.9		
HCM Level of Service	B		
Intersection Capacity Utilization	48.7%	ICU Level of Service	A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.87		1.00	1.00	0.98	
Flt Protected	1.00		0.95	1.00	1.00	
Satd. Flow (prot)	1629		1789	1883	1843	
Flt Permitted	1.00		0.68	1.00	1.00	
Satd. Flow (perm)	1629		1272	1883	1843	
Volume (vph)	1	558	71	453	107	20
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1	558	71	453	107	20
Lane Group Flow (vph)	559	0	71	453	127	0
Turn Type			Perm			
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	23.0		24.0	24.0	24.0	
Effective Green, g (s)	23.0		24.0	24.0	24.0	
Actuated g/C Ratio	0.42		0.44	0.44	0.44	
Clearance Time (s)	4.0		4.0	4.0	4.0	
Lane Grp Cap (vph)	681		555	822	804	
v/s Ratio Prot	c0.34			c0.24	0.07	
v/s Ratio Perm			0.06			
v/c Ratio	0.82		0.13	0.55	0.16	
Uniform Delay, d1	14.2		9.3	11.5	9.4	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	10.7		0.5	2.7	0.4	
Delay (s)	24.9		9.7	14.2	9.8	
Level of Service	C		A	B	A	
Approach Delay (s)	24.9			13.6	9.8	
Approach LOS	C			B	A	

Intersection Summary			
HCM Average Control Delay	18.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.68		
Cycle Length (s)	55.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	65.1%	ICU Level of Service	B

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (veh/h)	6	169	381	88	66	34
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	6	169	381	88	66	34

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total (vph)	62	113	254	215	100
Volume Left (vph)	6	0	0	0	66
Volume Right (vph)	0	0	0	88	34
Hadj (s)	0.1	0.0	0.0	-0.2	0.0
Departure Headway (s)	5.2	5.2	5.0	4.7	5.2
Degree Utilization, x	0.09	0.16	0.35	0.28	0.14
Capacity (veh/h)	669	668	710	748	647
Control Delay (s)	7.5	8.0	9.4	8.3	9.1
Approach Delay (s)	7.8		8.9		9.1
Approach LOS	A		A		A

Intersection Summary			
Delay	8.7		
HCM Level of Service	A		
Intersection Capacity Utilization	25.7%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (veh/h)	0	17	23	7	2	0	20	0	13	0	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	0	17	23	7	2	0	20	0	13	0	0	0

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	17	23	7	2	20	13	0	0
Volume Left (vph)	0	0	7	0	20	0	0	0
Volume Right (vph)	0	23	0	0	0	13	0	0
Hadj (s)	0.0	-0.6	0.2	0.0	0.2	-0.6	0.0	0.0
Departure Headway (s)	4.6	4.0	4.8	4.6	4.8	4.0	4.6	4.6
Degree Utilization, x	0.02	0.03	0.01	0.00	0.03	0.01	0.00	0.00
Capacity (veh/h)	770	877	736	760	727	868	778	778
Control Delay (s)	6.5	5.9	6.7	6.4	6.8	5.9	6.4	6.4
Approach Delay (s)	6.2		6.6		6.4		0.0	
Approach LOS	A		A		A		A	

Intersection Summary			
Delay	6.3		
HCM Level of Service	A		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A

Movement	SBL	SBR	SBR2	SEL	SET	SER	NWL	NWT	NWR	NEL2	NEL	NER
Lane Configurations												
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
Lane Util. Factor		1.00			0.91	1.00		0.91			1.00	1.00
Frt		0.86			1.00	0.85		1.00			1.00	0.85
Flt Protected		1.00			1.00	1.00		1.00			0.95	1.00
Satd. Flow (prot)		1629			5142	1601		5139			1789	1601
Flt Permitted		1.00			1.00	1.00		1.00			0.69	1.00
Satd. Flow (perm)		1629			5142	1601		5139			1294	1601
Volume (vph)	0	0	63	0	2532	128	0	2774	10	171	6	21
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	0	63	0	2532	128	0	2774	10	171	6	21
Lane Group Flow (vph)	0	63	0	0	2532	128	0	2784	0	0	177	21
Turn Type						Perm				Perm		Perm
Protected Phases					4			4			6	
Permitted Phases		6				4				6		6
Actuated Green, G (s)		23.0			59.0	59.0		59.0			23.0	23.0
Effective Green, g (s)		23.0			59.0	59.0		59.0			23.0	23.0
Actuated g/C Ratio		0.26			0.66	0.66		0.66			0.26	0.26
Clearance Time (s)		4.0			4.0	4.0		4.0			4.0	4.0
Lane Grp Cap (vph)		416			3371	1050		3369			331	409
v/s Ratio Prot					0.49			c0.54				
v/s Ratio Perm		0.04				0.08					c0.14	0.01
v/c Ratio		0.15			0.75	0.12		0.83			0.53	0.05
Uniform Delay, d1		25.9			10.5	5.8		11.6			28.9	25.3
Progression Factor		1.00			1.00	1.00		1.59			1.00	1.00
Incremental Delay, d2		0.8			1.6	0.2		1.4			6.1	0.2
Delay (s)		26.7			12.1	6.0		19.9			35.0	25.5
Level of Service		C			B	A		B			C	C
Approach Delay (s)	26.7				11.8			19.9			34.0	
Approach LOS	C				B			B			C	

Intersection Summary			
HCM Average Control Delay	16.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.74		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	77.5%	ICU Level of Service	C

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	1035	2	6	1226	36	5
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	1035	2	6	1226	36	5

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	690	347	415	817	41
Volume Left (vph)	0	0	6	0	36
Volume Right (vph)	0	2	0	0	5
Hadj (s)	0.0	0.0	0.0	0.0	0.1
Departure Headway (s)	6.0	6.0	5.9	5.9	7.0
Degree Utilization, x	1.14	0.57	0.67	1.33	0.08
Capacity (veh/h)	598	594	605	626	508
Control Delay (s)	104.2	15.5	18.9	176.5	10.6
Approach Delay (s)	74.5		123.5		10.6
Approach LOS	F		F		B

Intersection Summary			
Delay	99.5		
HCM Level of Service	F		
Intersection Capacity Utilization	45.7%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	1014	29	6	1232	4	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	1014	29	6	1232	4	1

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	676	367	417	821	5
Volume Left (vph)	0	0	6	0	4
Volume Right (vph)	0	29	0	0	1
Hadj (s)	0.0	0.0	0.0	0.0	0.1
Departure Headway (s)	5.8	5.8	5.7	5.7	6.9
Degree Utilization, x	1.09	0.59	0.66	1.31	0.01
Capacity (veh/h)	612	602	616	637	512
Control Delay (s)	86.7	15.5	18.2	168.1	10.0
Approach Delay (s)	61.6		117.6		10.0
Approach LOS	F		F		A

Intersection Summary			
Delay	91.8		
HCM Level of Service	F		
Intersection Capacity Utilization	45.8%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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		1.00			1.00			0.91			0.91	
Frt		1.00			0.88			1.00			1.00	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1874			1658			5127			5141	
Flt Permitted		1.00			1.00			1.00			1.00	
Satd. Flow (perm)		1871			1658			5127			5141	
Volume (vph)	3	363	13	0	41	325	0	2001	38	0	2246	3
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	3	363	13	0	41	325	0	2001	38	0	2246	3
Lane Group Flow (vph)	0	379	0	0	366	0	0	2039	0	0	2249	0
Turn Type	Perm			Perm								
Protected Phases		4			8			6			2	
Permitted Phases	4			8				6				
Actuated Green, G (s)		32.0			32.0			50.0			50.0	
Effective Green, g (s)		32.0			32.0			50.0			50.0	
Actuated g/C Ratio		0.36			0.36			0.56			0.56	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		665			590			2848			2856	
v/s Ratio Prot					c0.22			0.40			c0.44	
v/s Ratio Perm		0.20										
v/c Ratio		0.57			0.62			0.72			0.79	
Uniform Delay, d1		23.4			24.0			14.8			15.8	
Progression Factor		1.00			1.00			0.70			0.98	
Incremental Delay, d2		3.5			4.8			0.7			1.8	
Delay (s)		27.0			28.8			11.1			17.4	
Level of Service		C			C			B			B	
Approach Delay (s)		27.0			28.8			11.1			17.4	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	16.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.72		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	72.4%	ICU Level of Service	C

c Critical Lane Group

Movement	WBL	WBR	NBL	NBR	SEL	SER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.76		1.00	0.94	
Frt	1.00	0.85		0.86	1.00	
Flt Protected	0.95	1.00		1.00	0.95	
Satd. Flow (prot)	1789	3650		1629	5046	
Flt Permitted	0.95	1.00		1.00	0.95	
Satd. Flow (perm)	1789	3650		1629	5046	
Volume (vph)	179	2214	0	161	1980	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	179	2214	0	161	1980	0
Lane Group Flow (vph)	179	2214	0	161	1980	0
Turn Type	Prot			custom		
Protected Phases	8			4	2	
Permitted Phases		8 2		4		
Actuated Green, G (s)	27.0	90.0		27.0	55.0	
Effective Green, g (s)	27.0	90.0		27.0	55.0	
Actuated g/C Ratio	0.30	1.00		0.30	0.61	
Clearance Time (s)	4.0			4.0	4.0	
Lane Grp Cap (vph)	537	3650		489	3084	
v/s Ratio Prot	0.10			0.10	0.39	
v/s Ratio Perm		c0.61				
v/c Ratio	0.33	0.61		0.33	0.64	
Uniform Delay, d1	24.5	0.0		24.5	11.2	
Progression Factor	0.72	1.00		0.70	1.04	
Incremental Delay, d2	1.1	0.5		1.5	0.7	
Delay (s)	18.7	0.5		18.7	12.4	
Level of Service	B	A		B	B	
Approach Delay (s)	1.9		18.7		12.4	
Approach LOS	A		B		B	

Intersection Summary			
HCM Average Control Delay	7.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.61		
Cycle Length (s)	90.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	55.0%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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		0.91			0.91			1.00			1.00	
Frt		0.98			1.00			1.00			0.95	
Flt Protected		1.00			1.00			0.95			0.98	
Satd. Flow (prot)		5039			5137			1795			1762	
Flt Permitted		1.00			1.00			0.71			0.88	
Satd. Flow (perm)		5039			5137			1343			1576	
Volume (vph)	0	1915	295	0	2171	15	335	9	2	10	7	9
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1915	295	0	2171	15	335	9	2	10	7	9
Lane Group Flow (vph)	0	2210	0	0	2186	0	0	346	0	0	26	0
Turn Type							Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)		55.0			55.0			27.0			27.0	
Effective Green, g (s)		55.0			55.0			27.0			27.0	
Actuated g/C Ratio		0.61			0.61			0.30			0.30	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		3079			3139			403			473	
v/s Ratio Prot		c0.44			0.43							
v/s Ratio Perm								c0.26			0.02	
v/c Ratio		0.72			0.70			0.86			0.05	
Uniform Delay, d1		12.1			11.8			29.7			22.4	
Progression Factor		1.91			1.00			1.00			1.00	
Incremental Delay, d2		1.2			1.3			20.5			0.2	
Delay (s)		24.4			13.2			50.2			22.6	
Level of Service		C			B			D			C	
Approach Delay (s)		24.4			13.2			50.2			22.6	
Approach LOS		C			B			D			C	

Intersection Summary			
HCM Average Control Delay	21.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.76		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	76.1%	ICU Level of Service	C

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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		1.00			1.00			1.00			1.00	
Frt		0.97			1.00			0.99			0.95	
Flt Protected		0.99			1.00			0.97			0.99	
Satd. Flow (prot)		1809			1875			1802			1777	
Flt Permitted		0.79			1.00			0.72			0.96	
Satd. Flow (perm)		1443			1867			1341			1722	
Volume (vph)	87	242	92	7	531	16	104	52	19	25	127	94
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	87	242	92	7	531	16	104	52	19	25	127	94
Lane Group Flow (vph)	0	421	0	0	554	0	0	175	0	0	246	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		44.0			44.0			38.0			38.0	
Effective Green, g (s)		44.0			44.0			38.0			38.0	
Actuated g/C Ratio		0.49			0.49			0.42			0.42	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		705			913			566			727	
v/s Ratio Prot												
v/s Ratio Perm		0.29			c0.30			0.13			c0.14	
v/c Ratio		0.60			0.61			0.31			0.34	
Uniform Delay, d1		16.6			16.7			17.3			17.5	
Progression Factor		1.00			1.32			1.00			1.00	
Incremental Delay, d2		3.7			3.0			1.4			1.3	
Delay (s)		20.3			25.1			18.7			18.8	
Level of Service		C			C			B			B	
Approach Delay (s)		20.3			25.1			18.7			18.8	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	21.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.48		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	89.2%	ICU Level of Service	D

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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		1.00			1.00			1.00			1.00	
Frt		0.99			0.97			1.00			0.99	
Flt Protected		0.96			1.00			1.00			1.00	
Satd. Flow (prot)		1793			1833			1882			1855	
Flt Permitted		0.77			1.00			1.00			0.94	
Satd. Flow (perm)		1447			1831			1880			1756	
Volume (vph)	42	5	3	2	87	21	2	594	3	41	571	59
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	42	5	3	2	87	21	2	594	3	41	571	59
Lane Group Flow (vph)	0	50	0	0	110	0	0	599	0	0	671	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		498			631			1065			995	
v/s Ratio Prot												
v/s Ratio Perm		0.03			c0.06			0.32			c0.38	
v/c Ratio		0.10			0.17			0.56			0.67	
Uniform Delay, d1		20.0			20.6			12.4			13.7	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.4			0.6			2.1			3.7	
Delay (s)		20.4			21.2			14.6			17.3	
Level of Service		C			C			B			B	
Approach Delay (s)		20.4			21.2			14.6			17.3	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	16.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.49		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	83.5%	ICU Level of Service	D

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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	1.00	1.00		1.00	1.00	1.00		0.91			0.91	
Frt	1.00	0.93		1.00	1.00	0.85		1.00			0.97	
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			1.00	
Satd. Flow (prot)	1789	1750		1789	1883	1601		5141			4996	
Flt Permitted	0.73	1.00		0.75	1.00	1.00		1.00			1.00	
Satd. Flow (perm)	1366	1750		1406	1883	1601		5141			4996	
Volume (vph)	230	9	8	1	49	415	0	2208	1	0	2419	565
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	230	9	8	1	49	415	0	2208	1	0	2419	565
Lane Group Flow (vph)	230	17	0	1	49	415	0	2209	0	0	2984	0
Turn Type	Perm			Perm		Perm						
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8						
Actuated Green, G (s)	32.0	32.0		32.0	32.0	32.0		50.0			50.0	
Effective Green, g (s)	32.0	32.0		32.0	32.0	32.0		50.0			50.0	
Actuated g/C Ratio	0.36	0.36		0.36	0.36	0.36		0.56			0.56	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Grp Cap (vph)	486	622		500	670	569		2856			2776	
v/s Ratio Prot		0.01			0.03			0.43			c0.60	
v/s Ratio Perm	0.17			0.00		c0.26						
v/c Ratio	0.47	0.03		0.00	0.07	0.73		0.77			1.07	
Uniform Delay, d1	22.5	18.9		18.7	19.2	25.2		15.6			20.0	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	3.3	0.1		0.0	0.2	8.0		2.1			41.3	
Delay (s)	25.8	19.0		18.7	19.4	33.2		17.7			61.3	
Level of Service	C	B		B	B	C		B			E	
Approach Delay (s)		25.3			31.7			17.7			61.3	
Approach LOS		C			C			B			E	

Intersection Summary			
HCM Average Control Delay	41.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.94		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	91.1%	ICU Level of Service	E

c Critical Lane Group

2030 ALTERNATIVE 2

(Replace and Widen) WEEKEND

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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
Lane Util. Factor		0.95			0.95	1.00			1.00	1.00		1.00
Frt		1.00			1.00	0.85			0.86	1.00		0.85
Flt Protected		1.00			1.00	1.00			1.00	0.95		1.00
Satd. Flow (prot)		3568			3579	1601			1629	1789		1601
Flt Permitted		1.00			1.00	1.00			1.00	0.95		1.00
Satd. Flow (perm)		3568			3579	1601			1629	1789		1601
Volume (vph)	0	986	20	0	1066	11	0	0	6	1	0	12
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	986	20	0	1066	11	0	0	6	1	0	12
Lane Group Flow (vph)	0	1006	0	0	1066	11	0	0	6	1	0	12
Turn Type						Free			custom	Prot		custom
Protected Phases		8			8					2		
Permitted Phases		8				Free			2			2
Actuated Green, G (s)		48.0			48.0	75.0			19.0	19.0		19.0
Effective Green, g (s)		48.0			48.0	75.0			19.0	19.0		19.0
Actuated g/C Ratio		0.64			0.64	1.00			0.25	0.25		0.25
Clearance Time (s)		4.0			4.0				4.0	4.0		4.0
Lane Grp Cap (vph)		2284			2291	1601			413	453		406
v/s Ratio Prot		0.28			c0.30					0.00		
v/s Ratio Perm						0.01			0.00			c0.01
v/c Ratio		0.44			0.47	0.01			0.01	0.00		0.03
Uniform Delay, d1		6.8			6.9	0.0			21.0	20.9		21.1
Progression Factor		1.00			1.00	1.00			1.00	1.00		1.00
Incremental Delay, d2		0.6			0.7	0.0			0.1	0.0		0.1
Delay (s)		7.4			7.6	0.0			21.0	20.9		21.2
Level of Service		A			A	A			C	C		C
Approach Delay (s)		7.4			7.5			21.0			21.2	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM Average Control Delay	7.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.34		
Cycle Length (s)	75.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	44.6%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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			0.91			0.91	
Frt		0.99			0.86			1.00			1.00	
Flt Protected		0.95			1.00			1.00			1.00	
Satd. Flow (prot)		3393			1629			5142			5142	
Flt Permitted		0.73			1.00			1.00			1.00	
Satd. Flow (perm)		2606			1629			5142			5142	
Volume (vph)	375	1	18	0	0	8	0	2434	0	0	1991	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	375	1	18	0	0	8	0	2434	0	0	1991	0
Lane Group Flow (vph)	0	394	0	0	8	0	0	2434	0	0	1991	0
Turn Type	Perm			Perm					Free			
Protected Phases		4			8			6			2	
Permitted Phases	4			8					Free			
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		898			561			2914			2914	
v/s Ratio Prot					0.00			c0.47			0.39	
v/s Ratio Perm		c0.15										
v/c Ratio		0.44			0.01			0.84			0.68	
Uniform Delay, d1		22.8			19.4			16.0			13.8	
Progression Factor		1.00			1.00			1.11			0.25	
Incremental Delay, d2		1.6			0.0			2.1			1.1	
Delay (s)		24.3			19.5			19.9			4.6	
Level of Service		C			B			B			A	
Approach Delay (s)		24.3			19.5			19.9			4.6	
Approach LOS		C			B			B			A	

Intersection Summary			
HCM Average Control Delay	14.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.69		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	81.1%	ICU Level of Service	D

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (veh/h)	144	0	4	34	23	10
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	144	0	4	34	23	10

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total (vph)	144	0	4	34	33
Volume Left (vph)	144	0	0	0	23
Volume Right (vph)	0	0	0	34	10
Hadj (s)	0.2	0.0	0.0	-0.6	0.0
Departure Headway (s)	4.8	4.6	4.7	4.1	4.3
Degree Utilization, x	0.19	0.00	0.01	0.04	0.04
Capacity (veh/h)	737	786	755	856	794
Control Delay (s)	7.8	6.4	6.5	6.1	7.5
Approach Delay (s)	7.8		6.1		7.5
Approach LOS	A		A		A

Intersection Summary			
Delay	7.4		
HCM Level of Service	A		
Intersection Capacity Utilization	24.6%	ICU Level of Service	A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.87		1.00	1.00	0.99	
Flt Protected	1.00		0.95	1.00	1.00	
Satd. Flow (prot)	1631		1789	1883	1869	
Flt Permitted	1.00		0.75	1.00	1.00	
Satd. Flow (perm)	1631		1404	1883	1869	
Volume (vph)	4	345	4	145	17	1
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	4	345	4	145	17	1
Lane Group Flow (vph)	349	0	4	145	18	0
Turn Type			Perm			
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	23.0		24.0	24.0	24.0	
Effective Green, g (s)	23.0		24.0	24.0	24.0	
Actuated g/C Ratio	0.42		0.44	0.44	0.44	
Clearance Time (s)	4.0		4.0	4.0	4.0	
Lane Grp Cap (vph)	682		613	822	816	
v/s Ratio Prot	c0.21			c0.08	0.01	
v/s Ratio Perm			0.00			
v/c Ratio	0.51		0.01	0.18	0.02	
Uniform Delay, d1	11.8		8.8	9.5	8.8	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	2.7		0.0	0.5	0.0	
Delay (s)	14.6		8.8	9.9	8.9	
Level of Service	B		A	A	A	
Approach Delay (s)	14.6			9.9	8.9	
Approach LOS	B			A	A	

Intersection Summary			
HCM Average Control Delay	13.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.34		
Cycle Length (s)	55.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	35.9%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (veh/h)	1	37	90	23	24	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	1	37	90	23	24	0

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total (vph)	13	25	60	53	24
Volume Left (vph)	1	0	0	0	24
Volume Right (vph)	0	0	0	23	0
Hadj (s)	0.0	0.0	0.0	-0.2	0.2
Departure Headway (s)	4.7	4.7	4.6	4.4	4.5
Degree Utilization, x	0.02	0.03	0.08	0.06	0.03
Capacity (veh/h)	759	756	773	811	775
Control Delay (s)	6.6	6.6	6.8	6.5	7.6
Approach Delay (s)	6.6		6.6		7.6
Approach LOS	A		A		A

Intersection Summary			
Delay	6.8		
HCM Level of Service	A		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (veh/h)	0	5	6	17	5	0	4	0	4	0	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	0	5	6	17	5	0	4	0	4	0	0	0

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	5	6	17	5	4	4	0	0
Volume Left (vph)	0	0	17	0	4	0	0	0
Volume Right (vph)	0	6	0	0	0	4	0	0
Hadj (s)	0.0	-0.6	0.2	0.0	0.2	-0.6	0.0	0.0
Departure Headway (s)	4.6	4.0	4.8	4.6	4.8	4.0	4.6	4.6
Degree Utilization, x	0.01	0.01	0.02	0.01	0.01	0.00	0.00	0.00
Capacity (veh/h)	781	902	752	776	733	878	788	788
Control Delay (s)	6.4	5.8	6.7	6.4	6.6	5.8	6.4	6.4
Approach Delay (s)	6.1		6.6		6.2		0.0	
Approach LOS	A		A		A		A	

Intersection Summary			
Delay	6.4		
HCM Level of Service	A		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A

Movement	SBL	SBR	SBR2	SEL	SET	SER	NWL	NWT	NWR	NEL2	NEL	NER
Lane Configurations												
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
Lane Util. Factor			1.00		0.91	1.00		0.91			1.00	1.00
Frt			0.85		1.00	0.85		1.00			1.00	0.85
Flt Protected			1.00		1.00	1.00		1.00			0.95	1.00
Satd. Flow (prot)			1601		5142	1601		5140			1789	1601
Flt Permitted			1.00		1.00	1.00		1.00			0.75	1.00
Satd. Flow (perm)			1601		5142	1601		5140			1412	1601
Volume (vph)	0	0	1	0	2426	90	0	2370	4	85	1	6
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	0	1	0	2426	90	0	2370	4	85	1	6
Lane Group Flow (vph)	0	0	1	0	2426	90	0	2374	0	0	86	6
Turn Type			custom			Perm				Perm		Perm
Protected Phases					4			4			6	
Permitted Phases		6	6			4				6		6
Actuated Green, G (s)			23.0		59.0	59.0		59.0			23.0	23.0
Effective Green, g (s)			23.0		59.0	59.0		59.0			23.0	23.0
Actuated g/C Ratio			0.26		0.66	0.66		0.66			0.26	0.26
Clearance Time (s)			4.0		4.0	4.0		4.0			4.0	4.0
Lane Grp Cap (vph)			409		3371	1050		3370			361	409
v/s Ratio Prot					c0.47			0.46				
v/s Ratio Perm			0.00			0.06					c0.06	0.00
v/c Ratio			0.00		0.72	0.09		0.70			0.24	0.01
Uniform Delay, d1			25.0		10.1	5.7		9.9			26.6	25.0
Progression Factor			1.00		1.00	1.00		1.63			1.00	1.00
Incremental Delay, d2			0.0		1.4	0.2		1.0			1.6	0.1
Delay (s)			25.0		11.5	5.8		17.1			28.1	25.1
Level of Service			C		B	A		B			C	C
Approach Delay (s)	25.0				11.3			17.1			27.9	
Approach LOS	C				B			B			C	

Intersection Summary			
HCM Average Control Delay	14.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.58		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	65.0%	ICU Level of Service	B

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	946	22	3	1061	22	5
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	946	22	3	1061	22	5

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	631	337	357	707	27
Volume Left (vph)	0	0	3	0	22
Volume Right (vph)	0	22	0	0	5
Hadj (s)	0.0	0.0	0.0	0.0	0.1
Departure Headway (s)	5.8	5.8	5.8	5.8	6.9
Degree Utilization, x	1.02	0.54	0.57	1.13	0.05
Capacity (veh/h)	614	614	613	628	511
Control Delay (s)	63.3	14.1	15.0	99.8	10.3
Approach Delay (s)	46.1		71.4		10.3
Approach LOS	E		F		B

Intersection Summary			
Delay	58.7		
HCM Level of Service	F		
Intersection Capacity Utilization	40.1%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	939	10	4	1053	9	5
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	939	10	4	1053	9	5

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	626	323	355	702	14
Volume Left (vph)	0	0	4	0	9
Volume Right (vph)	0	10	0	0	5
Hadj (s)	0.0	0.0	0.0	0.0	-0.1
Departure Headway (s)	5.7	5.7	5.7	5.7	6.8
Degree Utilization, x	1.00	0.51	0.56	1.11	0.03
Capacity (veh/h)	620	618	621	646	522
Control Delay (s)	58.2	13.4	14.5	90.7	10.0
Approach Delay (s)	43.0		65.1		10.0
Approach LOS	E		F		A

Intersection Summary			
Delay	54.3		
HCM Level of Service	F		
Intersection Capacity Utilization	40.1%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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		1.00			1.00			0.91			0.91	
Frt		1.00			0.87			1.00			1.00	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1883			1630			5125			5142	
Flt Permitted		1.00			1.00			1.00			1.00	
Satd. Flow (perm)		1882			1630			5125			5142	
Volume (vph)	1	216	0	0	1	357	0	1857	41	0	1633	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1	216	0	0	1	357	0	1857	41	0	1633	0
Lane Group Flow (vph)	0	217	0	0	358	0	0	1898	0	0	1633	0
Turn Type	Perm			Perm								
Protected Phases		4			8			6			2	
Permitted Phases	4			8				6				
Actuated Green, G (s)		32.0			32.0			50.0			50.0	
Effective Green, g (s)		32.0			32.0			50.0			50.0	
Actuated g/C Ratio		0.36			0.36			0.56			0.56	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		669			580			2847			2857	
v/s Ratio Prot					c0.22			c0.37			0.32	
v/s Ratio Perm		0.12										
v/c Ratio		0.32			0.62			0.67			0.57	
Uniform Delay, d1		21.1			23.9			14.1			13.0	
Progression Factor		1.00			1.00			0.76			0.99	
Incremental Delay, d2		1.3			4.9			0.7			0.8	
Delay (s)		22.4			28.8			11.3			13.7	
Level of Service		C			C			B			B	
Approach Delay (s)		22.4			28.8			11.3			13.7	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	14.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.65		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	65.6%	ICU Level of Service	B

c Critical Lane Group

Movement	WBL	WBR	NBL	NBR	SEL	SER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.76		1.00	0.94	
Frt	1.00	0.85		0.86	1.00	
Flt Protected	0.95	1.00		1.00	0.95	
Satd. Flow (prot)	1789	3650		1629	5046	
Flt Permitted	0.95	1.00		1.00	0.95	
Satd. Flow (perm)	1789	3650		1629	5046	
Volume (vph)	72	1622	0	38	1841	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	72	1622	0	38	1841	0
Lane Group Flow (vph)	72	1622	0	38	1841	0
Turn Type	Prot			custom		
Protected Phases	8			4	2	
Permitted Phases		8 2		4		
Actuated Green, G (s)	27.0	90.0		27.0	55.0	
Effective Green, g (s)	27.0	90.0		27.0	55.0	
Actuated g/C Ratio	0.30	1.00		0.30	0.61	
Clearance Time (s)	4.0			4.0	4.0	
Lane Grp Cap (vph)	537	3650		489	3084	
v/s Ratio Prot	0.04			0.02	c0.36	
v/s Ratio Perm		c0.44				
v/c Ratio	0.13	0.44		0.08	0.60	
Uniform Delay, d1	23.0	0.0		22.6	10.7	
Progression Factor	0.62	1.00		0.84	1.02	
Incremental Delay, d2	0.5	0.3		0.2	0.6	
Delay (s)	14.6	0.3		19.1	11.6	
Level of Service	B	A		B	B	
Approach Delay (s)	0.9		19.1		11.6	
Approach LOS	A		B		B	

Intersection Summary			
HCM Average Control Delay	6.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.54		
Cycle Length (s)	90.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	45.7%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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		0.91			0.91			1.00			1.00	
Frt		0.98			1.00			1.00			0.86	
Flt Protected		1.00			1.00			0.95			1.00	
Satd. Flow (prot)		5023			5139			1792			1629	
Flt Permitted		1.00			1.00			0.78			1.00	
Satd. Flow (perm)		5023			5139			1460			1629	
Volume (vph)	0	1607	294	0	1657	6	66	2	2	0	0	4
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1607	294	0	1657	6	66	2	2	0	0	4
Lane Group Flow (vph)	0	1901	0	0	1663	0	0	70	0	0	4	0
Turn Type							Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)		55.0			55.0			27.0			27.0	
Effective Green, g (s)		55.0			55.0			27.0			27.0	
Actuated g/C Ratio		0.61			0.61			0.30			0.30	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		3070			3141			438			489	
v/s Ratio Prot		c0.38			0.32						0.00	
v/s Ratio Perm								c0.05				
v/c Ratio		0.62			0.53			0.16			0.01	
Uniform Delay, d1		10.9			10.1			23.2			22.1	
Progression Factor		2.25			1.00			1.00			1.00	
Incremental Delay, d2		0.8			0.6			0.8			0.0	
Delay (s)		25.5			10.7			23.9			22.1	
Level of Service		C			B			C			C	
Approach Delay (s)		25.5			10.7			23.9			22.1	
Approach LOS		C			B			C			C	

Intersection Summary			
HCM Average Control Delay	18.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.47		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	54.8%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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		1.00			1.00			1.00			1.00	
Frt		1.00			0.99			0.99			0.97	
Flt Protected		0.96			1.00			0.97			1.00	
Satd. Flow (prot)		1804			1866			1805			1820	
Flt Permitted		0.39			1.00			0.72			0.97	
Satd. Flow (perm)		730			1865			1338			1779	
Volume (vph)	375	57	3	1	465	34	105	60	20	20	180	57
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	375	57	3	1	465	34	105	60	20	20	180	57
Lane Group Flow (vph)	0	435	0	0	500	0	0	185	0	0	257	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		44.0			44.0			38.0			38.0	
Effective Green, g (s)		44.0			44.0			38.0			38.0	
Actuated g/C Ratio		0.49			0.49			0.42			0.42	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		357			912			565			751	
v/s Ratio Prot												
v/s Ratio Perm		c0.60			0.27			0.14			c0.14	
v/c Ratio		1.22			0.55			0.33			0.34	
Uniform Delay, d1		23.0			16.1			17.4			17.6	
Progression Factor		1.00			1.16			1.00			1.00	
Incremental Delay, d2		121.1			2.4			1.5			1.2	
Delay (s)		144.1			20.9			19.0			18.8	
Level of Service		F			C			B			B	
Approach Delay (s)		144.1			20.9			19.0			18.8	
Approach LOS		F			C			B			B	

Intersection Summary			
HCM Average Control Delay	59.2	HCM Level of Service	E
HCM Volume to Capacity ratio	0.81		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	88.1%	ICU Level of Service	D

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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		1.00			1.00			1.00			1.00	
Frt		0.98			0.88			1.00			0.99	
Flt Protected		0.97			1.00			1.00			1.00	
Satd. Flow (prot)		1796			1656			1882			1870	
Flt Permitted		0.94			1.00			1.00			0.99	
Satd. Flow (perm)		1740			1653			1881			1853	
Volume (vph)	4	2	1	1	1	14	1	544	3	11	563	29
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	4	2	1	1	1	14	1	544	3	11	563	29
Lane Group Flow (vph)	0	7	0	0	16	0	0	548	0	0	603	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		599			569			1066			1050	
v/s Ratio Prot												
v/s Ratio Perm		0.00			c0.01			0.29			c0.33	
v/c Ratio		0.01			0.03			0.51			0.57	
Uniform Delay, d1		19.4			19.5			11.9			12.5	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.0			0.1			1.8			2.3	
Delay (s)		19.5			19.6			13.7			14.8	
Level of Service		B			B			B			B	
Approach Delay (s)		19.5			19.6			13.7			14.8	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	14.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.37		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	48.4%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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	1.00	1.00		1.00	1.00	1.00		0.91			0.91	
Frt	1.00	0.97		1.00	1.00	0.85		1.00			0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			1.00	
Satd. Flow (prot)	1789	1827		1789	1883	1601		5141			5063	
Flt Permitted	0.75	1.00		0.74	1.00	1.00		1.00			1.00	
Satd. Flow (perm)	1417	1827		1396	1883	1601		5141			5063	
Volume (vph)	9	20	5	3	8	66	0	1900	3	0	1958	224
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	9	20	5	3	8	66	0	1900	3	0	1958	224
Lane Group Flow (vph)	9	25	0	3	8	66	0	1903	0	0	2182	0
Turn Type	Perm			Perm		Perm						
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8						
Actuated Green, G (s)	32.0	32.0		32.0	32.0	32.0		50.0			50.0	
Effective Green, g (s)	32.0	32.0		32.0	32.0	32.0		50.0			50.0	
Actuated g/C Ratio	0.36	0.36		0.36	0.36	0.36		0.56			0.56	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Grp Cap (vph)	504	650		496	670	569		2856			2813	
v/s Ratio Prot		0.01			0.00			0.37			c0.43	
v/s Ratio Perm	0.01			0.00		c0.04						
v/c Ratio	0.02	0.04		0.01	0.01	0.12		0.67			0.78	
Uniform Delay, d1	18.8	18.9		18.7	18.8	19.5		14.1			15.6	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	0.1	0.1		0.0	0.0	0.4		1.2			2.2	
Delay (s)	18.9	19.1		18.8	18.8	19.9		15.4			17.8	
Level of Service	B	B		B	B	B		B			B	
Approach Delay (s)		19.0			19.7			15.4			17.8	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	16.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.52		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	54.2%	ICU Level of Service	A

c Critical Lane Group

2030 ALTERNATIVE 5

(Parkway: Diamond Option) AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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
Lane Util. Factor		0.95			0.95		1.00		1.00	1.00		1.00
Frt		1.00			1.00		1.00		0.85	1.00		0.85
Flt Protected		1.00			1.00		0.95		1.00	0.95		1.00
Satd. Flow (prot)		3579			3579		1789		1601	1789		1601
Flt Permitted		1.00			1.00		0.95		1.00	0.95		1.00
Satd. Flow (perm)		3579			3579		1789		1601	1789		1601
Volume (vph)	0	1255	0	0	228	0	2	0	2	5	0	6
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1255	0	0	228	0	2	0	2	5	0	6
Lane Group Flow (vph)	0	1255	0	0	228	0	2	0	2	5	0	6
Turn Type				Perm			custom		custom	Prot		custom
Protected Phases		8			8					2		
Permitted Phases		8		8			2		2			2
Actuated Green, G (s)		38.0			38.0		29.0		29.0	29.0		29.0
Effective Green, g (s)		38.0			38.0		29.0		29.0	29.0		29.0
Actuated g/C Ratio		0.51			0.51		0.39		0.39	0.39		0.39
Clearance Time (s)		4.0			4.0		4.0		4.0	4.0		4.0
Lane Grp Cap (vph)		1813			1813		692		619	692		619
v/s Ratio Prot		c0.35			0.06					0.00		
v/s Ratio Perm							0.00		0.00			c0.00
v/c Ratio		0.69			0.13		0.00		0.00	0.01		0.01
Uniform Delay, d1		14.1			9.7		14.1		14.1	14.1		14.2
Progression Factor		1.00			1.00		1.00		1.00	1.00		1.00
Incremental Delay, d2		2.2			0.1		0.0		0.0	0.0		0.0
Delay (s)		16.3			9.9		14.1		14.1	14.2		14.2
Level of Service		B			A		B		B	B		B
Approach Delay (s)		16.3			9.9			14.1			14.2	
Approach LOS		B			A			B			B	

Intersection Summary			
HCM Average Control Delay	15.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.40		
Cycle Length (s)	75.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	51.4%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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			0.91			0.91	
Frt		1.00			0.87			1.00			1.00	
Flt Protected		0.95			1.00			1.00			1.00	
Satd. Flow (prot)		3401			1632			5142			5140	
Flt Permitted		0.59			0.99			1.00			1.00	
Satd. Flow (perm)		2115			1625			5142			5140	
Volume (vph)	304	3	8	6	0	371	0	3136	0	0	2143	5
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	304	3	8	6	0	371	0	3136	0	0	2143	5
Lane Group Flow (vph)	0	315	0	0	377	0	0	3136	0	0	2148	0
Turn Type	Perm			Perm								
Protected Phases		4			8			6			2	
Permitted Phases	4			8								
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		729			560			2914			2913	
v/s Ratio Prot								c0.61			0.42	
v/s Ratio Perm		0.15			c0.23							
v/c Ratio		1.26dl			0.67			1.08			0.74	
Uniform Delay, d1		22.7			25.2			19.5			14.5	
Progression Factor		1.00			1.00			1.00			0.42	
Incremental Delay, d2		1.9			6.3			41.5			1.3	
Delay (s)		24.6			31.5			61.0			7.4	
Level of Service		C			C			E			A	
Approach Delay (s)		24.6			31.5			61.0			7.4	
Approach LOS		C			C			E			A	

Intersection Summary			
HCM Average Control Delay	37.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.92		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	110.7%	ICU Level of Service	G

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

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (veh/h)	515	3	11	61	47	94
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	515	3	11	61	47	94

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total (vph)	515	3	11	61	141
Volume Left (vph)	515	0	0	0	47
Volume Right (vph)	0	0	0	61	94
Hadj (s)	0.2	0.0	0.0	-0.6	-0.3
Departure Headway (s)	5.2	5.0	5.3	4.7	5.1
Degree Utilization, x	0.74	0.00	0.02	0.08	0.20
Capacity (veh/h)	685	709	640	722	649
Control Delay (s)	20.0	6.8	7.2	7.0	9.3
Approach Delay (s)	19.9		7.0		9.3
Approach LOS	C		A		A

Intersection Summary			
Delay	16.6		
HCM Level of Service	C		
Intersection Capacity Utilization	50.3%	ICU Level of Service	A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.87		1.00	1.00	0.97	
Flt Protected	1.00		0.95	1.00	1.00	
Satd. Flow (prot)	1630		1789	1883	1826	
Flt Permitted	1.00		0.66	1.00	1.00	
Satd. Flow (perm)	1630		1242	1883	1826	
Volume (vph)	2	268	87	526	119	35
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	2	268	87	526	119	35
Lane Group Flow (vph)	270	0	87	526	154	0
Turn Type			Perm			
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	23.5		24.0	24.0	24.0	
Effective Green, g (s)	23.5		24.0	24.0	24.0	
Actuated g/C Ratio	0.42		0.43	0.43	0.43	
Clearance Time (s)	4.0		4.0	4.0	4.0	
Lane Grp Cap (vph)	690		537	814	790	
v/s Ratio Prot	c0.17			c0.28	0.08	
v/s Ratio Perm			0.07			
v/c Ratio	0.39		0.16	0.65	0.19	
Uniform Delay, d1	11.1		9.6	12.4	9.8	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	1.7		0.6	3.9	0.6	
Delay (s)	12.7		10.3	16.3	10.3	
Level of Service	B		B	B	B	
Approach Delay (s)	12.7			15.5	10.3	
Approach LOS	B			B	B	

Intersection Summary			
HCM Average Control Delay	14.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.52		
Cycle Length (s)	55.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	51.1%	ICU Level of Service	A

c Critical Lane Group

Movement	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	426	46	44	69	144	99
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	426	46	44	69	144	99

Direction, Lane #	SB 1	SE 1	SE 2	NW 1	NW 2
Volume Total (vph)	472	67	46	96	147
Volume Left (vph)	426	44	0	0	0
Volume Right (vph)	46	0	0	0	99
Hadj (s)	0.2	0.2	0.0	0.0	-0.4
Departure Headway (s)	5.0	6.2	6.1	5.9	5.5
Degree Utilization, x	0.65	0.12	0.08	0.16	0.22
Capacity (veh/h)	698	541	552	572	616
Control Delay (s)	16.9	8.8	8.4	8.8	8.9
Approach Delay (s)	16.9	8.6		8.9	
Approach LOS	C	A		A	

Intersection Summary			
Delay	13.4		
HCM Level of Service	B		
Intersection Capacity Utilization	40.2%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (veh/h)	0	5	5	2	5	0	33	0	0	0	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	0	5	5	2	5	0	33	0	0	0	0	0

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	5	5	2	5	33	0	0	0
Volume Left (vph)	0	0	2	0	33	0	0	0
Volume Right (vph)	0	5	0	0	0	0	0	0
Hadj (s)	0.0	-0.6	0.2	0.0	0.2	0.0	0.0	0.0
Departure Headway (s)	4.6	4.0	4.8	4.6	4.8	4.5	4.6	4.6
Degree Utilization, x	0.01	0.01	0.00	0.01	0.04	0.00	0.00	0.00
Capacity (veh/h)	769	876	738	762	741	797	793	793
Control Delay (s)	6.4	5.8	6.6	6.5	6.8	6.3	6.4	6.4
Approach Delay (s)	6.1		6.5		6.8		0.0	
Approach LOS	A		A		A		A	

Intersection Summary			
Delay	6.6		
HCM Level of Service	A		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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		1.00	1.00					0.91			0.91	
Frt		1.00	0.85					1.00			1.00	
Flt Protected		1.00	1.00					1.00			1.00	
Satd. Flow (prot)		1883	1601					5142			5142	
Flt Permitted		1.00	1.00					1.00			1.00	
Satd. Flow (perm)		1883	1601					5142			5142	
Volume (vph)	0	3	77	0	0	0	0	3053	0	0	2817	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	3	77	0	0	0	0	3053	0	0	2817	0
Lane Group Flow (vph)	0	3	77	0	0	0	0	3053	0	0	2817	0
Turn Type			Perm									
Protected Phases		4						6			2	
Permitted Phases			4									
Actuated Green, G (s)		23.0	23.0					59.0			59.0	
Effective Green, g (s)		23.0	23.0					59.0			59.0	
Actuated g/C Ratio		0.26	0.26					0.66			0.66	
Clearance Time (s)		4.0	4.0					4.0			4.0	
Lane Grp Cap (vph)		481	409					3371			3371	
v/s Ratio Prot		0.00						c0.59			0.55	
v/s Ratio Perm			c0.05									
v/c Ratio		0.01	0.19					0.91			0.84	
Uniform Delay, d1		25.0	26.2					13.1			11.8	
Progression Factor		1.00	1.00					1.00			1.00	
Incremental Delay, d2		0.0	1.0					4.6			2.6	
Delay (s)		25.0	27.2					17.8			14.4	
Level of Service		C	C					B			B	
Approach Delay (s)		27.1			0.0			17.8			14.4	
Approach LOS		C			A			B			B	

Intersection Summary			
HCM Average Control Delay	16.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.70		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	70.4%	ICU Level of Service	C

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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	
Lane Util. Factor		1.00			1.00		0.97	1.00			1.00	
Frt		0.93			1.00		1.00	0.90			0.88	
Flt Protected		1.00			0.96		0.95	1.00			1.00	
Satd. Flow (prot)		1756			1800		3471	1687			1644	
Flt Permitted		1.00			0.62		0.73	1.00			0.97	
Satd. Flow (perm)		1756			1161		2683	1687			1604	
Volume (vph)	0	71	71	114	9	0	1238	200	460	3	0	32
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	71	71	114	9	0	1238	200	460	3	0	32
Lane Group Flow (vph)	0	142	0	0	123	0	1238	660	0	0	35	0
Turn Type				Perm			Perm			Perm		
Protected Phases		4			8			6			2	
Permitted Phases		4		8			6			2		
Actuated Green, G (s)		23.5			23.5		58.5	58.5			58.5	
Effective Green, g (s)		23.5			23.5		58.5	58.5			58.5	
Actuated g/C Ratio		0.26			0.26		0.65	0.65			0.65	
Clearance Time (s)		4.0			4.0		4.0	4.0			4.0	
Lane Grp Cap (vph)		459			303		1744	1097			1043	
v/s Ratio Prot		0.08						0.39				
v/s Ratio Perm					c0.11		c0.46				0.02	
v/c Ratio		0.31			0.41		0.71	0.60			0.03	
Uniform Delay, d1		26.7			27.5		10.2	9.1			5.6	
Progression Factor		1.00			1.00		1.00	1.00			1.00	
Incremental Delay, d2		1.7			4.0		2.5	2.4			0.1	
Delay (s)		28.5			31.5		12.7	11.5			5.7	
Level of Service		C			C		B	B			A	
Approach Delay (s)		28.5			31.5			12.3			5.7	
Approach LOS		C			C			B			A	

Intersection Summary			
HCM Average Control Delay	14.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	66.9%	ICU Level of Service	B

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL2	NBL	NBR	SEL	SER
Lane Configurations											
Ideal Flow (vphpl)	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		
Lane Util. Factor	1.00	0.95			1.00	1.00	1.00		1.00		
Frt	1.00	1.00			1.00	0.85	1.00		0.85		
Flt Protected	0.95	1.00			1.00	1.00	0.95		1.00		
Satd. Flow (prot)	1789	3579			1883	1601	1789		1601		
Flt Permitted	0.72	1.00			1.00	1.00	0.95		1.00		
Satd. Flow (perm)	1361	3579			1883	1601	1789		1601		
Volume (vph)	74	1251	0	0	53	177	70	0	4	0	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	74	1251	0	0	53	177	70	0	4	0	0
Lane Group Flow (vph)	74	1251	0	0	53	177	70	0	4	0	0
Turn Type	Perm					Free	custom		custom	Prot	
Protected Phases		4			8					6	
Permitted Phases	4					Free	2		2		
Actuated Green, G (s)	59.0	59.0			59.0	90.0	23.0		23.0		
Effective Green, g (s)	59.0	59.0			59.0	90.0	23.0		23.0		
Actuated g/C Ratio	0.66	0.66			0.66	1.00	0.26		0.26		
Clearance Time (s)	4.0	4.0			4.0		4.0		4.0		
Lane Grp Cap (vph)	892	2346			1234	1601	457		409		
v/s Ratio Prot		c0.35			0.03						
v/s Ratio Perm	0.05					0.11	c0.04		0.00		
v/c Ratio	0.08	0.53			0.04	0.11	0.15		0.01		
Uniform Delay, d1	5.6	8.2			5.5	0.0	26.0		25.0		
Progression Factor	1.00	1.00			1.00	1.00	1.00		1.00		
Incremental Delay, d2	0.2	0.9			0.1	0.1	0.7		0.0		
Delay (s)	5.8	9.1			5.6	0.1	26.7		25.0		
Level of Service	A	A			A	A	C		C		
Approach Delay (s)		8.9			1.4			26.6		0.0	
Approach LOS		A			A			C		A	

Intersection Summary			
HCM Average Control Delay	8.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.43		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	45.1%	ICU Level of Service	A

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	1139	1	4	214	3	6
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	1139	1	4	214	3	6

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	759	381	75	143	9
Volume Left (vph)	0	0	4	0	3
Volume Right (vph)	0	1	0	0	6
Hadj (s)	0.0	0.0	0.0	0.0	-0.3
Departure Headway (s)	4.7	4.7	5.7	5.7	5.8
Degree Utilization, x	1.00	0.50	0.12	0.22	0.01
Capacity (veh/h)	748	750	618	624	602
Control Delay (s)	53.2	11.2	8.2	9.1	8.9
Approach Delay (s)	39.2		8.8		8.9
Approach LOS	E		A		A

Intersection Summary			
Delay	34.1		
HCM Level of Service	D		
Intersection Capacity Utilization	41.5%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	1143	7	8	227	5	2
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	1143	7	8	227	5	2

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	762	388	84	151	7
Volume Left (vph)	0	0	8	0	5
Volume Right (vph)	0	7	0	0	2
Hadj (s)	0.0	0.0	0.1	0.0	0.0
Departure Headway (s)	4.8	4.7	5.7	5.7	6.1
Degree Utilization, x	1.01	0.51	0.13	0.24	0.01
Capacity (veh/h)	746	749	616	623	569
Control Delay (s)	54.8	11.4	8.3	9.2	9.2
Approach Delay (s)	40.2		8.9		9.2
Approach LOS	E		A		A

Intersection Summary			
Delay	34.7		
HCM Level of Service	D		
Intersection Capacity Utilization	41.8%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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		1.00			1.00			0.91			0.91	
Frt		1.00			0.88			1.00			1.00	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1880			1656			5122			5141	
Flt Permitted		1.00			1.00			1.00			1.00	
Satd. Flow (perm)		1877			1651			5122			5141	
Volume (vph)	4	520	6	3	31	281	0	2451	65	0	1861	3
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	4	520	6	3	31	281	0	2451	65	0	1861	3
Lane Group Flow (vph)	0	530	0	0	315	0	0	2516	0	0	1864	0
Turn Type	Perm			Perm								
Protected Phases		4			8			6			2	
Permitted Phases	4			8				6				
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		647			569			2902			2913	
v/s Ratio Prot								c0.49			0.36	
v/s Ratio Perm		c0.28			0.19							
v/c Ratio		0.82			0.55			0.87			0.64	
Uniform Delay, d1		26.9			23.9			16.6			13.3	
Progression Factor		1.00			1.00			0.39			1.00	
Incremental Delay, d2		11.1			3.8			0.4			1.0	
Delay (s)		38.0			27.7			6.9			14.2	
Level of Service		D			C			A			B	
Approach Delay (s)		38.0			27.7			6.9			14.2	
Approach LOS		D			C			A			B	

Intersection Summary			
HCM Average Control Delay	13.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.85		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	85.2%	ICU Level of Service	D

c Critical Lane Group

Movement	WBL	WBR	NBL	NBR	SEL	SER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.76		1.00	0.94	
Frt	1.00	0.85		0.86	1.00	
Flt Protected	0.95	1.00		1.00	0.95	
Satd. Flow (prot)	1789	3650		1629	5046	
Flt Permitted	0.95	1.00		1.00	0.95	
Satd. Flow (perm)	1789	3650		1629	5046	
Volume (vph)	158	1838	0	128	2423	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	158	1838	0	128	2423	0
Lane Group Flow (vph)	158	1838	0	128	2423	0
Turn Type	Prot			custom		
Protected Phases	8				2	
Permitted Phases		8 2		4		
Actuated Green, G (s)	25.0	90.0		25.0	57.0	
Effective Green, g (s)	25.0	90.0		25.0	57.0	
Actuated g/C Ratio	0.28	1.00		0.28	0.63	
Clearance Time (s)	4.0			4.0	4.0	
Lane Grp Cap (vph)	497	3650		453	3196	
v/s Ratio Prot	0.09				c0.48	
v/s Ratio Perm		c0.50		0.08		
v/c Ratio	0.32	0.50		0.28	0.76	
Uniform Delay, d1	25.7	0.0		25.5	11.6	
Progression Factor	1.00	1.00		0.54	0.21	
Incremental Delay, d2	1.7	0.5		1.5	0.8	
Delay (s)	27.4	0.5		15.2	3.2	
Level of Service	C	A		B	A	
Approach Delay (s)	2.6		15.2		3.2	
Approach LOS	A		B		A	

Intersection Summary			
HCM Average Control Delay	3.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.67		
Cycle Length (s)	90.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	61.5%	ICU Level of Service	B

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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		0.91			0.91			1.00			1.00	
Frt		0.98			1.00			1.00			0.96	
Flt Protected		1.00			1.00			0.95			0.97	
Satd. Flow (prot)		5032			5139			1793			1748	
Flt Permitted		1.00			1.00			0.72			0.84	
Satd. Flow (perm)		5032			5139			1351			1510	
Volume (vph)	0	2263	377	0	1819	6	225	4	3	12	1	6
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	2263	377	0	1819	6	225	4	3	12	1	6
Lane Group Flow (vph)	0	2640	0	0	1825	0	0	232	0	0	19	0
Turn Type							Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases		2					8			4		
Actuated Green, G (s)		59.0			59.0			23.5			23.5	
Effective Green, g (s)		59.0			59.0			23.5			23.5	
Actuated g/C Ratio		0.65			0.65			0.26			0.26	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		3281			3350			351			392	
v/s Ratio Prot		c0.52			0.36							
v/s Ratio Perm								c0.17			0.01	
v/c Ratio		0.80			0.54			0.66			0.05	
Uniform Delay, d1		11.5			8.5			29.9			25.1	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		2.2			0.6			9.4			0.2	
Delay (s)		13.7			9.1			39.4			25.4	
Level of Service		B			A			D			C	
Approach Delay (s)		13.7			9.1			39.4			25.4	
Approach LOS		B			A			D			C	

Intersection Summary			
HCM Average Control Delay	13.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.76		
Cycle Length (s)	90.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	78.3%	ICU Level of Service	C

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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	
Lane Util. Factor	1.00	1.00			1.00			1.00			1.00	
Frt	1.00	1.00			1.00			1.00			0.95	
Flt Protected	0.95	1.00			1.00			0.96			0.98	
Satd. Flow (prot)	1789	1881			1880			1808			1758	
Flt Permitted	0.59	1.00			0.99			0.75			0.90	
Satd. Flow (perm)	1120	1881			1871			1411			1617	
Volume (vph)	303	194	2	6	217	1	149	34	2	15	10	14
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	303	194	2	6	217	1	149	34	2	15	10	14
Lane Group Flow (vph)	303	196	0	0	224	0	0	185	0	0	39	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	44.0	44.0			44.0			38.0			38.0	
Effective Green, g (s)	44.0	44.0			44.0			38.0			38.0	
Actuated g/C Ratio	0.49	0.49			0.49			0.42			0.42	
Clearance Time (s)	4.0	4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)	548	920			915			596			683	
v/s Ratio Prot		0.10										
v/s Ratio Perm	c0.27				0.12			c0.13			0.02	
v/c Ratio	0.55	0.21			0.24			0.31			0.06	
Uniform Delay, d1	16.1	13.1			13.4			17.3			15.4	
Progression Factor	1.00	1.00			1.21			1.00			1.00	
Incremental Delay, d2	4.0	0.5			0.6			1.4			0.2	
Delay (s)	20.1	13.7			16.8			18.6			15.6	
Level of Service	C	B			B			B			B	
Approach Delay (s)		17.6			16.8			18.6			15.6	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	17.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.44		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	55.4%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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		1.00			1.00			1.00			1.00	
Frt		0.99			0.95			1.00			0.99	
Flt Protected		0.96			1.00			1.00			1.00	
Satd. Flow (prot)		1793			1783			1882			1863	
Flt Permitted		0.83			0.99			1.00			0.99	
Satd. Flow (perm)		1541			1777			1875			1852	
Volume (vph)	44	9	5	1	9	6	5	563	2	8	575	49
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	44	9	5	1	9	6	5	563	2	8	575	49
Lane Group Flow (vph)	0	58	0	0	16	0	0	570	0	0	632	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		28.0			28.0			54.0			54.0	
Effective Green, g (s)		28.0			28.0			54.0			54.0	
Actuated g/C Ratio		0.31			0.31			0.60			0.60	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		479			553			1125			1111	
v/s Ratio Prot												
v/s Ratio Perm		c0.04			0.01			0.30			c0.34	
v/c Ratio		0.12			0.03			0.51			0.57	
Uniform Delay, d1		22.2			21.5			10.3			10.9	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.5			0.1			1.6			2.1	
Delay (s)		22.7			21.6			12.0			13.0	
Level of Service		C			C			B			B	
Approach Delay (s)		22.7			21.6			12.0			13.0	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	13.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.42		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	48.3%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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	1.00	1.00		1.00	1.00	1.00		0.91			0.91	
Frt	1.00	0.98		1.00	1.00	0.85		1.00			0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			1.00	
Satd. Flow (prot)	1789	1846		1789	1883	1601		5141			5041	
Flt Permitted	0.76	1.00		0.71	1.00	1.00		1.00			1.00	
Satd. Flow (perm)	1422	1846		1342	1883	1601		5141			5041	
Volume (vph)	469	59	9	1	4	364	0	2241	1	0	2240	335
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	469	59	9	1	4	364	0	2241	1	0	2240	335
Lane Group Flow (vph)	469	68	0	1	4	364	0	2242	0	0	2575	0
Turn Type	Perm			Perm		Perm						
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8						
Actuated Green, G (s)	30.0	30.0		30.0	30.0	30.0		52.0			52.0	
Effective Green, g (s)	30.0	30.0		30.0	30.0	30.0		52.0			52.0	
Actuated g/C Ratio	0.33	0.33		0.33	0.33	0.33		0.58			0.58	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Grp Cap (vph)	474	615		447	628	534		2970			2913	
v/s Ratio Prot		0.04			0.00			0.44			c0.51	
v/s Ratio Perm	c0.33			0.00		0.23						
v/c Ratio	0.99	0.11		0.00	0.01	0.68		0.75			0.88	
Uniform Delay, d1	29.8	20.8		20.0	20.0	25.9		14.2			16.4	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	38.8	0.4		0.0	0.0	6.9		1.8			4.3	
Delay (s)	68.7	21.1		20.0	20.1	32.8		16.1			20.7	
Level of Service	E	C		C	C	C		B			C	
Approach Delay (s)		62.6			32.6			16.1			20.7	
Approach LOS		E			C			B			C	

Intersection Summary			
HCM Average Control Delay	23.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.92		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	101.8%	ICU Level of Service	F

c Critical Lane Group

2030 ALTERNATIVE 5

(Parkway: Diamond Option) PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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		0.95		1.00	0.95		1.00		1.00	1.00		1.00
Frt		1.00		1.00	1.00		1.00		0.85	1.00		0.85
Flt Protected		1.00		0.95	1.00		0.95		1.00	0.95		1.00
Satd. Flow (prot)		3579		1789	3579		1789		1601	1789		1601
Flt Permitted		1.00		0.24	1.00		0.95		1.00	0.95		1.00
Satd. Flow (perm)		3579		446	3579		1789		1601	1789		1601
Volume (vph)	0	890	0	5	1197	0	6	0	9	18	0	86
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	890	0	5	1197	0	6	0	9	18	0	86
Lane Group Flow (vph)	0	890	0	5	1197	0	6	0	9	18	0	86
Turn Type				Perm			custom		custom	Prot		custom
Protected Phases		8			8					2		
Permitted Phases		8		8			2		2			2
Actuated Green, G (s)		28.0		28.0	28.0		24.0		24.0	24.0		24.0
Effective Green, g (s)		28.0		28.0	28.0		24.0		24.0	24.0		24.0
Actuated g/C Ratio		0.47		0.47	0.47		0.40		0.40	0.40		0.40
Clearance Time (s)		4.0		4.0	4.0		4.0		4.0	4.0		4.0
Lane Grp Cap (vph)		1670		208	1670		716		640	716		640
v/s Ratio Prot		0.25			c0.33					0.01		
v/s Ratio Perm				0.01			0.00		0.01			c0.05
v/c Ratio		0.53		0.02	0.72		0.01		0.01	0.03		0.13
Uniform Delay, d1		11.4		8.6	12.8		10.8		10.9	10.9		11.4
Progression Factor		1.00		1.00	1.00		1.00		1.00	1.00		1.00
Incremental Delay, d2		1.2		0.2	2.7		0.0		0.0	0.1		0.4
Delay (s)		12.6		8.8	15.5		10.9		10.9	11.0		11.8
Level of Service		B		A	B		B		B	B		B
Approach Delay (s)		12.6			15.5			10.9			11.7	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	14.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.45		
Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	51.7%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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			0.91			0.91	
Frt		0.99			0.87			1.00			1.00	
Flt Protected		0.95			1.00			1.00			1.00	
Satd. Flow (prot)		3393			1631			5142			5140	
Flt Permitted		0.62			1.00			1.00			1.00	
Satd. Flow (perm)		2193			1628			5142			5140	
Volume (vph)	134	0	6	5	0	513	0	2640	0	0	2755	5
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	134	0	6	5	0	513	0	2640	0	0	2755	5
Lane Group Flow (vph)	0	140	0	0	518	0	0	2640	0	0	2760	0
Turn Type	Perm			Perm					Free			
Protected Phases		4			8			6			2	
Permitted Phases	4			8					Free			
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		755			561			2914			2913	
v/s Ratio Prot								0.51			c0.54	
v/s Ratio Perm		0.06			c0.32							
v/c Ratio		0.19			0.92			0.91			0.95	
Uniform Delay, d1		20.7			28.4			17.4			18.2	
Progression Factor		1.00			1.00			1.00			0.45	
Incremental Delay, d2		0.5			23.1			5.3			5.0	
Delay (s)		21.2			51.5			22.7			13.2	
Level of Service		C			D			C			B	
Approach Delay (s)		21.2			51.5			22.7			13.2	
Approach LOS		C			D			C			B	

Intersection Summary			
HCM Average Control Delay	20.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.94		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	102.8%	ICU Level of Service	F

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (veh/h)	394	6	19	32	47	125
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	394	6	19	32	47	125

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total (vph)	394	6	19	32	172
Volume Left (vph)	394	0	0	0	47
Volume Right (vph)	0	0	0	32	125
Hadj (s)	0.2	0.0	0.0	-0.6	-0.3
Departure Headway (s)	5.2	5.0	5.3	4.7	4.7
Degree Utilization, x	0.57	0.01	0.03	0.04	0.22
Capacity (veh/h)	675	701	643	725	714
Control Delay (s)	13.6	6.8	7.3	6.7	9.1
Approach Delay (s)	13.5		6.9		9.1
Approach LOS	B		A		A

Intersection Summary			
Delay	11.7		
HCM Level of Service	B		
Intersection Capacity Utilization	45.5%	ICU Level of Service	A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.87		1.00	1.00	0.98	
Flt Protected	1.00		0.95	1.00	1.00	
Satd. Flow (prot)	1631		1789	1883	1844	
Flt Permitted	1.00		0.66	1.00	1.00	
Satd. Flow (perm)	1631		1247	1883	1844	
Volume (vph)	4	470	81	422	126	23
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	4	470	81	422	126	23
Lane Group Flow (vph)	474	0	81	422	149	0
Turn Type			Perm			
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	23.5		24.0	24.0	24.0	
Effective Green, g (s)	23.5		24.0	24.0	24.0	
Actuated g/C Ratio	0.42		0.43	0.43	0.43	
Clearance Time (s)	4.0		4.0	4.0	4.0	
Lane Grp Cap (vph)	691		539	814	797	
v/s Ratio Prot	c0.29			c0.22	0.08	
v/s Ratio Perm			0.06			
v/c Ratio	0.69		0.15	0.52	0.19	
Uniform Delay, d1	13.0		9.6	11.5	9.7	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	5.5		0.6	2.4	0.5	
Delay (s)	18.5		10.2	13.9	10.2	
Level of Service	B		B	B	B	
Approach Delay (s)	18.5			13.3	10.2	
Approach LOS	B			B	B	

Intersection Summary			
HCM Average Control Delay	15.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.60		
Cycle Length (s)	55.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	58.2%	ICU Level of Service	A

c Critical Lane Group

Movement	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	380	87	64	87	207	218
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	380	87	64	87	207	218

Direction, Lane #	SB 1	SE 1	SE 2	NW 1	NW 2
Volume Total (vph)	467	93	58	138	287
Volume Left (vph)	380	64	0	0	0
Volume Right (vph)	87	0	0	0	218
Hadj (s)	0.1	0.2	0.0	0.0	-0.4
Departure Headway (s)	5.4	6.5	6.4	6.1	5.6
Degree Utilization, x	0.70	0.17	0.10	0.23	0.45
Capacity (veh/h)	646	514	524	566	617
Control Delay (s)	20.1	9.7	8.9	9.7	11.8
Approach Delay (s)	20.1	9.4		11.1	
Approach LOS	C	A		B	

Intersection Summary			
Delay	14.9		
HCM Level of Service	B		
Intersection Capacity Utilization	53.3%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (veh/h)	0	16	24	9	5	0	18	0	5	0	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	0	16	24	9	5	0	18	0	5	0	0	0

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	16	24	9	5	18	5	0	0
Volume Left (vph)	0	0	9	0	18	0	0	0
Volume Right (vph)	0	24	0	0	0	5	0	0
Hadj (s)	0.0	-0.6	0.2	0.0	0.2	-0.6	0.0	0.0
Departure Headway (s)	4.6	4.0	4.8	4.6	4.9	4.1	4.6	4.6
Degree Utilization, x	0.02	0.03	0.01	0.01	0.02	0.01	0.00	0.00
Capacity (veh/h)	774	882	741	765	724	865	776	776
Control Delay (s)	6.5	5.9	6.7	6.4	6.8	5.9	6.4	6.4
Approach Delay (s)	6.1		6.6		6.6		0.0	
Approach LOS	A		A		A		A	

Intersection Summary			
Delay	6.4		
HCM Level of Service	A		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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		1.00	1.00					0.91			0.91	
Frt		1.00	0.85					1.00			1.00	
Flt Protected		1.00	1.00					1.00			1.00	
Satd. Flow (prot)		1883	1601					5142			5142	
Flt Permitted		1.00	1.00					1.00			1.00	
Satd. Flow (perm)		1883	1601					5142			5142	
Volume (vph)	0	9	236	0	0	0	0	2398	0	0	3401	1
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	9	236	0	0	0	0	2398	0	0	3401	1
Lane Group Flow (vph)	0	9	236	0	0	0	0	2398	0	0	3402	0
Turn Type			Perm									
Protected Phases		4						6			2	
Permitted Phases			4									
Actuated Green, G (s)		23.0	23.0					59.0			59.0	
Effective Green, g (s)		23.0	23.0					59.0			59.0	
Actuated g/C Ratio		0.26	0.26					0.66			0.66	
Clearance Time (s)		4.0	4.0					4.0			4.0	
Lane Grp Cap (vph)		481	409					3371			3371	
v/s Ratio Prot		0.00						0.47			c0.66	
v/s Ratio Perm			c0.15									
v/c Ratio		0.02	0.58					0.71			1.01	
Uniform Delay, d1		25.1	29.3					10.0			15.5	
Progression Factor		1.00	1.00					1.00			1.00	
Incremental Delay, d2		0.1	5.8					1.3			17.8	
Delay (s)		25.1	35.1					11.3			33.3	
Level of Service		C	D					B			C	
Approach Delay (s)		34.7			0.0			11.3			33.3	
Approach LOS		C			A			B			C	

Intersection Summary			
HCM Average Control Delay	24.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.89		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	75.7%	ICU Level of Service	C

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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	
Lane Util. Factor		1.00			1.00		0.97	1.00			1.00	
Frt		0.98			1.00		1.00	0.88			0.88	
Flt Protected		1.00			0.96		0.95	1.00			1.00	
Satd. Flow (prot)		1845			1806		3471	1656			1645	
Flt Permitted		1.00			0.49		0.69	1.00			0.95	
Satd. Flow (perm)		1845			925		2507	1656			1572	
Volume (vph)	0	239	43	72	12	0	840	107	441	14	0	140
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	239	43	72	12	0	840	107	441	14	0	140
Lane Group Flow (vph)	0	282	0	0	84	0	840	548	0	0	154	0
Turn Type				Perm			Perm			Perm		
Protected Phases		4			8			6			2	
Permitted Phases		4		8			6			2		
Actuated Green, G (s)		23.5			23.5		58.5	58.5			58.5	
Effective Green, g (s)		23.5			23.5		58.5	58.5			58.5	
Actuated g/C Ratio		0.26			0.26		0.65	0.65			0.65	
Clearance Time (s)		4.0			4.0		4.0	4.0			4.0	
Lane Grp Cap (vph)		482			242		1630	1076			1022	
v/s Ratio Prot		c0.15						0.33				
v/s Ratio Perm					0.09		c0.34				0.10	
v/c Ratio		0.59			0.35		0.52	0.51			0.15	
Uniform Delay, d1		29.0			27.0		8.3	8.2			6.1	
Progression Factor		1.00			1.34		1.00	1.00			1.00	
Incremental Delay, d2		5.1			3.9		1.2	1.7			0.3	
Delay (s)		34.1			40.2		9.5	10.0			6.4	
Level of Service		C			D		A	A			A	
Approach Delay (s)		34.1			40.2			9.7			6.4	
Approach LOS		C			D			A			A	

Intersection Summary			
HCM Average Control Delay	14.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.54		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	75.4%	ICU Level of Service	C

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL2	NBL	NBR	SEL	SER
Lane Configurations											
Ideal Flow (vphpl)	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		
Lane Util. Factor	1.00	0.95			1.00	1.00	1.00		1.00		
Frt	1.00	1.00			1.00	0.85	1.00		0.85		
Flt Protected	0.95	1.00			1.00	1.00	0.95		1.00		
Satd. Flow (prot)	1789	3579			1883	1601	1789		1601		
Flt Permitted	0.73	1.00			1.00	1.00	0.95		1.00		
Satd. Flow (perm)	1374	3579			1883	1601	1789		1601		
Volume (vph)	334	888	0	0	42	1234	42	0	3	0	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	334	888	0	0	42	1234	42	0	3	0	0
Lane Group Flow (vph)	334	888	0	0	42	1234	42	0	3	0	0
Turn Type	Perm					Free	custom		custom	Prot	
Protected Phases		4			8					6	
Permitted Phases	4					Free	2		2		
Actuated Green, G (s)	59.0	59.0			59.0	90.0	23.0		23.0		
Effective Green, g (s)	59.0	59.0			59.0	90.0	23.0		23.0		
Actuated g/C Ratio	0.66	0.66			0.66	1.00	0.26		0.26		
Clearance Time (s)	4.0	4.0			4.0		4.0		4.0		
Lane Grp Cap (vph)	901	2346			1234	1601	457		409		
v/s Ratio Prot		0.25			0.02						
v/s Ratio Perm	0.24					c0.77	0.02		0.00		
v/c Ratio	0.37	0.38			0.03	0.77	0.09		0.01		
Uniform Delay, d1	7.1	7.1			5.5	0.0	25.5		25.0		
Progression Factor	1.08	1.07			1.00	1.00	1.00		1.00		
Incremental Delay, d2	1.0	0.4			0.1	3.7	0.4		0.0		
Delay (s)	8.6	8.0			5.5	3.7	25.9		25.0		
Level of Service	A	A			A	A	C		C		
Approach Delay (s)		8.2			3.7			25.9		0.0	
Approach LOS		A			A			C		A	

Intersection Summary			
HCM Average Control Delay	6.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.77		
Cycle Length (s)	90.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	35.2%	ICU Level of Service	A

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	878	4	5	1193	1	4
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	878	4	5	1193	1	4

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	585	297	403	795	5
Volume Left (vph)	0	0	5	0	1
Volume Right (vph)	0	4	0	0	4
Hadj (s)	0.0	0.0	0.0	0.0	-0.4
Departure Headway (s)	5.8	5.8	5.6	5.6	6.4
Degree Utilization, x	0.94	0.48	0.62	1.23	0.01
Capacity (veh/h)	615	611	631	655	550
Control Delay (s)	45.5	12.7	16.1	134.5	9.5
Approach Delay (s)	34.5		94.7		9.5
Approach LOS	D		F		A

Intersection Summary			
Delay	69.0		
HCM Level of Service	F		
Intersection Capacity Utilization	44.4%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	865	23	6	1200	3	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	865	23	6	1200	3	1

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	577	311	406	800	4
Volume Left (vph)	0	0	6	0	3
Volume Right (vph)	0	23	0	0	1
Hadj (s)	0.0	0.0	0.0	0.0	0.0
Departure Headway (s)	5.8	5.7	5.6	5.6	6.8
Degree Utilization, x	0.93	0.50	0.63	1.24	0.01
Capacity (veh/h)	614	614	630	654	515
Control Delay (s)	43.1	13.1	16.3	138.3	9.9
Approach Delay (s)	32.6		97.2		9.9
Approach LOS	D		F		A

Intersection Summary			
Delay	69.7		
HCM Level of Service	F		
Intersection Capacity Utilization	44.9%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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		1.00			1.00			0.91			0.91	
Frt		1.00			0.88			1.00			1.00	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1873			1653			5137			5141	
Flt Permitted		0.91			0.99			1.00			1.00	
Satd. Flow (perm)		1708			1646			5137			5141	
Volume (vph)	45	473	5	5	39	404	0	2108	14	0	2393	1
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	45	473	5	5	39	404	0	2108	14	0	2393	1
Lane Group Flow (vph)	0	523	0	0	448	0	0	2122	0	0	2394	0
Turn Type	Perm			Perm								
Protected Phases		4			8			6			2	
Permitted Phases	4			8				6				
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		588			567			2911			2913	
v/s Ratio Prot								0.41			c0.47	
v/s Ratio Perm		c0.31			0.27							
v/c Ratio		0.89			0.79			0.73			0.82	
Uniform Delay, d1		27.9			26.6			14.4			15.8	
Progression Factor		1.00			1.00			0.35			1.00	
Incremental Delay, d2		18.1			10.7			0.7			2.1	
Delay (s)		45.9			37.3			5.6			17.9	
Level of Service		D			D			A			B	
Approach Delay (s)		45.9			37.3			5.6			17.9	
Approach LOS		D			D			A			B	

Intersection Summary			
HCM Average Control Delay	17.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.85		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	111.2%	ICU Level of Service	G

c Critical Lane Group

Movement	WBL	WBR	NBL	NBR	SEL	SER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.76		1.00	0.94	
Frt	1.00	0.85		0.86	1.00	
Flt Protected	0.95	1.00		1.00	0.95	
Satd. Flow (prot)	1789	3650		1629	5046	
Flt Permitted	0.95	1.00		1.00	0.95	
Satd. Flow (perm)	1789	3650		1629	5046	
Volume (vph)	212	2362	0	123	2075	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	212	2362	0	123	2075	0
Lane Group Flow (vph)	212	2362	0	123	2075	0
Turn Type	Prot			custom		
Protected Phases	8				2	
Permitted Phases		8 2		4		
Actuated Green, G (s)	25.0	90.0		25.0	57.0	
Effective Green, g (s)	25.0	90.0		25.0	57.0	
Actuated g/C Ratio	0.28	1.00		0.28	0.63	
Clearance Time (s)	4.0			4.0	4.0	
Lane Grp Cap (vph)	497	3650		453	3196	
v/s Ratio Prot	0.12				0.41	
v/s Ratio Perm		c0.65		0.08		
v/c Ratio	0.43	0.65		0.27	0.65	
Uniform Delay, d1	26.6	0.0		25.4	10.3	
Progression Factor	1.00	1.00		0.55	0.18	
Incremental Delay, d2	2.7	0.9		1.4	0.7	
Delay (s)	29.3	0.9		15.5	2.6	
Level of Service	C	A		B	A	
Approach Delay (s)	3.2		15.5		2.6	
Approach LOS	A		B		A	

Intersection Summary			
HCM Average Control Delay	3.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.65		
Cycle Length (s)	90.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	58.4%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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		0.91			0.91			1.00			1.00	
Frt		0.98			1.00			1.00			0.93	
Flt Protected		1.00			1.00			0.95			0.98	
Satd. Flow (prot)		5032			5135			1795			1711	
Flt Permitted		1.00			1.00			0.71			0.91	
Satd. Flow (perm)		5032			5135			1334			1596	
Volume (vph)	0	1950	323	0	2272	21	405	14	5	16	1	19
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1950	323	0	2272	21	405	14	5	16	1	19
Lane Group Flow (vph)	0	2273	0	0	2293	0	0	424	0	0	36	0
Turn Type							Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)		59.0			59.0			23.5			23.5	
Effective Green, g (s)		59.0			59.0			23.5			23.5	
Actuated g/C Ratio		0.65			0.65			0.26			0.26	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		3281			3348			346			414	
v/s Ratio Prot		c0.45			0.45							
v/s Ratio Perm								c0.32			0.02	
v/c Ratio		0.69			0.68			1.23			0.09	
Uniform Delay, d1		10.0			9.9			33.5			25.4	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.2			1.2			124.5			0.4	
Delay (s)		11.2			11.1			158.0			25.8	
Level of Service		B			B			F			C	
Approach Delay (s)		11.2			11.1			158.0			25.8	
Approach LOS		B			B			F			C	

Intersection Summary			
HCM Average Control Delay	23.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.84		
Cycle Length (s)	90.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	81.7%	ICU Level of Service	D

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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	
Lane Util. Factor	1.00	1.00			1.00			1.00			1.00	
Frt	1.00	0.95			1.00			0.97			0.93	
Flt Protected	0.95	1.00			1.00			0.99			1.00	
Satd. Flow (prot)	1789	1797			1872			1812			1742	
Flt Permitted	0.48	1.00			0.99			0.96			1.00	
Satd. Flow (perm)	907	1797			1864			1762			1737	
Volume (vph)	116	210	92	7	341	13	14	52	19	3	35	45
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	116	210	92	7	341	13	14	52	19	3	35	45
Lane Group Flow (vph)	116	302	0	0	361	0	0	85	0	0	83	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	44.0	44.0			44.0			38.0			38.0	
Effective Green, g (s)	44.0	44.0			44.0			38.0			38.0	
Actuated g/C Ratio	0.49	0.49			0.49			0.42			0.42	
Clearance Time (s)	4.0	4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)	443	879			911			744			733	
v/s Ratio Prot		0.17										
v/s Ratio Perm	0.13				c0.19			c0.05			0.05	
v/c Ratio	0.26	0.34			0.40			0.11			0.11	
Uniform Delay, d1	13.5	14.1			14.6			15.8			15.8	
Progression Factor	1.00	1.00			1.27			1.00			1.00	
Incremental Delay, d2	1.4	1.1			1.3			0.3			0.3	
Delay (s)	14.9	15.2			19.8			16.1			16.1	
Level of Service	B	B			B			B			B	
Approach Delay (s)		15.1			19.8			16.1			16.1	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	17.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.27		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	50.9%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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		1.00			1.00			1.00			1.00	
Frt		0.99			0.99			1.00			0.99	
Flt Protected		0.96			1.00			1.00			1.00	
Satd. Flow (prot)		1796			1867			1882			1858	
Flt Permitted		0.79			1.00			1.00			0.99	
Satd. Flow (perm)		1482			1866			1874			1841	
Volume (vph)	40	7	3	1	78	5	6	573	1	11	561	59
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	40	7	3	1	78	5	6	573	1	11	561	59
Lane Group Flow (vph)	0	50	0	0	84	0	0	580	0	0	631	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		28.0			28.0			54.0			54.0	
Effective Green, g (s)		28.0			28.0			54.0			54.0	
Actuated g/C Ratio		0.31			0.31			0.60			0.60	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		461			581			1124			1105	
v/s Ratio Prot												
v/s Ratio Perm		0.03			c0.05			0.31			c0.34	
v/c Ratio		0.11			0.14			0.52			0.57	
Uniform Delay, d1		22.1			22.4			10.4			11.0	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.5			0.5			1.7			2.1	
Delay (s)		22.6			22.9			12.1			13.1	
Level of Service		C			C			B			B	
Approach Delay (s)		22.6			22.9			12.1			13.1	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	13.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.43		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	51.7%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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	1.00	1.00		1.00	1.00	1.00		0.91			0.91	
Frt	1.00	0.94		1.00	1.00	0.85		1.00			0.97	
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			1.00	
Satd. Flow (prot)	1789	1764		1789	1883	1601		5141			4994	
Flt Permitted	0.72	1.00		0.75	1.00	1.00		1.00			1.00	
Satd. Flow (perm)	1361	1764		1403	1883	1601		5141			4994	
Volume (vph)	231	11	8	1	53	392	0	2169	1	0	2501	593
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	231	11	8	1	53	392	0	2169	1	0	2501	593
Lane Group Flow (vph)	231	19	0	1	53	392	0	2170	0	0	3094	0
Turn Type	Perm			Perm		Perm						
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8						
Actuated Green, G (s)	30.0	30.0		30.0	30.0	30.0		52.0			52.0	
Effective Green, g (s)	30.0	30.0		30.0	30.0	30.0		52.0			52.0	
Actuated g/C Ratio	0.33	0.33		0.33	0.33	0.33		0.58			0.58	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Grp Cap (vph)	454	588		468	628	534		2970			2885	
v/s Ratio Prot		0.01			0.03			0.42			c0.62	
v/s Ratio Perm	0.17			0.00		c0.24						
v/c Ratio	0.51	0.03		0.00	0.08	0.73		0.73			1.07	
Uniform Delay, d1	24.1	20.2		20.0	20.6	26.5		13.9			19.0	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	4.0	0.1		0.0	0.3	8.7		1.6			40.1	
Delay (s)	28.1	20.3		20.0	20.8	35.2		15.5			59.1	
Level of Service	C	C		C	C	D		B			E	
Approach Delay (s)		27.5			33.4			15.5			59.1	
Approach LOS		C			C			B			E	

Intersection Summary			
HCM Average Control Delay	40.0	HCM Level of Service	D
HCM Volume to Capacity ratio	0.95		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	89.0%	ICU Level of Service	D

c Critical Lane Group

2030 ALTERNATIVE 5

(Parkway: Diamond Option) WEEKEND

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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
Lane Util. Factor		0.95			0.95		1.00		1.00	1.00		1.00
Frt		1.00			1.00		1.00		0.85	1.00		0.85
Flt Protected		1.00			1.00		0.95		1.00	0.95		1.00
Satd. Flow (prot)		3579			3579		1789		1601	1789		1601
Flt Permitted		1.00			1.00		0.95		1.00	0.95		1.00
Satd. Flow (perm)		3579			3579		1789		1601	1789		1601
Volume (vph)	0	586	0	0	506	0	6	0	4	2	0	10
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	586	0	0	506	0	6	0	4	2	0	10
Lane Group Flow (vph)	0	586	0	0	506	0	6	0	4	2	0	10
Turn Type				Perm			custom		custom	Prot		custom
Protected Phases		8			8					2		
Permitted Phases		8		8			2		2			2
Actuated Green, G (s)		38.0			38.0		29.0		29.0	29.0		29.0
Effective Green, g (s)		38.0			38.0		29.0		29.0	29.0		29.0
Actuated g/C Ratio		0.51			0.51		0.39		0.39	0.39		0.39
Clearance Time (s)		4.0			4.0		4.0		4.0	4.0		4.0
Lane Grp Cap (vph)		1813			1813		692		619	692		619
v/s Ratio Prot		c0.16			0.14					0.00		
v/s Ratio Perm							0.00		0.00			c0.01
v/c Ratio		0.32			0.28		0.01		0.01	0.00		0.02
Uniform Delay, d1		10.9			10.6		14.2		14.1	14.1		14.2
Progression Factor		1.00			1.00		1.00		1.00	1.00		1.00
Incremental Delay, d2		0.5			0.4		0.0		0.0	0.0		0.0
Delay (s)		11.4			11.0		14.2		14.2	14.1		14.2
Level of Service		B			B		B		B	B		B
Approach Delay (s)		11.4			11.0			14.2			14.2	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	11.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.19		
Cycle Length (s)	75.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	32.9%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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			0.91			0.91	
Frt		1.00			0.87			1.00			1.00	
Flt Protected		0.95			1.00			1.00			1.00	
Satd. Flow (prot)		3399			1631			5142			5140	
Flt Permitted		0.59			1.00			1.00			1.00	
Satd. Flow (perm)		2109			1628			5142			5140	
Volume (vph)	293	0	8	3	0	357	0	2363	0	0	2328	5
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	293	0	8	3	0	357	0	2363	0	0	2328	5
Lane Group Flow (vph)	0	301	0	0	360	0	0	2363	0	0	2333	0
Turn Type	Perm			Perm					Free			
Protected Phases		4			8			6			2	
Permitted Phases	4			8					Free			
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		726			561			2914			2913	
v/s Ratio Prot								c0.46			0.45	
v/s Ratio Perm		0.14			c0.22							
v/c Ratio		1.16dl			0.64			0.81			0.80	
Uniform Delay, d1		22.6			24.8			15.6			15.5	
Progression Factor		1.00			1.00			1.00			0.61	
Incremental Delay, d2		1.7			5.6			2.6			1.8	
Delay (s)		24.3			30.4			18.2			11.2	
Level of Service		C			C			B			B	
Approach Delay (s)		24.3			30.4			18.2			11.2	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	16.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.75		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	94.2%	ICU Level of Service	E

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

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (veh/h)	143	0	4	20	14	17
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	143	0	4	20	14	17

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total (vph)	143	0	4	20	31
Volume Left (vph)	143	0	0	0	14
Volume Right (vph)	0	0	0	20	17
Hadj (s)	0.2	0.0	0.0	-0.6	-0.2
Departure Headway (s)	4.8	4.6	4.7	4.1	4.1
Degree Utilization, x	0.19	0.00	0.01	0.02	0.04
Capacity (veh/h)	740	789	756	858	839
Control Delay (s)	7.7	6.4	6.5	6.0	7.2
Approach Delay (s)	7.7		6.1		7.2
Approach LOS	A		A		A

Intersection Summary			
Delay	7.5		
HCM Level of Service	A		
Intersection Capacity Utilization	24.6%	ICU Level of Service	A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.87		1.00	1.00	0.99	
Flt Protected	1.00		0.95	1.00	1.00	
Satd. Flow (prot)	1631		1789	1883	1873	
Flt Permitted	1.00		0.74	1.00	1.00	
Satd. Flow (perm)	1631		1396	1883	1873	
Volume (vph)	4	331	4	145	24	1
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	4	331	4	145	24	1
Lane Group Flow (vph)	335	0	4	145	25	0
Turn Type			Perm			
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	23.5		24.0	24.0	24.0	
Effective Green, g (s)	23.5		24.0	24.0	24.0	
Actuated g/C Ratio	0.42		0.43	0.43	0.43	
Clearance Time (s)	4.0		4.0	4.0	4.0	
Lane Grp Cap (vph)	691		604	814	810	
v/s Ratio Prot	c0.21			c0.08	0.01	
v/s Ratio Perm			0.00			
v/c Ratio	0.48		0.01	0.18	0.03	
Uniform Delay, d1	11.6		9.0	9.7	9.1	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	2.4		0.0	0.5	0.1	
Delay (s)	14.0		9.0	10.2	9.1	
Level of Service	B		A	B	A	
Approach Delay (s)	14.0			10.1	9.1	
Approach LOS	B			B	A	

Intersection Summary			
HCM Average Control Delay	12.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.33		
Cycle Length (s)	55.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	35.0%	ICU Level of Service	A

c Critical Lane Group

Movement	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	444	37	38	23	37	131
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	444	37	38	23	37	131

Direction, Lane #	SB 1	SE 1	SE 2	NW 1	NW 2
Volume Total (vph)	481	46	15	25	143
Volume Left (vph)	444	38	0	0	0
Volume Right (vph)	37	0	0	0	131
Hadj (s)	0.2	0.2	0.0	0.0	-0.5
Departure Headway (s)	4.7	6.1	5.9	5.8	5.2
Degree Utilization, x	0.62	0.08	0.03	0.04	0.21
Capacity (veh/h)	754	548	562	579	641
Control Delay (s)	15.1	8.4	7.8	7.8	8.4
Approach Delay (s)	15.1	8.2		8.3	
Approach LOS	C	A		A	

Intersection Summary			
Delay	12.9		
HCM Level of Service	B		
Intersection Capacity Utilization	38.8%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (veh/h)	0	6	5	1	1	0	9	0	0	0	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	0	6	5	1	1	0	9	0	0	0	0	0

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	6	5	1	1	9	0	0	0
Volume Left (vph)	0	0	1	0	9	0	0	0
Volume Right (vph)	0	5	0	0	0	0	0	0
Hadj (s)	0.0	-0.6	0.2	0.0	0.2	0.0	0.0	0.0
Departure Headway (s)	4.6	4.0	4.8	4.6	4.8	4.5	4.5	4.5
Degree Utilization, x	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.00
Capacity (veh/h)	783	904	751	775	743	799	798	798
Control Delay (s)	6.4	5.8	6.6	6.4	6.6	6.3	6.3	6.3
Approach Delay (s)	6.1		6.5		6.6		0.0	
Approach LOS	A		A		A		A	

Intersection Summary			
Delay	6.4		
HCM Level of Service	A		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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	
Lane Util. Factor			1.00					0.91			0.91	
Frt			0.85					1.00			1.00	
Flt Protected			1.00					1.00			1.00	
Satd. Flow (prot)			1601					5142			5139	
Flt Permitted			1.00					1.00			1.00	
Satd. Flow (perm)			1601					5142			5139	
Volume (vph)	0	0	89	0	0	0	0	2271	0	0	2978	12
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	0	89	0	0	0	0	2271	0	0	2978	12
Lane Group Flow (vph)	0	0	89	0	0	0	0	2271	0	0	2990	0
Turn Type			Perm									
Protected Phases		4						6			2	
Permitted Phases			4									
Actuated Green, G (s)			23.0					59.0			59.0	
Effective Green, g (s)			23.0					59.0			59.0	
Actuated g/C Ratio			0.26					0.66			0.66	
Clearance Time (s)			4.0					4.0			4.0	
Lane Grp Cap (vph)			409					3371			3369	
v/s Ratio Prot								0.44			c0.58	
v/s Ratio Perm			c0.06									
v/c Ratio			0.22					0.67			0.89	
Uniform Delay, d1			26.4					9.6			12.8	
Progression Factor			1.00					1.00			1.00	
Incremental Delay, d2			1.2					1.1			3.9	
Delay (s)			27.6					10.7			16.7	
Level of Service			C					B			B	
Approach Delay (s)		27.6			0.0			10.7			16.7	
Approach LOS		C			A			B			B	

Intersection Summary			
HCM Average Control Delay	14.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.70		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	61.1%	ICU Level of Service	B

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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	
Lane Util. Factor		1.00			1.00		0.97	1.00			1.00	
Frt		0.97			1.00		1.00	0.87			0.87	
Flt Protected		1.00			0.95		0.95	1.00			1.00	
Satd. Flow (prot)		1829			1797		3471	1641			1632	
Flt Permitted		1.00			0.74		0.72	1.00			1.00	
Satd. Flow (perm)		1829			1396		2625	1641			1628	
Volume (vph)	0	132	36	29	1	0	569	78	478	1	0	58
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	132	36	29	1	0	569	78	478	1	0	58
Lane Group Flow (vph)	0	168	0	0	30	0	569	556	0	0	59	0
Turn Type				Perm			Perm			Perm		
Protected Phases		4			8			6			2	
Permitted Phases		4		8			6			2		
Actuated Green, G (s)		23.5			23.5		58.5	58.5			58.5	
Effective Green, g (s)		23.5			23.5		58.5	58.5			58.5	
Actuated g/C Ratio		0.26			0.26		0.65	0.65			0.65	
Clearance Time (s)		4.0			4.0		4.0	4.0			4.0	
Lane Grp Cap (vph)		478			365		1706	1067			1058	
v/s Ratio Prot		c0.09						c0.34				
v/s Ratio Perm					0.02		0.22				0.04	
v/c Ratio		0.35			0.08		0.33	0.52			0.06	
Uniform Delay, d1		27.1			25.1		7.0	8.3			5.7	
Progression Factor		1.00			1.00		1.00	1.00			1.00	
Incremental Delay, d2		2.0			0.4		0.5	1.8			0.1	
Delay (s)		29.1			25.5		7.6	10.2			5.8	
Level of Service		C			C		A	B			A	
Approach Delay (s)		29.1			25.5			8.8			5.8	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM Average Control Delay	11.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.47		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	49.4%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL2	NBL	NBR	SEL	SER
Lane Configurations											
Ideal Flow (vphpl)	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		
Lane Util. Factor	1.00	0.95			1.00	1.00	1.00		1.00		
Frt	1.00	1.00			1.00	0.85	1.00		0.85		
Flt Protected	0.95	1.00			1.00	1.00	0.95		1.00		
Satd. Flow (prot)	1789	3579			1883	1601	1789		1601		
Flt Permitted	0.75	1.00			1.00	1.00	0.95		1.00		
Satd. Flow (perm)	1412	3579			1883	1601	1789		1601		
Volume (vph)	171	585	0	0	12	503	18	0	1	0	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	171	585	0	0	12	503	18	0	1	0	0
Lane Group Flow (vph)	171	585	0	0	12	503	18	0	1	0	0
Turn Type	Perm					Perm	custom		custom		
Protected Phases		4			8						
Permitted Phases	4					8	2		2		
Actuated Green, G (s)	59.0	59.0			59.0	59.0	23.0		23.0		
Effective Green, g (s)	59.0	59.0			59.0	59.0	23.0		23.0		
Actuated g/C Ratio	0.66	0.66			0.66	0.66	0.26		0.26		
Clearance Time (s)	4.0	4.0			4.0	4.0	4.0		4.0		
Lane Grp Cap (vph)	926	2346			1234	1050	457		409		
v/s Ratio Prot		0.16			0.01						
v/s Ratio Perm	0.12					c0.31	c0.01		0.00		
v/c Ratio	0.18	0.25			0.01	0.48	0.04		0.00		
Uniform Delay, d1	6.1	6.4			5.4	7.8	25.2		25.0		
Progression Factor	1.00	1.00			1.00	1.00	1.00		1.00		
Incremental Delay, d2	0.4	0.3			0.0	1.6	0.2		0.0		
Delay (s)	6.5	6.6			5.4	9.3	25.4		25.0		
Level of Service	A	A			A	A	C		C		
Approach Delay (s)		6.6			9.3			25.3		0.0	
Approach LOS		A			A			C		A	

Intersection Summary			
HCM Average Control Delay	7.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.36		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	47.3%	ICU Level of Service	A

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	570	3	4	491	2	3
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	570	3	4	491	2	3

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	380	193	168	327	5
Volume Left (vph)	0	0	4	0	2
Volume Right (vph)	0	3	0	0	3
Hadj (s)	0.0	0.0	0.0	0.0	-0.2
Departure Headway (s)	5.0	5.0	5.0	5.0	5.6
Degree Utilization, x	0.52	0.27	0.23	0.46	0.01
Capacity (veh/h)	717	711	694	704	579
Control Delay (s)	12.1	8.5	8.4	11.0	8.7
Approach Delay (s)	10.9		10.1		8.7
Approach LOS	B		B		A

Intersection Summary			
Delay	10.5		
HCM Level of Service	B		
Intersection Capacity Utilization	25.9%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	565	5	5	496	1	6
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	565	5	5	496	1	6

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	377	193	170	331	7
Volume Left (vph)	0	0	5	0	1
Volume Right (vph)	0	5	0	0	6
Hadj (s)	0.0	0.0	0.0	0.0	-0.5
Departure Headway (s)	5.0	5.0	5.0	5.0	5.4
Degree Utilization, x	0.52	0.27	0.24	0.46	0.01
Capacity (veh/h)	715	710	693	703	599
Control Delay (s)	12.1	8.6	8.4	11.1	8.5
Approach Delay (s)	10.9		10.2		8.5
Approach LOS	B		B		A

Intersection Summary			
Delay	10.5		
HCM Level of Service	B		
Intersection Capacity Utilization	25.8%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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		1.00			1.00			0.91			0.91	
Frt		1.00			0.87			1.00			1.00	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1882			1631			5141			5141	
Flt Permitted		0.99			1.00			1.00			1.00	
Satd. Flow (perm)		1874			1626			5141			5141	
Volume (vph)	6	463	0	4	1	407	0	1856	3	0	1921	1
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	6	463	0	4	1	407	0	1856	3	0	1921	1
Lane Group Flow (vph)	0	469	0	0	412	0	0	1859	0	0	1922	0
Turn Type	Perm			Perm								
Protected Phases		4			8			6			2	
Permitted Phases	4			8				6				
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		645			560			2913			2913	
v/s Ratio Prot								0.36			c0.37	
v/s Ratio Perm		0.25			c0.25							
v/c Ratio		0.73			0.74			0.64			0.66	
Uniform Delay, d1		25.8			25.9			13.2			13.5	
Progression Factor		1.00			1.00			0.31			0.51	
Incremental Delay, d2		7.0			8.4			0.6			1.0	
Delay (s)		32.8			34.3			4.7			8.0	
Level of Service		C			C			A			A	
Approach Delay (s)		32.8			34.3			4.7			8.0	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM Average Control Delay	11.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.69		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	70.9%	ICU Level of Service	C

c Critical Lane Group

Movement	WBL	WBR	NBL	NBR	SEL	SER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.76		1.00	0.94	
Frt	1.00	0.85		0.86	1.00	
Flt Protected	0.95	1.00		1.00	0.95	
Satd. Flow (prot)	1789	3650		1629	5046	
Flt Permitted	0.95	1.00		1.00	0.95	
Satd. Flow (perm)	1789	3650		1629	5046	
Volume (vph)	73	1909	0	35	1841	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	73	1909	0	35	1841	0
Lane Group Flow (vph)	73	1909	0	35	1841	0
Turn Type	Prot			custom		
Protected Phases	8				2	
Permitted Phases		8 2		4		
Actuated Green, G (s)	25.0	90.0		25.0	57.0	
Effective Green, g (s)	25.0	90.0		25.0	57.0	
Actuated g/C Ratio	0.28	1.00		0.28	0.63	
Clearance Time (s)	4.0			4.0	4.0	
Lane Grp Cap (vph)	497	3650		453	3196	
v/s Ratio Prot	0.04				c0.36	
v/s Ratio Perm		c0.52		0.02		
v/c Ratio	0.15	0.52		0.08	0.58	
Uniform Delay, d1	24.5	0.0		24.0	9.5	
Progression Factor	1.57	1.00		0.85	0.16	
Incremental Delay, d2	0.5	0.4		0.3	0.6	
Delay (s)	38.8	0.4		20.8	2.1	
Level of Service	D	A		C	A	
Approach Delay (s)	1.8		20.8		2.1	
Approach LOS	A		C		A	

Intersection Summary			
HCM Average Control Delay	2.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.56		
Cycle Length (s)	90.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	47.9%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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		0.91			0.91			1.00			1.00	
Frt		0.98			1.00			1.00			0.90	
Flt Protected		1.00			1.00			0.95			1.00	
Satd. Flow (prot)		5060			5141			1792			1693	
Flt Permitted		1.00			1.00			0.74			1.00	
Satd. Flow (perm)		5060			5141			1391			1693	
Volume (vph)	0	1696	202	0	1881	3	132	2	3	0	1	3
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1696	202	0	1881	3	132	2	3	0	1	3
Lane Group Flow (vph)	0	1898	0	0	1884	0	0	137	0	0	4	0
Turn Type							Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)		50.5			50.5			31.5			31.5	
Effective Green, g (s)		50.5			50.5			31.5			31.5	
Actuated g/C Ratio		0.56			0.56			0.35			0.35	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		2839			2885			487			593	
v/s Ratio Prot		c0.38			0.37						0.00	
v/s Ratio Perm								c0.10				
v/c Ratio		0.67			0.65			0.28			0.01	
Uniform Delay, d1		13.9			13.7			21.1			19.1	
Progression Factor		0.42			1.00			1.00			1.00	
Incremental Delay, d2		1.1			1.2			1.4			0.0	
Delay (s)		6.9			14.8			22.5			19.1	
Level of Service		A			B			C			B	
Approach Delay (s)		6.9			14.8			22.5			19.1	
Approach LOS		A			B			C			B	

Intersection Summary			
HCM Average Control Delay	11.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.52		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	58.2%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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	
Lane Util. Factor	1.00	1.00			1.00			1.00			1.00	
Frt	1.00	0.92			0.99			0.97			0.92	
Flt Protected	0.95	1.00			1.00			0.99			1.00	
Satd. Flow (prot)	1789	1724			1852			1812			1740	
Flt Permitted	0.67	1.00			0.99			0.96			1.00	
Satd. Flow (perm)	1268	1724			1838			1762			1737	
Volume (vph)	293	46	60	8	122	15	15	55	20	2	30	40
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	293	46	60	8	122	15	15	55	20	2	30	40
Lane Group Flow (vph)	293	106	0	0	145	0	0	90	0	0	72	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	44.0	44.0			44.0			38.0			38.0	
Effective Green, g (s)	44.0	44.0			44.0			38.0			38.0	
Actuated g/C Ratio	0.49	0.49			0.49			0.42			0.42	
Clearance Time (s)	4.0	4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)	620	843			899			744			733	
v/s Ratio Prot		0.06										
v/s Ratio Perm	c0.23				0.08			c0.05			0.04	
v/c Ratio	0.47	0.13			0.16			0.12			0.10	
Uniform Delay, d1	15.3	12.5			12.8			15.8			15.7	
Progression Factor	1.00	1.00			0.56			1.00			1.00	
Incremental Delay, d2	2.6	0.3			0.4			0.3			0.3	
Delay (s)	17.9	12.8			7.5			16.2			15.9	
Level of Service	B	B			A			B			B	
Approach Delay (s)		16.5			7.5			16.2			15.9	
Approach LOS		B			A			B			B	

Intersection Summary			
HCM Average Control Delay	14.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.31		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	39.5%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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		1.00			1.00			1.00			1.00	
Frt		0.98			0.91			1.00			1.00	
Flt Protected		0.97			0.99			1.00			1.00	
Satd. Flow (prot)		1795			1688			1880			1874	
Flt Permitted		0.87			0.97			1.00			0.99	
Satd. Flow (perm)		1621			1662			1875			1858	
Volume (vph)	24	8	4	3	1	9	4	515	5	11	566	18
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	24	8	4	3	1	9	4	515	5	11	566	18
Lane Group Flow (vph)	0	36	0	0	13	0	0	524	0	0	595	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		28.0			28.0			54.0			54.0	
Effective Green, g (s)		28.0			28.0			54.0			54.0	
Actuated g/C Ratio		0.31			0.31			0.60			0.60	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		504			517			1125			1115	
v/s Ratio Prot												
v/s Ratio Perm		c0.02			0.01			0.28			c0.32	
v/c Ratio		0.07			0.03			0.47			0.53	
Uniform Delay, d1		21.8			21.5			10.0			10.6	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.3			0.1			1.4			1.8	
Delay (s)		22.1			21.6			11.4			12.4	
Level of Service		C			C			B			B	
Approach Delay (s)		22.1			21.6			11.4			12.4	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	12.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.38		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	47.8%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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	1.00	1.00		1.00	1.00	1.00		0.91			0.91	
Frt	1.00	0.92		1.00	1.00	0.85		1.00			0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			1.00	
Satd. Flow (prot)	1789	1731		1789	1883	1601		5140			5053	
Flt Permitted	0.75	1.00		0.75	1.00	1.00		1.00			1.00	
Satd. Flow (perm)	1417	1731		1411	1883	1601		5140			5053	
Volume (vph)	9	6	7	7	8	27	0	1839	5	0	2017	261
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	9	6	7	7	8	27	0	1839	5	0	2017	261
Lane Group Flow (vph)	9	13	0	7	8	27	0	1844	0	0	2278	0
Turn Type	Perm			Perm		Perm						
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8						
Actuated Green, G (s)	30.0	30.0		30.0	30.0	30.0		52.0			52.0	
Effective Green, g (s)	30.0	30.0		30.0	30.0	30.0		52.0			52.0	
Actuated g/C Ratio	0.33	0.33		0.33	0.33	0.33		0.58			0.58	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Grp Cap (vph)	472	577		470	628	534		2970			2920	
v/s Ratio Prot		0.01			0.00			0.36			c0.45	
v/s Ratio Perm	0.01			0.00		c0.02						
v/c Ratio	0.02	0.02		0.01	0.01	0.05		0.62			0.78	
Uniform Delay, d1	20.1	20.2		20.1	20.1	20.3		12.5			14.6	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	0.1	0.1		0.1	0.0	0.2		1.0			2.1	
Delay (s)	20.2	20.2		20.2	20.1	20.5		13.5			16.7	
Level of Service	C	C		C	C	C		B			B	
Approach Delay (s)		20.2			20.4			13.5			16.7	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	15.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.51		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	54.8%	ICU Level of Service	A

c Critical Lane Group

2030 ALTERNATIVE 5

(Parkway: Circle Drive Option) AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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		4.0
Lane Util. Factor		0.95	1.00	1.00	0.95		1.00		1.00	1.00		1.00
Frt		1.00	0.85	1.00	1.00		1.00		0.85	1.00		0.85
Flt Protected		1.00	1.00	0.95	1.00		0.95		1.00	0.95		1.00
Satd. Flow (prot)		3579	1601	1789	3579		1789		1601	1789		1601
Flt Permitted		1.00	1.00	0.14	1.00		0.95		1.00	0.95		1.00
Satd. Flow (perm)		3579	1601	261	3579		1789		1601	1789		1601
Volume (vph)	0	1191	10	8	196	0	10	0	9	6	0	6
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1191	10	8	196	0	10	0	9	6	0	6
Lane Group Flow (vph)	0	1191	10	8	196	0	10	0	9	6	0	6
Turn Type			Perm	Perm			custom		custom	Prot		custom
Protected Phases		8			8					2		
Permitted Phases		8	8	8			2		2			2
Actuated Green, G (s)		38.0	38.0	38.0	38.0		29.0		29.0	29.0		29.0
Effective Green, g (s)		38.0	38.0	38.0	38.0		29.0		29.0	29.0		29.0
Actuated g/C Ratio		0.51	0.51	0.51	0.51		0.39		0.39	0.39		0.39
Clearance Time (s)		4.0	4.0	4.0	4.0		4.0		4.0	4.0		4.0
Lane Grp Cap (vph)		1813	811	132	1813		692		619	692		619
v/s Ratio Prot		c0.33			0.05					0.00		
v/s Ratio Perm			0.01	0.03			0.01		c0.01			0.00
v/c Ratio		0.66	0.01	0.06	0.11		0.01		0.01	0.01		0.01
Uniform Delay, d1		13.7	9.2	9.4	9.7		14.2		14.2	14.2		14.2
Progression Factor		1.00	1.00	1.00	1.00		1.00		1.00	1.00		1.00
Incremental Delay, d2		1.9	0.0	0.9	0.1		0.0		0.0	0.0		0.0
Delay (s)		15.6	9.2	10.3	9.8		14.2		14.2	14.2		14.2
Level of Service		B	A	B	A		B		B	B		B
Approach Delay (s)		15.5			9.8			14.2			14.2	
Approach LOS		B			A			B			B	

Intersection Summary			
HCM Average Control Delay	14.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.38		
Cycle Length (s)	75.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	49.6%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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			0.91			0.91	
Frt		1.00			0.87			1.00			1.00	
Flt Protected		0.95			1.00			1.00			1.00	
Satd. Flow (prot)		3399			1632			5142			5141	
Flt Permitted		0.60			1.00			1.00			1.00	
Satd. Flow (perm)		2122			1625			5142			5141	
Volume (vph)	285	0	8	6	0	379	0	3145	0	0	2188	2
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	285	0	8	6	0	379	0	3145	0	0	2188	2
Lane Group Flow (vph)	0	293	0	0	385	0	0	3145	0	0	2190	0
Turn Type	Perm			Perm					Free			
Protected Phases		4			8			6			2	
Permitted Phases	4			8					Free			
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		731			560			2914			2913	
v/s Ratio Prot								c0.61			0.43	
v/s Ratio Perm		0.14			c0.24							
v/c Ratio		1.20dl			0.69			1.08			0.75	
Uniform Delay, d1		22.4			25.3			19.5			14.7	
Progression Factor		1.00			1.00			1.00			0.43	
Incremental Delay, d2		1.6			6.7			42.7			1.4	
Delay (s)		24.1			32.1			62.2			7.7	
Level of Service		C			C			E			A	
Approach Delay (s)		24.1			32.1			62.2			7.7	
Approach LOS		C			C			E			A	

Intersection Summary			
HCM Average Control Delay	38.6	HCM Level of Service	D
HCM Volume to Capacity ratio	0.93		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	110.3%	ICU Level of Service	G

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

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (veh/h)	507	4	11	61	45	94
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	507	4	11	61	45	94

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total (vph)	507	4	11	61	139
Volume Left (vph)	507	0	0	0	45
Volume Right (vph)	0	0	0	61	94
Hadj (s)	0.2	0.0	0.0	-0.6	-0.3
Departure Headway (s)	5.1	4.9	5.3	4.7	5.1
Degree Utilization, x	0.73	0.01	0.02	0.08	0.20
Capacity (veh/h)	685	710	642	725	655
Control Delay (s)	19.3	6.8	7.2	6.9	9.3
Approach Delay (s)	19.2		7.0		9.3
Approach LOS	C		A		A

Intersection Summary			
Delay	16.1		
HCM Level of Service	C		
Intersection Capacity Utilization	49.7%	ICU Level of Service	A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.87		1.00	1.00	0.97	
Flt Protected	1.00		0.95	1.00	1.00	
Satd. Flow (prot)	1630		1789	1883	1828	
Flt Permitted	1.00		0.66	1.00	1.00	
Satd. Flow (perm)	1630		1240	1883	1828	
Volume (vph)	2	280	85	520	121	34
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	2	280	85	520	121	34
Lane Group Flow (vph)	282	0	85	520	155	0
Turn Type			Perm			
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	23.5		24.0	24.0	24.0	
Effective Green, g (s)	23.5		24.0	24.0	24.0	
Actuated g/C Ratio	0.42		0.43	0.43	0.43	
Clearance Time (s)	4.0		4.0	4.0	4.0	
Lane Grp Cap (vph)	690		536	814	790	
v/s Ratio Prot	c0.17			c0.28	0.08	
v/s Ratio Perm			0.07			
v/c Ratio	0.41		0.16	0.64	0.20	
Uniform Delay, d1	11.2		9.6	12.4	9.8	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	1.8		0.6	3.8	0.6	
Delay (s)	12.9		10.2	16.2	10.3	
Level of Service	B		B	B	B	
Approach Delay (s)	12.9			15.3	10.3	
Approach LOS	B			B	B	

Intersection Summary			
HCM Average Control Delay	13.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.52		
Cycle Length (s)	55.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	51.5%	ICU Level of Service	A

c Critical Lane Group

Movement	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	398	40	32	74	151	63
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	398	40	32	74	151	63

Direction, Lane #	SB 1	SE 1	SE 2	NW 1	NW 2
Volume Total (vph)	438	57	49	101	113
Volume Left (vph)	398	32	0	0	0
Volume Right (vph)	40	0	0	0	63
Hadj (s)	0.2	0.1	0.0	0.0	-0.3
Departure Headway (s)	4.9	6.0	5.9	5.8	5.4
Degree Utilization, x	0.59	0.09	0.08	0.16	0.17
Capacity (veh/h)	708	557	568	585	621
Control Delay (s)	14.8	8.4	8.2	8.7	8.3
Approach Delay (s)	14.8	8.3		8.5	
Approach LOS	B	A		A	

Intersection Summary			
Delay	12.1		
HCM Level of Service	B		
Intersection Capacity Utilization	37.3%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (veh/h)	0	5	6	3	5	0	33	0	2	0	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	0	5	6	3	5	0	33	0	2	0	0	0

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	5	6	3	5	33	2	0	0
Volume Left (vph)	0	0	3	0	33	0	0	0
Volume Right (vph)	0	6	0	0	0	2	0	0
Hadj (s)	0.0	-0.6	0.2	0.0	0.2	-0.6	0.0	0.0
Departure Headway (s)	4.6	4.0	4.8	4.6	4.8	4.0	4.6	4.6
Degree Utilization, x	0.01	0.01	0.00	0.01	0.04	0.00	0.00	0.00
Capacity (veh/h)	768	874	737	761	740	898	792	792
Control Delay (s)	6.5	5.9	6.6	6.5	6.8	5.8	6.4	6.4
Approach Delay (s)	6.1		6.5		6.7		0.0	
Approach LOS	A		A		A		A	

Intersection Summary			
Delay	6.6		
HCM Level of Service	A		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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			1.00		0.95			0.91			0.91	
Frt			0.86		1.00			1.00			1.00	
Flt Protected			1.00		1.00			1.00			1.00	
Satd. Flow (prot)			1629		3579			5142			5142	
Flt Permitted			1.00		1.00			1.00			1.00	
Satd. Flow (perm)			1629		3579			5142			5142	
Volume (vph)	0	0	75	0	211	0	0	3063	0	0	2636	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	0	75	0	211	0	0	3063	0	0	2636	0
Lane Group Flow (vph)	0	0	75	0	211	0	0	3063	0	0	2636	0
Turn Type			custom	Perm								
Protected Phases					8			6			2	
Permitted Phases			4	8								
Actuated Green, G (s)			23.0		23.0			59.0			59.0	
Effective Green, g (s)			23.0		23.0			59.0			59.0	
Actuated g/C Ratio			0.26		0.26			0.66			0.66	
Clearance Time (s)			4.0		4.0			4.0			4.0	
Lane Grp Cap (vph)			416		915			3371			3371	
v/s Ratio Prot					c0.06			c0.60			0.51	
v/s Ratio Perm			0.05									
v/c Ratio			0.18		0.23			0.91			0.78	
Uniform Delay, d1			26.1		26.5			13.2			11.0	
Progression Factor			1.00		1.00			1.00			1.00	
Incremental Delay, d2			0.9		0.6			4.8			1.9	
Delay (s)			27.1		27.1			18.0			12.8	
Level of Service			C		C			B			B	
Approach Delay (s)		27.1			27.1			18.0			12.8	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	16.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.72		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	79.7%	ICU Level of Service	C

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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		4.0
Lane Util. Factor		0.95		1.00	1.00		0.97	1.00	1.00	1.00		1.00
Frt		0.98		1.00	1.00		1.00	1.00	0.85	1.00		0.85
Flt Protected		1.00		0.95	1.00		0.95	1.00	1.00	0.95		1.00
Satd. Flow (prot)		3517		1789	1883		3471	1883	1601	1789		1601
Flt Permitted		1.00		0.69	1.00		0.95	1.00	1.00	0.62		1.00
Satd. Flow (perm)		3517		1303	1883		3471	1883	1601	1171		1601
Volume (vph)	0	85	11	1	5	0	1182	214	429	4	0	58
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	85	11	1	5	0	1182	214	429	4	0	58
Lane Group Flow (vph)	0	96	0	1	5	0	1182	214	429	4	0	58
Turn Type				Perm			Perm		Perm	custom		custom
Protected Phases		4			8			6				
Permitted Phases		4		8			6		6	2		2
Actuated Green, G (s)		23.5		23.5	23.5		58.5	58.5	58.5	58.5		58.5
Effective Green, g (s)		23.5		23.5	23.5		58.5	58.5	58.5	58.5		58.5
Actuated g/C Ratio		0.26		0.26	0.26		0.65	0.65	0.65	0.65		0.65
Clearance Time (s)		4.0		4.0	4.0		4.0	4.0	4.0	4.0		4.0
Lane Grp Cap (vph)		918		340	492		2256	1224	1041	761		1041
v/s Ratio Prot		c0.03			0.00			0.11				
v/s Ratio Perm				0.00			c0.34		0.27	0.00		0.04
v/c Ratio		0.10		0.00	0.01		0.52	0.17	0.41	0.01		0.06
Uniform Delay, d1		25.3		24.6	24.6		8.4	6.2	7.5	5.5		5.7
Progression Factor		1.00		1.30	1.25		1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2		0.2		0.0	0.0		0.9	0.3	1.2	0.0		0.1
Delay (s)		25.5		32.1	30.9		9.2	6.5	8.7	5.5		5.8
Level of Service		C		C	C		A	A	A	A		A
Approach Delay (s)		25.5			31.1			8.8			5.8	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM Average Control Delay	9.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.40		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	50.6%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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
Lane Util. Factor		0.95			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				0.95		1.00
Satd. Flow (prot)		3555			1883	1601				1789		1601
Flt Permitted		0.92			1.00	1.00				0.95		1.00
Satd. Flow (perm)		3290			1883	1601				1789		1601
Volume (vph)	122	1185	18	0	6	190	0	0	0	4	0	6
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	122	1185	18	0	6	190	0	0	0	4	0	6
Lane Group Flow (vph)	0	1325	0	0	6	190	0	0	0	4	0	6
Turn Type	Perm					Free				custom		custom
Protected Phases		4			8							
Permitted Phases	4					Free				2		2
Actuated Green, G (s)		59.0			59.0	90.0				23.0		23.0
Effective Green, g (s)		59.0			59.0	90.0				23.0		23.0
Actuated g/C Ratio		0.66			0.66	1.00				0.26		0.26
Clearance Time (s)		4.0			4.0					4.0		4.0
Lane Grp Cap (vph)		2157			1234	1601				457		409
v/s Ratio Prot					0.00							
v/s Ratio Perm		c0.40				c0.12				0.00		0.00
v/c Ratio		0.61			0.00	0.12				0.01		0.01
Uniform Delay, d1		8.9			5.4	0.0				25.0		25.0
Progression Factor		1.31			1.00	1.00				1.00		1.00
Incremental Delay, d2		1.2			0.0	0.2				0.0		0.1
Delay (s)		12.9			5.4	0.2				25.0		25.1
Level of Service		B			A	A				C		C
Approach Delay (s)		12.9			0.3			0.0			25.1	
Approach LOS		B			A			A			C	

Intersection Summary			
HCM Average Control Delay	11.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.46		
Cycle Length (s)	90.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	50.2%	ICU Level of Service	A

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	1123	1	7	185	6	8
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	1123	1	7	185	6	8

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	749	375	69	123	14
Volume Left (vph)	0	0	7	0	6
Volume Right (vph)	0	1	0	0	8
Hadj (s)	0.0	0.0	0.1	0.0	-0.2
Departure Headway (s)	4.7	4.7	5.7	5.6	5.8
Degree Utilization, x	0.99	0.49	0.11	0.19	0.02
Capacity (veh/h)	749	751	616	622	599
Control Delay (s)	49.3	11.1	8.2	8.8	9.0
Approach Delay (s)	36.6		8.6		9.0
Approach LOS	E		A		A

Intersection Summary			
Delay	32.2		
HCM Level of Service	D		
Intersection Capacity Utilization	41.1%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	1122	6	5	198	5	2
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	1122	6	5	198	5	2

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	748	380	71	132	7
Volume Left (vph)	0	0	5	0	5
Volume Right (vph)	0	6	0	0	2
Hadj (s)	0.0	0.0	0.0	0.0	0.0
Departure Headway (s)	4.7	4.7	5.6	5.6	6.1
Degree Utilization, x	0.98	0.50	0.11	0.21	0.01
Capacity (veh/h)	751	754	619	624	575
Control Delay (s)	48.5	11.1	8.1	8.9	9.1
Approach Delay (s)	35.9		8.6		9.1
Approach LOS	E		A		A

Intersection Summary			
Delay	31.6		
HCM Level of Service	D		
Intersection Capacity Utilization	41.2%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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		1.00			1.00			0.91			0.91	
Frt		1.00			0.88			0.99			1.00	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1878			1647			5110			5139	
Flt Permitted		1.00			0.99			1.00			1.00	
Satd. Flow (perm)		1871			1629			5110			5139	
Volume (vph)	7	519	8	8	19	312	0	2443	105	0	1874	7
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	7	519	8	8	19	312	0	2443	105	0	1874	7
Lane Group Flow (vph)	0	534	0	0	339	0	0	2548	0	0	1881	0
Turn Type	Perm			Perm								
Protected Phases		4			8			6			2	
Permitted Phases	4			8				6				
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		644			561			2896			2912	
v/s Ratio Prot								c0.50			0.37	
v/s Ratio Perm		c0.29			0.21							
v/c Ratio		0.83			0.60			0.88			0.65	
Uniform Delay, d1		27.1			24.4			16.9			13.3	
Progression Factor		1.00			1.00			0.39			1.00	
Incremental Delay, d2		11.8			4.8			0.4			1.0	
Delay (s)		38.8			29.2			7.0			14.3	
Level of Service		D			C			A			B	
Approach Delay (s)		38.8			29.2			7.0			14.3	
Approach LOS		D			C			A			B	

Intersection Summary			
HCM Average Control Delay	14.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.86		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	87.7%	ICU Level of Service	D

c Critical Lane Group

Movement	WBL	WBR	NBL	NBR	SEL	SER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.76		1.00	0.94	
Frt	1.00	0.85		0.86	1.00	
Flt Protected	0.95	1.00		1.00	0.95	
Satd. Flow (prot)	1789	3650		1629	5046	
Flt Permitted	0.95	1.00		1.00	0.95	
Satd. Flow (perm)	1789	3650		1629	5046	
Volume (vph)	135	1852	0	118	2416	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	135	1852	0	118	2416	0
Lane Group Flow (vph)	135	1852	0	118	2416	0
Turn Type		custom		custom	Prot	
Protected Phases	8				2	
Permitted Phases		8 2		4		
Actuated Green, G (s)	25.0	90.0		25.0	57.0	
Effective Green, g (s)	25.0	90.0		25.0	57.0	
Actuated g/C Ratio	0.28	1.00		0.28	0.63	
Clearance Time (s)	4.0			4.0	4.0	
Lane Grp Cap (vph)	497	3650		453	3196	
v/s Ratio Prot	0.08				c0.48	
v/s Ratio Perm		c0.51		0.07		
v/c Ratio	0.27	0.51		0.26	0.76	
Uniform Delay, d1	25.4	0.0		25.3	11.6	
Progression Factor	1.00	1.00		0.52	0.19	
Incremental Delay, d2	1.3	0.5		1.4	0.8	
Delay (s)	26.7	0.5		14.5	2.9	
Level of Service	C	A		B	A	
Approach Delay (s)	2.3		14.5		2.9	
Approach LOS	A		B		A	

Intersection Summary			
HCM Average Control Delay	3.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.67		
Cycle Length (s)	90.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	60.1%	ICU Level of Service	B

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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		0.91			0.91			1.00			1.00	
Frt		0.98			1.00			1.00			0.92	
Flt Protected		1.00			1.00			0.95			0.98	
Satd. Flow (prot)		5024			5138			1795			1701	
Flt Permitted		1.00			1.00			0.71			0.89	
Satd. Flow (perm)		5024			5138			1336			1546	
Volume (vph)	0	2220	401	0	1815	10	209	6	2	12	1	19
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	2220	401	0	1815	10	209	6	2	12	1	19
Lane Group Flow (vph)	0	2621	0	0	1825	0	0	217	0	0	32	0
Turn Type							Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)		59.0			59.0			23.5			23.5	
Effective Green, g (s)		59.0			59.0			23.5			23.5	
Actuated g/C Ratio		0.65			0.65			0.26			0.26	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		3275			3350			347			401	
v/s Ratio Prot		c0.52			0.36							
v/s Ratio Perm								c0.16			0.02	
v/c Ratio		0.80			0.54			0.63			0.08	
Uniform Delay, d1		11.5			8.5			29.6			25.3	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		2.2			0.6			8.3			0.4	
Delay (s)		13.6			9.1			37.9			25.7	
Level of Service		B			A			D			C	
Approach Delay (s)		13.6			9.1			37.9			25.7	
Approach LOS		B			A			D			C	

Intersection Summary			
HCM Average Control Delay	13.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.75		
Cycle Length (s)	90.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	77.2%	ICU Level of Service	C

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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	
Lane Util. Factor	1.00	1.00			1.00			1.00			1.00	
Frt	1.00	1.00			1.00			1.00			0.95	
Flt Protected	0.95	1.00			1.00			0.96			0.98	
Satd. Flow (prot)	1789	1881			1881			1808			1758	
Flt Permitted	0.63	1.00			1.00			0.75			0.90	
Satd. Flow (perm)	1182	1881			1877			1411			1617	
Volume (vph)	283	208	2	3	185	1	149	34	2	15	10	14
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	283	208	2	3	185	1	149	34	2	15	10	14
Lane Group Flow (vph)	283	210	0	0	189	0	0	185	0	0	39	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	44.0	44.0			44.0			38.0			38.0	
Effective Green, g (s)	44.0	44.0			44.0			38.0			38.0	
Actuated g/C Ratio	0.49	0.49			0.49			0.42			0.42	
Clearance Time (s)	4.0	4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)	578	920			918			596			683	
v/s Ratio Prot		0.11										
v/s Ratio Perm	c0.24				0.10			c0.13			0.02	
v/c Ratio	0.49	0.23			0.21			0.31			0.06	
Uniform Delay, d1	15.5	13.2			13.1			17.3			15.4	
Progression Factor	1.00	1.00			0.94			1.00			1.00	
Incremental Delay, d2	2.9	0.6			0.5			1.4			0.2	
Delay (s)	18.4	13.8			12.8			18.6			15.6	
Level of Service	B	B			B			B			B	
Approach Delay (s)		16.4			12.8			18.6			15.6	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	16.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.41		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	52.5%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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		1.00			1.00			1.00			1.00	
Frt		0.98			0.98			1.00			0.99	
Flt Protected		0.97			0.99			1.00			1.00	
Satd. Flow (prot)		1785			1837			1882			1862	
Flt Permitted		0.85			0.98			1.00			0.99	
Satd. Flow (perm)		1573			1813			1875			1843	
Volume (vph)	34	8	7	3	12	2	5	562	2	12	574	49
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	34	8	7	3	12	2	5	562	2	12	574	49
Lane Group Flow (vph)	0	49	0	0	17	0	0	569	0	0	635	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		28.0			28.0			54.0			54.0	
Effective Green, g (s)		28.0			28.0			54.0			54.0	
Actuated g/C Ratio		0.31			0.31			0.60			0.60	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		489			564			1125			1106	
v/s Ratio Prot												
v/s Ratio Perm		c0.03			0.01			0.30			c0.34	
v/c Ratio		0.10			0.03			0.51			0.57	
Uniform Delay, d1		22.0			21.6			10.3			11.0	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.4			0.1			1.6			2.2	
Delay (s)		22.5			21.7			12.0			13.2	
Level of Service		C			C			B			B	
Approach Delay (s)		22.5			21.7			12.0			13.2	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	13.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.41		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	51.5%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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	1.00	1.00		1.00	1.00	1.00		0.91			0.91	
Frt	1.00	0.98		1.00	1.00	0.85		1.00			0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			1.00	
Satd. Flow (prot)	1789	1837		1789	1883	1601		5141			5040	
Flt Permitted	0.75	1.00		0.72	1.00	1.00		1.00			1.00	
Satd. Flow (perm)	1420	1837		1358	1883	1601		5141			5040	
Volume (vph)	483	46	9	1	6	357	0	2232	1	0	2250	342
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	483	46	9	1	6	357	0	2232	1	0	2250	342
Lane Group Flow (vph)	483	55	0	1	6	357	0	2233	0	0	2592	0
Turn Type	Perm			Perm		Perm						
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8						
Actuated Green, G (s)	30.0	30.0		30.0	30.0	30.0		52.0			52.0	
Effective Green, g (s)	30.0	30.0		30.0	30.0	30.0		52.0			52.0	
Actuated g/C Ratio	0.33	0.33		0.33	0.33	0.33		0.58			0.58	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Grp Cap (vph)	473	612		453	628	534		2970			2912	
v/s Ratio Prot		0.03			0.00			0.43			c0.51	
v/s Ratio Perm	c0.34			0.00		0.22						
v/c Ratio	1.02	0.09		0.00	0.01	0.67		0.75			0.89	
Uniform Delay, d1	30.0	20.6		20.0	20.1	25.7		14.2			16.5	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	46.8	0.3		0.0	0.0	6.5		1.8			4.6	
Delay (s)	76.8	20.9		20.0	20.1	32.2		16.0			21.1	
Level of Service	E	C		C	C	C		B			C	
Approach Delay (s)		71.1			32.0			16.0			21.1	
Approach LOS		E			C			B			C	

Intersection Summary			
HCM Average Control Delay	24.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.94		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	102.0%	ICU Level of Service	F

c Critical Lane Group

2030 ALTERNATIVE 5

(Parkway: Circle Drive Option) PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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
Lane Util. Factor		0.95			0.95		1.00		1.00	1.00		1.00
Frt		1.00			1.00		1.00		0.85	1.00		0.85
Flt Protected		1.00			1.00		0.95		1.00	0.95		1.00
Satd. Flow (prot)		3577			3579		1789		1601	1789		1601
Flt Permitted		1.00			1.00		0.95		1.00	0.95		1.00
Satd. Flow (perm)		3577			3579		1789		1601	1789		1601
Volume (vph)	0	825	3	0	1156	0	8	0	6	26	0	84
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	825	3	0	1156	0	8	0	6	26	0	84
Lane Group Flow (vph)	0	828	0	0	1156	0	8	0	6	26	0	84
Turn Type				Perm			custom		custom	Prot		custom
Protected Phases		8			8					2		
Permitted Phases		8		8			2		2			2
Actuated Green, G (s)		38.0			38.0		29.0		29.0	29.0		29.0
Effective Green, g (s)		38.0			38.0		29.0		29.0	29.0		29.0
Actuated g/C Ratio		0.51			0.51		0.39		0.39	0.39		0.39
Clearance Time (s)		4.0			4.0		4.0		4.0	4.0		4.0
Lane Grp Cap (vph)		1812			1813		692		619	692		619
v/s Ratio Prot		0.23			c0.32					0.01		
v/s Ratio Perm							0.00		0.00			c0.05
v/c Ratio		0.46			0.64		0.01		0.01	0.04		0.14
Uniform Delay, d1		11.9			13.5		14.2		14.2	14.3		14.9
Progression Factor		1.00			1.00		1.00		1.00	1.00		1.00
Incremental Delay, d2		0.8			1.7		0.0		0.0	0.1		0.5
Delay (s)		12.7			15.2		14.2		14.2	14.4		15.3
Level of Service		B			B		B		B	B		B
Approach Delay (s)		12.7			15.2			14.2			15.1	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	14.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.42		
Cycle Length (s)	75.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	50.5%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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			0.91			0.91	
Frt		0.99			0.87			1.00			1.00	
Flt Protected		0.95			1.00			1.00			1.00	
Satd. Flow (prot)		3391			1631			5142			5142	
Flt Permitted		0.61			1.00			1.00			1.00	
Satd. Flow (perm)		2161			1628			5142			5142	
Volume (vph)	115	0	6	6	0	507	0	2665	0	0	2796	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	115	0	6	6	0	507	0	2665	0	0	2796	0
Lane Group Flow (vph)	0	121	0	0	513	0	0	2665	0	0	2796	0
Turn Type	Perm			Perm					Free			
Protected Phases		4			8			6			2	
Permitted Phases	4			8					Free			
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		744			561			2914			2914	
v/s Ratio Prot								0.52			c0.54	
v/s Ratio Perm		0.06			c0.32							
v/c Ratio		0.16			0.91			0.91			0.96	
Uniform Delay, d1		20.5			28.2			17.5			18.5	
Progression Factor		1.00			1.00			1.00			0.57	
Incremental Delay, d2		0.5			21.9			5.8			6.0	
Delay (s)		21.0			50.1			23.3			16.6	
Level of Service		C			D			C			B	
Approach Delay (s)		21.0			50.1			23.3			16.6	
Approach LOS		C			D			C			B	

Intersection Summary			
HCM Average Control Delay	22.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.94		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	102.1%	ICU Level of Service	F

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (veh/h)	392	6	19	31	51	116
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	392	6	19	31	51	116

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total (vph)	392	6	19	31	167
Volume Left (vph)	392	0	0	0	51
Volume Right (vph)	0	0	0	31	116
Hadj (s)	0.2	0.0	0.0	-0.6	-0.3
Departure Headway (s)	5.2	5.0	5.3	4.7	4.7
Degree Utilization, x	0.56	0.01	0.03	0.04	0.22
Capacity (veh/h)	677	702	646	728	711
Control Delay (s)	13.5	6.8	7.2	6.7	9.0
Approach Delay (s)	13.4		6.9		9.0
Approach LOS	B		A		A

Intersection Summary			
Delay	11.7		
HCM Level of Service	B		
Intersection Capacity Utilization	45.0%	ICU Level of Service	A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.87		1.00	1.00	0.98	
Flt Protected	1.00		0.95	1.00	1.00	
Satd. Flow (prot)	1630		1789	1883	1843	
Flt Permitted	1.00		0.67	1.00	1.00	
Satd. Flow (perm)	1630		1253	1883	1843	
Volume (vph)	3	490	78	422	121	23
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	3	490	78	422	121	23
Lane Group Flow (vph)	493	0	78	422	144	0
Turn Type			Perm			
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	23.5		24.0	24.0	24.0	
Effective Green, g (s)	23.5		24.0	24.0	24.0	
Actuated g/C Ratio	0.42		0.43	0.43	0.43	
Clearance Time (s)	4.0		4.0	4.0	4.0	
Lane Grp Cap (vph)	690		542	814	797	
v/s Ratio Prot	c0.30			c0.22	0.08	
v/s Ratio Perm			0.06			
v/c Ratio	0.71		0.14	0.52	0.18	
Uniform Delay, d1	13.2		9.5	11.5	9.7	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	6.2		0.6	2.4	0.5	
Delay (s)	19.5		10.1	13.9	10.2	
Level of Service	B		B	B	B	
Approach Delay (s)	19.5			13.3	10.2	
Approach LOS	B			B	B	

Intersection Summary			
HCM Average Control Delay	15.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Cycle Length (s)	55.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	59.4%	ICU Level of Service	A

c Critical Lane Group

Movement	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	370	83	52	93	216	194
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	370	83	52	93	216	194

Direction, Lane #	SB 1	SE 1	SE 2	NW 1	NW 2
Volume Total (vph)	453	83	62	144	266
Volume Left (vph)	370	52	0	0	0
Volume Right (vph)	83	0	0	0	194
Hadj (s)	0.1	0.2	0.0	0.0	-0.4
Departure Headway (s)	5.3	6.4	6.3	6.0	5.6
Degree Utilization, x	0.67	0.15	0.11	0.24	0.41
Capacity (veh/h)	651	521	531	572	621
Control Delay (s)	18.6	9.4	8.9	9.7	11.2
Approach Delay (s)	18.6	9.2		10.6	
Approach LOS	C	A		B	

Intersection Summary			
Delay	14.0		
HCM Level of Service	B		
Intersection Capacity Utilization	44.4%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (veh/h)	0	14	25	10	4	0	18	0	12	0	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	0	14	25	10	4	0	18	0	12	0	0	0

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	14	25	10	4	18	12	0	0
Volume Left (vph)	0	0	10	0	18	0	0	0
Volume Right (vph)	0	25	0	0	0	12	0	0
Hadj (s)	0.0	-0.6	0.2	0.0	0.2	-0.6	0.0	0.0
Departure Headway (s)	4.6	4.0	4.8	4.6	4.9	4.1	4.6	4.6
Degree Utilization, x	0.02	0.03	0.01	0.01	0.02	0.01	0.00	0.00
Capacity (veh/h)	771	878	738	761	725	866	776	776
Control Delay (s)	6.5	5.9	6.7	6.5	6.8	5.9	6.4	6.4
Approach Delay (s)	6.1		6.6		6.4		0.0	
Approach LOS	A		A		A		A	

Intersection Summary			
Delay	6.3		
HCM Level of Service	A		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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			1.00		0.95			0.91			0.91	
Frt			0.86		1.00			1.00			1.00	
Flt Protected			1.00		1.00			1.00			1.00	
Satd. Flow (prot)			1629		3579			5142			5142	
Flt Permitted			1.00		1.00			1.00			1.00	
Satd. Flow (perm)			1629		3579			5142			5142	
Volume (vph)	0	0	234	0	124	0	0	2431	0	0	3291	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	0	234	0	124	0	0	2431	0	0	3291	0
Lane Group Flow (vph)	0	0	234	0	124	0	0	2431	0	0	3291	0
Turn Type			custom	Perm								
Protected Phases					8			6			2	
Permitted Phases			4	8								
Actuated Green, G (s)			23.0		23.0			59.0			59.0	
Effective Green, g (s)			23.0		23.0			59.0			59.0	
Actuated g/C Ratio			0.26		0.26			0.66			0.66	
Clearance Time (s)			4.0		4.0			4.0			4.0	
Lane Grp Cap (vph)			416		915			3371			3371	
v/s Ratio Prot					0.03			0.47			c0.64	
v/s Ratio Perm			c0.14									
v/c Ratio			0.56		0.14			0.72			0.98	
Uniform Delay, d1			29.1		25.8			10.1			14.8	
Progression Factor			1.00		1.00			1.00			1.00	
Incremental Delay, d2			5.4		0.3			1.4			10.9	
Delay (s)			34.5		26.1			11.5			25.7	
Level of Service			C		C			B			C	
Approach Delay (s)		34.5			26.1			11.5			25.7	
Approach LOS		C			C			B			C	

Intersection Summary			
HCM Average Control Delay	20.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.86		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	74.9%	ICU Level of Service	C

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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		4.0
Lane Util. Factor		0.95		1.00	1.00		0.97	1.00	1.00	1.00		1.00
Frt		1.00		1.00	1.00		1.00	1.00	0.85	1.00		0.85
Flt Protected		1.00		0.95	1.00		0.95	1.00	1.00	0.95		1.00
Satd. Flow (prot)		3563		1789	1883		3471	1883	1601	1789		1601
Flt Permitted		1.00		0.57	1.00		0.95	1.00	1.00	0.69		1.00
Satd. Flow (perm)		3563		1073	1883		3471	1883	1601	1295		1601
Volume (vph)	0	239	7	4	7	0	781	108	432	14	0	187
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	239	7	4	7	0	781	108	432	14	0	187
Lane Group Flow (vph)	0	246	0	4	7	0	781	108	432	14	0	187
Turn Type				Perm			Perm		Perm	custom		custom
Protected Phases		4			8			6				
Permitted Phases		4		8			6		6	2		2
Actuated Green, G (s)		23.5		23.5	23.5		58.5	58.5	58.5	58.5		58.5
Effective Green, g (s)		23.5		23.5	23.5		58.5	58.5	58.5	58.5		58.5
Actuated g/C Ratio		0.26		0.26	0.26		0.65	0.65	0.65	0.65		0.65
Clearance Time (s)		4.0		4.0	4.0		4.0	4.0	4.0	4.0		4.0
Lane Grp Cap (vph)		930		280	492		2256	1224	1041	842		1041
v/s Ratio Prot		c0.07			0.00			0.06				
v/s Ratio Perm				0.00			0.22		c0.27	0.01		0.12
v/c Ratio		0.26		0.01	0.01		0.35	0.09	0.41	0.02		0.18
Uniform Delay, d1		26.4		24.7	24.7		7.1	5.8	7.5	5.6		6.2
Progression Factor		1.00		1.05	1.08		1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2		0.7		0.1	0.1		0.4	0.1	1.2	0.0		0.4
Delay (s)		27.1		26.1	26.6		7.5	6.0	8.8	5.6		6.6
Level of Service		C		C	C		A	A	A	A		A
Approach Delay (s)		27.1			26.4			7.8			6.5	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM Average Control Delay	10.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.37		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	50.7%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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
Lane Util. Factor	1.00	1.00			1.00	1.00				1.00		1.00
Frt	1.00	1.00			1.00	0.85				1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00				0.95		1.00
Satd. Flow (prot)	1789	1880			1883	1601				1789		1601
Flt Permitted	0.75	1.00			1.00	1.00				0.95		1.00
Satd. Flow (perm)	1416	1880			1883	1601				1789		1601
Volume (vph)	387	810	10	0	9	1224	0	0	0	3	0	16
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	387	810	10	0	9	1224	0	0	0	3	0	16
Lane Group Flow (vph)	387	820	0	0	9	1224	0	0	0	3	0	16
Turn Type	Perm					Free				custom		custom
Protected Phases		4			8							
Permitted Phases	4					Free				2		2
Actuated Green, G (s)	59.0	59.0			59.0	90.0				23.0		23.0
Effective Green, g (s)	59.0	59.0			59.0	90.0				23.0		23.0
Actuated g/C Ratio	0.66	0.66			0.66	1.00				0.26		0.26
Clearance Time (s)	4.0	4.0			4.0					4.0		4.0
Lane Grp Cap (vph)	928	1232			1234	1601				457		409
v/s Ratio Prot		0.44			0.00							
v/s Ratio Perm	0.27					c0.76				0.00		0.01
v/c Ratio	0.42	0.67			0.01	0.76				0.01		0.04
Uniform Delay, d1	7.3	9.5			5.4	0.0				25.0		25.2
Progression Factor	1.07	1.11			1.00	1.00				1.00		1.00
Incremental Delay, d2	1.3	2.8			0.0	3.5				0.0		0.2
Delay (s)	9.2	13.3			5.4	3.5				25.0		25.4
Level of Service	A	B			A	A				C		C
Approach Delay (s)		12.0			3.5			0.0			25.3	
Approach LOS		B			A			A			C	

Intersection Summary			
HCM Average Control Delay	7.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.76		
Cycle Length (s)	90.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	53.2%	ICU Level of Service	A

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	814	3	5	1180	1	3
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	814	3	5	1180	1	3

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	543	274	398	787	4
Volume Left (vph)	0	0	5	0	1
Volume Right (vph)	0	3	0	0	3
Hadj (s)	0.0	0.0	0.0	0.0	-0.4
Departure Headway (s)	5.7	5.7	5.4	5.4	6.4
Degree Utilization, x	0.87	0.44	0.60	1.19	0.01
Capacity (veh/h)	616	613	643	667	547
Control Delay (s)	33.6	11.9	15.2	119.0	9.4
Approach Delay (s)	26.3		84.1		9.4
Approach LOS	D		F		A

Intersection Summary			
Delay	60.4		
HCM Level of Service	F		
Intersection Capacity Utilization	44.0%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	805	20	6	1189	5	2
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	805	20	6	1189	5	2

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	537	288	402	793	7
Volume Left (vph)	0	0	6	0	5
Volume Right (vph)	0	20	0	0	2
Hadj (s)	0.0	0.0	0.0	0.0	0.0
Departure Headway (s)	5.8	5.7	5.5	5.5	6.8
Degree Utilization, x	0.86	0.46	0.61	1.21	0.01
Capacity (veh/h)	614	614	640	663	517
Control Delay (s)	32.9	12.3	15.5	125.1	9.9
Approach Delay (s)	25.7		88.2		9.9
Approach LOS	D		F		A

Intersection Summary			
Delay	62.5		
HCM Level of Service	F		
Intersection Capacity Utilization	44.6%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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		1.00			1.00			0.91			0.91	
Frt		1.00			0.88			1.00			1.00	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1872			1656			5135			5141	
Flt Permitted		0.90			1.00			1.00			1.00	
Satd. Flow (perm)		1698			1652			5135			5141	
Volume (vph)	48	490	6	3	44	393	0	2109	19	0	2398	1
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	48	490	6	3	44	393	0	2109	19	0	2398	1
Lane Group Flow (vph)	0	544	0	0	440	0	0	2128	0	0	2399	0
Turn Type	Perm			Perm								
Protected Phases		4			8			6			2	
Permitted Phases	4			8				6				
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		585			569			2910			2913	
v/s Ratio Prot								0.41			c0.47	
v/s Ratio Perm		c0.32			0.27							
v/c Ratio		0.93			0.77			0.73			0.82	
Uniform Delay, d1		28.5			26.4			14.4			15.8	
Progression Factor		1.00			1.00			0.35			0.67	
Incremental Delay, d2		23.4			9.8			0.7			2.1	
Delay (s)		51.9			36.2			5.7			12.8	
Level of Service		D			D			A			B	
Approach Delay (s)		51.9			36.2			5.7			12.8	
Approach LOS		D			D			A			B	

Intersection Summary			
HCM Average Control Delay	15.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.86		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	111.9%	ICU Level of Service	G

c Critical Lane Group

Movement	WBL	WBR	NBL	NBR	SEL	SER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.76		1.00	0.94	
Frt	1.00	0.85		0.86	1.00	
Flt Protected	0.95	1.00		1.00	0.95	
Satd. Flow (prot)	1789	3650		1629	5046	
Flt Permitted	0.95	1.00		1.00	0.95	
Satd. Flow (perm)	1789	3650		1629	5046	
Volume (vph)	207	2367	0	121	2077	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	207	2367	0	121	2077	0
Lane Group Flow (vph)	207	2367	0	121	2077	0
Turn Type	Prot			custom		
Protected Phases	8				2	
Permitted Phases		8 2		2		
Actuated Green, G (s)	25.0	90.0		57.0	57.0	
Effective Green, g (s)	25.0	90.0		57.0	57.0	
Actuated g/C Ratio	0.28	1.00		0.63	0.63	
Clearance Time (s)	4.0			4.0	4.0	
Lane Grp Cap (vph)	497	3650		1032	3196	
v/s Ratio Prot	0.12				0.41	
v/s Ratio Perm		c0.65		0.07		
v/c Ratio	0.42	0.65		0.12	0.65	
Uniform Delay, d1	26.5	0.0		6.5	10.3	
Progression Factor	1.37	1.00		1.00	0.19	
Incremental Delay, d2	1.2	0.4		0.2	0.7	
Delay (s)	37.6	0.4		6.8	2.7	
Level of Service	D	A		A	A	
Approach Delay (s)	3.4		6.8		2.7	
Approach LOS	A		A		A	

Intersection Summary			
HCM Average Control Delay	3.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.65		
Cycle Length (s)	90.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	58.5%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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		0.91			0.91			1.00			1.00	
Frt		0.98			1.00			1.00			0.94	
Flt Protected		1.00			1.00			0.95			0.99	
Satd. Flow (prot)		5033			5133			1796			1738	
Flt Permitted		1.00			1.00			0.71			0.89	
Satd. Flow (perm)		5033			5133			1332			1578	
Volume (vph)	0	1951	321	0	2254	26	426	12	0	10	8	16
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1951	321	0	2254	26	426	12	0	10	8	16
Lane Group Flow (vph)	0	2272	0	0	2280	0	0	438	0	0	34	0
Turn Type							Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)		45.9			45.9			36.1			36.1	
Effective Green, g (s)		45.9			45.9			36.1			36.1	
Actuated g/C Ratio		0.51			0.51			0.40			0.40	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		2567			2618			534			633	
v/s Ratio Prot		c0.45			0.44							
v/s Ratio Perm								c0.33			0.02	
v/c Ratio		0.89			0.87			0.82			0.05	
Uniform Delay, d1		19.7			19.4			24.1			16.5	
Progression Factor		0.68			1.00			1.00			1.00	
Incremental Delay, d2		4.0			4.3			13.2			0.2	
Delay (s)		17.4			23.8			37.3			16.7	
Level of Service		B			C			D			B	
Approach Delay (s)		17.4			23.8			37.3			16.7	
Approach LOS		B			C			D			B	

Intersection Summary			
HCM Average Control Delay	22.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.86		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	82.4%	ICU Level of Service	D

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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	
Lane Util. Factor	1.00	1.00			1.00			1.00			1.00	
Frt	1.00	0.96			0.99			0.97			1.00	
Flt Protected	0.95	1.00			1.00			0.99			1.00	
Satd. Flow (prot)	1789	1800			1868			1812			1870	
Flt Permitted	0.48	1.00			0.99			0.97			0.99	
Satd. Flow (perm)	901	1800			1859			1770			1859	
Volume (vph)	90	220	92	7	338	20	14	52	19	3	35	1
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	90	220	92	7	338	20	14	52	19	3	35	1
Lane Group Flow (vph)	90	312	0	0	365	0	0	85	0	0	39	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	44.0	44.0			44.0			38.0			38.0	
Effective Green, g (s)	44.0	44.0			44.0			38.0			38.0	
Actuated g/C Ratio	0.49	0.49			0.49			0.42			0.42	
Clearance Time (s)	4.0	4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)	440	880			909			747			785	
v/s Ratio Prot		0.17										
v/s Ratio Perm	0.10				c0.20			c0.05			0.02	
v/c Ratio	0.20	0.35			0.40			0.11			0.05	
Uniform Delay, d1	13.1	14.2			14.6			15.8			15.3	
Progression Factor	1.00	1.00			1.20			1.00			1.00	
Incremental Delay, d2	1.0	1.1			1.3			0.3			0.1	
Delay (s)	14.1	15.3			18.9			16.1			15.5	
Level of Service	B	B			B			B			B	
Approach Delay (s)		15.1			18.9			16.1			15.5	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	16.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.27		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	51.6%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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		1.00			1.00			1.00			1.00	
Frt		0.99			0.99			1.00			0.99	
Flt Protected		0.96			1.00			1.00			1.00	
Satd. Flow (prot)		1800			1868			1882			1859	
Flt Permitted		0.79			1.00			1.00			0.99	
Satd. Flow (perm)		1478			1866			1879			1850	
Volume (vph)	40	7	2	1	80	5	3	567	2	7	563	59
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	40	7	2	1	80	5	3	567	2	7	563	59
Lane Group Flow (vph)	0	49	0	0	86	0	0	572	0	0	629	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		28.0			28.0			54.0			54.0	
Effective Green, g (s)		28.0			28.0			54.0			54.0	
Actuated g/C Ratio		0.31			0.31			0.60			0.60	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		460			581			1127			1110	
v/s Ratio Prot												
v/s Ratio Perm		0.03			c0.05			0.30			c0.34	
v/c Ratio		0.11			0.15			0.51			0.57	
Uniform Delay, d1		22.1			22.4			10.4			10.9	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.5			0.5			1.6			2.1	
Delay (s)		22.6			22.9			12.0			13.0	
Level of Service		C			C			B			B	
Approach Delay (s)		22.6			22.9			12.0			13.0	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	13.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.42		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	48.9%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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	1.00	1.00		1.00	1.00	1.00		0.91			0.91	
Frt	1.00	0.96		1.00	1.00	0.85		1.00			0.97	
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			1.00	
Satd. Flow (prot)	1789	1806		1789	1883	1601		5141			4997	
Flt Permitted	0.72	1.00		0.74	1.00	1.00		1.00			1.00	
Satd. Flow (perm)	1359	1806		1391	1883	1601		5141			4997	
Volume (vph)	240	21	8	1	54	381	0	2169	1	0	2503	578
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	240	21	8	1	54	381	0	2169	1	0	2503	578
Lane Group Flow (vph)	240	29	0	1	54	381	0	2170	0	0	3081	0
Turn Type	Perm			Perm		Perm						
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8						
Actuated Green, G (s)	30.0	30.0		30.0	30.0	30.0		52.0			52.0	
Effective Green, g (s)	30.0	30.0		30.0	30.0	30.0		52.0			52.0	
Actuated g/C Ratio	0.33	0.33		0.33	0.33	0.33		0.58			0.58	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Grp Cap (vph)	453	602		464	628	534		2970			2887	
v/s Ratio Prot		0.02			0.03			0.42			c0.62	
v/s Ratio Perm	0.18			0.00		c0.24						
v/c Ratio	0.53	0.05		0.00	0.09	0.71		0.73			1.07	
Uniform Delay, d1	24.3	20.3		20.0	20.6	26.2		13.9			19.0	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	4.4	0.2		0.0	0.3	7.9		1.6			38.1	
Delay (s)	28.7	20.5		20.0	20.9	34.1		15.5			57.1	
Level of Service	C	C		C	C	C		B			E	
Approach Delay (s)		27.8			32.5			15.5			57.1	
Approach LOS		C			C			B			E	

Intersection Summary			
HCM Average Control Delay	38.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.94		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	88.8%	ICU Level of Service	D

c Critical Lane Group

2030 ALTERNATIVE 5

(Parkway: Circle Drive Option) WEEKEND

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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		0.95	1.00		0.95		1.00		1.00	1.00		1.00
Frt		1.00	0.85		1.00		1.00		0.85	1.00		0.85
Flt Protected		1.00	1.00		1.00		0.95		1.00	0.95		1.00
Satd. Flow (prot)		3579	1601		3579		1789		1601	1789		1601
Flt Permitted		1.00	1.00		1.00		0.95		1.00	0.95		1.00
Satd. Flow (perm)		3579	1601		3579		1789		1601	1789		1601
Volume (vph)	0	522	3	0	488	0	6	0	5	2	0	9
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	522	3	0	488	0	6	0	5	2	0	9
Lane Group Flow (vph)	0	522	3	0	488	0	6	0	5	2	0	9
Turn Type			Perm	Perm			custom		custom	Prot		custom
Protected Phases		8			8					2		
Permitted Phases		8	8	8			2		2			2
Actuated Green, G (s)		38.0	38.0		38.0		29.0		29.0	29.0		29.0
Effective Green, g (s)		38.0	38.0		38.0		29.0		29.0	29.0		29.0
Actuated g/C Ratio		0.51	0.51		0.51		0.39		0.39	0.39		0.39
Clearance Time (s)		4.0	4.0		4.0		4.0		4.0	4.0		4.0
Lane Grp Cap (vph)		1813	811		1813		692		619	692		619
v/s Ratio Prot		c0.15			0.14					0.00		
v/s Ratio Perm			0.00				0.00		0.00			c0.01
v/c Ratio		0.29	0.00		0.27		0.01		0.01	0.00		0.01
Uniform Delay, d1		10.7	9.1		10.6		14.2		14.2	14.1		14.2
Progression Factor		1.00	1.00		1.00		1.00		1.00	1.00		1.00
Incremental Delay, d2		0.4	0.0		0.4		0.0		0.0	0.0		0.0
Delay (s)		11.1	9.2		10.9		14.2		14.2	14.1		14.2
Level of Service		B	A		B		B		B	B		B
Approach Delay (s)		11.1			10.9			14.2			14.2	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	11.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.17		
Cycle Length (s)	75.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	31.1%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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			0.91			0.91	
Frt		1.00			0.87			1.00			1.00	
Flt Protected		0.95			1.00			1.00			1.00	
Satd. Flow (prot)		3403			1632			5142			5140	
Flt Permitted		0.59			1.00			1.00			1.00	
Satd. Flow (perm)		2098			1625			5142			5140	
Volume (vph)	305	0	5	5	0	320	0	2395	0	0	2354	5
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	305	0	5	5	0	320	0	2395	0	0	2354	5
Lane Group Flow (vph)	0	310	0	0	325	0	0	2395	0	0	2359	0
Turn Type	Perm			Perm					Free			
Protected Phases		4			8			6			2	
Permitted Phases	4			8					Free			
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		723			560			2914			2913	
v/s Ratio Prot								c0.47			0.46	
v/s Ratio Perm		0.15			c0.20							
v/c Ratio		1.11dl			0.58			0.82			0.81	
Uniform Delay, d1		22.7			24.2			15.8			15.6	
Progression Factor		1.00			1.00			1.00			0.61	
Incremental Delay, d2		1.9			4.3			2.8			1.9	
Delay (s)		24.5			28.5			18.6			11.5	
Level of Service		C			C			B			B	
Approach Delay (s)		24.5			28.5			18.6			11.5	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	16.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.73		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	93.3%	ICU Level of Service	E

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

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (veh/h)	144	0	4	21	17	17
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	144	0	4	21	17	17

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total (vph)	144	0	4	21	34
Volume Left (vph)	144	0	0	0	17
Volume Right (vph)	0	0	0	21	17
Hadj (s)	0.2	0.0	0.0	-0.6	-0.2
Departure Headway (s)	4.8	4.6	4.7	4.1	4.1
Degree Utilization, x	0.19	0.00	0.01	0.02	0.04
Capacity (veh/h)	738	787	755	856	830
Control Delay (s)	7.8	6.4	6.5	6.0	7.3
Approach Delay (s)	7.8		6.1		7.3
Approach LOS	A		A		A

Intersection Summary			
Delay	7.5		
HCM Level of Service	A		
Intersection Capacity Utilization	24.6%	ICU Level of Service	A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.87		1.00	1.00	0.99	
Flt Protected	1.00		0.95	1.00	1.00	
Satd. Flow (prot)	1631		1789	1883	1873	
Flt Permitted	1.00		0.74	1.00	1.00	
Satd. Flow (perm)	1631		1396	1883	1873	
Volume (vph)	4	333	4	145	24	1
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	4	333	4	145	24	1
Lane Group Flow (vph)	337	0	4	145	25	0
Turn Type			Perm			
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	23.5		24.0	24.0	24.0	
Effective Green, g (s)	23.5		24.0	24.0	24.0	
Actuated g/C Ratio	0.42		0.43	0.43	0.43	
Clearance Time (s)	4.0		4.0	4.0	4.0	
Lane Grp Cap (vph)	691		604	814	810	
v/s Ratio Prot	c0.21			c0.08	0.01	
v/s Ratio Perm			0.00			
v/c Ratio	0.49		0.01	0.18	0.03	
Uniform Delay, d1	11.6		9.0	9.7	9.1	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	2.5		0.0	0.5	0.1	
Delay (s)	14.1		9.0	10.2	9.1	
Level of Service	B		A	B	A	
Approach Delay (s)	14.1			10.1	9.1	
Approach LOS	B			B	A	

Intersection Summary			
HCM Average Control Delay	12.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.33		
Cycle Length (s)	55.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	35.1%	ICU Level of Service	A

c Critical Lane Group

Movement	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	459	34	33	25	37	113
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	459	34	33	25	37	113

Direction, Lane #	SB 1	SE 1	SE 2	NW 1	NW 2
Volume Total (vph)	493	41	17	25	125
Volume Left (vph)	459	33	0	0	0
Volume Right (vph)	34	0	0	0	113
Hadj (s)	0.2	0.2	0.0	0.0	-0.5
Departure Headway (s)	4.6	6.0	5.9	5.8	5.2
Degree Utilization, x	0.63	0.07	0.03	0.04	0.18
Capacity (veh/h)	763	548	562	576	637
Control Delay (s)	15.3	8.3	7.8	7.8	8.2
Approach Delay (s)	15.3	8.2		8.1	
Approach LOS	C	A		A	

Intersection Summary			
Delay	13.2		
HCM Level of Service	B		
Intersection Capacity Utilization	38.8%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (veh/h)	0	6	5	1	1	0	9	0	0	0	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	0	6	5	1	1	0	9	0	0	0	0	0

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	6	5	1	1	9	0	0	0
Volume Left (vph)	0	0	1	0	9	0	0	0
Volume Right (vph)	0	5	0	0	0	0	0	0
Hadj (s)	0.0	-0.6	0.2	0.0	0.2	0.0	0.0	0.0
Departure Headway (s)	4.6	4.0	4.8	4.6	4.8	4.5	4.5	4.5
Degree Utilization, x	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.00
Capacity (veh/h)	783	904	751	775	743	799	798	798
Control Delay (s)	6.4	5.8	6.6	6.4	6.6	6.3	6.3	6.3
Approach Delay (s)	6.1		6.5		6.6		0.0	
Approach LOS	A		A		A		A	

Intersection Summary			
Delay	6.4		
HCM Level of Service	A		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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			1.00		0.95			0.91			0.91	
Frt			0.86		1.00			1.00			1.00	
Flt Protected			1.00		1.00			1.00			1.00	
Satd. Flow (prot)			1629		3579			5142			5142	
Flt Permitted			1.00		1.00			1.00			1.00	
Satd. Flow (perm)			1629		3579			5142			5142	
Volume (vph)	0	0	82	0	72	0	0	2306	0	0	2907	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	0	82	0	72	0	0	2306	0	0	2907	0
Lane Group Flow (vph)	0	0	82	0	72	0	0	2306	0	0	2907	0
Turn Type			custom	Perm								
Protected Phases					8			6			2	
Permitted Phases			4	8								
Actuated Green, G (s)			23.0		23.0			59.0			59.0	
Effective Green, g (s)			23.0		23.0			59.0			59.0	
Actuated g/C Ratio			0.26		0.26			0.66			0.66	
Clearance Time (s)			4.0		4.0			4.0			4.0	
Lane Grp Cap (vph)			416		915			3371			3371	
v/s Ratio Prot					0.02			0.45			c0.57	
v/s Ratio Perm			c0.05									
v/c Ratio			0.20		0.08			0.68			0.86	
Uniform Delay, d1			26.3		25.5			9.7			12.3	
Progression Factor			1.00		1.00			1.00			1.00	
Incremental Delay, d2			1.1		0.2			1.1			3.2	
Delay (s)			27.3		25.6			10.8			15.5	
Level of Service			C		C			B			B	
Approach Delay (s)		27.3			25.6			10.8			15.5	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	13.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.68		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	66.2%	ICU Level of Service	B

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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		4.0
Lane Util. Factor		0.95		1.00	1.00		0.97	1.00	1.00	1.00		1.00
Frt		1.00		1.00	1.00		1.00	1.00	0.85	1.00		0.85
Flt Protected		1.00		0.95	1.00		0.95	1.00	1.00	0.95		1.00
Satd. Flow (prot)		3571		1789	1883		3471	1883	1601	1789		1601
Flt Permitted		1.00		0.66	1.00		0.95	1.00	1.00	0.70		1.00
Satd. Flow (perm)		3571		1241	1883		3471	1883	1601	1324		1601
Volume (vph)	0	145	2	2	2	0	510	83	490	1	0	82
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	145	2	2	2	0	510	83	490	1	0	82
Lane Group Flow (vph)	0	147	0	2	2	0	510	83	490	1	0	82
Turn Type				Perm			Perm		Perm	custom		custom
Protected Phases		4			8			6				
Permitted Phases		4		8			6		6	2		2
Actuated Green, G (s)		23.5		23.5	23.5		58.5	58.5	58.5	58.5		58.5
Effective Green, g (s)		23.5		23.5	23.5		58.5	58.5	58.5	58.5		58.5
Actuated g/C Ratio		0.26		0.26	0.26		0.65	0.65	0.65	0.65		0.65
Clearance Time (s)		4.0		4.0	4.0		4.0	4.0	4.0	4.0		4.0
Lane Grp Cap (vph)		932		324	492		2256	1224	1041	861		1041
v/s Ratio Prot		c0.04			0.00			0.04				
v/s Ratio Perm				0.00			0.15		c0.31	0.00		0.05
v/c Ratio		0.16		0.01	0.00		0.23	0.07	0.47	0.00		0.08
Uniform Delay, d1		25.6		24.6	24.6		6.5	5.8	7.9	5.5		5.8
Progression Factor		1.00		1.33	1.34		1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2		0.4		0.0	0.0		0.2	0.1	1.5	0.0		0.1
Delay (s)		26.0		32.8	32.9		6.7	5.9	9.5	5.5		6.0
Level of Service		C		C	C		A	A	A	A		A
Approach Delay (s)		26.0			32.8			7.9			6.0	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM Average Control Delay	9.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.38		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	47.0%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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	
Lane Util. Factor		0.95			1.00	1.00				1.00	1.00	
Frt		1.00			1.00	0.85				1.00	0.85	
Flt Protected		0.99			1.00	1.00				0.95	1.00	
Satd. Flow (prot)		3524			1883	1601				1789	1601	
Flt Permitted		0.86			1.00	1.00				0.95	1.00	
Satd. Flow (perm)		3062			1883	1601				1789	1601	
Volume (vph)	212	520	5	0	2	494	0	0	0	2	0	3
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	212	520	5	0	2	494	0	0	0	2	0	3
Lane Group Flow (vph)	0	737	0	0	2	494	0	0	0	2	3	0
Turn Type	Perm					Free				Perm		
Protected Phases		4			8						2	
Permitted Phases	4					Free				2		
Actuated Green, G (s)		59.0			59.0	90.0				23.0	23.0	
Effective Green, g (s)		59.0			59.0	90.0				23.0	23.0	
Actuated g/C Ratio		0.66			0.66	1.00				0.26	0.26	
Clearance Time (s)		4.0			4.0					4.0	4.0	
Lane Grp Cap (vph)		2007			1234	1601				457	409	
v/s Ratio Prot					0.00						0.00	
v/s Ratio Perm		c0.24				c0.31				0.00		
v/c Ratio		0.37			0.00	0.31				0.00	0.01	
Uniform Delay, d1		7.0			5.3	0.0				25.0	25.0	
Progression Factor		1.15			1.00	1.00				1.00	1.00	
Incremental Delay, d2		0.5			0.0	0.5				0.0	0.0	
Delay (s)		8.6			5.3	0.5				25.0	25.0	
Level of Service		A			A	A				C	C	
Approach Delay (s)		8.6			0.5			0.0			25.0	
Approach LOS		A			A			A			C	

Intersection Summary			
HCM Average Control Delay	5.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.35		
Cycle Length (s)	90.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	34.0%	ICU Level of Service	A

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	507	5	5	473	2	4
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	507	5	5	473	2	4

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	338	174	163	315	6
Volume Left (vph)	0	0	5	0	2
Volume Right (vph)	0	5	0	0	4
Hadj (s)	0.0	0.0	0.0	0.0	-0.3
Departure Headway (s)	4.9	4.9	5.0	5.0	5.5
Degree Utilization, x	0.46	0.24	0.23	0.44	0.01
Capacity (veh/h)	719	714	703	712	596
Control Delay (s)	11.0	8.3	8.2	10.6	8.5
Approach Delay (s)	10.0		9.8		8.5
Approach LOS	B		A		A

Intersection Summary			
Delay	9.9		
HCM Level of Service	A		
Intersection Capacity Utilization	24.2%	ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (veh/h)	502	5	3	478	1	5
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (veh/h)	502	5	3	478	1	5

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	335	172	162	319	6
Volume Left (vph)	0	0	3	0	1
Volume Right (vph)	0	5	0	0	5
Hadj (s)	0.0	0.0	0.0	0.0	-0.4
Departure Headway (s)	4.9	4.9	5.0	5.0	5.3
Degree Utilization, x	0.46	0.24	0.22	0.44	0.01
Capacity (veh/h)	719	714	704	713	609
Control Delay (s)	10.9	8.2	8.2	10.6	8.4
Approach Delay (s)	10.0		9.8		8.4
Approach LOS	A		A		A

Intersection Summary			
Delay	9.9		
HCM Level of Service	A		
Intersection Capacity Utilization	24.0%	ICU Level of Service	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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		1.00			1.00			0.91			0.91	
Frt		1.00			0.87			1.00			1.00	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1878			1631			5139			5142	
Flt Permitted		0.99			1.00			1.00			1.00	
Satd. Flow (perm)		1859			1628			5139			5142	
Volume (vph)	11	439	6	3	1	397	0	1900	7	0	1957	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	11	439	6	3	1	397	0	1900	7	0	1957	0
Lane Group Flow (vph)	0	456	0	0	401	0	0	1907	0	0	1957	0
Turn Type	Perm			Perm								
Protected Phases		4			8			6			2	
Permitted Phases	4			8				6				
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		640			561			2912			2914	
v/s Ratio Prot								0.37			c0.38	
v/s Ratio Perm		0.25			c0.25							
v/c Ratio		0.71			0.71			0.65			0.67	
Uniform Delay, d1		25.6			25.7			13.4			13.6	
Progression Factor		1.00			1.00			0.31			0.52	
Incremental Delay, d2		6.6			7.6			0.6			1.1	
Delay (s)		32.3			33.2			4.8			8.2	
Level of Service		C			C			A			A	
Approach Delay (s)		32.3			33.2			4.8			8.2	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM Average Control Delay	11.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.69		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	73.2%	ICU Level of Service	C

c Critical Lane Group

Movement	WBL	WBR	NBL	NBR	SEL	SER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.76		1.00	0.94	
Frt	1.00	0.85		0.86	1.00	
Flt Protected	0.95	1.00		1.00	0.95	
Satd. Flow (prot)	1789	3650		1629	5046	
Flt Permitted	0.95	1.00		1.00	0.95	
Satd. Flow (perm)	1789	3650		1629	5046	
Volume (vph)	71	1945	0	38	1885	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	71	1945	0	38	1885	0
Lane Group Flow (vph)	71	1945	0	38	1885	0
Turn Type	Prot			custom		
Protected Phases	8				2	
Permitted Phases		8 2		4		
Actuated Green, G (s)	25.0	90.0		25.0	57.0	
Effective Green, g (s)	25.0	90.0		25.0	57.0	
Actuated g/C Ratio	0.28	1.00		0.28	0.63	
Clearance Time (s)	4.0			4.0	4.0	
Lane Grp Cap (vph)	497	3650		453	3196	
v/s Ratio Prot	0.04				c0.37	
v/s Ratio Perm		c0.53		0.02		
v/c Ratio	0.14	0.53		0.08	0.59	
Uniform Delay, d1	24.4	0.0		24.0	9.7	
Progression Factor	1.57	1.00		0.71	0.18	
Incremental Delay, d2	0.5	0.4		0.4	0.6	
Delay (s)	38.9	0.4		17.5	2.3	
Level of Service	D	A		B	A	
Approach Delay (s)	1.8		17.5		2.3	
Approach LOS	A		B		A	

Intersection Summary			
HCM Average Control Delay	2.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.57		
Cycle Length (s)	90.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	48.7%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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		0.91			0.91			1.00			1.00	
Frt		0.98			1.00			0.99			0.92	
Flt Protected		1.00			1.00			0.95			1.00	
Satd. Flow (prot)		5022			5141			1788			1731	
Flt Permitted		1.00			1.00			0.74			1.00	
Satd. Flow (perm)		5022			5141			1392			1731	
Volume (vph)	0	1644	302	0	1922	1	126	0	5	0	2	3
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1644	302	0	1922	1	126	0	5	0	2	3
Lane Group Flow (vph)	0	1946	0	0	1923	0	0	131	0	0	5	0
Turn Type							Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)		50.5			50.5			31.5			31.5	
Effective Green, g (s)		50.5			50.5			31.5			31.5	
Actuated g/C Ratio		0.56			0.56			0.35			0.35	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		2818			2885			487			606	
v/s Ratio Prot		c0.39			0.37						0.00	
v/s Ratio Perm								c0.09				
v/c Ratio		0.69			0.67			0.27			0.01	
Uniform Delay, d1		14.2			13.8			21.0			19.1	
Progression Factor		0.42			1.00			1.00			1.00	
Incremental Delay, d2		1.2			1.2			1.4			0.0	
Delay (s)		7.1			15.1			22.3			19.1	
Level of Service		A			B			C			B	
Approach Delay (s)		7.1			15.1			22.3			19.1	
Approach LOS		A			B			C			B	

Intersection Summary			
HCM Average Control Delay	11.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.53		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	59.1%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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	
Lane Util. Factor	1.00	1.00			1.00			1.00			1.00	
Frt	1.00	1.00			0.97			0.97			0.99	
Flt Protected	0.95	1.00			1.00			0.99			0.99	
Satd. Flow (prot)	1789	1883			1831			1808			1860	
Flt Permitted	0.66	1.00			0.99			0.97			0.98	
Satd. Flow (perm)	1246	1883			1825			1761			1838	
Volume (vph)	305	47	0	6	120	30	15	50	20	5	35	2
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	305	47	0	6	120	30	15	50	20	5	35	2
Lane Group Flow (vph)	305	47	0	0	156	0	0	85	0	0	42	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	44.0	44.0			44.0			38.0			38.0	
Effective Green, g (s)	44.0	44.0			44.0			38.0			38.0	
Actuated g/C Ratio	0.49	0.49			0.49			0.42			0.42	
Clearance Time (s)	4.0	4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)	609	921			892			744			776	
v/s Ratio Prot		0.02										
v/s Ratio Perm	c0.24				0.09			c0.05			0.02	
v/c Ratio	0.50	0.05			0.17			0.11			0.05	
Uniform Delay, d1	15.6	12.1			12.9			15.8			15.4	
Progression Factor	1.00	1.00			0.58			1.00			1.00	
Incremental Delay, d2	2.9	0.1			0.4			0.3			0.1	
Delay (s)	18.5	12.2			7.9			16.1			15.5	
Level of Service	B	B			A			B			B	
Approach Delay (s)		17.6			7.9			16.1			15.5	
Approach LOS		B			A			B			B	

Intersection Summary			
HCM Average Control Delay	14.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.32		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	40.5%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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		1.00			1.00			1.00			1.00	
Frt		0.98			0.95			1.00			1.00	
Flt Protected		0.97			0.97			1.00			1.00	
Satd. Flow (prot)		1791			1739			1880			1875	
Flt Permitted		0.87			0.93			1.00			0.99	
Satd. Flow (perm)		1615			1653			1873			1863	
Volume (vph)	25	8	5	7	1	5	5	523	6	9	592	17
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	25	8	5	7	1	5	5	523	6	9	592	17
Lane Group Flow (vph)	0	38	0	0	13	0	0	534	0	0	618	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		28.0			28.0			54.0			54.0	
Effective Green, g (s)		28.0			28.0			54.0			54.0	
Actuated g/C Ratio		0.31			0.31			0.60			0.60	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		502			514			1124			1118	
v/s Ratio Prot												
v/s Ratio Perm		c0.02			0.01			0.29			c0.33	
v/c Ratio		0.08			0.03			0.48			0.55	
Uniform Delay, d1		21.9			21.5			10.1			10.8	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.3			0.1			1.4			2.0	
Delay (s)		22.2			21.6			11.5			12.7	
Level of Service		C			C			B			B	
Approach Delay (s)		22.2			21.6			11.5			12.7	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	12.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.39		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	47.9%	ICU Level of Service	A

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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	1.00	1.00		1.00	1.00	1.00		0.91			0.91	
Frt	1.00	0.92		1.00	1.00	0.85		1.00			0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			1.00	
Satd. Flow (prot)	1789	1729		1789	1883	1601		5141			5054	
Flt Permitted	0.72	1.00		0.75	1.00	1.00		1.00			1.00	
Satd. Flow (perm)	1364	1729		1413	1883	1601		5141			5054	
Volume (vph)	9	5	6	1	50	29	0	1855	2	0	2024	259
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	9	5	6	1	50	29	0	1855	2	0	2024	259
Lane Group Flow (vph)	9	11	0	1	50	29	0	1857	0	0	2283	0
Turn Type	Perm			Perm		Perm						
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8						
Actuated Green, G (s)	30.0	30.0		30.0	30.0	30.0		52.0			52.0	
Effective Green, g (s)	30.0	30.0		30.0	30.0	30.0		52.0			52.0	
Actuated g/C Ratio	0.33	0.33		0.33	0.33	0.33		0.58			0.58	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Grp Cap (vph)	455	576		471	628	534		2970			2920	
v/s Ratio Prot		0.01			c0.03			0.36			c0.45	
v/s Ratio Perm	0.01			0.00		0.02						
v/c Ratio	0.02	0.02		0.00	0.08	0.05		0.63			0.78	
Uniform Delay, d1	20.1	20.1		20.0	20.5	20.4		12.6			14.6	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	0.1	0.1		0.0	0.2	0.2		1.0			2.2	
Delay (s)	20.2	20.2		20.0	20.8	20.6		13.6			16.8	
Level of Service	C	C		C	C	C		B			B	
Approach Delay (s)		20.2			20.7			13.6			16.8	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	15.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.52		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	54.9%	ICU Level of Service	A

c Critical Lane Group

APPENDIX D

QUEUE LENGTH CALCULATIONS

2000

(Existing Conditions) AM

Lane Group	WBL	WBR	NBL	NBR	SEL	SER	SER2	NEL	NER	NER2
Lane Configurations										
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	0	0	25	0		0	0	
Storage Lanes	0	1	0	1	1	1		0	0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	35	10	15	9	15	9	9	15	35	9
Right Turn on Red		Yes		Yes			Yes			Yes
Link Speed (mph)	30		30		30			30		
Link Distance (ft)	125		63		85			133		
Travel Time (s)	2.8		1.4		1.9			3.0		
Volume (vph)	228	23	0	0	118	0	6	0	557	8
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Group Flow (vph)	228	23	0	0	118	0	6	0	565	0
Queue Length 50th (ft)	29	0			33		0		94	
Queue Length 95th (ft)	48	0			64		0		138	
Internal Link Dist (ft)	45		1		5			53		
50th Up Block Time (%)					50%				24%	
95th Up Block Time (%)	10%				53%		18%		33%	
Turn Bay Length (ft)					25					
50th Bay Block Time %					19%					
95th Bay Block Time %					38%					
Queuing Penalty (veh)	11				64				159	

Intersection Summary	
Area Type:	Other

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	35		0	0		0	0		0	0		0
Storage Lanes	0		0	0		0	0		1	0		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		127			727			193			474	
Travel Time (s)		2.9			16.5			4.4			10.8	
Volume (vph)	179	64	3	0	7	27	0	3092	625	0	1237	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Group Flow (vph)	0	246	0	0	34	0	0	3092	625	0	1237	0
Queue Length 50th (ft)		52			3			~723	0		12	
Queue Length 95th (ft)		82			22			#815	0		20	
Internal Link Dist (ft)		47			647			113			394	
50th Up Block Time (%)		10%						38%				
95th Up Block Time (%)		30%						39%				
Turn Bay Length (ft)												
50th Bay Block Time %												
95th Bay Block Time %												
Queuing Penalty (veh)		50						1190				

Intersection Summary

Area Type: Other

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

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

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		435			410			474			503	
Travel Time (s)		9.9			9.3			10.8			11.4	
Volume (vph)	7	482	0	0	23	52	0	2421	80	0	1190	2
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Group Flow (vph)	0	489	0	0	75	0	0	2501	0	0	1192	0
Queue Length 50th (ft)		244			9			121			186	
Queue Length 95th (ft)		#372			38			m112			228	
Internal Link Dist (ft)		355			330			394			423	
50th Up Block Time (%)												
95th Up Block Time (%)		9%										
Turn Bay Length (ft)												
50th Bay Block Time %												
95th Bay Block Time %												
Queuing Penalty (veh)		23										

Intersection Summary

Area Type: Other

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

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

Lane Group	WBL	WBR	NBL	NBR	SEL	SER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15	9	15	9	15	9
Right Turn on Red		Yes		Yes		Yes
Link Speed (mph)	30		30		30	
Link Distance (ft)	108		53		503	
Travel Time (s)	2.5		1.2		11.4	
Volume (vph)	216	1169	0	208	2391	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Lane Group Flow (vph)	216	1169	0	208	2391	0
Queue Length 50th (ft)	103	10		94	529	
Queue Length 95th (ft)	171	10		160	578	
Internal Link Dist (ft)	28		1		423	
50th Up Block Time (%)	32%			71%	10%	
95th Up Block Time (%)	34%			71%	14%	
Turn Bay Length (ft)						
50th Bay Block Time %						
95th Bay Block Time %						
Queuing Penalty (veh)	71			148	281	

Intersection Summary	
Area Type:	Other

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	115		0	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		108			436			291			426	
Travel Time (s)		2.5			9.9			6.6			9.7	
Volume (vph)	0	2283	410	0	1384	4	71	1	2	6	5	17
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Group Flow (vph)	0	2693	0	0	1388	0	0	74	0	0	28	0
Queue Length 50th (ft)		0			141			28			4	
Queue Length 95th (ft)		634			172			64			22	
Internal Link Dist (ft)		28			356			211			346	
50th Up Block Time (%)												
95th Up Block Time (%)		28%										
Turn Bay Length (ft)												
50th Bay Block Time %												
95th Bay Block Time %												
Queuing Penalty (veh)		381										

Intersection Summary	
Area Type:	Other

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	95		0	115		0	0		0	0		0
Storage Lanes	1		0	1		1	0		0	0		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		534			429			677			106	
Travel Time (s)		12.1			9.8			15.4			2.4	
Volume (vph)	308	66	4	0	4	77	0	1994	0	0	2033	347
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Group Flow (vph)	308	70	0	0	4	77	0	1994	0	0	2380	0
Queue Length 50th (ft)	151	26			2	27		258			320	
Queue Length 95th (ft)	246	57			9	59		309			383	
Internal Link Dist (ft)		454			349			597			26	
50th Up Block Time (%)											36%	
95th Up Block Time (%)											36%	
Turn Bay Length (ft)	95											
50th Bay Block Time %	29%											
95th Bay Block Time %	44%											
Queuing Penalty (veh)	25											

Intersection Summary	
Area Type:	Other

2000

(Existing Conditions) PM

Lane Group	WBL	WBR	NBL	NBR	SEL	SER	SER2	NEL	NER	NER2
Lane Configurations										
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	0	0	25	0		0	0	
Storage Lanes	0	1	0	1	1	1		0	0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	35	10	15	9	15	9	9	15	35	9
Right Turn on Red		Yes		Yes			Yes			Yes
Link Speed (mph)	30		30		30			30		
Link Distance (ft)	125		63		85			133		
Travel Time (s)	2.8		1.4		1.9			3.0		
Volume (vph)	1318	442	0	0	14	0	499	0	873	19
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Group Flow (vph)	1318	442	0	0	14	0	499	0	892	0
Queue Length 50th (ft)	260	0			4		165		175	
Queue Length 95th (ft)	347	0			13		274		246	
Internal Link Dist (ft)	45		1		5			53		
50th Up Block Time (%)	45%						53%		37%	
95th Up Block Time (%)	47%				39%		53%		41%	
Turn Bay Length (ft)					25					
50th Bay Block Time %							47%			
95th Bay Block Time %							50%			
Queuing Penalty (veh)	610				2		271		346	

Intersection Summary	
Area Type:	Other

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	35		0	0		0	0		0	0		0
Storage Lanes	0		0	0		0	0		1	0		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		127			727			193			474	
Travel Time (s)		2.9			16.5			4.4			10.8	
Volume (vph)	41	13	31	0	30	262	0	1573	161	0	2472	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Group Flow (vph)	0	85	0	0	292	0	0	1573	161	0	2472	0
Queue Length 50th (ft)		12			130			191	0		100	
Queue Length 95th (ft)		28			209			231	0		136	
Internal Link Dist (ft)		47			647			113			394	
50th Up Block Time (%)								20%				
95th Up Block Time (%)								24%				
Turn Bay Length (ft)												
50th Bay Block Time %												
95th Bay Block Time %												
Queuing Penalty (veh)								340				

Intersection Summary	
Area Type:	Other

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		435			410			474			503	
Travel Time (s)		9.9			9.3			10.8			11.4	
Volume (vph)	2	314	0	3	68	324	0	1392	0	0	2184	2
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Group Flow (vph)	0	316	0	0	395	0	0	1392	0	0	2186	0
Queue Length 50th (ft)		140			188			42			431	
Queue Length 95th (ft)		219			294			49			506	
Internal Link Dist (ft)		355			330			394			423	
50th Up Block Time (%)												
95th Up Block Time (%)											9%	
Turn Bay Length (ft)												
50th Bay Block Time %												
95th Bay Block Time %												
Queuing Penalty (veh)											93	

Intersection Summary	
Area Type:	Other

Lane Group	WBL	WBR	NBL	NBR	SEL	SER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15	9	15	9	15	9
Right Turn on Red		Yes		Yes		Yes
Link Speed (mph)	30		30		30	
Link Distance (ft)	108		53		503	
Travel Time (s)	2.5		1.2		11.4	
Volume (vph)	227	2143	0	127	1362	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Lane Group Flow (vph)	227	2143	0	127	1362	0
Queue Length 50th (ft)	96	68		34	229	
Queue Length 95th (ft)	m106	56		73	267	
Internal Link Dist (ft)	28		1		423	
50th Up Block Time (%)	25%	20%		62%		
95th Up Block Time (%)	26%	21%		63%		
Turn Bay Length (ft)						
50th Bay Block Time %						
95th Bay Block Time %						
Queuing Penalty (veh)	58	441		78		

Intersection Summary	
Area Type:	Other

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

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	115		0	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		108			436			291			426	
Travel Time (s)		2.5			9.9			6.6			9.7	
Volume (vph)	0	1463	142	0	2115	8	412	10	3	9	6	8
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Group Flow (vph)	0	1605	0	0	2123	0	0	425	0	0	23	0
Queue Length 50th (ft)		338			371			199			5	
Queue Length 95th (ft)		383			442			#336			16	
Internal Link Dist (ft)		28			356			211			346	
50th Up Block Time (%)		7%			4%			4%				
95th Up Block Time (%)		28%			12%			26%				
Turn Bay Length (ft)												
50th Bay Block Time %												
95th Bay Block Time %												
Queuing Penalty (veh)		285										

Intersection Summary

Area Type: Other

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

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	95		0	115		0	0		0	0		0
Storage Lanes	1		0	1		1	0		0	0		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		534			429			677			106	
Travel Time (s)		12.1			9.8			15.4			2.4	
Volume (vph)	230	5	3	1	64	437	0	2101	1	0	1907	344
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Group Flow (vph)	230	8	0	1	64	437	0	2102	0	0	2251	0
Queue Length 50th (ft)	97	2		0	23	207		328			339	
Queue Length 95th (ft)	164	11		4	49	323		391			407	
Internal Link Dist (ft)		454			349			597			26	
50th Up Block Time (%)											41%	
95th Up Block Time (%)						2%					41%	
Turn Bay Length (ft)	95			115								
50th Bay Block Time %	7%											
95th Bay Block Time %	30%											
Queuing Penalty (veh)	1											

Intersection Summary	
Area Type:	Other

2000

(Existing Conditions) WEEKEND

2030 ALTERNATIVE 1

(No Build) AM

Lane Group	EBT	WBT	WBR	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	1656	791	11	0	2	0	3
Act Effct Green (s)	48.0	48.0	75.0		19.0		19.0
Actuated g/C Ratio	0.64	0.64	1.00		0.25		0.25
v/c Ratio	0.73	0.35	0.01		0.00		0.01
Uniform Delay, d1	8.9	6.2	0.0		21.0		0.0
Delay	9.3	6.3	0.0		21.0		14.7
LOS	A	A	A		C		B
Approach Delay	9.3	6.2		0.0		17.2	
Approach LOS	A	A		A		B	
Queue Length 50th (m)	71.2	23.6	0.0		0.2		0.0
Queue Length 95th (m)	95.1	32.4	0.0		1.7		1.9
Internal Link Dist (m)	1.9	10.7		24.5		2.1	
50th Up Block Time (%)	35%	23%					
95th Up Block Time (%)	35%	26%					2%
Turn Bay Length (m)					7.6		
50th Bay Block Time %							
95th Bay Block Time %							
Queuing Penalty (veh)	584	193					

Intersection Summary

Cycle Length: 75

Offset: 0 (0%), Referenced to phase 2:SBL and 6:, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 8.3 Intersection LOS: A

Intersection Capacity Utilization 56.4% ICU Level of Service A

	→	←	↘	↖
Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	363	42	3094	1933
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	0.40	0.07	1.06	0.66
Uniform Delay, d1	22.4	15.0	19.5	13.5
Delay	22.8	16.4	55.8	3.3
LOS	C	B	E	A
Approach Delay	22.8	16.4	55.8	3.3
Approach LOS	C	B	E	A
Queue Length 50th (m)	24.8	3.7	~212.0	17.3
Queue Length 95th (m)	36.8	10.4	#242.0	17.5
Internal Link Dist (m)	14.6	197.6	34.7	120.6
50th Up Block Time (%)	29%		44%	
95th Up Block Time (%)	41%		45%	
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	127		1380	

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 1.06

Intersection Signal Delay: 34.6 — Intersection LOS: C

Intersection Capacity Utilization 89.5% — ICU Level of Service D

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

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

Lane Group	EBL	NBL	NBT	SBT
Lane Group Flow (vph)	358	99	554	117
Act Effct Green (s)	23.0	24.0	24.0	24.0
Actuated g/C Ratio	0.42	0.44	0.44	0.44
v/c Ratio	0.40	0.18	0.67	0.14
Uniform Delay, d1	0.1	9.4	12.4	7.1
Delay	1.7	9.9	13.1	7.7
LOS	A	A	B	A
Approach Delay	1.7		12.6	7.7
Approach LOS	A		B	A
Queue Length 50th (m)	0.1	5.7	41.5	5.0
Queue Length 95th (m)	12.0	13.1	70.4	12.4
Internal Link Dist (m)	81.2		167.4	73.9
50th Up Block Time (%)				
95th Up Block Time (%)				
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary	
Cycle Length: 55	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.67	
Intersection Signal Delay: 8.6	Intersection LOS: A
Intersection Capacity Utilization 58.0%	ICU Level of Service A

Lane Group	SBL	SBR	SET	SER	NWT	NEL	NER
Lane Group Flow (vph)	0	5	3084	241	2259	56	10
Act Effct Green (s)		23.0	59.0	59.0	59.0	23.0	23.0
Actuated g/C Ratio		0.26	0.66	0.66	0.66	0.26	0.26
v/c Ratio		0.01	0.91	0.21	0.67	0.15	0.02
Uniform Delay, d1		0.0	13.3	0.0	9.5	25.9	22.5
Delay		9.4	15.4	0.9	14.8	26.5	24.2
LOS		A	B	A	B	C	C
Approach Delay	9.4		14.3		14.8	26.1	
Approach LOS	A		B		B	C	
Queue Length 50th (m)		0.0	149.1	0.0	135.6	7.5	1.2
Queue Length 95th (m)		2.0	177.8	7.0	148.7	17.0	5.0
Internal Link Dist (m)	24.9		110.0		34.7	18.1	
50th Up Block Time (%)			12%		19%		
95th Up Block Time (%)			16%		18%	2%	
Turn Bay Length (m)							
50th Bay Block Time %							
95th Bay Block Time %							
Queuing Penalty (veh)			423		415		

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2: and 6:NESBL, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.91
Intersection Signal Delay: 14.6 Intersection LOS: B
Intersection Capacity Utilization 76.3% ICU Level of Service C

	→	←	↘	↖
Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	456	197	2517	1769
Act Effct Green (s)	32.0	32.0	50.0	50.0
Actuated g/C Ratio	0.36	0.36	0.56	0.56
v/c Ratio	0.68	0.33	0.88	0.62
Uniform Delay, d1	24.6	19.5	17.4	13.5
Delay	25.3	20.0	9.6	13.5
LOS	C	B	A	B
Approach Delay	25.3	20.0	9.6	13.5
Approach LOS	C	B	A	B
Queue Length 50th (m)	66.0	22.6	40.4	92.8
Queue Length 95th (m)	99.1	39.6	m38.0	114.6
Internal Link Dist (m)	108.7	101.1	120.6	124.6
50th Up Block Time (%)				
95th Up Block Time (%)	1%			
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 12.8 Intersection LOS: B

Intersection Capacity Utilization 80.7% ICU Level of Service D

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

Lane Group	WBL	WBR	NBL	NBR	SEL
Lane Group Flow (vph)	222	1748	0	132	2383
Act Effct Green (s)	27.0	90.0		27.0	55.0
Actuated g/C Ratio	0.30	1.00		0.30	0.61
v/c Ratio	0.41	0.48		0.27	0.77
Uniform Delay, d1	25.2	0.0		23.0	12.9
Delay	18.8	1.4		11.5	13.0
LOS	B	A		B	B
Approach Delay	3.4		11.5		13.0
Approach LOS	A		B		B
Queue Length 50th (m)	31.8	12.5		12.6	160.0
Queue Length 95th (m)	51.8	11.7		m10.8	174.8
Internal Link Dist (m)	0.1		1.4		124.6
50th Up Block Time (%)	65%	21%		33%	11%
95th Up Block Time (%)	65%	28%		36%	15%
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)	145	434		46	302

Intersection Summary	
Cycle Length: 90	
Offset: 27 (30%), Referenced to phase 2:SEL and 6:, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.77	
Intersection Signal Delay: 8.7	Intersection LOS: A
Intersection Capacity Utilization 64.3%	ICU Level of Service B
m Volume for 95th percentile queue is metered by upstream signal.	

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	2594	1839	183	37
Act Effct Green (s)	55.0	55.0	27.0	27.0
Actuated g/C Ratio	0.61	0.61	0.30	0.30
v/c Ratio	0.84	0.59	0.46	0.08
Uniform Delay, d1	13.4	10.6	25.6	17.6
Delay	24.1	10.7	26.4	19.2
LOS	C	B	C	B
Approach Delay	24.1	10.7	26.4	19.2
Approach LOS	C	B	C	B
Queue Length 50th (m)	174.9	64.1	25.6	3.6
Queue Length 95th (m)	190.9	76.8	45.1	10.4
Internal Link Dist (m)	0.1	109.0	64.6	106.0
50th Up Block Time (%)	36%			
95th Up Block Time (%)	35%			
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	922			

Intersection Summary	
Cycle Length: 90	
Offset: 55 (61%), Referenced to phase 2:EBT, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.84	
Intersection Signal Delay: 18.9	Intersection LOS: B
Intersection Capacity Utilization 74.8%	ICU Level of Service C

	→	←	↑	↓
Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	591	506	154	245
Act Effct Green (s)	44.0	44.0	38.0	38.0
Actuated g/C Ratio	0.49	0.49	0.42	0.42
v/c Ratio	1.31	0.55	0.29	0.32
Uniform Delay, d1	22.3	16.1	16.6	16.5
Delay	144.9	23.4	17.1	16.8
LOS	F	C	B	B
Approach Delay	144.9	23.4	17.1	16.8
Approach LOS	F	C	B	B
Queue Length 50th (m)	~132.4	77.8	16.6	26.1
Queue Length 95th (m)	#195.2	108.8	30.5	43.1
Internal Link Dist (m)	11.4	203.1	131.5	96.8
50th Up Block Time (%)	51%			
95th Up Block Time (%)	53%			
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 1.31

Intersection Signal Delay: 69.7 Intersection LOS: E

Intersection Capacity Utilization 94.4% ICU Level of Service E

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

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

	→	←	↑	↓
Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	71	20	570	650
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	0.14	0.03	0.54	0.62
Uniform Delay, d1	18.5	6.8	12.1	12.7
Delay	19.1	12.2	12.5	13.2
LOS	B	B	B	B
Approach Delay	19.1	12.3	12.5	13.2
Approach LOS	B	B	B	B
Queue Length 50th (m)	7.6	0.8	57.1	68.4
Queue Length 95th (m)	16.9	5.4	84.5	101.7
Internal Link Dist (m)	129.5	100.4	143.2	47.2
50th Up Block Time (%)				18%
95th Up Block Time (%)				26%
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.62

Intersection Signal Delay: 13.2 Intersection LOS: B

Intersection Capacity Utilization 53.7% ICU Level of Service A

Lane Group	EBL	EBT	WBL	WBT	WBR	NBT	SBT
Lane Group Flow (vph)	467	50	1	5	384	2241	2479
Act Effct Green (s)	32.0	32.0	32.0	32.0	32.0	50.0	50.0
Actuated g/C Ratio	0.36	0.36	0.36	0.36	0.36	0.56	0.56
v/c Ratio	0.92	0.08	0.00	0.01	0.67	0.78	0.88
Uniform Delay, d1	27.8	17.2	19.0	18.8	24.3	15.7	16.9
Delay	46.1	18.0	19.0	18.8	25.1	16.0	17.9
LOS	D	B	B	B	C	B	B
Approach Delay		43.4		25.0		16.0	17.9
Approach LOS		D		C		B	B
Queue Length 50th (m)	76.5	5.1	0.1	0.6	54.8	104.3	125.3
Queue Length 95th (m)	#134.6	12.5	1.1	2.8	86.1	124.3	149.3
Internal Link Dist (m)		138.8		106.8		182.4	8.4
50th Up Block Time (%)							42%
95th Up Block Time (%)	4%						42%
Turn Bay Length (m)	29.0		35.1				
50th Bay Block Time %	43%						
95th Bay Block Time %	55%						
Queuing Penalty (veh)	24						

Intersection Summary
Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.92
Intersection Signal Delay: 20.0 Intersection LOS: C
Intersection Capacity Utilization 103.0% ICU Level of Service F
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

2030 ALTERNATIVE 1

(No Build) PM

Lane Group	EBT	WBT	WBR	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	1047	1378	11	0	9	0	50
Act Effct Green (s)	48.0	48.0	75.0		19.0		19.0
Actuated g/C Ratio	0.64	0.64	1.00		0.25		0.25
v/c Ratio	0.46	0.60	0.01		0.02		0.11
Uniform Delay, d1	6.9	7.9	0.0		21.0		0.0
Delay	7.0	8.1	0.0		21.2		7.3
LOS	A	A	A		C		A
Approach Delay	7.0	8.0		0.0		9.4	
Approach LOS	A	A		A		A	
Queue Length 50th (m)	34.6	52.4	0.0		1.0		0.0
Queue Length 95th (m)	46.2	69.2	0.0		4.2		7.5
Internal Link Dist (m)	1.9	10.7		24.5		2.1	
50th Up Block Time (%)	34%	30%					
95th Up Block Time (%)	35%	31%			41%		56%
Turn Bay Length (m)					7.6		
50th Bay Block Time %							
95th Bay Block Time %							7%
Queuing Penalty (veh)	362	422			2		14

Intersection Summary	
Cycle Length: 75	
Offset: 0 (0%), Referenced to phase 2:SBL and 6:, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.60	
Intersection Signal Delay: 7.6	Intersection LOS: A
Intersection Capacity Utilization 48.1%	ICU Level of Service A

	→	←	↘	↖
Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	205	254	2439	2493
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	0.21	0.45	0.84	0.86
Uniform Delay, d1	20.5	22.6	16.1	16.4
Delay	20.7	23.2	18.1	4.9
LOS	C	C	B	A
Approach Delay	20.7	23.2	18.1	4.9
Approach LOS	C	C	B	A
Queue Length 50th (m)	12.7	33.3	91.6	28.9
Queue Length 95th (m)	20.8	54.6	111.9	41.1
Internal Link Dist (m)	14.6	197.6	34.7	120.6
50th Up Block Time (%)			41%	
95th Up Block Time (%)	22%		43%	
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	23		1023	

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.86
Intersection Signal Delay: 12.3 Intersection LOS: B
Intersection Capacity Utilization 70.4% ICU Level of Service C

Lane Group	EBL	NBL	NBT	SBT
Lane Group Flow (vph)	529	86	447	136
Act Effct Green (s)	23.0	24.0	24.0	24.0
Actuated g/C Ratio	0.42	0.44	0.44	0.44
v/c Ratio	0.54	0.16	0.54	0.17
Uniform Delay, d1	0.1	9.4	11.4	7.8
Delay	1.5	9.8	12.0	8.2
LOS	A	A	B	A
Approach Delay	1.5		11.6	8.2
Approach LOS	A		B	A
Queue Length 50th (m)	0.2	4.9	30.9	6.4
Queue Length 95th (m)	14.4	11.7	53.0	14.6
Internal Link Dist (m)	81.2		167.4	73.9
50th Up Block Time (%)				
95th Up Block Time (%)				
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 55

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.54

Intersection Signal Delay: 6.8 Intersection LOS: A

Intersection Capacity Utilization 62.9% ICU Level of Service B

Lane Group	SBL	SBR	SET	SER	NWT	NEL	NER
Lane Group Flow (vph)	5	97	2414	129	2772	191	21
Act Effct Green (s)	23.0	23.0	59.0	59.0	59.0	23.0	23.0
Actuated g/C Ratio	0.26	0.26	0.66	0.66	0.66	0.26	0.26
v/c Ratio	0.01	0.24	0.72	0.12	0.82	0.60	0.05
Uniform Delay, d1	25.0	25.6	10.1	0.0	11.6	29.4	16.8
Delay	25.2	26.2	10.3	1.1	19.4	30.5	19.9
LOS	C	C	B	A	B	C	B
Approach Delay	26.2		9.8		19.4	29.4	
Approach LOS	C		A		B	C	
Queue Length 50th (m)	0.7	12.9	88.2	0.0	187.0	29.1	1.8
Queue Length 95th (m)	3.3	25.5	104.5	5.2	200.7	51.4	7.3
Internal Link Dist (m)	24.9		110.0		34.7	18.1	
50th Up Block Time (%)					22%	32%	
95th Up Block Time (%)		8%	2%		25%	51%	
Turn Bay Length (m)							
50th Bay Block Time %							
95th Bay Block Time %							
Queuing Penalty (veh)					642	79	

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2: and 6:NESBL, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.82	
Intersection Signal Delay: 15.6	Intersection LOS: B
Intersection Capacity Utilization 80.2%	ICU Level of Service D

Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	368	357	1993	2210
Act Effct Green (s)	32.0	32.0	50.0	50.0
Actuated g/C Ratio	0.36	0.36	0.56	0.56
v/c Ratio	0.55	0.60	0.70	0.77
Uniform Delay, d1	23.2	23.5	14.5	15.6
Delay	23.8	24.2	11.2	16.0
LOS	C	C	B	B
Approach Delay	23.8	24.2	11.2	16.0
Approach LOS	C	C	B	B
Queue Length 50th (m)	50.2	49.4	41.4	132.9
Queue Length 95th (m)	77.1	77.6	40.2	157.5
Internal Link Dist (m)	108.7	101.1	120.6	124.6
50th Up Block Time (%)				5%
95th Up Block Time (%)				10%
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				167

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.77	
Intersection Signal Delay: 15.3	Intersection LOS: B
Intersection Capacity Utilization 72.6%	ICU Level of Service C

Lane Group	WBL	WBR	NBL	NBR	SEL
Lane Group Flow (vph)	198	2173	0	141	1936
Act Effct Green (s)	27.0	90.0		27.0	55.0
Actuated g/C Ratio	0.30	1.00		0.30	0.61
v/c Ratio	0.37	0.60		0.28	0.63
Uniform Delay, d1	24.8	0.0		21.5	11.0
Delay	18.8	2.1		14.0	11.9
LOS	B	A		B	B
Approach Delay	3.5		14.0		11.9
Approach LOS	A		B		B
Queue Length 50th (m)	28.5	18.5		18.2	106.7
Queue Length 95th (m)	m41.9	15.9		34.5	124.4
Internal Link Dist (m)	0.1		1.4		124.6
50th Up Block Time (%)	65%	28%		27%	
95th Up Block Time (%)	65%	37%		31%	6%
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)	130	707		41	56

Intersection Summary	
Cycle Length: 90	
Offset: 27 (30%), Referenced to phase 2:SEL and 6:, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.63	
Intersection Signal Delay: 7.5	Intersection LOS: A
Intersection Capacity Utilization 54.5%	ICU Level of Service A
m Volume for 95th percentile queue is metered by upstream signal.	

	→	←	↑	↓
Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	2146	2155	359	22
Act Effct Green (s)	55.0	55.0	27.0	27.0
Actuated g/C Ratio	0.61	0.61	0.30	0.30
v/c Ratio	0.69	0.69	0.88	0.05
Uniform Delay, d1	11.4	11.7	29.9	16.2
Delay	23.2	11.9	45.3	18.3
LOS	C	B	D	B
Approach Delay	23.2	11.9	45.3	18.3
Approach LOS	C	B	D	B
Queue Length 50th (m)	137.5	83.2	58.7	1.9
Queue Length 95th (m)	151.6	99.0	#108.6	7.3
Internal Link Dist (m)	0.1	109.0	64.6	106.0
50th Up Block Time (%)	37%			
95th Up Block Time (%)	36%		42%	
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	782			

Intersection Summary

Cycle Length: 90
Offset: 55 (61%), Referenced to phase 2:EBT, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.88
Intersection Signal Delay: 19.7 Intersection LOS: B
Intersection Capacity Utilization 75.6% ICU Level of Service C
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	392	541	73	224
Act Effct Green (s)	44.0	44.0	38.0	38.0
Actuated g/C Ratio	0.49	0.49	0.42	0.42
v/c Ratio	0.48	0.59	0.09	0.29
Uniform Delay, d1	14.3	16.5	11.2	13.0
Delay	14.8	23.1	12.2	13.4
LOS	B	C	B	B
Approach Delay	14.8	23.1	12.2	13.4
Approach LOS	B	C	B	B
Queue Length 50th (m)	40.6	81.5	5.3	18.9
Queue Length 95th (m)	64.4	113.9	13.2	34.5
Internal Link Dist (m)	11.4	203.1	131.5	96.8
50th Up Block Time (%)	39%			
95th Up Block Time (%)	43%			
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.59

Intersection Signal Delay: 18.0 Intersection LOS: B

Intersection Capacity Utilization 73.7% ICU Level of Service C

	→	←	↑	↓
Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	57	90	591	662
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	0.11	0.14	0.56	0.64
Uniform Delay, d1	17.2	14.9	12.3	12.9
Delay	18.2	15.7	12.8	13.5
LOS	B	B	B	B
Approach Delay	18.2	15.7	12.8	13.5
Approach LOS	B	B	B	B
Queue Length 50th (m)	5.7	7.8	60.2	70.9
Queue Length 95th (m)	13.8	17.9	89.1	106.1
Internal Link Dist (m)	129.5	100.4	143.2	47.2
50th Up Block Time (%)				19%
95th Up Block Time (%)				27%
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.64	
Intersection Signal Delay: 13.5	Intersection LOS: B
Intersection Capacity Utilization 58.8%	ICU Level of Service A

Lane Group	EBL	EBT	WBL	WBT	WBR	NBT	SBT
Lane Group Flow (vph)	234	14	1	50	426	2206	2935
Act Effct Green (s)	32.0	32.0	32.0	32.0	32.0	50.0	50.0
Actuated g/C Ratio	0.36	0.36	0.36	0.36	0.36	0.56	0.56
v/c Ratio	0.48	0.02	0.00	0.07	0.74	0.77	1.04
Uniform Delay, d1	22.6	14.8	19.0	19.2	25.2	15.6	19.3
Delay	23.3	16.6	19.0	19.5	27.3	15.8	46.0
LOS	C	B	B	B	C	B	D
Approach Delay		22.9		26.5		15.8	46.0
Approach LOS		C		C		B	D
Queue Length 50th (m)	31.1	1.2	0.1	5.6	63.1	101.5	~200.5
Queue Length 95th (m)	52.5	5.1	1.1	13.1	#100.0	120.9	#229.7
Internal Link Dist (m)		138.8		106.8		182.4	8.4
50th Up Block Time (%)							43%
95th Up Block Time (%)					3%		44%
Turn Bay Length (m)	29.0		35.1				
50th Bay Block Time %	10%						
95th Bay Block Time %	33%						
Queuing Penalty (veh)	3						

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 1.04

Intersection Signal Delay: 32.1 Intersection LOS: C

Intersection Capacity Utilization 92.0% ICU Level of Service E

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

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

2030 ALTERNATIVE 1

(No Build) WEEKEND

Lane Group	EBT	WBT	WBR	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	960	1130	11	0	2	0	10
Act Effct Green (s)	48.0	48.0	75.0		19.0		19.0
Actuated g/C Ratio	0.64	0.64	1.00		0.25		0.25
v/c Ratio	0.42	0.49	0.01		0.00		0.02
Uniform Delay, d1	6.6	7.1	0.0		21.0		0.0
Delay	6.8	7.3	0.0		21.0		12.1
LOS	A	A	A		C		B
Approach Delay	6.8	7.2		0.0		13.6	
Approach LOS	A	A		A		B	
Queue Length 50th (m)	30.5	38.6	0.0		0.2		0.0
Queue Length 95th (m)	41.3	51.3	0.0		1.7		3.4
Internal Link Dist (m)	1.9	10.7		24.5		2.1	
50th Up Block Time (%)	34%	28%					
95th Up Block Time (%)	35%	30%					33%
Turn Bay Length (m)					7.6		
50th Bay Block Time %							
95th Bay Block Time %							
Queuing Penalty (veh)	330	325					1

Intersection Summary

Cycle Length: 75

Offset: 0 (0%), Referenced to phase 2:SBL and 6:, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.49

Intersection Signal Delay: 7.0 Intersection LOS: A

Intersection Capacity Utilization 41.2% ICU Level of Service A

	→	←	↘	↖
Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	382	9	2441	1987
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	0.42	0.02	0.84	0.68
Uniform Delay, d1	22.4	0.0	16.1	13.8
Delay	22.8	10.9	18.3	3.1
LOS	C	B	B	A
Approach Delay	22.8	10.9	18.3	3.1
Approach LOS	C	B	B	A
Queue Length 50th (m)	26.1	0.0	91.8	19.6
Queue Length 95th (m)	38.6	3.1	112.0	23.5
Internal Link Dist (m)	14.6	197.6	34.7	120.6
50th Up Block Time (%)	31%		42%	
95th Up Block Time (%)	42%		43%	
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	139		1030	

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.84	
Intersection Signal Delay: 12.4	Intersection LOS: B
Intersection Capacity Utilization 80.8%	ICU Level of Service D

Lane Group	EBL	NBL	NBT	SBT
Lane Group Flow (vph)	350	4	145	18
Act Effct Green (s)	23.0	24.0	24.0	24.0
Actuated g/C Ratio	0.42	0.44	0.44	0.44
v/c Ratio	0.40	0.01	0.18	0.02
Uniform Delay, d1	0.1	8.8	9.4	8.3
Delay	1.7	8.8	9.7	8.7
LOS	A	A	A	A
Approach Delay	1.7		9.7	8.7
Approach LOS	A		A	A
Queue Length 50th (m)	0.3	0.3	8.3	0.9
Queue Length 95th (m)	12.0	1.5	17.0	3.6
Internal Link Dist (m)	81.2		167.4	73.9
50th Up Block Time (%)				
95th Up Block Time (%)				
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 55

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.40

Intersection Signal Delay: 4.3 Intersection LOS: A

Intersection Capacity Utilization 35.9% ICU Level of Service A

Lane Group	SBL	SET	SER	NWT	NEL	NER
Lane Group Flow (vph)	0	2433	99	2363	85	7
Act Effct Green (s)		59.0	59.0	59.0	23.0	23.0
Actuated g/C Ratio		0.66	0.66	0.66	0.26	0.26
v/c Ratio		0.72	0.09	0.70	0.24	0.02
Uniform Delay, d1		10.1	0.0	9.9	26.5	3.6
Delay		10.3	1.3	15.7	27.2	16.3
LOS		B	A	B	C	B
Approach Delay	0.0	10.0		15.7	26.3	
Approach LOS	A	A		B	C	
Queue Length 50th (m)		89.4	0.0	140.1	11.7	0.1
Queue Length 95th (m)		105.8	4.7	153.0	23.7	3.4
Internal Link Dist (m)	24.9	110.0		34.7	18.1	
50th Up Block Time (%)				20%		
95th Up Block Time (%)		3%		20%	23%	
Turn Bay Length (m)						
50th Bay Block Time %						
95th Bay Block Time %						
Queuing Penalty (veh)				468	9	

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2: and 6:NEL, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.72	
Intersection Signal Delay: 13.0	Intersection LOS: B
Intersection Capacity Utilization 58.4%	ICU Level of Service A

Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	219	301	1925	1692
Act Effct Green (s)	32.0	32.0	50.0	50.0
Actuated g/C Ratio	0.36	0.36	0.56	0.56
v/c Ratio	0.33	0.51	0.68	0.59
Uniform Delay, d1	21.1	21.4	14.2	13.2
Delay	21.6	22.0	10.7	13.3
LOS	C	C	B	B
Approach Delay	21.6	22.0	10.7	13.3
Approach LOS	C	C	B	B
Queue Length 50th (m)	27.2	38.0	37.2	93.5
Queue Length 95th (m)	44.9	62.2	35.7	112.0
Internal Link Dist (m)	108.7	101.1	120.6	124.6
50th Up Block Time (%)				
95th Up Block Time (%)				
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.68
Intersection Signal Delay: 13.2 Intersection LOS: B
Intersection Capacity Utilization 62.7% ICU Level of Service B

Lane Group	WBL	WBR	NBL	NBR	SEL
Lane Group Flow (vph)	61	1675	0	38	1848
Act Effct Green (s)	27.0	90.0		27.0	55.0
Actuated g/C Ratio	0.30	1.00		0.30	0.61
v/c Ratio	0.11	0.46		0.08	0.60
Uniform Delay, d1	22.8	0.0		11.7	10.7
Delay	14.0	2.1		8.7	10.9
LOS	B	A		A	B
Approach Delay	2.5		8.7		10.9
Approach LOS	A		A		B
Queue Length 50th (m)	7.7	18.9		1.6	101.7
Queue Length 95th (m)	m14.6	19.6		m2.6	117.3
Internal Link Dist (m)	0.1		1.4		124.6
50th Up Block Time (%)	65%	19%		9%	
95th Up Block Time (%)	65%	26%		17%	4%
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)	39	376		5	34

Intersection Summary	
Cycle Length: 90	
Offset: 27 (30%), Referenced to phase 2:SEL and 6:, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.60	
Intersection Signal Delay: 6.9	Intersection LOS: A
Intersection Capacity Utilization 45.2%	ICU Level of Service A
m Volume for 95th percentile queue is metered by upstream signal.	

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	1902	1715	67	6
Act Effct Green (s)	55.0	55.0	27.0	27.0
Actuated g/C Ratio	0.61	0.61	0.30	0.30
v/c Ratio	0.61	0.55	0.15	0.01
Uniform Delay, d1	10.3	10.2	22.0	7.3
Delay	24.0	10.3	22.7	16.5
LOS	C	B	C	B
Approach Delay	24.0	10.3	22.7	16.5
Approach LOS	C	B	C	B
Queue Length 50th (m)	128.2	57.6	8.1	0.3
Queue Length 95th (m)	142.8	69.3	17.7	2.9
Internal Link Dist (m)	0.1	109.0	64.6	106.0
50th Up Block Time (%)	28%			
95th Up Block Time (%)	28%			
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	533			

Intersection Summary

Cycle Length: 90

Offset: 55 (61%), Referenced to phase 2:EBT, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.61

Intersection Signal Delay: 17.6 Intersection LOS: B

Intersection Capacity Utilization 54.7% ICU Level of Service A

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	430	479	178	207
Act Effct Green (s)	44.0	44.0	38.0	38.0
Actuated g/C Ratio	0.49	0.49	0.42	0.42
v/c Ratio	1.16	0.53	0.30	0.27
Uniform Delay, d1	22.9	15.6	16.3	13.4
Delay	103.5	18.0	16.8	13.8
LOS	F	B	B	B
Approach Delay	103.5	18.0	16.8	13.8
Approach LOS	F	B	B	B
Queue Length 50th (m)	~89.0	59.7	18.8	17.9
Queue Length 95th (m)	#145.2	88.0	33.6	32.7
Internal Link Dist (m)	11.4	203.1	131.5	96.8
50th Up Block Time (%)	48%			
95th Up Block Time (%)	53%			
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 1.16

Intersection Signal Delay: 45.6 Intersection LOS: D

Intersection Capacity Utilization 83.8% ICU Level of Service D

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

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

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	14	15	536	601
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	0.02	0.03	0.50	0.57
Uniform Delay, d1	15.3	3.9	11.8	12.4
Delay	17.1	11.5	12.2	12.8
LOS	B	B	B	B
Approach Delay	17.1	11.5	12.2	12.8
Approach LOS	B	B	B	B
Queue Length 50th (m)	1.3	0.4	52.2	61.4
Queue Length 95th (m)	5.2	4.4	77.5	91.3
Internal Link Dist (m)	129.5	100.4	143.2	47.2
50th Up Block Time (%)				15%
95th Up Block Time (%)				24%
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.57	
Intersection Signal Delay: 12.6	Intersection LOS: B
Intersection Capacity Utilization 48.3%	ICU Level of Service A

Lane Group	EBL	EBT	WBL	WBT	WBR	NBT	SBT
Lane Group Flow (vph)	9	25	5	7	52	1896	2165
Act Effct Green (s)	32.0	32.0	32.0	32.0	32.0	50.0	50.0
Actuated g/C Ratio	0.36	0.36	0.36	0.36	0.36	0.56	0.56
v/c Ratio	0.02	0.04	0.01	0.01	0.09	0.66	0.77
Uniform Delay, d1	18.8	14.4	18.8	18.7	15.5	14.1	15.2
Delay	19.0	15.9	19.0	18.9	16.6	14.3	15.5
LOS	B	B	B	B	B	B	B
Approach Delay		16.7		17.1		14.3	15.5
Approach LOS		B		B		B	B
Queue Length 50th (m)	1.0	2.1	0.6	0.8	4.7	78.9	97.5
Queue Length 95th (m)	4.1	7.2	2.8	3.6	12.2	94.3	116.5
Internal Link Dist (m)		138.8		106.8		182.4	8.4
50th Up Block Time (%)							41%
95th Up Block Time (%)							41%
Turn Bay Length (m)	29.0		35.1				
50th Bay Block Time %							
95th Bay Block Time %							
Queuing Penalty (veh)							

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.77	
Intersection Signal Delay: 15.0	Intersection LOS: B
Intersection Capacity Utilization 53.3%	ICU Level of Service A

2030 ALTERNATIVE 2

(Replace and Widen) AM

Lane Group	EBT	WBT	WBR	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	1676	760	12	0	3	2	0	10
Act Effct Green (s)	48.0	48.0	75.0		19.0	19.0		19.0
Actuated g/C Ratio	0.64	0.64	1.00		0.25	0.25		0.25
v/c Ratio	0.74	0.33	0.01		0.01	0.00		0.02
Uniform Delay, d1	9.0	6.2	0.0		0.0	21.0		0.0
Delay	9.4	6.3	0.0		0.0	21.0		12.1
LOS	A	A	A		A	C		B
Approach Delay	9.4	6.2		0.0			13.6	
Approach LOS	A	A		A			B	
Queue Length 50th (m)	73.0	22.5	0.0		0.0	0.2		0.0
Queue Length 95th (m)	97.6	30.8	0.0		0.0	1.7		3.4
Internal Link Dist (m)	18.4	14.6		23.6			7.9	
50th Up Block Time (%)	28%	17%						
95th Up Block Time (%)	30%	22%						
Turn Bay Length (m)						7.6		
50th Bay Block Time %								
95th Bay Block Time %								
Queuing Penalty (veh)	491	147						

Intersection Summary

Cycle Length: 75

Offset: 0 (0%), Referenced to phase 2:SBL and 6:, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.74

Intersection Signal Delay: 8.4 Intersection LOS: A

Intersection Capacity Utilization 63.6% ICU Level of Service B

Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	355	40	3087	1838
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	0.39	0.07	1.06	0.63
Uniform Delay, d1	22.4	13.2	19.5	13.1
Delay	22.7	15.1	54.9	3.1
LOS	C	B	D	A
Approach Delay	22.7	15.1	54.9	3.1
Approach LOS	C	B	D	A
Queue Length 50th (m)	24.2	3.1	~211.0	14.7
Queue Length 95th (m)	36.0	9.7	#241.0	14.6
Internal Link Dist (m)	14.6	197.6	34.7	120.6
50th Up Block Time (%)	28%		44%	
95th Up Block Time (%)	40%		45%	
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	122		1375	

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 1.06

Intersection Signal Delay: 34.5 Intersection LOS: C

Intersection Capacity Utilization 89.2% ICU Level of Service D

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

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

Lane Group	EBL	NBL	NBT	SBT
Lane Group Flow (vph)	360	72	578	118
Act Effct Green (s)	23.0	24.0	24.0	24.0
Actuated g/C Ratio	0.42	0.44	0.44	0.44
v/c Ratio	0.40	0.13	0.70	0.15
Uniform Delay, d1	0.1	9.2	12.6	7.2
Delay	1.7	9.6	13.5	7.8
LOS	A	A	B	A
Approach Delay	1.7		13.0	7.8
Approach LOS	A		B	A
Queue Length 50th (m)	0.1	4.1	44.1	5.1
Queue Length 95th (m)	12.1	10.1	74.8	12.6
Internal Link Dist (m)	81.2		167.4	73.9
50th Up Block Time (%)				
95th Up Block Time (%)				
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 55
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.70
Intersection Signal Delay: 8.9 Intersection LOS: A
Intersection Capacity Utilization 59.4% ICU Level of Service A

Lane Group	SBL	SBR	SET	SER	NWT	NEL	NER
Lane Group Flow (vph)	0	4	3076	244	2161	56	10
Act Effct Green (s)		23.0	59.0	59.0	59.0	23.0	23.0
Actuated g/C Ratio		0.26	0.66	0.66	0.66	0.26	0.26
v/c Ratio		0.01	0.91	0.22	0.64	0.15	0.02
Uniform Delay, d1		0.0	13.3	0.0	9.2	25.9	22.5
Delay		5.8	15.2	0.8	14.0	26.5	24.2
LOS		A	B	A	B	C	C
Approach Delay	5.8		14.1		14.0	26.1	
Approach LOS	A		B		B	C	
Queue Length 50th (m)		0.0	148.3	0.0	127.1	7.5	1.2
Queue Length 95th (m)		1.4	176.5	7.0	142.3	17.0	5.0
Internal Link Dist (m)	24.9		110.0		34.7	18.1	
50th Up Block Time (%)			12%		18%		
95th Up Block Time (%)			15%		17%	2%	
Turn Bay Length (m)							
50th Bay Block Time %							
95th Bay Block Time %							
Queuing Penalty (veh)			418		378		

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2: and 6:NEL, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.91	
Intersection Signal Delay: 14.2	Intersection LOS: B
Intersection Capacity Utilization 76.1%	ICU Level of Service C

Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	461	157	2527	1718
Act Effct Green (s)	32.0	32.0	50.0	50.0
Actuated g/C Ratio	0.36	0.36	0.56	0.56
v/c Ratio	0.69	0.26	0.89	0.60
Uniform Delay, d1	24.7	18.3	17.4	13.3
Delay	25.4	18.8	9.6	13.3
LOS	C	B	A	B
Approach Delay	25.4	18.8	9.6	13.3
Approach LOS	C	B	A	B
Queue Length 50th (m)	67.0	16.9	40.5	88.3
Queue Length 95th (m)	100.5	31.1	m38.2	109.5
Internal Link Dist (m)	108.7	101.1	120.6	118.4
50th Up Block Time (%)				
95th Up Block Time (%)	2%			
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.89	
Intersection Signal Delay: 12.7	Intersection LOS: B
Intersection Capacity Utilization 81.3%	ICU Level of Service D
m Volume for 95th percentile queue is metered by upstream signal.	

Lane Group	WBL	WBR	NBL	NBR	SEL
Lane Group Flow (vph)	240	1695	0	120	2378
Act Effct Green (s)	27.0	90.0		27.0	55.0
Actuated g/C Ratio	0.30	1.00		0.30	0.61
v/c Ratio	0.45	0.46		0.24	0.77
Uniform Delay, d1	25.4	0.0		22.7	12.9
Delay	19.2	1.2		11.6	13.3
LOS	B	A		B	B
Approach Delay	3.5		11.6		13.3
Approach LOS	A		B		B
Queue Length 50th (m)	34.6	10.8		11.3	159.6
Queue Length 95th (m)	56.0	10.0		m10.1	174.5
Internal Link Dist (m)	0.1		0.1		118.4
50th Up Block Time (%)	70%	21%		65%	11%
95th Up Block Time (%)	70%	27%		64%	15%
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)	167	407		77	314

Intersection Summary	
Cycle Length: 90	
Offset: 27 (30%), Referenced to phase 2:SEL and 6:, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.77	
Intersection Signal Delay: 9.0	Intersection LOS: A
Intersection Capacity Utilization 65.2%	ICU Level of Service B
m Volume for 95th percentile queue is metered by upstream signal.	

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	2583	1802	185	38
Act Effct Green (s)	55.0	55.0	27.0	27.0
Actuated g/C Ratio	0.61	0.61	0.30	0.30
v/c Ratio	0.83	0.57	0.47	0.08
Uniform Delay, d1	13.4	10.5	25.6	17.2
Delay	23.7	10.6	26.4	18.8
LOS	C	B	C	B
Approach Delay	23.7	10.6	26.4	18.8
Approach LOS	C	B	C	B
Queue Length 50th (m)	174.2	62.1	25.9	3.6
Queue Length 95th (m)	190.1	74.7	45.5	10.6
Internal Link Dist (m)	0.7	109.0	64.6	106.0
50th Up Block Time (%)	27%			
95th Up Block Time (%)	27%			
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	709			

Intersection Summary

Cycle Length: 90
Offset: 55 (61%), Referenced to phase 2:EBT, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.83
Intersection Signal Delay: 18.6 Intersection LOS: B
Intersection Capacity Utilization 74.7% ICU Level of Service C

	→	←	↑	↓
Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	567	517	153	255
Act Effct Green (s)	44.0	44.0	38.0	38.0
Actuated g/C Ratio	0.49	0.49	0.42	0.42
v/c Ratio	1.29	0.56	0.29	0.33
Uniform Delay, d1	22.1	16.2	16.6	16.6
Delay	139.8	24.0	17.2	17.0
LOS	F	C	B	B
Approach Delay	139.8	24.0	17.2	17.0
Approach LOS	F	C	B	B
Queue Length 50th (m)	~125.5	80.9	16.5	27.4
Queue Length 95th (m)	#187.6	112.4	30.5	44.9
Internal Link Dist (m)	11.4	200.0	131.5	96.8
50th Up Block Time (%)	50%			
95th Up Block Time (%)	53%			
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 1.29

Intersection Signal Delay: 66.1 Intersection LOS: E

Intersection Capacity Utilization 94.2% ICU Level of Service E

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

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

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	70	28	590	647
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	0.14	0.05	0.56	0.61
Uniform Delay, d1	19.7	4.9	12.3	12.7
Delay	20.1	10.5	12.8	13.2
LOS	C	B	B	B
Approach Delay	20.1	10.5	12.8	13.2
Approach LOS	C	B	B	B
Queue Length 50th (m)	8.0	0.8	60.1	67.8
Queue Length 95th (m)	17.2	6.2	89.0	101.0
Internal Link Dist (m)	129.5	100.4	143.2	47.2
50th Up Block Time (%)				18%
95th Up Block Time (%)				26%
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.61
Intersection Signal Delay: 13.3 Intersection LOS: B
Intersection Capacity Utilization 53.5% ICU Level of Service A

Lane Group	EBL	EBT	WBL	WBT	WBR	NBT	SBT
Lane Group Flow (vph)	475	51	1	5	379	2249	2485
Act Effct Green (s)	32.0	32.0	32.0	32.0	32.0	50.0	50.0
Actuated g/C Ratio	0.36	0.36	0.36	0.36	0.36	0.56	0.56
v/c Ratio	0.94	0.08	0.00	0.01	0.66	0.79	0.88
Uniform Delay, d1	28.1	17.3	19.0	18.8	24.1	15.8	17.0
Delay	49.3	18.0	19.0	18.8	25.0	16.1	18.1
LOS	D	B	B	B	C	B	B
Approach Delay		46.3		24.9		16.1	18.1
Approach LOS		D		C		B	B
Queue Length 50th (m)	78.4	5.2	0.1	0.6	53.9	105.1	125.9
Queue Length 95th (m)	#137.9	12.6	1.1	2.8	84.9	124.9	150.1
Internal Link Dist (m)		138.8		106.8		182.4	8.4
50th Up Block Time (%)							42%
95th Up Block Time (%)	6%						42%
Turn Bay Length (m)	29.0		35.1				
50th Bay Block Time %	43%						
95th Bay Block Time %	55%						
Queuing Penalty (veh)	25						

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.94
Intersection Signal Delay: 20.4 Intersection LOS: C
Intersection Capacity Utilization 103.2% ICU Level of Service F
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

2030 ALTERNATIVE 2

(Replace and Widen) PM

Lane Group	EBT	WBT	WBR	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	1178	1327	9	0	3	6	0	459
Act Effct Green (s)	48.0	48.0	75.0		19.0	19.0		19.0
Actuated g/C Ratio	0.64	0.64	1.00		0.25	0.25		0.25
v/c Ratio	0.52	0.58	0.01		0.01	0.01		1.00
Uniform Delay, d1	7.2	7.7	0.0		0.0	21.0		23.7
Delay	7.3	7.9	0.0		0.0	21.2		60.0
LOS	A	A	A		A	C		E
Approach Delay	7.3	7.9		0.0			59.5	
Approach LOS	A	A		A			E	
Queue Length 50th (m)	40.6	49.3	0.0		0.0	0.6		~57.0
Queue Length 95th (m)	54.1	65.2	0.0		0.0	3.3		#114.6
Internal Link Dist (m)	18.4	14.6		23.6			7.9	
50th Up Block Time (%)	23%	27%						65%
95th Up Block Time (%)	26%	29%						71%
Turn Bay Length (m)						7.6		
50th Bay Block Time %								65%
95th Bay Block Time %								72%
Queuing Penalty (veh)	285	377						317

Intersection Summary

Cycle Length: 75

Offset: 0 (0%), Referenced to phase 2:SBL and 6:, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 1.00

Intersection Signal Delay: 15.7 Intersection LOS: B

Intersection Capacity Utilization 71.8% ICU Level of Service C

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

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

	→	←	↘	↖
Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	208	264	2560	2468
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	0.23	0.46	0.88	0.85
Uniform Delay, d1	20.8	22.8	16.8	16.2
Delay	21.1	23.4	20.1	5.1
LOS	C	C	C	A
Approach Delay	21.1	23.4	20.1	5.1
Approach LOS	C	C	C	A
Queue Length 50th (m)	13.1	34.9	99.9	29.1
Queue Length 95th (m)	21.4	56.9	120.1	43.9
Internal Link Dist (m)	14.6	197.6	34.7	120.6
50th Up Block Time (%)			43%	
95th Up Block Time (%)	23%		43%	
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	24		1102	

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 13.6 Intersection LOS: B

Intersection Capacity Utilization 81.7% ICU Level of Service D

Lane Group	EBL	NBL	NBT	SBT
Lane Group Flow (vph)	559	71	453	127
Act Effct Green (s)	23.0	24.0	24.0	24.0
Actuated g/C Ratio	0.42	0.44	0.44	0.44
v/c Ratio	0.56	0.13	0.55	0.16
Uniform Delay, d1	0.0	9.2	11.5	7.8
Delay	1.4	9.6	12.0	8.2
LOS	A	A	B	A
Approach Delay	1.4		11.7	8.2
Approach LOS	A		B	A
Queue Length 50th (m)	0.1	4.0	31.5	6.0
Queue Length 95th (m)	14.7	10.0	54.0	13.8
Internal Link Dist (m)	81.2		167.4	73.9
50th Up Block Time (%)				
95th Up Block Time (%)				
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 55
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.56
Intersection Signal Delay: 6.6 Intersection LOS: A
Intersection Capacity Utilization 65.1% ICU Level of Service B

Lane Group	SBL	SBR	SET	SER	NWT	NEL	NER
Lane Group Flow (vph)	0	63	2532	128	2784	177	21
Act Effct Green (s)		23.0	59.0	59.0	59.0	23.0	23.0
Actuated g/C Ratio		0.26	0.66	0.66	0.66	0.26	0.26
v/c Ratio		0.15	0.75	0.12	0.83	0.53	0.05
Uniform Delay, d1		24.6	10.5	0.0	11.6	28.9	19.2
Delay		25.4	10.8	1.1	19.0	29.8	21.3
LOS		C	B	A	B	C	C
Approach Delay	25.4		10.3		19.0	28.9	
Approach LOS	C		B		B	C	
Queue Length 50th (m)		8.0	96.6	0.0	187.1	26.4	2.1
Queue Length 95th (m)		17.9	114.5	5.2	201.0	46.9	7.6
Internal Link Dist (m)	24.9		110.0		34.7	18.1	
50th Up Block Time (%)					22%	28%	
95th Up Block Time (%)			5%		25%	48%	
Turn Bay Length (m)							
50th Bay Block Time %							
95th Bay Block Time %							
Queuing Penalty (veh)			64		646	67	

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2: and 6:NEL, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.83	
Intersection Signal Delay: 15.4	Intersection LOS: B
Intersection Capacity Utilization 77.5%	ICU Level of Service C

	→	←	↘	↖
Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	379	366	2039	2249
Act Effct Green (s)	32.0	32.0	50.0	50.0
Actuated g/C Ratio	0.36	0.36	0.56	0.56
v/c Ratio	0.57	0.62	0.72	0.79
Uniform Delay, d1	23.3	23.6	14.7	15.8
Delay	23.9	24.4	10.5	15.8
LOS	C	C	B	B
Approach Delay	23.9	24.4	10.5	15.8
Approach LOS	C	C	B	B
Queue Length 50th (m)	51.9	51.0	39.2	136.4
Queue Length 95th (m)	79.6	79.9	38.4	160.9
Internal Link Dist (m)	108.7	101.1	120.6	118.4
50th Up Block Time (%)				10%
95th Up Block Time (%)				11%
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				231

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.79
Intersection Signal Delay: 14.9 Intersection LOS: B
Intersection Capacity Utilization 72.4% ICU Level of Service C

Lane Group	WBL	WBR	NBL	NBR	SEL
Lane Group Flow (vph)	179	2214	0	161	1980
Act Effct Green (s)	27.0	90.0		27.0	55.0
Actuated g/C Ratio	0.30	1.00		0.30	0.61
v/c Ratio	0.33	0.61		0.32	0.64
Uniform Delay, d1	24.5	0.0		22.3	11.2
Delay	17.9	2.3		16.0	11.9
LOS	B	A		B	B
Approach Delay	3.5		16.0		11.9
Approach LOS	A		B		B
Queue Length 50th (m)	25.4	20.3		21.5	109.9
Queue Length 95th (m)	m34.9	17.7		40.3	140.2
Internal Link Dist (m)	0.1		0.1		118.4
50th Up Block Time (%)	70%	29%		65%	2%
95th Up Block Time (%)	70%	38%		65%	8%
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)	125	740		105	79

Intersection Summary	
Cycle Length: 90	
Offset: 27 (30%), Referenced to phase 2:SEL and 6:, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.64	
Intersection Signal Delay: 7.6	Intersection LOS: A
Intersection Capacity Utilization 55.0%	ICU Level of Service A
m Volume for 95th percentile queue is metered by upstream signal.	

	→	←	↑	↓
Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	2210	2186	346	26
Act Effct Green (s)	55.0	55.0	27.0	27.0
Actuated g/C Ratio	0.61	0.61	0.30	0.30
v/c Ratio	0.71	0.70	0.86	0.05
Uniform Delay, d1	11.7	11.8	29.7	15.4
Delay	22.7	12.0	41.9	17.7
LOS	C	B	D	B
Approach Delay	22.7	12.0	41.9	17.7
Approach LOS	C	B	D	B
Queue Length 50th (m)	140.9	85.3	56.1	2.2
Queue Length 95th (m)	154.8	101.3	#103.4	7.9
Internal Link Dist (m)	0.7	109.0	64.6	106.0
50th Up Block Time (%)	29%			
95th Up Block Time (%)	28%	1%	36%	
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	623			

Intersection Summary	
Cycle Length: 90	
Offset: 55 (61%), Referenced to phase 2:EBT, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.86	
Intersection Signal Delay: 19.2	Intersection LOS: B
Intersection Capacity Utilization 76.1%	ICU Level of Service C

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

	→	←	↑	↓
Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	421	554	175	246
Act Effct Green (s)	44.0	44.0	38.0	38.0
Actuated g/C Ratio	0.49	0.49	0.42	0.42
v/c Ratio	0.59	0.61	0.31	0.33
Uniform Delay, d1	15.5	16.6	16.4	14.1
Delay	16.2	22.8	16.9	14.5
LOS	B	C	B	B
Approach Delay	16.2	22.8	16.9	14.5
Approach LOS	B	C	B	B
Queue Length 50th (m)	47.2	81.9	18.6	22.4
Queue Length 95th (m)	76.4	115.1	33.6	39.5
Internal Link Dist (m)	11.4	200.0	131.5	96.8
50th Up Block Time (%)	40%			
95th Up Block Time (%)	44%			
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.61
Intersection Signal Delay: 18.6 Intersection LOS: B
Intersection Capacity Utilization 89.2% ICU Level of Service D

	→	←	↑	↓
Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	50	110	599	671
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	0.10	0.17	0.56	0.67
Uniform Delay, d1	18.8	17.8	12.4	13.4
Delay	19.4	18.2	12.8	14.1
LOS	B	B	B	B
Approach Delay	19.4	18.2	12.8	14.1
Approach LOS	B	B	B	B
Queue Length 50th (m)	5.4	11.3	61.3	74.6
Queue Length 95th (m)	13.2	22.8	90.7	112.6
Internal Link Dist (m)	129.5	100.4	143.2	47.2
50th Up Block Time (%)				20%
95th Up Block Time (%)				28%
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.67
Intersection Signal Delay: 14.1 Intersection LOS: B
Intersection Capacity Utilization 83.5% ICU Level of Service D

Lane Group	EBL	EBT	WBL	WBT	WBR	NBT	SBT
Lane Group Flow (vph)	230	17	1	49	415	2209	2984
Act Effct Green (s)	32.0	32.0	32.0	32.0	32.0	50.0	50.0
Actuated g/C Ratio	0.36	0.36	0.36	0.36	0.36	0.56	0.56
v/c Ratio	0.47	0.03	0.00	0.07	0.73	0.77	1.06
Uniform Delay, d1	22.5	16.6	19.0	19.2	24.9	15.6	19.3
Delay	23.2	17.6	19.0	19.5	26.3	15.9	52.0
LOS	C	B	B	B	C	B	D
Approach Delay		22.8		25.5		15.9	52.0
Approach LOS		C		C		B	D
Queue Length 50th (m)	30.4	1.7	0.1	5.5	60.8	101.9	~207.0
Queue Length 95th (m)	51.5	5.9	1.1	12.8	94.9	121.0	#236.0
Internal Link Dist (m)		138.8		106.8		182.4	8.4
50th Up Block Time (%)							43%
95th Up Block Time (%)							44%
Turn Bay Length (m)	29.0		35.1				
50th Bay Block Time %	9%						
95th Bay Block Time %	32%						
Queuing Penalty (veh)	3						

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 1.06

Intersection Signal Delay: 35.2 Intersection LOS: D

Intersection Capacity Utilization 91.1% ICU Level of Service E

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

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

2030 ALTERNATIVE 2

(Replace and Widen) WEEKEND

Lane Group	EBT	WBT	WBR	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	1006	1066	11	0	6	1	0	12
Act Effct Green (s)	48.0	48.0	75.0		19.0	19.0		19.0
Actuated g/C Ratio	0.64	0.64	1.00		0.25	0.25		0.25
v/c Ratio	0.44	0.47	0.01		0.01	0.00		0.03
Uniform Delay, d1	6.7	6.9	0.0		0.0	21.0		0.0
Delay	6.9	7.1	0.0		0.0	21.0		11.7
LOS	A	A	A		A	C		B
Approach Delay	6.9	7.0		0.0			12.4	
Approach LOS	A	A		A			B	
Queue Length 50th (m)	32.5	35.4	0.0		0.0	0.1		0.0
Queue Length 95th (m)	43.6	47.3	0.0		0.0	1.2		3.7
Internal Link Dist (m)	15.9	18.2		13.9			0.8	
50th Up Block Time (%)	22%	21%						
95th Up Block Time (%)	25%	25%				29%		60%
Turn Bay Length (m)						7.6		
50th Bay Block Time %								
95th Bay Block Time %								
Queuing Penalty (veh)	235	242						3

Intersection Summary	
Cycle Length: 75	
Offset: 0 (0%), Referenced to phase 2:SBL and 6:, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.47	
Intersection Signal Delay: 6.9	Intersection LOS: A
Intersection Capacity Utilization 44.6%	ICU Level of Service A

Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	394	8	2434	1991
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	0.44	0.01	0.84	0.68
Uniform Delay, d1	22.6	0.0	16.0	13.8
Delay	22.9	10.5	18.2	3.6
LOS	C	B	B	A
Approach Delay	22.9	10.5	18.2	3.6
Approach LOS	C	B	B	A
Queue Length 50th (m)	27.1	0.0	91.3	23.8
Queue Length 95th (m)	40.0	2.7	111.4	28.2
Internal Link Dist (m)	14.6	197.6	34.7	120.6
50th Up Block Time (%)	32%		42%	
95th Up Block Time (%)	43%		43%	
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	148		1025	

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 12.5 Intersection LOS: B

Intersection Capacity Utilization 81.1% ICU Level of Service D

Lane Group	EBL	NBL	NBT	SBT
Lane Group Flow (vph)	349	4	145	18
Act Effct Green (s)	23.0	24.0	24.0	24.0
Actuated g/C Ratio	0.42	0.44	0.44	0.44
v/c Ratio	0.40	0.01	0.18	0.02
Uniform Delay, d1	0.1	8.8	9.4	8.3
Delay	1.7	8.8	9.7	8.7
LOS	A	A	A	A
Approach Delay	1.7		9.7	8.7
Approach LOS	A		A	A
Queue Length 50th (m)	0.3	0.3	8.3	0.9
Queue Length 95th (m)	12.1	1.5	17.0	3.6
Internal Link Dist (m)	81.2		167.4	73.9
50th Up Block Time (%)				
95th Up Block Time (%)				
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary	
Cycle Length: 55	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.40	
Intersection Signal Delay: 4.3	Intersection LOS: A
Intersection Capacity Utilization 35.9%	ICU Level of Service A

Lane Group	SBL	SBR2	SET	SER	NWT	NEL	NER
Lane Group Flow (vph)	0	1	2426	90	2374	86	6
Act Effct Green (s)		23.0	59.0	59.0	59.0	23.0	23.0
Actuated g/C Ratio		0.26	0.66	0.66	0.66	0.26	0.26
v/c Ratio		0.00	0.72	0.08	0.70	0.24	0.01
Uniform Delay, d1		0.0	10.1	0.0	9.9	26.5	0.0
Delay		4.0	10.3	1.3	16.5	27.2	15.3
LOS		A	B	A	B	C	B
Approach Delay	4.0		10.0		16.5	26.4	
Approach LOS	A		A		B	C	
Queue Length 50th (m)		0.0	88.8	0.0	140.3	11.8	0.0
Queue Length 95th (m)		0.4	105.4	4.5	153.5	23.9	2.9
Internal Link Dist (m)	24.9		110.0		34.7	18.1	
50th Up Block Time (%)					21%		
95th Up Block Time (%)			3%		22%	23%	
Turn Bay Length (m)							
50th Bay Block Time %							
95th Bay Block Time %							
Queuing Penalty (veh)					501	10	

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2: and 6:NEL, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 13.4 Intersection LOS: B

Intersection Capacity Utilization 65.0% ICU Level of Service B

Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	217	358	1898	1633
Act Effct Green (s)	32.0	32.0	50.0	50.0
Actuated g/C Ratio	0.36	0.36	0.56	0.56
v/c Ratio	0.32	0.60	0.67	0.57
Uniform Delay, d1	21.1	22.3	14.0	13.0
Delay	21.5	23.1	10.8	13.0
LOS	C	C	B	B
Approach Delay	21.5	23.1	10.8	13.0
Approach LOS	C	C	B	B
Queue Length 50th (m)	26.9	47.3	37.1	88.2
Queue Length 95th (m)	44.4	75.7	35.7	105.8
Internal Link Dist (m)	108.7	101.1	120.6	121.7
50th Up Block Time (%)				
95th Up Block Time (%)				
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.67	
Intersection Signal Delay: 13.3	Intersection LOS: B
Intersection Capacity Utilization 65.6%	ICU Level of Service B

Lane Group	WBL	WBR	NBL	NBR	SEL
Lane Group Flow (vph)	72	1622	0	38	1841
Act Effct Green (s)	27.0	90.0		27.0	55.0
Actuated g/C Ratio	0.30	1.00		0.30	0.61
v/c Ratio	0.13	0.44		0.08	0.60
Uniform Delay, d1	23.0	0.0		11.7	10.7
Delay	14.4	1.9		12.3	11.1
LOS	B	A		B	B
Approach Delay	2.4		12.3		11.1
Approach LOS	A		B		B
Queue Length 50th (m)	9.2	17.0		1.6	101.2
Queue Length 95th (m)	m18.0	17.9		m3.7	116.8
Internal Link Dist (m)	0.1		2.4		121.7
50th Up Block Time (%)	65%	18%			
95th Up Block Time (%)	65%	24%		14%	4%
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)	47	347		2	37

Intersection Summary

Cycle Length: 90
Offset: 27 (30%), Referenced to phase 2:SEL and 6:, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.60
Intersection Signal Delay: 7.0 Intersection LOS: A
Intersection Capacity Utilization 45.7% ICU Level of Service A
m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBT →	WBT ←	NBT ↑	SBT ↓
Lane Group Flow (vph)	1901	1663	70	4
Act Effct Green (s)	55.0	55.0	27.0	27.0
Actuated g/C Ratio	0.61	0.61	0.30	0.30
v/c Ratio	0.61	0.53	0.16	0.01
Uniform Delay, d1	10.3	10.0	22.4	0.0
Delay	23.7	10.2	23.0	0.0
LOS	C	B	C	A
Approach Delay	23.7	10.2	23.0	0.0
Approach LOS	C	B	C	A
Queue Length 50th (m)	128.3	55.2	8.6	0.0
Queue Length 95th (m)	142.8	66.4	18.5	0.0
Internal Link Dist (m)	0.1	109.0	64.6	106.0
50th Up Block Time (%)	81%			
95th Up Block Time (%)	28%			
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	1031			

Intersection Summary	
Cycle Length: 90	
Offset: 55 (61%), Referenced to phase 2:EBT, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.61	
Intersection Signal Delay: 17.5	Intersection LOS: B
Intersection Capacity Utilization 54.8%	ICU Level of Service A

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	435	500	185	257
Act Effct Green (s)	44.0	44.0	38.0	38.0
Actuated g/C Ratio	0.49	0.49	0.42	0.42
v/c Ratio	1.22	0.55	0.32	0.34
Uniform Delay, d1	22.9	15.8	16.6	16.0
Delay	121.6	18.9	17.1	16.4
LOS	F	B	B	B
Approach Delay	121.6	18.9	17.1	16.4
Approach LOS	F	B	B	B
Queue Length 50th (m)	~93.7	64.0	19.9	26.6
Queue Length 95th (m)	#150.2	93.5	35.5	44.5
Internal Link Dist (m)	11.4	196.0	131.5	96.8
50th Up Block Time (%)	49%			
95th Up Block Time (%)	54%			
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 1.22

Intersection Signal Delay: 50.6 Intersection LOS: D

Intersection Capacity Utilization 88.1% ICU Level of Service D

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

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

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	7	16	548	603
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	0.01	0.03	0.51	0.57
Uniform Delay, d1	16.6	2.4	11.9	12.4
Delay	18.4	10.4	12.3	12.8
LOS	B	B	B	B
Approach Delay	18.4	10.4	12.3	12.8
Approach LOS	B	B	B	B
Queue Length 50th (m)	0.7	0.2	53.8	61.7
Queue Length 95th (m)	3.5	4.4	79.9	91.6
Internal Link Dist (m)	129.5	100.4	143.2	47.2
50th Up Block Time (%)				15%
95th Up Block Time (%)				24%
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.57	
Intersection Signal Delay: 12.6	Intersection LOS: B
Intersection Capacity Utilization 48.4%	ICU Level of Service A

Lane Group	EBL	EBT	WBL	WBT	WBR	NBT	SBT
Lane Group Flow (vph)	9	25	3	8	66	1903	2182
Act Effct Green (s)	32.0	32.0	32.0	32.0	32.0	50.0	50.0
Actuated g/C Ratio	0.36	0.36	0.36	0.36	0.36	0.56	0.56
v/c Ratio	0.02	0.04	0.01	0.01	0.11	0.67	0.77
Uniform Delay, d1	18.8	15.1	18.7	18.8	16.4	14.1	15.2
Delay	19.0	16.4	19.0	18.9	17.4	14.3	15.5
LOS	B	B	B	B	B	B	B
Approach Delay		17.1		17.6		14.3	15.5
Approach LOS		B		B		B	B
Queue Length 50th (m)	1.0	2.2	0.3	0.9	6.4	79.5	98.9
Queue Length 95th (m)	4.1	7.3	2.1	3.7	15.0	94.9	118.0
Internal Link Dist (m)		138.8		106.8		182.4	8.4
50th Up Block Time (%)							41%
95th Up Block Time (%)							42%
Turn Bay Length (m)	29.0		35.1				
50th Bay Block Time %							
95th Bay Block Time %							
Queuing Penalty (veh)							

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.77	
Intersection Signal Delay: 15.0	Intersection LOS: B
Intersection Capacity Utilization 54.2%	ICU Level of Service A

2030 ALTERNATIVE 5

(Parkway: Diamond Option) AM

Lane Group	EBT	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	1255	228	2	0	2	5	0	6
Act Effct Green (s)	38.0	38.0	29.0		29.0	29.0		29.0
Actuated g/C Ratio	0.51	0.51	0.39		0.39	0.39		0.39
v/c Ratio	0.69	0.13	0.00		0.00	0.01		0.01
Uniform Delay, d1	14.0	9.7	14.0		0.0	14.2		0.0
Delay	14.4	9.8	14.0		10.5	14.2		9.0
LOS	B	A	B		B	B		A
Approach Delay	14.4	9.8		12.3			11.4	
Approach LOS	B	A		B			B	
Queue Length 50th (m)	66.5	8.4	0.2		0.0	0.4		0.0
Queue Length 95th (m)	88.3	13.7	1.4		1.2	2.3		2.2
Internal Link Dist (m)	222.2	219.6		26.3			7.1	
50th Up Block Time (%)								
95th Up Block Time (%)								
Turn Bay Length (m)						7.6		
50th Bay Block Time %								
95th Bay Block Time %								
Queuing Penalty (veh)								

Intersection Summary

Cycle Length: 75

Offset: 0 (0%), Referenced to phase 2:NBSBL and 6:, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.69

Intersection Signal Delay: 13.7   Intersection LOS: B

Intersection Capacity Utilization 51.4%   ICU Level of Service A

	→	←	↘	↖
Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	315	377	3136	2148
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	1.26dl	0.67	1.08	0.74
Uniform Delay, d1	22.7	24.7	19.5	14.5
Delay	23.2	25.5	58.8	6.1
LOS	C	C	E	A
Approach Delay	23.2	25.5	58.8	6.1
Approach LOS	C	C	E	A
Queue Length 50th (m)	21.8	54.0	~223.4	32.3
Queue Length 95th (m)	33.6	84.8	#251.5	35.9
Internal Link Dist (m)	32.2	176.0	58.1	100.9
50th Up Block Time (%)			34%	
95th Up Block Time (%)	6%		37%	
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	10		1111	

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 1.08
Intersection Signal Delay: 35.9 Intersection LOS: D
Intersection Capacity Utilization 110.7% ICU Level of Service G
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
dl Defacto Left Lane. Recode with 1 though lane as a left lane.

Lane Group	EBL	NBL	NBT	SBT
Lane Group Flow (vph)	270	87	526	154
Act Effct Green (s)	23.5	24.0	24.0	24.0
Actuated g/C Ratio	0.42	0.43	0.43	0.43
v/c Ratio	0.32	0.16	0.65	0.19
Uniform Delay, d1	0.1	9.6	12.4	7.5
Delay	1.9	10.0	13.0	7.9
LOS	A	B	B	A
Approach Delay	1.9		12.6	7.9
Approach LOS	A		B	A
Queue Length 50th (m)	0.1	5.0	39.4	6.9
Queue Length 95th (m)	10.5	12.1	66.8	15.8
Internal Link Dist (m)	81.1		167.5	74.1
50th Up Block Time (%)				
95th Up Block Time (%)				
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 55.5
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.65
Intersection Signal Delay: 9.1 — Intersection LOS: A
Intersection Capacity Utilization 51.1% — ICU Level of Service A

Lane Group	EBT	EBR	WBT	SET	NWT
Lane Group Flow (vph)	3	77	0	3053	2817
Act Effct Green (s)	23.0	23.0		59.0	59.0
Actuated g/C Ratio	0.26	0.26		0.66	0.66
v/c Ratio	0.01	0.19		0.91	0.84
Uniform Delay, d1	25.0	25.5		13.1	11.8
Delay	25.0	26.0		14.7	12.2
LOS	C	C		B	B
Approach Delay	26.0			14.7	12.2
Approach LOS	C			B	B
Queue Length 50th (m)	0.4	10.1		145.5	120.5
Queue Length 95th (m)	2.5	21.2		173.3	142.8
Internal Link Dist (m)	42.8		49.6	198.8	42.8
50th Up Block Time (%)					24%
95th Up Block Time (%)					25%
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)					687

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.91	
Intersection Signal Delay: 13.7	Intersection LOS: B
Intersection Capacity Utilization 70.4%	ICU Level of Service C

Lane Group	EBT	WBT	SEL	SET	NWT
Lane Group Flow (vph)	142	123	1238	660	35
Act Effct Green (s)	23.5	23.5	58.5	58.5	58.5
Actuated g/C Ratio	0.26	0.26	0.65	0.65	0.65
v/c Ratio	0.29	0.41	0.71	0.56	0.03
Uniform Delay, d1	16.0	27.4	10.2	4.6	0.5
Delay	16.9	28.4	10.6	4.9	2.3
LOS	B	C	B	A	A
Approach Delay	16.9	28.4		8.7	2.3
Approach LOS	B	C		A	A
Queue Length 50th (m)	11.8	17.6	63.9	29.7	0.2
Queue Length 95th (m)	26.6	33.5	86.9	54.5	3.1
Internal Link Dist (m)	51.1	18.4		46.5	264.4
50th Up Block Time (%)		3%	14%		
95th Up Block Time (%)		37%	19%	9%	
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)		23	204	30	

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.71

Intersection Signal Delay: 10.2 Intersection LOS: B

Intersection Capacity Utilization 66.9% ICU Level of Service B

Lane Group	EBL	EBT	WBT	WBR	NBL2	NBL	NBR	SEL
Lane Group Flow (vph)	74	1251	53	177	70	0	4	0
Act Effct Green (s)	59.0	59.0	59.0	90.0	23.0		23.0	
Actuated g/C Ratio	0.66	0.66	0.66	1.00	0.26		0.26	
v/c Ratio	0.08	0.53	0.04	0.11	0.15		0.01	
Uniform Delay, d1	5.6	8.2	5.5	0.0	25.9		0.0	
Delay	5.8	8.4	5.6	0.0	26.4		0.0	
LOS	A	A	A	A	C		A	
Approach Delay		8.2	1.3			25.0		0.0
Approach LOS		A	A			C		A
Queue Length 50th (m)	4.1	53.4	2.9	0.0	9.4		0.0	
Queue Length 95th (m)	8.7	68.2	6.5	0.0	19.7		0.0	
Internal Link Dist (m)		71.6	222.2			129.9		57.2
50th Up Block Time (%)								
95th Up Block Time (%)		4%						
Turn Bay Length (m)								
50th Bay Block Time %								
95th Bay Block Time %								
Queuing Penalty (veh)		23						

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NBL and 6:SEL, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.53	
Intersection Signal Delay: 8.0	Intersection LOS: A
Intersection Capacity Utilization 45.1%	ICU Level of Service A

Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	530	315	2516	1864
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	0.82	0.55	0.87	0.64
Uniform Delay, d1	26.9	22.8	16.5	13.2
Delay	31.6	23.5	6.7	13.4
LOS	C	C	A	B
Approach Delay	31.6	23.5	6.7	13.4
Approach LOS	C	C	A	B
Queue Length 50th (m)	82.5	41.7	32.6	74.6
Queue Length 95th (m)	#134.6	67.3	m30.3	89.4
Internal Link Dist (m)	123.5	93.1	100.9	105.5
50th Up Block Time (%)				
95th Up Block Time (%)	15%			
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	40			

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 12.7 Intersection LOS: B

Intersection Capacity Utilization 85.2% ICU Level of Service D

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

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

Lane Group	WBL	WBR	NBL	NBR	SEL
Lane Group Flow (vph)	158	1838	0	128	2423
Act Effct Green (s)	25.0	90.0		25.0	57.0
Actuated g/C Ratio	0.28	1.00		0.28	0.63
v/c Ratio	0.32	0.50		0.28	0.76
Uniform Delay, d1	25.7	0.0		24.4	11.6
Delay	26.3	0.0		13.4	2.5
LOS	C	A		B	A
Approach Delay	2.1		13.4		2.5
Approach LOS	A		B		A
Queue Length 50th (m)	21.6	0.0		6.0	12.4
Queue Length 95th (m)	37.9	0.0		11.0	13.4
Internal Link Dist (m)	0.1		2.0		105.5
50th Up Block Time (%)	72%			56%	
95th Up Block Time (%)	72%			60%	
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)	114			73	

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:SEL and 6:, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.76
Intersection Signal Delay: 2.6 Intersection LOS: A
Intersection Capacity Utilization 61.5% ICU Level of Service B

	→	←	↑	↓
Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	2640	1825	232	19
Act Effct Green (s)	59.0	59.0	23.5	23.5
Actuated g/C Ratio	0.65	0.65	0.26	0.26
v/c Ratio	0.80	0.54	0.66	0.05
Uniform Delay, d1	11.0	8.5	29.8	17.1
Delay	11.3	8.6	31.1	20.2
LOS	B	A	C	C
Approach Delay	11.3	8.6	31.1	20.2
Approach LOS	B	A	C	C
Queue Length 50th (m)	105.9	55.7	35.9	1.7
Queue Length 95th (m)	126.4	66.8	60.9	6.9
Internal Link Dist (m)	0.1	108.3	66.0	87.3
50th Up Block Time (%)	35%			
95th Up Block Time (%)	35%		1%	
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	916			

Intersection Summary

Cycle Length: 90.5

Offset: 0 (0%), Referenced to phase 2:EBT, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.80

Intersection Signal Delay: 11.3 Intersection LOS: B

Intersection Capacity Utilization 78.3% ICU Level of Service C

Lane Group	EBL	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	303	196	224	185	39
Act Effct Green (s)	44.0	44.0	44.0	38.0	38.0
Actuated g/C Ratio	0.49	0.49	0.49	0.42	0.42
v/c Ratio	0.55	0.21	0.25	0.31	0.06
Uniform Delay, d1	16.1	13.0	13.3	17.2	9.8
Delay	17.0	13.3	16.5	17.7	11.4
LOS	B	B	B	B	B
Approach Delay		15.5	16.5	17.7	11.4
Approach LOS		B	B	B	B
Queue Length 50th (m)	35.1	18.4	15.6	20.6	2.5
Queue Length 95th (m)	60.3	31.0	37.4	35.9	8.2
Internal Link Dist (m)		15.7	211.1	130.9	81.8
50th Up Block Time (%)	31%	13%			
95th Up Block Time (%)	39%	29%			
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)					

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.55	
Intersection Signal Delay: 16.0	Intersection LOS: B
Intersection Capacity Utilization 55.4%	ICU Level of Service A

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	58	16	570	632
Act Effct Green (s)	28.0	28.0	54.0	54.0
Actuated g/C Ratio	0.31	0.31	0.60	0.60
v/c Ratio	0.12	0.03	0.51	0.57
Uniform Delay, d1	20.2	13.4	10.3	10.7
Delay	21.1	17.0	10.7	11.2
LOS	C	B	B	B
Approach Delay	21.1	17.0	10.7	11.2
Approach LOS	C	B	B	B
Queue Length 50th (m)	6.5	1.2	51.9	59.8
Queue Length 95th (m)	15.1	5.6	76.8	89.0
Internal Link Dist (m)	129.6	100.1	143.2	47.4
50th Up Block Time (%)				13%
95th Up Block Time (%)				22%
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.57	
Intersection Signal Delay: 11.5	Intersection LOS: B
Intersection Capacity Utilization 48.3%	ICU Level of Service A

Lane Group	EBL	EBT	WBL	WBT	WBR	NBT	SBT
Lane Group Flow (vph)	469	68	1	4	364	2242	2575
Act Effct Green (s)	30.0	30.0	30.0	30.0	30.0	52.0	52.0
Actuated g/C Ratio	0.33	0.33	0.33	0.33	0.33	0.58	0.58
v/c Ratio	0.99	0.11	0.00	0.01	0.68	0.75	0.88
Uniform Delay, d1	29.8	19.2	20.0	20.0	25.4	14.2	15.9
Delay	62.4	19.8	20.0	20.2	26.3	14.5	16.9
LOS	E	B	B	C	C	B	B
Approach Delay		57.0		26.2		14.5	16.9
Approach LOS		E		C		B	B
Queue Length 50th (m)	79.9	7.5	0.1	0.5	53.0	98.3	127.3
Queue Length 95th (m)	#141.0	16.5	1.2	2.7	83.5	117.1	151.7
Internal Link Dist (m)		138.9		106.7		182.4	8.3
50th Up Block Time (%)							40%
95th Up Block Time (%)	8%						40%
Turn Bay Length (m)	15.2						
50th Bay Block Time %	55%						
95th Bay Block Time %	62%	11%					
Queuing Penalty (veh)	40	26					

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.99
Intersection Signal Delay: 20.3 Intersection LOS: C
Intersection Capacity Utilization 101.8% ICU Level of Service F
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

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(Parkway: Diamond Option) PM

Lane Group	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	890	5	1197	6	0	9	18	0	86
Act Effct Green (s)	28.0	28.0	28.0	24.0		24.0	24.0		24.0
Actuated g/C Ratio	0.47	0.47	0.47	0.40		0.40	0.40		0.40
v/c Ratio	0.53	0.02	0.72	0.01		0.01	0.03		0.13
Uniform Delay, d1	11.3	8.6	12.8	10.8		0.0	10.9		6.7
Delay	11.6	9.0	13.2	11.0		6.7	11.1		8.0
LOS	B	A	B	B		A	B		A
Approach Delay	11.6		13.2		8.4			8.5	
Approach LOS	B		B		A			A	
Queue Length 50th (m)	34.2	0.3	51.9	0.4		0.0	1.2		3.4
Queue Length 95th (m)	48.5	1.8	72.6	2.1		2.1	4.3		10.5
Internal Link Dist (m)	222.2		219.6		26.3			7.1	
50th Up Block Time (%)									
95th Up Block Time (%)									26%
Turn Bay Length (m)							7.6		
50th Bay Block Time %									
95th Bay Block Time %									24%
Queuing Penalty (veh)									13

Intersection Summary	
Cycle Length: 60	
Offset: 0 (0%), Referenced to phase 2:NBSBL and 6:, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.72	
Intersection Signal Delay: 12.3	Intersection LOS: B
Intersection Capacity Utilization 51.7%	ICU Level of Service A

Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	140	518	2640	2760
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	0.18	0.92	0.91	0.95
Uniform Delay, d1	20.3	28.3	17.4	18.2
Delay	20.6	44.7	19.3	13.1
LOS	C	D	B	B
Approach Delay	20.7	44.7	19.3	13.1
Approach LOS	C	D	B	B
Queue Length 50th (m)	8.6	84.8	138.5	47.1
Queue Length 95th (m)	15.5	#145.9	164.5	#78.5
Internal Link Dist (m)	32.2	176.0	58.1	100.9
50th Up Block Time (%)			26%	2%
95th Up Block Time (%)			29%	6%
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)			732	76

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.95
Intersection Signal Delay: 18.7 Intersection LOS: B
Intersection Capacity Utilization 102.8% ICU Level of Service F
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	NBL	NBT	SBT
Lane Group Flow (vph)	474	81	422	149
Act Effct Green (s)	23.5	24.0	24.0	24.0
Actuated g/C Ratio	0.42	0.43	0.43	0.43
v/c Ratio	0.49	0.15	0.52	0.18
Uniform Delay, d1	0.1	9.5	11.5	8.2
Delay	1.5	10.0	12.0	8.5
LOS	A	A	B	A
Approach Delay	1.5		11.7	8.5
Approach LOS	A		B	A
Queue Length 50th (m)	0.2	4.7	29.3	7.4
Queue Length 95th (m)	13.7	11.3	50.5	16.3
Internal Link Dist (m)	81.1		167.5	74.1
50th Up Block Time (%)				
95th Up Block Time (%)				
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 55.5

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.52

Intersection Signal Delay: 7.0 Intersection LOS: A

Intersection Capacity Utilization 58.2% ICU Level of Service A

Lane Group	EBT	EBR	WBT	SET	NWT
Lane Group Flow (vph)	9	236	0	2398	3402
Act Effct Green (s)	23.0	23.0		59.0	59.0
Actuated g/C Ratio	0.26	0.26		0.66	0.66
v/c Ratio	0.02	0.57		0.71	1.01
Uniform Delay, d1	25.0	28.2		10.0	15.5
Delay	25.2	29.0		10.2	31.4
LOS	C	C		B	C
Approach Delay	28.9			10.2	31.4
Approach LOS	C			B	C
Queue Length 50th (m)	1.2	34.5		86.8	~200.2
Queue Length 95th (m)	4.7	57.7		103.2	#255.8
Internal Link Dist (m)	42.8		63.5	198.8	42.8
50th Up Block Time (%)					28%
95th Up Block Time (%)		24%			30%
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)		28			985

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 1.01
Intersection Signal Delay: 22.9 Intersection LOS: C
Intersection Capacity Utilization 75.7% ICU Level of Service C
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBT	WBT	SEL	SET	NWT
Lane Group Flow (vph)	282	84	840	548	154
Act Effct Green (s)	23.5	23.5	58.5	58.5	58.5
Actuated g/C Ratio	0.26	0.26	0.65	0.65	0.65
v/c Ratio	0.58	0.35	0.52	0.45	0.14
Uniform Delay, d1	27.8	27.0	8.3	1.2	0.5
Delay	28.5	37.8	8.5	1.5	1.4
LOS	C	D	A	A	A
Approach Delay	28.5	37.8		5.8	1.4
Approach LOS	C	D		A	A
Queue Length 50th (m)	40.9	13.9	35.0	6.2	0.8
Queue Length 95th (m)	65.8	28.2	48.4	17.6	6.7
Internal Link Dist (m)	51.1	18.4		46.5	264.4
50th Up Block Time (%)					
95th Up Block Time (%)	21%	38%	7%		
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)	30	16	28		

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.58
Intersection Signal Delay: 10.2 Intersection LOS: B
Intersection Capacity Utilization 75.4% ICU Level of Service C

Lane Group	EBL	EBT	WBT	WBR	NBL2	NBL	NBR	SEL
Lane Group Flow (vph)	334	888	42	1234	42	0	3	0
Act Effct Green (s)	59.0	59.0	59.0	90.0	23.0		23.0	
Actuated g/C Ratio	0.66	0.66	0.66	1.00	0.26		0.26	
v/c Ratio	0.37	0.38	0.03	0.77	0.09		0.01	
Uniform Delay, d1	7.0	7.1	5.5	0.0	25.5		0.0	
Delay	7.9	7.7	5.5	0.0	25.9		0.0	
LOS	A	A	A	A	C		A	
Approach Delay		7.7	0.2			24.2		0.0
Approach LOS		A	A			C		A
Queue Length 50th (m)	29.9	42.1	2.3	0.0	5.6		0.0	
Queue Length 95th (m)	53.5	61.2	5.5	0.0	13.4		0.0	
Internal Link Dist (m)		71.6	222.2			129.9		57.2
50th Up Block Time (%)								
95th Up Block Time (%)								
Turn Bay Length (m)								
50th Bay Block Time %								
95th Bay Block Time %								
Queuing Penalty (veh)								

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBL and 6:SEL, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.77
Intersection Signal Delay: 4.2 Intersection LOS: A
Intersection Capacity Utilization 35.2% ICU Level of Service A

	→	←	↘	↖
Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	523	448	2122	2394
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	0.89	0.79	0.73	0.82
Uniform Delay, d1	27.8	26.3	14.4	15.8
Delay	38.4	30.4	5.0	16.1
LOS	D	C	A	B
Approach Delay	38.4	30.4	5.0	16.1
Approach LOS	D	C	A	B
Queue Length 50th (m)	84.2	68.4	15.8	114.3
Queue Length 95th (m)	#142.6	#115.0	m30.4	135.6
Internal Link Dist (m)	123.5	93.1	100.9	101.6
50th Up Block Time (%)				7%
95th Up Block Time (%)	21%	19%		13%
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	55	42		244

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.89	
Intersection Signal Delay: 15.1	Intersection LOS: B
Intersection Capacity Utilization 111.2%	ICU Level of Service G
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	

Lane Group	WBL	WBR	NBL	NBR	SEL
Lane Group Flow (vph)	212	2362	0	123	2075
Act Effct Green (s)	25.0	90.0		25.0	57.0
Actuated g/C Ratio	0.28	1.00		0.28	0.63
v/c Ratio	0.43	0.65		0.27	0.65
Uniform Delay, d1	26.6	0.0		22.7	10.3
Delay	27.2	0.0		12.9	1.9
LOS	C	A		B	A
Approach Delay	2.2		12.9		1.9
Approach LOS	A		B		A
Queue Length 50th (m)	30.0	0.0		6.1	10.0
Queue Length 95th (m)	49.9	0.0		11.3	10.8
Internal Link Dist (m)	0.1		2.0		101.6
50th Up Block Time (%)	72%			63%	
95th Up Block Time (%)	72%			67%	
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)	153			80	

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:SEL and 6:, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.65	
Intersection Signal Delay: 2.4	Intersection LOS: A
Intersection Capacity Utilization 58.4%	ICU Level of Service A

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	2273	2293	424	36
Act Effct Green (s)	59.0	59.0	23.5	23.5
Actuated g/C Ratio	0.65	0.65	0.26	0.26
v/c Ratio	0.69	0.68	1.22	0.09
Uniform Delay, d1	9.5	9.9	33.4	18.9
Delay	9.7	10.1	130.1	20.9
LOS	A	B	F	C
Approach Delay	9.7	10.1	130.1	20.9
Approach LOS	A	B	F	C
Queue Length 50th (m)	78.6	81.5	~92.1	3.5
Queue Length 95th (m)	93.8	96.7	#148.1	10.7
Internal Link Dist (m)	0.1	108.3	66.0	87.3
50th Up Block Time (%)	35%		34%	
95th Up Block Time (%)	35%		61%	
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	789			

Intersection Summary

Cycle Length: 90.5
Offset: 0 (0%), Referenced to phase 2:EBT, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 1.22
Intersection Signal Delay: 20.1 Intersection LOS: C
Intersection Capacity Utilization 81.7% ICU Level of Service D
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	116	302	361	85	83
Act Effct Green (s)	44.0	44.0	44.0	38.0	38.0
Actuated g/C Ratio	0.49	0.49	0.49	0.42	0.42
v/c Ratio	0.26	0.34	0.40	0.11	0.11
Uniform Delay, d1	13.5	12.3	14.4	12.1	7.0
Delay	14.1	12.6	18.8	12.7	8.6
LOS	B	B	B	B	A
Approach Delay		13.0	18.8	12.7	8.6
Approach LOS		B	B	B	A
Queue Length 50th (m)	11.2	26.7	33.2	6.7	3.8
Queue Length 95th (m)	22.4	44.1	59.4	15.2	12.0
Internal Link Dist (m)		15.7	201.5	130.9	81.8
50th Up Block Time (%)		25%			
95th Up Block Time (%)	20%	35%			
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)					

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.40

Intersection Signal Delay: 14.8 Intersection LOS: B

Intersection Capacity Utilization 50.9% ICU Level of Service A

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	50	84	580	631
Act Effct Green (s)	28.0	28.0	54.0	54.0
Actuated g/C Ratio	0.31	0.31	0.60	0.60
v/c Ratio	0.11	0.14	0.52	0.57
Uniform Delay, d1	20.7	21.2	10.4	10.7
Delay	21.4	21.6	10.8	11.1
LOS	C	C	B	B
Approach Delay	21.4	21.6	10.8	11.1
Approach LOS	C	C	B	B
Queue Length 50th (m)	5.8	9.9	53.2	59.7
Queue Length 95th (m)	13.9	20.3	79.1	89.0
Internal Link Dist (m)	129.6	100.1	143.2	47.4
50th Up Block Time (%)				13%
95th Up Block Time (%)				22%
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.57	
Intersection Signal Delay: 12.0	Intersection LOS: B
Intersection Capacity Utilization 51.7%	ICU Level of Service A

Lane Group	EBL	EBT	WBL	WBT	WBR	NBT	SBT
Lane Group Flow (vph)	231	19	1	53	392	2170	3094
Act Effct Green (s)	30.0	30.0	30.0	30.0	30.0	52.0	52.0
Actuated g/C Ratio	0.33	0.33	0.33	0.33	0.33	0.58	0.58
v/c Ratio	0.51	0.03	0.00	0.08	0.73	0.73	1.06
Uniform Delay, d1	24.1	17.0	20.0	20.6	26.0	13.9	18.3
Delay	24.9	18.2	20.0	20.9	27.9	14.1	50.2
LOS	C	B	B	C	C	B	D
Approach Delay		24.4		27.0		14.1	50.2
Approach LOS		C		C		B	D
Queue Length 50th (m)	31.7	1.9	0.1	6.2	58.2	92.8	~214.3
Queue Length 95th (m)	53.7	6.5	1.2	14.1	#91.4	110.6	#243.1
Internal Link Dist (m)		138.9		106.7		182.4	8.3
50th Up Block Time (%)							41%
95th Up Block Time (%)							42%
Turn Bay Length (m)	15.2						
50th Bay Block Time %	38%						
95th Bay Block Time %	50%						
Queuing Penalty (veh)	8						

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 1.06

Intersection Signal Delay: 34.3 Intersection LOS: C

Intersection Capacity Utilization 89.0% ICU Level of Service D

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

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

2030 ALTERNATIVE 5
(Parkway: Diamond Option) WEEKEND

Lane Group	EBT	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	586	506	6	0	4	2	0	10
Act Effct Green (s)	38.0	38.0	29.0		29.0	29.0		29.0
Actuated g/C Ratio	0.51	0.51	0.39		0.39	0.39		0.39
v/c Ratio	0.32	0.28	0.01		0.01	0.00		0.02
Uniform Delay, d1	10.9	10.6	14.2		0.0	14.0		0.0
Delay	11.1	10.8	14.3		9.5	14.0		8.2
LOS	B	B	B		A	B		A
Approach Delay	11.1	10.8		12.4			9.2	
Approach LOS	B	B		B			A	
Queue Length 50th (m)	24.1	20.2	0.5		0.0	0.2		0.0
Queue Length 95th (m)	34.2	29.2	2.7		1.7	1.4		2.7
Internal Link Dist (m)	222.2	219.6		26.3			7.1	
50th Up Block Time (%)								
95th Up Block Time (%)								
Turn Bay Length (m)						7.6		
50th Bay Block Time %								
95th Bay Block Time %								
Queuing Penalty (veh)								

Intersection Summary	
Cycle Length: 75	
Offset: 0 (0%), Referenced to phase 2:NBSBL and 6:, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.32	
Intersection Signal Delay: 10.9	Intersection LOS: B
Intersection Capacity Utilization 32.9%	ICU Level of Service A

Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	301	360	2363	2333
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	1.16dl	0.64	0.81	0.80
Uniform Delay, d1	22.3	24.5	15.6	15.4
Delay	22.7	25.3	15.9	9.6
LOS	C	C	B	A
Approach Delay	22.7	25.3	15.9	9.6
Approach LOS	C	C	B	A
Queue Length 50th (m)	20.4	51.1	111.5	52.7
Queue Length 95th (m)	31.9	80.4	132.6	55.7
Internal Link Dist (m)	32.2	176.0	58.1	100.9
50th Up Block Time (%)			22%	
95th Up Block Time (%)	3%		26%	3%
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)			566	

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.81	
Intersection Signal Delay: 14.2	Intersection LOS: B
Intersection Capacity Utilization 94.2%	ICU Level of Service E
dl Defacto Left Lane. Recode with 1 though lane as a left lane.	

Lane Group	EBL	NBL	NBT	SBT
Lane Group Flow (vph)	335	4	145	25
Act Effct Green (s)	23.5	24.0	24.0	24.0
Actuated g/C Ratio	0.42	0.43	0.43	0.43
v/c Ratio	0.38	0.01	0.18	0.03
Uniform Delay, d1	0.1	9.0	9.7	8.7
Delay	1.7	9.0	10.0	9.0
LOS	A	A	A	A
Approach Delay	1.7		9.9	9.0
Approach LOS	A		A	A
Queue Length 50th (m)	0.3	0.3	8.5	1.3
Queue Length 95th (m)	11.7	1.5	17.3	4.6
Internal Link Dist (m)	81.1		167.5	74.1
50th Up Block Time (%)				
95th Up Block Time (%)				
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 55.5
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.38
Intersection Signal Delay: 4.5 — Intersection LOS: A
Intersection Capacity Utilization 35.0% — ICU Level of Service A

Lane Group	EBT	EBR	WBT	SET	NWT
Lane Group Flow (vph)	0	89	0	2271	2990
Act Effct Green (s)		23.0		59.0	59.0
Actuated g/C Ratio		0.26		0.66	0.66
v/c Ratio		0.21		0.67	0.89
Uniform Delay, d1		23.6		9.6	12.8
Delay		24.1		9.7	13.8
LOS		C		A	B
Approach Delay	24.1			9.7	13.8
Approach LOS	C			A	B
Queue Length 50th (m)		10.9		78.7	138.6
Queue Length 95th (m)		22.8		93.4	164.8
Internal Link Dist (m)	42.8		49.6	198.8	42.8
50th Up Block Time (%)					25%
95th Up Block Time (%)					26%
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)					769

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.89
Intersection Signal Delay: 12.2 Intersection LOS: B
Intersection Capacity Utilization 61.1% ICU Level of Service B

Lane Group	EBT	WBT	SEL	SET	NWT
Lane Group Flow (vph)	168	30	569	556	59
Act Effct Green (s)	23.5	23.5	58.5	58.5	58.5
Actuated g/C Ratio	0.26	0.26	0.65	0.65	0.65
v/c Ratio	0.34	0.08	0.33	0.45	0.05
Uniform Delay, d1	24.4	25.1	7.0	0.8	0.1
Delay	25.0	25.5	7.2	1.2	1.7
LOS	C	C	A	A	A
Approach Delay	25.0	25.5		4.2	1.7
Approach LOS	C	C		A	A
Queue Length 50th (m)	21.3	3.9	20.2	4.4	0.1
Queue Length 95th (m)	38.6	10.6	28.3	15.4	3.8
Internal Link Dist (m)	51.1	18.4		46.5	264.4
50th Up Block Time (%)					
95th Up Block Time (%)					
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)					

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.45	
Intersection Signal Delay: 7.1	Intersection LOS: A
Intersection Capacity Utilization 49.4%	ICU Level of Service A

Lane Group	EBL	EBT	WBT	WBR	NBL2	NBL	NBR	SEL
Lane Group Flow (vph)	171	585	12	503	18	0	1	0
Act Effct Green (s)	59.0	59.0	59.0	59.0	23.0		23.0	
Actuated g/C Ratio	0.66	0.66	0.66	0.66	0.26		0.26	
v/c Ratio	0.18	0.25	0.01	0.41	0.04		0.00	
Uniform Delay, d1	6.1	6.4	5.3	0.0	25.2		0.0	
Delay	6.2	6.4	5.4	0.6	25.5		0.0	
LOS	A	A	A	A	C		A	
Approach Delay		6.4	0.7			24.2		
Approach LOS		A	A			C		
Queue Length 50th (m)	10.3	19.4	0.6	0.0	2.4		0.0	
Queue Length 95th (m)	18.2	26.4	2.3	9.3	7.5		0.0	
Internal Link Dist (m)		71.6	222.2			129.9		57.2
50th Up Block Time (%)								
95th Up Block Time (%)								
Turn Bay Length (m)								
50th Bay Block Time %								
95th Bay Block Time %								
Queuing Penalty (veh)								

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBL and 6:, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.41

Intersection Signal Delay: 4.4 Intersection LOS: A

Intersection Capacity Utilization 47.3% ICU Level of Service A

	→	←	↘	↖
Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	469	412	1859	1922
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	0.73	0.73	0.64	0.66
Uniform Delay, d1	25.8	25.1	13.2	13.5
Delay	26.5	26.7	4.2	7.0
LOS	C	C	A	A
Approach Delay	26.5	26.7	4.2	7.0
Approach LOS	C	C	A	A
Queue Length 50th (m)	70.0	60.1	13.9	23.8
Queue Length 95th (m)	105.0	94.0	20.3	43.8
Internal Link Dist (m)	123.5	93.1	100.9	103.4
50th Up Block Time (%)				
95th Up Block Time (%)		7%		
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)		14		

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.73
Intersection Signal Delay: 9.6 Intersection LOS: A
Intersection Capacity Utilization 70.9% ICU Level of Service C

Lane Group	WBL	WBR	NBL	NBR	SEL
Lane Group Flow (vph)	73	1909	0	35	1841
Act Effct Green (s)	25.0	90.0		25.0	57.0
Actuated g/C Ratio	0.28	1.00		0.28	0.63
v/c Ratio	0.15	0.52		0.07	0.58
Uniform Delay, d1	24.5	0.0		9.5	9.5
Delay	39.0	3.3		12.1	1.6
LOS	D	A		B	A
Approach Delay	4.6		12.1		1.6
Approach LOS	A		B		A
Queue Length 50th (m)	13.2	31.1		1.3	5.1
Queue Length 95th (m)	m20.7	32.7		6.6	10.5
Internal Link Dist (m)	0.1		0.1		103.4
50th Up Block Time (%)	65%	25%		96%	
95th Up Block Time (%)	65%	33%		71%	
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)	48	559		29	

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:SEL and 6:, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.58	
Intersection Signal Delay: 3.2	Intersection LOS: A
Intersection Capacity Utilization 47.9%	ICU Level of Service A
m Volume for 95th percentile queue is metered by upstream signal.	

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	1898	1884	137	4
Act Effct Green (s)	50.5	50.5	31.5	31.5
Actuated g/C Ratio	0.56	0.56	0.35	0.35
v/c Ratio	0.66	0.65	0.28	0.01
Uniform Delay, d1	13.5	13.7	20.9	4.8
Delay	5.8	13.9	21.5	14.2
LOS	A	B	C	B
Approach Delay	5.8	13.9	21.5	14.3
Approach LOS	A	B	C	B
Queue Length 50th (m)	19.5	76.9	16.7	0.1
Queue Length 95th (m)	27.4	92.2	30.9	2.3
Internal Link Dist (m)	0.1	108.3	66.0	87.3
50th Up Block Time (%)	131%			
95th Up Block Time (%)	35%			
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	1571			

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:EBT, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.66
Intersection Signal Delay: 10.2 Intersection LOS: B
Intersection Capacity Utilization 58.2% ICU Level of Service A

Lane Group	EBL	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	293	106	145	90	72
Act Effct Green (s)	44.0	44.0	44.0	38.0	38.0
Actuated g/C Ratio	0.49	0.49	0.49	0.42	0.42
v/c Ratio	0.47	0.12	0.16	0.12	0.10
Uniform Delay, d1	15.3	5.2	11.9	12.2	6.8
Delay	15.9	6.3	6.8	12.7	8.6
LOS	B	A	A	B	A
Approach Delay		13.4	6.8	12.7	8.6
Approach LOS		B	A	B	A
Queue Length 50th (m)	32.2	4.0	5.7	7.1	3.2
Queue Length 95th (m)	53.9	12.1	13.9	15.9	10.8
Internal Link Dist (m)		15.7	207.9	130.9	81.8
50th Up Block Time (%)	29%				
95th Up Block Time (%)	38%				
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)					

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.47

Intersection Signal Delay: 11.4 Intersection LOS: B

Intersection Capacity Utilization 39.5% ICU Level of Service A

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	36	13	524	595
Act Effct Green (s)	28.0	28.0	54.0	54.0
Actuated g/C Ratio	0.31	0.31	0.60	0.60
v/c Ratio	0.07	0.02	0.47	0.53
Uniform Delay, d1	19.4	6.6	10.0	10.5
Delay	20.3	14.2	10.3	10.9
LOS	C	B	B	B
Approach Delay	20.3	14.2	10.3	10.9
Approach LOS	C	B	B	B
Queue Length 50th (m)	3.9	0.5	46.0	55.1
Queue Length 95th (m)	10.5	4.5	68.5	82.0
Internal Link Dist (m)	129.6	100.1	143.2	47.4
50th Up Block Time (%)				11%
95th Up Block Time (%)				21%
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.53

Intersection Signal Delay: 10.9 Intersection LOS: B

Intersection Capacity Utilization 47.8% ICU Level of Service A

Lane Group	EBL	EBT	WBL	WBT	WBR	NBT	SBT
Lane Group Flow (vph)	9	13	7	8	27	1844	2278
Act Effct Green (s)	30.0	30.0	30.0	30.0	30.0	52.0	52.0
Actuated g/C Ratio	0.33	0.33	0.33	0.33	0.33	0.58	0.58
v/c Ratio	0.02	0.02	0.01	0.01	0.05	0.62	0.78
Uniform Delay, d1	20.1	9.2	20.0	20.1	9.7	12.5	14.2
Delay	20.3	14.8	20.3	20.2	13.4	12.7	14.5
LOS	C	B	C	C	B	B	B
Approach Delay		17.0		15.9		12.7	14.5
Approach LOS		B		B		B	B
Queue Length 50th (m)	1.0	0.7	0.8	0.9	1.5	71.2	100.2
Queue Length 95th (m)	4.2	4.6	3.7	3.8	7.0	85.2	119.7
Internal Link Dist (m)		138.9		106.7		182.4	8.3
50th Up Block Time (%)							39%
95th Up Block Time (%)							39%
Turn Bay Length (m)	15.2						
50th Bay Block Time %							
95th Bay Block Time %							
Queuing Penalty (veh)							

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.78
Intersection Signal Delay: 13.7 Intersection LOS: B
Intersection Capacity Utilization 54.8% ICU Level of Service A

2030 ALTERNATIVE 5

(Parkway: Circle Drive Option) AM

Lane Group	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	1191	10	8	196	10	0	9	6	0	6
Act Effct Green (s)	38.0	38.0	38.0	38.0	29.0		29.0	29.0		29.0
Actuated g/C Ratio	0.51	0.51	0.51	0.51	0.39		0.39	0.39		0.39
v/c Ratio	0.66	0.01	0.06	0.11	0.01		0.01	0.01		0.01
Uniform Delay, d1	13.7	0.0	9.4	9.6	14.2		0.0	14.2		0.0
Delay	14.0	5.3	10.1	9.8	14.3		8.3	14.3		9.0
LOS	B	A	B	A	B		A	B		A
Approach Delay	13.9			9.8		11.5			11.7	
Approach LOS	B			A		B			B	
Queue Length 50th (m)	61.4	0.0	0.6	7.1	0.9		0.0	0.5		0.0
Queue Length 95th (m)	81.8	2.1	2.7	12.1	3.6		2.6	2.7		2.2
Internal Link Dist (m)	222.2			219.6		26.3			7.1	
50th Up Block Time (%)										
95th Up Block Time (%)										
Turn Bay Length (m)								7.6		
50th Bay Block Time %										
95th Bay Block Time %										
Queuing Penalty (veh)										

Intersection Summary	
Cycle Length: 75	
Offset: 0 (0%), Referenced to phase 2:NBSBL and 6:, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.66	
Intersection Signal Delay: 13.3	Intersection LOS: B
Intersection Capacity Utilization 49.6%	ICU Level of Service A

Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	293	385	3145	2190
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	1.20dl	0.68	1.08	0.75
Uniform Delay, d1	22.4	24.9	19.5	14.7
Delay	22.9	25.8	60.1	6.4
LOS	C	C	E	A
Approach Delay	22.9	25.8	60.1	6.4
Approach LOS	C	C	E	A
Queue Length 50th (m)	20.0	55.7	~224.6	34.7
Queue Length 95th (m)	31.2	87.0	#252.6	38.6
Internal Link Dist (m)	32.2	176.0	58.1	100.9
50th Up Block Time (%)			34%	
95th Up Block Time (%)	2%		37%	
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)			1118	

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 1.08
Intersection Signal Delay: 36.5   Intersection LOS: D
Intersection Capacity Utilization 110.3%   ICU Level of Service G
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
dl Defacto Left Lane. Recode with 1 though lane as a left lane.

Lane Group	EBL	NBL	NBT	SBT
Lane Group Flow (vph)	282	85	520	155
Act Effct Green (s)	23.5	24.0	24.0	24.0
Actuated g/C Ratio	0.42	0.43	0.43	0.43
v/c Ratio	0.33	0.16	0.64	0.19
Uniform Delay, d1	0.1	9.6	12.3	7.6
Delay	1.8	10.0	13.0	8.0
LOS	A	A	B	A
Approach Delay	1.8		12.6	8.0
Approach LOS	A		B	A
Queue Length 50th (m)	0.1	4.9	38.7	7.1
Queue Length 95th (m)	10.7	11.8	65.7	16.0
Internal Link Dist (m)	81.1		167.5	74.1
50th Up Block Time (%)				
95th Up Block Time (%)				
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 55.5

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.64

Intersection Signal Delay: 9.0 | Intersection LOS: A

Intersection Capacity Utilization 51.5% | ICU Level of Service A

Lane Group	EBT	EBR	WBT	SET	NWT
Lane Group Flow (vph)	0	75	211	3063	2636
Act Effct Green (s)		23.0	23.0	59.0	59.0
Actuated g/C Ratio		0.26	0.26	0.66	0.66
v/c Ratio		0.18	0.23	0.91	0.78
Uniform Delay, d1		25.4	26.5	13.2	11.0
Delay		25.9	26.7	15.0	11.2
LOS		C	C	B	B
Approach Delay	25.9		26.7	15.0	11.2
Approach LOS	C		C	B	B
Queue Length 50th (m)		9.8	15.2	146.7	104.6
Queue Length 95th (m)		20.8	24.3	174.6	124.1
Internal Link Dist (m)	42.8		63.5	278.7	42.8
50th Up Block Time (%)					22%
95th Up Block Time (%)					24%
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)					603

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.91	
Intersection Signal Delay: 13.9	Intersection LOS: B
Intersection Capacity Utilization 79.7%	ICU Level of Service C

Lane Group	EBT	WBL	WBT	SEL	SET	SER	NWL	NWT	NWR
Lane Group Flow (vph)	96	1	5	1182	214	429	4	0	58
Act Effct Green (s)	23.5	23.5	23.5	58.5	58.5	58.5	58.5		58.5
Actuated g/C Ratio	0.26	0.26	0.26	0.65	0.65	0.65	0.65		0.65
v/c Ratio	0.10	0.00	0.01	0.52	0.17	0.36	0.01		0.05
Uniform Delay, d1	22.3	25.0	24.6	8.3	6.2	0.0	5.5		0.0
Delay	22.5	32.0	31.0	8.5	6.3	0.7	5.5		1.7
LOS	C	C	C	A	A	A	A		A
Approach Delay	22.5		31.2		6.4			1.9	
Approach LOS	C		C		A			A	
Queue Length 50th (m)	5.8	0.2	0.7	49.8	13.0	0.0	0.2		0.0
Queue Length 95th (m)	11.7	1.5	3.9	64.1	21.5	9.0	1.3		3.6
Internal Link Dist (m)	29.6		16.5		46.2			264.3	
50th Up Block Time (%)				8%					
95th Up Block Time (%)				14%					
Turn Bay Length (m)									
50th Bay Block Time %									
95th Bay Block Time %									
Queuing Penalty (veh)				128					

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NWL and 6:SETL, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.52

Intersection Signal Delay: 7.1 Intersection LOS: A

Intersection Capacity Utilization 50.6% ICU Level of Service A

Lane Group	EBT	WBT	WBR	SET	NWL	NWT	NWR
Lane Group Flow (vph)	1325	6	190	0	4	0	6
Act Effct Green (s)	59.0	59.0	90.0		23.0		23.0
Actuated g/C Ratio	0.66	0.66	1.00		0.26		0.26
v/c Ratio	0.61	0.00	0.12		0.01		0.01
Uniform Delay, d1	8.9	5.3	0.0		25.0		0.0
Delay	11.9	5.3	0.0		25.2		15.3
LOS	B	A	A		C		B
Approach Delay	11.9	0.2				19.3	
Approach LOS	B	A				B	
Queue Length 50th (m)	93.0	0.4	0.0		0.5		0.0
Queue Length 95th (m)	119.5	1.5	0.0		3.0		2.9
Internal Link Dist (m)	78.4	222.2		57.2		49.0	
50th Up Block Time (%)	12%						
95th Up Block Time (%)	19%						
Turn Bay Length (m)							
50th Bay Block Time %							
95th Bay Block Time %							
Queuing Penalty (veh)	205						

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NWL and 6:, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.61	
Intersection Signal Delay: 10.5	Intersection LOS: B
Intersection Capacity Utilization 50.2%	ICU Level of Service A

Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	534	339	2548	1881
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	0.83	0.60	0.88	0.65
Uniform Delay, d1	27.0	23.4	16.7	13.3
Delay	32.2	24.1	6.9	13.5
LOS	C	C	A	B
Approach Delay	32.2	24.1	6.9	13.5
Approach LOS	C	C	A	B
Queue Length 50th (m)	83.5	46.0	32.9	75.8
Queue Length 95th (m)	#136.4	73.6	m30.4	90.6
Internal Link Dist (m)	123.5	93.1	100.9	98.4
50th Up Block Time (%)				
95th Up Block Time (%)	16%			
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	43			

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.88
Intersection Signal Delay: 12.9 Intersection LOS: B
Intersection Capacity Utilization 87.7% ICU Level of Service D
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	WBL	WBR	NBL	NBR	SEL
Lane Group Flow (vph)	135	1852	0	118	2416
Act Effct Green (s)	25.0	90.0		25.0	57.0
Actuated g/C Ratio	0.28	1.00		0.28	0.63
v/c Ratio	0.27	0.51		0.26	0.76
Uniform Delay, d1	25.4	0.0		23.9	11.6
Delay	25.9	0.0		12.7	2.2
LOS	C	A		B	A
Approach Delay	1.8		12.7		2.2
Approach LOS	A		B		A
Queue Length 50th (m)	18.2	0.0		0.0	11.2
Queue Length 95th (m)	32.9	0.0		0.0	12.1
Internal Link Dist (m)	0.1		0.1		98.4
50th Up Block Time (%)	72%			63%	
95th Up Block Time (%)	72%			63%	
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)	97			74	

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:SEL and 6:, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.76

Intersection Signal Delay: 2.3 Intersection LOS: A

Intersection Capacity Utilization 60.1% ICU Level of Service B

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	2621	1825	217	32
Act Effct Green (s)	59.0	59.0	23.5	23.5
Actuated g/C Ratio	0.65	0.65	0.26	0.26
v/c Ratio	0.79	0.54	0.63	0.08
Uniform Delay, d1	10.9	8.5	29.6	10.2
Delay	11.2	8.6	30.6	15.2
LOS	B	A	C	B
Approach Delay	11.2	8.6	30.6	15.3
Approach LOS	B	A	C	B
Queue Length 50th (m)	104.1	55.7	33.3	1.7
Queue Length 95th (m)	124.0	66.7	57.1	8.5
Internal Link Dist (m)	0.1	108.3	66.0	87.3
50th Up Block Time (%)	35%			
95th Up Block Time (%)	35%			
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	909			

Intersection Summary

Cycle Length: 90.5
Offset: 0 (0%), Referenced to phase 2:EBT, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.79
Intersection Signal Delay: 11.1 Intersection LOS: B
Intersection Capacity Utilization 77.2% ICU Level of Service C

Lane Group	EBL	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	283	210	189	185	39
Act Effct Green (s)	44.0	44.0	44.0	38.0	38.0
Actuated g/C Ratio	0.49	0.49	0.49	0.42	0.42
v/c Ratio	0.49	0.23	0.21	0.31	0.06
Uniform Delay, d1	15.4	13.1	13.1	17.2	9.8
Delay	16.2	13.4	12.5	17.7	11.4
LOS	B	B	B	B	B
Approach Delay		15.0	12.5	17.7	11.4
Approach LOS		B	B	B	B
Queue Length 50th (m)	31.4	19.9	10.2	20.6	2.5
Queue Length 95th (m)	53.5	33.1	26.4	35.9	8.2
Internal Link Dist (m)		15.7	201.6	130.9	81.8
50th Up Block Time (%)	29%	16%			
95th Up Block Time (%)	38%	30%			
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)					

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.49

Intersection Signal Delay: 14.9 Intersection LOS: B

Intersection Capacity Utilization 52.5% ICU Level of Service A

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	49	17	569	635
Act Effct Green (s)	28.0	28.0	54.0	54.0
Actuated g/C Ratio	0.31	0.31	0.60	0.60
v/c Ratio	0.10	0.03	0.51	0.57
Uniform Delay, d1	18.8	19.0	10.3	10.8
Delay	19.9	20.1	10.7	11.2
LOS	B	C	B	B
Approach Delay	19.9	20.1	10.7	11.2
Approach LOS	B	C	B	B
Queue Length 50th (m)	5.1	1.8	51.7	60.5
Queue Length 95th (m)	13.0	6.3	76.6	89.9
Internal Link Dist (m)	129.6	100.1	143.2	47.4
50th Up Block Time (%)				14%
95th Up Block Time (%)				22%
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary
Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.57
Intersection Signal Delay: 11.4 Intersection LOS: B
Intersection Capacity Utilization 51.5% ICU Level of Service A

Lane Group	EBL	EBT	WBL	WBT	WBR	NBT	SBT
Lane Group Flow (vph)	483	55	1	6	357	2233	2592
Act Effct Green (s)	30.0	30.0	30.0	30.0	30.0	52.0	52.0
Actuated g/C Ratio	0.33	0.33	0.33	0.33	0.33	0.58	0.58
v/c Ratio	1.02	0.09	0.00	0.01	0.66	0.75	0.88
Uniform Delay, d1	30.0	18.7	20.0	20.0	25.3	14.2	16.0
Delay	70.0	19.4	20.0	20.2	26.1	14.4	17.1
LOS	E	B	B	C	C	B	B
Approach Delay		64.8		26.0		14.4	17.1
Approach LOS		E		C		B	B
Queue Length 50th (m)	~86.1	5.9	0.1	0.7	51.6	97.8	129.0
Queue Length 95th (m)	#146.9	13.9	1.2	3.3	81.7	116.1	153.9
Internal Link Dist (m)		138.9		106.7		182.4	8.3
50th Up Block Time (%)							40%
95th Up Block Time (%)	12%						40%
Turn Bay Length (m)	15.2						
50th Bay Block Time %	56%						
95th Bay Block Time %	62%	1%					
Queuing Penalty (veh)	32						

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 1.02
Intersection Signal Delay: 21.1 Intersection LOS: C
Intersection Capacity Utilization 102.0% ICU Level of Service F
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

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(Parkway: Circle Drive Option) PM

Lane Group	EBT	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	828	1156	8	0	6	26	0	84
Act Effct Green (s)	38.0	38.0	29.0		29.0	29.0		29.0
Actuated g/C Ratio	0.51	0.51	0.39		0.39	0.39		0.39
v/c Ratio	0.46	0.64	0.01		0.01	0.04		0.13
Uniform Delay, d1	11.9	13.5	14.1		0.0	14.3		5.7
Delay	12.1	13.8	14.2		9.0	14.5		7.6
LOS	B	B	B		A	B		A
Approach Delay	12.1	13.8		12.0			9.2	
Approach LOS	B	B		B			A	
Queue Length 50th (m)	37.1	58.8	0.7		0.0	2.2		2.9
Queue Length 95th (m)	50.5	78.1	3.1		2.2	6.7		10.8
Internal Link Dist (m)	222.2	219.6		26.3			7.1	
50th Up Block Time (%)								
95th Up Block Time (%)						5%		26%
Turn Bay Length (m)						7.6		
50th Bay Block Time %								
95th Bay Block Time %						1%		24%
Queuing Penalty (veh)								14

Intersection Summary	
Cycle Length: 75	
Offset: 0 (0%), Referenced to phase 2:NBSBL, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.64	
Intersection Signal Delay: 12.9	Intersection LOS: B
Intersection Capacity Utilization 50.5%	ICU Level of Service A

Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	121	513	2665	2796
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	0.16	0.91	0.91	0.96
Uniform Delay, d1	20.3	28.1	17.5	18.5
Delay	20.6	42.9	19.9	17.0
LOS	C	D	B	B
Approach Delay	20.6	42.9	19.9	17.0
Approach LOS	C	D	B	B
Queue Length 50th (m)	7.4	83.7	141.2	56.5
Queue Length 95th (m)	13.7	#143.6	167.6	#114.0
Internal Link Dist (m)	32.2	176.0	58.1	100.9
50th Up Block Time (%)			27%	5%
95th Up Block Time (%)			29%	7%
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)			748	164

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.96

Intersection Signal Delay: 20.5 Intersection LOS: C

Intersection Capacity Utilization 102.1% ICU Level of Service F

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

Lane Group	EBL	NBL	NBT	SBT
Lane Group Flow (vph)	493	78	422	144
Act Effct Green (s)	23.5	24.0	24.0	24.0
Actuated g/C Ratio	0.42	0.43	0.43	0.43
v/c Ratio	0.51	0.14	0.52	0.18
Uniform Delay, d1	0.1	9.5	11.5	8.1
Delay	1.5	9.9	12.0	8.4
LOS	A	A	B	A
Approach Delay	1.5		11.7	8.4
Approach LOS	A		B	A
Queue Length 50th (m)	0.2	4.5	29.3	7.0
Queue Length 95th (m)	13.8	11.0	50.5	15.7
Internal Link Dist (m)	81.1		167.5	74.1
50th Up Block Time (%)				
95th Up Block Time (%)				
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 55.5
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.52
Intersection Signal Delay: 6.9 — Intersection LOS: A
Intersection Capacity Utilization 59.4% — ICU Level of Service A

Lane Group	EBT	EBR	WBT	SET	NWT
Lane Group Flow (vph)	0	234	124	2431	3291
Act Effct Green (s)		23.0	23.0	59.0	59.0
Actuated g/C Ratio		0.26	0.26	0.66	0.66
v/c Ratio		0.56	0.14	0.72	0.98
Uniform Delay, d1		28.3	25.8	10.1	14.8
Delay		29.0	26.0	10.3	22.9
LOS		C	C	B	C
Approach Delay	29.0		26.0	10.3	22.9
Approach LOS	C		C	B	C
Queue Length 50th (m)		34.2	8.7	89.1	177.2
Queue Length 95th (m)		57.1	15.5	105.8	#241.3
Internal Link Dist (m)	42.8		63.5	278.7	42.8
50th Up Block Time (%)					27%
95th Up Block Time (%)		23%			29%
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)		27			920

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.98
Intersection Signal Delay: 18.2 Intersection LOS: B
Intersection Capacity Utilization 74.9% ICU Level of Service C
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBT	WBL	WBT	SEL	SET	SER	NWL	NWT	NWR
Lane Group Flow (vph)	246	4	7	781	108	432	14	0	187
Act Effct Green (s)	23.5	23.5	23.5	58.5	58.5	58.5	58.5		58.5
Actuated g/C Ratio	0.26	0.26	0.26	0.65	0.65	0.65	0.65		0.65
v/c Ratio	0.26	0.01	0.01	0.35	0.09	0.36	0.02		0.17
Uniform Delay, d1	26.0	24.8	24.6	7.1	5.8	0.0	5.6		0.0
Delay	26.3	26.2	26.7	7.2	5.9	0.7	5.6		1.0
LOS	C	C	C	A	A	A	A		A
Approach Delay	26.3		26.5		5.0			1.3	
Approach LOS	C		C		A			A	
Queue Length 50th (m)	17.5	0.5	1.0	27.9	6.2	0.0	0.8		0.0
Queue Length 95th (m)	27.3	3.3	4.6	37.1	11.7	9.0	2.7		6.3
Internal Link Dist (m)	44.6		119.0		46.2			264.3	
50th Up Block Time (%)									
95th Up Block Time (%)									
Turn Bay Length (m)									
50th Bay Block Time %									
95th Bay Block Time %									
Queuing Penalty (veh)									

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NWL and 6:SETL, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.36	
Intersection Signal Delay: 7.6	Intersection LOS: A
Intersection Capacity Utilization 50.7%	ICU Level of Service A

Lane Group	EBL	EBT	WBT	WBR	SET	NWL	NWT	NWR
Lane Group Flow (vph)	387	820	9	1224	0	3	0	16
Act Effct Green (s)	59.0	59.0	59.0	90.0		23.0		23.0
Actuated g/C Ratio	0.66	0.66	0.66	1.00		0.26		0.26
v/c Ratio	0.42	0.67	0.01	0.76		0.01		0.04
Uniform Delay, d1	7.3	9.4	5.3	0.0		25.0		0.0
Delay	8.2	11.1	5.4	0.0		25.0		11.9
LOS	A	B	A	A		C		B
Approach Delay		10.2	0.0				13.9	
Approach LOS		B	A				B	
Queue Length 50th (m)	34.6	88.1	0.5	0.0		0.4		0.0
Queue Length 95th (m)	55.0	126.7	2.0	0.0		2.5		4.8
Internal Link Dist (m)		119.0	222.2		57.2		49.0	
50th Up Block Time (%)								
95th Up Block Time (%)		9%						
Turn Bay Length (m)								
50th Bay Block Time %								
95th Bay Block Time %								
Queuing Penalty (veh)		38						

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NWL, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.76	
Intersection Signal Delay: 5.1	Intersection LOS: A
Intersection Capacity Utilization 53.2%	ICU Level of Service A

Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	544	440	2128	2399
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	0.93	0.77	0.73	0.82
Uniform Delay, d1	28.4	26.1	14.4	15.8
Delay	44.8	29.4	5.1	10.9
LOS	D	C	A	B
Approach Delay	44.8	29.4	5.1	10.9
Approach LOS	D	C	A	B
Queue Length 50th (m)	89.4	66.6	16.4	55.0
Queue Length 95th (m)	#151.7	#111.2	m30.3	91.8
Internal Link Dist (m)	123.5	93.1	100.9	103.3
50th Up Block Time (%)				
95th Up Block Time (%)	28%	16%		4%
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	75	34		42

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.93

Intersection Signal Delay: 13.5 Intersection LOS: B

Intersection Capacity Utilization 111.9% ICU Level of Service G

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

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

Lane Group	WBL	WBR	NBL	NBR	SEL
Lane Group Flow (vph)	207	2367	0	121	2077
Act Effct Green (s)	25.0	90.0		57.0	57.0
Actuated g/C Ratio	0.28	1.00		0.63	0.63
v/c Ratio	0.42	0.65		0.08	0.65
Uniform Delay, d1	26.5	0.0		0.0	10.3
Delay	37.1	3.5		0.0	2.0
LOS	D	A		A	A
Approach Delay	6.2		0.0		2.0
Approach LOS	A		A		A
Queue Length 50th (m)	35.8	33.5		0.0	10.9
Queue Length 95th (m)	m41.7	24.9		0.0	m11.0
Internal Link Dist (m)	0.1		0.1		103.3
50th Up Block Time (%)	71%	39%			
95th Up Block Time (%)	72%	51%			
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)	147	1061			

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:SEL, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.65	
Intersection Signal Delay: 4.2	Intersection LOS: A
Intersection Capacity Utilization 58.5%	ICU Level of Service A
m Volume for 95th percentile queue is metered by upstream signal.	

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	2272	2280	438	34
Act Effct Green (s)	45.9	45.9	36.1	36.1
Actuated g/C Ratio	0.51	0.51	0.40	0.40
v/c Ratio	0.88	0.87	0.82	0.05
Uniform Delay, d1	19.0	19.4	24.0	15.5
Delay	14.1	20.3	30.5	16.0
LOS	B	C	C	B
Approach Delay	14.1	20.3	30.5	16.0
Approach LOS	B	C	C	B
Queue Length 50th (m)	60.9	120.7	66.1	3.3
Queue Length 95th (m)	62.0	143.3	#117.3	9.0
Internal Link Dist (m)	0.1	108.3	66.0	87.3
50th Up Block Time (%)	49%	7%	7%	
95th Up Block Time (%)	49%	14%	32%	
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	1113			

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:EBT, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.88	
Intersection Signal Delay: 18.4	Intersection LOS: B
Intersection Capacity Utilization 82.4%	ICU Level of Service D

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

Lane Group	EBL	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	90	312	365	85	39
Act Effct Green (s)	44.0	44.0	44.0	38.0	38.0
Actuated g/C Ratio	0.49	0.49	0.49	0.42	0.42
v/c Ratio	0.20	0.35	0.40	0.11	0.05
Uniform Delay, d1	13.0	12.5	14.4	12.1	14.9
Delay	13.6	12.8	17.7	12.7	15.3
LOS	B	B	B	B	B
Approach Delay		13.0	17.7	12.7	15.3
Approach LOS		B	B	B	B
Queue Length 50th (m)	8.5	28.1	32.0	6.7	3.8
Queue Length 95th (m)	17.7	45.9	58.2	15.2	9.5
Internal Link Dist (m)		15.7	200.1	130.9	81.8
50th Up Block Time (%)		26%			
95th Up Block Time (%)	12%	36%			
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)					

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.40
Intersection Signal Delay: 15.0 Intersection LOS: B
Intersection Capacity Utilization 51.6% ICU Level of Service A

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	49	86	572	629
Act Effct Green (s)	28.0	28.0	54.0	54.0
Actuated g/C Ratio	0.31	0.31	0.60	0.60
v/c Ratio	0.11	0.15	0.51	0.56
Uniform Delay, d1	21.1	21.3	10.3	10.7
Delay	21.8	21.7	10.7	11.1
LOS	C	C	B	B
Approach Delay	21.8	21.7	10.7	11.1
Approach LOS	C	C	B	B
Queue Length 50th (m)	5.7	10.1	52.1	59.3
Queue Length 95th (m)	13.8	20.7	77.2	88.3
Internal Link Dist (m)	129.6	100.1	143.2	47.4
50th Up Block Time (%)				13%
95th Up Block Time (%)				22%
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.56

Intersection Signal Delay: 12.0 | Intersection LOS: B

Intersection Capacity Utilization 48.9% | ICU Level of Service A

Lane Group	EBL	EBT	WBL	WBT	WBR	NBT	SBT
Lane Group Flow (vph)	240	29	1	54	381	2170	3081
Act Effct Green (s)	30.0	30.0	30.0	30.0	30.0	52.0	52.0
Actuated g/C Ratio	0.33	0.33	0.33	0.33	0.33	0.58	0.58
v/c Ratio	0.53	0.05	0.00	0.09	0.71	0.73	1.05
Uniform Delay, d1	24.3	18.2	20.0	20.6	25.7	13.9	18.4
Delay	25.1	19.0	20.0	20.9	26.7	14.1	48.5
LOS	C	B	B	C	C	B	D
Approach Delay		24.4		26.0		14.1	48.5
Approach LOS		C		C		B	D
Queue Length 50th (m)	33.2	3.0	0.1	6.3	56.1	92.8	~212.6
Queue Length 95th (m)	56.1	8.8	1.2	14.2	88.3	110.6	#241.3
Internal Link Dist (m)		138.9		106.7		182.4	8.3
50th Up Block Time (%)							41%
95th Up Block Time (%)							42%
Turn Bay Length (m)	15.2						
50th Bay Block Time %	39%						
95th Bay Block Time %	50%						
Queuing Penalty (veh)	13						

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 1.05
Intersection Signal Delay: 33.2 Intersection LOS: C
Intersection Capacity Utilization 88.8% ICU Level of Service D
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

2030 ALTERNATIVE 5

(Parkway: Circle Drive Option) WEEKEND

Lane Group	EBT	EBR	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	522	3	488	6	0	5	2	0	9
Act Effct Green (s)	38.0	38.0	38.0	29.0		29.0	29.0		29.0
Actuated g/C Ratio	0.51	0.51	0.51	0.39		0.39	0.39		0.39
v/c Ratio	0.29	0.00	0.27	0.01		0.01	0.00		0.01
Uniform Delay, d1	10.7	0.0	10.6	14.2		0.0	14.0		0.0
Delay	10.8	6.3	10.7	14.3		9.2	14.0		8.3
LOS	B	A	B	B		A	B		A
Approach Delay	10.8		10.7		12.0			9.4	
Approach LOS	B		B		B			A	
Queue Length 50th (m)	21.1	0.0	19.4	0.5		0.0	0.2		0.0
Queue Length 95th (m)	30.2	1.2	28.2	2.7		1.9	1.4		2.6
Internal Link Dist (m)	222.2		219.6		26.3			7.1	
50th Up Block Time (%)									
95th Up Block Time (%)									
Turn Bay Length (m)							7.6		
50th Bay Block Time %									
95th Bay Block Time %									
Queuing Penalty (veh)									

Intersection Summary

Cycle Length: 75
Offset: 0 (0%), Referenced to phase 2:NBSBL and 6:, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.29
Intersection Signal Delay: 10.7 Intersection LOS: B
Intersection Capacity Utilization 31.1% ICU Level of Service A

Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	310	325	2395	2359
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	1.11dl	0.58	0.82	0.81
Uniform Delay, d1	22.5	23.9	15.8	15.6
Delay	23.0	24.6	16.1	9.8
LOS	C	C	B	A
Approach Delay	23.0	24.6	16.1	9.8
Approach LOS	C	C	B	A
Queue Length 50th (m)	21.2	45.0	114.5	54.6
Queue Length 95th (m)	33.0	71.7	135.9	55.2
Internal Link Dist (m)	32.2	176.0	58.1	100.9
50th Up Block Time (%)			23%	
95th Up Block Time (%)	5%		26%	3%
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	8		586	40

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 14.3 Intersection LOS: B

Intersection Capacity Utilization 93.3% ICU Level of Service E

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

Lane Group	EBL	NBL	NBT	SBT
Lane Group Flow (vph)	337	4	145	25
Act Effct Green (s)	23.5	24.0	24.0	24.0
Actuated g/C Ratio	0.42	0.43	0.43	0.43
v/c Ratio	0.38	0.01	0.18	0.03
Uniform Delay, d1	0.1	9.0	9.7	8.7
Delay	1.7	9.0	10.0	9.0
LOS	A	A	A	A
Approach Delay	1.7		9.9	9.0
Approach LOS	A		A	A
Queue Length 50th (m)	0.3	0.3	8.5	1.3
Queue Length 95th (m)	11.8	1.5	17.3	4.6
Internal Link Dist (m)	81.1		167.5	74.1
50th Up Block Time (%)				
95th Up Block Time (%)				
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary	
Cycle Length: 55.5	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.38	
Intersection Signal Delay: 4.5	Intersection LOS: A
Intersection Capacity Utilization 35.1%	ICU Level of Service A

Lane Group	EBT	EBR	WBT	SET	NWT
Lane Group Flow (vph)	0	82	72	2306	2907
Act Effct Green (s)		23.0	23.0	59.0	59.0
Actuated g/C Ratio		0.26	0.26	0.66	0.66
v/c Ratio		0.19	0.08	0.68	0.86
Uniform Delay, d1		23.2	25.4	9.7	12.3
Delay		23.8	25.7	9.9	12.7
LOS		C	C	A	B
Approach Delay	23.8		25.7	9.9	12.7
Approach LOS	C		C	A	B
Queue Length 50th (m)		9.8	5.0	81.0	129.5
Queue Length 95th (m)		21.1	10.2	95.9	153.8
Internal Link Dist (m)	42.8		63.5	278.7	42.8
50th Up Block Time (%)					24%
95th Up Block Time (%)					26%
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)					730

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.86	
Intersection Signal Delay: 11.8	Intersection LOS: B
Intersection Capacity Utilization 66.2%	ICU Level of Service B

Lane Group	EBT	WBL	WBT	SEL	SET	SER	NWL	NWT	NWR
Lane Group Flow (vph)	147	2	2	510	83	490	1	0	82
Act Effct Green (s)	23.5	23.5	23.5	58.5	58.5	58.5	58.5		58.5
Actuated g/C Ratio	0.26	0.26	0.26	0.65	0.65	0.65	0.65		0.65
v/c Ratio	0.16	0.01	0.00	0.23	0.07	0.40	0.00		0.08
Uniform Delay, d1	25.4	24.5	24.5	6.5	5.8	0.0	6.0		0.0
Delay	25.7	33.0	33.0	6.5	5.9	0.7	6.0		1.4
LOS	C	C	C	A	A	A	A		A
Approach Delay	25.7		33.0		3.8			1.5	
Approach LOS	C		C		A			A	
Queue Length 50th (m)	10.2	0.2	0.2	16.6	4.7	0.0	0.1		0.0
Queue Length 95th (m)	17.6	2.5	2.5	23.0	9.4	9.5	0.6		4.3
Internal Link Dist (m)	29.6		16.5		46.2			264.3	
50th Up Block Time (%)									
95th Up Block Time (%)									
Turn Bay Length (m)									
50th Bay Block Time %									
95th Bay Block Time %									
Queuing Penalty (veh)									

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NWL and 6:SETL, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.40	
Intersection Signal Delay: 6.2	Intersection LOS: A
Intersection Capacity Utilization 47.0%	ICU Level of Service A

Lane Group	EBT	WBT	WBR	SET	NWL	NWT
Lane Group Flow (vph)	737	2	494	0	2	3
Act Effct Green (s)	59.0	59.0	90.0		23.0	23.0
Actuated g/C Ratio	0.66	0.66	1.00		0.26	0.26
v/c Ratio	0.37	0.00	0.31		0.00	0.00
Uniform Delay, d1	7.0	5.5	0.0		25.0	0.0
Delay	8.2	5.5	0.0		25.0	0.0
LOS	A	A	A		C	A
Approach Delay	8.2	0.0				10.0
Approach LOS	A	A				A
Queue Length 50th (m)	34.3	0.1	0.0		0.3	0.0
Queue Length 95th (m)	46.4	0.8	0.0		2.0	0.0
Internal Link Dist (m)	78.4	222.2		57.2		49.0
50th Up Block Time (%)						
95th Up Block Time (%)						
Turn Bay Length (m)						
50th Bay Block Time %						
95th Bay Block Time %						
Queuing Penalty (veh)						

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NWTL and 6:, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.37
Intersection Signal Delay: 4.9 | Intersection LOS: A
Intersection Capacity Utilization 34.0% | ICU Level of Service A

	→	←	↘	↖
Lane Group	EBT	WBT	SET	NWT
Lane Group Flow (vph)	456	401	1907	1957
Act Effct Green (s)	31.0	31.0	51.0	51.0
Actuated g/C Ratio	0.34	0.34	0.57	0.57
v/c Ratio	0.71	0.71	0.66	0.67
Uniform Delay, d1	25.5	24.9	13.4	13.6
Delay	26.3	25.8	4.3	7.3
LOS	C	C	A	A
Approach Delay	26.3	25.8	4.3	7.3
Approach LOS	C	C	A	A
Queue Length 50th (m)	67.5	58.1	14.2	23.9
Queue Length 95th (m)	101.4	90.9	22.3	46.4
Internal Link Dist (m)	123.5	93.1	100.9	106.3
50th Up Block Time (%)				
95th Up Block Time (%)		5%		
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)		10		

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.71	
Intersection Signal Delay: 9.5	Intersection LOS: A
Intersection Capacity Utilization 73.2%	ICU Level of Service C

Lane Group	WBL	WBR	NBL	NBR	SEL
Lane Group Flow (vph)	71	1945	0	38	1885
Act Effct Green (s)	25.0	90.0		25.0	57.0
Actuated g/C Ratio	0.28	1.00		0.28	0.63
v/c Ratio	0.14	0.53		0.08	0.59
Uniform Delay, d1	24.4	0.0		11.9	9.6
Delay	39.1	3.6		10.9	1.7
LOS	D	A		B	A
Approach Delay	4.8		10.9		1.7
Approach LOS	A		B		A
Queue Length 50th (m)	12.9	33.5		0.0	5.8
Queue Length 95th (m)	m19.8	35.5		5.7	11.4
Internal Link Dist (m)	0.1		0.5		106.3
50th Up Block Time (%)	65%	26%		2%	
95th Up Block Time (%)	66%	35%		58%	
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)	46	590		11	

Intersection Summary

Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:SEL and 6:, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.59
Intersection Signal Delay: 3.4 Intersection LOS: A
Intersection Capacity Utilization 48.7% ICU Level of Service A
m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	1946	1923	131	5
Act Effct Green (s)	50.5	50.5	31.5	31.5
Actuated g/C Ratio	0.56	0.56	0.35	0.35
v/c Ratio	0.68	0.67	0.27	0.01
Uniform Delay, d1	13.5	13.8	20.6	7.6
Delay	5.7	14.0	21.2	14.8
LOS	A	B	C	B
Approach Delay	5.7	14.0	21.2	14.8
Approach LOS	A	B	C	B
Queue Length 50th (m)	0.2	79.6	15.8	0.2
Queue Length 95th (m)	26.5	95.1	29.5	2.5
Internal Link Dist (m)	0.1	108.3	66.0	87.3
50th Up Block Time (%)	67%			
95th Up Block Time (%)	13%			
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)	774			

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:EBT, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.68

Intersection Signal Delay: 10.2 Intersection LOS: B

Intersection Capacity Utilization 59.1% ICU Level of Service A

	↗	→	←	↑	↓
Lane Group	EBL	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	305	47	156	85	42
Act Effct Green (s)	44.0	44.0	44.0	38.0	38.0
Actuated g/C Ratio	0.49	0.49	0.49	0.42	0.42
v/c Ratio	0.50	0.05	0.17	0.11	0.05
Uniform Delay, d1	15.6	12.0	11.2	11.9	14.6
Delay	16.2	12.2	6.7	12.6	15.0
LOS	B	B	A	B	B
Approach Delay		15.7	6.7	12.6	15.0
Approach LOS		B	A	B	B
Queue Length 50th (m)	34.2	4.1	6.0	6.6	4.0
Queue Length 95th (m)	57.1	9.5	15.1	15.1	9.9
Internal Link Dist (m)		15.7	208.7	130.9	81.8
50th Up Block Time (%)	31%				
95th Up Block Time (%)	39%				
Turn Bay Length (m)					
50th Bay Block Time %					
95th Bay Block Time %					
Queuing Penalty (veh)					

Intersection Summary	
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.50	
Intersection Signal Delay: 13.0	Intersection LOS: B
Intersection Capacity Utilization 40.5%	ICU Level of Service A

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	38	13	534	618
Act Effct Green (s)	28.0	28.0	54.0	54.0
Actuated g/C Ratio	0.31	0.31	0.60	0.60
v/c Ratio	0.08	0.03	0.48	0.55
Uniform Delay, d1	18.9	13.2	10.0	10.7
Delay	20.0	17.5	10.4	11.1
LOS	B	B	B	B
Approach Delay	20.0	17.5	10.4	11.1
Approach LOS	B	B	B	B
Queue Length 50th (m)	4.0	1.0	47.2	58.3
Queue Length 95th (m)	10.9	5.0	70.3	86.5
Internal Link Dist (m)	129.6	100.1	143.2	47.4
50th Up Block Time (%)				13%
95th Up Block Time (%)				22%
Turn Bay Length (m)				
50th Bay Block Time %				
95th Bay Block Time %				
Queuing Penalty (veh)				

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.55

Intersection Signal Delay: 11.1 Intersection LOS: B

Intersection Capacity Utilization 47.9% ICU Level of Service A

Lane Group	EBL	EBT	WBL	WBT	WBR	NBT	SBT
Lane Group Flow (vph)	9	11	1	50	29	1857	2283
Act Effct Green (s)	30.0	30.0	30.0	30.0	30.0	52.0	52.0
Actuated g/C Ratio	0.33	0.33	0.33	0.33	0.33	0.58	0.58
v/c Ratio	0.02	0.02	0.00	0.08	0.05	0.63	0.78
Uniform Delay, d1	20.1	9.1	20.0	20.5	11.1	12.5	14.2
Delay	20.3	15.2	20.0	20.9	14.1	12.7	14.5
LOS	C	B	B	C	B	B	B
Approach Delay		17.5		18.4		12.7	14.5
Approach LOS		B		B		B	B
Queue Length 50th (m)	1.0	0.6	0.1	5.9	1.9	72.0	100.8
Queue Length 95th (m)	4.2	4.1	1.2	13.6	7.6	86.2	120.3
Internal Link Dist (m)		138.9		106.7		182.4	8.3
50th Up Block Time (%)							39%
95th Up Block Time (%)							39%
Turn Bay Length (m)	15.2						
50th Bay Block Time %							
95th Bay Block Time %							
Queuing Penalty (veh)							

Intersection Summary

Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.78

Intersection Signal Delay: 13.8 Intersection LOS: B

Intersection Capacity Utilization 54.9% ICU Level of Service A

APPENDIX E

SEGMENT MERGE / DIVERGE LEVEL OF SERVICE CALCULATIONS

2000

(Existing Conditions) AM

HCS: Ramps and Ramp Junctions Release 3.1c

Phone: Fax:
E-mail:

DIVERGE ANALYSIS

Location: 101 SB at Park Presidio
Analyst: BM
Analysis Time Period: AM
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Diverge	
Freeway Data:		
Number of Lanes in Freeway	3	
Free-Flow Speed on Freeway	60.0	mph
Volume on Freeway	6149	vph
Off Ramp Data:		
Side of Freeway	Right	
Number of Lanes in Ramp	1	
Free-Flow Speed on Ramp	45.0	mph
Volume on Ramp	1932	vph
Length of First Accel/Decel Lane	1700	ft
Length of Second Accel/Decel Lane	500	ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	No	
Volume on Adjacent Ramp	0	vph
Position of Adjacent Ramp	Upstream	
Type of Adjacent Ramp	On	
Distance to Adjacent Ramp	1000	ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Level	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Volume, V (vph)	6149	1932	0	vph
Peak-Hour Factor, PHF	0.90	0.90	0.90	
Peak 15-min Volume, v15	1708	537	0	v
Trucks and Buses	2	2	0	%
Trucks and Buses PCE, ET	3.0	3.0	1.5	
Recreational Vehicles	0	0	0	%
Recreational Vehicle PCE, ER	2.0	2.0	1.2	
Heavy Vehicle Adjustment, fHV	0.962	0.962	1.000	
Driver Population Adjustment, fP	1.00	1.00	1.00	
Adjusted Flow Rate, vp	7106	2233	0	pcph

ANALYSIS and RESULTS of DIVERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FD} = 0.480 Using Equation 7

Flow in Lanes 1 and 2, $v_{12} = v_R + (v_F - v_R) P_{FD}$ = 4570 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	7106	6900	Yes
v_{12}	4570	4400	Yes
$v_{FO} = v_F - v_R$	4873	6900	No
v_R	2233	2100	Yes

Level of Service Operation (if not LOS F):

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 28+ pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence F

Speed in Ramp Influence Area, S_R 51 mph

Phone: Fax:
E-mail:

MERGE ANALYSIS

Location: 101 SB from Park Presidio
Analyst: BM
Analysis Time Period: AM
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Merge	
Freeway Data:		
Number of Lanes in Freeway	3	
Free-Flow Speed on Freeway	60.0	mph
Volume on Freeway	4217	vph
On Ramp Data:		
Side of Freeway	Right	
Number of Lanes in Ramp	1	
Free-Flow Speed on Ramp	45.0	mph
Volume on Ramp	986	vph
Length of First Accel/Decel Lane	0	ft
Length of Second Accel/Decel Lane		ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	Yes	
Volume on Adjacent Ramp	3717	vph
Position of Adjacent Ramp	Downstream	
Type of Adjacent Ramp	Off	
Distance to Adjacent Ramp	4000	ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Volume, V (vph)	4217	986	3717	vph
Peak-Hour Factor, PHF	0.90	0.90	0.90	
Peak 15-min Volume, v15	1171	274	1033	v
Trucks and Buses	2	2	0	%
Trucks and Buses PCE, ET	3.0	3.0	3.0	
Recreational Vehicles	0	0	0	%
Recreational Vehicle PCE, ER	2.0	2.0	2.0	
Heavy Vehicle Adjustment, fHV	0.962	0.962	1.000	
Driver Population Adjustment, fP	1.00	1.00	1.00	
Adjusted Flow Rate, vp	4873	1139	4130	pcph

ANALYSIS and RESULTS of MERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FM} = 0.577 Using Equation 2

Flow in Lanes 1 and 2, $v_{12} = v_F (P_{FM})$ = 2814 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
v_{FO}	6012	6900	No
v_{R12}	3953	4600	No

Level of Service Operation (if not LOS F):

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 36- pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence E

Speed in Ramp Influence Area, S_R 50.6 mph

Phone: Fax:
E-mail:

MERGE ANALYSIS

Location: 101 NB from Park Presidio
Analyst: BM
Analysis Time Period: AM
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Merge	
Freeway Data:		
Number of Lanes in Freeway	4	
Free-Flow Speed on Freeway	60.0	mph
Volume on Freeway	1601	vph
On Ramp Data:		
Side of Freeway	Right	
Number of Lanes in Ramp	2	
Free-Flow Speed on Ramp	45.0	mph
Volume on Ramp	1393	vph
Length of First Accel/Decel Lane	0	ft
Length of Second Accel/Decel Lane	400	ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	No	
Volume on Adjacent Ramp		vph
Position of Adjacent Ramp		
Type of Adjacent Ramp		
Distance to Adjacent Ramp		ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Volume, V (vph)	1601	1393		vph
Peak-Hour Factor, PHF	0.90	0.90		
Peak 15-min Volume, v15	445	387		v
Trucks and Buses	0	0		%
Trucks and Buses PCE, ET	3.0	3.0		
Recreational Vehicles	0	0		%
Recreational Vehicle PCE, ER	2.0	2.0		
Heavy Vehicle Adjustment, fHV	1.000	1.000		
Driver Population Adjustment, fP	1.00	1.00		
Adjusted Flow Rate, vp	1779	1548		pcph

ANALYSIS and RESULTS of MERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FM} = 0.209 Using Equation Spec
Flow in Lanes 1 and 2, $v_{12} = v_F (P_{FM})$ = 372 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
v_{FO}	3327	9200	No
v_{R12}	1920	4600	No

Level of Service Operation (if not LOS F):

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 17+ pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence B

Speed in Ramp Influence Area, S_R 54.4 mph

HCS: Ramps and Ramp Junctions Release 3.1c

Phone: Fax:
E-mail:

DIVERGE ANALYSIS

Location: 101 NB at Park Presidio
Analyst: BM
Analysis Time Period: AM
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Diverge	
Freeway Data:		
Number of Lanes in Freeway	3	
Free-Flow Speed on Freeway	60.0	mph
Volume on Freeway	2049	vph
Off Ramp Data:		
Side of Freeway	Right	
Number of Lanes in Ramp	1	
Free-Flow Speed on Ramp	35.0	mph
Volume on Ramp	448	vph
Length of First Accel/Decel Lane	50	ft
Length of Second Accel/Decel Lane	500	ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	No	
Volume on Adjacent Ramp	0	vph
Position of Adjacent Ramp	Upstream	
Type of Adjacent Ramp	On	
Distance to Adjacent Ramp	1000	ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Level	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Volume, V (vph)	2049	448	0	vph
Peak-Hour Factor, PHF	0.90	0.90	0.90	
Peak 15-min Volume, v15	569	124	0	v
Trucks and Buses	0	0	0	%
Trucks and Buses PCE, ET	3.0	3.0	1.5	
Recreational Vehicles	0	0	0	%
Recreational Vehicle PCE, ER	2.0	2.0	1.2	
Heavy Vehicle Adjustment, fHV	1.000	1.000	1.000	
Driver Population Adjustment, fP	1.00	1.00	1.00	
Adjusted Flow Rate, vp	2277	498	0	pcph

ANALYSIS and RESULTS of DIVERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FD} = 0.680 Using Equation 7
Flow in Lanes 1 and 2, $v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1708 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2277	6900	No
v_{12}	1708	4400	No
$v_{FO} = v_F - v_R$	1779	6900	No
v_R	498	2000	No

Level of Service Operation (if not LOS F):

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 18+ pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence B

Speed in Ramp Influence Area, S_R 51 mph

HCS: Ramps and Ramp Junctions Release 3.1c

Phone: Fax:
E-mail:

DIVERGE ANALYSIS

Location: 101 SB to Marina/Richardson
Analyst: BM
Analysis Time Period: Existing-AM
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Diverge	
Freeway Data:		
Number of Lanes in Freeway	3	
Free-Flow Speed on Freeway	60.0	mph
Volume on Freeway	5203	vph
Off Ramp Data:		
Side of Freeway	Left	
Number of Lanes in Ramp	2	
Free-Flow Speed on Ramp	35.0	mph
Volume on Ramp	1486	vph
Length of First Accel/Decel Lane	0	ft
Length of Second Accel/Decel Lane	0	ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	No	
Volume on Adjacent Ramp	0	vph
Position of Adjacent Ramp	Upstream	
Type of Adjacent Ramp	On	
Distance to Adjacent Ramp	1000	ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Level	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Volume, V (vph)	5203	1486	0	vph
Peak-Hour Factor, PHF	0.90	0.90	0.90	
Peak 15-min Volume, v15	1445	413	0	v
Trucks and Buses	2	2	0	%
Trucks and Buses PCE, ET	3.0	3.0	1.5	
Recreational Vehicles	0	0	0	%
Recreational Vehicle PCE, ER	2.0	2.0	1.2	
Heavy Vehicle Adjustment, fHV	0.962	0.962	1.000	
Driver Population Adjustment, fP	1.00	1.00	1.00	
Adjusted Flow Rate, vp	6012	1717	0	pcph

ANALYSIS and RESULTS of DIVERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FD} = 0.450 Using Equation Spec
Flow in Lanes 1 and 2, $v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3650 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	6012	6900	No
v_{12}	3650	4400	No
$v_{FO} = v_F - v_R$	4295	6900	No
v_R	1717	3800	No

Level of Service Operation (if not LOS F):

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 37+ pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence E

Speed in Ramp Influence Area, S_R 50 mph

Phone: Fax:
E-mail:

MERGE ANALYSIS

Location: Marina/Richardson to 101
Analyst: BM
Analysis Time Period: AM
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis Merge
Freeway Data:
Number of Lanes in Freeway 3
Free-Flow Speed on Freeway 55.0 mph
Volume on Freeway 1443 vph
On Ramp Data:
Side of Freeway Left
Number of Lanes in Ramp 2
Free-Flow Speed on Ramp 35.0 mph
Volume on Ramp 606 vph
Length of First Accel/Decel Lane 0 ft
Length of Second Accel/Decel Lane 0 ft
Adjacent Ramp Data if one exists:
Does adjacent ramp exist? No
Volume on Adjacent Ramp vph
Position of Adjacent Ramp
Type of Adjacent Ramp
Distance to Adjacent Ramp ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Volume, V (vph)	1443	606		vph
Peak-Hour Factor, PHF	0.90	0.90		
Peak 15-min Volume, v15	401	168		v
Trucks and Buses	2	2		%
Trucks and Buses PCE, ET	3.0	3.0		
Recreational Vehicles	0	0		%
Recreational Vehicle PCE, ER	2.0	2.0		
Heavy Vehicle Adjustment, fHV	0.962	0.962		
Driver Population Adjustment, fP	1.00	1.00		
Adjusted Flow Rate, vp	1667	700		pcph

ANALYSIS and RESULTS of MERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FM} = 0.555 Using Equation Spec

Flow in Lanes 1 and 2, $v_{12} = v_F (P_{FM})$ = 925 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
v_{FO}	2367	6750	No
v_{R12}	1736	4600	No

Level of Service Operation (if not LOS F):

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 19- pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence B

Speed in Ramp Influence Area, S_R 50.5 mph

HCS: Ramps and Ramp Junctions Release 3.1c

Phone: Fax:
E-mail:

MERGE ANALYSIS

Location: Park Presidio SB from 101
Analyst: BM
Analysis Time Period: Existing-AM
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Merge	
Freeway Data:		
Number of Lanes in Freeway	2	
Free-Flow Speed on Freeway	55.0	mph
Volume on Freeway	1932	vph
On Ramp Data:		
Side of Freeway	Right	
Number of Lanes in Ramp	1	
Free-Flow Speed on Ramp	35.0	mph
Volume on Ramp	448	vph
Length of First Accel/Decel Lane	50	ft
Length of Second Accel/Decel Lane		ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	No	
Volume on Adjacent Ramp		vph
Position of Adjacent Ramp		
Type of Adjacent Ramp		
Distance to Adjacent Ramp		ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Volume, V (vph)	1932	448		vph
Peak-Hour Factor, PHF	0.90	0.90		
Peak 15-min Volume, v15	537	124		v
Trucks and Buses	2	2		%
Trucks and Buses PCE, ET	3.0	3.0		
Recreational Vehicles	0	0		%
Recreational Vehicle PCE, ER	2.0	2.0		
Heavy Vehicle Adjustment, fHV	0.962	0.962		
Driver Population Adjustment, fP	1.00	1.00		
Adjusted Flow Rate, vp	2233	518		pcph

ANALYSIS and RESULTS of MERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FM} = 1.000 Using Equation 1
Flow in Lanes 1 and 2, $v_{12} = v_F (P_{FM})$ = 2233 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
v_{FO}	2751	4500	No
v_{R12}	2751	4600	No

Level of Service Operation (if not LOS F):

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 26+ pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence C

Speed in Ramp Influence Area, S_R 50.1 mph

HCS: Ramps and Ramp Junctions Release 3.1c

Phone: Fax:
E-mail:

DIVERGE ANALYSIS

Location: Park Presidio at 101
Analyst: BM
Analysis Time Period: AM
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Diverge	
Freeway Data:		
Number of Lanes in Freeway	2	
Free-Flow Speed on Freeway	55.0	mph
Volume on Freeway	2379	vph
Off Ramp Data:		
Side of Freeway	Right	
Number of Lanes in Ramp	1	
Free-Flow Speed on Ramp	45.0	mph
Volume on Ramp	986	vph
Length of First Accel/Decel Lane	150	ft
Length of Second Accel/Decel Lane	500	ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	No	
Volume on Adjacent Ramp	0	vph
Position of Adjacent Ramp	Upstream	
Type of Adjacent Ramp	On	
Distance to Adjacent Ramp	1000	ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Level	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Volume, V (vph)	2379	986	0	vph
Peak-Hour Factor, PHF	0.90	0.90	0.90	
Peak 15-min Volume, v15	661	274	0	v
Trucks and Buses	2	2	0	%
Trucks and Buses PCE, ET	3.0	3.0	1.5	
Recreational Vehicles	0	0	0	%
Recreational Vehicle PCE, ER	2.0	2.0	1.2	
Heavy Vehicle Adjustment, fHV	0.962	0.962	1.000	
Driver Population Adjustment, fP	1.00	1.00	1.00	
Adjusted Flow Rate, vp	2749	1139	0	pcph

ANALYSIS and RESULTS of DIVERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FD} = 1.000 Using Equation 6

Flow in Lanes 1 and 2, $v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2749 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2749	4500	No
v_{12}	2749	4400	No
$v_{FO} = v_F - v_R$	1610	4500	No
v_R	1139	2100	No

Level of Service Operation (if not LOS F):

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 27- pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence C

Speed in Ramp Influence Area, S_R 50 mph

2000

(Existing Conditions) PM

HCS: Ramps and Ramp Junctions Release 3.1c

Phone: Fax:
E-mail:

DIVERGE ANALYSIS

Location: 101 SB at Park Presidio
Analyst: BM
Analysis Time Period: PM
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Diverge	
Freeway Data:		
Number of Lanes in Freeway	3	
Free-Flow Speed on Freeway	60.0	mph
Volume on Freeway	3120	vph
Off Ramp Data:		
Side of Freeway	Right	
Number of Lanes in Ramp	1	
Free-Flow Speed on Ramp	45.0	mph
Volume on Ramp	1236	vph
Length of First Accel/Decel Lane	1700	ft
Length of Second Accel/Decel Lane	500	ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	No	
Volume on Adjacent Ramp	0	vph
Position of Adjacent Ramp	Upstream	
Type of Adjacent Ramp	On	
Distance to Adjacent Ramp	1000	ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Level	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Volume, V (vph)	3120	1236	0	vph
Peak-Hour Factor, PHF	0.90	0.90	0.90	
Peak 15-min Volume, v15	867	343	0	v
Trucks and Buses	2	2	0	%
Trucks and Buses PCE, ET	3.0	3.0	1.5	
Recreational Vehicles	0	0	0	%
Recreational Vehicle PCE, ER	2.0	2.0	1.2	
Heavy Vehicle Adjustment, fHV	0.962	0.962	1.000	
Driver Population Adjustment, fP	1.00	1.00	1.00	
Adjusted Flow Rate, vp	3605	1428	0	pcph

ANALYSIS and RESULTS of DIVERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FD} = 0.604 Using Equation 7
Flow in Lanes 1 and 2, $v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2743 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3605	6900	No
v_{12}	2743	4400	No
$v_{FO} = v_F - v_R$	2177	6900	No
v_R	1428	2100	No

Level of Service Operation (if not LOS F):

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\ L_D$ = 13- pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence B

Speed in Ramp Influence Area, S_R 52 mph

Phone: Fax:
E-mail:

MERGE ANALYSIS

Location: 101 SB from Park Presidio
Analyst: BM
Analysis Time Period: PM
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Merge	
Freeway Data:		
Number of Lanes in Freeway	3	
Free-Flow Speed on Freeway	60.0	mph
Volume on Freeway	1884	vph
On Ramp Data:		
Side of Freeway	Right	
Number of Lanes in Ramp	1	
Free-Flow Speed on Ramp	45.0	mph
Volume on Ramp	724	vph
Length of First Accel/Decel Lane	0	ft
Length of Second Accel/Decel Lane		ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	Yes	
Volume on Adjacent Ramp	1734	vph
Position of Adjacent Ramp	Downstream	
Type of Adjacent Ramp	Off	
Distance to Adjacent Ramp	4000	ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Volume, V (vph)	1884	724	1734	vph
Peak-Hour Factor, PHF	0.90	0.90	0.90	
Peak 15-min Volume, v15	523	201	482	v
Trucks and Buses	2	2	0	%
Trucks and Buses PCE, ET	3.0	3.0	3.0	
Recreational Vehicles	0	0	0	%
Recreational Vehicle PCE, ER	2.0	2.0	2.0	
Heavy Vehicle Adjustment, fHV	0.962	0.962	1.000	
Driver Population Adjustment, fP	1.00	1.00	1.00	
Adjusted Flow Rate, vp	2177	837	1927	pcph

ANALYSIS and RESULTS of MERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FM} = 0.577 Using Equation 2
Flow in Lanes 1 and 2, $v_{12} = v_F (P_{FM})$ = 1257 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
v_{FO}	3014	6900	No
v_{R12}	2094	4600	No

Level of Service Operation (if not LOS F):

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 21+ pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence C

Speed in Ramp Influence Area, S_R 53.7 mph

HCS: Ramps and Ramp Junctions Release 3.1c

Phone: Fax:
E-mail:

MERGE ANALYSIS

Location: 101 NB from Park Presidio
Analyst: BM
Analysis Time Period: PM
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Merge	
Freeway Data:		
Number of Lanes in Freeway	4	
Free-Flow Speed on Freeway	60.0	mph
Volume on Freeway	3605	vph
On Ramp Data:		
Side of Freeway	Right	
Number of Lanes in Ramp	2	
Free-Flow Speed on Ramp	45.0	mph
Volume on Ramp	2044	vph
Length of First Accel/Decel Lane	0	ft
Length of Second Accel/Decel Lane	400	ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	No	
Volume on Adjacent Ramp		vph
Position of Adjacent Ramp		
Type of Adjacent Ramp		
Distance to Adjacent Ramp		ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Volume, V (vph)	3605	2044		vph
Peak-Hour Factor, PHF	0.90	0.90		
Peak 15-min Volume, v15	1001	568		v
Trucks and Buses	2	2		%
Trucks and Buses PCE, ET	3.0	3.0		
Recreational Vehicles	0	0		%
Recreational Vehicle PCE, ER	2.0	2.0		
Heavy Vehicle Adjustment, fHV	0.962	0.962		
Driver Population Adjustment, fP	1.00	1.00		
Adjusted Flow Rate, vp	4166	2362		pcph

ANALYSIS and RESULTS of MERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FM} = 0.209 Using Equation Spec
Flow in Lanes 1 and 2, $v_{12} = v_F (P_{FM})$ = 872 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
v_{FO}	6528	9200	No
v_{R12}	3234	4600	No

Level of Service Operation (if not LOS F):

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 27+ pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence C

Speed in Ramp Influence Area, S_R 53.1 mph

HCS: Ramps and Ramp Junctions Release 3.1c

Phone: Fax:
E-mail:

DIVERGE ANALYSIS

Location: 101 NB at Park Presidio
Analyst: BM
Analysis Time Period: PM
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Diverge	
Freeway Data:		
Number of Lanes in Freeway	3	
Free-Flow Speed on Freeway	60.0	mph
Volume on Freeway	4619	vph
Off Ramp Data:		
Side of Freeway	Right	
Number of Lanes in Ramp	1	
Free-Flow Speed on Ramp	35.0	mph
Volume on Ramp	1014	vph
Length of First Accel/Decel Lane	50	ft
Length of Second Accel/Decel Lane	500	ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	No	
Volume on Adjacent Ramp	0	vph
Position of Adjacent Ramp	Upstream	
Type of Adjacent Ramp	On	
Distance to Adjacent Ramp	1000	ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Level	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Volume, V (vph)	4619	1014	0	vph
Peak-Hour Factor, PHF	0.90	0.90	0.90	
Peak 15-min Volume, v15	1283	282	0	v
Trucks and Buses	2	2	0	%
Trucks and Buses PCE, ET	3.0	3.0	1.5	
Recreational Vehicles	0	0	0	%
Recreational Vehicle PCE, ER	2.0	2.0	1.2	
Heavy Vehicle Adjustment, fHV	0.962	0.962	1.000	
Driver Population Adjustment, fP	1.00	1.00	1.00	
Adjusted Flow Rate, vp	5338	1172	0	pcph

ANALYSIS and RESULTS of DIVERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FD} = 0.573 Using Equation 7

Flow in Lanes 1 and 2, $v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3558 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5338	6900	No
v_{12}	3558	4400	No
$v_{FO} = v_F - v_R$	4166	6900	No
v_R	1172	2000	No

Level of Service Operation (if not LOS F):

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D = 34+$ pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence D

Speed in Ramp Influence Area, S_R 50 mph

Phone: Fax:
E-mail:

DIVERGE ANALYSIS

Location: 101 SB at Marina/Richardson
Analyst: BM
Analysis Time Period: PM
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Diverge	
Freeway Data:		
Number of Lanes in Freeway	3	
Free-Flow Speed on Freeway	60.0	mph
Volume on Freeway	2607	vph
Off Ramp Data:		
Side of Freeway	Left	
Number of Lanes in Ramp	2	
Free-Flow Speed on Ramp	35.0	mph
Volume on Ramp	873	vph
Length of First Accel/Decel Lane	0	ft
Length of Second Accel/Decel Lane	0	ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	No	
Volume on Adjacent Ramp	0	vph
Position of Adjacent Ramp	Upstream	
Type of Adjacent Ramp	On	
Distance to Adjacent Ramp	1000	ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Level	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Volume, V (vph)	2607	873	0	vph
Peak-Hour Factor, PHF	0.90	0.90	0.90	
Peak 15-min Volume, v15	724	243	0	v
Trucks and Buses	2	2	0	%
Trucks and Buses PCE, ET	3.0	3.0	1.5	
Recreational Vehicles	0	0	0	%
Recreational Vehicle PCE, ER	2.0	2.0	1.2	
Heavy Vehicle Adjustment, fHV	0.962	0.962	1.000	
Driver Population Adjustment, fP	1.00	1.00	1.00	
Adjusted Flow Rate, vp	3013	1009	0	pcph

ANALYSIS and RESULTS of DIVERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FD} = 0.450 Using Equation Spec

Flow in Lanes 1 and 2, $v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1911 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3013	6900	No
v_{12}	1911	4400	No
$v_{FO} = v_F - v_R$	2004	6900	No
v_R	1009	3800	No

Level of Service Operation (if not LOS F):

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 22- pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence C

Speed in Ramp Influence Area, S_R 51 mph

HCS: Ramps and Ramp Junctions Release 3.1c

Phone: Fax:
E-mail:

MERGE ANALYSIS

Location: Doyle Dr/Richardson to 101
Analyst: BM
Analysis Time Period: PM
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Merge	
Freeway Data:		
Number of Lanes in Freeway	3	
Free-Flow Speed on Freeway	55.0	mph
Volume on Freeway	2802	vph
On Ramp Data:		
Side of Freeway	Left	
Number of Lanes in Ramp	2	
Free-Flow Speed on Ramp	35.0	mph
Volume on Ramp	1817	vph
Length of First Accel/Decel Lane	0	ft
Length of Second Accel/Decel Lane	0	ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	No	
Volume on Adjacent Ramp		vph
Position of Adjacent Ramp		
Type of Adjacent Ramp		
Distance to Adjacent Ramp		ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Volume, V (vph)	2802	1817		vph
Peak-Hour Factor, PHF	0.90	0.90		
Peak 15-min Volume, v15	778	505		v
Trucks and Buses	2	2		%
Trucks and Buses PCE, ET	3.0	3.0		
Recreational Vehicles	0	0		%
Recreational Vehicle PCE, ER	2.0	2.0		
Heavy Vehicle Adjustment, fHV	0.962	0.962		
Driver Population Adjustment, fP	1.00	1.00		
Adjusted Flow Rate, vp	3238	2100		pcph

ANALYSIS and RESULTS of MERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FM} = 0.555 Using Equation Spec

Flow in Lanes 1 and 2, $v_{12} = v_F (P_{FM})$ = 1797 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
v_{FO}	5338	6750	No
v_{R12}	4112	4600	No

Level of Service Operation (if not LOS F):

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 37- pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence E

Speed in Ramp Influence Area, S_R 47.7 mph

HCS: Ramps and Ramp Junctions Release 3.1c

Phone: Fax:
E-mail:

MERGE ANALYSIS

Location: Park Presidio SB from 101
Analyst: BM
Analysis Time Period: PM
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Merge	
Freeway Data:		
Number of Lanes in Freeway	2	
Free-Flow Speed on Freeway	55.0	mph
Volume on Freeway	1236	vph
On Ramp Data:		
Side of Freeway	Right	
Number of Lanes in Ramp	1	
Free-Flow Speed on Ramp	35.0	mph
Volume on Ramp	1014	vph
Length of First Accel/Decel Lane	50	ft
Length of Second Accel/Decel Lane		ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	No	
Volume on Adjacent Ramp		vph
Position of Adjacent Ramp		
Type of Adjacent Ramp		
Distance to Adjacent Ramp		ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Volume, V (vph)	1236	1014		vph
Peak-Hour Factor, PHF	0.90	0.90		
Peak 15-min Volume, v15	343	282		v
Trucks and Buses	2	2		%
Trucks and Buses PCE, ET	3.0	3.0		
Recreational Vehicles	0	0		%
Recreational Vehicle PCE, ER	2.0	2.0		
Heavy Vehicle Adjustment, fHV	0.962	0.962		
Driver Population Adjustment, fP	1.00	1.00		
Adjusted Flow Rate, vp	1428	1172		pcph

ANALYSIS and RESULTS of MERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FM} = 1.000 Using Equation 1
Flow in Lanes 1 and 2, $v_{12} = v_F (P_{FM})$ = 1428 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
v_{FO}	2600	4500	No
v_{R12}	2600	4600	No

Level of Service Operation (if not LOS F):

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 25- pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence C

Speed in Ramp Influence Area, S_R 50.2 mph

Phone: Fax:
E-mail:

DIVERGE ANALYSIS

Location: Park Presidio at 101
Analyst: BM
Analysis Time Period: PM
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Diverge	
Freeway Data:		
Number of Lanes in Freeway	2	
Free-Flow Speed on Freeway	55.0	mph
Volume on Freeway	2768	vph
Off Ramp Data:		
Side of Freeway	Right	
Number of Lanes in Ramp	1	
Free-Flow Speed on Ramp	45.0	mph
Volume on Ramp	724	vph
Length of First Accel/Decel Lane	150	ft
Length of Second Accel/Decel Lane	500	ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	No	
Volume on Adjacent Ramp	0	vph
Position of Adjacent Ramp	Upstream	
Type of Adjacent Ramp	On	
Distance to Adjacent Ramp	1000	ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Level	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Volume, V (vph)	2768	724	0	vph
Peak-Hour Factor, PHF	0.90	0.90	0.90	
Peak 15-min Volume, v15	769	201	0	v
Trucks and Buses	2	2	0	%
Trucks and Buses PCE, ET	3.0	3.0	1.5	
Recreational Vehicles	0	0	0	%
Recreational Vehicle PCE, ER	2.0	2.0	1.2	
Heavy Vehicle Adjustment, fHV	0.962	0.962	1.000	
Driver Population Adjustment, fP	1.00	1.00	1.00	
Adjusted Flow Rate, vp	3199	837	0	pcph

ANALYSIS and RESULTS of DIVERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FD} = 1.000 Using Equation 6

Flow in Lanes 1 and 2, $v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3199 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3199	4500	No
v_{12}	3199	4400	No
$v_{FO} = v_F - v_R$	2362	4500	No
v_R	837	2100	No

Level of Service Operation (if not LOS F):

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 30+ pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence D

Speed in Ramp Influence Area, S_R 50 mph

2000

(Existing Conditions) WEEKEND

HCS: Ramps and Ramp Junctions Release 3.1c

Phone: Fax:
E-mail:

DIVERGE ANALYSIS

Location: 101 SB at Park Presidio
Analyst: BM
Analysis Time Period: Weekend
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Diverge	
Freeway Data:		
Number of Lanes in Freeway	3	
Free-Flow Speed on Freeway	60.0	mph
Volume on Freeway	4573	vph
Off Ramp Data:		
Side of Freeway	Right	
Number of Lanes in Ramp	1	
Free-Flow Speed on Ramp	45.0	mph
Volume on Ramp	1685	vph
Length of First Accel/Decel Lane	1700	ft
Length of Second Accel/Decel Lane	500	ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	No	
Volume on Adjacent Ramp	0	vph
Position of Adjacent Ramp	Upstream	
Type of Adjacent Ramp	On	
Distance to Adjacent Ramp	1000	ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Level	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Volume, V (vph)	4573	1685	0	vph
Peak-Hour Factor, PHF	0.90	0.90	0.90	
Peak 15-min Volume, v15	1270	468	0	v
Trucks and Buses	2	2	0	%
Trucks and Buses PCE, ET	3.0	3.0	1.5	
Recreational Vehicles	0	0	0	%
Recreational Vehicle PCE, ER	2.0	2.0	1.2	
Heavy Vehicle Adjustment, fHV	0.962	0.962	1.000	
Driver Population Adjustment, fP	1.00	1.00	1.00	
Adjusted Flow Rate, vp	5284	1947	0	pcph

ANALYSIS and RESULTS of DIVERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FD} = 0.538 Using Equation 7

Flow in Lanes 1 and 2, $v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3743 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5284	6900	No
v_{12}	3743	4400	No
$v_{FO} = v_F - v_R$	3337	6900	No
v_R	1947	2100	No

Level of Service Operation (if not LOS F):

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 21+ pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence C

Speed in Ramp Influence Area, S_R 51 mph

HCS: Ramps and Ramp Junctions Release 3.1c

Phone: Fax:
E-mail:

MERGE ANALYSIS

Location: 101 SB from Park Presidio
Analyst: BM
Analysis Time Period: Weekend
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Merge	
Freeway Data:		
Number of Lanes in Freeway	3	
Free-Flow Speed on Freeway	60.0	mph
Volume on Freeway	3571	vph
On Ramp Data:		
Side of Freeway	Right	
Number of Lanes in Ramp	1	
Free-Flow Speed on Ramp	45.0	mph
Volume on Ramp	683	vph
Length of First Accel/Decel Lane	0	ft
Length of Second Accel/Decel Lane		ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	Yes	
Volume on Adjacent Ramp	2745	vph
Position of Adjacent Ramp	Downstream	
Type of Adjacent Ramp	Off	
Distance to Adjacent Ramp	4000	ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Rolling	
Grade	%	%	%	
Length	mi	mi	mi	
Volume, V (vph)	3571	683	2745	vph
Peak-Hour Factor, PHF	0.90	0.90	0.90	
Peak 15-min Volume, v15	992	190	763	v
Trucks and Buses	2	2	0	%
Trucks and Buses PCE, ET	3.0	3.0	3.0	
Recreational Vehicles	0	0	0	%
Recreational Vehicle PCE, ER	2.0	2.0	2.0	
Heavy Vehicle Adjustment, fHV	0.962	0.962	1.000	
Driver Population Adjustment, fP	1.00	1.00	1.00	
Adjusted Flow Rate, vp	4126	789	3050	pcph

ANALYSIS and RESULTS of MERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FM} = 0.577 Using Equation 2
Flow in Lanes 1 and 2, $v_{12} = v_F (P_{FM})$ = 2383 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
v_{FO}	4915	6900	No
v_{R12}	3172	4600	No

Level of Service Operation (if not LOS F):

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 30- pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence D

Speed in Ramp Influence Area, S_R 52.5 mph

Phone: Fax:
E-mail:

MERGE ANALYSIS

Location: 101 NB from Park Presidio
Analyst: BM
Analysis Time Period: Weekend
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Merge	
Freeway Data:		
Number of Lanes in Freeway	4	
Free-Flow Speed on Freeway	60.0	mph
Volume on Freeway	3327	vph
On Ramp Data:		
Side of Freeway	Right	
Number of Lanes in Ramp	2	
Free-Flow Speed on Ramp	45.0	mph
Volume on Ramp	2010	vph
Length of First Accel/Decel Lane	0	ft
Length of Second Accel/Decel Lane	400	ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	No	
Volume on Adjacent Ramp		vph
Position of Adjacent Ramp		
Type of Adjacent Ramp		
Distance to Adjacent Ramp		ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Volume, V (vph)	3327	2010		vph
Peak-Hour Factor, PHF	0.90	0.90		
Peak 15-min Volume, v15	924	558		v
Trucks and Buses	2	2		%
Trucks and Buses PCE, ET	3.0	3.0		
Recreational Vehicles	0	0		%
Recreational Vehicle PCE, ER	2.0	2.0		
Heavy Vehicle Adjustment, fHV	0.962	0.962		
Driver Population Adjustment, fP	1.00	1.00		
Adjusted Flow Rate, vp	3845	2323		pcph

ANALYSIS and RESULTS of MERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FM} = 0.209 Using Equation Spec

Flow in Lanes 1 and 2, $v_{12} = v_F (P_{FM})$ = 805 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
v_{FO}	6168	9200	No
v_{R12}	3128	4600	No

Level of Service Operation (if not LOS F):

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 26+ pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence C

Speed in Ramp Influence Area, S_R 53.3 mph

HCS: Ramps and Ramp Junctions Release 3.1c

Phone: Fax:
E-mail:

DIVERGE ANALYSIS

Location: 101 NB at Park Presidio
Analyst: BM
Analysis Time Period: Weekend
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Diverge	
Freeway Data:		
Number of Lanes in Freeway	3	
Free-Flow Speed on Freeway	60.0	mph
Volume on Freeway	2534	vph
Off Ramp Data:		
Side of Freeway	Right	
Number of Lanes in Ramp	1	
Free-Flow Speed on Ramp	35.0	mph
Volume on Ramp	524	vph
Length of First Accel/Decel Lane	50	ft
Length of Second Accel/Decel Lane	500	ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	No	
Volume on Adjacent Ramp	0	vph
Position of Adjacent Ramp	Upstream	
Type of Adjacent Ramp	On	
Distance to Adjacent Ramp	1000	ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Level	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Volume, V (vph)	2534	524	0	vph
Peak-Hour Factor, PHF	0.90	0.90	0.90	
Peak 15-min Volume, v15	704	146	0	v
Trucks and Buses	2	2	0	%
Trucks and Buses PCE, ET	3.0	3.0	1.5	
Recreational Vehicles	0	0	0	%
Recreational Vehicle PCE, ER	2.0	2.0	1.2	
Heavy Vehicle Adjustment, fHV	0.962	0.962	1.000	
Driver Population Adjustment, fP	1.00	1.00	1.00	
Adjusted Flow Rate, vp	2928	606	0	pcph

ANALYSIS and RESULTS of DIVERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FD} = 0.659 Using Equation 7
Flow in Lanes 1 and 2, $v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2136 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2928	6900	No
v_{12}	2136	4400	No
$v_{FO} = v_F - v_R$	2322	6900	No
v_R	606	2000	No

Level of Service Operation (if not LOS F):

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 22+ pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence C

Speed in Ramp Influence Area, S_R 51 mph

HCS: Ramps and Ramp Junctions Release 3.1c

Phone: Fax:
E-mail:

DIVERGE ANALYSIS

Location: 101 SB at Marina/Richardson
Analyst: BM
Analysis Time Period: Weekend
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Diverge	
Freeway Data:		
Number of Lanes in Freeway	3	
Free-Flow Speed on Freeway	60.0	mph
Volume on Freeway	3572	vph
Off Ramp Data:		
Side of Freeway	Left	
Number of Lanes in Ramp	2	
Free-Flow Speed on Ramp	35.0	mph
Volume on Ramp	1078	vph
Length of First Accel/Decel Lane	0	ft
Length of Second Accel/Decel Lane	0	ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	No	
Volume on Adjacent Ramp	0	vph
Position of Adjacent Ramp	Upstream	
Type of Adjacent Ramp	On	
Distance to Adjacent Ramp	1000	ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Level	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Volume, V (vph)	3572	1078	0	vph
Peak-Hour Factor, PHF	0.90	0.90	0.90	
Peak 15-min Volume, v15	992	299	0	v
Trucks and Buses	2	2	0	%
Trucks and Buses PCE, ET	3.0	3.0	1.5	
Recreational Vehicles	0	0	0	%
Recreational Vehicle PCE, ER	2.0	2.0	1.2	
Heavy Vehicle Adjustment, fHV	0.962	0.962	1.000	
Driver Population Adjustment, fP	1.00	1.00	1.00	
Adjusted Flow Rate, vp	4128	1246	0	pcph

ANALYSIS and RESULTS of DIVERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FD} = 0.450 Using Equation Spec
Flow in Lanes 1 and 2, $v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2543 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4128	6900	No
v_{12}	2543	4400	No
$v_{FO} = v_F - v_R$	2882	6900	No
v_R	1246	3800	No

Level of Service Operation (if not LOS F):

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 27+ pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence C

Speed in Ramp Influence Area, S_R 50 mph

HCS: Ramps and Ramp Junctions Release 3.1c

Phone: Fax:
E-mail:

MERGE ANALYSIS

Location: Marina/Richardson to 101
Analyst: BM
Analysis Time Period: Weekend
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Merge	
Freeway Data:		
Number of Lanes in Freeway	3	
Free-Flow Speed on Freeway	55.0	mph
Volume on Freeway	1505	vph
On Ramp Data:		
Side of Freeway	Left	
Number of Lanes in Ramp	2	
Free-Flow Speed on Ramp	35.0	mph
Volume on Ramp	930	vph
Length of First Accel/Decel Lane	0	ft
Length of Second Accel/Decel Lane	0	ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	No	
Volume on Adjacent Ramp		vph
Position of Adjacent Ramp		
Type of Adjacent Ramp		
Distance to Adjacent Ramp		ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Volume, V (vph)	1505	930		vph
Peak-Hour Factor, PHF	0.90	0.90		
Peak 15-min Volume, v15	418	258		v
Trucks and Buses	2	2		%
Trucks and Buses PCE, ET	3.0	3.0		
Recreational Vehicles	0	0		%
Recreational Vehicle PCE, ER	2.0	2.0		
Heavy Vehicle Adjustment, fHV	0.962	0.962		
Driver Population Adjustment, fP	1.00	1.00		
Adjusted Flow Rate, vp	1739	1075		pcph

ANALYSIS and RESULTS of MERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FM} = 0.555 Using Equation Spec
Flow in Lanes 1 and 2, $v_{12} = v_F (P_{FM})$ = 965 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
v_{FO}	2814	6750	No
v_{R12}	2155	4600	No

Level of Service Operation (if not LOS F):

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 22- pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence C

Speed in Ramp Influence Area, S_R 50.4 mph

HCS: Ramps and Ramp Junctions Release 3.1c

Phone: Fax:
E-mail:

MERGE ANALYSIS

Location: Park Presidio SB from 101
Analyst: BM
Analysis Time Period: Weekend
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Merge	
Freeway Data:		
Number of Lanes in Freeway	2	
Free-Flow Speed on Freeway	55.0	mph
Volume on Freeway	2209	vph
On Ramp Data:		
Side of Freeway	Right	
Number of Lanes in Ramp	1	
Free-Flow Speed on Ramp	30.0	mph
Volume on Ramp	524	vph
Length of First Accel/Decel Lane	500	ft
Length of Second Accel/Decel Lane		ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	No	
Volume on Adjacent Ramp		vph
Position of Adjacent Ramp		
Type of Adjacent Ramp		
Distance to Adjacent Ramp		ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Volume, V (vph)	2209	524		vph
Peak-Hour Factor, PHF	0.90	0.90		
Peak 15-min Volume, v15	614	146		v
Trucks and Buses	2	2		%
Trucks and Buses PCE, ET	3.0	3.0		
Recreational Vehicles	0	0		%
Recreational Vehicle PCE, ER	2.0	2.0		
Heavy Vehicle Adjustment, fHV	0.962	0.962		
Driver Population Adjustment, fP	1.00	1.00		
Adjusted Flow Rate, vp	2553	606		pcph

ANALYSIS and RESULTS of MERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FM} = 1.000 Using Equation 1
Flow in Lanes 1 and 2, $v_{12} = v_F (P_{FM})$ = 2553 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
v_{FO}	3159	4500	No
v_{R12}	3159	4600	No

Level of Service Operation (if not LOS F):

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 27- pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence C

Speed in Ramp Influence Area, S_R 50.0 mph

Phone: Fax:
E-mail:

DIVERGE ANALYSIS

Location: Park Presidio at 101
Analyst: BM
Analysis Time Period: Weekend
Date Performed: 12/5/2001

FREEWAY-RAMP COMPONENTS AND CHARACTERISTICS

Type of Analysis	Diverge	
Freeway Data:		
Number of Lanes in Freeway	2	
Free-Flow Speed on Freeway	55.0	mph
Volume on Freeway	2000	vph
Off Ramp Data:		
Side of Freeway	Right	
Number of Lanes in Ramp	1	
Free-Flow Speed on Ramp	45.0	mph
Volume on Ramp	683	vph
Length of First Accel/Decel Lane	150	ft
Length of Second Accel/Decel Lane	500	ft
Adjacent Ramp Data if one exists:		
Does adjacent ramp exist?	No	
Volume on Adjacent Ramp	0	vph
Position of Adjacent Ramp	Upstream	
Type of Adjacent Ramp	On	
Distance to Adjacent Ramp	1000	ft

VOLUME ADJUSTMENT

Junction Components	Freeway	Ramp	Adjacent Ramp	
Terrain Type	Rolling	Rolling	Level	
Grade	0.00 %	0.00 %	0.00 %	
Length	0.00 mi	0.00 mi	0.00 mi	
Volume, V (vph)	2000	683	0	vph
Peak-Hour Factor, PHF	0.90	0.90	0.90	
Peak 15-min Volume, v15	556	190	0	v
Trucks and Buses	2	2	0	%
Trucks and Buses PCE, ET	3.0	3.0	1.5	
Recreational Vehicles	0	0	0	%
Recreational Vehicle PCE, ER	2.0	2.0	1.2	
Heavy Vehicle Adjustment, fHV	0.962	0.962	1.000	
Driver Population Adjustment, fP	1.00	1.00	1.00	
Adjusted Flow Rate, vp	2311	789	0	pcph

ANALYSIS and RESULTS of DIVERGE AREAS

Estimation of Flow entering Lanes 1 and 2:
Proportion of Freeway Vehicles
in Lanes 1 and 2, P_{FD} = 1.000 Using Equation 6
Flow in Lanes 1 and 2, $v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2311 pcph

Capacity Checks:

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2311	4500	No
v_{12}	2311	4400	No
$v_{FO} = v_F - v_R$	1522	4500	No
v_R	789	2100	No

Level of Service Operation (if not LOS F):

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 23- pc/mi/ln

Level of Service for Ramp-Freeway Junction Areas of Influence C

Speed in Ramp Influence Area, S_R 50 mph

2030 ALTERNATIVE 1

(No Build) AM

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/27/2004
Analysis time period: No Build-AM
Freeway/dir or travel: Park Presidio SB from 101
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	2258	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	383	vph
Length of first accel/decel lane	50	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2258	383		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	627	106		v
Trucks and buses	2	0		%
Recreational vehicles	0	0		%
Terrain type:	Rolling	Rolling	Level	
Grade	%	%	%	

Length	mi	mi	mi
Trucks and buses PCE, ET	3.0	3.0	
Recreational vehicle PCE, ER	2.0	2.0	
Heavy vehicle adjustment, fHV	0.962	1.000	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2609	426	pcp

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2609 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	3035	4500	No
v_{R12}	3035	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 28.6 pc/mi

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable, M_S = 0.399

Space mean speed in ramp influence area, S_R = 49.8 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 49.8 mph

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	7/27/2004
Analysis time period:	No Build-AM
Freeway/dir or travel:	Marina/Richardson to 101
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	806	vph

On Ramp Data

Side of freeway	Left	
Number of lanes in ramp	2	
Free-flow speed on ramp	35.0	mph
Volume on ramp	2141	vph
Length of first accel/decel lane	50	ft
Length of second accel/decel lane	0	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	806	2141		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	224	595		v
Trucks and buses	2	0		%
Recreational vehicles	0	0		%
Terrain type:	Rolling	Rolling	Level	
Grade	%	%	%	

Length	mi	mi	mi
Trucks and buses PCE, ET	3.0	1.5	
Recreational vehicle PCE, ER	2.0	2.0	
Heavy vehicle adjustment, fHV	0.962	1.000	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	931	2379	pcp

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 0.555 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 517 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	3310	6900	No
v_{R12}	2958	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 26.8 pc/mi

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable, M_S = 0.389

Space mean speed in ramp influence area, S_R = 53.0 mph

Space mean speed in outer lanes, S_0 = 60.0 mph

Space mean speed for all vehicles, S = 53.7 mph

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	7/27/2004
Analysis time period:	No Build-AM
Freeway/dir or travel:	101 SB to Marina/Richardson
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4981	vph

Off Ramp Data

Side of freeway	Left	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	3325	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	0	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	4981		3325			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1384		924			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Rolling		Rolling		Level	
Grade	0.00	%	0.00	%		%

Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	3.0	3.0		
Recreational vehicle PCE, ER	2.0	2.0		
Heavy vehicle adjustment, fHV	0.962	1.000		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	5756	3694		pcp

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 0.450 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 4622 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5756	6900	No
v_{12}	4622	4400	Yes
$v_{FO} = v_F - v_R$	2062	6900	No
v_R	3694	3800	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 46.0 pc/mi/

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable, D_S = 0.760

Space mean speed in ramp influence area, S_R = 46 mph

Space mean speed in outer lanes, S_0 = 65.8 mph

Space mean speed for all vehicles, S = 48.6 mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	No Build-AM
Freeway/dir or travel:	101 NB at Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2947	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	383	vph
Length of first accel/decel lane	50	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2947	383		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	819	106		v
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Composite	Composite	Level	
Grade	4.57 %	3.30 %	%	

Length	0.22	mi	0.20	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	2.5		1.2			
Heavy vehicle adjustment, fHV	1.000		1.000			
Driver population factor, fP	1.00		1.00			
Flow rate, vp	3274		426			pcp

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 0.659 Using Equation 5

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2302 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3274	6900	No
v_{12}	2302	4400	No
$v_{FO} = v_F - v_R$	2848	6900	No
v_R	426	2000	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 23.6 pc/mi/

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable, D_S = 0.466

Space mean speed in ramp influence area, S_R = 52 mph

Space mean speed in outer lanes, S_0 = 65.8 mph

Space mean speed for all vehicles, S = 55.1 mph

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	7/27/2004
Analysis time period:	No Build-AM
Freeway/dir or travel:	101 NB from Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2564	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-flow speed on ramp	45.0	mph
Volume on ramp	2455	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	400	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2564		2455			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	712		682			v
Trucks and buses	0		0			%
Recreational vehicles	0		0			%
Terrain type:	Grade		Grade		Level	
Grade	2.80	%	4.90	%		%

Length	0.30	mi	0.30	mi	mi
Trucks and buses PCE, ET	1.5		1.5		
Recreational vehicle PCE, ER	1.2		1.2		
Heavy vehicle adjustment, fHV	1.000		1.000		
Driver population factor, fP	1.00		1.00		
Flow rate, vp	2849		2728		pcp

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2849 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	5577	4600	Yes
v_{R12}	5577	4600	Yes

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 45.2 pc/mi

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable, M_S = 1.316

Space mean speed in ramp influence area, S_R = 36.3 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 36.3 mph

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/27/2004
Analysis time period: No Build-AM
Freeway/dir or travel: 101 SB from Park Presidio
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4345	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	637	vph
Length of first accel/decel lane	100	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	4345		637			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1207		177			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Grade		Grade		Level	
Grade	-4.70	%	-4.57	%		%

Length	0.22	mi	0.22	mi	mi
Trucks and buses PCE, ET	1.5		1.5		
Recreational vehicle PCE, ER	1.2		1.2		
Heavy vehicle adjustment, fHV	0.990		1.000		
Driver population factor, fP	1.00		1.00		
Flow rate, vp	4876		708		pcp

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 0.580 Using Equation 1

$v_{12} = v_F (P_{FM})$ = 2830 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	5584	6900	No
v_{R12}	3538	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 32.1 pc/mi

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable, M_S = 0.446

Space mean speed in ramp influence area, S_R = 52.0 mph

Space mean speed in outer lanes, S_0 = 54.4 mph

Space mean speed for all vehicles, S = 52.8 mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: ER
Agency/Co.:
Date performed: 7/27/2004
Analysis time period: No Build-AM
Freeway/dir or travel: 101 SB at Park Presidio
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	6441	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	2258	vph
Length of first accel/decel lane	1700	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	6441	2258		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	1789	627		v
Trucks and buses	2	0		%
Recreational vehicles	0	0		%
Terrain type:	Rolling	Rolling	Level	
Grade	0.00 %	6.00 %	%	

Length	0.30 mi	0.33 mi	mi
Trucks and buses PCE, ET	3.0	3.0	
Recreational vehicle PCE, ER	2.0	2.0	
Heavy vehicle adjustment, fHV	0.962	1.000	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	7443	2509	pcp

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 0.436 Using Equation 8

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 4660 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	7443	9200	No
v_{12}	4660	4400	Yes
$v_{FO} = v_F - v_R$	4934	9200	Yes
v_R	2509	2100	Yes

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 29.0 pc/mi/

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	D_S	= 0.524	
Space mean speed in ramp influence area,	S_R	= 51	mph
Space mean speed in outer lanes,	S_0	= 64.3	mph
Space mean speed for all vehicles,	S	= 55.0	mph

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/27/2004
Analysis time period: No Build-AM
Freeway/dir or travel: Park Presidio at 101
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	3082	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	637	vph
Length of first accel/decel lane	150	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3082		637			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	856		177			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Rolling		Rolling		Level	
Grade	0.00	%	0.00	%		%

```
     Length                                0.00    mi  0.00    mi          mi
Trucks and buses PCE, ET                   3.0         3.0
Recreational vehicle PCE, ER               2.0         2.0
Heavy vehicle adjustment, fHV              0.962       1.000
Driver population factor, fP               1.00        1.00
Flow rate, vp                              3561        708                  pcp

                         Estimation of V12 Diverge Areas

                  L  =    0.00    (Equation 25-8 or 25-9)
                   EQ
                  P  =    1.000   Using Equation  0
                   FD
                  v  = v  + (v - v ) P  =  3561   pc/h
                   12   R     F   R   FD

                               Capacity Checks

                           Actual        Maximum         LOS F?
     v  = v                3561          4500            No
      Fi   F
     v                     3561          4400            No
      12
     v  = v - v            2853          4500            No
      FO   F   R
     v                     708           2100            No
      R

                 Level of Service Determination (if not F)

Density,               D = 4.252 + 0.0086 v  - 0.009  L   =   33.5    pc/mi/
                        R                   12         D
Level of service for ramp-freeway junction areas of influence D

                             Speed Estimation

Intermediate speed variable,                 D  = 0.362
                                              S
Space mean speed in ramp influence area,     S  = 50      mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 50.3    mph
```

2030 ALTERNATIVE 1

(No Build) PM

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/27/2004
Analysis time period: No Build-PM
Freeway/dir or travel: Park Presidio SB from 101
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	2145	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	790	vph
Length of first accel/decel lane	50	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2145	790		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	596	219		v
Trucks and buses	2	0		%
Recreational vehicles	0	0		%
Terrain type:	Rolling	Rolling	Level	
Grade	%	%	%	

Length	mi	mi	mi
Trucks and buses PCE, ET	3.0	3.0	
Recreational vehicle PCE, ER	2.0	2.0	
Heavy vehicle adjustment, fHV	0.962	1.000	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2479	878	pcp

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2479 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	3357	4500	No
v_{R12}	3357	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 30.9 pc/mi

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable, M_S = 0.429

Space mean speed in ramp influence area, S_R = 49.4 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 49.4 mph

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst: ER
Agency/Co.:
Date performed: 7/27/2004
Analysis time period: No Build-PM
Freeway/dir or travel: Marina/Richardson to 101
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	1875	vph

On Ramp Data

Side of freeway	Left	
Number of lanes in ramp	2	
Free-flow speed on ramp	35.0	mph
Volume on ramp	2931	vph
Length of first accel/decel lane	50	ft
Length of second accel/decel lane	0	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1875	2931		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	521	814		v
Trucks and buses	2	0		%
Recreational vehicles	0	0		%
Terrain type:	Rolling	Rolling	Level	
Grade	%	%	%	

Length		mi	mi	mi
Trucks and buses PCE, ET	3.0	1.5		
Recreational vehicle PCE, ER	2.0	2.0		
Heavy vehicle adjustment, fHV	0.962	1.000		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	2167	3257		pcp

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 0.555 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1203 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	5424	6900	No
v_{R12}	4604	4600	Yes

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 39.3 pc/mi

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable, M_S = 0.704

Space mean speed in ramp influence area, S_R = 47.3 mph

Space mean speed in outer lanes, S_0 = 58.8 mph

Space mean speed for all vehicles, S = 48.8 mph

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/27/2004
Analysis time period: No Build-PM
Freeway/dir or travel: 101 SB at Marina/Richardson
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3590	vph

Off Ramp Data

Side of freeway	Left	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	2543	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	0	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3590	2543		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	997	706		v
Trucks and buses	2	0		%
Recreational vehicles	0	0		%
Terrain type:	Rolling	Rolling	Level	
Grade	0.00 %	0.00 %		%

Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	3.0		3.0			
Recreational vehicle PCE, ER	2.0		2.0			
Heavy vehicle adjustment, fHV	0.962		1.000			
Driver population factor, fP	1.00		1.00			
Flow rate, vp	4148		2826			pcp

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 0.450 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3421 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4148	6900	No
v_{12}	3421	4400	No
$v_{FO} = v_F - v_R$	1322	6900	No
v_R	2826	3800	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 35.1 pc/mi/

Level of service for ramp-freeway junction areas of influence E

Speed Estimation

Intermediate speed variable, D_S = 0.682

Space mean speed in ramp influence area, S_R = 48 mph

Space mean speed in outer lanes, S_0 = 65.8 mph

Space mean speed for all vehicles, S = 49.5 mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	No Build-PM
Freeway/dir or travel:	101 NB at Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	4806	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	790	vph
Length of first accel/decel lane	50	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4806	790		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	1335	219		v
Trucks and buses	2	0		%
Recreational vehicles	0	0		%
Terrain type:	Grade	Grade	Level	
Grade	4.57 %	3.56 %	%	

```
     Length                                    0.22    mi  0.20    mi           mi
Trucks and buses PCE, ET                       1.5         1.5
Recreational vehicle PCE, ER                   1.2         1.2
Heavy vehicle adjustment, fHV                  0.990       1.000
Driver population factor, fP                   1.00        1.00
Flow rate, vp                                  5393        878                   pcp

                         Estimation of V12 Diverge Areas

                  L  =    0.00    (Equation 25-8 or 25-9)
                   EQ
                  P  =    0.585   Using Equation  5
                   FD
                  v  = v  + (v - v ) P  =  3518   pc/h
                   12   R     F   R   FD

                               Capacity Checks

                           Actual         Maximum         LOS F?
     v  = v                5393           7050            No
      Fi   F
     v                     3518           4400            No
      12
     v  = v - v            4515           7050            No
      FO   F   R
     v                     878            2000            No
      R

                 Level of Service Determination (if not F)

Density,                D = 4.252 + 0.0086 v  - 0.009  L   =   34.1    pc/mi/
                         R                   12          D
Level of service for ramp-freeway junction areas of influence D

                             Speed Estimation

Intermediate speed variable,                 D  = 0.507
                                              S
Space mean speed in ramp influence area,     S  = 53      mph
                                              R
Space mean speed in outer lanes,             S  = 67.9    mph
                                              0
Space mean speed for all vehicles,           S  = 57.6    mph
```

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	No Build-PM
Freeway/dir or travel:	101 NB from Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4016	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-flow speed on ramp	45.0	mph
Volume on ramp	2203	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	400	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	4016		2203			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1116		612			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Grade		Grade		Level	
Grade	2.80	%	4.90	%		%

Length	0.30	mi	0.30	mi	mi
Trucks and buses PCE, ET	1.5		1.5		
Recreational vehicle PCE, ER	1.2		1.2		
Heavy vehicle adjustment, fHV	0.990		1.000		
Driver population factor, fP	1.00		1.00		
Flow rate, vp	4507		2448		pcp

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 0.209 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 942 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	6955	9200	No
v_{R12}	3390	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 28.3 pc/mi

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable, M_S = 0.401

Space mean speed in ramp influence area, S_R = 52.8 mph

Space mean speed in outer lanes, S_0 = 55.4 mph

Space mean speed for all vehicles, S = 54.1 mph

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	7/27/2004
Analysis time period:	No Build-PM
Freeway/dir or travel:	101 SB from Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2929	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	661	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2929		661			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	814		184			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Grade		Grade		Level	
Grade	-4.70	%	-4.57	%		%

Length	0.22	mi	0.22	mi	mi
Trucks and buses PCE, ET	1.5		1.5		
Recreational vehicle PCE, ER	1.2		1.2		
Heavy vehicle adjustment, fHV	0.990		1.000		
Driver population factor, fP	1.00		1.00		
Flow rate, vp	3287		734		pcp

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 0.577 Using Equation 1

$v_{12} = v_F (P_{FM})$ = 1898 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	4021	6900	No
v_{R12}	2632	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ = 25.7 pc/mi

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable, M_S = 0.375

Space mean speed in ramp influence area, S_R = 53.2 mph

Space mean speed in outer lanes, S_0 = 56.8 mph

Space mean speed for all vehicles, S = 54.4 mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/27/2004
Analysis time period: No Build-PM
Freeway/dir or travel: 101 SB at Park Presidio
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	5074	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	2145	vph
Length of first accel/decel lane	1700	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	5074		2145			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1409		596			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Grade		Grade		Level	
Grade	0.00	%	6.00	%		%

Length	0.30 mi	0.33 mi	mi
Trucks and buses PCE, ET	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	
Heavy vehicle adjustment, fHV	0.990	1.000	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	5694	2383	pcp

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 0.508 Using Equation 5

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 4065 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5694	6900	No
v_{12}	4065	4400	No
$v_{FO} = v_F - v_R$	3311	6900	Yes
v_R	2383	2100	Yes

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 23.9 pc/mi/

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable, D_S = 0.512

Space mean speed in ramp influence area, S_R = 51 mph

Space mean speed in outer lanes, S_0 = 63.4 mph

Space mean speed for all vehicles, S = 53.8 mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/27/2004
Analysis time period: No Build-PM
Freeway/dir or travel: Park Presidio at 101
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	2864	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	661	vph
Length of first accel/decel lane	150	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2864		661			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	796		184			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Rolling		Rolling		Level	
Grade	0.00	%	0.00	%		%

Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	3.0	3.0		
Recreational vehicle PCE, ER	2.0	2.0		
Heavy vehicle adjustment, fHV	0.962	1.000		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	3310	734		pcp

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3310 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3310	4500	No
v_{12}	3310	4400	No
$v_{FO} = v_F - v_R$	2576	4500	No
v_R	734	2100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 31.4 pc/mi/

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable,	D_S = 0.364		
Space mean speed in ramp influence area,	S_R = 50	mph	
Space mean speed in outer lanes,	S_0 = N/A	mph	
Space mean speed for all vehicles,	S = 50.3	mph	

2030 ALTERNATIVE 1

(No Build) WEEKEND

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/27/2004
Analysis time period: Weekend-No Build
Freeway/dir or travel: Park Presidio SB from 101
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	2054	vph

On Ramp Data

Side of freeway	Left	
Number of lanes in ramp	1	
Free-flow speed on ramp	30.0	mph
Volume on ramp	110	vph
Length of first accel/decel lane	50	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2054	110		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	571	31		v
Trucks and buses	2	0		%
Recreational vehicles	0	0		%
Terrain type:	Rolling	Rolling	Level	
Grade	%	%	%	

```
     Length                                          mi           mi           mi
Trucks and buses PCE, ET                     3.0          3.0
Recreational vehicle PCE, ER                 2.0          2.0
Heavy vehicle adjustment, fHV                0.962        1.000
Driver population factor, fP                 1.00         1.00
Flow rate, vp                                2374         122                    pcp

                         Estimation of V12 Merge Areas

                  L   =    0.00    (Equation 25-2 or 25-3)
                   EQ
                  P   =    1.000   Using Equation  0
                   FM
                  v   = v  (P  ) =  2374   pc/h
                   12   F   FM

                               Capacity Checks

                           Actual        Maximum         LOS F?
     v                     2496          4500            No
      FO
     v                     2780          4600            No
      R12

                 Level of Service Determination (if not F)

Density, D = 5.475 + 0.00734 v  + 0.0078 v   - 0.00627 L   =   24.6    pc/mi
          R                   R            12            A
Level of service for ramp-freeway junction areas of influence  C

                             Speed Estimation

Intermediate speed variable,                 M  = 0.381
                                              S
Space mean speed in ramp influence area,     S  = 50.0    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 50.0    mph
```

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	Weekend-No Build
Freeway/dir or travel:	Marina/Richardson to 101
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	1142	vph

On Ramp Data

Side of freeway	Left	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	2407	vph
Length of first accel/decel lane	50	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1142	2407		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	317	669		v
Trucks and buses	2	0		%
Recreational vehicles	0	0		%
Terrain type:	Rolling	Rolling	Level	
Grade	%	%	%	

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Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	Weekend-No Build
Freeway/dir or travel:	101 SB at Marina/Richardson
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3493	vph

Off Ramp Data

Side of freeway	Left	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	2532	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	0	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3493		2532			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	970		703			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Rolling		Rolling		Level	
Grade	0.00	%	0.00	%		%

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/27/2004
Analysis time period: No Build-Weekend
Freeway/dir or travel: 101 NB at Park Presidio
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	3550	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	110	vph
Length of first accel/decel lane	50	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3550		110			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	986		31			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Rolling		Rolling		Level	
Grade	4.57	%	3.56	%		%

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	WEEKEND
Freeway/dir or travel:	101 NB from Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3439	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-flow speed on ramp	45.0	mph
Volume on ramp	2194	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	400	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3439		2194			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	955		609			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Grade		Grade		Level	
Grade	2.80	%	4.90	%		%

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Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	7/27/2004
Analysis time period:	No Build-Weekend
Freeway/dir or travel:	101 SB from Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3376	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	45.0	mph
Volume on ramp	117	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3376		117			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	938		33			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Grade		Grade		Level	
Grade	-4.70	%	-4.57	%		%

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/27/2004
Analysis time period: No Build-Weekend
Freeway/dir or travel: 101 SB at Park Presidio
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	5430	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	2054	vph
Length of first accel/decel lane	1700	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	5430		2054			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1508		571			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Grade		Grade		Level	
Grade	0.00	%	6.00	%		%

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	Weekend-No Build
Freeway/dir or travel:	Park Presidio at 101
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	1955	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	117	vph
Length of first accel/decel lane	150	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1955		117			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	543		33			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Rolling		Rolling		Level	
Grade	0.00	%	0.00	%		%

2030 ALTERNATIVE 2

(Replace and Widen) AM

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst: ER
Agency/Co.:
Date performed: 12/5/2001
Analysis time period: AM
Freeway/dir or travel: Park Presidio SB from 101
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2099	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	30.0	mph
Volume on ramp	386	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2099	386		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	583	107		v
Trucks and buses	2	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level	Level	
Grade	%	%	%	

Length	mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	
Heavy vehicle adjustment, fHV	0.990	1.000	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2356	429	pcp

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2356 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2785	4600	No
v_{R12}	2785	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 23.9 pc/mi

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable, M_S = 0.354

Space mean speed in ramp influence area, S_R = 53.6 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 53.6 mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/27/2004
Analysis time period: AM
Freeway/dir or travel: Doyle Dr/Richardson to 101
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	770	vph

On Ramp Data

Side of freeway	Left	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	2208	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	770		2208			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	214		613			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade		%		%		%

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	AM
Freeway/dir or travel:	101 SB at Doyle Dr/Richardson
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4996	vph

Off Ramp Data

Side of freeway	Left	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	3320	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	0	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	4996		3320			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1388		922			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

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Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	AM
Freeway/dir or travel:	101 NB at Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2979	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	30.0	mph
Volume on ramp	386	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2979		386			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	828		107			v
Trucks and buses	0		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/27/2004
Analysis time period: AM
Freeway/dir or travel: 101 NB from Park Presidio
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2593	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-flow speed on ramp	40.0	mph
Volume on ramp	2420	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	400	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2593		2420			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	720		672			v
Trucks and buses	0		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade		%		%		%

Phone: Fax:
E-mail:

Merge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/27/2004
Analysis time period: AM
Freeway/dir or travel: 101 SB from Park Presidio
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	4314	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	40.0	mph
Volume on ramp	681	vph
Length of first accel/decel lane	200	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	4314		681			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1198		189			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade		%		%		%

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/27/2004
Analysis time period: AM
Freeway/dir or travel: 101 SB at Park Presidio
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	6414	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	40.0	mph
Volume on ramp	2099	vph
Length of first accel/decel lane	1700	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	6414		2099			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1782		583			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/27/2004
Analysis time period: AM
Freeway/dir or travel: Park Presidio at 101
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	3101	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	681	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3101		681			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	861		189			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

2030 ALTERNATIVE 2
(Replace and Widen) PM

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/204
Analysis time period:	PM
Freeway/dir or travel:	Park Presidio SB from 101
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2258	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	30.0	mph
Volume on ramp	726	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2258		726			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	627		202			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade		%		%		%

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	27/7/2004
Analysis time period:	PM
Freeway/dir or travel:	Doyle Dr/Richardson to 101
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	1787	vph

On Ramp Data

Side of freeway	Left	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	3008	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1787		3008			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	496		836			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade		%		%		%

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	PM
Freeway/dir or travel:	101 SB at Doyle Dr/Richardson
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3838	vph

Off Ramp Data

Side of freeway	Left	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	2660	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	0	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3838		2660			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1066		739			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/27/2004
Analysis time period: PM
Freeway/dir or travel: 101 NB at Park Presidio
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	4795	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	30.0	mph
Volume on ramp	726	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	4795		726			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1332		202			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/27/2004
Analysis time period: PM
Freeway/dir or travel: 101 NB from Park Presidio
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4068	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-flow speed on ramp	40.0	mph
Volume on ramp	2194	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	400	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4068	2194		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	1130	609		v
Trucks and buses	2	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level	Level	
Grade	%	%	%	

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	PM
Freeway/dir or travel:	101 SB from Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3180	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	40.0	mph
Volume on ramp	658	vph
Length of first accel/decel lane	200	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3180		658			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	883		183			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade		%		%		%

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/27/2004
Analysis time period: PM
Freeway/dir or travel: 101 SB at Park Presidio
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	5437	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	40.0	mph
Volume on ramp	2258	vph
Length of first accel/decel lane	1700	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	5437		2258			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1510		627			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			
Heavy vehicle adjustment, fHV	0.990		1.000			
Driver population factor, fP	1.00		1.00			
Flow rate, vp	6102		2509			pcp

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 0.492 Using Equation 5

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 4277 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	6102	7050	No
v_{12}	4277	4400	No
$v_{FO} = v_F - v_R$	3593	7050	Yes
v_R	2509	2100	Yes

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 25.7 pc/mi/

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	D_S = 0.589	
Space mean speed in ramp influence area,	S_R = 51	mph
Space mean speed in outer lanes,	S_0 = 68.1	mph
Space mean speed for all vehicles,	S = 55.5	mph

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/27/2004
Analysis time period: PM
Freeway/dir or travel: Park Presidio at 101
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	2853	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	658	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2853		658			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	793		183			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

2030 ALTERNATIVE 2

(Replace and Widen) WEEKEND

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	Weekend
Freeway/dir or travel:	Park Presidio SB from 101
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2070	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	30.0	mph
Volume on ramp	112	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2070		112			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	575		31			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade		%		%		%

```
     Length                                       mi           mi           mi
Trucks and buses PCE, ET               1.5          1.5
Recreational vehicle PCE, ER           1.2          1.2
Heavy vehicle adjustment, fHV          0.990        1.000
Driver population factor, fP           1.00         1.00
Flow rate, vp                          2323         124                      pcp
```

Estimation of V12 Merge Areas

```
                  L   =    0.00    (Equation 25-2 or 25-3)
                   EQ
                  P   =    1.000   Using Equation  0
                   FM
                  v   = v  (P  ) =  2323   pc/h
                   12   F   FM
```

Capacity Checks

```
                           Actual        Maximum         LOS F?
     v                     2447          4600            No
      FO
     v                     2447          4600            No
      R12
```

Level of Service Determination (if not F)

```
Density, D = 5.475 + 0.00734 v  + 0.0078 v   - 0.00627 L   =   21.4    pc/mi
          R                   R            12           A
Level of service for ramp-freeway junction areas of influence  C
```

Speed Estimation

```
Intermediate speed variable,                 M  = 0.336
                                              S
Space mean speed in ramp influence area,     S  = 54.0    mph
                                              R
Space mean speed in outer lanes,             S  =  N/A    mph
                                              0
Space mean speed for all vehicles,           S  = 54.0    mph
```

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	Weekend
Freeway/dir or travel:	Doyle Dr/Richardson to 101
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	1078	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	2455	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1078		2455			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	299		682			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade		%		%		%

Length	mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	
Heavy vehicle adjustment, fHV	0.990	1.000	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	1210	2728	pcp

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 0.577 Using Equation 1

$v_{12} = v_F (P_{FM})$ = 699 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	3938	6750	No
v_{R12}	3427	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 31.0 pc/mi

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable, M_S = 0.441

Space mean speed in ramp influence area, S_R = 49.3 mph

Space mean speed in outer lanes, S_0 = 55.0 mph

Space mean speed for all vehicles, S = 49.9 mph

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	Weekend
Freeway/dir or travel:	101 SB at Doyle Dr/Richardson
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3501	vph

Off Ramp Data

Side of freeway	Left	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	2516	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	0	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3501		2516			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	973		699			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	Weekend
Freeway/dir or travel:	101 NB at Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3533	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	30.0	mph
Volume on ramp	112	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3533		112			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	981		31			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

Phone: Fax:
E-mail:

Merge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/27/2004
Analysis time period: Weekend
Freeway/dir or travel: 101 NB from Park Presidio
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3327	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-flow speed on ramp	40.0	mph
Volume on ramp	2010	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	400	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3327	2010		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	924	558		v
Trucks and buses	2	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level	Level	
Grade	%	%	%	

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/27/2004
Analysis time period: Weekend
Freeway/dir or travel: 101 SB from Park Presidio
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3376	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	40.0	mph
Volume on ramp	125	vph
Length of first accel/decel lane	200	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3376		125			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	938		35			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade		%		%		%

Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	0.990	1.000		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	3789	139		pcp

Estimation of V12 Merge Areas

$L_{EQ} =$ 0.00 (Equation 25-2 or 25-3)

$P_{FM} =$ 0.583 Using Equation 1

$v_{12} = v_F (P_{FM}) =$ 2209 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	3928	6900	No
v_{R12}	2348	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A =$ 22.5 pc/mi

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable, $M_S = 0.346$

Space mean speed in ramp influence area, $S_R = 53.8$ mph

Space mean speed in outer lanes, $S_0 = 56.1$ mph

Space mean speed for all vehicles, $S = 54.7$ mph

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/27/2004
Analysis time period: Weekend
Freeway/dir or travel: 101 SB at Park Presidio
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	5446	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	40.0	mph
Volume on ramp	2070	vph
Length of first accel/decel lane	1700	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	5446		2070			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1513		575			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	Weekend
Freeway/dir or travel:	Park Presidio at 101
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	1975	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	125	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1975		125			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	549		35			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

2030 ALTERNATIVE 5

(Parkway: Diamond Option) AM

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	AM
Freeway/dir or travel:	101 SB at Doyle Dr/Richardson
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4951	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	1898	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	200	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	4951		1898			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1375		527			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

Length	0.00	mi	0.00	mi	mi
Trucks and buses PCE, ET	1.5		1.5		
Recreational vehicle PCE, ER	1.2		1.2		
Heavy vehicle adjustment, fHV	0.990		1.000		
Driver population factor, fP	1.00		1.00		
Flow rate, vp	5556		2109		pcp

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 0.260 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3005 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5556	9200	No
v_{12}	3005	4400	No
$v_{FO} = v_F - v_R$	3447	9200	No
v_R	2109	3800	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 28.3 pc/mi/

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable, D_S = 0.618

Space mean speed in ramp influence area, S_R = 49 mph

Space mean speed in outer lanes, S_0 = 64.7 mph

Space mean speed for all vehicles, S = 55.1 mph

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	AM
Freeway/dir or travel:	Park Presidio at 101
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	3071	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	623	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3071		623			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	853		173			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/28/2004
Analysis time period: AM
Freeway/dir or travel: Park Presidio SB from 101
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2222	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	30.0	mph
Volume on ramp	354	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2222	354		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	617	98		v
Trucks and buses	2	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level	Level	
Grade	%	%	%	

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	AM
Freeway/dir or travel:	101 NB at Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2994	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	30.0	mph
Volume on ramp	354	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2994		354			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	832		98			v
Trucks and buses	0		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	AM
Freeway/dir or travel:	101 NB from Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2641	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-flow speed on ramp	40.0	mph
Volume on ramp	2451	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	400	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2641	2451		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	734	681		v
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level	Level	
Grade	%	%	%	

```
     Length                                             mi           mi           mi
Trucks and buses PCE, ET                       1.5          1.5
Recreational vehicle PCE, ER                   1.2          1.2
Heavy vehicle adjustment, fHV                  1.000        1.000
Driver population factor, fP                   1.00         1.00
Flow rate, vp                                  2934         2723                    pcp

                         Estimation of V12 Merge Areas

                  L   =    0.00    (Equation 25-2 or 25-3)
                   EQ
                  P   =    0.209   Using Equation  0
                   FM
                  v   = v  (P  ) =  613    pc/h
                   12   F   FM

                               Capacity Checks

                           Actual         Maximum         LOS F?
     v                     5657           9200            No
      FO
     v                     3336           4600            No
      R12

                 Level of Service Determination (if not F)

Density, D = 5.475 + 0.00734 v  + 0.0078 v   - 0.00627 L   =   27.7    pc/mi
          R                    R            12            A
Level of service for ramp-freeway junction areas of influence  C

                             Speed Estimation

Intermediate speed variable,                 M  = 0.399
                                              S
Space mean speed in ramp influence area,     S  = 52.8    mph
                                              R
Space mean speed in outer lanes,             S  = 57.6    mph
                                              0
Space mean speed for all vehicles,           S  = 54.7    mph
```

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	AM
Freeway/dir or travel:	101 SB from Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	4328	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	40.0	mph
Volume on ramp	623	vph
Length of first accel/decel lane	200	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	4328		623			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1202		173			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade		%		%		%

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/28/2004
Analysis time period: AM
Freeway/dir or travel: 101 SB at Park Presidio
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	4	
Free-flow speed on freeway	65.0	mph
Volume on freeway	6550	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	40.0	mph
Volume on ramp	2222	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	500	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	6550		2222			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1819		617			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

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Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	AM
Freeway/dir or travel:	101 NB exit diverge to Girard
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2817	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	74	vph
Length of first accel/decel lane	200	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2817		74			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	783		21			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

2030 ALTERNATIVE 5

(Parkway: Diamond Option) PM

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/28/2004
Analysis time period: PM
Freeway/dir or travel: 101 SB at Doyle Dr/Richardson
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3785	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	1388	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	200	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3785		1388			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1051		386			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	PM
Freeway/dir or travel:	Park Presidio at 101
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	2792	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	596	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2792		596			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	776		166			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/204
Analysis time period:	PM
Freeway/dir or travel:	Park Presidio SB from 101
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2423	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	30.0	mph
Volume on ramp	671	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2423		671			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	673		186			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade		%		%		%

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/28/2004
Analysis time period: PM
Freeway/dir or travel: 101 NB at Park Presidio
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	4924	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	30.0	mph
Volume on ramp	671	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	4924		671			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1368		186			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

Phone: Fax:
E-mail:

Merge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/28/2004
Analysis time period: PM
Freeway/dir or travel: 101 NB from Park Presidio
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4252	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-flow speed on ramp	40.0	mph
Volume on ramp	2196	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	400	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	4252		2196			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1181		610			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade		%		%		%

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	PM
Freeway/dir or travel:	101 SB from Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3194	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	40.0	mph
Volume on ramp	596	vph
Length of first accel/decel lane	200	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3194		596			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	887		166			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade		%		%		%

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/28/2004
Analysis time period: PM
Freeway/dir or travel: 101 SB at Park Presidio
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	4	
Free-flow speed on freeway	65.0	mph
Volume on freeway	5612	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	40.0	mph
Volume on ramp	2423	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	500	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	5612		2423			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1559		673			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	PM
Freeway/dir or travel:	101 NB exit diverge to Girard
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3401	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	45	vph
Length of first accel/decel lane	200	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3401		45			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	945		13			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

2030 ALTERNATIVE 5

(Parkway: Diamond Option) WEEKEND

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	Weekend
Freeway/dir or travel:	101 SB at Doyle Dr/Richardson
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3397	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	1126	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	200	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3397		1126			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	944		313			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/28/2004
Analysis time period: Weekend
Freeway/dir or travel: Park Presidio at 101
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	1875	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	105	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1875		105			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	521		29			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

Phone: Fax:
E-mail:

Merge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/28/2004
Analysis time period: Weekend
Freeway/dir or travel: Park Presidio SB from 101
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2180	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	30.0	mph
Volume on ramp	98	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2180		98			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	606		27			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade		%		%		%

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/28/2004
Analysis time period: Weekend
Freeway/dir or travel: 101 NB at Park Presidio
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3633	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	30.0	mph
Volume on ramp	98	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3633		98			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1009		27			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	Weekend
Freeway/dir or travel:	101 NB from Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3535	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-flow speed on ramp	40.0	mph
Volume on ramp	1769	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	400	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3535		1769			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	982		491			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade		%		%		%

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	Weekend
Freeway/dir or travel:	101 SB from Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3292	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	40.0	mph
Volume on ramp	105	vph
Length of first accel/decel lane	200	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3292		105			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	914		29			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade		%		%		%

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	Weekend
Freeway/dir or travel:	101 SB at Doyle Dr/Richardson
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2978	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	19	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2978		19			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	827		5			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

2030 ALTERNATIVE 5

(Parkway: Circle Drive Option) AM

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	AM
Freeway/dir or travel:	Park Presidio at 101
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	3072	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	593	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3072		593			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	853		165			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	AM
Freeway/dir or travel:	Park Presidio SB from 101
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2261	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	30.0	mph
Volume on ramp	331	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2261		331			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	628		92			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade		%		%		%

Length	mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	
Heavy vehicle adjustment, fHV	0.990	1.000	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2537	368	pcp

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2537 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2905	4600	No
v_{R12}	2905	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 24.8 pc/mi

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable, M_S = 0.362

Space mean speed in ramp influence area, S_R = 53.5 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 53.5 mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	AM
Freeway/dir or travel:	101 NB at Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2948	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	30.0	mph
Volume on ramp	331	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2948		331			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	819		92			v
Trucks and buses	0		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

Length	0.00 mi	0.00 mi	mi
Trucks and buses PCE, ET	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	
Heavy vehicle adjustment, fHV	1.000	1.000	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3276	368	pcp

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 0.661 Using Equation 5

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2291 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3276	6900	No
v_{12}	2291	4400	No
$v_{FO} = v_F - v_R$	2908	6900	No
v_R	368	2000	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 19.5 pc/mi/

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable, D_S = 0.526

Space mean speed in ramp influence area, S_R = 51 mph

Space mean speed in outer lanes, S_0 = 65.8 mph

Space mean speed for all vehicles, S = 54.3 mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/28/2004
Analysis time period: AM
Freeway/dir or travel: 101 NB from Park Presidio
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2617	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-flow speed on ramp	40.0	mph
Volume on ramp	2479	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	400	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2617	2479		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	727	689		v
Trucks and buses	0	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level	Level	
Grade	%	%	%	

Length	mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	
Heavy vehicle adjustment, fHV	1.000	1.000	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2908	2754	pcp

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 0.209 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 608 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	5662	9200	No
v_{R12}	3362	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 27.9 pc/mi

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable, M_S = 0.402

Space mean speed in ramp influence area, S_R = 52.8 mph

Space mean speed in outer lanes, S_0 = 57.7 mph

Space mean speed for all vehicles, S = 54.7 mph

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	AM
Freeway/dir or travel:	101 SB from Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	4291	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	40.0	mph
Volume on ramp	593	vph
Length of first accel/decel lane	200	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4291	593		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	1192	165		v
Trucks and buses	2	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level	Level	
Grade	%	%	%	

Length	mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	
Heavy vehicle adjustment, fHV	0.990	1.000	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4815	659	pcp

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 0.583 Using Equation 1

$v_{12} = v_F (P_{FM})$ = 2808 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	5474	7050	No
v_{R12}	3467	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 31.0 pc/mi

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable, M_S = 0.430

Space mean speed in ramp influence area, S_R = 55.1 mph

Space mean speed in outer lanes, S_0 = 59.6 mph

Space mean speed for all vehicles, S = 56.7 mph

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	AM
Freeway/dir or travel:	101 SB at Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	4	
Free-flow speed on freeway	65.0	mph
Volume on freeway	6556	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	40.0	mph
Volume on ramp	2261	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	500	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	6556		2261			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1821		628			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			
Heavy vehicle adjustment, fHV	0.990		1.000			
Driver population factor, fP	1.00		1.00			
Flow rate, vp	7357		2512			pcp

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 0.260 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3772 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	7357	9400	No
v_{12}	3772	4400	No
$v_{FO} = v_F - v_R$	4845	9400	No
v_R	2512	4100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 32.2 pc/mi/

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable,	D_S =	0.589	
Space mean speed in ramp influence area,	S_R =	51	mph
Space mean speed in outer lanes,	S_0 =	68.2	mph
Space mean speed for all vehicles,	S =	58.5	mph

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/28/2004
Analysis time period: AM
Freeway/dir or travel: 101 SB at Doyle Dr/Richardson
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4888	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	1825	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	200	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	4888		1825			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1358		507			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

Length	0.00	mi	0.00	mi	mi
Trucks and buses PCE, ET	1.5		1.5		
Recreational vehicle PCE, ER	1.2		1.2		
Heavy vehicle adjustment, fHV	0.990		1.000		
Driver population factor, fP	1.00		1.00		
Flow rate, vp	5485		2028		pcp

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 0.260 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2927 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5485	9200	No
v_{12}	2927	4400	No
$v_{FO} = v_F - v_R$	3457	9200	No
v_R	2028	3800	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 27.6 pc/mi/

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	D_S = 0.611	
Space mean speed in ramp influence area,	S_R = 49	mph
Space mean speed in outer lanes,	S_0 = 64.7	mph
Space mean speed for all vehicles,	S = 55.3	mph

2030 ALTERNATIVE 5

(Parkway: Circle Drive Option) PM

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	PM
Freeway/dir or travel:	Park Presidio at 101
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	2790	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	589	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2790		589			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	775		164			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

```
    Length                                  0.00    mi  0.00    mi          mi
Trucks and buses PCE, ET                    1.5         1.5
Recreational vehicle PCE, ER                1.2         1.2
Heavy vehicle adjustment, fHV               0.990       1.000
Driver population factor, fP                1.00        1.00
Flow rate, vp                               3131        654                  pcp

                        Estimation of V12 Diverge Areas

                 L  =    0.00    (Equation 25-8 or 25-9)
                  EQ
                 P  =    1.000   Using Equation  0
                  FD
                 v  = v  + (v - v ) P  =  3131   pc/h
                  12   R      F   R   FD

                              Capacity Checks

                          Actual        Maximum         LOS F?
     v  = v               3131          4500            No
      Fi   F
     v                    3131          4400            No
      12
     v  = v - v           2477          4500            No
      FO   F   R
     v                    654           2000            No
      R

                Level of Service Determination (if not F)

Density,              D = 4.252 + 0.0086 v  - 0.009  L   =   26.7    pc/mi/
                       R                   12          D
Level of service for ramp-freeway junction areas of influence C

                             Speed Estimation

Intermediate speed variable,                  D  = 0.487
                                               S
Space mean speed in ramp influence area,      S  = 49      mph
                                               R
Space mean speed in outer lanes,              S  =  N/A    mph
                                               0
Space mean speed for all vehicles,            S  = 48.7    mph
```

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/28/204
Analysis time period: PM
Freeway/dir or travel: Park Presidio SB from 101
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2409	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	30.0	mph
Volume on ramp	672	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2409	672		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	669	187		v
Trucks and buses	2	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level	Level	
Grade	%	%	%	

Length	mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	
Heavy vehicle adjustment, fHV	0.990	1.000	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2703	747	pcp

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2703 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	3450	4600	No
v_{R12}	3450	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 28.9 pc/mi

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable, M_S = 0.414

Space mean speed in ramp influence area, S_R = 52.6 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 52.6 mph

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	PM
Freeway/dir or travel:	101 NB at Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	65.0	mph
Volume on freeway	4902	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	30.0	mph
Volume on ramp	672	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	4902		672			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1362		187			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

Length	0.00 mi	0.00 mi	mi
Trucks and buses PCE, ET	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	
Heavy vehicle adjustment, fHV	0.990	1.000	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	5501	747	pcp

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 0.588 Using Equation 5

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3543 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	5501	7050	No
v_{12}	3543	4400	No
$v_{FO} = v_F - v_R$	4754	7050	No
v_R	747	2000	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 30.2 pc/mi/

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable, D_S = 0.560

Space mean speed in ramp influence area, S_R = 52 mph

Space mean speed in outer lanes, S_0 = 67.6 mph

Space mean speed for all vehicles, S = 56.7 mph

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/28/2004
Analysis time period: PM
Freeway/dir or travel: 101 NB from Park Presidio
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	4230	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-flow speed on ramp	40.0	mph
Volume on ramp	2201	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	400	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	4230	2201		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	1175	611		v
Trucks and buses	2	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level	Level	
Grade	%	%	%	

Length	mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	
Heavy vehicle adjustment, fHV	0.990	1.000	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4747	2446	pcp

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 0.209 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 992 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	7193	9200	No
v_{R12}	3438	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 28.7 pc/mi

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable, M_S = 0.410

Space mean speed in ramp influence area, S_R = 52.6 mph

Space mean speed in outer lanes, S_0 = 55.0 mph

Space mean speed for all vehicles, S = 53.9 mph

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	PM
Freeway/dir or travel:	101 SB from Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3163	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	40.0	mph
Volume on ramp	589	vph
Length of first accel/decel lane	200	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3163		589			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	879		164			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade		%		%		%

Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	0.990	1.000		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	3550	654		pcp

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 0.583 Using Equation 1

$v_{12} = v_F (P_{FM}) =$ 2070 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	4204	6900	No
v_{R12}	2724	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A =$ 25.2 pc/mi

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M_S =	0.364	
Space mean speed in ramp influence area,	S_R =	53.4	mph
Space mean speed in outer lanes,	S_0 =	56.5	mph
Space mean speed for all vehicles,	S =	54.5	mph

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	PM
Freeway/dir or travel:	101 SB at Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	4	
Free-flow speed on freeway	65.0	mph
Volume on freeway	5572	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	40.0	mph
Volume on ramp	2409	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	500	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	5572		2409			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1548		669			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

```
     Length                                    0.00    mi  0.00    mi          mi
Trucks and buses PCE, ET                       1.5         1.5
Recreational vehicle PCE, ER                   1.2         1.2
Heavy vehicle adjustment, fHV                  0.990       1.000
Driver population factor, fP                   1.00        1.00
Flow rate, vp                                  6253        2677                  pcp

                         Estimation of V12 Diverge Areas

                  L  =    0.00    (Equation 25-8 or 25-9)
                   EQ
                  P  =    0.260   Using Equation  0
                   FD
                  v  = v  + (v - v ) P  =  3607   pc/h
                   12   R      F   R   FD

                               Capacity Checks

                           Actual         Maximum         LOS F?
     v  = v                6253           9400            No
      Fi   F
     v                     3607           4400            No
      12
     v  = v - v            3576           9400            No
      FO   F   R
     v                     2677           4100            No
      R

                 Level of Service Determination (if not F)

Density,               D = 4.252 + 0.0086 v  - 0.009  L   =   30.8    pc/mi/
                        R                   12          D
Level of service for ramp-freeway junction areas of influence D

                             Speed Estimation

Intermediate speed variable,                 D  = 0.604
                                              S
Space mean speed in ramp influence area,     S  = 51      mph
                                              R
Space mean speed in outer lanes,             S  = 70.0    mph
                                              0
Space mean speed for all vehicles,           S  = 57.7    mph
```

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	PM
Freeway/dir or travel:	101 SB at Doyle Dr/Richardson
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3752	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	1321	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	200	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3752		1321			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1042		367			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

Length	0.00 mi	0.00 mi	mi
Trucks and buses PCE, ET	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	
Heavy vehicle adjustment, fHV	0.990	1.000	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4211	1468	pcp

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 0.260 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2181 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4211	9200	No
v_{12}	2181	4400	No
$v_{FO} = v_F - v_R$	2743	9200	No
v_R	1468	3800	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 21.2 pc/mi/

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	D_S = 0.560	
Space mean speed in ramp influence area,	S_R = 50	mph
Space mean speed in outer lanes,	S_0 = 65.8	mph
Space mean speed for all vehicles,	S = 56.5	mph

2030 ALTERNATIVE 5

(Parkway: Circle Drive Option) WEEKEND

Phone: Fax:
E-mail:

Diverge Analysis

Analyst: ER
Agency/Co.:
Date performed: 07/27/2004
Analysis time period: Weekend
Freeway/dir or travel: Park Presidio at 101
Junction:
Jurisdiction:
Analysis Year:
Description:

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	55.0	mph
Volume on freeway	1892	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	104	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1892		104			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	526		29			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	0.990	1.000		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	2123	116		pcp

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2123 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2123	4500	No
v_{12}	2123	4400	No
$v_{FO} = v_F - v_R$	2007	4500	No
v_R	116	2000	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 18.0 pc/mi/

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable, D_S = 0.438

Space mean speed in ramp influence area, S_R = 49 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 49.3 mph

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	Weekend
Freeway/dir or travel:	Park Presidio SB from 101
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2181	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	30.0	mph
Volume on ramp	102	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2181	102		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	606	28		v
Trucks and buses	2	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level	Level	
Grade	%	%	%	

Length		mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	0.990	1.000		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	2448	113		pcp

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2448 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2561	4600	No
v_{R12}	2561	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 22.3 pc/mi

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable, M_S = 0.342

Space mean speed in ramp influence area, S_R = 53.9 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 53.9 mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	Weekend
Freeway/dir or travel:	101 NB at Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3612	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	30.0	mph
Volume on ramp	102	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3612		102			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1003		28			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			
Heavy vehicle adjustment, fHV	0.990		1.000			
Driver population factor, fP	1.00		1.00			
Flow rate, vp	4053		113			pcp

Estimation of V12 Diverge Areas

$L_{EQ} = 0.00$ (Equation 25-8 or 25-9)

$P_{FD} = 0.653$ Using Equation 5

$v_{12} = v_R + (v_F - v_R) P_{FD} = 2688$ pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4053	6900	No
v_{12}	2688	4400	No
$v_{FO} = v_F - v_R$	3940	6900	No
v_R	113	2000	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086 v_{12} - 0.009 L_D = 22.9$ pc/mi/

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable, $D_S = 0.503$

Space mean speed in ramp influence area, $S_R = 51$ mph

Space mean speed in outer lanes, $S_0 = 64.4$ mph

Space mean speed for all vehicles, $S = 54.8$ mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/27/2004
Analysis time period:	Weekend
Freeway/dir or travel:	101 NB from Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3510	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-flow speed on ramp	40.0	mph
Volume on ramp	1789	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	400	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3510		1789			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	975		497			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade		%		%		%

```
     Length                                          mi           mi           mi
Trucks and buses PCE, ET                     1.5          1.5
Recreational vehicle PCE, ER                 1.2          1.2
Heavy vehicle adjustment, fHV                0.990        1.000
Driver population factor, fP                 1.00         1.00
Flow rate, vp                                3939         1988                   pcp

                         Estimation of V12 Merge Areas

                  L   =    0.00    (Equation 25-2 or 25-3)
                   EQ
                  P   =    0.209   Using Equation  0
                   FM
                  v  = v  (P  ) =  823    pc/h
                   12   F   FM

                               Capacity Checks

                           Actual        Maximum         LOS F?
     v                     5927          9200            No
      FO
     v                     2811          4600            No
      R12

                 Level of Service Determination (if not F)

Density, D = 5.475 + 0.00734 v  + 0.0078 v   - 0.00627 L   =   24.0    pc/mi
          R                   R            12             A
Level of service for ramp-freeway junction areas of influence  C

                             Speed Estimation

Intermediate speed variable,                 M  = 0.354
                                              S
Space mean speed in ramp influence area,     S  = 53.6    mph
                                              R
Space mean speed in outer lanes,             S  = 56.2    mph
                                              0
Space mean speed for all vehicles,           S  = 54.9    mph
```

HCS2000: Ramps and Ramp Junctions Release 4.1a

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	Weekend
Freeway/dir or travel:	101 SB from Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3285	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	40.0	mph
Volume on ramp	104	vph
Length of first accel/decel lane	200	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3285	104		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	913	29		v
Trucks and buses	2	0		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level	Level	
Grade	%	%	%	

Length	mi	mi	mi
Trucks and buses PCE, ET	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	
Heavy vehicle adjustment, fHV	0.990	1.000	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3687	116	pcp

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 0.583 Using Equation 1

$v_{12} = v_F (P_{FM})$ = 2150 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	3803	6900	No
v_{R12}	2266	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 21.8 pc/mi

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable, M_S = 0.343

Space mean speed in ramp influence area, S_R = 53.8 mph

Space mean speed in outer lanes, S_0 = 56.3 mph

Space mean speed for all vehicles, S = 54.8 mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	Weekend
Freeway/dir or travel:	101 SB at Park Presidio
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	5466	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	40.0	mph
Volume on ramp	2181	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	500	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	5466		2181			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	1518		606			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%	%	

Length	0.00	mi	0.00	mi	mi
Trucks and buses PCE, ET	1.5		1.5		
Recreational vehicle PCE, ER	1.2		1.2		
Heavy vehicle adjustment, fHV	0.990		1.000		
Driver population factor, fP	1.00		1.00		
Flow rate, vp	6134		2423		pcp

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 0.260 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3388 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	6134	9200	No
v_{12}	3388	4400	No
$v_{FO} = v_F - v_R$	3711	9200	No
v_R	2423	4100	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 28.9 pc/mi/

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable, D_S = 0.581

Space mean speed in ramp influence area, S_R = 50 mph

Space mean speed in outer lanes, S_0 = 64.4 mph

Space mean speed for all vehicles, S = 55.2 mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	ER
Agency/Co.:	
Date performed:	07/28/2004
Analysis time period:	Weekend
Freeway/dir or travel:	101 SB at Doyle Dr/Richardson
Junction:	
Jurisdiction:	
Analysis Year:	
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	4	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3389	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	1083	vph
Length of first accel/decel lane	0	ft
Length of second accel/decel lane	200	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3389		1083			vph
Peak-hour factor, PHF	0.90		0.90			
Peak 15-min volume, v15	941		301			v
Trucks and buses	2		0			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%		%

Length	0.00 mi	0.00 mi	mi
Trucks and buses PCE, ET	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	
Heavy vehicle adjustment, fHV	0.990	1.000	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3803	1203	pcp

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 0.260 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1879 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3803	9200	No
v_{12}	1879	4400	No
$v_{FO} = v_F - v_R$	2600	9200	No
v_R	1203	3800	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 18.6 pc/mi/

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable, D_S = 0.536

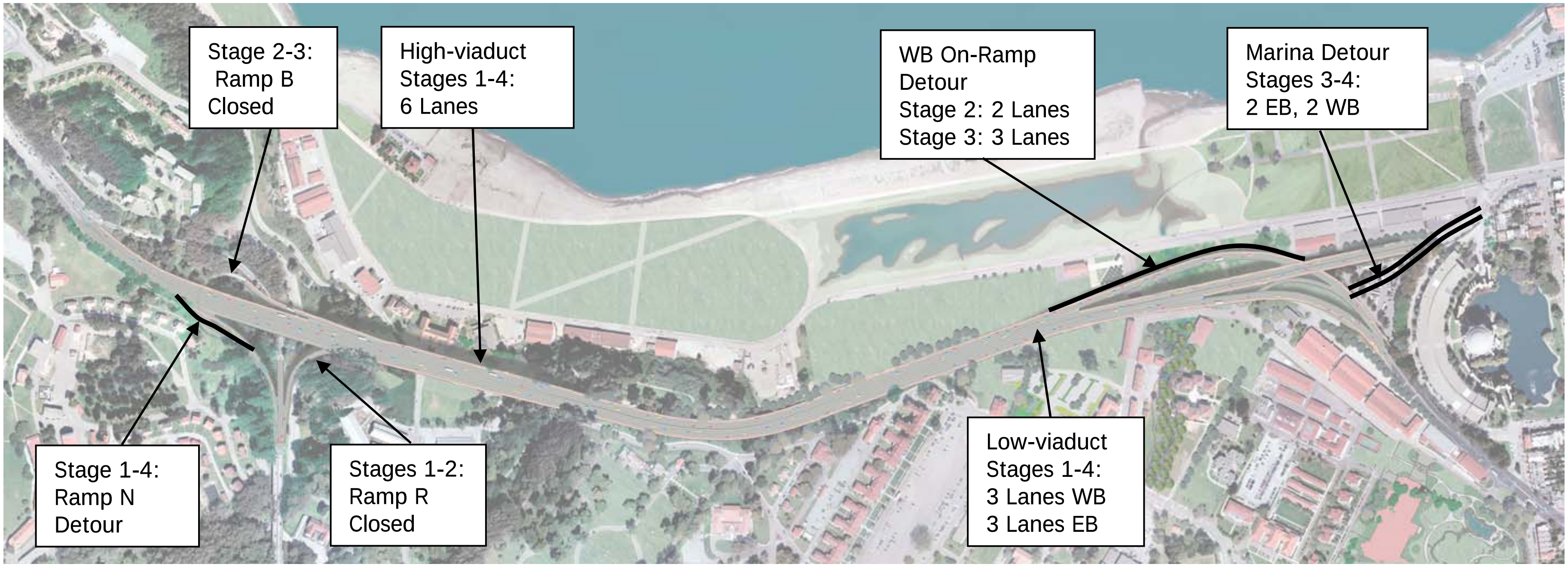
Space mean speed in ramp influence area, S_R = 50 mph

Space mean speed in outer lanes, S_0 = 65.8 mph

Space mean speed for all vehicles, S = 57.1 mph

APPENDIX F

CONSTRUCTION STAGING PLANS



Stage 1

Construction: Construct southern portion of High Viaduct and outside widening portion of low Viaduct. Demolish Ramp R. Construct portion of temporary widening of WB on-ramp from Richardson Blvd. and temporary Ramp N.

Detours: WB and EB Doyle Drive traffic on existing alignment. Ramp R is closed.

Stage 2

Construction: Demolish Ramps N and B. Complete construction of southern portion of High Viaduct and replacement of Ramp R and Ramp N. Construct portion of inside widening of Low Viaduct, temporary detour to Marina Blvd., and remainder of temporary WB on-ramp from Richardson Blvd.

Detours: Divert EB Doyle Drive to SB Park Presidio Blvd. traffic on to temporary Ramp N. Ramp B is closed.

Stage 3

Construction: Demolish old High Viaduct and construct north portion of new structure. Replacement of Ramp B. Demolish old Low Viaduct and construct remainder of new structure. Demolish old off-ramp to Richardson Blvd.

Detours: Traffic is moved on to the southern portion of the new High Viaduct. New Ramp R is opened to traffic. Traffic is switched to portion of new Low Viaduct. Marina traffic is switched to temporary detour.

Stage 4

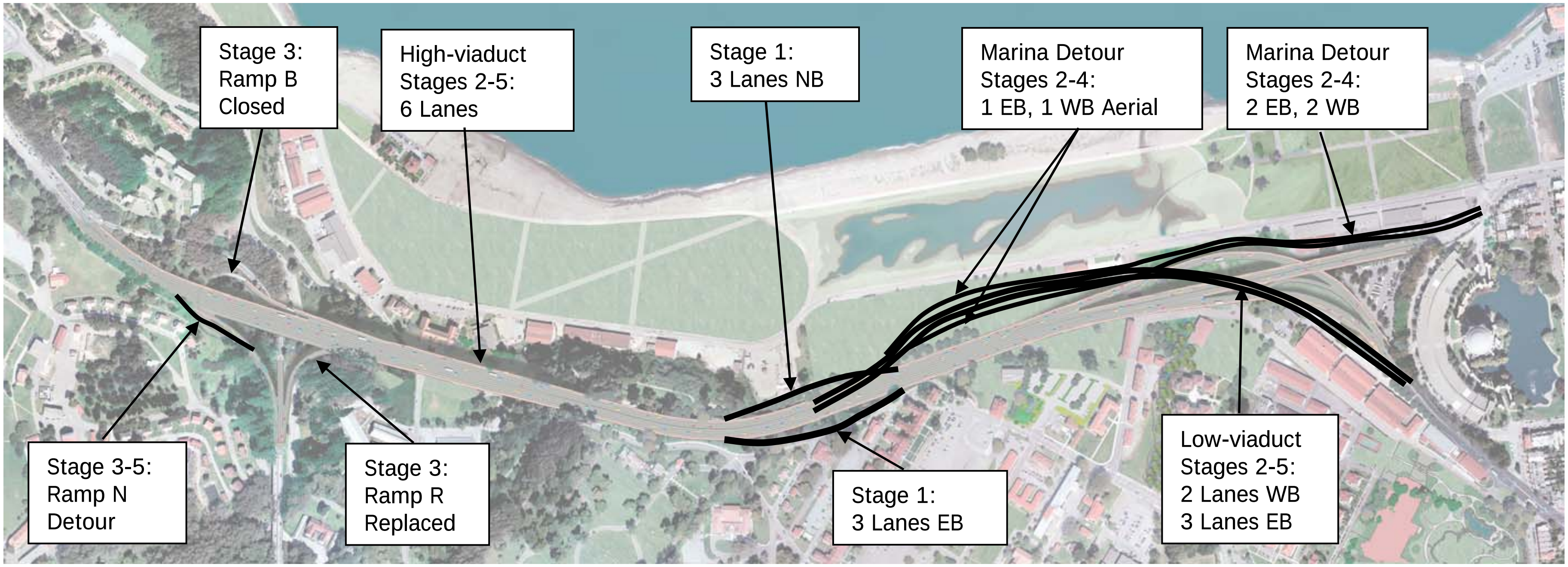
Construction: Complete construction of closure pour and median barrier of High and Low Viaduct. Remove all remaining temporary detours.

Detours: Shift all traffic on to new facility.

FHWA Caltrans

Doyle
Drive
Project

Construction Staging
Alternative 2 - Replace & Widen No Detour



Stage 1

Construction: Replace west portion of Low Viaduct between the Cemetery and Main Post.

Detours: WB and EB Doyle Dr. traffic diverted on to temporary detours north and south of construction area.

Stage 2

Construction: Construct southern portion of High Viaduct and temporary Ramp N, demolish Ramp R and remove temporary detours north and south of the west portion of Low Viaduct. Construct Marina and Low Viaduct detours.

Detours: WB and EB Doyle Drive traffic switched back to existing alignment.

Stage 3

Construction: Demolish Ramps N and B. Complete construction of southern portion of High Viaduct, replacement of Ramp R and Ramp N, and replace Low Viaduct.

Detours: East of the Cemetery, WB and EB traffic is diverted on to a temporary structure north of the Low Viaduct. The detour goes over Halleck St., the existing structure, and connects to Richardson Ave. near the Palace of Fine Arts. Marina traffic splits off the main detour west of Halleck St. on to a separate temporary structure that goes over Halleck and Marshall streets and connects to Marina Blvd. at Lyon St. Divert EB Doyle Dr. to SB Park Presidio Blvd. traffic on to temporary Ramp N. Ramp B is closed.

Stage 4

Construction: Demolish old high-viaduct and construct north portion of new structure. Replacement of Ramp B. Remove all temporary detour structures.

Detours: Traffic is moved on to the southern portion of the new high-viaduct. New Ramp R is opened to traffic.

Stage 5

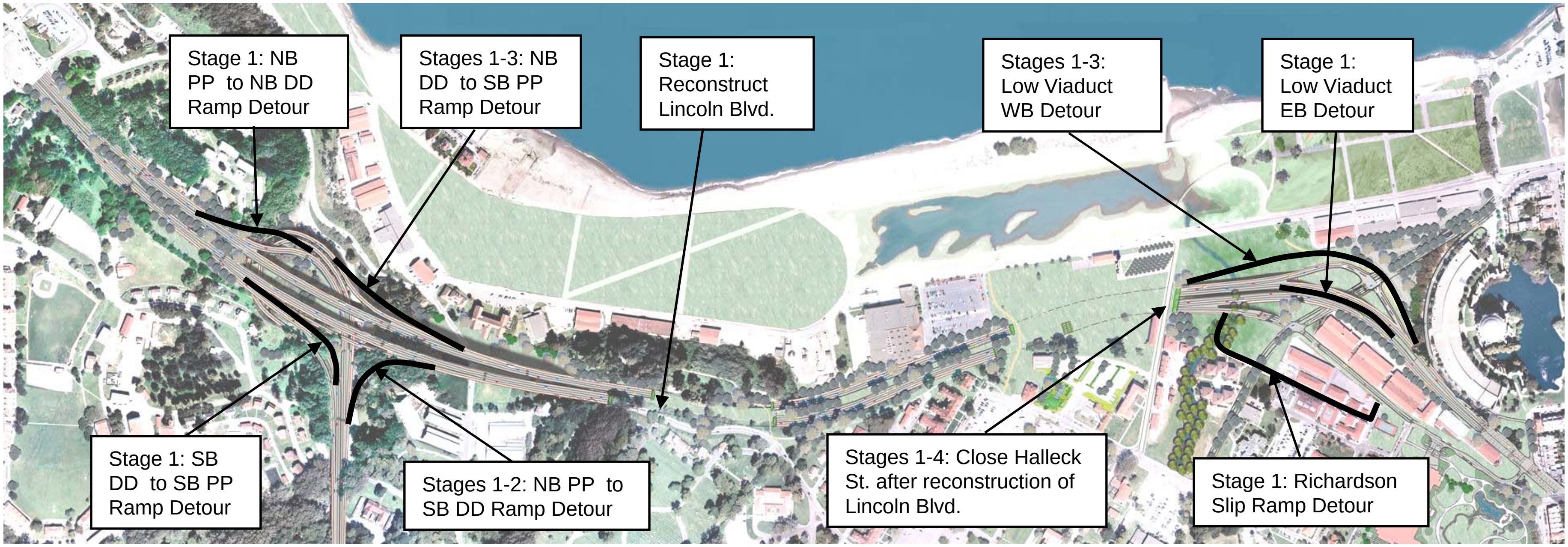
Construction: Complete construction of closure pour and median barrier of high Viaduct. Remove temporary Ramp N.

Detours: Shift all traffic on to new facility.

FHWA Caltrans

Doyle Drive Project

Construction Staging
Alternative 2 - Replace & Widen With Detour



Stage 1

Construction: Construct portions of EB DD from the Park Presidio Interchange to Richardson Ave. Construct offline portions of WB DD between the Battery and Main Post Tunnels and between the Park Presidio Interchange and the Toll Plaza. Construct portions of the Park Presidio Interchange ramps. Construct portions of the Girard Rd. Interchange. Construct temporary detours for WB and EB Low Viaduct at Richardson Ave. Construct temporary detours for Park Presidio Interchange ramps. Construct temporary detour for Richardson Ave. slip ramp.

Detours: Divert EB and WB DD on to detours between Low Viaduct and Richardson Ave. Divert EB DD to SB PP and from NB PP to WB DD ramps on to temporary detours. Divert NB PP to EB DD on to a combination of temporary and permanent ramp. Divert WB DD to SB PP on to a combination of temporary and permanent ramp. Divert traffic from Richardson Ave. slip ramp on to temporary detour. Close Halleck St. after reconstruction of Lincoln Blvd.

Stage 2

Construction: Construct WB High Viaduct between Park Presidio Interchange and the Cemetery. Construct remaining portions of the Battery Tunnel. Construct WB DD causeway at Tennessee Hollow. Remove the Marina Viaduct from Tennessee Hollow to Marina Boulevard. Complete construction of Girard Road Interchange. Remove temporary detour fro EB DD to Richardson Avenue. Remove temporary detour from NB PP to EB DD.

Detours: Divert EB DD on to permanent alignment but with 3 lanes. Open permanent WB DD between the Park Presidio Interchange and the Toll Plaza. Open permanent NB PP to WB DD ramp and permanent NB PP to EB DD ramp.

Stage 3

Construction: Remove portions of the existing High Viaduct and construct the remaining portion of the permanent ramp from WB DD to SB PP. Complete construction of the Battery Tunnels. Remove the Low Viaduct between the Cemetery and Halleck Street. Complete construction of EB DD and construct additional portions of WB DD from Cemetery to Halleck Street.

Detours: Divert WB DD on to a combination of temporary and permanent alignment from Richardson Avenue to the Toll Plaza.

Stage 4

Construction: Complete WB DD Main Post Tunnel and construct Halleck Street. Remove remaining portion of existing High Viaduct and residual segments of existing and temporary facilities.

Detours: Open all traffic movements to permanent alignments and open Halleck Street.

Design Options

Merchant Road Option: If selected, this option would be constructed during Stage 1.

Hook Ramp Option: If selected, this option would eliminate the need for the NB PP to SB DD ramp detour during Stages 1-2. Subsequent stages would remain unchanged.

Circle Drive Option: If selected, this option would eliminate the need for the Richardson slip ramp detour. Subsequent stages would remain unchanged.

Doyle Drive Project

FHWA Caltrans

Construction Staging
Alternative 5 – Presidio Parkway

SOUTH ACCESS TO THE GOLDEN GATE BRIDGE

DOYLE DRIVE

ADDENDUM TO THE FINAL

TRAFFIC AND TRANSIT OPERATIONS REPORT

OCTOBER 2006

7.0 DESIGN YEAR CONDITION OF REFINED PRESIDIO PARKWAY ALTERNATIVE

This chapter describes the forecasted traffic and transit operations for the Refined Presidio Parkway alternative and expands an evaluation of nearby intersections to report the various potential results of traffic from the different alternatives. This chapter is intended as a supplemental chapter to the *Traffic and Transit Operations Report* published in December 2004.

The DEIS/R was circulated for public comment in December 2005 and the comment period closed on March 31, 2006. There were two public hearings during the public comment period to present the proposed alternatives to the public and solicit their comments on the alternatives. In addition, several informal workshops were held to enhance the public's understanding of the alternatives, gather input and review proposed design refinements. The recommendation of a preferred alternative was made based on the refined alternatives.

Additional analysis of area intersections is also included because of many comments received during the review of the Draft EIR/EIS. In particular, a number of neighborhood concerns about traffic intrusion onto local neighborhood streets are examined here.

7.1 REFINED PRESIDIO PARKWAY ALTERNATIVE

7.1.1 Refinements to Presidio Parkway Alternative

In response to comments received during the public circulation period and to address traffic circulation, tidal inundation issues, the elimination of the underground parking below Doyle Drive and the provision of additional surface parking to more closely match the existing condition, the following refinements were made to the Presidio Parkway Alternative:

- The Hook Ramp option at the Park Presidio interchange was modified to reuse portions of the existing ramps to reduce impacts to resources while achieving similar improvements to traffic safety.
- In order to simplify construction, a portion of the alignment west of the Battery tunnels was adjusted to accommodate single stage construction of each tunnel structure.
- To reduce disturbance to the existing bluff, the refined alternative proposes to raise the profile of the southbound lanes by up to three meters (ten feet). The change in profile will need to balance the need to reduce impacts to the bluff with the potential for greater noise impacts and visual intrusion. To further retain the cultural relationship between the upper and lower portions of the Presidio, the landscaping over the Main Post tunnels would recreate the bluff north of the tunnels.
- The accommodation of marsh expansion in to the project corridor would subject the proposed facility to coastal events such as storm surge and tsunamis. In order to meet serviceability design criteria, the profile was raised to clear the 100-year tsunami elevation of 3.4 meters NAVD88. To accommodate the revised mainline profile, the profile of Halleck Street would have to be raised by an additional 0.8 meter (2.6 feet) at the north face of building 228, with the crest of Halleck Street at elevation 10 meters (32.8 feet), similar to the previous alternative.
- The revised profile of the mainline facilitated the creation of greater separation between the northbound and southbound roadways over the future marsh expansion area providing an opportunity for increased light penetration to the ground. The additional curvature to the southbound roadway also enhanced the traffic calming impact of the roadway, reducing traffic speeds before reaching city streets.
- By redesigning the Richardson connection as ramps connecting to an urban street, rather than mainline segments, the traffic balance between Richardson Avenue and Marina Boulevard is more closely matched to the existing condition in the refined alternative.
- In conjunction with the realignment of the southbound roadway, the intersection of the off-ramp to Girard Road was moved twenty meters south (66 feet). This moved the connection along Gorgas

Avenue away from the Gorgas Avenue warehouses, thereby preserving the streetscape in front of the buildings.

- The intersection for the northbound on-ramp was also moved twenty meters (66 feet) south. In conjunction with reducing the northbound off-ramp from two lanes to one lane, much of the landscaping area west of the Palace of Fine Arts was preserved.
- In response to the plans by San Francisco Department of Recreation and Parks (SFDRP) for the rehabilitation of the Palace of Fine Arts and surrounding grounds, the refined alternative maintained Palace Drive as a two-way road and incorporates the modifications proposed by SFDRP at north and south ends where Palace Drive connects to Lyon Street. Based on comments from the Lyon Street residents the Refined Presidio Parkway alternative will also maintain Lyon Street as a two-way street with connection to Bay Street.
- To enhance pedestrian safety and accessibility, the proposed design included pedestrian access under Doyle Drive from the Gorgas warehouses to the Palace of Fine Arts and under Girard Road from the Palace of Fine Arts to the Mason Street warehouses.
- The refinements to the alternative also included a parking concept also that maintains a similar parking supply to the existing condition. The main features were:
  - Elimination of underground parking below Doyle Drive;
  - Redesign parking west of Palace Drive and south of Mason Street warehouses as surface parking rather than underground parking;
  - Modify Palace Drive to provide perpendicular parking on both sides of a two-way Palace Drive;
  - Provide surface parking behind the Gorgas warehouses, and;
  - Provide on-street parking along Gorgas Avenue.

The Doyle Drive Subcommittee to the Citizens' Advisory Committee (CAC), the Doyle Drive Executive Committee comprised of lead, cooperating and responsible agencies and the Authority CAC all held meetings in July 2006 to consider recommendations for a preferred alternative and design options. All three groups made identical recommendations for selection of the Presidio Parkway and design options. The recommendations were: Alternative 5, Presidio Parkway, with specific design elements including the modified Hook Ramp Option for the Presidio Parkway Interchange and the Diamond Option for Presidio Access. The groups did not support including the Merchant Road Slip Ramp Option. In addition, the subcommittee voted to support three design refinements; 1) move Girard Intersection south, 2) restrict Lyon Street connection for the Presidio and 3) Reserve additional right-of-way for the connection from Marina Boulevard to Doyle Drive.

7.1.2 Preferred Alternative: Refined Presidio Parkway Alternative

The refined Presidio Parkway Alternative would replace the existing facility with a new six-lane facility and an eastbound auxiliary lane, between the Park Presidio interchange and the new Presidio access at Girard Road. (See Figure 1-5) The new facility would consist of two 3.3-meter (11 foot) lanes and one 3.6-meter (12 foot) outside lane in each direction with 3.0-meter outside shoulders and 1.2-meter inside shoulders. The southbound direction would include a 3.3-meter (11 foot) auxiliary lane from the Park Presidio Interchange to the Girard Road exit ramp. The width of the proposed landscaped median would vary from 5.0 meters (16 feet) to 12.5 meters (41 feet). To minimize impacts to the park, the footprint of the new facility would overlap with a large portion of the existing facility's footprint east of the Park Presidio interchange.

A 450-meter (1,476-foot) long high-viaduct would be constructed between the Park Presidio interchange and the San Francisco National Cemetery. The height of the high-viaduct would vary from twenty to 35 meters (66 to 115 feet) above the ground surface. Shallow cut-and-cover tunnels would extend 240 meters (787 feet) past the cemetery to east of Battery Blaney. The facility would then continue towards the Main Post in an open at-grade roadway with a wide heavily landscaped median. A retaining wall between four to eight meters (13 to 26 feet) high would be constructed along the south side of the facility between the Battery and Main Post tunnels. A landscaped berm would be constructed along the north side of the facility to shield park visitors from the proposed facility.

From Building 106 (Band Barracks) cut-and-cover tunnels up to 310 meters long (984 feet) would extend to east of Halleck Street. The amount of fill over the tunnels is being coordinated with the Trust based on requirements of the Vegetation Management Plan. The expected minimum depth to support native vegetation is two meters (6 feet). The facility would then rise slightly on a low level causeway 160 meters (525 feet) long over the site of the proposed Tennessee Hollow restoration and then pass over a depressed Girard Road. The low causeway would rise to approximately three meters (10 feet) above the surrounding ground surface at its highest point. East of Girard Road the facility would return to existing grade north of the Gorgas warehouses and connect to Richardson Avenue. The proposed facility would provide a transition zone starting from the Main Post tunnel to reduce vehicle speeds prior to entering city streets. A motor control and switch gear room to operate the tunnel life safety equipment would be integrated with the Main Post tunnels.

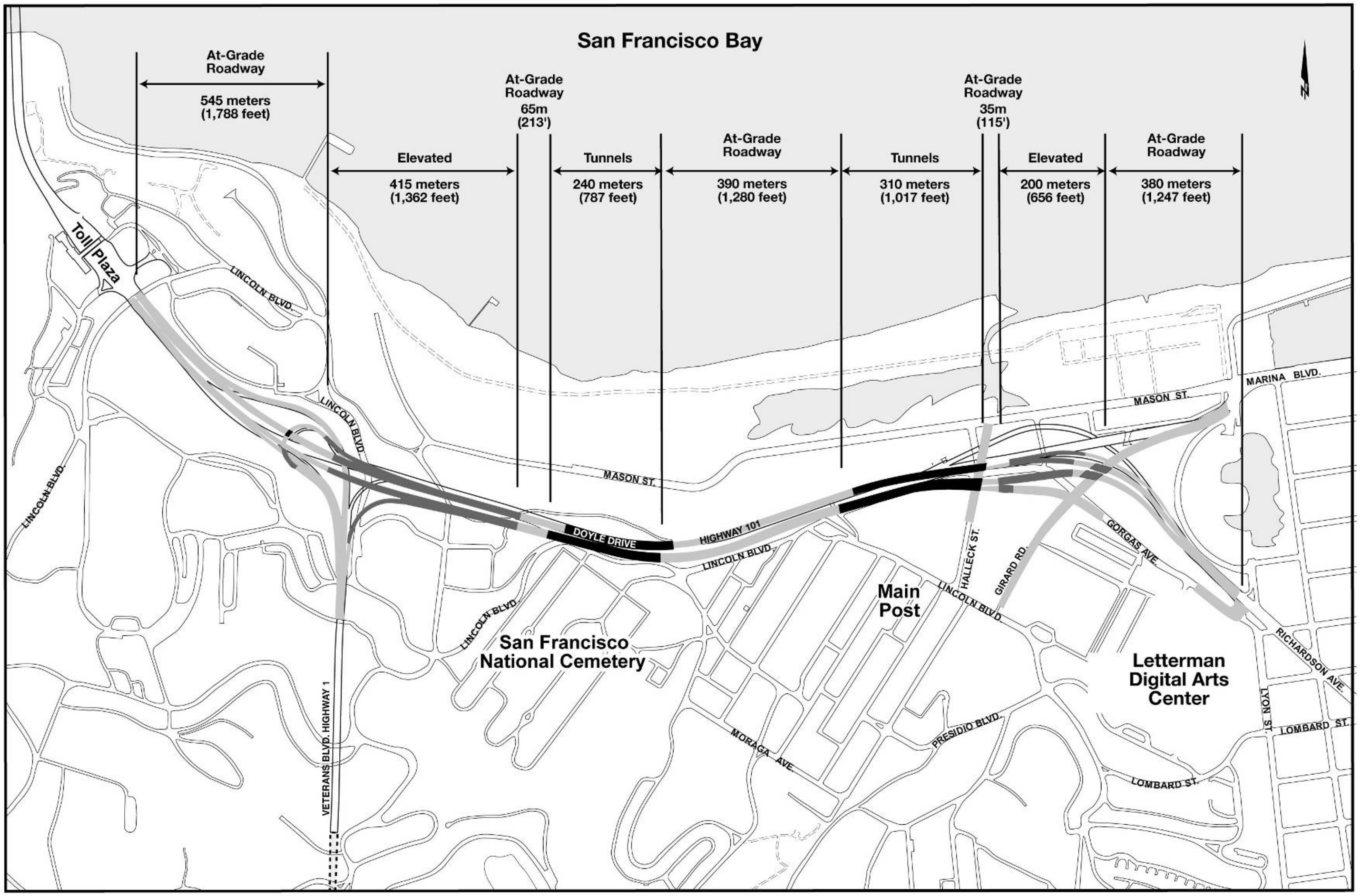
The Park Presidio interchange would be reconfigured due to the realignment of Doyle Drive to the south. The exit ramp from eastbound Doyle Drive to southbound Veterans Boulevard would be replaced with standard exit ramp geometry and widened to two lanes. The loop of the westbound Doyle Drive exit ramp to southbound Veterans Boulevard would be improved to provide standard exit ramp geometry. The northbound Veterans Boulevard connection to westbound Doyle Drive would be realigned to provide standard entrance ramp geometry. The northbound Veterans Boulevard connection to eastbound Doyle Drive would be reconstructed in a similar configuration as the existing directional ramp with improved sight lines, exit and entrance geometry.

The Refined Presidio Parkway Alternative would provide direct access to the Presidio and indirect access to Marina Boulevard in both directions via access ramps from Doyle Drive connecting to an extension of Girard Road. East of the new Letterman garage, Gorgas Avenue is a one-way street with a signalized intersection at Richardson Avenue. North of Richardson Avenue, Lyon Street will remain in its existing configuration that provides access to the two-way to Palace Drive. The surface parking spaces would be reconfigured to maintain the existing parking supply in the area and improve pedestrian access between the Presidio and the Palace of Fine Arts.

Retaining walls would be required at the Park Presidio interchange to accommodate the reconstruction of the ramps. Retaining walls would also be required in the eastern end of the alignment primarily along the extended Girard Road. Fences would be required along the edge of the at-grade portions of the roadway to restrict pedestrian access onto the roadway.

FIGURE 7.1-1

ALTERNATIVE 5: REFINED PRESIDIO PARKWAY



7.2 LOCATIONS FOR ADDITIONAL INTERSECTION ANALYSIS

The original report examined impacts to a number of facilities. Specifically, these intersections were evaluated:

- Lyon Street and Marina Boulevard
- US 101 / Richardson Avenue and Francisco Street
- Merchant Road (GGB Viewing Area) and Lincoln Boulevard (East)
- Merchant Road (GGB Viewing Area) and Lincoln Boulevard (West)
- Girard Road and Lincoln Boulevard
- Halleck Street and Mason Street
- US 101/ Richardson Avenue and Gorgas Street
- Marina Boulevard / Girard Road and Gorgas Street/US 101 SB ramp
- Marina Boulevard / Girard Road and US 101 NB ramp
- Broderick Street and Marina Boulevard
- Divisadero Street and Marina Boulevard
- US 101 / Richardson Avenue and Chestnut Street
- US 101 / Richardson Avenue and Lombard Street
- US 101 / Lombard Street and Broderick Street
- Lyon Street and Lombard Street (Lombard Gate)
- Presidio Boulevard and Pacific Avenue
- Park Presidio Boulevard and Lake Street
- US 101 NB ramps and GGB Viewing Area (Merchant Road)

This report examines potential impacts to additional intersections. These intersections are:

- Baker Street and Beach Street
- Baker Street and Francisco Street
- Baker Street and Lombard Street
- Baker Street and Greenwich Street
- Baker Street and Filbert Street
- Broderick Street and Beach Street
- Broderick Street and Francisco Street
- Broderick Street and Chestnut Street
- Broderick Street and Greenwich Street
- Broderick Street and Filbert Street
- Divisadero Street and Francisco Street
- Divisadero Street and Chestnut Street
- Divisadero Street and Lombard Street
- Divisadero Street and Greenwich Street
- Divisadero Street and Filbert Street
- Fillmore Street and Lombard Street
- Scott Street / Cervantes Street and Marina Boulevard
- Buchanan Street/ Marina Boulevard and Beach Street
- Laguna Street and Bay Street
- Van Ness Avenue and Bay Street
- Van Ness Avenue and Lombard Street

7.3 INTERSECTION LEVEL OF SERVICE

In the Design Year, the No-Build Alternative and the Parkway Alternative options have a new signal on Richardson Avenue at Gorgas Avenue/Lyon Street. Timing plans for those new signals were developed in accordance with the existing signal timing progression used for downstream/upstream signals. Fixed signal timing plans for new signals on other roadways were optimized to provide the least amount of intersection delay.

7.3.1 Previously Studied Intersections

The refined version of the Parkway Alternative also has two additional intersections, located where the southbound and northbound ramps link to the connected Marina Boulevard/Girard Road.

The AM Intersection LOS analysis results are shown in Table 7.3-1, with the PM Intersection LOS analysis results summarized in Table 7.3-2. Although LOS describes the overall measure of effectiveness for an intersection, individual approaches may operate at a better or worse LOS.

Findings

The AM peak hour analysis in Table 7.3-1 shows that intersections generally operate at the same level in all alternatives. The Refined Presidio Parkway alternative would result in small shifts in traffic so that the estimated average level of service at some intersections changed; these changes were generally less than five seconds average delay, and in some cases result in small shifts between Levels of Service A, B and C. The analysis shows that the intersections in the study area would continue to operate with acceptable level of service for all alternatives except the two unsignalized intersections along Marina (Marina at Divisadero and Marina at Broderick). Both of these intersections operate at LOS F during the existing conditions with significant delays; the Refined Presidio Parkway alternative would result in less delay than the No Build or the baseline, even though they continue to operate at Level of Service F.

The PM peak hour analysis in Table 7.3-2 shows that intersections generally operate at the same level in all alternatives. The Refined Presidio Parkway alternative would result in small shifts in traffic so that the estimated average level of service at some intersections changed; these changes were generally less than five seconds average delay, and in some cases result in small shifts between Levels of Service A, B and C. The analysis shows that the intersections in the study area would continue to operate with acceptable level of service for all alternatives except the two unsignalized intersections along Marina (Marina at Divisadero and Marina at Broderick). Both of these intersections operate at LOS F during the existing conditions with significant delays; the Refined Presidio Parkway alternative would result in less delay than the No Build or the baseline, even though they continue to operate at Level of Service F.

With the exception of the Parkway alternatives during the AM and Weekend Peak periods, these intersections would continue to experience significant delays. It should be noted that the delay in most alternatives is less than the delay during the existing conditions and very similar to forecast delay that would occur during the No Build Alternative project condition.

Detailed technical calculations are provided in Appendix S-1.

TABLE 7.3-1
AM PEAK HOUR INTERSECTION LEVEL OF SERVICE RESULTS BY ALTERNATIVE

Intersection				Alternative		
					Design Year	
No.	North/South	East/West		Base Year	1 No Build	5 Refined Presidio Parkway
1	Lyon	Marina	Control Delay [1] LOS	Signal 13 B	Signal 10 A	Signal 15 B
2	101 / Richardson	Francisco	Control Delay [1] LOS	Signal 34 C	Signal 35 C	Signal 28 C
3	Merchant (GGB Viewing Area)	Lincoln (east)	Control Delay [1] LOS	2-way [2] 13 B	All-way 18 C	All-way 20 C
4	Merchant	Lincoln (west)	Control Delay [1] LOS	2-way [2] 10 A	Signal 15 B	Signal 14 B
5	Girard	Lincoln	Control Delay [1] LOS	2-way [2] <1 A	2-way [2] 11 B	All-way 17 C
6	Halleck	Mason	Control Delay [1] LOS	All-way 6 A	All-way 7 A	All-way 6 A
7	US 101/ Richardson	Gorgas / Lyon	Control Delay [1] LOS	- - -	Signal 17 B	Signal 13 B
8	Marina / Girard	Gorgas / US 101 SB Ramps	Control Delay [1] LOS	- - -	- - -	Signal 18 B
9	Marina / Girard	US 101 NB Ramps	Control Delay [1] LOS	- - -	- - -	Signal 7 A
10	Broderick	Marina	Control Delay [1] LOS	All-way 59 F	All-way 99 F	All-way 55 F
11	Divisadero	Marina	Control Delay [1] LOS	All-way 79 F	All-way >100 F	All-way 58 F
12	101 / Richardson	Chestnut	Control Delay [1] LOS	Signal 12 B	Signal 14 B	Signal 21 C

Notes

1. Delay is measured in seconds per vehicle
2. For two-way stop controlled intersections, the delay and LOS for the worst movement is given

TABLE 7.3-1
AM PEAK HOUR INTERSECTION LEVEL OF SERVICE RESULTS BY ALTERNATIVE (Continued)

Intersection				Alternative		
					Design Year	
No.	North/South	East/West		Base Year	1 No Build	5 Refined Presidio Parkway
13[3]	101 / Richardson	Lombard	Control Delay [1] LOS	Signal 10 B	Signal 9 A	Signal 3 A
14[3]	101 / Lombard	Broderick	Control Delay [1] LOS	Signal 21 C	Signal 21 C	Signal 13 B
15	Lyon	Lombard Gate	Control Delay [1] LOS	All-way 29 D	Signal 26 C	Signal 19 B
16	Presidio	Pacific	Control Delay [1] LOS	All-way 16 C	Signal 15 B	Signal 13 B
17	Park Presidio	Lake	Control Delay [1] LOS	Signal 17 B	Signal 24 C	Signal 24 C
18[4]	Merchant (GGB Viewing Area)	NB 101 Ramps	Control Delay [1] LOS	All-way 9 A	All-way 12 B	All-way 24 C

Notes

1. Delay is measured in seconds per vehicle
3. Intersection #14, Lombard and Broderick, and #13, Lombard and Richardson are coordinated.
4. The intersection of Merchant Road and GGB Viewing Area has a free northbound left turn and a free eastbound west turn. The delay has been calculated based on an all-way stop

Source: DKS Associates, 2006

TABLE 7.3-2
PM PEAK HOUR INTERSECTION LEVEL OF SERVICE RESULTS BY ALTERNATIVE

Intersection				**Alternative**		
					Design Year	
No.	**North/South**	**East/West**		**Base Year**	**1 No Build**	**5 Refined Presidio Parkway**
1	Lyon	Marina	Control	Signal	Signal	Signal
			Delay [1]	18	9	15
			LOS	B	A	B
2	Richardson	Francisco	Control	Signal	Signal	Signal
			Delay [1]	10	14	16
			LOS	A	B	B
3	Merchant (GGB Viewing Area)	Lincoln (east)	Control	2-way [2]	All-way	All-way
			Delay [1]	12	15	13
			LOS	B	C	B
4	Merchant	Lincoln (west)	Control	2-way [2]	Signal	Signal
			Delay [1]	11	17	12
			LOS	B	B	B
5	Girard	Lincoln	Control	2-way [2]	2-way [2]	All-way
			Delay [1]	<1	13	16
			LOS	A	B	C
6	Halleck	Mason	Control	All-way	All-way	All-way
			Delay [1]	6	7	7
			LOS	A	A	A
7	Richardson / 101	Gorgas / Lyon	Control	-	Signal	Signal
			Delay [1]	-	17	16
			LOS	-	B	B
8	Marina / Girard	Gorgas / 101 SB Ramps	Control	-	-	Signal
			Delay [1]	-	-	15
			LOS	-	-	B
9	Marina / Girard	101 NB Ramps	Control	-	-	Signal
			Delay [1]	-	-	8
			LOS	-	-	A
10	Broderick	Marina	Control	All-way	All-way	All-way
			Delay [1]	>100	>100	79
			LOS	F	F	F
11	Divisadero	Marina	Control	All-way	All-way	All-way
			Delay [1]	>100	>100	78
			LOS	F	F	F
12	Richardson	Chestnut	Control	Signal	Signal	Signal
			Delay [1]	15	17	13
			LOS	B	B	B

Notes
1. Delay is measured in seconds per vehicle
2. For two-way stop controlled intersections, the delay and LOS for the worst movement is given

TABLE 7.3-2
PM PEAK HOUR INTERSECTION LEVEL OF SERVICE RESULTS BY ALTERNATIVE
(Continued)

Intersection				Alternative		
					Design Year	
No.	North/South	East/West		Base Year	1 No Build	5 Refined Presidio Parkway
13[3]	Richardson	Lombard	Control	Signal	Signal	Signal
			Delay [1]	5	7	3
			LOS	A	A	A
14[3]	101 / Lombard	Broderick	Control	Signal	Signal	Signal
			Delay [1]	25	22	17
			LOS	C	C	B
15	Lyon	Lombard Gate	Control	All-way	Signal	Signal
			Delay [1]	18	20	16
			LOS	C	C	B
16	Presidio	Pacific	Control	All-way	Signal	Signal
			Delay [1]	19	16	14
			LOS	C	B	B
17	Park Presidio	Lake	Control	Signal	Signal	Signal
			Delay [1]	21	38	35
			LOS	C	D	C
18[4]	Merchant (GGB Viewing Area)	NB 101 Ramps	Control	All-way	All-way	All-way
			Delay [1]	13	11	15
			LOS	B	B	B

Notes
1. Delay is measured in seconds per vehicle
3. Intersection #14, Lombard and Broderick, and #13, Lombard and Richardson are coordinated.
4. The intersection of Merchant Road and GGB Viewing Area has a free northbound left turn and a free eastbound west turn. The delay has been calculated based on an all-way stop

Source: DKS Associates, 2006

7.3.2 Additionally-Studied Intersections

Additionally-studied intersections were selected to cover concerns that the base Traffic and Transportation Report did not study these. The additional intersections are listed in Section 7.2.

The analysis for these intersections is based upon travel estimates and forecasts obtained from the San Francisco Countywide Model, which was the same source of the data for the original intersections. It is noted that the travel model was not specifically validated for turning movement volumes. A review of these volumes compared with data made available from the San Francisco Metropolitan Transportation Authority (Department of Parking and Traffic) suggests that they are reasonable approximations of traffic counts.

Many of the additional intersections are all-way stops. The methodology for analyzing all-way stops calculates delay from all vehicles approaching the intersection, some approaches may experience a higher average delay at the approach with the greatest volume. In particular, some residents have noted that there may be additional traffic at certain times during the day as a result of undue delays on Richardson Avenue and Lombard Street. These occurrences were not identified in the base year model to be high enough to deteriorate the calculated level of service to an unreasonable condition. The future year forecasts are a result of changing travel patterns in the area.

Findings

The AM peak hour analysis of additional intersections is summarized in Table 7.3-3. The analysis shows that most of the additional intersections that were analyzed are projected to perform at Level of Service A or B in all base and future years. Intersections along Divisadero Street are projected to operate at Level of Service C and D in all scenarios. The intersection of Divisadero Street and Lombard Street is shown to have improvement of 9 seconds between the No Build and the Refined Presidio Parkway condition as a result of minor shifts in traffic flows through the Marina District. The intersection of Divisadero Street and Greenwich Street is projected to deteriorate slightly between the No Build and Refined Presidio Parkway conditions by nine seconds, resulting in Level of Service D, which is acceptable.

The PM peak hour analysis of additional intersections is summarized in Table 7.3-4. This analysis also shows that most of the additional intersections that were analyzed are projected to perform at Level of Service A, B or C in both the base and future years. While most show average delays varying by less than five seconds, there are a two locations where changes are noted between the No Build and Refined Presidio Parkway Condition – at Divisadero Street and Lombard Street, and at Van Ness Avenue and Bay Street. The Divisadero Street and Lombard Street is shown to have a deterioration of 10 seconds between the No Build and the Refined Presidio Parkway condition as a result of minor shifts in traffic flows through the Marina District. Bay Street and Van Ness Avenue is projected to improve by 18 seconds between the No Build and Refined Presidio Parkway conditions. The intersection of Bay Street and Laguna Street is projected to operate at Level of Service E in both future year scenarios. Two intersections -- Beach Street and Marina Boulevard, and Bay Street and Van Ness Avenue -- operate at Level of Service E in the base year condition, but are anticipated to improve to Level of Service D or better in all design year alternatives.

Technical details of the assumptions and results are provided in Appendix S-1.

TABLE 7.3-3
AM PEAK HOUR LEVEL OF SERVICE RESULTS BY ALTERNATIVE FOR ADDITIONAL INTERSECTIONS

Intersection				Alternative		
					Design Year	
No.	North/South	East/West		Base Year	1 No Build	5 Refined Presidio Parkway
1	Baker	Beach	Control Delay[1] LOS	2-way [2] 7 A	2-way [2] <1 A	2-way [2] 1 A
2	Baker	Francisco	Control Delay LOS	All-way 8 A	All-way 11 B	All-way 7 A
3	Baker	Lombard	Control Delay [1] LOS	All-way 10 A	All-way 9 A	All-way 12 B
4	Baker	Greenwich	Control Delay [1] LOS	All-way 8 A	All-way 8 A	All-way 9 A
5	Baker	Filbert	Control Delay [1] LOS	All-way 8 A	All-way 8 A	All-way 9 A
6	Broderick	Beach	Control Delay[1] LOS	All-way 8 A	All-way 7 A	All-way 7 A
7	Broderick	Francisco	Control Delay [1] LOS	2-way [2] 10 B	2-way [2] 14 B	2-way [2] 9 A
8	Broderick	Chestnut	Control Delay [1] LOS	All-way 9 A	All-way 9 A	All-way 9 A
9	Broderick	Greenwich	Control Delay [1] LOS	All-way 9 A	All-way 9 A	All-way 11 B
10	Broderick	Filbert	Control Delay LOS	All-way 8 A	All-way 8 A	All-way 8 A
11	Divisadero	Francisco	Control Delay [1] LOS	All-way 8 A	All-way 8 A	All-way 7 A
12	Divisadero	Chestnut	Control Delay [1] LOS	All-way 13 B	All-way 15 B	All-way 9 A

Notes
1. Delay is measured in seconds per vehicle
2. For two-way stop controlled intersections, the delay and LOS for the worst movement is given

Source: DKS Associates, 2006

TABLE 7.3-3
AM PEAK HOUR LEVEL OF SERVICE RESULTS BY ALTERNATIVE FOR ADDITIONAL INTERSECTIONS (Continued)

Intersection				Alternative		
					Design Year	
No.	**North/South**	**East/West**		**Base Year**	**1 No Build**	**5 Refined Presidio Parkway**
13	Divisadero	Lombard	Control Delay [1] LOS	Signal 42 D	Signal 36 D	Signal 27 C
14	Divisadero	Greenwich	Control Delay [1] LOS	All-way 12 B	All-way 17 C	All-way 26 D
15	Divisadero	Filbert	Control Delay [1] LOS	All-way 14 B	All-way 18 C	All-way 18 C
17	Fillmore	Lombard	Control Delay [1] LOS	Signal 14 B	Signal 14 B	Signal 14 B
18	Scott / Cervantes	Marina	Control Delay [1] LOS	Signal 19 B	Signal 15 B	Signal 13 B
19	Buchanan / Marina	Beach	Control Delay [1] LOS	Signal 9 A	Signal 8 A	Signal 8 A
20	Laguna	Bay	Control Delay [1] LOS	Signal 34 C	Signal 32 C	Signal 33 C
21	Van Ness	Bay	Control Delay [1] LOS	Signal 19 B	Signal 16 B	Signal 15 B
22	Van Ness	Lombard	Control Delay [1] LOS	Signal 19 B	Signal 17 B	Signal 17 B

Notes
1. Delay is measured in seconds per vehicle

Source: DKS Associates, 2006

TABLE 7.3-4
PM PEAK HOUR LEVEL OF SERVICE RESULTS BY ALTERNATIVE FOR ADDITIONAL INTERSECTIONS

Intersection				Alternative		
					Design Year	
No.	North/South	East/West		Base Year	1 No Build	5 Refined Presidio Parkway
1	Baker	Beach	Control Delay LOS	2-way [2] 9 A	2-way [2] 9 A	2-way [2] <4 A
2	Baker	Francisco	Control Delay LOS	All-way 8 A	All-way 9 A	All-way 9 A
3	Baker	Lombard	Control Delay [1] LOS	All-way 9 A	All-way 8 A	All-way 10 B
4	Baker	Greenwich	Control Delay [1] LOS	All-way 7 A	All-way 7 A	All-way 8 A
5	Baker	Filbert	Control Delay [1] LOS	All-way 7 A	All-way 7 A	All-way 8 A
6	Broderick	Beach	Control Delay[1] LOS	All-way 7 A	All-way 8 A	All-way 7 A
7	Broderick	Francisco	Control Delay [1] LOS	2-way [2] 10 B	2-way [2] 11 B	2-way [2] 14 B
8	Broderick	Chestnut	Control Delay [1] LOS	All-way 10 B	All-way 11 B	All-way 9 A
9	Broderick	Greenwich	Control Delay [1] LOS	All-way 9 A	All-way 9 A	All-way 9 A
10	Broderick	Filbert	Control Delay LOS	All-way 8 A	All-way 9 A	All-way 9 A
11	Divisadero	Francisco	Control Delay [1] LOS	All-way 8 A	All-way 9 A	All-way 9 A
12	Divisadero	Chestnut	Control Delay [1] LOS	All-way 13 B	All-way 18 C	All-way 14 B

Notes

1. Delay is measured in seconds per vehicle
2. For two-way stop controlled intersections, the delay and LOS for the worst movement is given

Source: DKS Associates, 2006

TABLE 7.3-4
PM PEAK HOUR LEVEL OF SERVICE RESULTS BY ALTERNATIVE FOR ADDITIONAL INTERSECTIONS (Continued)

Intersection				Alternative		
					Design Year	
No.	**North/South**	**East/West**		**Base Year**	**1 No Build**	**5 Refined Presidio Parkway**
13	Divisadero	Lombard	Control Delay [1] LOS	Signal 12 B	Signal 13 B	Signal 23 C
14	Divisadero	Greenwich	Control Delay [1] LOS	All-way 15 B	All-way 16 C	All-way 16 C
15	Divisadero	Filbert	Control Delay [1] LOS	All-way 15 C	All-way 17 C	All-way 16 C
17	Fillmore	Lombard	Control Delay [1] LOS	Signal 14 B	Signal 15 B	Signal 20 C
18	Scott / Cervantes	Marina	Control Delay [1] LOS	Signal 11 B	Signal 12 B	Signal 13 B
19	Buchanan / Marina	Beach	Control Delay [1] LOS	Signal 60 E	Signal 32 C	Signal 31 C
20	Laguna	Bay	Control Delay [1] LOS	Signal 41 D	Signal 58 E	Signal 58 E
21	Van Ness	Bay	Control Delay [1] LOS	Signal 80 E	Signal 35 D	Signal 17 B
22	Van Ness	Lombard	Control Delay [1] LOS	Signal 30 C	Signal 27 C	Signal 30 C

Notes
1. Delay is measured in seconds per vehicle

Source: DKS Associates, 2006

7.4 SEGMENT LEVEL OF SERVICE

As a result of the Refined Presidio Parkway Alternative, traffic volumes on several mainline segments are projected to shift slightly. Because of these shifts, a reevaluation of the projected segment levels of service has been performed.

A full explanation of the segment level of service methodology is found in Chapter 2 of the Traffic and Transit Operations Report. It is noted that the enumeration of the segments for the Urban Street Segment Level of Service tables are between 5 and 8, corresponding to the order of the segments in the Highway Level of Service tables.

Findings

The results are shown in Tables 7.4-1 and 7.4-2 for the AM peak hour condition as applied to Highway and Urban Street segment level of service. The tables demonstrate the refined alternative in comparison with the No Build Alternative and the Baseline condition. These results demonstrate that most of the highway segments are now similar between the Refined Presidio Parkway Alternative and the No Build condition. As a result of the minor shifts in traffic volumes, the resulting shifts did not result in the occurrence of new roadway deficiencies of either highway or urban street segments except for the Golden Gate Bridge in the non-peak direction. This shift is a result of variations in the calculations from the San Francisco Countywide Model rather than as a result of the Refined Presidio Parkway alternative.

The PM peak hour condition analysis is summarized in Tables 7.4-3 and 7.4-4 for Highway and Urban Street segments respectively. Again, these results demonstrate that most of the highway segments are now similar between the Refined Presidio Parkway Alternative and the No Build condition. As a result of the minor shifts in traffic volumes, the resulting shifts did not result in the occurrence of new roadway deficiencies of either highway or urban street segments. Notable changes are observed with northbound Richardson Avenue traffic in the Urban Street Segment level of service for the PM condition. This is projected to operate satisfactorily in the base year, but operate at Level of Service E in both the No Build and Refined Presidio Parkway Alternatives by the design year. In addition, the northbound Golden Gate Bridge segment is projected to deteriorate from Level of Service E to Level of Service F, and the southbound Golden Gate Bridge segment is projected to deteriorate from Level of Service C to Level of Service E in both design year alternatives.

TABLE 7.4-1
HIGHWAY SEGMENT LEVEL OF SERVICE -- AM PEAK HOUR

No.	Location	Dir	Criteria	Unit	Base Year	Design Year: 1 No Build	Design Year: 5 Refined Presidio Parkway
1	US 101 From the Merchant Drive Ramps to Park Presidio Blvd	SB	Peak Hourly Volume	vehicles	6150	6441	6540
			Lanes	lanes	4	4	4
			Flow Rate	pc/h/lane	1537	1610	1635
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*50*	*49*	*49*
			Density	*v/lane/mile*	*31*	*33*	*33*
			LOS		D	D	D
2[1]	US 101 From Park Presidio Blvd to the Merchant Drive Ramps	NB	Peak Hourly Volume	vehicles	2994	5019	5092
			Lanes	number	3	4	4
			Flow Rate	pc/h/lane	998	1255	1273
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*
			Density	*v/lane/mile*	*20*	*25*	*26*
			LOS		C	C[1]	C[1]
3	US 101 From Park Presidio to the Marina Blvd Access Ramps	SB	Peak Hourly Volume	vehicles	5203	4981	4886
			Lanes	number	4	4	4
			Flow Rate	pc/h/lane	1301	1245	1221
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*
			Density	*v/lane/mile*	*26*	*25*	*24*
			LOS		D	C	C
4	US 101 From the Marina Blvd Access Ramps to Park Presidio	NB	Peak Hourly Volume	vehicles	2049	2947	2940
			Lanes	number	3	3	3
			Flow Rate	pc/h/lane	683	982	980
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*
			Density	*v/lane/mile*	*14*	*20*	*20*
			LOS		B	C	C
5	Richardson From the Marina Blvd Access Ramps to north of Lyon St	SB	Peak Hourly Volume	vehicles	3717	3325	2899
			Lanes	lanes	2	2	3
			Flow Rate	pc/h/lane	1858	1663	966
			Free Flow Speed	*miles/hour*	*50*	*50*	*45*
			Congested Speed	*miles/hour*	*48*	*49*	*n/a*
			Density	*v/lane/mile*	*39*	*34*	*22*
			LOS		E	D	C
6	Richardson from north of Lyon St to the Marina Blvd Access Ramps	NB	Peak Hourly Volume	vehicles	1443	2141	2143
			Lanes	number	2	2	2
			Flow Rate	pc/h/lane	721	1071	1071
			Free Flow Speed	*miles/hour*	*50*	*50*	*45*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*
			Density	*v/lane/mile*	*14*	*21*	*24*
			LOS		B	C	C

Source: DKS Associates, 2006

TABLE 7.4-1
HIGHWAY SEGMENT LEVEL OF SERVICE -- AM PEAK HOUR (Continued)

No.	Location	Dir	Criteria	Unit	Base Year	Design Year: 1 No Build	Design Year: 5 Refined Presidio Parkway
7	Marina Blvd From the Doyle Drive Merge to Lyon St	EB	Peak Hourly Volume	vehicles	1486	1656	n/a[1]
			Lanes	number	2	2	n/a[1]
			Flow Rate	pc/h/lane	743	828	n/a[1]
			Free Flow Speed	*miles/hour*	*35*	*35*	*n/a*[1]
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*[1]
			Density	*v/lane/mile*	*21*	*24*	*n/a*[1]
			LOS		C	C	n/a[1]
8	Marina Blvd From Lyon St to the Doyle Drive merge	WB	Peak Hourly Volume	vehicles	606	806	n/a[1]
			Lanes	number	2	2	n/a[1]
			Flow Rate	pc/h/lane	303	403	n/a[1]
			Free Flow Speed	*miles/hour*	*35*	*35*	*n/a*[1]
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*[1]
			Density	*v/lane/mile*	*9*	*12*	*n/a*[1]
			LOS		A	B	n/a[1]
9	Park Presidio From the US 101 Ramps to the Park Presidio Tunnel	SB	Peak Hourly Volume	vehicles	2380	2480	2594
			Lanes	number	2	2	2
			Flow Rate	pc/h/lane	1190	1240	1297
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*
			Density	*v/lane/mile*	*24*	*25*	*26*
			LOS		C	C	C
10	Park Presidio From the Park Presidio Tunnel to the US 101 Ramps	NB	Peak Hourly Volume	vehicles	2379	3092	3092
			Lanes	number	2	2	2
			Flow Rate	pc/h/lane	1190	1546	1546
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*50*	*50*
			Density	*v/lane/mile*	*24*	*31*	*32*
			LOS		C	D	D
11	US 101 between Park Presidio on and off-ramps	SB	Peak Hourly Volume	vehicles	4217	4345	4261
			Lanes	number	3	3	3
			Flow Rate	pc/h/lane	1406	1448	1420
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*50*	*50*	*50*
			Density	*v/lane/mile*	*28*	*29*	*28*
			LOS		D	D	D
12	US 101 between Park Presidio off and on-ramps	NB	Hour Volume	vehicles	1601	2564	2940
			Lanes	number	3	3	3
			Flow Rate	pc/h/lane	534	855	980
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*
			Density	*v/lane/mile*	*11*	*17*	*20*
			LOS		A	B	C

Notes

1. This segment is coded as an Urban Street Segment under the two Parkway alternatives

Source: DKS Associates, 2006

TABLE 7.4-1
HIGHWAY SEGMENT LEVEL OF SERVICE -- AM PEAK HOUR (Continued)

No.	Location	Dir	Criteria	Unit	Base Year	Design Year 1 No Build	Design Year 5 Refined Presidio Parkway
13	US 101 between Marin County and Merchant Road (Golden Gate Bridge)	SB	Peak Hourly Volume	vehicles	5780	6098	6081
			Lanes	number	4	3	3
			Flow Rate	pc/h/lane	1445	2033	2027
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*50*	*46*	*46*
			Density	*v/lane/mile*	*29*	*44*	*44*
			LOS		D	F[2]	F[2]
14	US 101 between Merchant Road and Marin County (Golden Gate Bridge)	NB	Peak Hourly Volume	vehicles	2862	4990	4985
			Lanes	number	2	3	3
			Flow Rate	pc/h/lane	1431	1663	1662
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*50*	*49*	*49*
			Density	*v/lane/mile*	*29*	*34*	*34*
			LOS		D	D[3]	D[3]

Notes

2. If Golden Gate Bridge southbound configuration remains at the current four lanes, this segment would operate at LOS D for all future design year scenarios. However, the analysis also shows that queuing would be significant on Doyle Drive if this configuration is used, and that queuing on the bridge would be minimal in this configuration
3. If Golden Gate Bridge northbound configuration remains at the current two lanes, this segment would operate at LOS F for all future design year scenarios

Source: DKS Associates, 2006

TABLE 7.4-2
URBAN STREET SEGMENT LEVEL OF SERVICE -- AM PEAK HOUR

No.	Location	Dir	Criteria	Unit	Base Year	Design Year 1 No Build	Design Year 5 Refined Presidio Parkway
5	Richardson Street from Francisco to north of Lyon Street	SB	Urban Street Classification		III	III	III
			Peak Hourly Volume	vehicles	3717	3094	2986
			Speed	*FFS*	*35*	*35*	*35*
				calculated	*19*	*23*	*24*
			LOS		C	C	C
6	Richardson Street from north of Lyon Street to Francisco Street.	NB	Urban Street Classification		III	III	III
			Peak Hourly Volume	vehicles	1443	2259	2158
			Speed	*FFS*	*35*	*35*	*35*
				calculated	*26*	*22*	*21*
			LOS		B	C	C
7	Marina Blvd From the Doyle Drive Merge to Lyon St	EB	Urban Street Classification		III	III	IV
			Peak Hourly Volume	vehicles	1486	1656	1300
			Speed	*FFS*	*35*	*35*	*30*
				calculated	*26*	*26*	*26*
			LOS		B	B	B
8	Marina Blvd From Lyon St to the Doyle Drive merge	WB	Urban Street Classification		III	III	IV
			Peak Hourly Volume	vehicles	606	806	718
			Speed	*FFS*	*35*	*35*	*30*
				calculated	*27*	*27*	*26*
			LOS		B	B	B

Source: DKS Associates, 2006

TABLE 7.4-3
HIGHWAY SEGMENT LEVEL OF SERVICE -- PM PEAK HOUR

No.	Location	Dir	Criteria	Unit	Base Year	Design Year 1 No Build	Design Year 5 Refined Presidio Parkway
1	US 101 From the Merchant Drive Ramps to Park Presidio Blvd	SB	Peak Hourly Volume	vehicles	3120	5074	5602
			Lanes	lanes	3	4	4
			Flow Rate	pc/h/lane	1040	1268	1400
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*50*
			Density	*v/lane/mile*	*21*	*25*	*28*
			LOS		C	C	D
2	US 101 From Park Presidio Blvd to the Merchant Drive Ramps	NB	Peak Hourly Volume	vehicles	5649	6219	6403
			Lanes	number	4	4	4
			Flow Rate	pc/h/lane	1412	1555	1601
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*50*	*49*	*49*
			Density	*v/lane/mile*	*28*	*32*	*33*
			LOS		D	D	D
3	US 101 From Park Presidio to the Marina Blvd Access Ramps	SB	Peak Hourly Volume	vehicles	2608	3590	3715
			Lanes	number	2	4	4
			Flow Rate	pc/h/lane	1304	897	929
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*
			Density	*v/lane/mile*	*26*	*18*	*19*
			LOS		D	B	C
4	US 101 From the Marina Blvd Access Ramps to Park Presidio	NB	Peak Hourly Volume	vehicles	4619	4806	4746
			Lanes	number	3	3	3
			Flow Rate	pc/h/lane	1540	1602	1582
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*50*	*49*	*49*
			Density	*v/lane/mile*	*31*	*33*	*32*
			LOS		D	D	D
5	Richardson From the Marina Blvd Access Ramps to north of Lyon St	SB	Peak Hourly Volume	vehicles	1734	2543	2157
			Lanes	lanes	2	2	3
			Flow Rate	pc/h/lane	867	1271	719
			Free Flow Speed	*miles/hour*	*50*	*50*	*45*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*
			Density	*v/lane/mile*	*17*	*25*	*16*
			LOS		B	C	B
6	Richardson from north of Lyon St to the Marina Blvd Access Ramps	NB	Peak Hourly Volume	vehicles	2802	2931	3074
			Lanes	number	2	2	2
			Flow Rate	pc/h/lane	1401	1466	1537
			Free Flow Speed	*miles/hour*	*50*	*50*	*45*
			Congested Speed	*miles/hour*	*50*	*50*	*45*
			Density	*v/lane/mile*	*28*	*29*	*35*
			LOS		D	D	D

Source: DKS Associates, 2006

TABLE 7.4-3
HIGHWAY SEGMENT LEVEL OF SERVICE – PM PEAK HOUR (Continued)

No.	Location	Dir	Criteria	Unit	Base Year	Design Year: 1 No Build	Design Year: 5 Refined Presidio Parkway
7	Marina Boulevard From the Doyle Drive Merge to Lyon St	EB	Peak Hourly Volume	vehicles	873	1047	n/a[1]
			Lanes	number	2	2	n/a[1]
			Flow Rate	pc/h/lane	437	523	n/a[1]
			Free Flow Speed	*miles/hour*	*35*	*35*	*n/a*[1]
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*[1]
			Density	*v/lane/mile*	*13*	*15*	*n/a*[1]
			LOS		B	B	n/a[1]
8	Marina Blvd From Lyon St to the Doyle Drive merge	WB	Peak Hourly Volume	vehicles	1817	1875	n/a[1]
			Lanes	number	2	2	n/a[1]
			Flow Rate	pc/h/lane	909	937	n/a[1]
			Free Flow Speed	*miles/hour*	*35*	*35*	*n/a*[1]
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*[1]
			Density	*v/lane/mile*	*26*	*27*	*n/a*[1]
			LOS		C	D	n/a[1]
9	Park Presidio From the US 101 Ramps to the Park Presidio Tunnel	SB	Peak Hourly Volume	vehicles	2251	2935	3058
			Lanes	number	2	2	2
			Flow Rate	pc/h/lane	1125	1468	1529
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*50*	*50*
			Density	*v/lane/mile*	*23*	*30*	*31*
			LOS		C	D	D
10	Park Presidio From the Park Presidio Tunnel to the US 101 Ramps	NB	Peak Hourly Volume	vehicles	2768	2864	2828
			Lanes	number	2	2	2
			Flow Rate	pc/h/lane	1384	1432	1414
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*50*	*50*
			Density	*v/lane/mile*	*28*	*29*	*28*
			LOS		D	D	D
11	US 101 between Park Presidio on and off-ramps	SB	Peak Hourly Volume	vehicles	1884	2929	3123
			Lanes	number	3	3	3
			Flow Rate	pc/h/lane	628	976	1041
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*n/a*
			Density	*v/lane/mile*	*13*	*20*	*21*
			LOS		B	C	C
12	US 101 between Park Presidio off and on-ramps	NB	Peak Hourly Volume	vehicles	3605	4016	4746
			Lanes	number	3	3	3
			Flow Rate	pc/h/lane	1202	1339	1582
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*n/a*	*n/a*	*50*
			Density	*v/lane/mile*	*24*	*27*	*32*
			LOS		C	D	D

Notes:

1. This segment is coded as an Urban Street Segment under the two Parkway alternatives

Source: DKS Associates, 2006

TABLE 7.4-3
HIGHWAY SEGMENT LEVEL OF –SERVICE -- PM PEAK HOUR (Continued)

No.	Location	Dir	Criteria	Unit	Base Year	Design Year: 1 No Build	Design Year: 5 Refined Presidio Parkway
13	US 101 between Marin County and Merchant Road (Golden Gate Bridge)	SB	Peak Hourly Volume	vehicles	2987	5275	5736
			Lanes	number	3	3	3
			Flow Rate	pc/h/lane	996	1758	1912
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*N/A*	*48*	*47*
			Density	*v/lane/mile*	*20*	*37*	*41*
			LOS		C	E[2]	E[2]
14	US 101 between Merchant Road and Marin County (Golden Gate Bridge)	NB	Peak Hourly Volume	vehicles	5890	6450	6497
			Lanes	number	3	3	3
			Flow Rate	pc/h/lane	1963	2150	2166
			Free Flow Speed	*miles/hour*	*50*	*50*	*50*
			Congested Speed	*miles/hour*	*47*	*45*	*45*
			Density	*v/lane/mile*	*42*	*47*	*48*
			LOS		E	F[2]	F[2]

Notes:

2. Golden Gate Bridge segments are projected to operate at a deficient level of service in all scenarios in the design year in both directions.

Source: DKS Associates, 2006

TABLE 7.4-4
URBAN STREET SEGMENT LEVEL OF SERVICE -- PM PEAK HOUR

						Design Year	
No.	**Location**	**Dir**	**Criteria**	**Unit**	**Base Year**	**1 No Build**	**5 Refined Presidio Parkway**
5	Richardson Street from Francisco to north of Lyon Street	SB	Urban Street Classification		III	III	III
			Peak Hourly Volume	vehicles	1734	2439	2403
			Speed	*FFS*	*35*	*35*	*35*
				calculated	*26*	*26*	*26*
			LOS		B	B	B
6	Richardson Street from north of Lyon Street to Francisco Street.	NB	Urban Street Classification		III	III	III
			Peak Hourly Volume	vehicles	2776	2772	3081
			Speed	*FFS*	*35*	*35*	*35*
				calculated	*14*	*13*	*13*
			LOS		D	E	E
7	Marina Blvd From the Doyle Drive Merge to Lyon St	EB	Urban Street Classification		III	III	IV
			Peak Hourly Volume	vehicles	873	1047	1022
			Speed	*FFS*	*35*	*35*	*30*
				calculated	*27*	*27*	*26*
			LOS		B	B	B
8	Marina Blvd From Lyon St to the Doyle Drive merge	WB	Urban Street Classification		III	III	IV
			Peak Hourly Volume	vehicles	1817	1875	1367
			Speed	*FFS*	*35*	*35*	*30*
				calculated	*25*	*25*	*27*
			LOS		B	B	A

Source: DKS Associates, 2006

APPENDIX S-1

DETAILED INTERSECTION LEVEL OF SERVICE CALCULATIONS

2030 ALTERNATIVE 5

(Refined Presidio Parkway Alternative) AM

Original Intersections

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1286	14	3	709	0	4	0	1	7	0	5
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		0.95		1.00	0.95		1.00		1.00	1.00		1.00
Frt		1.00		1.00	1.00		1.00		0.85	1.00		0.85
Flt Protected		1.00		0.95	1.00		0.95		1.00	0.95		1.00
Satd. Flow (prot)		3573		1789	3579		1789		1601	1789		1601
Flt Permitted		1.00		0.11	1.00		0.95		1.00	0.95		1.00
Satd. Flow (perm)		3573		203	3579		1789		1601	1789		1601
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1286	14	3	709	0	4	0	1	7	0	5
RTOR Reduction (vph)	0	1	0	0	0	0	0	0	1	0	0	3
Lane Group Flow (vph)	0	1299	0	3	709	0	4	0	0	7	0	2
Turn Type				Perm			custom		custom	custom		custom
Protected Phases		8			8					2		
Permitted Phases		8		8			2		2	2		2
Actuated Green, G (s)		38.0		38.0	38.0		29.0		29.0	29.0		29.0
Effective Green, g (s)		38.0		38.0	38.0		29.0		29.0	29.0		29.0
Actuated g/C Ratio		0.51		0.51	0.51		0.39		0.39	0.39		0.39
Clearance Time (s)		4.0		4.0	4.0		4.0		4.0	4.0		4.0
Lane Grp Cap (vph)		1810		103	1813		692		619	692		619
v/s Ratio Prot		c0.36			0.20					c0.00		
v/s Ratio Perm				0.01			0.00		0.00			0.00
v/c Ratio		0.72		0.03	0.39		0.01		0.00	0.01		0.00
Uniform Delay, d1		14.3		9.3	11.4		14.1		14.1	14.2		14.1
Progression Factor		1.00		1.00	1.00		1.00		1.00	1.00		1.00
Incremental Delay, d2		2.5		0.5	0.6		0.0		0.0	0.0		0.0
Delay (s)		16.8		9.8	12.0		14.2		14.1	14.2		14.1
Level of Service		B		A	B		B		B	B		B
Approach Delay (s)		16.8			12.0			14.1			14.2	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	15.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	52.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	168	0	0	0	0	72	0	2986	0	0	1917	0
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			0.91			0.91	
Frt		1.00			0.86			1.00			1.00	
Flt Protected		0.95			1.00			1.00			1.00	
Satd. Flow (prot)		3400			1629			5142			5142	
Flt Permitted		0.71			1.00			1.00			1.00	
Satd. Flow (perm)		2541			1629			5142			5142	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	168	0	0	0	0	72	0	2986	0	0	1917	0
RTOR Reduction (vph)	0	0	0	0	7	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	168	0	0	65	0	0	2986	0	0	1917	0
Turn Type	Perm			Perm					Free			
Protected Phases		4			8			6			2	
Permitted Phases	4			8					Free			
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		875			561			2914			2914	
v/s Ratio Prot					0.04			c0.58			0.37	
v/s Ratio Perm		c0.07										
v/c Ratio		0.19			0.12			1.02			0.66	
Uniform Delay, d1		20.7			20.1			19.5			13.5	
Progression Factor		1.00			1.00			1.00			0.38	
Incremental Delay, d2		0.5			0.4			23.3			1.0	
Delay (s)		21.2			20.6			42.8			6.1	
Level of Service		C			C			D			A	
Approach Delay (s)		21.2			20.6			42.8			6.1	
Approach LOS		C			C			D			A	

Intersection Summary			
HCM Average Control Delay	28.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	80.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	2	249	81	531	128	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.87		1.00	1.00	0.97	
Flt Protected	1.00		0.95	1.00	1.00	
Satd. Flow (prot)	1631		1789	1883	1829	
Flt Permitted	1.00		0.65	1.00	1.00	
Satd. Flow (perm)	1631		1231	1883	1829	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	2	249	81	531	128	35
RTOR Reduction (vph)	144	0	0	0	18	0
Lane Group Flow (vph)	107	0	81	531	145	0
Turn Type			Perm			
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	23.5		24.0	24.0	24.0	
Effective Green, g (s)	23.5		24.0	24.0	24.0	
Actuated g/C Ratio	0.42		0.43	0.43	0.43	
Clearance Time (s)	4.0		4.0	4.0	4.0	
Lane Grp Cap (vph)	691		532	814	791	
v/s Ratio Prot	c0.07			c0.28	0.08	
v/s Ratio Perm			0.07			
v/c Ratio	0.16		0.15	0.65	0.18	
Uniform Delay, d1	9.9		9.6	12.5	9.7	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	0.5		0.6	4.0	0.5	
Delay (s)	10.4		10.2	16.5	10.2	
Level of Service	B		B	B	B	
Approach Delay (s)	10.4			15.7	10.2	
Approach LOS	B			B	B	

Intersection Summary			
HCM Average Control Delay	13.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	55.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	50.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	0	0	87	0	0	0	0	2899	0	0	2143	15
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	
Lane Util. Factor			1.00					0.91			0.91	
Frt			0.85					1.00			1.00	
Flt Protected			1.00					1.00			1.00	
Satd. Flow (prot)			1601					5142			5136	
Flt Permitted			1.00					1.00			1.00	
Satd. Flow (perm)			1601					5142			5136	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	0	87	0	0	0	0	2899	0	0	2143	15
RTOR Reduction (vph)	0	0	1	0	0	0	0	0	0	0	1	0
Lane Group Flow (vph)	0	0	86	0	0	0	0	2899	0	0	2157	0
Turn Type			Perm									
Protected Phases		4						6			2	
Permitted Phases			4									
Actuated Green, G (s)			23.0					59.0			59.0	
Effective Green, g (s)			23.0					59.0			59.0	
Actuated g/C Ratio			0.26					0.66			0.66	
Clearance Time (s)			4.0					4.0			4.0	
Lane Grp Cap (vph)			409					3371			3367	
v/s Ratio Prot								c0.56			0.42	
v/s Ratio Perm			c0.05									
v/c Ratio			0.21					0.86			0.64	
Uniform Delay, d1			26.3					12.2			9.2	
Progression Factor			1.00					1.00			1.00	
Incremental Delay, d2			1.2					3.1			0.9	
Delay (s)			27.5					15.4			10.2	
Level of Service			C					B			B	
Approach Delay (s)		27.5			0.0			15.4			10.2	
Approach LOS		C			A			B			B	

Intersection Summary			
HCM Average Control Delay	13.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	68.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	0	215	53	141	8	0	1278	211	498	3	0	35
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	
Lane Util. Factor		1.00			1.00		0.97	1.00			1.00	
Frt		0.97			1.00		1.00	0.89			0.88	
Flt Protected		1.00			0.95		0.95	1.00			1.00	
Satd. Flow (prot)		1833			1798		3471	1685			1643	
Flt Permitted		1.00			0.38		0.73	1.00			0.97	
Satd. Flow (perm)		1833			716		2676	1685			1603	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	215	53	141	8	0	1278	211	498	3	0	35
RTOR Reduction (vph)	0	10	0	0	0	0	0	95	0	0	12	0
Lane Group Flow (vph)	0	258	0	0	149	0	1278	615	0	0	26	0
Turn Type				Perm			Perm			Perm		
Protected Phases		4			8			6			2	
Permitted Phases		4		8			6			2		
Actuated Green, G (s)		23.5			23.5		58.5	58.5			58.5	
Effective Green, g (s)		23.5			23.5		58.5	58.5			58.5	
Actuated g/C Ratio		0.26			0.26		0.65	0.65			0.65	
Clearance Time (s)		4.0			4.0		4.0	4.0			4.0	
Lane Grp Cap (vph)		479			187		1739	1095			1042	
v/s Ratio Prot		0.14						0.36				
v/s Ratio Perm					c0.21		c0.48				0.02	
v/c Ratio		0.54			0.80		0.73	0.56			0.02	
Uniform Delay, d1		28.6			31.0		10.6	8.7			5.6	
Progression Factor		1.00			1.00		1.00	1.00			1.00	
Incremental Delay, d2		4.3			28.7		2.8	2.1			0.0	
Delay (s)		32.9			59.7		13.4	10.8			5.6	
Level of Service		C			E		B	B			A	
Approach Delay (s)		32.9			59.7			12.4			5.6	
Approach LOS		C			E			B			A	

Intersection Summary			
HCM Average Control Delay	17.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	75.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL2	NBL	NBR	SEL	SER
Lane Configurations											
Volume (vph)	228	1300	0	0	46	672	103	0	0	0	0
Ideal Flow (vphpl)	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				
Lane Util. Factor	1.00	0.95			1.00	1.00	1.00				
Frt	1.00	1.00			1.00	0.85	1.00				
Flt Protected	0.95	1.00			1.00	1.00	0.95				
Satd. Flow (prot)	1789	3579			1883	1601	1789				
Flt Permitted	0.73	1.00			1.00	1.00	0.95				
Satd. Flow (perm)	1369	3579			1883	1601	1789				
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	228	1300	0	0	46	672	103	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	228	1300	0	0	46	672	103	0	0	0	0
Turn Type	Perm					Free	custom		custom		
Protected Phases		4			8					6	
Permitted Phases	4					Free	2		2		
Actuated Green, G (s)	59.0	59.0			59.0	90.0	23.0				
Effective Green, g (s)	59.0	59.0			59.0	90.0	23.0				
Actuated g/C Ratio	0.66	0.66			0.66	1.00	0.26				
Clearance Time (s)	4.0	4.0			4.0		4.0				
Lane Grp Cap (vph)	897	2346			1234	1601	457				
v/s Ratio Prot		c0.36			0.02						
v/s Ratio Perm	0.17					c0.42	0.06				
v/c Ratio	0.25	0.55			0.04	0.42	0.23				
Uniform Delay, d1	6.4	8.4			5.5	0.0	26.5				
Progression Factor	1.00	1.00			1.00	1.00	1.00				
Incremental Delay, d2	0.7	0.9			0.1	0.8	1.1				
Delay (s)	7.1	9.3			5.5	0.8	27.6				
Level of Service	A	A			A	A	C				
Approach Delay (s)		9.0			1.1			27.6		0.0	
Approach LOS		A			A			C		A	

Intersection Summary			
HCM Average Control Delay	7.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	48.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	0	194	0	0	16	154	0	2557	429	0	1764	19
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		1.00			1.00			0.91			0.91	
Frt		1.00			0.88			0.98			1.00	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1883			1653			5031			5134	
Flt Permitted		1.00			1.00			1.00			1.00	
Satd. Flow (perm)		1883			1653			5031			5134	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	194	0	0	16	154	0	2557	429	0	1764	19
RTOR Reduction (vph)	0	0	0	0	10	0	0	26	0	0	1	0
Lane Group Flow (vph)	0	194	0	0	160	0	0	2960	0	0	1782	0
Turn Type	Perm			Perm								
Protected Phases		4			8			6			2	
Permitted Phases	4			8				6				
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		649			569			2851			2909	
v/s Ratio Prot		c0.10			0.10			c0.59			0.35	
v/s Ratio Perm												
v/c Ratio		0.30			0.28			1.04			0.61	
Uniform Delay, d1		21.6			21.4			19.5			12.9	
Progression Factor		1.00			1.00			0.36			1.00	
Incremental Delay, d2		1.2			1.2			18.6			0.9	
Delay (s)		22.7			22.6			25.7			13.8	
Level of Service		C			C			C			B	
Approach Delay (s)		22.7			22.6			25.7			13.8	
Approach LOS		C			C			C			B	

Intersection Summary			
HCM Average Control Delay	21.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	76.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations						
Volume (vph)	0	117	185	1743	2529	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00	1.00	0.76	0.94	
Frt		1.00	1.00	0.85	1.00	
Flt Protected		1.00	1.00	1.00	0.95	
Satd. Flow (prot)		1883	1883	3650	5046	
Flt Permitted		1.00	1.00	1.00	0.95	
Satd. Flow (perm)		1883	1883	3650	5046	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	117	185	1743	2529	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	117	185	1743	2529	0
Turn Type				custom		
Protected Phases			8		2	
Permitted Phases		4		8 2		
Actuated Green, G (s)		25.0	25.0	90.0	57.0	
Effective Green, g (s)		25.0	25.0	90.0	57.0	
Actuated g/C Ratio		0.28	0.28	1.00	0.63	
Clearance Time (s)		4.0	4.0		4.0	
Lane Grp Cap (vph)		523	523	3650	3196	
v/s Ratio Prot			0.10		c0.50	
v/s Ratio Perm		0.06		c0.48		
v/c Ratio		0.22	0.35	0.48	0.79	
Uniform Delay, d1		25.0	26.0	0.0	12.1	
Progression Factor		0.68	1.00	1.00	0.20	
Incremental Delay, d2		1.0	1.9	0.4	0.2	
Delay (s)		18.1	27.9	0.4	2.6	
Level of Service		B	C	A	A	
Approach Delay (s)		18.1	3.1		2.6	
Approach LOS		B	A		A	

Intersection Summary			
HCM Average Control Delay	3.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	64.5%	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	2306	407	0	1750	6	217	2	0	13	1	17
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		0.91			0.91			1.00			1.00	
Frt		0.98			1.00			1.00			0.93	
Flt Protected		1.00			1.00			0.95			0.98	
Satd. Flow (prot)		5026			5139			1795			1708	
Flt Permitted		1.00			1.00			0.71			0.88	
Satd. Flow (perm)		5026			5139			1328			1532	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	2306	407	0	1750	6	217	2	0	13	1	17
RTOR Reduction (vph)	0	27	0	0	0	0	0	0	0	0	13	0
Lane Group Flow (vph)	0	2686	0	0	1756	0	0	219	0	0	18	0
Turn Type							Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)		59.0			59.0			23.5			23.5	
Effective Green, g (s)		59.0			59.0			23.5			23.5	
Actuated g/C Ratio		0.65			0.65			0.26			0.26	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		3277			3350			345			398	
v/s Ratio Prot		c0.53			0.34							
v/s Ratio Perm								c0.16			0.01	
v/c Ratio		0.82			0.52			0.63			0.05	
Uniform Delay, d1		11.8			8.3			29.7			25.1	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		2.4			0.6			8.6			0.2	
Delay (s)		14.2			8.9			38.3			25.3	
Level of Service		B			A			D			C	
Approach Delay (s)		14.2			8.9			38.3			25.3	
Approach LOS		B			A			D			C	

Intersection Summary			
HCM Average Control Delay	13.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	90.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	79.1%	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)	354	77	0	0	231	2	0	0	0	0	0	16
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	1.00	1.00			1.00						1.00	
Frt	1.00	1.00			1.00						0.86	
Flt Protected	0.95	1.00			1.00						1.00	
Satd. Flow (prot)	1789	1883			1881						1629	
Flt Permitted	0.57	1.00			1.00						1.00	
Satd. Flow (perm)	1081	1883			1881						1629	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	354	77	0	0	231	2	0	0	0	0	0	16
RTOR Reduction (vph)	0	0	0	0	1	0	0	0	0	0	9	0
Lane Group Flow (vph)	354	77	0	0	232	0	0	0	0	0	7	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	44.0	44.0			44.0						38.0	
Effective Green, g (s)	44.0	44.0			44.0						38.0	
Actuated g/C Ratio	0.49	0.49			0.49						0.42	
Clearance Time (s)	4.0	4.0			4.0						4.0	
Lane Grp Cap (vph)	528	921			920						688	
v/s Ratio Prot		0.04			0.12						c0.00	
v/s Ratio Perm	c0.33											
v/c Ratio	0.67	0.08			0.25						0.01	
Uniform Delay, d1	17.5	12.3			13.4						15.1	
Progression Factor	1.00	1.00			1.00						1.00	
Incremental Delay, d2	6.6	0.2			0.6						0.0	
Delay (s)	24.1	12.4			14.0						15.1	
Level of Service	C	B			B						B	
Approach Delay (s)		22.0			14.0			0.0			15.1	
Approach LOS		C			B			A			B	

Intersection Summary			
HCM Average Control Delay	19.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	45.2%	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)	38	7	0	0	11	7	0	561	3	6	590	49
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		1.00			1.00			1.00			1.00	
Frt		1.00			0.95			1.00			0.99	
Flt Protected		0.96			1.00			1.00			1.00	
Satd. Flow (prot)		1807			1785			1882			1863	
Flt Permitted		0.82			1.00			1.00			1.00	
Satd. Flow (perm)		1546			1785			1882			1857	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	38	7	0	0	11	7	0	561	3	6	590	49
RTOR Reduction (vph)	0	0	0	0	5	0	0	0	0	0	3	0
Lane Group Flow (vph)	0	45	0	0	13	0	0	564	0	0	642	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		28.0			28.0			54.0			54.0	
Effective Green, g (s)		28.0			28.0			54.0			54.0	
Actuated g/C Ratio		0.31			0.31			0.60			0.60	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		481			555			1129			1114	
v/s Ratio Prot					0.01			0.30				
v/s Ratio Perm		c0.03									c0.35	
v/c Ratio		0.09			0.02			0.50			0.58	
Uniform Delay, d1		22.0			21.5			10.3			11.0	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.4			0.1			1.6			2.2	
Delay (s)		22.4			21.6			11.9			13.2	
Level of Service		C			C			B			B	
Approach Delay (s)		22.4			21.6			11.9			13.2	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	13.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	54.7%	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)	468	43	8	0	5	361	0	2263	1	0	2248	345
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	
Lane Util. Factor	1.00	1.00			1.00	1.00		0.91			0.91	
Frt	1.00	0.98			1.00	0.85		1.00			0.98	
Flt Protected	0.95	1.00			1.00	1.00		1.00			1.00	
Satd. Flow (prot)	1789	1839			1883	1601		5141			5039	
Flt Permitted	0.75	1.00			1.00	1.00		1.00			1.00	
Satd. Flow (perm)	1421	1839			1883	1601		5141			5039	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	468	43	8	0	5	361	0	2263	1	0	2248	345
RTOR Reduction (vph)	0	3	0	0	0	3	0	0	0	0	23	0
Lane Group Flow (vph)	468	48	0	0	5	358	0	2264	0	0	2570	0
Turn Type	Perm			Perm		Perm						
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8						
Actuated Green, G (s)	30.0	30.0			30.0	30.0		52.0			52.0	
Effective Green, g (s)	30.0	30.0			30.0	30.0		52.0			52.0	
Actuated g/C Ratio	0.33	0.33			0.33	0.33		0.58			0.58	
Clearance Time (s)	4.0	4.0			4.0	4.0		4.0			4.0	
Lane Grp Cap (vph)	474	613			628	534		2970			2911	
v/s Ratio Prot		0.03			0.00			0.44			c0.51	
v/s Ratio Perm	c0.33					0.22						
v/c Ratio	0.99	0.08			0.01	0.67		0.76			0.88	
Uniform Delay, d1	29.8	20.5			20.1	25.7		14.3			16.4	
Progression Factor	1.00	1.00			1.00	1.00		1.00			1.00	
Incremental Delay, d2	38.3	0.2			0.0	6.5		1.9			4.3	
Delay (s)	68.1	20.8			20.1	32.3		16.2			20.7	
Level of Service	E	C			C	C		B			C	
Approach Delay (s)		63.5			32.1			16.2			20.7	
Approach LOS		E			C			B			C	

Intersection Summary			
HCM Average Control Delay	23.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	102.0%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (vph)	516	5	11	55	39	101
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	516	5	11	55	39	101

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total (vph)	516	5	11	55	140
Volume Left (vph)	516	0	0	0	39
Volume Right (vph)	0	0	0	55	101
Hadj (s)	0.53	0.03	0.03	-0.67	-0.34
Departure Headway (s)	5.5	5.0	5.4	4.7	5.1
Degree Utilization, x	0.79	0.01	0.02	0.07	0.20
Capacity (veh/h)	644	705	625	719	644
Control Delay (s)	24.5	6.8	7.3	6.9	9.3
Approach Delay (s)	24.3		7.0		9.3
Approach LOS	C		A		A

Intersection Summary			
Delay	19.9		
HCM Level of Service	C		
Intersection Capacity Utilization	50.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	466	42	43	62	134	225
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	466	42	43	62	134	225
Direction, Lane #	**SB 1**	**SE 1**	**SE 2**	**NW 1**	**NW 2**	
Volume Total (vph)	508	64	41	89	270	
Volume Left (vph)	466	43	0	0	0	
Volume Right (vph)	42	0	0	0	225	
Hadj (s)	0.17	0.37	0.03	0.03	-0.55	
Departure Headway (s)	5.3	7.0	6.6	6.2	5.6	
Degree Utilization, x	0.75	0.12	0.08	0.15	0.42	
Capacity (veh/h)	664	473	496	544	605	
Control Delay (s)	22.1	9.7	8.9	9.2	11.5	
Approach Delay (s)	22.1	9.4		10.9		
Approach LOS	C	A		B		

Intersection Summary			
Delay	16.6		
HCM Level of Service	C		
Intersection Capacity Utilization	52.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	2	0	8	0	0	0	0	30	0	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	2	0	8	0	0	0	0	30	0	0	0

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	2	0	8	0	0	30	0	0
Volume Left (vph)	0	0	8	0	0	0	0	0
Volume Right (vph)	0	0	0	0	0	30	0	0
Hadj (s)	0.03	0.00	0.53	0.00	0.00	-0.67	0.00	0.00
Departure Headway (s)	4.6	4.6	5.1	4.6	4.5	3.9	4.5	4.5
Degree Utilization, x	0.00	0.00	0.01	0.00	0.00	0.03	0.00	0.00
Capacity (veh/h)	771	790	688	791	800	927	797	797
Control Delay (s)	6.4	6.4	7.0	6.4	6.3	5.8	6.3	6.3
Approach Delay (s)	6.4		7.0		5.8		0.0	
Approach LOS	A		A		A		A	

Intersection Summary			
Delay	6.1		
HCM Level of Service	A		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	1190	0	0	707	1	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	1190	0	0	707	1	0

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	793	397	236	471	1
Volume Left (vph)	0	0	0	0	1
Volume Right (vph)	0	0	0	0	0
Hadj (s)	0.03	0.03	0.03	0.03	0.23
Departure Headway (s)	5.3	5.3	5.7	5.7	7.0
Degree Utilization, x	1.16	0.58	0.37	0.74	0.00
Capacity (veh/h)	676	659	616	619	495
Control Delay (s)	107.8	14.1	10.8	22.2	10.0
Approach Delay (s)	76.6		18.4		10.0
Approach LOS	F		C		A

Intersection Summary			
Delay	54.9		
HCM Level of Service	F		
Intersection Capacity Utilization	42.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	1192	3	0	709	13	2
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	1192	3	0	709	13	2

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	795	400	236	473	15
Volume Left (vph)	0	0	0	0	13
Volume Right (vph)	0	3	0	0	2
Hadj (s)	0.03	0.03	0.03	0.03	0.13
Departure Headway (s)	5.4	5.3	5.8	5.8	6.9
Degree Utilization, x	1.18	0.59	0.38	0.76	0.03
Capacity (veh/h)	665	659	609	612	503
Control Delay (s)	115.3	14.7	11.0	23.2	10.1
Approach Delay (s)	81.6		19.1		10.1
Approach LOS	F		C		B

Intersection Summary			
Delay	58.0		
HCM Level of Service	F		
Intersection Capacity Utilization	43.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	128	0	114	0	0	0	0	26	1	562	9	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	128	0	114	0	0	0	0	26	1	562	9	0

Direction, Lane #	EB 1	EB 2	WB 1	SE 1	NW 1	NW 2
Volume Total (vph)	128	114	0	27	562	9
Volume Left (vph)	128	0	0	0	562	0
Volume Right (vph)	0	114	0	1	0	0
Hadj (s)	0.23	-0.57	0.00	0.01	0.53	0.03
Departure Headway (s)	5.8	3.2	5.8	5.2	5.5	5.0
Degree Utilization, x	0.21	0.10	0.00	0.04	0.85	0.01
Capacity (veh/h)	584	1121	590	656	651	711
Control Delay (s)	10.2	6.6	8.8	8.4	30.7	6.8
Approach Delay (s)	8.5		0.0	8.4	30.3	
Approach LOS	A		A	A	D	

Intersection Summary			
Delay	23.3		
HCM Level of Service	C		
Intersection Capacity Utilization	51.6%	ICU Level of Service	A
Analysis Period (min)	15		

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(Refined Presidio Parkway Alternative) PM

Original Intersections

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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		0.95		1.00	0.95		1.00		1.00	1.00		1.00
Frt		1.00		1.00	1.00		1.00		0.85	1.00		0.85
Flt Protected		1.00		0.95	1.00		0.95		1.00	0.95		1.00
Satd. Flow (prot)		3575		1789	3579		1789		1601	1789		1601
Flt Permitted		1.00		0.18	1.00		0.95		1.00	0.95		1.00
Satd. Flow (perm)		3575		346	3579		1789		1601	1789		1601
Volume (vph)	0	1015	7	2	1210	0	13	0	5	23	0	144
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1015	7	2	1210	0	13	0	5	23	0	144
RTOR Reduction (vph)	0	1	0	0	0	0	0	0	3	0	0	20
Lane Group Flow (vph)	0	1021	0	2	1210	0	13	0	2	23	0	124
Turn Type				Perm			custom		custom	custom		custom
Protected Phases		8			8					2		
Permitted Phases		8		8			2		2	2		2
Actuated Green, G (s)		28.0		28.0	28.0		24.0		24.0	24.0		24.0
Effective Green, g (s)		28.0		28.0	28.0		24.0		24.0	24.0		24.0
Actuated g/C Ratio		0.47		0.47	0.47		0.40		0.40	0.40		0.40
Clearance Time (s)		4.0		4.0	4.0		4.0		4.0	4.0		4.0
Lane Grp Cap (vph)		1668		161	1670		716		640	716		640
v/s Ratio Prot		0.29			c0.34					0.01		
v/s Ratio Perm				0.01			0.01		0.00			c0.08
v/c Ratio		0.61		0.01	0.72		0.02		0.00	0.03		0.19
Uniform Delay, d1		11.9		8.6	12.9		10.9		10.8	10.9		11.7
Progression Factor		1.00		1.00	1.00		1.00		1.00	1.00		1.00
Incremental Delay, d2		1.7		0.1	2.8		0.0		0.0	0.1		0.7
Delay (s)		13.6		8.7	15.7		10.9		10.8	11.0		12.4
Level of Service		B		A	B		B		B	B		B
Approach Delay (s)		13.6			15.7			10.9			12.2	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	14.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	55.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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			0.91			0.91	
Frt		1.00			0.86			1.00			1.00	
Flt Protected		0.95			1.00			1.00			1.00	
Satd. Flow (prot)		3400			1629			5142			5142	
Flt Permitted		0.28			1.00			1.00			1.00	
Satd. Flow (perm)		1008			1629			5142			5142	
Volume (vph)	38	0	0	0	0	422	0	2403	0	0	2620	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	38	0	0	0	0	422	0	2403	0	0	2620	0
RTOR Reduction (vph)	0	0	0	0	1	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	38	0	0	421	0	0	2403	0	0	2620	0
Turn Type	Perm			Perm					Free			
Protected Phases		4			8			6			2	
Permitted Phases	4			8					Free			
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		347			561			2914			2914	
v/s Ratio Prot					c0.26			0.47			c0.51	
v/s Ratio Perm		0.04										
v/c Ratio		0.11			0.75			0.82			0.90	
Uniform Delay, d1		20.1			26.1			15.9			17.2	
Progression Factor		1.00			1.00			1.00			0.39	
Incremental Delay, d2		0.6			8.9			2.8			3.2	
Delay (s)		20.7			35.0			18.7			9.9	
Level of Service		C			C			B			A	
Approach Delay (s)		20.7			35.0			18.7			9.9	
Approach LOS		C			C			B			A	

Intersection Summary			
HCM Average Control Delay	15.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	90.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.87		1.00	1.00	0.98	
Flt Protected	1.00		0.95	1.00	1.00	
Satd. Flow (prot)	1631		1789	1883	1841	
Flt Permitted	1.00		0.67	1.00	1.00	
Satd. Flow (perm)	1631		1260	1883	1841	
Volume (vph)	4	482	70	433	115	23
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	4	482	70	433	115	23
RTOR Reduction (vph)	278	0	0	0	13	0
Lane Group Flow (vph)	208	0	70	433	125	0
Turn Type			Perm			
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	23.5		24.0	24.0	24.0	
Effective Green, g (s)	23.5		24.0	24.0	24.0	
Actuated g/C Ratio	0.42		0.43	0.43	0.43	
Clearance Time (s)	4.0		4.0	4.0	4.0	
Lane Grp Cap (vph)	691		545	814	796	
v/s Ratio Prot	c0.13			c0.23	0.07	
v/s Ratio Perm			0.06			
v/c Ratio	0.30		0.13	0.53	0.16	
Uniform Delay, d1	10.6		9.5	11.6	9.6	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	1.1		0.5	2.5	0.4	
Delay (s)	11.7		10.0	14.1	10.0	
Level of Service	B		A	B	B	
Approach Delay (s)	11.7			13.5	10.0	
Approach LOS	B			B	B	

Intersection Summary			
HCM Average Control Delay	12.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	55.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	59.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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	
Lane Util. Factor			1.00					0.91			0.91	
Frt			0.85					1.00			1.00	
Flt Protected			1.00					1.00			1.00	
Satd. Flow (prot)			1601					5142			5140	
Flt Permitted			1.00					1.00			1.00	
Satd. Flow (perm)			1601					5142			5140	
Volume (vph)	0	0	246	0	0	0	0	2157	0	0	3074	6
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	0	246	0	0	0	0	2157	0	0	3074	6
RTOR Reduction (vph)	0	0	9	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	237	0	0	0	0	2157	0	0	3080	0
Turn Type			Perm									
Protected Phases		4						6			2	
Permitted Phases			4									
Actuated Green, G (s)			23.0					59.0			59.0	
Effective Green, g (s)			23.0					59.0			59.0	
Actuated g/C Ratio			0.26					0.66			0.66	
Clearance Time (s)			4.0					4.0			4.0	
Lane Grp Cap (vph)			409					3371			3370	
v/s Ratio Prot								0.42			c0.60	
v/s Ratio Perm			c0.15									
v/c Ratio			0.58					0.64			0.91	
Uniform Delay, d1			29.3					9.2			13.3	
Progression Factor			1.00					1.00			1.00	
Incremental Delay, d2			5.9					0.9			5.0	
Delay (s)			35.2					10.1			18.3	
Level of Service			D					B			B	
Approach Delay (s)		35.2			0.0			10.1			18.3	
Approach LOS		D			A			B			B	

Intersection Summary			
HCM Average Control Delay	15.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	69.5%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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	
Lane Util. Factor		1.00			1.00		0.97	1.00			1.00	
Frt		0.99			1.00		1.00	0.88			0.87	
Flt Protected		1.00			0.96		0.95	1.00			1.00	
Satd. Flow (prot)		1869			1806		3471	1656			1638	
Flt Permitted		1.00			0.39		0.69	1.00			0.98	
Satd. Flow (perm)		1869			726		2506	1656			1604	
Volume (vph)	0	289	18	97	16	0	1006	107	446	8	0	147
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	289	18	97	16	0	1006	107	446	8	0	147
RTOR Reduction (vph)	0	2	0	0	0	0	0	156	0	0	51	0
Lane Group Flow (vph)	0	305	0	0	113	0	1006	397	0	0	104	0
Turn Type				Perm			Perm			Perm		
Protected Phases		4			8			6			2	
Permitted Phases		4		8			6			2		
Actuated Green, G (s)		23.5			23.5		58.5	58.5			58.5	
Effective Green, g (s)		23.5			23.5		58.5	58.5			58.5	
Actuated g/C Ratio		0.26			0.26		0.65	0.65			0.65	
Clearance Time (s)		4.0			4.0		4.0	4.0			4.0	
Lane Grp Cap (vph)		488			190		1629	1076			1043	
v/s Ratio Prot		c0.16						0.24				
v/s Ratio Perm					0.16		c0.40				0.06	
v/c Ratio		0.62			0.59		0.62	0.37			0.10	
Uniform Delay, d1		29.4			29.1		9.2	7.3			5.9	
Progression Factor		1.00			1.00		1.00	1.00			1.00	
Incremental Delay, d2		5.9			13.0		1.8	1.0			0.2	
Delay (s)		35.3			42.1		11.0	8.2			6.1	
Level of Service		D			D		B	A			A	
Approach Delay (s)		35.3			42.1			10.0			6.1	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM Average Control Delay	15.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	78.5%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL2	NBL	NBR	SEL	SER
Lane Configurations											
Ideal Flow (vphpl)	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				
Lane Util. Factor	1.00	0.95			1.00	1.00	1.00				
Frt	1.00	1.00			1.00	0.85	1.00				
Flt Protected	0.95	1.00			1.00	1.00	0.95				
Satd. Flow (prot)	1789	3579			1883	1601	1789				
Flt Permitted	0.74	1.00			1.00	1.00	0.95				
Satd. Flow (perm)	1401	3579			1883	1601	1789				
Volume (vph)	419	1022	0	0	21	1346	93	0	0	0	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	419	1022	0	0	21	1346	93	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	419	1022	0	0	21	1346	93	0	0	0	0
Turn Type	Perm					Free	custom		custom	Prot	
Protected Phases		4			8					6	
Permitted Phases	4					Free	2		2		
Actuated Green, G (s)	59.0	59.0			59.0	90.0	23.0				
Effective Green, g (s)	59.0	59.0			59.0	90.0	23.0				
Actuated g/C Ratio	0.66	0.66			0.66	1.00	0.26				
Clearance Time (s)	4.0	4.0			4.0		4.0				
Lane Grp Cap (vph)	918	2346			1234	1601	457				
v/s Ratio Prot		0.29			0.01						
v/s Ratio Perm	0.30					c0.84	0.05				
v/c Ratio	0.46	0.44			0.02	0.84	0.20				
Uniform Delay, d1	7.6	7.5			5.4	0.0	26.3				
Progression Factor	1.00	1.00			1.00	1.00	1.00				
Incremental Delay, d2	1.6	0.6			0.0	5.5	1.0				
Delay (s)	9.3	8.1			5.4	5.5	27.3				
Level of Service	A	A			A	A	C				
Approach Delay (s)		8.4			5.5			27.3		0.0	
Approach LOS		A			A			C		A	

Intersection Summary			
HCM Average Control Delay	7.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	41.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
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		1.00			1.00			0.91			0.91	
Frt		1.00			0.88			0.98			1.00	
Flt Protected		0.99			1.00			1.00			1.00	
Satd. Flow (prot)		1868			1661			5064			5138	
Flt Permitted		0.93			1.00			1.00			1.00	
Satd. Flow (perm)		1743			1661			5064			5138	
Volume (vph)	15	75	0	0	49	337	0	2161	242	0	2285	12
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	15	75	0	0	49	337	0	2161	242	0	2285	12
RTOR Reduction (vph)	0	0	0	0	3	0	0	15	0	0	0	0
Lane Group Flow (vph)	0	90	0	0	383	0	0	2388	0	0	2297	0
Turn Type	Perm			Perm								
Protected Phases		4			8			6			2	
Permitted Phases	4			8				6				
Actuated Green, G (s)		31.0			31.0			51.0			51.0	
Effective Green, g (s)		31.0			31.0			51.0			51.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.57	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		600			572			2870			2912	
v/s Ratio Prot					c0.23			c0.47			0.45	
v/s Ratio Perm		0.05										
v/c Ratio		0.15			0.67			0.83			0.79	
Uniform Delay, d1		20.4			25.1			16.0			15.3	
Progression Factor		1.00			1.00			0.28			1.00	
Incremental Delay, d2		0.5			6.1			1.6			1.8	
Delay (s)		20.9			31.3			6.1			17.1	
Level of Service		C			C			A			B	
Approach Delay (s)		20.9			31.3			6.1			17.1	
Approach LOS		C			C			A			B	

Intersection Summary			
HCM Average Control Delay	13.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	77.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00	1.00	0.76	0.94	
Frt		1.00	1.00	0.85	1.00	
Flt Protected		1.00	1.00	1.00	0.95	
Satd. Flow (prot)		1883	1883	3650	5046	
Flt Permitted		1.00	1.00	1.00	0.95	
Satd. Flow (perm)		1883	1883	3650	5046	
Volume (vph)	0	126	217	2258	2126	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	126	217	2258	2126	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	126	217	2258	2126	0
Turn Type			Prot			
Protected Phases			8		2	
Permitted Phases		4		8 2		
Actuated Green, G (s)		25.0	25.0	90.0	57.0	
Effective Green, g (s)		25.0	25.0	90.0	57.0	
Actuated g/C Ratio		0.28	0.28	1.00	0.63	
Clearance Time (s)		4.0	4.0		4.0	
Lane Grp Cap (vph)		523	523	3650	3196	
v/s Ratio Prot			0.12		c0.42	
v/s Ratio Perm		0.07		c0.62		
v/c Ratio		0.24	0.41	0.62	0.67	
Uniform Delay, d1		25.2	26.5	0.0	10.5	
Progression Factor		0.49	1.00	1.00	0.16	
Incremental Delay, d2		1.1	2.4	0.8	0.6	
Delay (s)		13.5	28.9	0.8	2.2	
Level of Service		B	C	A	A	
Approach Delay (s)		13.5	3.3		2.2	
Approach LOS		B	A		A	

Intersection Summary			
HCM Average Control Delay	3.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	58.5%	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												
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		0.91			0.91			1.00			1.00	
Frt		0.98			1.00			1.00			0.93	
Flt Protected		1.00			1.00			0.95			0.98	
Satd. Flow (prot)		5050			5140			1794			1717	
Flt Permitted		1.00			1.00			0.71			0.91	
Satd. Flow (perm)		5050			5140			1332			1586	
Volume (vph)	0	2039	277	0	2221	6	358	3	0	10	3	15
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	2039	277	0	2221	6	358	3	0	10	3	15
RTOR Reduction (vph)	0	19	0	0	0	0	0	0	0	0	7	0
Lane Group Flow (vph)	0	2297	0	0	2227	0	0	361	0	0	21	0
Turn Type							Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)		59.0			59.0			23.5			23.5	
Effective Green, g (s)		59.0			59.0			23.5			23.5	
Actuated g/C Ratio		0.65			0.65			0.26			0.26	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		3292			3351			346			412	
v/s Ratio Prot		c0.45			0.43							
v/s Ratio Perm								c0.27			0.01	
v/c Ratio		0.70			0.66			1.04			0.05	
Uniform Delay, d1		10.1			9.7			33.5			25.1	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.3			1.1			60.1			0.2	
Delay (s)		11.3			10.7			93.6			25.4	
Level of Service		B			B			F			C	
Approach Delay (s)		11.3			10.7			93.6			25.4	
Approach LOS		B			B			F			C	

Intersection Summary			
HCM Average Control Delay	17.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	90.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	78.9%	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												
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	1.00	1.00			1.00						1.00	
Frt	1.00	1.00			1.00						0.86	
Flt Protected	0.95	1.00			1.00						1.00	
Satd. Flow (prot)	1789	1883			1882						1629	
Flt Permitted	0.45	1.00			1.00						1.00	
Satd. Flow (perm)	855	1883			1882						1629	
Volume (vph)	116	155	0	0	357	2	0	0	0	0	0	16
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	116	155	0	0	357	2	0	0	0	0	0	16
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	9	0
Lane Group Flow (vph)	116	155	0	0	359	0	0	0	0	0	7	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	44.0	44.0			44.0						38.0	
Effective Green, g (s)	44.0	44.0			44.0						38.0	
Actuated g/C Ratio	0.49	0.49			0.49						0.42	
Clearance Time (s)	4.0	4.0			4.0						4.0	
Lane Grp Cap (vph)	418	921			920						688	
v/s Ratio Prot		0.08			c0.19						c0.00	
v/s Ratio Perm	0.14											
v/c Ratio	0.28	0.17			0.39						0.01	
Uniform Delay, d1	13.6	12.8			14.5						15.1	
Progression Factor	1.00	1.00			1.12						1.00	
Incremental Delay, d2	1.6	0.4			1.2						0.0	
Delay (s)	15.2	13.2			17.4						15.1	
Level of Service	B	B			B						B	
Approach Delay (s)		14.1			17.4			0.0			15.1	
Approach LOS		B			B			A			B	

Intersection Summary			
HCM Average Control Delay	16.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.21		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	40.4%	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												
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		1.00			1.00			1.00			1.00	
Frt		1.00			0.99			1.00			0.99	
Flt Protected		0.96			1.00			1.00			1.00	
Satd. Flow (prot)		1811			1863			1883			1860	
Flt Permitted		0.80			1.00			1.00			0.99	
Satd. Flow (perm)		1501			1861			1883			1839	
Volume (vph)	29	7	0	2	112	9	0	562	2	13	562	53
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	29	7	0	2	112	9	0	562	2	13	562	53
RTOR Reduction (vph)	0	0	0	0	3	0	0	0	0	0	4	0
Lane Group Flow (vph)	0	36	0	0	120	0	0	564	0	0	624	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		28.0			28.0			54.0			54.0	
Effective Green, g (s)		28.0			28.0			54.0			54.0	
Actuated g/C Ratio		0.31			0.31			0.60			0.60	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		467			579			1130			1103	
v/s Ratio Prot								0.30				
v/s Ratio Perm		0.02			c0.06						c0.34	
v/c Ratio		0.08			0.21			0.50			0.57	
Uniform Delay, d1		21.9			22.8			10.3			10.9	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.3			0.8			1.6			2.1	
Delay (s)		22.2			23.6			11.9			13.0	
Level of Service		C			C			B			B	
Approach Delay (s)		22.2			23.6			11.9			13.0	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	13.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	63.2%	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												
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	1.00	1.00		1.00	1.00	1.00		0.91			0.91	
Frt	1.00	0.94		1.00	1.00	0.85		1.00			0.97	
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			1.00	
Satd. Flow (prot)	1789	1779		1789	1883	1601		5141			4994	
Flt Permitted	0.73	1.00		0.75	1.00	1.00		1.00			1.00	
Satd. Flow (perm)	1373	1779		1403	1883	1601		5141			4994	
Volume (vph)	232	12	7	1	43	417	0	2101	1	0	2472	586
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	232	12	7	1	43	417	0	2101	1	0	2472	586
RTOR Reduction (vph)	0	2	0	0	0	5	0	0	0	0	44	0
Lane Group Flow (vph)	232	17	0	1	43	412	0	2102	0	0	3014	0
Turn Type	Perm			Perm		Perm						
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8						
Actuated Green, G (s)	30.0	30.0		30.0	30.0	30.0		52.0			52.0	
Effective Green, g (s)	30.0	30.0		30.0	30.0	30.0		52.0			52.0	
Actuated g/C Ratio	0.33	0.33		0.33	0.33	0.33		0.58			0.58	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Grp Cap (vph)	458	593		468	628	534		2970			2885	
v/s Ratio Prot		0.01			0.02			0.41			c0.60	
v/s Ratio Perm	0.17			0.00		c0.26						
v/c Ratio	0.51	0.03		0.00	0.07	0.77		0.71			1.04	
Uniform Delay, d1	24.1	20.2		20.0	20.5	26.9		13.6			19.0	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	4.0	0.1		0.0	0.2	10.4		1.5			29.9	
Delay (s)	28.0	20.3		20.0	20.7	37.3		15.0			48.9	
Level of Service	C	C		C	C	D		B			D	
Approach Delay (s)		27.4			35.7			15.0			48.9	
Approach LOS		C			D			B			D	

Intersection Summary			
HCM Average Control Delay	34.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	89.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (vph)	404	6	22	41	35	104
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	404	6	22	41	35	104

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total (vph)	404	6	22	41	139
Volume Left (vph)	404	0	0	0	35
Volume Right (vph)	0	0	0	41	104
Hadj (s)	0.53	0.03	0.03	-0.67	-0.36
Departure Headway (s)	5.5	5.0	5.3	4.6	4.8
Degree Utilization, x	0.61	0.01	0.03	0.05	0.18
Capacity (veh/h)	643	707	644	743	695
Control Delay (s)	15.5	6.8	7.3	6.6	8.8
Approach Delay (s)	15.4		6.9		8.8
Approach LOS	C		A		A

Intersection Summary			
Delay	13.0		
HCM Level of Service	B		
Intersection Capacity Utilization	44.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	382	89	28	96	225	279
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	382	89	28	96	225	279

Direction, Lane #	SB 1	SE 1	SE 2	NW 1	NW 2
Volume Total (vph)	471	60	64	150	354
Volume Left (vph)	382	28	0	0	0
Volume Right (vph)	89	0	0	0	279
Hadj (s)	0.08	0.27	0.03	0.03	-0.52
Departure Headway (s)	5.5	7.0	6.8	6.2	5.7
Degree Utilization, x	0.72	0.12	0.12	0.26	0.56
Capacity (veh/h)	633	472	488	554	615
Control Delay (s)	21.5	9.7	9.5	10.2	14.3
Approach Delay (s)	21.5	9.6		13.1	
Approach LOS	C	A		B	

Intersection Summary			
Delay	16.3		
HCM Level of Service	C		
Intersection Capacity Utilization	55.3%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	5	0	29	0	0	0	0	22	0	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	5	0	29	0	0	0	0	22	0	0	0

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	5	0	29	0	0	22	0	0
Volume Left (vph)	0	0	29	0	0	0	0	0
Volume Right (vph)	0	0	0	0	0	22	0	0
Hadj (s)	0.03	0.00	0.53	0.00	0.00	-0.67	0.00	0.00
Departure Headway (s)	4.6	4.6	5.1	4.6	4.6	3.9	4.6	4.6
Degree Utilization, x	0.01	0.00	0.04	0.00	0.00	0.02	0.00	0.00
Capacity (veh/h)	772	791	692	794	786	896	783	783
Control Delay (s)	6.4	6.4	7.1	6.4	6.4	5.8	6.4	6.4
Approach Delay (s)	6.4		7.1		5.8		0.0	
Approach LOS	A		A		A		A	

Intersection Summary			
Delay	6.5		
HCM Level of Service	A		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	995	0	0	1194	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	995	0	0	1194	0	0

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	663	332	398	796	0
Volume Left (vph)	0	0	0	0	0
Volume Right (vph)	0	0	0	0	0
Hadj (s)	0.03	0.03	0.03	0.03	0.00
Departure Headway (s)	5.7	5.7	5.6	5.6	6.9
Degree Utilization, x	1.06	0.53	0.62	1.24	0.00
Capacity (veh/h)	621	616	629	649	525
Control Delay (s)	74.1	13.8	16.2	140.6	9.9
Approach Delay (s)	54.0		99.1		0.0
Approach LOS	F		F		A

Intersection Summary			
Delay	78.6		
HCM Level of Service	F		
Intersection Capacity Utilization	36.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	964	41	0	1200	1	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	964	41	0	1200	1	1

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total (vph)	643	362	400	800	2
Volume Left (vph)	0	0	0	0	1
Volume Right (vph)	0	41	0	0	1
Hadj (s)	0.03	-0.05	0.03	0.03	-0.17
Departure Headway (s)	5.8	5.7	5.7	5.7	6.8
Degree Utilization, x	1.03	0.57	0.63	1.26	0.00
Capacity (veh/h)	618	623	622	642	523
Control Delay (s)	65.4	14.7	16.7	148.5	9.8
Approach Delay (s)	47.2		104.6		9.8
Approach LOS	E		F		A

Intersection Summary			
Delay	78.3		
HCM Level of Service	F		
Intersection Capacity Utilization	43.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	228	0	111	0	0	0	0	28	2	431	14	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	228	0	111	0	0	0	0	28	2	431	14	0

Direction, Lane #	EB 1	EB 2	WB 1	SE 1	NW 1	NW 2
Volume Total (vph)	228	111	0	30	431	14
Volume Left (vph)	228	0	0	0	431	0
Volume Right (vph)	0	111	0	2	0	0
Hadj (s)	0.23	-0.57	0.00	-0.01	0.53	0.03
Departure Headway (s)	5.5	3.2	5.7	5.4	5.8	5.3
Degree Utilization, x	0.35	0.10	0.00	0.04	0.69	0.02
Capacity (veh/h)	615	1121	577	624	609	667
Control Delay (s)	11.4	6.5	8.7	8.6	19.3	7.2
Approach Delay (s)	9.8		0.0	8.6	19.0	
Approach LOS	A		A	A	C	

Intersection Summary			
Delay	14.8		
HCM Level of Service	B		
Intersection Capacity Utilization	49.8%	ICU Level of Service	A
Analysis Period (min)	15		

BASE YEAR

AM

Additional Intersections

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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	
Lane Util. Factor		0.91			0.91		1.00	1.00		1.00	1.00	
Frt		0.98			1.00		1.00	0.97		1.00	0.89	
Flt Protected		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		5044			5140		1789	1834		1789	1679	
Flt Permitted		1.00			1.00		0.49	1.00		0.71	1.00	
Satd. Flow (perm)		5044			5140		914	1834		1334	1679	
Volume (vph)	0	1715	249	0	814	2	371	62	13	119	60	158
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1715	249	0	814	2	371	62	13	119	60	158
RTOR Reduction (vph)	0	21	0	0	0	0	0	8	0	0	106	0
Lane Group Flow (vph)	0	1943	0	0	816	0	371	67	0	119	112	0
Turn Type							Perm			Perm		
Protected Phases		2			6			4			8	
Permitted Phases							4			8		
Actuated Green, G (s)		58.5			58.5		23.0	23.0		23.0	23.0	
Effective Green, g (s)		58.5			58.5		23.5	23.5		23.5	23.5	
Actuated g/C Ratio		0.65			0.65		0.26	0.26		0.26	0.26	
Clearance Time (s)		4.0			4.0		4.5	4.5		4.5	4.5	
Lane Grp Cap (vph)		3279			3341		239	479		348	438	
v/s Ratio Prot		c0.39			0.16			0.04			0.07	
v/s Ratio Perm							c0.41			0.09		
v/c Ratio		0.59			0.24		1.55	0.14		0.34	0.26	
Uniform Delay, d1		9.0			6.6		33.2	25.5		27.0	26.3	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.8			0.2		268.2	0.6		2.7	1.4	
Delay (s)		9.8			6.7		301.4	26.1		29.6	27.7	
Level of Service		A			A		F	C		C	C	
Approach Delay (s)		9.8			6.7			255.1			28.4	
Approach LOS		A			A			F			C	

Intersection Summary			
HCM Average Control Delay	41.5	HCM Level of Service	D
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	82.1%	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												
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	
Lane Util. Factor		0.91			0.91		1.00	1.00			1.00	
Frt		0.98			1.00		1.00	0.98			1.00	
Flt Protected		1.00			1.00		0.95	1.00			0.99	
Satd. Flow (prot)		5030			5123		1789	1854			1858	
Flt Permitted		1.00			1.00		0.50	1.00			0.87	
Satd. Flow (perm)		5030			5123		942	1854			1639	
Volume (vph)	0	1557	263	0	716	18	82	144	17	75	196	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1557	263	0	716	18	82	144	17	75	196	0
RTOR Reduction (vph)	0	26	0	0	3	0	0	5	0	0	0	0
Lane Group Flow (vph)	0	1794	0	0	731	0	82	156	0	0	271	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		54.0			54.0		27.0	27.0			27.0	
Effective Green, g (s)		54.0			54.0		28.0	28.0			28.0	
Actuated g/C Ratio		0.60			0.60		0.31	0.31			0.31	
Clearance Time (s)		4.0			4.0		5.0	5.0			5.0	
Lane Grp Cap (vph)		3018			3074		293	577			510	
v/s Ratio Prot		c0.36			0.14			0.08				
v/s Ratio Perm							0.09				c0.17	
v/c Ratio		0.59			0.24		0.28	0.27			0.53	
Uniform Delay, d1		11.2			8.4		23.4	23.3			25.6	
Progression Factor		1.00			1.00		1.00	1.00			1.00	
Incremental Delay, d2		0.9			0.2		2.4	1.2			3.9	
Delay (s)		12.1			8.6		25.8	24.5			29.5	
Level of Service		B			A		C	C			C	
Approach Delay (s)		12.1			8.6			24.9			29.5	
Approach LOS		B			A			C			C	

Intersection Summary			
HCM Average Control Delay	13.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	69.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	EBR2	WBT	SBT	SBR	NWL2	NWL
Lane Configurations								
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0				4.0
Lane Util. Factor	0.95			0.95				0.97
Frt	0.97			1.00				1.00
Flt Protected	1.00			1.00				0.95
Satd. Flow (prot)	3469			3579				3471
Flt Permitted	1.00			1.00				0.95
Satd. Flow (perm)	3469			3579				3471
Volume (vph)	1103	279	4	219	0	0	7	373
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1103	279	4	219	0	0	7	373
RTOR Reduction (vph)	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	1386	0	0	219	0	0	0	380
Turn Type						Perm	Perm	
Protected Phases	6			6	4			8
Permitted Phases						4	8	
Actuated Green, G (s)	45.0			45.0				10.0
Effective Green, g (s)	45.0			45.0				9.5
Actuated g/C Ratio	0.60			0.60				0.13
Clearance Time (s)	4.0			4.0				3.5
Lane Grp Cap (vph)	2081			2147				440
v/s Ratio Prot	c0.40			0.06				
v/s Ratio Perm								0.11
v/c Ratio	0.67			0.10				0.86
Uniform Delay, d1	10.0			6.4				32.1
Progression Factor	1.00			1.00				1.00
Incremental Delay, d2	1.7			0.1				19.6
Delay (s)	11.7			6.5				51.7
Level of Service	B			A				D
Approach Delay (s)	11.7			6.5	0.0			51.7
Approach LOS	B			A	A			D

Intersection Summary			
HCM Average Control Delay	18.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	20.5
Intersection Capacity Utilization	57.0%	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												
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							
Lane Util. Factor		0.95	1.00		0.95							
Frt		1.00	0.85		1.00							
Flt Protected		1.00	1.00		1.00							
Satd. Flow (prot)		3579	1601		3579							
Flt Permitted		1.00	1.00		1.00							
Satd. Flow (perm)		3579	1601		3579							
Volume (vph)	0	787	411	0	223	0	0	0	0	0	0	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	787	411	0	223	0	0	0	0	0	0	0
RTOR Reduction (vph)	0	0	212	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	787	199	0	223	0	0	0	0	0	0	0
Turn Type	Perm		custom			custom	Perm			Perm		
Protected Phases		2	6					4			4	
Permitted Phases	2				2	2	4			4		
Actuated Green, G (s)		60.0	44.0		60.0							
Effective Green, g (s)		59.5	43.5		59.5							
Actuated g/C Ratio		0.66	0.48		0.66							
Clearance Time (s)		3.5	3.5		3.5							
Lane Grp Cap (vph)		2366	774		2366							
v/s Ratio Prot		c0.22	0.12									
v/s Ratio Perm					0.06							
v/c Ratio		0.33	0.26		0.09							
Uniform Delay, d1		6.6	13.7		5.5							
Progression Factor		1.00	1.00		1.00							
Incremental Delay, d2		0.4	0.8		0.1							
Delay (s)		7.0	14.5		5.6							
Level of Service		A	B		A							
Approach Delay (s)		9.6			5.6			0.0			0.0	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM Average Control Delay	9.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	30.5
Intersection Capacity Utilization	28.8%	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												
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		1.00	0.88		1.00		0.94	1.00			0.95	1.00
Frt		1.00	0.85		1.00		1.00	1.00			1.00	0.85
Flt Protected		1.00	1.00		1.00		0.95	1.00			1.00	1.00
Satd. Flow (prot)		1883	2818		1883		5046	1883			3579	1601
Flt Permitted		1.00	1.00		1.00		0.95	1.00			1.00	1.00
Satd. Flow (perm)		1883	2818		1883		5046	1883			3579	1601
Volume (vph)	0	435	975	0	14	0	392	207	0	0	181	3
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	435	975	0	14	0	392	207	0	0	181	3
RTOR Reduction (vph)	0	0	344	0	0	0	0	0	0	0	0	2
Lane Group Flow (vph)	0	435	631	0	14	0	392	207	0	0	181	1
Turn Type	Perm		pt+ov	Perm			Prot			Perm		Perm
Protected Phases		4	4 5		8		5	2			6	
Permitted Phases	4			8						6		6
Actuated Green, G (s)		39.5	54.5		39.5		11.5	42.5			27.5	27.5
Effective Green, g (s)		40.0	55.0		40.0		11.0	42.0			27.0	27.0
Actuated g/C Ratio		0.44	0.61		0.44		0.12	0.47			0.30	0.30
Clearance Time (s)		4.5			4.5		3.5	3.5			3.5	3.5
Lane Grp Cap (vph)		837	1722		837		617	879			1074	480
v/s Ratio Prot		c0.23	0.22		0.01		c0.08	c0.11			0.05	
v/s Ratio Perm												0.00
v/c Ratio		0.52	0.37		0.02		0.64	0.24			0.17	0.00
Uniform Delay, d1		18.1	8.8		14.0		37.6	14.4			23.2	22.1
Progression Factor		1.00	1.00		1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2		2.3	0.6		0.0		4.9	0.6			0.3	0.0
Delay (s)		20.4	9.4		14.0		42.5	15.0			23.6	22.1
Level of Service		C	A		B		D	B			C	C
Approach Delay (s)		12.8			14.0			33.0			23.5	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM Average Control Delay	19.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	52.4%	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												
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
Lane Util. Factor		0.95			0.95			0.91			0.95	1.00
Frt		1.00			1.00			1.00			1.00	0.85
Flt Protected		1.00			1.00			1.00			1.00	1.00
Satd. Flow (prot)		3574			3579			5128			3579	1601
Flt Permitted		1.00			1.00			0.94			1.00	1.00
Satd. Flow (perm)		3574			3579			4820			3579	1601
Volume (vph)	0	1408	11	0	338	0	1	744	13	0	169	363
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1408	11	0	338	0	1	744	13	0	169	363
RTOR Reduction (vph)	0	1	0	0	0	0	0	2	0	0	0	282
Lane Group Flow (vph)	0	1418	0	0	338	0	0	756	0	0	169	81
Turn Type	Perm			Perm			Perm			Perm		Perm
Protected Phases		4			4			2			2	
Permitted Phases	4			4			2			2		2
Actuated Green, G (s)		61.0			61.0			19.0			19.0	19.0
Effective Green, g (s)		62.0			62.0			20.0			20.0	20.0
Actuated g/C Ratio		0.69			0.69			0.22			0.22	0.22
Clearance Time (s)		5.0			5.0			5.0			5.0	5.0
Lane Grp Cap (vph)		2462			2466			1071			795	356
v/s Ratio Prot		c0.40			0.09						0.05	
v/s Ratio Perm								c0.16				0.05
v/c Ratio		0.58			0.14			0.71			0.21	0.23
Uniform Delay, d1		7.2			4.8			32.3			28.6	28.7
Progression Factor		1.00			1.00			1.00			1.00	1.00
Incremental Delay, d2		1.0			0.1			3.9			0.6	1.5
Delay (s)		8.2			4.9			36.2			29.2	30.1
Level of Service		A			A			D			C	C
Approach Delay (s)		8.2			4.9			36.2			29.8	
Approach LOS		A			A			D			C	

Intersection Summary			
HCM Average Control Delay	18.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	61.3%	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												
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	
Lane Util. Factor		0.91			1.00	0.88		1.00		0.95	0.95	
Frt		0.95			1.00	0.85		0.96		1.00	0.99	
Flt Protected		1.00			1.00	1.00		0.97		0.95	0.97	
Satd. Flow (prot)		4888			1883	2818		1749		1700	1728	
Flt Permitted		1.00			1.00	1.00		0.63		0.95	0.97	
Satd. Flow (perm)		4888			1883	2818		1143		1700	1728	
Volume (vph)	0	599	293	0	297	211	33	0	13	736	199	27
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	599	293	0	297	211	33	0	13	736	199	27
RTOR Reduction (vph)	0	99	0	0	0	59	0	11	0	0	3	0
Lane Group Flow (vph)	0	793	0	0	297	152	0	35	0	473	486	0
Turn Type	Perm					pt+ov	Perm			Split		
Protected Phases		4			4	4 2		6		2	2	
Permitted Phases	4						6					
Actuated Green, G (s)		17.0			17.0	65.5		17.5		45.0	45.0	
Effective Green, g (s)		16.5			16.5	65.0		17.0		44.5	44.5	
Actuated g/C Ratio		0.18			0.18	0.72		0.19		0.49	0.49	
Clearance Time (s)		3.5			3.5			3.5		3.5	3.5	
Lane Grp Cap (vph)		896			345	2035		216		841	854	
v/s Ratio Prot		c0.16			0.16	0.05				0.28	c0.28	
v/s Ratio Perm								c0.03				
v/c Ratio		0.89			0.86	0.07		0.16		0.56	0.57	
Uniform Delay, d1		35.8			35.6	3.7		30.6		15.9	16.0	
Progression Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Incremental Delay, d2		12.5			23.5	0.1		1.6		2.7	2.8	
Delay (s)		48.3			59.1	3.7		32.2		18.6	18.8	
Level of Service		D			E	A		C		B	B	
Approach Delay (s)		48.3			36.1			32.2			18.7	
Approach LOS		D			D			C			B	

Intersection Summary			
HCM Average Control Delay	33.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	55.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	0	0	0	0	85	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	0	0	0	85	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	170	0			0	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	170	0			0	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			95	
cM capacity (veh/h)	777	1085			1623	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	0	0	85
Volume Left	0	0	85
Volume Right	0	0	0
cSH	1700	1700	1623
Volume to Capacity	0.00	0.00	0.05
Queue Length 95th (m)	0.0	0.0	1.3
Control Delay (s)	0.0	0.0	7.3
Lane LOS	A		A
Approach Delay (s)	0.0	0.0	7.3
Approach LOS	A		

Intersection Summary			
Average Delay	7.3		
Intersection Capacity Utilization	8.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	2	322	0	2	96	0	0	8	4	0	60	3
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	2	322	0	2	96	0	0	8	4	0	60	3

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	324	98	12	63
Volume Left (vph)	2	2	0	0
Volume Right (vph)	0	0	4	3
Hadj (s)	0.04	0.04	-0.17	0.01
Departure Headway (s)	4.2	4.5	4.8	4.9
Degree Utilization, x	0.38	0.12	0.02	0.09
Capacity (veh/h)	834	771	682	675
Control Delay (s)	9.8	8.1	7.8	8.3
Approach Delay (s)	9.8	8.1	7.8	8.3
Approach LOS	A	A	A	A

Intersection Summary			
Delay	9.2		
HCM Level of Service	A		
Intersection Capacity Utilization	27.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	1	124	3	1	3	13	0	4	0	10	43	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	1	124	3	1	3	13	0	4	0	10	43	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	82	67	43	132	67	4	43			4		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	82	67	43	132	67	4	43			4		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	85	100	100	100	99	100			99		
cM capacity (veh/h)	888	819	1027	737	819	1080	1566			1618		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	128	17	4	53
Volume Left	1	1	0	10
Volume Right	3	13	0	0
cSH	823	996	1566	1618
Volume to Capacity	0.16	0.02	0.00	0.01
Queue Length 95th (m)	4.2	0.4	0.0	0.1
Control Delay (s)	10.2	8.7	0.0	1.4
Lane LOS	B	A		A
Approach Delay (s)	10.2	8.7	0.0	1.4
Approach LOS	B	A		

Intersection Summary			
Average Delay	7.5		
Intersection Capacity Utilization	23.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	25	24	0	0	14	0	7	0	0	111	0	17
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	25	24	0	0	14	0	7	0	0	111	0	17

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	49	14	7	128
Volume Left (vph)	25	0	7	111
Volume Right (vph)	0	0	0	17
Hadj (s)	0.14	0.03	0.23	0.13
Departure Headway (s)	4.4	4.3	4.4	4.2
Degree Utilization, x	0.06	0.02	0.01	0.15
Capacity (veh/h)	799	807	790	846
Control Delay (s)	7.6	7.4	7.4	7.9
Approach Delay (s)	7.6	7.4	7.4	7.9
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.8		
HCM Level of Service	A		
Intersection Capacity Utilization	22.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	136	10	0	281	3	0	0	0	1	192	33
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	136	10	0	281	3	0	0	0	1	192	33

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	146	284	0	226
Volume Left (vph)	0	0	0	1
Volume Right (vph)	10	3	0	33
Hadj (s)	-0.01	0.03	0.00	-0.05
Departure Headway (s)	4.8	4.7	5.3	4.9
Degree Utilization, x	0.20	0.37	0.00	0.31
Capacity (veh/h)	694	728	609	685
Control Delay (s)	9.0	10.5	8.3	10.0
Approach Delay (s)	9.0	10.5	0.0	10.0
Approach LOS	A	B	A	B

Intersection Summary			
Delay	10.0		
HCM Level of Service	A		
Intersection Capacity Utilization	33.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	0	0	0	0	0	0	33	0	153	172	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	0	0	0	0	0	0	33	0	153	172	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	0	0	33	325
Volume Left (vph)	0	0	0	153
Volume Right (vph)	0	0	0	0
Hadj (s)	0.00	0.00	0.03	0.13
Departure Headway (s)	4.7	4.7	4.2	4.1
Degree Utilization, x	0.00	0.00	0.04	0.37
Capacity (veh/h)	717	717	827	882
Control Delay (s)	7.7	7.7	7.4	9.4
Approach Delay (s)	0.0	0.0	7.4	9.4
Approach LOS	A	A	A	A

Intersection Summary			
Delay	9.2		
HCM Level of Service	A		
Intersection Capacity Utilization	27.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	325	0	168	98	7	0	52	12	109	165	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	325	0	168	98	7	0	52	12	109	165	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	325	273	64	274
Volume Left (vph)	0	168	0	109
Volume Right (vph)	0	7	12	0
Hadj (s)	0.03	0.14	-0.08	0.11
Departure Headway (s)	5.4	5.6	6.1	5.8
Degree Utilization, x	0.49	0.43	0.11	0.44
Capacity (veh/h)	626	602	494	575
Control Delay (s)	13.5	12.7	9.8	13.3
Approach Delay (s)	13.5	12.7	9.8	13.3
Approach LOS	B	B	A	B

Intersection Summary			
Delay	13.0		
HCM Level of Service	B		
Intersection Capacity Utilization	63.4%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	16	127	2	10	0	23	28	8	0	149	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	16	127	2	10	0	23	28	8	0	149	1

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	143	12	59	150
Volume Left (vph)	0	2	23	0
Volume Right (vph)	127	0	8	1
Hadj (s)	-0.50	0.07	0.03	0.03
Departure Headway (s)	3.9	4.6	4.4	4.3
Degree Utilization, x	0.15	0.02	0.07	0.18
Capacity (veh/h)	879	730	774	793
Control Delay (s)	7.6	7.7	7.8	8.3
Approach Delay (s)	7.6	7.7	7.8	8.3
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.9		
HCM Level of Service	A		
Intersection Capacity Utilization	29.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	6	120	2	0	0	0	444	0	0	308	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	6	120	2	0	0	0	444	0	0	308	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	126	2	444	308
Volume Left (vph)	0	2	0	0
Volume Right (vph)	120	0	0	0
Hadj (s)	-0.54	0.23	0.03	0.03
Departure Headway (s)	5.1	6.2	4.7	4.8
Degree Utilization, x	0.18	0.00	0.57	0.41
Capacity (veh/h)	622	489	755	721
Control Delay (s)	9.2	9.2	13.8	11.1
Approach Delay (s)	9.2	9.2	13.8	11.1
Approach LOS	A	A	B	B

Intersection Summary			
Delay	12.2		
HCM Level of Service	B		
Intersection Capacity Utilization	37.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	3	8	64	2	0	0	6	440	2	43	411	3
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	3	8	64	2	0	0	6	440	2	43	411	3

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	75	2	448	457
Volume Left (vph)	3	2	6	43
Volume Right (vph)	64	0	2	3
Hadj (s)	-0.47	0.23	0.03	0.05
Departure Headway (s)	5.5	6.4	4.7	4.7
Degree Utilization, x	0.11	0.00	0.58	0.59
Capacity (veh/h)	568	467	753	751
Control Delay (s)	9.2	9.4	14.0	14.3
Approach Delay (s)	9.2	9.4	14.0	14.3
Approach LOS	A	A	B	B

Intersection Summary			
Delay	13.8		
HCM Level of Service	B		
Intersection Capacity Utilization	59.2%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	0	0	0	0	0	0	0	0	0	201	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	0	0	0	0	0	0	0	0	0	201	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	0	0	0	201
Volume Left (vph)	0	0	0	0
Volume Right (vph)	0	0	0	0
Hadj (s)	0.00	0.00	0.00	0.03
Departure Headway (s)	4.3	4.3	4.1	3.9
Degree Utilization, x	0.00	0.00	0.00	0.22
Capacity (veh/h)	801	801	881	911
Control Delay (s)	7.3	7.3	7.1	8.0
Approach Delay (s)	0.0	0.0	0.0	8.0
Approach LOS	A	A	A	A

Intersection Summary			
Delay	8.0		
HCM Level of Service	A		
Intersection Capacity Utilization	13.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	51	2	0	0	0	0	21	1	0	163	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	51	2	0	0	0	0	21	1	0	163	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	53	0	22	163
Volume Left (vph)	0	0	0	0
Volume Right (vph)	2	0	1	0
Hadj (s)	0.01	0.00	0.01	0.03
Departure Headway (s)	4.3	4.4	4.2	4.1
Degree Utilization, x	0.06	0.00	0.03	0.18
Capacity (veh/h)	798	796	832	868
Control Delay (s)	7.6	7.4	7.3	8.0
Approach Delay (s)	7.6	0.0	7.3	8.0
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.8		
HCM Level of Service	A		
Intersection Capacity Utilization	18.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	0	0	0	0	0	0	0	0	60	141	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	0	0	0	0	0	0	0	0	60	141	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	0	0	0	201
Volume Left (vph)	0	0	0	60
Volume Right (vph)	0	0	0	0
Hadj (s)	0.00	0.00	0.00	0.09
Departure Headway (s)	4.3	4.3	4.1	4.0
Degree Utilization, x	0.00	0.00	0.00	0.22
Capacity (veh/h)	800	800	880	897
Control Delay (s)	7.3	7.3	7.1	8.1
Approach Delay (s)	0.0	0.0	0.0	8.1
Approach LOS	A	A	A	A

Intersection Summary			
Delay	8.1		
HCM Level of Service	A		
Intersection Capacity Utilization	14.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	85	0	0	0	6	0	31	0	33	25	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	85	0	0	0	6	0	31	0	33	25	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	85	6	31	58
Volume Left (vph)	0	0	0	33
Volume Right (vph)	0	6	0	0
Hadj (s)	0.03	-0.57	0.03	0.15
Departure Headway (s)	4.1	3.6	4.2	4.3
Degree Utilization, x	0.10	0.01	0.04	0.07
Capacity (veh/h)	848	961	828	820
Control Delay (s)	7.6	6.6	7.3	7.6
Approach Delay (s)	7.6	6.6	7.3	7.6
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.5		
HCM Level of Service	A		
Intersection Capacity Utilization	20.9%	ICU Level of Service	A
Analysis Period (min)	15		

BASE YEAR

PM

Additional Intersections

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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	
Lane Util. Factor		0.91			0.91		1.00	1.00		1.00	1.00	
Frt		0.96			1.00		1.00	0.97		1.00	0.97	
Flt Protected		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		4921			5129		1789	1828		1789	1822	
Flt Permitted		1.00			1.00		0.71	1.00		0.59	1.00	
Satd. Flow (perm)		4921			5129		1335	1828		1111	1822	
Volume (vph)	0	1082	434	0	1814	30	256	127	31	28	58	16
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1082	434	0	1814	30	256	127	31	28	58	16
RTOR Reduction (vph)	0	81	0	0	2	0	0	10	0	0	11	0
Lane Group Flow (vph)	0	1436	0	0	1842	0	256	148	0	28	63	0
Turn Type							Perm			Perm		
Protected Phases		2			6			4			8	
Permitted Phases							4			8		
Actuated Green, G (s)		58.5			58.5		23.0	23.0		23.0	23.0	
Effective Green, g (s)		58.5			58.5		23.5	23.5		23.5	23.5	
Actuated g/C Ratio		0.65			0.65		0.26	0.26		0.26	0.26	
Clearance Time (s)		4.0			4.0		4.5	4.5		4.5	4.5	
Lane Grp Cap (vph)		3199			3334		349	477		290	476	
v/s Ratio Prot		0.29			c0.36			0.08			0.03	
v/s Ratio Perm							c0.19			0.03		
v/c Ratio		0.45			0.55		0.73	0.31		0.10	0.13	
Uniform Delay, d1		7.8			8.6		30.4	26.7		25.2	25.4	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.5			0.7		12.8	1.7		0.7	0.6	
Delay (s)		8.2			9.3		43.2	28.4		25.9	26.0	
Level of Service		A			A		D	C		C	C	
Approach Delay (s)		8.2			9.3			37.6			26.0	
Approach LOS		A			A			D			C	

Intersection Summary			
HCM Average Control Delay	12.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	63.9%	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												
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		0.91			0.91			1.00			1.00	
Frt		0.98			0.99			0.99			1.00	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		5019			5102			1868			1880	
Flt Permitted		1.00			1.00			1.00			1.00	
Satd. Flow (perm)		5019			5102			1868			1880	
Volume (vph)	0	894	169	0	1876	101	0	277	16	0	279	4
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	894	169	0	1876	101	0	277	16	0	279	4
RTOR Reduction (vph)	0	31	0	0	6	0	0	2	0	0	1	0
Lane Group Flow (vph)	0	1032	0	0	1971	0	0	291	0	0	282	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)		54.0			54.0			27.0			27.0	
Effective Green, g (s)		54.0			54.0			28.0			28.0	
Actuated g/C Ratio		0.60			0.60			0.31			0.31	
Clearance Time (s)		4.0			4.0			5.0			5.0	
Lane Grp Cap (vph)		3011			3061			581			585	
v/s Ratio Prot		0.21			c0.39			c0.16			0.15	
v/s Ratio Perm												
v/c Ratio		0.34			0.64			0.50			0.48	
Uniform Delay, d1		9.1			11.7			25.3			25.1	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.3			1.1			3.1			2.8	
Delay (s)		9.4			12.8			28.4			28.0	
Level of Service		A			B			C			C	
Approach Delay (s)		9.4			12.8			28.4			28.0	
Approach LOS		A			B			C			C	

Intersection Summary			
HCM Average Control Delay	14.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	60.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	EBR2	WBT	SBT	SBR	NWL
Lane Configurations							
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0			4.0
Lane Util. Factor	0.95			0.95			0.97
Frt	0.95			1.00			1.00
Flt Protected	1.00			1.00			0.95
Satd. Flow (prot)	3400			3579			3471
Flt Permitted	1.00			1.00			0.95
Satd. Flow (perm)	3400			3579			3471
Volume (vph)	600	286	13	1506	0	0	8
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	600	286	13	1506	0	0	8
RTOR Reduction (vph)	1	0	0	0	0	0	0
Lane Group Flow (vph)	898	0	0	1506	0	0	8
Turn Type						Perm	
Protected Phases	6			6	4		8
Permitted Phases						4	
Actuated Green, G (s)	45.0			45.0			10.0
Effective Green, g (s)	45.0			45.0			9.5
Actuated g/C Ratio	0.60			0.60			0.13
Clearance Time (s)	4.0			4.0			3.5
Lane Grp Cap (vph)	2040			2147			440
v/s Ratio Prot	0.26			c0.42			c0.00
v/s Ratio Perm							
v/c Ratio	0.44			0.70			0.02
Uniform Delay, d1	8.2			10.4			28.7
Progression Factor	1.00			1.00			1.00
Incremental Delay, d2	0.7			1.9			0.1
Delay (s)	8.8			12.3			28.7
Level of Service	A			B			C
Approach Delay (s)	8.8			12.3	0.0		28.7
Approach LOS	A			B	A		C

Intersection Summary			
HCM Average Control Delay	11.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	20.5
Intersection Capacity Utilization	51.6%	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												
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		0.95			1.00				
Frt		1.00	0.85		1.00			1.00				
Flt Protected		1.00	1.00		1.00			0.95				
Satd. Flow (prot)		3579	1601		3579			1789				
Flt Permitted		1.00	1.00		1.00			0.76				
Satd. Flow (perm)		3579	1601		3579			1426				
Volume (vph)	0	600	4	0	841	0	488	0	0	0	0	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	600	4	0	841	0	488	0	0	0	0	0
RTOR Reduction (vph)	0	0	2	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	600	2	0	841	0	0	488	0	0	0	0
Turn Type	Perm		custom			custom	Perm			Perm		
Protected Phases		2	6					4			4	
Permitted Phases	2				2	2	4			4		
Actuated Green, G (s)		60.0	44.0		60.0			23.0				
Effective Green, g (s)		59.5	43.5		59.5			22.5				
Actuated g/C Ratio		0.66	0.48		0.66			0.25				
Clearance Time (s)		3.5	3.5		3.5			3.5				
Lane Grp Cap (vph)		2366	774		2366			357				
v/s Ratio Prot		0.17	0.00									
v/s Ratio Perm					c0.24			c0.34				
v/c Ratio		0.25	0.00		0.36			1.37				
Uniform Delay, d1		6.2	12.0		6.8			33.8				
Progression Factor		1.00	1.00		1.00			1.00				
Incremental Delay, d2		0.3	0.0		0.4			182.2				
Delay (s)		6.5	12.0		7.2			215.9				
Level of Service		A	B		A			F				
Approach Delay (s)		6.5			7.2			215.9			0.0	
Approach LOS		A			A			F			A	

Intersection Summary			
HCM Average Control Delay	59.7	HCM Level of Service	E
HCM Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	57.0%	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												
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		1.00	0.88		1.00		0.94	1.00			0.95	1.00
Frt		1.00	0.85		1.00		1.00	1.00			1.00	0.85
Flt Protected		1.00	1.00		1.00		0.95	1.00			1.00	1.00
Satd. Flow (prot)		1883	2818		1883		5046	1883			3579	1601
Flt Permitted		1.00	1.00		1.00		0.95	1.00			1.00	1.00
Satd. Flow (perm)		1883	2818		1883		5046	1883			3579	1601
Volume (vph)	0	195	746	0	159	0	1198	173	0	0	639	24
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	195	746	0	159	0	1198	173	0	0	639	24
RTOR Reduction (vph)	0	0	522	0	0	0	0	0	0	0	0	17
Lane Group Flow (vph)	0	195	224	0	159	0	1198	173	0	0	639	7
Turn Type	Perm		Perm	Perm			Prot			Perm		Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4		4	8						6		6
Actuated Green, G (s)		26.5	26.5		26.5		25.0	55.5			26.5	26.5
Effective Green, g (s)		27.0	27.0		27.0		25.0	55.0			26.0	26.0
Actuated g/C Ratio		0.30	0.30		0.30		0.28	0.61			0.29	0.29
Clearance Time (s)		4.5	4.5		4.5		4.0	3.5			3.5	3.5
Lane Grp Cap (vph)		565	845		565		1402	1151			1034	463
v/s Ratio Prot		c0.10			0.08		c0.24	0.09			c0.18	
v/s Ratio Perm			0.08									0.00
v/c Ratio		0.35	0.26		0.28		0.85	0.15			0.62	0.01
Uniform Delay, d1		24.6	24.0		24.1		30.8	7.5			27.7	22.9
Progression Factor		1.00	1.00		1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2		1.7	0.8		1.2		6.8	0.3			2.8	0.1
Delay (s)		26.3	24.7		25.3		37.6	7.8			30.5	22.9
Level of Service		C	C		C		D	A			C	C
Approach Delay (s)		25.0			25.3			33.8			30.2	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM Average Control Delay	30.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	62.1%	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												
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
Lane Util. Factor		0.95			0.95			0.91			0.95	1.00
Frt		1.00			1.00			0.96			1.00	0.85
Flt Protected		0.99			1.00			1.00			1.00	1.00
Satd. Flow (prot)		3523			3579			4960			3579	1601
Flt Permitted		0.50			1.00			1.00			1.00	1.00
Satd. Flow (perm)		1774			3579			4960			3579	1601
Volume (vph)	285	904	33	0	1420	0	0	278	86	0	872	722
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	285	904	33	0	1420	0	0	278	86	0	872	722
RTOR Reduction (vph)	0	2	0	0	0	0	0	62	0	0	0	42
Lane Group Flow (vph)	0	1220	0	0	1420	0	0	302	0	0	872	680
Turn Type	Perm						Perm			Perm		Perm
Protected Phases		4			4			2			2	
Permitted Phases	4						2			2		2
Actuated Green, G (s)		57.0			57.0			23.0			23.0	23.0
Effective Green, g (s)		58.0			58.0			24.0			24.0	24.0
Actuated g/C Ratio		0.64			0.64			0.27			0.27	0.27
Clearance Time (s)		5.0			5.0			5.0			5.0	5.0
Lane Grp Cap (vph)		1143			2306			1323			954	427
v/s Ratio Prot					0.40			0.06			0.24	
v/s Ratio Perm		c0.69										c0.42
v/c Ratio		1.83dl			0.62			0.23			0.91	1.59
Uniform Delay, d1		16.0			9.4			25.8			32.0	33.0
Progression Factor		1.00			1.00			1.00			1.00	1.00
Incremental Delay, d2		46.5			1.2			0.4			14.6	277.7
Delay (s)		62.5			10.7			26.2			46.6	310.7
Level of Service		E			B			C			D	F
Approach Delay (s)		62.5			10.7			26.2			166.2	
Approach LOS		E			B			C			F	

Intersection Summary			
HCM Average Control Delay	79.6	HCM Level of Service	E
HCM Volume to Capacity ratio	1.22		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	107.7%	ICU Level of Service	G
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	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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	
Lane Util. Factor		0.91			1.00	0.88		1.00		0.95	0.95	
Frt		0.99			1.00	0.85		1.00		1.00	1.00	
Flt Protected		1.00			1.00	1.00		0.95		0.95	0.97	
Satd. Flow (prot)		5085			1883	2818		1789		1700	1733	
Flt Permitted		1.00			1.00	1.00		0.95		0.95	0.97	
Satd. Flow (perm)		5085			1883	2818		1789		1700	1733	
Volume (vph)	0	365	29	0	677	1338	266	0	9	581	155	10
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	365	29	0	677	1338	266	0	9	581	155	10
RTOR Reduction (vph)	0	10	0	0	0	372	0	2	0	0	1	0
Lane Group Flow (vph)	0	384	0	0	677	966	0	273	0	365	380	0
Turn Type						pt+ov	Split			Split		
Protected Phases		4			4	4 2	6	6		2	2	
Permitted Phases												
Actuated Green, G (s)		28.0			28.0	65.5		17.5		34.0	34.0	
Effective Green, g (s)		27.5			27.5	65.0		17.0		33.5	33.5	
Actuated g/C Ratio		0.31			0.31	0.72		0.19		0.37	0.37	
Clearance Time (s)		3.5			3.5			3.5		3.5	3.5	
Lane Grp Cap (vph)		1554			575	2035		338		633	645	
v/s Ratio Prot		0.08			c0.36	0.34		c0.15		0.21	c0.22	
v/s Ratio Perm												
v/c Ratio		0.25			1.18	0.47		0.81		0.58	0.59	
Uniform Delay, d1		23.5			31.2	5.3		34.9		22.6	22.7	
Progression Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Incremental Delay, d2		0.4			96.9	0.8		18.5		3.8	3.9	
Delay (s)		23.9			128.2	6.1		53.5		26.4	26.6	
Level of Service		C			F	A		D		C	C	
Approach Delay (s)		23.9			47.1			53.5			26.5	
Approach LOS		C			D			D			C	

Intersection Summary			
HCM Average Control Delay	40.5	HCM Level of Service	D
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	81.4%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	3	0	6	0	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	3	0	6	0	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	6	6			6	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	6	6			6	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	1015	1077			1615	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	3	6	0
Volume Left	3	0	0
Volume Right	0	0	0
cSH	1015	1700	1700
Volume to Capacity	0.00	0.00	0.00
Queue Length 95th (m)	0.1	0.0	0.0
Control Delay (s)	8.6	0.0	0.0
Lane LOS	A		
Approach Delay (s)	8.6	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	2	187	0	18	339	0	0	46	8	0	34	23
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	2	187	0	18	339	0	0	46	8	0	34	23

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	189	357	54	57
Volume Left (vph)	2	18	0	0
Volume Right (vph)	0	0	8	23
Hadj (s)	0.04	0.04	-0.05	-0.21
Departure Headway (s)	4.6	4.5	5.2	5.0
Degree Utilization, x	0.24	0.44	0.08	0.08
Capacity (veh/h)	747	781	619	634
Control Delay (s)	9.1	10.9	8.6	8.5
Approach Delay (s)	9.1	10.9	8.6	8.5
Approach LOS	A	B	A	A

Intersection Summary			
Delay	10.0		
HCM Level of Service	B		
Intersection Capacity Utilization	39.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	10	0	1	113	0	2	23	0	0	34	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	10	0	1	113	0	2	23	0	0	34	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	118	61	34	66	61	23	34			23		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	118	61	34	66	61	23	34			23		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	99	100	100	86	100	100			100		
cM capacity (veh/h)	768	829	1039	918	829	1054	1578			1592		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	10	114	25	34
Volume Left	0	1	2	0
Volume Right	0	0	0	0
cSH	829	830	1578	1592
Volume to Capacity	0.01	0.14	0.00	0.00
Queue Length 95th (m)	0.3	3.6	0.0	0.0
Control Delay (s)	9.4	10.0	0.6	0.0
Lane LOS	A	B	A	
Approach Delay (s)	9.4	10.0	0.6	0.0
Approach LOS	A	B		

Intersection Summary			
Average Delay	6.8		
Intersection Capacity Utilization	16.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	30	21	0	0	133	0	6	0	18	0	0	13
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	30	21	0	0	133	0	6	0	18	0	0	13

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	51	133	24	13
Volume Left (vph)	30	0	6	0
Volume Right (vph)	0	0	18	13
Hadj (s)	0.15	0.03	-0.37	-0.57
Departure Headway (s)	4.3	4.1	3.9	3.8
Degree Utilization, x	0.06	0.15	0.03	0.01
Capacity (veh/h)	829	873	862	907
Control Delay (s)	7.5	7.8	7.1	6.8
Approach Delay (s)	7.5	7.8	7.1	6.8
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.6		
HCM Level of Service	A		
Intersection Capacity Utilization	27.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	187	0	0	204	0	13	0	0	0	0	112
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	187	0	0	204	0	13	0	0	0	0	112

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	187	204	13	112
Volume Left (vph)	0	0	13	0
Volume Right (vph)	0	0	0	112
Hadj (s)	0.03	0.03	0.23	-0.57
Departure Headway (s)	4.4	4.4	5.2	4.2
Degree Utilization, x	0.23	0.25	0.02	0.13
Capacity (veh/h)	781	778	631	773
Control Delay (s)	8.8	8.9	8.3	7.9
Approach Delay (s)	8.8	8.9	8.3	7.9
Approach LOS	A	A	A	A

Intersection Summary			
Delay	8.6		
HCM Level of Service	A		
Intersection Capacity Utilization	24.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	0	0	0	0	94	0	260	3	0	166	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	0	0	0	0	94	0	260	3	0	166	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	0	94	263	166
Volume Left (vph)	0	0	0	0
Volume Right (vph)	0	94	3	0
Hadj (s)	0.00	-0.57	0.03	0.03
Departure Headway (s)	5.0	4.3	4.3	4.4
Degree Utilization, x	0.00	0.11	0.32	0.20
Capacity (veh/h)	657	760	808	779
Control Delay (s)	8.0	7.8	9.3	8.6
Approach Delay (s)	0.0	7.8	9.3	8.6
Approach LOS	A	A	A	A

Intersection Summary			
Delay	8.8		
HCM Level of Service	A		
Intersection Capacity Utilization	26.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	194	0	28	357	80	0	92	65	22	74	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	194	0	28	357	80	0	92	65	22	74	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	194	465	157	96
Volume Left (vph)	0	28	0	22
Volume Right (vph)	0	80	65	0
Hadj (s)	0.03	-0.06	-0.21	0.08
Departure Headway (s)	5.3	4.9	5.6	6.0
Degree Utilization, x	0.29	0.63	0.24	0.16
Capacity (veh/h)	623	712	570	523
Control Delay (s)	10.5	15.9	10.3	10.1
Approach Delay (s)	10.5	15.9	10.3	10.1
Approach LOS	B	C	B	B

Intersection Summary			
Delay	13.2		
HCM Level of Service	B		
Intersection Capacity Utilization	62.7%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	19	32	12	76	0	107	59	7	0	52	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	19	32	12	76	0	107	59	7	0	52	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	51	88	173	52
Volume Left (vph)	0	12	107	0
Volume Right (vph)	32	0	7	0
Hadj (s)	-0.34	0.06	0.13	0.03
Departure Headway (s)	4.2	4.5	4.4	4.5
Degree Utilization, x	0.06	0.11	0.21	0.06
Capacity (veh/h)	808	744	787	765
Control Delay (s)	7.5	8.1	8.6	7.8
Approach Delay (s)	7.5	8.1	8.6	7.8
Approach LOS	A	A	A	A

Intersection Summary			
Delay	8.2		
HCM Level of Service	A		
Intersection Capacity Utilization	34.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	3	0	0	9	1	17	92	394	0	0	491	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	3	0	0	9	1	17	92	394	0	0	491	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	3	27	486	491
Volume Left (vph)	3	9	92	0
Volume Right (vph)	0	17	0	0
Hadj (s)	0.23	-0.28	0.07	0.03
Departure Headway (s)	6.4	5.8	4.6	4.5
Degree Utilization, x	0.01	0.04	0.62	0.62
Capacity (veh/h)	469	529	772	777
Control Delay (s)	9.4	9.0	14.7	14.7
Approach Delay (s)	9.4	9.0	14.7	14.7
Approach LOS	A	A	B	B

Intersection Summary			
Delay	14.5		
HCM Level of Service	B		
Intersection Capacity Utilization	65.0%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	7	2	13	6	6	9	25	471	7	0	497	4
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	7	2	13	6	6	9	25	471	7	0	497	4

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	22	21	503	501
Volume Left (vph)	7	6	25	0
Volume Right (vph)	13	9	7	4
Hadj (s)	-0.26	-0.17	0.04	0.03
Departure Headway (s)	5.9	6.0	4.6	4.6
Degree Utilization, x	0.04	0.04	0.64	0.64
Capacity (veh/h)	519	514	767	765
Control Delay (s)	9.1	9.2	15.6	15.5
Approach Delay (s)	9.1	9.2	15.6	15.5
Approach LOS	A	A	C	C

Intersection Summary			
Delay	15.3		
HCM Level of Service	C		
Intersection Capacity Utilization	55.6%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	0	0	0	0	0	0	13	0	0	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	0	0	0	0	0	0	13	0	0	0	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	0	0	13	0
Volume Left (vph)	0	0	0	0
Volume Right (vph)	0	0	0	0
Hadj (s)	0.00	0.00	0.03	0.00
Departure Headway (s)	3.9	3.9	3.9	3.9
Degree Utilization, x	0.00	0.00	0.01	0.00
Capacity (veh/h)	910	910	912	915
Control Delay (s)	6.9	6.9	7.0	6.9
Approach Delay (s)	0.0	0.0	7.0	0.0
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.0		
HCM Level of Service	A		
Intersection Capacity Utilization	6.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	0	0	0	0	0	0	246	1	0	143	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	0	0	0	0	0	0	246	1	0	143	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	0	0	247	143
Volume Left (vph)	0	0	0	0
Volume Right (vph)	0	0	1	0
Hadj (s)	0.00	0.00	0.03	0.03
Departure Headway (s)	4.7	4.7	4.1	4.2
Degree Utilization, x	0.00	0.00	0.28	0.17
Capacity (veh/h)	705	705	872	853
Control Delay (s)	7.7	7.7	8.6	8.0
Approach Delay (s)	0.0	0.0	8.6	8.0
Approach LOS	A	A	A	A

Intersection Summary			
Delay	8.4		
HCM Level of Service	A		
Intersection Capacity Utilization	16.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	0	0	0	0	6	0	7	0	0	0	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	0	0	0	0	6	0	7	0	0	0	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	0	6	7	0
Volume Left (vph)	0	0	0	0
Volume Right (vph)	0	6	0	0
Hadj (s)	0.00	-0.57	0.03	0.00
Departure Headway (s)	3.9	3.3	3.9	3.9
Degree Utilization, x	0.00	0.01	0.01	0.00
Capacity (veh/h)	912	1066	908	913
Control Delay (s)	6.9	6.4	7.0	6.9
Approach Delay (s)	0.0	6.4	7.0	0.0
Approach LOS	A	A	A	A

Intersection Summary			
Delay	6.7		
HCM Level of Service	A		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	0	0	0	0	135	0	21	0	12	27	3
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	0	0	0	0	135	0	21	0	12	27	3

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	0	135	21	42
Volume Left (vph)	0	0	0	12
Volume Right (vph)	0	135	0	3
Hadj (s)	0.00	-0.57	0.03	0.05
Departure Headway (s)	4.2	3.5	4.2	4.2
Degree Utilization, x	0.00	0.13	0.02	0.05
Capacity (veh/h)	851	1015	814	822
Control Delay (s)	7.2	7.0	7.3	7.4
Approach Delay (s)	0.0	7.0	7.3	7.4
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.1		
HCM Level of Service	A		
Intersection Capacity Utilization	24.0%	ICU Level of Service	A
Analysis Period (min)	15		

ALTERNATIVE 1
(No Build) AM
Additional Intersections

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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	
Lane Util. Factor		0.91			0.91		1.00	1.00		1.00	1.00	
Frt		0.98			1.00		1.00	0.96		1.00	0.91	
Flt Protected		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		5016			5141		1789	1804		1789	1722	
Flt Permitted		1.00			1.00		0.61	1.00		0.72	1.00	
Satd. Flow (perm)		5016			5141		1148	1804		1356	1722	
Volume (vph)	0	1853	361	0	1315	2	437	41	16	83	63	84
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1853	361	0	1315	2	437	41	16	83	63	84
RTOR Reduction (vph)	0	32	0	0	0	0	0	12	0	0	53	0
Lane Group Flow (vph)	0	2182	0	0	1317	0	437	45	0	83	94	0
Turn Type							Perm			Perm		
Protected Phases		2			6			4			8	
Permitted Phases							4			8		
Actuated Green, G (s)		58.5			58.5		23.0	23.0		23.0	23.0	
Effective Green, g (s)		58.5			58.5		23.5	23.5		23.5	23.5	
Actuated g/C Ratio		0.65			0.65		0.26	0.26		0.26	0.26	
Clearance Time (s)		4.0			4.0		4.5	4.5		4.5	4.5	
Lane Grp Cap (vph)		3260			3342		300	471		354	450	
v/s Ratio Prot		c0.43			0.26			0.03			0.05	
v/s Ratio Perm							c0.38			0.06		
v/c Ratio		0.67			0.39		1.46	0.10		0.23	0.21	
Uniform Delay, d1		9.8			7.4		33.2	25.2		26.2	26.0	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.1			0.3		223.1	0.4		1.6	1.1	
Delay (s)		10.9			7.8		256.4	25.6		27.7	27.0	
Level of Service		B			A		F	C		C	C	
Approach Delay (s)		10.9			7.8			229.7			27.3	
Approach LOS		B			A			F			C	

Intersection Summary			
HCM Average Control Delay	36.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	86.5%	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												
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	
Lane Util. Factor		0.91			0.91		1.00	1.00			1.00	
Frt		0.97			1.00		1.00	0.99			1.00	
Flt Protected		1.00			1.00		0.95	1.00			0.99	
Satd. Flow (prot)		5002			5122		1789	1872			1859	
Flt Permitted		1.00			1.00		0.52	1.00			0.84	
Satd. Flow (perm)		5002			5122		987	1872			1577	
Volume (vph)	0	1596	352	0	1165	31	131	222	9	65	178	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1596	352	0	1165	31	131	222	9	65	178	0
RTOR Reduction (vph)	0	39	0	0	3	0	0	1	0	0	0	0
Lane Group Flow (vph)	0	1909	0	0	1193	0	131	230	0	0	243	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		54.0			54.0		27.0	27.0			27.0	
Effective Green, g (s)		54.0			54.0		28.0	28.0			28.0	
Actuated g/C Ratio		0.60			0.60		0.31	0.31			0.31	
Clearance Time (s)		4.0			4.0		5.0	5.0			5.0	
Lane Grp Cap (vph)		3001			3073		307	582			491	
v/s Ratio Prot		c0.38			0.23			0.12				
v/s Ratio Perm							0.13				c0.15	
v/c Ratio		0.64			0.39		0.43	0.39			0.49	
Uniform Delay, d1		11.6			9.4		24.6	24.3			25.2	
Progression Factor		1.00			1.00		1.00	1.00			1.00	
Incremental Delay, d2		1.0			0.4		4.3	2.0			3.5	
Delay (s)		12.7			9.8		28.9	26.3			28.8	
Level of Service		B			A		C	C			C	
Approach Delay (s)		12.7			9.8			27.3			28.8	
Approach LOS		B			A			C			C	

Intersection Summary			
HCM Average Control Delay	14.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	73.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	EBR2	WBL	WBT	SBT	SBR	NWL	NWR2
Lane Configurations									
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0				4.0			4.0	
Lane Util. Factor	0.95				0.95			0.97	
Frt	0.96				1.00			0.99	
Flt Protected	1.00				1.00			0.96	
Satd. Flow (prot)	3448				3578			3457	
Flt Permitted	1.00				0.95			0.96	
Satd. Flow (perm)	3448				3414			3457	
Volume (vph)	923	295	1	1	521	0	0	300	21
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	923	295	1	1	521	0	0	300	21
RTOR Reduction (vph)	0	0	0	0	0	0	0	7	0
Lane Group Flow (vph)	1219	0	0	0	522	0	0	314	0
Turn Type				Perm			Perm		
Protected Phases	6				6	4		8	
Permitted Phases				6			4		
Actuated Green, G (s)	45.0				45.0			10.0	
Effective Green, g (s)	45.0				45.0			9.5	
Actuated g/C Ratio	0.60				0.60			0.13	
Clearance Time (s)	4.0				4.0			3.5	
Lane Grp Cap (vph)	2069				2048			438	
v/s Ratio Prot	c0.35							c0.09	
v/s Ratio Perm					0.15				
v/c Ratio	0.59				0.25			0.72	
Uniform Delay, d1	9.3				7.1			31.5	
Progression Factor	1.00				1.00			1.00	
Incremental Delay, d2	1.2				0.3			9.7	
Delay (s)	10.5				7.4			41.1	
Level of Service	B				A			D	
Approach Delay (s)	10.5				7.4	0.0		41.1	
Approach LOS	B				A	A		D	

Intersection Summary			
HCM Average Control Delay	14.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	20.5
Intersection Capacity Utilization	50.9%	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												
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		0.95			1.00				
Frt		1.00	0.85		1.00			1.00				
Flt Protected		1.00	1.00		1.00			0.95				
Satd. Flow (prot)		3579	1601		3579			1789				
Flt Permitted		1.00	1.00		1.00			0.76				
Satd. Flow (perm)		3579	1601		3579			1426				
Volume (vph)	0	599	349	0	497	0	6	0	0	0	0	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	599	349	0	497	0	6	0	0	0	0	0
RTOR Reduction (vph)	0	0	180	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	599	169	0	497	0	0	6	0	0	0	0
Turn Type	Perm		custom			custom	Perm			Perm		
Protected Phases		2	6					4			4	
Permitted Phases	2				2	2	4			4		
Actuated Green, G (s)		60.0	44.0		60.0			23.0				
Effective Green, g (s)		59.5	43.5		59.5			22.5				
Actuated g/C Ratio		0.66	0.48		0.66			0.25				
Clearance Time (s)		3.5	3.5		3.5			3.5				
Lane Grp Cap (vph)		2366	774		2366			357				
v/s Ratio Prot		c0.17	0.11									
v/s Ratio Perm					0.14			c0.00				
v/c Ratio		0.25	0.22		0.21			0.02				
Uniform Delay, d1		6.2	13.4		6.0			25.4				
Progression Factor		1.00	1.00		1.00			1.00				
Incremental Delay, d2		0.3	0.6		0.2			0.1				
Delay (s)		6.5	14.1		6.2			25.5				
Level of Service		A	B		A			C				
Approach Delay (s)		9.3			6.2			25.5			0.0	
Approach LOS		A			A			C			A	

Intersection Summary			
HCM Average Control Delay	8.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.19		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	26.6%	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												
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		1.00	0.88		1.00		0.94	1.00			0.95	1.00
Frt		1.00	0.85		1.00		1.00	1.00			1.00	0.85
Flt Protected		1.00	1.00		1.00		0.95	1.00			1.00	1.00
Satd. Flow (prot)		1883	2818		1883		5046	1883			3579	1601
Flt Permitted		1.00	1.00		1.00		0.95	1.00			1.00	1.00
Satd. Flow (perm)		1883	2818		1883		5046	1883			3579	1601
Volume (vph)	0	442	1083	0	20	0	256	14	0	0	87	15
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	442	1083	0	20	0	256	14	0	0	87	15
RTOR Reduction (vph)	0	0	421	0	0	0	0	0	0	0	0	11
Lane Group Flow (vph)	0	442	662	0	20	0	256	14	0	0	87	5
Turn Type	Perm		pt+ov	Perm			Prot			Perm		Perm
Protected Phases		4	4 5		8		5	2			6	
Permitted Phases	4			8						6		6
Actuated Green, G (s)		39.5	54.5		39.5		11.5	42.5			27.5	27.5
Effective Green, g (s)		40.0	55.0		40.0		11.0	42.0			27.0	27.0
Actuated g/C Ratio		0.44	0.61		0.44		0.12	0.47			0.30	0.30
Clearance Time (s)		4.5			4.5		3.5	3.5			3.5	3.5
Lane Grp Cap (vph)		837	1722		837		617	879			1074	480
v/s Ratio Prot		c0.23	c0.23		0.01		0.05	0.01			c0.02	
v/s Ratio Perm												0.00
v/c Ratio		0.53	0.38		0.02		0.41	0.02			0.08	0.01
Uniform Delay, d1		18.1	8.9		14.0		36.5	12.9			22.6	22.1
Progression Factor		1.00	1.00		1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2		2.4	0.7		0.1		2.1	0.0			0.1	0.0
Delay (s)		20.5	9.5		14.1		38.6	12.9			22.7	22.1
Level of Service		C	A		B		D	B			C	C
Approach Delay (s)		12.7			14.1			37.2			22.7	
Approach LOS		B			B			D			C	

Intersection Summary			
HCM Average Control Delay	16.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	54.6%	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												
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
Lane Util. Factor		0.95			0.95			0.91			0.95	1.00
Frt		1.00			1.00			0.98			1.00	0.85
Flt Protected		1.00			1.00			1.00			1.00	1.00
Satd. Flow (prot)		3579			3579			5029			3579	1601
Flt Permitted		1.00			1.00			0.94			1.00	1.00
Satd. Flow (perm)		3579			3579			4724			3579	1601
Volume (vph)	0	1354	0	0	744	0	3	543	92	0	85	307
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1354	0	0	744	0	3	543	92	0	85	307
RTOR Reduction (vph)	0	0	0	0	0	0	0	26	0	0	0	208
Lane Group Flow (vph)	0	1354	0	0	744	0	0	612	0	0	85	99
Turn Type	Perm			Perm			Perm			Perm		Perm
Protected Phases		4			4			2			2	
Permitted Phases	4			4			2			2		2
Actuated Green, G (s)		61.0			61.0			19.0			19.0	19.0
Effective Green, g (s)		62.0			62.0			20.0			20.0	20.0
Actuated g/C Ratio		0.69			0.69			0.22			0.22	0.22
Clearance Time (s)		5.0			5.0			5.0			5.0	5.0
Lane Grp Cap (vph)		2466			2466			1050			795	356
v/s Ratio Prot		c0.38			0.21						0.02	
v/s Ratio Perm								c0.13				0.06
v/c Ratio		0.55			0.30			0.58			0.11	0.28
Uniform Delay, d1		7.0			5.5			31.3			27.9	29.0
Progression Factor		1.00			1.00			1.00			1.00	1.00
Incremental Delay, d2		0.9			0.3			2.4			0.3	1.9
Delay (s)		7.9			5.8			33.6			28.2	30.9
Level of Service		A			A			C			C	C
Approach Delay (s)		7.9			5.8			33.6			30.3	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM Average Control Delay	15.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	62.2%	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												
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	
Lane Util. Factor		0.91			1.00	0.88		1.00		0.95	0.95	
Frt		0.97			1.00	0.85		0.98		1.00	1.00	
Flt Protected		1.00			1.00	1.00		0.96		0.95	0.97	
Satd. Flow (prot)		4969			1883	2818		1768		1700	1734	
Flt Permitted		1.00			1.00	1.00		0.56		0.95	0.97	
Satd. Flow (perm)		4969			1883	2818		1028		1700	1734	
Volume (vph)	0	680	197	0	296	467	73	0	14	548	159	12
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	680	197	0	296	467	73	0	14	548	159	12
RTOR Reduction (vph)	0	58	0	0	0	130	0	7	0	0	2	0
Lane Group Flow (vph)	0	819	0	0	296	337	0	80	0	352	365	0
Turn Type	Perm					pt+ov	Perm			Split		
Protected Phases		4			4	4 2		6		2	2	
Permitted Phases	4						6					
Actuated Green, G (s)		17.0			17.0	65.5		17.5		45.0	45.0	
Effective Green, g (s)		16.5			16.5	65.0		17.0		44.5	44.5	
Actuated g/C Ratio		0.18			0.18	0.72		0.19		0.49	0.49	
Clearance Time (s)		3.5			3.5			3.5		3.5	3.5	
Lane Grp Cap (vph)		911			345	2035		194		841	857	
v/s Ratio Prot		c0.16			0.16	0.12				0.21	c0.21	
v/s Ratio Perm								c0.08				
v/c Ratio		0.90			0.86	0.17		0.41		0.42	0.43	
Uniform Delay, d1		35.9			35.6	3.9		32.1		14.5	14.6	
Progression Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Incremental Delay, d2		13.6			23.1	0.2		6.3		1.5	1.6	
Delay (s)		49.5			58.8	4.1		38.4		16.0	16.1	
Level of Service		D			E	A		D		B	B	
Approach Delay (s)		49.5			25.3			38.4			16.1	
Approach LOS		D			C			D			B	

Intersection Summary			
HCM Average Control Delay	31.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	52.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	0	0	0	0	0	7
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	0	0	0	0	7
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	7	0			0	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	7	0			0	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	1014	1085			1623	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	0	0	7
Volume Left	0	0	0
Volume Right	0	0	0
cSH	1700	1700	1623
Volume to Capacity	0.00	0.00	0.00
Queue Length 95th (m)	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0
Lane LOS	A		
Approach Delay (s)	0.0	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	6.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	19	78	0	3	201	0	0	10	3	230	19	21
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	19	78	0	3	201	0	0	10	3	230	19	21

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	97	204	13	270
Volume Left (vph)	19	3	0	230
Volume Right (vph)	0	0	3	21
Hadj (s)	0.07	0.04	-0.10	0.16
Departure Headway (s)	5.0	4.8	4.9	4.8
Degree Utilization, x	0.13	0.27	0.02	0.36
Capacity (veh/h)	671	706	662	706
Control Delay (s)	8.7	9.6	8.0	10.6
Approach Delay (s)	8.7	9.6	8.0	10.6
Approach LOS	A	A	A	B

Intersection Summary			
Delay	9.9		
HCM Level of Service	A		
Intersection Capacity Utilization	44.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	316	153	0	12	0	0	20	0	0	66	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	316	153	0	12	0	0	20	0	0	66	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	92	86	66	397	86	20	66			20		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	92	86	66	397	86	20	66			20		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	61	85	100	99	100	100			100		
cM capacity (veh/h)	882	804	998	331	804	1058	1536			1596		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	469	12	20	66
Volume Left	0	0	0	0
Volume Right	153	0	0	0
cSH	858	804	1536	1596
Volume to Capacity	0.55	0.01	0.00	0.00
Queue Length 95th (m)	25.7	0.3	0.0	0.0
Control Delay (s)	14.1	9.5	0.0	0.0
Lane LOS	B	A		
Approach Delay (s)	14.1	9.5	0.0	0.0
Approach LOS	B	A		

Intersection Summary			
Average Delay	11.9		
Intersection Capacity Utilization	36.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	3	478	0	0	23	0	0	1	0	0	0	24
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	3	478	0	0	23	0	0	1	0	0	0	24

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	481	23	1	24
Volume Left (vph)	3	0	0	0
Volume Right (vph)	0	0	0	24
Hadj (s)	0.04	0.03	0.03	-0.57
Departure Headway (s)	4.0	4.4	5.0	4.4
Degree Utilization, x	0.54	0.03	0.00	0.03
Capacity (veh/h)	888	777	641	726
Control Delay (s)	11.6	7.6	8.1	7.5
Approach Delay (s)	11.6	7.6	8.1	7.5
Approach LOS	B	A	A	A

Intersection Summary			
Delay	11.2		
HCM Level of Service	B		
Intersection Capacity Utilization	37.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	136	6	0	193	0	3	0	0	0	137	33
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	136	6	0	193	0	3	0	0	0	137	33

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	142	193	3	170
Volume Left (vph)	0	0	3	0
Volume Right (vph)	6	0	0	33
Hadj (s)	0.01	0.03	0.23	-0.08
Departure Headway (s)	4.6	4.5	5.1	4.6
Degree Utilization, x	0.18	0.24	0.00	0.22
Capacity (veh/h)	754	756	636	728
Control Delay (s)	8.6	9.0	8.2	8.9
Approach Delay (s)	8.6	9.0	8.2	8.9
Approach LOS	A	A	A	A

Intersection Summary			
Delay	8.8		
HCM Level of Service	A		
Intersection Capacity Utilization	26.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	0	0	0	0	43	0	165	1	145	218	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	0	0	0	0	43	0	165	1	145	218	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	0	43	166	363
Volume Left (vph)	0	0	0	145
Volume Right (vph)	0	43	1	0
Hadj (s)	0.00	-0.57	0.03	0.11
Departure Headway (s)	5.1	4.5	4.4	4.3
Degree Utilization, x	0.00	0.05	0.20	0.43
Capacity (veh/h)	633	710	793	819
Control Delay (s)	8.1	7.7	8.5	10.5
Approach Delay (s)	0.0	7.7	8.5	10.5
Approach LOS	A	A	A	B

Intersection Summary			
Delay	9.7		
HCM Level of Service	A		
Intersection Capacity Utilization	41.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	1	216	95	102	204	24	0	39	4	309	33	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	1	216	95	102	204	24	0	39	4	309	33	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	312	330	43	342
Volume Left (vph)	1	102	0	309
Volume Right (vph)	95	24	4	0
Hadj (s)	-0.15	0.05	-0.02	0.21
Departure Headway (s)	5.6	5.7	6.5	6.0
Degree Utilization, x	0.48	0.52	0.08	0.57
Capacity (veh/h)	605	594	440	564
Control Delay (s)	13.6	14.8	10.0	16.6
Approach Delay (s)	13.6	14.8	10.0	16.6
Approach LOS	B	B	B	C

Intersection Summary			
Delay	14.9		
HCM Level of Service	B		
Intersection Capacity Utilization	70.6%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	15	314	2	17	0	25	30	9	3	26	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	15	314	2	17	0	25	30	9	3	26	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	329	19	64	29
Volume Left (vph)	0	2	25	3
Volume Right (vph)	314	0	9	0
Hadj (s)	-0.54	0.06	0.03	0.05
Departure Headway (s)	3.6	4.5	4.6	4.7
Degree Utilization, x	0.33	0.02	0.08	0.04
Capacity (veh/h)	974	762	718	699
Control Delay (s)	8.4	7.6	8.0	7.9
Approach Delay (s)	8.4	7.6	8.0	7.9
Approach LOS	A	A	A	A

Intersection Summary			
Delay	8.3		
HCM Level of Service	A		
Intersection Capacity Utilization	36.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	1	1	145	3	0	2	43	491	0	16	408	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	1	1	145	3	0	2	43	491	0	16	408	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	147	5	534	424
Volume Left (vph)	1	3	43	16
Volume Right (vph)	145	2	0	0
Hadj (s)	-0.56	-0.09	0.05	0.04
Departure Headway (s)	5.6	6.5	5.0	5.1
Degree Utilization, x	0.23	0.01	0.74	0.60
Capacity (veh/h)	570	462	707	688
Control Delay (s)	10.3	9.6	20.5	15.4
Approach Delay (s)	10.3	9.6	20.5	15.4
Approach LOS	B	A	C	C

Intersection Summary			
Delay	17.2		
HCM Level of Service	C		
Intersection Capacity Utilization	59.0%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	2	14	16	2	0	1	6	532	3	3	552	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	2	14	16	2	0	1	6	532	3	3	552	1

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	32	3	541	556
Volume Left (vph)	2	2	6	3
Volume Right (vph)	16	1	3	1
Hadj (s)	-0.25	-0.03	0.03	0.03
Departure Headway (s)	6.1	6.4	4.7	4.6
Degree Utilization, x	0.05	0.01	0.70	0.72
Capacity (veh/h)	526	490	754	765
Control Delay (s)	9.4	9.4	17.8	18.5
Approach Delay (s)	9.4	9.4	17.8	18.5
Approach LOS	A	A	C	C

Intersection Summary			
Delay	17.9		
HCM Level of Service	C		
Intersection Capacity Utilization	42.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	0	0	0	0	0	0	3	0	0	144	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	0	0	0	0	0	0	3	0	0	144	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	0	0	3	144
Volume Left (vph)	0	0	0	0
Volume Right (vph)	0	0	0	0
Hadj (s)	0.00	0.00	0.03	0.03
Departure Headway (s)	4.2	4.2	4.1	3.9
Degree Utilization, x	0.00	0.00	0.00	0.16
Capacity (veh/h)	831	831	867	910
Control Delay (s)	7.2	7.2	7.1	7.7
Approach Delay (s)	0.0	0.0	7.1	7.7
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.7		
HCM Level of Service	A		
Intersection Capacity Utilization	10.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	13	0	0	0	0	0	152	0	0	211	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	13	0	0	0	0	0	152	0	0	211	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	13	0	152	211
Volume Left (vph)	0	0	0	0
Volume Right (vph)	0	0	0	0
Hadj (s)	0.03	0.00	0.03	0.03
Departure Headway (s)	4.7	4.7	4.2	4.1
Degree Utilization, x	0.02	0.00	0.18	0.24
Capacity (veh/h)	699	721	845	865
Control Delay (s)	7.8	7.7	8.1	8.4
Approach Delay (s)	7.8	0.0	8.1	8.4
Approach LOS	A	A	A	A

Intersection Summary			
Delay	8.2		
HCM Level of Service	A		
Intersection Capacity Utilization	21.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	0	0	0	0	1	0	0	0	17	127	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	0	0	0	0	1	0	0	0	17	127	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	0	1	0	144
Volume Left (vph)	0	0	0	17
Volume Right (vph)	0	1	0	0
Hadj (s)	0.00	-0.57	0.00	0.06
Departure Headway (s)	4.2	3.6	4.0	4.0
Degree Utilization, x	0.00	0.00	0.00	0.16
Capacity (veh/h)	830	946	900	904
Control Delay (s)	7.2	6.6	7.0	7.7
Approach Delay (s)	0.0	6.6	0.0	7.7
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.7		
HCM Level of Service	A		
Intersection Capacity Utilization	17.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	0	0	0	0	6	0	22	0	3	18	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	0	0	0	0	6	0	22	0	3	18	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	0	6	22	21
Volume Left (vph)	0	0	0	3
Volume Right (vph)	0	6	0	0
Hadj (s)	0.00	-0.57	0.03	0.06
Departure Headway (s)	4.0	3.4	4.0	4.0
Degree Utilization, x	0.00	0.01	0.02	0.02
Capacity (veh/h)	900	1032	902	894
Control Delay (s)	7.0	6.4	7.1	7.1
Approach Delay (s)	0.0	6.4	7.1	7.1
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.0		
HCM Level of Service	A		
Intersection Capacity Utilization	13.5%	ICU Level of Service	A
Analysis Period (min)	15		

ALTERNATIVE 1

(No Build) PM

Additional Intersections

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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	
Lane Util. Factor		0.91			0.91		1.00	1.00		1.00	1.00	
Frt		0.97			1.00		1.00	0.99		1.00	0.95	
Flt Protected		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		4964			5131		1789	1864		1789	1796	
Flt Permitted		1.00			1.00		0.70	1.00		0.46	1.00	
Satd. Flow (perm)		4964			5131		1316	1864		860	1796	
Volume (vph)	0	1510	454	0	1914	28	224	219	16	34	62	28
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1510	454	0	1914	28	224	219	16	34	62	28
RTOR Reduction (vph)	0	60	0	0	2	0	0	3	0	0	15	0
Lane Group Flow (vph)	0	1904	0	0	1940	0	224	232	0	34	75	0
Turn Type							Perm			Perm		
Protected Phases		2			6			4			8	
Permitted Phases							4			8		
Actuated Green, G (s)		58.5			58.5		23.0	23.0		23.0	23.0	
Effective Green, g (s)		58.5			58.5		23.5	23.5		23.5	23.5	
Actuated g/C Ratio		0.65			0.65		0.26	0.26		0.26	0.26	
Clearance Time (s)		4.0			4.0		4.5	4.5		4.5	4.5	
Lane Grp Cap (vph)		3227			3335		344	487		225	469	
v/s Ratio Prot		c0.38			0.38			0.12			0.04	
v/s Ratio Perm							c0.17			0.04		
v/c Ratio		0.59			0.58		0.65	0.48		0.15	0.16	
Uniform Delay, d1		8.9			8.9		29.6	28.1		25.6	25.6	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.8			0.7		9.2	3.3		1.4	0.7	
Delay (s)		9.7			9.6		38.8	31.4		27.0	26.4	
Level of Service		A			A		D	C		C	C	
Approach Delay (s)		9.7			9.6			35.0			26.5	
Approach LOS		A			A			D			C	

Intersection Summary			
HCM Average Control Delay	12.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
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												
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		0.91			0.91			1.00			1.00	
Frt		0.97			0.99			0.99			1.00	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		4983			5095			1860			1875	
Flt Permitted		1.00			1.00			1.00			1.00	
Satd. Flow (perm)		4983			5095			1860			1875	
Volume (vph)	0	1126	293	0	1924	124	0	328	29	0	320	11
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1126	293	0	1924	124	0	328	29	0	320	11
RTOR Reduction (vph)	0	52	0	0	8	0	0	3	0	0	1	0
Lane Group Flow (vph)	0	1367	0	0	2040	0	0	354	0	0	330	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)		54.0			54.0			27.0			27.0	
Effective Green, g (s)		54.0			54.0			28.0			28.0	
Actuated g/C Ratio		0.60			0.60			0.31			0.31	
Clearance Time (s)		4.0			4.0			5.0			5.0	
Lane Grp Cap (vph)		2990			3057			579			583	
v/s Ratio Prot		0.27			c0.40			c0.19			0.18	
v/s Ratio Perm												
v/c Ratio		0.46			0.67			0.61			0.57	
Uniform Delay, d1		9.9			12.0			26.4			25.9	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.5			1.2			4.7			3.9	
Delay (s)		10.4			13.2			31.1			29.9	
Level of Service		B			B			C			C	
Approach Delay (s)		10.4			13.2			31.1			29.9	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM Average Control Delay	15.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	65.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	EBR2	WBL	WBT	SBT	SBR	NWL	NWR2
Lane Configurations									
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0				4.0			4.0	
Lane Util. Factor	0.95				0.95			0.97	
Frt	0.96				1.00			1.00	
Flt Protected	1.00				1.00			0.95	
Satd. Flow (prot)	3432				3577			3476	
Flt Permitted	1.00				0.94			0.95	
Satd. Flow (perm)	3432				3380			3476	
Volume (vph)	746	277	2	10	1003	0	0	252	3
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	746	277	2	10	1003	0	0	252	3
RTOR Reduction (vph)	0	0	0	0	0	0	0	1	0
Lane Group Flow (vph)	1025	0	0	0	1013	0	0	254	0
Turn Type				Perm			Perm		
Protected Phases	6				6	4		8	
Permitted Phases				6			4		
Actuated Green, G (s)	45.0				45.0			10.0	
Effective Green, g (s)	45.0				45.0			9.5	
Actuated g/C Ratio	0.60				0.60			0.13	
Clearance Time (s)	4.0				4.0			3.5	
Lane Grp Cap (vph)	2059				2028			440	
v/s Ratio Prot	0.30							c0.07	
v/s Ratio Perm					c0.30				
v/c Ratio	0.50				0.50			0.58	
Uniform Delay, d1	8.6				8.6			30.9	
Progression Factor	1.00				1.00			1.00	
Incremental Delay, d2	0.9				0.9			5.4	
Delay (s)	9.4				9.5			36.3	
Level of Service	A				A			D	
Approach Delay (s)	9.4				9.5	0.0		36.3	
Approach LOS	A				A	A		D	

Intersection Summary			
HCM Average Control Delay	12.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	20.5
Intersection Capacity Utilization	48.7%	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												
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		0.95			1.00				
Frt		1.00	0.85		1.00			1.00				
Flt Protected		1.00	1.00		1.00			0.95				
Satd. Flow (prot)		3579	1601		3579			1789				
Flt Permitted		1.00	1.00		1.00			0.76				
Satd. Flow (perm)		3579	1601		3579			1426				
Volume (vph)	0	566	164	0	620	0	399	0	0	0	0	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	566	164	0	620	0	399	0	0	0	0	0
RTOR Reduction (vph)	0	0	85	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	566	79	0	620	0	0	399	0	0	0	0
Turn Type	Perm		custom			custom	Perm			Perm		
Protected Phases		2	6					4			4	
Permitted Phases	2				2	2	4			4		
Actuated Green, G (s)		60.0	44.0		60.0			23.0				
Effective Green, g (s)		59.5	43.5		59.5			22.5				
Actuated g/C Ratio		0.66	0.48		0.66			0.25				
Clearance Time (s)		3.5	3.5		3.5			3.5				
Lane Grp Cap (vph)		2366	774		2366			357				
v/s Ratio Prot		0.16	0.05									
v/s Ratio Perm					c0.17			c0.28				
v/c Ratio		0.24	0.10		0.26			1.12				
Uniform Delay, d1		6.1	12.6		6.3			33.8				
Progression Factor		1.00	1.00		1.00			1.00				
Incremental Delay, d2		0.2	0.3		0.3			83.4				
Delay (s)		6.4	12.9		6.5			117.1				
Level of Service		A	B		A			F				
Approach Delay (s)		7.8			6.5			117.1			0.0	
Approach LOS		A			A			F			A	

Intersection Summary			
HCM Average Control Delay	32.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	45.9%	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												
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		1.00	0.88		1.00		0.94	1.00			0.95	1.00
Frt		1.00	0.85		1.00		1.00	1.00			1.00	0.85
Flt Protected		1.00	1.00		1.00		0.95	1.00			1.00	1.00
Satd. Flow (prot)		1883	2818		1883		5046	1883			3579	1601
Flt Permitted		1.00	1.00		1.00		0.95	1.00			1.00	1.00
Satd. Flow (perm)		1883	2818		1883		5046	1883			3579	1601
Volume (vph)	0	220	1161	0	201	0	922	95	0	0	198	55
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	220	1161	0	201	0	922	95	0	0	198	55
RTOR Reduction (vph)	0	0	813	0	0	0	0	0	0	0	0	39
Lane Group Flow (vph)	0	220	348	0	201	0	922	95	0	0	198	16
Turn Type	Perm		Perm	Perm			Prot			Perm		Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4		4	8						6		6
Actuated Green, G (s)		26.5	26.5		26.5		25.0	55.5			26.5	26.5
Effective Green, g (s)		27.0	27.0		27.0		25.0	55.0			26.0	26.0
Actuated g/C Ratio		0.30	0.30		0.30		0.28	0.61			0.29	0.29
Clearance Time (s)		4.5	4.5		4.5		4.0	3.5			3.5	3.5
Lane Grp Cap (vph)		565	845		565		1402	1151			1034	463
v/s Ratio Prot		0.12			0.11		c0.18	0.05			c0.06	
v/s Ratio Perm			c0.12									0.01
v/c Ratio		0.39	0.41		0.36		0.66	0.08			0.19	0.03
Uniform Delay, d1		25.0	25.2		24.7		28.7	7.2			24.1	23.0
Progression Factor		1.00	1.00		1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2		2.0	1.5		1.7		2.4	0.1			0.4	0.1
Delay (s)		27.0	26.6		26.4		31.1	7.3			24.5	23.1
Level of Service		C	C		C		C	A			C	C
Approach Delay (s)		26.7			26.4			28.9			24.2	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM Average Control Delay	27.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
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												
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
Lane Util. Factor		0.95			0.95			0.91			0.95	1.00
Frt		1.00			1.00			0.94			1.00	0.85
Flt Protected		0.99			1.00			1.00			1.00	1.00
Satd. Flow (prot)		3551			3579			4835			3579	1601
Flt Permitted		0.51			1.00			1.00			1.00	1.00
Satd. Flow (perm)		1833			3579			4835			3579	1601
Volume (vph)	186	1003	0	0	1420	0	0	220	145	0	690	493
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	186	1003	0	0	1420	0	0	220	145	0	690	493
RTOR Reduction (vph)	0	0	0	0	0	0	0	103	0	0	0	42
Lane Group Flow (vph)	0	1189	0	0	1420	0	0	262	0	0	690	451
Turn Type	Perm						Perm			Perm		Perm
Protected Phases		4			4			2			2	
Permitted Phases	4						2			2		2
Actuated Green, G (s)		57.0			57.0			23.0			23.0	23.0
Effective Green, g (s)		58.0			58.0			24.0			24.0	24.0
Actuated g/C Ratio		0.64			0.64			0.27			0.27	0.27
Clearance Time (s)		5.0			5.0			5.0			5.0	5.0
Lane Grp Cap (vph)		1181			2306			1289			954	427
v/s Ratio Prot					0.40			0.05			0.19	
v/s Ratio Perm		c0.65										c0.28
v/c Ratio		1.21dl			0.62			0.20			0.72	1.06
Uniform Delay, d1		16.0			9.4			25.6			30.0	33.0
Progression Factor		1.00			1.00			1.00			1.00	1.00
Incremental Delay, d2		27.8			1.2			0.4			4.8	59.3
Delay (s)		43.8			10.7			25.9			34.7	92.3
Level of Service		D			B			C			C	F
Approach Delay (s)		43.8			10.7			25.9			58.7	
Approach LOS		D			B			C			E	

Intersection Summary			
HCM Average Control Delay	35.2	HCM Level of Service	D
HCM Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	101.5%	ICU Level of Service	G
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	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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	
Lane Util. Factor		0.91			1.00	0.88		1.00		0.95	0.95	
Frt		0.98			1.00	0.85		0.99		1.00	0.99	
Flt Protected		1.00			1.00	1.00		0.95		0.95	0.98	
Satd. Flow (prot)		5015			1883	2818		1787		1700	1746	
Flt Permitted		1.00			1.00	1.00		0.95		0.95	0.98	
Satd. Flow (perm)		5015			1883	2818		1787		1700	1746	
Volume (vph)	0	550	108	0	764	1023	208	0	9	471	230	22
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	550	108	0	764	1023	208	0	9	471	230	22
RTOR Reduction (vph)	0	33	0	0	0	284	0	2	0	0	3	0
Lane Group Flow (vph)	0	625	0	0	764	739	0	215	0	354	366	0
Turn Type						pt+ov	Split			Split		
Protected Phases		4			4	4 2	6	6		2	2	
Permitted Phases												
Actuated Green, G (s)		28.0			28.0	65.5		17.5		34.0	34.0	
Effective Green, g (s)		27.5			27.5	65.0		17.0		33.5	33.5	
Actuated g/C Ratio		0.31			0.31	0.72		0.19		0.37	0.37	
Clearance Time (s)		3.5			3.5			3.5		3.5	3.5	
Lane Grp Cap (vph)		1532			575	2035		338		633	650	
v/s Ratio Prot		0.12			c0.41	0.26		c0.12		0.21	c0.21	
v/s Ratio Perm												
v/c Ratio		0.41			1.33	0.36		0.64		0.56	0.56	
Uniform Delay, d1		24.8			31.2	4.7		33.7		22.4	22.4	
Progression Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Incremental Delay, d2		0.8			159.6	0.5		8.9		3.5	3.5	
Delay (s)		25.6			190.9	5.2		42.5		25.9	26.0	
Level of Service		C			F	A		D		C	C	
Approach Delay (s)		25.6			84.6			42.5			26.0	
Approach LOS		C			F			D			C	

Intersection Summary			
HCM Average Control Delay	57.9	HCM Level of Service	E
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	82.0%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	1	81	4	0	0	2
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	1	81	4	0	0	2
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	6	4			4	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	6	4			4	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	92			100	
cM capacity (veh/h)	1015	1080			1618	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	82	4	2
Volume Left	1	0	0
Volume Right	81	0	0
cSH	1079	1700	1618
Volume to Capacity	0.08	0.00	0.00
Queue Length 95th (m)	1.9	0.0	0.0
Control Delay (s)	8.6	0.0	0.0
Lane LOS	A		
Approach Delay (s)	8.6	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	8.0		
Intersection Capacity Utilization	15.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	29	53	1	2	338	30	0	22	6	142	15	23
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	29	53	1	2	338	30	0	22	6	142	15	23

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	83	370	28	180
Volume Left (vph)	29	2	0	142
Volume Right (vph)	1	30	6	23
Hadj (s)	0.10	-0.01	-0.09	0.12
Departure Headway (s)	5.0	4.6	5.2	5.1
Degree Utilization, x	0.12	0.47	0.04	0.26
Capacity (veh/h)	664	758	618	646
Control Delay (s)	8.7	11.5	8.4	9.9
Approach Delay (s)	8.7	11.5	8.4	9.9
Approach LOS	A	B	A	A

Intersection Summary			
Delay	10.6		
HCM Level of Service	B		
Intersection Capacity Utilization	49.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	197	93	0	239	0	1	46	0	0	49	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	197	93	0	239	0	1	46	0	0	49	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	216	97	49	288	97	46	49			46		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	216	97	49	288	97	46	49			46		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	75	91	100	70	100	100			100		
cM capacity (veh/h)	567	793	1020	487	793	1023	1558			1562		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	290	239	47	49
Volume Left	0	0	1	0
Volume Right	93	0	0	0
cSH	853	793	1558	1562
Volume to Capacity	0.34	0.30	0.00	0.00
Queue Length 95th (m)	11.5	9.7	0.0	0.0
Control Delay (s)	11.4	11.5	0.2	0.0
Lane LOS	B	B	A	
Approach Delay (s)	11.4	11.5	0.2	0.0
Approach LOS	B	B		

Intersection Summary			
Average Delay	9.7		
Intersection Capacity Utilization	26.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	12	307	0	0	254	1	0	5	0	0	0	5
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	12	307	0	0	254	1	0	5	0	0	0	5

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	319	255	5	5
Volume Left (vph)	12	0	0	0
Volume Right (vph)	0	1	0	5
Hadj (s)	0.04	0.03	0.03	-0.57
Departure Headway (s)	4.2	4.3	5.2	4.6
Degree Utilization, x	0.37	0.30	0.01	0.01
Capacity (veh/h)	841	822	620	689
Control Delay (s)	9.7	9.1	8.2	7.6
Approach Delay (s)	9.7	9.1	8.2	7.6
Approach LOS	A	A	A	A

Intersection Summary			
Delay	9.4		
HCM Level of Service	A		
Intersection Capacity Utilization	35.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	1	174	21	0	167	0	10	1	0	4	23	49
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	1	174	21	0	167	0	10	1	0	4	23	49

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	196	167	11	76
Volume Left (vph)	1	0	10	4
Volume Right (vph)	21	0	0	49
Hadj (s)	-0.03	0.03	0.22	-0.34
Departure Headway (s)	4.3	4.3	5.0	4.4
Degree Utilization, x	0.23	0.20	0.02	0.09
Capacity (veh/h)	823	796	657	752
Control Delay (s)	8.5	8.4	8.1	7.8
Approach Delay (s)	8.5	8.4	8.1	7.8
Approach LOS	A	A	A	A

Intersection Summary			
Delay	8.4		
HCM Level of Service	A		
Intersection Capacity Utilization	22.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	0	0	1	0	61	0	273	0	31	298	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	0	0	1	0	61	0	273	0	31	298	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	0	62	273	329
Volume Left (vph)	0	1	0	31
Volume Right (vph)	0	61	0	0
Hadj (s)	0.00	-0.55	0.03	0.05
Departure Headway (s)	5.3	4.7	4.4	4.4
Degree Utilization, x	0.00	0.08	0.34	0.40
Capacity (veh/h)	599	679	789	795
Control Delay (s)	8.3	8.1	9.7	10.3
Approach Delay (s)	0.0	8.1	9.7	10.3
Approach LOS	A	A	A	B

Intersection Summary			
Delay	9.8		
HCM Level of Service	A		
Intersection Capacity Utilization	45.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	2	161	39	53	255	189	116	70	61	145	33	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	2	161	39	53	255	189	116	70	61	145	33	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	202	497	247	178
Volume Left (vph)	2	53	116	145
Volume Right (vph)	39	189	61	0
Hadj (s)	-0.08	-0.17	-0.02	0.20
Departure Headway (s)	6.2	5.6	6.4	6.8
Degree Utilization, x	0.35	0.77	0.44	0.33
Capacity (veh/h)	514	626	505	470
Control Delay (s)	12.5	24.6	14.3	13.1
Approach Delay (s)	12.5	24.6	14.3	13.1
Approach LOS	B	C	B	B

Intersection Summary			
Delay	18.3		
HCM Level of Service	C		
Intersection Capacity Utilization	64.9%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	68	143	3	104	0	171	86	4	0	32	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	68	143	3	104	0	171	86	4	0	32	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	211	107	261	32
Volume Left (vph)	0	3	171	0
Volume Right (vph)	143	0	4	0
Hadj (s)	-0.37	0.04	0.16	0.03
Departure Headway (s)	4.4	5.0	4.9	5.1
Degree Utilization, x	0.26	0.15	0.35	0.04
Capacity (veh/h)	757	671	704	644
Control Delay (s)	9.0	8.8	10.5	8.3
Approach Delay (s)	9.0	8.8	10.5	8.3
Approach LOS	A	A	B	A

Intersection Summary			
Delay	9.5		
HCM Level of Service	A		
Intersection Capacity Utilization	39.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	1	0	30	4	5	2	57	456	0	0	515	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	1	0	30	4	5	2	57	456	0	0	515	1

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	31	11	513	516
Volume Left (vph)	1	4	57	0
Volume Right (vph)	30	2	0	1
Hadj (s)	-0.54	0.00	0.06	0.03
Departure Headway (s)	5.6	6.2	4.6	4.6
Degree Utilization, x	0.05	0.02	0.66	0.66
Capacity (veh/h)	546	492	753	764
Control Delay (s)	8.9	9.4	16.3	16.2
Approach Delay (s)	8.9	9.4	16.3	16.2
Approach LOS	A	A	C	C

Intersection Summary			
Delay	16.0		
HCM Level of Service	C		
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												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	5	3	9	3	5	20	8	488	3	0	546	3
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	5	3	9	3	5	20	8	488	3	0	546	3

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	17	28	499	549
Volume Left (vph)	5	3	8	0
Volume Right (vph)	9	20	3	3
Hadj (s)	-0.22	-0.37	0.03	0.03
Departure Headway (s)	6.1	5.9	4.7	4.6
Degree Utilization, x	0.03	0.05	0.65	0.71
Capacity (veh/h)	515	528	757	766
Control Delay (s)	9.3	9.2	15.9	18.0
Approach Delay (s)	9.3	9.2	15.9	18.0
Approach LOS	A	A	C	C

Intersection Summary			
Delay	16.7		
HCM Level of Service	C		
Intersection Capacity Utilization	42.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	0	0	0	0	0	0	11	0	0	43	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	0	0	0	0	0	0	11	0	0	43	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	0	0	11	43
Volume Left (vph)	0	0	0	0
Volume Right (vph)	0	0	0	0
Hadj (s)	0.00	0.00	0.03	0.03
Departure Headway (s)	4.0	4.0	4.0	3.9
Degree Utilization, x	0.00	0.00	0.01	0.05
Capacity (veh/h)	888	888	901	907
Control Delay (s)	7.0	7.0	7.0	7.1
Approach Delay (s)	0.0	0.0	7.0	7.1
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.1		
HCM Level of Service	A		
Intersection Capacity Utilization	6.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	1	5	0	1	0	0	261	2	1	284	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	1	5	0	1	0	0	261	2	1	284	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	6	1	263	285
Volume Left (vph)	0	0	0	1
Volume Right (vph)	5	0	2	0
Hadj (s)	-0.47	0.03	0.03	0.03
Departure Headway (s)	4.6	5.1	4.2	4.2
Degree Utilization, x	0.01	0.00	0.31	0.33
Capacity (veh/h)	690	625	836	836
Control Delay (s)	7.6	8.1	9.1	9.3
Approach Delay (s)	7.6	8.1	9.1	9.3
Approach LOS	A	A	A	A

Intersection Summary			
Delay	9.2		
HCM Level of Service	A		
Intersection Capacity Utilization	25.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	0	0	0	0	4	0	6	0	10	32	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	0	0	0	0	4	0	6	0	10	32	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	0	4	6	42
Volume Left (vph)	0	0	0	10
Volume Right (vph)	0	4	0	0
Hadj (s)	0.00	-0.57	0.03	0.08
Departure Headway (s)	4.0	3.4	4.0	4.0
Degree Utilization, x	0.00	0.00	0.01	0.05
Capacity (veh/h)	900	1028	898	895
Control Delay (s)	7.0	6.4	7.0	7.2
Approach Delay (s)	0.0	6.4	7.0	7.2
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.1		
HCM Level of Service	A		
Intersection Capacity Utilization	18.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	0	0	0	82	40	0	36	0	11	27	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	0	0	0	82	40	0	36	0	11	27	1

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	0	122	36	39
Volume Left (vph)	0	0	0	11
Volume Right (vph)	0	40	0	1
Hadj (s)	0.00	-0.16	0.03	0.08
Departure Headway (s)	4.2	3.9	4.2	4.3
Degree Utilization, x	0.00	0.13	0.04	0.05
Capacity (veh/h)	843	902	816	815
Control Delay (s)	7.2	7.5	7.4	7.5
Approach Delay (s)	0.0	7.5	7.4	7.5
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.5		
HCM Level of Service	A		
Intersection Capacity Utilization	22.2%	ICU Level of Service	A
Analysis Period (min)	15		

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(Refined Presidio Parkway Alternative) AM

Additional Intersections

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	2003	320	0	1300	2	395	125	20	13	69	71
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	
Lane Util. Factor		0.91			0.91		1.00	1.00		1.00	1.00	
Frt		0.98			1.00		1.00	0.98		1.00	0.92	
Flt Protected		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		5036			5141		1789	1844		1789	1740	
Flt Permitted		1.00			1.00		0.62	1.00		0.61	1.00	
Satd. Flow (perm)		5036			5141		1171	1844		1154	1740	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	2003	320	0	1300	2	395	125	20	13	69	71
RTOR Reduction (vph)	0	24	0	0	0	0	0	7	0	0	41	0
Lane Group Flow (vph)	0	2299	0	0	1302	0	395	138	0	13	99	0
Turn Type							Perm			Perm		
Protected Phases		2			6			4			8	
Permitted Phases							4			8		
Actuated Green, G (s)		58.5			58.5		23.0	23.0		23.0	23.0	
Effective Green, g (s)		58.5			58.5		23.5	23.5		23.5	23.5	
Actuated g/C Ratio		0.65			0.65		0.26	0.26		0.26	0.26	
Clearance Time (s)		4.0			4.0		4.5	4.5		4.5	4.5	
Lane Grp Cap (vph)		3273			3342		306	481		301	454	
v/s Ratio Prot		c0.46			0.25			0.08			0.06	
v/s Ratio Perm							c0.34			0.01		
v/c Ratio		0.70			0.39		1.29	0.29		0.04	0.22	
Uniform Delay, d1		10.1			7.4		33.2	26.6		24.8	26.0	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.3			0.3		153.2	1.5		0.3	1.1	
Delay (s)		11.4			7.7		186.4	28.1		25.1	27.1	
Level of Service		B			A		F	C		C	C	
Approach Delay (s)		11.4			7.7			143.9			27.0	
Approach LOS		B			A			F			C	

Intersection Summary			
HCM Average Control Delay	27.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	85.7%	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)	0	1743	252	0	1152	35	134	220	7	48	194	0
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	
Lane Util. Factor		0.91			0.91		1.00	1.00			1.00	
Frt		0.98			1.00		1.00	1.00			1.00	
Flt Protected		1.00			1.00		0.95	1.00			0.99	
Satd. Flow (prot)		5044			5119		1789	1875			1865	
Flt Permitted		1.00			1.00		0.51	1.00			0.90	
Satd. Flow (perm)		5044			5119		964	1875			1695	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1743	252	0	1152	35	134	220	7	48	194	0
RTOR Reduction (vph)	0	21	0	0	4	0	0	1	0	0	0	0
Lane Group Flow (vph)	0	1974	0	0	1183	0	134	226	0	0	242	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		54.0			54.0		27.0	27.0			27.0	
Effective Green, g (s)		54.0			54.0		28.0	28.0			28.0	
Actuated g/C Ratio		0.60			0.60		0.31	0.31			0.31	
Clearance Time (s)		4.0			4.0		5.0	5.0			5.0	
Lane Grp Cap (vph)		3026			3071		300	583			527	
v/s Ratio Prot		c0.39			0.23			0.12				
v/s Ratio Perm							0.14				c0.14	
v/c Ratio		0.65			0.39		0.45	0.39			0.46	
Uniform Delay, d1		11.8			9.4		24.8	24.3			24.9	
Progression Factor		1.00			1.00		1.00	1.00			1.00	
Incremental Delay, d2		1.1			0.4		4.8	1.9			2.9	
Delay (s)		12.9			9.7		29.6	26.2			27.8	
Level of Service		B			A		C	C			C	
Approach Delay (s)		12.9			9.7			27.5			27.8	
Approach LOS		B			A			C			C	

Intersection Summary			
HCM Average Control Delay	14.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	74.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	EBR2	WBT	SBT	SBR	NWL
Lane Configurations							
Volume (vph)	885	307	2	453	0	0	255
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0			4.0
Lane Util. Factor	0.95			0.95			0.97
Frt	0.96			1.00			1.00
Flt Protected	1.00			1.00			0.95
Satd. Flow (prot)	3440			3579			3471
Flt Permitted	1.00			1.00			0.95
Satd. Flow (perm)	3440			3579			3471
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	885	307	2	453	0	0	255
RTOR Reduction (vph)	0	0	0	0	0	0	0
Lane Group Flow (vph)	1194	0	0	453	0	0	255
Turn Type						Perm	
Protected Phases	6			6	4		8
Permitted Phases						4	
Actuated Green, G (s)	45.0			45.0			10.0
Effective Green, g (s)	45.0			45.0			9.5
Actuated g/C Ratio	0.60			0.60			0.13
Clearance Time (s)	4.0			4.0			3.5
Lane Grp Cap (vph)	2064			2147			440
v/s Ratio Prot	c0.35			0.13			c0.07
v/s Ratio Perm							
v/c Ratio	0.58			0.21			0.58
Uniform Delay, d1	9.2			6.9			30.9
Progression Factor	1.00			1.00			1.00
Incremental Delay, d2	1.2			0.2			5.5
Delay (s)	10.4			7.1			36.3
Level of Service	B			A			D
Approach Delay (s)	10.4			7.1	0.0		36.3
Approach LOS	B			A	A		D

Intersection Summary			
HCM Average Control Delay	13.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	20.5
Intersection Capacity Utilization	48.3%	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	598	283	0	442	0	1	0	0	0	0	0
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		0.95			1.00				
Frt		1.00	0.85		1.00			1.00				
Flt Protected		1.00	1.00		1.00			0.95				
Satd. Flow (prot)		3579	1601		3579			1789				
Flt Permitted		1.00	1.00		1.00			0.76				
Satd. Flow (perm)		3579	1601		3579			1426				
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	598	283	0	442	0	1	0	0	0	0	0
RTOR Reduction (vph)	0	0	146	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	598	137	0	442	0	0	1	0	0	0	0
Turn Type	Perm		custom			custom	Perm			Perm		
Protected Phases		2	6					4			4	
Permitted Phases	2				2	2	4			4		
Actuated Green, G (s)		60.0	44.0		60.0			23.0				
Effective Green, g (s)		59.5	43.5		59.5			22.5				
Actuated g/C Ratio		0.66	0.48		0.66			0.25				
Clearance Time (s)		3.5	3.5		3.5			3.5				
Lane Grp Cap (vph)		2366	774		2366			357				
v/s Ratio Prot		c0.17	0.09									
v/s Ratio Perm					0.12			c0.00				
v/c Ratio		0.25	0.18		0.19			0.00				
Uniform Delay, d1		6.2	13.1		5.9			25.3				
Progression Factor		1.00	1.00		1.00			1.00				
Incremental Delay, d2		0.3	0.5		0.2			0.0				
Delay (s)		6.5	13.6		6.1			25.3				
Level of Service		A	B		A			C				
Approach Delay (s)		8.8			6.1			25.3			0.0	
Approach LOS		A			A			C			A	

Intersection Summary			
HCM Average Control Delay	7.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.18		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	26.5%	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	467	1037	0	24	0	225	39	0	0	79	15
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		1.00	0.88		1.00		0.94	1.00			0.95	1.00
Frt		1.00	0.85		1.00		1.00	1.00			1.00	0.85
Flt Protected		1.00	1.00		1.00		0.95	1.00			1.00	1.00
Satd. Flow (prot)		1883	2818		1883		5046	1883			3579	1601
Flt Permitted		1.00	1.00		1.00		0.95	1.00			1.00	1.00
Satd. Flow (perm)		1883	2818		1883		5046	1883			3579	1601
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	467	1037	0	24	0	225	39	0	0	79	15
RTOR Reduction (vph)	0	0	438	0	0	0	0	0	0	0	0	11
Lane Group Flow (vph)	0	467	599	0	24	0	225	39	0	0	79	5
Turn Type	Perm		pt+ov	Perm			Prot			Perm		Perm
Protected Phases		4	4 5		8		5	2			6	
Permitted Phases	4			8						6		6
Actuated Green, G (s)		39.5	54.5		39.5		11.5	42.5			27.5	27.5
Effective Green, g (s)		40.0	52.0		40.0		11.0	42.0			27.0	27.0
Actuated g/C Ratio		0.44	0.58		0.44		0.12	0.47			0.30	0.30
Clearance Time (s)		4.5			4.5		3.5	3.5			3.5	3.5
Lane Grp Cap (vph)		837	1628		837		617	879			1074	480
v/s Ratio Prot		c0.25	c0.21		0.01		0.04	0.02			c0.02	
v/s Ratio Perm												0.00
v/c Ratio		0.56	0.37		0.03		0.36	0.04			0.07	0.01
Uniform Delay, d1		18.5	10.2		14.1		36.3	13.1			22.5	22.1
Progression Factor		1.00	1.00		1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2		2.7	0.6		0.1		1.7	0.1			0.1	0.0
Delay (s)		21.1	10.8		14.1		38.0	13.2			22.7	22.1
Level of Service		C	B		B		D	B			C	C
Approach Delay (s)		14.0			14.1			34.3			22.6	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM Average Control Delay	17.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	52.9%	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	1312	0	0	704	0	2	470	123	0	88	262
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
Lane Util. Factor		0.95			0.95			0.91			0.95	1.00
Frt		1.00			1.00			0.97			1.00	0.85
Flt Protected		1.00			1.00			1.00			1.00	1.00
Satd. Flow (prot)		3579			3579			4982			3579	1601
Flt Permitted		1.00			1.00			0.94			1.00	1.00
Satd. Flow (perm)		3579			3579			4681			3579	1601
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1312	0	0	704	0	2	470	123	0	88	262
RTOR Reduction (vph)	0	0	0	0	0	0	0	52	0	0	0	204
Lane Group Flow (vph)	0	1312	0	0	704	0	0	543	0	0	88	58
Turn Type	Perm			Perm			Perm			Perm		Perm
Protected Phases		4			4			2			2	
Permitted Phases	4			4			2			2		2
Actuated Green, G (s)		61.0			61.0			19.0			19.0	19.0
Effective Green, g (s)		62.0			62.0			20.0			20.0	20.0
Actuated g/C Ratio		0.69			0.69			0.22			0.22	0.22
Clearance Time (s)		5.0			5.0			5.0			5.0	5.0
Lane Grp Cap (vph)		2466			2466			1040			795	356
v/s Ratio Prot		c0.37			0.20						0.02	
v/s Ratio Perm								c0.12				0.04
v/c Ratio		0.53			0.29			0.52			0.11	0.16
Uniform Delay, d1		6.9			5.4			30.8			27.9	28.2
Progression Factor		1.00			1.00			1.00			1.00	1.00
Incremental Delay, d2		0.8			0.3			1.9			0.3	1.0
Delay (s)		7.7			5.7			32.7			28.2	29.2
Level of Service		A			A			C			C	C
Approach Delay (s)		7.7			5.7			32.7			29.0	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM Average Control Delay	14.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	57.5%	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)	0	653	148	0	308	392	36	211	6	538	97	6
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	
Lane Util. Factor		0.91			1.00	0.88		1.00		0.95	0.95	
Frt		0.97			1.00	0.85		1.00		1.00	1.00	
Flt Protected		1.00			1.00	1.00		0.99		0.95	0.97	
Satd. Flow (prot)		4999			1883	2818		1864		1700	1725	
Flt Permitted		1.00			1.00	1.00		0.91		0.95	0.97	
Satd. Flow (perm)		4999			1883	2818		1702		1700	1725	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	653	148	0	308	392	36	211	6	538	97	6
RTOR Reduction (vph)	0	41	0	0	0	109	0	1	0	0	1	0
Lane Group Flow (vph)	0	760	0	0	308	283	0	252	0	317	323	0
Turn Type	Perm					pt+ov	Perm			Split		
Protected Phases		4			4	4 2		6		2	2	
Permitted Phases	4						6					
Actuated Green, G (s)		17.0			17.0	65.5		17.5		45.0	45.0	
Effective Green, g (s)		16.5			16.5	65.0		17.0		44.5	44.5	
Actuated g/C Ratio		0.18			0.18	0.72		0.19		0.49	0.49	
Clearance Time (s)		3.5			3.5			3.5		3.5	3.5	
Lane Grp Cap (vph)		916			345	2035		321		841	853	
v/s Ratio Prot		0.15			c0.16	0.10				0.19	c0.19	
v/s Ratio Perm								c0.15				
v/c Ratio		0.83			0.89	0.14		0.79		0.38	0.38	
Uniform Delay, d1		35.4			35.9	3.9		34.8		14.1	14.2	
Progression Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Incremental Delay, d2		8.6			27.6	0.1		17.4		1.3	1.3	
Delay (s)		44.0			63.5	4.0		52.2		15.4	15.4	
Level of Service		D			E	A		D		B	B	
Approach Delay (s)		44.0			30.2			52.2			15.4	
Approach LOS		D			C			D			B	

Intersection Summary			
HCM Average Control Delay	33.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	57.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	0	0	0	1	10
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	0	0	0	1	10
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	12	0			0	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	12	0			0	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	1007	1085			1623	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	0	0	11
Volume Left	0	0	1
Volume Right	0	0	0
cSH	1700	1700	1623
Volume to Capacity	0.00	0.00	0.00
Queue Length 95th (m)	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.7
Lane LOS	A		A
Approach Delay (s)	0.0	0.0	0.7
Approach LOS	A		

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	6.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	17	196	0	2	168	3	0	10	8	0	30	2
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	17	196	0	2	168	3	0	10	8	0	30	2

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	213	173	18	32
Volume Left (vph)	17	2	0	0
Volume Right (vph)	0	3	8	2
Hadj (s)	0.05	0.03	-0.23	0.00
Departure Headway (s)	4.2	4.3	4.6	4.8
Degree Utilization, x	0.25	0.20	0.02	0.04
Capacity (veh/h)	830	826	720	688
Control Delay (s)	8.7	8.4	7.7	8.0
Approach Delay (s)	8.7	8.4	7.7	8.0
Approach LOS	A	A	A	A

Intersection Summary			
Delay	8.5		
HCM Level of Service	A		
Intersection Capacity Utilization	31.0%	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 (veh/h)	0	5	0	0	45	0	1	19	0	21	21	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	5	0	0	45	0	1	19	0	21	21	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	106	84	21	86	84	19	21			19		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	106	84	21	86	84	19	21			19		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	99	100	100	94	100	100			99		
cM capacity (veh/h)	826	795	1056	886	795	1059	1595			1597		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	5	45	20	42
Volume Left	0	0	1	21
Volume Right	0	0	0	0
cSH	795	795	1595	1597
Volume to Capacity	0.01	0.06	0.00	0.01
Queue Length 95th (m)	0.1	1.4	0.0	0.3
Control Delay (s)	9.6	9.8	0.4	3.7
Lane LOS	A	A	A	A
Approach Delay (s)	9.6	9.8	0.4	3.7
Approach LOS	A	A		

Intersection Summary			
Average Delay	5.8		
Intersection Capacity Utilization	18.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	0	0	0	46	0	0	1	0	5	0	16
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	0	0	0	46	0	0	1	0	5	0	16

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	0	46	1	21
Volume Left (vph)	0	0	0	5
Volume Right (vph)	0	0	0	16
Hadj (s)	0.00	0.03	0.03	-0.38
Departure Headway (s)	4.0	4.0	4.1	3.6
Degree Utilization, x	0.00	0.05	0.00	0.02
Capacity (veh/h)	900	896	865	975
Control Delay (s)	7.0	7.2	7.1	6.7
Approach Delay (s)	0.0	7.2	7.1	6.7
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.0		
HCM Level of Service	A		
Intersection Capacity Utilization	15.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	65	13	0	207	0	1	0	0	75	324	25
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	65	13	0	207	0	1	0	0	75	324	25

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	78	207	1	424
Volume Left (vph)	0	0	1	75
Volume Right (vph)	13	0	0	25
Hadj (s)	-0.07	0.03	0.23	0.03
Departure Headway (s)	5.2	5.1	5.5	4.7
Degree Utilization, x	0.11	0.29	0.00	0.55
Capacity (veh/h)	625	652	594	737
Control Delay (s)	8.9	10.2	8.5	13.3
Approach Delay (s)	8.9	10.2	8.5	13.3
Approach LOS	A	B	A	B

Intersection Summary			
Delay	11.9		
HCM Level of Service	B		
Intersection Capacity Utilization	38.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	6	0	0	0	58	0	162	2	319	90	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	6	0	0	0	58	0	162	2	319	90	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	6	58	164	409
Volume Left (vph)	0	0	0	319
Volume Right (vph)	0	58	2	0
Hadj (s)	0.03	-0.57	0.03	0.19
Departure Headway (s)	5.3	4.6	4.5	4.4
Degree Utilization, x	0.01	0.07	0.21	0.50
Capacity (veh/h)	596	686	768	794
Control Delay (s)	8.4	8.0	8.7	11.8
Approach Delay (s)	8.4	8.0	8.7	11.8
Approach LOS	A	A	A	B

Intersection Summary			
Delay	10.6		
HCM Level of Service	B		
Intersection Capacity Utilization	44.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	203	0	95	169	27	3	34	90	19	57	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	203	0	95	169	27	3	34	90	19	57	1

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	203	291	127	77
Volume Left (vph)	0	95	3	19
Volume Right (vph)	0	27	90	1
Hadj (s)	0.03	0.04	-0.39	0.08
Departure Headway (s)	4.8	4.7	4.8	5.4
Degree Utilization, x	0.27	0.38	0.17	0.11
Capacity (veh/h)	698	723	670	597
Control Delay (s)	9.6	10.6	8.8	9.1
Approach Delay (s)	9.6	10.6	8.8	9.1
Approach LOS	A	B	A	A

Intersection Summary			
Delay	9.8		
HCM Level of Service	A		
Intersection Capacity Utilization	50.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	3	32	2	27	0	30	25	5	0	44	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	3	32	2	27	0	30	25	5	0	44	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	35	29	60	44
Volume Left (vph)	0	2	30	0
Volume Right (vph)	32	0	5	0
Hadj (s)	-0.51	0.05	0.08	0.03
Departure Headway (s)	3.6	4.2	4.2	4.1
Degree Utilization, x	0.04	0.03	0.07	0.05
Capacity (veh/h)	954	830	841	853
Control Delay (s)	6.8	7.4	7.5	7.3
Approach Delay (s)	6.8	7.4	7.5	7.3
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.3		
HCM Level of Service	A		
Intersection Capacity Utilization	19.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	42	147	138	3	0	18	57	480	0	0	388	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	42	147	138	3	0	18	57	480	0	0	388	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	327	21	537	388
Volume Left (vph)	42	3	57	0
Volume Right (vph)	138	18	0	0
Hadj (s)	-0.19	-0.45	0.06	0.03
Departure Headway (s)	6.4	7.2	5.9	6.1
Degree Utilization, x	0.58	0.04	0.88	0.66
Capacity (veh/h)	539	407	594	562
Control Delay (s)	17.7	10.5	36.6	20.0
Approach Delay (s)	17.7	10.5	36.6	20.0
Approach LOS	C	B	E	C

Intersection Summary			
Delay	26.2		
HCM Level of Service	D		
Intersection Capacity Utilization	82.8%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	5	20	44	2	0	1	3	531	3	6	521	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	5	20	44	2	0	1	3	531	3	6	521	1

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	69	3	537	528
Volume Left (vph)	5	2	3	6
Volume Right (vph)	44	1	3	1
Hadj (s)	-0.33	-0.03	0.03	0.04
Departure Headway (s)	6.0	6.5	4.8	4.8
Degree Utilization, x	0.11	0.01	0.71	0.70
Capacity (veh/h)	532	475	735	739
Control Delay (s)	9.7	9.5	18.7	18.3
Approach Delay (s)	9.7	9.5	18.7	18.3
Approach LOS	A	A	C	C

Intersection Summary			
Delay	18.0		
HCM Level of Service	C		
Intersection Capacity Utilization	42.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	0	0	0	0	0	0	1	0	6	331	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	0	0	0	0	0	0	1	0	6	331	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	0	0	1	337
Volume Left (vph)	0	0	0	6
Volume Right (vph)	0	0	0	0
Hadj (s)	0.00	0.00	0.03	0.04
Departure Headway (s)	4.6	4.6	4.2	3.9
Degree Utilization, x	0.00	0.00	0.00	0.37
Capacity (veh/h)	738	738	826	910
Control Delay (s)	7.6	7.6	7.2	9.2
Approach Delay (s)	0.0	0.0	7.2	9.2
Approach LOS	A	A	A	A

Intersection Summary			
Delay	9.2		
HCM Level of Service	A		
Intersection Capacity Utilization	25.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	38	108	0	0	0	0	150	2	6	76	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	38	108	0	0	0	0	150	2	6	76	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	146	0	152	82
Volume Left (vph)	0	0	0	6
Volume Right (vph)	108	0	2	0
Hadj (s)	-0.41	0.00	0.03	0.05
Departure Headway (s)	4.0	4.6	4.3	4.4
Degree Utilization, x	0.16	0.00	0.18	0.10
Capacity (veh/h)	849	746	797	770
Control Delay (s)	7.8	7.6	8.3	7.9
Approach Delay (s)	7.8	0.0	8.3	7.9
Approach LOS	A	A	A	A

Intersection Summary			
Delay	8.0		
HCM Level of Service	A		
Intersection Capacity Utilization	24.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	0	0	0	0	1	0	0	0	150	179	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	0	0	0	0	1	0	0	0	150	179	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	0	1	0	329
Volume Left (vph)	0	0	0	150
Volume Right (vph)	0	1	0	0
Hadj (s)	0.00	-0.57	0.00	0.13
Departure Headway (s)	4.6	4.0	4.2	4.0
Degree Utilization, x	0.00	0.00	0.00	0.37
Capacity (veh/h)	737	809	847	890
Control Delay (s)	7.6	7.1	7.2	9.4
Approach Delay (s)	0.0	7.1	0.0	9.4
Approach LOS	A	A	A	A

Intersection Summary			
Delay	9.3		
HCM Level of Service	A		
Intersection Capacity Utilization	27.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	1	0	0	0	6	0	18	0	4	14	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	1	0	0	0	6	0	18	0	4	14	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	1	6	18	18
Volume Left (vph)	0	0	0	4
Volume Right (vph)	0	6	0	0
Hadj (s)	0.03	-0.57	0.03	0.08
Departure Headway (s)	4.0	3.4	4.0	4.0
Degree Utilization, x	0.00	0.01	0.02	0.02
Capacity (veh/h)	882	1038	902	891
Control Delay (s)	7.0	6.4	7.0	7.1
Approach Delay (s)	7.0	6.4	7.0	7.1
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.0		
HCM Level of Service	A		
Intersection Capacity Utilization	14.2%	ICU Level of Service	A
Analysis Period (min)	15		

2030 ALTERNATIVE 5
(Refined Presidio Parkway Alternative) PM
Additional Intersections

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
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	
Lane Util. Factor		0.91			0.91		1.00	1.00		1.00	1.00	
Frt		0.97			1.00		1.00	0.99		1.00	0.96	
Flt Protected		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		4977			5138		1789	1864		1789	1808	
Flt Permitted		1.00			1.00		0.72	1.00		0.61	1.00	
Satd. Flow (perm)		4977			5138		1357	1864		1153	1808	
Volume (vph)	0	1616	439	0	2072	9	160	205	15	18	41	15
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1616	439	0	2072	9	160	205	15	18	41	15
RTOR Reduction (vph)	0	91	0	0	1	0	0	3	0	0	1	0
Lane Group Flow (vph)	0	1964	0	0	2080	0	160	217	0	18	55	0
Turn Type							Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases							2			6		
Actuated Green, G (s)		23.0			23.0		23.0	23.0		23.0	23.0	
Effective Green, g (s)		23.0			23.0		23.0	23.0		23.0	23.0	
Actuated g/C Ratio		0.43			0.43		0.43	0.43		0.43	0.43	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)		2120			2188		578	794		491	770	
v/s Ratio Prot		0.39			c0.40			0.12			0.03	
v/s Ratio Perm							c0.12			0.02		
v/c Ratio		0.93			0.95		0.28	0.27		0.04	0.07	
Uniform Delay, d1		14.7			15.0		10.1	10.1		9.0	9.2	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		8.5			10.7		1.2	0.8		0.1	0.2	
Delay (s)		23.2			25.7		11.3	10.9		9.2	9.4	
Level of Service		C			C		B	B		A	A	
Approach Delay (s)		23.2			25.7			11.1			9.3	
Approach LOS		C			C			B			A	

Intersection Summary			
HCM Average Control Delay	23.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	54.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	63.2%	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												
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		0.91			0.91			1.00			1.00	
Frt		0.98			0.99			0.99			1.00	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		5058			5093			1869			1877	
Flt Permitted		1.00			1.00			1.00			1.00	
Satd. Flow (perm)		5058			5093			1869			1877	
Volume (vph)	0	1265	154	0	1968	133	0	278	15	0	405	11
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1265	154	0	1968	133	0	278	15	0	405	11
RTOR Reduction (vph)	0	28	0	0	14	0	0	3	0	0	1	0
Lane Group Flow (vph)	0	1391	0	0	2087	0	0	290	0	0	415	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		23.0			23.0			23.0			23.0	
Effective Green, g (s)		23.0			23.0			23.0			23.0	
Actuated g/C Ratio		0.43			0.43			0.43			0.43	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		2154			2169			796			799	
v/s Ratio Prot		0.27			c0.41			0.15			c0.22	
v/s Ratio Perm												
v/c Ratio		0.65			0.96			0.36			0.52	
Uniform Delay, d1		12.3			15.1			10.5			11.4	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.5			12.3			1.3			2.4	
Delay (s)		13.8			27.4			11.8			13.8	
Level of Service		B			C			B			B	
Approach Delay (s)		13.8			27.4			11.8			13.8	
Approach LOS		B			C			B			B	

Intersection Summary			
HCM Average Control Delay	20.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	54.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	69.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	EBR2	WBL	WBT	SBT	SBR	NWL	NWR2
Lane Configurations									
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0				4.0			4.0	
Lane Util. Factor	0.95				0.95			0.97	
Frt	0.95				1.00			1.00	
Flt Protected	1.00				1.00			0.95	
Satd. Flow (prot)	3408				3571			3476	
Flt Permitted	1.00				0.89			0.95	
Satd. Flow (perm)	3408				3172			3476	
Volume (vph)	657	298	9	39	947	0	0	253	3
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	657	298	9	39	947	0	0	253	3
RTOR Reduction (vph)	1	0	0	0	0	0	0	1	0
Lane Group Flow (vph)	963	0	0	0	986	0	0	255	0
Turn Type				Perm			Perm		
Protected Phases	6				6	4		8	
Permitted Phases				6			4		
Actuated Green, G (s)	45.0				45.0			10.0	
Effective Green, g (s)	45.0				45.0			9.5	
Actuated g/C Ratio	0.60				0.60			0.13	
Clearance Time (s)	4.0				4.0			3.5	
Lane Grp Cap (vph)	2045				1903			440	
v/s Ratio Prot	0.28							c0.07	
v/s Ratio Perm					c0.31				
v/c Ratio	0.47				0.52			0.58	
Uniform Delay, d1	8.4				8.7			30.9	
Progression Factor	1.00				1.00			1.00	
Incremental Delay, d2	0.8				1.0			5.5	
Delay (s)	9.1				9.7			36.4	
Level of Service	A				A			D	
Approach Delay (s)	9.1				9.7	0.0		36.4	
Approach LOS	A				A	A		D	

Intersection Summary			
HCM Average Control Delay	12.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	20.5
Intersection Capacity Utilization	68.7%	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												
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		0.95			1.00				
Frt		1.00	0.85		1.00			1.00				
Flt Protected		1.00	1.00		1.00			0.95				
Satd. Flow (prot)		3579	1601		3579			1789				
Flt Permitted		1.00	1.00		1.00			0.76				
Satd. Flow (perm)		3579	1601		3579			1426				
Volume (vph)	0	569	76	0	603	0	390	0	0	0	0	0
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	569	76	0	603	0	390	0	0	0	0	0
RTOR Reduction (vph)	0	0	39	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	569	37	0	603	0	0	390	0	0	0	0
Turn Type	Perm		custom			custom	Perm			Perm		
Protected Phases		2	6					4			4	
Permitted Phases	2				2	2	4			4		
Actuated Green, G (s)		60.0	44.0		60.0			23.0				
Effective Green, g (s)		59.5	43.5		59.5			22.5				
Actuated g/C Ratio		0.66	0.48		0.66			0.25				
Clearance Time (s)		3.5	3.5		3.5			3.5				
Lane Grp Cap (vph)		2366	774		2366			357				
v/s Ratio Prot		0.16	0.02									
v/s Ratio Perm					c0.17			c0.27				
v/c Ratio		0.24	0.05		0.25			1.09				
Uniform Delay, d1		6.1	12.3		6.2			33.8				
Progression Factor		1.00	1.00		1.00			1.00				
Incremental Delay, d2		0.2	0.1		0.3			74.8				
Delay (s)		6.4	12.4		6.5			108.5				
Level of Service		A	B		A			F				
Approach Delay (s)		7.1			6.5			108.5			0.0	
Approach LOS		A			A			F			A	

Intersection Summary			
HCM Average Control Delay	31.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	44.9%	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												
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		1.00	0.88		1.00		0.94	1.00			0.95	1.00
Frt		1.00	0.85		1.00		1.00	1.00			1.00	0.85
Flt Protected		1.00	1.00		1.00		0.95	1.00			1.00	1.00
Satd. Flow (prot)		1883	2818		1883		5046	1883			3579	1601
Flt Permitted		1.00	1.00		1.00		0.95	1.00			1.00	1.00
Satd. Flow (perm)		1883	2818		1883		5046	1883			3579	1601
Volume (vph)	0	406	666	0	290	0	1117	85	0	0	352	33
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	406	666	0	290	0	1117	85	0	0	352	33
RTOR Reduction (vph)	0	0	466	0	0	0	0	0	0	0	0	23
Lane Group Flow (vph)	0	406	200	0	290	0	1117	85	0	0	352	10
Turn Type	Perm		Perm	Perm			Prot			Perm		Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4		4	8						6		6
Actuated Green, G (s)		26.5	26.5		26.5		25.0	55.5			26.5	26.5
Effective Green, g (s)		27.0	27.0		27.0		25.0	55.0			26.0	26.0
Actuated g/C Ratio		0.30	0.30		0.30		0.28	0.61			0.29	0.29
Clearance Time (s)		4.5	4.5		4.5		4.0	3.5			3.5	3.5
Lane Grp Cap (vph)		565	845		565		1402	1151			1034	463
v/s Ratio Prot		c0.22			0.15		c0.22	0.05			c0.10	
v/s Ratio Perm			0.07									0.01
v/c Ratio		0.72	0.24		0.51		0.80	0.07			0.34	0.02
Uniform Delay, d1		28.1	23.7		26.1		30.1	7.1			25.2	22.9
Progression Factor		1.00	1.00		1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2		7.7	0.7		3.3		4.8	0.1			0.9	0.1
Delay (s)		35.8	24.4		29.4		34.9	7.3			26.1	23.0
Level of Service		D	C		C		C	A			C	C
Approach Delay (s)		28.7			29.4			33.0			25.9	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM Average Control Delay	30.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	62.3%	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												
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
Lane Util. Factor		0.95			0.95			0.91			0.95	1.00
Frt		1.00			1.00			0.99			1.00	0.85
Flt Protected		1.00			1.00			1.00			1.00	1.00
Satd. Flow (prot)		3579			3579			5083			3579	1601
Flt Permitted		1.00			1.00			1.00			1.00	1.00
Satd. Flow (perm)		3579			3579			5083			3579	1601
Volume (vph)	0	1142	0	0	1779	0	0	340	28	0	537	208
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1142	0	0	1779	0	0	340	28	0	537	208
RTOR Reduction (vph)	0	0	0	0	0	0	0	10	0	0	0	19
Lane Group Flow (vph)	0	1142	0	0	1779	0	0	358	0	0	537	189
Turn Type	Perm			Perm			Perm			Perm		Perm
Protected Phases		4			4			2			2	
Permitted Phases	4			4			2			2		2
Actuated Green, G (s)		57.0			57.0			23.0			23.0	23.0
Effective Green, g (s)		58.0			58.0			24.0			24.0	24.0
Actuated g/C Ratio		0.64			0.64			0.27			0.27	0.27
Clearance Time (s)		5.0			5.0			5.0			5.0	5.0
Lane Grp Cap (vph)		2306			2306			1355			954	427
v/s Ratio Prot		0.32			c0.50			0.07			c0.15	
v/s Ratio Perm												0.12
v/c Ratio		0.50			0.77			0.26			0.56	0.44
Uniform Delay, d1		8.4			11.3			26.0			28.5	27.4
Progression Factor		1.00			1.00			1.00			1.00	1.00
Incremental Delay, d2		0.8			2.6			0.5			2.4	3.3
Delay (s)		9.1			13.9			26.5			30.9	30.7
Level of Service		A			B			C			C	C
Approach Delay (s)		9.1			13.9			26.5			30.8	
Approach LOS		A			B			C			C	

Intersection Summary			
HCM Average Control Delay	16.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	79.2%	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												
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	
Lane Util. Factor		0.91			1.00	0.88		1.00		0.95	0.95	
Frt		0.99			1.00	0.85		1.00		1.00	0.98	
Flt Protected		1.00			1.00	1.00		0.98		0.95	0.98	
Satd. Flow (prot)		5065			1883	2818		1835		1700	1719	
Flt Permitted		1.00			1.00	1.00		0.98		0.95	0.98	
Satd. Flow (perm)		5065			1883	2818		1835		1700	1719	
Volume (vph)	0	415	46	0	747	918	136	143	5	504	204	63
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	415	46	0	747	918	136	143	5	504	204	63
RTOR Reduction (vph)	0	15	0	0	0	201	0	1	0	0	8	0
Lane Group Flow (vph)	0	446	0	0	747	717	0	283	0	380	383	0
Turn Type						pt+ov	Split			Split		
Protected Phases		4			4	4 2	6	6		2	2	
Permitted Phases												
Actuated Green, G (s)		28.0			28.0	65.5		17.5		34.0	34.0	
Effective Green, g (s)		27.5			27.5	65.0		17.0		33.5	33.5	
Actuated g/C Ratio		0.31			0.31	0.72		0.19		0.37	0.37	
Clearance Time (s)		3.5			3.5			3.5		3.5	3.5	
Lane Grp Cap (vph)		1548			575	2035		347		633	640	
v/s Ratio Prot		0.09			c0.40	0.25		c0.15		c0.22	0.22	
v/s Ratio Perm												
v/c Ratio		0.29			1.30	0.35		0.82		0.60	0.60	
Uniform Delay, d1		23.8			31.2	4.7		35.0		22.8	22.8	
Progression Factor		1.00			1.00	1.00		1.00		1.00	1.00	
Incremental Delay, d2		0.5			147.1	0.5		18.8		4.2	4.1	
Delay (s)		24.3			178.3	5.1		53.8		27.0	26.9	
Level of Service		C			F	A		D		C	C	
Approach Delay (s)		24.3			82.8			53.8			27.0	
Approach LOS		C			F			D			C	

Intersection Summary			
HCM Average Control Delay	58.2	HCM Level of Service	E
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	85.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	0	0	2	0	0	18
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	0	2	0	0	18
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	20	2			2	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	20	2			2	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	997	1082			1620	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	0	2	18
Volume Left	0	0	0
Volume Right	0	0	0
cSH	1700	1700	1620
Volume to Capacity	0.00	0.00	0.00
Queue Length 95th (m)	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0
Lane LOS	A		
Approach Delay (s)	0.0	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	6.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	17	70	0	9	374	8	0	11	9	4	23	12
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	17	70	0	9	374	8	0	11	9	4	23	12

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	87	391	20	39
Volume Left (vph)	17	9	0	4
Volume Right (vph)	0	8	9	12
Hadj (s)	0.07	0.03	-0.24	-0.13
Departure Headway (s)	4.5	4.2	4.8	4.9
Degree Utilization, x	0.11	0.45	0.03	0.05
Capacity (veh/h)	770	842	677	666
Control Delay (s)	8.1	10.6	7.9	8.1
Approach Delay (s)	8.1	10.6	7.9	8.1
Approach LOS	A	B	A	A

Intersection Summary			
Delay	9.9		
HCM Level of Service	A		
Intersection Capacity Utilization	33.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	6	5	0	389	0	1	34	0	13	34	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	6	5	0	389	0	1	34	0	13	34	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	290	96	34	104	96	34	34			34		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	290	96	34	104	96	34	34			34		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	99	100	100	51	100	100			99		
cM capacity (veh/h)	402	787	1039	861	787	1039	1578			1578		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	11	389	35	47
Volume Left	0	0	1	13
Volume Right	5	0	0	0
cSH	885	787	1578	1578
Volume to Capacity	0.01	0.49	0.00	0.01
Queue Length 95th (m)	0.3	21.1	0.0	0.2
Control Delay (s)	9.1	14.0	0.2	2.1
Lane LOS	A	B	A	A
Approach Delay (s)	9.1	14.0	0.2	2.1
Approach LOS	A	B		

Intersection Summary			
Average Delay	11.7		
Intersection Capacity Utilization	35.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	0	0	0	389	1	0	19	0	11	1	34
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	0	0	0	389	1	0	19	0	11	1	34

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	0	390	19	46
Volume Left (vph)	0	0	0	11
Volume Right (vph)	0	1	0	34
Hadj (s)	0.00	0.03	0.03	-0.36
Departure Headway (s)	4.4	4.1	4.9	4.4
Degree Utilization, x	0.00	0.44	0.03	0.06
Capacity (veh/h)	792	869	679	739
Control Delay (s)	7.4	10.3	8.0	7.7
Approach Delay (s)	0.0	10.3	8.0	7.7
Approach LOS	A	B	A	A

Intersection Summary			
Delay	9.9		
HCM Level of Service	A		
Intersection Capacity Utilization	36.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	149	7	0	252	0	39	0	0	4	193	68
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	149	7	0	252	0	39	0	0	4	193	68

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	156	252	39	265
Volume Left (vph)	0	0	39	4
Volume Right (vph)	7	0	0	68
Hadj (s)	0.01	0.03	0.23	-0.12
Departure Headway (s)	5.0	4.9	5.6	4.9
Degree Utilization, x	0.22	0.35	0.06	0.36
Capacity (veh/h)	658	685	575	688
Control Delay (s)	9.5	10.5	8.9	10.6
Approach Delay (s)	9.5	10.5	8.9	10.6
Approach LOS	A	B	A	B

Intersection Summary			
Delay	10.2		
HCM Level of Service	B		
Intersection Capacity Utilization	41.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	0	0	0	0	149	0	212	2	58	222	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	0	0	0	0	149	0	212	2	58	222	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	0	149	214	280
Volume Left (vph)	0	0	0	58
Volume Right (vph)	0	149	2	0
Hadj (s)	0.00	-0.57	0.03	0.08
Departure Headway (s)	5.3	4.5	4.6	4.6
Degree Utilization, x	0.00	0.19	0.27	0.36
Capacity (veh/h)	609	727	748	753
Control Delay (s)	8.3	8.5	9.3	10.1
Approach Delay (s)	0.0	8.5	9.3	10.1
Approach LOS	A	A	A	B

Intersection Summary			
Delay	9.5		
HCM Level of Service	A		
Intersection Capacity Utilization	45.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	80	3	20	377	108	6	55	153	17	52	7
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	80	3	20	377	108	6	55	153	17	52	7

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	83	505	214	76
Volume Left (vph)	0	20	6	17
Volume Right (vph)	3	108	153	7
Hadj (s)	0.01	-0.09	-0.39	0.02
Departure Headway (s)	5.4	4.7	5.1	5.8
Degree Utilization, x	0.12	0.67	0.30	0.12
Capacity (veh/h)	600	736	632	545
Control Delay (s)	9.2	16.6	10.4	9.6
Approach Delay (s)	9.2	16.6	10.4	9.6
Approach LOS	A	C	B	A

Intersection Summary			
Delay	13.8		
HCM Level of Service	B		
Intersection Capacity Utilization	53.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	0	19	11	278	0	111	51	2	0	46	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	0	19	11	278	0	111	51	2	0	46	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	19	289	164	46
Volume Left (vph)	0	11	111	0
Volume Right (vph)	19	0	2	0
Hadj (s)	-0.57	0.04	0.16	0.03
Departure Headway (s)	4.2	4.5	4.9	4.9
Degree Utilization, x	0.02	0.36	0.22	0.06
Capacity (veh/h)	791	765	699	677
Control Delay (s)	7.3	10.0	9.2	8.2
Approach Delay (s)	7.3	10.0	9.2	8.2
Approach LOS	A	B	A	A

Intersection Summary			
Delay	9.5		
HCM Level of Service	A		
Intersection Capacity Utilization	44.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	20	0	41	4	15	5	134	357	0	0	480	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	20	0	41	4	15	5	134	357	0	0	480	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	61	24	491	480
Volume Left (vph)	20	4	134	0
Volume Right (vph)	41	5	0	0
Hadj (s)	-0.30	-0.06	0.09	0.03
Departure Headway (s)	5.9	6.3	4.8	4.8
Degree Utilization, x	0.10	0.04	0.66	0.64
Capacity (veh/h)	511	485	724	736
Control Delay (s)	9.6	9.5	16.6	15.9
Approach Delay (s)	9.6	9.5	16.6	15.9
Approach LOS	A	A	C	C

Intersection Summary			
Delay	15.7		
HCM Level of Service	C		
Intersection Capacity Utilization	68.0%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	5	7	36	3	6	8	9	477	4	2	520	3
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	5	7	36	3	6	8	9	477	4	2	520	3

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	48	17	490	525
Volume Left (vph)	5	3	9	2
Volume Right (vph)	36	8	4	3
Hadj (s)	-0.40	-0.21	0.03	0.03
Departure Headway (s)	5.8	6.1	4.7	4.7
Degree Utilization, x	0.08	0.03	0.64	0.69
Capacity (veh/h)	535	501	737	753
Control Delay (s)	9.3	9.3	15.9	17.3
Approach Delay (s)	9.3	9.3	15.9	17.3
Approach LOS	A	A	C	C

Intersection Summary			
Delay	16.2		
HCM Level of Service	C		
Intersection Capacity Utilization	41.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	0	0	0	0	0	0	39	0	0	199	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	0	0	0	0	0	0	39	0	0	199	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	0	0	39	199
Volume Left (vph)	0	0	0	0
Volume Right (vph)	0	0	0	0
Hadj (s)	0.00	0.00	0.03	0.03
Departure Headway (s)	4.4	4.4	4.1	4.0
Degree Utilization, x	0.00	0.00	0.04	0.22
Capacity (veh/h)	783	783	856	901
Control Delay (s)	7.4	7.4	7.3	8.1
Approach Delay (s)	0.0	0.0	7.3	8.1
Approach LOS	A	A	A	A

Intersection Summary			
Delay	8.0		
HCM Level of Service	A		
Intersection Capacity Utilization	13.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	1	5	0	1	1	7	203	2	26	182	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	1	5	0	1	1	7	203	2	26	182	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	6	2	212	208
Volume Left (vph)	0	0	7	26
Volume Right (vph)	5	1	2	0
Hadj (s)	-0.47	-0.27	0.03	0.06
Departure Headway (s)	4.3	4.5	4.2	4.2
Degree Utilization, x	0.01	0.00	0.24	0.24
Capacity (veh/h)	747	714	850	850
Control Delay (s)	7.4	7.6	8.5	8.5
Approach Delay (s)	7.4	7.6	8.5	8.5
Approach LOS	A	A	A	A

Intersection Summary			
Delay	8.5		
HCM Level of Service	A		
Intersection Capacity Utilization	31.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	0	0	0	0	11	0	27	0	8	191	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	0	0	0	0	11	0	27	0	8	191	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	0	11	27	199
Volume Left (vph)	0	0	0	8
Volume Right (vph)	0	11	0	0
Hadj (s)	0.00	-0.57	0.03	0.04
Departure Headway (s)	4.4	3.8	4.1	4.0
Degree Utilization, x	0.00	0.01	0.03	0.22
Capacity (veh/h)	786	887	848	895
Control Delay (s)	7.4	6.9	7.3	8.1
Approach Delay (s)	0.0	6.9	7.3	8.1
Approach LOS	A	A	A	A

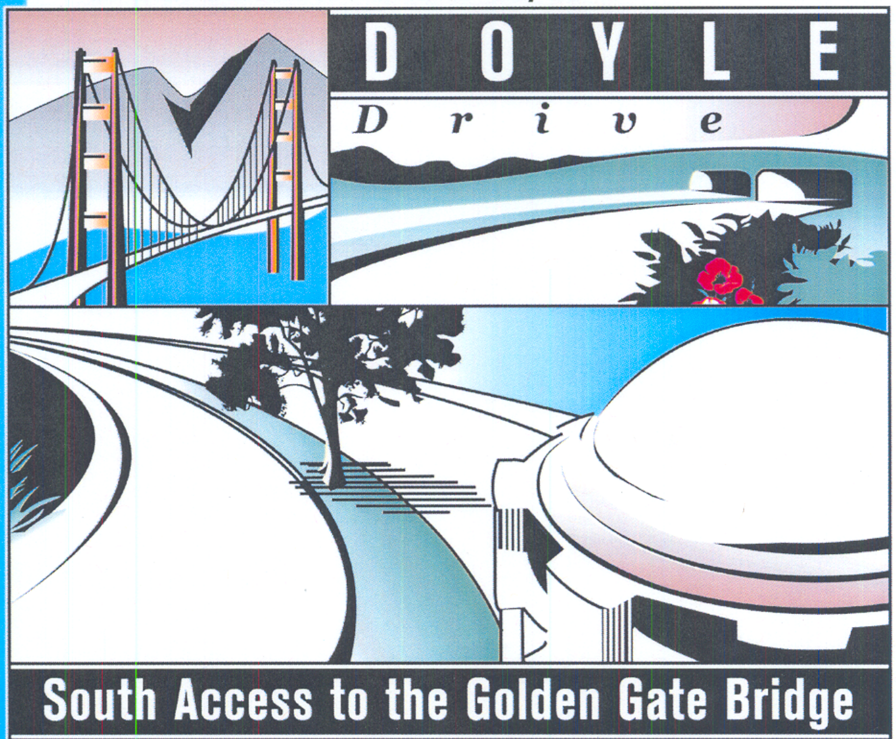
Intersection Summary			
Delay	8.0		
HCM Level of Service	A		
Intersection Capacity Utilization	26.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	0	0	0	0	4	0	21	0	4	31	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	0	0	0	0	4	0	21	0	4	31	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	0	4	21	35
Volume Left (vph)	0	0	0	4
Volume Right (vph)	0	4	0	0
Hadj (s)	0.00	-0.57	0.03	0.06
Departure Headway (s)	4.0	3.5	4.0	4.0
Degree Utilization, x	0.00	0.00	0.02	0.04
Capacity (veh/h)	886	1021	900	897
Control Delay (s)	7.0	6.5	7.1	7.1
Approach Delay (s)	0.0	6.5	7.1	7.1
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.1		
HCM Level of Service	A		
Intersection Capacity Utilization	15.0%	ICU Level of Service	A
Analysis Period (min)	15		

SFCTA Contract Number 99/00-7



FINAL VISUAL IMPACT ASSESSMENT
September 2004

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EXECUTIVE SUMMARY

INTRODUCTION

This report presents results of the Visual Impact Assessment conducted for the South Access to the Golden Gate Bridge (Doyle Drive) Study.

Doyle Drive is located in the Presidio of San Francisco (the Presidio), in the northern part of the City of San Francisco at the southern approach to the Golden Gate Bridge. Doyle Drive is within the Golden Gate National Recreation Area (GGNRA), in San Francisco County, California. Doyle Drive is over 70 years old and is approaching the end of its useful life, although regular maintenance, seismic retrofit and partial rehabilitation activities are keeping the structure safe in the short term.

The purpose of the Doyle Drive Study is to determine the most appropriate alternative to improve the seismic, structural, and traffic safety of the roadway within the setting and context of the Presidio of San Francisco and its purpose as a National Park. Objectives of the Doyle Drive project are:

1. To improve the seismic, structural and traffic safety of Doyle Drive;

2. To maintain the functions that the Doyle Drive corridor serves as part of the regional and City transportation network;

3. To improve the functionality of Doyle Drive as an approach to the Golden Gate Bridge;

4. To preserve the natural, cultural, scenic and recreational values of affected portions of the Presidio, a national historic landmark district;

5. To be consistent with the San Francisco General Plan and the Final Presidio General Management Plan Amendment and adopted updates;

6. To minimize the effects of noise and other pollution from the Doyle Drive corridor on natural areas and recreational qualities at Crissy Field and other areas adjacent to the project;

7. To minimize the traffic impacts of Doyle Drive on the Presidio and local roadways;

8. To improve intermodal and vehicular access to the Presidio; and

9. To redesign the Doyle Drive corridor using the parkway concept described within the Doyle Drive Intermodal Study (November 1996).

Preliminary alternatives were developed by sponsoring agencies and consultant staff for the Doyle Drive study. These alternatives represented potential transportation solutions to the need identified for the year 2030 planning horizon year for the Doyle Drive study. The build alternatives were developed with input from the scoping process and reflect the parkway concept that evolved through the previous studies. After a screening analysis was conducted and various design options were refined, three alternatives were selected for further consideration:

Alternative 1: No-Build (Retrofit) Alternative

Alternative 2: Replace and Widen Alternative

Alternative 5: Presidio Parkway Alternative

Each alternative is described in more detail in the Introduction.

METHODOLOGY

The Visual Impact Assessment methodology was developed using guidelines provided in the Federal Highway Administration's (FHWA*) Approach to Visual Assessment of Highway Projects* (FHWA, no date). The existing visual conditions in the project area were evaluated in terms of landscape types and distinct visual features. The evaluation also considered other factors such as the project's visual influence zone (the overall area from which the project is potentially visible), the important views and viewing conditions, and viewer types, activities, and attitudes. The next step included assessing the changes that would be introduced by the project, and the anticipated viewer response to those changes. To aid in this analysis, computer-generated visual simulations were prepared from 19 viewpoints around the Presidio and adjacent neighborhoods. The viewpoints represent a broad range of views and viewers. Based on these evaluations, the degree of visual impact was determined.

SUMMARY OF EXISTING VISUAL CONDITIONS

Doyle Drive is located on the northern edge of the San Francisco peninsula within the Presidio. This area of northern California is one of the most scenic areas in the world, where the blue waters of the Bay and Pacific Ocean combine with islands, bridges, mountains and urban skylines to create both picturesque and impressive vistas.

Doyle Drive sits within the Presidio at the southern end of the Golden Gate Bridge, which links San Francisco to Marin County and crosses the entrance to San Francisco Bay. The Golden Gate Bridge is one of the symbols of San Francisco and northern California and attracts visitors from around the world to view this magnificent architectural and engineering wonder. At the east end of Doyle Drive is the City of San Francisco, which in its own right is considered a scenic, architectural and engineering wonder. The Presidio, a once military-post-turned-National-Park, has a unique scenic character. Much of this former military post is open space with woodlands of eucalyptus, cypress and Monterey pines. Structures within the Presidio vary in architecture, size and use, but seem to share a common utilitarian feel and most noticeably, a consistent color and material scheme (cream and brick color buildings with red roofs).

Within the Presidio, Doyle Drive is the primary transportation corridor. From points north of Doyle Drive, along Crissy Field and Mason Street, Doyle Drive is most noticeable because of its elevated position, heavy support columns of the low viaduct and steel truss sections of the high viaduct. From the south side Doyle Drive is less noticeable because of the intervening topography, vegetation and buildings. The most noticeable element of Doyle Drive is the steel and concrete high viaduct section over McDowell Avenue. The steel elements of the high viaduct, which are painted red, and the light gray of the concrete columns stand out against the green-forested background of the Presidio.

The high viaduct and low viaduct differ substantially in their architecture and appearance. In addition to being a much taller structure, the high viaduct utilizes relatively few support columns and has long spans between supports. From areas beneath the high viaduct, approximately a dozen vertical columns can be seen, two for each of the six supports that are in view. This viaduct has a network of steel cross-members supporting the roadway deck, as does the Golden Gate Bridge. The cross-members are painted the same color as the bridge. Viewed from Crissy Field, the relationship between the high viaduct and the Golden Gate Bridge is evident. On the other hand, the low viaduct has concrete columns and a concrete deck with no steel cross-members. Its lower height places it more directly within a person's line of sight. High use areas surround the eastern half of the low viaduct where large numbers of people view it at close range as they pass directly by or under it. The existing low viaduct has spans of only 30 feet between supports and thus more vertical columns per unit length as compared to the high viaduct. Near its eastern terminus, the low viaduct splits into three separate structures: the Richardson Avenue on-ramp, Richardson Avenue off-ramp, and the bi-directional Marina Boulevard ramp. The width of the area occupied by the three elevated structures, about where Marshall Street crosses under Doyle Drive, is roughly four times greater than in other areas, creating a large, mostly empty and visually unappealing space beneath. From the corner of Marshall Street and Mason Street, more than one hundred vertical columns can be seen supporting the decks of the three structures. Much of the area beneath the low viaduct has been used as parking lots bounded by chain-link fence.

SUMMARY OF VISUAL EFFECTS

Several key criteria were used to assess the visual effects of the proposed alternatives:

- Potential obstruction or expansion of views
- Change in vividness (visual power or memorability)
- Change in intactness (visual integrity of the natural or man-made landscape)
- Effect on overall unity (visual coherence and compositional harmony) of the view
- Potential for community disruption or change in visual orientation

The change in visual quality for each alternative was assessed and given a rating from high to low.

Visual Resource Policies

There are four primary planning documents which provide direction regarding the scenic/visual resources with the study area. These plans include:

- Final General Management Plan Amendment (GMPA)
- Presidio Trust Management Plan (PTMP)
- San Francisco Bay Plan (SFBP)
- San Francisco Master Plan (SFMP)

All four of these plans set forth scenic/visual resource goals and policies intended to preserve, enhance, restore and respect scenic vistas, historic structures and visually important landscapes and streetscapes with the Presidio and surrounding neighborhoods. Each alternative was evaluated to determine its consistency with the scenic/visual resource goals and policies in each of these plans (see sections 2.5, 3.4 and Appendix B for a complete list of scenic/visual resource goals and policies and evaluation).

Visual Changes by Alternative

The project alternatives studied in depth generally fall into one of two categories, they either:

1. Produce relatively little long term change and therefore maintain current levels of visual quality and also views available to motorists on Doyle Drive, but fail to improve visual quality where it may be affected by the existing Doyle Drive in certain areas of the Presidio, or

2. Produce substantial long term change, much of which improves visual quality in certain areas of the Presidio by removing portions of the existing elevated structures and placing Doyle Drive underground, but at the same time eliminate views that motorists now enjoy from those portions of Doyle Drive.

The No-Build Alternative and Replace and Widen Alternative - Detour Option fall into the first category. The No Build Alternative would produce no change and the Replace and Widen Alternative - Detour Option would result in little change in existing visual conditions. The Replace and Widen - No Detour Option would fall between these two categories. The primary visual change associated with this alternative would be the raising of the low viaduct structure approximately two meters (six feet) which would result in a negative visual effect (increased view blockage and visual dominance) primarily when viewed from the main post area. Under the Presidio Parkway Alternative, the existing high and low viaduct structures would be demolished and new facilities would be constructed. The Presidio Parkway Alternative would place portions of the low viaduct structure below grade and/or underground, thus removing it from the landscape. The Presidio Parkway Alternative also provides direct connections between Doyle Drive and local roads within the Presidio, requiring realignment of streets, removal of buildings, and redevelopment of affected areas. Such actions would produce changes and localized improvements in visual quality in some areas, especially in the lower Tennessee Hollow area. Modifications associated with the Presidio Parkway Alternative would restore visual connections between areas of the Presidio that have been separated by Doyle Drive's low viaduct.

The Replace and Widen - No Detour Option would require the construction of detour facilities to carry Doyle Drive traffic for approximately five years while the existing facilities are demolished and the permanent, new facility is under construction. A detour structure would be built just north of and parallel to the existing low viaduct. Access to Marina Boulevard during construction would be maintained on an elevated temporary structure South of Mason Street. On and off ramps to the mainline detour facility would be located near the Post Exchange (PX) building. The detour structure would be demolished once the new Doyle Drive facility is complete.

INTRODUCTION

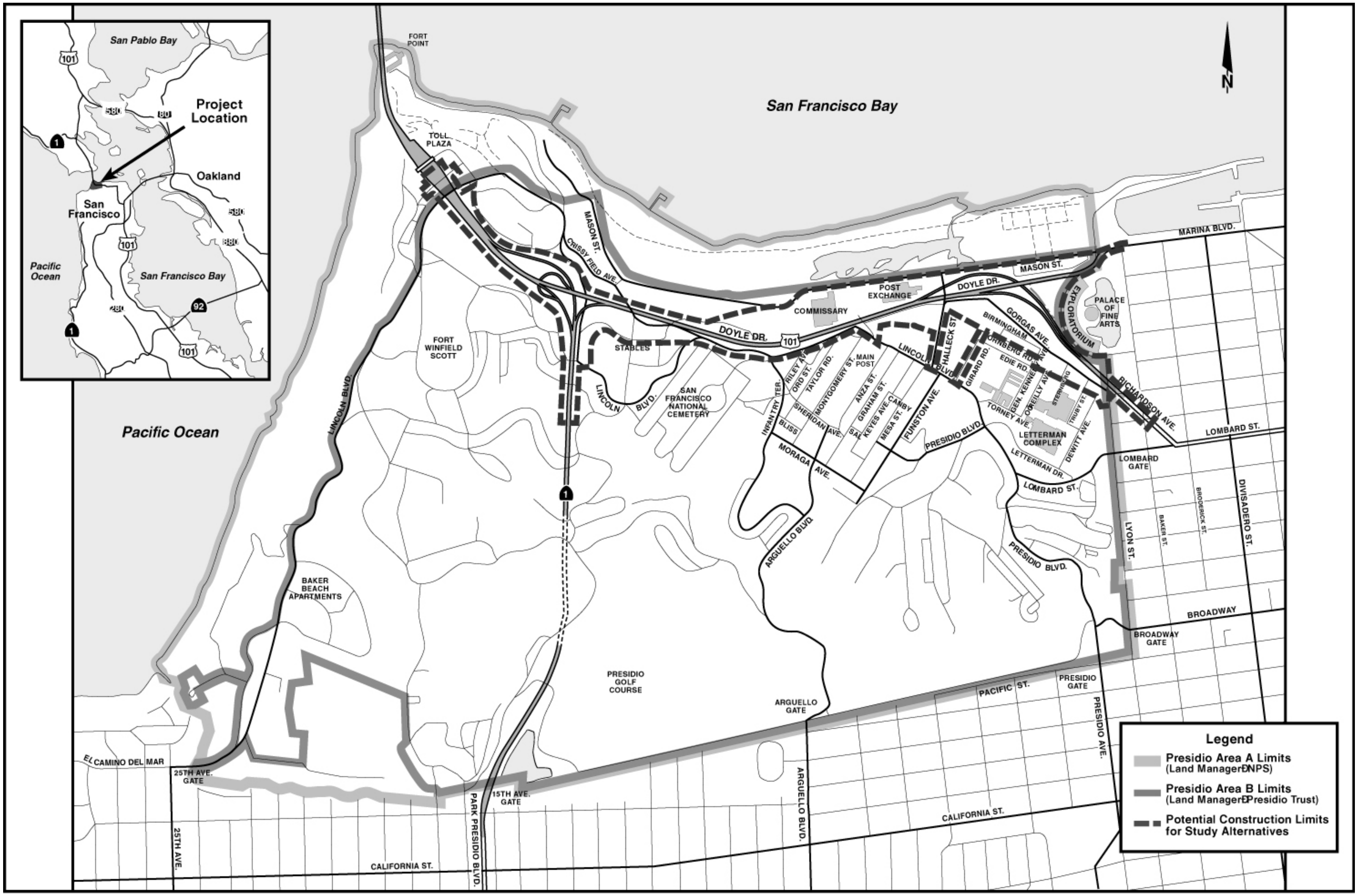
Doyle Drive is located in the Presidio of San Francisco (the Presidio), in the northern part of the City of San Francisco at the southern approach to the Golden Gate Bridge (see Figure 1-1). In 1994, when the US Army transferred jurisdiction of the Presidio to the National Park Service (NPS), it became part of the National Park system and Golden Gate National Recreation Area (GGNRA). In 1998, management of the Presidio was divided between two federal agencies: The Presidio Trust (the Trust), the agency responsible for oversight of 80 percent of the Presidio delineated as Area B; and the NPS, which is responsible for management of the coastal portions of the park (the remaining 20 percent) that are delineated as Area A. Doyle Drive lies predominately within the Area B lands managed by the Trust with a small portion at the western end located in Area A on land operated by the Golden Gate Bridge, Highway and Transportation District (GGBHTD). The Presidio has also been designated a National Historic Landmark District (NHLD) since 1962 with the Doyle Drive roadway determined to be a contributing element to that landmark.

Doyle Drive, the southern approach of US 101 to the Golden Gate Bridge, is 2.4 kilometers (1.5 miles) long with six traffic lanes. There are three San Francisco approach ramps which connect to Doyle Drive: one beginning at the intersection of Marina Boulevard and Lyon Street; one at the intersection of Richardson Avenue and Lyon Street; and one where Park Presidio Boulevard (State Route 1) merges into Doyle Drive approximately 1.6 kilometers (one mile) west of the Marina Boulevard approach (see Figure 1-1). Doyle Drive passes through the Presidio on an elevated concrete viaduct (low-viaduct) and transitions to a high steel truss viaduct (high-viaduct) as it approaches the Golden Gate Bridge Toll Plaza.

Doyle Drive is nearly 70 years old and it is approaching the end of its useful life, although regular maintenance, seismic retrofit, and partial rehabilitation activities are keeping the structure safe in the short term. However, further structural degradation caused by age and the effects of heavy traffic and exposure to salt air will cause the structures to become seismically and structurally unsafe in the coming years. In addition, the eastern portion of the aging facility is located in a potential liquefaction zone identified on the State of California Seismic Hazard Zones map dated August 2000.

Currently, Doyle Drive has nonstandard design elements, including travel lanes from 2.9 to 3.0 meters (9.5 to 10.0 feet) in width, no fixed median barrier, no shoulders and exit ramps that have tight turning radii. During peak traffic hours, plastic pylons are manually moved to provide a median lane as well as to reverse the direction of traffic flow of several lanes (Project Study Report: Doyle Drive Reconstruction, 1993).

**FIGURE I.1:
PROJECT LOCATION**



PROJECT PURPOSE

The purpose of the South Access to the Golden Gate Bridge - Doyle Drive Project is to replace Doyle Drive in order to improve the seismic, structural, and traffic safety of the roadway within the setting and context of the Presidio of San Francisco and its purpose as a National Park.

PROJECT ALTERNATIVES

This section describes the build alternatives in terms of physical and operating characteristics and a No-Build Alternative. As shown in Figure I-1, the project limits are from Merchant Road, just south of the Golden Gate Bridge Toll Plaza, to the intersection of Richardson Avenue/Francisco Street and Marina Boulevard/Lyon Street. During the screening process, all alternatives were evaluated for their ability to meet the project's Purpose and Need. Detailed drawings showing the plan and profile of each alternative in addition to the various design options can be found in Appendix A.

Alternative 1: No-Build Alternative

The No-Build Alternative represents the future year conditions if no other actions are taken in the study area beyond what is already programmed by the year 2020. The No-Build Alternative provides the baseline for existing environmental conditions and future travel conditions against which all other alternatives are compared.

Doyle Drive would remain in its current configuration, with six traffic lanes ranging in width from 2.9 to 3.0 meters (9.5 to 10 feet) and an overall facility width of 20.4 meters (67 feet) (see Figure 1-2). There are no fixed median barriers or shoulders. The lane configuration is changed by manually moving plastic pylons to increase the number of lanes in the peak direction of traffic. The facility passes through the Presidio on a high steel truss viaduct and a low elevated concrete viaduct with lengths of 463 meters (1,519 feet) and 1,137 meters (3,730 feet), respectively. This alternative does not improve the seismic, structural, or traffic safety of the roadway.

Vehicular access to the Presidio is available from Doyle Drive via the off-ramp to Merchant Road at the Golden Gate Bridge Toll Plaza. Presidio access at the east end of the project will be provided for southbound traffic via a right turn from Richardson Avenue to Gorgas Avenue. Presidio access for northbound traffic will be provided by a slip ramp from Richardson Avenue to Gorgas Avenue, which is currently under construction.

Alternative 2: Replace and Widen Alternative

The Replace and Widen Alternative would replace the 463-meter (1,519-foot) high-viaduct and the 1,137-meter (3,730-foot) low-viaduct with wider structures that meet the most current seismic and structural design standards (see Figure 1-3). The new facility would be replaced on the existing alignment and widened to incorporate improvements for increased traffic safety.

This alternative would include either six 3.6-meter (12-foot) lanes and a 3.6-meter (12-foot) eastbound auxiliary lane with a fixed median barrier or six 3.6-meter (12-foot) lanes with a moveable median barrier. The new facility would have an overall width of 38.0 meters (124 feet). The fixed median barrier option would require localized lane width reduction to 3.3 meters (11 feet) to avoid impacts to the historic batteries and Lincoln Boulevard, reducing the facility width to 32.4 meters (106 feet). Both options would include continuous outside shoulders along the facility. At the Park Presidio interchange, the two ramps connecting eastbound Doyle Drive to Park Presidio Boulevard and the ramp connecting westbound Doyle Drive to southbound Park Presidio Boulevard would be reconfigured to accommodate the wider facility. The Replace and Widen Alternative would operate similar to the existing facility except that there would be a median barrier and shoulders to accommodate disabled vehicles.

The Replace and Widen Alternative includes two options for the construction staging:

No Detour Option – The widened portion of the new facility would be constructed on both sides and above the existing low-viaduct and would maintain traffic on the existing structure. Traffic would be incrementally shifted to the new facility as it is widened over the top of the existing structure. Once all traffic is on the new structure, the existing structure would be demolished and the new portions of the facility would be connected. To allow for the construction staging using the existing facility, the new low-viaduct would be constructed two meters (six feet) higher than the existing low-viaduct structure.

With Detour Option - A 20.4-meter (67-foot) wide temporary detour facility would be constructed to the north of existing Doyle Drive to maintain traffic through the construction period. Access to Marina Boulevard during construction would be maintained on an elevated temporary structure south of Mason Street. On and off ramps to the mainline detour facility would be located near the Post Exchange (PX) building.

Vehicular access to the Presidio is available from Doyle Drive via the off-ramp to Merchant Road at the Golden Gate Bridge Toll Plaza. Presidio access at the east end of the project will be provided for southbound traffic via a right turn from Richardson Avenue to Gorgas Avenue. There would be no Presidio access for northbound traffic at the east end of Doyle Drive due to geometric constraints and concerns for traffic safety.

Alternative 5: Presidio Parkway Alternative

The Presidio Parkway Alternative would replace the existing facility with a new six-lane facility and an eastbound auxiliary lane, between the Park Presidio interchange and the new Presidio access at Girard Road (see Figure 1-4). The new facility would have an overall width of up to 45 meters (148 feet), and would incorporate wide landscaped medians and continuous shoulders. To minimize impacts to the park, the footprint of the new facility would include a large portion of the existing facility's footprint east of the Park Presidio interchange. A 450-meter (1,476-foot) high-viaduct would be constructed between the Park Presidio interchange and the San Francisco National Cemetery. Shallow cut-and-cover tunnels would extend 240 meters (787 feet) past the cemetery to east of Battery Blaney. The facility would then continue towards the Main Post in an open depressed roadway with a wide heavily landscaped median. From Building 106 (Band Barracks) cut-and-cover tunnels up to 310 meters long (984 feet) would extend to east of Halleck Street. The facility would then rise slightly on a low level causeway 160 meters (525 feet) long over the site of the proposed Tennessee Hollow restoration and a depressed Girard Road. East of Girard Road the facility would return to existing grade north of the Gorgas warehouses and connect to Richardson Avenue.

The Presidio Parkway Alternative would include an underground parking facility at the eastern end of the project corridor between the Mason Street Warehouses, Gorgas Street Warehouses and Palace of Fine Arts. The parking garage would supply approximately 500 spaces to maintain the existing parking supply in the area and improve pedestrian and vehicular access between the Presidio and the Palace of Fine Arts.

At the intersection with Merchant Road, just east of the toll plaza, a design option has been developed for a Merchant Road slip ramp. This option would provide an additional new connection from westbound Doyle Drive to Merchant Road. This ramp would provide direct access to the Golden Gate Visitors' Center and alleviate the congested weaving section where northbound Park Presidio Boulevard merges into Doyle Drive.

The Park Presidio interchange would be reconfigured due to the realignment of Doyle Drive to the south. The exit ramp from eastbound Doyle Drive to southbound Park Presidio Boulevard would be replaced with standard exit ramp geometry and widened to two lanes. The loop of the westbound Doyle Drive exit ramp to southbound Park Presidio Boulevard would be improved to provide standard exit ramp geometry. The northbound Park Presidio Boulevard connection to westbound Doyle Drive would be realigned to provide standard entrance ramp geometry. There are two options for the northbound Park Presidio Boulevard ramp to an eastbound Doyle Drive connection:

Option 1: Loop Ramp - Replace the existing ramp with a loop ramp to the left to reduce construction close to the Cavalry Stables and provide standard entrance and exit ramp geometry.

Option 2: Hook Ramp - Rebuild the ramp with a similar configuration as the existing ramp with a curve to the right and improved exit and entrance geometry.

The Presidio Parkway Alternative includes two options for direct access to the Presidio and Marina Boulevard at the eastern end of the project:

Diamond Option – Direct access to the Presidio and Marina Boulevard in both directions is provided by the access ramps from Doyle Drive connecting to a grade-separated interchange at Girard Road. East of the new Letterman garage, Gorgas Avenue is a one-way street and connects to Richardson Avenue with access to Palace Drive via a signalized intersection at Lyon Street.

Circle Drive Option – The Circle Drive Option provides direct access to the Presidio and Marina Boulevard for eastbound traffic by access ramps connecting to a grade-separated interchange of Girard Road. Westbound traffic from Richardson Avenue would access the Presidio and Palace Drive through a jug handle intersection with Gorgas Avenue.

CONSTRUCTION ACTIVITIES

The following section describes the construction activities associated with all build alternatives including staging and temporary detours. Diagrams depicting the construction staging and detours for the Replace and Widen Alternative are contained in Appendix C.

Pre-Construction Staging

Two staging areas have been identified. The primary staging area would be located between Doyle Drive and Mason Street at the parking lot for the Post Exchange (PX) and Commissary. Both buildings will remain under the Replace and Widen – No Detour option. Alternately, both the PX and the Commissary will be removed under the Replace and Widen – With Detour option to facilitate construction of the temporary detour, thereby enlarging the area available for staging. The Parkway Alternative will require the removal of the PX building only. The secondary staging area would be located at the parking lot between Buildings 230 and 1063 at the west end of Gorgas Avenue. Depending on schedule and sequence of work, completed sections of detours and permanent structures could also be used for staging.

Storage of equipment and materials on-site would be limited to the staging areas to minimize ground disturbance. The majority of equipment and materials would be transported to the site using designated haul roads during daytime hours to minimize disturbance to the surrounding residential neighborhoods and to comply with the City of San Francisco construction noise ordinance. Doyle Drive from the west, Mason Street, and Lincoln Boulevard have been identified as haul roads. Additional haul roads, including completed detour roads, would be identified prior to the start of construction. Following construction, all haul roads would be restored to existing conditions or as defined by the land managing agency.

Construction

All build alternatives would involve standard construction techniques and require large-scale construction equipment and labor-intensive activities. General activities would include:

- Excavation, grading, stockpiling of soil;
- Removal of vegetation and existing facilities; and
- Erection of temporary falsework and shoring, roadway construction, placement of reinforced concrete and precast concrete, landscaping, and demobilization.

Equipment would include drill rigs, pile and pneumatic hammers, backhoes, sheet piling, cranes, bentonite mixing and processing equipment, an on-site concrete batching plant, concrete trucks, and delivery trucks. Impact tools would be equipped with intake and exhaust mufflers while pavement breakers and jackhammers would be equipped with acoustically attenuating shields or shrouds. The construction period is an estimated four to five years for all alternatives.

Methods of construction could include the use of ground-supported falsework for the aerial structures, cast-in-drilled-hole (CIDH) piles for the foundations, and cut-and-cover for the tunnels. Specialized overhead construction techniques are being considered for the aerial structures to minimize ground disturbance. CIDH piles (reinforced concrete piles which are cast in a pre-drilled hole or casing) are recommended as the primary foundation support methodology, however, there are other non-conventional alternatives which may be considered. Oscillated non-driven piles are one such alternative, although they are typically about a third more expensive than conventionally installed driven piles. Driven piles should still be considered in certain less sensitive locations, because they are widely available, generally smaller in diameter, more economically feasible, and historically proven since the original Doyle Drive viaducts were constructed on driven piles. A driven pile program would be implemented only at locations deemed to be outside those areas where pile hammer noise could have a potential negative effect. Decision about which methods to use will depend on cost, feasibility of construction, and avoidance of sensitive resources, and would be made early in the final design of the preferred alternative.

Aerial Structures and Substructures

There are three superstructure types being considered for the aerial structures: the concrete box-girder, variable depth haunch girder, and constant depth girder. The concrete box-girder design is standard in California and requires shorter spans and therefore more support columns. Both the variable depth and constant depth girders allow for longer span of up to 80 meters (262 feet).

Aerial structure foundations would most likely be CIDH piles approximately 20 meters (65 feet) long and 0.9 to 3.0 meters (3 to 10 feet) in diameter. The installation of a CIDH pile would require either drilling a hole to a pre-determined depth or driving a casing using vibratory or oscillation techniques and removing the soil. A rebar support cage would then be lowered into the center of the hole or casing and concrete be poured in, forming the pile. Depending on groundwater levels, full-length casings could be required but if not, the hole would be filled with bentonite slurry to stabilize the walls. This would require a bentonite processing plant on-site to process displaced bentonite as concrete is poured. The slurry would be displaced from the hole as the concrete is placed from a concrete pump truck using concrete delivered from mix trucks or from an on-site plant.

Tunnels

The tunnels would be constructed using the cut-and-cover method. The typical sequence for construction would include excavation to the necessary length and depth; installation of required substructures and ground water conveyance systems, if necessary; installation of waterproof membrane; pouring of concrete for the base slabs, walls, and the roof; covering the top and sides of the tunnel with a waterproofing membrane; and backfilling over the top of the tunnel to create the approved topography. For the Main Post tunnel the roof would be built out of precast sections to minimize disruption to traffic operations.

Because of potential hydrological and biological sensitivity at the bluff area, further hydrogeologic investigations would be conducted before final design to determine the hydrogeology and extent of groundwater flow. A water transfer concept was developed that would be necessary to transfer groundwater around the tunnel without allowing longitudinal flow along the exterior of the concrete walls to maintain wetland vegetation on the northern bluff face. The concept includes high-permeability strip drains to intercept groundwater on the upstream (south) side of the tunnel and transport it around the outside of the tunnel to locations on the downstream (north) side of the tunnel.

At the closest point at the National Cemetery, the limit of the tunnel structure would be 1 meter (3 feet) north of the National Cemetery fence line. No tiebacks would be used in this area and rigid shoring system that would be incorporated into the final tunnel wall would be designed to minimize any ground movement and avoid the cemetery.

It is anticipated that majority of the material excavated during construction of the tunnels would be suitable for reuse as fill in the project corridor; however, any unsuitable material would require off-site disposal. For reuse of excavated soils in the project corridor, the Caltrans thresholds for soil contaminants would need to be used.

Demolition of Detours and Existing Structures

Standard demolition equipment would be used to dismantle the existing structures and the temporary detour structures after completion of the replacement structures. Demolition would include cutting and pulverization of concrete into pieces on-site that could be used as back fill in the project corridor. Piles from the existing structure would be cut off to an elevation 1 meter (3.28 feet) below grade per Caltrans standard specifications. Curtains may be required during demolition of existing structure to contain release of airborne lead.

Replace and Widen Detours

A temporary detour would be necessary to maintain traffic during the replacement of the low viaduct. The construction period would last approximately five years. The replacement of the low-viaduct would require detours in two stages. The first stage would detour traffic north and south of the west portion of the low-viaduct. The detours would match the existing profile. The second stage would detour the mainline traffic north of the existing structure. The mainline detour would be similar to the existing roadway with 3.0 meter (9.8 feet) lanes and a reversible center lane to accommodate peak direction traffic. The detour would descend from the new western portion of the low-viaduct similar to the existing structure. The Marina ramp detour would split off the mainline with the mainline detour rising to go over the existing Marina and Richardson ramps. Once clear of the existing structure, the mainline detour would descend to grade adjacent to the Palace of Fine Arts.

The Marina ramp detour keeps the Marina traffic on an elevated detour with a similar profile to the existing structure. The elevated detour aligns to the south of Mason Street and requires the temporary removal of four Mason Street Warehouses.

SECTION 1: METHODOLOGY

This chapter describes the methodology and criteria used in assessing the existing visual conditions and the potential visual impacts of the proposed project alternatives for the South Access to the Golden Gate Bridge–Doyle Drive Project.

The study methodology was developed using guidelines provided in the Federal Highway Administration's (FHWA) *Approach to Visual Assessment of Highway Projects* (FHWA, no date). The existing visual conditions in the project area are comprised of actual visual resources (described in terms of visual character and quality), the characteristics of viewers, namely viewer exposure (the ability to see the project area), and viewer sensitivity. The visual resources were analyzed in terms of landscape types and distinct visual features within the region. The evaluation of viewer characteristics took into account the project's visual influence zone (the overall area from which the project would be potentially visible), the important views and viewing conditions, and viewer numbers, types, activities, and attitudes. These components defined the existing conditions. The next step was to assess the changes that would be introduced by the project, and the anticipated viewer response to that change. Based on these evaluations, the degree of visual impact was determined.

1.1 INVENTORY METHODS—VISUAL RESOURCES

1.1.1 Regional Landscape Character

The first step in identifying visual character is to define the regional landscape in which the project study area is located. This helps establish a frame of reference for comparing the visual effects of alternatives and determining their significance. Regional landscapes constitute broad areas defined by physical and ecological factors, and are characterized by specific combinations of four components: landform (or topography), water, vegetation, and man-made development.

1.1.2 Visual Influence Zone/Study Area

Defining the visual influence zone of the project is important to establish the visual study area. The visual influence zone is defined as the general land area or envelope within which the project may be seen, and in turn visually influences potential viewers. This is often referred to as a project's "viewshed." A project's viewshed is most often defined by topographic features such as ridgelines, which create the visual and physical boundaries of the visual envelope.

1.1.3 Landscape Units

Landscape units are portions of the study area that have a distinct visual character. Their boundaries are often marked by distinct changes in visual character or spatial experience, such as a valley entrance, a river crossing, or a change in land use pattern. The visual character of some units is strongly influenced by specific landscape features, such as a large structure, individual landform, or a distinctive body of water.

1.1.4 Visual Image Types

Image types are areas that exhibit a fairly homogeneous visual quality. In combination, several image types influence the character of the larger landscape unit. Image types describe variations within landscape units that have implications for visual quality and viewer exposure; they provide a more detailed framework for comparing the visual effects of a project and developing appropriate mitigation strategies. Each image type may be found within any landscape unit area. A Visual Image Type of an area is based on landscape and development features which, in combination, give the area a certain “look” within the regional context. Key features that determine a Visual Image Type include:

- Landscape Components—the type, configuration and composition of design components, including slope, water forms, vegetation, and structures. These components influence what is visually dominant within each typical image type.

- Land-Use Concept—within developed areas, the density and spatial arrangement of open space, access, landscape patterns, and buildings which dictates how views are oriented, enclosed, or focused.

- Level of Landscaping and Visual Design—the extent and significance of landscaped areas, and the degree of investment in, or attention to, aesthetics in the design and maintenance of the area.

1.1.5 Visual Quality Evaluation

The existing visual quality for each of the landscape units identified within the project study area was evaluated and rated. The evaluation looks for indicators of the level of visual relationships, rather than judgments of physical landscape components. This approach provides a set of three evaluative criteria proven to be useful in previous visual impact studies: vividness, intactness, and unity. These criteria are defined as follows:

- Vividness is the visual power or memorability of landscape components as they combine in striking and distinctive visual patterns. An example within the study area is the distinctive relationship of land and water observed from the existing Doyle Drive.

- Intactness is the visual integrity of the natural and man-made landscape of the immediate environs and its freedom from encroaching elements. An example within the study area is the Crissy Field wetland restoration area, which is a natural area with few man-made features.

- Unity is the visual coherence and compositional harmony of the viewshed. The viewshed entails all natural and man-made features found within the normal view range. In man-altered landscapes, it frequently attests to the careful design or fit of individual components in the landscape. An example is the way man-made elements such as the Golden Gate Bridge combine with natural features such as San Francisco Bay and the Marin Headlands to provide a coherent visage unique to the Bay Area.

1.2 INVENTORY METHODS—VIEWER CHARACTERISTICS

Evaluation of viewer characteristics and sensitivity incorporates the visual preferences of viewers, viewer activities, viewer awareness of visual character and issues, and local values and goals. This methodology is used to determine the existing visual conditions (Chapter 2.0) and changes that would occur to those conditions due to the project (Chapter 3.0). The complexities in documenting viewer sensitivity are partially addressed through a physical inventory of viewer types and landscape characteristics affecting viewer exposure, as well as through interpretations of viewer sensitivity information obtained from previously recorded comments and other studies. For projects with high visibility, the direct solicitation of viewer response information through public meetings, workshops, and newsletters is invaluable in identifying local preferences and locally significant visual features or concerns. In this study, analysis of existing information and field data has been supplemented with information gained through informal viewer response information obtained during public meetings.

1.2.1 Viewer Type

The main distinction between types of viewer groups is whether views are from Doyle Drive (highway users or motorists) or toward the Doyle Drive corridor. Within these two main groups are subcategories relating to highway use (commuters, recreationalists, commercial users, tourists, etc.) and viewer location/land use (residential, commercial, local road-user, recreational, etc.). The characteristics of these viewing locations and viewer activities determine viewer sensitivity in the study area (see below).

1.2.2 Viewer Exposure

Viewer exposure refers to the visibility of the project from surrounding viewpoints as well as the viewing sequence from the road-user's viewpoint. Use patterns that determine viewpoints can be categorized by location, use-volume, and timing, as well as by viewer type. Viewer exposure relates to duration and frequency of views, and whether the viewer is located at a given site or is moving. The direction and speed of travel can profoundly influence the exposure to views. View position refers to the observer's height in relation to what is being viewed. This relationship is important in determining scenic quality and potential visual impact. This relationship applies to both viewers of the project and viewers from the project.

Viewing angle is also an important factor in evaluating viewer exposure. In general, a 45-degree viewing angle is preferable because it allows the viewer to see depth, architectural features and length of the feature being viewed. Highly acute viewing angles are less preferable because architectural details are often reduced as well as the depth of the feature being viewed. Perpendicular angles are also less preferable than a 45-degree viewing angle because depth of the feature is often lost, while architectural details are more visible.

Viewing conditions such as lighting, seasonal variation, and weather can also influence the experience of views.

Viewing distance affects the degree of visibility of landscape features. Close viewpoints, typically within 0 to 0.5 kilometers (0 to 0.3 miles), permit perception of landscape detail and small-scale features. An intermediate viewpoint, typically from 0.5 to 5.0 kilometers (0.3 to 3.0 miles), permits the viewer to perceive the relationship of landscape features, although detailed perception is considerably reduced. Distant viewpoints, typically beyond 5.0 kilometers (3.0 miles) from the viewer, allow only perception of large-scale features (e.g., ridges, the Bay, and urban settlements), with little detail and considerable loss of color contrast.

Viewing distance also exerts a considerable influence on the viewer's visual experience. Typically, a person can readily perceive objects within an approximately 40 degree range directly in front of him/her, in the horizontal plain, without moving his/her head or eyes (this is called the "normal view range" or the "normal view cone," and is replicated in 50 millimeter lens using a 35 mm camera). From close viewpoints, Doyle Drive, due to its length, will encompass the entire view cone of a viewer facing it, and changes to it will be prominent. But from distant viewpoints, Doyle Drive will encompass only a portion of the view cone of a person facing it, making it possible that changes to the roadway will be less prominent.

The visibility of the existing road is dictated by topographic screening and other factors, such as structures and vehicles. Visibility of the existing conditions was documented in field photography.

Within the study area, sensitive viewpoints for analysis and photo-simulation studies were chosen to represent visual resource issues and the major viewer groups. Representative viewing areas were mapped from field analysis and map interpretation.

1.2.3 Applicable Policies

Various planning and regulatory documents from the National Park Service, Presidio Trust, Federal Highway Administration, Caltrans, and City and County of San Francisco have been reviewed to identify policies governing aesthetics. These policies are incorporated into the visual baseline studies to provide background regarding viewer characteristics and expected viewer response to change. The policies also provide a basis for identifying potential conflicts between the project and local agencies' policies regarding aesthetics. A summary of these policies and analysis of consistency of the proposed alternatives with each policy is contained in Appendix B.

1.3 VISUAL IMPACT ASSESSMENT METHODS

The methodology used to assess visual impacts is also taken from the FHWA guidelines referenced in Section 1.1. The impact assessment process, shown in Figures 1.3.1 and 1.3.2 (Visual Resources Methodology Flowcharts), incorporates and combines the two principal visual impact components: visual resource change and viewer response to that change. Visual resource change is analyzed in terms of visual dominance and other specific visual effects of alternatives, together with change in visual quality. Viewer responses to these changes are interpreted on the basis of viewer types identified in the baseline study. Visual simulations have been prepared to assist the analysis, using computer-generated information overlaid on photographic images from actual site photos at selected viewpoints. In addition, the relationship of the project to applicable plans and policies are examined, and any inconsistencies between potential impacts and adopted policies are highlighted.

1.3.1 Visual Impact Types and Assessment Criteria

Visual impacts have been categorized into general types. Separate criteria apply to each different visual impact type. The relationship of these impact types to the overall impact assessment is shown in Figure 1.3.2.

1.3.1.1 Criteria-Specific Effects on Viewers

The criteria used to determine effects on viewers include: visual dominance of the project; view obstruction or view expansion; effects on community disruption; viewer orientation; and design quality issues, such as changes in vividness, intactness and unity.

Visual Dominance. Visual dominance refers to the contrast between the proposed improvements and their setting described in terms of vegetation, landform, and structural changes. Dominance is a function of how potentially noticeable the project is to the viewer, ranging from:

- Inevident — Project is visible but generally not noticeable.
- Subordinate — Project is noticeable, but attracts less attention than other components of the setting.
- Co-dominant—Project attracts attention equally with other components of the setting.
- Dominant—Project dominates the view and attracts more attention than other components of the setting.

Visual elements of scale, form, line, and position, as seen from representative sensitive viewing locations, determine the degree of contrast and dominance.

FIGURE 1.3.1
VISUAL RESOURCES METHODOLOGY FLOWCHART (BASELINE)

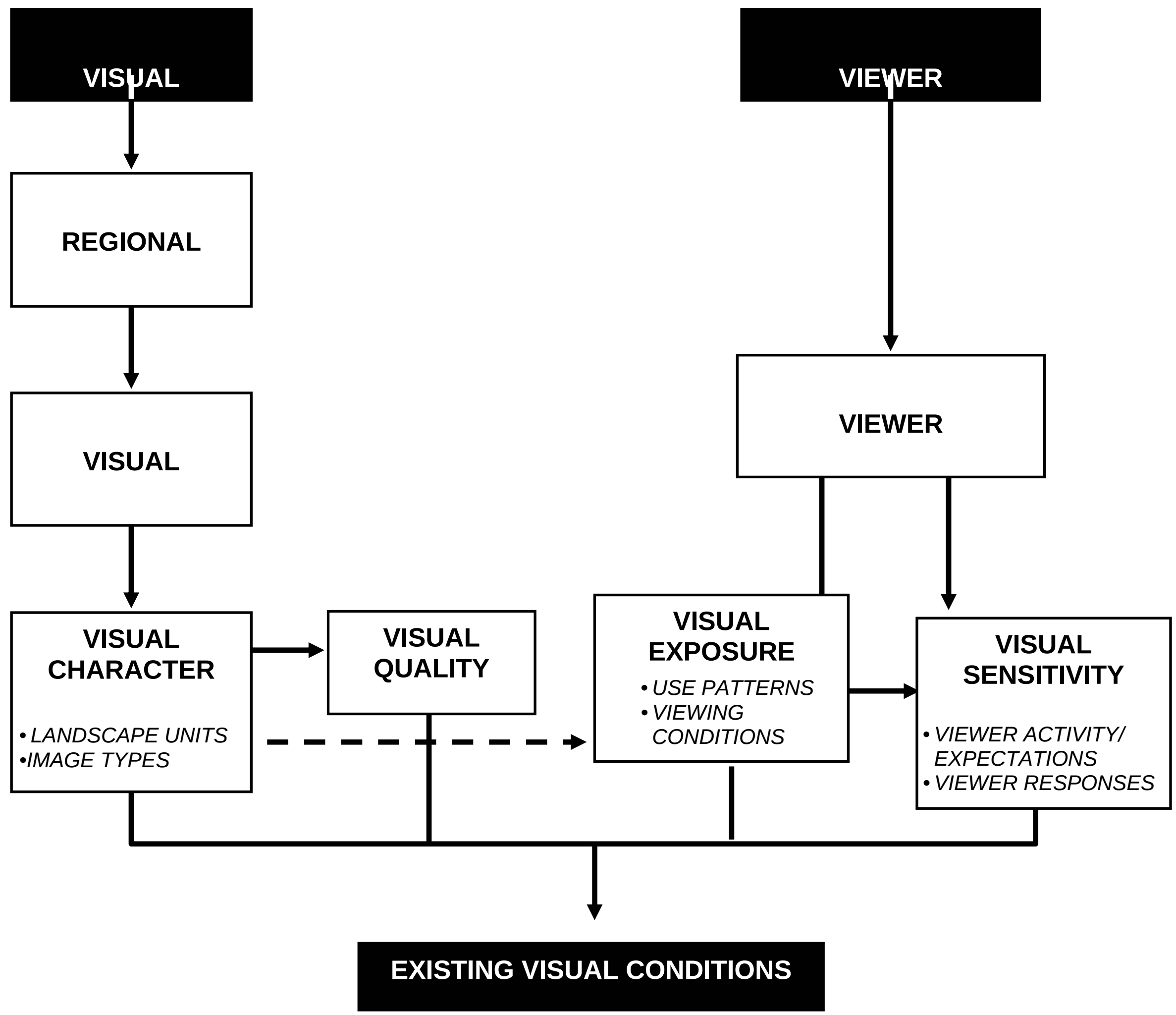
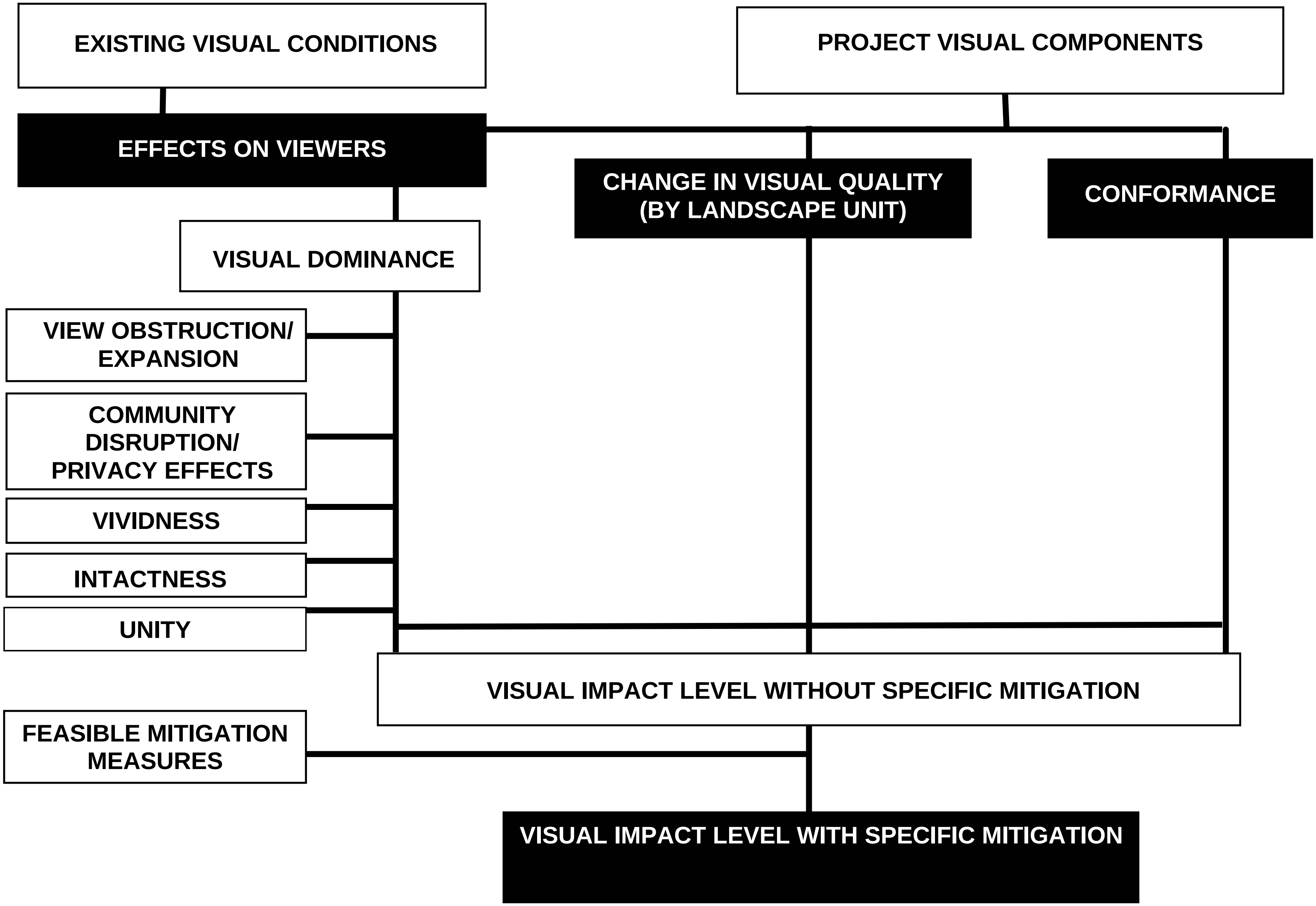


FIGURE 1.3.2
VISUAL RESOURCES METHODOLOGY FLOWCHART (IMPACTS)



It is fairly straightforward to determine the expected degree of visual dominance for the project from a given viewpoint. The determination involves an evaluation of the visibility and visual contrast of project components within their surroundings, together with viewing distance and degree of visual exposure for the viewer. Preferably, this analysis would be aided by the use of visual simulations (see below).

A visually dominant project represents a more substantial visual change if it occurs in areas such as an intact natural landscape or NHLD, as Doyle Drive does. In general, if the project would cause the facility to change from a more dominant to a less dominant level, the effect is generally considered to be beneficial. Conversely, if the dominance of the roadway increases because of the project, the effect is generally considered to be adverse.

It is important to stress that visual dominance is only one of the criteria which may be considered in evaluating visual quality. The visual effect may be altered considerably by other criteria, including view obstruction/expansion; vividness; intactness; unity; community disruption/privacy/orientation; design quality, art, architecture; and loss or addition of attractive landscape features (e.g., trees).

View Obstruction or Expansion. View obstruction or expansion is a criterion that may modify the degree of adverse effect expected from the dominance evaluation. In terms of view blockage, existing views may be eliminated as a result of structural or landform additions that may block visual access. Conversely, views may be improved or made newly available as a result of existing structural and landform elements being moved or removed. View obstruction or expansion is categorized as follows:

– Obstructed view — Project fully or largely blocks views of notable landscape features or vistas.

– Partial view obstruction — Project interrupts or partly screens views of notable landscape features or vistas, but some experience of viewing features or vistas remains.

– New or expanded view — Project opens up views of notable landscape features or vistas.

In this study, notable landscape features may include either positive visual elements with high visual unity and intactness (views of the Bay, ridgelines, open space, historic landmark buildings) or negative ones with low unity and intactness (storage facilities, maintenance yards, stockpile areas). Therefore, whether the effect on view obstruction is considered adverse or beneficial depends on the object being viewed. This criterion has been applied only where important views or viewing directions toward notable features are affected; it is not applied in situations where general or unspecified views may be blocked.

Community Disruption, Orientation, and Privacy. Considerations of community disruption, viewer orientation, and privacy represent a set of criteria, which reflects typical viewer responses and perceptions about the relationship of transportation corridors to the surrounding neighborhood.

Community Disruption—Changes in both physical and visual conditions can influence the degree of community disruption perceived by local residents because of a project. This report considers only the visual evidence of community disruption and not access or land-use effects. Changes that make the project more visible and more obstructive tend to increase perceived community disruption. This criterion applies mainly to views to the road from residential, recreational, and office commercial viewer groups.

Orientation or “way-finding” pertains to visual information (landmarks, signage, indicators of local character) along the freeway or other travel routes, which may cue travelers to their regional and local position, and which potentially improve a sense of direction or perceived safety. Orientation is evaluated as either being improved (when views to recognized landscape features are opened up, or viewing sequences along important entry routes become less confusing) or worsened (when continuous view blockage along travel routes prevent orientation to surrounding communities and natural features, or when a complicated travel path leads to frequent changes in view direction).

Privacy is an important consideration in residential neighborhoods where direct sight-lines from the roadway to adjacent homes and gardens are perceived as adverse to the inhabitants. Major increases or reductions in privacy are evaluated.

Design Quality, Art and Architectural Features. The design quality, art and architectural features criterion describes those aspects of the project design that may reflect creative aesthetics design input and which need to be documented under FHWA procedures. Although a matter of considerable subjectivity, design features that attempt to increase aesthetic qualities can be evaluated, much like landscape units or specific landscape features, in terms of vividness, unity, and intactness.

1.3.1.2 Overall Effects on Viewers

An overall determination of adverse and beneficial effects on viewers is based on a combined evaluation of all the criteria described above. Impacts are categorized as:

- Strongly Beneficial—substantial visual change and considerable increase in the overall visual quality, with the likelihood of strongly positive viewer responses.
- Beneficial—moderate degrees of visual change and an increase in the overall visual quality, with the likelihood of positive viewer responses.
- Minimally Beneficial—tangible visual changes and a minimal increase in overall visual quality, with the likelihood of moderately positive viewer responses.
- Negligible—little or no visual change and no tangible reduction or increase in visual quality, without negative or positive viewer responses expected.
- Minimally adverse—a tangible degree of visual change and a minimal reduction in overall visual quality, with the likelihood of some moderately negative viewer responses.
- Adverse—moderate degrees of visual change and a reduction in the overall visual quality, with the likelihood of negative viewer responses.
- Strongly Adverse—substantial visual change and considerable reduction in the overall visual quality, with the likelihood of strongly negative viewer responses.

In the absence of a formal viewer response survey on reactions to predicted visual impacts, the evaluation of viewer responses is based on the following: general criteria of visual sensitivity derived from FHWA guidance; past visual studies conducted by Public Affairs Management (PAM); interpretation of viewer responses obtained during the baseline studies; and informal viewer response information obtained during public meetings.

Effects on viewers are further subdivided by viewer type, since different viewer groups (associated with particular image types described in the baseline study) may have different levels of sensitivity to visual issues. For the purposes of impact documentation, viewer types are classified as:

- Residential viewers (from adjacent neighborhoods and on the Presidio)
- Institutional viewers (office and other workers at the Presidio, etc.)
- Users of other main roads and cross-streets
- Recreational users (bicyclists, pedestrians, etc.)
- Tourists
- Project users (roadway travelers)
- From the Bay, watercraft.

Views from Doyle Drive. Commuters and recreational viewers are considered to have highest sensitivity and commercial users are considered to have lowest sensitivity. Due to the lack of quantified information on the composition of viewer types within the freeway traveler category, no attempt has been made to discriminate between types of travelers on grounds of sensitivity. Therefore the analysis is conducted from the point of view of commuters and recreational/tourists that will be traveling on the roadway.

1.3.1.3 Change in Visual Quality

Change in visual quality addresses the effect of the project on overall visual quality at the landscape unit scale. This can be determined by reevaluation of the vividness, unity, and intactness criteria for the unit with the post-project condition, noting both specific changes and overall changes in visual character. This analysis reflects the cumulative effects of the project on views as documented for particular viewpoints and image types (see Section 1.3.1.1), as well as inherent changes in visual character regardless of specific existing viewpoints.

1.3.1.4 Conformance with Applicable Policies

Policies governing aesthetics and related issues concerning the project study area have been reviewed in relation to the project description for conformance. Potential conflicts with these policies are described in the impact assessment and in Appendix B.

1.3.2 Visual Mitigation Planning

Based on evaluation of the proposed project (using the impact criteria described above), potential visual mitigation measures of adverse effects (both substantial and minor) are considered along with any policy conflicts.

1.3.3 Impact Documentation

Visual Simulations. In order to assist in the analysis and documentation of visual resource change, a series of 19 representative viewpoints were identified. For each viewpoint, “before” and “after” photographs were prepared to simulate the proposed project alternatives. The viewpoints were chosen on the basis of a variety of factors, including high visibility/close proximity to sensitive viewers; specific views or types of views identified as important by the public; and range of view types available to the public (close proximity to long-distance views). Of the 19 viewpoints, one of the viewpoints represents the motorist’s view while traveling along Doyle Drive.

Once the viewpoints were established, photographs were taken in the field from each viewpoint and documented (when feasible, with a 50mm lens to replicate the view from the typical human eye). (See Section 1.2.2.) A representative photograph was chosen from each viewpoint to be developed as a computer simulation. The selected photographs are meant to exemplify existing conditions at the viewpoints, but it is important to recognize that these conditions may differ over the course of the day, due to meteorological conditions and the movement of the sun.

A computer database was developed for each viewpoint to correspond to key reference points (existing landscape characteristics) and proposed project components to be shown in the photograph. Proposed changes were displayed for each viewpoint by overlaying a three-dimensional computer model on the photograph and rendering it (applying paint) to reflect the proposed project's expected appearance in full detail, including colors, shadows, and lighting. Reproductions of the before and after simulations are provided in Chapter 3.0 of this report. Photo simulations accurately represent the location, scale, and mass of potential new facilities. However, as shown, the architectural character and certain engineering characteristics of highway structures, and landscape treatments within the highway right-of-way and adjacent areas of the Presidio are for illustrative purposes only.

SECTION 2: AFFECTED ENVIRONMENT

2.1. EXISTING VISUAL CHARACTER AND CONTEXT

2.1.1 Regional Landscape and Scenic Resources

Doyle Drive is located on the northern edge of the San Francisco peninsula within the Presidio National Park. This area of northern California is one of the most scenic areas in the world, where the blue waters of the Bay and Pacific Ocean combine with islands, bridges, mountains and urban skylines to create both picturesque and impressive vistas.

The visual character of the San Francisco Bay region is a melding of urban and suburban development within and around mountains, open space and water. Examples of this aesthetic are the seven bridges that cross the Bay at various points. These include the Golden Gate Bridge, San Francisco – Oakland Bay Bridge, and Richmond-San Rafael Bridge. Dense urban areas such as San Francisco and Oakland are balanced by natural and open space areas such as the headlands of the Golden Gate National Recreation Area, and East Bay hills. The waters of the Bay and Pacific Ocean are almost always active, as they contain major shipping routes for the transportation of goods in and out of the Ports of Oakland and San Francisco. The Bay waters are also the source of a bustling year-round fishing industry and are extremely popular for recreational boating, sailing and windsurfing. From almost any vantage point, on any given day, each of these elements play a part in the regional aesthetic and character of the Bay Area.

2.1.2 Context of Doyle Drive within the Regional and Local Landscape

Doyle Drive is the southern entrance to the Golden Gate Bridge which, crossing the entrance to the San Francisco Bay, links San Francisco to Marin County. Doyle Drive sits within the Presidio of San Francisco and is, therefore, part of the Golden Gate National Recreation Area (GGNRA). The Golden Gate Bridge is one of the symbols of San Francisco and northern California and attracts visitors from around the world to view this magnificent architectural and engineering wonder. Doyle Drive connects the Golden Gate Bridge to the Marina and Cow Hollow neighborhoods, and the rest of the city of San Francisco, and passes through the Presidio National Park. Formerly a military base, the Presidio provides its own unique scenic character. Much of the Presidio is comprised of open space and historic landscape, with woodlands of eucalyptus, cypress and Monterey pines. However, the areas surrounding Doyle Drive within the Presidio are more developed with older residences, military batteries, warehouses, and a national cemetery. Structures within the Presidio vary in architectural structure, size, and use, but seem to share a common style and most noticeably, a consistent color and material scheme (cream and brick color buildings with red roofs). Many of the Presidio buildings are included in the National Register of Historic Places database.

Within this context, Doyle Drive is a primary transportation corridor. From points north of Doyle Drive, along Crissy Field and Mason Street, Doyle Drive is noticeable because of its elevated position along the bluffs, heavy support columns and steel truss sections. From the south side, Doyle Drive is less noticeable because of the intervening topography, vegetation and buildings. The most noticeable element of Doyle Drive is the steel and concrete elevated section over McDowell Avenue. The steel elements, which are painted red, along with the light gray color of the concrete columns, stand out against the green-forested background of the Presidio. When viewed from a distance, this “high viaduct” forms a continuous linear feature and connects visually to the Golden Gate Bridge.

2.1.3 Context of Doyle Drive for Automobile Drivers/Commuters

Motorists traveling on Doyle Drive have a wide variety of visual experiences. When traveling northbound from San Francisco, it is quite evident that the viewer is leaving the urban environment of San Francisco, and entering the more rural setting of the Presidio and, after crossing the Golden Gate Bridge, eventually Marin County. However, this transition is gradual as the Presidio provides a progression of visual character from urban (areas around Gorgas Gate and the Main Post) to broad elevated views of the Golden Gate Bridge, San Francisco Bay, and Crissy Field, to wooded and natural areas, before reaching the Golden Gate Bridge toll plaza.

In the reverse direction (from north to south), the visual character of Doyle Drive transitions from more natural and rural characteristics to an urban character, as views of San Francisco become more prominent for motorists traveling south. The best views for motorists occur in the southbound direction as Doyle Drive leads away from the toll plaza and comes out of the wooded areas near the Park Presidio interchange. In this area, views open up of San Francisco, the Bay, Crissy Field, and Alcatraz Island. Further on, there are close-up views of the Main Post area, the National Cemetery, and the dome of the Palace of Fine Arts becomes visible.

A solid 3-foot tall concrete barrier (guardrail) lines the outside shoulder of Doyle Drive. This concrete barrier limits some views by obstructing the lower portion of the view immediately adjacent to the roadway, especially for persons traveling in small, low-profile vehicles.

2.2 EXISTING VISUAL IMAGE TYPES AND LANDSCAPE UNITS

To facilitate a description and analysis of the study area, it has been subdivided into landscape units that encompass distinct spatial areas. Landscape units are geographically discreet areas that are often separated by natural features such as bodies of water, ridges, or changes in vegetation. Each landscape unit has a certain visual character based upon the land uses and features that comprise it. These smaller scale land uses or features within each landscape unit are called image types. Each landscape unit is subdivided into its various image types that combine to give the larger landscape unit its character. Figure 2.2-1 depicts the boundaries of the landscape units that make up the Doyle Drive study area. Figure 2.2-2 provides examples of the different image types that are present within the landscape units.

FIGURE 2.2-1
LANDSCAPE UNITS

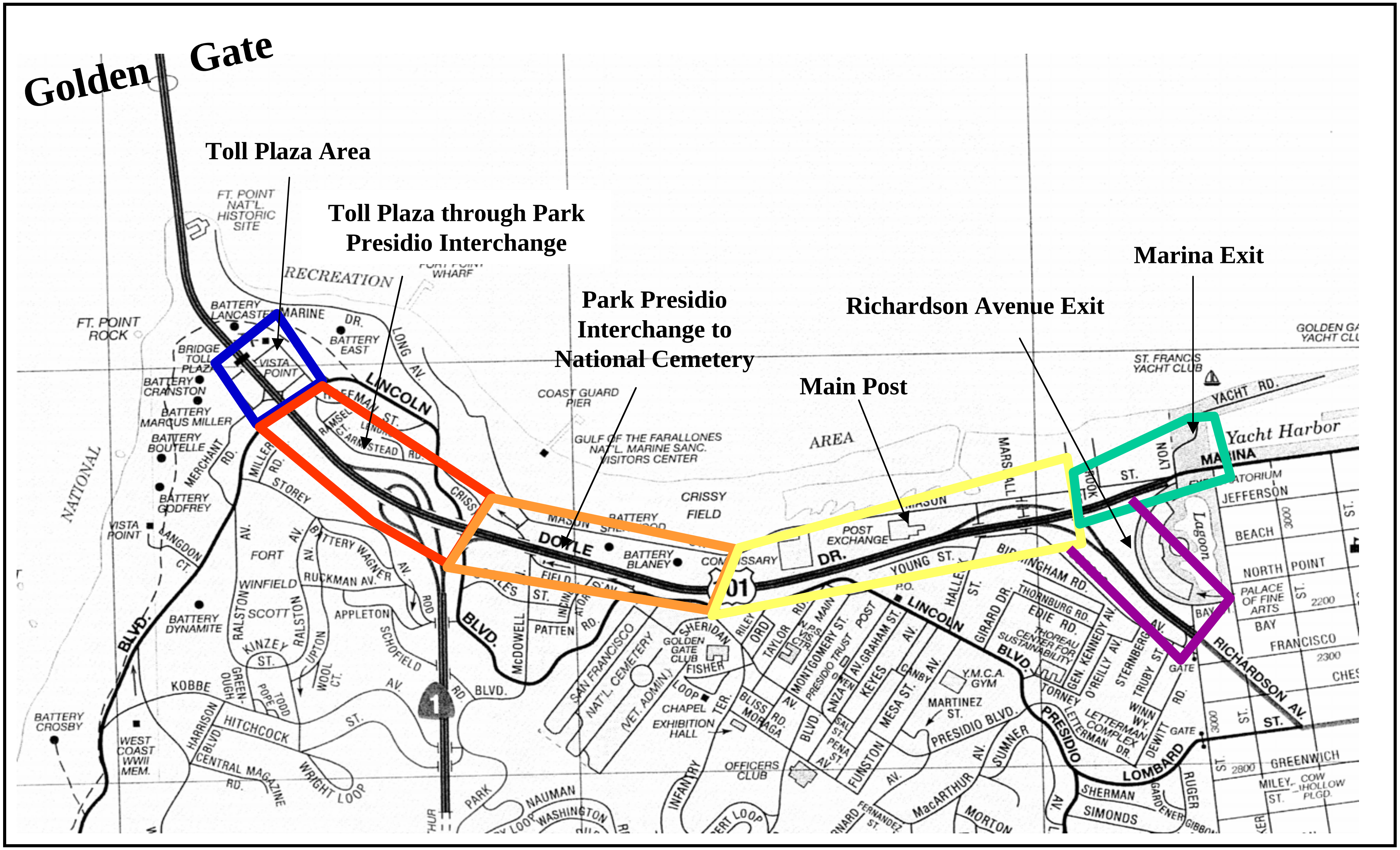


FIGURE 2.2-2
IMAGE TYPES IN THE STUDY AREA

Urban Residential

Cemetery

Medium Density Housing

Toll Plaza

Light Industrial

Historic

FIGURE 2.2-2 (CONTINUED)
IMAGE TYPES IN THE STUDY AREA

Marsh/Coastal

Woodlands

Park/Active Recreation

2.2.1 Visual Image Types

Residential

– **Urban Residential.** Urban residential image types are characterized by the Marina and Cow Hollow residential neighborhoods of San Francisco. The typical residence is 2-3 stories with ground level retail along major thoroughfares such as Chestnut and Lombard Streets.

– **Medium Density Housing.** Medium density residential image types are found within the Presidio. These areas were once officers' quarters and military housing and take the form of single and multi-family structures. Many of these structures are now being converted to civilian housing or office space.

Light Industrial

This image type is characterized by larger one story and multi-story shed-like structures within the Presidio. These buildings were once used by the military for manufacturing and storage of equipment. These buildings are mostly being converted to civilian light industrial and office uses.

Institutional/Military

– **Cemetery.** The San Francisco National Cemetery is a unique military image type located within the Presidio. The consistency of headstone types and layout of the cemetery provide a strong visual image.

– **Toll Plaza.** The Golden Gate Bridge toll plaza presents a unique institutional image type due to its architecture and associated facilities (historical markers, vantage points, parking lots, etc.).

Historical/Landmark

This image type is represented by structures and associated features that are contributing elements to the Presidio National Historic Landmark District. These include structures and features such as older residences military batteries, other military buildings, and the Main Post Parade Grounds within the Presidio. Historical landscaping, such as the forest and designated historic trees also contribute to the historical/landmark image type. While it is located outside of the Presidio, the Palace of Fine Arts/Exploratorium fits into this image type.

Open Space

– **Marsh and Coastal Areas.** This image type is located along the northern boundary of the Presidio and has been greatly enhanced with the Crissy Field wetland restoration project. This restoration has created coastal dune habitat, marsh/shoreline habitat and recreational opportunities.

– **Woodland.** The most distinctive image types associated with the Presidio are its trees and wooded areas. This image type can take the form of large areas of eucalyptus, cypress or Monterey pine woodlands, or smaller groupings of trees throughout the Presidio.

Parks / Active Recreation

The Presidio provides a wide range of recreational opportunities. Areas specifically intended for recreational activity have a distinct image type such as the walkways through Crissy Field, tennis courts along Gorgas Avenue, and fishing at the Fort Point Pier.

2.2.2 Landscape Units

This section contains a description of each of the landscape units identified in the study area. The image types encompassed within each landscape unit are noted (see Figures 2.2-2 and 2.2-3 for a photographic representation of this discussion).

Toll Plaza Area – The Golden Gate Bridge toll plaza is located at the southern end of the bridge and the northern most part of the Presidio. The toll plaza is located on a high bluff looking over the Pacific Ocean, Golden Gate Bridge and San Francisco Bay. There are several image types located in this landscape unit including the toll plaza buildings, trees and wooded areas, and recreational uses. While the area is heavily used by tourists as a vantage point to view the Bridge, there are no residences in this landscape unit. Tourists stop at the parking lots in this landscape unit to access the pedestrian lane along the east side of the Bridge, and explore the headlands on the north side. On most days, several tour buses will be parked in the small parking area located on the north side of Doyle Drive. The toll plaza area is crowded with cars as they stop to pay tolls in the southbound direction, and squeeze to the right in the northbound direction to pass around the plaza and enter the bridge. The overall aesthetic of this landscape unit is of a busy institutional and historic place. It has great importance to motorists traveling in both directions, as it is the entrance to the Presidio and San Francisco for southbound motorists, and the sign of leaving San Francisco and the Presidio and entering the Golden Gate Bridge for northbound motorists.

Toll Plaza Area Landscape Unit

Toll Plaza through Park Presidio Interchange Landscape Unit

Park Presidio Interchange to National Cemetery Landscape Unit

Richardson Avenue Exit Landscape Unit

Marina Exit Landscape Unit

Main Post Landscape Unit

Toll Plaza through Park Presidio Interchange – Immediately southeast after the toll plaza area, Doyle Drive travels along the top of a densely vegetated coastal bluff. This landscape unit is lined by eucalyptus, cypress, Monterey pine trees, and shrubs. There are no views of the Bay afforded motorists through this landscape unit, and little view of adjacent features within the Presidio. This landscape unit provides an aesthetic of traveling through a relatively natural area, or park-like setting, with the roadway and right-of-way fences being the primary man-made features that are visible. There are residences located within this landscape unit. Multi-family residences are located north of Doyle Drive along Armistead Road, but because of topographic features, do not have a view of Doyle Drive. Residences which have not been unoccupied as of June 2002, are also located south of Doyle Drive along Storey Avenue in the Fort Scott area. These residences have views to the north, but currently do not look onto Doyle Drive because of a dense row of shrubs and trees along the roadway which create an effective visual buffer.

Park Presidio Interchange to National Cemetery – This landscape unit contains a variety of image types as well as some broader views. After leaving the Park Presidio Interchange, Doyle Drive becomes an elevated structure (high viaduct) and provides a vantage point as it crosses over McDowell Avenue and the Cavalry Stables before heading back into a small wooded area. In this area, Doyle Drive is perched at the edge of a lower bluff with views of the National Cemetery, and Monterey Pine forest to the south, and wooded/shrubby vegetation to the north, blocking views of the Bay and uses along Mason Street. There are no residences located within this landscape unit.

Main Post – This landscape unit starts just east of the National Cemetery. In this location, Doyle Drive is elevated most of the way on a low viaduct structure, passing in close proximity to offices, warehouses, some medium density housing, and parking lot located within the Main Post area. Residences with views of Doyle Drive are limited to the buildings located on Girard Drive where about thirty (30) residents have views of Doyle Drive. To the north, unobstructed views of Crissy Field, light industrial buildings, and the Bay are afforded motorists traveling on Doyle Drive.

Marina Exit – This landscape unit extends from the Main Post to the touchdown with Marina Boulevard. There are several image types that make up this landscape unit including the Palace of Fine Arts which is designated by the City and County of San Francisco as a state historic structure, views of light industrial uses along Mason Street, open space and recreational uses associated with Crissy Field and the Marina Green and residential uses of the Marina neighborhood. However, residences with views of Doyle Drive are limited to four to six houses located near the corner of Lyon Street and Marina Boulevard.

Richardson Avenue Exit – This landscape unit extends from the Main Post to the touchdown at Richardson Avenue. This landscape unit is the most urban in character within the study area containing light industrial image types (along Gorgas Avenue), residential uses (of the Marina and Cow Hollow neighborhoods), and the Palace of Fine Arts (historic landmark).

Table 2.2-1 provides a summary of the visual qualities of the existing landscape units.

TABLE 2.2-1:
LANDSCAPE UNITS

Landscape Unit	Description
Toll Plaza Area	• Toll Plaza is located at the southern end of the bridge and the northern most part of the Presidio on a high bluff looking over the Pacific Ocean, Golden Gate Bridge, and San Francisco Bay. • Heavily used by tourists as a vantage point to view the bridge, as an access point to the pedestrian walkway on the east side of the bridge, and for motor vehicle traffic heading both north and south. • Image types include the toll plaza buildings and structures, trees and wooded areas, and recreational uses. • Overall aesthetic is of a busy institutional and historic place
Toll Plaza through Park Presidio Interchange	• Immediately after the Toll Plaza Doyle Drive travels along a densely vegetated coastal bluff lined with eucalyptus, cypress, Monterey pines, and shrubs. • No views of the Bay afforded to motorists and little view of the adjacent features within the Presidio. • Aesthetic of traveling through a relatively natural area but with a sense of being within in an urban area due to size of and scale of Doyle Drive and Park Presidio Interchange.
Park Presidio Interchange to National Cemetery	• Variety of image types as well as some broader views as Doyle Drive becomes an elevated structure after leaving the Park Presidio Interchange and crossing over McDowell Avenue before heading back into a small wooded area. • Views of the National Cemetery and Monterey pine forest to the south, and wooded/shrubby vegetation blocking views of the Bay and uses along Mason Street to the north.
Main Post	• Just after the National Cemetery, Doyle Drive passes through the Main Post area on a low concrete viaduct structure. • More open views for motorists traveling on Doyle Drive. • To the south, views include the medium density housing and commercial buildings of the Main Post and to the north are unobstructed views of Crissy Field, light industrial buildings, and the Bay. • The closely spaced columns and relatively short spans of the deck girders obscure views for pedestrians, bicyclists, and motorists on the Presidio grounds.
Marina Exit	• Extends from the Main Post to the touchdown with Marina Boulevard. • Image types include the Palace of Fine Arts which is a historic landmark, views of light industrial uses along Mason Street, open space and recreational uses associated with Crissy Field and the Marina Green, and residential uses of the Marina neighborhood.
Richardson Avenue Exit	• Extends from the Main Post to the touchdown at Richardson Avenue. • Most urban in character within the study area. • Image types include light industrial along Gorgas Avenue, high density residential uses of the Marina and Cow Hollow neighborhoods, and Palace of Fine Arts historic landmark.

2.3 VIEWER GROUPS

The following section describes the different viewer groups that experience the roadway. These viewers can be broken down into two basic types: those with views from Doyle Drive (motorists) and those with views of Doyle Drive (park goers, residents, workers, recreational users, tourists, etc.).

2.3.1 Views from Doyle Drive

Views from Doyle Drive are quite varied and range from close views of trees and vegetation, buildings, and unique features such as the National Cemetery, to long-range dramatic views of San Francisco, Alcatraz Island and the San Francisco skyline. Views from Doyle Drive are primarily restricted to motorists. While there are some provisions for pedestrian and bicycle access along Doyle Drive in the form of a separated sidewalk, these facilities are not often used because of more attractive pedestrian and bicycles routes within the Presidio. Appendix E contains photos depicting views while traveling on Doyle Drive and Richardson Avenue.

2.3.2 Views to Doyle Drive

A person's experience of Doyle Drive varies based upon location, the duration of the view, and the frequency of exposure to views of the roadway. In this chapter, a cross-section of viewers was chosen to provide a representative sample of viewers who would experience a change in their viewshed as a result of the project.

2.4 EXISTING VISUAL QUALITY

The following 19 viewpoints were selected in consultation with Caltrans, the Trust and NPS. These viewpoints are depicted in Figures 2.4-1, 2.4-2, and 2.4-3, have been studied in detail in order to assist in the analysis and documentation of visual resource change.

FIGURE 2.4.1-1
KEY TO VIEWPOINTS

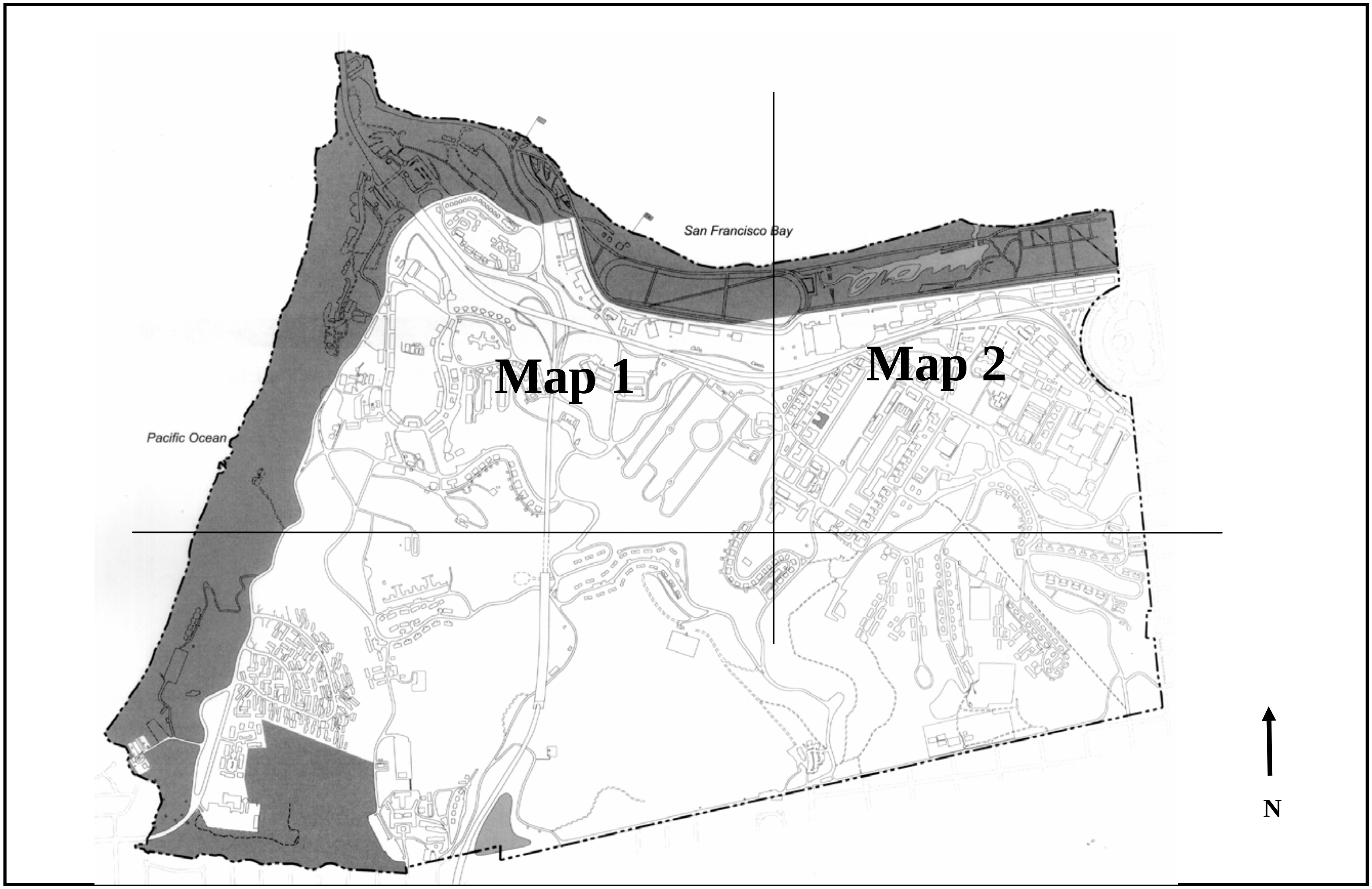


FIGURE 2.4.1-2
WESTERN SECTION VIEWPOINTS

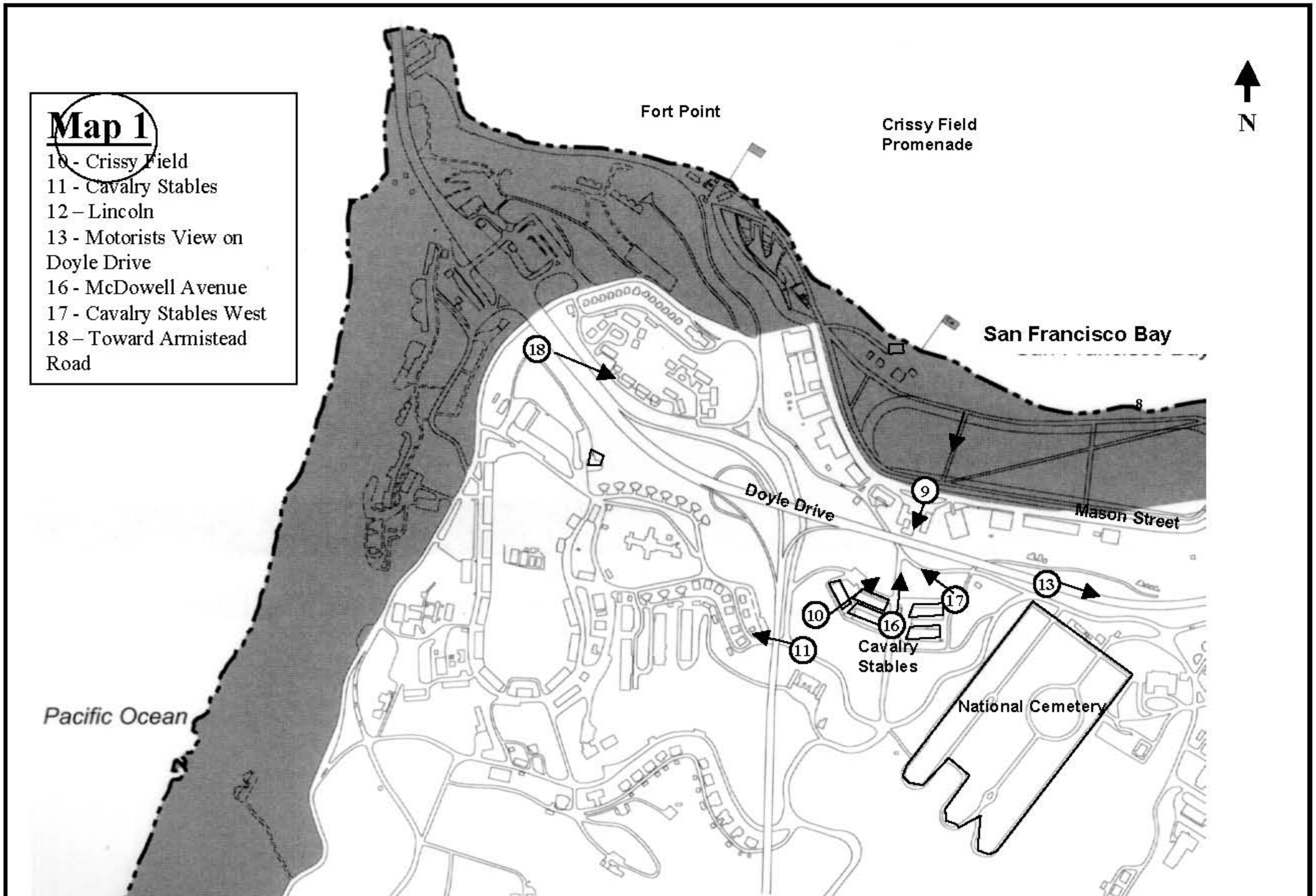
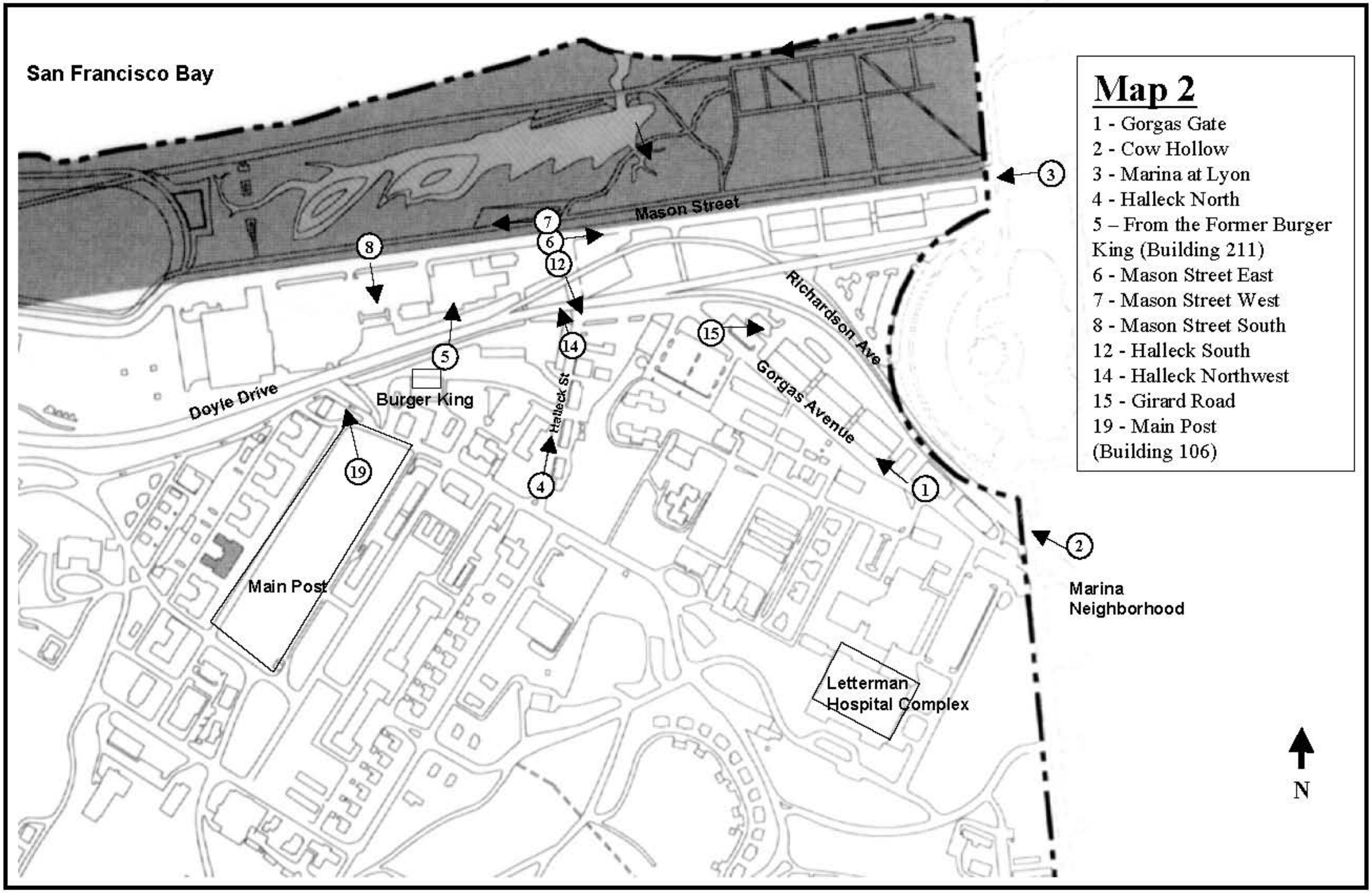


FIGURE 2.4.1-3
EASTERN SECTION VIEWPOINTS



2.4.1 Viewpoint 1: Gorgas Gate

Overall View

This viewpoint is located in the Richardson Avenue Exit Landscape Unit. The view is looking northwest along Gorgas Avenue. The Gorgas Warehouses line the right side of the road, creating a historic streetscape, while paved parking lots, trees and scattered buildings make up the visual aesthetic on the left side of the road. Doyle Drive is a visible and distinct feature from this viewpoint because of its elevated location, which blocks the lower half of distant views in the northwest. Only the two red towers of the Golden Gate Bridge and the tops of the mountains of the Marin Headlands can be seen in the distance rising up above this elevated section of Doyle drive. The primary viewer groups in this area are workers, residents and recreation users.

Visual Quality

From the Gorgas Gate Viewpoint, the low viaduct portion of Doyle Drive is a dominant visual element due to its location along the industrial area on Gorgas Avenue with the Golden Gate Bridge and the Marin Headlands in the background. However, the low viaduct structure of Doyle does not combine with these natural elements or colors of the Presidio, the Bay or the Marin Headlands or the industrial edge of the Gorgas Warehouses, resulting in low intactness and unity.

The elevated section of Doyle Drive also acts as a visual divider between the Presidio and Crissy Field Recreation Area and blocks views to the Bay from Gorgas Avenue resulting in a low overall visual quality rating.

Viewpoint 1 – Gorgas Gate

2.4.2 Viewpoint 2: Marina Neighborhood

Overview

This viewpoint is located on Richardson Avenue at Bay Street. The existing view is looking north from the median on Richardson Avenue. Historic warehouses line the west side of the road. The low viaduct portion of Doyle Drive touches down onto Richardson Avenue. The Golden Gate Bridge and the tops of the mountains in the Marin Headlands can be seen in the distance.

Visual Quality

Richardson Avenue, lined by rectangular white, historic warehouses on the west and numerous evergreen trees to the east, is the dominant feature in this landscape unit. Although the Marin Headlands are in view in the distance they are overpowered by the presence of the roadway and buildings. From the Marina Neighborhood Viewpoint, Doyle Drive can be seen from a distance but is highly obscured by numerous trees that line Richardson Avenue. The contributing elements of the view result in a medium rating for vividness.

In this area, Richardson Avenue acts as a physical divider between the Presidio/Cow Hollow Neighborhood and Marina Neighborhood. While view blockage is not a significant issue in this particular area, this transportation corridor divides the community resulting in medium intactness and unity within the view, resulting in low overall visual quality rating.

Viewpoint 2 – Marina Neighborhood

2.4.3 Viewpoint 3: Marina at Lyon

Overall View

This viewpoint is located on Doyle Drive adjacent to the Palace of Fine Arts/Exploratorium looking to the west. The existing view is of Doyle Drive as it connects with Marina Boulevard. Warehouses located along Mason Street in the Presidio are visible on the left. The primary viewer groups from this vantage point are motorists, residents and recreation users at the Marina Green and Crissy Field.

Visual Quality

From the Marina at Lyon Viewpoint, Doyle Drive is a very dominant visual element. It is the most prominent feature in this view. However, since the surrounding uses consist of historic landscape, commercial and industrial uses, the view exhibits a low intactness and unity. Doyle Drive also acts as a visual divider between the Presidio/Crissy Field/Marina Green areas from the Marina Neighborhood, resulting in a low overall visual quality rating.

Viewpoint 3 – Marina at Lyon

2.4.4 Viewpoint 4: Halleck North

Overall View

This viewpoint is located on Halleck looking north. In this view, Doyle Drive is a major feature because of its elevated location. Presidio buildings line both sides of the street and the mountaintops of the Marin Headlands are seen in the distance. The primary viewer groups in this area are workers, residents and recreation users.

Visual Quality

From this head-on angle, the low viaduct portion of Doyle Drive is a distinct feature as it crosses over Halleck Street. The roadway image represented by the low viaduct structure is somewhat out of place with the historic structures of the Main Post resulting in a rating of medium/low intactness and unity.

Although the historic structure provide positive visual elements, the low viaduct structure acts as a visual divider between the Presidio and Crissy Field Recreation Area and blocks views from the Main Post to the Bay, resulting in a low overall visual quality rating.

Viewpoint 4 – Halleck North

2.4.5 Viewpoint 5: From the Former Burger King (Building 211)

Overall View

This viewpoint is located behind the former Burger King restaurant (Building 211) located along Lincoln Boulevard looking north. The existing view is of the low viaduct portion of Doyle Drive with Crissy Field, the Bay and the Marin Headlands visible beyond.

Visual Quality

From the former Burger King restaurant, the low viaduct structure dominates the view. The elevated structure blocks the majority of the view and creates a visual barrier between the Main Post and Crissy Field. From this viewpoint Doyle Drive does not fit in with the surrounding visual character resulting in low intactness and low unity and, therefore a low overall visual quality rating.

Viewpoint 5 – From the Former Burger King (Building 211)

2.4.6 Viewpoint 6: Mason Street East

Overall View

This viewpoint is located on the northwest corner of Mason Street and Halleck looking east. The existing view is of the low viaduct portion of Doyle Drive with the Palace of Fine Arts/Exploratorium just beyond the elevated section of Doyle Drive. Crissy Field is on the left and the Marina Green is beyond the row of trees in the distance. The primary viewer groups in this area are workers and recreation users.

Visual Quality

From the Mason Street East Viewpoint, the low viaduct structure is elevated higher than any of the surrounding features in the area. The horizontal elements and numerous support columns dominate the view. However, these same elements are clearly out of place in the context of Crissy Field and the surrounding uses. The row of columns presents low intactness and unity with the surrounding environment.

The elevated structure completely blocks views of warehouses in the Letterman area and the Marina neighborhood beyond and acts as a visual divider between Crissy Field and the Main Post areas, resulting in a low overall visual quality rating.

Viewpoint 6 – Mason Street East

2.4.7 Viewpoint 7: Mason Street West

Overall View

This viewpoint is located on Mason Street near Halleck. The existing view is of the low viaduct portion of Doyle Drive with the high viaduct in the distance. The prominent building in the background is the Crissy Field Interpretive Center. Crissy Field is just beyond the Interpretive Center. The primary viewer groups in this area are motorists, workers, and recreation users.

Visual Quality

From the Mason Street West Viewpoint, the low viaduct portion of Doyle Drive runs parallel to the view. The unique construction and the elevated nature of the structure result in a medium vividness rating within this viewpoint. However, the light gray elevated structure runs parallel to Mason Street and from this viewpoint completely blocks the view to the Main Post. The material and architecture of the low viaduct does not fit in with the surrounding character resulting in a low unity rating and a low overall visual quality rating.

Viewpoint 7 – Mason Street West

2.4.8 Viewpoint 8: Mason Street South

Overall View

This viewpoint is located on Mason Street looking across the parking lot at the PX building. The existing view is of the low viaduct portion of Doyle Drive. The primary viewer groups in this area are workers and recreation users.

Visual Quality

The light gray color of the viaduct and the horizontal and vertical elements detract from the landscape and historic buildings of the Main Post resulting in low intactness and unity ratings. However, the mixture of historic elements and the horizontal low viaduct structure combine to create medium vividness. Overall this viewpoint receives a low visual quality rating.

Viewpoint 8: Mason Street South

2.4.9 Viewpoint 9: Crissy Field

Overall View

This viewpoint is located on the northwest side of Crissy Field. The view is to the south across Crissy Field to Stilwell Hall framed by the Doyle Drive high viaduct in the background.

Visual Quality

From this acute angle, the prominent red structure of the high viaduct of Doyle Drive stands out above the white structure of Stilwell Hall and the green grass of Crissy Field. When viewed from Crissy Field, its metal truss and concrete support columns are out of context with the other visual elements within the view disrupting visual intactness and unity. However, the large grassy field and surrounding landscape provide vividness to the view. Stilwell Hall also provides vividness in this view as, when viewed from this angle, the two protruding ends and depth of the structure is visible from this viewpoint, resulting in a medium vividness rating and a medium overall visual quality rating. The high viaduct itself provides vividness.

Viewpoint 9: Crissy Field

2.4.10 Viewpoint 10: Cavalry Stables North

Overall View

The Cavalry Stables are located on both sides of McDowell Avenue just south of Doyle Drive. The view is from behind the stables looking northeast with the stables in the foreground and the high viaduct in the background.

Visual Quality

From this acute angle, the prominent red structure of the high viaduct of Doyle Drive stands out above the grayish rooftops of the Cavalry Stables. The elevated structure rises high above the Cavalry Stables and the metal truss and concrete support columns interrupt the visual cohesiveness of this viewpoint. Although, Doyle Drive acts as a visual divider between the stables and Crissy Field, the angles of the rooftops of the historic stables and the bridge of the high viaduct have an interesting geometric unity, resulting in a medium overall visual quality rating.

Viewpoint 10: Calvary Stables North

2.4.11 Viewpoint 11: Lincoln Boulevard

Overall View

This viewpoint is looking west from Lincoln Boulevard toward the Park Presidio elevated freeway.

Visual Quality

From this angle, the columns and elevated structure stand out amidst the trees residential structures beyond. The horizontal deck structure and vertical support columns interrupt the visual cohesiveness of this view. Park Presidio also visually divides this section of the Presidio and blocks views of the residential area of Fort Winfield Scott, resulting in a medium overall visual quality rating.

Viewpoint 11: Lincoln Boulevard

2.4.12 Viewpoint 12: Halleck South

This viewpoint is located on the northeast corner of Mason Street and Halleck looking south. The existing view is of the low viaduct portion of Doyle Drive. The primary viewer groups in this area are workers and recreation users.

Visual Quality

From this acute and close-up angle, the columns and elevated structure of the low viaduct portion of Doyle Drive dominates the view and obstructs views of the Main Post. The elevated structure interrupts the visual cohesiveness of the area resulting in low intactness and unity and a low overall visual quality rating.

Viewpoint 12: Halleck South

2.4.13 Viewpoint 13: Motorist View on Doyle Drive

Overall View

This viewpoint is from Doyle Drive in the vicinity of the National Cemetery looking east. This view represents motorists traveling on Doyle Drive for the full distance and not from this single viewpoint. Section 2.2.3, Landscape Units, provides descriptions of the motorists' views while traveling along Doyle Drive.

Visual Quality

From the motorists' perspective on Doyle Drive, the views range from medium to high in visual quality. In some locations, motorists are afforded the spectacular views of the Bay, Presidio, and San Francisco (exhibiting high vividness, unity and intactness). There are also locations where the motorist view is limited to the areas immediately adjacent the roadway, resulting in ratings of medium vividness, unity and intactness and a medium overall visual quality rating.

Viewpoint 13: Motorist View on Doyle Drive

2.4.14 Viewpoint 14: Halleck Northwest

Overall View

This viewpoint is located on Halleck Street looking north, further north along Halleck Street than Viewpoint 4. Similar to Viewpoint 4, Doyle Drive is a major feature because of its elevated location in this view. Presidio buildings line both sides of the street and the mountaintops of the Marin Headlands and Angel Island are seen in the distance. The primary viewer groups in this area are workers, residents and recreation users.

Visual Quality

From this angle, the low viaduct portion of Doyle Drive, which crosses over Halleck Street, is a distinct feature. The roadway image represented by the low viaduct structure is somewhat out of place with the historic structures of the Main Post and large trees between the buildings on the left side of Halleck Street, resulting in medium/low intactness and unity ratings.

The low viaduct structure acts as a visual divider between the Presidio and Crissy Field Recreation Area and blocks views from the Main Post to the Bay. However, the somewhat low elevation of the viaduct results in medium visual dominance but still obstructs views of much of the Marin Headlands and Angel Island. The overall visual quality rating of this viewpoint is medium.

Viewpoint 14: Halleck Northwest

2.4.15 Viewpoint 15: Girard Road

Overall View

This viewpoint is located in the Richardson Avenue Exit Landscape Unit. The view is looking east toward Gorgas Avenue. The Gorgas Warehouses line the left side of the road from this view and create a historic streetscape element, with a paved parking lot adjacent to the north. Trees and scattered bushes run parallel to the warehouses in the background of this view. Beyond the trees, further in the background, the dome of the Palace of Fine Arts is visible above the trees the trees. From this viewpoint, the low viaduct of Doyle Drive is not visible, as it is hidden behind the trees. The primary viewer groups in this area are workers, residents and recreation users.

Visual Quality

From the Girard Road viewpoint, Doyle Drive is not visible and the Gorgas Warehouses and the dome of the Palace of Fine Arts are the dominant visual elements. The low (one-story) nature of the warehouses allows exposure to the slightly higher trees in the background and the Palace of Fine Arts, further in the background. The “layered” nature of the view provides unity between the landscape elements and the man-made features of the viewshed. The historic streetscape, highlighted by the Gorgas Warehouses, also adds to the vividness of the view. However, Gorgas Street and the paved parking lot are in the foreground detract from the other, more interesting elements within the view. The overall visual quality rating of this viewpoint is medium.

Viewpoint 15: Girard Road

2.4.16 Viewpoint 16: McDowell Avenue

Overall View

The view is looking north along McDowell Avenue. Doyle Drive runs across the viewshed on a high viaduct with views of Stilwell Hall, straight ahead, and two of the Calvary Stables to the left. In the distance, slight views of Crissy Field, the bay and the Marin Headlands are also visible from this viewpoint. The primary viewer groups in this area are workers and recreation users.

Visual Quality

From the McDowell Avenue viewpoint, the high viaduct portion of Doyle Drive is a dominant visual element because of its size and position. The viaduct partially obstructs the views of Stilwell Hall, Crissy Field, the Bay and the Marin Headlands. The low viaduct structure acts as a visual divider between the Calvary Stables and the Presidio and Crissy Field Recreation Area and appears somewhat “out of place” from the viewpoint, reducing the intactness and unity ratings and resulting in an overall visual quality rating of medium.

Viewpoint 16: McDowell Avenue

2.4.17 Viewpoint 17: Cavalry Stables West

Overall View

This viewpoint is located in front of the Cavalry Stables. The view is looking west from Lincoln Boulevard. The Doyle Drive high viaduct is visible from this view point. As the viaduct runs west, it disappears in the tall trees. Left of the trees, one of the Stables is visible. Between the supporting columns of the high viaduct, several Presidio buildings, the Golden Gate Bridge and the Marin Headlands can be seen. The primary viewer group in this area is Presidio employees that work in Buildings 667 and 669 as they are located off of the main roads.

Visual Quality

From this angle, the high viaduct portion of Doyle Drive is the dominant feature, as it is viewed at a near 45 degree angle, which exposes the viewer to the depth and size of the viaduct. The roadway image represented by the high viaduct structure is somewhat out of place with the high trees, grassy areas and Presidio buildings in the background. However, the view of the Golden Gate Bridge and the Marin Headlands in the distance provides connectivity between the high viaduct and the Golden Gate Bridge, resulting in medium overall visual quality rating.

Viewpoint 17: Cavalry Stables West

2.4.18 Viewpoint 18: Toward Armistead Road

Overall View

This viewpoint is located along Doyle Drive. The view is looking west toward Armistead Road. Doyle Drive is at-grade and visible from this viewpoint. Doyle Drive is lined with tall, mature trees that act as buffers on each side, creating a park-like aesthetic for motorists, the primary viewers of this viewpoint.

Visual Quality

Doyle Drive is the dominant feature within this viewpoint. The near 45 degree angle of Doyle Drive shows its width and length, which extends beyond the view. Doyle Drive appears out of place within lining of tall trees, which are contributing elements to the woodland feature of the Presidio, which results in a medium overall visual quality rating.

Viewpoint 18: Toward Armistead Road

2.4.19 Viewpoint 19: Main Post (Building 106)

Overall View

The Main Post (Building 106) viewpoint is located within the Parade Grounds of the Main Post. From this view, a portion of Doyle Drive is slightly visible through the trees. Historic Building 106 and the parking area of the Main Post/Parade Grounds are visible within this view, as well as mature cypress and palm trees and a variety of landscaping. The Marina Headlands are also visible in the distance. Main Post employees and recreational users are the primary viewer groups of this viewpoint.

Visual Quality

The parking area of the Main Post/Parade Grounds is the dominant feature within this view and Doyle Drive is hardly noticeable as it is screened by the landscaping and historic building (Building 106). The unique landscape of the Main Post and the historic building, both of which contribute the historicity of the Presidio, appear out of place adjacent to the large, paved parking area, resulting in a medium overall visual quality rating.

Viewpoint 19: Main Post (Building 106)

2.4.20 Summary of Viewpoints

Table 2.4-1 provides a summary of the existing visual quality for each viewpoint.

TABLE 2.4-1
SUMMARY OF EXISTING VISUAL QUALITY

Viewpoint Number	Viewpoint Title	Setting	Vividness	Intactness	Unity	Overall Visual Quality
1	Gorgas Gate	Looking northwest along Gorgas Avenue	High	Low	Low	Low
2	Marina Neighborhood	Looking north in front of residences along Richardson Avenue	Medium	Medium	Medium	Medium
3	Marina at Lyon	At Doyle Drive adjacent to the Palace of Fine Arts looking to the west	Medium	Medium	Low	Low
4	Halleck North	Looking north from Halleck Street	Medium	Medium	Low	Low
5	Former Burger King Restaurant	Looking north behind the former Burger King Restaurant	High	Low	Low	Low
6	Mason Street East	Northwest corner of Mason and Halleck Streets looking east	High	Low	Low	Low
7	Mason Street West	Northwest corner of Mason and Halleck Streets looking west	High	Low	Low	Low
8	Mason Street South	On Mason Street looking south across the parking lot at the PX building	High	Low	Low	Low
9	Crissy Field	Looking south across Crissy Field to Stilwell Hall and the high-viaduct	High	Low	Medium	Medium
10	Cavalry Stables	Looking north from behind the stables	High	Low	Medium	Low
11	Lincoln Boulevard	Looking west from Lincoln Blvd. towards Park Presidio elevated freeway	Medium	Low	Low	Medium

Viewpoint Number	Viewpoint Title	Setting	Vividness	Intactness	Unity	Overall Visual Quality
12	Halleck Street South	Looking south from the northeast corner of Mason and Halleck Streets	High	Low	Low	Low
13	Motorists View on Doyle Drive	From Doyle Drive looking east in the vicinity of the National Cemetery	High	Medium	Medium	Medium
14	Halleck Northwest	Looking North on Halleck Street, further north than Viewpoint 4	Low	Medium	Low	Medium
15	Girard Road	Looking east toward Gorgas Avenue towards the Palace of Fine Arts	Medium	Medium	Medium	Medium
16	McDowell Avenue	Looking north on McDowell Avenue toward high viaduct	Medium	Medium	Medium	Medium
17	Cavalry Stable West	Looking west on Lincoln Boulevard toward high viaduct	Medium	Medium	Medium	Medium
18	Toward Armistead Road	Looking west on Doyle Drive toward Armistead Road.	Low	Medium	Medium	Medium
19	Main Post (Building 106)	Looking north from the Main Post parking area.	High	Medium	Medium	Medium

2.5 REVIEW OF PLANS AND POLICIES

This section provides a review of the federal, state, and local policies and plans affecting development within the Doyle Drive study area. Presidio Area A is managed by a public partnership between the National Park Service and the Presidio Trust, each of which has published plans containing policies pertaining to the visual elements of the Presidio surrounding the project area of Doyle Drive. Located in the City and County of San Francisco, adjacent to the San Francisco Bay, any project proposed for the park is also subject to the plans that cover these regions.

2.5.1 Final General Management Plan Amendment, Presidio of San Francisco—National Park Service

The National Park Service, a federal agency, adopted the *General Management Plan Amendment* (GMPA) in 1994 to provide a vision and guidelines for future development of the Presidio as a national park. At that time, the NPS operated under the assumption that the Presidio would continue to receive federal funds. The GMPA was reviewed for policies relevant to the South Access to the Golden Gate Bridge – Doyle Drive Project. While the GMPA does not contain specific visual policies, it does include recommendations regarding visual impacts associated with the Doyle Drive Replacement Project, such as the following.

- "Preserve, enhance and restore scenic vistas; retain the regional visual quality of the Presidio." (Page 34)

- "Emphasis will be placed on respecting the visual grandeur and qualities and values of the Golden Gate." (Page 65)

- In the reconstruction of Doyle Drive, "Reopening scenic vistas from the main post, cemetery, and cavalry stables across Crissy Field to San Francisco Bay will also be promoted…. The visual and physical impacts of the new drive should be minimized to the extent possible, including limiting traffic lanes to three in each direction." (Pages 48-9)

- "The O'Reilly Avenue and Gorgas Avenue streetscapes will be preserved and the buildings rehabilitated." (Page 72)

- "The historic warehouses and their streetscape along the south side of Mason Street will be preserved and adapted for new uses." (Page 89)

2.5.2 Presidio Trust Management Plan: Land Use Policies for Area B of the Presidio of San Francisco—Presidio Trust

The U.S. Congress established the Presidio Trust in 1996 as the federal organization responsible for the long-term financial sustainability of the Presidio. Inseparable from this responsibility is the mandate to preserve and protect the park, and the Trust collaborates with the NPS to ensure that the vision of park preservation is not lost. The *Presidio Trust Management Plan* (PTMP), adopted in 2001, is a statement of policy intended to guide future implementation decisions. The PTMP was reviewed for policies relevant to the Doyle Drive Replacement Project. Chapter 1: "Preserving and Enhancing Park Resources" and Chapter 3: "Planning Districts: Concepts & Guidelines" contain policies concerning Visual Analysis.

- "Increase open space areas to enhance the park and improve the Presidio's natural, scenic, and recreational qualities. Enhance the Presidio's spectacular views and vistas. Maintain the Presidio's ecological value, and the intrinsic values to the human senses and human health…" (Chapter 1)

- "The Presidio Trust will enhance the park's spectacular views, restore historic visual connections, and provide screening of elements that disrupt historic landscapes. Future projects, such as removal of selected buildings, pavement, and vegetation, restoration of natural systems, and new trail connections and viewpoints, will increase opportunities for scenic viewing and improve the quality of scenic vistas. New construction will preserve scenic views as well as those features that make the park an important visual resource." (Chapter 1)

- "Improve pedestrian and visual connections between the Main Post and Crissy Field (Area B). Reinforce the historic connection along Halleck Street. Incorporate an open space connection to Crissy Field (Area B) as part of the planning for reconstruction of Doyle Drive." (Chapter 3)

- "Re-establish historic views and visual connections, such as those between Infantry Terrace and the Main Parade Ground. Retain and enhance views from the Main Post to the Bay." (Chapter 3)

- In the Letterman district, which corresponds to the Richardson Avenue Exit Landscape Unit, "Ensure that planning and design efforts consider connections and relationships to adjacent districts—the Main Post and Crissy Field (Area B)." (Chapter 3)

- "Restore and protect Tennessee Hollow as a vibrant ecological corridor and a unique backdrop to the developed environment of the Letterman district. Coordinate restoration of Tennessee Hollow with future planning for the Main Post, Crissy Field (Area B), Doyle Drive, and the Letterman district to ensure that the corridor provides an ecologically rich and complex buffer between planning districts." (Chapter 3)

- In the Fort Scott district, which corresponds to the Toll Plaza to Park Presidio Interchange Landscape Unit, "Maintain and enhance low trees and shrubs to provide a buffer against Doyle Drive. Selectively remove non-historic trees and landscape features, consistent with the *Vegetation Management Plan*, to re-establish views and Fort Scott's historic visual connection to the Golden Gate, San Francisco Bay, and the coast." (Chapter 3)

- In the South Hills district, which includes the National Cemetery Landscape Unit, "Maintain and improve historic and scenic views of the adjoining city, San Francisco Bay, and the Pacific Ocean from within the Presidio and from surrounding neighborhoods." (Chapter 3)

2.5.3 *San Francisco Bay Plan* – San Francisco Bay Conservation and Development Commission

The Bay Conservation and Development Commission (BCDC), a state agency, adopted the San Francisco Bay Plan in 1968 and has subsequently amended its content. The *Bay Plan* was reviewed for policies that might affect the Doyle Drive Replacement Project. The section concerning "Appearance, Design, and Scenic Views of Development around the Bay" is most relevant to the Visual Analysis of the project.

- "Structures and facilities that do not take advantage of or visually complement the Bay should be located and designed so as not to impact visually on the Bay and shoreline." (Policy 4)

- "Access routes to Bay crossings should be designed so as to orient the traveler to the Bay (as in the main approaches to the Golden Gate Bridge). Similar consideration should be given to the design of highway and mass transit routes paralleling the Bay (by providing frequent views of the Bay, if possible, so the traveler knows which way he or she is moving in relation to the Bay). Guardrails, fences, landscaping, and other structures related to such routes should be designed and located so as to maintain and to take advantage of Bay views. New or rebuilt roads in the hills above the Bay and in areas along the shores of the Bay should be constructed as scenic parkways in order to take full advantage of the commanding views of the Bay." (Policy 7)

- "Towers, bridges, or other structures near or over the Bay should be designed as landmarks that suggest the location of the waterfront when it is not visible, especially in flat areas. But such landmarks should be low enough to assure the continued visual dominance of the Bay." (Policy 10)

- "Views of the Bay from vista points and from roads should be maintained by appropriate arrangements and heights of all developments and landscaping between the view areas and the water. In this regard, particular attention should be given to all waterfront locations, areas below vista points, and areas along roads that provide good views of the bay for travelers, particularly areas below roads coming over ridges and providing a 'first view' of the Bay (shown in Bay Plan Map No. 2, Proposed Major Uses of the Bay and Shoreline)." (Policy 14)

2.5.4 *San Francisco Master Plan*—City and County of San Francisco

The *Master Plan* is a municipal document that is constantly amended, growing with the City's plans to grow. The *Master Plan* is divided into several elements, which discuss specific topics and areas of concern. Three elements— Recreation and Open Space, Transportation, and Environmental Protection— contain policies that affect the Doyle Drive Replacement Project, but only apply to the Marina and at the Richardson Avenue end of the project where the City has jurisdiction. Those concerned with the Visual Analysis follow.

– "Preserve sunlight in public open spaces." (I.3.14)

– "Preserve the open space and natural historic, scenic and recreational features of the Presidio." (Page I.3.15)

– "No new structures should be built that would adversely affect the scenic beauty and natural character of the Presidio." (Page I.3.15)

– "Assure that new development adjacent to the shoreline capitalizes on its unique waterfront location, considers shoreline land use provisions, improves visual and physical access tot he water, and conforms with urban design policies." (Page I.3.25)

– "Protect land from changes that would make it unsafe or unsightly." (Page I.6.10)

– "Design and locate facilities to preserve the historic city fabric and the natural landscape, and to protect views. Care must be taken to ensure that street and transit improvements are made to enhance the beauty and delicate fabric of the city and to protect views of the city, the bay, the ocean and the hills." (Page I.4.12)

SECTION 3: ENVIRONMENTAL CONSEQUENCES

3.1 INTRODUCTION

The following chapter contains the analysis of the potential visual impacts of the Build Alternatives being evaluated for the Doyle Drive Study. The visual analysis is based on the methodology contained in Chapter 1.0.

Chapter 3.0 begins with an analysis of the visual effects of the Replace and Widen Alternative and the Presidio Parkway Alternative within the six landscape units, which make up the project study area. Where appropriate, construction-period visual impacts are also discussed. This is followed by an analysis of the potential visual changes from seventeen viewpoints located within the Presidio. For each of these viewpoints, computer-generated simulations of each of the build alternatives were prepared. These simulations were used to evaluate the potential change in visual quality. For each viewpoint, a summary table is included indicating the visual quality ratings for the build alternatives.

3.2 VISUAL CHANGES BY LANDSCAPE UNIT

This chapter describes the visual changes and potential visual impacts of the proposed alternatives being studied as part of the Doyle Drive Study. For each landscape unit the visual changes that would occur during construction (short-term) and operation (permanent) were analyzed. This analysis is based on the description of each alternative contained in the Introduction section of this report, diagrams of each project alternative contained in Appendix A, construction staging and detour plans contained in Appendix C, and tree cover removal diagrams contained in Appendix D.

The No Build Alternative would have no visual impact since it would not change the existing visual environment, but would instead perpetuate the visual conditions associated with the existing facility, as described in Chapter 2. Similarly, the Replace and Widen Alternative would have minimal long-term visual impacts since it involves only modest changes to the existing facility. However, the Replace and Widen Alternative would perpetuate the visual conditions associated with the existing facility. During construction, the Replace and Widen Alternative-Detour Option would result in substantial visual changes primarily due to the construction of a temporary detour structure. The Presidio Parkway Alternative would have the most noticeable construction period and long-term visual changes because both the location and profile of the roadway would change substantially.

3.2.1 Toll Plaza

The Toll Plaza Landscape Unit starts where Doyle Drive and the Golden Gate Bridge connect at a series of toll booths that span across the southern section of the bridge. The parking lot on the east side of the toll booths on Doyle Drive contains a vista point with expansive views of the Golden Gate Bridge, San Francisco Bay, and the Marin Headlands. Across Doyle Drive, on the west side of this landscape unit, a wooded area surrounds a parking lot that provides parking for Golden Gate Transit employees as well as commuters. Across from the parking lot, and on the south side of Lincoln Road, along a grassy hillside lined with eucalyptus trees, a row of vacant white houses on Storey Avenue parallels Doyle Drive. These houses are being retained for future housing. These areas are accessed from the Merchant Road off ramps south of the Toll Plaza on Doyle Drive, and Lincoln Drive which runs under Doyle Drive south of Merchant Road. Woodlands and Marsh/Coastal areas are the image types associated with this landscape unit.

Construction Period

A detailed description of the construction activities, including staging and construction detours, is provided in the Introduction chapter of this report. Appendix C contains diagrams depicting construction staging sequences and detours for the Replace and Widen Alternative. Woodlands are the dominant image type in this landscape unit.

Replace and Widen Alternative – No construction activities would take place under the Replace and Widen Alternative in this landscape unit. Therefore, no visual impacts would occur and there would be no changes to the existing visual environment.

Presidio Parkway Alternative – Option 1 – Loop Ramp and Option 2 – Hook Ramp – Visual impacts would occur during both the construction and operation period under the Presidio Parkway Alternative Options 1 and 2. The thick row of trees that lines the north side of Doyle Drive would be removed to accommodate the new onramps from northbound Park Presidio to northbound Doyle Drive, and northbound Doyle Drive to southbound Park Presidio. The apartment buildings along Armistead Road would become visible with the removal of portions of the wooded areas along the north side of Doyle Drive.

Presidio Parkway Alternative – Merchant Road Slip Ramp – The Merchant Road slip ramp would require the additional tree removal along the north side of Doyle Drive, as well as the demolition of the row of apartment buildings along Armistead Road.

Operation Period

Replace and Widen Alternative – As stated previously, the reconstruction of Doyle Drive for the Replace and Widen Alternative would begin south of the Toll Plaza, and no long-term visual impacts would occur as a result of this project in the Toll Plaza Landscape Unit. The visual intactness and unity of this landscape unit would remain the same both during and after construction.

Presidio Parkway Alternative – Option 1 – Loop Ramp and Option 2 – Hook Ramp – Long-term visual impacts would occur as a result of either Options 1 or 2 under the Presidio Parkway Alternative. Mature vegetation on the north side of Doyle Drive would be removed to accommodate the reconstructed onramps from northbound Park Presidio to northbound Doyle Drive, and northbound Doyle Drive to southbound Park Presidio. Removal of this vegetation would result in the apartment buildings located along Armistead Road to be visible to motorists traveling on Doyle Drive, which would substantially change the park-like aesthetic n this landscape unit, resulting in an adverse visual change for motorists and residents.

Presidio Parkway Alternative – Merchant Road Slip Ramp – The construction of the Merchant Road slip ramp would require the removal of the apartment buildings along Armistead Road and some mature vegetation along the north side of Doyle Drive. Removal of the apartment buildings would improve the visual aesthetic when compared to the other Presidio Parkway Alternatives, but the amount of vegetation removed and substantially widened roads in this area would still result in an adverse visual change.

3.2.2 Toll Plaza through Park Presidio Interchange

This Landscape Unit primarily contains Doyle Drive and woodland image type, consisting mostly of tall eucalyptus and pine trees.

Construction Period

A detailed description of the construction activities, including staging and construction detours, is provided in the Introduction chapter of this report. Appendix C contains diagrams depicting construction staging sequences and detours for the Replace and Widen Alternative.

Replace and Widen Alternative – Detour Option – This alternative includes improvements within the existing alignment of Doyle Drive, which would not result in substantial visual changes. However, the removal of some trees and vegetation may be necessary to allow for heavy construction equipment to access the construction site. Substantial amounts of equipment would be present during the construction of the new interchange, and would adversely affect the visual quality of the landscape unit during construction. A temporary detour facility would also be constructed to the north of Doyle Drive to maintain traffic through the construction period. The area would appear to be a construction site for the duration of the construction period, and would have a short-term adverse visual impact on this landscape unit.

Replace and Widen Alternative – No Detour Option – With this alternative, traffic would continue to flow on the existing facility while construction of new north and southbound lanes would begin on Doyle Drive. No additional vegetation removal would be required for detour lanes of traffic beyond that which would be removed for the new facility. Traffic would eventually begin to flow on the new lanes as construction is completed.

Presidio Parkway Alternative – The woodland image type is the predominant image type in this landscape unit. A thin row of trees (two to three rows deep) runs along Doyle Drive, giving the impression of dense woodland. Construction activities would include grading and the removal of vegetation and trees for the construction of the new Doyle Drive/Park Presidio interchange. This would result in an adverse change to the image type of this landscape unit.

During construction, a considerable amount of heavy construction equipment would be visible within the landscape unit. Demolition and construction of the new high viaduct would begin at the eastern end of this landscape unit.

Operation Period

Replace and Widen Alternative – To accommodate the replacing and widening of Doyle Drive, significant amounts of vegetation and mature trees may be removed from this landscape unit. The widening of Doyle Drive would bring the alignment closer to the residential structures along Storey Avenue. Removal of this vegetation would remove the existing visual buffer between residences along Storey Avenue and Doyle Drive. This would be considered an adverse effect on the views from these residences.

The motorist's view would change due to the removal of vegetation along the north side of Doyle Drive. Removal of this vegetation could create additional views of the San Francisco Bay and the Presidio. This would result in an improvement in the motorist's viewing experience.

Overall, the visual effects of the Replace and Widen Alternative on the Toll Plaza to Park Presidio Landscape Unit may be considered negligible, with some reduction in visual quality from points within the Presidio (residences along Storey Avenue), when balanced against improved views for motorists traveling on Doyle Drive.

Presidio Parkway Alternative – The Presidio Parkway Alternative would realign Doyle Drive to the north of the existing facility, further from most of the residences along Storey Avenue. However, reconstruction of the Park Presidio Interchange would bring this facility closer to two residences on Storey Avenue (Buildings

1289 and 1290). Some vegetation and tree removal would be necessary along both the north and south sides of Doyle Drive in this landscape unit.

The Presidio Parkway Alternative would result in improved visual conditions for most residences along Storey Avenue. Southbound traffic flow onto Park Presidio would run below the level of the residences, and northbound traffic from Park Presidio onto Doyle Drive would be blocked from view by existing viaducts for through-traffic along Doyle Drive.

Views for motorists traveling on Doyle Drive would be reduced. On- and off-ramps to Park Presidio from Doyle Drive would have few vantage points of the San Francisco Bay or Presidio of San Francisco because traffic would flow below the existing grade.

Overall, the visual effects of the Parkway Alternative on the Toll Plaza to Park Presidio Landscape Unit would be minimal due to the construction of sub-level lanes of traffic that would be less visible from at-grade residences or from areas within the Presidio.

3.2.3 Park Presidio Interchange to National Cemetery

The National Cemetery Landscape Unit includes four different image types: Historic, Park/Active Recreation, Woodland, and Cemetery. Below the high viaduct structure, Stilwell Hall and other historic airfield structures are located to the north of Doyle Drive. The newly restored recreation area of Crissy Field is located to the north of Stilwell Hall, along the San Francisco Bay. The historic Cavalry Stables are located to the south of the existing high viaduct structure. To the east of Stilwell Hall and the Cavalry Stables, the high viaduct touches down and enters a wooded area at-grade, passes the National Cemetery, and then transitions into the low viaduct structure. There are no residences in this landscape unit. Two historic Battery buildings (Batteries Blaney and Slaughter) would be stabilized during the construction period and retained during the operation period.

Construction Period

A detailed description of the construction activities, including staging and construction detours, is provided in the Introduction chapter of this report. Appendix C contains diagrams depicting construction staging sequences and detours for the Replace and Widen Alternative.

During the construction period, the visual quality of the National Cemetery Landscape Unit would reflect the extensive construction activity required to dismantle the existing high viaduct, construct a new high viaduct structure, and cut and cover underground segments. Large trucks and heavy equipment would be required and would be clearly visible throughout this landscape unit. As a result, substantial alteration of the visual character of this landscape unit would occur during the construction of either build alternative. However, these impacts would not continue beyond the construction period.

Replace and Widen Alternative – Detour Option – This alternative would include demolishing and reconstructing the high viaduct structure of Doyle Drive, and replacing and widening the at-grade road (to the east of the high viaduct structure) to Sheridan Avenue. Construction activities would require the presence of substantial amounts of equipment during this process and would include grading and the removal of plants and trees for construction. Under this option, a 20.4-meter (67-foot) temporary detour facility would be constructed to the north of existing Doyle Drive to maintain traffic through the construction period.

Replace and Widen Alternative – No Detour Option – The widened portion of the new facility would be constructed on both sides and above the existing viaduct and would maintain traffic on the existing structure. Traffic would continue to emerge from the bluff near the National Cemetery after the high viaduct structure along the existing facility, and construction would begin above the level of the existing roadway. Less vegetation removal would be necessary to accommodate detour lanes of traffic, which would be a long-term beneficial visual impact in this landscape unit.

Traffic would be incrementally shifted to the new facility as it is widened over the top of the existing structure. Once all traffic is on the new structure, the existing structure would be demolished and the new portions of the facility would be connected.

Presidio Parkway Alternative – Option 1 (Loop Ramp) and Option 2 (Hook Ramp) – Construction activities would include grading and, in the case of Option 2, the removal of a row of eucalyptus trees on the southwest side of Doyle Drive to accommodate the realigned viaduct structure. Option 1 would require less removal of vegetation because the alignment of the new facility would not change substantially from the existing ramp. Option 2 would move the ramp further south, closer to the Cavalry Stables, and would require the removal of eucalyptus trees on the bluff to the west of the high viaduct structure.

Heavy excavation would be necessary in this area for the tunnel trench. The Presidio Parkway Alternative would result in a temporary impact on the visual quality of this landscape unit.

Operation Period

Replace and Widen Alternative – Under the Replace and Widen Alternative, the high viaduct structure would be widened and realigned further south, closer to the Cavalry Stables. The existing high viaduct is approximately 86 meters (286 feet) from the nearest Cavalry Stables building. Under the Replace and Widen Alternative, the high viaduct would be 69 meters (228 feet) from the nearest Cavalry Stables building. The widening of Doyle Drive would also require the removal of vegetation along the north side of Lincoln Boulevard which would affect the views from Lincoln Boulevard and the National Cemetery. Trees and vegetation removed during construction would be replanted where appropriate.

Views for motorists would not change substantially under this alternative because the alignment and profile of the high viaduct would not change, and at-grade portions of Doyle Drive near the National Cemetery would remain the same. Vegetation removal to accommodate the wider lanes may create additional views of the Presidio and Bay near the National Cemetery, which would be considered a beneficial effect on the motorist's view.

Overall, the Replace and Widen Alternative would result in a negligible change in visual quality within the National Cemetery landscape unit.

Presidio Parkway Alternative Option 1 (Loop Ramp) and Option 2 (Hook Ramp) – Upon completion of construction of Option 1, this landscape unit may look relatively the same because the new high viaduct of Doyle Drive would look similar to the existing high viaduct structure.

The realignment of Doyle Drive to the south of the existing roadway under Option 2 would have an adverse effect on views of Doyle Drive from points within the Presidio looking north. A row of eucalyptus trees (woodland image type) would be removed on the south side of the existing Doyle Drive to accommodate the new alignment of the viaduct for Option 2.

The historic image types in this landscape unit would not be directly affected; however, under Option 2 (Hook Ramp), the high viaduct and new northbound Park Presidio and eastbound Doyle Drive ramps would be much closer to the Cavalry Stables. Currently, the high viaduct is 86 meters (286 feet) at its closest point to the Cavalry Stables. Option 2 (Hook Ramp) would move the eastbound Doyle Drive onramp closer to the northwest corner of the stables to the high viaduct by approximately 42.1 meters (154.2 feet). The proximity of the realigned viaduct and ramp would result in an adverse effect on the visual continuity of the Cavalry

Stables area. However, views to Stilwell Hall from McDowell Avenue would open as a result of the new viaduct.

A tall grove of Monterey pine, which is growing in the pet cemetery, would be removed for the new high viaduct, which would detract from the visual uniqueness of the pet cemetery. A section of mature trees on the eastern hillside would be removed where the high viaduct touches down and the portal structure begins. In addition, elements of the historic landscape by Lincoln Boulevard would be removed to relocate Doyle Drive underground. This would include the removal of several large trees in this area.

On the east side, the existing at-grade sections of Doyle Drive would be removed and Doyle Drive would be reconstructed in a tunnel. Doyle Drive is visible when looking north from the National Cemetery. Removal of the at-grade sections from this landscape unit would improve views from the National Cemetery and intactness and unity of the visual elements within this landscape unit.

The effect on motorists' views within this landscape unit would be most dramatic in this landscape unit where Doyle Drive would be removed and placed in a tunnel. Views that motorists currently have of the National Cemetery and surrounding landscape would be permanently removed. This change to the motorist's view would be adverse.

The visual experience of pedestrians traveling within this landscape unit would improve in the areas where Doyle Drive would be placed in a tunnel. In areas where a new viaduct would be constructed, the visual experience would negligibly change as the new structures would be of similar scale.

The alignment and profile of the high viaduct structure would be reconstructed lower to the ground and aligned farther south, which would have a minimal affect on the motorist's view.

The overall visual quality under the Parkway Alternative varies depending on perspective. From the perspective of views and visual quality within in the Presidio, the Parkway Alternative would result in an overall beneficial change because much of Doyle Drive would be removed from sight, allowing for the reestablishment of views and visual connectivity within the Presidio. Removal of some large trees along Lincoln Boulevard to relocate Doyle Drive and moving the high viaduct structure closer to the Cavalry Stables buildings would be considered adverse visual aspects of the Parkway Alternative. However, removal of the roadway in the eastern portion of this landscape unit would be a beneficial effect on visual quality from viewpoints within the Presidio and National Cemetery. From the motorist's perspective, the Parkway Alternative would result in an adverse effect on visual quality because of the reduction in views of the Golden Gate Bridge, San Francisco Bay, and Presidio by placing Doyle Drive in a tunnel.

3.2.4 Main Post

This landscape unit consists of two basic image types: historic buildings of the Main Post, located on the south side of Doyle Drive, and the newly restored marsh and wetlands of Crissy Field. Looking south from Crissy Field, the structures of the low viaduct are very prominent and block views of the Presidio and the tree-lined hillsides. Looking from the Main Post area northward, the low viaduct partially blocks views and the traffic on Doyle Drive is plainly visible. The low viaduct of Doyle Drive is visible from thirty housing units in Swords to Plowshares (a program, which provides housing, rehabilitation and counseling to veterans in need). Doyle Drive blocks views of Crissy Field from these units.

Construction Period

A detailed description of the construction activities, including staging and construction detours, is provided in the Introduction chapter of this report. Appendix C contains diagrams depicting construction staging sequences and detours for the Replace and Widen Alternative.

Construction activities would be highly visible within this landscape unit. Construction of a detour to re-route all existing traffic around the construction would result in a substantial change to the visual character of this landscape unit during the construction period.

Replace and Widen Alternative – No Detour Option – The widened portion of the new facility would be constructed above the existing low-viaduct (approximately two meters (six feet) above the existing structure) and would maintain traffic on the existing structure. Traffic would be incrementally shifted to the new facility as it is widened over the top of the existing structure, and the existing structure would be demolished after the new facility is complete. The visual impacts of the construction period in this landscape unit would be adverse, as it would minimize existing views of the Golden Gate and Crissy field from viewpoints on the south side of Doyle Drive and in the Presidio. The lack of a detour structure transition under this option would reduce the visual intrusion during construction.

Replace and Widen Alternative – Detour Option – Construction activities would require the presence of substantial amounts of construction and grading equipment during this process. The presence of construction equipment would adversely affect the visual quality of this landscape unit, but would be less than the amount of equipment required for the Presidio Parkway Alternative.

Construction of the temporary detour would introduce a substantial new visual element to this landscape unit during construction. The elevated detour would increase the visual barrier between the Main Post/Crissy Field during the construction period.

Presidio Parkway Alternative – Substantial alteration of the visual character of this landscape unit would occur during construction. The low viaduct would be demolished, existing buildings would be underpinned or temporarily removed, and the alignment would be excavated for the underground tunnel. This would result in temporary visual impacts that would occur during the construction period. Construction would require considerable amounts of heavy construction equipment, which would be highly noticeable throughout the project area. This would result in a temporary impact to the visual quality of this landscape unit.

Construction activities would also require removal of trees and vegetation for grading and excavation activities, and the temporary storage of stockpiles of soil and materials. These temporary visual changes would be noticeable by motorists using Doyle Drive as well as people who live, work, and recreate in the Presidio and Marina neighborhoods adjacent to the project area.

Operation Period

Replace and Widen Alternative – No Detour Option – The Replace and Widen- No Detour Option would result in a low viaduct structure approximately two meters (six feet) higher than the existing viaduct. The new structure would be more visually dominant in this landscape unit.

Replace and Widen Alternative – Detour Option – Following the replacement and widening of the roadway, the landscape unit would reflect minimal change in visual quality. The low viaduct structures would exhibit a wider profile because of the addition of shoulders and the widening of travel lanes, however the height and appearance would remain relatively unchanged.

Presidio Parkway Alternative – The existing viaduct structure would be removed from this landscape unit and Doyle Drive would be placed entirely at-grade or underground. Removal of the elevated portions of Doyle Drive in this landscape unit would improve the overall intactness and unity of the visual elements, and would open up new views of the Bay and the Main Post from locations within the Presidio. This would result in an improvement in the overall visual character of the landscape unit.

Impacts on the motorist's visual experience of this landscape unit would vary. Doyle Drive would be realigned at-grade, and a landscaped median strip between north and southbound lanes would be constructed from the National Cemetery to the Post Commissary. A row of trees and landscaping would be added to the north of the realigned Doyle Drive, which would block most views of the Golden Gate and Presidio. This would, however, along with the landscaped median, increase motorists' views of vegetation from along the roadway.

Doyle Drive would be in an underground tunnel throughout the western half of this landscape unit. Views of the Golden Gate Bridge and Presidio would be removed from the motorist's view when Doyle Drive becomes a tunnel between the Post Commissary and Halleck Street. This would adversely affect the motorist's view along Doyle Drive.

The western tunnel portal would be constructed to the west of Building 106 near the Post Commissary, and the eastern tunnel portal would be constructed to the east of Halleck Street. Tunnel portals would introduce new visual elements into this landscape unit. Added landscaping over the tunnels would allow for more visual continuity between the Main Post and Crissy Field open space areas.

From the perspective of views and visual quality within in the Presidio, the Parkway Alternative would result in an overall beneficial change because a portion of Doyle Drive through this landscape unit would be placed underground, allowing for the reestablishment of views, visual connectivity within the Presidio, and extensions of open meadows from Crissy Field.

3.2.5 Marina Exit

The Marina Exit Landscape Unit includes three image types: Park/Active Recreation (Crissy Field), Light Industrial (Mason Street Warehouses) and Urban Residential (Marina neighborhood). In this area the low viaduct structures are prominent and resemble a maze of columns and cement that disperse in many directions. The landscaping itself is unmaintaned.

Construction Period

A detailed description of the construction activities, including staging and construction detours, is provided in the Introduction chapter of this report. Appendix C contains diagrams depicting construction staging sequences and detours for the Replace and Widen Alternative.

Replace and Widen Alternative – This alternative would include replacing and widening the low viaduct structure of Doyle Drive. Construction activities would require the presence of substantial amounts of equipment during this process and would include grading and removal of plants and trees for construction.

Presidio Parkway Alternative – Construction activities would require the presence of substantial amounts of construction and grading equipment during this process, especially on Richardson Avenue near the Palace of Fine Arts. Doyle Drive would merge onto Richardson Avenue after emerging from the tunnel to the east side of Halleck Street.

During the construction period, the Parkway Alternative would require the construction of minor temporary detours to route traffic around construction areas. As part of the construction, Marshall Street would be removed, Girard Road would be extended and Halleck Street would be shortened. Excavation using large trucks and heavy equipment would be required in this area during tunnel and portal construction. The Presidio Parkway Alternative would result in a substantial change in the visual quality of this landscape unit during construction.

Operation Period

Replace and Widen Alternative – Following construction, the landscape unit would reflect minimal change in visual quality. The low viaduct structures would exhibit a wider cross section because of the addition of shoulders and the widening of travel lanes. The height and appearance of Doyle Drive would remain relatively unchanged under the Detour Option, but would be slightly elevated under the No Detour option. However, under either alternative there would be a minimal change in visual quality.

The overall change in visual quality of the Marina Exit landscape unit would be negligible because minor widening of the roadway would occur.

Presidio Parkway Alternative – The existing roadway and the low viaduct structures would be removed from this landscape unit, and Doyle Drive would be reconstructed at-grade or on a low viaduct structure after a depressed Girard Road. Removal of the elevated structures of Doyle Drive would create new views from within the Presidio and from the Palace of Fine Arts. Removal of elevated portions of the roadway and replacing them with a depressed Girard Road would have an adverse effect on the motorist's view of the Golden Gate and Presidio but improved views from points within the Presidio. Landscaped buffers proposed for the at-grade sections of Doyle Drive would enhance the appearance of the roadway.

Overall, the change in visual quality within the Marina Landscape Unit would be beneficial because elevated portions of Doyle Drive would be removed, opening views and improving visual connectivity within the Presidio.

3.2.6 Richardson Avenue Exit

This landscape unit primarily consists of Light Industrial and Urban Residential image types.

Construction Period

A detailed description of the construction activities, including staging and construction detours, is provided in the Introduction chapter of this report. Appendix C contains diagrams depicting construction staging sequences and detours for the Replace and Widen Alternative. If construction schedules for other projects in the Presidio overlap with construction activities for Doyle Drive, a temporary adverse visual impact would occur due to the volume and visibility of construction equipment and detour facilities.

Replace and Widen Alternative – This alternative would include replacing and widening the low viaduct structure of Doyle Drive and re-paving Richardson Avenue. Construction activities would require the presence of substantial amounts of equipment during this process and would include grading and removal of plants and trees for construction.

Presidio Parkway Alternative – Diamond and Circle Drive Options – The Richardson Avenue Exit landscape unit would require considerable alteration. Under this alternative, two options are being considered, the Diamond Option and the Circle Drive Option.

Under the Diamond Option, direct access to the Presidio and Marina Boulevard in both directions would be provided by the access ramps from Doyle Drive connecting to a grade-separated interchange at Girard Road. East of the new Letterman garage, Gorgas Avenue would connect to Richardson Avenue with access to Palace Drive via a signalized intersection at Lyon Street.

Under the Circle Drive Option, Gorgas Avenue connects with Richardson Avenue with access to Palace Drive via a signalized intersection at Lyon Street. Westbound traffic from Richardson Avenue would access the Presidio and Palace Drive through a jug handle intersection with Gorgas Road.

Under both options, Doyle Drive would be re-aligned to the southwest, closer to the Gorgas Warehouses. The greatest change would occur between Richardson Boulevard and Gorgas Avenue. This area includes the Gorgas Street warehouses. In the Circle Drive Option, one of the historic warehouses (Building 1151) would be demolished to make room for the Gorgas Avenue and Doyle Drive intersection. In either, large trucks and heavy equipment will be required on site during construction. The landscape unit would visually appear as a construction zone during this period, and there would be a substantial change in the visual quality of the landscape unit.

Operation Period

Replace and Widen Alternative – Following construction, this landscape unit would reflect minimal change in visual quality. The low viaduct structures would be wider due to the addition of shoulders and the widening of travel lanes. The height and appearance would remain relatively unchanged, resulting in only a minor change in visual quality.

Presidio Parkway Alternative – Long-term visual changes in this landscape unit would include realigning the northbound onramp to Doyle Drive further south, and the removal of Building 1151, to accommodate the Gorgas Avenue and Doyle Drive intersection under the Circle Drive Option.

Vegetation removal to accommodate the realignment may create additional views of the Gorgas Warehouses and the Presidio, which would be considered a beneficial effect for motorists and residents in the Marina neighborhood. Additionally, views to the Palace of Fine Arts would not significantly change under this alternative. A pedestrian overcrossing would provide access across Doyle Drive to Crissy Field, which would be considered a beneficial impact on pedestrians' views of Crissy Field, the Golden Gate, and the Presidio.

Both the Diamond and Circle Drive Options of the Presidio Parkway Alternative would result in decreased visual quality for employees of the Gorgas Warehouses. Doyle Drive would be aligned in close proximity to the structures, removing the existing mature trees that run parallel to the warehouses and act as a visual buffer between the warehouses and the existing Doyle Drive. This would be considered an adverse affect to the warehouse employees.

3.3 VISUAL CHANGES AND EFFECT ON VIEWER GROUPS

The following section discusses the impacts of each alternative at the 19 viewpoints (see Figures 2.4-2 and 2.4-3). Mitigation measures for impacts to cultural resources would require relocating historic structures such as Building 201 and the Mason Street Warehouses during construction. Once construction is complete the Building would be replaced in their original locations. As decided by the Trust, NPS and Caltrans, simulations of the condition prior to replacing historic building (unmitigated) are included and analyzed for select viewpoints.

The options for Replace and Widen (No Detour, Detour) and Presidio Parkway Alternatives (Diamond, Circle Drive) are also discussed where the visual impacts of the options would differ within a viewpoint.

3.3.1 Viewpoint 1: Gorgas Gate

Summary of Existing Conditions

The Gorgas Gate Viewpoint is located in the Marina Exit Landscape Unit. The view is looking northwest along Gorgas Avenue. The Gorgas Warehouses line the right side of the road creating a historic streetscape, while paved parking lots, trees and one building line the left side. Doyle Drive is a major feature from this viewpoint because of its elevated location, which blocks the lower half of distant views in the northwest. Only the two red towers of the Golden Gate Bridge and the tops of the mountains of the Marin Headlands can be seen in the distance rising up above this elevated section of Doyle Drive. The primary viewer groups in this area are workers, residents and recreation users.

Visual Effects of Alternatives

No-Build Alternative – The No-Build Alternative would not modify any of the visual effects of Doyle Drive. There would be no significant visual changes from this viewpoint with this alternative.

Replace and Widen Alternative –Under the Replace and Widen Alternative, Doyle Drive would be slightly modified by widening the low viaduct in the vicinity and creating more space between the support columns. The widening of the support columns would slightly enhance the views of the base of the Marin Headlands. These modifications would be hardly visible from this viewpoint and the overall change in visual quality from this view point would be negligible. The Detour and No Detour Options would not differ from this viewpoint. (See Figure 3.3.1 and Table 3.3.1)

Presidio Parkway Alternative – Under the Presidio Parkway Alternative, Doyle Drive would remain on a viaduct through this area, however the viaduct would be lower than the existing structure and would be less visible under this alternative. The lowering of the viaduct would result in better views of the Golden Gate Bridge and the upper, higher elevations of the Marin Headlands. The lowering of the viaduct and construction of a wall along this portion of the Doyle Drive alignment would also obstruct views of the base of the headlands. The overall change in visual quality from this viewpoint would be minimally beneficial. (See Figure 3.3.1 and Table 3.3.1)

TABLE 3.3.1
OVERALL VISUAL QUALITY CHANGE FROM THE GORGAS GATE VIEWPOINT

Alternative	Visual Dominance of Doyle Drive	View Obstruction	Community Disruption/ Orientation/ Privacy	Vividness	Intactness	Unity	Overall Visual Quality
Existing							
No-Build	High	High	Medium	Low	Low	Low	Low
Change							
Replace and Widen	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Presidio Parkway	Beneficial	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Existing Condition

Replace and Widen Alternative

Presidio Parkway Alternative

FIGURE 3.3.1 VIEWPOINT 1: GORGAS GATE

3.3.2 Viewpoint 2: Cow Hollow

Summary of Existing Conditions

This viewpoint is located on Richardson Avenue at Bay Street. The existing view is looking north in front of residences in the Cow Hollow Neighborhood along Richardson Avenue. Historic warehouses line the southbound side of the road. This is near where the low viaduct portion of Doyle Drive touches down onto Richardson Avenue. The Doyle Drive Viaduct is visible in the distance. The Golden Gate Bridge and the tops of the mountains in the Marin Headlands can be seen in the distance.

Visual Effects of Alternatives

No-Build Alternative – The No-Build Alternative would not modify any of the visual effects of Doyle Drive. There would be no significant visual changes from this viewpoint with these two alternatives.

Replace and Widen Alternative – Under the Replace and Widen Alternative, Doyle Drive would be slightly modified by widening the low viaduct in this area. These modifications would not be visible from this viewpoint. The No Detour and Detour Options would not differ from this viewpoint. (See Figure 3.3.2 and Table 3.3.2)

Presidio Parkway Alternative – Diamond and Circle Drive Options –The Circle Drive Option of the Presidio Parkway Alternative would lower Doyle Drive out of view. One of the historic warehouses (Building 1151) would be removed and an intersection would be created within the view. This would open views of the other historic buildings of the Presidio and of the Golden Gate Bridge. This would increase the vividness of the view and increase the overall visual quality.

The Diamond Option of the Presidio Parkway Alternative would make minor improvements on Richardson Avenue and slightly modify Doyle Drive by widening and lowering the low viaduct in the distance. The widening would not be visible from this viewpoint. The lowering of the viaduct would remove the viaduct from view, increasing the views of the Marin Headlands. The removal of the viaduct would increase the intactness and unity of the view by removing the Doyle Drive viaduct, which acts as a physical divider between the low landscape in the distance and the Marin Headlands. This would result in beneficial changes to the overall visual quality of the view. (See Figure 3.3.2 and Table 3.3.2)

TABLE 3.3.2:
OVERALL VISUAL QUALITY CHANGE FROM THE COW HOLLOW VIEWPOINT

Alternative	Visual Dominance of Doyle Drive	View Obstruction	Community Disruption/ Orientation/ Privacy	Vividness	Intactness	Unity	Overall Visual Quality
Existing							
No-Build	Low	Medium	Medium	Low	Low	Medium	Low
Change							
Replace and Widen	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Presidio Parkway (Diamond Option)	Beneficial	Beneficial	Beneficial	Slightly Beneficial	Beneficial	Beneficial	Beneficial
Presidio Parkway (Circle Drive Option)	Beneficial	Beneficial	Beneficial	Slightly Beneficial	Beneficial	Beneficial	Beneficial

Existing Condition

Parkway Alternative – Diamond Option

Replace and Widen Alternative

Parkway Alternative – Circle Drive Option

FIGURE 3.3.2 VIEWPOINT 2: MARINA NEIGHBORHOOD

3.3.3 Viewpoint 3: Marina at Lyon

Summary of Existing Conditions

This viewpoint is located at Doyle Drive adjacent to the Palace of Fine Arts looking to the west. The existing view is of the Marina Boulevard connection with Doyle Drive. The warehouses that line Mason Street are visible on the right. The primary viewer groups from this vantage point are motorists, residents and recreation users at the Marina Green and Crissy Field.

Visual Effects of Alternatives

No-Build Alternative – The No-Build Alternative would not modify any of the visual effects of Doyle Drive. There would be no significant visual changes from this viewpoint with this alternative.

Replace and Widen Alternative - Under the Replace and Widen Alternative, Doyle Drive would be slightly modified by adding a concrete median and widening the low viaduct. The latter would not be visible from this viewpoint. The No Detour and Detour Options would not differ from this viewpoint. (See Figure 3.3.3 and Table 3.3.3)

Presidio Parkway Alternative – From this viewpoint, Doyle Drive, which is the key visual element, would be slightly modified to include a grassy center median. Modifying Doyle Drive under this alternative would require the removal of many of the mature trees within this view. Views of the Presidio Buildings would open under this alternative as would additional views of Doyle Drive. Removal of the trees and natural landscape would greatly reduce the woodland element of the view, exposing the man made structures behind it. Although the man made elements introduced into the view are historic, the removal of trees reduces the unity of the view in relation to the woodland elements further in the background. This alternative would result in adverse changes to the overall visual quality of the view. (See Figure 3.3.3 and Table 3.3.3)

TABLE 3.3.3:
OVERALL VISUAL QUALITY CHANGE FROM THE MARINA AT LYON VIEWPOINT

Alternative	Visual Dominance of Doyle Drive	View Obstruction	Community Disruption/ Orientation/Privacy	Vividness	Intactness	Unity	Overall Visual Quality
Existing							
No-Build	High	Low	Medium	Medium	Low	Low	Low
Change							
Replace and Widen	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Presidio Parkway	Adverse	Negligible	Negligible	Adverse	Adverse	Adverse	Adverse

Existing Condition

Replace and Widen Alternative

Presidio Parkway Alternative

FIGURE 3.3.3 VIEWPOINT 3: MARINA AT LYON

3.3.4 Viewpoint 4: Halleck Street North

Summary of Existing Conditions

This viewpoint is located on Halleck Street looking north. In this view, Doyle Drive is a distinct feature because of its elevated location, which spans Halleck Street. Presidio buildings line both sides of the street, giving this view an historic feel, while the mountaintops of the Marin Headlands are visible in the distance. The primary viewer groups in this area are workers, residents and recreation users (i.e. tennis courts in this area).

Visual Effects of Alternatives

No-Build Alternative - The No-Build Alternative would not modify any of the visual effects of Doyle Drive. There would be no significant visual changes from this viewpoint with this alternative.

Replace and Widen Alternative – Under the Replace and Widen Alternative, Doyle Drive would be modified by widening the high viaduct. The No Detour Option would elevate the viaduct and would result in the increased visual dominance of Doyle Drive. The support columns would be placed further apart, slightly increasing views of the Bay and the Marin Headlands. With the Detour Option, modifications made to the structure would not be very apparent from this viewpoint. The columns that support the low viaduct in this viewpoint would be modified and would be less visible, creating a slightly more unified view. (See Figure 3.3.4 and Table 3.3.4)

Presidio Parkway Alternative – Under the Presidio Parkway Alternative, the low viaduct of Doyle Drive, which stretches across Halleck Street and acts as a visual barrier, would be removed and placed in a tunnel. The removal of the viaduct would create a clearer view of the Marin Headlands in the distance. Removal of the above ground elements of Doyle Drive would improve the intactness and unity of the view from this location by linking the historic Presidio Buildings with Crissy Field and the Marin Headlands. Additional connectivity to the Marin Headlands is also created by the elevated tunnel cover through a “rolling hills’ element, further improving the unity and intactness of the view. The overall visual quality of this viewpoint would improve under this alternative. With implementation of cultural resource mitigation, Building 201 would be returned to its place. (See Figure 3.3.4 and Table 3.3.4)

Presidio Parkway Alternative (Unmitigated) – Under this alternative, mitigation recommended by the cultural resources analysis would not be implemented. Mitigation measures for impacts to cultural resources would require relocating historic structures such as building 201 during construction. Once construction is complete the Building would be replaced in its original location. Under this alternative, the removal of Building 201 would result in slightly adverse effects to the unity and intactness of the view by reducing the historic streetscape. The slightly adverse effect on unity and intactness would result in a slightly adverse effect on the overall visual quality of the view. (See Figure 3.3.4 and Table 3.3.4)

TABLE 3.3.4:
OVERALL VISUAL QUALITY CHANGE FROM THE HALLECK NORTH VIEWPOINT

Alternative	Visual Dominance of Doyle Drive	View Obstruction	Community Disruption/ Orientation/ Privacy	Vividness	Intactness	Unity	Overall Visual Quality
Existing							
No-Build	High	High	Low	Low	Medium	Low	Low
Change							
Replace and Widen (No Detour Option)	Slightly Adverse	Slightly Adverse	Negligible	Negligible	Negligible	Negligible	Slightly Adverse
Replace and Widen (Detour Option)	Slightly Adverse	Minimally Beneficial	Negligible	Negligible	Negligible	Negligible	Negligible
Presidio Parkway	Beneficial	Beneficial	Beneficial	Beneficial	Beneficial	Beneficial	Beneficial
Presidio Parkway (Unmitigated)	Beneficial	Beneficial	Beneficial	Beneficial	Slightly Adverse	Slightly Adverse	Slightly Adverse

Replace and Widen Alternative – No Detour Option

Replace and Widen Alternative – Detour Option

Existing Condition

Presidio Parkway Alternative (Unmitigated)

Presidio Parkway Alternative

FIGURE 3.3.4 VIEWPOINT 4: HALLECK NORTH

3.3.5 Viewpoint 5: From the Former Burger King (Building 211)

Summary of Existing Conditions

This viewpoint is located behind the Former Burger King Restaurant facing north. The existing view is the low viaduct portion of Doyle Drive with two of the Presidio buildings, Crissy Field, the Bay and the Marin Headlands beyond.

Visual Effects of Alternatives

No-Build Alternative – The No-Build Alternative would not modify any of the visual effects of Doyle Drive. There would be no significant visual changes from this viewpoint with this alternative.

Replace and Widen Alternative - Under the Replace and Widen Alternative, Doyle Drive would be modified by widening the low viaduct. The No Detour Option alternative would, elevate the viaduct resulting in increased dominance of Doyle Drive and obstruction of views of the Bay and the Marin Headlands. Modifications from the Detour Option would not be visible from this viewpoint. The columns that support the low viaduct in this viewpoint would be modified and would be less visible, creating a slightly more unified view. (See Figure 3.3.5 and Table 3.3.5)

Presidio Parkway Alternative – From this viewpoint, the low viaduct portion of Doyle Drive, which acts as a visual barrier to visual resources in the background, would be removed and replaced in a tunnel. The PX Building and the parking lot next to the Interpretive Center would also be removed under this alternative. Removal of the low viaduct structure would open up views to the water of the San Francisco Bay, Crissy Field Interpretive Center and hills of the North Bay.

The visual intactness and unity of this view would greatly improve by visually linking the historic Interpretive Center with Crissy Field and the Bay beyond. Landscaping along Mason Street and around the interpretive Center would also become visible. Removal of the above-ground elements of Doyle Drive, the PX Building, and the parking lot would improve the intactness and unity of the view from this location by leaving only one man made structure in the view, maintaining its historic element. Under this alternative, the visual quality of the view from this location would improve dramatically. (See Figure 3.3.5 and Table 3.3.5)

TABLE 3.3.5:
OVERALL VISUAL QUALITY CHANGE FROM THE FORMER BURGER KING VIEWPOINT

Alternative	Visual Dominance of Doyle Drive	View Obstruction	Community Disruption/ Orientation/ Privacy	Vividness	Intactness	Unity	Overall Visual Quality
Existing							
No-Build	High	High	High	Low	Low	Low	Low
Change							
Replace and Widen (No Detour Option)	Slightly Adverse	Slightly Adverse	Negligible	Negligible	Negligible	Negligible	Slightly Adverse
Replace and Widen (No Detour Option)	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Presidio Parkway	Strongly Beneficial	Strongly Beneficial	Strongly Beneficial	Strongly Beneficial	Strongly Beneficial	Strongly Beneficial	Strongly Beneficial

3.3.6 Viewpoint 6: Mason Street East

Summary of Existing Conditions

This viewpoint is located on the northwest corner of Mason and Halleck Streets looking east. The existing view is the low viaduct portion of Doyle Drive with the Palace of Fine Arts just beyond the elevated section of Doyle Drive. Crissy Field Recreation Area is on the left and Marina Green is beyond that. The primary viewer groups in this area are workers and recreation users.

Visual Effects of Alternatives

No-Build Alternative – The No-Build Alternative would not modify any of the visual effects of Doyle Drive. There would be no significant visual changes from this viewpoint with this alternative.

Replace and Widen Alternative – The No Detour Option would lower the viaduct slightly and have similar, slightly noticeable visual effects as the Detour Option. Under the Detour Option, Doyle Drive would be modified by widening the viaduct structure in this area. Only slight visual effects would be noticed such as the simpler architectural aesthetic on the façade and fewer columns of the reconstructed viaduct structure. (See Figure 3.3.6 and Table 3.3.6)

Replace and Widen Alternative (Detour Option) (Unmitigated) – Under this alternative, the Mason Street warehouses are not replaced after construction. From this vantage point, the Mason Street Warehouses are fairly distant in this view and their removal has little effect on the overall visual quality. Their removal would however, would have a slight effect on the unity and intactness of this view.

Presidio Parkway Alternative – This Alternative would result in a dramatic effect on the view from this location. The once visually dominant low viaduct structure would be removed and placed underground. The only visible roads from this viewpoint would be Gorgas Avenue, Mason Street and the realigned Halleck Street. This would greatly open up views of the Palace of Fine Arts which, under this alternative, would provide visual orientation in this view. The grassy knoll, that would cover he tunnel, would create unity to the Palace of Fine Arts and its surrounding landscape consisting of mature trees. The removal of Doyle Drive would greatly increase the intactness and unity of the elements within the view and improve the overall visual quality of the viewpoint. (See Figure 3.3.6 and Table 3.3.6)

TABLE 3.3.6:
OVERALL VISUAL QUALITY CHANGE FROM THE MASON STREET EAST VIEWPOINT

Alternative	Visual Dominance of Doyle Drive	View Obstruction	Community Disruption/ Orientation/ Privacy	Vividness	Intactness	Unity	Overall Visual Quality
Existing							
No-Build	High	High	Medium	Low	Low	Low	Low
Change							
Replace and Widen (No Detour Option)	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Replace and Widen (Detour Option)	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Replace and Widen (Detour Option) (Unmitigated)	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Presidio Parkway	Strongly Beneficial	Strongly Beneficial	Strongly Beneficial	Strongly Beneficial	Strongly Beneficial	Strongly Beneficial	Strongly Beneficial

Replace and Widen Alternative – No Detour Option

Existing Condition

Replace and Widen Alternative – Detour Option

Presidio Parkway Alternative

FIGURE 3.3.5 VIEWPOINT 5: FROM THE FORMER BURGER KING BUILDING

Replace and Widen Alternative – No Detour Option

Replace and Widen Alternative – Detour Option (Unmitigated)

Existing Condition

Replace and Widen Alternative – Detour Option

Presidio Parkway Alternative

FIGURE 3.3.6 VIEWPOINT 6: MASON STREET EAST

3.3.7 Viewpoint 7: Mason Street West

Summary of Existing Conditions

This viewpoint is located on Mason Street near Halleck. The existing view includes the low viaduct portion of Doyle Drive with the high viaduct in the distance. The prominent building in the distance is the Crissy Field Interpretive Center. Crissy Field is to the right of the Interpretive Center. The primary viewer groups in this area are workers and recreation users.

Visual Effects of Alternatives

No-Build Alternative – The No-Build Alternative would not modify any of the visual effects of Doyle Drive. There would be no significant visual changes from this viewpoint with these two alternatives.

Replace and Widen Alternative – The No Detour Option would lower the viaduct which would open slight views of the mature landscaping in the background. Although lowered, Doyle Drive would remain the dominant visual element of this view. Under the Detour Option of the Replace and Widen Alternative, Doyle Drive would be modified by widening the low viaduct in this vicinity. No visual aspects of these modifications would be visible from this viewpoint. (See Figure 3.3.7 and Table 3.3.7)

Presidio Parkway Alternative – The low viaduct structure, which is a dominant visual feature from this viewpoint, would be removed and placed in a tunnel. A grassy area would be included under this alternative as well to cover the tunnel. The realigned Halleck Street would be visible, running across the grassy area covering the tunnel. A visual connection with tree covered hillsides, grassy knoll and historic Presidio buildings (particularly 201 and 228) would be created. Additional connectivity to the hills in the background is also created by the elevated tunnel cover through a “rolling hills’ element, further improving the unity and intactness of the view. The entrance to the tunnel, which is visible from this view would detract from the intactness of the viewpoint, however, removing the viaduct would remain strongly beneficial to the intactness view and would improve the overall visual quality within the view. (See Figure 3.3.7 and Table 3.3.7)

TABLE 3.3.7:
OVERALL VISUAL QUALITY CHANGE FROM THE MASON STREET WEST VIEWPOINT

Alternative	Visual Dominance of Doyle Drive	View Obstruction	Community Disruption/ Orientation/ Privacy	Vividness	Intactness	Unity	Overall Visual Quality
Existing							
No-Build	High	High	High	Low	Low	Low	Low
Change							
Replace and Widen (No Detour Option)	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Replace and Widen (Detour Option)	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Presidio Parkway	Strongly Beneficial	Strongly Beneficial	Strongly Beneficial	Strongly Beneficial	Strongly Beneficial	Strongly Beneficial	Strongly Beneficial

Replace and Widen Alternative – No Detour Option

Existing Condition

Replace and Widen Alternative – Detour Option

Presidio Parkway Alternative

FIGURE 3.3.7 VIEWPOINT 7: MASON STREET WEST

3.3.8 Viewpoint 8: Mason Street South

Summary of Existing Conditions

This viewpoint is located on Mason Street looking across the parking lot at the PX building. The existing view is of the low viaduct structure. The primary viewer groups in this area are workers and recreation users.

Visual Effects of Alternatives

No-Build Alternative – The No-Build Alternative would not modify any of the visual effects of Doyle Drive. There would be no visual changes from this viewpoint because the 'no build' alternative would not modify Doyle Drive.

Replace and Widen Alternative – Under the Replace and Widen Alternative, No Detour Option, Doyle Drive would be slightly elevated, and the parking area visible in the foreground would be removed and replaced with grass, which would increase the visual unity and intactness of this viewpoint. Under the Detour Option, Doyle Drive would be modified by widening the low viaduct in the vicinity. The visual aspects of these modifications would not be visible from this viewpoint. The parking area would be removed as well, resulting in similar visual benefits as the No Detour Option. (See Figure 3.3.8 and Table 3.3.8)

Presidio Parkway Alternative – The low viaduct would be removed and placed in a tunnel under this alternative, thereby eliminating it from view. The tunnel would be covered by a grassy hill. The intactness and unity of the area would be improved through the removal of the low viaduct structure, and would be further enhanced by the grassy hill and reduction of the parking lot. The historic brick buildings of Main Post, seen atop the east bluff, would become a more central attraction from this viewpoint. Some of the mature trees would be removed under this alternative; however, the removal of the viaduct would greatly improve the overall visual quality within the view. (See Figure 3.3.8 and Table 3.3.8)

TABLE 3.3.8:
OVERALL VISUAL QUALITY CHANGE FROM THE MASON STREET SOUTH VIEWPOINT

Alternative	Visual Dominance of Doyle Drive	View Obstruction	Community Disruption/ Orientation/ Privacy	Vividness	Intactness	Unity	Overall Visual Quality
Existing							
No-Build	High	High	High	Medium	Low	Low	Low
Change							
Replace and Widen (No Detour Option)	Minimally Beneficial	Minimally Beneficial	Minimally Beneficial	Beneficial	Beneficial	Beneficial	Beneficial
Replace and Widen (Detour Option)	Minimally Beneficial	Minimally Beneficial	Minimally Beneficial	Beneficial	Beneficial	Beneficial	Beneficial
Presidio Parkway	Strongly Beneficial	Strongly Beneficial	Strongly Beneficial	Strongly Beneficial	Strongly Beneficial	Strongly Beneficial	Strongly Beneficial

Replace and Widen Alternative – No Detour Option

Existing Condition

Replace and Widen Alternative – Detour Option

Presidio Parkway Alternative

FIGURE 3.3.8 VIEWPOINT 8: MASON STREET SOUTH

3.3.9 Viewpoint 9: Crissy Field

Summary of Existing Conditions

This viewpoint is located on the northwest side of Crissy Field. The view is to the south looking across Crissy Field to Stilwell Hall with the high viaduct of Doyle Drive in the background.

Visual Effects of Alternatives

No-Build Alternative – The No-Build Alternative would not modify any of the visual elements of Doyle Drive. The high viaduct structure stands tall above Stilwell Hall and the level green meadow of Crissy Field. There would be no visual changes with the No-Build Alternative.

Replace and Widen Alternative –In this vicinity, the Replace and Widen Alternative would involve the construction of a new, wider high viaduct in the same location as the existing structure. Because of its larger size, the reconstructed high viaduct would increase obstruction of views to the natural landscape within the Presidio behind the viaduct. It is assumed that the relationship in appearance with the Golden Gate Bridge would be retained. The No Detour and Detour Options would not differ from this viewpoint. (See Figure 3.3.9 and Table 3.3.9)

Presidio Parkway Alternative – In this vicinity, the Presidio Parkway Alternative would involve construction of a new, high viaduct south of the existing structure, slightly further from the viewer. The new structure would remain a dominant visual element from this viewpoint. The high viaduct under this alternative would be of the same approximate scale as the existing viaduct. It is assumed that its relationship in appearance with the Golden Gate Bridge would be retained. The construction of the new viaduct would result in negligible change to the overall visual quality of the viewpoint. (See Figure 3.3.9 and Table 3.3.9)

TABLE 3.3.9:
OVERALL VISUAL QUALITY CHANGE FROM THE CRISSY FIELD VIEWPOINT

Alternative	Visual Dominance of Doyle Drive	View Obstruction	Community Disruption/ Orientation/ Privacy	Vividness	Intactness	Unity	Overall Visual Quality
Existing							
No-Build	High	Medium	Low	Medium	Low	Medium	Medium
Change							
Replace and Widen	Negligible	Minimally Adverse	Negligible	Negligible	Negligible	Negligible	Negligible
Presidio Parkway	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Existing Condition

Replace and Widen Alternative

Presidio Parkway Alternative

FIGURE 3.3.9 VIEWPOINT 9: CRISSY FIELD

3.3.10 Viewpoint 10: Cavalry Stables North

Summary of Existing Conditions

The Cavalry Stables are located on McDowell Avenue just south of Doyle Drive. The view is from behind the stables looking north, with the stables in the foreground. From this viewpoint the high viaduct structure stands tall above the rooftops of the Cavalry Stables and partially obstructs views of Crissy Field and the water. The horizontal lines of the roofs of the Cavalry Stables combined with the horizontal lines of the high viaduct to create an interesting geometric unity from this viewpoint, which would not change substantially under either of these alternatives. However, the intactness of the area from this viewpoint remains low, due to the mixture of architectural elements, designs and colors.

Visual Effects of Alternatives

No-Build Alternative – The No-Build Alternative would not modify any of the visual effects of Doyle Drive. There would be no visual changes from this viewpoint with this alternative.

Replace and Widen Alternative – In this vicinity, the Replace and Widen Alternative would involve the construction of a new, wider high viaduct in the same location as the existing structure. The new structure would be visible from this viewpoint, but changes in overall visual quality would be negligible because the new structure would be similar in scale to the existing viaduct. The No Detour and Detour Options would not differ from this viewpoint. (See Figure 3.3.10 and Table 3.3.10)

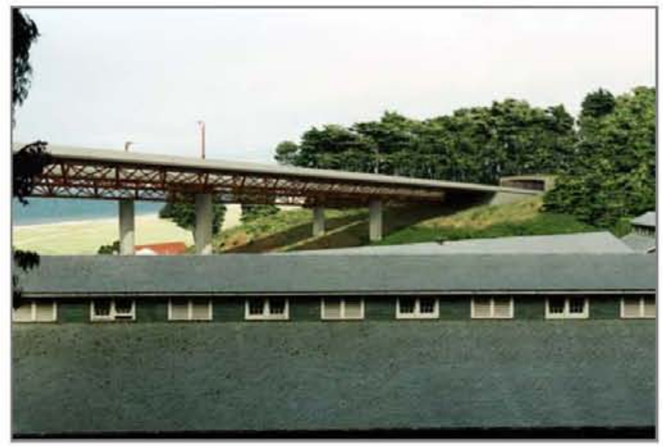
Presidio Parkway Alternative – Under the Presidio Parkway Alternative, the high viaduct would be reconstructed closer to the Calvary Stables. Although the proposed viaduct would be lower in elevation, the views from this viewpoint would remain relatively the same although some of the forested area near the entrance of the tunnel would be removed. Under these alternatives, the overall visual quality of the view would remain approximately the same. (See Figure 3.3.10 and Table 3.3.10)

TABLE 3.3.10:
OVERALL VISUAL QUALITY CHANGE FROM THE CAVALRY STABLES VIEWPOINT

Alternative	Visual Dominance of Doyle Drive	View Obstruction	Community Disruption/ Orientation/ Privacy	Vividness	Intactness	Unity	Overall Visual Quality
Existing							
No-Build	High	Medium	Low	Medium	Low	Medium	Medium
Change							
Replace and Widen	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Presidio Parkway	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Existing Condition

Replace and Widen Alternative



Presidio Parkway Alternative

FIGURE 3.3.10 VIEWPOINT 10: CAVALRY STABLES

3.3.11 Viewpoint 11: Lincoln Boulevard

Summary of Existing Conditions

This viewpoint is looking west from Lincoln Boulevard toward the Park Presidio elevated freeway. Doyle Drive is not visible within this view.

Visual Effects of Alternatives

No-Build Alternative – The No-Build Alternative would not modify any of the visual elements of Doyle Drive. There would be no visual changes from this viewpoint with this alternative.

Replace and Widen Alternative – Under this alternative, the elevated structure of Doyle Drive would be slightly modified. The visual aspects of these modifications would not be visible from this viewpoint. The No Detour and Detour Options would not differ from this viewpoint. (See Figure 3.3.11 and Table 3.3.11)

Presidio Parkway Alternative – Visual changes from this viewpoint would be limited to slight modifications to the elevated structure. There would be six slender columns and a thicker bridge deck that would result in some additional view obstruction underneath the elevated structure.

Since the visual changes to the elevated structure would be minimal, the overall visual quality of the view at this location would remain unchanged. (See Figure 3.3.11 and Table 3.3.11)

TABLE 3.3.11:
OVERALL VISUAL QUALITY CHANGE FROM THE LINCOLN BOULEVARD VIEWPOINT

Alternative	Visual Dominance of Doyle Drive	View Obstruction	Community Disruption/ Orientation/ Privacy	Vividness	Intactness	Unity	Overall Visual Quality
Existing							
No-Build	High	Medium	Low	Medium	Low	Low	Medium
Change							
Replace and Widen	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Presidio Parkway	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Existing Condition

Replace and Widen Alternative

Presidio Parkway Alternative

FIGURE 3.3.11 VIEWPOINT 11: LINCOLN BOULEVARD

3.3.12 Viewpoint 12: Halleck South

Summary of Existing Conditions

This viewpoint is located on the northeast corner of Mason Street and Halleck Street looking south. The existing view includes the low viaduct portion of Doyle Drive. The primary viewer groups in this area are workers and recreation users.

Visual Effects of Alternatives

No-Build Alternative – The No-Build Alternative would not modify any of the visual elements of Doyle Drive. There would be no visual changes from this viewpoint with this alternative.

Replace and Widen Alternative – The No Detour Option would slightly elevate the viaduct and would result in only minor visual effects, similar to the Detour Option. Under the Detour Option, only minor visual changes would be apparent such as the simpler architectural aesthetic on the façade and columns of the reconstructed viaduct structure. (See Figure 3.3.12 and Table 3.3.12)

Presidio Parkway Alternative –Under this alternative, the low viaduct structure would be demolished and Doyle Drive would be reconstructed in a tunnel. Removal of the low viaduct would create a visual connection between Crissy Field and the lower Tennessee Hollow/Main Post Area, although the elevated grassy knoll obstructs complete views of these buildings. Removal of the viaduct would improve the overall visual quality within the viewpoint. (See Figure 3.3.12 and Table 3.3.12)

Presidio Parkway Alternative (Unmitigated) –Under this alternative, building 201 would not be relocated to its original location. From this viewpoint however, only the roof top would be visible if the building were to be relocated. (See Figure 3.3.12, Presidio Parkway Alternative). As a result, the visual effects of this alternative, from this viewpoint only, would be improved when compared to the Presidio Parkway Alternative because, from this viewpoint, the historic elements and context of this building are not visible.(See Figure 3.3.12 and Table 3.3.12)

TABLE 3.3.12:
OVERALL VISUAL QUALITY CHANGE FROM THE HALLECK STREET SOUTH VIEWPOINT

Alternative	Visual Dominance of Doyle Drive	View Obstruction	Community Disruption/ Orientation/ Privacy	Vividness	Intactness	Unity	Overall Visual Quality
Existing							
No-Build	High	High	Medium	Low	Low	Low	Low
Change							
Replace and Widen (No Detour Option)	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Replace and Widen (Detour Option)	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Presidio Parkway	Strongly Beneficial	Strongly Beneficial	Strongly Beneficial	Strongly Beneficial	Strongly Beneficial	Strongly Beneficial	Strongly Beneficial
Parkway Presidio (Unmitigated)	Strongly Beneficial	Strongly Beneficial	Strongly Beneficial	Strongly Beneficial	Beneficial	Beneficial	Strongly Beneficial

Replace and Widen Alternative – No Detour Option

Replace and Widen Alternative – Detour Option

Existing Condition

Presidio Parkway Alternative (Unmitigated)

Presidio Parkway Alternative

FIGURE 3.3.12 VIEWPOINT 12: HALLECK SOUTH

3.3.13 Viewpoint 13 Motorist View on Doyle Drive

Summary of Existing Conditions

This viewpoint is from Doyle Drive in the vicinity of the National Cemetery looking east. This view represents motorists at this point traveling on Doyle Drive. Section 2.2.3, Landscape Units, provides descriptions of the motorist's views while traveling along Doyle Drive.

Visual Effects of Alternatives

No-Build Alternative – The No-Build Alternative would not modify any of the visual elements of Doyle Drive. There would be no visual changes from this viewpoint with this alternative.

Replace and Widen Alternative – The No Detour Option would slightly elevate the viaduct. This would only slightly change the visual effects which would not be readily visible from this viewpoint. Under the Replace and Widen Alternative, Detour Option, a center divider would be constructed on Doyle Drive. Doyle Drive would also be widened and restriped under this alternative. These changes would have a minimal effect on the overall visual quality, as the changes would not be readily visible from this viewpoint. (See Figure 3.3.13 and Table 3.3.13)

Presidio Parkway Alternative – Under the Presidio Parkway Alternative, at-grade and above-ground portions of Doyle Drive would be removed and placed in a tunnel at this viewpoint. As motorists approach the end of the tunnel, views begin to open, however, while in the tunnel, the motorist's view would change dramatically as the existing views of the National Cemetery, woodlands, Main Post and Crissy Field would be completely obstructed. Additionally, architectural features of Doyle Drive, such as lighting standards matching those of the Golden Gate Bridge would be replaced by tunnel lighting. (See Figure 3.3.13 and Table 3.3.13)

This would affect approximately 105,000 to 108,000 vehicles a day in the year 2030. This change in motorists' views under the Presidio Parkway Alternative would be considered adverse.

TABLE 3.3.13:
OVERALL VISUAL QUALITY CHANGE FROM THE MOTORIST'S VIEW ON DOYLE DRIVE

Alternative	Visual Dominance of Doyle Drive	View Obstruction	Community Disruption/ Orientation/ Privacy	Vividness	Intactness	Unity	Overall Visual Quality
Existing							
No-Build	High	Low	None	Medium	Medium	Medium	Medium
Change							
Replace and Widen (No Detour Option)	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Replace and Widen (Detour Option)	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Presidio Parkway	Negligible	Strongly Adverse	Strongly Adverse	Strongly Adverse	Strongly Adverse	Strongly Adverse	Strongly Adverse

Replace and Widen Alternative – No Detour Option

Existing Condition

Replace and Widen Alternative – Detour Option

Presidio Parkway Alternative

FIGURE 3.3.13 VIEWPOINT 13: MOTORIST VIEW ON DOYLE DRIVE

3.3.14 Viewpoint 14: Halleck Northwest

Summary of Existing Conditions

This viewpoint is located on Halleck looking north, further north along Halleck Street than Viewpoint 4. Similar to Viewpoint 4, Doyle Drive is a major feature because of its elevated location in this view. Presidio buildings line both sides of the street and the mountaintops of the Marin Headlands and Angel Island are seen in the distance. The primary viewer groups in this area are workers, residents and recreation users.

Only slight visual effects would be noticed such as the simpler architectural aesthetic on the façade and columns of the reconstructed viaduct structure. The No Detour Option would slightly elevate the viaduct and would result in only slight visual effects, similar to the Detour Option.

Visual Effects of Alternatives

No-Build Alternative – The No-Build Alternative would not modify any of the visual elements of Doyle Drive. There would be no visual changes from this viewpoint with this alternative.

Replace and Widen Alternative – The Replace and Widen – No Detour Option would slightly elevate the viaduct and would result in visual effects similar to the Detour Option. Under the Detour Option, Doyle Drive would be widened and re-striped, and would remain in its current alignment. These changes would have a minimal effect on the overall visual quality, as the changes would not be readily visible from this viewpoint. (See Figure 3.3.14 and Table 3.3.14)

Presidio Parkway Alternative – Under the Presidio Parkway Alternative, the Doyle Drive low viaduct would be removed and placed underground. Removal of the low viaduct would provide an open view to the bay, the Marin Headlands, and Angel Island. One of the Presidio buildings would be removed to accommodate the tunnel and replaced with a grassy field. Removal of the viaduct would improve the vividness of the viewpoint, making the bay and the Marin Headlands the dominant elements of the view. Connectivity to the Marin Headlands is also created by the elevated tunnel being covered by a “rolling hills’ element, improving the unity and intactness of the view. The overall visual quality of the viewpoint would improve under the Presidio Parkway Alternative. (See Figure 3.3.14 and Table 3.3.14)

Presidio Parkway Alternative (Unmitigated) – Under this alternative, the removal of Building 201 would result in slightly adverse effects to the unity and intactness of the view by reducing the historic streetscape. However, removal of the building would reduce view obstruction and improve views to the Bay and Angel Island in the distance. From an overall visual quality perspective, the slightly adverse effect on unity and intactness would result in a slightly adverse effect on the overall visual quality of the view. (See Figure 3.3.14 and Table 3.3.14)

TABLE 3.3.14:
OVERALL VISUAL QUALITY CHANGE FROM HALLECK NORTHWEST

Alternative	Visual Dominance of Doyle Drive	View Obstruction	Community Disruption/ Orientation/ Privacy	Vividness	Intactness	Unity	Overall Visual Quality
Existing							
No-Build	Medium	High	Low	Low	Medium	Low	Medium
Change							
Replace and Widen (No Detour Option)	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Replace and Widen (Detour Option)	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Presidio Parkway	Beneficial	Beneficial	Beneficial	Beneficial	Beneficial	Beneficial	Beneficial
Presidio Parkway (Unmitigated)	Beneficial	Beneficial	Beneficial	Beneficial	Slightly Adverse	Slightly Adverse	Slightly Adverse

3.3.15 Viewpoint 15: Girard Road

Summary of Existing Conditions

This viewpoint is located in the Richardson Avenue Exit Landscape Unit. The view is looking east toward Gorgas Avenue. The Gorgas Warehouses line the left side of the road from this view, creating a historic streetscape element with a paved parking lot adjacent to the north. Trees and scattered bushes run parallel to the warehouses in the background of this view. Beyond the trees in the background the dome of the Palace of Fine Arts, which stands higher than the trees, is visible. From this viewpoint, Doyle Drive is not visible. At this point, it is in a low viaduct hidden behind the trees. The primary viewer groups in this area are workers, residents and recreation users.

Visual Effects of Alternatives

No-Build Alternative – The No-Build Alternative would not modify any of the visual elements of Doyle Drive. There would be no visual changes from this viewpoint with this alternative.

Replace and Widen Alternative – The Replace and Widen – No Detour Option would place Doyle Drive into the view, partially obstructing the views of the trees as well. This would reduce the vividness of the view and the overall visual quality. Under the Detour Option, Doyle Drive would be widened and re-striped, and would remain in its current alignment. A new structure would be constructed in front of the existing parking area which would require the removal of mature trees in the background and obstruct views of the remaining trees. This would reduce the vividness of the view and the overall visual quality. (See Figure 3.3.15 and Table 3.3.15)

Presidio Parkway Alternative – Under the Presidio Parkway Alternative, Doyle Drive would be moved closer to the warehouses and into the view. The existing parking lot would be removed and replaced by the realigned Girard Avenue. The view of the Palace of Fine Arts and the Gorgas Warehouses would remain, maintaining the orientation of the view. Views of the mature trees would become partially obstructed by the low viaduct. The addition of Doyle Drive and the Girard Avenue and Gorgas Road intersection, with traffic signals, to the view would reduce the intactness and unity of the view and detract from the historic streetscape element of the Gorgas Warehouses, resulting in adverse changes to the overall visual quality of the view. (See Figure 3.3.15 and Table 3.3.15)

TABLE 3.3.15:
OVERALL VISUAL QUALITY CHANGE FROM GIRARD ROAD

Alternative	Visual Dominance of Doyle Drive	View Obstruction	Community Disruption/ Orientation/ Privacy	Vividness	Intactness	Unity	Overall Visual Quality
Existing							
No-Build	Low	Low	Low	Medium	Medium	Medium	Medium
Change							
Replace and Widen (No Detour Option)	Adverse	Slightly Adverse	Slightly Adverse	Slightly Adverse	Negligible	Negligible	Slightly Adverse
Replace and Widen (Detour Option)	Negligible	Adverse	Negligible	Adverse	Negligible	Negligible	Slightly Adverse
Presidio Parkway	Strongly Adverse	Adverse	Negligible	Adverse	Adverse	Adverse	Adverse

Replace and Widen Alternative – No Detour Option

Existing Condition

Replace and Widen Alternative – Detour Option

Presidio Parkway Alternative

FIGURE 3.3.15 VIEWPOINT 15: GIRARD ROAD

3.3.16 Viewpoint 16: McDowell Avenue

Summary of Existing Conditions

The view is looking north along McDowell Avenue. Doyle Drive runs across the viewshed on a high viaduct with views of Stilwell Hall, straight ahead, and two of the Calvary Stables to the left. In the distance, views of Crissy Field, the bay, and the Marin Headlands are also visible from this viewpoint. The primary viewer groups in this area are workers, residents and recreation users.

Visual Effects of Alternatives

No-Build Alternative – The No-Build Alternative would not modify any of the visual elements of Doyle Drive. There would be no visual changes from this viewpoint with this alternative.

Replace and Widen – Under the Replace and Widen Alternative, Doyle Drive would be removed and reconstructed closer to the Calvary Stables. Because of the proximity to the stables, the structure would appear larger. The support columns would be placed at a distance that would allow a clearer view of Stilwell Hall, the Marin Headlands and the Bay beneath Doyle Drive and between the support columns. However, the increased dominance of Doyle Drive within this view would result in low intactness, unity, and overall low visual quality. The No Detour and Detour Options would not differ from this viewpoint. (See Figure 3.3.16 and Table 3.3.16)

Presidio Parkway Alternative – Under the Presidio Parkway Alternative Option, Doyle Drive would be removed and reconstructed closer to the Cavalry Stables. Because of the proximity to the Cavalry Stables, the structure would appear larger. The distance between support columns would be larger and allow for a clearer view of Stilwell Hall, the Marin Headlands and the Bay beneath Doyle Drive. However, the increased dominance of the Doyle Drive within this view results in low intactness, unity, and overall visual quality. (See Figure 3.3.16 and Table 3.3.16)

TABLE 3.3.16: OVERALL VISUAL QUALITY CHANGE FROM MCDOWELL AVENUE

Alternative	Visual Dominance of Doyle Drive	View Obstruction	Community Disruption/ Orientation/ Privacy	Vividness	Intactness	Unity	Overall Visual Quality
Existing							
No-Build	High	Medium	Low	Medium	Medium	Medium	Medium
Change							
Replace and Widen	Minimally Adverse	Negligible	Minimally Adverse	Minimally Adverse	Minimally Adverse	Minimally Adverse	Minimally Adverse
Presidio Parkway	Minimally Adverse	Negligible	Minimally Adverse	Minimally Adverse	Minimally Adverse	Minimally Adverse	Minimally Adverse

Replace and Widen Alternative – No Detour Option

Replace and Widen Alternative – Detour Option

Existing Condition

Presidio Parkway Alternative (Unmitigated)

Presidio Parkway Alternative

FIGURE 3.3.14 VIEWPOINT 14: HALLECK NORTHWEST

Existing Condition

Replace and Widen Alternative

Presidio Parkway Alternative

FIGURE 3.3.16 VIEWPOINT 16: MCDOWELL AVENUE

3.3.17 Viewpoint 17: Cavalry Stables West

Summary of Existing Conditions

This viewpoint is located in front of the Cavalry Stables. The view is looking west along on Lincoln Boulevard. Doyle Drive, on a high viaduct, is visible from this view point. As the viaduct runs west, it disappears in the tall trees. Left of the trees, one of the Stables is visible. Through the supporting columns of the high viaduct, several presidio buildings are also visible. Small views of the Golden Gate Bridge and the Marin Headlands can be seen in the far distance. The primary viewer group in this area is presidio employees that work in Buildings 667 and 669.

Visual Effects of Alternatives

No-Build Alternative – The No-Build Alternative would not modify any of the visual elements of Doyle Drive. There would be no visual changes from this viewpoint with this alternative.

Replace and Widen Alternative – Under the Replace and Widen Alternative, the Doyle Drive high viaduct would be removed and reconstructed closer to the viewpoint. Because of its closer proximity, the high viaduct becomes more visually dominant in this view. The architectural design of the new viaduct should maintain its connectivity to the Golden Gate Bridge in the background. However, moving the viaduct closer to the viewpoint would increase Doyle Drive's visual dominance and reduce the intactness and unity of the view and overall visual quality of the view. The No Detour and Detour Options would not differ from this viewpoint. (See Figure 3.3.17 and Table 3.3.17)

Presidio Parkway Alternative – Under the Presidio Parkway Alternative, the Doyle Drive high viaduct would be removed and reconstructed closer to the viewpoint. Because of its closer proximity, the high viaduct would become more visually dominant in this view. The architectural design of the new viaduct, particularly the metal support beams, would maintain its visual connectivity to the Golden Gate Bridge in the background. However, moving the viaduct closer to the viewpoint would increase Doyle Drive's visual dominance and reduce the intactness and unity of the view and overall visual quality of the view. (See Figure 3.3.17 and Table 3.3.17)

TABLE 3.3.17:
OVERALL VISUAL QUALITY CHANGE FROM THE CALVARY STABLES WEST

Alternative	Visual Dominance of Doyle Drive	View Obstruction	Community Disruption/ Orientation/ Privacy	Vividness	Intactness	Unity	Overall Visual Quality
Existing							
No-Build	High	Medium	Low	Medium	Medium	Medium	Medium
Change							
Replace and Widen	Minimally Adverse	Minimally Adverse	Minimally Adverse	Minimally Adverse	Minimally Adverse	Minimally Adverse	Minimally Adverse
Presidio Parkway	Minimally Adverse	Minimally Adverse	Minimally Adverse	Minimally Adverse	Minimally Adverse	Minimally Adverse	Minimally Adverse

Existing Condition

Replace and Widen Alternative

Presidio Parkway Alternative

FIGURE 3.3.17 VIEWPOINT 17: CAVALRY STABLES WEST

3.3.18 Viewpoint 18: Toward Armistead Road

Summary of Existing Conditions

This viewpoint is located along Doyle Drive. The view is looking west toward Armistead Road. Doyle Drive is at-grade and visible from this viewpoint. Doyle Drive is lined with tall, mature trees that act as buffers on each side, creating a park-like aesthetic for motorists, the primary viewers of this viewpoint.

Visual Effects of Alternatives

No-Build Alternative – The No-Build Alternative would not modify any of the visual elements of Doyle Drive. There would be no visual changes from this viewpoint with this alternative.

Replace and Widen Alternative – The Replace and Widen Alternative would not modify any of the visual elements of Doyle Drive at this location. There would be no visual changes from this viewpoint with this alternative. (See Figure 3.3.18 and Table 3.3.18)

Presidio Parkway Alternative – The No Slip Ramp Option would remove some of the large trees to accommodate the wider road creating a gap in vegetation, exposing the apartment buildings along Armistead Road to view. This greatly decreases the park-like aesthetic for motorists traveling along this portion of Doyle Drive resulting in an adverse change in overall visual quality. Exposing the apartment buildings to motorists would also create privacy issues for the residents.

The Merchant Road Slip Ramp Option would place a slip ramp adjacent to Doyle Drive which would require the removal of trees along Doyle Drive as well as the apartment buildings along Armistead Road that would be visible under the No Slip Ramp Option resulting in a consistent landscaped/green corridor, similar to the existing aesthetic. However, the removal of some of the vegetation would result in minimally adverse changes to the vividness of the viewpoint. (See Figure 3.3.18 and Table 3.3.18)

TABLE 3.3.18:
OVERALL VISUAL QUALITY CHANGE FROM THE TOWARD ARMISTEAD ROAD VIEWPOINT

Alternative	Visual Dominance of Doyle Drive	View Obstruction	Community Disruption/ Orientation/ Privacy	Vividness	Intactness	Unity	Overall Visual Quality
Existing							
No-Build	High	Low	Low	Low	Medium	Medium	Medium
Change							
Replace and Widen- No Detour Option	No Change	No Change	No Change	No Change	No Change	No Change	No Change
Presidio Parkway (No Slip Ramp Option)	Negligible	Negligible	Adverse	Adverse	Adverse	Adverse	Adverse
Presidio Parkway (Merchant Slip Ramp Option)	Negligible	Negligible	Negligible	Minimally Adverse	Negligible	Negligible	Negligible

Replace and Widen Alternative

Existing Condition

Presidio Parkway Alternative – Merchant Road Slip Ramp Option

Presidio Parkway Alternative

FIGURE 3.3.18 VIEWPOINT 18: TOWARD ARMISTEAD ROAD

3.3.19 Viewpoint 19: Main Post (Building 106)

Summary of Existing Conditions

The Main Post (Building 106) viewpoint is located within the Parade Grounds of the Main Post. From this view, a portion of Doyle Drive is slightly visible through the trees. Historic Building 106 and the parade grounds parking area are visible within this view, as well as eucalyptus, cypress and palm trees and a variety of landscaping. The Marina Headlands are also visible in the distance. Main Post employees and recreational users are the primary viewer groups of this viewpoint.

Visual Effects of Alternatives

No-Build Alternative – The No-Build Alternative would not modify any of the visual elements of Doyle Drive. There would be no visual changes from this viewpoint with this alternative.

Replace and Widen Alternative – The Replace and Widen No Detour Option would elevate the Doyle Drive Viaduct by two meters (six feet), increasing the viaduct's visibility within this view. The elevated structure would decrease the unity of the view established by Building 106 and unique landscaping of the Presidio. Elevating Doyle Drive would also slightly obstruct views to the headlands in the distance. The increased view of the viaduct would result in adverse changes to the vividness, intactness, and unity of the viewpoint resulting in adverse changes to the overall visual quality of the view.

Under the Replace and Widen Detour Option, Doyle drive would remain at its current elevation. Modifications to Doyle Drive under this option would not be visible from this viewpoint resulting I negligible changes to the overall visual quality of the viewpoint. (See Figure 3.3.19 and Table 3.3.19)

Presidio Parkway Alternative – The Presidio Parkway Alternative would place Doyle Drive into a tunnel at this segment and remove the viaduct from this view. Removing Doyle Drive from this viewpoint would result in slightly increased views of the headlands and minimally beneficial changes to the vividness, unity, and overall visual quality of the viewpoint. (See Figure 3.3.19 and Table 3.3.19)

TABLE 3.3.19:
OVERALL VISUAL QUALITY CHANGE FROM THE MAIN POST (BUILDING 106) VIEWPOINT

Alternative	Visual Dominance of Doyle Drive	View Obstruction	Community Disruption/ Orientation/ Privacy	Vividness	Intactness	Unity	Overall Visual Quality
Existing							
No-Build	Low	Low	Low	High	Medium	Medium	Medium
Change							
Replace and Widen (No Detour Option)	Adverse	Adverse	Negligible	Adverse	Adverse	Adverse	Adverse
Replace and Widen (Detour Option)	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Presidio Parkway	Minimally Beneficial	Minimally Beneficial	Negligible	Minimally Beneficial	Minimally Beneficial	Minimally Beneficial	Minimally Beneficial

Replace and Widen Alternative – No Detour Option

Existing Condition

Replace and Widen Alternative – Detour Option

Presidio Parkway Alternative

FIGURE 3.3.19 VIEWPOINT 19: MAIN POST (BUILDING 106)

3.4 CONSISTENCY WITH SCENIC/VISUAL RESOURCE PLANS AND POLICIES

The project alternatives vary with regard to consistency with federal, state, and local plans and policies regarding scenic/visual resources. Appendix B contains a complete evaluation of the consistency of each alternative with relevant scenic/visual plans and policies. In general, Alternative 1 (No-Build) would result in no change to the existing visual quality and character of the project area. The Replace and Widen Alternative would result in substantial visual change during construction, but long-term the visual change would be minor (with the Detour Option) to moderate (with the No Detour Option) through the Main Post/Crissy Field and Letterman areas of the Presidio. However, each of these alternatives would perpetuate the existing visual conditions associated with Doyle Drive, which in some locations involve view blockage and visual separation of adjacent areas of the Presidio. Since they would not improve views and visual quality, they are considered inconsistent with a number of NPS and Presidio Trust planning policies regarding scenic/visual resources. At the same time, these alternatives preserve scenic views and vistas of the Presidio, the Bay, and the Golden Gate Bridge that occur from Doyle Drive, consistent with scenic/visual resources policies of other agencies.

Presidio Parkway Alternative (Presidio Parkway) would be generally consistent with scenic/visual resources policies because much of Doyle Drive would be removed from the landscape and placed in a tunnel. This would restore historic vistas and improve views from certain areas within the Presidio, consistent with NPS and Presidio Trust planning policies. However, these benefits would be achieved at the expense of views enjoyed by motorists on Doyle Drive, which is inconsistent with other planning policies.

SECTION 4: MITIGATION MEASURES

During the 4-5 year construction period, all build alternatives would result in a substantial adverse change in the visual character of the study area. All build alternatives would require the removal of substantial amounts of existing landscaping and vegetation during construction, resulting in a substantial negative visual impact. The Replace and Widen, Detour Option would also require the construction of a detour road and structure north of the existing Doyle Drive alignment to re-route traffic around construction areas. After construction is complete the detour road and structure would be removed and all temporarily affected areas restored to their appropriate native vegetation in natural areas, or appropriate ornamental vegetation type in landscaped areas. In some areas full restoration of mature natural species may take between ten and twenty years.

Design Guidelines for restoration of temporarily affected areas will be developed with the Trust, the National Park Service, and the State Office of Historic Preservation. The Design Guidelines will be a collaborative effort, and will provide a planning and design framework for the new construction and associated landscaping for Doyle Drive. The Design Guidelines will incorporate the Secretary of Interior's Standards for Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes (National Parks Service, 1995). The Design Guidelines will provide a framework to ensure that the design and construction of Doyle Drive will be compatible with the Presidio as a National Historic Landmark District. The Design Guidelines will include sections on context and history, guidelines, design review, and other relevant background information. Within the Design Guidelines, restoration criteria will include general restoration concepts and methods, including matching the original lighting standards of Doyle Drive which match those of the Golden Gate Bridge.

Additional Design Guidelines will include vegetation and landscaping restoration in accordance with the Presidio Vegetation Management Plan and in coordination with the Presidio trust. Based on the principles in the Presidio Vegetation Management Plan and the Presidio Trust Management Plan, some vegetation could be selectively removed to enhance views where appropriate and in consultation with the Presidio Trust.

Monitoring of restored areas will occur for five consecutive years following plant installation using standard ecological methods that qualitatively estimate plant cover and to document survival rates and growth characteristics.

SECTION 5: REFERENCES

The following documents were referenced in the preparation of this Draft Visual Impact Assessment:

Federal Highway Administration Guidelines, US Department of Transportation, no date.

Secretary of Interior's Standards for Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes, US National Parks Service, 1996.

South Access to the Golden Gate Bridge – Doyle Drive Final Public Meeting and Outreach Summary Report, Prepared by Public Affairs Management, April 2004.

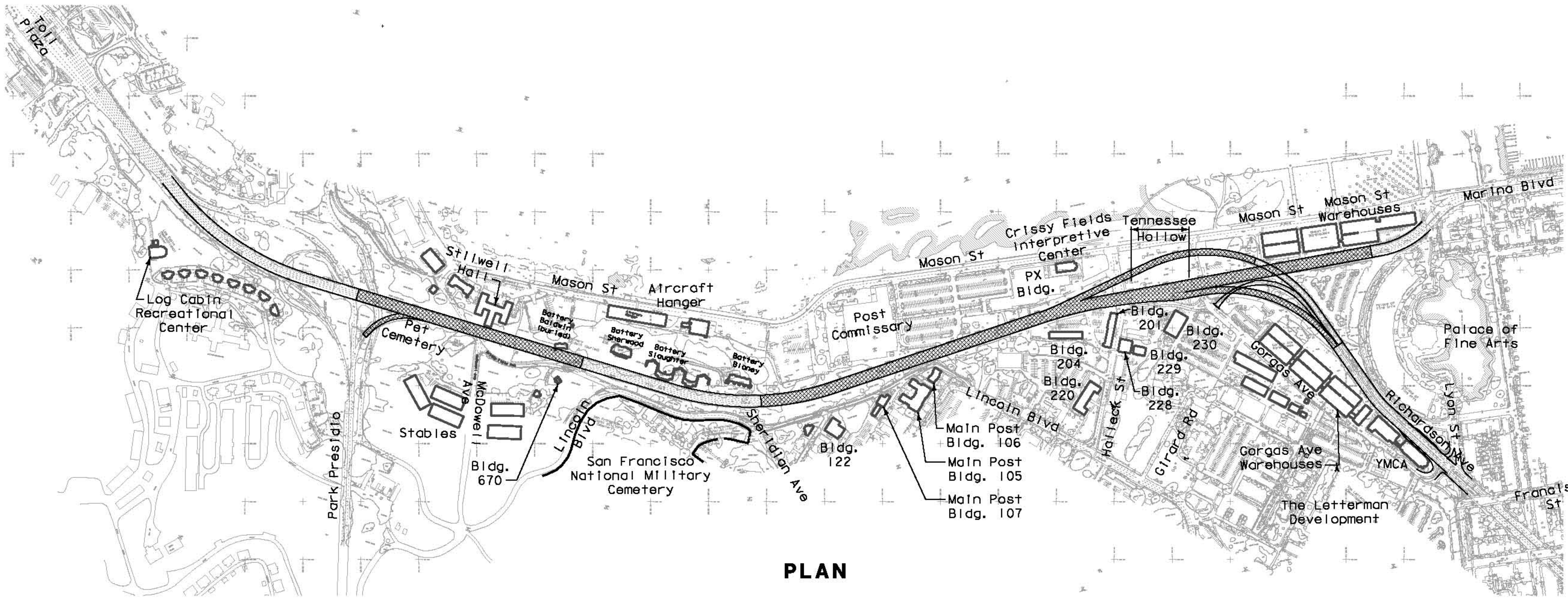
Coast Highway Management Plan Scenic Qualities Inventory Report. Prepared by Public Affairs Management for Caltrans District 5, January 2002.

I680 Auxiliary Lanes Visual Assessment, Prepared by Public Affairs Management, July 1998.

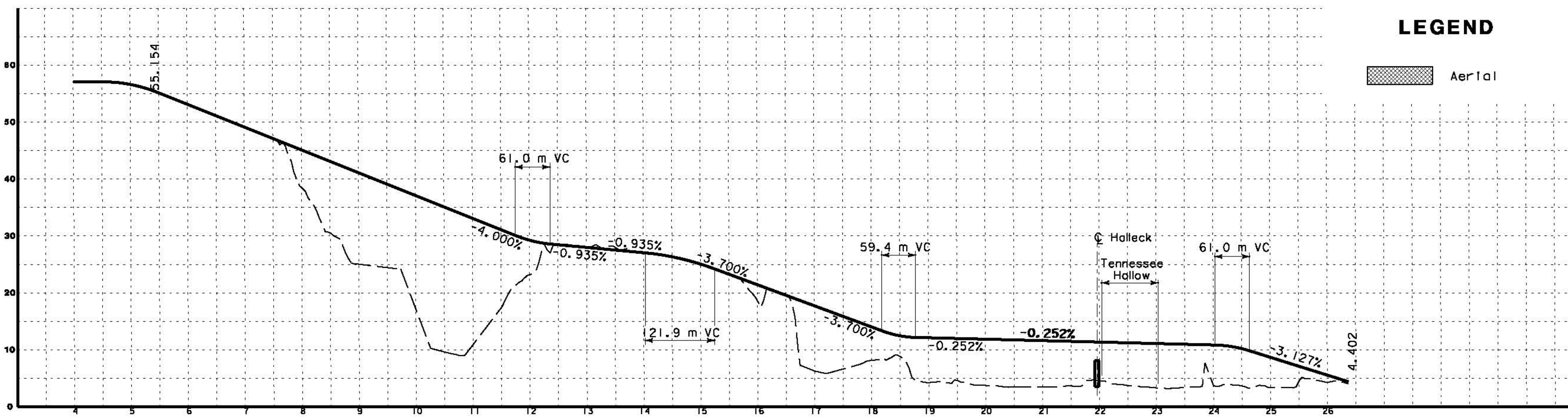
APPENDIX A

MAPS

1. No Build



PLAN



PROFILE

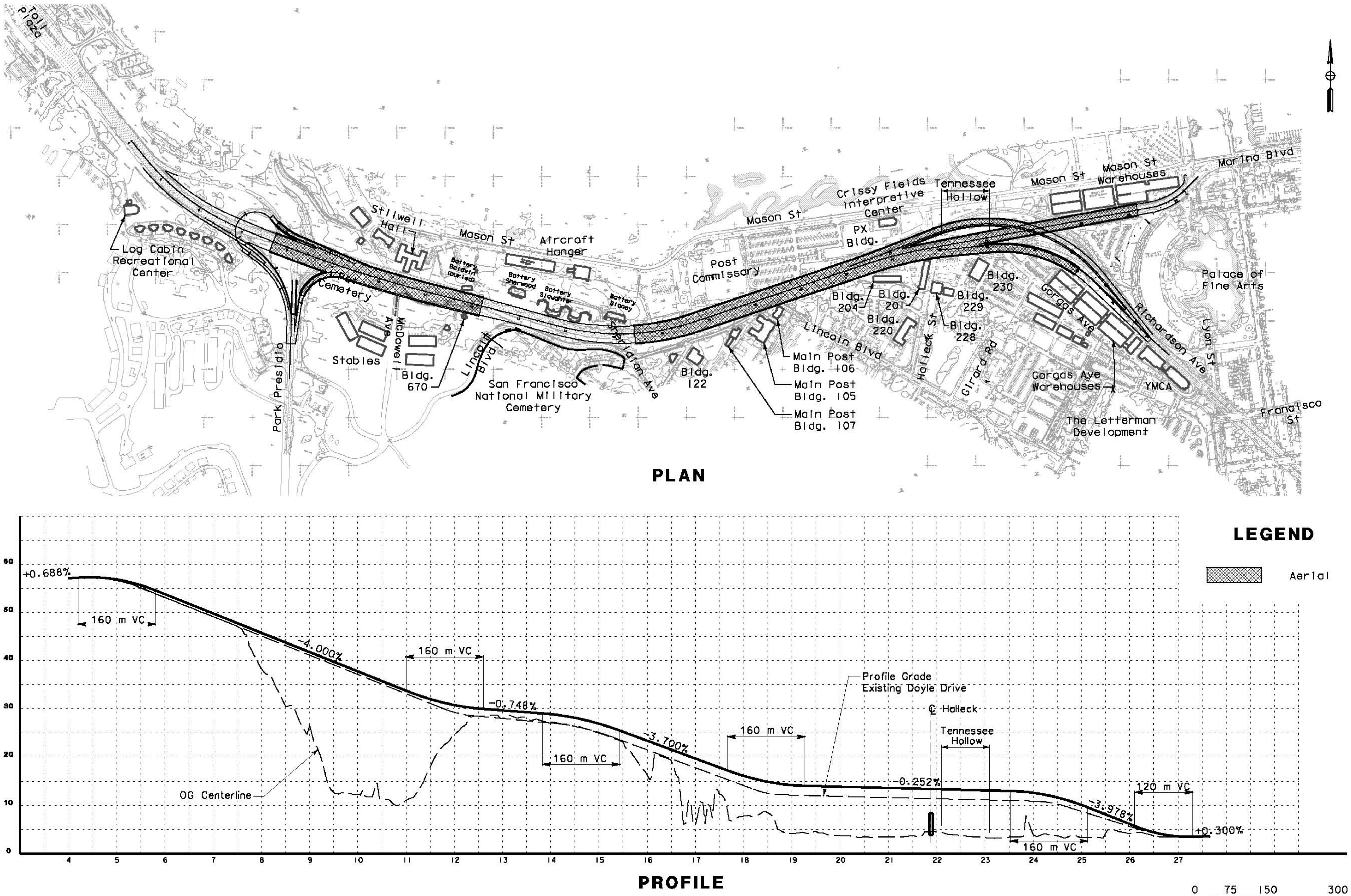
LEGEND

Aerial

0 75 150 300

arsham
7/13/2004 1:22:37 PM
t:\13145\ms\dgn\nb-1117.dgn

2a. Replace and Widen - No Detour



LEGEND

Aerial

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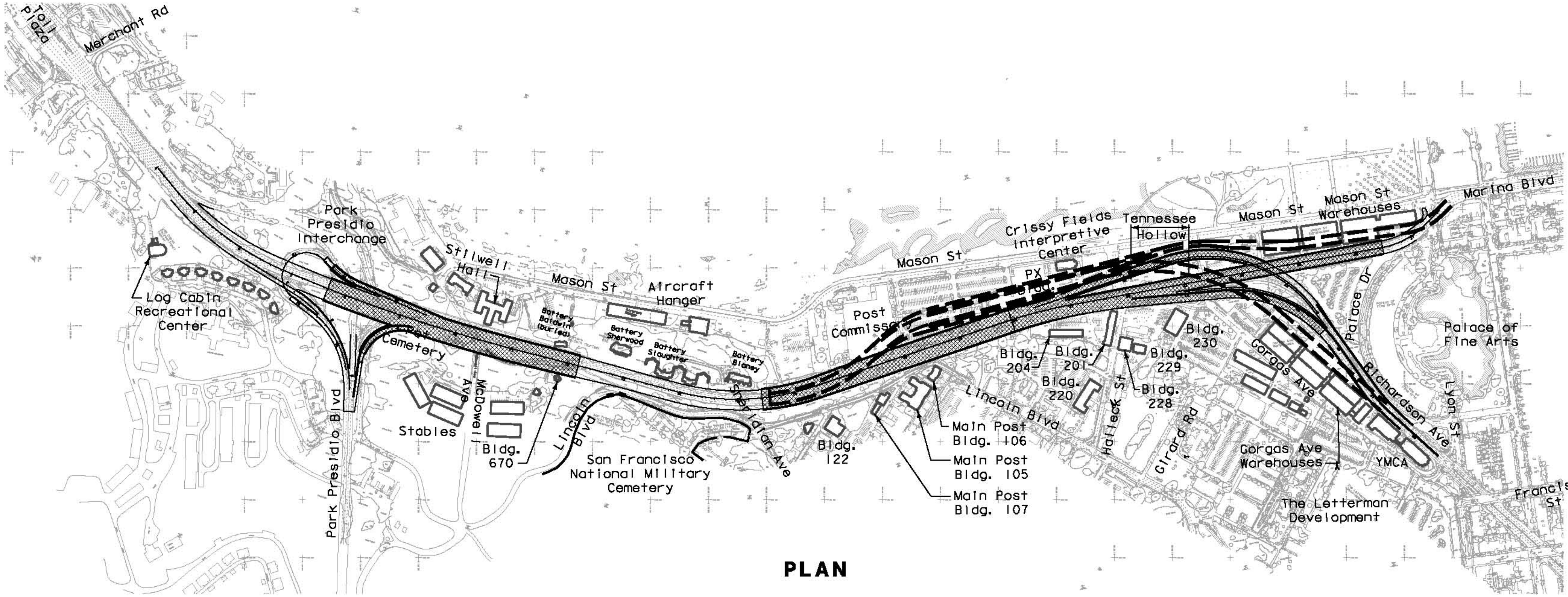
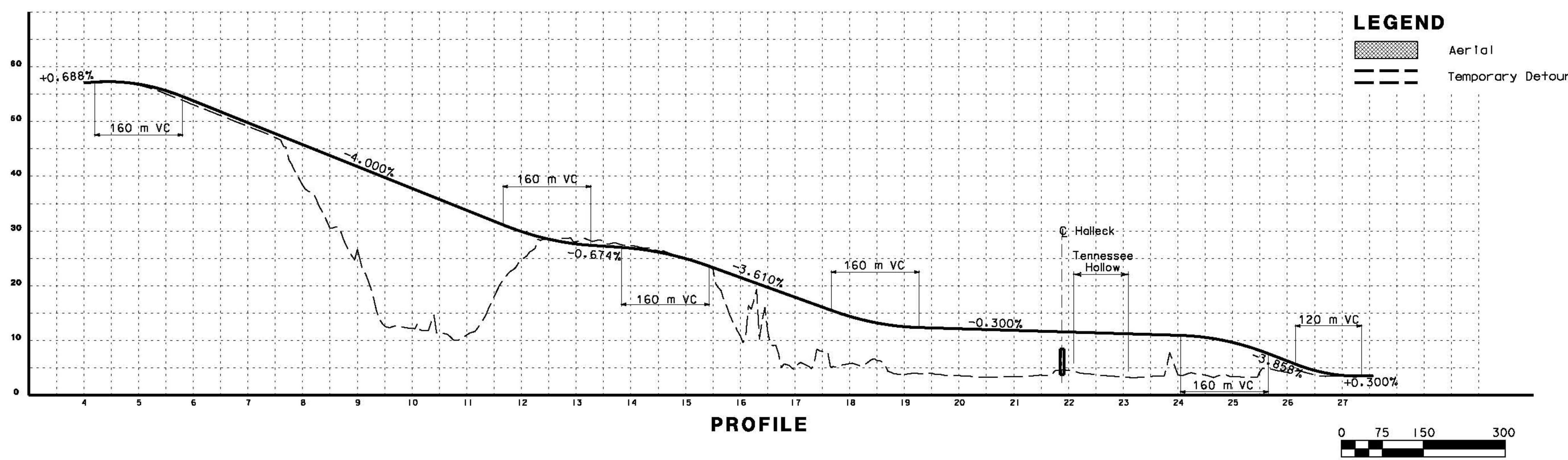
2. Replace and Widen - With Detour





graham
9/14/2004 11:27:48 AM
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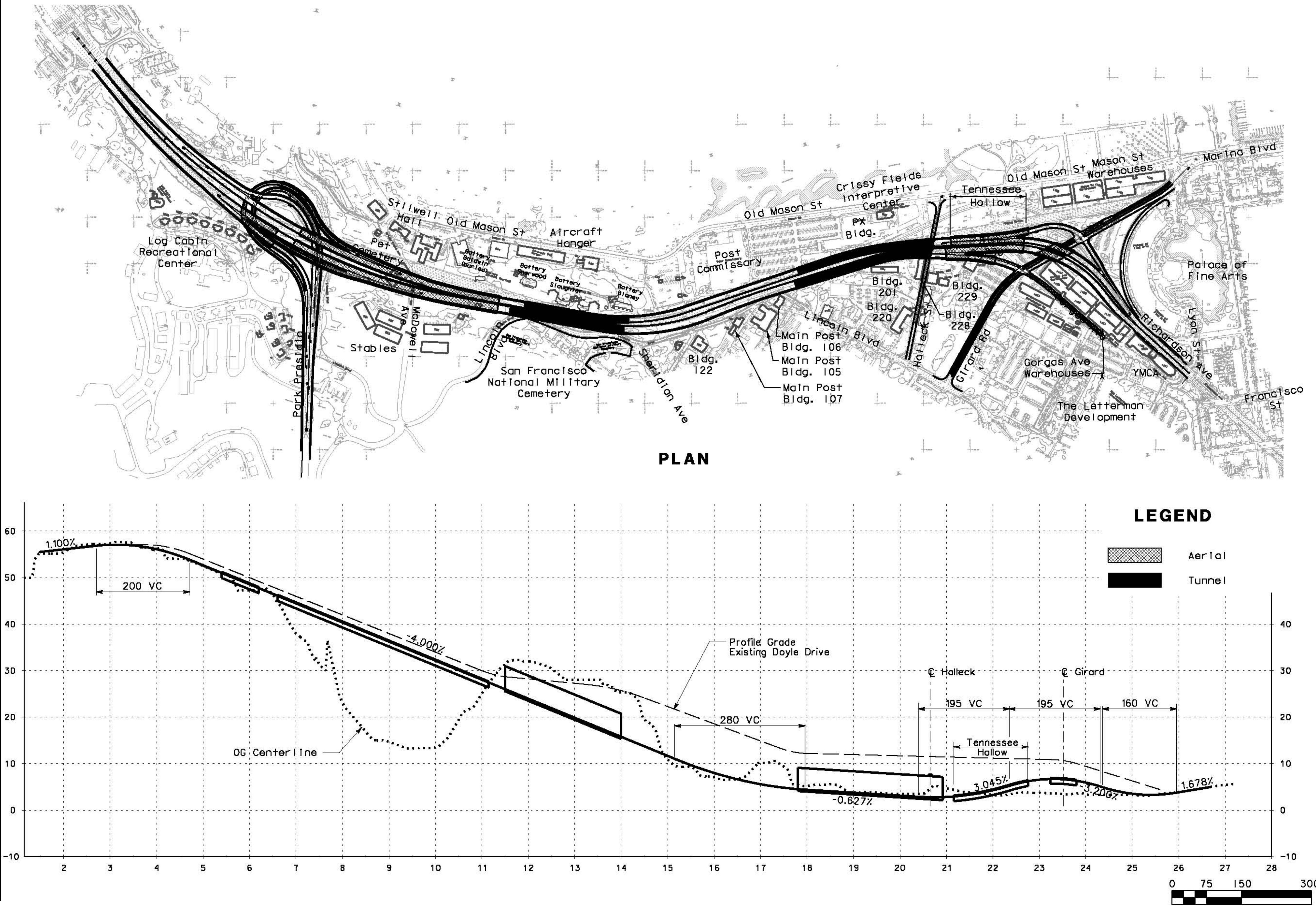
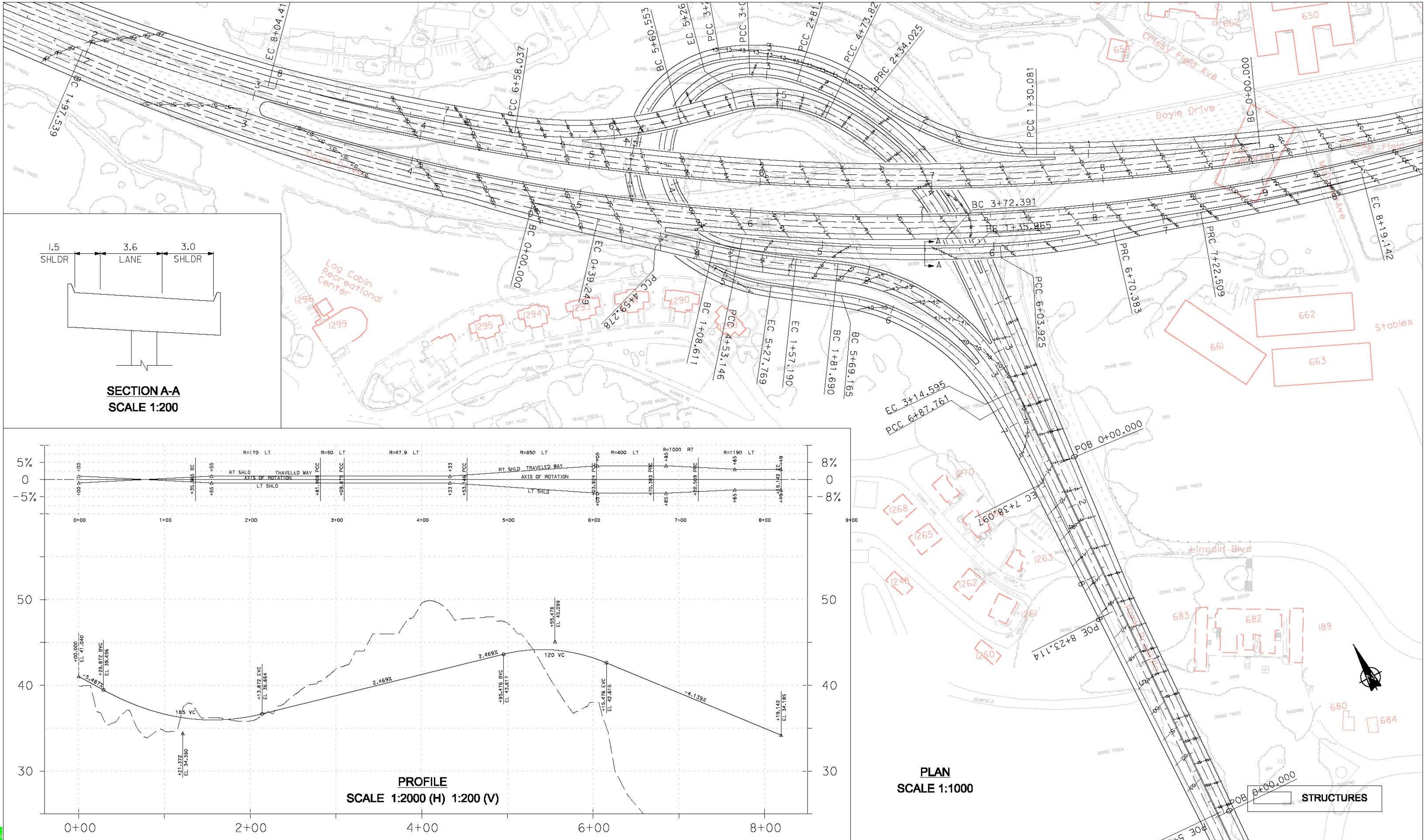
5. Presidio Parkway





SECTION A-A
SCALE 1:200

PROFILE
SCALE 1:2000 (H) 1:200 (V)

PLAN
SCALE 1:1000

Caltrans

Issue	Date	By	Chkd	Appd

Job Title
ALTERNATIVE 5
PRESIDIO PARKWAY

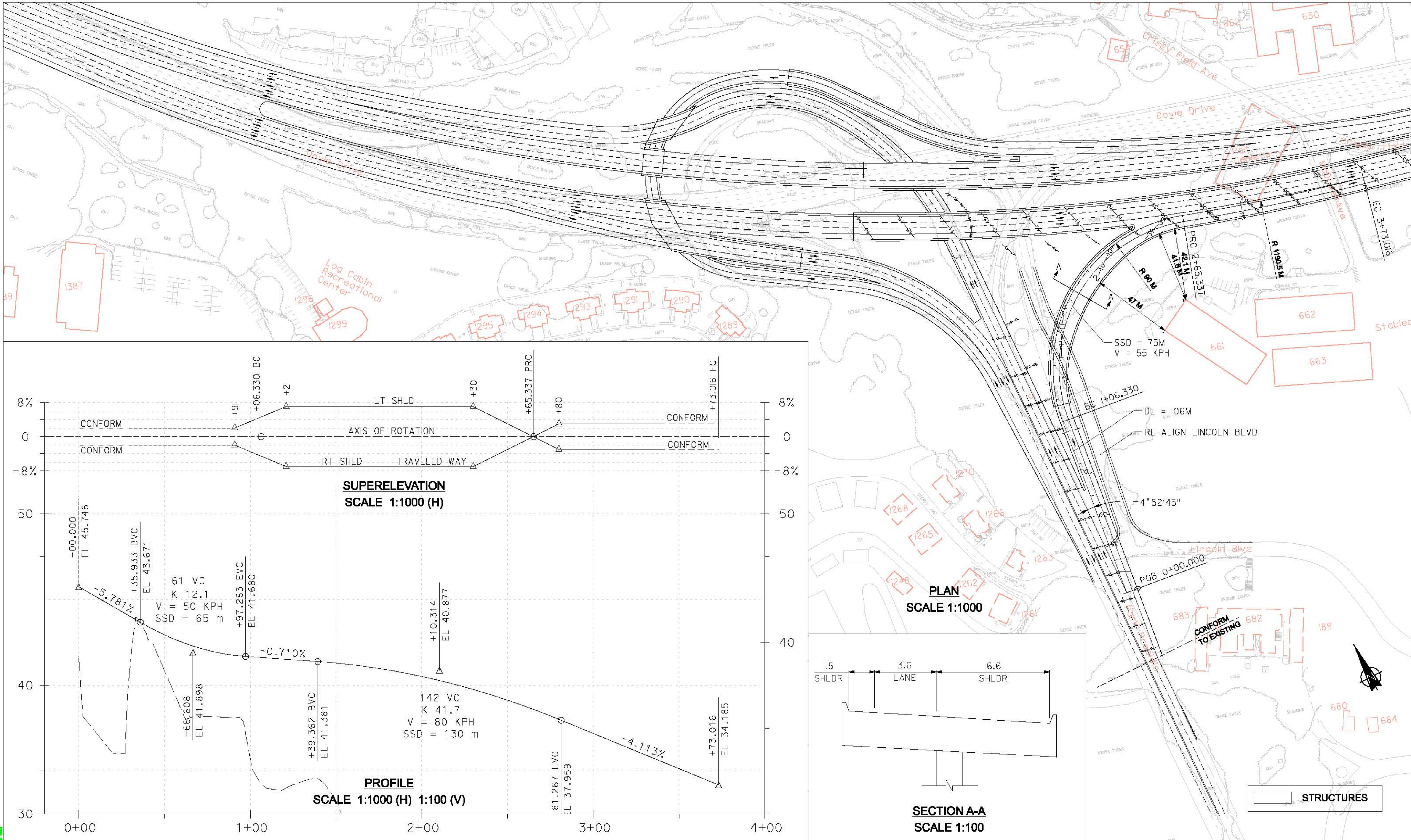
Drawing Title
OPTION 1: LOOP RAMP

Scale
AS SHOWN

File Name

Drawing Status
PRELIMINARY

Job No	Drawing No	Issue
130168-00	SFSK-054A	



Issue	Date	By	Chkd	Appd

Job Title
ALTERNATIVE 5
PRESIDIO PARKWAY

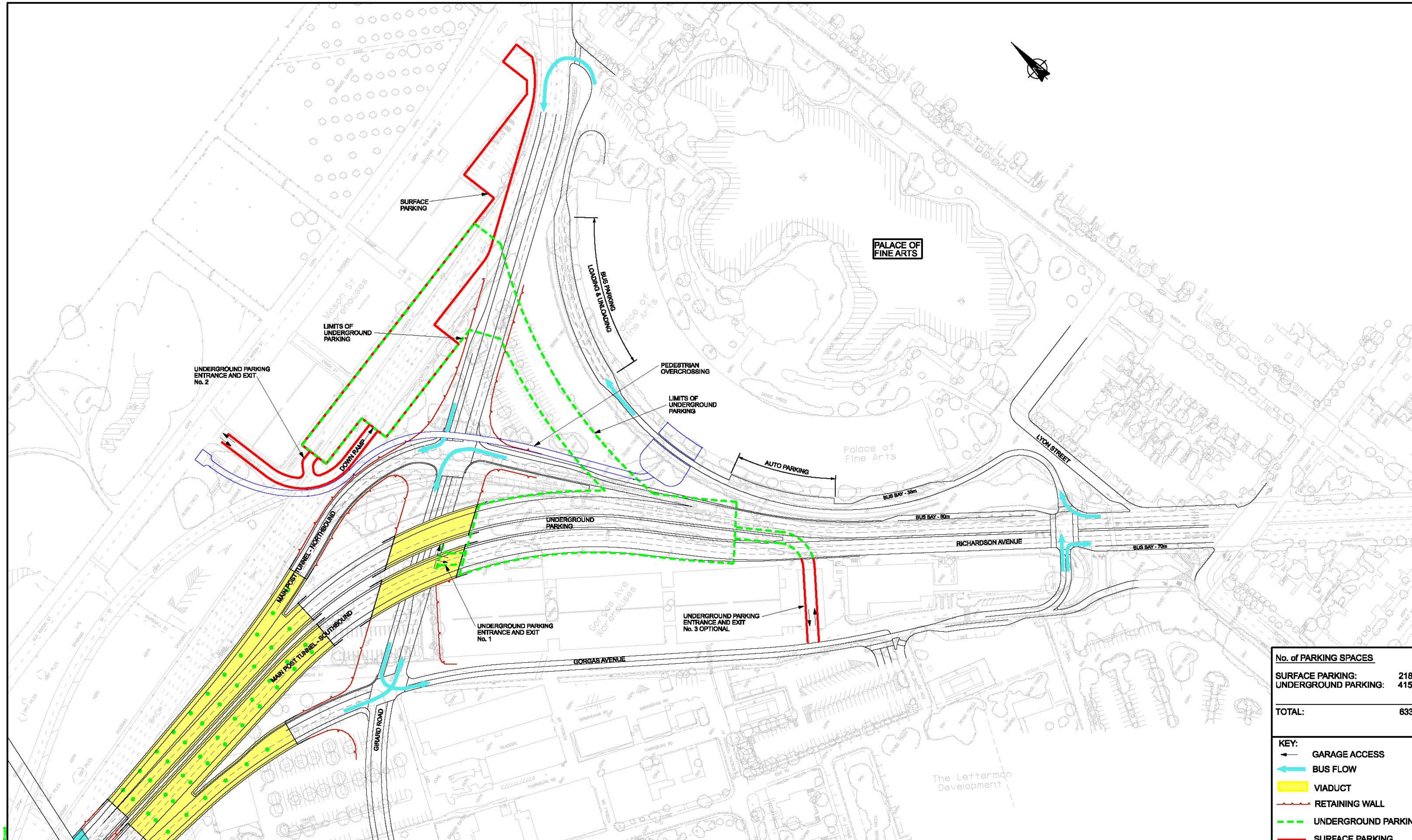
Drawing Title
OPTION 2: HOOK RAMP
(WITH GEOMETRIC REFINEMENTS)

Scale
AS SHOWN

File Name

Drawing Status
PERLIMINARY

Job No	Drawing No	Issue
130168-00	SFSK-054	



NOTES.
1. AUTO PARKING ESTIMATE IS BASED ON THE GUIDLINE OF 32.5 m2 per VEHICLE.
2. VEHICLE CLEARANCE:
1m Structure
3m Min

Issue	Date	By	Chkd	Appd

Job Title
ALTERNATIVE 5
PRESIDIO PARKWAY

Drawing Title
LAYOUT PLAN
DIAMOND OPTION
EAST END
PARKING & CIRCULATION

Scale: 1:1000
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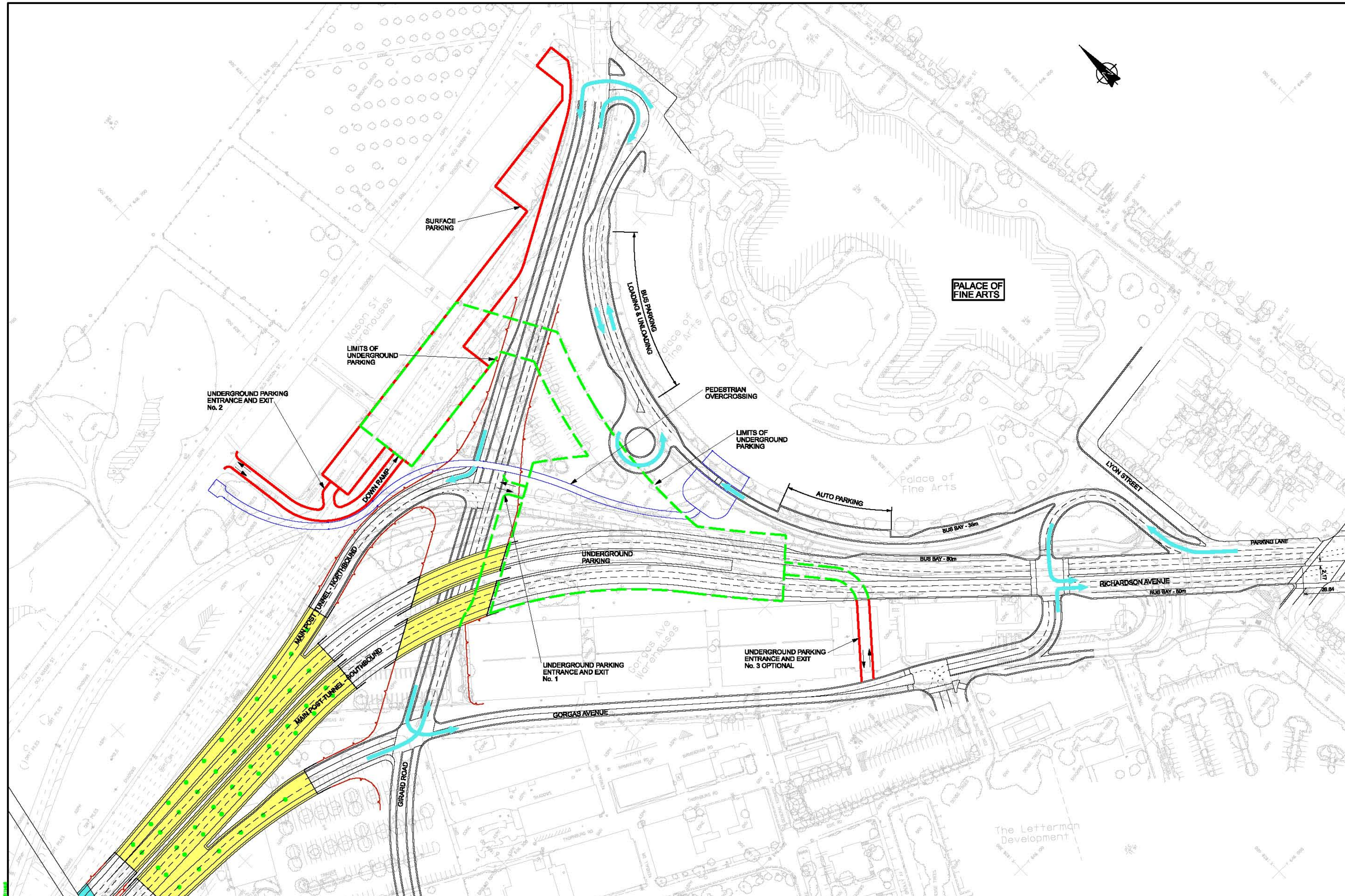
Drawing Status: DRAFT
Job No: 130168-00
Drawing No: SFSK-052
Issue: -



No. of PARKING SPACES

SURFACE PARKING:	218
UNDERGROUND PARKING:	415
TOTAL:	633

KEY:

- GARAGE ACCESS
- BUS FLOW
- VIADUCT
- RETAINING WALL
- UNDERGROUND PARKING
- SURFACE PARKING

NOTES.

1. AUTO PARKING ESTIMATE IS BASED ON THE GUIDELINE OF 32.5 m2 per VEHICLE.
2. VEHICLE CLEARANCE:

1m Structure
3m Min

Caltrans

Issue	Date	By	Chkd	Appd

Job Title
ALTERNATIVE 5
PRESIDIO PARKWAY

Drawing Title
LAYOUT PLAN
CIRCLE DRIVE
EAST END
PARKING & CIRCULATION

Scale: 1:1000
File Name SFSK-051.DGN
Drawing Status DRAFT
Job No 130168-00
Drawing No SFSK-051
Issue -

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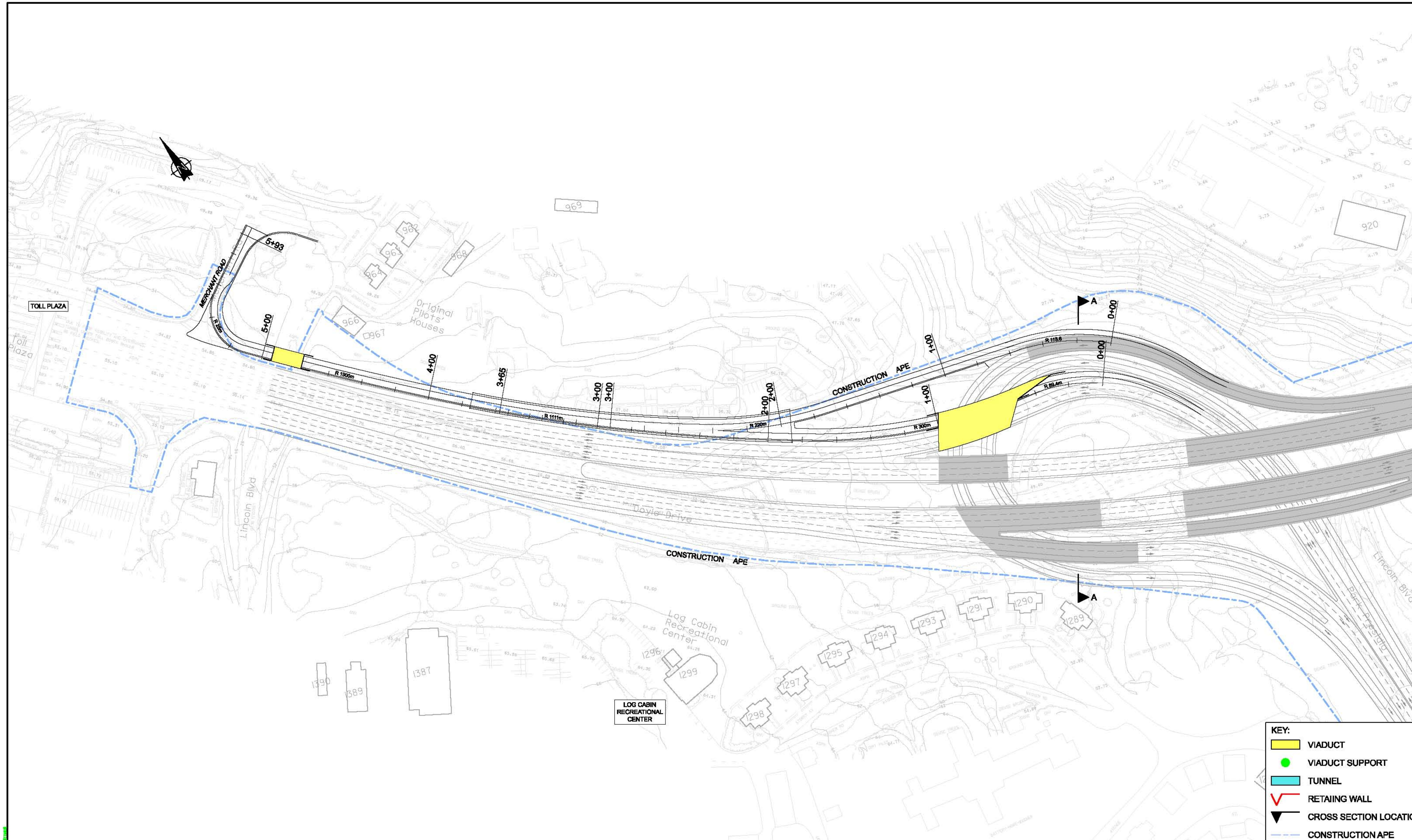


Issue	Date	By	Chkd	Appd

Job Title
ALTERNATIVE 5
PRESIDIO PARKWAY

Drawing Title
LAYOUT PLAN
MERCHANT ROAD OFF-RAMP

Scale: 1:1000
File Name SFSK-M01.DGN
Drawing Status
DRAFT
Job No 130158-00
Drawing No SFSK-M01
Issue -

APPENDIX B

CONSISTENCY WITH SCENIC/VISUAL RESOURCE PLANS

APPENDIX B – Consistency with Scenic/Visual Resource Plans and Policies

Table 1: General Management Plan - Presidio of San Francisco - National Park Service

Policies	Alt 1 - No Build	Alt 2 – Replace and Widen	Alt 5 – Presidio Parkway
Preserve, enhance and restore scenic vistas; retain the regional visual quality of the Presidio.	***Inconsistent*** –No changes would be made to Doyle Drive and therefore it would not preserve, enhance or restore scenic vistas. The visual quality of the Presidio would be retained with no improvements.	***Inconsistent*** – Doyle Drive would be widened in its current location and would have an adverse affect on visual quality.	***Consistent*** – Portions of Doyle Drive would be underground and would not be visible from the surface. It would preserve, enhance and restore scenic vistas; and it would help restore the regional visual quality of the Presidio.
Emphasis will be placed on respecting the visual grandeur and qualities and values of the Golden Gate	***Inconsistent*** –No changes would be made to Doyle Drive and therefore it would not preserve, enhance or restore scenic vistas. The visual quality of the Presidio would be retained with no improvements.	***Inconsistent*** – Focus is placed on replacing and widening Doyle Drive with little emphasis on respecting the visual grandeur and qualities and values of the Golden Gate. The high viaduct would try and reflect the Golden Gate Bridge colors and design qualities.	***Consistent*** – Views would be opened up and there would be great emphasis on respecting visual grandeur and qualities and values of the Golden Gate.
In the reconstruction of Doyle Drive, "Reopening scenic vistas from the main post, cemetery, and cavalry stables across Crissy Field to San Francisco Bay will also be promoted…. The visual and physical impacts of the new drive should be minimized to the extent possible, including limiting traffic lanes to three in each direction	***Inconsistent*** –No changes would be made to Doyle Drive and therefore it would not reopen any scenic vistas.	***Inconsistent*** – Doyle Drive would be widened in its current location and alignment.	***Consistent*** – Portions of Doyle Drive would be underground and would create no visual impacts. It would reopen scenic vistas from the main post, cemetery, and across Crissy Field to San Francisco Bay. The Cavalry Stables would remain the same because the high viaduct structure would remain. Doyle Drive would be limited to three lanes in each direction.

Policies	Alt 1 - No Build	Alt 2 – Replace and Widen	Alt 5 – Presidio Parkway
The O'Reilly Avenue and Gorgas Avenue streetscapes will be preserved and the buildings rehabilitated.	***Consistent*** - No changes would be made to Doyle Drive and therefore it would not change the O'Reilly Avenue and Gorgas Avenue streetscapes.	***Consistent*** – Doyle Drive would be widened in its current location and it would not change the O'Reilly Avenue and Gorgas Avenue streetscapes.	***Inconsistent*** –A portion of the YMCA facility would be removed in this alternative.
The historic warehouses and their streetscape along the south side of Mason Street will be preserved and adapted for new uses."	***Consistent*** - No changes would be made to Doyle Drive and therefore it would not change the historic warehouses or their streetscape.	***Consistent*** – Doyle Drive would be widened in its current location and it would not change the historic warehouses or their streetscape.	***Consistent*** – The historic warehouses and their streetscape along the south side of Mason Street will be preserved.

Table 2: *Presidio Trust Management Plan: Land Use Policies for Area B of the Presidio of San Francisco*—Presidio Trust

Policies	Alt 1 - No Build	Alt 2 – Replace and Widen	Alt 5 – Presidio Parkway
Increase open space areas to enhance the park and improve the Presidio's natural, scenic, and recreational qualities. Enhance the Presidio's spectacular views and vistas. Maintain the Presidio's ecological value, and the intrinsic values to the human senses and human health…"	***Inconsistent*** –No changes would be made to Doyle Drive and therefore it would not further enhance the park and improve the Presidio's natural, scenic, and recreational qualities	***Inconsistent*** – Doyle Drive would be widened in its current location and in some places would have an adverse affect on visual quality.	***Consistent*** – Portions of Doyle Drive would be underground and would create no visual impacts. It would Increase open space areas to enhance the park and improve the Presidio's natural, scenic, and recreational qualities. Enhance the Presidio's spectacular views and vistas. Maintain the Presidio's ecological value, and the intrinsic values to the human senses and human health
New construction will preserve scenic views as well as those features that make the park an important visual resource."	See above	See above	See above

Policies	Alt 1 - No Build	Alt 2 – Replace and Widen	Alt 5 – Presidio Parkway
Improve pedestrian and visual connections between the Main Post and Crissy Field (Area B). Reinforce the historic connection along Halleck Street. Incorporate an open space connection to Crissy Field (Area B) as part of the planning for reconstruction of Doyle Drive."	***Inconsistent*** –No changes would be made to Doyle Drive and therefore it would not improve visual connections between the Main Post and Crissy Field, reinforce the historic connection along Halleck Street or incorporate an open space connection to Crissy Field as part of the planning for reconstruction of Doyle Drive.	***Inconsistent*** –Doyle Drive would be widened in its current location and would not improve visual connections between the Main Post and Crissy Field, reinforce the historic connection along Halleck Street or incorporate an open space connection to Crissy Field reconstruction of Doyle Drive. as part of the planning for	***Consistent*** – Portions of Doyle Drive would be underground and would improve pedestrian and visual connections between the Main Post and Crissy Field. It would reinforce the historic connection along Halleck Street. And incorporate an open space connection to Crissy Field as part of the planning for reconstruction of Doyle Drive
Re-establish historic views and visual connections, such as those between Infantry Terrace and the Main Parade Ground. Retain and enhance views from the Main Post to the Bay."	***Inconsistent*** –No changes would be made to Doyle Drive and therefore it would not re-establish historic views and visual connections or retain or enhance views from the Main Post to the Bay.	***Inconsistent*** –Doyle Drive would be widened in its current location and would not re-establish historic views and visual connections or retain or enhance views from the Main Post to the Bay.	***Consistent*** – Portions of Doyle Drive would be underground and would re-establish historic views and visual connections and would retain and enhance views from the Main Post to the Bay.
In the Letterman district, which corresponds to the Richardson Avenue Exit Landscape Unit, "Ensure that planning and design efforts consider connections and relationships to adjacent districts—the Main Post and Crissy Field (Area B).	***Inconsistent*** –No changes would be made to Doyle Drive and therefore it would not consider connections and relationships to adjacent districts.	***Inconsistent*** –Doyle Drive would be widened in its current location and would not consider connections and relationships to adjacent districts.	***Consistent*** – Relationships to adjacent districts—the Main Post and Crissy Field - were considered in the planning and design efforts. Portions of Doyle Drive would be underground in this alternative and therefore would create a natural relationship to adjacent districts.
Restore and protect Tennessee Hollow as a vibrant ecological corridor and a unique backdrop to the developed environment of the Letterman district. Coordinate restoration of Tennessee Hollow with future planning for the Main Post, Crissy Field (Area B), Doyle Drive, and the Letterman district to ensure that the corridor provides an ecologically rich and complex buffer between planning districts."	***Inconsistent*** –No changes would be made to Doyle Drive and therefore it would not restore and protect Tennessee Hollow as a vibrant ecological corridor and a unique backdrop to the developed environment of the Letterman district.	***Inconsistent*** –Doyle Drive would be widened in its current location and would not restore and protect Tennessee Hollow as a vibrant ecological corridor and a unique backdrop to the developed environment of the Letterman district.	***Consistent*** – Because portions of Doyle Drive would be underground it would contribute to restoring and protecting Tennessee Hollow as a vibrant ecological corridor and a unique backdrop to the developed environment of the Letterman district. Restoration of Tennessee Hollow was discussed in planning for Doyle Drive.

Policies	Alt 1 - No Build	Alt 2 – Replace and Widen	Alt 5 – Presidio Parkway
In the Fort Scott district, which corresponds to the Toll Plaza to Park Presidio Interchange Landscape Unit, "Maintain and enhance low trees and shrubs to provide a buffer against Doyle Drive. Selectively remove non-historic trees and landscape features, consistent with the *Vegetation Management Plan*, to re-establish views and Fort Scott's historic visual connection to the Golden Gate, San Francisco Bay, and the coast."	***Inconsistent*** –No changes would be made to Doyle Drive and therefore it would not maintain or enhance low trees and shrubs to provide a buffer against Doyle Drive.	***Consistent*** – In replacing and widening Doyle Drive, maintenance of affected trees and shrubs would be managed.	*Consistent* – Low trees and shrubs would be maintained and mitigation is provided that would require consistency with the Vegetation Management Plan.
In the South Hills district, which includes the National Cemetery Landscape Unit, "Maintain and improve historic and scenic views of the adjoining city, San Francisco Bay, and the Pacific Ocean from within the Presidio and from surrounding neighborhoods.	***Inconsistent*** –No changes would be made to Doyle Drive and therefore it would not maintain or improve scenic views of the adjoining city, San Francisco Bay, and the Pacific Ocean from within the Presidio and from surrounding neighborhoods.	***Inconsistent*** –Doyle Drive would be widened in its current location and would not maintain or improve scenic views of the adjoining city, San Francisco Bay, and the Pacific Ocean from within the Presidio and from surrounding neighborhoods in fact it may be detrimental.	***Consistent*** – On the west end of this landscape unit, Doyle Drive would be underground and therefore there would maintain and improve historic and scenic views of the adjoining city, San Francisco Bay, and the Pacific Ocean from within the Presidio and from surrounding neighborhoods. ***Inconsistent*** – The eastern end of this landscape unit would remain the same as the existing.

Table 3: *San Francisco Bay Plan* – San Francisco Bay Conservation and Development Commission

Policies	Alt 1 - No Build	Alt 2 – Replace and Widen	Alt 5 – Presidio Parkway
Structures and facilities that do not take advantage of or visually complement the Bay should be located and designed so as not to impact visually on the Bay and shoreline	***Inconsistent*** –No changes would be made to Doyle Drive and therefore the current visual impact of Doyle Drive on the Bay and shoreline would remain the same.	***Inconsistent*** –Doyle Drive would be widened in its current location and would visually impact the Bay and shoreline.	***Consistent*** – Doyle Drive would be underground for most of this alternative and would not visually impact the Bay or shoreline.

Policies	Alt 1 - No Build	Alt 2 – Replace and Widen	Alt 5 – Presidio Parkway
Access routes to Bay crossings should be designed so as to orient the traveler to the Bay (as in the main approaches to the Golden Gate Bridge). Similar consideration should be given to the design of highway and mass transit routes paralleling the Bay (by providing frequent views of the Bay, if possible, so the traveler knows which way he or she is moving in relation to the Bay). Guardrails, fences, landscaping, and other structures related to such routes should be designed and located so as to maintain and to take advantage of Bay views. New or rebuilt roads in the hills above the Bay and in areas along the shores of the Bay should be constructed as scenic parkways in order to take full advantage of the commanding views of the Bay.”	Inconsistent **–**No changes would be made to Doyle Drive and therefore the current conditions would remain.	***Inconsistent*** –Doyle Drive would be widened in its current location and therefore the current visual conditions would remain.	***Inconsistent*** – Portions of this alternative would be underground and there would be no Bay views for the traveler.
Towers, bridges, or other structures near or over the Bay should be designed as landmarks that suggest the location of the waterfront when it is not visible, especially in flat areas. But such landmarks should be low enough to assure the continued visual dominance of the Bay	***Inconsistent*** –No changes would be made to Doyle Drive and therefore the current conditions would remain.	***Inconsistent*** –Doyle Drive would be widened in its current location and therefore the current visual conditions would remain.	***Inconsistent*** – Portions of this alternative would be underground and there would be no landmarks that suggest the location of the waterfront.
Views of the Bay from vista points and from roads should be maintained by appropriate arrangements and heights of all developments and landscaping between the view areas and the water. In this regard, particular attention should be given to all waterfront locations, areas below vista points, and areas along roads that provide good views of the bay for travelers, particularly areas below roads coming over ridges and providing a ‘first view’ of the Bay (shown in Bay Plan Map No. 2, Proposed Major Uses of the Bay and Shoreline).”	***Inconsistent*** –No changes would be made to Doyle Drive and therefore the current conditions would remain.	***Inconsistent*** –Doyle Drive would be widened in its current location and therefore the current visual conditions would remain.	***Consistent*** – Views of the Bay would be maintained and improved and particular attention would be given to all waterfront locations. ***Inconsistent*** –Attention would not be given to views of the bay for travelers because Doyle Drive would be underground.

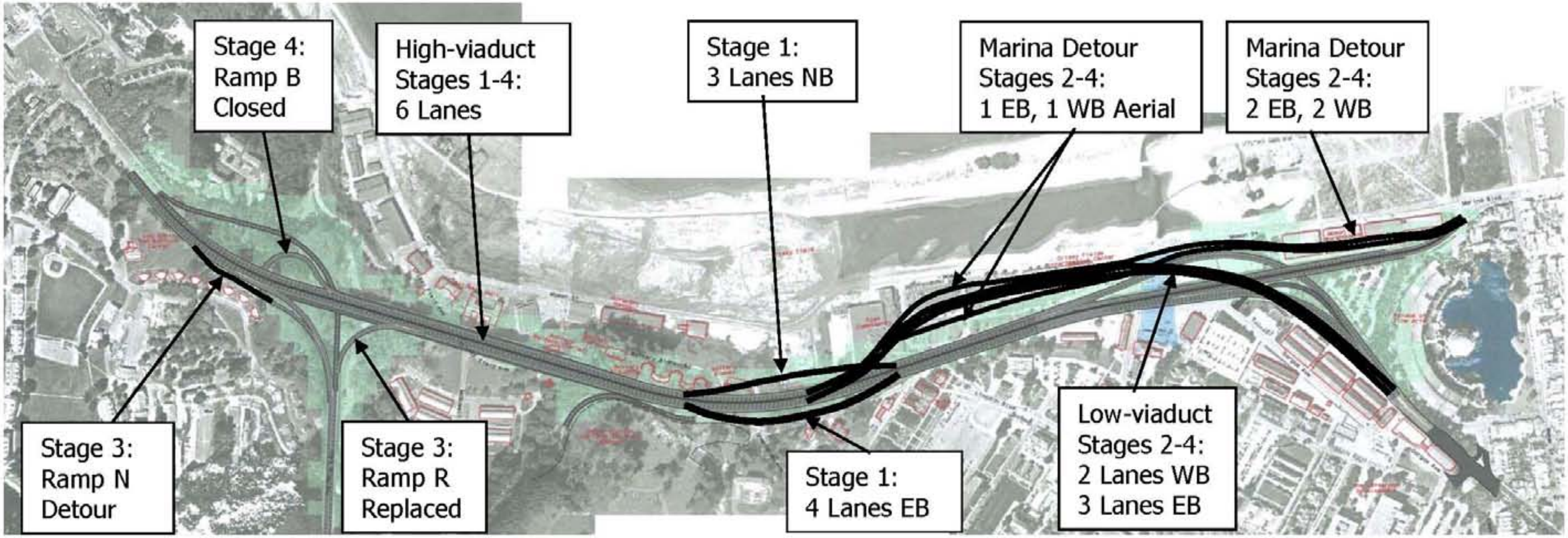
Table 4: *San Francisco Master Plan*—City and County of San Francisco

Policies	Alt 1 - No Build	Alt 2 – Replace and Widen	Alt 5 – Presidio Parkway
Preserve sunlight in public open spaces	***Inconsistent*** –No changes would be made to Doyle Drive and therefore the current conditions would remain.	***Inconsistent*** –Doyle Drive would be widened in its current location and therefore the current visual conditions would remain.	***Consistent*** **–** Doyle Drive would be underground for most of this alternative and would preserve sunlight in public open spaces. The only exception may be the high viaduct over the Pet Cemetery.
Preserve the open space and natural historic, scenic and recreational features of the Presidio	***Inconsistent*** –No changes would be made to Doyle Drive and therefore the current conditions would remain.	***Inconsistent*** –Doyle Drive would be widened in its current location and therefore the current visual conditions would remain.	***Consistent*** **–** Because portions of Doyle Drive would be underground, it would preserve the open space and natural historic, scenic and recreational features of the Presidio.
No new structures should be built that would adversely affect the scenic beauty and natural character of the Presidio	***Consistent*** –No changes would be made to Doyle Drive and therefore no new structures should be built that would adversely affect the scenic beauty and natural character of the Presidio	***Consistent*** –Doyle Drive would be widened in its current location and therefore no new structures should be built that would adversely affect the scenic beauty and natural character of the Presidio	***Consistent*** –No new structures would be built that would adversely affect the scenic beauty and natural character of the Presidio.
Assure that new development adjacent to the shoreline capitalizes on its unique waterfront location, considers shoreline land use provisions, improves visual and physical access to t he water, and conforms with urban design policies."	***Consistent*** –There would be no new development close to the shoreline.	***Consistent*** –There would be no new development close to the shoreline.	***Consistent*** –There would be no new development close to the shoreline.
Protect land from changes that would make it unsafe or unsightly."	***Inconsistent*** –No changes would be made to Doyle Drive and therefore the current conditions would remain.	***Inconsistent*** –Doyle Drive would be widened in its current location and therefore the current visual conditions would remain.	***Consistent*** **–** Since portions of Doyle Drive would be underground it would protect land from changes that would make it unsafe or unsightly.

Policies	Alt 1 - No Build	Alt 2 – Replace and Widen	Alt 5 – Presidio Parkway
Design and locate facilities to preserve the historic city fabric and the natural landscape, and to protect views. Care must be taken to ensure that street and transit improvements are made to enhance the beauty and delicate fabric of the city and to protect views of the city, the bay, the ocean and the hills."	***Inconsistent*** –No changes would be made to Doyle Drive and therefore the current conditions would remain.	***Inconsistent*** –Doyle Drive would be widened in its current location and therefore the current visual conditions would remain.	***Consistent –*** This alternative would ensure that transit improvements are made to enhance the beauty and delicate fabric of the city and to protect views of the city, the bay, the ocean and the hills.

APPENDIX C

CONSTRUCTION STAGING AND DETOUR DIAGRAMS FOR THE REPLACE AND WIDEN ALTERNATIVE



Stage 1

Construction: Replace west portion of Low Viaduct between the Cemetery and Main Post.

Detours: WB and EB Doyle Dr. traffic diverted on to temporary detours north and south of construction area.

Stage 2

Construction: Construct southern portion of High Viaduct and replace Low Viaduct.

Detours: East of the Cemetery, WB and EB traffic is diverted on to a temporary structure north of the low-viaduct. The detour goes over Halleck St., the existing structure, and connects to Richardson Ave. near the Palace of Fine Arts. Marina traffic splits off the main detour west of Halleck St. on to a separate temporary structure that goes over Halleck and Marshall streets and connects to Marina Blvd. at Lyon St.

Stage 3

Construction: Demolish Ramps N and R. Complete construction of southern portion of high-viaduct, replacement of Ramp R and replacement of low-viaduct.

Detours: Divert EB Doyle Dr. to SB Park Presidio Blvd. traffic on to temporary Ramp N. New Ramp R is opened to traffic. WB and EB traffic remains on the detour north of the low-viaduct

Stage 4

Construction: Demolish old high-viaduct and construct north portion of new structure.
Detours: Traffic is moved on to the southern portion of the new high-viaduct. Ramp B is closed.

Stage 5

Construction: Replacement of Ramp B. Remove temporary detour structures.

Detours: Shift all traffic on to new facility.

Doyle Drive Project

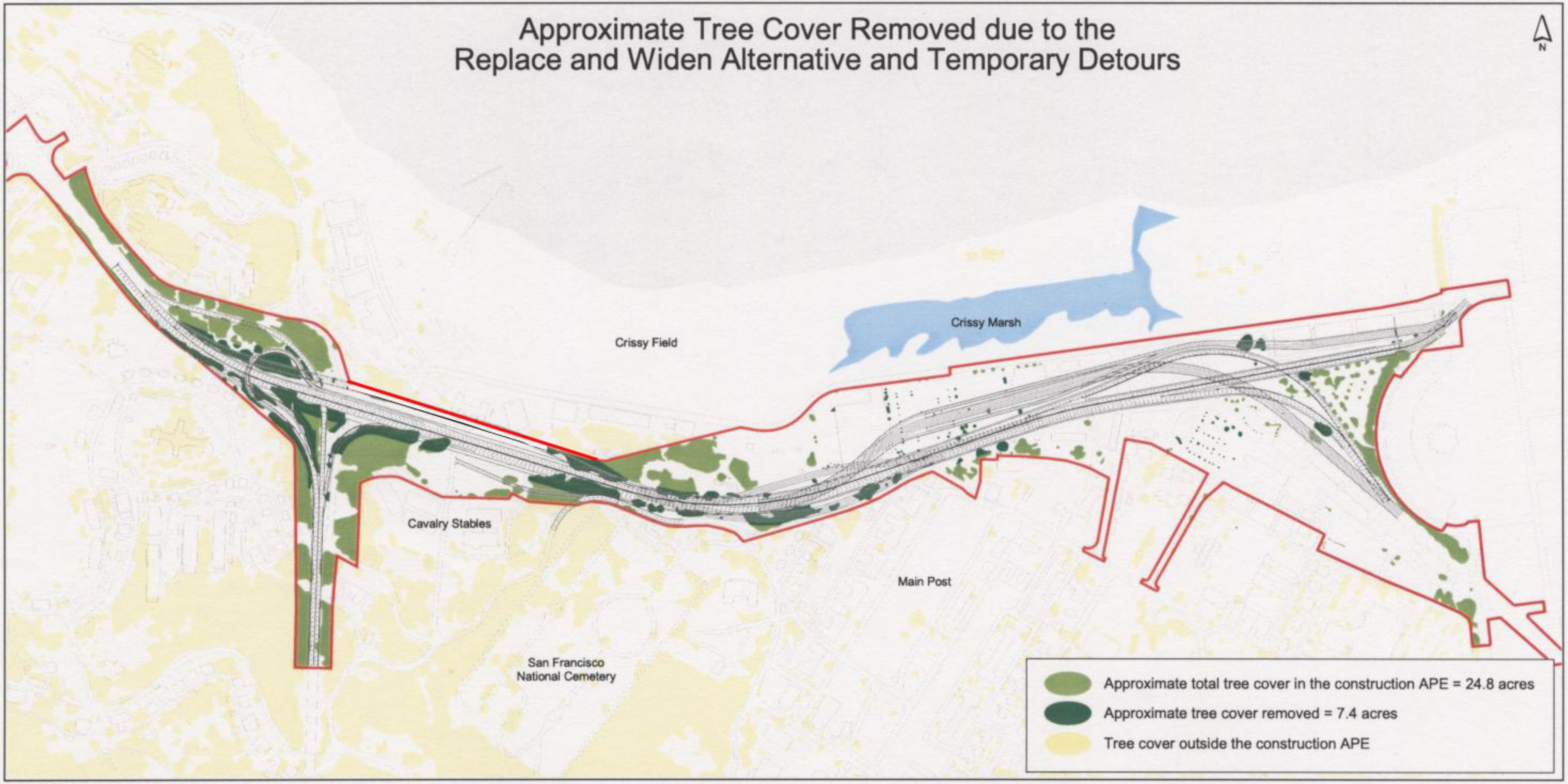
FHWA Caltrans

Construction Staging Alternative 2-Replace & Widen

APPENDIX D

TREE COVER REMOVAL DIAGRAMS FOR EACH BUILD ALTERNATIVE

Approximate Tree Cover Removed due to the Replace and Widen Alternative and Temporary Detours

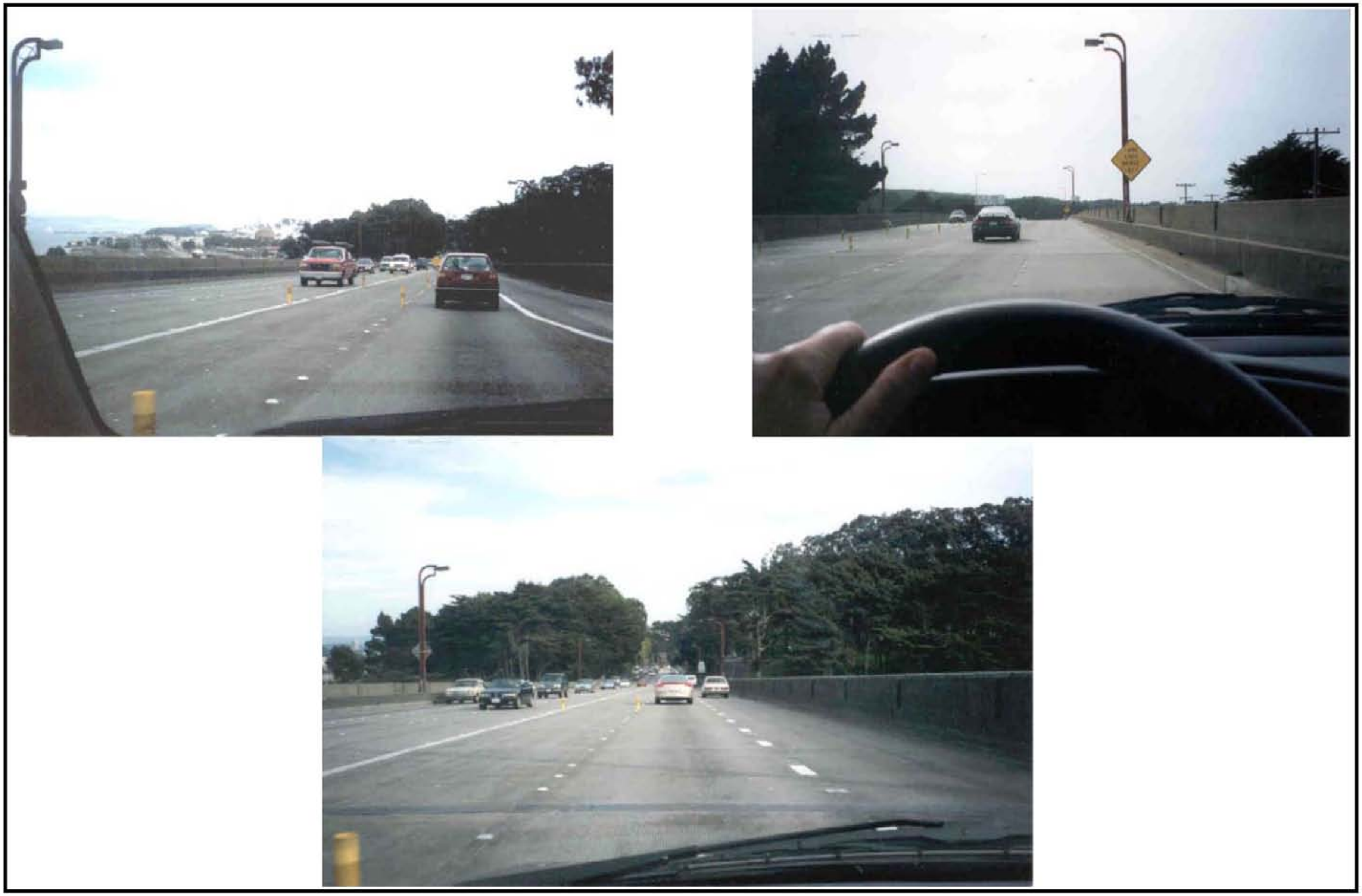


Data Source: National Park Service and Presidio Trust

Data Source: National Park Service and Presidio Trust

APPENDIX E

PHOTOS REPRESENTING DRIVER'S VIEW WHILE TRAVELING ON DOYLE DRIVE



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