7. TRANSPORTATION AND CIRCULATION

This chapter describes: (1) the existing and planned transportation system in the vicinity of the proposed Marina Shores Village project, including roadway, bicycle, pedestrian, and transit provisions; (2) the anticipated impacts of the project on these provisions; and (3) associated mitigation needs. The findings in this chapter were formulated by the EIR transportation engineers, Fehr & Peers Associates, Inc. The technical appendices for the EIR transportation and circulation chapter are available for review at the City of Redwood City Community Development Services Department, City Hall, 1017 Middlefield Road.

7.1 SETTING

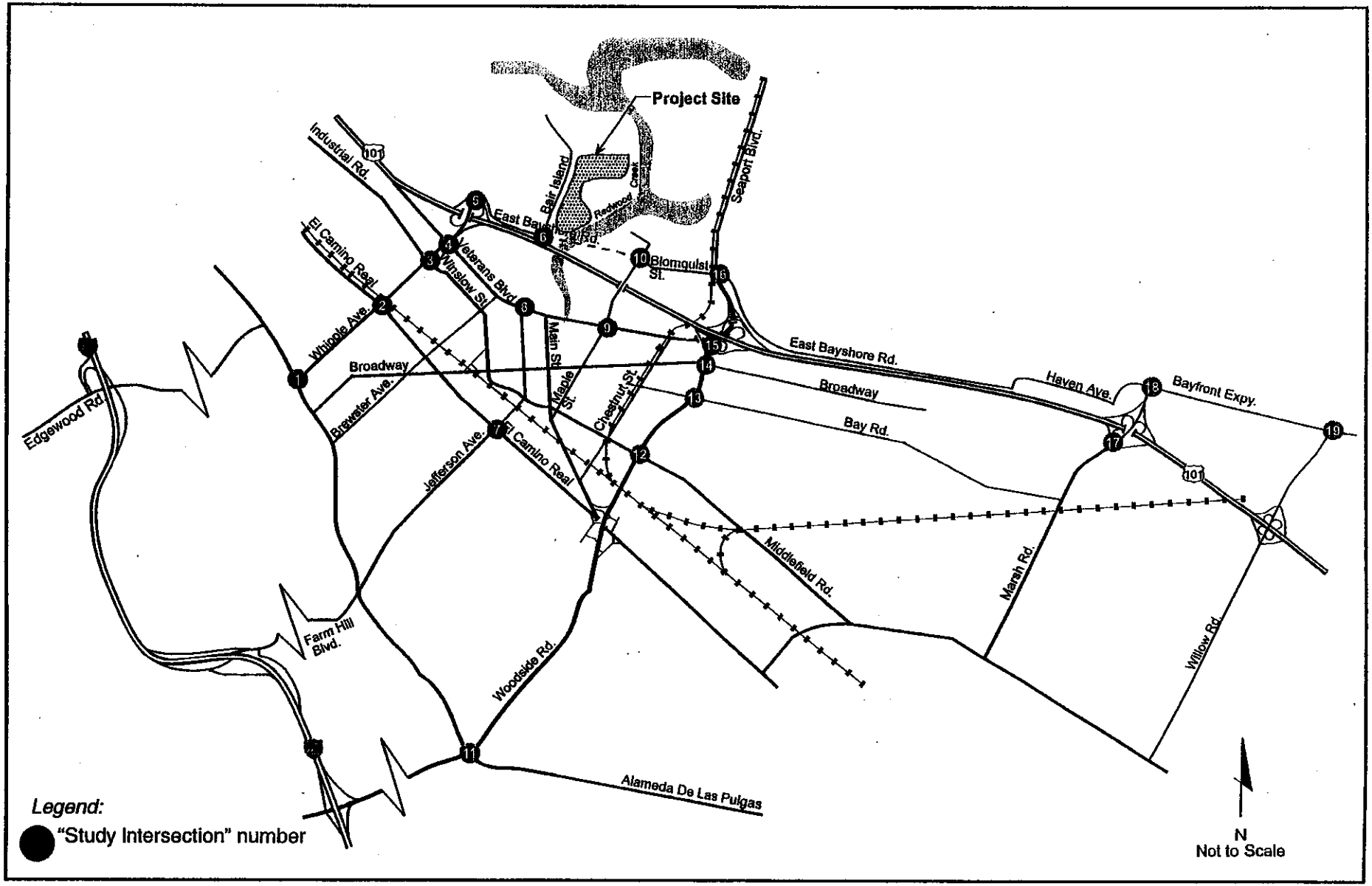
7.1.1 Roadway Setting

Figure 7.1 indicates the location of the project site in relationship to the nearby roadway system and associated "study" intersections (i.e., intersections identified by the City as potentially affected by the project and therefore included in the scope of the EIR traffic analysis).

(a) Key Roadway Links. Key interregional and local routes serving the project vicinity are illustrated on Figure 7.1 and described below.

U.S. 101 is a major north-south regional route serving the west coast. The route extends northward from Redwood City through San Francisco, Marin, and Sonoma counties and continues into the states of Oregon and Washington. South of Redwood City, U.S. 101 extends through San Jose and the California Central Coast into Southern California. Near the project site, U.S. 101 is generally an eight-lane freeway. South of Whipple Avenue and into Santa Clara County, one lane of the route in each direction is restricted to high occupancy vehicles (carpools, van pools, buses, and motorcycles) during the commute hours. Access to the project site from U.S. 101 is and would continue to be accommodated via an interchange at Whipple Avenue. Although U.S. 101 is oriented in a northwest-southeast direction in Redwood City, the freeway is considered to be a north-south regional route for the purposes of this EIR. The orientations of all other roadways are described in directions consistent with this U.S. 101 assumption.

I-280 is a second major north-south regional route serving Redwood City. The route begins in San Francisco and extends south through Palo Alto to San Jose, primarily in an eight-lane freeway configuration. As illustrated on Figure 7.1, access to the project site from I-280 is provided via interchanges with Edgewood Road (via Alameda de las Pulgas), Farm Hill Boulevard (which becomes Jefferson Avenue), and Woodside Road.



SOURCE: Fehr & Peers Associates, Inc.

Figure 7.1
LOCAL AND REGIONAL ROADWAY SYSTEM

Figure 7.1. Local and Regional Roadway System.

Woodside Road (SR 84) is an east-west arterial roadway and a designated state highway (State Route 84). The route is four- to six-lanes between I-280 and U.S. 101. West of I-280 to SR 1, Woodside Road becomes a two-lane rural highway. East of U.S. 101, Woodside Road becomes Seaport Boulevard. The Woodside Road--Seaport Boulevard/U.S. 101 interchange is a major access point for Redwood City; Woodside Road is the only major east-west, high-capacity facility through the city. A grade-separated interchange is provided at El Camino Real.

El Camino Real (SR 82) is a north-south, four-lane, intraregional arterial roadway and designated state highway (State Route 82), and is one of the primary commercial corridors in Redwood City. The route begins in Santa Clara County and extends north through Redwood City to San Francisco. In Redwood City, El Camino Real includes a grade-separated interchange with Woodside Road.

Seaport Boulevard is an east-west, four-lane arterial roadway extending from U.S. 101 east toward the Bay, where it terminates. West of U.S. 101, the route becomes Woodside Road (State Route 84).

Veterans Boulevard is a north-south arterial extending from U.S. 101 south of Whipple Avenue to U.S. 101 north of Woodside Road. The route is a six-lane divided arterial. Between Chestnut Street and Woodside Road, the route becomes two lanes. The northern and southern termini of Veterans Boulevard are a southbound off-ramp and on-ramp to U.S. 101, respectively.

Whipple Avenue is an east-west roadway extending from Alameda de las Pulgas to U.S. 101. Between Alameda del las Pulgas and El Camino Real, Whipple Avenue is two lanes. Just west of El Camino Real, Whipple Avenue widens to a four-lane arterial roadway to U.S. 101. East of U.S. 101, the route turns to the south and becomes East Bayshore Road, a two-lane collector roadway.

Jefferson Avenue is an east-west, four-lane arterial roadway beginning at Veterans Boulevard and extending west to Alameda de las Pulgas. Jefferson Boulevard is grade-separated at the Southern Pacific Transportation Company (SPTC)/CalTrain railroad crossing adjacent to downtown Redwood City. West of Alameda de las Pulgas, Jefferson Avenue becomes Farm Hill Boulevard and extends to an interchange with I-280.

East Bayshore Road is a north-south, two-lane collector roadway that parallels U.S. 101 and serves commercial, industrial, and residential uses in the Bair Island Road area of Redwood City. The route terminates at Whipple Avenue to the north and at Bair Island Road to the south. Other discontinuous segments of a frontage road designated as East Bayshore Road extend south through Menlo Park and East Palo Alto on the east side of U.S. 101.

Bair Island Road is an east-west, two-lane collector roadway that provides direct access to the project site from East Bayshore Road. Bair Island Road begins at its intersection with East Bayshore Road and extends east toward the Bay, where it terminates.

Blomquist Street is a north-south, two-lane local roadway extending between Maple Street and Seaport Boulevard. South of Seaport Boulevard, Blomquist Street becomes East Bayshore Road.

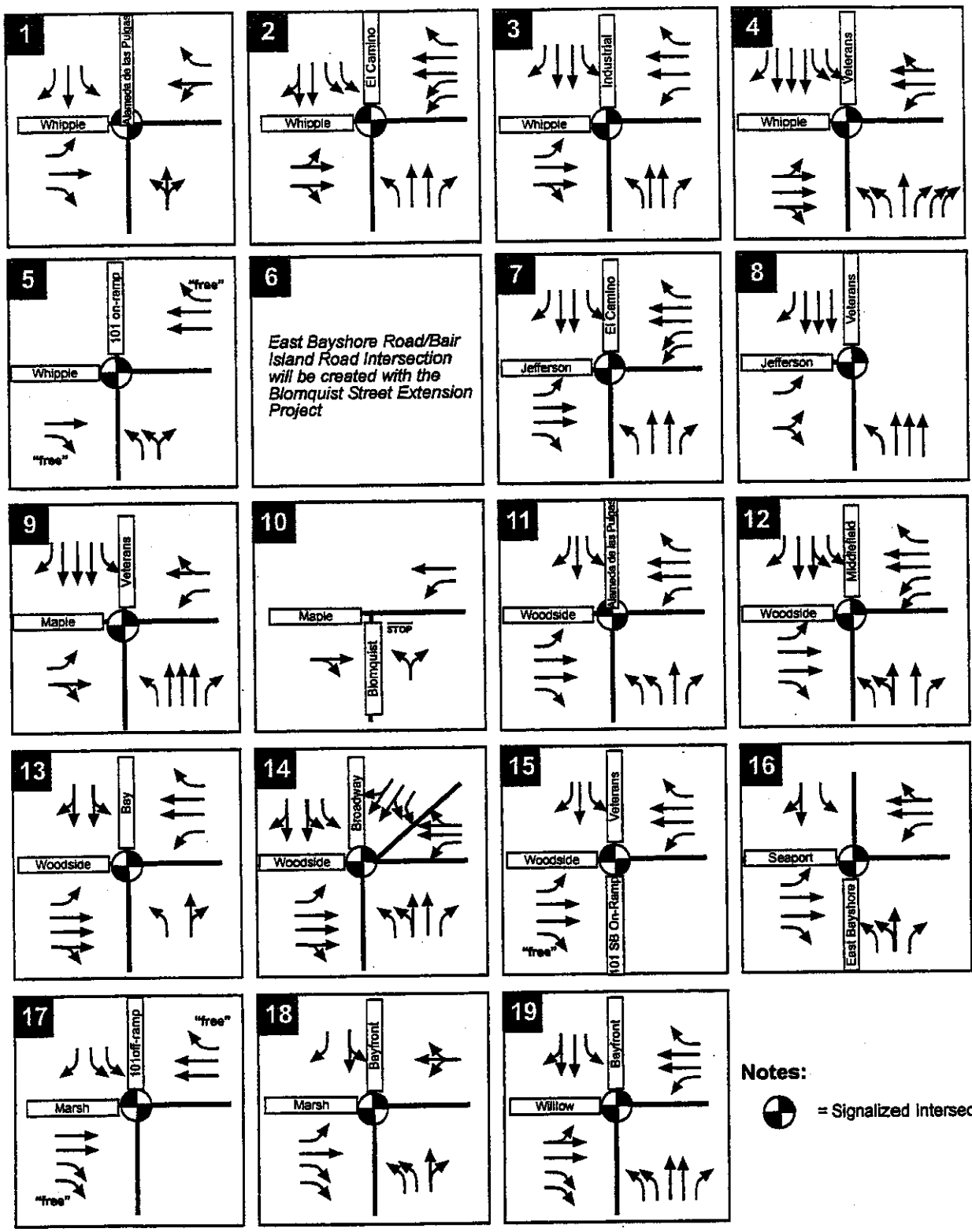
Maple Street is an east-west, two-lane local roadway beginning at El Camino Real and extending eastward over U.S. 101. Maple Street terminates east of its intersection with Blomquist Street.

(b) Study Intersections. Intersections, rather than midblock roadway segments, are almost always the critical capacity-controlling locations for urban and suburban roadway networks. The following nineteen (19) "study intersections" have been selected by the City and the EIR transportation consultants as those most likely to be affected by the proposed project and warranting study in this EIR:

1. Alameda de las Pulgas/Whipple Avenue
2. El Camino Real/Whipple Avenue
3. Winslow Street (Industrial Road)/Whipple Avenue
4. Veterans Boulevard (U.S. 101 Southbound Off-Ramp)/Whipple Avenue
5. U.S. 101 Northbound Off-Ramp/Whipple Avenue
6. East Bayshore Road/Bair Island Road (this intersection will only be analyzed in scenarios that include the Blomquist Street extension)
7. El Camino Real/Jefferson Avenue
8. Veterans Boulevard/Jefferson Avenue
9. Veterans Boulevard/Maple Street
10. Blomquist Street/Maple Street
11. Alameda de las Pulgas/Woodside Road
12. Middlefield Road/Woodside Road
13. Bay Road/Woodside Road
14. Broadway/Woodside Road/U.S. 101 Southbound Off-Ramp
15. Veterans Boulevard/Woodside Road
16. Blomquist Street (East Bayshore Road)/Seaport Boulevard
17. U.S. 101 Southbound Ramps/Marsh Road
18. Bayfront Expressway/Marsh Road
19. Bayfront Expressway/Willow Road

The locations of the 19 study intersections are shown on Figure 7.1. Existing lane configurations and associated traffic control devices (i.e., traffic signals or stop signs) at each study intersection are illustrated on Figure 7.2.

(c) Freeway Interchanges. In addition to analysis of these 19 study intersections, this EIR describes the results of a merging, diverging, and weaving analysis conducted at the U.S. 101/Whipple Avenue and U.S. 101/Woodside Road freeway interchanges.



SOURCE: Fehr & Peers Associates, Inc.

Figure 7.2
EXISTING INTERSECTION LANE CONFIGURATIONS

Figure 7.2. Existing Intersection Lane Configurations.

(d) Freeway Segments. A freeway capacity analysis was also conducted by the EIR traffic engineers on potentially affected segments of U.S. 101, I-280, and the Dumbarton Bridge (SR 84).

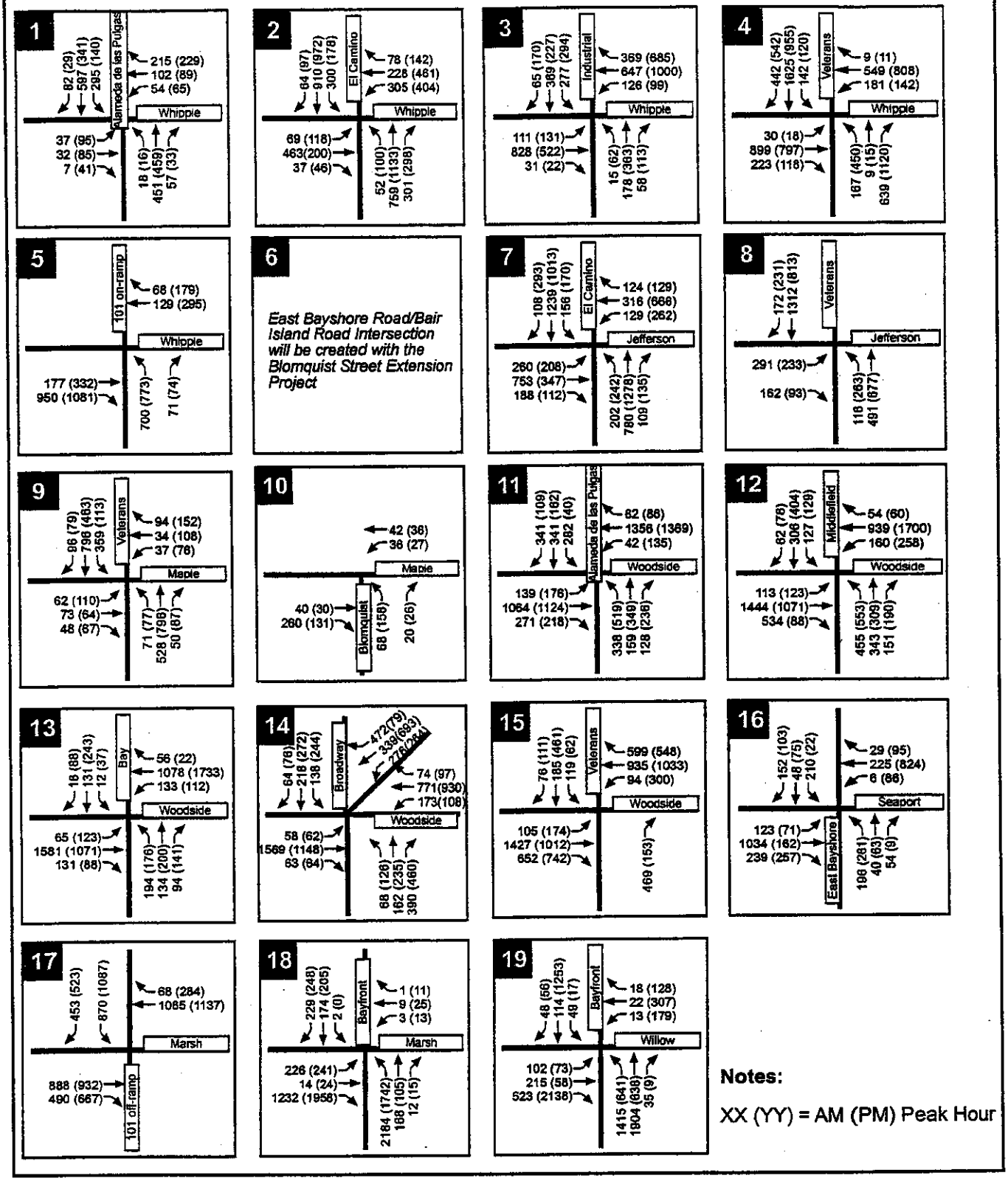
7.1.2 Roadway System Assessment Methodology

(a) Existing Traffic Volumes. Existing operational conditions at key study intersections have been analyzed for both the critical weekday morning (AM) and weekday evening (PM) peak hours. Peak traffic congestion conditions in Redwood City and its vicinity usually occur during the morning and evening commute periods between 7:00 and 9:00 AM and 4:00 and 6:00 PM, respectively. To ascertain existing roadway operational conditions, intersection operations have been evaluated using the highest one-hour volume counted during each of these periods. Recent traffic counts from July and October 2001 were obtained for some of the study intersections from the *2001 San Mateo County Congestion Management Program Monitoring Report* prepared by Fehr & Peers Associates. These recent counts were supplemented with new counts conducted by Fehr & Peers Associates in January and February 2002. Due to recent economic conditions in the Bay Area, existing volumes at the study intersections may be lower than previous counts conducted at these intersections. Figure 7.3 presents the analysis findings in terms of existing AM and PM peak-hour turning movement counts at the study intersections.

(b) Intersection Analysis Methodology. Level of service (LOS) is a qualitative grading system to depict traffic flow conditions. The LOS grading system considers such traffic flow factors such as speed, travel time, delay, and freedom to maneuver. Six levels of operation or "grades" are typically used, ranging from LOS A, representing the best operating conditions, to LOS F, representing the worst operating conditions. LOS E represents “at capacity” operations. When actual volumes exceed intersection design capacity, stop-and-go conditions typically result and operations are designated as LOS F. The City of Redwood City has defined the limit of acceptable operations as LOS D.

The proper level of service calculation methodology for intersections is dependent on the type of intersection control device--i.e., whether the intersection is controlled by traffic signals, stop signs, or roundabouts. The analysis methodology used in this EIR for each of these intersection types is described below.

Analysis of Signalized Intersections. The analysis in this EIR of operations at all signalized study intersections has been conducted using the methodology described in chapter 16 of the *2000 Highway Capacity Manual (HCM)* (Transportation Research Board). This methodology determines the LOS rating based on the average "control delay" experienced at the intersection (in seconds per vehicle). "Control delay" includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration. The average delay for the various signalized study intersections (with the exception of the Broadway/Woodside Road intersection) was calculated using the TRAFFIX analysis software and is correlated to level of service designations (ratings) as summarized in Table 7.1.



SOURCE: Fehr & Peers Associates, Inc.

Figure 7.3
EXISTING PEAK-HOUR INTERSECTION VOLUMES

Figure 7.3. Existing Peak Hour Intersection Volumes.

Table 7.1
SIGNALIZED INTERSECTION LEVEL OF SERVICE DEFINITIONS

Level of Service	Definition of Traffic Conditions	Average Control Delay Per Vehicle (Seconds)
A	Operations with very low delay occurring with favorable progression and/or short cycle lengths.	≤ 10.0
B	Operations with low delay occurring with good progression and/or short cycle lengths.	10.1 to 20.0
C	Operations with average delays resulting from fair progression and/or longer cycle lengths. Individual cycle failures begin to appear.	20.1 to 35.0
D	Operations with longer delays due to a combination of unfavorable progression, long cycle lengths, and high V/C ratios. Many vehicles stop and individual cycle failures are noticeable.	35.1 to 55.0
E	Operations with high delay values indicating poor progression, long cycle lengths, and high V/C ratios. Individual cycle failures are frequent occurrences.	55.1 to 80.0
F	Operations with delays unacceptable to most drivers occurring due to over-saturation, poor progression, or very long cycle lengths.	> 80.0

SOURCE: Transportation Research Board, *Highway Capacity Manual*, 2000.

Note:

V/C = volume-to-capacity.

The Broadway/Woodside Road intersection has five approach legs and four departure legs. The TRAFFIX LOS software cannot analyze intersections with more than four approaches. Therefore the intersection was analyzed using the Synchro 5.0 software package, which can evaluate intersections with more than four approaches. The Synchro software package correlates LOS designations (ratings) to the average control delay and is consistent with the methodology presented in the *2000 Highway Capacity Manual*.

Analysis of Unsignalized Intersections. For unsignalized (four-way, stop-controlled and side street, stop-controlled) study intersections, level of service calculations have been conducted using the methodology contained in chapter 17 of the *2000 Highway Capacity Manual.* Similar to signalized intersections, LOS ratings are based on the "average control delay" expressed in seconds per vehicle. At two-way or side street-controlled intersections, the control delay (level of service) is calculated for each movement, not for the intersection as a whole. For approaches composed of a single lane, the control delay is computed as the average of all movements in that lane. At four-way stop-controlled intersections, the LOS rating is based on the average control delay experienced on all approaches. Table 7.2 summarizes the relationship between delay and LOS for unsignalized intersections.

Analysis of Roundabouts. The planned extension of Blomquist Street over Redwood Creek will extend northward to the existing East Bayshore Road/Bair Island Road intersection (see subsection 7.1.6(a) of this chapter, Background Roadway Improvements, for details of this plan). City staff is considering use of a roundabout at this intersection to control traffic and provide a distinctive design feature in the Bair Island Road area.

The operation of the planned roundabout under the various future traffic scenarios considered in this analysis was evaluated using the aaSIDRA software package. The aaSIDRA software (formerly known as SIDRA) was developed in 1984 by ARRB Transport Research Ltd. in Australia to evaluate roundabouts. The aaSIDRA model computes the control delay for each approach and the entire intersection based on traffic volumes, geometrics of the roundabout, and calculated headways. The delays are correlated to LOS similar to unsignalized intersections. The aaSIDRA model uses parameters that have been calibrated to achieve consistency with the *2000 Highway Capacity Manual*. The relationship between delay and LOS for roundabouts is the same as those delays presented for unsignalized intersections (Table 7.2).

Freeway Ramp Merging and Diverging Analysis. For the EIR assessment of six ramps at two "study" freeway interchanges, ramp merging and diverging operations have been analyzed using the 2000 Highway Capacity Software (HCS) package. The software is designed to be consistent with the freeway ramp merging and diverging evaluation methodology contained in chapters 24 and 25 of the *2000 Highway Capacity Manual.* This methodology correlates the LOS ratings to projected (computed) vehicle densities (passenger cars per mile per lane). Table 7.3 summarizes the methodology relationship between vehicular density and LOS for freeway ramps.

Table 7.2
UNSIGNALIZED (INCLUDING ROUNDABOUTS)
INTERSECTION LEVEL OF SERVICE DEFINITIONS

Level of Service	Definition of Traffic Conditions	Average Control Delay Per Vehicle (Seconds)
A	Little or no delay	≤ 10.0
B	Short traffic delays	10.1 to 15.0
C	Average traffic delays	15.1 to 25.0
D	Long traffic delays	25.1 to 35.0
E	Very long traffic delays	35.1 to 50.0
F	Extreme traffic delays with intersection capacity exceeded	> 50.0

SOURCE: Transportation Research Board, *Highway Capacity Manual*, 2000.

Table 7.3
FREEWAY RAMP MERGING AND DIVERGING LEVEL OF SERVICE DEFINITIONS

Level of Service	Density (pc/mi/ln)
A	≤ 10.0
B	10.1 to 20.0
C	20.1 to 28.0
D	28.1 to 35.0
E	≥ 35.1
F	Demand Exceeds Capacity

SOURCE: Transportation Research Board, *Highway Capacity Manual*, 2000.

Note:

Density is presented in passenger cars per mile per lane (pc/mi/ln).

Freeway Ramp Weaving Analysis. The weaving analysis on freeway auxiliary lanes was conducted using the nomograph for design and operation of weaving sections presented in the *Highway Design Manual* (California Department of Transportation, Fifth Edition). The nomograph correlates the total weaving volume and the length of the weaving section to a level of service (LOS A through LOS F). The nomograph is presented in appendix 21.3 of this EIR.

The service level calculation sheets completed for this EIR analysis for all the scenarios studied at all four "study" freeway ramp merging, diverging, and weaving operations are presented in appendix 21.3(B).

Freeway Segment Analysis. Existing level of service ratings for the potentially affected segments of the U.S. 101, I-280, and SR 84 (Dumbarton Bridge) freeway segments were obtained from the City/County Association of Governments of San Mateo County's (C/CAG's) *2001 San Mateo CMP Monitoring Report*. To evaluate project impacts on these freeway segments, a capacity analysis was conducted. For the purpose of this EIR analysis, each "study" freeway segment is considered to operate unacceptably if the existing or projected volume of vehicles using the segment exceeds the segment's design capacity.

In conducting this analysis, mixed-flow freeway lanes (i.e., non-restricted travel lanes for all legal motor vehicles--autos, trucks, motorcycles, etc.) were analyzed separately from high occupancy vehicle (HOV) lanes. To be consistent with methodologies presented in the *San Mateo CMP Monitoring Report*, a design capacity of 2,300 vehicles per lane per hour (vplph) was used for mixed-flow lanes on U.S. 101 and I-280, 1,800 vplph for HOV lanes on U.S. 101, and 1,100 vplph for segments of SR 84.

7.1.3 Roadway System Analysis Results--Existing Conditions

(a) Intersection Analysis Results--Existing Conditions. Existing lane configurations and peak-hour turning movement volumes were used to calculate existing levels of service for the 19 "study" intersections during the AM and PM peak hours. It should be noted that adjustments were made to the "green time" allocated to certain movements at the El Camino Real/Whipple Avenue signalized intersection to account for additional peak-hour delays due to CalTrain movements through Redwood City. The results of the existing intersection LOS analyses are presented in Table 7.4. The corresponding calculation sheets are contained in appendix 21.3(B).

AM Peak-Hour Intersection Operations. The results of the analysis indicate that most (17) of the study intersections are currently operating acceptably (LOS D or better). The Broadway/Woodside Road intersection is currently operating at an unacceptable level--LOS F.

Observations at the Broadway/Woodside Road intersection indicated that the amount of "green time" currently allocated to the Broadway approaches was insufficient to serve the demand. Vehicles on Broadway were observed to wait up to three cycles to get through the intersection. The results of the LOS analysis are consistent with these field observations.

Table 7.4
INTERSECTION LEVELS OF SERVICE--EXISTING

Study Intersections		Intersection Control	AM Peak-Hour Delay/LOS	PM Peak-Hour Delay/LOS
1.	Alameda de las Pulgas/ Whipple Avenue	Signal	24.8/C	24.7/C
2.	El Camino Real/Whipple Avenue	Signal	33.1/C	42.8/D
3.	Winslow Street/Whipple Avenue	Signal	31.1/C	40.1/D
4.	Veterans Boulevard/Whipple Avenue	Signal	35.8/D	33.9/C
5.	U.S. 101 Northbound Off-Ramp/ Whipple Avenue	Signal	7.8/A	11.1/B
6.	East Bayshore Road (Blomquist Street)/ Bair Island Road	Unsignalized	n/a (see Note 3 below)	n/a (see Note 3 below)
7.	El Camino Real/Jefferson Avenue	Signal	42.5/D	45.3/D
8.	Veterans Boulevard/Jefferson Avenue	Signal	15.1/B	26.4/C
9.	Veterans Boulevard/Maple Street	Signal	21.5/C	29.9/C
10.	Blomquist Street/Maple Street	2-Way Stop	10.6/B	10.7/B
11.	Alameda de las Pulgas/ Woodside Road	Signal	35.6/D	35.5/D
12.	Middlefield Road/Woodside Road	Signal	36.8/D	46.4/D
13.	Bay Road/Woodside Road	Signal	23.5/C	31.1/C
14.	Broadway/Woodside Road	Signal	>180/F	>180/F
15.	Veterans Boulevard/Woodside Road	Signal	21.1/C	40.1/D
16.	Blomquist Street/Seaport Boulevard	Signal	28.7/C	29.7/C
17.	U.S. 101 Southbound Ramps/ Marsh Road	Signal	14.9/B	16.3/B
18.	Bayfront Expressway/Marsh Road	Signal	28.3/C	25.5/C
19.	Bayfront Expressway/Willow Road	Signal	25.4/C	105.1/F

SOURCE: Fehr & Peers Associates, Inc.

Notes:

(1) Signalized intersection LOS ratings are based on average control delay expressed in seconds per vehicle. Unsignalized intersection LOS ratings are based on total control delay expressed in seconds per vehicle. Signalized and unsignalized analysis methodologies were obtained from the *2000 Highway Capacity Manual*, Transportation Research Board.

(2) Adjustments have been made to the LOS calculations at the El Camino Real/Whipple Avenue intersection to account for CalTrain movement preemption of the signal. CalTrain movements affect 20 to 30 percent of the cycles at the intersection during each peak hour. Therefore, the amount of "green time" allocated to the affected turning movements was decreased by 20 to 30 percent and reallocated to the northbound and southbound through movements.

(3) The East Bayshore Road/Bair Island Road intersection (#6) was not analyzed under Existing Conditions. It will be analyzed under scenarios that include the planned Blomquist Street Extension over Redwood Creek.

Observations at the El Camino Real/Whipple Avenue intersection indicated that when the signal is not being preempted by CalTrain movements, the intersection is currently operating at an acceptable level. When the signal is preempted by a CalTrain movement, delays to southbound left turns and northbound right turns, and on the eastbound and westbound approaches, are increased. Observations indicated that the train preemptions typically last for approximately one cycle per train, and eight trains currently pass through Redwood City during the peak hour. This preemption occurs for 21 percent of the cycles. Although longer delays were observed during some CalTrain movement preemptions, over the course of the entire peak hour, the intersection was observed to operate at an acceptable average LOS level under existing conditions.

PM Peak-Hour Intersection Operations. The results of the level of service analysis indicate that the Broadway/Woodside Road and Bayfront Expressway/Willow Road intersections are currently operating at an unacceptable LOS F under existing conditions. The remaining 16 "study" intersections are operating acceptably, LOS D or better, under existing conditions.

Observations at the Broadway/Woodside Road and Bayfront Expressway/Willow Road intersections indicate that vehicles are waiting multiple cycle lengths to get through the intersections, and the intersections are therefore operating at LOS F under existing conditions.

During the PM peak hour, seven CalTrain trains travel through Redwood City. Observations indicated that each train preempted one cycle during the peak hour at the El Camino Real/Whipple Avenue intersection. During the PM peak hour, this preemption occurred for 27 percent of the cycles. Although longer delays were observed during the CalTrain movement preemptions, the intersection was observed to operate at an acceptable average LOS level over the course of the entire peak hour.

(b) Freeway Ramp Analysis Results--Existing Conditions. Existing freeway ramp volumes, freeway mainline volumes, free-flow speeds, merging/diverging lengths, and proximity to upstream/downstream merges/diverges were used as inputs to calculate existing levels of service at the six "study" freeway ramps. The results of the ramp merging and diverging analysis are presented in Table 7.5. The results in the table indicate that the southbound U.S. 101 diverge onto Veterans Boulevard is currently operating at LOS E during the AM and PM peak hours, and the southbound U.S. 101 merge from Woodside Road is currently operating at LOS F during the AM peak hour and LOS E during the PM peak hour. The remaining four "study" merges and diverges are currently operating at LOS C or D during the AM and PM peak hours.

(c) Freeway Segment Analysis Results--Existing Conditions. Conditions along county freeway segments are periodically reported by C/CAG as part of its Congestion Management Program (CMP). Recent freeway operating levels were obtained from C/CAG's *2001 San Mateo County CMP Monitoring Report* (Fehr & Peers Associates, 2002). The operating levels of U.S. 101 and I-280 presented in the CMP Monitoring Report are based on travel time surveys, with the corresponding LOS rating correlated to speed. The LOS ratings for

Table 7.5
RAMP MERGING AND DIVERGING LEVELS OF SERVICE--EXISTING

Merge/Diverge		AM Peak-Hour Density/LOS	PM Peak-Hour Density/LOS
1.	Southbound U.S. 101 Off-Ramp / Veterans Boulevard	39.3/E	37.0/E
2.	Southbound U.S. 101 On-Ramp / Whipple Avenue	34.4/D	32.5/D
3.	Northbound U.S. 101 Off-Ramp/ Whipple Avenue	29.6/D	33.1/D
4.	Northbound U.S. 101 On-Ramp/ Whipple Avenue	27.0/C	31.1/D
5.	Southbound U.S. 101 On-Ramp/ Woodside Road	39.3/F	37.3/E
6.	Northbound U.S. 101 Off-Ramp/ Woodside Road (Seaport Boulevard)	23.5/C	29.4/D

SOURCE: Fehr & Peers Associates, Inc.

Notes:

(1) Merging and diverging LOS evaluated using the 2000 *Highway Capacity Software* (HCS) package.

(2) Density is presented in passenger cars per mile per lane (pc/mi/ln).

segments of SR 84 are based on traffic volume, with the corresponding LOS rating correlated to traffic density (passenger cars per mile per lane). The resulting findings regarding the current status of freeway operating conditions is presented in Table 7.6.

AM Peak-Hour Freeway Operations. As shown in Table 7.6, mixed flow lanes on northbound U.S. 101 between Whipple Avenue and the Santa Clara County line are currently operating at LOS F in the AM peak hour. The other northbound study segments and all eastbound study segments (including the HOV lanes on U.S. 101) are currently operating at LOS A or LOS B in the AM peak hour.

The table also indicates that southbound mixed flow segments of U.S. 101 are operating at LOS F, southbound HOV lanes on U.S. 101 are operating at LOS E, and westbound segments of SR 84 are operating at LOS F, in the AM peak hour. Southbound segments of I-280 are currently operating at LOS D or LOS B in the AM peak hour.

PM Peak-Hour Freeway Operations. Table 7.6 indicates that the northbound and southbound segments of U.S. 101 between SR 92 and Whipple Avenue are currently operating at LOS F, and eastbound segments of SR 84 are also operating at LOS F, during the PM peak hour. All other study segments are operating at LOS A, LOS B, or LOS D during the PM peak hour.

7.1.4 Bicycle and Pedestrian Facilities

Bicycle facilities in the project vicinity include bike paths, bike lanes, and bike routes. Bike paths are paved trails that are separated from the roadways. Bike lanes are lanes on roadways designated for use by bicycles by striping, pavement legends, and signs. Bike routes are roadways that are designated for bicycle use with signs.

Pedestrian facilities in the project vicinity include sidewalks, crosswalks, and pedestrian signals. These existing bicycle and pedestrian facilities are described below.

(a) General. Pedestrian and bicycle facilities near the project site include conventional pedestrian sidewalks located along portions of East Bayshore Road and Bair Island Road, an unpaved levee pedestrian and bicycle path in the Bair Island National Wildlife Refuge, and designated on-street bicycle lanes on Bair Island Road. The sidewalks in the project vicinity are discontinuous and do not link East Bayshore Road directly with Whipple Avenue, and the bicycle lanes are sub-standard (i.e., not wide enough). Access to the Bair Island Refuge trail is provided via a trailhead located at the eastern terminus of Whipple Road. Additional access is provided from Bair Island Road northwest of the Peninsula Marina property. There are also existing bicycle lanes on Blomquist Street, with access to a pedestrian and bicycle bridge over Redwood Creek. There is currently no paved connection between the north end of this bridge and Bair Island Road.

Bicycle and pedestrian facilities are planned to be incorporated into the planned Blomquist Street Extension over Redwood Creek. There are no other existing pedestrian or bicycle facilities in the vicinity of the project site.

Table 7.6
FREEWAY SEGMENT LEVELS OF SERVICE--EXISTING

Freeway Segment	AM Peak-Hour LOS	PM Peak-Hour LOS
1. U.S. 101: SR 92 to Whipple Avenue		
Northbound	B	F
Southbound	F	F
2. U.S. 101: Whipple Avenue to Santa Clara County Line, Mixed Flow Lanes		
Northbound	F	B
Southbound	F	D
3. U.S. 101: Whipple Avenue to Santa Clara County Line, HOV Lanes		
Northbound	B	D
Southbound	E	B
4. I-280: SR 92 to SR 84 (Woodside Road)		
Northbound	B	D
Southbound	D	B
5. I-280: SR 84 (Woodside Road) to Santa Clara County Line		
Northbound	B	D
Southbound	B	B
6. SR 84: Willow Road to University Avenue		
Eastbound	A	F
Westbound	F	A
6. SR 84: University Avenue to Alameda County Line		
Eastbound	A	F
Westbound	F	A

SOURCE: Fehr & Peers Associates, Inc.

(b) San Francisco Bay Trail. The San Francisco Bay Trail consists of a planned pedestrian and bicycle trail and path system that will ultimately be approximately 640 kilometers (400 miles) long, encircling the Bay, and will include crossings on all of the toll bridges. The system has been planned and is being implemented by the Association of Bay Area Governments (ABAG). At this time, approximately 340 kilometers (210 miles) of the trail have been completed. Near the project site, the existing trail terminates to the north in San Carlos near Mariner Park and begins again in the San Francisco Bay National Wildlife Refuge in Menlo Park. The proposed alignment of the ABAG-planned extension of the Bay Trail traverses the southern edge of the project site, as illustrated on Figure 4.4 in chapter 4 (Land Use) of this EIR. The proposed extension alignment starts north of the project site, at the terminus of the existing Bay Trail segment in San Carlos near Mariner Park, passes around San Carlos Airport along the levee adjacent to U.S. 101, skirting the edge of the Bair Island National Wildlife Refuge along the southwestern edge of the project site, and continues along East Bayshore Road to connect with the existing Bay Trail segment in the San Francisco Bay National Wildlife Refuge in Menlo Park. According to the ABAG web site, the local segment of the trail is planned to be accommodated via the existing levee road path in the Bair Island Wildlife Refuge. Completion of this Bay Trail segment will substantially improve continuous non-automobile access to the area east of Highway 101.

7.1.5 Public Transit

Existing bus service in San Mateo County is provided by the San Mateo County Transit District (SamTrans). Commuter rail (CalTrain) service is provided by the Peninsula Corridor Joint Powers Board. During commute periods, CalTrain provides extended service to Morgan Hill and Gilroy. These bus, rail, and other local transit provisions are described in more detail below.

(a) SamTrans Service. Currently, no direct SamTrans service is provided to the project site. However, SamTrans Route RX and Route 270 operate near the project site.

Route RX. Route RX is an express bus route providing access from Palo Alto and San Francisco through Redwood City. In Redwood City, Route RX operates along El Camino Real, Brewster Avenue (stopping at the Redwood City CalTrain Station), Veterans Boulevard, Whipple Avenue, and U.S. 101. Route RX operates in the northbound direction only during the AM peak period on 15- to 30-minute headways, and in the southbound direction only during the PM peak period on 30- to 40-minute headways.

Route 270. Route 270 is a local bus route operating between the Redwood City CalTrain Station and Marsh Road via El Camino Real, Jefferson Avenue, Veterans Boulevard, Maple Street, Blomquist Street, East Bayshore Road, Haven Avenue, Marsh Road, Bay Road, and Broadway. Route 270 also has limited service on Seaport Boulevard, operating during commute periods only on one-hour headways up to the Seaport Plaza development area.

(b) CalTrain Service. The closest CalTrain station to the project site is the Redwood City CalTrain Station, located in downtown Redwood City approximately 1-1/2 miles to the west. CalTrain operates from 5:00 AM until 12:00 PM on 15- to 40-minute headways during the weekday. On Saturdays, CalTrain operates from 7:00 AM until 1:30 PM on one-hour headways. Sunday operations are from 8:00 AM until 11:45 PM on one- to two-hour headways.

(c) Shuttle Service. There are currently two local, privately operated employer shuttles providing service to and from the Redwood City CalTrain Station:

Pacific Shores Employer Shuttle. The Pacific Shores Employer Shuttle is operated by the Pacific Shores development, with routes along Maple Street, Blomquist Street, and Seaport Boulevard, to provide transit access to and from Pacific Shores on Seaport Boulevard. The shuttle operates during commute periods only on 30- to 60-minute headways.

Seaport Employer Shuttle. Similarly, the Seaport Employer Shuttle is operated by the Seaport Center development, with routes along Middlefield Road, Woodside Road, and Seaport Boulevard, to provide direct transit access to and from Seaport Center. The shuttle operates during commute periods only on 30- to 45-minute headways.

7.1.6 Anticipated Background Roadway Conditions

Background Conditions are defined in this analysis as transportation conditions anticipated to occur immediately prior to completion of the proposed project, including existing traffic volumes plus changes in transportation conditions anticipated between now and then due to development projects recently approved[1] or currently under construction in the study area, and due to anticipated roadway system improvements.

(a) Background Roadway Improvements. A number of local roadway improvements have been approved and fully funded, and are expected to be completed and operational prior to completion of the proposed project. These include:

- a planned improvement to the southbound approach to the Blomquist Street-East Bayshore Road/Seaport Boulevard intersection, which will include the addition of a dedicated right turn lane and conversion of the existing shared through/right-turn lane to a dedicated through lane (identified as a mitigation measure for the Pacific Shores office development);

- a planned widening of Woodside Road from four to six through lanes. In the eastbound direction, the western limit of the widening will begin at approximately the gore point of the eastbound on-ramp onto Woodside Road from Hazel Avenue and end just east of Spring

[1]Recently approved developments are defined as projects, other than the proposed project, that have recently been approved, but are not yet constructed or occupied.

Street. In the westbound direction, the eastern limit of the widening will begin at Broadway and end at approximately the gore point for the westbound on-ramp from Redwood Avenue (expected to be completed by 2007);

- planned new auxiliary lanes on U.S. 101 through Redwood City between Ralston Avenue and Marsh Road affecting the U.S. 101/Whipple Avenue and U.S. 101/Woodside Road interchange (expected to begin construction in the Spring of 2003),[2] and

- a project currently underway to widen Bayfront Expressway from four lanes (two in each direction) to six lanes (three in each direction) between Marsh Road and the Dumbarton Bridge, which will affect intersection lane configurations at the Bayfront Expressway/ Marsh Road and Bayfront Expressway/Willow Road study intersections.

The City has also developed plans for the extension of Blomquist Street north over Redwood Creek. The extension would link Blomquist Street to East Bayshore Road at its intersection with Bair Island Road. Since this particular planned roadway improvement is not yet fully funded, it has not been included as part of the background analysis.

Additionally, a study is currently underway to recommend improvements to the U.S. 101/Woodside Road interchange. No definitive project has yet been identified.

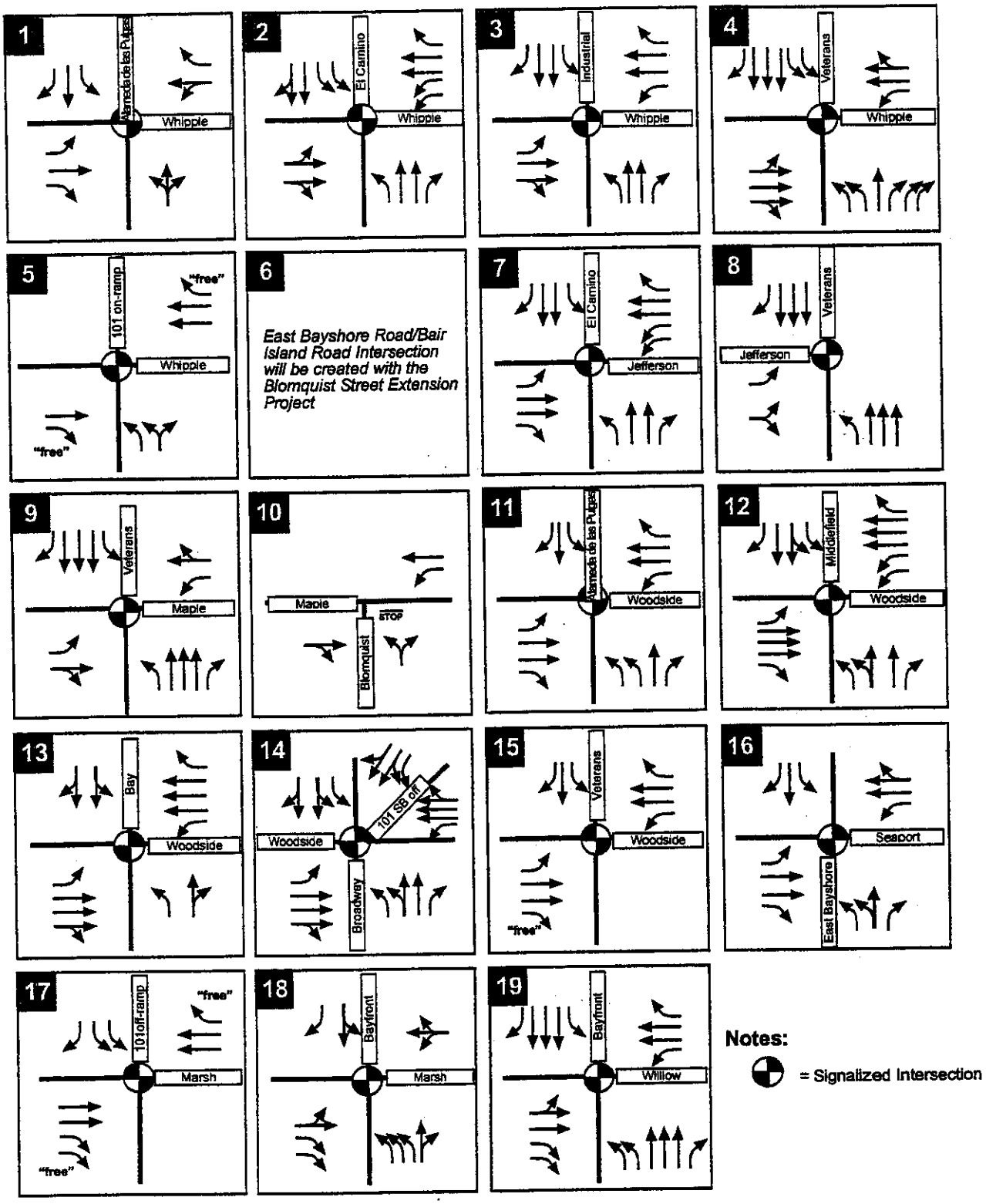
The intersection lane configurations and traffic control devices assumed in this EIR for Background Conditions are illustrated on Figure 7.4.

(b) Background Traffic Estimates. Traffic volumes for Background Conditions were estimated by adding traffic from anticipated cumulative (approved but not yet constructed or occupied) developments in the study area to the existing conditions volumes obtained from counts. The technical appendices for this EIR transportation and circulation chapter (available for review at the City of Redwood City Community Development Services Department at City Hall) contain a list of study area approved but as yet unoccupied projects, their associated trip generation estimates, and resulting projected traffic volumes at the study intersections. The projected traffic volumes under Background Conditions are illustrated on Figure 7.5.

(c) Projected Intersection Operations. Levels of service were calculated for the study intersections under Background Conditions (i.e., assuming the projected background traffic volumes and anticipated lane configurations). Table 7.7 presents the LOS results under Background Conditions.

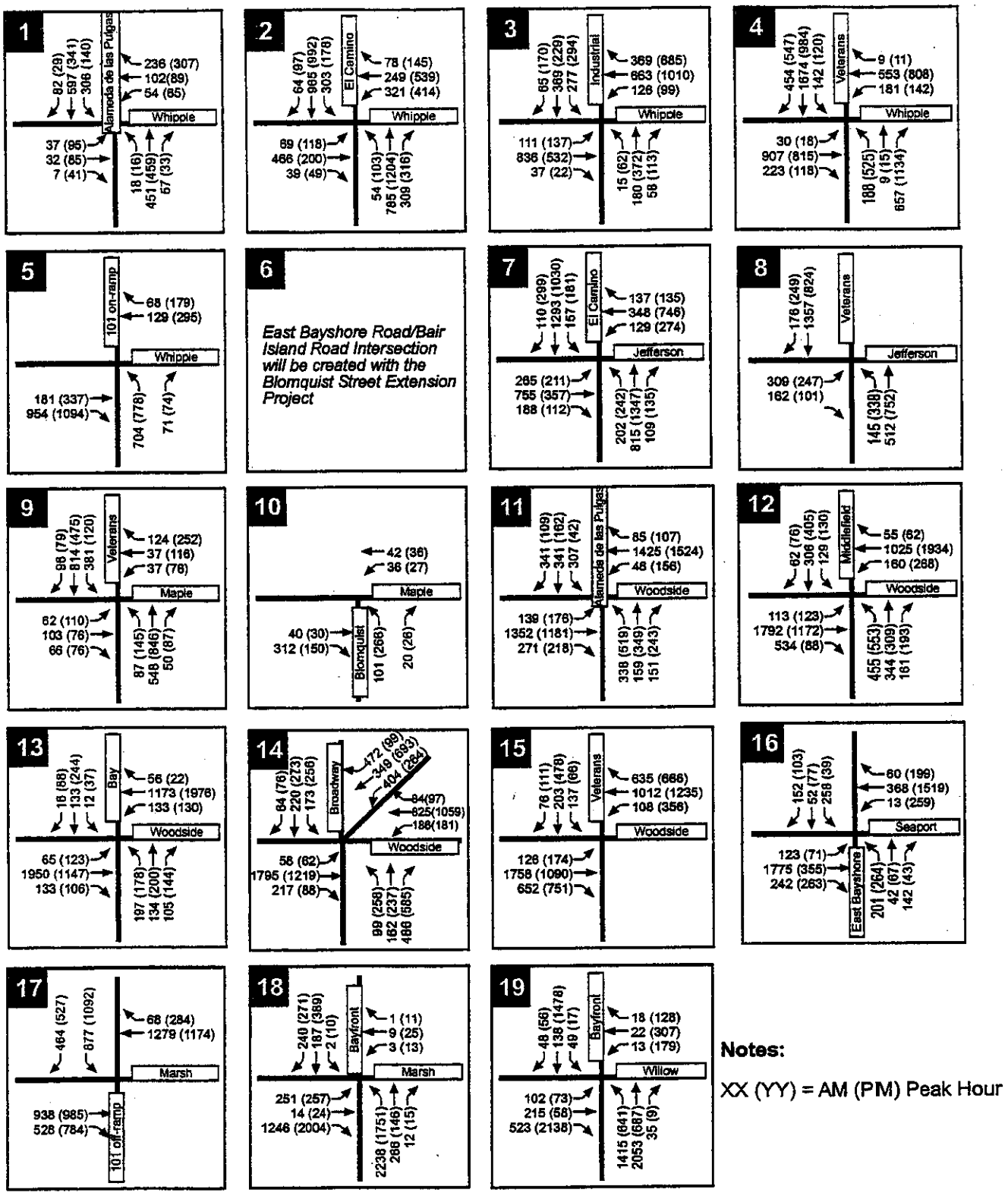
The results of the analysis indicate that the following significant LOS impacts are anticipated under Background Conditions without the project:

[2]This roadway improvement has been incorporated into the ramp merging, diverging, and weaving analysis under Background Conditions.



SOURCE: Fehr & Peers Associates, Inc.

Figure 7.4
BACKGROUND LANE CONFIGURATIONS



SOURCE: Fehr & Peers Associates, Inc.

Figure 7.5

BACKGROUND PEAK-HOUR INTERSECTION VOLUMES

Figure 7.4. Background Lane Configurations.

Figure 7.5. Background Peak Hour Intersection Volumes.

Table 7.7
INTERSECTION LEVELS OF SERVICE--BACKGROUND CONDITIONS

Study Intersections		Intersection Control	AM Peak-Hour Delay/LOS	PM Peak-Hour Delay/LOS
1.	Alameda de las Pulgas/ Whipple Avenue	Signal	25.4/C	25.5/C
2.	El Camino Real/Whipple Avenue	Signal	33.9/C	47.4/D
3.	Winslow Street/Whipple Avenue	Signal	31.1/C	40.4/D
4.	Veterans Boulevard/Whipple Avenue	Signal	36.3/D	36.7/D
5.	U.S. 101 Northbound Off-Ramp/ Whipple Avenue	Signal	7.9/A	11.2/B
6.	East Bayshore Road (Blomquist Street)/ Bair Island Road	Unsignalized	n/a	n/a
7.	El Camino Real/Jefferson Avenue	Signal	41.1/D	47.6/D
8.	Veterans Boulevard/Jefferson Avenue	Signal	15.7/B	28.3/C
9.	Veterans Boulevard/Maple Street	Signal	23.3/C	39.7/D
10.	Blomquist Street/Maple Street	2-Way Stop	11.3/B	12.1/B
11.	Alameda de las Pulgas/ Woodside Road	Signal	37.9/D	37.2/D
12.	Middlefield Road/Woodside Road	Signal	35.5/D	42.2/D
13.	Bay Road/Woodside Road	Signal	22.4/C	30.1/C
14.	Broadway/Woodside Road	Signal	>180/F	>180/F
15.	Veterans Boulevard/Woodside Road	Signal	21.5/C	41.7/D
16.	Blomquist Street/Seaport Boulevard	Signal	36.2/D	29.8/C
17.	U.S. 101 Southbound Ramps/ Marsh Road	Signal	15.4/B	16.5/B
18.	Bayfront Expressway/Marsh Road	Signal	25.0/C	29.2/C
19.	Bayfront Expressway/Willow Road	Signal	20.9/C	72.6/E

SOURCE: Fehr & Peers Associates, Inc.

Notes:

(1) Signalized intersection LOS ratings are based on average control delay expressed in seconds per vehicle. Unsignalized intersection LOS ratings are based on total control delay expressed in seconds per vehicle. Signalized and unsignalized analysis methodologies were obtained from the *2000 Highway Capacity Manual*, Transportation Research Board.

(2) Adjustments have been made to the LOS calculations at the El Camino Real/Whipple Avenue intersection to account for CalTrain movement preemption of the signal. CalTrain movements affect 20 to 30 percent of the cycles at the intersection during each peak hour. Therefore, the amount of "green time" allocated to the affected turning movements was decreased by 20 to 30 percent and reallocated to the northbound and southbound through movements.

(3) The East Bayshore Road/Bair Island Road intersection (#6) was not analyzed under Background Conditions. It will be analyzed under scenarios that include the planned Blomquist Street Extension over Redwood Creek.

- the Broadway/Woodside Road intersection is expected to continue to operate at an unacceptable LOS F during the AM and PM peak hours; and

- the Bayfront Expressway/Willow Road intersection is expected to maintain acceptable operations during the AM peak hour, but operate at an unacceptable LOS E during the PM peak hour.

Although the projected PM peak-hour LOS E condition is considered to be unacceptable, the operational condition is expected to improve over existing conditions due to the intersection improvements associated with the planned widening of the Bayfront Expressway.

The remaining study intersections are expected to maintain acceptable operations--i.e., LOS D or better--under Background Conditions.

(d) Background Freeway Segment Capacity Analysis. A Background Conditions capacity analysis has been completed to identify the capacity [or volume-to-capacity (V/C)] that will be available on segments of the U.S. 101, SR 84, and I-280 freeways[3] in the project vicinity when the proposed project is scheduled to come "on line." The Background Conditions capacity analysis includes the expected increased capacity on segments of U.S. 101 and SR 84 due to planned lane additions and alterations to those facilities. Upon completion of these improvements, U.S. 101 south of Whipple Avenue in the study area is expected to have a total of five lanes in each direction, including one high occupancy vehicle (HOV) lane, three mixed-flow lanes, and one auxiliary lane (merging/diverging). North of Whipple Avenue, U.S. 101 is also expected to have a total of five lanes in each direction, including four mixed-flow lanes, one auxiliary lane, and no HOV lane. SR 84 is expected to be widened from four lanes (two in each direction) to six lanes (three in each direction). The resulting freeway segment capacities have been analyzed and are presented in Table 7.8. The "background" V/C ratios for study area segments of I-280 are also presented. No alterations to these I-280 segments are currently planned.

A typical freeway design capacity of 2,300 vehicles per lane per hour (vplph) was assumed for the analysis of mixed-flow lane segments of U.S. 101 and I-280. The U.S. 101 HOV lanes were

[3]US 101 and I-280 are freeways (i.e., are multi-lane, divided highways with a minimum of two lanes for the exclusive use of traffic in each direction and full control of access without traffic interruption--*Highway Capacity Manual*). However, SR 84 operates more like an expressway (i.e., is designed to move high volumes of traffic, have limited access, and minimize traffic signals--*Highway Capacity Manual*). SR 84 is included in the *San Mateo CMP Monitoring Report* and was therefore included in this freeway analysis for illustrative purposes.

assumed to have a typical design capacity of 1,800 vplph. To remain consistent with methodologies presented in the *San Mateo CMP Monitoring Report*, capacities of 1,100 vplph were used for the study area segments of SR 84.

Table 7.8
FREEWAY SEGMENT CAPACITY ANALYSIS--BACKGROUND CONDITIONS

Freeway Segment	Lane Type	Capacity	AM Peak Hour Volume	AM Peak Hour V/C	PM Peak Hour Volume	PM Peak Hour V/C
U.S. 101:						
SB SR 92 to Whipple	Mixed Flow	9,200	8,640	0.94	7,772	0.84
SB Whipple to Woodside	Mixed Flow	6,900	7,779	1.13	7,746	1.12
	HOV	1,800	1,056	0.59	1,080	0.60
SB Woodside to Marsh	Mixed Flow	6,900	7,720	1.12	6,388	0.93
	HOV	1,800	1,136	0.63	939	0.52
NB Marsh to Woodside	Mixed Flow	6,900	5,187	0.75	4,001	0.58
	HOV	1,800	889	0.49	639	0.36
NB Woodside to Whipple	Mixed Flow	6,900	5,597	0.81	4,333	0.63
	HOV	1,800	1,110	0.62	1,018	0.57
NB Whipple to SR 92	Mixed Flow	9,200	7,008	0.76	6,274	0.68
I-280:						
SB SR 92 to Edgewood	Mixed Flow	9,200	7,737	0.84	4,327	0.47
SB Edgewood to Farm Hill	Mixed Flow	9,200	8,169	0.89	4,220	0.46
SB Farm Hill to Woodside	Mixed Flow	9,200	8,273	0.90	4,881	0.53
SB Woodside to County Line	Mixed Flow	9,200	5,392	0.59	3,973	0.43
NB County Line to Woodside	Mixed Flow	9,200	3,074	0.33	5,660	0.62
NB Woodside to Farm Hill	Mixed Flow	9,200	4,259	0.46	7,779	0.85
NB Farm Hill to Edgewood	Mixed Flow	9,200	3,877	0.42	7,277	0.79
NB Edgewood to SR 92	Mixed Flow	9,200	4,354	0.47	7,480	0.81
SR 84:						
EB Willow to University	Mixed Flow	3,300	650	0.20	3,570	1.08
EB University to County Line	Mixed Flow	3,300	1,600	0.48	4,892	1.48
WB County Line to University	Mixed Flow	3,300	4,703	1.43	1,481	0.45
WB University to Willow Road	Mixed Flow	3,300	3,354	1.02	1,288	0.39

SOURCE: Fehr & Peers Associates and Caltrans.

Notes:

(1) Typical design capacity for mixed-flow lanes on freeway segments is assumed to be 2,300 vehicles per lane per hour (vplph). Auxiliary lanes are not included in the analysis. See text [subsection 7.1.6(d)] for description of how traffic in the auxiliary lanes has been addressed.

(2) Typical design capacity for HOV lanes on freeway segments is assumed to be 1,800 vplph.

(3) Typical design capacity for mixed-flow lanes on SR 84 (an expressway) is assumed to be 1,100 vplph, consistent with design capacities identified in the *San Mateo CMP Monitoring Report*.

(4) Volumes on U.S. 101 and I-280, including existing volumes, were obtained from count data provided by Caltrans plus traffic from approved projects in the area.

(5) V/C = volume-to-capacity ratio.

(6) NB = northbound; SB = southbound; EB = eastbound; WB = westbound.

Existing and planned freeway auxiliary lanes (merging/diverging lanes at interchanges) were not included in this freeway segment analysis; the operations of study area auxiliary lanes are addressed in the Background Freeway Ramp Capacity Analysis discussion which follows under item (e). However, vehicles entering the freeway segment via the auxiliary lane will merge into and occupy capacity in the mixed-flow lanes for a portion of the freeway segment. Likewise, vehicles exiting the freeway (which were occupying capacity in the mixed-flow lanes) will merge into the auxiliary lane and occupy that lane for only a portion of the freeway segment. Therefore, half of all vehicles that would use the auxiliary lane in each freeway segment (both entering and exiting the freeway mainline) were included in the capacity analysis for the mixed-flow lanes.

To determine the number of vehicles using the HOV lanes, the estimated percent of HOVs on U.S. 101 was obtained from the "Measures of Effectiveness" projections included in the *U.S. 101 Auxiliary Lane Project Study* (prepared for Caltrans by Fehr & Peers Associates, November 2000). Additionally, because vehicles entering the freeway from the auxiliary lanes will occupy the mixed-flow lanes of U.S. 101 for only a portion of each study segment, the mixed-flow lane V/C analysis assumes that half of the total vehicles expected to use the auxiliary lanes will also use capacity on the mainline section of U.S. 101.

The results of the Background Conditions freeway segment capacity analysis indicates that the southbound segments of U.S. 101 between Whipple Avenue and Marsh Road are expected to have V/C ratios greater than 1.0, where demand will exceed capacity, during the AM peak hour. The southbound segment of U.S. 101 between Whipple Avenue and Woodside Road is expected to have a V/C ratio of 1.12 during the PM peak hour. During the AM peak hour, both westbound study segments of SR 84 are expected to have V/C ratios greater than 1.0. During the PM peak hour, both eastbound segments of SR 84 are expected to have V/C ratios greater than 1.0.

(e) Background Freeway Ramp Capacity Analysis. To verify that the study area freeway ramps at the Whipple Avenue and Woodside Road interchanges would have sufficient "Background Condition" capacity to serve expected demand, a volume-to-capacity analysis was conducted for each of the study ramps. For the purpose of this analysis, capacities presented in Chapter 25 of the *2000 Highway Capacity Manual* were used based on the free-flow speed of the study ramps. The results are presented in Table 7.9. The results of the analysis indicate that all of the study ramps will have excess capacity (V/C ratios less than 1.0) under Background Conditions.

The planned addition of auxiliary lanes to U.S. 101 will provide a continuous weaving lane between the on- and off-ramps at the Ralston Avenue interchange “north” of the study area (north of the Whipple Avenue interchange) and Marsh Road interchange “south” of the study area (south of the Woodside Road interchange). As a result, vehicles traveling along the study area segments of U.S. 101 will be required to make at least one lane change to enter and exit the freeway at the Whipple Avenue and Woodside Road interchanges, an operation that is defined as "weaving."

Table 7.9
FREEWAY RAMP CAPACITY ANALYSIS--BACKGROUND CONDITIONS

U.S. 101 Freeway Ramp	Capacity	AM Peak Hour Volume	AM Peak Hour V/C	PM Peak Hour Volume	PM Peak Hour V/C
SB U.S. 101 Off-Ramp/ Veterans Boulevard	3,800	1,747	0.46	1,455	0.38
SB U.S. 101 On-Ramp/Westbound Whipple Avenue	1,900	72	0.04	124	0.07
NB U.S. 101 Off-Ramp/Whipple Avenue	2,000	699	0.35	954	0.48
NB U.S. 101 On-Ramp/Westbound Whipple Avenue	2,000	72	0.04	162	0.08
SB U.S. 101 On-Ramp/Woodside Road	2,000	1,007	0.50	1,052	0.53
NB U.S. 101 Off-Ramp/Woodside Road (Seaport Blvd.)	1,900	1,284	0.68	1,265	0.67

SOURCE: Fehr & Peers Associates and Caltrans.

Notes:

(1) Capacity based on information presented in Chapter 25 of the *2000 Highway Capacity Manual* and the posted recommended travel speed on the ramp.

(2) Volumes include existing count data provided by Caltrans plus traffic from approved projects.

(3) V/C = volume-to-capacity Ratio.

(4) NB = northbound; SB = southbound.

To analyze the operation of freeway weaving segments in California, the nomograph presented in the Caltrans *2000 Highway Design Manual* (Figure 504.7A) is used to correlate the weaving volume and length of the weaving section to a level of service (LOS) rating. Due to the adequate length of the proposed new auxiliary lanes along the study area segment of U.S. 101, the nomograph indicates that the weaving segment is "out of realm of weaving" (i.e., would not contribute to dangerous weaving maneuvers). Weaving segments that are "sufficiently long" provide more than an adequate space for drivers to find a gap and enter or exit the freeway, and, according to Caltrans operations staff, require no further analysis.

7.2 PERTINENT PLANS AND POLICIES

7.2.1 Agencies with Jurisdiction Over Transportation in Redwood City

The City of Redwood City has jurisdiction over all City streets and City-operated traffic signals. Several regional and state agencies have jurisdiction over regional transportation system planning and funding. The City/County Association of Governments of San Mateo County (C/CAG), which is the state-authorized Congestion Management Agency in San Mateo County, and the Metropolitan Transportation Commission (MTC), which is the state-authorized regional transportation planning agency for the nine-county Bay Region, oversee and coordinate funding for intra-regional transportation improvement programs. The State of California Department of Transportation (Caltrans) has jurisdiction over Redwood City-serving freeways (U.S. 101 and I-280), freeway ramps, and designated state routes (SR 82/El Camino Real and SR 84/Woodside Road). Transit service providers such as CalTrain, SamTrans, and the Water Transportation Authority (the agency responsible for providing ferry service) have jurisdiction over their respective services. These various jurisdictional agencies and their pertinent specific responsibilities and funding abilities are more specifically described below.

(a) City of Redwood City. The City of Redwood City is responsible for planning, constructing, and maintaining local public transportation facilities, including all City streets, City-operated traffic signals, sidewalks, and bicycle facilities. These local services are funded primarily by gas-tax revenue and developer fees.

(b) C/CAG. The City/County Council of Governments of San Mateo County (C/CAG) is the state-designated regional Congestion Management Agency (CMA) that sets state and federal funding priorities for improvements affecting its San Mateo County Congestion Management Program (CMP) designated regional roadway system. C/CAG-designated CMP roadway system components in Redwood City include SR 82 (El Camino Real), SR 84 (Woodside Road), U.S. 101, and I-280. C/CAG-designated CMP intersections in Redwood City include El Camino Real/Whipple Avenue, Bayfront Expressway/Marsh Road (borders Redwood City), and Woodside Road/Middlefield Road.

C/CAG has adopted mitigation guidelines to reduce the number of net new regional roadway system vehicle trips generated by new developments, entitled *C/CAG Guidelines for the*

Implementation of the Land Use Component of the 1999 Congestion Management Program. These guidelines apply to all developments that generate 100 or more net new peak-period trips on the CMP network and are subject to CEQA review. These guidelines ensure that *"the developer and/or tenants will reduce the demand for all new peak-hour trips (including the first 100 trips) projected to be generated by the development."*[4]

(c) Metropolitan Transportation Commission (MTC). The state-designated regional transportation planning agency for the nine-county San Francisco Bay Area is the Metropolitan Transportation Commission (MTC). MTC is the clearinghouse for state and federal transportation improvement funds. Each county CMA, including C/CAG, is required to forward a capital improvement project list to MTC. MTC reviews the lists submitted by all nine counties and submits a regional priority list to the California Transportation Commission (CTC) and/or the Federal Highway Administration for selection of projects to receive funding. Funded projects are included in the Regional Transportation Plan (RTP).

(d) Caltrans. The California Department of Transportation (Caltrans) has authority over the state highway system, including mainline facilities, interchanges, and arterial state routes. Caltrans approves the planning and design of improvements for all state-controlled facilities. State-controlled facilities in Redwood City include U.S. 101 and its interchanges at Whipple Avenue and Woodside Road, El Camino Real (SR 82), and Woodside Road (SR 84), including the El Camino Real/Woodside Road interchange.

7.2.2 Pertinent Plans and Policies

City and regional plans and policies in place that affect transportation in Redwood City and are relevant to consideration of the environmental impacts of the proposed project are described below.

(a) Redwood City Strategic General Plan. The Redwood City Strategic General Plan *Circulation Element* (adopted in 1990, revised in 1993) contains the following relevant objectives and policies:

- *Allow for the safe and convenient movement and access of motor vehicles in Redwood City, but not at the expense of the environment or the overall quality of life in Redwood City or to the detriment of alternative transportation modes.* (Motor Vehicle Transportation Objective 1, page 7-7)

- *Local road projects that are not part of the State Highway System shall not be included in the Circulation Element if one or more of the following impacts are likely to result:*

[4] *Revised C/CAG Guidelines for the Implementation of the Land Use Component of the 1999 Congestion Management Program,* C/CAG (Walter Martone), October 11, 2000.

- *Increases road capacity, thereby encouraging increased through automobile traffic;*
- *Requires a substantial acquisition of land;*
- *Results in a substantial loss of housing and/or business;*
- *Encroaches into environmentally sensitive areas, such as open space and wetlands, resulting in a substantial loss of these areas;*
- *Routes increased traffic through residential neighborhoods; or*
- *Is extremely costly in terms of benefits achieved.* (Motor Vehicle Transportation Objective 2, page 7-7)

- *Participate in formulating and supporting the goals and policies of the Congestion Management Plan for San Mateo County by cooperating with adjacent jurisdictions so as to more effectively deal with traffic congestion and traffic impacts.* (Motor Vehicle Transportation Policy MV-2, page 7-7)

- *Create conditions to allow for better utilization of the existing public transportation system that will increase public transportation use and the subsequent improvement of the public transportation infrastructure and expansion of service.* (Public Transportation Objective 1, page 7-13)

- *Establish site planning and architectural standards for new building projects that would incorporate transit access and orientation. Such standards would apply to both public and private building projects located along existing bus routes to enhance pedestrian access and convenient public transit access.* (Public Transportation Policy PT-4, page 7-14)

- *Make walking and bicycling a realistic and more widespread transportation alternative in Redwood City by establishing a series of policies to create an urban environment that will make walking and bicycling safe, efficient, and convenient.* (Non-Motorized Transportation Objective, page 7-26)

- *Designate areas for mixed use and higher density residential development to create pedestrian-oriented environments. This policy shall complement the policies in the Public Transportation section as they pertain to land use.* (Non-Motorized Transportation Policy NM-1, page 7-26)

- *Minimum standards for sidewalk widths shall be maintained. Loss of sidewalk surface due to encroachment and/or the installation of poles, street furniture, and/or other utility hardware shall be avoided. If any sidewalk surface is lost to these or other uses, additional sidewalk surface shall be provided that is equal to or more than the amount of sidewalk surface lost.* (Non-Motorized Transportation Policy NM-3, page 7-26)

- *Provide and maintain continuity to the existing bikeway system within Redwood City by eliminating missing segments in the system. Bikeway continuity shall also be provided, whenever possible, through such means as eliminating parking on one or both sides of the street and/or through street modification. If these measures are not feasible, the posting of appropriate signs and pavement markings shall be required.* (Non-Motorized Transportation Policy NM-8, page 7-27)

- *All new traffic signal installations and existing traffic signal modifications shall include installation of bicycle-sensitive signal detector loops.* (Non-Motorized Transportation Policy NM-11, page 7-27)

Railroad Grade Separations. The City's General Plan also discusses potential future railroad grade separations as a means to reduce traffic delays and conflicts between CalTrain and automobiles. The General Plan discusses possible locations for railroad grade separations that include Jefferson Avenue, which has already been constructed, and Whipple Avenue. Discussions with City staff have indicated that construction of a grade separation at Whipple Avenue is not expected in the near future.

Roadway Improvements. The General Plan also identifies the following projected roadway improvement needs:

- the Blomquist Street Extension, which would extend Blomquist Street from its current terminus at Maple Street northward, over Redwood Creek, to the East Bayshore Road/Bair Island Road intersection (as previously indicted, this extension has been partially funded);

- the extension of Skyway Road at San Carlos Airport south from its current terminus at Pulgas Creek to Whipple Avenue, to provide a parallel alternative to U.S. 101 and provide a direct non-freeway connection between Redwood Shores and the rest of Redwood City. No funding has been identified for this improvement and the planned extension alignment would encroach onto wetlands, which will result in substantial mitigation needs. Construction of this project is not anticipated in the foreseeable future; and

- the extension of the Bayfront Expressway from its current terminus at Marsh Road in Menlo Park northward to Seaport Boulevard, in a realigned four-lane configuration that would replace the existing segment of East Bayshore Road. City leadership is currently opposed to this extension, based on plans reviewed to date, which suggest that negative local impacts of the extension outweigh the benefits for Redwood City.

The General Plan also discusses the possibility of constructing an elevated viaduct for Woodside Road between El Camino Real and U.S. 101. This recommendation was, in part, due to increased traffic expected on Woodside Road due to the Bayfront Expressway project. Due to the environmental constraints associated with this project, and the funded widening of

Woodside Road between El Camino Real and U.S. 101 (see Background Conditions), this project will not occur in the foreseeable future.
The addition of on- and off-ramps on the existing Maple Street overcrossing of U.S. 101 has also been recommended in the General Plan. This improvement would create an additional interchange on U.S. 101 in Redwood City; however, the General Plan also notes that there is currently not enough spacing between the existing interchanges at Whipple Avenue and Woodside Road to meet Caltrans design standards, and as a result, recognizes that this new interchange could only be built concurrently with the complete reconstruction of the U.S. 101/Woodside Road interchange. This project is not expected to occur in the near future.

(b) Redwood City Traffic Impact Mitigation Fee Study. The *Redwood City Traffic Impact Mitigation Fee Study* was prepared and adopted to establish a source of funding for future transportation system capital improvements in Redwood City. The funding needs identified in the study are discussed below.

Identified Intersection Improvement Needs:

▪ ▪	El Camino Real/Whipple Avenue	Addition of a receiving lane for the westbound right-turn creating a "free" right turn movement
▪ ▪	Veterans Boulevard/Whipple Avenue	Addition of an eastbound right turn lane
▪ ▪	Veterans Boulevard/Middlefield Road	Installation of a traffic signal
▪ ▪	El Camino Real/Beech (Lincoln)	Close center median
▪ ▪	Bay Road/Fifth Street	Installation of a traffic signal
▪ ▪	Various locations near schools	Install lighted pedestrian crossings

Identified Travel Corridor and Areawide Improvements:

- Woodside Road (SR 84) has been identified for widening to six lanes from El Camino Real to U.S. 101. A Caltrans-prepared Project Study Report (PSR) and Environmental Document (ED) have been approved for this project. Discussions with City staff indicate that completion of the widening is anticipated in the near future (less than five years). The Mitigation Fee Study has also identified a need for the widening of Woodside Road to six lanes from El Camino Real to Valota Road to improve traffic flow through the corridor and to provide LOS D operation, which is currently considered an "acceptable" LOS standard.

- East Bayshore Road (south of Whipple Avenue) has been identified for widening to three lanes[5] due to existing long delays during peak periods, especially when movies start/end at

[5]The Traffic Impact Mitigation Fee Study text identifies this roadway for widening to four lanes. Discussions with City staff have indicated that the study states "four lanes" erroneously, and that it should

the Century 12 cinema complex (see Figure 4.1 herein). The City has approved a proposal to relocate the cinema complex to downtown Redwood City, a measure that may ease peak travel demands on East Bayshore Road and Whipple Avenue. Depending on this and other future and proposed land uses in the Bair Island Road area, East Bayshore Road may not need widening in the future.

- The Blomquist Street Extension, from Maple Street, over Redwood Creek, to the East Bayshore Road/Bair Island Road intersection has been identified in the *Mitigation Fee Study* as necessary to provide additional and emergency access to the Bair Island Road area.

- Veterans Boulevard has been identified as needing widening to four lanes from Chestnut Street to Woodside Road.

- Neighborhood traffic management programs (NTMP) have also been identified as needed, including installation of traffic calming/improvement projects in local neighborhoods to alleviate cut-through traffic and speeding.

Identified Alternative Modes/Transit Potential Projects:

- A bicycle connection is identified as a potential project between Veterans Boulevard and Seaport Boulevard using the right-of-way of the existing railroad spur. However, the fee study also indicates that this connection is infeasible while the railroad spur is active.

- A City-based shuttle system is identified as a potential project.

- A full-time city transportation demand management (TDM) coordinator is identified as a potential way to encourage alternative transportation modes. The coordinator would have the responsibility to develop TDM traffic reduction plans, assist employers in establishing and operating employee trip reduction plans, and coordinate with regional agencies and traffic relief organizations.

- Miscellaneous transit, pedestrian, and bicycle projects are also identified as potential improvements, such as bus shelters, benches, pedestrian amenities, Americans with Disability Act (ADA) curb ramps, closing sidewalk and bike lane gaps, park and ride lots, and transit center improvements.

- The City currently funds the Redwood Shores Taxi Shuttle to/from the CalTrain Station from the traffic fees.

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be three lanes.

(c) City Parking Policies and Requirements. The City of Redwood City has adopted the following pertinent on-site parking supply requirements:

- two parking spaces per unit plus one guest space per four units (or 2.25 spaces per unit) for condominiums;
- one parking space per 300 square feet of office space (ten percent of the spaces must be designated for carpools/vanpools);
- one space for every three seats in a restaurant; and
- one space per 200 square feet of retail space.

(d) Redwood City Bayfront Study Formulation Program. As described in section 4.2 of this EIR, land use/urban design and transportation planning studies are currently being conducted by the City for the Bayfront Area, which is the area east of U.S. 101 generally bounded by Whipple Avenue and Seaport Boulevard. The planning area includes the project site and surrounding Bair Island Road area, the area along Blomquist Street (including the proposed Blomquist Extension), the Port, and the Pacific Shores Area.

The purpose of the planning study is to develop land use and circulation alternatives for the Bayfront Area for consideration by City Council. The transportation component of the study includes a "fatal flaw" analysis of the existing roadway system. The transportation component also examines the feasibility of alternative modes of travel to the Bayfront Area. Some of the alternative mode options currently being explored include use of the existing railroad right-of-way under U.S. 101 that parallels Seaport Boulevard as a transit corridor during peak commute periods, creation of ferry service terminals, increased bus and shuttle service, water taxi service, improved pedestrian and bicycle service to the area, and the possibility of additional pedestrian and bicycle bridges over Redwood Creek within the area.

The *Bayfront Study* is being formulated concurrently with this EIR, and will be available for review by the City Council in March 2003. A copy of the current *Bayfront Study* is available for review at the City of Redwood City Community Development Services Department, City Hall, 1017 Middlefield Road.

(e) C/CAG Guidelines for the Implementation of the Land Use Component of the 1999 Congestion Management Program. C/CAG, the San Mateo County CMA, has adopted guidelines for the land use component of its Congestion Management Program (CMP) in order to reduce the regional traffic impacts of substantive new developments. The guidelines apply to all projects that generate 100 or more net new peak-period trips on the CMP network and are subject to CEQA review. Projects in the county that meet this criterion are required to:

(1) Determine if a combination of acceptable options/measures is possible that will fully reduce the net number of trips that the project is anticipated to generate on the CMP roadway

network (including the first 100 trips). Options and measures that could be implemented include:

- Build adequate roadway and/or transit improvements so that the added peak-hour trips will have no measurable impact on the CMP roadway network.

- The developer may also contribute a one-time only payment of $20,000 per peak-hour trip (including the first 100 trips) to a special fund for the implementation of appropriate transportation demand management (TDM) system measures at the development.

- Implement a TDM program that has the capacity to fully reduce the demand for new peak-period trips. C/CAG has provided a list of TDM measures and their associated "trip credit" to assist in the development of a TDM program. The list of C/CAG-approved TDM measures (as part of the transportation and circulation technical appendices) is available for review at the City of Redwood City Community Development Services Department, City Hall, 1017 Middlefield Road. Also, *Mitigation 7-2* in this chapter refers to TDM measures currently identified in the *Bayfront Study* as applicable to the proposed Marina Shores Village project (excerpted at the end of this chapter).

- Negotiate with C/CAG staff for other acceptable ways to mitigate trips for specific developments on a case-by-case basis.

- The portion of traffic impact mitigation fees collected by Redwood City as part of its Traffic Impact Fee Mitigation Program that are used to mitigate project impacts on the CMP roadway network will count as a credit toward the project's per-trip mitigation requirements under the CMP.

(2) If the combination of options/measures can fully reduce the number of trips on the CMP roadway network, the information must be included as part of the environmental documents that are circulated and adopted by the local jurisdiction.

(3) If the combination of options/measures cannot fully reduce the number of trips on the CMP roadway network, Walter Martone at C/CAG should be contacted for review and approval as early in the process as possible so that the agreed upon plan can be included in the environmental documents placed in circulation.

(4) If an agreement is not reached with C/CAG staff on the mitigation plan, an immediate review by the C/CAG Board will be scheduled so that the local jurisdiction project approval process will not be delayed.

(f) ABAG's San Francisco Bay Trail. As described previously in subsection 7.1.4(b) of this chapter, some existing segments of the ABAG-planned Bay Trail have been constructed north and south of the project area, and preliminary alignments to close the local Bay Trail gap have

been identified. *Impact 7-9* of this chapter discusses potential conflicts between the proposed project and the ABAG-proposed alignment of the Bay Trail.

(g) CalTrain. CalTrain is expected to expand its current service along the southern Peninsula. The "baby bullet" program includes the construction of additional passing tracks to the existing CalTrain line, along the existing JPB alignment, to allow express service trains to pass local service trains between San Francisco and San Jose. The program would also include station modifications, and the purchase of five additional trains to establish express service through the corridor.

(h) Water Transit Authority. The Water Transit Authority has completed a plan to increase water transit throughout the San Francisco Bay area. The plan identifies a new ferry terminal to be located in Redwood City. Discussions with City staff have indicated that the new terminal would likely be located at the terminus of Seaport Boulevard (adjacent to the Pacific Shores development). The CEQA-compliance (environmental) document for the plan has been completed and is undergoing public review.

7.3 IMPACTS AND MITIGATION MEASURES

7.3.1 Significance Criteria

(a) General Criteria. Based on the CEQA Guidelines, the project would be considered in this EIR to create a significant impact on traffic or parking conditions if it would:[6]

(1) Cause an increase in traffic that is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume-to-capacity ratio on roads, or congestion at intersections);

(2) Substantially increase hazards due to a design feature (i.e., sharp curves or dangerous intersections) or incompatible uses;

(3) Result in inadequate emergency access;

(4) Result in inadequate parking capacity; or

(5) Conflict with adopted policies, plans, or programs supporting alternative transportation.

(b) Intersection Impacts. Based on existing CEQA and Redwood City standards, traffic impacts at intersections are identified in this EIR chapter as significant if the addition of project traffic causes:

[6]CEQA Guidelines, Appendix G, item XV(a and d-g).

(1) operations (level of service) at a signalized intersection to deteriorate from an acceptable level (LOS D or better) under Background Conditions to an unacceptable level (LOS E or F); or

(2) operations (average delay) at a signalized intersection already operating at an unacceptable level (LOS E or F) under Background Conditions to increase by five or more seconds; or

(3) operations at an unsignalized intersection to deteriorate from an acceptable level (LOS D or better) under Background Conditions to an unacceptable level (LOS E or F) ***and*** the traffic volumes at the intersection satisfy the Caltrans Peak-Hour Volume warrant for traffic signal installation; or

(4) the average delay at an unsignalized intersection already operating at an unacceptable level (LOS E or F) to increase by five or more seconds ***and*** the traffic volumes at the intersection satisfy the Caltrans Peak-Hour Volume warrant for traffic signal installation; or

(5) a substantial increase in hazards due to a design feature (i.e., sharp curves or dangerous intersections) or incompatible uses.[7]

(c) Freeway Segment Impacts. Based on common CEQA practice, traffic impacts on the study freeway segments are identified in this EIR as significant if the addition of project traffic:

(1) causes the volume on the freeway segment to exceed its capacity; or

(2) increases the amount of traffic on a freeway segment already exceeding its capacity by more than one percent of the freeway segment's design capacity.

(d) Freeway Ramp Merging/Diverging Impacts. Based on common CEQA practice, the proposed project is considered to result in a significant freeway ramp merging or diverging impact if the addition of project traffic:

(1) causes the level of service of a freeway ramp to degrade from an acceptable level (LOS D or better) to an unacceptable level (LOS E or LOS F); or

(2) adds traffic to a freeway ramp already a operating at an unacceptable level (LOS E or LOS F).

[7]CEQA Guidelines, Appendix G, item XV(d).

(e) Freeway Ramp Capacity Impacts. Based on common CEQA practice, the proposed project is considered to result in a significant freeway ramp capacity impact if its implementation:

(1) causes the volume-to-capacity ratio (V/C) of the freeway ramp to exceed 1.0; or

(2) adds traffic to a freeway ramp with an existing V/C greater than 1.0.

(f) Transit, Bicycle, and Pedestrian Impacts. Based on common CEQA practice, the proposed project is considered in this EIR to result in a significant impact if its implementation conflicts with any existing, planned, or possible future transit, bicycle, and/or pedestrian facility, services, or associated policy.

(g) Emergency Access Impacts. Based on common CEQA practice, the proposed project is considered in this EIR to result in a significant impact if it would result in inadequate emergency access[8] and, in particular, if the addition of project traffic would cause or exacerbate existing LOS F operations on Bair Island Road, East Bayshore Road, or Whipple Avenue (near the project site) in an emergency situation (i.e., an evacuation). Emergency situations are defined to occur when the entire Bair Island Road area needs to be evacuated in a short period of time (e.g., 30 minutes).

(h) C/CAG CMA Roadway Network Impacts. The proposed project is considered in this EIR to have a significant impact if its trip generation rate is more than 100 trips per hour and the project does not incorporate the associated mitigation requirements identified in the *C/CAG Guidelines for Implementation of the Land Use Component of the 1999 Congestion Management Program*.

7.3.2 Project Trip Generation

The proposed Marina Shores development would ultimately (at buildout) include 1,930 for-sale, high-rise condominium units, 300,000 square feet of office space, and 12,000 square feet of retail space.

Table 7.10 presents trip generation estimates for the proposed project land uses. The trip generation rates and associated trip reductions (due to the mixed use nature of the project) are described in more detail below.

(a) Residential Land Use. The residential land use component of the proposed project includes 1,930 for-sale condominium units. Typically, trip generation estimates for the proposed residential units would be estimated using rates published in the Institute of Transportation Engineers' (ITE) *Trip Generation* (Sixth Edition) manual for "high-rise condominiums." However, because the proposed land use is not prevalent in the San Francisco Bay Area and

[8]CEQA Guidelines, Appendix G, item XV(e).

the actual commute and other travel habits of such high-rise condominium households may be significantly different than what is reflected in the conventional ITE figures, City staff and the Planning Commission directed that research be conducted to determine if the ITE rates were adequately representative of local conditions.

Table 7.10
PROJECT TRIP GENERATION

Land Use	Size	Trip Rates Daily	AM	PM	Total Trips Daily	AM	PM
High-Rise Condominiums	1,930 units	5.86	0.34	0.38	11,310	656	733
Reduction due to condo/retail mixed use component (13% off retail)				*(33)*	*(1)*	*(3)*	
Reduction due to condo/restaurant mixed use component (13% off restaurant)					*(102)*	*(7)*	*(8)*
Reduction due to condo/office mixed use component (3% off office)				*(93)*	*(13)*	*(12)*	
High-Rise Condominiums Subtotal--Net New Trips					11,082	635	710
Office	300,000 square feet	10.29	1.49	1.39	3,086	448	416
Reduction due to office/retail mixed use component (3% off retail)					*(8)*	*(0)*	*(1)*
Reduction due to office/restaurant mixed use component (3% off restaurant)				*(23)*	*(2)*	*(2)*	
Reduction due to condo/office mixed use component (3% off office)				*(93)*	*(13)*	*(12)*	
Office Subtotal--Net New Trips					2,962	433	401
Restaurant	6,000 square feet	130.34	9.27	10.86	782	56	65
Reduction due to office/restaurant mixed use component (3% off restaurant)				*(23)*	*(2)*	*(2)*	
Reduction due to condo/restaurant mixed use component (13% off restaurant)					*(102)*	*(7)*	*(8)*
Restaurant Subtotal--Net New Trips					657	47	55
Retail	6,000 square feet	42.92	1.03	3.74	258	6	22
Reduction due to condo/retail mixed use component (13% off retail)				*(33)*	*(1)*	*(3)*	
Reduction due to office/retail mixed use component (3% off retail)					*(8)*	*(0)*	*(1)*
Retail Subtotal--Net New Trips					217	5	18
Total Gross Trips					15,436	1,166	1,236
Existing Trips Generated by Site					(810)	(81)	(85)
Trip Reductions					*(518)*	*(46)*	*(52)*
Total Net New Trips					**14,108**	**1,039**	**1,099**

SOURCE: Fehr & Peers Associates, Inc. (see notes below for additional sources).

Notes:

(1) Trip rates shown are per unit for residential development and per 1,000 square feet for office and commercial uses.

(2) Trip rates derived from *Trip Generation, Sixth Edition*, Institute of Transportation Engineers (ITE), 1997.

(3) Mixed use trip reductions based on allowable trip reduction estimates presented in the *Santa Clara County VTA Transportation Impact Analysis (TIA) Guidelines,* 1998.

(4) Existing trips determined from peak-hour counts conducted by Fehr & Peers Associates in May 2002. Daily volume estimated by assuming that peak-hour volumes represent approximately ten percent of daily trips.

To address this issue, trip generation surveys were conducted by the EIR transportation consultant, Fehr & Peers Associates, during the AM and PM peak hours at three similar high-rise condominium complexes in the City of San Mateo. Data from the trip generation surveys were summarized in a memorandum to City staff, which is available for review (as part of the transportation and circulation technical appendices) at the City of Redwood City Community Development Services Department, City Hall, 1017 Middlefield Road.

The results of the surveys indicated that observed trip generation rates at the high-rise condominium developments in San Mateo were approximately equivalent to, but slightly lower than, the published ITE rates. Therefore, it was determined that the slightly more conservative (i.e., higher) ITE rates should be used to estimate the number of trips generated by the proposed project residential uses.

Following common practice, trip reductions were applied to the gross residential trip generation estimates as warranted to account for anticipated internalization of trips within the project due to its particular mixed use (residential-office-retail) characteristics. The reductions were based on allowable trip reduction estimates presented in the *Santa Clara County VTA Transportation Impact Analysis (TIA) Guidelines*, 1998. Redwood City and C/CAG do not publish similar trip reductions; the Santa Clara County information is therefore considered to be the closest comparable data.

As shown in Table 7.10, the results of the trip generation estimates indicate that the condominium component of the proposed project at buildout is expected to generate approximately 11,082 net new daily trips, 635 net new AM peak-hour trips (119 inbound/516 outbound), and 710 net new PM peak-hour trips (440 inbound/270 outbound).

(b) Office Land Use. The office component of the proposed project includes 300,000 square feet of office space. Trip generation estimates for this proposed office space were estimated using standard ITE rates for “general office building.” Following common practice, trip reductions were also applied to the gross trip generation estimates as warranted to account for internalization of trips (mixed use).

As shown in Table 7.10, the results of the trip generation estimates indicate that the office component of the proposed project at buildout is expected to generate 2,962 net new daily trips, 433 net new AM peak-hour trips (382 inbound/51 outbound), and 401 net new PM peak-hour trips (67 inbound/334 outbound).

(c) Restaurant Land Use. The retail land use component of the proposed project includes 12,000 square feet of "retail" space. It is estimated that approximately half of this "retail" space would be occupied by a restaurant use or uses. Trip generation estimates for 6,000 square feet of the "retail" space total were therefore estimated using ITE rates for a "high-turnover (sit-down) restaurant." Trip reductions were also applied to this land use component’s gross trip generation estimates to account for internalization of trips (mixed use) to and from the office and residential uses.

The results of the trip generation estimates indicate that the restaurant component of the proposed project at buildout is expected to generate 657 net new daily trips, 47 net new AM peak-hour trips (23 inbound/24 outbound), and 55 net new PM peak-hour trips (33 inbound/22 outbound).

(d) Retail Land Use. The remaining project "retail" space (6,000 square feet) is assumed to include residential and office support services such as a dry-cleaner, post office, convenience market, or similar uses. Trip generation estimates for the remaining retail component were therefore estimated using ITE “shopping center” rates.

Similar to the other land use components of the proposed project, trip reductions were also applied to this land use component’s gross trip generation estimates as warranted to account for internalization of trips (mixed use).

The results of the trip generation estimates indicate that the retail component of the proposed project at buildout is expected to generate 217 net new daily trips, 5 net new AM peak-hour trips (3 inbound/2 outbound), and 18 net new PM peak-hour trips (9 inbound/9 outbound).

(e) Existing Land Uses. The project site currently contains a 90,000-square-foot office building (of which 1,600 square feet are occupied by a small restaurant), a 7,000-square-foot (300-seat) larger restaurant, 263 boat slips, and storage for approximately 120 boats and RVs. To capture the existing number of trips generated by these existing land uses, peak-period driveway counts were conducted at the site by Fehr & Peers Associates in May 2002. The results indicated that the current site was generating 81 AM peak-hour trips (70 inbound/11 outbound) and 85 PM peak-hour trips (17 inbound/68 outbound). The number of existing daily trips is therefore estimated to be 810, based on a ten percent peak-hour factor, per standard engineering practice.

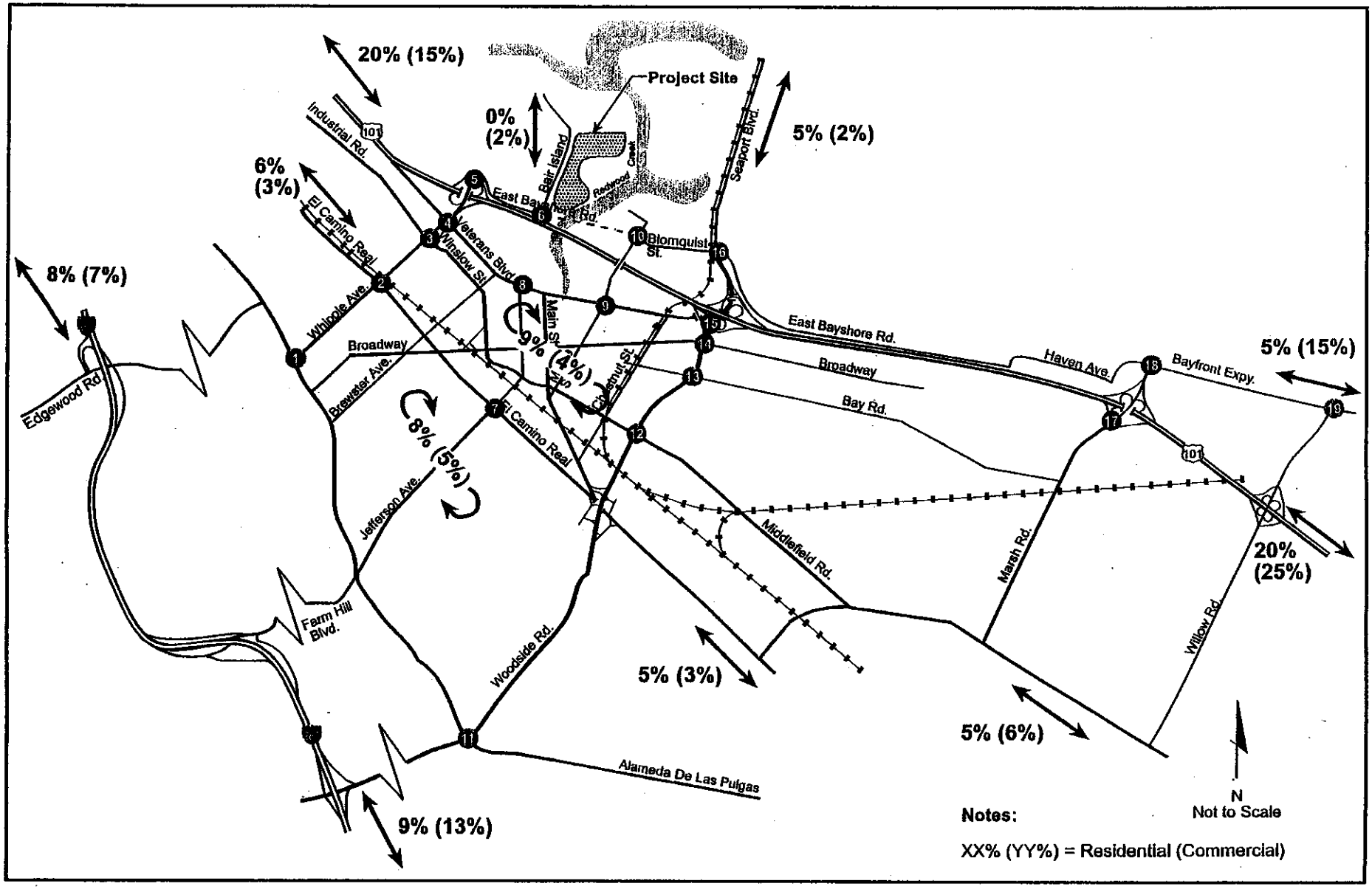
(f) Net New Trips. In total, the proposed project is therefore expected to generate 1,039 net new AM peak-hour trips (456 inbound/583 outbound) and 1,099 net new PM peak-hour trips (532 inbound/567 outbound).

7.3.3 Projected Trip Distribution

For purposes of this EIR, two projected trip distribution patterns were developed for the proposed project--one for the residential component, and another for the office and retail components. The distribution patterns are presented on Figure 7.6. The derivation of these distribution pattern assumptions is described below.

(a) Residential Trip Distribution. The distribution of the residential project trips to the local and regional roadway network was determined based on existing travel patterns in the area, the relative locations of complementary land uses, and previous traffic studies for developments in

the vicinity. 1990 U.S. Census *Transportation Planning Package* (CTPP) data was reviewed to determine the workplace location for employed residents in Redwood



SOURCE: Fehr & Peers Associates, Inc.

Figure 7.6
PROJECT TRIP DISTRIBUTION

City. Travel patterns derived from this information were applied in the trip distribution pattern analysis. (Note: Journey-to-work data from the 2000 census had not been released at the time of this analysis.)

Based on this available information, it is estimated that approximately 35 percent of the residential trips would be distributed to the north, 40 percent to the south, five percent to the east via the Dumbarton Bridge, 10 percent to the west, and 10 percent to local Redwood City trip ends.

(b) Office/Retail Trip Distribution. The distribution of the project office and retail trips onto the local roadway network was determined based on existing travel patterns in the area and the relative locations of complementary land uses. 1990 U.S. Census data regarding residential locations for people employed in Redwood City was reviewed to estimate existing travel patterns in the area. Additionally, City-staff-provided home zip code information for employees at the Sun Microsystems campus in nearby Menlo Park was used to adjust the Census-data-based distribution pattern estimates. Based on this methodology, it is estimated that approximately 25 percent of the project office/retail trips would be distributed to the north, 45 percent to the south, 15 percent to the east via the Dumbarton Bridge, five percent to the west, and 10 percent to local origins/destinations in Redwood City.

7.3.4 Project Trip Assignment

Trips generated by the proposed project were assigned to the roadway system based on the trip distribution patterns (directions of approach and departure) described above. Resultant project trip assignments for the AM and PM peak hours are illustrated on Figure 7.7. Project trips were added to Background Condition traffic volumes to estimate intersection volumes under Project Conditions. The results are shown on Figure 7.8.

7.3.5 Intersection Impacts--Project Conditions

Level of service (LOS) calculations were conducted to evaluate intersection operations under the Project Conditions scenario. The results are summarized in Table 7.11. The table lists projected levels of service and the change in delay compared to Background Conditions at each study intersection. Associated impact and mitigation findings are described in detail below.

Impact 7-1: Project Impact on the El Camino Real/Whipple Avenue Intersection. During the PM peak hour under Existing and Background Conditions, the El Camino Real/Whipple Avenue intersection is expected to operate at LOS D, an acceptable level. The addition of project-generated traffic is expected to degrade operations at the intersection to LOS E, an unacceptable level, during the PM peak hour. This effect would represent a ***significant impact*** [see criteria (a)(1) and (b)(1) in subsection 7.3.1, "Significance Criteria," above].

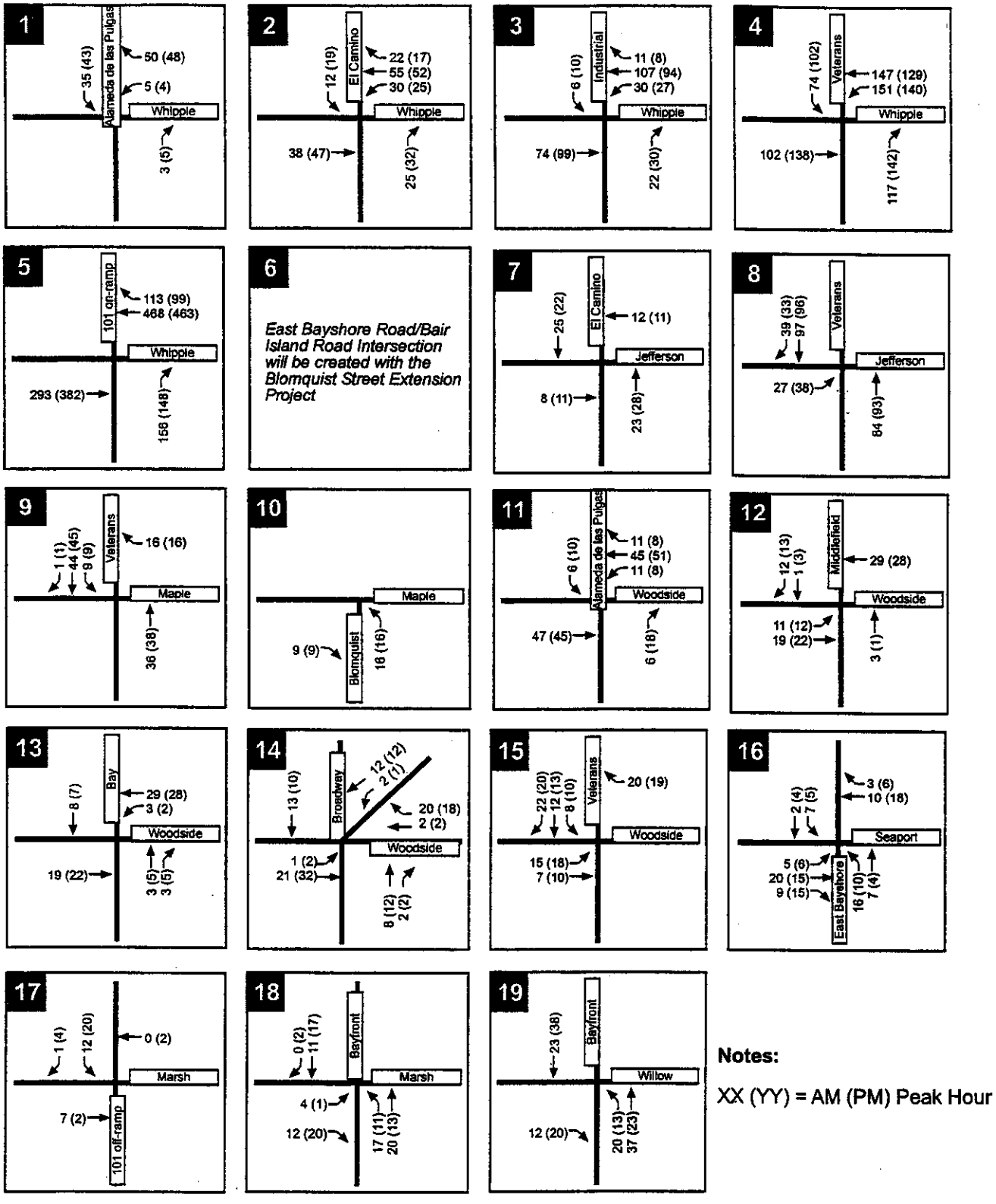
Mitigation 7-1. An improvement has been identified for this location in the *Redwood City Traffic Impact Mitigation Fee Study* (TIMFS). The identified improvement includes the addition of a receiving lane for westbound right-turns, creating a "free" westbound right-turn movement. However, the level of service analysis conducted for this EIR indicates that this improvement would not mitigate the project impact at the intersection.

If the nearby Whipple Avenue CalTrain railroad crossing is reconstructed to provide a grade-separated crossing, the El Camino Real/Whipple Avenue intersection would be expected to operate acceptably.

Without a grade-separated railroad crossing, the eastbound approach to the intersection would have to be widened in order for the intersection to operate acceptably under Project Conditions. The widening would need to include provision of a dedicated eastbound right turn lane, and the existing shared through/right-turn lane would need to be converted to a dedicated through lane. This improvement would require additional right-of-way acquisition and building structure modification since both sides of the affected approach are currently developed with buildings near the roadway. The measures identified above are considered to be infeasible due to these right-of-way constraints. Therefore, the effect of project traffic on the El Camino Real/Whipple Avenue intersection would represent a ***significant unavoidable impact***.

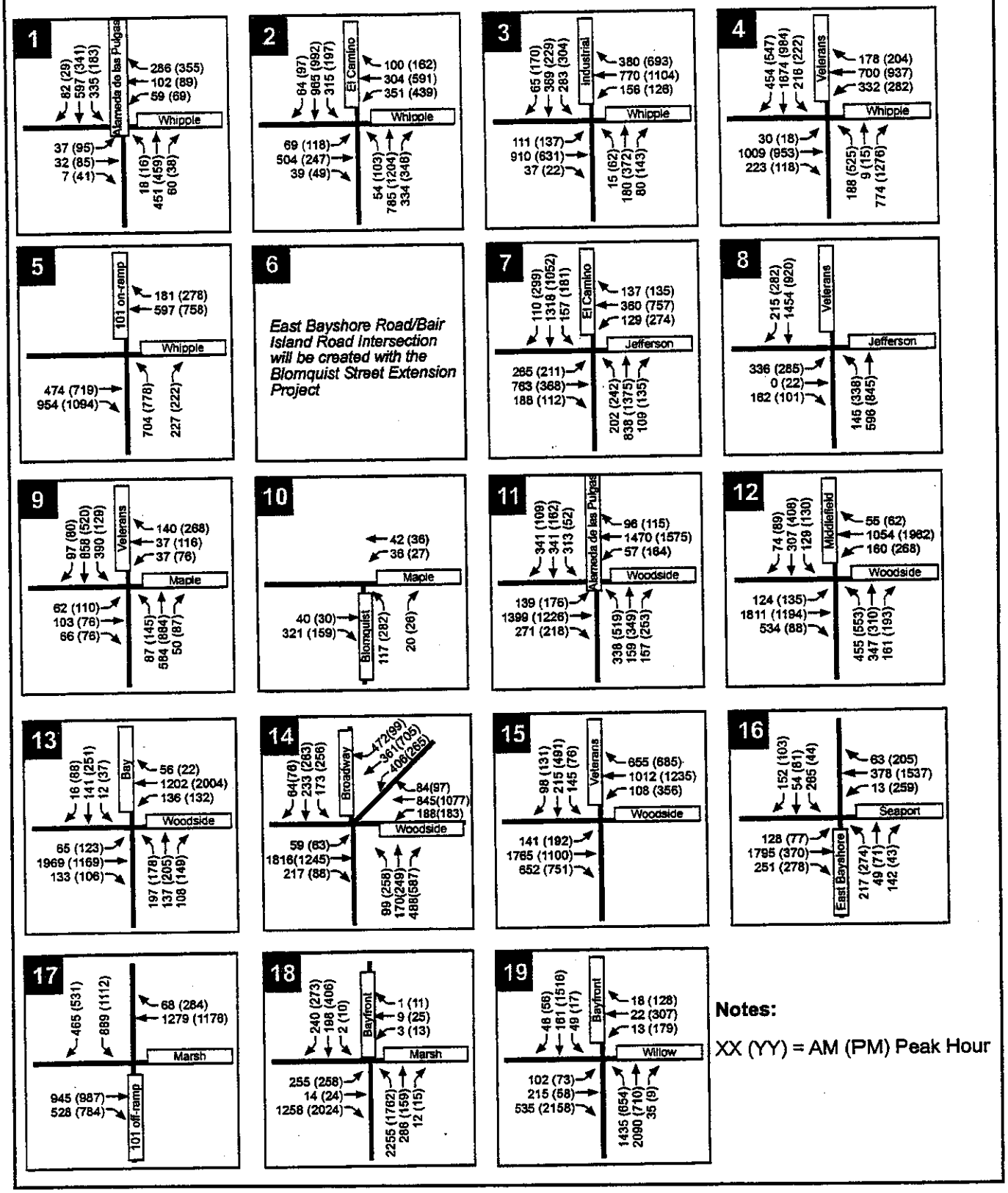
The level of service analysis for the El Camino Real/Whipple Avenue intersection included adjustments to signal timing to account for train movements at the nearby CalTrain railroad crossing at Whipple Avenue. Calculations conducted for the intersection under Project Conditions without adjusted signal timings (i.e., if CalTrain movements did not affect operations at the intersection) indicate that the intersection would operate acceptably. Therefore, if the nearby Whipple Avenue CalTrain railroad crossing is reconstructed to provide a grade-separated crossing, the El Camino Real/Whipple Avenue intersection would be expected to operate acceptably.

The level of service analysis for the intersection also indicates that, without a grade-separated railroad crossing at Whipple Avenue (i.e., with the adjusted signal timings to account for the nearby, at-grade railroad movements), the intersection would have to be widened in order for the intersection to operate acceptably under Project Conditions. The widening would need to include provision of a dedicated eastbound right turn lane, and the existing shared through/right-turn lane would need to be converted to a dedicated through lane. This improvement would require additional right-of-way acquisition and building structure modification since both sides of the affected approach are currently developed with buildings near the roadway.



SOURCE: Fehr & Peers Associates, Inc.

Figure 7.7
PROJECT TRIP ASSIGNMENT



SOURCE: Fehr & Peers Associates, Inc.

Figure 7.8
PROJECT PEAK-HOUR INTERSECTION VOLUMES

Table 7.11
INTERSECTION LEVELS OF SERVICE--PROJECT CONDITIONS

Study Intersections		AM Peak-Hour Delay/LOS	PM Peak-Hour Delay/LOS	Change in Delay (AM/PM)
1.	Alameda de las Pulgas/ Whipple Avenue	27.5/C	27.4/C	+2.1/+1.9
2.	El Camino Real/Whipple Avenue	37.1/D	**56.2/E**	+3.2/**+8.8**
3.	Winslow Street/Whipple Avenue	31.6/C	40.4/D	+0.5/+0.0
4.	Veterans Boulevard/Whipple Avenue	41.0/D	45.4/D	+4.7/+10.5
5.	U.S. 101 Northbound Off-Ramp/ Whipple Avenue	11.7/B	15.7/B	+3.8/+4.5
6.	East Bayshore Road (Blomquist Street)/ Bair Island Road	n/a	n/a	n/a
7.	El Camino Real/Jefferson Avenue	41.5/D	48.1/D	+0.4/+0.5
8.	Veterans Boulevard/Jefferson Avenue	15.7/B	28.3/C	+0.0/+0.0
9.	Veterans Boulevard/Maple Street	23.4/C	32.8/C	+0.1/-10.9
10.	Blomquist Street/Maple Street	11.5/B	12.4/B	+0.2/+0.3
11.	Alameda de las Pulgas/ Woodside Road	39.0/D	38.0/D	+1.1/+0.8
12.	Middlefield Road/Woodside Road	35.7/D	42.6/D	+0.2/+0.4
13.	Bay Road/Woodside Road	22.6/C	30.3/C	+0.2/+0.2
14.	Broadway/Woodside Road	> 180/F	> 180/F	+2.7/+1.3
15.	Veterans Boulevard/Woodside Road	22.6/C	43.1/D	+1.1/+1.4
16.	Blomquist Street/Seaport Boulevard	37.6/D	30.5/C	+1.4/+0.7
17.	U.S. 101 Southbound Ramps/ Marsh Road	15.5/B	16.7/B	+0.1/+0.2
18.	Bayfront Expressway/Marsh Road	25.1/C	29.5/C	+0.1/+0.3
19.	Bayfront Expressway/Willow Road	21.2/C	76.3/F	+0.3/+3.7

SOURCE: Fehr & Peers Associates, Inc.

Notes:

(1) Signalized intersection LOS ratings are based on average control delay expressed in seconds per vehicle. Unsignalized intersection LOS ratings are based on total control delay expressed in seconds per vehicle. Signalized and unsignalized analysis methodologies were obtained from the *2000 Highway Capacity Manual*, Transportation Research Board.

(2) Adjustments have been made to the LOS calculations at the El Camino Real/Whipple Avenue intersection to account for CalTrain movement preemption of the signal. CalTrain movements affect 20 to 30 percent of the cycles at the intersection during each peak hour. Therefore, the amount of "green time" allocated to the affected turning movements was decreased by 20 to 30 percent and reallocated to the northbound and southbound through movements.

(3) The East Bayshore Road/Bair Island Road intersection (#6) was not analyzed under Background Conditions. It will be analyzed under scenarios that include the planned Blomquist Street Extension over Redwood Creek.

(4) "Change in delay" is the change in average delay between Background and Project Conditions.

(5) Impacts are designated in **BOLD** type.

7.3.6 Freeway Impacts--Project Conditions

Segments of U.S. 101, I-280, and SR 84 (east of University Avenue on the Dumbarton Bridge) were evaluated for the AM and PM peak hours under Project Conditions to identify any potentially significant project-related traffic increases on freeway segments.[9] After the planned addition of auxiliary lanes to U.S. 101, the U.S. 101 freeway will have three mixed-flow lanes, one high-occupancy vehicle lane (HOV), and one auxiliary lane in each direction south of Whipple Avenue. North of Whipple Avenue, U.S. 101 will have four mixed-flow lanes and one auxiliary lane in each direction. I-280 has four mixed-flow lanes in each direction in the project vicinity. SR 84 will have three lanes in each direction after its planned widening is completed.

A typical freeway design capacity of 2,300 vehicles per lane per hour (vplph) was used for the analysis of mixed-flow lane segments of U.S. 101 and I-280. The HOV lanes were assumed to have a typical design capacity of 1,800 vplph. To remain consistent with methodologies presented in the *San Mateo CMP Monitoring Report*, capacities of 1,100 vplph were used for segments of SR 84.

Freeway auxiliary lanes (merging/diverging lanes at interchanges) were not included in this analysis. The operations of the auxiliary lanes are addressed in the freeway ramp impacts discussion (subsection 7.3.7 herein). However, vehicles entering the freeway segment via the auxiliary lane will merge into and occupy capacity in the mixed-flow lanes for a portion of the freeway segment. Likewise, vehicles exiting the freeway (which were occupying capacity in the mixed-flow lanes) will merge into the auxiliary lanes and occupy capacity in that lane for only a portion of the freeway segment. Therefore, half of all vehicles that would use the auxiliary lane in each segment (both entering and exiting the freeway mainline) were included in the capacity analysis for the mixed-flow lanes.

To determine the number of vehicles using the HOV lanes, the percent of HOVs on U.S. 101 was obtained from the "Measures of Effectiveness" projections included in the *U.S. 101 Auxiliary Lane Project Study* (prepared for Caltrans by Fehr & Peers Associates, November 2000).

[9]US 101 and I-280 are freeways (i.e., are multi-lane, divided highways with a minimum of two lanes for the exclusive use of traffic in each direction and full control of access without traffic interruption--*Highway Capacity Manual*). However, SR 84 operates more like an expressway (i.e., is designed to move high volumes of traffic, have limited access, and minimize traffic signals--*Highway Capacity Manual*). SR 84 is included in the *San Mateo CMP Monitoring Report* and was therefore included in this freeway analysis for illustrative purposes.

The results of the Project Conditions freeway segment analysis for the AM peak hour are presented in Table 7.12. The results for the PM peak hour are presented in Table 7.13.

The analysis results indicate that the proposed project would result in a significant impact on four freeway segments during the AM peak hour and on three freeway segments during the PM peak hour.

Impact 7-2: Project Impact on U.S. 101 Southbound Mixed-Flow Lanes, Whipple Avenue to Woodside Road Segment--AM Peak Hour. C/CAG's *2001 San Mateo CMP Monitoring Report* determined that this freeway segment currently operates at LOS F--i.e., existing volumes exceed the segment's capacity--in the AM peak hour. The project is expected to increase volumes by more than one percent of the freeway segment's capacity during the AM peak hour. This effect would represent a ***significant impact*** [see criteria (a)(1) and (c)(2) in subsection 7.3.1, "Significance Criteria," above].

Mitigation 7-2. The project shall minimize impacts on this freeway segment by implementing a transportation demand management (TDM) program. The purpose of this program would be to encourage alternative travel modes to the single-occupant vehicle, thereby reducing the number of trips added to this freeway segment and lessening this project impact.

As part of the proposed project, the applicant is proposing to establish, in cooperation with SamTrans, a shuttle bus system connecting the project via downtown Redwood City to the CalTrain station and El Camino intraregional transit corridor approximately 1.5 miles southeast of the project site. Listed at the end of this chapter are other TDM measures currently being considered for the Marina Shores Village project as part of the *Bayfront Study--Bayfront Transportation Options Study*. In consultation with the City of Redwood City and City/County Council of Governments of San Mateo County (C/CAG), the project sponsor shall design a comprehensive TDM program for approval by the City and by C/CAG prior to City approval of any tentative subdivision map or development agreement for the project. It is recommended that the TDM measures implemented by the proposed project be consistent with those identified for residential development and employment centers in the City's *Bayfront Study*.

The TDM program shall include a provision for preparation by the project sponsor, and review by the City or City-designated TDM coordinator, of an *annual report* documenting the effectiveness of the TDM program. Future additions or changes to the TDM program shall be identified by the City or C/CAG, if and as necessary, based on the program's annually documented effectiveness in reducing the number of project-generated vehicular trips. This TDM annual report review process shall remain in effect for five years after full project buildout.

Full mitigation of this impact (i.e., to a less-than-significant level) would require the addition of another southbound through lane to the freeway segment. The addition

of another through travel lane, with a design capacity of 2,300 vehicles per lane per hour, would more than offset the addition of project traffic (the project is expected to add 145 trips to this freeway segment). However, freeway widening is generally considered to be beyond the scope of a single development project--i.e., an infeasible mitigation requirement. Therefore, the effect of project traffic on this freeway segment is considered to represent a ***significant unavoidable impact***.

Table 7.12
FREEWAY SEGMENT LEVELS OF SERVICE--PROJECT CONDITIONS, AM PEAK HOUR

Freeway Segment	Lane Type	Capacity	Background Volume	Background V/C	Project Trips	Project V/C	Percent Impact	Significant Impact
U.S. 101:								
SB SR 92 to Whipple	Mixed Flow	9,200	8,640	0.94	74	0.95	0.80%	NO
SB Whipple	Mixed Flow	6,900	7,779	1.13	145	1.15	2.10%	**YES**
to Woodside	HOV	1,800	1,056	0.59	24	0.60	1.33%	NO
SB Woodside	Mixed Flow	6,900	7,720	1.12	126	1.14	1.83%	**YES**
to Marsh	HOV	1,800	1,136	0.63	20	0.64	1.11%	NO
NB Marsh	Mixed Flow	6,900	5,187	0.75	123	0.77	1.78%	NO
to Woodside	HOV	1,800	889	0.49	25	0.51	1.39%	NO
NB Woodside	Mixed Flow	6,900	5,597	0.81	129	0.83	1.87%	NO
to Whipple	HOV	1,800	1,110	0.62	27	0.63	1.50%	NO
NB Whipple to SR 92	Mixed Flow	9,200	7,008	0.76	113	0.77	1.23%	NO
***I-280*:**								
SB SR 92 to Edgewood	Mixed Flow	9,200	7,737	0.84	33	0.84	0.36%	NO
SB Edgewood to Farm Hill	Mixed Flow	9,200	8,169	0.89	13	0.89	0.14%	NO
SB Farm Hill to Woodside	Mixed Flow	9,200	8,273	0.90	12	0.90	0.13%	NO
SB Woodside to County Line	Mixed Flow	9,200	5,392	0.59	55	0.59	0.60%	NO
NB County Line to Woodside	Mixed Flow	9,200	3,074	0.33	55	0.34	0.60%	NO
NB Woodside to Farm Hill	Mixed Flow	9,200	4,259	0.46	9	0.46	0.10%	NO
NB Farm Hill to Edgewood	Mixed Flow	9,200	3,877	0.42	9	0.42	0.10%	NO
NB Edgewood to SR 92	Mixed Flow	9,200	4,354	0.47	46	0.48	0.50%	NO
SR 84:								
EB Willow to University	Mixed Flow	3,300	650	0.20	36	0.21	1.09%	NO

EB University to County Line	Mixed Flow	3,300	1,600	0.48	36	0.50	1.09%	NO
WB County Line to University	Mixed Flow	3,300	4,703	1.43	57	1.44	1.73%	**YES**
WB University to Willow Road	Mixed Flow	3,300	3,354	1.02	57	1.03	1.73%	**YES**

SOURCE: Fehr & Peers Associates and Caltrans.

Notes:

(1) Typical design capacity for mixed-flow lanes on freeway segments is assumed to be 2,300 vehicles per lane per hour (vplph). Auxiliary lanes are not included in the analysis. See text [subsection 7.1.6(d)] for description of how traffic in the auxiliary lanes has been addressed.

(2) Typical design capacity for HOV lanes on freeway segments is assumed to be 1,800 vplph.

(3) Typical design capacity for mixed-flow lanes on SR 84 (an expressway) is assumed to be 1,100 vplph, consistent with design capacities identified in the *San Mateo CMP Monitoring Report*.

(4) Volumes on U.S. 101 and I-280 consist of volumes obtained from existing count data provided by Caltrans plus trips from approved projects.

(5) V/C = volume-to-capacity ratio.

(6) "Percent Impact" was determined by dividing the number of project trips by the freeway segment's capacity.

(7) NB = northbound; SB = southbound; EB = eastbound; WB = westbound.

Table 7.13
FREEWAY SEGMENT LEVELS OF SERVICE--PROJECT CONDITIONS, PM PEAK HOUR

Freeway Segment	Lane Type	Capacity	Background Volume	Background V/C	Project Trips	Project V/C	Percent Impact	Significant Impact
U.S. 101:								
SB SR 92 to Whipple	Mixed Flow	9,200	7,772	0.84	102	0.86	1.11%	NO
SB Whipple	Mixed Flow	6,900	7,746	1.12	127	1.14	1.84%	**YES**
to Woodside	HOV	1,800	1,080	0.60	21	0.61	1.17%	NO
SB Woodside	Mixed Flow	6,900	6,388	0.93	149	0.95	2.16%	NO
to Marsh	HOV	1,800	939	0.52	24	0.54	1.33%	NO
NB Marsh	Mixed Flow	6,900	4,001	0.58	113	0.60	1.64%	NO
to Woodside	HOV	1,800	639	0.36	22	0.37	1.22%	NO
NB Woodside	Mixed Flow	6,900	4,333	0.63	161	0.65	2.33%	NO
to Whipple	HOV	1,800	1,018	0.57	32	0.58	1.78%	NO
NB Whipple to SR 92	Mixed Flow	9,200	6,274	0.68	99	0.69	1.08%	NO
I-280:								
SB SR 92 to Edgewood	Mixed Flow	9,200	4,327	0.47	42	0.47	0.46%	NO
SB Edgewood to Farm Hill	Mixed Flow	9,200	4,220	0.46	14	0.46	0.15%	NO
SB Farm Hill to Woodside	Mixed Flow	9,200	4,881	0.53	13	0.53	0.14%	NO
SB Woodside to County Line	Mixed Flow	9,200	3,973	0.43	63	0.44	0.68%	NO
NB County Line to Woodside	Mixed Flow	9,200	5,660	0.62	52	0.62	0.57%	NO
NB Woodside to Farm Hill	Mixed Flow	9,200	7,779	0.85	9	0.85	0.10%	NO
NB Farm Hill to Edgewood	Mixed Flow	9,200	7,277	0.79	9	0.79	0.10%	NO
NB Edgewood to SR 92	Mixed Flow	9,200	7,480	0.81	42	0.82	0.46%	NO
SR 84:								
EB Willow to University	Mixed Flow	3,300	3,570	1.08	58	1.10	1.76%	**YES**
EB University to County Line	Mixed Flow	3,300	4,892	1.48	58	1.50	1.76%	**YES**
WB County Line to University	Mixed Flow	3,300	1,481	0.45	36	0.46	1.09%	NO
WB University to Willow Road	Mixed Flow	3,300	1,288	0.39	36	0.40	1.09%	NO

SOURCE: Fehr & Peers Associates and Caltrans.

Notes:

(1) Typical design capacity for mixed-flow lanes on freeway segments is assumed to be 2,300 vehicles per lane per hour (vplph). Auxiliary lanes are not included in the analysis. See text [subsection 7.1.6(d)] for description of how traffic in the auxiliary lanes has been addressed.

(2) Typical design capacity for HOV lanes on freeway segments is assumed to be 1,800 vplph.

(3) Typical design capacity for mixed-flow lanes on SR 84 (an expressway) is assumed to be 1,100 vplph, consistent with design capacities identified in the *San Mateo CMP Monitoring Report*.

(4) Volumes on U.S. 101 and I-280 consist of volumes obtained from existing count data provided by Caltrans plus trips from approved projects.

(5) V/C = volume-to-capacity ratio.

(6) "Percent Impact" was determined by dividing the number of project trips by the freeway segment's capacity.

(7) NB = northbound; SB = southbound; EB = eastbound; WB = westbound.

As part of the proposed project, the applicant is proposing to establish, in cooperation with SamTrans, a shuttle bus system connecting the project via downtown Redwood City to the CalTrain station and El Camino intraregional transit corridor approximately 1.5 miles southeast of the project site. Based on the applicant's conversations with a representative of SamTrans,[10] a transit shuttle program for Marina Shores Village could be designed as a single shuttle bus with a roundtrip route that would take approximately 30 to 35 minutes, as follows:

(1) Pete's Harbor property (start)--three stops (plus optional stop at "Villas at Bair Island");

(2) Peninsula Marina property--four stops at residential buildings, one stop at office building;

(3) Surface streets to Sequoia CalTrain Station (Bair Island Road to East Bayshore Boulevard to Whipple Avenue to Veterans Boulevard to Jefferson Avenue to Middlefield Road into Sequoia Station lot); and

(4) Surface streets returning to Marina Shores Village.

Additional shuttle service could be added based on rider demand. Once the Blomquist Extension is completed, the Marina Shores Village shuttle could link with existing shuttles that presently serve Seaport Center and Pacific Shores Center.

Also, existing residential development on Bair Island Road (Marina Pointe Townhomes and "Villas at Bair Island") and potential future residential development in the area (e.g., the Syufy site) could also be added to the Marina Shores Village shuttle system to increase local ridership.

Impact 7-3: Project Impact on U.S. 101 Southbound Mixed-Flow Lanes, Woodside Road to Marsh Road Segment--AM Peak Hour. C/CAG's *2001 San Mateo CMP Monitoring Report* determined that this freeway segment currently operates at LOS F--i.e., existing volumes exceed the segment's capacity--in the AM Peak Hour. The project is expected to increase volumes by more than one percent of the freeway segment's capacity during the AM peak hour. This effect would represent a ***significant impact*** [see criteria (a)(1) and (c)(2) in subsection 7.3.1, "Significance Criteria," above].

[10] *Transit Shuttle Program Between Marina Shores Village and CalTrain (Redwood City)*, Tim Ridner, Glenborough-Pauls, LLC, November 18, 2002.

Mitigation 7-3. The project shall minimize impacts on this freeway segment by implementing a transportation demand management (TDM) program, as described under *Mitigation 7-2*.

Full mitigation of this impact (i.e., to a less-than-significant level) would require the addition of another southbound through lane to the freeway segment. The addition of another through travel lane, with a capacity of 2,300 vehicles per lane per hour, would more than offset the addition of project traffic (the project is expected to add 126 trips to this freeway segment). However, freeway widening is generally considered to be beyond the scope of a single development project--i.e., an infeasible mitigation requirement. Therefore, the effect of project traffic on this freeway segment is considered to represent a ***significant unavoidable impact***.

Impact 7-4: Project Impact on Westbound SR 84, County Line to University Avenue and University Avenue to Willow Road Segments--AM Peak Hour. C/CAG's *2001 San Mateo CMP Monitoring Report* determined that these two freeway segments currently operate at LOS F--i.e., the existing volumes exceed both segments' capacities, in the AM peak hour (even after the planned widening is completed). Volumes are expected to continue to exceed the segments' capacity under Background and Project Conditions. The project is expected to increase volumes by more than one percent of each segment's capacity during the AM peak hour. This effect would represent a ***significant impact*** [see criteria (a)(1) and (c)(2) in subsection 7.3.1, "Significance Criteria," above].

Mitigation 7-4. The project shall minimize impacts on these two freeway segments by implementing a transportation demand management (TDM) program, as described under *Mitigation 7-2*.

Full mitigation of this impact (i.e., to a less-than-significant level) would require the addition of another westbound through lane to both segments. The addition of another through travel lane, with a design capacity of 1,100 vehicles per lane per hour, would more than offset the addition of project traffic (the project is expected to add 57 trips to the segments). However, freeway widening is generally considered to be beyond the scope of a single development project--i.e., an infeasible mitigation requirement. Therefore, the effect of project traffic on these segments is considered to represent a ***significant unavoidable impact***.

Impact 7-5: Project Impact on U.S. 101 Southbound Mixed-Flow Lanes,

Whipple Avenue to Woodside Road Segment--PM Peak Hour. C/CAG's *2001 San Mateo CMP Monitoring Report* determined that the segment of this freeway between Whipple Avenue and the county line currently operates at LOS D, an acceptable level. However, the capacity analysis in this EIR for Existing, Background, and Project Conditions indicated that volumes on the Whipple Avenue to Woodside Road segment exceed its capacity. The project is expected to increase volumes by more than one percent of the freeway segment's capacity during the PM peak hour. This effect would represent a ***significant impact*** [see criteria (a)(1) and (c)(2) under subsection 7.3.1, "Significance Criteria," above].

Mitigation 7-5. The project shall minimize impacts on this freeway segment by implementing a transportation demand management (TDM) program, as described under *Mitigation 7-2*.

Full mitigation of this impact (i.e., to a less-than-significant level) would require the addition of another southbound through lane to the freeway segment. The addition of another through travel lane, with a capacity of 2,300 vehicles per lane per hour, would more than offset the addition of project traffic (the project is expected to add 127 trips to this freeway segment). However, freeway widening is generally considered to be beyond the scope of a single development project--i.e., an infeasible mitigation requirement. Therefore, the effect of project traffic on this freeway segment is considered to represent a ***significant unavoidable impact***.

Impact 7-6: Project Impact on Eastbound SR 84, Willow Road to University Avenue and University Avenue to the County Line Segments--PM Peak Hour. C/CAG's *2001 San Mateo CMP Monitoring Report* determined that these freeway segments currently operate at LOS F--i.e., existing volumes exceed both segments' capacities in the PM peak hour (even after the planned widening is completed). Volumes are expected to continue to exceed the segments' capacity under Background and Project Conditions. The project is expected to increase volumes by more than one percent of each segment's capacity during the PM peak hour. This effect would represent a ***significant impact*** [see criteria (a)(1) and (c)(2) in subsection 7.3.1, "Significance Criteria," above].

Mitigation 7-6. The project shall minimize impacts on this freeway segment by implementing a transportation demand management (TDM) program, as described under *Mitigation 7-2*.

Full mitigation of this impact (i.e., to less-than-significant level) would require the addition of another eastbound through lane to both segments. The addition of another through travel lane, with a capacity of 1,100 vehicles per lane per hour,

would more than offset the addition of project traffic (the project is expected to add 58 trips to the segments). However, freeway widening is generally considered to be beyond the scope of a single development project--i.e., an infeasible mitigation requirement. Therefore, the effect of project traffic on these segments is considered to represent a ***significant unavoidable impact***.

7.3.7 Project Impacts on Freeway Ramps

As discussed under subsections 7.1.6(a) (Background Roadway Improvements) and 7.1.6(d) (Background Freeway Segment Capacity Analysis) herein, the planned addition of auxiliary lanes to U.S. 101 will affect the merging and diverging analysis conducted under Existing Conditions. To verify that the freeway ramps would have sufficient capacity to serve expected demand under Project Conditions, a volume-to-capacity analysis was conducted for each of the study ramps. For the purpose of this analysis, capacities presented in Chapter 25 of the *2000 Highway Capacity Manual* were used based on the free-flow speed of the study ramps. The results are presented in Table 7.14.

The results of the freeway ramp capacity analysis indicate that all of the study ramps are expected to have adequate capacity (i.e., V/C ratios less than 1.0) under Project Conditions during the AM and PM peak hours.

Table 7.14
FREEWAY RAMP CAPACITY ANALYSIS--PROJECT CONDITIONS

		AM Peak Hour			PM Peak Hour		
U.S. 101 Freeway Ramp	Capacity	Volume	Project Trips	V/C	Volume	Project Trips	V/C
SB U.S. 101 Off-Ramp/ Veterans Boulevard	3,800	1,821	74	0.48	1,557	102	0.41
SB U.S. 101 On-Ramp/ Westbound Whipple Avenue	1,900	241	169	0.13	317	193	0.17
NB U.S. 101 Off-Ramp/ Whipple Avenue	2,000	855	156	0.43	1,102	148	0.55
NB U.S. 101 On-Ramp/ Westbound Whipple Avenue	1,900	185	113	0.10	261	99	0.14
SB U.S. 101 On-Ramp/ Woodside Road	2,000	1,019	12	0.51	1,065	13	0.53
NB U.S. 101 Off-Ramp/ Woodside Road (Seaport Blvd.)	1,900	1,300	16	0.68	1,282	17	0.67

SOURCE: Fehr & Peers Associates and Caltrans.
Notes:

(1) Capacity based on information presented in Chapter 25 of the *2000 Highway Capacity Manual* and the posted recommended travel speed on the ramp

(2) Volumes obtained from existing count data provided by Caltrans *plus* traffic from approved projects *plus* trips generated by the proposed project.

(3) V/C = volume-to-capacity ratio.

(4) NB = northbound; SB = southbound.

7.3.8 Project Impacts on Transit, Pedestrian, and Bicycle Facilities

Impact 7-7: Transit Accessibility Impact. *Mitigation 4-3* in the Land Use chapter of this EIR calls for establishment of a convenient *transit link* between the project and local and regional express transit corridors and/or hubs, including the El Camino Real transit corridor and Redwood City CalTrain intermodal station, and between the project, downtown Redwood City, and other local employment, financial, and retail concentrations. This link could take the form of a private system and/or SamTrans operated routes. Under either scenario, the project, as well as other anticipated development in the Bayfront/Bair Island Road area, could justify the addition of one or more SamTrans bus routes into the area (the issue of expanded transit services is also discussed in the City's *Bayfront Study*--see subsection 7.2.2.d in EIR chapter 7, Transportation and Circulation). Currently, there is inadequate existing space for a SamTrans bus to turn around in the Bair Island Road area, a roadway deficiency that would preclude a future bus route from conveniently serving the area. This deficiency would therefore represent a ***significant impact*** [see criteria (a)(5) and (f) in subsection 7.3.1, "Significance Criteria," above].

Currently, there are no public bus routes operating along Bair Island Road near the project site. However, there are some private employee shuttles operating in the Seaport and Pacific Shores areas--see subsection 7.1.5(c) herein. The project, as well as other anticipated development in the Bair Island Road area, may justify the addition of a SamTrans bus route on East Bayshore Road and Bair Island Road. *Mitigation 4-4* in the Land Use chapter of this EIR calls for establishment of a convenient *transit link* between the project and local and regional express transit corridors and/or hubs, including the El Camino Real transit corridor and Redwood City Caltrain intermodal station, and between the project, downtown Redwood City, and other local employment, financial, and retail concentrations. Because these two roads (East Bayshore Road and Bair Island Road) are essentially a lengthy cul-de-sac, there is inadequate existing space for provision of a full-size transit bus to turn around in the Bair Island Road area.

Mitigation 7-7. Implement *Mitigation 4-3*. As part of or in addition to that mitigation, the project shall accommodate on-site or contribute its fair share to a bus turn-around in the Bair Island Road area to allow for more convenient SamTrans bus service into the area. With implementation of a bus turn-around in the area, the transit accessibility impact would be reduced to a ***less-than-significant level.***

The project applicant is proposing to establish, in cooperation with SamTrans, a shuttle bus system connecting the project via downtown Redwood City to the CalTrain station and El Camino intraregional transit corridor. This proposal is discussed above as part of *Mitigation 7-2*.

Impact 7-8: Project Pedestrian Accessibility Impacts. There is access from Bair Island Road to the Bair Island Wildlife Refuge. This area contains a multi-use path that provides facilities for both pedestrians and bicycles. However, existing pedestrian facilities near the project site consist of discontinuous sidewalks along Bair Island Road and East Bayshore Road. If the project were constructed in a similar manner without a sidewalk along its local Bair Island Road frontage, the project would contribute to and exacerbate the existing discontinuity of pedestrian facilities. This effect would represent a ***significant impact*** [see criteria (a)(2), (a)(5), and (f) in subsection 7.3.1, "Significance Criteria," above].

Mitigation 7-8. The project shall construct a continuous pedestrian facility, such as a sidewalk and/or pedestrian path, along the entire length of the project's Bair Island Road frontage. With such a facility, this impact would be reduced to a ***less-than-significant level.***

Impact 7-9: Bicycle Accessibility Impact. The planned San Francisco Bay Trail extension may include bicycle facilities along Bair Island Road in the project vicinity, including the project's Bair Island Road frontage. Construction of the proposed project could result in insufficient right-of-way width along Bair Island Road to accommodate such facilities. This effect would represent a ***significant impact*** [see criteria (a)(2), (a)(5), and (f) in subsection 7.3.1, "Significance Criteria," above].

The San Francisco Bay Trail extension is a planned bicycle and pedestrian facility that will be constructed in the area. Although the trail alignment through the Bair Island Road area has not be finalized, preliminary alignments (see Figure 4.4 in chapter 4, Land Use) indicate that the trail will cross Redwood Creek on the planned Blomquist Street Extension, travel east on Bair Island Road, and connect to the trailhead for the Bair Island Wildlife Refuge located on Bair Island Road between the storage facility and the existing Marina Pointe townhome development.

Mitigation 7-9. The project shall dedicate adequate right-of-way along Bair Island Road to accommodate future bicycle facilities. With a dedicated right-of-way of adequate width, the project would not preclude future construction of adequate bicycle facilities in the area and this impact would be reduced to a ***less-than-significant level.***

7.3.9 Project Emergency Access Impacts

Roadway segments on Bair Island Road, East Bayshore Road, and Whipple Avenue (near the project site) were analyzed to determine the adequacy of access to and from the project site during an emergency. The evaluation was based on three basic assumptions:

(1) The entire Bair Island Road area had to be evacuated in approximately 30 minutes;

(2) Emergency evacuation traffic would be generated at a rate of one outbound vehicle trip per household; and

(3) Only one lane could be used to evacuate traffic from the area (the other lane would need to remain open for emergency vehicle access).

Based on these emergency traffic assumptions, nearby roadway capacities and intersection operations were evaluated to determine emergency access adequacy.

Impact 7-10: Project Condition Emergency Access Impact. During an emergency evacuation of the Bair Island Road area with the proposed project at full occupancy, volumes on Bair Island Road, East Bayshore Road, and Whipple Avenue (near the project site) could be expected to exceed roadway capacities, resulting in LOS F operations. This effect would represent a ***significant impact*** [see criteria (a)(3) and (g) in subsection 7.3.1, "Significance Criteria," above]. A sensitivity analysis has been conducted to determine how many new project residential units could be developed in the Bair Island Road area before the Blomquist Street Extension would be needed to maintain adequate emergency access. The results of the analysis (available for review at the City of Redwood City Community Development Services Department, City Hall, 1017 Middlefield Road) indicate that the existing roadway has the capacity to accommodate 750 new dwelling units before a secondary access would be needed to accommodate the assumed emergency scenario.

Mitigation 7-10. The extension of Blomquist Street over Redwood Creek to the East Bayshore Road/Bair Island Road intersection is currently planned by the City and partially funded. The Blomquist Street Extension over Redwood Creek would reduce this potential emergency access impact to a ***less-than-significant level***-- i.e., would provide sufficient emergency access to the Bair Island Road area with full buildout of the proposed project.

This additional access is also expected to change local vehicular travel patterns and the assignment of project-generated traffic, resulting in a ***potentially significant secondary project impact*** at the Blomquist Street/Maple Street intersection (see *Secondary Impact 7-10A* which follows).

Currently, vehicles choosing to avoid U.S. 101 during periods of congestion can use East Bayshore Road south of Seaport Boulevard as a bypass route. The extension of Blomquist Street over Redwood Creek would extend this parallel facility from its current terminus at Seaport Boulevard northward to Whipple Avenue. The extension is also expected to shift some traffic from the congested U.S. 101/Woodside Road interchange to the U.S. 101/Whipple Avenue interchange. The extension of Blomquist Street would also provide additional access to the project site from the south and the west.

Secondary Impact 7-10A: Project-Related Secondary Impact of the Blomquist Extension (*Mitigation 7-10*) on the Blomquist Street/Maple Street Intersection. With completion of the Blomquist Street Extension, the Blomquist Street/Maple Street intersection would be expected to operate at LOS D during the AM peak hour and LOS F during the PM peak hour under Background Conditions. With the addition of the project traffic, operations at the intersection would be expected to degrade to LOS F during both the AM and PM peak hours. The change in the average delay at the intersection due to the project is expected to be more than 5.0 seconds. The intersection is also expected to satisfy the Caltrans Peak Hour Volume Warrant for traffic signal installation during both the AM and PM peak hours under Project Conditions. These secondary effects of *Mitigation 7-10*, the Blomquist Street Extension, would represent a ***significant secondary impact*** [see criteria (a)(1), (b)(1), and (b)(2) in subsection 7.3.1, "Significance Criteria," above].

Also, during the PM peak hour under Project Conditions with *Mitigation 7-10* (the Blomquist Street Extension), the El Camino Real/Whipple Avenue intersection is expected to operate at LOS E, an unacceptable level. However, this impact has already been identified as occurring under Project Conditions without the Blomquist Street Extension (*Impact 7-1*), and methods to mitigate this project impact are identified (*Mitigation 7-1*). As described under *Mitigation 7-1*, the project impact at the intersection is expected to remain *significant and unavoidable,* even with the planned Blomquist Street Extension.

Secondary Mitigation 7-10A. To mitigate project-related secondary traffic impacts at the Blomquist Street/Maple Street intersection: (a) the intersection shall be four-way stop-controlled; and (b) the northbound approach shall be widened to include a dedicated left turn lane and a shared through/right-turn lane. With these improvements, the intersection is expected to operate at LOS C during the AM and PM peak hours under Project Conditions.

Alternatively, install a traffic signal at the intersection. With signalization, the intersection is expected to operate at LOS B during the AM and PM peak hours under Project Conditions.

(continued)

Secondary Mitigation 7-10A (continued):

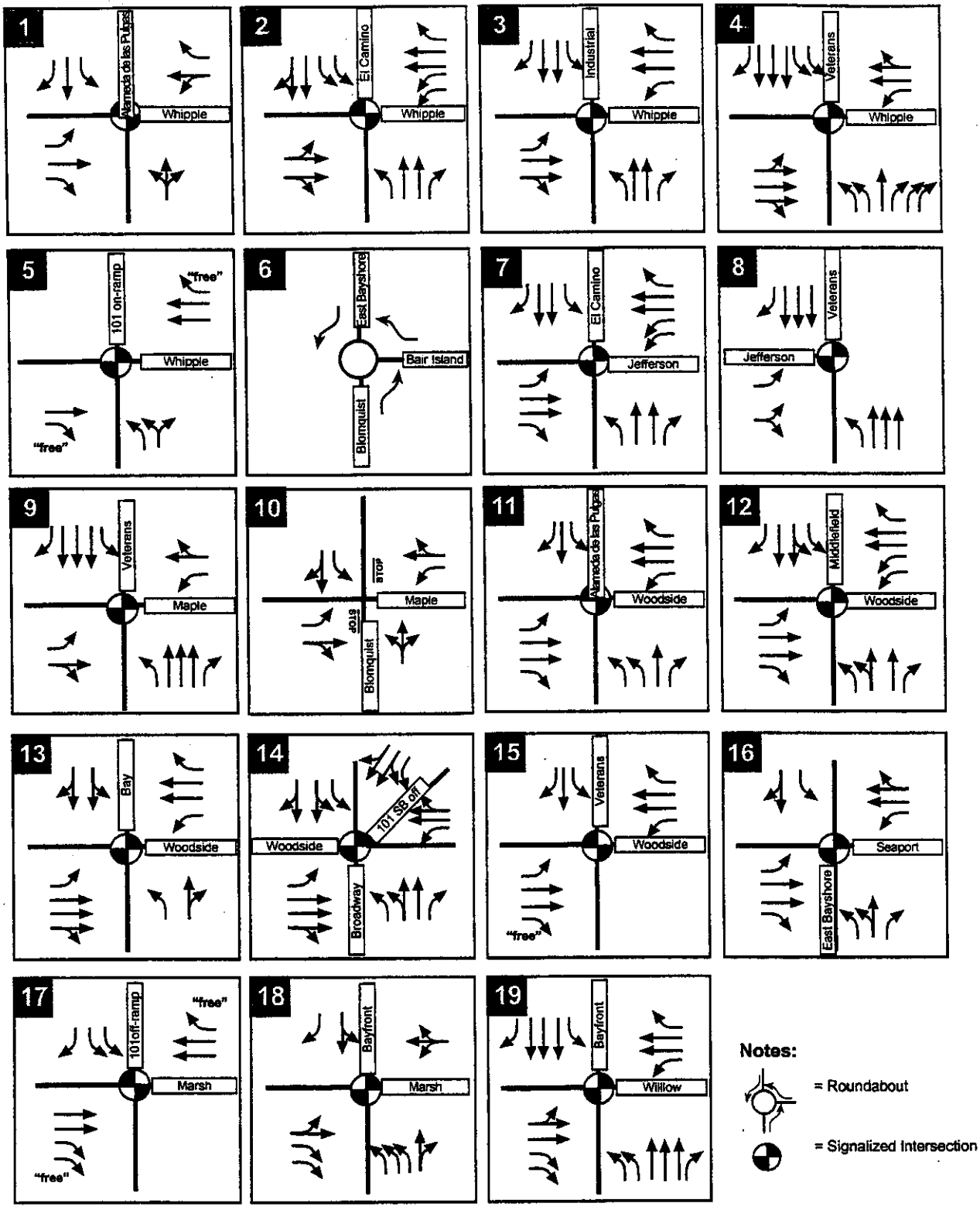
Or, as a third alternative, install a roundabout at the intersection. With the roundabout, the intersection would operate at LOS A during the AM and PM peak hours under Project Conditions.

Implementation of one of these secondary mitigation alternatives to City satisfaction would be a project responsibility. Implementation of any one of these three mitigation alternatives would reduce the project's secondary impact at the Blomquist Street/Maple Street intersection to a ***less-than-significant level.***

To identify the secondary traffic impacts of *Mitigation 7-10*, the extension of Blomquist Street over Redwood Creek, study intersection turning movement volume estimates made for Background Conditions (see subsection 7.1.6 herein) were adjusted to account for the new roadway segment and the associated redistribution of project and other trips to reflect the added access from the west and south via Blomquist Street. A level of service analysis was conducted under Background and Project Conditions with the Blomquist Street Extension.

Based on the results presented in the *Blomquist Street Extension/Bair Island Road Intersection Analysis* (Fehr & Peers Associates, August 2001) and subsequent discussions with City staff, the East Bayshore Road (Blomquist Street)/Bair Island Road intersection is expected to be controlled by a one-lane roundabout. The intersection control devices and lane configurations that were assumed in the analysis after the Blomquist Street Extension has been completed are presented on Figure 7.9. The Blomquist Street/Maple Street intersection was assumed to be stop-controlled on the eastbound and westbound approaches only.

The results of the operations analysis with the Blomquist Street Extension are presented in Table 7.15 for Background Conditions and Table 7.16 for Project Conditions.



SOURCE: Fehr & Peers Associates, Inc.

Figure 7.9

BACKGROUND LANE CONFIGURATIONS WITH BLOMQUIST EXTENSION

Table 7.15
INTERSECTION LEVELS OF SERVICE--BACKGROUND WITH BLOMQUIST STREET EXTENSION

Study Intersections		Intersection Control	AM Peak-Hour Delay/LOS	PM Peak-Hour Delay/LOS
1.	Alameda de las Pulgas/ Whipple Avenue	Signal	25.4/C	25.5/C
2.	El Camino Real/Whipple Avenue	Signal	33.9/C	47.4/D
3.	Winslow Street/Whipple Avenue	Signal	31.1/C	40.4/D
4.	Veterans Boulevard/Whipple Avenue	Signal	36.0/D	37.6/D
5.	U.S. 101 Northbound Off-Ramp/ Whipple Avenue	Signal	7.9/A	12.8/B
6.	East Bayshore Road (Blomquist Street)/ Bair Island Road	Roundabout	6.0/A	6.5/A
7.	El Camino Real/Jefferson Avenue	Signal	41.1/D	47.6/D
8.	Veterans Boulevard/Jefferson Avenue	Signal	16.1/B	28.1/C
9.	Veterans Boulevard/Maple Street	Signal	24.2/C	38.5/D
10.	Blomquist Street/Maple Street	2-Way Stop	33.3/D	109.7/F
11.	Alameda de las Pulgas/ Woodside Road	Signal	37.9/D	37.2/D
12.	Middlefield Road/Woodside Road	Signal	35.7/D	42.4/D
13.	Bay Road/Woodside Road	Signal	22.5/C	30.3/C
14.	Broadway/Woodside Road	Signal	>180/F	>180/F
15.	Veterans Boulevard/Woodside Road	Signal	17.3/B	36.2/D
16.	Blomquist Street/Seaport Boulevard	Signal	32.5/C	34.1/C
17.	U.S. 101 Southbound Ramps/ Marsh Road	Signal	15.4/B	16.5/B
18.	Bayfront Expressway/Marsh Road	Signal	25.0/C	29.2/C
19.	Bayfront Expressway/Willow Road	Signal	20.9/C	72.6/E

SOURCE: Fehr & Peers Associates.

Notes:

(1) Signalized intersection LOS ratings are based on average control delay expressed in seconds per vehicle. Unsignalized intersection LOS ratings are based on total control delay expressed in seconds per vehicle. Signalized and unsignalized analysis methodologies were obtained from the *2000 Highway Capacity Manual*, Transportation Research Board.

(2) Adjustments have been made to the LOS calculations at the El Camino Real/Whipple Avenue intersection to account for CalTrain movement preemption of the signal. CalTrain movements affect 20 to 30 percent of the cycles at the intersection during each peak hour. Therefore, the amount of "green time" allocated to the affected turning movements was decreased by 20 to 30 percent and reallocated to the northbound and southbound through movements.

(3) Operations at the East Bayshore Road (Blomquist Street)/Bair Island Road intersection (#6) were analyzed assuming that the intersection will be controlled with a one-lane roundabout. Roundabout operations were analyzed with the aaSIDRA software package and are consistent with the methods presented in the Transportation Research Board *2000 Highway Capacity Manual*.

Table 7.16
INTERSECTION LEVELS OF SERVICE--PROJECT WITH BLOMQUIST STREET EXTENSION

Study Intersections		AM Peak-Hour Delay/LOS	PM Peak-Hour Delay/LOS	Change in Delay (AM/PM)
1.	Alameda de las Pulgas/ Whipple Avenue	27.3/C	27.3/C	+1.9/+1.8
2.	El Camino Real/Whipple Avenue	36.6/D	**55.7/E**	+2.7/**+8.3**
3.	Winslow Street/Whipple Avenue	31.5/C	40.4/D	+0.4/+0.0
4.	Veterans Boulevard/Whipple Avenue	38.4/D	41.2/D	+2.4/+3.6
5.	U.S. 101 Northbound Off-Ramp/ Whipple Avenue	11.0/B	17.9/B	+3.1/+5.1
6.	East Bayshore Road (Blomquist Street)/ Bair Island Road	6.6/A	10.3/B	+0.6/+3.8
7.	El Camino Real/Jefferson Avenue	41.4/D	48.0/D	+0.3/+0.4
8.	Veterans Boulevard/Jefferson Avenue	16.1/B	27.9/C	+0.0/-0.2
9.	Veterans Boulevard/Maple Street	24.7/C	39.4/D	+0.5/+0.9
10.	Blomquist Street/Maple Street	**144.0/F**	**> 180/F**	**+110.7/+147.5**
11.	Alameda de las Pulgas/ Woodside Road	39.1/D	38.1/D	+1.2/+0.9
12.	Middlefield Road/Woodside Road	35.9/D	42.7/D	+0.2/+0.3
13.	Bay Road/Woodside Road	22.8/C	30.6/C	+0.3/+0.3
14.	Broadway/Woodside Road	> 180/F	> 180/F	+2.3/+1.2
15.	Veterans Boulevard/Woodside Road	18.4/B	36.7/D	+1.1/+0.5
16.	Blomquist Street/Seaport Boulevard	35.3/D	37.9/D	+2.8/+3.8
17.	U.S. 101 Southbound Ramps/ Marsh Road	15.5/B	16.7/B	+0.1/+0.2
18.	Bayfront Expressway/Marsh Road	26.0/C	30.3/C	+1.0/+1.1
19.	Bayfront Expressway/Willow Road	21.2/C	76.3/E	+0.3/+3.7

SOURCE: Fehr & Peers Associates.

Notes:

(1) Signalized intersection LOS ratings are based on average control delay expressed in seconds per vehicle. Unsignalized intersection LOS ratings are based on total control delay expressed in seconds per vehicle. Signalized and unsignalized analysis methodologies were obtained from the *2000 Highway Capacity Manual*, Transportation Research Board.

(2) Adjustments were made to the LOS calculations at the El Camino Real/Whipple Avenue intersection to account for CalTrain movement preemption of the signal. CalTrain movements affect 20 to 30 percent of the cycles at the intersection during each peak hour. Therefore, the amount of "green time" allocated to the affected turning movements was decreased by 20 to 30 percent and reallocated to the northbound and southbound through movements.

(3) Operations at the East Bayshore Road (Blomquist Street)/Bair Island Road intersection (#6) were analyzed assuming that the intersection will be controlled with a one-lane roundabout. Roundabout operations were analyzed with the aaSIDRA software package and are consistent with the methods presented in the Transportation Research Board *2000 Highway Capacity Manual*.

(4) "Change in delay" is the change in average delay between Background and Project Conditions.

(5) Impacts are designated in **BOLD** type.

7.3.10 C/CAG Analysis Requirements

Impact 7-11: Project Impacts on C/CAG's Congestion Management Plan (CMP) Roadway Network--PM Peak Hour. The proposed project is expected to generate 1,099 net new peak-hour trips during the PM peak hour. Because the project trip generation rate is more than 100 net new peak-hour trips and the project is subject to CEQA review, the proposed project must meet the requirements presented in the *C/CAG Guidelines for the Implementation of the Land Use Component of the 1999 Congestion Management Program*. Until the project meets these requirements to C/CAG satisfaction, the project's potential effects on C/CAG's CMP roadway network in the PM peak hours are considered to be ***significant*** [see criterion (h) in subsection 7.3.1, "Significance Criteria," above].

See the descriptions of C/CAG, the C/CAG Congestion Management Program (CMP) for San Mateo County, and associated C/CAG-adopted mitigation guidelines, in subsection 7.2.1(b) herein ("Pertinent Plans and Policies--C/CAG").

Mitigation 7-11. Based on the C/CAG requirements, and as required under *Mitigation 7-2* herein, the project sponsor shall implement and maintain a transportation demand management (TDM) program that meets the requirements presented in the *C/CAG Guidelines for the Implementation of the Land Use Component of the 1999 Congestion Management Program* in order to reduce the number of trips on the CMP roadway network. The TDM program, to be developed by the project sponsor, must be approved by both the City of Redwood City and C/CAG prior to City approval of any tentative subdivision map or development agreement for the proposed project. Implementation of this measure would reduce the impact to a ***less-than-significant level***.

An on-going land use and transportation planning study (the *Bayfront Study*) is being conducted for the Bayfront Area. The transportation component of that study recommends TDM measures that should be implemented in the Bayfront Area. (Listed at the end of this chapter are TDM measures currently being considered for the proposed Marina Shores Village project as part of the *Bayfront Study*.) It is recommended that the TDM measures implemented by the proposed project be consistent with those identified in the *Bayfront Study*. A copy of the current *Bayfront Study* is available for review at the City of Redwood City Community Development Services Department, City Hall, 1017 Middlefield Road.

7.3.11 Project Access and On-Site Circulation Adequacy

The proposed project site plan, dated April 3, 2002, was reviewed to assess the adequacy of site access, on-site circulation, and parking.

As illustrated by Figure 3.10 (Proposed On-Site Circulation Plan) in chapter 3 of this EIR (Project Description), vehicular access to the project is proposed to be accommodated via five driveways. All of these driveways would connect to Bair Island Road. The eastern end of Bair Island Road would terminate at the proposed parking area for the Outer Pete's Harbor marina.

Project Driveway Operational Impacts. During the AM peak hour, the five driveways are expected to serve from 20 to 440 inbound trips each and from 25 to 300 outbound trips each. During the PM peak hour, the driveways are expected to each serve from 40 to 275 inbound trips and from 30 to 460 outbound trips.

The westernmost driveway is expected to experience the longest delays because it serves the majority of the project traffic, and volumes on Bair Island Road are higher there than at any of the other driveways. Operation (level of service--LOS) at the westernmost driveway was assessed for the AM and PM peak hours. The driveway LOS analysis assumed that the driveway would be configured with a shared left/right-turn lane. The results of the analysis indicate that the westernmost driveway is expected to operate at an acceptable LOS C during both peak hours. Since the remaining driveways are expected to serve lower traffic volumes, all of the proposed driveways are expected to operate acceptably during the AM and PM peak hours under Project Conditions. Accordingly, ***no significant impact*** associated with project driveway operation (LOS) has been identified.

Mitigation: No significant impact has been identified; no mitigation is required.

Impact 7-12: Project Driveway Safety Impacts. If not properly aligned and accompanied by sight line obstruction controls (landscaping and street trees could limit sight distance for drivers entering and existing driveways), one or more of the project driveway connections to Bair Island Road could be dangerous intersections, representing a ***significant impact*** [see criterion (a)(5) in subsection 7.3.1, "Significance Criteria," above].

Mitigation 7-12. The following guidelines shall be followed in finalizing project access details:

- All driveways shall be aligned with existing driveways on the opposite side of Bair Island Road. If the driveways cannot be aligned, a minimum of 150-feet offset shall be provided between opposing driveways to minimize conflicting turning movements in the center two-way left turn lane.

(continued)

Mitigation 7-12 (continued):

- To minimize the potential for visual restrictions, a minimum sight distance of 200 feet shall be maintained at each driveway based on a posted speed limit of 25 mph and a design speed of 30 mph (assumed to be 5 mph higher than posted). This distance is the minimum distance that a driver of an exiting vehicle in a driveway should be able to see in each direction.

- Channelization of the driveways shall be provided to clearly direct drivers along safe vehicle paths and minimize pavement area.

Incorporation of these measures in the final project access details would reduce this impact to a ***less-than-significant level***.

Impact 7-13: Project Internal Circulation Impact. The project's internal vehicular, pedestrian, and bicycle circulation plan remains conceptual at this preliminary point. On-site circulation would be provided by two-way drive aisles between Bair Island Road and the southern reaches of the site. Internal roadway dimensions, circulation aisle widths, turnaround details, etc., have not yet been specified. If not properly designed with adequate roadway and circulation aisle widths, turning radii, and turnaround dimensions, the project internal vehicular circulation system could include substantial safety hazards and/or emergency access deficiencies, representing a ***significant impact*** [see criteria (a)(2), (a)(3), and (g) in subsection 7.3.1, "Significance Criteria," above].

Mitigation 7-13. The project's final internal circulation system design shall incorporate the following minimum standards:

- all two-way circulation aisles shall be a minimum of 24-feet wide;

- all one-way circulation aisles providing access to any 60-degree parking shall be a minimum of 16-feet wide;

- turning templates shall be applied to the final detailed site plans to ensure that vehicles can negotiate all required turning movements;

- since moving vans will need to access buildings at the south end of the site, the internal circulation system shall be designed to safely and conveniently accommodate these vehicles;

- dead-end circulation aisles are not desirable; turnarounds shall be provided at all dead-end parking aisles, some of which are already shown on the

preliminary site plan;

- the internal circulation plan shall be subject to review and approval by the City to ensure that adequate emergency access is provided;
- direct sidewalk connections shall be provided between all buildings; and
- all sidewalks should meet Americans with Disabilities Act (ADA) and City design standards.

Implementation of these measures would reduce this potential internal circulation impact to a ***less-than-significant level***.

At the time this EIR was prepared, no detailed site plans showing parking garage designs and surface parking designs were available for review.

7.3.12 Project Parking Adequacy

City of Redwood City parking requirements were reviewed to determine the number of parking spaces the proposed project would be required to provide. Current Redwood City parking requirements are presented in Table 7.17.

Table 7.17
REDWOOD CITY PARKING REQUIREMENTS

Land Use	City Requirement	Required Parking Supply
Condominium	2 spaces/unit plus 1 guest space/4 units	4,343 spaces
Office	1 space/300 square feet (10% must be designated for carpool/vanpool)	1,000 spaces
Restaurant	1 space/3 seats	54 spaces
Retail	1 space/200 square feet	30 spaces

SOURCE: Fehr & Peers Associates and City of Redwood City.

Note:

(1) City parking requirements for restaurants are based on number of seats. Required parking supply for the project restaurant was estimated by developing a factor to estimate the number of seats based on building size (square feet). To develop this factor, a square-footage per seat ratio of approximately 37 square feet was derived from restaurant parking requirements from the City of Sunnyvale. This factor was used to estimate the number of seats (162) in a 6,000-square-foot restaurant.

Impact 7-14: Potentially Inadequate Project Parking Provisions. In order for the project to comply with City parking requirements and meet other applicable parking design standards and common practice, parking for all project residential units, commercial activities, and recreational provisions would have to be contained on-site, in numbers and configurations which are sufficient to meet peak-period parking demands for these project uses and which are within convenient proximity to users. The project parking provisions must also be designed and managed to meet the parking control and security concerns of the City.

Based on City code requirements, the proposed project would be required to provide 5,427 parking spaces. The project, as proposed, would provide 5,120 parking spaces. Therefore it is recommended that the proposed project implement a shared parking concept (where different land uses share their parking facilities). Under a shared parking approach between the residential and commercial components of the project (which would each have different peak parking demand times), it is estimated that the project would have a peak temporal parking demand for 4,388 spaces, which is less than the 5,120 total parking spaces proposed. The current conceptual parking program description does not yet incorporate a level of design and management detail to permit full evaluation of parking adequacy--e.g., the relationships between the location of the various parking provisions and associated residential, commercial, and public recreational demands, the adequacy and competence of project parking management and security provisions (defensive design features, exterior and interior lighting, security surveillance and monitoring equipment, etc.), and adequacy of provision for interaction between project security personnel and the Redwood City Police Department.

If one or more of the parking design objectives identified above (total spaces, convenient proximity, and adequate control and security) are not met, the project on-site parking provisions could be inadequate, could result in overflow parking and spillover onto adjacent and nearby streets, and could result in inordinate patrolling and enforcement demands on the Redwood City Police Department. Either of these effects would represent a ***significant impact*** [see criteria (a)(4) in subsection 7.3.1, "Significance Criteria," above and (1) in subsection 10.3.3, "Significant Criteria"].

The current project description indicates that the project would provide 5,120 total parking spaces (see section 3.4.4 herein). Based on the current City parking requirements shown in Table 7.17, the proposed project would have to provide a total of 5,427 parking spaces, assuming no reduction for shared-use spaces. Thus, with no accounting for shared use, the project would result in a deficiency of 307 parking spaces according to City parking requirements. However, since the proposed project is a mixed use development, there may be opportunities for shared parking between project residential and commercial components, where the parking demand for these differing uses peaks at different times. A *shared parking*

analysis was conducted by Fehr & Peers to determine if the project, as a whole, would have sufficient parking facilities over the course of the day.

To be conservative, it was assumed that the peak parking demand for each of the proposed land uses was equivalent to the City's parking requirement for that land use. To estimate the temporal parking demand for each land use (i.e., the parking demand generated by each land use per time of day), distribution rates presented in the commonly used parking design manual *Shared Parking* (1983, Urban Land Institute and Barton-Aschman Associates, Inc.) were applied to the peak parking demand for that land use.

In summary, the *shared parking analysis* results indicate that the proposed project would have a peak temporal parking demand of 4,388 spaces. This is less than the proposed 5,120 parking spaces. Therefore, the proposed total parking supply would be sufficient to serve the peak temporal parking demand. However, there are additional factors that also significantly affect parking adequacy, such as parking space location (convenience to users) and security. To be fully adequate, the shared facilities would need to be in close proximity and conveniently accessible to both land uses. For example, the peak parking demand for the office is assumed to be approximately 1,000 spaces. Any shared spaces that would be used to serve office patrons during the day (and possibly residential visitors at night) would have to be in relatively close proximity to both uses. The feasibility of shared parking is also dependent on whether the nearby condominiums will have secured or gated parking facilities. Once the number of proposed spaces for each building is provided, the shared parking analysis can be further evaluated and refined.

Mitigation 7-14. Design and management measures shall be incorporated into the project to ensure that adequate peak-period parking provisions are provided within convenient proximity to users, and designed and managed to meet the parking control and security concerns of the Redwood City Police Department. The design and management measures shall include the following:

(1) *parking space-by-location provisions* that are adequate in number and convenient in proximity to projected peak residential, commercial, and recreational (public access) land uses;

(2) an *Ongoing Parking Management Program*, prepared for City staff review and approval, that tailors parking demand to availability within the development complex, details daytime and evening shared parking aspects, provides for maintenance of a 10 percent margin of available parking at all times, and includes provisions for

(continued)

Mitigation 7-14 (continued):

routine monitoring of parking use as project phased construction and occupancy occurs, continuing for three years following project buildout; and includes *design provisions to permit parking expansion* to be readily accommodated on-site, perhaps through the ability to construct additional parking decks, if such a need is indicated by the *parking monitoring program*.

Any future parking expansion shall not exceed the adopted per use parking space requirements of the City, and shall incorporate design features that, to the satisfaction of the City, reduce potential adverse land use compatibility or visual impacts to less-than-significant levels (e.g., locations behind residential and/or commercial structures, architectural features, vegetative screening); and

(3) *parking control and security provisions* that may include, but are not limited to, a full-time, on-site security and monitoring operation (e.g., security personnel, surveillance cameras, emergency telephones, adequate security lighting, adequate patrolling, adequate emergency access, and adequate coordination between project security operations and Redwood City Policy Department operations).

Implementation of these measures would reduce identified potential parking impacts to a ***less-than-significant level.***

7.3.13 Cumulative (Year 2020) Without Project Conditions

To estimate traffic at the study intersections under Cumulative (Year 2020) Conditions, future traffic estimates were developed to account for regional and local growth. Regional growth at the study intersections was estimated based on peak-period traffic volumes from the C/CAG countywide travel demand forecasting model for the base year (2000) and future (2020) scenarios. An annual growth factor of one percent per year was developed by comparing the base year to the future year forecasts at the study intersections. The annual growth factor was then applied to Existing Condition volumes that were adjusted to account for the Blomquist Street Extension [which was assumed to be complete under the Cumulative (Year 2020) Without Project scenario].

Local growth is represented by trips from approved and pending (reasonably foreseeable, but not yet approved) projects in the vicinity. These trips were then added to the factored Existing Condition volumes to estimate volumes under Cumulative (2020) Without Project conditions. A list of pending projects included in this analysis is available for review at the City of Redwood City Community Development Services Department, City Hall, 1017 Middlefield Road. Since some of the approved and pending projects may be included in the C/CAG travel demand forecasting model's land use assumptions, adding trips from these projects is considered a conservative approach for estimating cumulative (Year 2020) volumes.

(a) Cumulative Without Project Intersection Analysis. Level of service (LOS) calculations were conducted using the Cumulative (2020) Without Project condition volumes. The results of this cumulative LOS analysis are presented in Table 7.18. The Cumulative (2020) Without Project condition intersection turning movement volumes during the AM and PM peak hours are presented on Figure 7.10.

Planning staff from the Joint Powers Board were consulted to determine the expected future increase in CalTrain service over current operations. It was determined that 12 and 10 trains will affect operations at the Whipple Avenue/El Camino Real intersection during the AM and PM peak hours, respectively, under Cumulative Conditions. Adjustments were made to the "green time" allocated to certain movements at the intersection to account for additional peak-hour delays due to these CalTrain movements through Redwood City.

The results of the intersection LOS analysis for Cumulative (2020) Without Project conditions indicate that the El Camino Real/Whipple Avenue intersection is expected to operate at an unacceptable LOS E and LOS F during the AM and PM peak hours, respectively. The Veterans Boulevard/Whipple Avenue intersection is expected to operate at an unacceptable LOS E during the AM peak hour and an acceptable LOS D during the PM peak hour. The El Camino Real/Jefferson Avenue intersection is expected to operate at an unacceptable LOS E and LOS F during the AM and PM peak hours, respectively. The Alameda de las Pulgas/Woodside Road intersection is expected to operate at an unacceptable LOS F during the AM peak hour and LOS E during the PM peak hour. The Middlefield Road/Woodside Road intersection is expected operate at an acceptable LOS D during the AM peak hour and an unacceptable LOS E during the PM peak hour. The Veterans Boulevard/Woodside Road and Bayfront Expressway/Willow Road intersections are expected to operate acceptably (LOS D or better) during the AM peak hour, but are expected to operate at an unacceptable LOS F during the PM peak hour. The Blomquist Street/Maple Street, Broadway/Woodside Road, and Blomquist Street/Seaport Boulevard intersections are all expected to operate at an unacceptable LOS F during the AM and PM peak hours.

All other study intersections are expected to operate acceptably (LOS D or better) during the AM and PM peak hours under Cumulative Without Project conditions.

(b) Cumulative Without Project Freeway Segment Capacity Analysis. Study segments of U.S. 101, I-280, and SR 84 were reviewed for the AM and PM peak hours to evaluate expected freeway operations under Cumulative Without Project conditions. An annual growth rate in peak- hour volumes of 0.5 percent per year was estimated based on information from the C/CAG travel demand forecasting model and regional growth trends. This growth rate was applied to the existing volumes, and a freeway segment capacity analysis was conducted under Cumulative Without Project conditions.

The results of the freeway segment capacity analysis under Cumulative Without Project conditions are summarized in Table 7.19 and indicate that southbound U.S. 101 mixed-flow lanes, from SR 92 to Marsh Road, are expected to have a V/C ratio greater than 1.0, where

Table 7.18
INTERSECTION LEVELS OF SERVICE--CUMULATIVE (YEAR 2020) WITHOUT PROJECT CONDITIONS

	Study Intersections	Intersection Control	AM Peak-Hour Delay/LOS	PM Peak-Hour Delay/LOS
1.	Alameda de las Pulgas/ Whipple Avenue	Signal	34.7C	33.1/C
2.	El Camino Real/Whipple Avenue	Signal	64.1/E	98.6/F
3.	Winslow Street/Whipple Avenue	Signal	37.5/D	50.2/D
4.	Veterans Boulevard/Whipple Avenue	Signal	55.9/E	54.5/D
5.	U.S. 101 Northbound Off-Ramp/ Whipple Avenue	Signal	9.5/A	24.0/C
6.	East Bayshore Road/ Bair Island Road (Blomquist Street)	Roundabout	5.9/A	7.4/A
7.	El Camino Real/Jefferson Avenue	Signal	65.1/E	89.0/F
8.	Veterans Boulevard/Jefferson Avenue	Signal	20.5/C	32.5/C
9.	Veterans Boulevard/Maple Street	Signal	28.1/C	39.7/D
10.	Blomquist Street/Maple Street	2-Way Stop	> 180/F	> 180/F
11.	Alameda de las Pulgas/ Woodside Road	Signal	87.7/F	72.0/E
12.	Middlefield Road/Woodside Road	Signal	40.0/D	58.7/E
13.	Bay Road/Woodside Road	Signal	26.8/C	35.1/D
14.	Broadway/Woodside Road	Signal	>180/F	>180/F
15.	Veterans Boulevard/Woodside Road	Signal	47.9/D	100.1/F
16.	Blomquist Street/Seaport Boulevard	Signal	108.7/F	91.8/F
17.	U.S. 101 Southbound Ramps/ Marsh Road	Signal	18.1/B	21.0/C
18.	Bayfront Expressway/Marsh Road	Signal	29.7/C	35.3/D
19.	Bayfront Expressway/Willow Road	Signal	25.0/C	145.8/F

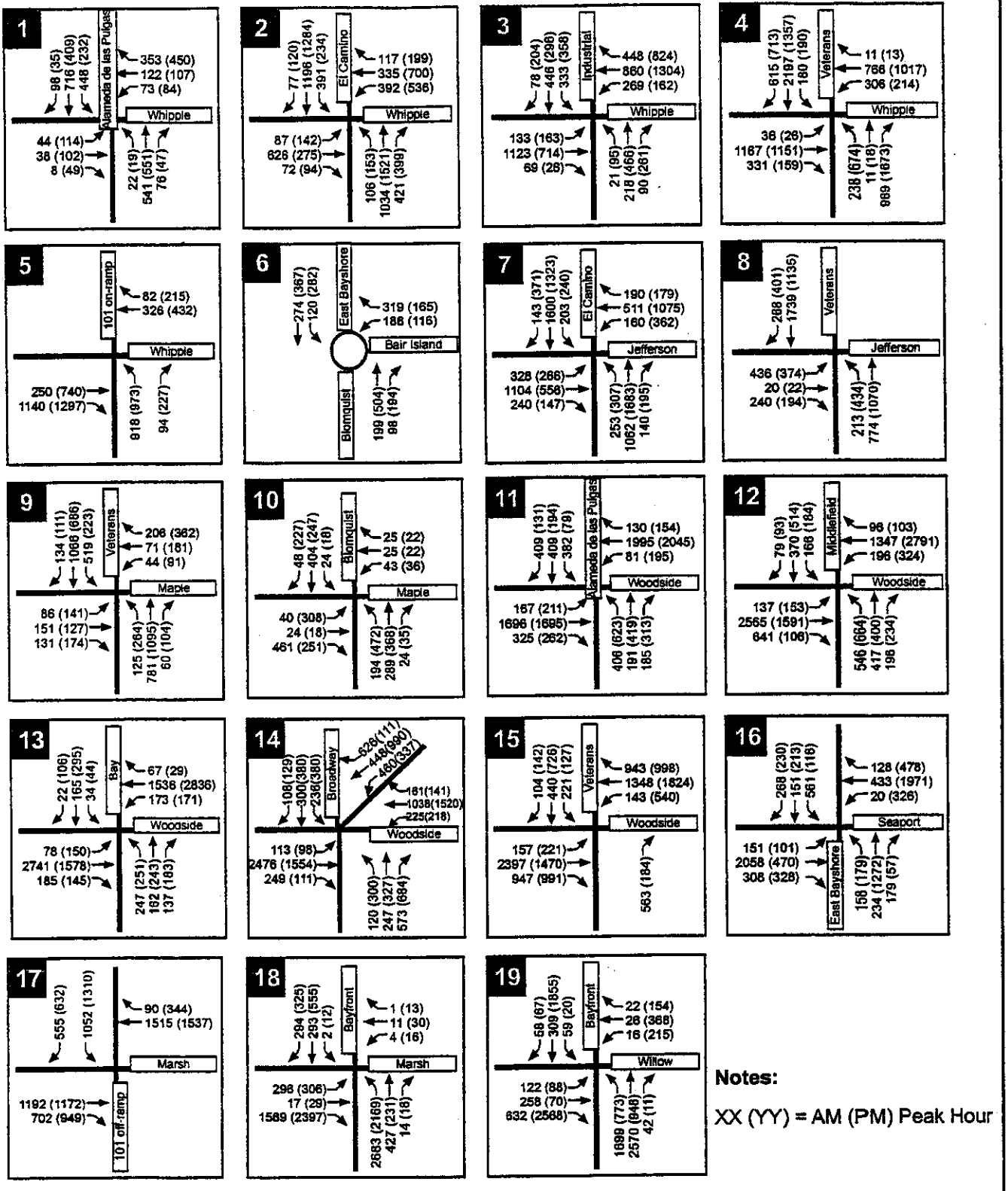
SOURCE: Fehr & Peers Associates.

Notes:

(1) Signalized intersection LOS ratings are based on average control delay expressed in seconds per vehicle. Unsignalized intersection LOS ratings are based on total control delay expressed in seconds per vehicle. Signalized and unsignalized analysis methodologies were obtained from the *2000 Highway Capacity Manual*, Transportation Research Board.

(2) Adjustments have been made to the LOS calculations at the El Camino Real/Whipple Avenue intersection to account for CalTrain movement preemption of the signal. CalTrain movements are expected to affect 30 to 40 percent of the cycles at the intersection during each peak hour. Therefore, the amount of "green time" allocated to the affected turning movements was decreased by 30 to 40 percent and reallocated to the northbound and southbound through movements.

(3) Operations at the East Bayshore Road (Blomquist Street)/Bair Island Road intersection (#6) were analyzed assuming that the intersection will be controlled with a one-lane roundabout. Roundabout operations were analyzed with the aaSIDRA software package and are consistent with the methods presented in the Transportation Research Board's *2000 Highway Capacity Manual*.



SOURCE: Fehr & Peers Associates, Inc.

Figure 7.10

CUMULATIVE (2020) WITHOUT PROJECT PEAK-HOUR INTERSECTION VOLUMES

Table 7.19
FREEWAY SEGMENT CAPACITY ANALYSIS--CUMULATIVE (YEAR 2020) WITHOUT PROJECT CONDITIONS

Freeway Segment	Lane Type	Capacity	AM Peak Hour Volume	AM Peak Hour V/C	PM Peak Hour Volume	PM Peak Hour V/C
U.S. 101:						
SB SR 92 to Whipple	Mixed Flow	9,200	9,452	1.03	8,502	0.92
SB Whipple to Woodside	Mixed Flow	6,900	8,510	1.23	8,474	1.23
	HOV	1,800	1,155	0.64	1,181	0.66
SB Woodside to Marsh	Mixed Flow	6,900	8,445	1.22	6,988	1.01
	HOV	1,800	1,242	0.69	1,027	0.57
NB Marsh to Woodside	Mixed Flow	6,900	5,674	0.82	4,377	0.63
	HOV	1,800	973	0.54	699	0.39
NB Woodside to Whipple	Mixed Flow	6,900	6,123	0.89	4,740	0.69
	HOV	1,800	1,214	0.67	1,114	0.62
NB Whipple to SR 92	Mixed Flow	9,200	7,666	0.83	6,863	0.75
I-280:						
SB SR 92 to Edgewood	Mixed Flow	9,200	8,464	0.92	4,733	0.51
SB Edgewood to Farm Hill	Mixed Flow	9,200	8,934	0.97	4,616	0.50
SB Farm Hill to Woodside	Mixed Flow	9,200	9,050	0.98	5,339	0.58
SB Woodside to County Line	Mixed Flow	9,200	5,898	0.64	4,346	0.47
NB County Line to Woodside	Mixed Flow	9,200	3,363	0.37	6,192	0.67
NB Woodside to Farm Hill	Mixed Flow	9,200	4,659	0.51	8,510	0.92
NB Farm Hill to Edgewood	Mixed Flow	9,200	4,241	0.46	7,961	0.87
NB Edgewood to SR 92	Mixed Flow	9,200	4,763	0.52	8,183	0.89
SR 84:						
EB Willow to University	Mixed Flow	3,300	711	0.22	3,905	1.18
EB University to County Line	Mixed Flow	3,300	1,750	0.53	5,352	1.62
WB County Line to University	Mixed Flow	3,300	5,145	1.56	1,620	0.49
WB University to Willow Road	Mixed Flow	3,300	3,669	1.11	1,409	0.43

SOURCE: Fehr & Peers Associates and Caltrans.

Notes:

(1) Typical design capacity for mixed-flow lanes on freeway segments is assumed to be 2,300 vehicles per lane per hour (vplph). Auxiliary lanes are not included in the analysis. Auxiliary lanes have been addressed in the freeway ramp capacity analysis.

(2) Typical design capacity for HOV lanes on freeway segments is assumed to be 1,800 vplph.

(3) Typical design capacity for mixed-flow lanes on SR 84 (an expressway) is assumed to be 1,100 vplph, consistent with design capacities identified in the *San Mateo CMP Monitoring Report*.

(4) Cumulative Without Project Volumes estimated by applying a 0.5% per year growth factor to the existing volumes.

(5) V/C = volume-to-capacity ratio.

(6) NB = northbound; SB = southbound; EB = eastbound; WB = westbound.

expected demand exceeds capacity, during the AM peak hour. Southbound U.S. 101 mixed-flow volumes, from Whipple Avenue to Marsh Road, are expected to exceed capacity during the PM peak hour as well. Westbound segments of SR 84 are expected to have V/C ratios greater than 1.0 during the AM peak hour. During the PM peak hour, eastbound segments of SR 84 are expected to have V/C ratios greater than 1.0. All other study segments are expected to have V/C ratios less than 1.0, where expected demand does not exceed the freeway segment's capacity.

(c) Cumulative Without Project Freeway Ramp Capacity Analysis. Operations of the study freeway ramps were reviewed by conducting a volume-to-capacity analysis under Cumulative Without Project conditions. The purpose of the analysis was to verify that the freeway ramps would have sufficient capacity to serve demand under Cumulative Without Project conditions.

A growth rate of 0.5 percent per year was applied to the existing volumes (obtained from Caltrans counts) and traffic from approved and pending projects in the area was added together to estimate volumes under Cumulative Without Project conditions. The results of the volume-to-capacity analysis are presented in Table 7.20.

The results of the analysis indicate that all of the study ramps are expected to have a V/C ratio less than 1.0, where expected demand does not exceed capacity, during the AM and PM peak hours under Cumulative Without Project conditions.

7.3.14 Cumulative (Year 2020) With Project Conditions

Trips generated by the proposed project were added to the Cumulative (2020) Without Project condition volumes to represent Cumulative With Project conditions. The Cumulative With Project intersection turning movement volumes during the AM and PM peak hours are presented on Figure 7.11.

The Cumulative With Project peak-hour turning movement volumes were used to conduct intersection LOS calculations at the study intersections. The results of the Cumulative (2020) With Project LOS analysis are summarized in Table 7.21. The table lists projected LOS ratings and the changes in delay compared to Cumulative (2020) Without Project conditions (Table 7.19) for each location. The analysis results summarized in Table 7.21 indicate that the addition of project traffic is expected to result in a *significant cumulative impact* at the following intersections:

- El Camino Real/Whipple Avenue
- Veterans Boulevard/Whipple Avenue
- Blomquist Street/Maple Street
- Alameda de las Pulgas/Woodside Road

Table 7.20
FREEWAY RAMP CAPACITY ANALYSIS--CUMULATIVE (YEAR 2020) WITHOUT PROJECT

U.S. 101 Freeway Ramp	Capacity	AM Peak Hour Volume	AM Peak Hour V/C	PM Peak Hour Volume	PM Peak Hour V/C
SB U.S. 101 Off-Ramp/ Veterans Boulevard	3,800	2,253	0.59	1,912	0.50
SB U.S. 101 On-Ramp/ Westbound Whipple Avenue	1,900	132	0.07	168	0.09
NB U.S. 101 Off-Ramp/ Whipple Avenue	2,000	852	0.43	1,227	0.61
NB U.S. 101 On-Ramp/ Westbound Whipple Avenue	2,000	123	0.06	196	0.10
SB U.S. 101 On-Ramp/ Woodside Road	2,000	1,515	0.76	1,605	0.80
NB U.S. 101 Off-Ramp/ Woodside Road (Seaport Blvd.)	1,900	1,669	0.88	1,724	0.91

SOURCE: Fehr & Peers Associates and Caltrans.

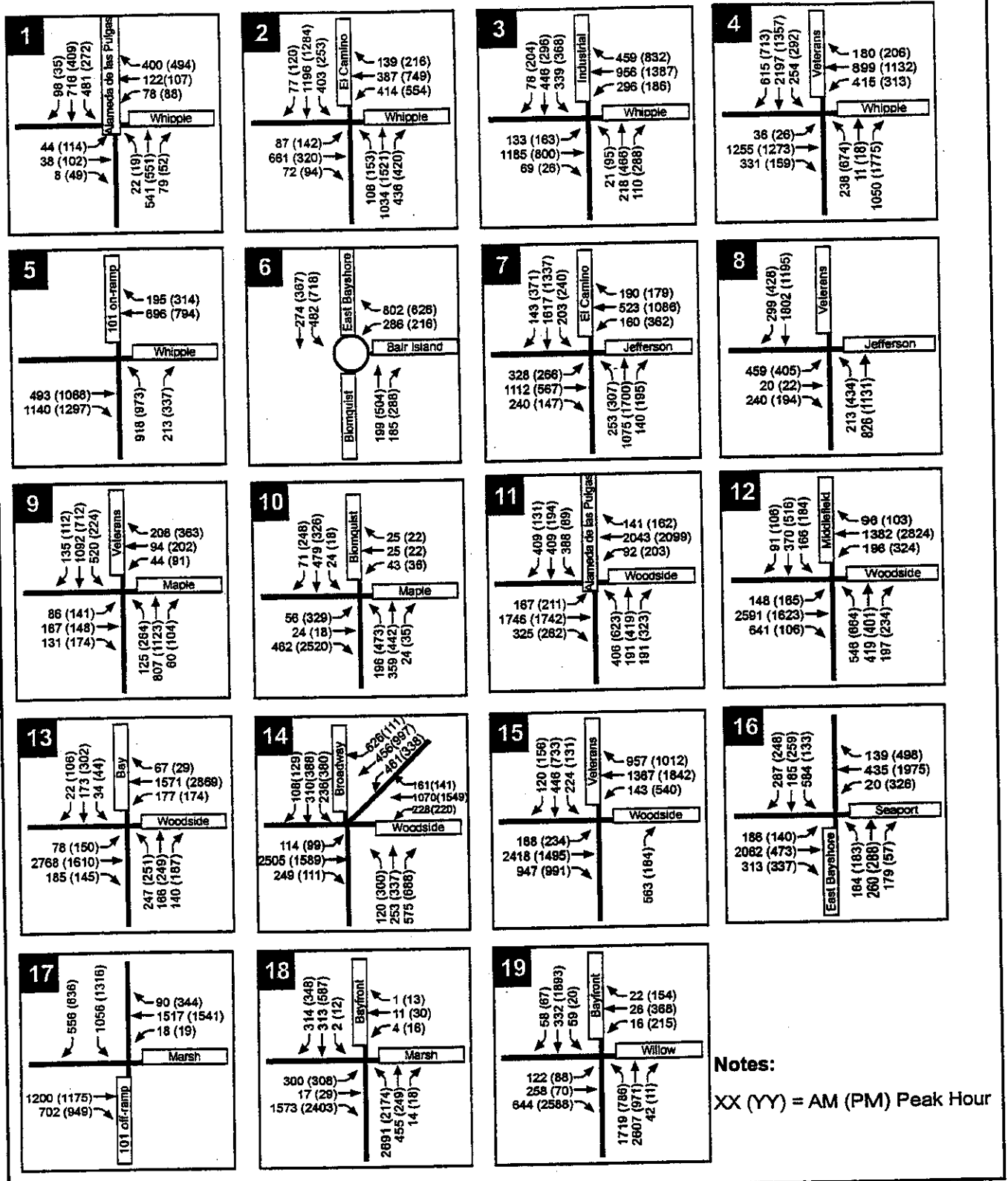
Notes:

(1) Capacity based on information presented in Chapter 25 of the *2000 Highway Capacity Manual* and the posted recommended travel speed on the ramp.

(2) Volumes obtained by applying a 0.5 percent growth factor to existing count data provided by Caltrans plus traffic from approved and pending projects.

(3) V/C = volume-to-capacity ratio.

(4) NB = northbound; SB = southbound.



SOURCE: Fehr & Peers Associates, Inc.

Figure 7.11

CUMULATIVE (2020) WITH PROJECT PEAK-HOUR INTERSECTION VOLUMES

Table 7.21
INTERSECTION LEVELS OF SERVICE--CUMULATIVE (YEAR 2020) WITH PROJECT CONDITIONS

Study Intersections		AM Peak-Hour Delay/LOS	PM Peak-Hour Delay/LOS	Change In Delay (AM/PM)
1.	Alameda de las Pulgas/ Whipple Avenue	39.1/D	38.5/D	+4.4/+5.
2.	El Camino Real/Whipple Avenue	**74.0/E**	**116.1/F**	**+9.9/+17.5**
3.	Winslow Street/Whipple Avenue	39.7/D	53.1/D	+2.2/+2.2
4.	Veterans Boulevard/Whipple Avenue	**76.1/E**	**68.4/E**	**+20.2/+13.8**
5.	U.S. 101 Northbound Off-Ramp/ Whipple Avenue	13.1/B	47.6/D	+3.6/+23.6
6.	East Bayshore Road/ Bair Island Road (Blomquist Street)	7.1/B	38.4/D	+1.2/+31.0
7.	El Camino Real/Jefferson Avenue	66.8/E	91.1/F	+1.7/+2.1
8.	Veterans Boulevard/Jefferson Avenue	21.0/C	32.8/C	+0.5/+0.3
9.	Veterans Boulevard/Maple Street	28.5/C	40.5/D	+0.4/+0.8
10.	Blomquist Street/Maple Street	> 180/F	**> 180/F**	N/A
11.	Alameda de las Pulgas/ Woodside Road	**93.4/F**	76.7/E	**+5.7**/+4.7
12.	Middlefield Road/Woodside Road	40.4/D	61.4/E	+0.0/+2.7
13.	Bay Road/Woodside Road	27.3/C	35.8/D	+0.5/+0.7
14.	Broadway/Woodside Road	> 180/F	**> 180/F**	+3.0/**+6.2**
15.	Veterans Boulevard/Woodside Road	50.1/D	**105.5/F**	+2.2/**+5.4**
16.	Blomquist Street/Seaport Boulevard	**116.5/F**	**105.7/F**	**+7.8/+13.9**
17.	U.S. 101 Southbound Ramps/ Marsh Road	18.2/B	21.3/C	+0.1/+0.3
18.	Bayfront Expressway/Marsh Road	31.1/C	36.9/D	+1.4/+1.6
19.	Bayfront Expressway/Willow Road	25.3/C	150.5/F	+0.3/+4.7

SOURCE: Fehr & Peers Associates.

Notes:

(1) Signalized intersection LOS ratings are based on average control delay expressed in seconds per vehicle. Unsignalized intersection LOS ratings are based on total control delay expressed in seconds per vehicle. Signalized and unsignalized analysis methodologies were obtained from the *2000 Highway Capacity Manual*, Transportation Research Board.

(2) Adjustments have been made to the LOS calculations at the El Camino Real/Whipple Avenue intersection to account for CalTrain movement preemption of the signal. CalTrain movements are expected to affect 30 to 40 percent of the cycles at the intersection during each peak hour. Therefore, the amount of "green time" allocated to the affected turning movements was decreased by 30 to 40 percent and reallocated to the northbound and southbound through movements.

(3) Operations at the East Bayshore Road (Blomquist Street)/Bair Island Road intersection (#6) were analyzed assuming that the intersection will be controlled with a one-lane roundabout. Roundabout operations were analyzed with the aaSIDRA software package and are consistent with the methods presented in the Transportation Research Board's *2000 Highway Capacity Manual*.

(4) "Change in delay" is the change in average delay between Background and Project Conditions.

(5) Impacts are designated in **BOLD** type.

(6) Change in delay at the Blomquist Street/Maple Street intersection cannot be accurately determined due to over-saturated conditions.

- Broadway/Woodside Road
- Veterans Boulevard/Woodside Road
- Blomquist Street/Seaport Boulevard

These cumulative impacts and associated mitigation measures are discussed in detail below.

Impact 7-15: Cumulative (2020) With Project Impact on the El Camino Real/Whipple Avenue Intersection. Under Cumulative (2020) Without Project conditions, the El Camino Real/Whipple Avenue intersection is expected to operate at an unacceptable LOS E and LOS F during the AM and PM peak hours, respectively. The addition of project traffic is expected to increase the average delay at the intersection by 9.9 and 17.5 seconds during the AM and PM peak hours, respectively. This effect would represent a ***significant cumulative impact*** [see criteria (a)(1) and (b)(2) in subsection 7.3.1, "Significance Criteria," above].

Note: These impact findings are based on comparison of Table 7.21 with Table 7.19.

Mitigation 7-15. An improvement has been identified for this location in the *Redwood City Traffic Impact Mitigation Fee Study* (TIMFS). The identified improvement includes the addition of a “free” westbound right-turn lane (i.e., a right turn lane that would not be controlled by the traffic signal) and associated receiving lane. However, the level of service analysis conducted for this EIR indicates that this improvement would not provide acceptable operations during the AM or PM peak hour under neither the Cumulative (2020) Without Project nor Cumulative (2020) With Project scenarios.

Therefore, implement either one of the following two alternative mitigation approaches in order to reduce the impact to a less-than-significant level:

(continued)

Mitigation 7-15 (continued):

(1) Grade-Separated Railroad Crossing at Whipple Avenue. The cumulative EIR LOS analysis for this intersection included adjustments to signal timing to account for the nearby CalTrain railroad crossing. Calculations conducted for the intersection under Cumulative (2020) With Project conditions without adjusted signal timings (i.e., if the train did not affect the operations at the intersection) indicate that the intersection would operate acceptably during the AM and PM peak hours. Therefore, if the railroad tracks were to be grade-separated from Whipple Avenue, the intersection is expected to operate acceptably. However, due to the

limited distance between the intersection and the CalTrain railroad tracks, grade separation may not be feasible. It should be noted that the grade separation of this railroad crossing has been identified as an objective in the Redwood City Strategic General Plan.

(2) Widening of the Eastbound Intersection Approach to Achieve Acceptable LOS During Both the AM and PM Peak Hours. For the intersection to operate at an "acceptable" LOS (D or better) under Cumulative (2020) With Project conditions without a railroad grade separation at Whipple Avenue, provide a dedicated right turn lane, two through lanes, and a dedicated left turn lane on the eastbound approach to the intersection (currently, the eastbound approach is configured with one shared through/left-turn lane and one shared through/right-turn lane). In addition, change the east-west left turn signal phasing from split (i.e., shared with opposing through traffic) to protected (i.e., exclusive). With these lane additions and signal phasing modifications, the intersection would be expected to operate acceptably (LOS D) during the AM and PM peak hours under Cumulative (2020) With Project conditions.

Widening the eastbound approach would tend to increase peak eastbound traffic volumes on a residential street and would require careful design to provide enough physical clearance to allow opposing eastbound and westbound left turns to proceed simultaneously. Additionally, both of the mitigation alternatives discussed above are considered to be infeasible due to right-of-way and physical constraints. Therefore, the addition of project traffic to the El Camino Real/Whipple Avenue intersection is expected to result in a ***significant unavoidable cumulative impact***.

Impact 7-16: Cumulative (2020) With Project Impact on the Veterans Boulevard/Whipple Avenue Intersection. Under Cumulative (2020) Without Project conditions, the Veterans Boulevard/Whipple Avenue intersection is expected to operate at LOS E, an unacceptable level, during the AM peak hour, and LOS D, an acceptable level, during the PM peak hour. The addition of project traffic is expected to degrade operations at the intersection to LOS E during the PM peak hour, an unacceptable level. Furthermore, the addition of project traffic is expected to increase the average delay at the intersection by more than 5.0 seconds during the AM and PM peak hours. Both of these effects would represent a ***significant cumulative impact*** [see criteria (a)(1) and (b)(1) in subsection 7.3.1, "Significance Criteria," above].

Note: These impact findings are based on comparison of Table 7.21 with Table 7.19.

Mitigation 7-16. An improvement has been identified for this intersection in the *Redwood City Traffic Impact Mitigation Fee Study* (TIMFS). The identified improvement includes the addition of a dedicated eastbound right turn lane. However, the level of service analysis conducted for this EIR indicates that this improvement alone would not provide acceptable operations during the AM or PM peak hour under Cumulative (2020) With Project conditions.

Therefore, in addition to the TIMFS-identified additional eastbound right turn lane, the addition of a second westbound left turn lane is needed to mitigate this AM and PM peak-hour Cumulative (2020) With Project impact--i.e., to achieve LOS D at this intersection. This improvement would reduce this cumulative intersection impact to a ***less-than-significant level.***

It should be noted that modification to the westbound approach may require widening of the Whipple Avenue overpass and will likely require coordination with Caltrans.

Impact 7-17: Cumulative (2020) With Project Impact on the Blomquist Street/Maple Street Intersection. The Blomquist Street/Maple Street intersection is expected to operate at LOS F during the AM and PM peak hours under Cumulative (2020) Conditions, with or without the proposed project. The addition of project traffic is expected to increase the average delay at the intersection by more than 5.0 seconds during the AM and PM peak hours. The intersection is also expected to meet the Caltrans "Peak Hour Volume Warrant" for traffic signal installation during the AM and PM peak hours under Cumulative (2020) With

Project conditions. These effects would represent a ***significant cumulative impact*** [see criteria (a)(1), (b)(2), and (b)(3) in subsection 7.3.1, "Significance Criteria," above].

Mitigation 7-17. Install a traffic signal at the intersection, widen the northbound approach to include a dedicated left turn lane and a shared through/right-turn lane, and reconfigure the southbound approach to include a dedicated left turn lane and a shared through/right-turn lane. With signalization and the recommended lane modifications, the intersection is expected to operate at LOS C during the AM and PM peak hours under Cumulative (2020) With Project conditions.

Alternatively, install a roundabout at the intersection. With installation of a roundabout, the intersection is expected to operate at LOS A and LOS B during the AM and PM peak hours, respectively.

Implementation of either one of the above mitigation alternatives would reduce this cumulative impact at the Blomquist Street/Maple Street intersection to a ***less-than-significant level.***

An analysis was conducted to determine if a roundabout, with similar dimensions to the one proposed at the East Bayshore Road (Blomquist Street)/Bair Island Road intersection, would mitigate project impacts at the intersection. The results indicated that the intersection would operate at LOS A and LOS B during the AM and PM peak hours, respectively, with the installation of a roundabout under Cumulative (2020) With Project conditions. This configuration may require additional right-of-way acquisition.

Impact 7-18: Cumulative (2020) With Project Impact on the Alameda de las Pulgas/Woodside Road Intersection. The Alameda de las Pulgas/Woodside Road intersection is expected to operate LOS F and LOS E during the AM and PM peak hours, respectively, under Cumulative Conditions with and without the project. Specifically, expected eastbound and westbound through volumes at the Alameda de las Pulgas/Woodside Road intersection under Cumulative Conditions (with and without the project) are expected to exceed the existing available capacity of the through lanes on Woodside Road (two through lanes in each direction). The addition of project traffic is expected to increase the average delay at the intersection by more than 5.0 seconds during the AM peak hour. This effect would represent a ***significant cumulative impact*** [see criteria (a)(1), (b)(2), and (b)(3) in subsection 7.3.1, "Significance Criteria," above].

Mitigation 7-18. To mitigate the Cumulative With Project impact at this

intersection, add a third through lane on the eastbound and westbound Woodside Road approaches.

The eastbound approach to the intersection has a striped shoulder and the westbound approach has a wide shoulder that provides on-street parking. The existing dedicated right turn lanes for both approaches, when combined with the existing wide shoulders, could be restriped as a shared through/right-turn lane. With this modification, the intersection is expected to operate at LOS D during the AM and PM peak hours under Cumulative (2020) With Project conditions. Therefore, these intersection modifications would reduce the Cumulative With Project impact at the Alameda de las Pulgas/Woodside Road intersection to a ***less-than-significant level.***

It should be noted that the lane additions described above would eliminate existing on-street parking on Woodside Road.

Impact 7-19: Cumulative (2020) With Project Impact on the Broadway/ Woodside Road Intersection. The Broadway/Woodside Road intersection is expected to operate at LOS F during the AM and PM peak hours under Cumulative Conditions with and without the project. The addition of project traffic is expected to increase the average delay at the intersection by more than 5.0 seconds during the PM peak hour only. This effect would represent a ***significant cumulative impact*** [see criteria (a)(1), (b)(2), and (b)(3) in subsection 7.3.1, "Significance Criteria," above].

Mitigation 7-19. Under Existing, Background, Project, and Cumulative (with and without the project) conditions, the intersection is expected to operate at LOS F with substantial delays. Due to right-of-way constraints, there are no feasible mitigation measures. Therefore, the project addition to the cumulative impact on the Broadway/Woodside Road intersection is expected to represent a ***significant unavoidable cumulative impact***.

It should be noted that if the current study to analyze and identify operational improvements to the U.S. 101/Woodside Road interchange [see subsection 7.1.6(a) herein] results in improvements to this interchange, these improvements, if ever constructed, could improve operations at the intersection.

Impact 7-20: Cumulative (2020) With Project Impact on the Veterans Boulevard/Woodside Road Intersection. The Veterans Boulevard/Woodside

Road intersection is expected to operate at LOS F during the PM peak hour under Cumulative Conditions with and without the project. The addition of project traffic is expected to increase the average delay at the intersection by more than 5.0 seconds during the PM peak hour. This effect would represent a ***significant cumulative impact*** [see criteria (a)(1), (b)(2), and (b)(3) in subsection 7.3.1, "Significance Criteria," above].

Mitigation 7-20. To mitigate this Cumulative With Project impact, widen the southbound approach on Veterans Boulevard to accommodate an additional through lane, with an associated receiving lane on the on-ramp to U.S. 101. With this improvement, the intersection is expected to operate at LOS D during the PM peak hour. This improvement would therefore reduce the Cumulative With Project impact at the Veterans Boulevard/Woodside Road intersection to a ***less-than-significant level.***

It should be noted that the U.S. 101 on-ramp would have to be widened to accommodate the receiving lane south of the intersection and to accommodate merging with the ramp connection from eastbound Woodside Road. If the ramp is not sufficiently widened, merging congestion could degrade ramp operations, making this mitigation undesirable. Additionally, Caltrans approval would be required.

Impact 7-21: Cumulative (2020) With Project Impact on the Blomquist Street/Seaport Boulevard Intersection. The Blomquist Street/Seaport Boulevard intersection is expected to operate at LOS F during the AM and PM peak hours under Cumulative Conditions with and without the project. The addition of project traffic is expected to increase the average delay at the intersection by more than 5.0 seconds during the AM and PM peak hours. This effect would represent a ***significant cumulative impact*** [see criteria (a)(1), (b)(2), and (b)(3) in subsection 7.3.1, "Significance Criteria," above].

Mitigation 7-21. To mitigate the Cumulative With Project impact at the Blomquist Street/Seaport Boulevard intersection, the southbound approach could be restriped to include a dedicated left turn lane, a shared through/left-turn lane, and a dedicated right turn lane. With this modification, the intersection is still expected to operate at unacceptable levels--LOS E and LOS F during the AM and PM peak hours, respectively. However, the average delay at the intersection would be reduced from 116.5 seconds and 105.7 seconds during the AM and PM peak hours to 70.2 and 94.5 seconds, respectively, under Cumulative (2020) With Project conditions. This modification would improve operations during the AM peak hour

when compared to Cumulative (2020) Without Project conditions. During the PM peak hour, the improvement would reduce the increase in average delay to 2.7 seconds between Cumulative Without Project and Cumulative With Project conditions, thus reducing the cumulative project impact at this intersection to a ***less-than-significant level.***

Alternatively, for the Blomquist Street/Seaport Boulevard intersection to operate "acceptably" (at LOS D) during the AM and PM peak hours, implement all of the following modifications at the intersection:

- Restripe the northbound right turn lane to be a shared through/right-turn lane. This improvement would require the addition of a receiving lane on the north side of the intersection.

- Restripe the southbound approach to include a dedicated left turn lane, a shared through/left-turn lane, and a dedicated right turn lane.

- Change east/west left turns from protected to permitted phasing.

With these improvements, the intersection is expected to operate at LOS D during the AM and PM peak hours under Cumulative (2020) With Project conditions. It should be noted that the addition of a second receiving lane on the north leg of the intersection would require widening of the roadway over the existing railroad tracks, requiring coordination with the railroad company and extensive re-grading of the adjacent property. Additionally, removing the east/west protected left turn phase could be difficult due to the significant volume of heavy trucks at the intersection.

Other Affected Intersections Under Cumulative (2020) Without Project Conditions. The results of this EIR analysis also indicate that, although the proposed project would not have a significant impact (i.e., would not increase average delay at the intersection by more than 5.0 seconds), some intersections are expected to operate at unacceptable levels under Cumulative Conditions with and without the project during certain peak hours. These intersections, and the improvements required to provide acceptable operations, are discussed below.

El Camino Real/Jefferson Avenue Intersection. Under Cumulative Conditions with and without the project, this intersection is expected to operate at LOS E and LOS F during the AM and PM peak hours, respectively. For the intersection to operate acceptably under Cumulative (2020) With Project conditions, volumes at the intersection warrant the addition of a second left turn lane to the northbound, southbound, and eastbound approaches. With these improvements, the intersection is expected to operate at an acceptable LOS D during the AM and PM peak hours. However, City staff has indicated that this improvement is not desirable by the City and is infeasible due to right-of-way-constraints.

Middlefield Road/Woodside Road Intersection. Under Cumulative Conditions with and without the project, this intersection is expected to operate at LOS D, an acceptable level, during the AM peak hour and LOS E, and unacceptable level, during the PM peak hour. For the intersection to operate at an acceptable level during the PM peak hour, an additional eastbound left turn lane would be needed. With this intersection improvement, the intersection is expected to operate at LOS D during the PM peak hour under Cumulative Conditions. However, City staff has indicated that this improvement is not desirable by the City and is infeasible due to right-of-way-constraints.

Bayfront Expressway/Willow Road. Under Cumulative Conditions, with and without the project, this intersection is expected to operate at an acceptable LOS C during the AM peak hour and an unacceptable LOS F during the PM peak hour. For the intersection to operate acceptably during the PM peak hour, the eastbound right turn lane would need to be reconfigured as a "free" right turn movement (i.e. not controlled by the intersection). This would require the addition of a receiving lane on Bayfront Expressway south of the intersection. With this improvement, the intersection is expected to operate at LOS D during the PM peak hour under Cumulative With Project conditions.

(b) Cumulative With Project Freeway Segment Capacity Analysis. Study segments of U.S. 101, I-280, and SR 84 were reviewed during the AM and PM peak hours to determine if a significant amount of project traffic would be added to these segments under Cumulative Conditions. The results of the AM peak hour analysis are presented in Table 7.22; the results of the PM peak hour capacity analysis are presented in Table 7.23.

Table 7.22
FREEWAY SEGMENT LEVELS OF SERVICE--CUMULATIVE WITH PROJECT CONDITIONS, AM PEAK HOUR

Freeway Segment	Lane Type	Capacity	Cumulative Volume	Cumulative V/C	Project Trips	Project V/C	Percent Impact	Significant Impact
U.S. 101								
SB SR 92 to Whipple	Mixed Flow	9,200	9,452	1.03	74	1.04	0.80%	NO
SB Whipple to Woodside	Mixed Flow	6,900	8,510	1.23	145	1.25	2.10%	**YES**
	HOV	1,800	1,155	0.64	24	0.66	1.33%	NO
SB Woodside to Marsh	Mixed Flow	6,900	8,445	1.22	126	1.24	1.83%	**YES**
	HOV	1,800	1,242	0.69	20	0.70	1.11%	NO
NB Marsh to Woodside	Mixed Flow	6,900	5,674	0.82	123	0.84	1.78%	NO
	HOV	1,800	973	0.54	25	0.55	1.39%	NO
NB Woodside to Whipple	Mixed Flow	6,900	6,123	0.89	129	0.91	1.87%	NO
	HOV	1,800	1,214	0.67	27	0.69	1.50%	NO
NB Whipple to SR 92	Mixed Flow	9,200	7,666	0.83	113	0.85	1.23%	NO
I-280								
SB SR 92 to Edgewood	Mixed Flow	9,200	8,464	0.92	33	0.92	0.36%	NO
SB Edgewood to Farm Hill	Mixed Flow	9,200	8,934	0.97	13	0.97	0.14%	NO
SB Farm Hill to Woodside	Mixed Flow	9,200	9,050	0.98	12	0.99	0.13%	NO
SB Woodside to County Line	Mixed Flow	9,200	5,898	0.64	55	0.65	0.60%	NO
NB County Line to Woodside	Mixed Flow	9,200	3,363	0.37	55	0.37	0.60%	NO
NB Woodside to Farm Hill	Mixed Flow	9,200	4,659	0.51	9	0.51	0.10%	NO
NB Farm Hill to Edgewood	Mixed Flow	9,200	3,241	0.35	9	0.35	0.10%	NO
NB Edgewood to SR 92	Mixed Flow	9,200	4,763	0.52	46	0.52	0.50%	NO
SR 84								
EB Willow to University	Mixed Flow	3,300	711	0.22	36	0.23	1.09%	NO
EB University to County Line	Mixed Flow	3,300	1,750	0.53	36	0.54	1.09%	NO
WB County Line to University	Mixed Flow	3,300	5,145	1.56	57	1.66	1.73%	**YES**
WB University	Mixed Flow	3,300	3,669	1.11	57	1.13	1.73%	**YES**

to Willow Road

SOURCE: Fehr & Peers Associates and Caltrans.

Notes:

(1) Typical design capacity for mixed-flow lanes on freeway segments is assumed to be 2,300 vehicles per lane per hour (vplph). Auxiliary lanes are not included in the analysis. See text [subsection 7.1.6(d)] for description of how traffic in the auxiliary lanes has been addressed.

(2) Typical design capacity for HOV lanes on freeway segments is assumed to be 1,800 vplph.

(3) Typical design capacity for mixed-flow lanes on SR 84 (an expressway) is assumed to be 1,100 vplph, consistent with design capacities identified in the *San Mateo CMP Monitoring Report*.

(4) Cumulative volumes obtained by applying a 0.5 percent growth factor to existing count data provided by Caltrans plus traffic from approved and pending projects.

(5) V/C = volume-to-capacity ratio.

(6) Percent Impact was determined by dividing the number of project trips by the freeway segment's capacity.

(7) NB = northbound; SB = southbound; EB = eastbound; WB = westbound.

Table 7.23
FREEWAY SEGMENT LEVELS OF SERVICE--CUMULATIVE WITH PROJECT CONDITIONS, PM PEAK HOUR

Freeway Segment	Lane Type	Capacity	Cumulative Volume	Cumulative V/C	Project Trips	Project V/C	Percent Impact	Significant Impact
U.S. 101								
SB SR 92 to Whipple	Mixed Flow	9,200	8,502	0.92	102	0.94	1.11%	**YES**
SB Whipple to Woodside	Mixed Flow	6,900	8,474	1.23	127	1.25	1.84%	**YES**
	HOV	1,800	1,181	0.66	21	0.67	1.17%	NO
SB Woodside to Marsh	Mixed Flow	6,900	6,988	1.01	149	1.03	2.16%	**YES**
	HOV	1,800	1,027	0.57	24	0.58	1.33%	NO
NB Marsh to Woodside	Mixed Flow	6,900	4,377	0.63	113	0.65	1.64%	NO
	HOV	1,800	699	0.39	22	0.40	1.22%	NO
NB Woodside to Whipple	Mixed Flow	6,900	4,740	0.69	161	0.71	2.33%	NO
	HOV	1,800	1,114	0.62	32	0.64	1.78%	NO
NB Whipple to SR 92	Mixed Flow	9,200	6,863	0.75	99	0.76	1.08%	NO
I-280								
SB SR 92 to Edgewood	Mixed Flow	9,200	4,733	0.51	42	0.52	0.46%	NO
SB Edgewood to Farm Hill	Mixed Flow	9,200	4,616	0.50	14	0.50	0.15%	NO
SB Farm Hill to Woodside	Mixed Flow	9,200	5,339	0.58	13	0.58	0.14%	NO
SB Woodside to County Line	Mixed Flow	9,200	4,346	0.47	63	0.48	0.68%	NO
NB County Line to Woodside	Mixed Flow	9,200	6,192	0.67	52	0.68	0.57%	NO
NB Woodside to Farm Hill	Mixed Flow	9,200	8,510	0.93	9	0.93	0.10%	NO
NB Farm Hill to Edgewood	Mixed Flow	9,200	7,961	0.87	9	0.87	0.10%	NO
NB Edgewood to SR 92	Mixed Flow	9,200	8,183	0.89	42	0.89	0.46%	NO
SR 84								
EB Willow to University	Mixed Flow	3,300	3,905	1.18	58	1.20	1.76%	**YES**
EB University to County Line	Mixed Flow	3,300	5,353	1.62	58	1.64	1.76%	**YES**
WB County Line to University	Mixed Flow	3,300	1,620	0.49	36	0.50	1.09%	NO
WB University	Mixed Flow	3,300	1,409	0.43	36	0.44	1.09%	NO

to Willow Road

SOURCE: Fehr & Peers Associates and Caltrans.

Notes:

(1) Typical design capacity for mixed-flow lanes on freeway segments is assumed to be 2,300 vehicles per lane per hour (vplph). Auxiliary lanes are not included in the analysis. See text [subsection 7.1.6(d)] for description of how traffic in the auxiliary lanes has been addressed.

(2) Typical design capacity for HOV lanes on freeway segments is assumed to be 1,800 vplph.

(3) Typical design capacity for mixed-flow lanes on SR 84 (an expressway) is assumed to be 1,100 vplph, consistent with design capacities identified in the *San Mateo CMP Monitoring Report*.

(4) Cumulative volumes obtained by applying a 0.5 percent growth factor to existing count data provided by Caltrans plus traffic from approved and pending projects.

(5) V/C = volume-to-capacity ratio.

(6) Percent Impact was determined by dividing the number of project trips by the freeway segment's capacity.

(7) NB = northbound; SB = southbound; EB = eastbound; WB = westbound.

Impact 7-22: Cumulative (2020) With and Without Project Impact on U.S. 101 Southbound Mixed-Flow Lanes, Whipple Avenue to Woodside Road Segment--AM Peak Hour. Capacity analysis results indicate that the volume-to-capacity (V/C) ratio for southbound mixed-flow (i.e., non-HOV) lanes along this U.S. 101 freeway segment under Cumulative Conditions would be greater than 1.0 (with and without the proposed project). The project is expected to increase traffic volumes by more than one percent of the freeway segment's capacity during the AM peak hour. This effect would represent a ***significant cumulative impact*** [see criteria (a)(1) and (c) in subsection 7.3.1, "Significance Criteria," above].

Mitigation 7-22. The project shall minimize impacts on this freeway segment by implementing a transportation demand management (TDM) program, as described under *Mitigation 7-2*.

Full mitigation of this impact (i.e., to a less-than-significant level) would require the addition of another southbound through lane to the freeway segment. The addition of another through travel lane, with a design capacity of 2,300 vehicles per lane per hour, would more than offset the addition of project traffic (the project is expected to add 145 trips to this freeway segment). However, freeway widening is generally considered to be beyond the scope of a single development project--i.e., an infeasible mitigation requirement. Therefore, the effect of project traffic on this freeway segment is considered to represent a ***significant unavoidable impact***.

Impact 7-23: Cumulative (2020) With and Without Project Impact on U.S. 101 Southbound Mixed-Flow Lanes, Woodside Road to Marsh Road Segment--AM Peak Hour. Capacity analysis results indicate that the V/C ratio for southbound mixed-flow (i.e., non HOV) lanes along this U.S. 101 freeway segment under Cumulative Conditions would be greater than 1.0 (with and without the proposed project). The project is expected to increase traffic volumes by more than one percent of the freeway segment's capacity during the AM peak hour. This effect would represent a ***significant cumulative impact*** [see criteria (a)(1) and (c) in subsection 7.3.1, "Significance Criteria," above].

Mitigation 7-23. The project shall minimize impacts on this freeway segment by implementing a transportation demand management (TDM) program, as described under *Mitigation 7-2*.

Full mitigation of this impact (i.e., to a less-than-significant level) would require the addition of another southbound through lane to the freeway segment. The addition

of another through travel lane, with a capacity of 2,300 vehicles per lane per hour, would more than offset the addition of project traffic (the project is expected to add 126 trips to this freeway segment). However, freeway widening is generally considered to be beyond the scope of a single development project--i.e., an infeasible mitigation requirement. Therefore, the effect of project traffic on this freeway segment is considered to represent a ***significant unavoidable impact***.

Impact 7-24: Cumulative (2020) With and Without Project Impact on Westbound SR 84, County Line to University Avenue and University Avenue to Willow Road Segments--AM Peak Hour. Capacity analysis results indicate that the V/C ratio for these two SR 84 segments under Cumulative Conditions would be greater than 1.0 (with and without the proposed project). The project is expected to increase traffic volumes by more than one percent of the segments' capacity during the AM peak hour. This effect would represent a ***significant cumulative impact*** [see criteria (a)(1) and (c) in subsection 7.3.1, "Significance Criteria," above].

Mitigation 7-24. The project shall minimize impacts on these two SR 84 segments by implementing a transportation demand management (TDM) program, as described under *Mitigation 7-2*.

Full mitigation of this impact (i.e., to a less-than-significant level) would require the addition of another westbound through lane to both segments. The addition of another through travel lane, with a design capacity of 1,100 vehicles per lane per hour, would more than offset the addition of project traffic (the project is expected to add 57 trips to the segments). However, freeway widening is generally considered to be beyond the scope of a single development project--i.e., an infeasible mitigation requirement. Therefore, the effect of project traffic on these segments is considered to represent a ***significant unavoidable impact***.

Impact 7-25: Cumulative (2020) With Project Impact on U.S. 101 Southbound Mixed-Flow Lanes, SR 92 to Whipple Road Segment--PM Peak Hour. Capacity analysis results indicate that the V/C ratio for southbound mixed-flow (i.e., non-HOV) lanes along this freeway segment under Cumulative Conditions would be less than 1.0 without the proposed project. The project is expected to increase the V/C ratio to more than 1.0. The project is also expected to increase traffic volumes by more than one percent of the freeway segment's capacity during the PM peak hour. This effect would represent a ***significant cumulative impact*** [see criteria (a)(1) and (c) in subsection 7.3.1, "Significance Criteria," above].

Mitigation 7-25. The project shall minimize impacts on this freeway segment by implementing a transportation demand management (TDM) program, as described under *Mitigation 7-2*.

Full mitigation of this impact (i.e., to a less-than-significant level) would require the addition of another southbound through lane to the freeway segment. The addition of another through travel lane, with a capacity of 2,300 vehicles per lane per hour, would more than offset the addition of project traffic (the project is expected to add 102 trips to this freeway segment). However, freeway widening is generally considered to be beyond the scope of a single development project--i.e., an infeasible mitigation requirement. Therefore, the effect of project traffic on this freeway segment is considered to represent a ***significant unavoidable impact***.

Impact 7-26: Cumulative (2020) With and Without Project Impact on U.S. 101 Southbound Mixed-Flow Lanes, Whipple Avenue to Woodside Road and Woodside Road to Marsh Road Segments--PM Peak Hour. Capacity analysis results indicate that the V/C ratio for southbound mixed-flow (i.e., non-HOV) lanes along these two freeway segments under Cumulative Conditions would be greater than 1.0 (with and without the proposed project). The project is expected to increase volumes by more than one percent of the segments' capacity during the PM peak hour. This effect would represent a ***significant cumulative impact*** [see criteria (a)(1) and (c) in subsection 7.3.1, "Significance Criteria," above].

Mitigation 7-26. The project shall minimize impacts on these freeway segments by implementing a transportation demand management (TDM) program, as described under *Mitigation 7-2*.

Full mitigation of this impact (i.e., to a less-than-significant level) would require the addition of another southbound through lane to each freeway segment. The addition of another through travel lane, with a capacity of 2,300 vehicles per lane per hour, would more than offset the addition of project traffic (the project is expected to add 127 trips and 149 trips to each freeway segment). However, freeway widening is generally considered to be beyond the scope of a single development project--i.e., an infeasible mitigation requirement. Therefore, the effect of project traffic on this freeway segment is considered to represent a ***significant unavoidable impact***.

Impact 7-27: Cumulative (2020) With and Without Project Impact on

Eastbound SR 84, Willow Road to University Avenue and University Avenue to the County Line Segments--PM Peak Hour. Capacity results analysis indicate that the V/C ratio for these two SR 84 segments under Cumulative Conditions would be greater than 1.0 (with and without the proposed project). The project is expected to increase traffic volumes by more than one percent of the segments' capacity during the PM peak hour. This effect would represent a ***significant cumulative impact*** [see criteria (a)(1) and (c) in subsection 7.3.1, "Significance Criteria," above].

Mitigation 7-27. The project shall minimize impacts on these SR 84 segments by implementing a transportation demand management (TDM) program, as described under *Mitigation 7-2*.

Full mitigation of this impact (i.e., to less-than-significant level) would require the addition of another eastbound through lane to both segments. The addition of another through travel lane, with a capacity of 1,100 vehicles per lane per hour, would more than offset the addition of project traffic (the project is expected to add 58 trips to the segments). However, freeway widening is generally considered to be beyond the scope of a single development project--i.e., an infeasible mitigation requirement. Therefore, the effect of project traffic on these segments is considered to represent a ***significant unavoidable impact***.

(c) Cumulative With Project Freeway Ramp Capacity Analysis. Operations of the study freeway ramps were reviewed by conducting a volume-to-capacity analysis under Cumulative With Project conditions. The purpose of this analysis was to determine whether the freeway ramps would have sufficient capacity to serve demand under Cumulative With Project conditions.

Project trips were added to volumes that were estimated under Cumulative Without Project conditions. The results of the volume-to-capacity analysis, which are presented in Table 7.24, indicate that all of the study ramps are expected to have a V/C ratio less than 1.0 during the AM and PM peak hours under Cumulative Conditions with or without the project--i.e. there would be sufficient capacity to serve expected demand.

Table 7.24
FREEWAY RAMP CAPACITY ANALYSIS--CUMULATIVE WITH PROJECT

U.S. 101 Freeway Ramp	Capacity	AM Peak Hour Volume	AM Peak Hour Project Trips	AM Peak Hour V/C	PM Peak Hour Volume	PM Peak Hour Project Trips	PM Peak Hour V/C
SB U.S. 101 Off-Ramp/ Veterans Boulevard	3,800	2,327	74	0.61	2,014	102	0.53
SB U.S. 101 On-Ramp/ Westbound Whipple Avenue	1,900	301	169	0.16	361	193	0.19
NB U.S. 101 Off-Ramp/ Whipple Avenue	2,000	1,008	156	0.50	1,375	148	0.69
NB U.S. 101 On-Ramp/ Westbound Whipple Avenue	1,900	236	113	0.12	295	99	0.16
SB U.S. 101 On-Ramp/ Woodside Road	2,000	1,527	12	0.76	1,618	13	0.81
NB U.S. 101 Off-Ramp/ Woodside Road (Seaport Blvd.)	1,900	1,685	16	0.89	1,741	17	0.92

SOURCE: Fehr & Peers Associates and Caltrans.

Notes:

(1) Capacity based on information presented in Chapter 25 of the *2000 Highway Capacity Manual* and the posted recommended travel speed on the ramp.

(2) Volumes obtained by applying a 0.5 percent per year growth factor to existing count data provided by Caltrans *plus* traffic from approved and pending projects *plus* trips generated by the proposed project.

(3) V/C = volume-to-capacity ratio.

(4) NB = northbound; SB = southbound.

FOR THE MARINA SHORES VILLAGE PROJECT

Excerpted from *Redwood City Bayfront Transportation Options Study, Executive Summary*, prepared by Fukuji Planning & Design and Kimley-Horn & Associates, February 2003.

The entire current version of this study is available for review at theCity of Redwood City Community Development Services Department,City Hall, 1017 Middlefield Road.

APPENDIX: TDM MEASURES RECOMMENDED