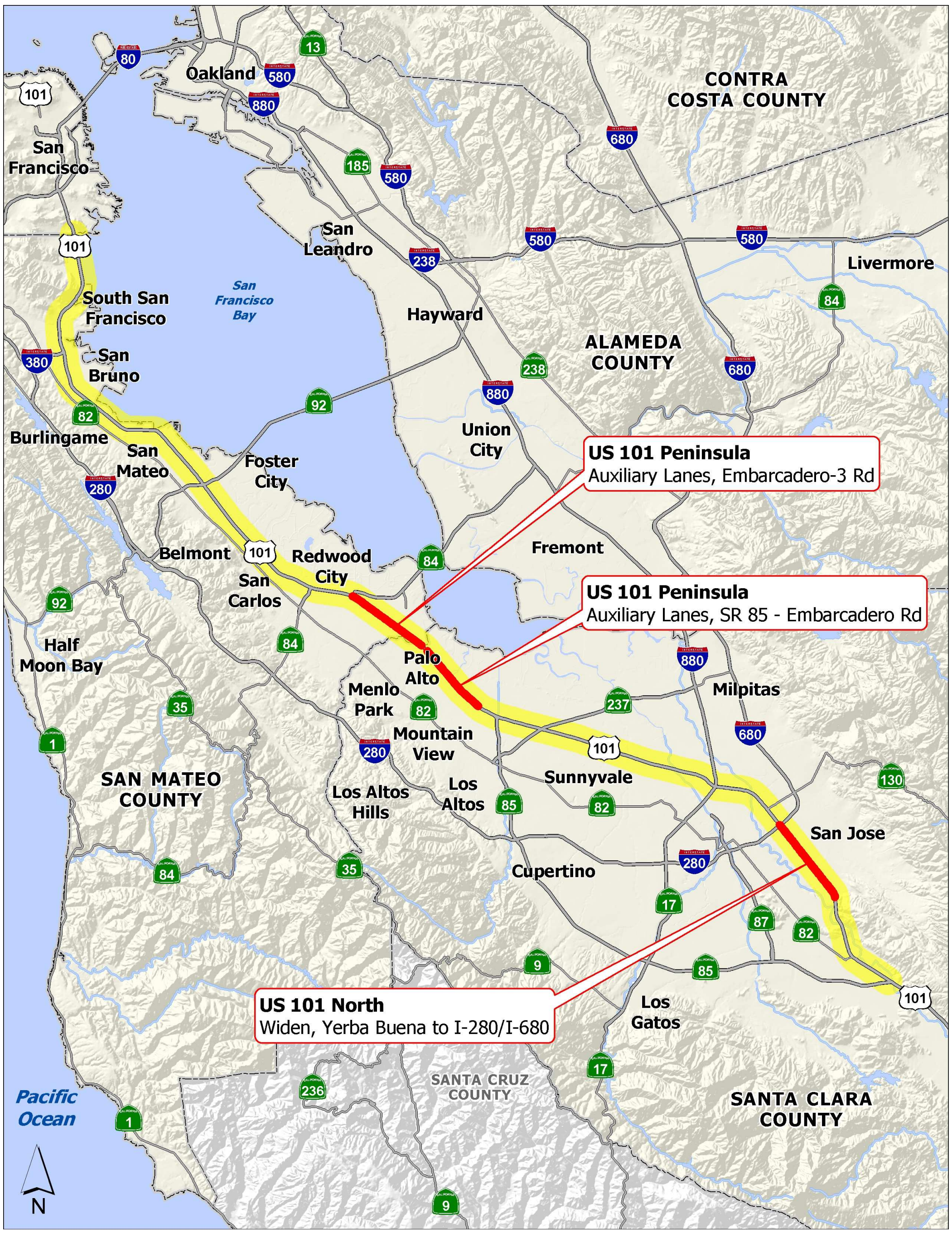
C O R R I D O R   S Y S T E M
M A N A G E M E N T P L A N

US 101 SOUTH

CSMP Corridor Limits

The US 101 South Corridor in the San Francisco Bay Area is a south/north route beginning at the SR 85 South Interchange in San Jose in Santa Clara County traversing northward and terminating at the San Francisco-San Mateo County line.



US 101 South
Corridor System Management Plan

APPROVED BY:

12/21/10

BIJAN SARTIPI
District 4 Director
California Department
of Transportation

Date

I accept this Corridor System Management Plan for the US 101 South Corridor as a document informing the regional transportation planning process.

ACCEPTED BY:

12/17/10

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US 101 South
Corridor System Management Plan

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STAKEHOLDER ACKNOWLEDGMENT

District 4 wishes to acknowledge the time and contributions of stakeholder groups and partner agencies. Current and continuing Corridor System Management Plan (CSMP) development is dependent upon the close participation and cooperation of all major stakeholders. This CSMP represents a cooperative commitment to develop a corridor management vision for the US 101 South Corridor. The strategies evaluated have the potential to impact the local arterial system and the regional and local planning agencies that have the corridor within their jurisdiction. These representatives participated in the Working Group and provided essential information, advice and feedback for the preparation of this CSMP. The stakeholders/partners include:

- Metropolitan Transportation Commission
- City/County Association of Governments of San Mateo
- San Mateo County Transportation Authority
- Santa Clara Valley Transportation Authority
- San Francisco County Transportation Authority

A website – **www.corridormobility.org –** has been created to support the development of the CSMPs and to provide stakeholders and the public with more information and an opportunity to provide input and review documents.

Disclaimer: The information, opinions, commitments, policies and strategies detailed in this document are those of Caltrans District 4 and do not necessarily represent the information, opinions, commitments, policies and strategies of partner agencies or other organizations identified in this document.

DEDICATION

To Patricia "Pat" Weston
(1951 - 2009)

Caltrans District 4 Planners dedicate this Corridor System Management Plan (CSMP) to the memory of Pat Weston, Chief, Caltrans Office of Advance System Planning, whose seemingly limitless energy and passion for transportation system planning in California has been an inspiration to countless transportation planners and engineers within Caltrans and its partner agencies. Pat's efforts elevated the importance of corridor-based system planning, performance measurement for system monitoring, and the blending of long-range planning with near-term operational strategies. This has resulted in stronger planning partnerships with Traffic Operations in Caltrans and led directly to the requirement to conduct comprehensive corridor planning through CSMP documents. This is but one of a long list of major achievements in Pat's lengthy Caltrans career. She generously shared her knowledge, wisdom and guidance with us over the years. She will be sorely missed as a planner, mentor and friend.

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US 101 SOUTH CSMP INTRODUCTION

A **Corridor System Management Plan** (CSMP) is a transportation planning document that examines the mobility of an urban freeway facility in a comprehensive manner based on performance assessments. A CSMP addresses the following questions:

- How is the freeway corridor performing?
- Why is it performing that way?
- What strategies and improvements can best address any problems?

CSMPs are based on the need to efficiently and effectively use all transportation modes and facilities in congested corridors so as to maximize mobility, improve safety, and reduce delay costs. While CSMPs primarily address freeways, there are important ties to local parallel roadways, transit services, and other modes of transportation pertinent to corridor mobility. These alternate modes will be more fully studied in future updates to the CSMPs.

Strategies for improvement to a transportation facility can include both operational and long-range capital improvements. Strategies are typically phased, and take into account transit usage, the arterial network, and connections to State Highways. Each CSMP presents an analysis of existing and future traffic conditions and proposes traffic management strategies and capital improvements to maintain and enhance mobility within the corridor. The corridor strategy is based on the integration of system planning and system management.

On March 15, 2007, the California Transportation Commission (CTC) adopted Resolution CMIA-P-0607-02 on Corridor System Management Plans. In this Resolution the CTC directed Caltrans and regional agencies to develop system strategies to "preserve the mobility gains of urban corridor capacity improvements over time that will be described in CSMPs, which may include the installation of traffic detection equipment, the use of ramp metering, operational improvements, and other traffic management elements as appropriate."

CSMPs are required for all Corridor Mobility Improvement Account (CMIA) and Highway 99 Bond projects. Both of these programs were established following the passage of Proposition 1B (The Highway Safety, Traffic Reduction, Air Quality, and Port Security Bond Act) in the November 2006 election. The CTC has since adopted guidelines and a program of projects for funding. The CMIA projects present a unique opportunity for the State's transportation system in providing congestion relief, enhanced mobility, improved safety, and stronger connectivity to benefit the traveling public.

US 101 SOUTH CSMP

EXECUTIVE SUMMARY

This Corridor System Management Plan (CSMP) represents a cooperative commitment to develop a corridor management vision for the US 101 South Corridor. The CSMP development process was a joint effort of the California Department of Transportation (Caltrans), the Metropolitan Transportation Commission (MTC), City/County Association of Governments of San Mateo County (C/CAG), San Mateo County Transportation Authority (SMCTA), and the Santa Clara Valley Transportation Authority (VTA). Although not within the defined boundaries of this CSMP, the San Francisco County Transportation Authority (SFCTA) was invited to participate. The goal is to propose strategies to achieve the highest mobility benefits to travelers along the US 101 South CSMP Corridor.

Corridor Study Limits

The study limits of the US 101 South CSMP extend for approximately 58 miles from the San Mateo/San Francisco county border near US 101/Candlestick Park to the US 101/SR 85 interchange junction in north Santa Clara County. These limits were set based on the geographic locations of the projects that received funding from the Corridor Mobility Improvement Account. The projects that received CMIA funds along the US 101 South corridor are:

- **Widen Highway – Yerba Buena to I-280/I-680 Interchange**
- **Auxiliary Lanes – SR 85 to Embarcadero Rd**
- **Auxiliary Lanes – Marsh Rd to Embarcadero Rd**

Corridor Management Strategies / Recommended Corridor Improvement Projects

Though this first generation CSMP has a strong focus on the freeway facility, addressing congestion requires not one strategy, but a multi-pronged approach that includes retaining and where possible recapturing freeway capacity, maintaining the freeway infrastructure, and investing in and encouraging the use of alternate modes, such as transit. ITS is becoming more and more important in managing the freeway in specific and transportation needs in general, and due to its cost-effectiveness ITS receives a top position among the strategies. Further recommended strategies range from advancing ramp-metering throughout the corridor, with adding auxiliary lanes where feasible, to creating HOV lanes that can be converted to express lanes. The combination of strategies promises to increase freeway efficiency and throughput and may avoid shifting congestion from one location to another that may be the case when just a single strategy is followed. Implementing a Smart Corridor Plan for having surface streets carry traffic away from the freeway during emergencies would benefit freeway operations. The variety of strategies available for addressing localized problems include land use decisions, specific transit mode improvements, demand management, freeway and surface street management, freeway and street improvements, and freeway/street operations.

ITS improvements have been the subject of several extensive studies for the 101 corridor and many of those recommendations are currently being implemented. It is recommended to continue implementation of the Caltrans District 4 ITS deployment approach.

Within this CSMP, a wide range of projects is also included of proposed improvements to specific parts of the freeway. Yet financial restrictions will most certainly guide the process; not all projects can be implemented. The lists of projects are provided to show both the intent for future improvements and make the wider range of options clear that are available within this corridor. The recommendation is to pick those projects that will provide a reasonable return on investment, along with delay reductions;

in particular, the various auxiliary lanes additions plus the highway widening funded through the Corridor Mobility Improvement Account (CMIA) program will then generate a good return on investment.

The San Mateo US 101 FPI Technical Corridor Analysis and the Santa Clara County VTP2035 are the main sources for the recommended strategies of this CSMP, although several other reports, General Plans, and sources such as Go California and SMART Corridor were used to shape the recommended strategies. Whereas the recommendations for the Santa Clara County portion of the US 101 South CSMP follow VTP2035, the FPI report provides both a short-term and long-term scenario for San Mateo County.

The full benefit of the CMIA funded projects and the CSMP recommended projects will not be realized without ongoing cooperative system management in the US 101 South corridor. The CSMP development process has brought the major transportation planning agencies in the corridor (Caltrans, MTC, VTA, C/CAG, SMCTA and SFCTA) together to develop this set of recommendations. The next step should be a continuous improvement process to work together on corridor management, further incorporation of other modes, and enhanced collaboration to develop the Sustainable Community Strategy (SCS) and Priority Development Areas (PDA) in the corridor. This will provide the foundation for the next generation CSMP and future Regional Transportation Plan (RTP) and FPI updates.

Figure ES1. US 101 Congestion.

The FPI report assumes a baseline list of improvements shown in Table ES1.

Project Name	Description
San Mateo County[1]	
Auxiliary Lanes – Marsh to Embarcadero	Widen NB and SB auxiliary lane segments from 4 lanes to 5
Auxiliary Lanes and Ramp Metering 3rd to Millbrae	Widen NB and SB auxiliary lane segments from 4 lanes to 5 and install ramp metering equipment. Ramp meters will be turned on as widening construction is completed.
Smart Corridor	Emergency re-route of traffic on US 101 via ITS and static signs on freeway, intersections, and parallel arterial streets. Includes emergency traffic signal timing plans and emergency response coordination via Caltrans freeway management center in Oakland.
US 101 Ramp Metering	Caltrans' SHOPP project for Ramp Metering (Rte 92 to SF County line)
SR 92 Widening – US 101 to I-280	Widen from 2 lanes to 3 lanes in each direction (To be implemented by 2030)
Santa Clara County	
US 101 HOV to HOT Conversion	Convert HOV lanes on US 101 in Santa Clara County to HOT lanes.
HOV Lane Extension – SR 85 to Oregon	Extend existing dual NB HOV lanes near the US 101/SR-85 interchange to a point south of the US 101/Oregon Expressway interchange.
Northbound Aux Lane – Rengstorff to San Antonio	Widen NB from 4 lanes to 5 (auxiliary lane)
Auxiliary Lane – San Antonio to Oregon	Widen NB and SB auxiliary from 4 lanes to 5
Extend NB Lane – Shoreline to Rengstorff	Remove lane drop on NB US 101 near Shoreline interchange by carrying lane through to Rengstorff interchange loop off-ramp.
US 101/Rengstorff Interchange Improvements	Modify Rengstorff on-ramp to NB US 101 to become 2 mixed flow lanes from its existing single lane configuration.
US 101/San Antonio Interchange Improvements	Modify San Antonio NB loop and diagonal on-ramps into one on-ramp to US 101.
US 101/Old Middlefield Interchange Improvements	Modify Old Middlefield on-ramp to SB US 101 from 1 HOV plus 1 mixed flow lane to 2 mixed flow lanes.
US 101/Oregon Interchange Improvements	Modify Oregon on-ramp to SB US 101 to become 2 mixed flow lanes and 1 HOV lane from its existing configuration of 1 mixed flow lane and 1 HOV lane.
US 101 Ramp Metering	Implement ramp meters for all US 101 on-ramps in Santa Clara County.

Table ES1. Baseline Improvement Projects 2015.
Source: *San Mateo US 101 Freeway Corridor Technical Analysis* – Exhibit 63.

[1] It is not certain when ramp metering will be activated between 3rd Avenue and Millbrae Avenue. Construction of US 101 Aux lanes between San Bruno Avenue and San Francisco County line is still under consideration. The US 101/Broadway I/C reconstruction with ramp metering is a likely project by 2015.

Next, the FPI Technical Analysis for San Mateo US 101 identified the following capacity improvements, grouped around specific locations:

ID	Location	Dir	Improvement	Limits	Cost
1	Willow Road	NB	Widen from 3 to 4 lanes	Off to Loop On	$ 1,400,000*
		NB	Widen aux from 4 to 5 lanes	Loop On to Loop Off	$ 16,100,000
		NB	Widen from 3 to 4 lanes	Loop Off to On	$ 1,300,000
		SB	Widen from 3 to 4 lanes	Loop Off to Diagonal On	$ 2,700,000
				Subtotal	$ 21,500,000
2	Third Avenue	NB	Widen from 4 to 5 lanes	Off to On	$ 14,500,000*
		SB	Widen from 4 to 5 lanes	Off to On	$ 16,500,000*
				Subtotal	$ 31,000,000
3	University Avenue	NB	Widen from 4 to 5 lanes	Lane Add to Off	$ 2,900,000
		NB	Widen from 3 to 4 lanes	Off to On	$ 15,900,000
		SB	Widen from 4 to 5 lanes	Lane Add to Univ. Off	$ 2,100,000
		SB	Widen from 3 to 4 lanes	Univ. Off to Univ. On	$ 18,500,000*
				Subtotal	$ 39,400,000
4	Hillsdale Boulevard[2]	NB	Widen from 4 to 5 lanes	Loop On to Diag. On	$ 2,800,000*
		NB	Widen aux from 5 to 6 lanes	Diagonal On to SR 92 Off	$ 900,000*
		NB	Widen aux from 5 to 6 lanes	Mar Diag. On to Hills Off	$ 17,800,000
		NB	Widen from 4 to 5 lanes	Hills Off to Hills Loop On	$ 6,600,000*
		SB	Widen from 4 to 5 lanes	Loop On to Diag. On	$ 2,200,000*
		SB	Widen from 4 to 5 lanes	Off to Loop On	$ 9,600,000*
		SB	Widen aux from 5 to 6 lanes	Hills On to Marine Off	$ 13,800,000*
		SB	Widen from 4 to 5 lanes	Marine Off to Marine On	$ 3,000,000*
				Subtotal	$ 56,700,000
5	Dore/Peninsula Avenue	NB	Widen from 4 to 5 lanes	Pen Off to Pen On	$ 7,500,000
6	Broadway/Anza Boulevard	NB	Widen from 4 to 5 lanes	Broadway Off to Broadway On	$ 11,000,000
7	Marsh Road	NB	Widen from 3 to 4 lanes	Off to Loop On	$ 3,200,000
		NB	Widen 3 to 4 lanes/extend downstream aux lane	Loop On to Diag. On	$ 3,200,000*
				Subtotal	$ 6,400,000
8	Aux Lanes – San Bruno to San Mateo/SF County Line	SB	Widen from 4 to 5 lanes	Mainline to Beatty Off	$ 6,700,000
		SB	Widen from 4 to 5 lanes	Beaty on to Sierra Point Off	$ 11,900,000
		SB	Widen from 4 to 5 lanes	Sierra On/Bayshore Off	$ 21,500,000
				Subtotal	$ 40,100,000
9	Miller Ave /S Airport Blvd.	SB	Widen from 4 to 5 lanes	Miller Off to S Airport Off	$ 15,300,000
		SB	Widen from 4 to 5 lanes	S Airport Off to S Airport On	$ 8,800,000
				Subtotal	$ 24,100,000
10	Bayshore/Oyster Point	SB	Widen from 4 to 5 lanes	Bayshore On to Oyster Pt On	$ 5,700,000*
11	SFO/Millbrae Avenue	NB	Widen from 4 to 5 lanes	Millbrae Off to Lane Add	$ 32,200,000
		NB	Widen from 5 to 6 lanes	Lane Add to SFO (2) Off	$ 2,300,000
		NB	Widen from 4 to 5 lanes	SFO (2) Off to Millbrae On	$ 3,300,000
				Subtotal	$ 37,800,000
12	Ralston/Marine Parkway	NB	Widen from 4 to 5 lanes	Loop On to Diagonal On	$ 1,600,000
13	Woodside	NB	Widen 3 to 4 mixed flow lanes	Off to On	$ 12,400,000*
14	SR 92	NB	Widen from 4 to 5 lanes	EB Loop On to WB On	$ 6,700,000*
15	Peninsula Avenue/Anza	NB	Widen from 5 to 6 lanes	Peninsula On to Anza Off	$ 24,000,000
16	Broadway/Millbrae	NB	Widen from 5 to 6 lanes	Broadway On to Millbrae Off	$ 8,000,000
17	Whipple Avenue	SB	Widen from 3 to 4 lanes	Lane Drop to Loop On	$ 3,400,000*
				Total	$337,300,000

Table ES2. Possible Project Groupings of Short Term Capacity Improvements.
Source: *San Mateo US 101 Freeway Corridor Technical Analysis* – Exhibit 113.
* indicates at least one design exception is assumed to be required.

[2] Auxiliary lane widening in northbound US 101 between Hillsdale Blvd on-ramp and SR 92 off-ramp would cause a difficult weave across two lanes of traffic for the Hillsdale diagonal on-ramp vehicles heading to NB US 101. Two lanes would drop at the SR 92 off-ramp, a distance of only 1200 feet from the Hillsdale diagonal on-ramp.

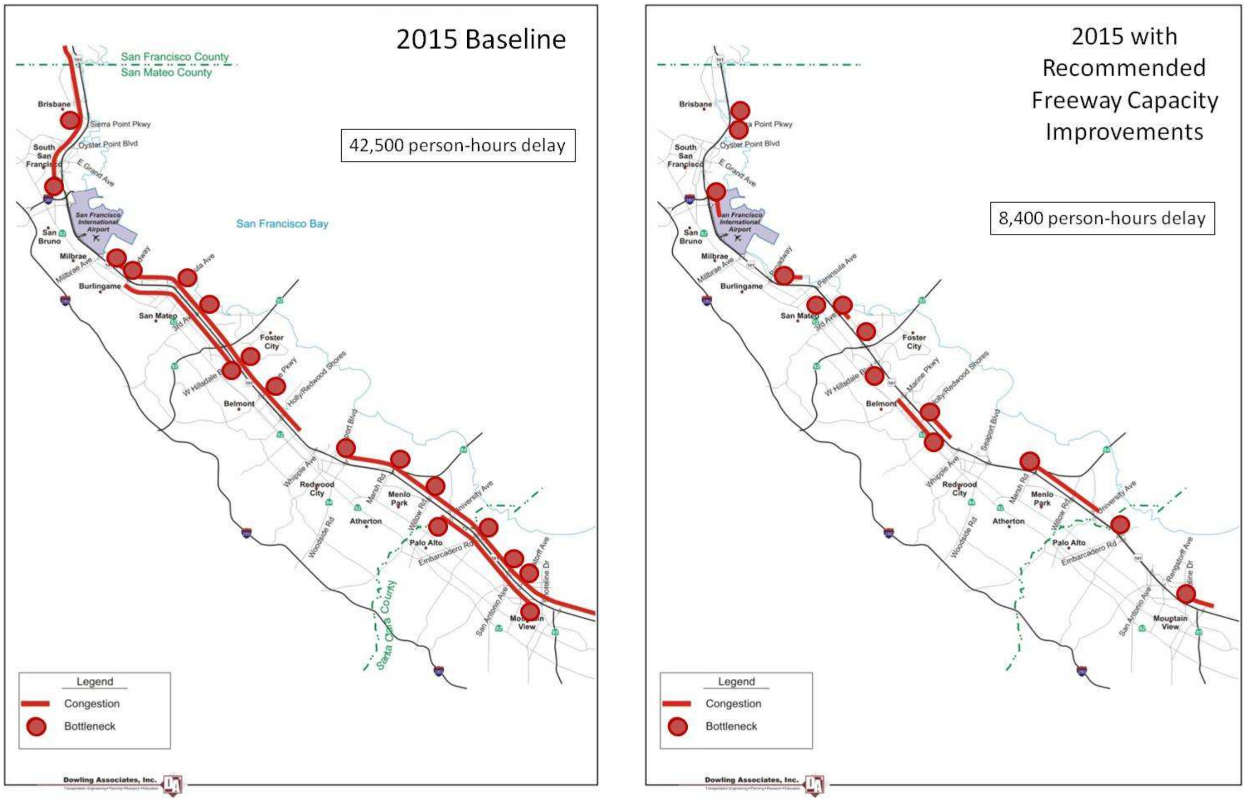

Figure ES2. 2015 Baseline and 2015 Improved Congestion Locations.
Source: *San Mateo US 101 Freeway Corridor Technical Analysis* – Exhibit 111.

Figure ES2 above provides a graphical comparison of freeway bottleneck locations and queues for 2015 baseline versus 2015 with recommended improvements to demonstrate the benefits of the proposed improvements.

Table ES3 below shows a summary of US 101 freeway mobility performance measures for both the 2015 and the 2030 improvement scenarios.

For the 2015 scenarios:

- The peak period demand as measured in terms of vehicle-miles traveled (VMT) is forecasted to increase by 39% in 2015 over current 2009 levels.
- The peak period vehicle-hours traveled (VHT) is forecasted to increase by 44% in 2015 over existing 2009 conditions.
- The peak period vehicle-hours of delay (VHD) is forecasted to increase by 57% in 2015 over existing 2009 conditions.
- The peak period mean speed would drop by 4% from current conditions to around 44 mph.

Freeway Mobility Performance Measures	2009 (Existing)	2015 (Base)	2015 Recommendations MOE	(Diff)	2030 (Base)	2030 Low Level Recommendations MOE	(Diff)
Vehicle Miles of Travel (VMT)	3,502,424	4,870,341	5,035,396	3%	4,947,243	5,349,363	8%
Vehicle Hours of Travel (VHT)	75,990	109,637	84,336	-23%	137,029	92,578	-32%
Vehicle Hours of Delay (VHD)	22,107	34,709	6,868	-80%	60,917	10,280	-83%
Mean Vehicle Speed (mph)	46	44	60	34%	36	58	60%
Person Miles of Travel (PMT)	4,284,762	5,967,535	6,168,686	3%	6,062,655	6,552,775	8%
Person Hours of Travel (PHT)	92,897	134,276	103,321	-23%	167,703	113,374	-32%
Person Hours of Delay (PHD)	26,978	42,468	8,418	-80%	74,431	12,562	-83%
Unreliability - Buffer Index	205%	206%	199%	-4%	212%	199%	-6%
Safety - Annual Collisions	690	831	552	-34%	1,022	645	-37%
Productivity - Lost Lane-Miles	428	591	350	-41%	847	494	-42%

Table ES3. Summary of US 101 Freeway Performance.
Source: *San Mateo US 101 Freeway Corridor Technical Analysis* – Exhibit 118 (FREQ Model Results).

2030 Low Level Improvement Scenario
The baseline analysis for the 2030 scenario for San Mateo was completed assuming no additional projects are built beyond the baseline improvements in 2015. The 2030 with no further improvements scenario is not considered a realistic future scenario. It was created solely for the purpose of providing a neutral benchmark for comparing long-term improvement strategies, and both future years are presented in the following table. The impacts of these improvements on mobility were assessed using the FREQ software.

In addition to the baseline improvements, ramp metering was assumed to be implemented and operational for all ramps except freeway-to-freeway ramps in 2030 (such as I-380 to US 101, and SR 92 to US 101).

For the 2030 scenarios:

- The peak period demand as measured in terms of vehicle-miles traveled (VMT) is forecasted to increase by 41% over existing 2009 levels.
- The peak period vehicle-hours traveled (VHT) is forecasted to increase by 80% over existing 2009 conditions.
- The peak period vehicle-hours of delay (VHD) is forecasted to increase by 176% over existing 2009 conditions.
- The average speed of peak period travel would drop by 22% from current conditions to approximately 36 mph.

Approximately $145 million of freeway capacity improvements (over and above the short term improvements) are recommended for implementation in the long term (2030). These recommended low level long term improvements would add approximately 23.4 lane miles of mainline capacity to US 101, which is 7.0 lane-miles of mainline capacity to US 101; over and above the 16.4 lane miles of added mainline capacity improvements included in the short term improvement recommendations.

The recommended 2030 low level freeway capacity improvements are designed to maintain all congestion within the current 4-hour AM peak and the current 5-hour PM peak. These improvements would ensure that the peak period capacity of US 101 is sufficient to serve the forecasted 2030 demand (assuming no shifts in demand from other congested streets and freeways occur to take advantage of the improved conditions on US 101).

A scenario of high level improvements for 2030 was investigated, but did not receive recommendation because of high cost and right-of-way requirements.

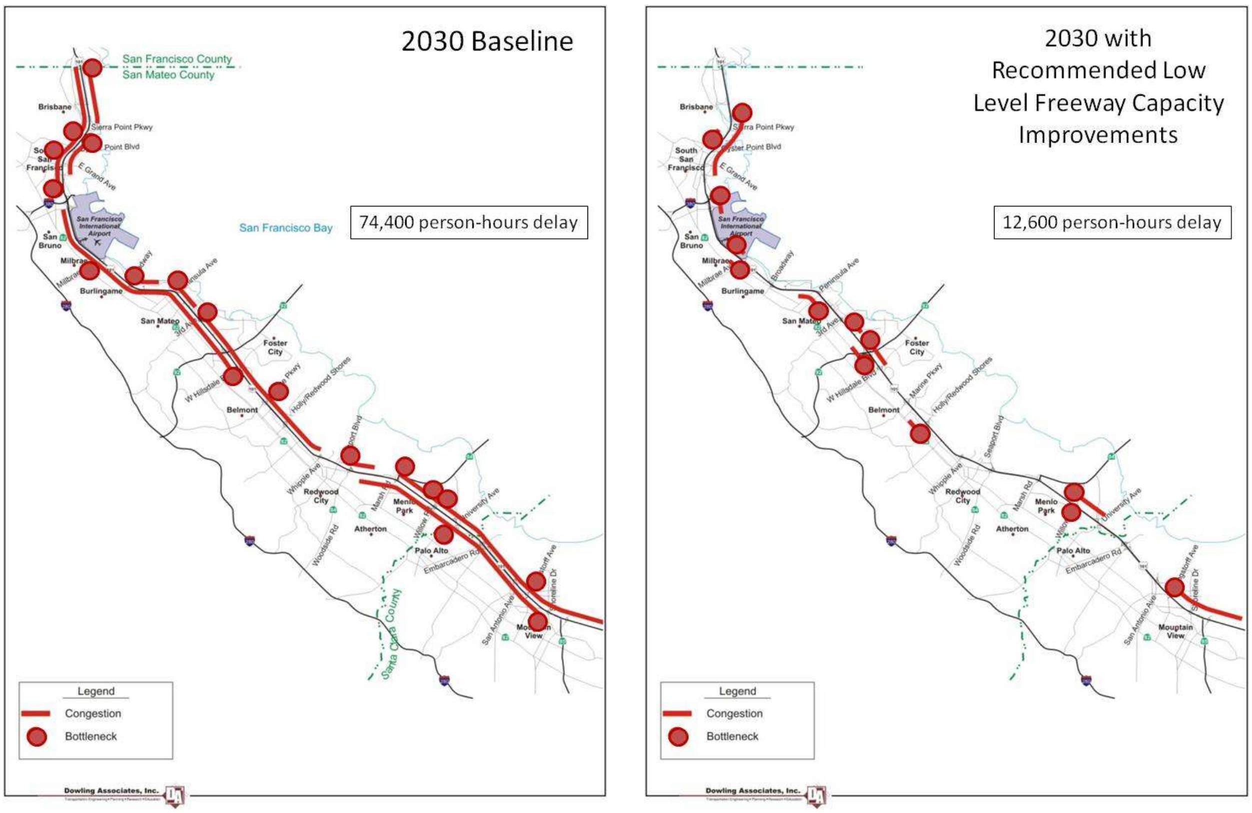

Figure ES3. US 101 Freeway Bottleneck and Queues Comparison for 2030.
Source: San Mateo US 101 Freeway Corridor Technical Analysis – Exhibit 116

Figure ES3 provides a graphical comparison of freeway bottleneck locations and queues for the 2030 baseline versus 2030 with recommended low level improvements, to demonstrate the benefits of the proposed improvements. Table ES4 shows the specific long term low level improvements for 2030; the included 2015 baseline improvement projects are highlighted with a mark in the table to the right.

Subsection		Long Term Low Level Improvement	Length (ft)	In 2015 short term
NB	**Northbound**			
3	Shoreline off-ramp to SR-85 on-ramp	Widen from 3 to 4 mixed flow lanes	1380	
4	SR-85 on-ramp to SR-85 HOV on-ramp	Widen from 4 to 5 mixed flow lanes	2085	
5	SR-85 HOV on-ramp to Middlefield off	Widen from 4 to 5 mixed flow lanes	995	
8	Shoreline on-ramp to Rengstorff off	Widen to provide auxiliary lane (4 to 5 mixed flow lanes)	2150	
10	Rengstorff loop off-ramp to on-ramp	Widen from 3 to 4 mixed flow lanes	654	
11	Rengstorff on-ramp to San Antonio off	Widen to provide auxiliary lane (4 to 5 mixed flow lanes)	1706	
12	San Antonio off-ramp to loop on-ramp	Widen from 3 to 4 mixed flow lanes	1412	
13	San Antonio loop on to diag. on-ramp	Widen from 3 to 4 mixed flow lanes	280	
14	San Antonio on-ramp	Widen on-ramp to provide additional storage for metering	N/A	
14	San Antonio on-ramp to Oregon off	Widen to provide auxiliary lane (4 to 5 mixed flow lanes)	6787	
15	Oregon off-ramp to Embarcadero on	Widen from 3 to 4 mixed flow lanes	3496	
16	Embarcadero on-ramp to Lane Add	Widen from 4 to 5 mixed flow lanes	3337	
17	Lane add to University off-ramp	Widen from 4 to 5 mixed flow lanes	1491	√
18	University off-ramp to on-ramp	Widen from 3 to 4 mixed flow lanes	2265	√
19	University on-ramp to Willow off-ramp	Widen to provide auxiliary lane (4 to 5 mixed flow lanes)	3099	
20	Willow off-ramp to loop on-ramp	Widen from 3 to 4 mixed flow lanes	545	√
21	Willow loop on-ramp to loop off-ramp	Widen to provide auxiliary lane (4 to 5 mixed flow lanes)	381	√
22	Willow loop off-ramp to on-ramp	Widen from 3 to 4 mixed flow lanes	499	√
24	Marsh off-ramp to loop on-ramp	Widen from 3 to 4 mixed flow lanes	966	
25	Marsh loop on-ramp to diagonal on	Extend existing downstream auxiliary lane between Marsh and Woodside (3 to 4 lanes)	981	√
26	Marsh on-ramp to Woodside off-ramp	Widen to provide auxiliary lane (4 to 5 mixed flow lanes)	6954	√
27	Woodside off-ramp to on-ramp	Widen from 3 to 4 mixed flow lanes	2981	√
28	Woodside on-ramp to Whipple off-ramp	Widen to provide auxiliary lane (4 to 5 mixed flow lanes)	4092	
31	Whipple on-ramp to Holly off-ramp	Widen to extend HOV lane to Holly	3634	
33	Holly off-ramp to on-ramp	Widen from 4 to 5 lanes	3123	
34	Holly on-ramp to Marine off-ramp	Widen to provide auxiliary lane (5 to 6 lanes)	3254	
35	Marine off-ramp to loop on-ramp	Widen from 4 to 5 lanes	1453	
36	Marine loop on-ramp to diagonal on-ramp	Extend existing downstream auxiliary lane between Marine and Hillsdale (4 to 5 lanes)	755	√
37	Marine diagonal on-ramp to Hillsdale off-ramp	Widen to provide auxiliary lane (5 to 6 lanes)	6200	√
38	Hillsdale off-ramp to loop on-ramp	Widen from 4 to 5 lanes	1631	√
39	Hillsdale loop on-ramp to diagonal on	Extend existing downstream auxiliary lane between Hillsdale and SR 92 (4 to 5 lanes)	1740	√
40	Hillsdale diagonal on-ramp to SR 92 off	Widen to provide auxiliary lane (5 to 6 lanes)	877	√
42	SR 92 loop on-ramp to diagonal on	Widen from 4 to 5 lanes	1002	√
47	3rd off-ramp to on-ramp	Widen from 4 to 5 lanes	1909	√
48	3rd on-ramp to Dore off-ramp	Widen to provide auxiliary lane (5 to 6 lanes)	2013	
50	Peninsula off-ramp to on-ramp	Widen from 4 to 5 lanes	1214	√

Table ES4.a. Long Term Low Level Improvements.
Source: *San Mateo US 101 Freeway Corridor Technical Analysis* – Exhibit 94.
Note: Check marks indicate improvements also recommended in short term 2015 scenario.

Subsection		Long Term Low Level Improvement	Length (ft)	In 2015 short term
NB	**Northbound**			
51	Peninsula on-ramp to Anza off-ramp	Widen to provide auxiliary lane (5 to 6 lanes)	4617	√
53	Anza on-ramp to Broadway off-ramp	Widen to provide auxiliary lane (5 to 6 lanes)	1165	
54	Broadway off-ramp to on-ramp	Widen from 4 to 5 lanes	2591	√
55	Broadway on-ramp to Millbrae off-ramp	Widen to provide auxiliary lane (5 to 6 lanes)	4450	√
56	Millbrae off-ramp to SFO lane add	Widen from 4 to 5 lanes	2158	√
57	Lane add to SFO off-ramp	Widen from 5 to 6 lanes	1399	√
58	SFO off-ramp to Millbrae on-ramp	Widen from 4 to 5 lanes	2206	
61	San Bruno off-ramp to I-380 off-ramp	Extend existing upstream auxiliary lane between SFO and San Bruno (5 to 6 lanes)	1055	
62	I-380 off-ramp to North Access off-ramp	Widen from 4 to 5 lanes	1948	
72	Bayshore off-ramp to Sierra off-ramp	Extend existing upstream auxiliary lane between Oyster and Bayshore (4 to 5 lanes)	973	
77	Harney on-ramp to study limit	Widen between Harney on-ramp to suitable termination point north of the San Mateo/San Francisco County Line (4 to 5 lanes)	2333	
SB	**Southbound**			
2	Study limit to Beatty off-ramp	Widen to provide auxiliary lane (4 to 5 lanes)	2400	√
4	Beatty on-ramp to Sierra Point off-ramp	Widen to provide auxiliary lane (4 to 5 lanes)	4243	√
6	Sierra Point on-ramp to Bayshore off	Widen to provide auxiliary lane (4 to 5 lanes)	7671	√
6	Sierra Point on-ramp	Widen on-ramp to provide additional storage and higher metering rate	N/A	
9	Bayshore on-ramp to Oyster Point on-ramp	Extend existing downstream auxiliary lane between Oyster and Miller (4 to 5 lanes)	1802	√
11	Miller off-ramp to S. Airport off-ramp	Extend existing upstream auxiliary lane between Oyster and Miller (4 to 5 lanes)	2580	√
12	S. Airport off-ramp to on-ramp	Widen from 4 to 5 lanes	2085	√
13	S. Airport on-ramp	Widen on-ramp to provide additional storage	N/A	
30	3rd off-ramp to on-ramp	Widen from 4 to 5 lanes	1795	√
35	Fashion Is. on-ramp to SR 92 EB on	Widen from 4 to 5 lanes	731	
36	SR 92 EB on-ramp to Hillsdale off-ramp	Widen to provide auxiliary lane (5 to 6 lanes)	947	
37	Hillsdale off-ramp to on-ramp	Widen from 4 to 5 lanes	2115	√
38	Hillsdale loop on-ramp to diagonal on-ramp	Extend existing downstream auxiliary lane between Hillsdale and Marine (4 to 5 lanes)	1155	√
39	Hillsdale on-ramp to Marine off-ramp	Widen to provide auxiliary lane (5 to 6 lanes)	5302	√
40	Marine off-ramp to on-ramp	Widen from 4 to 5 lanes	4270	√
41	Marine on-ramp to Holly off-ramp	Widen to provide auxiliary lane (5 to 6 lanes)	1676	
44	Brittan on-ramp to Whipple off-ramp	Widen to provide auxiliary lane (5 to 6 lanes)	2414	
46	Lane drop to Whipple on-ramp	Widen from 3 to 4 lanes	1429	√
56	Willow loop off-ramp to loop on-ramp	Widen from 3 to 4 lanes	431	√
58	Lane add to University off-ramp	Widen from 4 to 5 lanes	421	√
59	University off-ramp to on-ramp	Widen from 3 to 4 lanes	2083	√
67	Rengstorff on-ramp to Middlefield on	Extend existing downstream auxiliary lane between Middlefield and Shoreline (3 to 4 lanes)	3169	
68	Middlefield on-ramp	Widen on-ramp to provide additional storage for metering	N/A	
68	Middlefield to Shoreline	Widen to provide auxiliary lane (4 to 5 lanes)	688	

Table ES4.b. Long Term Low Level Improvements (continued).
Source: *San Mateo US 101 Freeway Corridor Technical Analysis* – Exhibit 94.

VTP 2035 Recommended Strategies

The Santa Clara Valley Transportation Plan 2035 builds on recommendations already found in the 2005 VTP 2030, and include the need to study county gateways and vital highway corridors, obtain greater utility from existing highway infrastructure, and develop an express lane network. As a result, part of the work in developing VTP 2035 Highway Projects involved an evaluation of the county gateways and key corridors within the county to increase efficiency, identify, define and prioritize improvements that relieve congestion, alleviate bottlenecks and enhance safety.

The VTP 2035 Highways project list includes 16 projects designed to improve the efficiency of the existing highway system, including auxiliary lane and ramp metering projects. VTA has promoted ramp metering in the Bay Area, and Santa Clara County is currently home to close to half of all ramp meters in the nine-county Bay Area region.

On US 101 the VTP Highways list includes:

H33: US 101 Auxiliary Lanes: SR 85 to Embarcadero Road.
H55: US 101 Southbound Improvements: San Antonio Road to Charleston Road/Rengstorff Avenue
H49: US 101 Southbound Auxiliary Lane improvement: Ellis Street to SR 237
H65: SR 237/Mathilda Avenue and US 101/Mathilda Avenue Interchange Improvements
H67: SR 237 Westbound to Northbound US 101 Ramp Improvements
H27: US 101 Southbound Auxiliary Lane: Great America Parkway to Lawrence Expressway
H23: US 101/Montague Expy./San Tomas Expy./Mission College Boulevard Interchange improvements
H24: US 101/Trimble Road/De La Cruz Boulevard/Central Expressway Interchange improvements
H48: US 101/Zanker Road/Skyport Drive/Fourth Street Interchange improvements
H28: US 101/Old Oakland Road Interchange improvements
H32: US 101 Southbound Auxiliary lane widening: I-880 to McKee
H26: US 101/Mabury Road/Taylor Street Interchange improvements
H29: US 101 Southbound widening: Story Road to Yerba Buena Road
H30: US 101/Capitol Expressway I/C improvements (includes new NB on-ramp from Yerba Buena Rd.)
H47: US 101/Hellyer Avenue Interchange improvements
H25: US 101/Blossom Hill Road Interchange improvements

Areas for Further Study

The US 101 South CSMP Working Group has identified several areas for future study:

- Developing an ITS plan for the corridor
- Additional focusing on Transit and non-highway improvements
- Identifying proactive Demand Management Strategies and related performance measurements
- Accident Response Improvement
- SR 92/US 101 Interchange Area Study
- Peninsula Avenue Interchange
- Candlestick/Harney Way Interchange
- Functioning of Santa Clara Expressways in relation to US 101
- Supporting statewide and regional programs such as GO California and the Sustainable Communities Strategy
- Supporting the Smart Corridor implementation, and
- Encouraging increased utilization of I-280
- Including the US 101 freeway in San Francisco County and Santa Clara County South of SR 85

The stakeholders of the US 101 South CSMP corridor are committed to continue working together on these mutual goals for corridor system management.

SECTION 1: CSMP DEVELOPMENT PROCESS

1.1 District CSMPs

Corridor System Management Plans (CSMPs) are transportation planning documents that recommend strategies for the safe and efficient mobility of people and goods within congested transportation corridors. A CSMP presents an analysis of a corridor's existing and future traffic conditions and proposes traffic management strategies and capital improvements to maintain and enhance mobility within that corridor.

This generation of CSMPs focuses on highway mobility within the context of some of the State's most congested urban corridors. While a CSMP describes arterials and other travel modes in the corridor, the focus of recommended strategies is on maximizing use of the existing highway infrastructure through coordinated application of system management technologies such as ramp metering, coordinated traffic signals, changeable message signs for traveler information, and incident management. The CSMP describes current land use, transit, bicycle/pedestrian facilities, and the FOCUS regional blueprint Priority Development and Conservation Areas. These are provided as a backdrop for understanding how the highway corridor functions.

CSMPs have been developed throughout the State for corridors where funding is allocated from the Corridor Mobility Improvement Account (CMIA) and Highway 99 Bond Programs. Both were created by the passage of the Highway Safety, Traffic Reduction, Air Quality, and Port Security Bond Act of 2006, approved by California voters as Proposition 1B in November 2006. The CSMPs carry out the vision of the CTC to develop agency partnerships in operating congested freeways, arterials, transit, and rail, with the intent to eventually develop CSMPs for all urban freeway corridors. Caltrans District 4 and the Regional Planning Agency, the Metropolitan Transportation Commission (MTC), are committed to working together to develop CSMPs for the Bay Area. MTC's related Freeway Performance Initiative (FPI) of corridor studies involves using public funds efficiently by the sharing of technical analysis and working group expertise.

For the San Francisco Bay Area (Caltrans District 4), ten CSMPs have been developed:

US 101 North (MRN/SON)
US 101 South (SM/SCL)
I-880 (ALA/SCL)
I-80 West (ALA/CC)
I-80 East (SOL)
I-580 East (ALA)
SR 4 (CC)
SR 24 (ALA/CC)
SR 12 (NAP/SOL)
SR 84 (SM/ALA)

The limits of the CSMPs were determined by identifying the key travel corridor in which the CMIA-funded projects were located. In close to all cases, the limits were used from District 4's Transportation Corridor Concept Reports (TCCRs) – which are located at http://www.dot.ca.gov/dist4/systemplanning/ctsp_documents.htm – as well as corridor limits used in the FPI. Figure 1.1.1 depicts the location of the corridors for the required CSMPs in District 4.

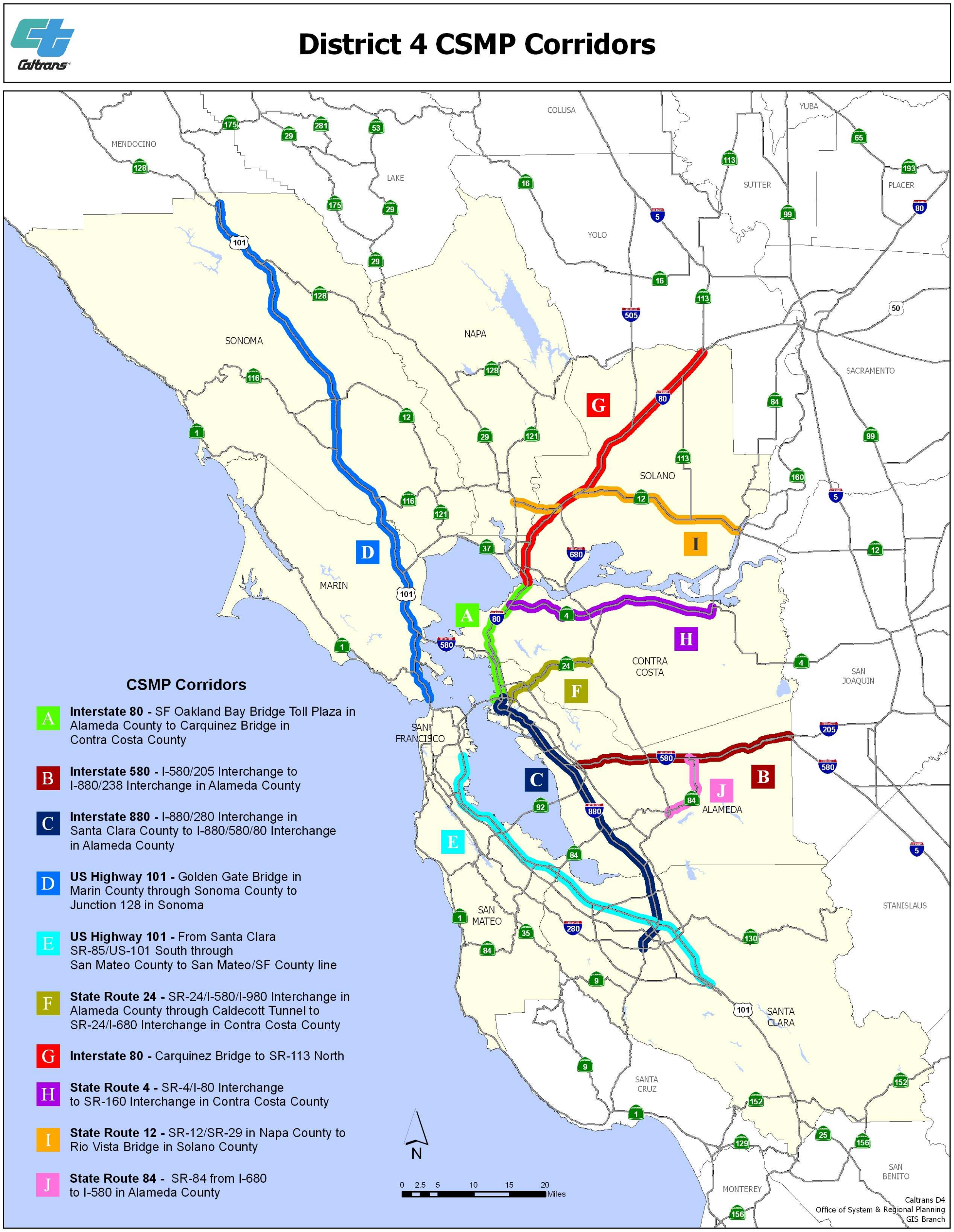

Figure 1.1.1. District 4 CSMP Corridors.

District CSMPs reflects information and projections from MTC's current Regional Transportation Plan (RTP) *Change in Motion, Transportation 2035 Plan*, adopted April 2009. The CSMP recommends strategies that could potentially become projects through the regional transportation project development and prioritization process. In the San Francisco Bay Area, the CSMP process is coordinated with MTC's Freeway Performance Initiative (FPI), a commitment to invest $1.6 billion over 25 years to deploy technology to manage congestion on the freeway system. The FPI provides the technical freeway performance analyses for the respective District 4 CSMPs.

The general goals of the CSMP are in the areas of:

- Mobility – reducing delay within the defined corridor
- Reliability – reducing the variations in travel time
- Safety – reducing accident and injury rates
- Productivity – increasing vehicle throughput by reducing lost lane mile capacity
- System Preservation – minimizing the amount of roadway requiring major maintenance
- Demand Management – providing strategies to reduce unnecessary demand on the system.

The CSMP "transportation network" can include all State Highways, major local arterials, intercity and regional rail service, regional transit services, and regional bicycle facilities. A team of corridor stakeholder agencies assists Caltrans in defining the corridor and its elements, and developing a viable and coordinated corridor plan.

Corridor performance assessment begins with utilizing existing travel data. With an adequate traffic detection system in place, a corridor performance assessment serves to evaluate the existing system management practices and any possible causes of performance problems. Modeling is then used to forecast future travel conditions along the corridor.

To predict the impacts of a variety of operational strategies and investment scenarios, traffic analysis methods are used, allowing the corridor team to evaluate and recommend operational strategies, capital improvement projects, and opportunities to integrate transportation technology. A documented CSMP is then prepared for review and acceptance by the applicable stakeholder agencies.

1.2 US 101 South CSMP

CSMPs have been developed throughout the State for corridors where funding is allocated from the Corridor Mobility Improvement Account. The CSMPs carry out the vision of the CTC to recommend strategies for the safe and efficient mobility of people and goods within congested transportation corridors. The recommendations and projects presented in this report were compiled from other completed transportation planning studies within the study limits and should not be viewed as an independent programming document.

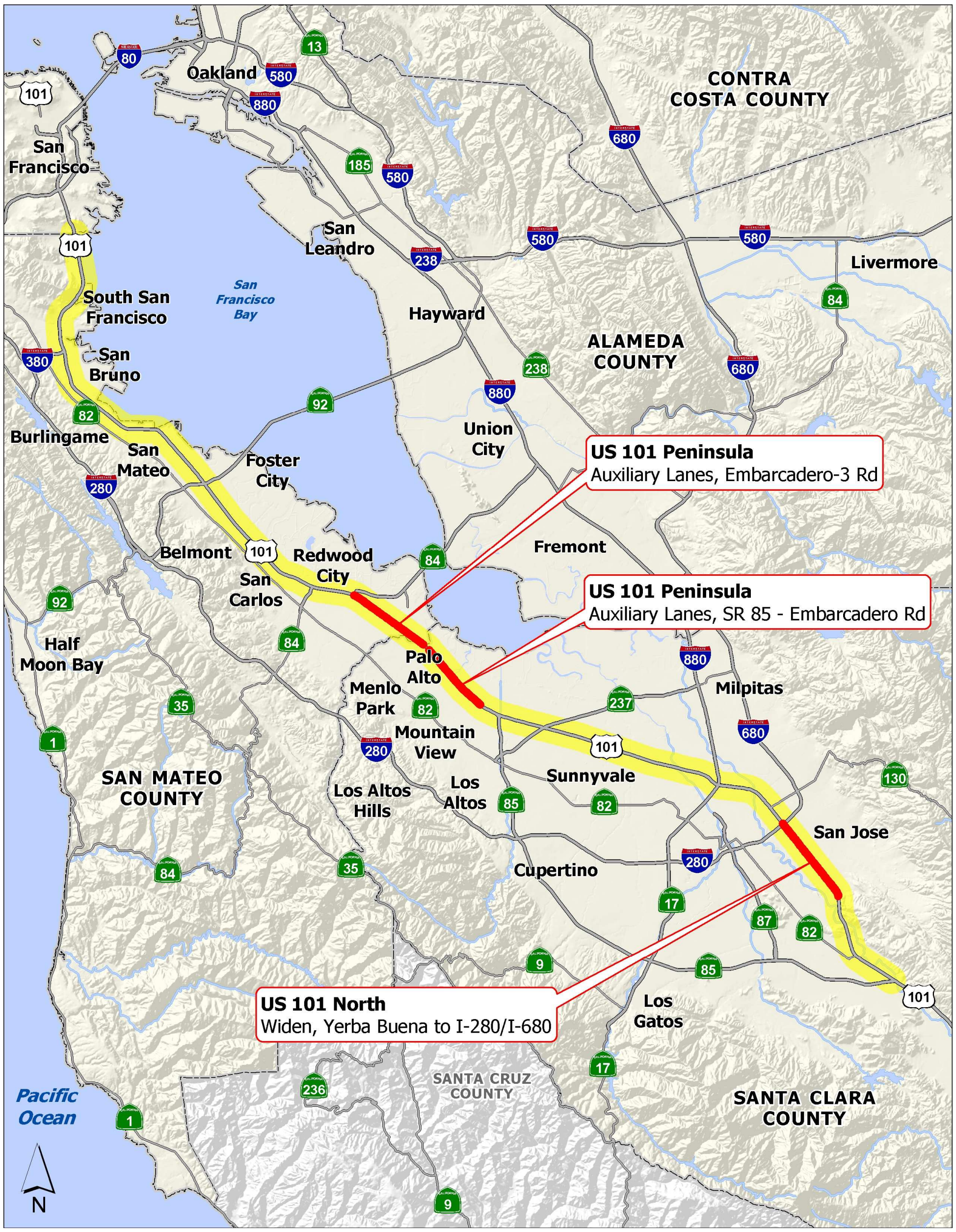

Figure 1.2.1. US 101 South CSMP with its three CMIA projects.

The limits of the US 101 South CSMP were determined in collaboration with MTC by identifying the key travel corridor in which CMIA-funded projects are located. The CMIA-funded projects are:

1) US 101 Auxiliary Lanes Project – Addition of auxiliary lanes in between interchanges from US 101/SR 84 (Marsh Road in Redwood City) to US 101/Embarcadero Road in Palo Alto;

2) US 101 Auxiliary Lanes Project – Continuation of adding auxiliary lanes and extension of carpool lanes from US 101 /Embarcadero Road to US 101/SR 85 in Mountain View;

3) US 101 Improvements Project – Addition of lanes from Tully Road to Capitol Expressway and reconfiguration of the US 101/Tully Road interchange in San Jose.

The former project will ease current congestion, as well as the projected increase in peak travel demand; also, it will improve operations and overall traffic flow. The latter projects serve to alleviate existing and projected congestion, as well as upgrade the facility to meet safety and operational requirements. The major benefits of the CMIA projects are shown in Table 1.2.1.

CMIA Projects – Major Project Benefits		
	Vehicle Hours of Delay Saved	Peak Hour Person-Minutes Saved
I-280/680 to Yerba Buena Road	3,530 Hours	281,078 Minutes
SR 85 to Embarcadero Road	2,949 Hours	234,829 Minutes
Marsh Road to Embarcadero Road	13,752 Hours	1,095,164 Minutes

Table 1.2.1. CMIA Benefits US 101 South CSMP.

The US 101 South CSMP reviews State Highways, local parallel roadways, the bicycle and pedestrian network, and regional transit services that may impact overall mobility.

The US 101 South CSMP examines existing bottlenecks in the US 101 corridor. While the CSMP may identify gaps in the bicycle and pedestrian network as well as in regional transit services, and it may discuss opportunities for the future, the main thrust of the recommended strategies is to enable better system management of the highway. More emphasis will be given to a corridor-wide multimodal approach in future, second-generation CSMP efforts. The CSMP makes some recommendations for increasing other modal services that can help the highway operate more efficiently.

The US 101 South CSMP focuses on highway mobility within the context of one of the State's most congested urban corridors. While the CSMP describes the arterials and other modes in the corridor and has as overall goal of improved demand management, the focus of the provided strategy recommendations is on maximizing throughput on the existing State Highway System infrastructure through coordinated application of system management technologies such as ramp metering, coordinated traffic signals, and changeable message signs for traveler information and incident management.
It describes the current land use, transit, bicycle/pedestrian facilities, and the FOCUS regional blueprint Priority Development and Conservation Areas. These are provided as a backdrop for understanding how the highway corridor currently operates and how it will operate in the future, given land use and growth changes and known projects that will be added to the transportation system.

Planning and Policy Framework

Since passage of Proposition 1B in 2006, Caltrans has implemented the CSMP process statewide for all corridors with projects funded by the Corridor Mobility Improvement Act program. The California Transportation Commission (CTC) requires that all corridors with a CMIA-funded project have a CSMP that is developed with regional and local partners. The CSMP recommends how the congestion-reduction gains from the CMIA projects will be maintained with supporting system management strategies. The

CTC has also provided guidance in the 2008 RTP Guidelines that state that CSMPs are an important input to the development of the Regional Transportation Plans (RTP 2035).

Since Caltrans and the regions launched this first cycle of corridor system management planning in 2007, the statewide planning policy context has evolved significantly. The State's AB 32 policy on reducing greenhouse gas emissions has moved into implementation with passage of SB 375, landmark legislation requiring the regions to meet state-designated greenhouse gas emissions reduction targets. Sustainable Communities Strategy (SCS), an important aspect of SB375, is being developed to promote better land-use patterns that help reduce greenhouse gas emissions.

Methodology

A corridor performance assessment and technical analysis of the US 101 South CSMP Corridor was conducted as a partnership between Caltrans and MTC. The Freeway Performance Initiative (FPI) assessed the performance of the route segment between the San Francisco-San Mateo county line and US 101/SR 85 North. A performance evaluation evaluates the current highway performance along the corridor and determines causes of performance problems.

Simulation modeling was used to forecast future travel conditions mainly on the freeway. Traffic analysis methods were used to identify bottlenecks and to predict the impacts of a variety of operational strategies and investment scenarios. The FREQ simulation model was limited to four intersections at each freeway interchange and could not feasibly model the diversion effects outside of their impacts on the surface streets in the immediate vicinity of each interchange. It could not feasibly model the diversion effects outside of their impacts on the surface streets in the immediate vicinity of each interchange; even so, it did provide useful information

For the Santa Clara County portion of the CSMP a variety of planning references are used: the FPI (where applicable), the CMIA projects, and the US 101 North Implementation Plan. In addition, VTA's Valley Transportation Plan (VTP 2035) and the Regional Transportation Plan (RTP 2035) are used to provide information on the Santa Clara segment, while Caltrans' 2008 Highway Congestion Monitoring Program HiComp) and Performance Measurement System (PeMS) are utilized to provide additional information about congestion in the entire corridor.

1.3 Consistency with Other Plans

California Strategic Growth Plan

CSMPs support the efforts of the State's 2006 Strategic Growth Plan (SGP), which calls for an infrastructure improvement program that includes a major transportation component (*Go California*). The SGP is based on the premise that investments in mobility throughout the system will yield significant improvements in congestion relief. A system management pyramid developed for the SGP outlines strategies to achieve the outcome of reduced congestion. As shown below, System Monitoring and Evaluation are the basic foundation upon which the other strategies are built. At the top of the pyramid, System Expansion and Completion will provide the desired mobility benefits to the extent that investments and implementation of the strategies below it establish a solid platform.

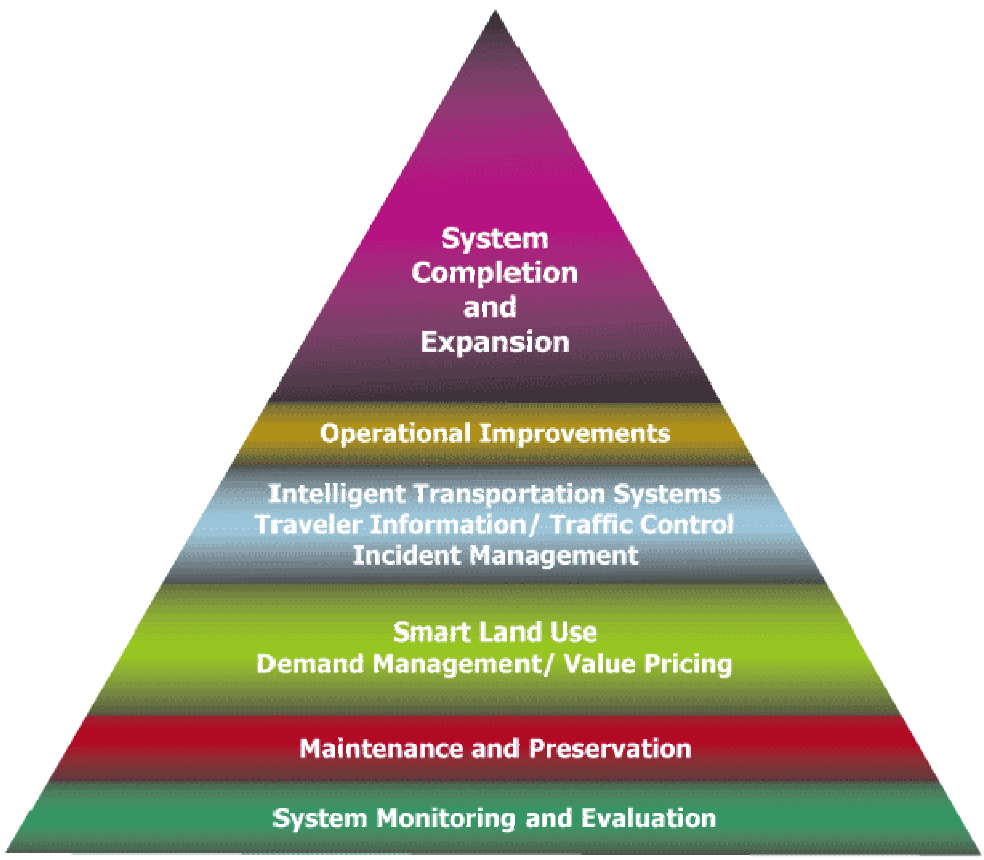

Figure 1.3.1. Strategic Growth Plan Pyramid.

Regional Blueprint Planning Program

The Regional Blueprint Planning Program supports the smart growth efforts of the Strategic Growth Plan by promoting smart land use choices at the regional and local levels. The Regional Blueprint Planning Program was a State grant program that launched Metropolitan Planning Organizations (MPOs) and Regional Transportation Planning Agencies (RTPAs) comprehensive scenario planning efforts around the State. Using consensus-building and a broad-based visioning approach, the Regional Blueprint effort examined future land use and its potential impact on the region's transportation networks, housing supply, jobs/housing balance, and resource management.

The Blueprint planning effort in the San Francisco Bay Area is titled FOCUS, a program lead by the Association of Bay Area Governments (ABAG) and the Metropolitan Transportation Commission (MTC) with support from the Bay Area Air Quality Management District (BAAQMD), the Bay Conservation and Development Commission (BCDC), and Caltrans. These agencies and local governments have participated in the Regional Blueprint Planning Program since the program's inception in 2005.

Bay Area Sustainable Communities Strategy

The Bay Area's Sustainable Communities Strategy aims to reduce greenhouse gas emissions through more efficient land use patterns, reduce vehicle travel, support transit, bicycle and pedestrian mode choices, and improve supply and affordability of housing to reduce commuting into the region.
The agencies and local governments participating in the Regional Blueprint Program are now moving towards developing a Sustainable Community Strategy (SCS). The SCS can be seen as the land use allocation in the Regional Transportation Plan, starting with the next update of the RTP, and has a goal to reduce the greenhouse gas (GHG) emissions from automobiles and light trucks to the target levels as approved by the Air Resources Board (ARB). CTC has developed guidance on how the regions will develop Sustainable Community Strategies in their next RTP cycle; MTC's next RTP is slated for completion in 2013.

State and Regional System Planning Efforts

Several Caltrans system planning documents have been utilized in the development of this CSMP. These include the 2005 California Transportation Plan (CTP) and the 1998 Interregional Transportation Strategic Plan (ITSP). Other Caltrans District 4 documents include the draft 2002 Transportation Corridor Concept Report (TCCR) for US 101 Peninsula Corridor: Golden Gate Bridge to Santa Clara SR 85, and the US 101 South Corridor: Santa Clara SR 85 to San Benito SR 156. The 2004 Transportation Management System Master Plan (revised 2008) and the 2004 California ITS Architecture and System Plan are also referenced.

System and regional planning documents prepared by other agencies that have influenced CSMP development include the 2009 Regional Transportation Plan (T2035) and the 2004 Bay Area Regional ITS Plan. Most notably, the MTC Freeway Performance Initiative (FPI) is a regional program that has provided a foundation for corridor-level performance-based decision making for the 2009 RTP (T2035). Important documents in this effort have been the 2007 FPI Performance & Analysis Framework, the 2007 FPI Prioritization Framework, and other FPI corridor-specific documents.

Additional studies include:

- Peninsula Gateway 2020 Corridor Study (C/CAG, VTA, SMCTA – 2008)
- US 101 North and US 101 Central Corridor Studies (VTA – 2004)
- SR 92/US 101 Study (C/CAG – in progress)
- San Mateo HOV Lane Study (MTC, C/CAG, Caltrans – in progress)
- Grand Boulevard Study (in progress)
- Bi-County Transportation Study (San Francisco/San Mateo – in progress)
- Comprehensive County Expressway Planning Study (2008)

1.4 Stakeholders

Current and continuing CSMP development is dependent upon the close participation and cooperation of all major stakeholders. The strategies evaluated have the potential to impact the local arterial system, the transit services along the corridor, and the regional and local planning agencies that have the corridor within their jurisdiction. The goal of the stakeholder engagement process is consensus among key stakeholder groups to develop the CSMP.

The stakeholder engagement process framework has stakeholders in two categories:

I. Core Working Group: Agencies primarily responsible for conducting planning efforts in the corridor.

II. Planning Agency Partners: Additional agencies responsible for implementing and monitoring CSMP strategies.

Each CSMP follows a workplan unique to the needs of the CSMP corridor and the identified stakeholders. The Core Working Group provides policy and technical guidance throughout the process and monitors CSMP development milestones. Additional planning agencies and other key stakeholder groups may be brought in to review and comment at key junctures, and help evaluate corridor improvement strategies.

The Core Working Group for the US 101 South CSMP Corridor is comprised of MTC, Santa Clara County Valley Transportation Authority (VTA), City/County Association of Governments of San Mateo (C/CAG), San Mateo County Transportation Authority (SMCTA), and Caltrans. Although not within the defined boundaries of this CSMP, the San Francisco County Transportation Authority (SFCTA) was invited to participate. Representatives meet periodically to discuss the goals, objectives, and schedule of the CSMP. The Core Working Group reviews operational data, analysis methodology, and technical reports. All stakeholder groups provide input on the recommended improvement strategies for the US 101 South CSMP Corridor. A list of stakeholders by category is presented below.

Core Working Group

- City/County Association of Governments of San Mateo (C/CAG)
- San Mateo County Transportation Authority (SMCTA)
- Santa Clara Valley Transportation Authority (VTA)
- San Francisco County Transportation Authority (SFCTA)
- Metropolitan Transportation Commission (MTC)
- Caltrans

Planning Agency Partners

- Brisbane
- San Bruno
- Burlingame
- Foster City
- San Carlos
- Atherton
- Palo Alto
- Mountain View
- Santa Clara
- Association of Bay Area Governments (ABAG)
- Transit Agencies (BART, Muni, SamTrans, VTA, Caltrain)
- South San Francisco
- Millbrae
- San Mateo
- Belmont
- Redwood City
- Menlo Park
- East Palo Alto
- Sunnyvale
- San Jose
- Bay Area Air Quality Management District (BAAQMD)
- California Highway Patrol (CHP)

1.5 CSMP Performance Measures

Caltrans works with stakeholders to develop goals, objectives, and performance measures that will focus on corridor improvement strategies. The core objectives and ultimate goals of the CSMP are: to reduce overall system delay within the corridor (Mobility), to reduce variation of travel time (Reliability), to provide alternatives to single occupant vehicles (Access), to reduce distressed lane miles (System Preservation), to lowering accident rates (Safety), to restore lane miles lost to congestion (Productivity), and to improve air quality (Clean Air). Performance measures that can be used as a starting point in reaching these goals include: vehicle hours of delay (VHD), mode split, pavement condition index, TASAS accident rates, truck percentages, and number of days exceeding Fed/State ozone standards. Table 1.5.1 below displays identified Goals, Objectives, and Performance Measures.

GOALS	OBJECTIVES	PERFORMANCE MEASURES
Mobility	Reduce reoccurring delay within the corridor	Vehicle Hour of Delay (PeMS, Probe Vehicles)
Reliability	Reduce variation of travel time	Average Travel Time; (PeMS, Buffer Index)
Access	Improve connectivity between all modes as alternatives to single occupant vehicles	Mode Split (% Auto, Transit)
System Preservation	Reduce distressed lane miles	Pavement Condition Data
Safety	Reduce accident and injury rates	TASAS Data
Productivity	Efficient goods movement	Equivalent lost lane miles
Clean Air	Improve air quality	Number of days exceeding Fed / State ozone standards

Table 1.5.1. CSMP Goals, Objectives & Performance Measures.

SECTION 2: CORRIDOR DESCRIPTION

Figure 2.1. Corridor Map.

2.1 Corridor Limits

The US 101 South CSMP Corridor begins at the SR 85/US 101 interchange (south) in San Jose, extends north through Santa Clara and San Mateo Counties and ends at the San Francisco/San Mateo County line. The length of the corridor is approximately 58 miles and includes connections with State Routes 85, 82, 130, 237, 109, 114, 84, 92 as well as Interstates 280, 380, 680 and 880.

US 101 is comprised of an eight to ten lane freeway throughout the corridor. US 101 generally consists of six mixed-flow lanes and two High Occupancy Vehicle (HOV) lanes. A southbound HOV lane begins just north of Whipple Avenue, and both northbound and southbound HOV lanes exist south of Whipple Avenue to Cochrane Road in Morgan Hill. The HOV lanes operate as a 2+ facility from 5 to 9 AM and from 3 to 7 PM. In 2006, direct HOV freeway-to-freeway connectors opened at the US 101/ SR 85 interchange (north). For most of the US 101 corridor, a paved median and concrete barrier separate the two travel directions.

2.2 Corridor Significance

The US 101 South CSMP corridor is primarily urban in character and serves as a major south-north connector between the Silicon Valley in the South Bay and San Francisco. US 101 on the Peninsula is the main access route to San Francisco International Airport (SFO). Travelling south from the Peninsula, US 101 serves as a major gateway to the high-tech Silicon Valley and the San Jose International Airport. US 101 links with the East Bay across the San Francisco Bay via the Dumbarton Bridge (SR 84), the San Mateo Bridge (SR 92), and the San Francisco-Oakland Bay Bridge (I-80). The corridor also provides access to the Ports of San Francisco and Redwood City. In the south, US 101 is an important freight corridor for the movement of agricultural products, as well as a commute route from the developing areas of southern Santa Clara County and San Benito County into the urbanized Silicon Valley/Santa Clara Valley.

2.3 State Route Designations

US 101 is functionally classified as a freeway facility along the entire length of this CSMP corridor. In the 1998 Interregional Transportation Strategic Plan, US 101 is designated as an interregional "Focus Route," specified as a facility of the highest priority for completion to the minimum standard in a 20-year planning period.

US 101 is designated a Surface Transportation Assistance Act (STAA) truck route, allowing large trucks to operate on this route. According to 2008 Caltrans Annual Average Daily Truck Traffic data, trucks comprise 3.23 to 10.29 percent of the total daily vehicle traffic along the CSMP corridor. The largest truck volumes occur near the junctions of SR 85 Bernal Road, SR 82 North, and I-280 West/I-680 North.

High Occupancy Vehicle (HOV) Lanes and Express Lanes

HOV lanes operate in the Santa Clara portion of the US 101 CSMP. Based on current developments towards implementing an express lane network in the Bay Area, the HOV lanes on US 101 will first be extended and in a later stage established as express lanes. Express lanes allow drivers in single occupancy vehicles (SOV) to pay to use of the HOV lane. The state law under which the lanes operate mandates that the facility operates at Level of Service C. At present, traffic density (vehicles per lane per hour) is used to determine when fees should be changed and to what fee level. Higher prices are charged as surplus capacity diminishes.

Existing ITS
Caltrans District 4's existing ITS infrastructure on the corridor includes ramp metering (RM) stations, Traffic Monitoring Stations (TMS), Wireless Magnetometer Vehicle Detection Stations, Changeable Message Sign (CMS), Extinguishable Message Sign (EMS), and Closed-Circuit Television (CCTV) cameras. Table 2.3.1 below provides a summary of both the existing ITS field elements and those that are under construction. The ITS infrastructure includes a Vehicle Infrastructure Integration (VII) test bed, FasTrak tag readers and real time speed information through 511.org.

ITS Infrastructures	Count
Ramp Meters (RM)	59
Traffic Monitoring Stations (TMS)	120
Changeable Message Sign (CMS)	10
Highway Advisory Radio (HAR)	5
Extinguishable Message Sign (EMS)	9
Closed-Circuit Television (CCTV)	38

Table 2.3.1. Existing ITS Elements or Under Construction.
Source: *San Mateo US 101 Freeway Corridor Technical Analysis* – Exhibit 96.

2.4 Additional Corridor Roads

The US 101 South CSMP corridor extends approximately 58 miles. Along this corridor are several major freeway-to-freeway interchanges. Figure 2.4.1 shows the study corridor includes the following major freeway-to-freeway interchanges:

- I-380 provides a 1.4-mile connection between I-280 and US 101;
- SR 92 (San Mateo-Hayward Bridge) connects US 101 with I-880 and I-280;
- SR 84 connects the East Bay to the Southern Peninsula; further north, it provides access to I-280;
- SR 85 provides an alternate route to US 101 between south San Jose and Mountain View; an express lane study is currently in place for the entire stretch of SR 85.
- SR 237 connects with SR 85 and I-880 and I-680 and provides access to high tech Silicon Valley industries;
- SR 87 connects SR 85 with the Norman Y. Mineta San Jose International Airport and US 101 via downtown San Jose;
- I-880 connects I-280, SR 17, US 101 and the East Bay sub-region;
- I-280 connects the Peninsula communities to San Francisco and San Jose;
- SR 82 parallels US 101;
- I-680 connects with I-80 in Solano County via the East Bay;
- Expressways in Santa Clara Valley operate with freeway-like results and provide substantial support to the transportation needs near and along US 101.

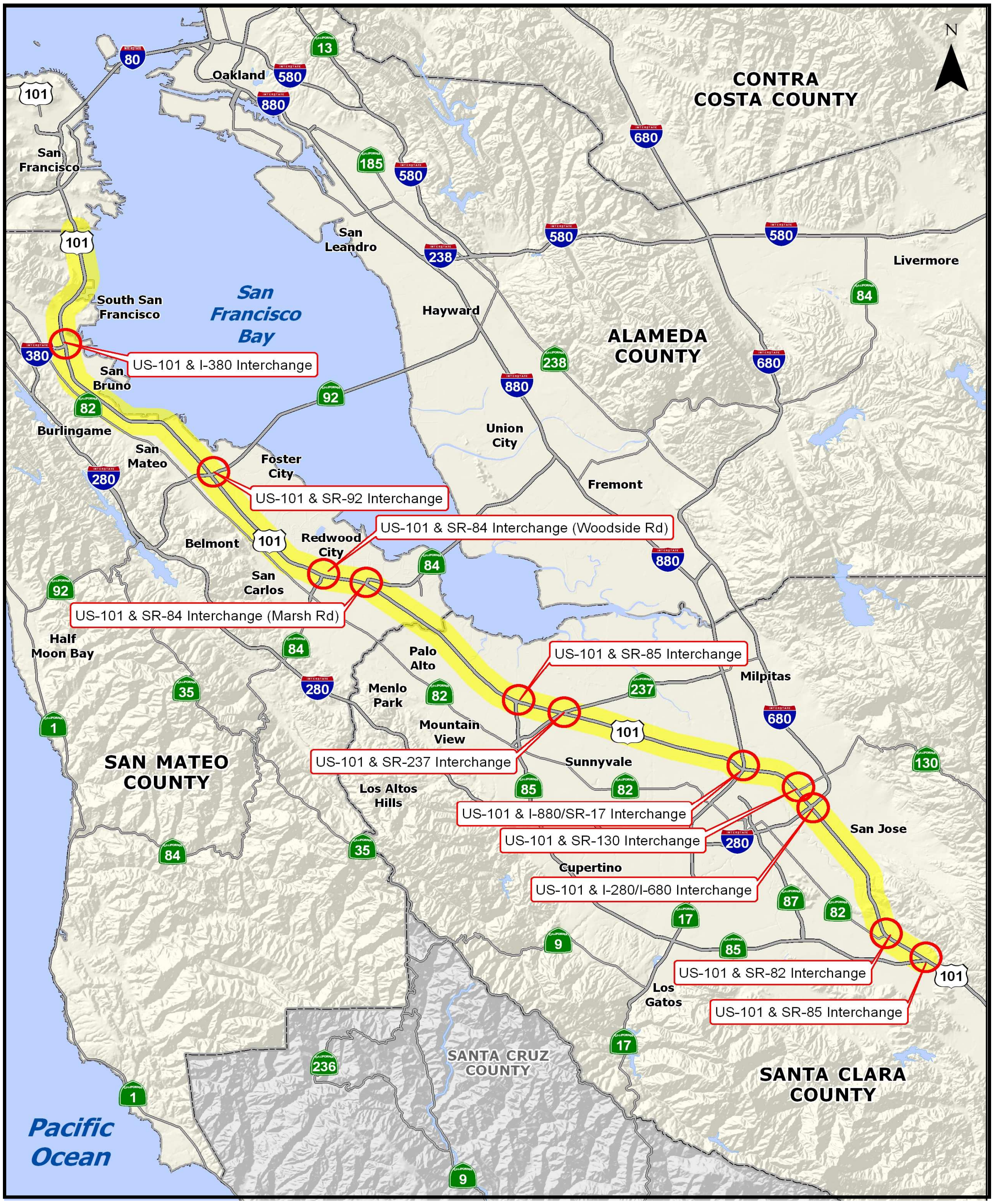

Figure 2.4.1. Major Interchanges along the SM/SCL US 101 South Corridor.

Of these arterials, SR 82 closely parallels US 101. The SR 82 facility functions more as a local arterial than a freeway and provides additional movement in the same south-north direction as US 101, allowing it to be used as an alternate facility. Although SR 82 has many signal-controlled intersections, this route can handle a large amount of traffic by utilizing ITS (Intelligent Transportation Systems) when US 101 is temporarily closed to traffic.

I-280 is another arterial that parallels US 101 from beginning to end, and provides an alternative route between San Jose and San Francisco. Although traffic on US 101 experiences higher volumes and greater congestion than on I-280, there are few convenient connections between both facilities. With I-380 as the exception, connecting routes between US 101 and I-280 are not established in the direction of a beneficial detour, and driving the additional miles can take longer than the time spent in congestion on US 101. For instance, a direct connection from I-280 to Silicon Valley's SR 237 is not available. The geographically more-direct alignment together with long detours to I-280 make US 101 the faster route for many users despite congestion.

The US 101 South CSMP corridor in San Mateo and Santa Clara Counties contains major local arterials that generally parallel the facility for the majority of its length. The following three tables show the principal parallel arterials for the US 101 South CSMP corridor next to El Camino Real. These are presented in three corridor sections: Southern San Jose, the section from downtown San Jose to the SCL/SM County Line, and the section from the SCL/SM County Line to the SM/SF County Line.
Of special character, the Central Expressway is part of the unique expressway system in Santa Clara County with freeway-like operations through Sunnyvale.

Section 1: Southern San Jose:

Additional Corridor Roads	**Portion of US 101 South Corridor**
Monterey Highway	South San Jose to downtown
South King Road / North King Road	South San Jose to downtown
McLaughlin Avenue / South 24th Street	South San Jose to downtown

Table 2.4.1. Additional Corridor Roads – Southern San Jose.

Section 2: Downtown San Jose- SCL/SM County Line:

Additional Corridor Roads	**Portion of US 101 South Corridor**
North First Street	San Jose to Airport
Central Expressway	Santa Clara to Palo Alto
East/West Middlefield Road	Mountain View to Redwood City

Table 2.4.2. Additional Corridor Roads – Downtown San Jose-SCL/SM County Line.

Section 3: SCL/SM County Line to SM/SF County Line:

Additional Corridor Roads	**Portion of US 101 South Corridor**
Veterans Blvd	Redwood City
Mariners Island Blvd	San Mateo, Foster City
Delaware St	San Mateo
Gateway Blvd	South SF
Airport Blvd	South SF, Burlingame

Table 2.4.3. Additional Corridor Roads – SCL/SM County Line to SM/SF County Line.
Source: *San Mateo County Smart Corridors Program* Concept of Operations Report Draft / Kimley Horn & Associates 2007.

2.5 Transit Network

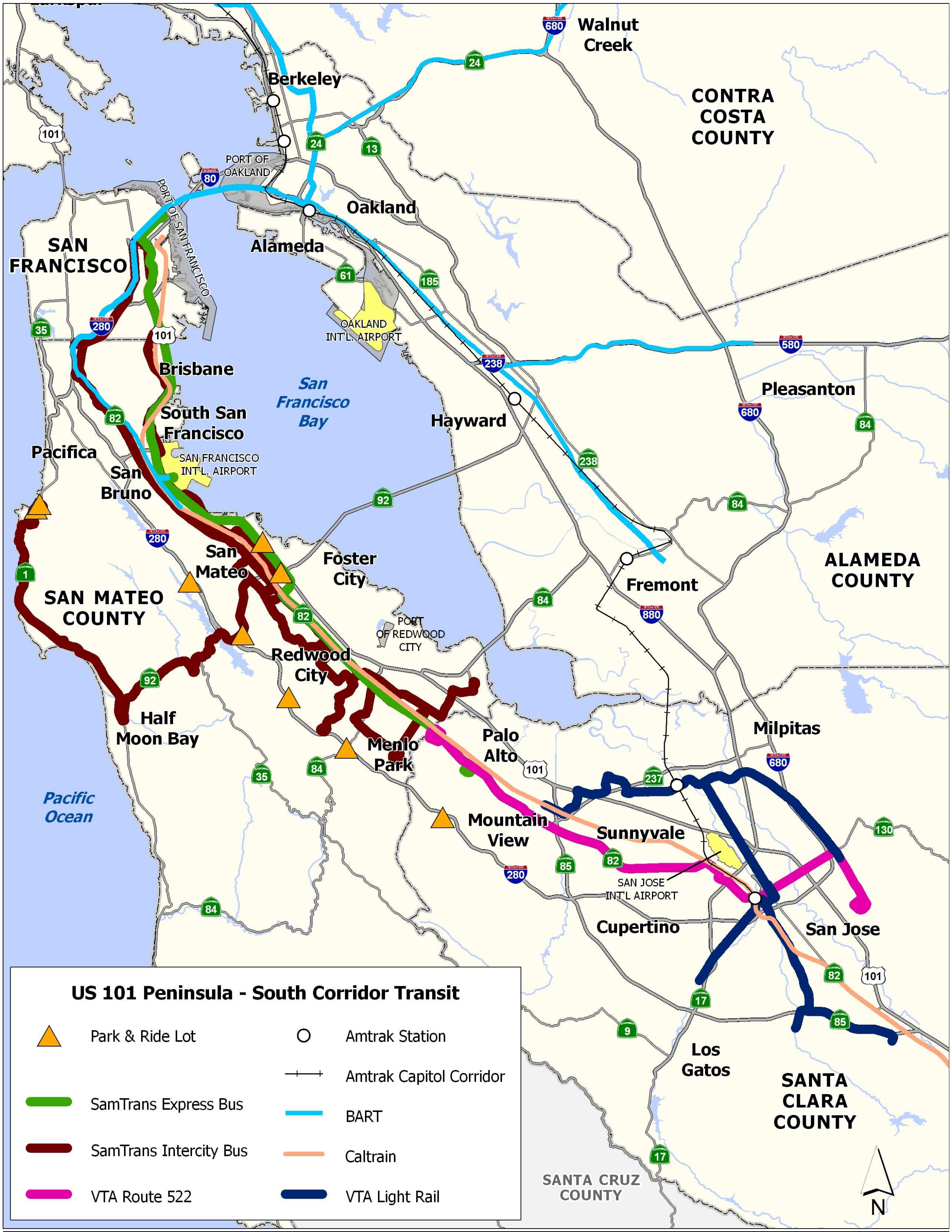

Figure 2.5.1. US 101 South CSMP Corridor Transit Map.

Various agencies provide transit service on or along US 101 in this corridor. Some services are specialized services, for instance, Caltrain provides rail service only, while other agencies provide a variety of transit services.

VTA

The Santa Clara Valley Transportation Authority (VTA) is responsible for bus and light-rail operations, congestion management, and for countywide transportation planning in Santa Clara County. VTA offers light rail service connecting Caltrain in Mountain View with various parts of San Jose, including downtown. In addition, VTA operates one express bus route, Route 104, along a portion of the US 101 between Stanford and the Penitencia Creek Transit Center in eastern San Jose, connecting employment centers along Route 237 with Caltrain. There is also a parallel bus rapid transit (BRT) route, Rapid 522, that connects East San Jose and downtown with Stanford University via SR 82. Rapid 522 serves 5200 riders per weekday, and has grown 15 percent since its 2005 inception. Part of its success can be explained by signal priority given to buses and their ability to use a "queue jump" lane at congested intersections. The increased on-time performance and the delay reductions attract higher numbers of passengers. While transit lines make use of parallel facility I-280, no transit line uses it north of Stanford University.

Caltrain

Along the entire length of US 101 South corridor, Caltrain provides regional commuter rail service from San Francisco to Gilroy. Caltrain's Peninsula Joint Powers Board consists of representatives from San Francisco, San Mateo, and Santa Clara counties. Three types of weekday service are available: local, limited, and Baby Bullet. Ever since Caltrain introduced its Baby Bullet commute-hour express train service in June 2004, passengers are able to travel between San Francisco and San Jose in less than an hour. Caltrain offers 22 bullet trains during the weekday peak period and also provides limited-stop trains with timed transfers during the peak period. As a result, overall weekday Caltrain ridership has increased from 25,550 in February 2004 to 39,122 in February 2009, a 53 percent increase in five years. Between 2009 and 2010 Caltrain has experienced a 6 percent decrease in ridership due to a downturn in the economy and decrease in service.

SamTrans

San Mateo's transportation agency provides express, intercity, and local bus service throughout San Mateo County. Several express and intercity lines extend into downtown San Francisco and Palo Alto. An important express line is the KX that connects Palo Alto, SFO and San Francisco. Many of the express bus services operate along US 101, and in addition to these services SamTrans operates several intercity routes on El Camino Real and other arterials parallel to US 101.

SamTrans carried 14,868,608 passengers annually on its fixed-route service during FY2006. During FY2009, SamTrans carried 15,551,135 passengers, close to a 5 percent increase over three years. As mentioned, most of SamTrans routes are along or parallel to US 101.

BART

The Bay Area Rapid Transit District (BART) provides weekday and weekend rail service to five San Francisco Bay Area counties. The rail network in San Mateo County was extended in 2003 beyond the original Daly City BART station to include newer stations in Colma, South San Francisco, San Bruno, Millbrae, and San Francisco International Airport. Much of this rail line operates near I-280 and is separated from US 101 by San Bruno Mountain. With the three southernmost stations parallel to

US 101 and providing easy access to downtown San Francisco, this regional rail line is an important transit mode in the northern US 101 corridor. SamTrans has reconfigured its routes throughout northern San Mateo County to serve BART.

In its *2008 Bart Report to Congress* BART mentioned a 23 percent increase in its average weekly ridership to SFO since opening. Surveyed in May of 2008, ridership on the extension was 186,000 passengers, though origin and destination along the five-county BART system were not further specified in this report.

In Santa Clara County, BART to San Jose is being developed in stages, but will ultimately reach downtown San Jose, connecting to Caltrain and other transit services, providing an alternative for riders using portions of US 101 in the South Bay and beyond.

Muni

Though not located along the CSMP corridor, Muni's level of service and connectivity to the other transit providers does influence the number of people using US 101 to and from San Francisco. Muni's connections to Caltrain and BART, for instance, add to the attractiveness of using transit along this corridor.

High-Speed Rail

The California High-Speed Rail Authority is putting plans in place to establish a high-speed train connection between San Francisco and Los Angeles; work may start as soon as 2012. This service would provide San Francisco and San Jose a very fast connection – establishing a 30-minute ride between both downtowns – and this connection may attract a large number of users.

Transit Service Frequency

As shown in the following map (Fig. 2.5.2), transit service frequency is not uniformly available along US 101, and this is one of the major influences on the choice of using one's car or taking transit. El Camino Real in particular is where the highest service frequencies are measured outside the San Francisco and San Jose areas. The areas where transit routes have infrequent service (vehicle arrival intervals of 60 minutes or more) are scarce and are found primarily in neighborhoods with lower densities located next to non-urbanized areas.

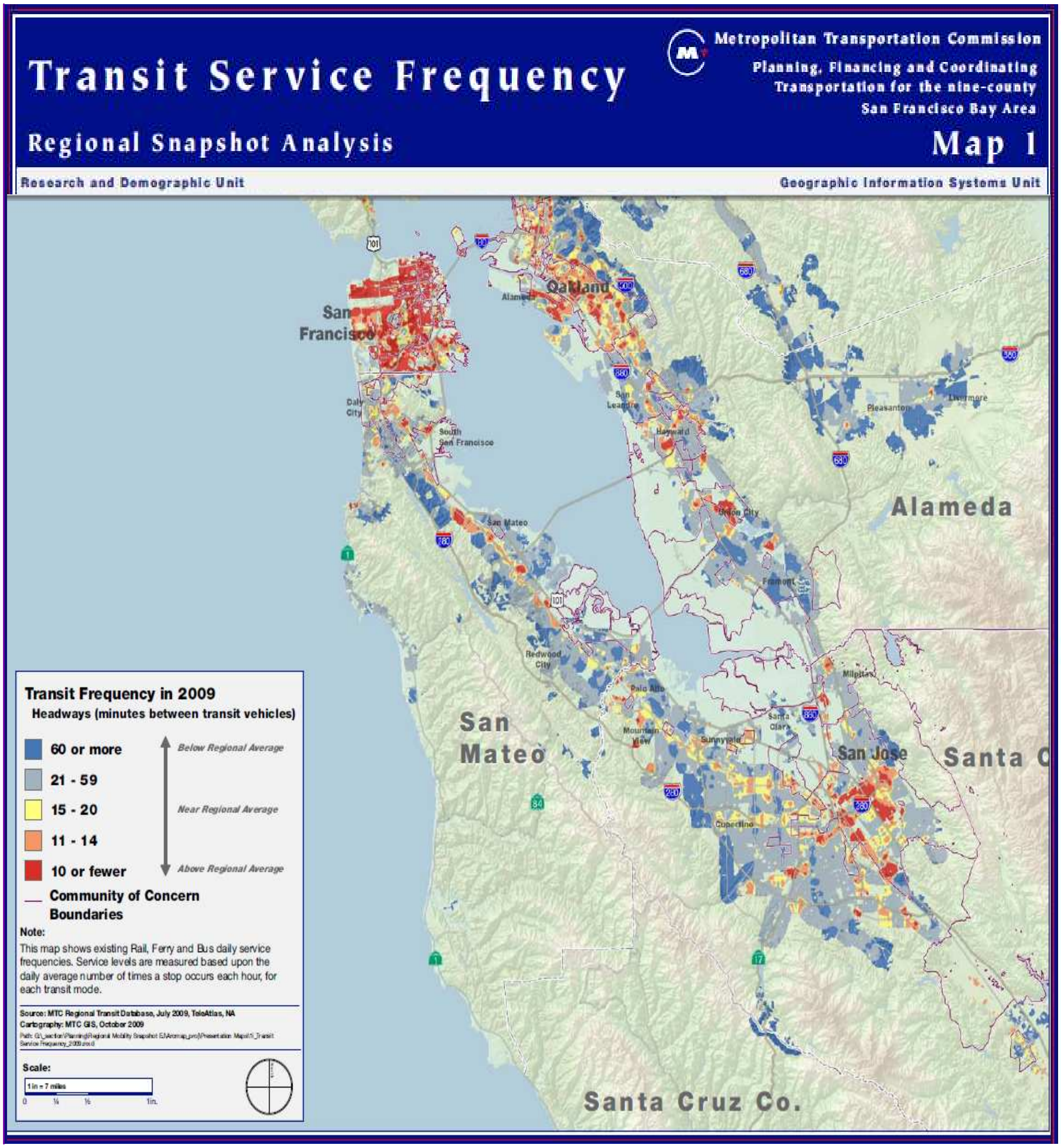

Figure 2.5.2. US 101 South Corridor Transit Service Frequency Map.
Source: *Metropolitan Transportation Commission.*

In summary, the US 101 South CSMP corridor provides multiple transit opportunities that can assist in managing congestion in the corridor; mass-transit for the longer distance and local transit specifically in areas where congestion is experienced. Caltrain service is the mass-transit rail service backbone of the peninsula, offering baby bullet express trains on an hourly schedule Monday through Friday. Similarly, Bay Area Rapid Transit (BART) serves the peninsula as far south as Millbrae and SFO. Local bus service is provided by Muni, SamTrans, and VTA. Muni has an extensive light rail system through San Francisco with an emphasis on the downtown area; three lines also come together at Balboa Park Station. VTA has an expanding light rail system in the Santa Clara Valley.

Vital connections
In light of US 101 and based on the five transit agencies' operations and the future High-Speed Rail (HSR), the following list shows vital connections between transit lines where a significant segment of users may access mass transit:

Downtown San Francisco

- Connection in downtown San Francisco between Caltrain and Muni light rail;
- Connections in downtown San Francisco and Balboa Park between BART and Muni light rail;
- Potential connection in downtown San Francisco between Caltrain, HSR, Muni, and BART;

Bayshore/Brisbane

- Potential connections South of San Francisco at Bayshore between Caltrain, SamTrans express buses, and Muni light rail;

Daly City

- Potential connection of Western San Francisco between BART and Muni light rail;

Millbrae/SFO

- Connection between BART and Caltrain near SFO at Millbrae;
- Connections between SamTrans express buses at Millbrae Station;
- Potential connection between HSR and BART, Caltrain and SamTrans express buses at Millbrae;

Western/Southern San Jose

- Connection at Mountain View between Caltrain and VTA light rail;
- Potential connections between Caltrain and VTA serving cities in western and southern Santa Clara County;

Downtown San Jose

- Connection downtown San Jose between Caltrain, VTA light rail and BRT;
- Potential connection downtown San Jose between High-Speed Rail and Caltrain, VTA Light Rail, future BART line, and Bus Rapid Transit.

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Additional transit lines of interest in light of the CMIA projects

The following map of major Regional Bus Service Providers (Fig. 2.5.3) shows the Dumbarton Express line. The Dumbarton Express is a California bus service operating between Union City BART station and Palo Alto Caltrain station via the Dumbarton Bridge (SR 84), and serves the local areas near the two northern CMIA projects found along the San Mateo-Santa Clara County line. The line is operated by a group of operators including BART, VTA, Union City Transit and AC Transit.

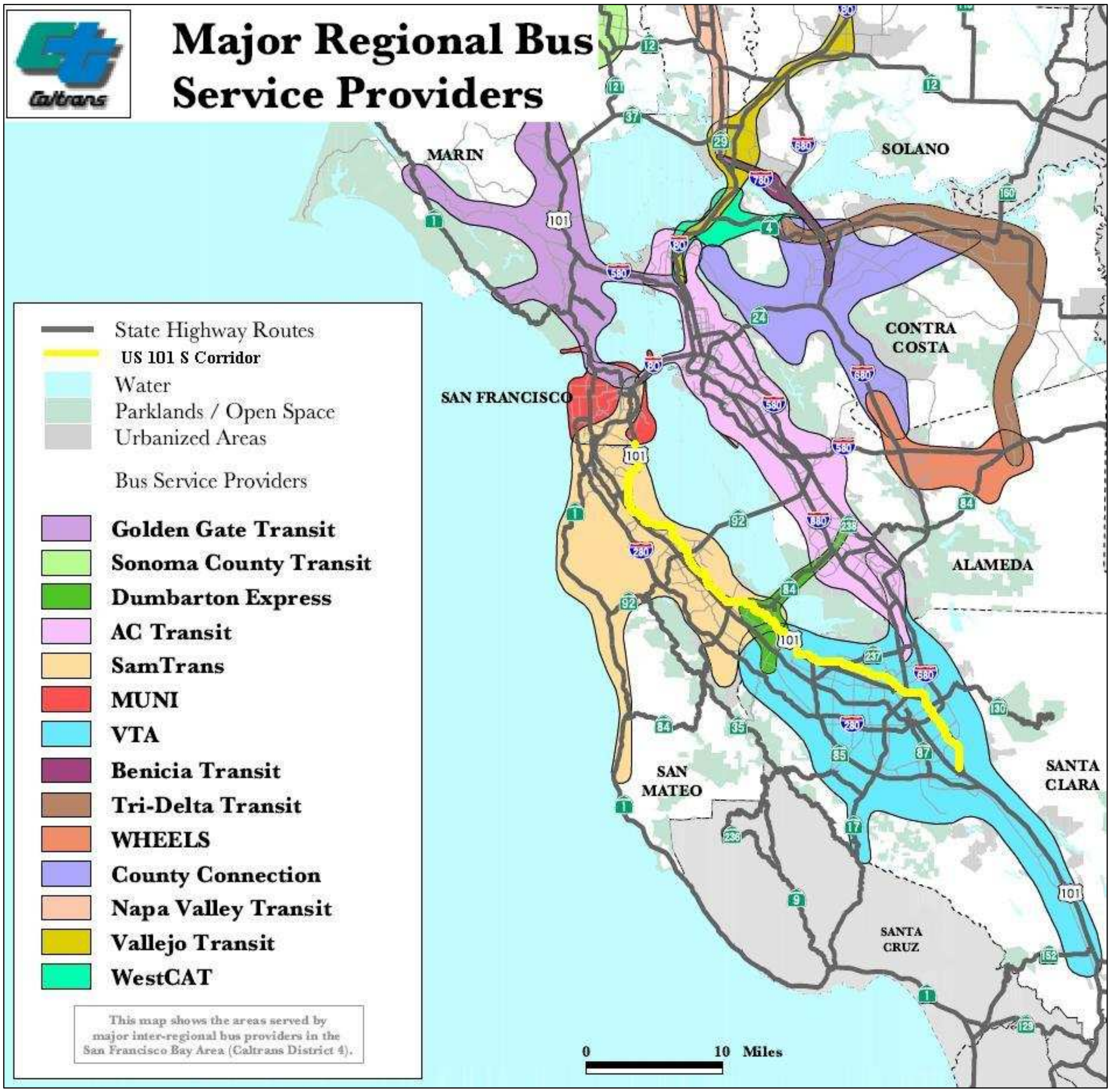


Figure 2.5.3. Bay Area Major Regional Bus Service Providers Map.

Park and Ride Facilities
There are several existing Park and Ride facilities along the corridor. Their locations and size are summarized in Table 2.5.1.

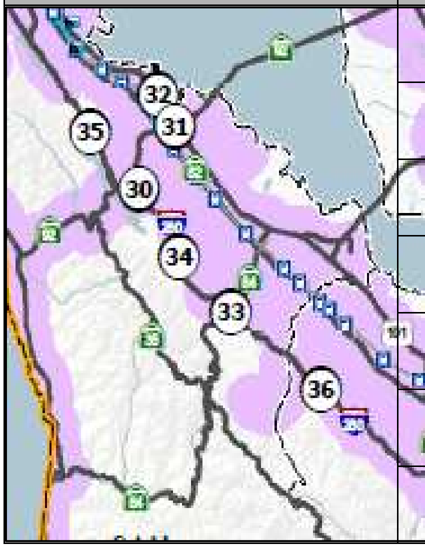
P + R US 101 South	Number	Location	City/Street	Parking Spaces	Usage %	Transit
	30	SM SR 92 PM 7.9	Belmont/ Ralston	25	76.0	None
	31	SM US 101 PM 11.9	San Mateo/ US 101/SR 92	174	39.1	SamTrans
	32	SM US 101 PM 13.5	San Mateo/ Third Street	13	92.3	None
	33	SM I-280 PM 14.2	Woodside/ Woodside	28	23.1	None
	34	SM I-280 PM 11.90	San Carlos/ Edgewood	44	100+	None
	35	SM I-280 PM 14.2	Hillsborough/ Hayne Road	24	68.2	None
	36	SCL I-280 PM 18.4	Los Altos/ Page Mill	40	100+	None

Table 2.5.1. Park and Ride lots along US 101 South Corridor operated and maintained by Caltrans.
Source: *511.org*
Number at facilities with “100+” includes creative parking.

2.6 Bicycle and Pedestrian Network

The Bicycle and Pedestrian network is a viable and integral part of the overall transportation system, especially for the shorter trips within the US 101 South CSMP corridor.

MTC’s 2001 *Regional Bicycle Plan* documents the region’s bicycling facilities, identifies the links in a region-wide bikeway network, and summarizes corresponding funding sources. The updated plan of 2009 focuses on bicycle connections to the public transportation network. The plan seeks to encourage and promote safer bicycling in the region. The Regional Bikeway Network (RBN) defines the San Francisco Bay Area’s continuous interconnected bicycling corridors of regional significance; the RBN includes both built and un-built bicycle segments.

The California Highway Design Manual identifies three types of bicycle facility:
- Class I Bikeway (Bike Path) provides a completely separated right of way for the exclusive use of bicycles and pedestrians while cross-flow by motorists is minimized;
- Class II Bikeway (Bike Lane) provides a striped lane for one-way bike travel on a street or highway;
- Class III Bikeway (Bike Route) provides for shared use with pedestrian or motor vehicle traffic.

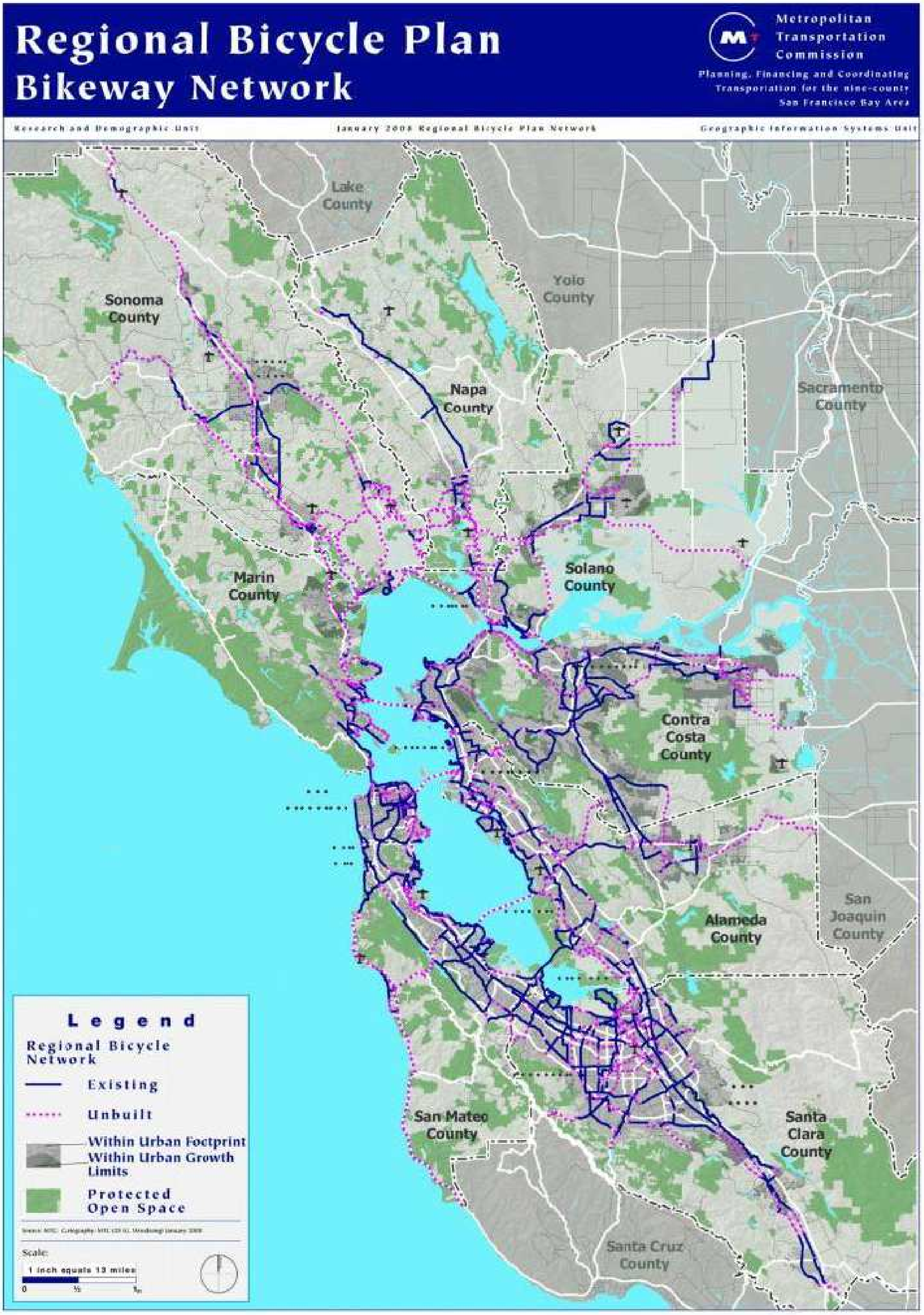


Figure 2.6.1. Regional Bicycle Plan.
Source: M*etropolitan Transportation Commission*.

Along the US 101 South CSMP corridor there are large sections of the RBN constructed and operational. The major bicycle routes along the US 101 South CSMP corridor include:

- Monterey Hwy (Class II) , Coyote Creek Trail (Class I), Tully Rd (Class II), PM R27.05 – 34.16
- Mabury Rd (Class II), Berryessa Rd (Class II), Old Oakland Rd (Class II), Old Bayshore Highway / N. 10th St (Class II), PM 34.16 – 38.17
- N First, Brokaw Rd, Airport Way (Class II), Guadalupe Parkway, PM 38.17 – 39.92
- Bowers / Great America Parkway (Class II), Lakeside (Class II), PM 39.92 – 46.02

Figure 2.6.2. Bikeway Network, Santa Clara County.
Source: *Metropolitan Transportation Commission*.

- Ellis Street, Whisman Road, (Class II), Stevens Creek Trail, PM 46.02 – 48.10
- Shoreline Boulevard, Rengstorff, Charleston Road, Bayshore Boulevard (Class II) Stevens Creek Trail, PM 48.10 – 52.55
- University Avenue, (Class II) Stevens Creek Trail, PM 0.0 – 6.62
- Willow Road, Bayshore Road (Class III), Bay Trail, Industrial Way, (Class II) Holly Street, Shoreway Road, Marine World Parkway, Hillsdale Boulevard (Class III), PM 6.62 – 11.88
- Norfolk Street (Class II), Airport Boulevard (Class III), El Camino Real (Class III), Bay Trail, PM 11.88 – 18.15

- El Camino Real (Class III), PM 18.15 – R20.72
- Airport Boulevard, Bayshore Boulevard, (Class III) Oyster Point Boulevard / Sisters Cities Boulevard (Class II), Sierra Point Parkway (Class II), Bay Trail, PM R20.72 – 26.10

In San Mateo, the North-South Bikeway will serve as the primary spine for local and regional bicycle travel in the county, so bicyclists do no longer need to use major arterials such as El Camino Real or find their way through a maze of secondary streets. The bikeway will link virtually all of the major regional destinations including Caltrain Stations, downtowns, and other large employment centers.

Figure 2.6.3. Bikeway Network, San Mateo County.
Source: *Metropolitan Transportation Commission*.

Additional opportunities exist to develop the RBN, and are located in the following areas near the US 101 South CSMP corridor:

- Between I-880 and Lawrence Expressway
- Between Menlo Park and Redwood City
- Between Millbrae and North of SFO
- North of Brisbane and SM/SF Co Line

2.7 Mode Split

Intermodal Facilities
The San Francisco International Airport (SFO) is located just south of the US 101 and I-380 interchange. SFO is one of the thirty busiest airports in the world and serves over 37 million passengers annually. Figure 2.7.1 shows a satellite image from the airport and Table 2.6.1 summarizes some demand related statistics of the SFO airport.

Figure 2.7.1. San Francisco International Airport.

Item	FY2006	FY2005	FY2004	% Change FY2006	% Change FY2005
Flight Operations	356,556	348,933	346,814	2.2%	0.6%
Landing Weight (in 000 lbs)	27,173,862	27,144,395	26,996,625	0.1%	0.5%
Total Passengers	33,564,798	33,207,241	31,344,758	1.1%	5.9%
Total Enplaned and Deplaned Passengers	32,987,672	32,648,635	30,771,464	1.0%	6.1%
Enplaned Passengers	16,490,345	16,249,093	15,396,139	1.5%	5.5%
Deplaned Passengers	16,497,327	16,399,542	15,375,325	0.6%	6.7%
Domestic Passengers	24,799,655	24,800,769	23,438,173	0.0%	5.8%
International Passengers	8,188,017	7,847,866	7,333,291	4.3%	7.0%
Cargo and U.S. Mail Tonnage (in metric tons)	593,750	587,635	552,118	1.0%	6.4%
Parking (cars exited)	3,048,816	3,149,129	3,158,429	-3.2%	-0.3%

Table 2.7.1. San Francisco International Airport Passenger and Cargo Statistics.
Source: *San Francisco International Airport, Financial Statements with Schedule of Passenger Facility Charge Revenues and Expenditures* - June 30, 2006 and 2005.

The Norman Y. Mineta San José International Airport (SJC) is located two miles northwest of downtown San Jose, near three major freeways: US 101, I-880 and State Route 87. Figure 2.7.2 shows an image of the San Jose Airport and Table 2.7.2 presents airport Passenger and Cargo statistics (2005-2007).

Figure 2.7.2. Norman Y. Mineta International Airport.
Source: *www.AirNav.com*

Item	FY2007	FY2006	FY2005	%Change FY2007	%Change FY2006
Flight Operations	187,261	188,462	193,987	-3.0%	-0.6%
Landing Weight (in 1000 lbs)	95,530,562	98,847,753	104,888,087	4.8%	-3.4%
Total Passengers	10,658,389	10,708,065	10,756,786	-5.6%	-0.5%
Enplaned Passengers	5,320,732	5,346,482	5,369,464	-5.2%	-0.5%
Deplaned Passengers	5,337,657	5,361,583	5,387,322	-5.9%	-0.4%
Domestic Passengers	10,505,188	10,080,733	10,051,063	-3.7%	-2.4%
International Passengers	153,201	226,727	217,441	-30.0%	-57.8%
Cargo and US Mail tonnage (metric tons)	182,860,802	202,089,559	209,322,831	-6.1%	-9.5%
Parking (cars exited)	1,544,803	1,626,156	1,678,911	-10.2%	-4.1%

Table 2.7.2. Norman Y. Mineta International Airport Passenger & Cargo Statistics.
Source: *Norman Y. Mineta International Airport, Financial Statements with Schedule of Passenger Facility Charge Revenues and Expenditures* – Dec 2007 and 2006 YTD.

The Millbrae Intermodal Terminal is located just south of SFO and provides one of the first cross-platform rail-to-rail links west of the Mississippi. The terminal serves Caltrain, BART and SamTrans.

Approximately ten miles further south is the Port of Redwood City, which provides berths for dry bulk and liquid bulk cargo, and serves as a marina with recreational boating facilities. The port can be accessed via US 101 and Union Pacific Railroad.

Mode Split by Jurisdiction

Information on Corridor Mode Split was provided by the 2007 American Community Survey (ACS) for the San Francisco Bay Area which compares data from the ACS with data from the 2000 Census, both provided by the U.S. Census Bureau. The geographical focus for the ACS is the nine-county San Francisco Bay Area. Data is reported for geographical areas with a population greater than 65,000. The table below reflects the modal split for means of transportation to work for cities along the US 101 South CSMP corridor and is taken from the ACS Socio-Economic Characteristics by Bay Area Public Use Microdata Area (PUMA) of Residence summary.

Mode Split (%)	SOV	HOV	Transit	Bike	Walk
San Jose	75.2	11.3	4.5	4.1	1.8
Santa Clara – Sunnyvale	79.0	9.0	3.8	2.3	2.9
Palo Alto – Mt View	71.2	5.8	3.7	6.6	4.8
Menlo Park–East Palo Alto	71.6	8.7	5.0	3.9	3.7
Redwood City – San Carlos	78.3	6.8	4.3	2.6	2.1
Millbrae – Burlingame	69.4	8.9	10.8	1.7	3.1
Brisbane – San Bruno	66.7	10.1	16.6	1.5	2.3

Table 2.7.3. Mode Split for the cities along the US 101 South CSMP Corridor.
Source: *2007 American Community Survey.*

2.8 Land Use / Major Traffic Generators

Overview / Land Use

The US 101 South CSMP corridor contains major land uses including agricultural, governmental, military, single and multi-family residential, industrial and commercial uses. Table 2.8.1 describes major land uses in the corridor within two miles of SR 101 center line.

Segment Information	Land Use
PM SM R20.72 – 26.10	At the southern end of the segment, mixed industrial and commercial land, high density residential, and commercial uses.
PM SM 18.15 – R20.72	Commercial, residential; industrial, open space on the west side of US 101, east side of US 101 is the San Francisco International Airport.
PM SM 11.88 – 18.15	Open space on the west side of US 101 and a mix of commercial and residential land uses on the east side of the facility.
PM SM 6.62 – 11.88	Low and high density residential, heavy industrial and commercial uses.
PM SM 0.0 – 6.62	Light industrial, commercial, residential land uses
PM SCL 48.1 – 52.55	Residential, commercial, and industrial
PM SCL 46.02 – 48.10	Industrial land uses and medium density residential.
PM SCL 39.92 – 46.02	Light and heavy industrial, medium residential, military (Moffett Field).
PM SCL 38.17 – 39.92	Low density residential, light industrial (research and development) uses.
PM SCL 34.16 – 38.17	High, medium, and low density residential development; industrial uses.
PM SCL R27.05 – 34.16	At the northern end of the segment, medium density residential, industrial uses, and parklands.

Table 2.8.1. Land Use Overview.

Major Traffic Generators

The US 101 South CSMP corridor is primarily urban in nature and has numerous major traffic generators ranging in size and sphere of influence. There are several *universities and colleges* in this corridor. Stanford University is the most prominent with about 15,000 students. It is located on over 8,100 acres in Palo Alto. Access from US 101 to Stanford University is provided via University Avenue and Embarcadero Road.

Other educational institutions are Santa Clara University, located near the De La Cruz Blvd. exit off US 101 (8,500 enrollment), Mission College in Santa Clara north of US 101 (18,000 enrollment), San Jose State University (CSUSJ) at the East St. James St. exit (32,000 enrollment), and the National Hispanic University, located off US 101 at Story Road (600 enrollment).

There are a dozen high schools near the US 101 South corridor. There are also more than 280 public and private elementary schools, middle schools, high schools, and public academies located along the corridor.

At least *ten major medical facilities* are found along the corridor including Kaiser Permanente (Redwood City), Sequoia Hospitals (Palo Alto, Belmont, and Redwood City), and Mills Peninsula Medical Center (Burlingame and San Mateo). The Stanford University Medical Center is located in Palo Alto near Sand Hill Road & Arboretum Road. There are five medical facilities in the southern portion of the corridor: Kaiser Permanente in Santa Clara and San Jose, Agnews Developmental Center, Choong-Ang Medical Facility in Santa Clara and Samaritan Medical Care Center in San Jose.

Several major *shopping centers or malls* are located adjacent or near the US 101 South CSMP corridor including:

- The Shops at Tanforan on El Camino Real at I-380
- Hillsdale Shopping Center
- Stanford Shopping Center
- Eastridge Shopping Center
- Oakridge Mall

There are also many local community shopping centers in the vicinity of US 101, for instance, at the Tully Road and Story Road areas.

Several *"big box" retail locations* are found immediately adjacent to US 101 at Brokaw Road, Tully Road, Rengstorff Road, and Lawrence Station Road in Sunnyvale, Embarcadero in East Palo Alto, Middlefield Road in Redwood City, Metro Center Boulevard in Foster City (off SR 92), and South Airport Blvd. in South San Francisco.

Major *entertainment facilities* include Candlestick Park, an outdoor sports and entertainment stadium located just over the county line in San Francisco at the northern terminus of the CSMP corridor. Candlestick Park seats 70,500 people and is home to the San Francisco 49ers professional football team. Stanford Stadium is located in Palo Alto. Previously the largest special-event facility in the Bay Area, the stadium was reconstructed in 2006, which reduced seating from 85,500 to 50,000. The Shoreline Amphitheater provides outdoor concert seating for about 22,000, whereas the Great America Theme park is located off Great America Parkway. There are two major sports and entertainment facilities in the southern portion of the 101 South corridor: the Spartan Stadium, used by San Jose State University, with a capacity of approximately 30,000, and the HP Pavilion, home to the San Jose Sharks professional hockey team and the San Jose Saber Cats, with a capacity of approximately 18,000. The Mexican Heritage Plaza located off Alum Rock Avenue is another heavily-used community and cultural arts facility.

The *San Jose Convention Center* hosts many conferences throughout the year, and is located in the downtown core of San Jose on West Santa Clara Street. The Santa Clara County Fairgrounds is home to the San Jose Flea Market and other community events throughout the year, located off Tully Road and US 101. The San Mateo County Event Center in San Mateo near East Hillsdale Blvd and US 101 is a 48-acre facility that hosts hundreds of trade/consumer shows, concerts, and special events.

There are approximately 18 *local parks and 15 public and private golf courses* throughout the corridor. Federal and state lands provide many recreational opportunities. Opportunities for leisure include Coyote Point County Recreation Area and Bayfront Park.

Significant future land-use developments

The area bordering San Mateo and San Francisco Counties is slated for several large-scale developments. With the approval of Proposition G, Hunters Point Shipyard and Candlestick Point will be home to 10,500 residential units, and the first phase of this development is underway. Other planned developments have been identified for Visitation Valley, Executive Park, Brisbane Baylands, and Daly City/Cow Palace.

Priority Development Areas

The Focus Our Vision (FOCUS) Program was developed by MTC and ABAG under a State Regional Blueprint Planning grant, and seeks to collaboratively address issues such as high housing costs, traffic congestion, and protection of natural resources. As the Regional Blueprint Planning Program for the Bay Area, the primary goal of FOCUS is to encourage future growth near transit and in the existing communities that surround the San Francisco Bay. The goal is to enhance existing neighborhoods and provide housing and transportation choices for all residents. For instance, by establishing Transit Oriented Developments (TOD), Single Occupancy Vehicle (SOV) trips can be reduced.

In the summer of 2007, local Bay Area governments were invited to designate an area within their community as a Priority Development Area (PDA). PDAs are infill development opportunities within existing communities. Local governments are then committed to creating more housing choices in locations easily accessible to transit, jobs, shopping, and services. To be eligible to become a PDA, an area must be within an existing community, near existing or planned fixed transit or served by comparable bus service, and planned for more housing. A *planned area* is part of an existing plan that is more specific than a general plan, such as a specific plan or an area plan. A *potential area* may be envisioned as a potential planning area that is not currently identified in a plan or may be part of an existing plan that requires changes.

The US 101 South CSMP Corridor includes the following approved PDAs

- Just north of I-680/I-280 I/C
- I-880 I/C to Trimble Rd
- El Camino Real (SR 82) Woodside Road (SR 84) to Ralston Ave.
- El Camino Real (SR 82) North of Ralston Ave to 3rd Ave
- El Camino Real (SR 82) Millbrae Ave to just north of I-380 I/C

The US 101 South CSMP Corridor has the following potential PDAs (as identified by FOCUS)

- SR 82 Monterey Highway (Edenvale) SJ
- Capitol Expressway through Eastridge SJ & S. King St
- Sunnyvale – Lawrence Expy and Tasman Dr.
- SR 82 Santa Clara to Menlo Park
- Area south of Bayfront Expy / Marsh Rd.
- Burlingame SR 82 El Camino Real
- SFO Area West of US 101 to I-380
- SR 82 El Camino Real San Bruno-Daly City to SM-SF County Line

2.9 Environmental Characteristics / Constraints

Environmental Setting

This Environmental Characteristics/Constraints section provides a general introduction to environmental constraints along the corridor. The natural environment of the US 101 South CSMP corridor is highly diversified in terms of its resources and related sensitivities.

It is important to note that the CSMP is general in concept; potential environmental issues affecting soil and air characteristics, storm water drainages, sensitive habitats (such as designated creeks wetlands, coastal and delta areas) as well as cultural resources, would need more detailed scoping and coordination when project development activities occur. To ensure compliance with environmental regulations, project proponents should also seek consultation for any potential impact to endangered species, especially since mitigation costs for impacts to these species' habitats are high and the limited availability of mitigation sites may impose additional constraints to any corridor-specific improvements. Coordination and approval with appropriate agencies would also be needed.

Further implications to cost, scope and schedule may occur with potential archeological sites found near the corridor, which require monitoring and appropriate documentation. Section 4(f) (49 U.S.C. 303) may require additional coordination to the surrounding recreational areas around the US 101 South CSMP corridor. Moreover, farmlands, floodplains, wetlands, utilities among other environmental studies may also need assessment for each segment listed for the corridor study.

The US 101 South corridor transitions within the region from agricultural land uses to a densely populated urban core with multiple land uses, including a mix of residential, industrial, commercial, and other mainly urban uses. Industrial and commercial uses are concentrated around SFO off US 101 and San Jose International Airport (SJC). SFO is adjacent to San Francisco Bay. Commercial and residential uses are located between SFO and San Mateo. North of SFO the predominant land use is mixed industrial and commercial. The Don Edwards San Francisco Bay National Wildlife Refuge lies on the east side of the Bay, whereas the southern portion of the US 101 corridor in this region includes some agricultural uses and rangeland. The corridor is not within the Coastal Zone, but is within the Bay Conservation and Development Commission's (BCDC) jurisdiction.

Figure 2.9.1 below show the significant environmental factors in the US 101 South CSMP corridor.

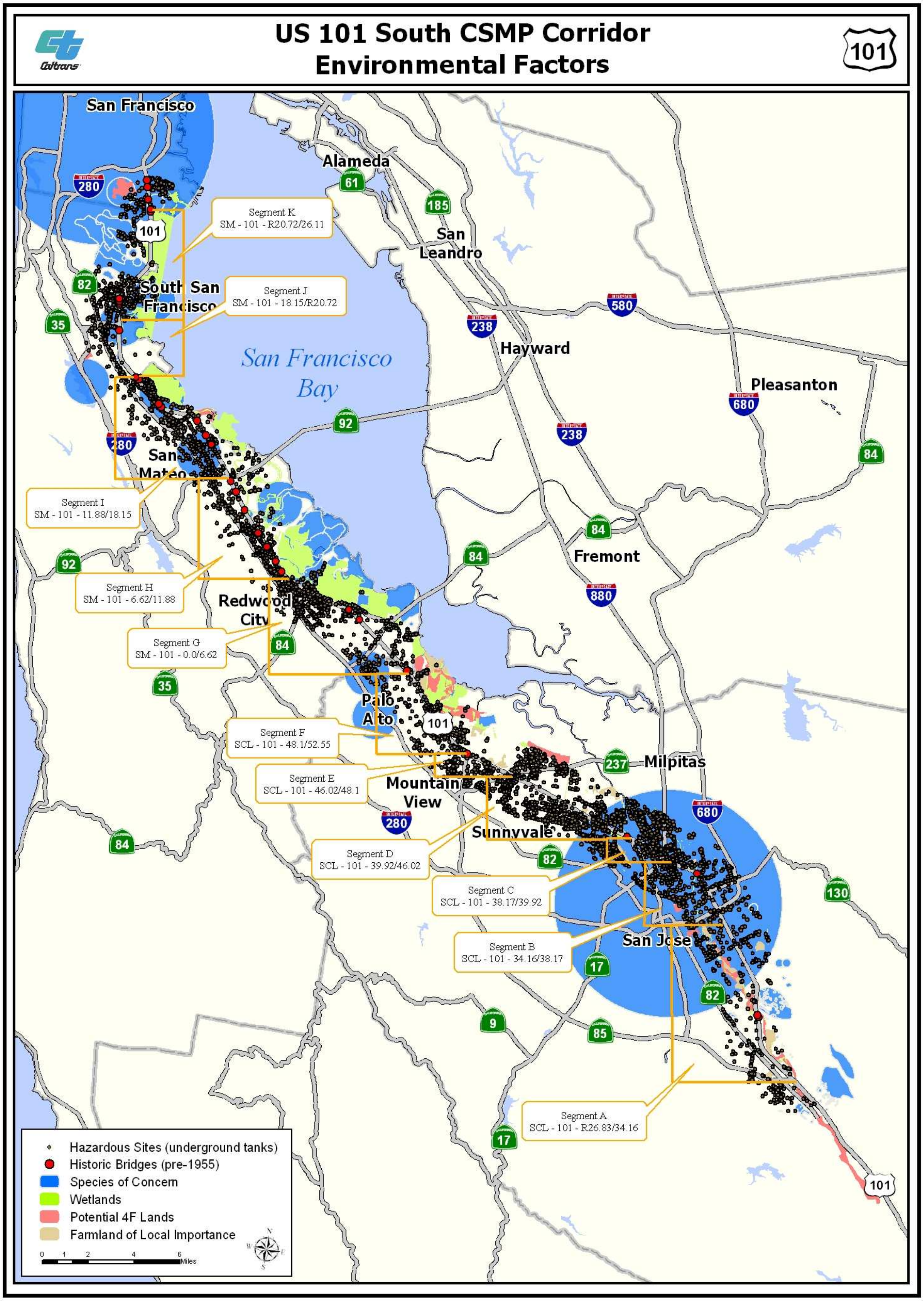


Figure 2.9.1. Environmental Factors in the South 101 CSMP Corridor.

The following table summarizes the major environmental factors within the US 101 South CSMP Corridor by segment.

US 101 South CSMP	Historic Bridges	Farmlands of Local Importance	Wetlands	Species of Concern	Potential 4F Lands*
PM SCL R27.05 – 34.16	X	X	X	X	X
PM SCL 34.16 – 38.17	X		X	X	X
PM SCL 38.17 – 39.92				X	
PM SCL 39.92 – 46.02	X		X		
PM SCL 46.02 – 48.01	X	X	X		
PM SCL 48.1 – 52.55	X		X		X
PM SM 0.0 – 6.62	X		X	X	X
PM SM 6.62 – 11.88	X		X	X	
PM SM 11.88 - 18.15	X		X	X	X
PM SM 18.15 – R20.72	X		X	X	
PM SM R20.72 - 26.10	X		X	X	X

Table 2.9.1. Summary of Environmental Factors within the US 101 South CSMP by segment.

** 4F indicates Public Parks, Recreation Lands, and Wildlife and Waterfowl Refuges.*

Air Quality

The San Francisco Bay Area Air Basin is California's second largest metropolitan area. The counties in the air basin include: Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, and the southern half of Sonoma County and the southwestern portion of Solano County. The unifying feature of the Basin is the San Francisco Bay which is oriented north-south and covers about 400 square miles of the area's total 5,545 square miles. Approximately 20 percent of California's population resides in this air basin.

Emissions of O_3 (Ozone) precursors NO (Nitrogen Monoxide) and TOG (Total Organic Gases) have decreased since 1975 and are projected to continue declining through 2010. This is the result of strict motor vehicle controls that have reduced emissions from mobile sources of these pollutants. Stationary source emissions of TOG have declined over the last 20 years because of new controls on oil refinery fugitive emissions and new rules for control of TOG from various industrial coatings and solvent operations.

Particulate-matter (PM10) emissions are predicted to increase through 2010. This increase is due to growth in emissions from area-wide sources, primarily fugitive dust sources. Mobile source emissions from diesel motor vehicles have been decreasing since 1990 even though population and VMT have been growing. This is due to stringent emission standards.

CO emissions have been declining in the basin over the last 25 years, and this trend is expected to continue. Motor vehicles and other mobile sources are the largest sources of CO emissions in the air basin. Due to stringent control measures, CO emissions from motor vehicles have been declining.

Greenhouse Gas Emission Measures
California passed the Global Warming Solutions Act of 2006 (AB 32) which seeks to reduce California's greenhouse gas emissions to 1990 levels by 2020, and to 80 percent of 1990 emission levels by 2050. A Climate Action Team was established with representatives from key State agencies responsible for implementing reduction strategies. AB 32 will establish a program of regulatory and market mechanisms to achieve quantifiable reductions of greenhouse gas and dictates that the California Air Resources Board is responsible for monitoring and planning for greenhouse gas reductions.The California Environmental Protection Agency is required to prepare a greenhouse gas emission reduction report card describing State agency actions to reduce greenhouse gas.

Transportation contributes 39 percent of California's gross greenhouse gas emissions. The State's strategy to lower emissions from transportation will likely focus on working with Congress to allow California to set higher vehicle efficiency and mileage standards, lower the levels of carbon in transportation fuels and transition the state to cleaner-burning alternative and renewable fuels.

Other strategies could include a multistate cap-and-trade program, or regional initiatives to focus development in transit-rich corridors (i.e. priority development areas) such as envisioned through the incorporation of the SCS in the next Regional Transportation Plan.

Hazardous Waste/Materials
Hazardous waste in California is regulated primarily under the authority of the federal Resource Conservation and Recovery Act of 1976 and the California Health and Safety Code. Health and Safety compliance regarding aerially deposited lead (ADL), polychlorinated biphenyls (PCBs), asbestos, and underground storage tanks among other potentially hazardous materials would need assessment if hazardous material is determined to be within the area of study.

Water Resources/Water Quality
Since there are coastal zones and creeks in the study area, studies would be required to determine impacts and develop appropriate mitigation on a project specific basis. BCDC consultation will also be assessed on a project specific basis during the Project Approval/ Environmental Document (PA/ED) phase. Executive Order 13112 requires that any federal action may not cause or promote the spread or introduction of invasive plant species. Measures will be taken to ensure that projects within the US 101 South CSMP corridor area comply with EO 13112.

The Federal Clean Water Act (CWA), under Section 402, oversees the permit program of the National Pollutant Discharge Elimination System (NPDES) that establishes a framework for regulating municipal and industrial point source discharges of storm water into the waters of the United States. To ensure compliance with CWA Section 402, the State Water Resources Control Board (SWRCB) has issued the Department a NPDES Permit (Order No.: 99-06-DWQ, NPDES No.: CAS000003) for storm water discharges from Department properties, facilities, and activities. This permit is governed by the San Francisco Bay Regional Water Quality Control Board (RWQCB-2) under the auspices of the SWRCB.

Floodplains
Since portions of US 101 are in a 100-year flood plain, measures will be taken in compliance with E.O. 11988. Executive Order 11988 (Floodplain Management) directs all federal agencies to refrain from conducting, supporting or allowing an action in the floodplain unless it is the only practical alternative. The Federal Highway Administration requirements for compliance are outlined in 23 CFR 650 Subpart A. In addition, Caltrans and partner agencies will need to consider evolving state policy on assumed Sea Level Rise as an impact of global climate change.

Rising Sea Level
There are increasing concerns surrounding rising sea level due to global climate change. Based on research, consulting with local governments, technical and scientific advisors, the Caltrans Climate Action Team forecasts that sea level will rise up to 55 inches by 2100. This sea level rise puts portions of the State Highway System and transportation corridors-at-risk. Low elevation areas face the greatest threat from rising sea level. According to Caltrans' February 2009 Preliminary Assessment on Vulnerability of Transportation Systems to Sea Level Rise, up to "40.4 miles of US 101 would be at risk given a 55-inch sea level rise" (34.5 miles in San Mateo County south from I-380, and 5.9 miles in Santa Clara County). Caltrans will need to consider the effects of global climate change when planning for future development of the US 101 South CSMP corridor.

Wetlands
The Executive Order for the Protection of Wetlands (E.O. 11990) also regulates the activities of federal agencies with regard to wetlands. Essentially, this executive order states that a federal agency, such as the Federal Highway Administration, cannot undertake or provide assistance for new construction located in wetlands unless the head of the agency finds 1) there is no practical alternative to the construction and 2) the proposed project includes all practical measures to minimize harm.

There may be drainage areas and wetlands off US 101. Any project's proposed scope of work would have to be adjusted to avoid or minimize impacts (particularly those associated with staging of equipment and materials) to the wetlands. Potential impacts will be evaluated during the PA/ED phase of proposed projects.

Biological Resources
The US 101 South CSMP corridor houses several different species listed on federal and state lists as threatened and endangered (T/E) species, while designated wetlands in the area are home for listed butterflies; vernal pools near the roadway may also support several T/E species. The US 101 corridor study limits are within areas of urban development and adjacent to heavily trafficked roads. At some locations, landscaped portions may house sensitive biotic species.

After a general query of California Natural Diversity Database (CNDDB), Table 2.9.2 indicates threatened and endangered species that have been noted within the corridor segments:

COMMON NAME	SCIENTIFIC NAME
Fauna	
American Peregrine Falcon	*Falco peregrinus anatum*
Bank Swallow	*Riparia riparia*
Bay Checkerspot Butterfly	*Euphydryas editha bayensis*
California Black Rail	*Laterallus jamaicensis coturniculus*
California Clapper Rail	*Rallus longirostris obsoletus*
California Least Tern	*Sternula antillarum browni*
California Red-Legged Frog	*Rana aurora draytonii*
California Tiger Salamander	*Ambystoma californiense*
Callippe Silverspot Butterfly	*Speyeria callippe callippe*
Marin Western Flax	*Hesperolinon congestum*
Mission Blue Butterfly	*Plebejus icarioides missionensis*
Myrtle's Silverspot	*Speyeria zerene myrtleae*
Salt-Marsh Harvest Mouse	*Reithrodontomys raviventris*
San Bruno Elfin Butterfly	*Callophrys mossii bayensis*
San Francisco Garter Snake	*Thamnophis sirtalis tetrataenia*
Steelhead - Central California Coast ESU	*Oncorhynchus mykiss irideus*
Tidewater Goby	*Eucyclogobius newberryi*
Western snowy plover	*Charadrius alexandrinus nivosus*
Flora	
Adobe Sanicle	*Sanicula maritima*
Beach Layia	*Layia carnosa*
California Seablite	*Suaeda californica*
Crystal Springs Fountain Thistle	*Cirsium fontinale var. fontinale*
Hickman's Cinquefoil	*Potentilla hickmanii*
Pacific Manzanita	*Arctostaphylos pacifica*
Presidio Manzanita	*Arctostaphylos hookeri ssp. ravenii*
Robust Spineflower	*Chorizanthe robusta var. robusta*
San Bruno Mountain Manzanita	*Arctostaphylos imbricata*
San Francisco Lessingia	*Lessingia germanorum*
San Mateo Thorn-Mint	*Acanthomintha duttonii*
San Mateo Woolly Sunflower	*Eriophyllum latilobum*
White-Rayed Pentachaeta	*Pentachaeta bellidiflora*

Table 2.9.2. Flora & Fauna in US 101 South CSMP Corridor.
Source: *California Natural Diversity Database (CNDDB).*

In addition, the California Department of Fish and Game considers all bat species as species of special concern. Potential impacts will be evaluated during the PA/ED phase of proposed projects.

Farmlands of Local Importance

Farmlands of Local Importance in California are regulated under the authority of the federal Farmland Protection Policy Act of 1981 and the California Department of Conservation, Natural Resource Conservation Service (NRCS). Natural Resource Conservation Service compliance regarding the treatment of farmland would need assessment if farmland is determined to be within the area of study.

Two areas have been identified in the corridor, one located in South San Jose, and the other located in Mountain View, both on the eastside of the facility.

Historic and Cultural Resources

Historic Resources

In the National Historic Preservation Act of 1966, national policy and procedures are set forth regarding historic properties defined as districts, sites, buildings, structures, and objects included in or eligible for the National Register of Historic Places. In terms of historic architectural resources, there are about 25 properties listed on the National Register of Historic Places (NRHP) within ½ mile of the US 101 South CSMP corridor. There is also the possibility of state or locally listed properties being located in the general vicinity of the project corridor. In terms of proximity, the following historic properties are closest (within 500 to 1,000 feet) to the 101 corridor in San Mateo and Santa Clara counties:

- South San Francisco, Martin Building at 220 Grand Avenue, listed on the NRHP.
- US Naval Air Station (Moffett Field and Ames Research Center – Mountain View/Sunnyvale). A 124-acre portion of Moffett Field is listed on the NRHP as the Shenandoah Plaza National Historic District, and includes Hangar 1, which was built to house the dirigible USS Macon. As well as contributing to the historic district, Hangar 1 is also a Naval Historical Monument and a California Historic Civil Engineering Landmark. Other historic properties at Moffett Field/Ames Research Center include the Unitary Plan Wind Tunnel, a National Historic Landmark. Though not yet listed on the National Register of Historic Places, at least five additional buildings or facilities at Moffett Field/Ames Research Center are likely eligible.

Along the US 101 South CSMP corridor, there are approximately 35 historical bridges that cross the facility. To qualify as a historical bridge, it needs to have been constructed prior to 1955. If the potential exists that cultural resources are impacted in and around the corridor, studies would be needed to see if any potential resources would be disturbed or affected. Historical properties could be in the sphere of influence, (within 1/2 mile) of the US 101 South CSMP corridor. Possible impacts to other historic architectural resources that are more distant to the corridor may also need to be evaluated.

Cultural Resources

During the PA/ED phase of project development, the Office of Cultural Resource Studies (OCRS) will determine which projects will qualify for screening. If a records search confirms a lack of resources within the proposed project areas, a memorandum to the file would be sufficient to achieve cultural resources compliance for projects proposed in the corridor. Measures would be taken under Section 106 of the National Historic Preservation Act (36 CFR 800).

Archeology

Sensitive archeological sites are known to exist along the corridor. Waterway routes in the corridor are of particular interest and need to be protected. Caltrans will follow Department procedure relating to sensitive archeological areas. It is necessary to identify culturally significant resources during project planning stages. Native American monitors observe archaeological excavations or construction activity in areas that are sensitive, based on mutual agreement. If sensitive material is found, Department policy and State and Federal Law require that activity in the area be stopped until appropriate action can be taken.

Source: NACS Branch Information Sheet History of the Presence of Native American monitors on CT projects

Parks / Open Space
Section 4(f) of USC 49 section 303 sets federal policy concerning the preservation of the natural beauty of open space and historic areas. Resources include publicly owned parks, recreation areas, wildlife or waterfowl refuges and historic sites. Environmental staff will determine the need for a Section 4(f) evaluation based on a specific project potential to impact 4(f) resources located in a given study area. Mitigation for impacts will be developed where appropriate in corridor-specific areas. Where specific projects for the CSMP study do not involve new right of way acquisition, potential impacts to 4(f) resources would be limited to "constructive use" or "proximity impacts" such as noise and/or dust levels that would interfere with the use of 4(f) facilities. Based on preliminary review, 4(f) resources located in the CSMP study area include, but are not limited to, Bayside Park (Burlingame), Poplar Creek Golf Course (San Mateo), Fiesta Meadows Park (San Mateo), Belmont Sports Complex (Belmont), Kelly Park (Menlo Park), and Greer Park (Palo Alto). Others are San Bruno Mountain State and County Park, 7th Avenue Park, Coyote Point County Recreation Area, Fiesta Meadows Park, Laguna Vista Park, Central Park, El Camino Park and Hoover Park. Table 2.9.3 below, identifies parks and/or open space in the corridor listed by jurisdiction.

Santa Clara County Parks	San Mateo County Parks	Preserves	State Parks
Santa Clara County	**San Mateo County**		
Coyote Creek Park	**Flood Park**	**Coyote Point County Recreation Area**	**San Bruno Mountain State and County Park**
City of San Jose	**City of Belmont**		
Windmill Springs Park	**Belmont Sports Complex**		
Meadowfair Park			
Kelley Park	**City of Burlingame**		
Emma Prusch Memorial Park	**Bayside Park**		
City of Palo Alto	**City of San Mateo**		
John Lucas Greer Park	**Fiesta Meadows Park**		
	Los Prados Park		
	Meadow Square Park		
	City of Menlo Park		
	Kelly Park		

Table 2.9.3. Park/Open Space in US 101 South CSMP Corridor.

Visual/Aesthetics
The US 101 South CSMP corridor in San Mateo and Santa Clara Counties is not a Scenic Highway and is not eligible for scenic highway designation. The majority of the corridor is urban in nature, with sound walls extending throughout the corridor. Neighboring businesses and commercial properties are often visible from the freeway.

Elements of transportation facilities typically include poles, sign structures, electrical equipment, etc. within the freeway right of way (R/W). Placement of poles and any miscellaneous structures within Bay Conservation Development Commission (BCDC) jurisdiction are subject to permit approval.

Community Impact Issues
If significant community impacts are identified, reasonable steps to avoid or minimize these are to be considered and incorporated into project-specific proposals.

If initial reviews indicate adverse community impacts, such as impacts on minority and low-income populations (Title VI of the Civil Rights Act of 1964 and Executive Order 12898), actions will be taken to ensure proper mitigation.

Compliance with State and federal regulations, including CEQA *Guidelines* 15355 and 40 CFR 1508.7, requires that cumulative impacts be mitigated where identified.

SECTION 3
CURRENT OPERATING CONDITIONS

3.1 Introduction to Current Operating Conditions

This section describes the current US 101 corridor conditions as derived from the following reports:

- San Mateo US 101 Freeway Corridor Technical Analysis *for Corridor System Management Plan*. The study limits are from the San Francisco/San Mateo County line to the SR-85 in Santa Clara County, a total of 26 miles. The report is dated September 30, 2010 and was prepared by Dowling Associates Inc.

- Traffic Operations Analysis Report, US 101 Auxiliary Lanes Project from Embarcadero to SR-85. The study limits extend from University Avenue to Ellis Street, slightly beyond the Auxiliary Lane project limits. This report is dated February 23, 2009 and was prepared by Fehr & Peers Associates for the Santa Clara Valley Transportation Authority and for the Environmental Report prepared by Caltrans District 4.

- The US 101 North Implementation Plan. The limits are from McKee Road interchange to the Trimble/De La Cruz interchange.

- Traffic Operations Report, US 101 Operational Improvements from I-280/I-680 to Yerba Buena Road. The study limits extend from McKee Road to Hellyer Avenue. This report is dated October 2005 and was prepared by Fehr & Peers Associates for Caltrans District 4, the Santa Clara Valley Transportation Authority, and the City of San Jose.

Together with VTP 2035, the Freeway Performance Measurement System PeMS and Highway Congestion Monitoring Program (HiComp) data, these documents provide an existing conditions performance assessment for significant segments of the US 101 CSMP Corridor.

3.2 US 101 in San Mateo

This section documents the current condition of the US 101 segment from the San Francisco/San Mateo County Line to the San Mateo/ Santa Clara County Line.

The information in this section is derived from the FPI Technical Analysis report titled "San Mateo US 101 Freeway Corridor Technical Analysis for Corridor System Management Plan." With the CMIA project located close to the county line, a small section along US 101 in Santa Clara County was included in the study between the Santa Clara County line and the US 101/SR 85 Interchange. The main focus of the report, however, remains in San Mateo County.

Within the study corridor limits, US 101 is primarily an eight-lane (8-lane) freeway facility, with four mixed-flow lanes in each direction between the US 101 Harney Way Interchange and US 101/Whipple Avenue Interchange. The corridor then narrows to a six-lane freeway facility with three mixed-flow lanes in each direction between the US 101/Whipple Avenue Interchange and US 101/University Avenue Interchange. Aux lanes are found between Millbrae and Third Street. The posted speed limit is 65 miles per hour.

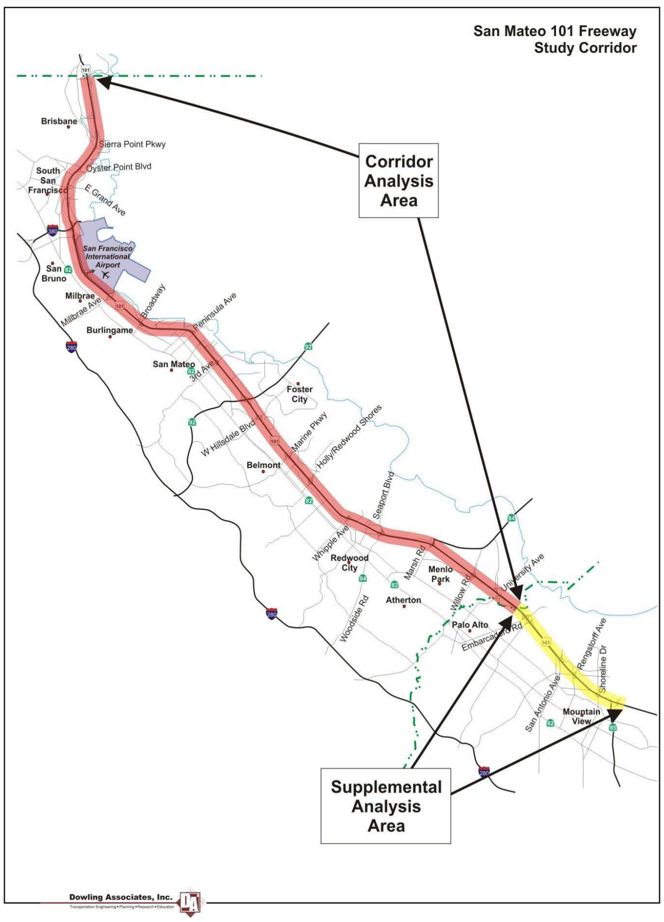


Figure 3.2.1. San Mateo 101 Freeway Study Corridor.

In Santa Clara County, the US 101 facility is six-lanes wide between the US 101/ SR 85 Interchange and the US 101/Embarcadero Road Interchange. Auxiliary lanes are constructed between various interchanges in the corridor.

In San Mateo County, there is an HOV lane in both directions beginning at the US 101/ Whipple Avenue interchange and continuing south to the Santa Clara County line (AM Peak Period 6:00 – 10:00 and PM Peak Period 2:30 – 7:30).

Caltrans' District 4's existing Intelligent Transportation System infrastructure on the corridor includes ramp metering stations, traffic monitoring stations, Changeable Message Signs (CMS), Highway Advisory Radio (HAR), Extinguishable Message Signs (EMS), and Closed-Circuit Television (CCTV) cameras.

US 101 currently has ramp metering installed that is operational in the northbound and southbound directions between University Avenue and Hillsdale Boulevard. Ramp metering hours of operation are from 6 – 10 AM and 3 – 7 PM.

US 101 freeway currently carries between 130,000 and 190,000 ADT (see Table 3.2.1). Peak-period volumes range from 50,000 to 60,000 vehicles (see Table 3.2.2). The 4-hour AM peak period volumes are typically 29% of daily traffic. The 5-hour PM peak period typically accounts for 32 % of daily traffic. The peak hour volumes are equal to about 7% of daily traffic. Table 3.2.3 shows the directional percentage of traffic during the AM and PM periods.

	At SR-85			At SR 92			At Harney Way		
Day	NB	SB	Total	NB	SB	Total	NB	SB	Total
1/26/09	93,752	88,238	181,990	75,173	95,248	170,421	80,634	90,147	170,781
1/27/09	94,473	90,397	184,870	77,254	94,959	172,213	81,881	93,070	174,951
1/28/09	96,839	92,430	189,269	78,110	97,538	175,648	84,876	95,001	179,877
1/29/09	98,439	91,405	189,844	80,399	97,831	178,230	85,670	97,128	182,798
1/30/09	101,652	89,466	191,118	82,124	99,174	181,298	87,254	99,233	186,487
1/31/09	79,766	51,180	130,946	73,637	84,124	157,761	76,857	74,831	151,688
2/1/09	70,063	43,436	113,499	61,425	74,055	135,480	69,471	63,216	132,687

Table 3.2.1. Daily Traffic Counts US 101 Mainline San Mateo County.
Source: *San Mateo US 101 Freeway Corridor Technical Analysis* – Exhibit 13.

Facility	Location	AM	PM
SR-101	At SR-85	53,792	61,411
SR-101	At SR 92	49,106	54,489
SR-101	At Harney Way	53,326	56,409

Table 3.2.2. Weekday Peak Period Mainline Traffic Volumes, January 2009.
Source: *San Mateo US 101 Freeway Corridor Technical Analysis* – Exhibit 14 (PeMS, January 27-29, 2009).

Facility	Location	AM (NB/SB)	PM (NB/SB)
SR-101	At SR-85	53/47	52/48
SR-101	At SR 92	42/58	46/54
SR-101	At Harney Way	48/52	46/54

Table 3.2.3. Directional percentage traffic during AM and PM peak periods.
Source: *San Mateo US 101 Freeway Corridor Technical Analysis* – Exhibit 21.

Table 3.2.4 shows the performance measures obtained from the FREQ models runs for the US 101 study corridor in 2009 between Palo Alto (SR 114) and the toll tag reader on I-280. Note that the AM peak extends from 6 AM to 10 AM weekdays and the PM peak extends from 2:30 PM to 7:30 PM weekdays.

MOE	NB AM HOV	NB AM Non-HOV	NB AM Total	SB AM HOV	SB AM Non-HOV	SB AM Total	AM Total
VMT	49,469	765,129	814,598	26,319	667,784	694,103	1,508,701
VHT	761	16040	16801	405	14542	14946	31747
MPH	65	48	48	65	46	46	48
PMT	108,695	876,430	985,124	63,076	757,870	820,945	1,806,070
PHT	1,672	18,641	20,313	970	16,671	17,641	37,954
MOE	**NB PM HOV**	**NB PM Non-HOV**	**NB PM Total**	**SB PM HOV**	**SB PM Non-HOV**	**SB PM Total**	**PM Total**
VMT	53,594	1,002,311	1,055,905	48,997	888,821	937,818	1,993,723
VHT	825	23907	24732	754	18757	19511	44243
MPH	65	42	43	65	47	48	45
PMT	123,294	1,188,135	1,311,429	110,174	1,057,088	1,167,262	2,478,692
PHT	1,897	28,838	30,735	1,695	22,513	24,208	54,943

Table 3.2.4. US 101 Performance Measures 2009.
Source: *San Mateo US 101 Freeway Corridor Technical Analysis* – Exhibit 34.
MOE: *Measure of Effectiveness*
VMT: *Vehicle Mile of Travel*
VHT: *Vehicle Hours Traveled*
MPH: *Mile per hour*
PMT: *Person Miles Traveled*
PHT: *Person Hours Traveled*

Origin and Destination

From the San Mateo County Travel Demand Model (2009), the following origin and destinations (O+D) per county for US 101 was found.

During the AM Peak Period, the O+D for US 101 Northbound Destination by County shows that of all US 101 traffic in this direction, 31 percent originated and stayed within San Mateo County, while 19 percent traveled from San Mateo County to San Francisco. From Santa Clara County, 24 percent traveled to San Mateo County and 7 percent to San Francisco via US 101. Meanwhile, Alameda County was the origin for 7 percent of US 101 traffic, whereas 3 percent of traffic had Alameda County as destination.

During the PM period in the Northbound direction, 28 percent originated and stayed within San Mateo County, while 33 percent traveled to San Francisco. Twenty percent started in Santa Clara going north, and one in four of them continued driving to San Francisco. Nine percent of drivers started in Alameda to go to San Mateo County, while two percent took US 101 from San Mateo to Alameda County.

During the AM Peak Period, the O+D for US 101 Southbound Destination by County shows that of all US 101 traffic in this direction 22 percent of traffic originated and remained in San Mateo County, while 29 percent arrived in this county from San Francisco. Driving to Santa Clara County, four percent of all US 101 drivers started their trip in San Francisco, and 35 percent started in San Mateo County. Alameda-, Contra Costa- and Solano-County drivers reaching San Mateo accounted together for seven percent, while one percent started in San Mateo with Alameda County as destination.

During the PM period in the Southbound direction, 42 percent originated and stayed within San Mateo County, while 19 percent traveled to Santa Clara County. Eighteen percent started in San Francisco going south to San Mateo County, while an additional one percent started there and continued on until reaching Santa Clara County. Alameda-, Contra Costa-, and Solano-County drivers reaching San Mateo together accounted for twelve percent, while two percent started in San Mateo with Alameda County as their destination.

Peak Period Vehicle Occupancy

Vehicle Occupancy was investigated by Dowling Associates (FPI, pages 38, 39), and in the northbound direction between 75 and 80 percent of the cars was found to be single occupancy vehicles. They accounted for between 60 and 65 percent of the individuals traveling on US 101. High Occupancy Vehicles were mostly 2-person vehicles, with a total of HOV usage between 15 and 19 percent for car split, amounting to 26 to 31 percent of the individuals. Close to ten percent of traffic was found to be buses, vanpools, motorcycles or trucks.

In the southbound direction between 79 and 82 percent of the cars were single occupancy vehicles. They accounted for between 63 and 65 percent of the individuals traveling on US 101 in this direction. HOVs were mostly 2-person vehicles, with a total of HOV usage between 15 and 17 percent for car split, amounting to 24 to 28 percent of the individuals traveling on US 101. Between eight and ten percent of traffic was found to be buses, vanpools, motorcycles or trucks.

Mobility

One measure of mobility is travel time. This metric is defined as how long it takes to drive the length of the corridor at various times of the day. The typical travel time is the historical average driving time between a starting and ending point for a particular day of the week and time of day. It is expressed in average minutes.

The FPI report utilized the Performance Measurement System (PeMS) tool to determine travel time on US 101 in San Mateo County. The 511 Electronic Toll Card (ETC) readers provide PeMS the travel times between the shown locations SR 114 and SR 92 (11 miles), and SR 92 and I-280 (16 miles).

Freeway	Travel Time Segment	Average Travel Time Through 24-Hr Period	Average Travel Time During AM Peak Period	Average Travel Time During PM Peak Period
US 101 NB	Palo Alto (SR 114) to SR 92	27	38	28
	SR 92 to I-280	36	46	34
US 101 SB	I-280 to SR 92	43	49	45
	SR 92 to Palo Alto (SR 114)	26	36	26

Table 3.2.5. Average Travel Time (in minutes).
Source: *San Mateo US 101 Freeway Corridor Technical Analysis* – Exhibit 32 (PeMS 511 toll-tag data).

Vehicle Hours of Delay
Another key measure of mobility is Vehicle Hours of Delay (VHD), monitoring the level of delay experienced by the traveling public (see Table 3.2.6). The average delay time for a 24-hour period was found to be 37 minutes in the northbound direction, and 36 minutes in the southbound direction.

Freeway	Travel Time Segment	Estimated Free-Flow Travel Time During off-peak	Average Delay Time Through 24-Hr Period
US 101 NB	Palo Alto (SR 114) to SR 92	11	17
	SR 92 to I-280	17	20
US 101 SB	I-280 to SR 92	20	22
	SR 92 to Palo Alto (SR 114)	12	14

Table 3.2.6. Average Delay Times (in minutes).
Source: *San Mateo US 101 Freeway Corridor Technical Analysis* – Exhibit 33 (PeMS 511 toll-tag data).

Reliability
The reliability or predictability of the freeway system is measured by the amount of variation of travel times and the buffer index. The buffer index represents the extra time that travelers must add to their average travel time when planning trips to ensure on-time arrival with a 95 percent confidence level.

Existing 2009							
Segment	**Stretch**	**Length (Miles)**	**Peak Period**	**Mean Time (min.)**	**Stndrd. Deviat. (min.)**	**95% Time (min.)**	**Buffer Index**
US 101 NB	Palo Alto (SR-114) to SR 92	10.75	6:00-10:00 AM	38	31	132	244%
US 101 NB	Palo Alto (SR-114) to SR 92	10.75	2:30-7:30 PM	28	15	73	164%
US 101 SB	SR 92 to Palo Alto (SR-114)	10.75	6:00-10:00 AM	36	29	125	243%
US 101 SB	SR 92 to Palo Alto (SR-114)	10.75	2:30-7:30 PM	26	19	83	219%
US 101 NB	SR 92 to I-280	15.85	6:00-10:00 AM	46	30	136	193%
US 101 NB	SR 92 to I-280	15.85	2:30-7:30 PM	34	25	107	220%
US 101 SB	I-280 to SR 92	15.85	6:00-10:00 AM	49	35	152	212%
US 101 SB	I-280 to SR 92	15.85	2:30-7:30 PM	45	23	113	154%

Table 3.2.7. Travel Time Reliability on US 101 in San Mateo.
Source: *San Mateo US 101 Freeway Corridor Technical Analysis* – Exhibit 36 (PeMS 511 toll-tag vehicle readers, January 1 – 31, 2009). Mean, Standard Deviation and 95 Percentile entries are in minutes.

The US 101 freeway between Palo Alto (SR 114) and SR 92 shows the lowest reliability (highest buffer indices, highest standard deviations, and highest mean travel times).

Productivity

Productivity is a system efficiency measure, the purpose of which is to analyze the capacity of the corridor at any given time. It is defined as vehicle throughput during peak congestion conditions, and is expressed in Lost Lane Miles (LLM). As congestion occurs, flow rates on the freeway decline due to merging, weaving and queuing, resulting in lower freeway throughput.

The lost lane-miles of productivity is computed according to the following equation.
Lost Lane Miles = {1 – (Observed Lane Throughput)/2000 vphpl} x Lanes x Congested Miles
Lost Lane-Miles = (Proportion lost throughput) x (Congested Lane-Miles)

Facility	Stretch	Year	Dir	Congested Lane-Miles	Lost Lane-Miles
US 101	SM/SF County Line to I-380	2009 AM	NB	0.77	0.42
			SB	0.00	0.00
		2009 PM	NB	18.22	10.02
			SB	19.91	10.95
US 101	I-380 to SR 92	2009 AM	NB	84.56	46.51
			SB	53.18	29.25
		2009 PM	NB	143.45	78.90
			SB	76.10	41.85
US 101	SR 92 to SM/SC County Line	2009 AM	NB	99.14	54.53
			SB	80.48	44.26
		2009 PM	NB	118.78	65.33
			SB	84.08	46.24

Table 3.2.8. Lost Productivity (2009).
Source: *San Mateo US 101 Freeway Corridor Technical Analysis* – Exhibit 47 (FREQ analysis, peak period results, lost throughput estimated at 55% for freeways).

Between the San Francisco County Line and I-380, the greatest loss of productivity occurs in the PM peak period. AM peak period congestion is at approximately 70% level of the PM peak period conditions.

Between I-380 and the Santa Clara County Line both the AM and PM peak periods suffer large losses in productivity. The greatest losses are south of the SR 92 interchange to the Santa Clara County Line.

Figure 3.2.2. US 101 South CSMP Congestion.

3.3 CMIA in Santa Clara County: US 101/SR 85 interchange to Embarcadero Road

This section documents the current condition of the US 101 segment from the Embarcadero Road to the SR 85 North interchange in Santa Clara County, as shown in Figure 3.3.

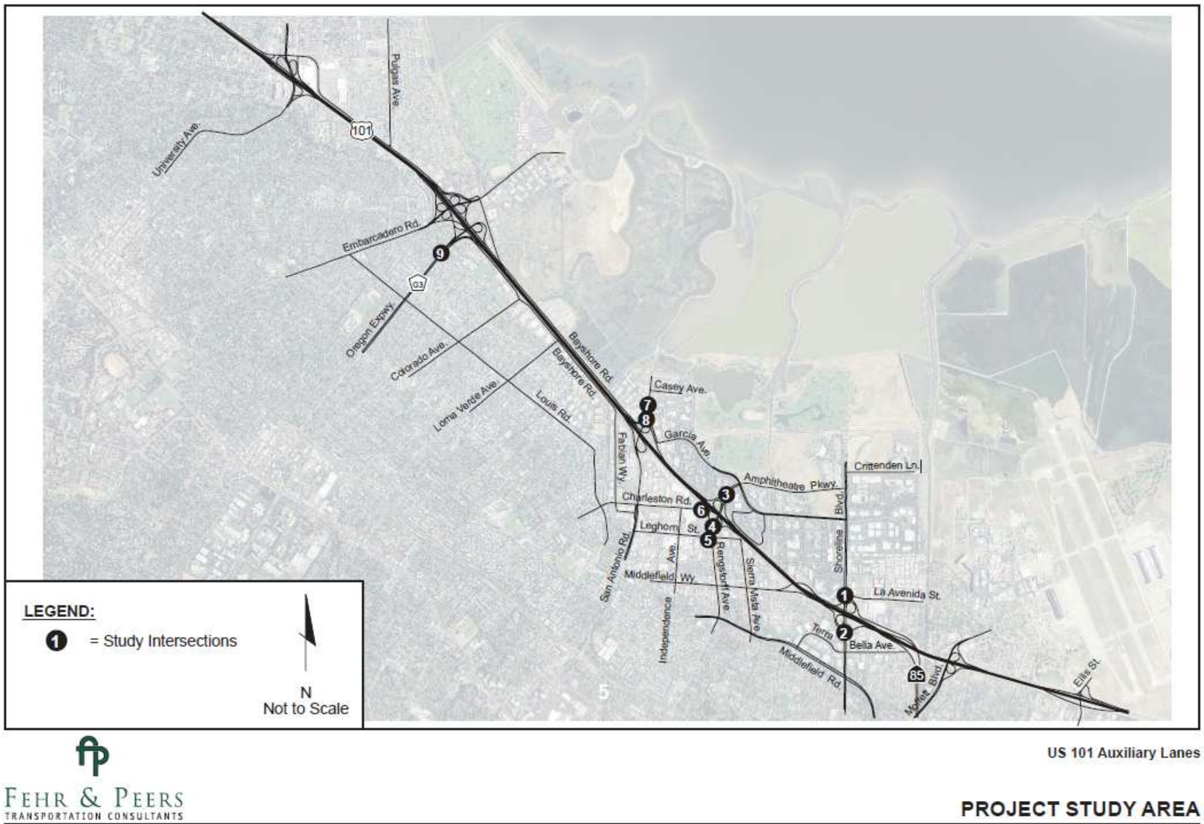


Figure 3.3. Project Study Area CMIA Project US 101/SR 85 interchange to Embarcadero Road.

US 101 Travel Time Survey Results

Travel time surveys were performed on US 101 in both directions during the 6:00 – 9:00 AM and the 4:00 – 7:00 PM peak periods in October and November 2007 using the floating car technique. Table 3.3.1a and Table 3.3.1b present the average travel times and speeds during the peak hour periods. The travel time data indicate that traffic conditions during the AM peak hour are congested in the northbound and southbound directions on segments within the study area. In the northbound direction, during the AM peak hour, average travel speed varies between 11 mph and 51 mph; in the southbound direction, during the AM peak hour, the average travel speed varies between 40 mph and 64 mph. During the PM peak hour, the northbound and southbound directions experience congestion on segments within the study area. In the northbound direction, average travel speed varies between 11 mph and 47 mph; in the southbound direction, during the PM peak hour, the average travel speed varies between 22 and 61 mph.

Segment	Distance (Miles)	Average Travel Time (Minutes:Seconds)	Average Travel Speed (Miles/Hour)
AM Peak Hour – Northbound			
Ellis Street On-Ramp to Moffett Boulevard Off-Ramp	0.44	0:25	24
Moffett Boulevard Off-Ramp to Moffett Boulevard On-Ramp	0.16	1:17	25
Moffett Boulevard On-Ramp to Shoreline Boulevard Off-Ramp	0.20	1:19	11
Shoreline Boulevard Off-Ramp to SR 85 On-Ramp	0.31	1:39	14
SR 85 On-Ramp to Old Middlefield Road Off-Ramp	0.34	1:31	19
Old Middlefield Road Off-Ramp to Shoreline Bouelvard On-Ramp	0.35	1:36	14
Shoreline Boulevard On-Ramp to NB Rengstorff Avenue Off-Ramp	0.42	0:55	28
NB Rengstorff Avenue Off-Ramp to Rengstorff Avenue On-Ramp	0.27	0:30	36
Rengstorff Avenue On-Ramp to San Antonio Road Off-Ramp	0.33	0:37	32
San Antonio Road Off-Ramp to San Antonio Road NB On-Ramp	0.25	0:41	24
San Antonio Road NB On-Ramp to Oregon Expressway/Embarcadero Road Off-Ramp	1.36	2:12	39
Oregon Expressway/Embarcadero Road Off-Ramp to Oregon Expressway/Embarcadero Road On-Ramp	0.64	0:46	51
Oregon Expressway/Embarcadero Road On-Ramp to University Road Off-Ramp	0.93	1:10	48
Subtotal	*5.98*	*14:44*	*24*
AM Peak Hour – Southbound			
University Avenue On-Ramp to Oregon Expressway/Embarcadero Road Off-Ramp	0.80	1:13	40
Oregon Expressway/Embarcadero Road Off-Ramp to Oregon Expressway/Embarcadero Road On-Ramp	0.62	0:56	44
Oregon Expressway/Embarcadero Road On-Ramp to San Antonio Road SB Off-Ramp	1.39	2:02	41
San Antonio Road SB Off-Ramp to Charleston Road On-Ramp	0.81	0:48	59
Charleston Road On-Ramp to Rengstorff Avenue Off-Ramp	0.06	0:04	56
Rengstorff Avenue Off-Ramp to Rengstorff Avenue On-Ramp	0.11	0:07	60
Rengstorff Avenue On-Ramp to Old Middlefield Road On-Ramp	0.61	0:41	54
Old Middlefield Road On-Ramp to Shoreline Boulevard Off-Ramp	0.14	0:09	55
Shoreline Boulevard Off-Ramp to SR 85 Off-Ramp	0.31	0:22	55
SR 85 Off-Ramp to Shoreline Boulevard On-Ramp	0.43	0:27	58
Shoreline Boulevard On-Ramp to Moffett Boulevard Off-Ramp	0.12	0:08	57
Moffett Boulevard Off-Ramp to Moffett Boulevard On-Ramp	0.10	0:06	50
Moffett Boulevard On-Ramp to Ellis Street Off-Ramp	0.50	0:29	64
Subtotal	*6.00*	*7:31*	*48*

Table 3.3.1.a. Existing US 101 Mainline Travel Times and Speeds – AM Peak Hours**.**
Source: *Traffic Operations Analysis Report*, US 101 Auxiliary Lanes Project from Embarcadero to SR 85 – Table 1.

Segment	Distance (Miles)	Average Travel Time (Minutes:Seconds)	Average Travel Speed (Miles/Hour)
PM Peak Hour – Northbound			
Ellis Street Off-Ramp to Ellis Street On-Ramp			
Ellis Street On-Ramp to Moffett Boulevard Off-Ramp	0.44	0:46	38
Moffett Boulevard Off-Ramp to Moffett Boulevard On-Ramp	0.16	0:10	47
Moffett Boulevard On-Ramp to Shoreline Boulevard Off-Ramp	0.20	0:36	23
Shoreline Boulevard Off-Ramp to SR 85 On-Ramp	0.31	0:39	22
SR 85 On-Ramp to Old Middlefield Road Off-Ramp	0.34	1:45	13
Old Middlefield Road Off-Ramp to Shoreline Bouelvard On-Ramp	0.35	2:08	11
Shoreline Boulevard On-Ramp to NB Rengstorff Avenue Off-Ramp	0.42	1:32	17
NB Rengstorff Avenue Off-Ramp to Rengstorff Avenue On-Ramp	0.27	0:51	20
Rengstorff Avenue On-Ramp to San Antonio Road Off-Ramp	0.33	0:54	24
San Antonio Road Off-Ramp to San Antonio Road NB On-Ramp	0.25	0:38	24
San Antonio Road NB On-Ramp to Oregon Expressway/Embarcadero Road Off-Ramp	1.36	2:20	36
Oregon Expressway/Embarcadero Road Off-Ramp to Oregon Expressway/Embarcadero Road On-Ramp	0.64	0:57	42
Oregon Expressway/Embarcadero Road On-Ramp to University Road Off-Ramp	0.93	1:22	43
Subtotal	*5.98*	*14:37*	*25*
PM Peak Hour – Southbound			
University Avenue On-Ramp to Oregon Expressway/Embarcadero Road Off-Ramp	0.80	1:14	42
Oregon Expressway/Embarcadero Road Off-Ramp to Oregon Expressway/Embarcadero Road On-Ramp	0.62	1:19	38
Oregon Expressway/Embarcadero Road On-Ramp to San Antonio Road SB Off-Ramp	1.39	2:16	40
San Antonio Road SB Off-Ramp to Charleston Road On-Ramp	0.81	2:00	28
Charleston Road On-Ramp to Rengstorff Avenue Off-Ramp	0.06	0:10	22
Rengstorff Avenue Off-Ramp to Rengstorff Avenue On-Ramp	0.11	0:17	24
Rengstorff Avenue On-Ramp to Old Middlefield Road On-Ramp	0.61	0:56	40
Old Middlefield Road On-Ramp to Shoreline Boulevard Off-Ramp	0.14	0:09	53
Shoreline Boulevard Off-Ramp to SR 85 Off-Ramp	0.31	0:22	53
SR 85 Off-Ramp to Shoreline Boulevard On-Ramp	0.43	0:25	62
Shoreline Boulevard On-Ramp to Moffett Boulevard Off-Ramp	0.12	0:07	60
Moffett Boulevard Off-Ramp to Moffett Boulevard On-Ramp	0.10	0:10	46
Moffett Boulevard On-Ramp to Ellis Street Off-Ramp	0.50	0:30	61
Subtotal	*6.00*	*9:54*	*36*

Table 3.3.1.b. Existing US 101 Mainline Travel Times and Speeds – PM Peak Hours.
Source: *Traffic Operations Analysis Report*, US 101 Auxiliary Lanes Project from Embarcadero to SR 85 – Table 1.

FREQ

FREQ simulation models representing northbound and southbound US 101 were developed to evaluate freeway mainline traffic operations during the 6:00 to 9:00 AM and 4:00 to 7:00 PM peak periods. A total of four FREQ models were developed (Northbound AM, Northbound PM, Southbound AM, and Southbound PM). The limits of the FREQ models are from just north of the SR 237 junction to the University Avenue interchange. Existing demand volumes, roadway lane configurations, truck percentage, etc. were used to develop the existing conditions models. The models were then used to determine traffic operations and the corridor Measures of Effectiveness (MOE), leading to the validation results for the bottleneck locations as shown in Table 3.3.2.

Direction/Peak Hr	Observed Location	FREQ Model location
Northbound AM	Lane drop, south of the Shoreline Boulevard on-ramp	Lane drop, south of the Shoreline Boulevard on-ramp
	Shoreline Boulevard on-ramp to Rengstorff Avenue off-ramp	Shoreline Boulevard on-ramp to Rengstorff Avenue off-ramp
	San Antonio Road on-ramp to Oregon Expressway/Embarcadero Road off-ramp segment	San Antonio Road on-ramp to Oregon Expressway/Embarcadero Road off-ramp segment
Northbound PM	San Antonio Road on-ramp to Oregon Expressway/Embarcadero Road off-ramp	San Antonio Road on-ramp to Oregon Expressway/Embarcadero Road off-ramp
	Oregon Expressway/Embarcadero Road on-ramp to University Avenue off-ramp	Oregon Expressway/Embarcadero Road on-ramp to University Avenue off-ramp
Southbound AM	University Avenue on-ramp to Oregon Expressway/Embarcadero Road off-ramp segment	University Avenue on-ramp to Oregon Expressway/Embarcadero Road off-ramp segment
	Charleston Road on-ramp to Rengstorff Avenue off-ramp weaving segment	Charleston Road on-ramp to Rengstorff Avenue off-ramp weaving segment
Southbound PM	Rengstorff Avenue on-ramp to Old Middlefield Road on-ramp	Rengstorff Avenue on-ramp to Old Middlefield Road on-ramp

Table 3.3.2. Bottleneck Validation Results.
Source: *Traffic Operations Analysis Report*, US 101 Auxiliary Lanes Project from Embarcadero to SR 85 – Table 6.

Freeway Corridor Measures of Effectiveness

Corridor MOEs are presented for the mixed flow and HOV lanes for the three-hour AM and PM peak periods to provide a better understanding of overall traffic operations during these periods. Generally, travel times are lower (travel speeds are higher) for the peak periods than the peak hours as they contain hours with less congestion. Corridor MOEs for the three-hour AM and PM peak periods are presented in Table 3.3.3 for the mixed flow and HOV lanes. These MOEs reflect only the section of US 101 between Ellis Street and University Avenue.

Measure of Effectiveness (Units)	Northbound AM (6:00 to 9:00)		Southbound AM (6:00 to 9:00)		Northbound PM (4:00 to 7:00)		Southbound PM (4:00 to 7:00)	
	Mixed Flow	HOV	Mixed Flow	HOV	Mixed Flow	HOV	Mixed Flow	HOV
Vehicles Miles of Travel (vehicle-miles)	98,720	20,607	86,632	17,768	100,085	24,425	96,931	23,429
Average Travel Time (minutes:seconds)	10:12	5:32	5:53	5:32	12:23	5:44	11:26	5:35
Average Travel Speed (mph)	35	65	61	65	29	65	31	64
Mainline Vehicle Delay (vehicle-hours)	1,011	0	6	0	1,344	0	1,173	0

Note: Existing Peak Period MOEs are presented for US 101 between Ellis Street and University Avenue.

Table 3.3.3. Existing Peak Period Measures of Effectiveness.
Source: *Traffic Operations Analysis Report*, US 101 Auxiliary Lanes Project from Embarcadero to SR 85 – Table 8.

Vehicle Miles of Travel (VMT)
VMT represents the total distance traveled by all vehicles using the US 101 corridor. VMT is the sum of the volume served for each segment multiplied by the length of each segment. The highest VMT in the mixed-flow lanes occurs during the northbound PM peak period, while the lowest occurs during the southbound AM peak period. Similarly in the HOV lanes, the highest VMT occurs in the northbound PM peak period, while the lowest occurs during the southbound AM peak period.

Average Travel Time (ATT)
As presented in Table 3.3.4, the ATT in the mixed-flow lanes is greatest in the northbound direction in the PM peak hour with an average time of 12 minutes and 23 seconds, while the lowest ATT is the southbound direction during the AM peak hour with an average time of 5 minutes and 53 seconds. In the HOV lanes, ATT in each direction is approximately 5 ½ minutes since these lanes are near free-flow conditions.

Average Travel Speed (ATS)
As presented in Table 3.3.3, the ATS is highest in the southbound AM direction with an average travel speed of 61 mph, while the lowest is the northbound PM direction with an average speed of 29 mph. In the HOV lanes, the ATS is near free-flow conditions, 65 mph, during each peak period in both directions.

Vehicle Delay
Vehicle delay is the amount of delay incurred during the peak hour as a result of congestion and demand exceeding the capacity of a freeway segment or ramp. Vehicle delays were computed using the FREQ model output and are represented in units of vehicle-hours. For this study vehicle delay is defined as the time between the time it takes to travel a segment at 50 mph, and the travel time for a segment at a speed below 50 mph. It is important to note that this definition of vehicle delay is different than the definition used by Caltrans for the State Highway Congestion Monitoring Program (HICOMP) Report. Vehicle delay in the HICOMP Report is defined as the time it takes to travel a segment at a recorded congested speed and the travel time at 35 mph (i.e. speeds above 35 mph are not considered congested). The definition of vehicle delay used in this study is the more appropriate measure for this study because it will more clearly differentiate delay among the alternatives.

Vehicle delays were computed using the FREQ model output and are represented in units of vehicle-hours. As shown in Table 3.3.3, the highest delay in the mixed-flow lanes is experienced in the PM northbound direction with a total delay of 1,344 vehicle-hours, while the lowest delay is experienced in the AM southbound direction with 6 vehicle-hours. No mainline vehicle delay is experienced in the HOV lanes. The FREQ model underestimates travel times during both peak periods in each northbound direction and during the AM peak period in the southbound direction. Therefore, the peak period vehicle delay is likely to be slightly higher than predicted by the FREQ model.

Freeway Levels of Service
Existing freeway mainline peak hour levels of service from the FREQ models are presented in Table 3.3.4. During the AM peak hour, the northbound freeway segments operate at LOS E or F between the Ellis Street off-ramp and the Oregon Expressway/Embarcadero Road off-ramp. In the southbound direction US 101 operates at LOS E or F between the following locations:

- University Avenue on-ramp and the Oregon Expressway/Embarcadero Road off-ramp
- Oregon Expressway/Embarcadero Road on-ramp and San Antonio Road diagonal off-ramp
- Charleston Road on-ramp and Rengstorff Avenue off-ramp

During the PM peak hour in the northbound direction, the segments between the Ellis Street on-ramp and the University Avenue off-ramp operates at LOS E or F due to the high demand volumes and the bottlenecks at the San Antonio Road-Oregon Expressway/Embarcadero Road and Oregon

Expressway/Embarcadero Road-University Avenue segments. In the southbound direction, between the University Avenue on-ramp and the Old Middlefield Road on-ramp, US 101 operates at LOS E or F due to the bottleneck between the Rengstorff Avenue on-ramp and the Old Middlefield Road on-ramp. The southbound direction operates at LOS D or better south of the Shoreline Boulevard off-ramp.

Location	Number of Lanes MF (HOV)[1]	AM Peak Hour		PM Peak Hour	
		Density[2]	LOS[3]	Density[2]	LOS[3]
Northbound					
Ellis Street On-Ramp to Moffett Boulevard Off-Ramp	3 (1)	**>45**	**F**	**>45**	**F**
Moffett Boulevard On-Ramp to Shoreline Boulevard Off-Ramp	4 (1)	**>45**	**F**	**>45**	**F**
SR 85 On-Ramp to Old Middlefield Road Off-Ramp	4 (1)	**>45**	**F**	**>45**	**F**
Old Middlefield Off-Ramp to Shoreline Boulevard On-Ramp	3 (1)	**>45**	**F**	**>45**	**F**
Shoreline Boulevard On-Ramp to Rengstorff Avenue Off- Ramp	3 (1)	**40.9[4]**	**E[4]**	**>45**	**F**
Rengstorff Avenue On-Ramp to San Antonio Road Off-Ramp	3 (1)	**>45[5]**	**F[5]**	**>45**	**F**
San Antonio Road On-Ramp to Oregon Expressway/ Embarcadero Road Off-Ramp	3 (1)	**39.6[4]**	**E[4]**	**39.0[4]**	**E[4]**
Oregon Expressway/Embarcadero Road On-Ramp to University Avenue Off-Ramp	3 (1)	32.6	D	**42.1[4]**	**E[4]**
Southbound					
University Avenue On-Ramp to Oregon Expressway/ Embarcadero Road Off-Ramp	3 (1)	**40.2[4]**	**E[4]**	**>45**	**F**
Oregon Expressway/Embarcadero Road On-Ramp to San Antonio Road SB Off-Ramp	3 (1)	**38.4**	**E**	**>45**	**F**
Charleston Road On-Ramp to Rengstorff Avenue Off-Ramp	4 (1)	**28.7[4,6]**	**E[4,6]**	**>45[5]**	**F[5]**
Rengstorff Avenue On-Ramp to Old Middlefield Road On-Ramp	3 (1)	31.5	D	**38.9[4]**	**E[4]**
Old Middlefield Road On-Ramp to Shoreline Boulevard Off-Ramp	4 (1)	24.7	C	33.7	D
Shoreline Boulevard Off-Ramp to SR 85 Off-Ramp	4 (1)	20.8	C	28.4	D
SR 85 On-Ramp to Shoreline Boulevard On-Ramp	3 (1)	22.9	C	24.1	C
Shoreline Boulevard On-Ramp to Moffett Boulevard Off-Ramp	4 (1)	18.8	C	21.3	C
Moffett Boulevard On-Ramp to Ellis Street Off-Ramp	3 (1)	25.7	C	30.1	D

Table 3.3.4. Existing Mainline Mixed Flow Lanes Operations Analysis.
Source: *Traffic Operations Analysis Report*, US 101 Auxiliary Lanes Project from Embarcadero to SR 85 – Table 9.

Bold denotes locations that operate overall at unacceptable service levels (LOS E or F)

1. MF = Mixed Flow Lanes; HOV = High Occupancy Vehicle Lanes
2. Density in passenger cars per mile per lane (pcpmpl) for mixed-flow lanes
3. Levels of service based on density. *Highway Capacity Manual* (Transportation Research Board, 2000)
4. Bottleneck location.
5. Section in queue, thus operations at LOS F assumed.
6. The density calculated for the segment between Charleston Road-Rengstorff Avenue in the southbound direction is based on four (4) travel lanes, which includes the 330 foot auxiliary lane.

3.4 US 101 Implementation Plan Report

This section documents the current condition of the US 101 segment from the Trimble Road/De La Cruz Blvd interchange to the McKee Road/US 101 interchange in Santa Clara County, associated with developing a strategy for phasing improvements in this study corridor of US 101.

This segment of US 101 is an 8-lane facility with the inside lanes used as High Occupancy Vehicle (HOV) lanes during the commute hours between 5:00 – 9:00 AM and between 3:00 – 7:00 PM.

Figure 3.4.1. Interchanges within the segment of US 101 Implementation Plan report.
Source: *US 101 Implementation Plan Report* – Project Location Map page 3.

Within the project limits, this portion of US 101 has the following local access interchanges:

- Trimble Road/De La Cruz Boulevard
- Brokaw Road/Airport Parkway/N 1st Street
- Old Oakland Road
- McKee Road

There is also a freeway-to-freeway interchange at I-880 and a partial freeway-to-freeway interchange at Route 87. At Old Bayshore Highway, near Zanker Road, there are both off and on-ramps to US 101 in the northbound direction only. In the southbound direction, there is an on-ramp from N 4th Street.

While previous studies have been performed on this segment of US 101, no formal project has been proposed. Following is a summary of previous major studies that were performed on the three interchanges studied in this implementation plan.

- As part of the original Measure ‘A’ US 101 Widening study in the late 1980s, potential configurations for a full interchange at US 101/Zanker Road/N 4th Street/Skyport Drive were developed. The E Taylor Street overcrossing was also studied at the time as a 4-lane facility with bridge spans designed to provide future ramp movements.

- The City of San Jose prepared a Project Study Report in 1990 for a partial cloverleaf interchange with full access to and from US 101 at Mabury Road. In 1997 the City of San Jose prepared project concept layouts and cost estimates for several projects on US 101 including the construction of a new interchange at US 101/Zanker Road/N 4th Street/Skyport Drive.

- A VTA sponsored *US Route 101 North Corridor Study* in 2005 proposed improvements at all three interchanges - US 101/Zanker Road/N 4th Street/Skyport Drive; US 101/Old Oakland Road; and US 101/Mabury Road/E Taylor Street.

- The City of San Jose also sponsored the *2006 North San Jose Deficiency Plan* which identified several locations and intersections which performed at LOS 'F'.

Deficiencies

Several studies have been completed over the last twenty years that analyzed mainline US 101 and interchanges and arterial streets within the cities of Santa Clara and San Jose. These various studies, including the 2004 and 2005 VTA Highway 101 Central and North Corridor Studies, have demonstrated that the existing interchanges and the local roads and streets in the corridor cannot provide the necessary traffic capacity and operational level of service to satisfactorily accommodate the future year demands.

Traffic forecasts and operations analyses were developed for 2035 using the FREQ Model and the traffic data available from the High Occupancy Toll (HOT) lane study that VTA is currently undertaking within the Santa Clara County limits. For consistency purposes, it was decided to use the same FREQ model that was developed for the Santa Clara County HOT Lane Feasibility Study. The results of the Implementation Plan study model match closely with the FREQ model for the HOT Lane Study and can be found in the Traffic Report completed by Parsons.

The traffic analyses performed show that in the AM Peak Hours, travel speeds along northbound mainline segments will be at or below 35 mph. Between 6:00 and 8:00 AM, a major bottleneck develops at the Old Bayshore Highway on-ramp, and traffic queues extend southerly to the US 101/I-280 interchange.

For the PM Peak Hours, there is a bottleneck that develops in the southbound direction between the I-880 interchange and the Old Oakland Road interchange. By the end of the second hour, 4:00 – 5:00 PM, vehicle queues are expected to extend to north of the US 101/De La Cruz Boulevard interchange. The average speed in the corridor mixed lanes ranges from stop and go (0 mph) to 45 mph.

Additionally, the concentration of employment along N 1st Street results in traffic overburdening the interchange with US 101. Despite the presence of light rail (including traffic signal priority), the congestion surrounding the interchange is not yet diminished, partly also because a parallel route crossing US 101 is lacking. The incomplete roadway grid north and east of US 101 concentrates the traffic onto a limited number of facilities as few alternative routes exist to spread traffic loadings.

3.5 Traffic Operations Report US 101 from I-280/I-680 to Yerba Buena

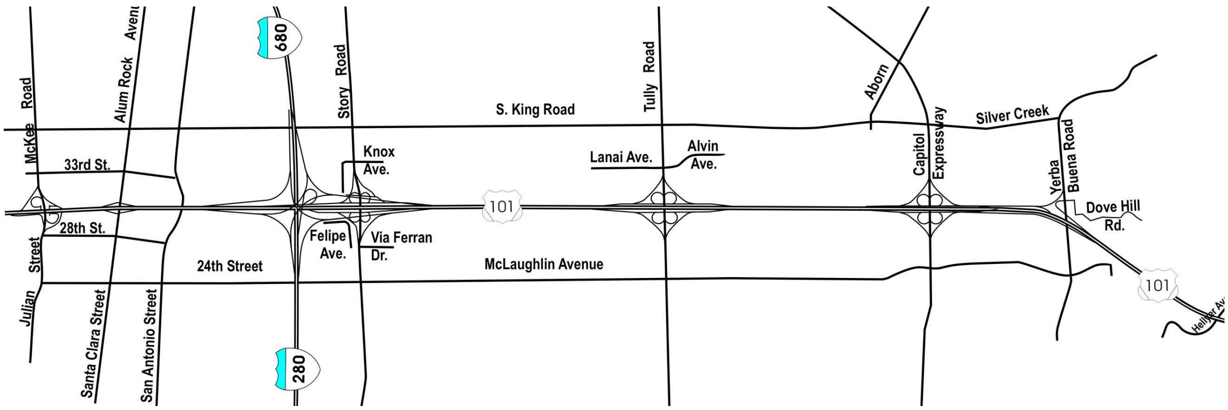


Figure 3.5.1. CMIA Project Limits and Study Area.
Source: *Traffic Operations Report* – page 3.

This section documents the current condition of the US 101 segment from I-280/I-680 to Yerba Buena Road in Santa Clara County, as mentioned in the " Traffic Operations Report, US 101 Operational Improvements from I-280/I-680 to Yerba Buena Road" report.

Traffic Characteristics

Table 3.5.1 summarizes average annual daily traffic volumes available from Caltrans for US 101 within the project area for the period from 1999 to 2003. The daily traffic volumes show that there is a substantial increase in the daily traffic volumes as you move from the southern end of the project area at the local interchange at Hellyer Avenue toward the system interchange at the junction at US 101 and I-280/I-680.Mainline freeway segments on US 101 were analyzed using the VISSIM micro-simulation software.

PM	Interchange	2003
30.1	Hellyer Avenue	126,000
31.7	Capitol Expressway	139,000
33.03	Tully Road	197,000
34.87	Junction with Route 280/680	244,000

Table 3.5.1. US 101 Average Annual Daily Traffic Volumes.
Source: *Traffic Operations Report*, US 101 Operational Improvements from I-280/I-680 to Yerba Buena Road – Table 4.

The 2002 truck counts for US 101 indicated that on a daily basis trucks represent 6 percent of the daily traffic. However, the percentage of trucks traveling during the peak commute periods tends to be lower than the daily rate. For the purposes of this analysis the percentage of trucks during the peak periods was assumed to be 3 percent. This level of truck activity was assumed based on the trip table data contained in the VTA's regional travel demand forecast model.

The percentage of high occupancy vehicles traveling during the peak periods was also developed from the VTA model trip tables. These tables assume that for the overall network 14 percent of the AM peak traffic and 19 percent of the PM peak traffic are high occupancy vehicles (HOV).

Section	AM Peak Hour			PM Peak Hour		
	NB	SB	Total	NB	SB	Total
I-280/I-680 to Tully Road	8,220 58%	5,875 42%	14,095 100%	7,390 47%	8,480 53%	15,870 100%
Tully Road to Capitol Expwy	8,470 61%	5,310 39%	13,780 100%	6,170 47%	6,930 53%	13,100 100%
Capitol Expwy to Yerba Buena Rd	6,430 66%	3,300 34%	9,730 100%	3,860 48%	4,150 52%	8,010 100%

Table 3.5.2. US 101 Peak Hour Directional Traffic Volumes.
Source: *Traffic Operations Report*, US 101 Operational Improvements from I-280/I-680 to Yerba Buena Road – Table 5.

During the AM peak period in the northbound direction, the section from south of Hellyer Avenue to the Tully Road diagonal on-ramp operates acceptably and traffic can enter and exit the freeway mainline without significant delays or congestion. Between the Tully Road diagonal on-ramp and the I-280/I-680 off-ramp, northbound traffic meets the back of the vehicle queue that extends from the existing bottleneck just north of the McKee Road on-ramps to this section of northbound US 101, a distance of approximately 3.8 miles. In addition, there are existing bottlenecks on US 101 north of the study area at the Trimble Road and Montague Expressway interchanges and congestion on the mainline (queuing, stop-and-go traffic) extends south on US 101 into the study area.

As a result there is a break down in the flow on the mainline of US 101 as far south as the lane-add located between the Tully Road interchange and the I-280/I-680 off-ramps. While vehicles on the northbound mainline are stopped, the I-280/I-680 off-ramps are not blocked and traffic flows freely.

Congestion and slowdowns also occur in the sections where the Tully Road on-ramps (loop and diagonal ramps) enter the northbound traffic flow and as northbound traffic slows down as it approaches the back of the queue. These locations are operating near capacity at LOS E conditions. The northbound section between the Capitol Expressway on-ramp and the Tully Road off-ramp operates at Level of Service D. The operation in this section is influenced by the metered on-ramp traffic from Capitol Expressway and Yerba Buena Road combined with the heavy volume of traffic exiting at Tully Road. LOS D operation extends south to the end of the study area.

Ramp metering is used in the northbound direction in the AM peak to control the flow of traffic from local streets onto the freeway. The metering is designed to limit the flow of vehicles onto the freeway in order to maintain better operations on the freeway. Northbound ramp metering is used at the Hellyer Avenue, Capitol Expressway (including Yerba Buena Road traffic), Tully Road, and Story Road interchanges.

Ramp Terminal Intersections

Since the interchanges at Tully Road and Capitol Expressway are currently full clover leaf configurations, there are no existing ramp termini intersections at these locations. The only ramp termini intersections are located at the Yerba Buena interchange. Table 3.5.3 summarizes the existing level of service for the two ramp intersections for the AM and PM peak hours.

Based on the existing traffic volumes the intersection serving southbound US 101 traffic is operating at LOS B during both the AM and PM peaks. The intersection serving northbound US 101 traffic at Yerba Buena Road operates at LOS A during both the AM and PM peaks. During the morning peak, the northbound on-ramp from Yerba Buena Road is under utilized due to the congestion on the C-D roadway that extends from Yerba Buena to Capitol Expressway.

Location	Delay (sec/veh)	LOS
AM Peak Hours		
Yerba Buena Road / SB US 101 On/Off	16.6	B
Yerba Buena Road / NB US 101 On/ Off	6.3	A
PM Peak Hour		
Yerba Buena Road / SB US 101 On/Off	17.7	B
Yerba Buena Road / NB US 101 On/ Off	8.5	A

Table 3.5.3. Ramp Termini Intersections – Existing Level of Services.
Source: *Traffic Operations Report*, US 101 Operational Improvements from I-280/I-680 to Yerba Buena Road – Table 10.

AM Peak Hour	Existing
NB US 101 - (s/o Hellyer Avenue Off-Ramp) to NB US 101 - (n/o McKee Road On-Ramp)	10.6
WB Yerba Buena Avenue (e/o Silver Creek Road) to NB US 101 (n/o McKee Road On-Ramp)	14.4
WB Aborn Road (e/o Capitol Expressway) to NB US 101 (n/o McKee Road On-Ramp)	18.1
WB Tully Road (e/o King Road) to NB US 101 (n/o McKee Road On-Ramp)	14.1
PM Peak Hour	
SB US 101 (n/o McKee Avenue Off-Ramp) to SB US 101 (s/o Hellyer Road On-Ramp)	9.1
SB I-680 (n/o King Road Off-Ramp) to SB US 101 (s/o Hellyer Road On-Ramp)	8.7
EB I-280 (w/o McLaughlin Ave. Off-Ramp) to SB US 101 (s/o Hellyer Road On-Ramp)	8.4

Table 3.5.4. Travel Time Performance (in minutes). Source: *Traffic Operations Report*, US 101 Operational Improvements from I-280/I-680 to Yerba Buena Road – Table 28.

AM Peak Hour	Existing
Vehicle miles traveled (VMT)	246,005
Vehicle hours traveled	7,735
System average speed	33.8
Vehicle hours of delay (VHD)	1,580
Passenger miles traveled	290,025
Passenger hours traveled	9,125
Passenger hours of delay	1,865
PM Peak Hour	
Vehicle miles traveled (VMT)	302.165
Vehicle hours traveled	8,455
System average speed	35.7
Vehicle hours of delay (VHD)	1,980
Passenger miles traveled	367,650
Passenger hours traveled	10,285
Passenger hours of delay	2,410

Table 3.5.5. System Wide Measures of Effectiveness. Source: *Traffic Operations Report*, US 101 Operational Improvements from I-280/I-680 to Yerba Buena Road – Table 27.

A different Measure of Effectiveness used in the traffic operations is travel times performance. Table 3.5.4 presents the results of the travel time performance for Existing key travel routes on northbound US 101 during the AM peak hour and southbound US 101 during the PM peak hour. Table 3.5.5 provides a summary of several key measures of effectiveness (MOEs) for the entire study area. These measures of effectiveness provide a system-wide comparison of the overall effectiveness of the proposed improvements using data for AM and PM peak hour conditions.

3.6 Other Reports on CSMP US 101 South

Safety
The collision history for the US 101 freeway for years 2005-2007 and first quarter 2008 was obtained from Caltrans TASAS system. The results are shown in Table 3.6.1. The collision rates have shown no particular trend, with rates increasing on some sections in some years and rates decreasing in other years on other sections. The collision rates are higher or lower than the state average for each facility type depending on the section and the year.

Accident Rates by US 101 CSMP Segment

CSMP Segment	County/Route	**AADT** (2009)	**Accident Rate** (Actual / Statewide Average)
SM PM 0.0-5.391	SM/US 101	177,000 - 199,000	0.88 / 1.08
SM PM 5.391-11.15	SM/US 101	189,000 - 239,000	0.69 / 1.09
SM PM 11.15-20.72	SM/US 101	204,000 - 243,000	0.66 / 1.18
SM PM 20.72-26.106	SM/US 101	188,000 - 229,000	0.43 / 1.04
SCL 48.10-52.55	SCL/US 101	153,000 - 217,000	1.04 / 1.12
SCL 40.70-48.10	SCL/US 101	134,000 - 184,000	0.94 / 0.93
SCL R36.14-40.70	SCL/US 101	135,000 - 188,000	1.33 / 0.97
SCL 34.87-R36.14	SCL/US 101	150,000 - 188,000	1.18 / 0.96
SCL 31.70-34.87	SCL/US 101	142,000 - 229,000	0.95 /1.10
SCL R28.61-31.70	SCL/US 101	128,000 - 142,000	0.51 / 0.85

Table 3.6.1. Accident Rates by CSMP Segment.
Source: *Traffic Accident Surveillance and Analysis System (TASAS)*, Table B (09-01-04 to 08-31-07) Caltrans D4.

Pavement Conditions
The maintenance of pavement is managed as two distinctive programs, maintenance and rehabilitation. Pavement Maintenance activities include: routine maintenance (day to day maintenance of roadway), major maintenance (planned work which is generally done by contract) and preventive maintenance (treatments applied when pavement distress is minimal, to extend the pavement life). Pavement Rehabilitation improves the facility and is designed to provide an additional ten years of service life. This is also planned work and generally done by contract. Maintenance activities keep the facility safe and serviceable until rehabilitation is needed. In the 2009 RTP, expanded funding for system preservation of pavement and bridges beyond SHOPP was discussed, and this may be revisited again in the 2013 RTP.

GIS based mapping depicts corridor pavement status throughout the state and is based on the Pavement Condition Report. The map depicts current US 101 South CSMP Corridor pavement condition by Damage Priority Group. The DPG legend for those shown on the map is:

RED: Major Damage—Rehab is scheduled.
GREEN: Minor Damage—Rehab is needed, not yet scheduled.
BLUE: Bad Ride Only—Surface is rough, but repair not required.

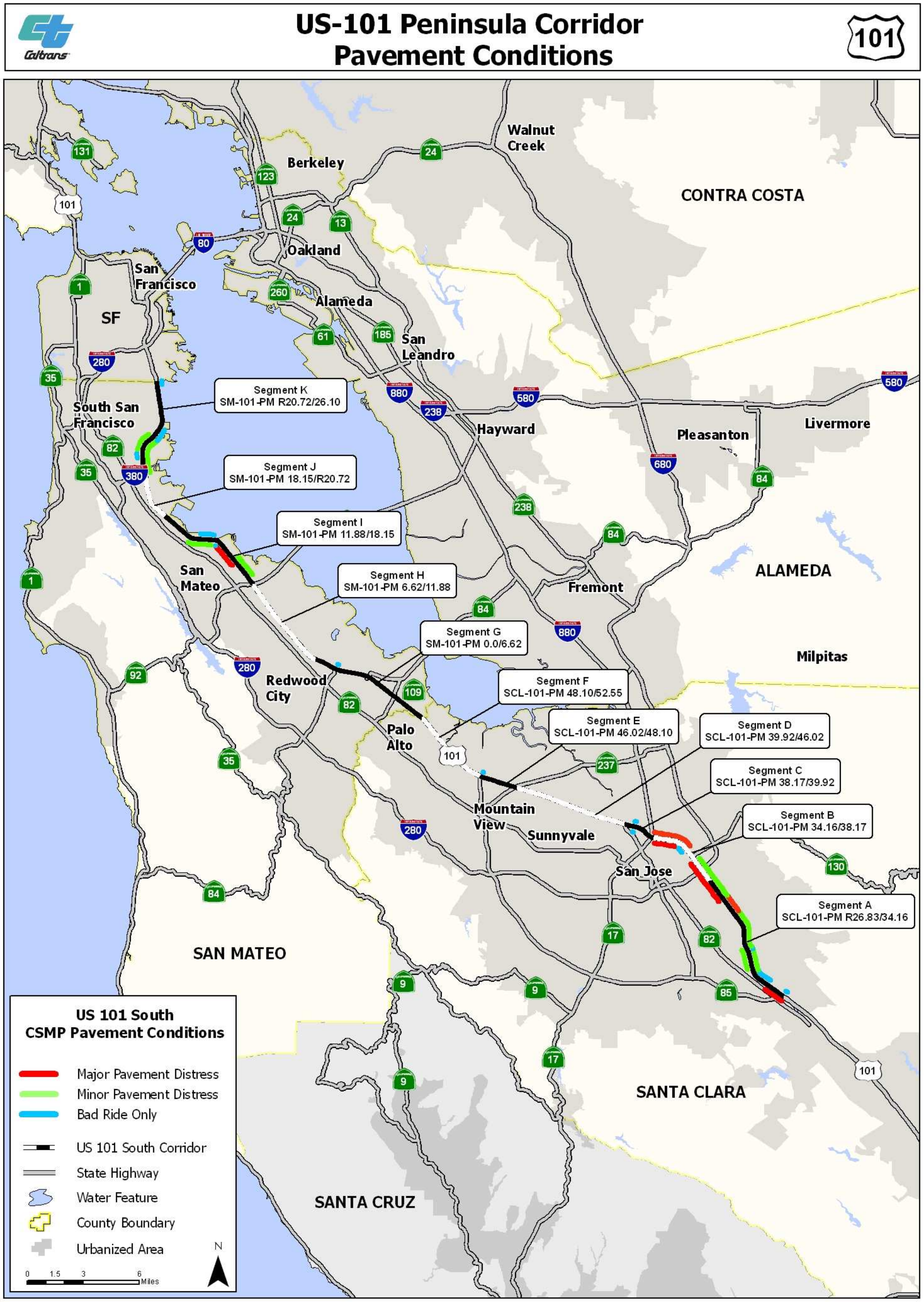


Figure 3.6.1. US 101 Pavement Conditions.
Source: *Caltrans District 4, Office of Regional Planning, GIS & Technical Support Branch*, November 2008.

SECTION 4
FUTURE PERFORMANCE ASSESSMENT

4.1 Introduction to Future Performance Assessment

This section describes the future US 101 corridor performance associated with completion of the three CMIA-funded projects on US 101. The information in this section is derived from the following reports:

- San Mateo US 101 Freeway Corridor Technical ReportAnalysis for Corridor System Management Plan. The study limits are from the San Francisco/San Mateo County line to the SR-85 in Santa Clara County, a total of 26 miles. The report is dated June 8, 2010 and was prepared by Dowling Associates Inc.

- Traffic Operations Analysis Report, US 101 Auxiliary Lanes Project from Embarcadero to SR-85. The study limits extend from University Avenue to Ellis Street, slightly beyond the Auxiliary Lane project limits. This report is dated February 23, 2009 and was prepared by Fehr & Peers Associates for the Santa Clara Valley Transportation Authority and for the Environmental Report prepared by Caltrans District 4.

- Traffic Operations Report, US 101 Operational Improvements from I-280/I-680 to Yerba Buena Road. The study limits extend from McKee Road to Hellyer Avenue. This report is dated October 2005 and was prepared by Fehr & Peers Associates for Caltrans District 4, the Santa Clara Valley Transportation Authority, and the City of San Jose.

4.2 Expected Performance of US 101 in San Mateo County

This section documents expected future year performance of the US 101 segment from the San Francisco/San Mateo County Line to the San Mateo/ Santa Clara County Line, associated with completion of the CMIA funded auxiliary lane project on both directions of US 101.

The information in this section is derived from the FPI Technical Analysis report titled “San Mateo US 101 Freeway Corridor Technical ReportAnalysis for Corridor System Management Plan”. Although the study area includes approximately 4.4 miles to the SR 85 interchange in Santa Clara County, to properly simulate southbound backups beyond the SM/SCL County line, the FPI Technical Analysis documents future performance only for the US 101 Corridor within San Mateo County.

In addition to completion of the CMIA auxiliary lane project, the FPI Technical Analysis assumes completion of the baseline improvement projects listed in Table 4.2.1, for both future years 2015 and 2030.

Project Name	Description
San Mateo County[3]	
Auxiliary Lanes – Marsh to Embarcadero	Widen NB and SB auxiliary lane segments from 4 lanes to 5
Auxiliary Lanes and Ramp Metering 3rd to Millbrae	Widen NB and SB auxiliary lane segments from 4 lanes to 5 and install ramp metering equipment. Ramp meters will be turned on as widening construction is completed.
Smart Corridor	Emergency re-route of traffic on US 101 via ITS and static signs on freeway, intersections, and parallel arterial streets. Includes emergency traffic signal timing plans and emergency response coordination via Caltrans freeway management center in Oakland.
US 101 Ramp Metering	Caltrans' SHOPP project for Ramp Metering (Rte 92 to SF County line)
SR 92 Widening – US 101 to I-280	Widen from 2 lanes to 3 lanes in each direction (To be implemented by 2030)
Santa Clara County	
US 101 HOV to HOT Conversion	Convert HOV lanes on US 101 in Santa Clara County to HOT lanes.
HOV Lane Extension – SR 85 to Oregon	Extend existing dual NB HOV lanes near the US 101/SR-85 interchange to a point south of the US 101/Oregon Expressway interchange.
Northbound Auxiliary Lane – Rengstorff to San Antonio	Widen NB from 4 lanes to 5 (auxiliary lane)
Auxiliary Lane – San Antonio to Oregon	Widen NB and SB auxiliary from 4 lanes to 5
Extend NB Lane – Shoreline to Rengstorff	Remove lane drop on NB US 101 near Shoreline interchange by carrying lane through to Rengstorff interchange loop off-ramp.
US 101/Rengstorff Interchange Improvements	Modify Rengstorff on-ramp to NB US 101 to become 2 mixed flow lanes from its existing single lane configuration.
US 101/San Antonio Interchange Improvements	Modify San Antonio NB loop and diagonal on-ramps into one on-ramp to US 101.
US 101/Old Middlefield Interchange Improvements	Modify Old Middlefield on-ramp to SB US 101 from 1 HOV plus 1 mixed flow lane to 2 mixed flow lanes.
US 101/Oregon Interchange Improvements	Modify Oregon on-ramp to SB US 101 to become 2 mixed flow lanes and 1 HOV lane from its existing configuration of 1 mixed flow lane and 1 HOV lane.
US 101 Ramp Metering	Implement ramp meters for all US 101 on-ramps in Santa Clara County.

Table 4.2.1. Baseline Improvement Projects.
Source: *San Mateo US 101 Freeway Corridor Technical Analysis* – Exhibit 63.

[3] It is not certain when ramp metering will be activated between 3rd Avenue and Millbrae Avenue. Construction of 101 Aux lanes between San Bruno Avenue and San Francisco County line is still under consideration. The US 101/Broadway I/C reconstruction with ramp metering is a likely project by 2015.

VMT Trends

The peak period vehicle miles of travel (VMT) on the freeway segments is forecasted to increase in 2030 by 3 percent to 115 percent in the AM peak period and 6 percent to 103 percent in the PM peak period.

Period	Freeway	Stretch	2009	2030	Growth
AM	US 101	SM/SF to I-380	252,630	544,399	115%
AM	US 101	I-380 to SR 92	462,153	477,175	3%
AM	US 101	SR 92 to SM/SC	793,917	1,126,081	42%
Subtotal			1,508,701	2,147,655	42%
PM	US 101	SM/SF to I-380	366,927	743,314	103%
PM	US 101	I-380 to SR 92	621,548	657,308	6%
PM	US 101	SR 92 to SM/SC	1,005,248	1,398,965	39%
Subtotal			1,993,723	2,799,588	40%
Total			3,502,424	4,947,243	41%

Table 4.2.2. Summary of Freeway VMT trends.
Source: *San Mateo US 101 Freeway Corridor Technical Analysis* – Exhibit 65.

The peak period vehicle miles of travel on the freeway is forecasted to increase by an overall of 42 percent in the AM peak period and 40 percent in the PM peak period in 2030. The expected increase in demand will result in:

For US 101 NB, between I-380 and the San Francisco County line

- An increase in AM Peak Period vehicle-hours delay from 17 to 1,080 hours between 2009 and 2030
- A near three fold increase in PM Peak Period vehicle-hours delay between 2009 and 2030

For US 101 SB, between San Francisco County line and I-380

- A seven fold increase in AM Peak Period vehicle-hours delay between 2009 and 2030
- An increase in PM Peak Period vehicle-hours delay from 140 to 3,295 hours between 2009 and 2030

For US 101 NB, between SR 92 and I-380

- A reduction of 13% in AM Peak Period vehicle-hours delay between 2009 and 2030, due to upstream bottleneck constraints south of SR 92 in 2030
- A reduction of 14% in PM Peak Period vehicle-hours delay between 2009 and 2030, due to upstream bottleneck constraints south of SR 92 in 2030

For US 101 SB, between I-380 and SR 92

- A 450% increase in AM Peak Period vehicle-hours delay between 2009 and 2030
- A reduction of 78% in PM Peak Period vehicle-hours delay between 2009 and 2030, due to upstream bottleneck constraints north of SR 92 in 2030

For US 101 NB, between Santa Clara County Line and SR 92

- More than six fold increase in AM Peak Period vehicle-hours delay between 2009 and 2030
- A 262% increase in PM Peak Period vehicle-hours delay between 2009 and 2030

For US 101 SB, between SR 92 and Santa Clara County Line

- A reduction of 39% in AM Peak Period vehicle-hours delay between 2009 and 2030, due to upstream bottleneck constraints north of SR 92 in 2030
- A 115% percent increase in PM Peak Period vehicle-hours delay between 2009 and 2030

Table 4.2.3.a shows the 2009 comparison table for both the 2015 and 2030 tabulation shown in Table 4.2.3.b for various freeway corridor measures of effectiveness (MOE's) including Vehicle Miles of Travel (VMT), Vehicle Hours of Travel (VHT), Vehicle Hours of Delay (VHD), Mean Vehicle Speed, Mean Delay per Vehicle, and Congested Lane Miles.

Measure of Effectiveness		**2009**							
		Northbound				Southbound			
		I-380 to SM/SF County Line	SR 92 to I-380	SM/SCL County Line to SR 92	Total Northbound	SM/SF County Line to I-380	I-380 to SR 92	SR 92 to SM/SCL County Line	Total Southbound
Vehicle Miles of Travel (vehicle-miles)	AM	130,954	250,567	433,077	814,598	121,676	211,587	360,840	694,103
	PM	198,491	325,536	531,877	1,055,904	168,436	296,011	473,370	937,817
Vehicle Hours of Travel (VHT)	AM	2,032	6,141	8,628	16,801	1,934	4,689	8,324	14,947
	PM	3,178	8,683	12,871	24,732	2,731	5,318	11,461	19,510
Vehicle Hours of Delay (VHD)	AM	17	2,286	1,965	4,268	62	1,433	2,772	4,267
	PM	124	3,674	4,688	8,486	140	764	4,179	5,083
Mean Vehicle Speed (mph)	AM	64.4	40.8	50.2		62.9	45.1	43.4	
	PM	62.5	37.5	41.3		61.7	55.7	41.3	
Mean Delay/Vehicle (mins)	AM	0.0	4.7	4.6		0.2	3.5	7.8	
	PM	0.2	5.8	8.9		0.3	1.3	9.0	
Congested Lane Miles	AM	0.8	59.3	67.0		0.0	28.3	35.1	
	PM	18.2	104.4	52.2		19.9	67.7	13.8	

Table 4.2.3.a. Measures of Effectiveness in 2015 and 2030 (with 2009 shown on this page).

Measure of Effectiveness		2015							
		Northbound				Southbound			
		I-380 to SM/SF County Line	SR 92 to I-380	SM/SCL County Line to SR 92	Total Northbound	SM/SF County Line to I-380	I-380 to SR 92	SR 92 to SM/SCL County Line	Total Southbound
Vehicle Miles of Travel (vehicle-miles)	AM	162,963	270,776	730,430	1,164,169	352,457	214,948	393,370	960,775
	PM	208,790	345,036	910,419	1,464,245	518,728	292,587	469,836	1,281,151
Vehicle Hours of Travel (VHT)	AM	2,649	6,161	18,692	27,502	5,675	6,360	7,634	19,669
	PM	3,413	9,177	20,793	33,383	13,156	4,582	11,344	29,082
Vehicle Hours of Delay (VHD)	AM	142	1,995	7,455	9,592	253	3,053	1,582	4,888
	PM	201	3,869	6,787	10,857	5,175	80	4,115	9,370
Mean Vehicle Speed (mph)	AM	61.5	43.9	39.1		62.1	33.8	51.5	
	PM	61.2	37.6	43.8		39.4	63.9	41.4	
Mean Delay/Vehicle (mins)	AM	0.3	3.8	15.8		0.6	7.3	4.1	
	PM	0.4	5.8	11.5		9.0	0.1	8.9	
Congested Lane Miles	AM	26.4	47.5	75.1		0.0	4.5	14.9	
	PM	26.4	71.0	63.8		172.2	2.4	9.9	
Measure of Effectiveness		**2030**							
		Northbound				Southbound			
		I-380 to SM/SF County Line	SR 92 to I-380	SM/SCL County Line to SR 92	Total Northbound	SM/SF County Line to I-380	I-380 to SR 92	SR 92 to SM/SCL County Line	Total Southbound
Vehicle Miles of Travel (vehicle-miles)	AM	167,419	268,356	726,647	1,162,422	376,980	208,818	399,434	985,232
	PM	220,343	350,630	913,729	1,484,702	522,971	306,678	485,237	1,314,886
Vehicle Hours of Travel (VHT)	AM	3,656	6,125	25,888	35,669	6,307	11,090	7,842	25,239
	PM	3,845	8,553	31,050	43,448	11,341	4,883	16,450	32,674
Vehicle Hours of Delay (VHD)	AM	1,080	1,996	14,709	17,785	507	7,878	1,697	10,082
	PM	455	3,158	16,992	20,605	3,295	165	8,984	12,444
Mean Vehicle Speed (mph)	AM	45.8	43.8	28.1		59.8	18.8	50.9	
	PM	57.3	41.0	29.4		46.1	62.8	29.5	
Mean Delay/Vehicle (mins)	AM	2.4	3.8	31.4		1.2	19.3	4.3	
	PM	0.8	4.6	28.8		5.7	0.3	18.9	
Congested Lane Miles	AM	29.8	40.9	72.4		105.5	7.4	6.9	
	PM	62.8	100.7	51.0		171.9	7.2	10.8	

Table 4.2.3.b. Measures of Effectiveness in 2015 and 2030.
Source: *San Mateo US 101 Freeway Corridor Technical Analysis* – Exhibits 66-71.

Trends in Reliability

The mean travel time, standard deviation, and 95 percentile highest travel times for the AM and PM peak periods for 2009 were directly measured from electronic toll collection tag (ETC) reader data stored in PeMS. Table 4.2.4 shows the trends in travel time variability (standard deviation of travel time) and the buffer index for 2009, 2015, and 2030. Reliability on US 101 between 2009 and 2015 is not forecasted to consistently improve or deteriorate. By 2030, reliability will deteriorate on all stretches of US 101 if no further capacity improvements are made after 2015.

Existing 2009							
Segment	Stretch	Miles	Peak	Mean Time (min.)	Std. Dev. Time (min.)	95% Time (min.)	Buffer Index
US 101 NB	Palo Alto (SR-114) to SR 92	10.75	6-10 AM	38	31	132	244%
US 101 NB	Palo Alto (SR-114) to SR 92	10.75	2:30-7:30 PM	28	15	73	164%
US 101 SB	SR 92 to Palo Alto (SR-114)	10.75	6-10 AM	36	29	125	243%
US 101 SB	SR 92 to Palo Alto (SR-114)	10.75	2:30-7:30 PM	26	19	83	219%
US 101 NB	SR 92 to I-280	15.85	6-10 AM	46	30	136	193%
US 101 NB	SR 92 to I-280	15.85	2:30-7:30 PM	34	25	107	220%
US 101 SB	I-280 to SR 92	15.85	6-10 AM	49	35	152	212%
US 101 SB	I-280 to SR 92	15.85	2:30-7:30 PM	45	23	113	154%
Baseline 2015							
Segment	Stretch	Miles	Peak	Mean Time (min.)	Std. Dev. Time (min.)	95% Time (min.)	Buffer Index
US 101 NB	Palo Alto (SR-114) to SR 92	10.75	6-10 AM	42	37	148	252%
US 101 NB	Palo Alto (SR-114) to SR 92	10.75	2:30-7:30 PM	29	16	78	167%
US 101 SB	SR 92 to Palo Alto (SR-114)	10.75	6-10 AM	32	25	109	241%
US 101 SB	SR 92 to Palo Alto (SR-114)	10.75	2:30-7:30 PM	25	19	80	217%
US 101 NB	SR 92 to I-280	15.85	6-10 AM	45	29	133	194%
US 101 NB	SR 92 to I-280	15.85	2:30-7:30 PM	34	25	108	215%
US 101 SB	I-280 to SR 92	15.85	6-10 AM	52	41	166	216%
US 101 SB	I-280 to SR 92	15.85	2:30-7:30 PM	44	21	108	147%
Baseline 2030							
Segment	Stretch	Miles	Peak	Mean Time (min.)	Std. Dev. Time (min.)	95% Time (min.)	Buffer Index
US 101 NB	Palo Alto (SR-114) to SR 92	10.75	6-10 AM	41	36	144	251%
US 101 NB	Palo Alto (SR-114) to SR 92	10.75	2:30-7:30 PM	34	20	96	184%
US 101 SB	SR 92 to Palo Alto (SR-114)	10.75	6-10 AM	32	25	110	241%
US 101 SB	SR 92 to Palo Alto (SR-114)	10.75	2:30-7:30 PM	32	24	105	233%
US 101 NB	SR 92 to I-280	15.85	6-10 AM	45	29	133	194%
US 101 NB	SR 92 to I-280	15.85	2:30-7:30 PM	33	24	102	212%
US 101 SB	I-280 to SR 92	15.85	6-10 AM	64	68	213	231%
US 101 SB	I-280 to SR 92	15.85	2:30-7:30 PM	44	22	109	148%

Table 4.2.4. Trends in Reliability on US 101**.**
Source: *San Mateo US 101 Freeway Corridor Technical Analysis* – Exhibit 78 (information based on ETC readers, locations on SR 114, SR 92 and I-280).

Trends in Safety

The forecasted 20% growth in peak period VMT between 2005 and 2030 could result in an increase in annual collisions along US 101.

Segment	Year	Daily VMT	Annual MVM	Rate/MVM	Annual Collisions
US 101	2005	701,500	215	0.42	90
SM/SF to I-380	2015	821,900	252	0.62	157
(5.6 miles)	2030	862,300	264	0.60	159
US 101	2005	1,102,900	338	0.67	226
I-380 to SR 92	2015	1,239,300	380	0.74	280
(9.0 miles)	2030	1,288,700	395	0.83	327
US 101	2005	1,560,400	479	0.78	374
SR 92 to SM/SC	2015	1,747,000	536	0.74	394
(10.7 miles)	2030	1,888,900	579	0.92	535
Growth			20%		48%

Table 4.2.5. Collision Trends on US 101.
Source: *San Mateo US 101 Freeway Corridor Technical Analysis* – Exhibit 79 (Caltrans TASAS Reports 2005-2007).

Collision rates are projected based on anticipated changes in operational speeds obtained from FREQ analysis. For example, as congestion gets worse, accident rate is projected to be higher. The relationship between speed and collision rate is developed based on existing data along the corridor.

Trends in Lost Productivity

The stretch of US 101 between the San Mateo/San Francisco County Line and I-380 is projected to experience a 234% increase in lost peak period productivity between 2009 and 2030. The stretch of US 101 between I-380 and SR 92 will see a 45% increase in lost productivity. The stretch of US 101 between SR 92 and the San Mateo/Santa Clara County Line will see a 44% increase in lost productivity. The increase in lost peak period productivity was calculated as the growth in the sum of the AM and PM congested lane-miles or lost lane-miles from 2009 to 2030.

Facility	Stretch	Year	Dir	Congested Lane-Miles	Lost Lane-Miles
US 101	SM/SF County Line to I-380	2009 AM	NB	0.77	0.42
			SB	0.00	0.00
		2009 PM	NB	18.22	10.02
			SB	19.91	10.95
		2015 AM	NB	26.42	14.53
			SB	0.00	0.00
		2015 PM	NB	26.43	14.54
			SB	178.26	98.04
		2030 AM	NB	48.78	26.83
			SB	105.53	58.04
		2030 PM	NB	62.85	34.57
			SB	178.26	98.04
US 101	I-380 to SR 92	2009 AM	NB	84.56	46.51
			SB	53.18	29.25
		2009 PM	NB	143.45	78.90
			SB	76.10	41.85
		2015 AM	NB	74.18	40.80
			SB	64.52	35.49
		2015 PM	NB	137.11	75.41
			SB	2.43	1.34
		2030 AM	NB	66.08	36.35
			SB	104.64	57.55
		2030 PM	NB	145.54	80.05
			SB	7.23	3.97
US 101	SR 92 to SM/SC County Line	2009 AM	NB	99.14	54.53
			SB	80.48	44.26
		2009 PM	NB	118.78	65.33
			SB	84.08	46.24
		2015 AM	NB	230.46	126.75
			SB	30.34	16.68
		2015 PM	NB	239.15	131.53
			SB	64.39	35.42
		2030 AM	NB	332.70	182.98
			SB	23.93	13.16
		2030 PM	NB	346.92	190.81
			SB	117.27	64.50

Table 4.2.6. Trends in Lost Productivity.
Source: *San Mateo US 101 Freeway Corridor Technical Analysis* – Exhibit 80.

4.3 Expected Performance of US 101 from Embarcadero to SR 85

This section documents expected future year performance of US 101 associated with completion of the CMIA funded auxiliary lane project on both directions of US 101, from Embarcadero to SR 85 in Santa Clara County.

The information in this section is derived from the Traffic Operations Analysis Report, US 101 Auxiliary Lanes Project from Embarcadero to SR 85. The study limits extend from University Avenue to Ellis Street, slightly beyond the auxiliary lane project limits.

The report provides expected performance in 2015 and 2035 associated with completion of the following improvements through the CMIA Project:

- Lane drop eliminated on northbound US 101, just prior to the Shoreline Boulevard northbound on-ramp. This requires extension of the existing auxiliary lane from the SR 85 northbound onramp through the Old Middlefield off-ramp, through the Shoreline Boulevard on-ramp. The Shoreline Boulevard on-ramp will become a standard merge on-ramp, and the auxiliary lane will continue through to the Rengstorff Avenue loop off-ramp.
- Auxiliary lanes at the following locations:
  - Northbound from the Rengstorff Avenue/Amphitheatre Parkway on-ramp to the San Antonio off-ramp
  - Northbound from the San Antonio Road on-ramp to the Oregon Expressway off-ramp
  - Southbound from the Oregon Expressway/Embarcadero Road on-ramp to the southbound San Antonio Road diagonal off-ramp
- Ramp improvements at the northbound San Antonio on-ramps to allow the loop on-ramp from northbound San Antonio Road to enter with a dedicated lane, then merge with the diagonal on-ramp from southbound San Antonio Road with a single merge point from the on-ramps to US 101. Ramp metering will be installed/implemented at this location (a single meter for the merge point).
- Ramp widening at the southbound Oregon Expressway on-ramp to provide two mixed flow lanes and one HOV lane. At US 101, a single lane on-ramp will remain.
- Ramp metering will be installed/implemented for the northbound Rengstorff Avenue/Amphitheatre Parkway on-ramp.
- Extension of the existing southbound Charleston Road on-ramp acceleration lane an additional 100 feet beyond the Rengstorff Avenue off-ramp

Measures of Performance US 101 from Embarcadero to SR 85

In the northbound direction, in 2015, the CMIA project relieves the bottlenecks between the San Antonio Road on-ramp and Oregon Expressway/Embarcadero Road off-ramp and the lane drop at the Old Middlefield Road overcrossing. The segment near the Shoreline Boulevard on-ramp, however, would continue to operate as a bottleneck during the AM peak period, and queues would develop upstream of this location. In the 2015 PM peak period, the bottleneck would continue to develop between the San Antonio Road on-ramp and Oregon Expressway/Embarcadero Road off-ramp.

In 2035, an existing bottleneck will not form between the San Antonio Road on-ramp and Oregon Expressway/Embarcadero Road off-ramp due to upstream bottlenecks that meter traffic demand to this section. The segment between the SR 85 on-ramp and Old Middlefield Road off-ramp, however, would operate as a bottleneck during the AM peak period, and queues would develop upstream of this location. In the 2035 PM peak period, a bottleneck would continue to develop between the San Antonio Road on-ramp and Oregon Expressway/Embarcadero Road off-ramp.

In 2015, a bottleneck will continue to develop between the Charleston Road on-ramp and Rengstorff Avenue off-ramp in the southbound direction during the AM peak period, and between the Rengstorff Avenue on-ramp and Old Middlefield Road on-ramp during the PM peak period. The auxiliary lanes will provide benefit to the corridor mainly by reducing the total vehicle hours of delay during the AM peak period and reducing the queue from this bottleneck during the AM and PM peak periods.

In 2035, a bottleneck will continue to develop between the Charleston Road onramp and Rengstorff Avenue off-ramp during both the AM and PM peak periods. The auxiliary lanes will provide benefit to the corridor by reducing the total vehicle hours of delay during the AM and PM peak periods.

Measures of Effectiveness		**2015**					
		Northbound			Southbound		
		No Project	Project	%Change	No Project	Project	%Change
Vehicle Miles of Travel (vehicle-miles)	AM	98,966	103,233	5%	344,718	344,078	0%
	PM	93,264	110,464	18%	306,982	316,123	3%
Average Travel Time Delay (minutes:seconds)	AM	11:58	9:29	-21%	25:58	25:14	-3%
	PM	16:14	11:39	-28%	37:14	40:10	8%
Individual Vehicle Delay (minutes:seconds)	AM	6:26	3:57	-39%	6:51	6:07	-11%
	PM	10:42	6:07	-43%	18:07	21:03	16%
Average Travel Speed (mph)	AM	30	38	27%	47	49	4%
	PM	22	31	41%	33	31	-6%
Mainline Vehicle Delay (vehicle-hours)	AM	1,447	887	-39%	1,430	1,219	-15%
	PM	1,963	1,256	-36%	3,693	4,419	20%

Table 4.3.1. Measures of Effectives in 2015.
Source: *Traffic Operations Analysis Report*, US 101 Auxiliary Lanes Project from Embarcadero to SR 85 – Tables 11 & 12.

Measures of Effectiveness		**2035**					
		Northbound			Southbound		
		No Project	Project	%Change	No Project	Project	%Change
Vehicle Miles of Travel (vehicle-miles)	AM	98,538	107,342	9%	367554	368606	0%
	PM	96,035	115,224	20%	349574	352835	1%
Average Travel Time Delay (minutes:seconds)	AM	12:20	7:26	-40%	28:57	28:12	-3%
	PM	14:06	10:33	-25%	1:35:42	1:36:46	1%
Individual Vehicle Delay (minutes:seconds)	AM	6:48	1:54	-72%	9:50	9:05	-8%
	PM	8:34	5:01	-41%	1:16:35	1:17:39	1%
Average Travel Speed (mph)	AM	29	48	66%	42	43	2%
	PM	26	34	31%	17	16	-6%
Mainline Vehicle Delay (vehicle-hours)	AM	1,559	356	-77%	2283	2059	-10%
	PM	1,596	1,037	-35%	14098	14491	3%

Table 4.3.2. Measures of Effectiveness in 2035.
Source: *Traffic Operations Analysis Report*, US 101 Auxiliary Lanes Project from Embarcadero to SR 85 – Tables 18 & 19.

4.4 Expected Performance of US 101 from I-280/I-680 to Yerba Buena Road

This section documents the expected future performance of US 101 from I-280/I-680 to Yerba Buena Road as document in the report titled " Traffic Operations Report, US 101 Operational Improvements from I-280/I-680 to Yerba Buena Road".

The report provides expected performance in 2030 associated with completion of the following improvements through the CMIA Project:

- Adding a southbound through lane on the US 101 mainline from the Story Road lane drop to south of the Capitol Expressway Interchange
- Adding a new on-ramp from the Capitol Expressway/Yerba Buena Road C-D road to northbound US 101 to serve Yerba Buena traffic entering the freeway
- Converting the Tully Road Interchange from a full cloverleaf to a partial cloverleaf design (eliminating the loop off-ramps)
- Converting the Capitol Expressway Interchange from a full cloverleaf to a partial cloverleaf design (eliminating the loop off-ramps)
- Adding a southbound auxiliary lane between the Tully Road and Capitol Expressway interchanges
- Adding a southbound auxiliary lane and removal of the existing collector distributor road between the Capitol Avenue on-ramps and the Yerba Buena off-ramp
- Adding a two-lane off-ramp at Yerba Buena Road

Measures of Performance US 101 from I-280/I-680 to Yerba Buena Road

Without the CMIA project, in 2030 the vehicle miles traveled (VMT) will increase 28 percent in the AM peak and 28 percent in the PM peak when compared to Existing Conditions. There are even larger increases in the vehicle hours traveled (VHT) of 41 percent during the AM peak and 38 percent during the PM peak. The total vehicle hours of delay (VHD) within the system almost double during both the AM and PM peaks. In 2030, without the CMIA project, there is a decrease in the average travel speed within the study area. There will be increased congestion on the freeway and more route diversion to local facilities.

With completion of the CMIA project, there are improvements in the system-wide measures of effectiveness during the AM peak in 2030. The primary benefit in the AM peak will be on the arterial streets due to the increase in vehicle storage provided at the northbound on-ramps at the Tully Road and Capitol Expressway interchanges and the construction of a diagonal on-ramp onto northbound US 101 from the Yerba Buena Road interchange. With additional vehicle storage at the on-ramps serving northbound US 101, there is less queue spillback interfering with the east/west traffic on both Tully Road and Capitol Expressway. When compared to the 2030 No CMIA Project AM Peak Hour Condition, the improved mobility results in an increase in VMT of 9% along with a corresponding significant decrease in VHD of 24%. The average travel speed in the study area improves from 28.8 mph to 32.9 mph, a 12% improvement when compared to No CMIA Project Conditions.

During the PM peak, the CMIA Project provides significant benefits due to the interchange reconfigurations, the addition of the southbound through lane on US 101 between the Story Road and Yerba Buena Road interchanges, and the new direct off-ramp to the Yerba Buena Road interchange. With the elimination of the existing bottleneck between the I-680/I-280 on-ramp and the Tully Road interchange, and significantly improved traffic flow on southbound US 101, there is an increase in the VMT of 9% and a decrease in VHD of 26% when compared to the No CMIA Project Conditions. The average travel speed in the study area improves from 33.1 mph to 37.0 mph, a 12% improvement.

AM Peak Hour	Existing	2030 No Project	2030 With Project	2030 % Change
Vehicle miles traveled (VMT)	246,005	313,975	342,285	9.0 %
Vehicle hours traveled	7,735	10,910	10,415	- 4.5%
System average speed	33.8	28.8	32.9	12.2%
Vehicle hours of delay (VHD)	1,580	3,515	2,655	- 24.5%
Passenger miles traveled	290,025	372,685	406,290	9.0%
Passenger hours traveled	9,125	12,950	12,365	- 4.5%
Passenger hours of delay	1,865	4,175	3,150	- 24.6%
PM Peak Hour				
Vehicle miles traveled (VMT)	302.165	386,750	422,035	9.1 %
Vehicle hours traveled	8,455	11,700	11,385	- 2.7 %
System average speed	35.7	33.1	37.0	11.8 %
Vehicle hours of delay (VHD)	1,980	3,555	2,630	- 26.0 %
Passenger miles traveled	367,650	460,230	502,220	9.1 %
Passenger hours traveled	10,285	13,920	13,545	- 2.7 %
Passenger hours of delay	2,410	4,230	3,130	- 26.0 %

Source: *Traffic Operations Report*, US 101 Operational Improvements from I-280/I-680 to Yerba Buena Road – Table 27.

Travel Time Performance US 101 from I-280/I-680 to Yerba Buena Road

In 2030, the Travel Time Analysis for the CMIA project indicates the CMIA project:

- Improves mobility and reduces congestion on the local arterial system without degrading the operating conditions of northbound US 101 during AM peak hour conditions; and
- Significantly improves travel times in the southbound US 101 by eliminating the existing bottleneck between the I-680/I-280 on-ramp and the Tully Road off-ramp and by reconfiguring the Tully Road, Capitol Expressway, and Yerba Buena Road interchanges.

		2030		
AM Peak Hour	**Existing**	**No Project**	**With Project**	**% Change**
NB US 101 - (s/o Hellyer Avenue Off-Ramp) to NB US 101 - (n/o McKee Road On-Ramp)	10.6	15.0	14.8	- 1.3 %
WB Yerba Buena Avenue (e/o Silver Creek Road) to NB US 101 (n/o McKee Road On-Ramp)	14.4	22.7	16.5	- 27.3 %
WB Aborn Road (e/o Capitol Expressway) to NB US 101 (n/o McKee Road On-Ramp)	18.1	23.9	19.3	- 19.2 %
WB Tully Road (e/o King Road) to NB US 101 (n/o McKee Road On-Ramp)	14.1	22.0	20.6	- 6.4 %
PM Peak Hour				
SB US 101 (n/o McKee Avenue Off-Ramp) to SB US 101 (s/o Hellyer Road On-Ramp)	9.1	13.9	7.8	- 43.9 %
SB I-680 (n/o King Road Off-Ramp) to SB US 101 (s/o Hellyer Road On-Ramp)	8.7	11.9	8.0	- 32.8 %
EB I-280 (w/o McLaughlin Ave. Off-Ramp) to SB US 101 (s/o Hellyer Road On-Ramp)	8.4	12.1	8.1	- 33.1 %

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4.5 Summary of US 101 CMIA Project Expected Performance

The three CMIA funded projects on US 101 in San Mateo and Santa Clara County provide improvements to the US 101 corridor, but reliability will deteriorate on most stretches of US 101 if no further capacity improvements are made after 2015. These projects and key performance metrics are illustrated in Figures 4.5.1 and 4.5.2.

Section 5 of this CSMP examines strategies that mitigate the bottlenecks and congestion identified in Section 3 Current Operating Conditions that will continue to exist after completion of the three CMIA projects. In addition, projects or strategies will be investigated to preserve the benefits achieved by these CMIA projects.

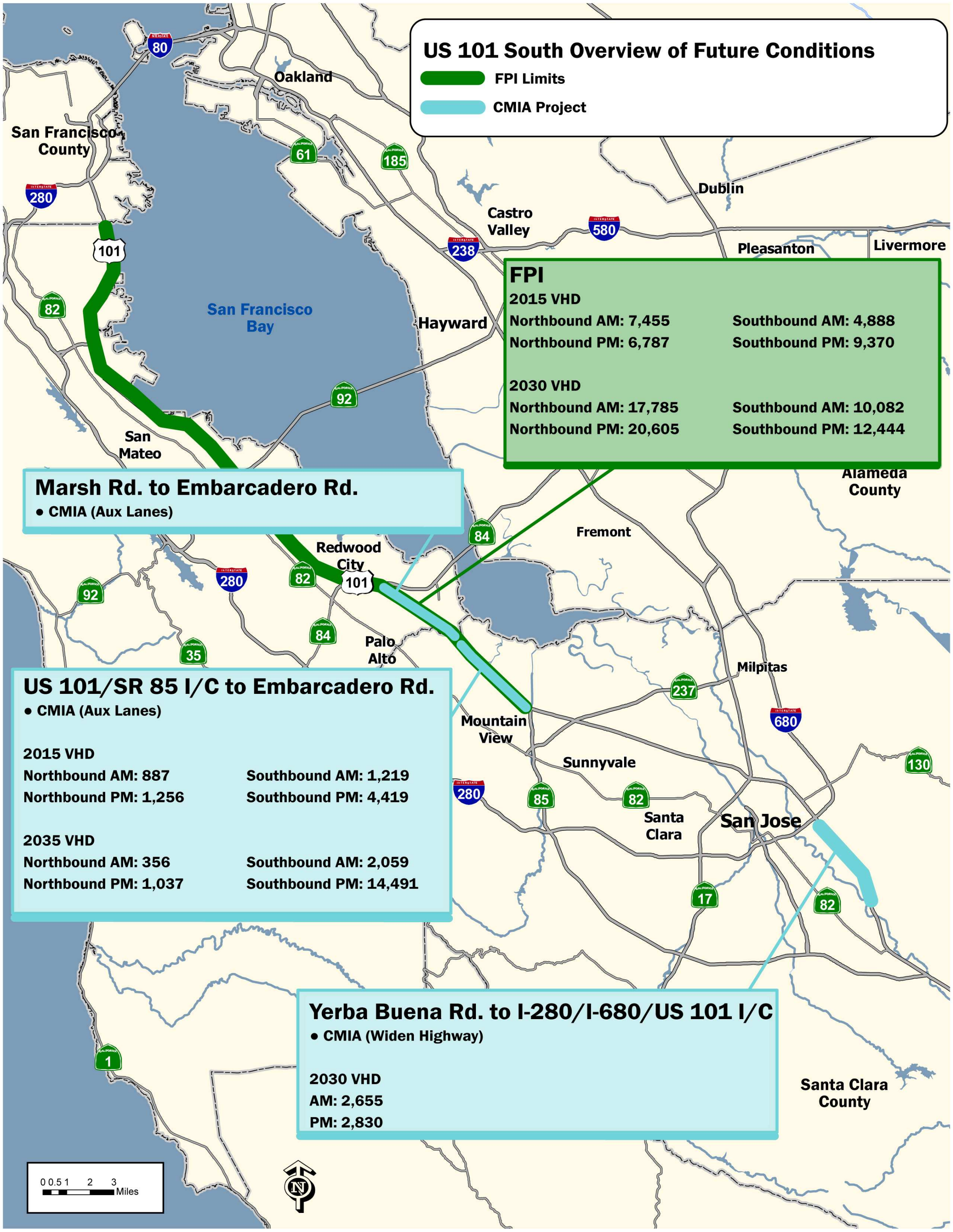

Figure 4.5.1. Future Year Vehicle Hours Delay (VHD).

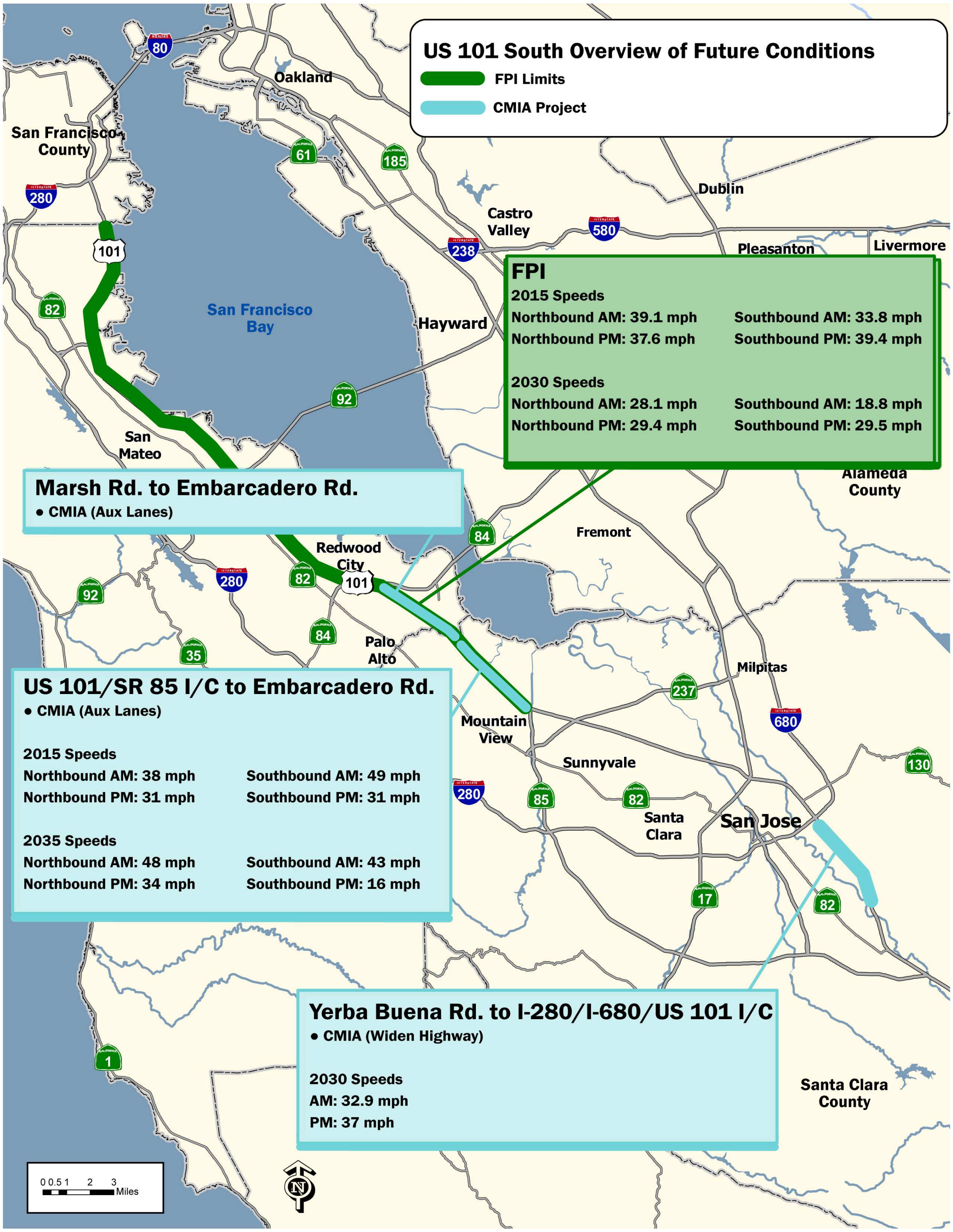

Figure 4.5.2. Future Year Speeds in miles per hour.

SECTION 5
RECOMMENDED STRATEGIES

5.1 Introduction to Recommended Strategies

The US 101 South CSMP Corridor is unique in character, with two important metropolitan centers linked by a well-established urbanized corridor. The limited right-of-way, the mixture of local and (inter)regional demands, and the multi-modal nature both on US 101 (business and private use, trucks, transit) and surrounding US 101 (aviation, rail, bus, paratransit, bike, and pedestrian modes) make US 101 South a complicated corridor in which to create a CSMP with generalized recommendations.

This first generation CSMP is primarily concentrated around freeway capacity enhancement. With the Freeway Technical Corridor Analysis report focusing on San Mateo County, and the other reports covering substantial freeway segments of Santa Clara County, the FPI report and VTA's Valley Transportation Plan 2035 are nevertheless excellent sources for CSMP recommended strategies. The San Mateo US 101 FPI Technical Corridor Analysis and the Santa Clara County VTP2035 are the main sources for the recommended strategies of this CSMP, although several other reports, General Plans, and sources such as Go California and SMART Corridor were used to shape the recommended strategies.

The variety of strategies available for addressing localized problems include land use decisions, transit improvements, demand management, freeway and surface street management, freeway and street improvements, and freeway/street operations. Each of these strategies affects one or both of the primary factors for congestion on US 101: demand and capacity. Management can affect both demand and capacity, separately or in combination. As shown in Table 5.1.1, changes in capacity will affect demand, and demand can affect capacity. The strategies and the methods used to evaluate them must recognize this feedback effect.

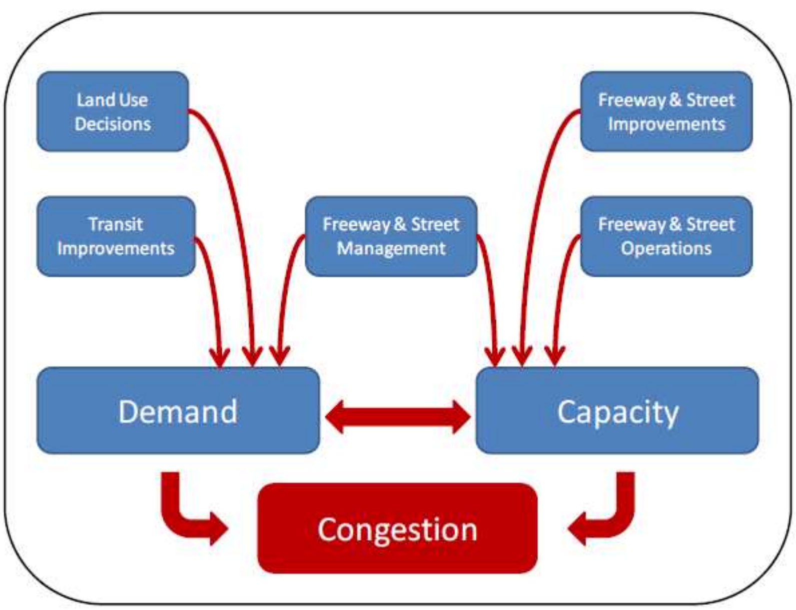

Table 5.1.1. Factors Affecting Freeway Corridor Congestion.
Source: *San Mateo US 101 Freeway Corridor Technical Analysis* – Exhibit 88.

Section 5 presents recommended strategies for the corridor and describes (where applicable) how the strategies were developed. A single strategy cannot provide the overall approach that fulfills all current and future transportation needs, and therefore all recommended strategies have their place in a multi-pronged approach to corridor planning. Without the help of ITS, recent improvements could not have been achieved, and the role of ITS can only increase in importance in the future. Where it is not feasible for the freeway to increase capacity by acquiring more right of way, other modes may have room to provide additional capacity. Meanwhile, smart use of arterials during emergencies can help improve the freeway's reliability. Making better use of other routes, such as Camino Real (SR 82) and I-280, can contribute to better transportation flows. Improved land use goals can actually diminish projected future transportation demands.

Many studies are presently underway, and it is expected that studies will remain a continuing aspect of managing this corridor to continually optimize the transportation needs in the ever-changing infrastructure environment.

5.2 ITS Recommended Strategies

Spearheaded by various individuals and organizations, ITS has become an integral part of freeway management, and the expectation is that ITS will continue to provide innovate contributions to manage this corridor in the future. ITS improvements can be considered low-cost improvements for freeway mobility. Consequently, completion of the ITS infrastructure should be given a top position for funding improvements for the US 101 freeway corridor.

Caltrans District 4 has established the following informal guidelines for positioning ITS field elements along a freeway corridor.

- Ramp Metering Stations: Caltrans District 4 recently completed a Ramp Meter Development Plan (RMDP) which identifies specific ramp meter deployment locations.
- Traffic Monitoring Stations (TMS): Spaced between 0.33 and 0.50 miles apart.
- CCTV Cameras: Spaced at one mile intervals. Cameras are considered at interchanges and between interchanges.
- Changeable Message Sign (CMS): Considered at decision points upstream of freeway-to-freeway interchanges. May also be considered for installations along long stretches of highway.
- EMS (extinguishable message sign) units are deployed at locations within the HAR transmitter's operating range, which are typically located between 5 and 10 miles apart.

The US 101 ITS infrastructure is further described in the Regional ITS Architecture, recently updated in 2008. The Regional ITS Architecture is the ITS planning framework for the Bay Area that was developed and currently maintained by MTC in cooperation with partner agencies (including Caltrans). This architecture was developed and maintained in compliance with the FHWA ITS Final Rule (23 CFR 940). A Regional ITS Architecture is the ITS planning framework for integrated ITS project development in a region specified by its stakeholders.

Similarly, The California Statewide ITS Architecture and System Plan (SWITSA) references the existing and developing regional ITS plans and architectures from all over the state. It focuses on interregional coordination and state-level needs, and identifies common transportation challenges and services. It also includes a 10-year system plan that describes the blueprint for deployment of specific projects that fall within the statewide and interregional services category.

ITS improvements have been the subject of several extensive studies for the 101 corridor and many of those recommendations are currently being implemented. It is recommended to continue implementation of the Caltrans District 4 ITS deployment approach.

Ramp Metering
Deploy ramp metering stations at the locations identified in the Caltrans Ramp Metering Deployment Plan (RMDP). A total of 29 ramp meter locations have been identified for installation.

Traffic Monitoring Stations
Traffic Monitoring Stations (TMS): The corridor has generally complete TMS coverage at 0.33 to 0.5 mile intervals. A strict interpretation of the maximum half-mile interval yields the recommendations given in Table 5.2.1.

Recommended Location	Existing TMS South	Existing TMS North	Existing Interval	Future Interval
SB SCl-101-49.95	49.5	50.4	0.9	0.45
NB SCl-101-50.08	49.75 (future/funded)	50.4	0.65	0.33
NB&SB SCl-101-50.70	50.4	51	0.6	0.3
NB&SB SM-101-2.88	2.55	3.2	0.65	0.33
NB&SB SM-101-4.30	4	4.6	0.6	0.3
NB&SB SM-101-10.05	9.69	10.40 (Construction)	0.71	0.36
NB&SB SM-101-10.73	10.40 (Construction)	11.06	0.66	0.33
NB SM-101-18.50	18.06	18.94	0.88	0.44
SB SM-101-18.33	17.84	18.83	0.99	0.5

Table 5.2.1. Recommended New TMS Stations.
Source: *San Mateo US 101 Freeway Corridor Technical Analysis* – Exhibit 100.

Closed Circuit Televisions
Closed Circuit Televisions (CCTV) are Pan-Tilt-Zoom cameras that are deployed at strategic locations allowing transportation management staff to monitor conditions and assist with incident management. The FPI consultant team recommends the locations listed in Table 5.2.2 based on the maximum one mile spacing interval recommended by District 4.

Install CCTVs between these mileposts:
SCl-50.32 and SCl-51.89
SM-3.52 and SM-4.69
SM-6.66 and SM-8.41
SM-8.41 and SM-9.55
SM-11.14 and SM-14.37 (two required)
SM-20.79 and SM-21.80
SM-21.80 and SM-23.22
SM-23.22 and SM-24.79
SM-25.07 and SM-26.11
Summary: 10 CCTV required

Table 5.2.2. Recommended New CCTV Locations.
Source: *San Mateo US 101 Freeway Corridor Technical Analysis* – Exhibit 101.

Additional coverage for blind spots where the one mile interval may be inadequate should also be considered. The blind spots that were identified are SM 3.05 Henderson Underpass, SM 22.20 Curve: Grand to Oyster Point, and SM 23.66 Curve at Shorepoint Overhead.

CMS Units
CMS units should be deployed at locations where drivers can adjust their routes to account for new information pertaining to roadway conditions. In the Bay Area they are also employed to disseminate real time travel times obtained from FastTrak toll tags. In addition to the CMS locations listed in the Caltrans District 4 ITS inventory, the consultant team recommends consideration be given to the locations listed in the table based on the major intersecting facilities noted in Table 5.2.3.

Northbound		**Southbound**	
Existing CMS/New CMS/*Intersecting Route*	**Milepost**	**Existing CMS/New CMS/*Intersecting Route***	**Milepost**
Existing CMS	SM-0.03	Existing CMS	SM-24.77
State Route 84	SM-3.59	*Interstate 380 SFO Airport*	SM-20.71 SM-19.12
Existing CMS	SM-5.63	Existing CMS	SM-18.52
Whipple Ave. / Holly St.	SM-6.62/SM-8.40	*Broadway*	SM-16.58
Existing CMS	SM-10.32	Existing CMS	SM-15.01
State Route 92	SM-11.91	*State Route 92*	SM-11.91
Existing CMS	SM-17.04	Existing CMS	SM-7.63
SFO Airport Interstate 380	*SM-18.92 SM20.71*	*State Route 84*	*SM-3.59*
Potential New CMS	**SM-22 to 26**	Existing CMS	SM-3.10
San Mateo/San Francisco County Line	*SM-26.11*	*State Route 114/Willow Road*	*SM-1.94*
		Existing CMS	SCL-51.52
		State Route 85	*SCL-48.10*

Table 5.2.3. Recommended New CMS Locations.
Source: *San Mateo US 101 Freeway Corridor Technical Analysis* – Exhibit 102.

Recommended ITS strategies for improved mobility can grouped as follows:

1. Arterial signalization
2. Ramp metering
3. Detection
4. Traveler information
5. Incident management

Combining these strategies may create additional benefits or may minimize negative impacts. For instance, a combination of adding auxiliary lanes and having ramp metering in place can add capacity while controlling the freeway environment when that becomes necessary.

From the VTP2035, the following figure shows ITS projects in Santa Clara County.

Figure 5.2.1. Constrained ITS Projects in Santa Clara County.
Source: *VTP2035* – Figure 2-6.

S25: *Palo Alto Smart Residential Arterials*
S24: *Rengstorff Avenue Traffic Signal Improvements*
S23: *Shoreline Boulevard Adaptive Traffic Signals*
S35: *King/Story Area Advanced Traffic Management System*

VTA's allocation of ITS projects give highest priority to projects that improve traffic flow through signal operations for local roadways/expressways, freeways (ramp meters), transit (priority treatment at traffic signals) and bicycle traffic (bicycle detection and signal timing). A part of the proposed allocation is reserved to fund countywide ITS operations, management and maintenance, and the remainder of the proposed allocation is for other ITS projects that emphasize integration and connectivity of the transportation network systems.

ITS is not just applicable to freeways and freeway users. Transit passengers also benefit from ITS and can further benefit from ITS innovations, such as is the case of Caltrain, which has user-reported real-time bike car availability on Twitter.

Currently Caltrans District 4 implements ITS improvements as part of other highway improvement projects in order to minimize installation costs. (Equipment does not have to be replaced when the new construction comes in.)

A recommended strategy from the US 101 South CSMP Working Group is to develop a collaborative ITS Plan for the entire corridor.

5.3 US 101 South CSMP Freeway Strategies

Short-term Freeway Strategies

For the short term (circa 2015), bottleneck specific capacity improvements were identified bottleneck by bottleneck and prioritized according to the severity of the congestion at each bottleneck in San Mateo County.

The traditional freeway capacity improvements necessary to mitigate forecasted 2015 baseline congestion were identified and prioritized for San Mateo County using a combination of the FREQ model and spreadsheet information. The FREQ model was used to identify the 2015 AM and PM peak hour bottlenecks and to compute the queue storage rates for each bottleneck.

The prioritization analysis was based on 2015 traffic levels starting with 2015 baseline conditions. To ensure that the San Mateo improvements could serve the expected demands arriving from Santa Clara County, a set level of improvements was assumed to be in place prior to the implementation of the improvements in San Mateo County. The baseline improvement projects are shown in Table 5.3.1.

The northbound projects tend to be more cost-effective (on a qualitative basis) than the southbound improvements because of the greater congestion at several bottlenecks in the northbound direction and the lower costs of the improvements. Both northbound and southbound improvements were selected for short term implementation because they have the greatest effectiveness at reducing queue buildups on the freeway at key bottlenecks during the morning and evening peak hours.

Note that the cost effectiveness analysis considered only freeway mainline mobility improvement benefits and the costs associated only with the freeway mainline capacity improvements. Interchange projects can also have safety and local access benefits not considered here, which may increase both the estimated cost of the projects and their benefits.

Potential groupings of the recommended freeway capacity improvements into interchange oriented improvement projects (mitigating both directions of travel at each or between each interchange) are given in Table 5.3.2. The potential groupings attempt to combine the individual freeway mainline improvements into logical groupings by interchange for planning and construction purposes.
The total estimated cost of these capacity improvements is $337.3 million.

Project Name	Description
San Mateo County[4]	
Auxiliary Lanes – Marsh to Embarcadero	Widen NB and SB auxiliary lane segments from 4 lanes to 5
Auxiliary Lanes and Ramp Metering – 3rd to Millbrae	Widen NB and SB auxiliary lane segments from 4 lanes to 5 and install ramp metering equipment. Ramp meters will be turned on as widening construction is completed.
Smart Corridor	Emergency re-route of traffic on US 101 via ITS and static signs on freeway, intersections, and parallel arterial streets. Includes emergency traffic signal timing plans and emergency response coordination via Caltrans freeway management center in Oakland.
US 101 Ramp Metering	Caltrans' SHOPP project for Ramp Metering (Rte 92 to SF County line)
SR 92 Widening – US 101 to I-280	Widen from 2 lanes to 3 lanes in each direction (To be implemented by 2030)
Santa Clara County	
US 101 HOV to HOT Conversion	Convert HOV lanes on US 101 in Santa Clara County to HOT lanes.
HOV Lane Extension – SR 85 to Oregon	Extend existing dual NB HOV lanes near the US 101/SR-85 interchange to a point south of the US 101/Oregon Expressway interchange.
Northbound Aux Lane – Rengstorff to San Antonio	Widen NB from 4 lanes to 5 (auxiliary lane)
Auxiliary Lane – San Antonio to Oregon	Widen NB and SB auxiliary from 4 lanes to 5
Extend NB Lane – Shoreline to Rengstorff	Remove lane drop on NB US 101 near Shoreline interchange by carrying lane through to Rengstorff interchange loop off-ramp.
US 101/Rengstorff Interchange Improvements	Modify Rengstorff on-ramp to NB US 101 to become 2 mixed flow lanes from its existing single lane configuration.
US 101/San Antonio Interchange Improvements	Modify San Antonio NB loop and diagonal on-ramps into one on-ramp to US 101.
US 101/Old Middlefield Interchange Improvements	Modify Old Middlefield on-ramp to SB US 101 from 1 HOV plus 1 mixed flow lane to 2 mixed flow lanes.
US 101/Oregon Interchange Improvements	Modify Oregon on-ramp to SB US 101 to become 2 mixed flow lanes and 1 HOV lane from its existing configuration of 1 mixed flow lane and 1 HOV lane.
US 101 Ramp Metering	Implement ramp meters for all US 101 on-ramps in Santa Clara County.

Table 5.3.1. Baseline Improvement Projects.
Source: *San Mateo US 101 Freeway Corridor Technical Analysis* – Exhibit 63.

[4] It is not certain when ramp metering will be activated between 3rd Avenue and Millbrae Avenue. Construction of 101 Aux lanes between San Bruno Avenue and San Francisco County line is still under consideration. The US 101/Broadway I/C reconstruction with ramp metering is a likely project by 2015.

The FPI Technical Analysis for San Mateo US 101 identified the following capacity improvements, grouped around specific locations:

ID	Location	Dir	Improvement	Limits	FREQ SS	Cost
1	Willow Road	NB	Widen from 3 to 4 lanes	Off to Loop On	20	$ 1,400,000*
		NB	Widen aux from 4 to 5 lanes	Loop On to Loop Off	21	$ 16,100,000
		NB	Widen from 3 to 4 lanes	Loop Off to On	22	$ 1,300,000
		SB	Widen from 3 to 4 lanes	Loop Off to Diagonal On	56	$ 2,700,000
				Subtotal		$ 21,500,000
2	Third Avenue	NB	Widen from 4 to 5 lanes	Off to On	47	$ 14,500,000*
		SB	Widen from 4 to 5 lanes	Off to On	30	$ 16,500,000*
				Subtotal		$ 31,000,000
3	University Avenue	NB	Widen from 4 to 5 lanes	Lane Add to Off	17	$ 2,900,000
		NB	Widen from 3 to 4 lanes	Off to On	18	$ 15,900,000
		SB	Widen from 4 to 5 lanes	Lane Add to Univ. Off	58	$ 2,100,000
		SB	Widen from 3 to 4 lanes	Univ. Off to Univ. On	59	$ 18,500,000*
				Subtotal		$ 39,400,000
4	Hillsdale Boulevard[5]	NB	Widen from 4 to 5 lanes	Loop On to Diag. On	39	$ 2,800,000*
		NB	Widen aux from 5 to 6 lanes	Diag On to SR 92 Off	40	$ 900,000*
		NB	Widen aux from 5 to 6 lanes	Mar Diag. On to Hills Off	37	$ 17,800,000
		NB	Widen from 4 to 5 lanes	Hills Off to Hills Loop On	38	$ 6,600,000*
		SB	Widen from 4 to 5 lanes	Loop On to Diag. On	38	$ 2,200,000*
		SB	Widen from 4 to 5 lanes	Off to Loop On	37	$ 9,600,000*
		SB	Widen aux from 5 to 6 lanes	Hills On to Marine Off	39	$ 13,800,000*
		SB	Widen from 4 to 5 lanes	Marine Off to Marine On	40	$ 3,000,000*
				Subtotal		$ 56,700,000
5	Dore/Peninsula Avenue	NB	Widen from 4 to 5 lanes	Pen Off to Pen On	50	$ 7,500,000
6	Broadway/Anza Boulevard	NB	Widen from 4 to 5 lanes	Brdwy Off to Brdwy On	54	$ 11,000,000
7	Marsh Road	NB	Widen from 3 to 4 lanes	Off to Loop On	24	$ 3,200,000
		NB	Widen 3 to 4 lanes/extend downstream aux lane	Loop On to Diag. On	25	$ 3,200,000*
				Subtotal		$ 6,400,000
8	Aux Lanes – San Bruno to San Mateo/SF County Line	SB	Widen from 4 to 5 lanes	Mainline to Beatty Off	2	$ 6,700,000
		SB	Widen from 4 to 5 lanes	Beaty on to Sierra Pt Off	4	$ 11,900,000
		SB	Widen from 4 to 5 lanes	Sierra On/Bayshore Off	6	$ 21,500,000
				Subtotal		$ 40,100,000
9	Miller Ave./S. Airport Blvd.	SB	Widen from 4 to 5 lanes	Miller Off to S Airport Off	11	$ 15,300,000
		SB	Widen from 4 to 5 lanes	S Airprt Off to S Airport On	12	$ 8,800,000
				Subtotal		$ 24,100,000
10	Bayshore/Oyster Point	SB	Widen from 4 to 5 lanes	Bayshore On to Oystr Pt On	9	$ 5,700,000*
11	SFO/Millbrae Avenue	NB	Widen from 4 to 5 lanes	Millbrae Off to Lane Add	56	$ 32,200,000
		NB	Widen from 5 to 6 lanes	Lane Add to SFO (2) Off	57	$ 2,300,000
		NB	Widen from 4 to 5 lanes	SFO (2) Off to Millbrae On	58	$ 3,300,000
				Subtotal		$ 37,800,000
12	Ralston/Marine Parkway	NB	Widen from 4 to 5 lanes	Loop On to Diagonal On	36	$ 1,600,000
13	Woodside	NB	Widen 3 to 4 mixed flow lanes	Off to On	27	$ 12,400,000*
14	SR 92	NB	Widen from 4 to 5 lanes	EB Loop On to WB On	42	$ 6,700,000*
15	Peninsula/Anza	NB	Widen from 5 to 6 lanes	Peninsula On to Anza Off	51	$ 24,000,000
16	Broadway/Millbrae	NB	Widen from 5 to 6 lanes	Brdwy On to Millbrae Off	55	$ 8,000,000
17	Whipple Avenue	SB	Widen from 3 to 4 lanes	Lane Drop to Loop On	46	$ 3,400,000*
				Total		$337,300,000

Table 5.3.2. Possible Project Groupings of Short Term Capacity Improvements.
Source: *San Mateo US 101 Freeway Corridor Technical Analysis* – Exhibit 113.
* indicates at least one design exception is assumed to be required.
FREQ SS: FREQ subsection numbers as used in Table 5.3.4.

[5] Auxiliary lane widening in northbound US 101 between Hillsdale Blvd on-ramp and SR 92 off-ramp would cause a difficult weave across two lanes of traffic for the Hillsdale diagonal on-ramp vehicles heading to NB US 101. Two lanes would drop at the SR 92 off-ramp, a distance of only 1200 feet from the Hillsdale diagonal on-ramp.

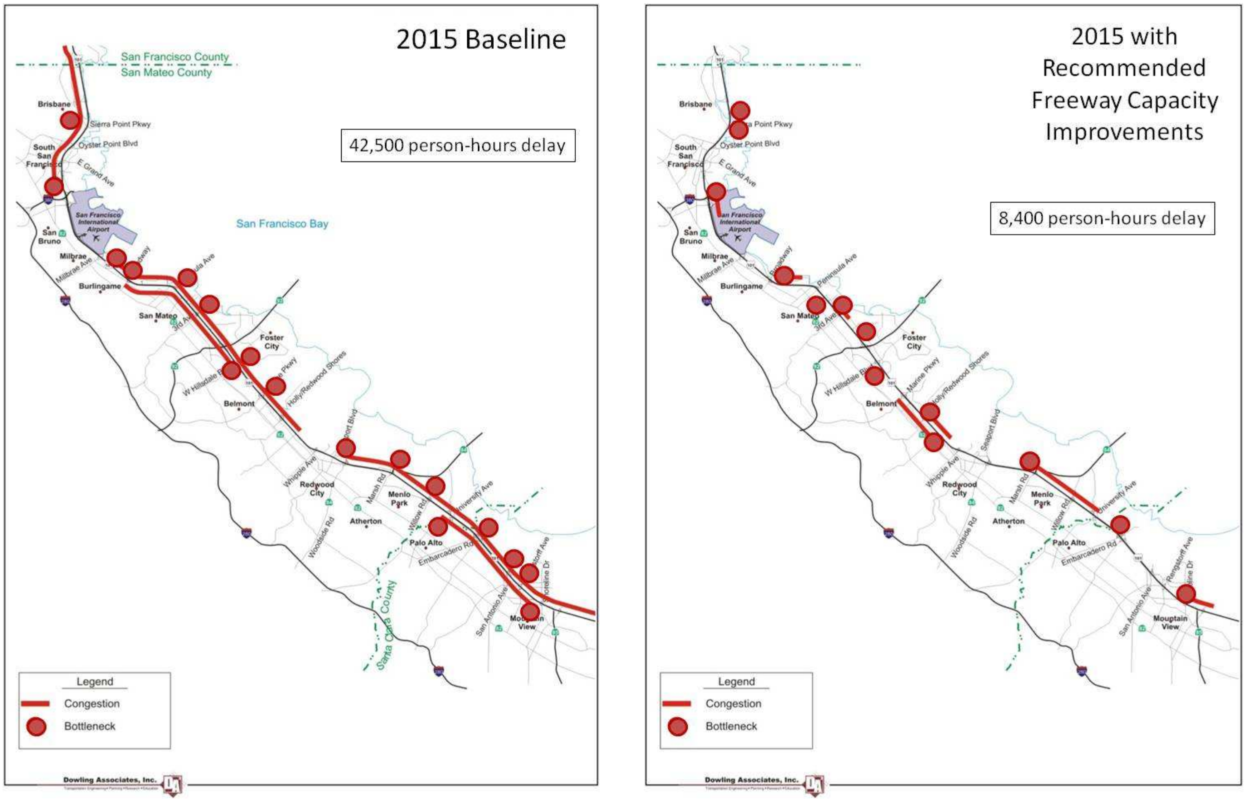

Figure 5.3.1. 2015 Baseline and 2015 Improved Congestion Locations.
Source: *San Mateo US 101 Freeway Corridor Technical Analysis* – Exhibit 111.

Figure 5.3.1 provides a graphical comparison of freeway bottleneck locations and queues for 2015 baseline versus 2015 with recommended improvements to demonstrate the benefits of the proposed improvements

The freeway mobility performance in 2015 with the baseline improvements is tabulated in Table 5.3.3.

- The peak period demand as measured in terms of vehicle-miles traveled (VMT) is forecasted to increase by 39% in 2015 over current 2009 levels.
- Peak period vehicle-hours traveled (VHT) is forecasted to increase by 44% in 2015 over existing 2009 conditions.
- Peak period vehicle-hours of delay (VHD) is forecasted to increase by 57% in 2015 over existing 2009 conditions.
- The peak period mean speed would drop by 4% from current conditions to around 44 mph.

Freeway Mobility Performance Measures	2009 (Existing)	2015 (Base)	2015 Recommendations MOE	(Diff)
Vehicle Miles of Travel (VMT)	3,502,424	4,870,341	5,035,396	3%
Vehicle Hours of Travel (VHT)	75,990	109,637	84,336	-23%
Vehicle Hours of Delay (VHD)	22,107	34,709	6,868	-80%
Mean Vehicle Speed (mph)	46	44	60	34%
Person Miles of Travel (PMT)	4,284,762	5,967,535	6,168,686	3%
Person Hours of Travel (PHT)	92,897	134,276	103,321	-23%
Person Hours of Delay (PHD)	26,978	42,468	8,418	-80%
Unreliability - Buffer Index	205%	206%	199%	-4%
Safety - Annual Collisions	690	831	552	-34%
Productivity - Lost Lane-Miles	428	591	350	-41%

Table 5.3.3. Summary of US 101 Freeway Performance with Improvements 2015.
Source: *San Mateo US 101 Freeway Corridor Technical Analysis* – Parts of Exhibit 118 (FREQ Model Results).
Note: Annual collisions are computed based on ADT's estimated using the C/CAG Model.

For the 2015 near term conditions, analysis results showed that the recommended improvements would significantly reduce vehicle delays by approximately 80% while increasing vehicle-miles traveled (VMT) by approximately 3%. Even though additional demands are not allowed to shift to US101, VMT and person-miles traveled (PMT) increase because the reduced congestion on the freeway allows queued vehicles to travel farther within the analysis period.

Travel time reliability would be improved with the recommended projects, as shown with the reduced buffer index – meaning the amount of extra time that the traveler must budget in order to be confident of arriving on-time, is reduced, which is a desirable outcome. As freeway congestion is relieved, collision rates will be reduced, resulting in increased safety along the corridor with an estimated 34% reduction in collisions. Similarly, productivity would be improved by 41% as congested lane-miles are reduced.

Long-term Freeway Strategies

This section presents first the alternatives analysis for long-term (year 2030) improvements to the San Mateo US 101 freeway, followed by the recommended strategies for Santa Clara County from the Valley Transportation Plan 2035.

A bundle of capacity improvements for 2030 was developed to preserve capacity at current (2009) levels for the San Mateo portion of US 101. Meanwhile, a second, more aggressive bundle of long term improvements was identified in the FPI report to eliminate forecasted freeway congestion in 2030. Yet the aggressive 2030 bundle was considered impractical to implement; only the low level recommendations are presented.

2030 Low Level Improvement Scenario

This level of improvement involves 29 lane-miles of added capacity (many of which were also included in the short term analysis described above) over and above the baseline improvements for 2015.

Improvements which were also recommended under the short term conditions are identified in Table 5.3.4 below (two pages), marked on the right side of the table.

Subsection		Long Term Low Level Improvement	Length (ft)	In 2015 short term
N B	Northbound			
3	Shoreline off-ramp to SR-85 on-ramp	Widen from 3 to 4 mixed flow lanes	1380	
4	SR-85 on-ramp to SR-85 HOV on-ramp	Widen from 4 to 5 mixed flow lanes	2085	
5	SR-85 HOV on-ramp to Middlefield off	Widen from 4 to 5 mixed flow lanes	995	
8	Shoreline on-ramp to Rengstorff off	Widen to provide auxiliary lane (4 to 5 mixed flow lanes)	2150	
10	Rengstorff loop off-ramp to on-ramp	Widen from 3 to 4 mixed flow lanes	654	
11	Rengstorff on-ramp to San Antonio off	Widen to provide auxiliary lane (4 to 5 mixed flow lanes)	1706	
12	San Antonio off-ramp to loop on-ramp	Widen from 3 to 4 mixed flow lanes	1412	
13	San Antonio loop on to diag. on-ramp	Widen from 3 to 4 mixed flow lanes	280	
14	San Antonio on-ramp	Widen on-ramp to provide additional storage for metering	N/A	
14	San Antonio on-ramp to Oregon off	Widen to provide auxiliary lane (4 to 5 mixed flow lanes)	6787	
15	Oregon off-ramp to Embarcadero on	Widen from 3 to 4 mixed flow lanes	3496	
16	Embarcadero on-ramp to Lane Add	Widen from 4 to 5 mixed flow lanes	3337	
17	Lane add to University off-ramp	Widen from 4 to 5 mixed flow lanes	1491	√
18	University off-ramp to on-ramp	Widen from 3 to 4 mixed flow lanes	2265	√
19	University on-ramp to Willow off-ramp	Widen to provide auxiliary lane (4 to 5 mixed flow lanes)	3099	
20	Willow off-ramp to loop on-ramp	Widen from 3 to 4 mixed flow lanes	545	√
21	Willow loop on-ramp to loop off-ramp	Widen to provide auxiliary lane (4 to 5 mixed flow lanes)	381	√
22	Willow loop off-ramp to on-ramp	Widen from 3 to 4 mixed flow lanes	499	√
24	Marsh off-ramp to loop on-ramp	Widen from 3 to 4 mixed flow lanes	966	
25	Marsh loop on-ramp to diagonal on	Extend existing downstream auxiliary lane between Marsh and Woodside (3 to 4 lanes)	981	√
26	Marsh on-ramp to Woodside off-ramp	Widen to provide auxiliary lane (4 to 5 mixed flow lanes)	6954	√
27	Woodside off-ramp to on-ramp	Widen from 3 to 4 mixed flow lanes	2981	√
28	Woodside on-ramp to Whipple off-ramp	Widen to provide auxiliary lane (4 to 5 mixed flow lanes)	4092	
31	Whipple on-ramp to Holly off-ramp	Widen to extend HOV lane to Holly	3634	
33	Holly off-ramp to on-ramp	Widen from 4 to 5 lanes	3123	
34	Holly on-ramp to Marine off-ramp	Widen to provide auxiliary lane (5 to 6 lanes)	3254	
35	Marine off-ramp to loop on-ramp	Widen from 4 to 5 lanes	1453	
36	Marine loop on-ramp to diagonal on-ramp	Extend existing downstream auxiliary lane between Marine and Hillsdale (4 to 5 lanes)	755	√
37	Marine diagonal on-ramp to Hillsdale off-ramp	Widen to provide auxiliary lane (5 to 6 lanes)	6200	√
38	Hillsdale off-ramp to loop on-ramp	Widen from 4 to 5 lanes	1631	√
39	Hillsdale loop on-ramp to diagonal on	Extend existing downstream auxiliary lane between Hillsdale and SR 92 (4 to 5 lanes)	1740	√
40	Hillsdale diagonal on-ramp to SR 92 off	Widen to provide auxiliary lane (5 to 6 lanes)	877	√
42	SR 92 loop on-ramp to diagonal on	Widen from 4 to 5 lanes	1002	√
47	3rd off-ramp to on-ramp	Widen from 4 to 5 lanes	1909	√
48	3rd on-ramp to Dore off-ramp	Widen to provide auxiliary lane (5 to 6 lanes)	2013	
50	Peninsula off-ramp to on-ramp	Widen from 4 to 5 lanes	1214	√

Table 5.3.4.a. Long Term Low Level Improvements.
Source: *San Mateo US 101 Freeway Corridor Technical Analysis* – Exhibit 94.

Subsection		Long Term Low Level Improvement	Length (ft)	In 2015 short term
NB	**Northbound**			
51	Peninsula on-ramp to Anza off-ramp	Widen to provide auxiliary lane (5 to 6 lanes)	4617	√
53	Anza on-ramp to Broadway off-ramp	Widen to provide auxiliary lane (5 to 6 lanes)	1165	
54	Broadway off-ramp to on-ramp	Widen from 4 to 5 lanes	2591	√
55	Broadway on-ramp to Millbrae off-ramp	Widen to provide auxiliary lane (5 to 6 lanes)	4450	√
56	Millbrae off-ramp to SFO lane add	Widen from 4 to 5 lanes	2158	√
57	Lane add to SFO off-ramp	Widen from 5 to 6 lanes	1399	√
58	SFO off-ramp to Millbrae on-ramp	Widen from 4 to 5 lanes	2206	
61	San Bruno off-ramp to I-380 off-ramp	Extend existing upstream auxiliary lane between SFO and San Bruno (5 to 6 lanes)	1055	
62	I-380 off-ramp to North Access off-ramp	Widen from 4 to 5 lanes	1948	
72	Bayshore off-ramp to Sierra off-ramp	Extend existing upstream auxiliary lane between Oyster and Bayshore (4 to 5 lanes)	973	
77	Harney on-ramp to study limit	Widen between Harney on-ramp to suitable termination point north of the San Mateo/San Francisco County Line (4 to 5 lanes)	2333	
SB	**Southbound**			
2	Study limit to Beatty off-ramp	Widen to provide auxiliary lane (4 to 5 lanes)	2400	√
4	Beatty on-ramp to Sierra Point off-ramp	Widen to provide auxiliary lane (4 to 5 lanes)	4243	√
6	Sierra Point on-ramp to Bayshore off	Widen to provide auxiliary lane (4 to 5 lanes)	7671	√
6	Sierra Point on-ramp	Widen on-ramp to provide additional storage and higher metering rate	N/A	
9	Bayshore on-ramp to Oyster Point on-ramp	Extend existing downstream auxiliary lane between Oyster and Miller (4 to 5 lanes)	1802	√
11	Miller off-ramp to S. Airport off-ramp	Extend existing upstream auxiliary lane between Oyster and Miller (4 to 5 lanes)	2580	√
12	S. Airport off-ramp to on-ramp	Widen from 4 to 5 lanes	2085	√
13	S. Airport on-ramp	Widen on-ramp to provide additional storage	N/A	
30	3rd off-ramp to on-ramp	Widen from 4 to 5 lanes	1795	√
35	Fashion Is. on-ramp to SR 92 EB on	Widen from 4 to 5 lanes	731	
36	SR 92 EB on-ramp to Hillsdale off-ramp	Widen to provide auxiliary lane (5 to 6 lanes)	947	
37	Hillsdale off-ramp to on-ramp	Widen from 4 to 5 lanes	2115	√
38	Hillsdale loop on-ramp to diagonal on-ramp	Extend existing downstream auxiliary lane between Hillsdale and Marine (4 to 5 lanes)	1155	√
39	Hillsdale on-ramp to Marine off-ramp	Widen to provide auxiliary lane (5 to 6 lanes)	5302	√
40	Marine off-ramp to on-ramp	Widen from 4 to 5 lanes	4270	√
41	Marine on-ramp to Holly off-ramp	Widen to provide auxiliary lane (5 to 6 lanes)	1676	
44	Brittan on-ramp to Whipple off-ramp	Widen to provide auxiliary lane (5 to 6 lanes)	2414	
46	Lane drop to Whipple on-ramp	Widen from 3 to 4 lanes	1429	√
56	Willow loop off-ramp to loop on-ramp	Widen from 3 to 4 lanes	431	√
58	Lane add to University off-ramp	Widen from 4 to 5 lanes	421	√
59	University off-ramp to on-ramp	Widen from 3 to 4 lanes	2083	√
67	Rengstorff on-ramp to Middlefield on	Extend existing downstream auxiliary lane between Middlefield and Shoreline (3 to 4 lanes)	3169	
68	Middlefield on-ramp	Widen on-ramp to provide additional storage for metering	N/A	
68	Middlefield to Shoreline	Widen to provide auxiliary lane (4 to 5 lanes)	688	

Table 5.3.4.b. Long Term Low Level Improvements.
Source: *San Mateo US 101 Freeway Corridor Technical Analysis* – Exhibit 94.

The baseline analysis for the 2030 scenario for San Mateo was completed assuming no additional projects are built beyond the baseline improvements in 2015. The 2030 with no further improvements scenario is not considered a realistic future scenario. It was created solely for the purpose of providing a neutral benchmark for comparing long-term improvement strategies, and both future years are presented in figure

5.3.2 and table 5.3.5. The impacts of these improvements on mobility were assessed using the FREQ software. Various levels of supplemental improvement scenarios are evaluated to address congestion problems revealed in the analysis of the long term conditions.

In addition to the baseline improvements, ramp metering was assumed to be implemented and operational for all ramps except freeway-to-freeway ramps in 2030 (such as I-380 to US 101, and SR 92 to US 101). The baseline improvements were the input for the San Mateo County travel demand model along with forecasted land use and regional network changes for the year 2030. The AM peak period and PM peak period demands forecasted by the San Mateo County model were then put into the FREQ models for the SM-101 corridor to assess corridor performance with the baseline improvements for 2030. The model results were reviewed to identify lingering bottlenecks after the baseline improvements are in place. The results were then aggregated into corridor-wide mobility performance measures.

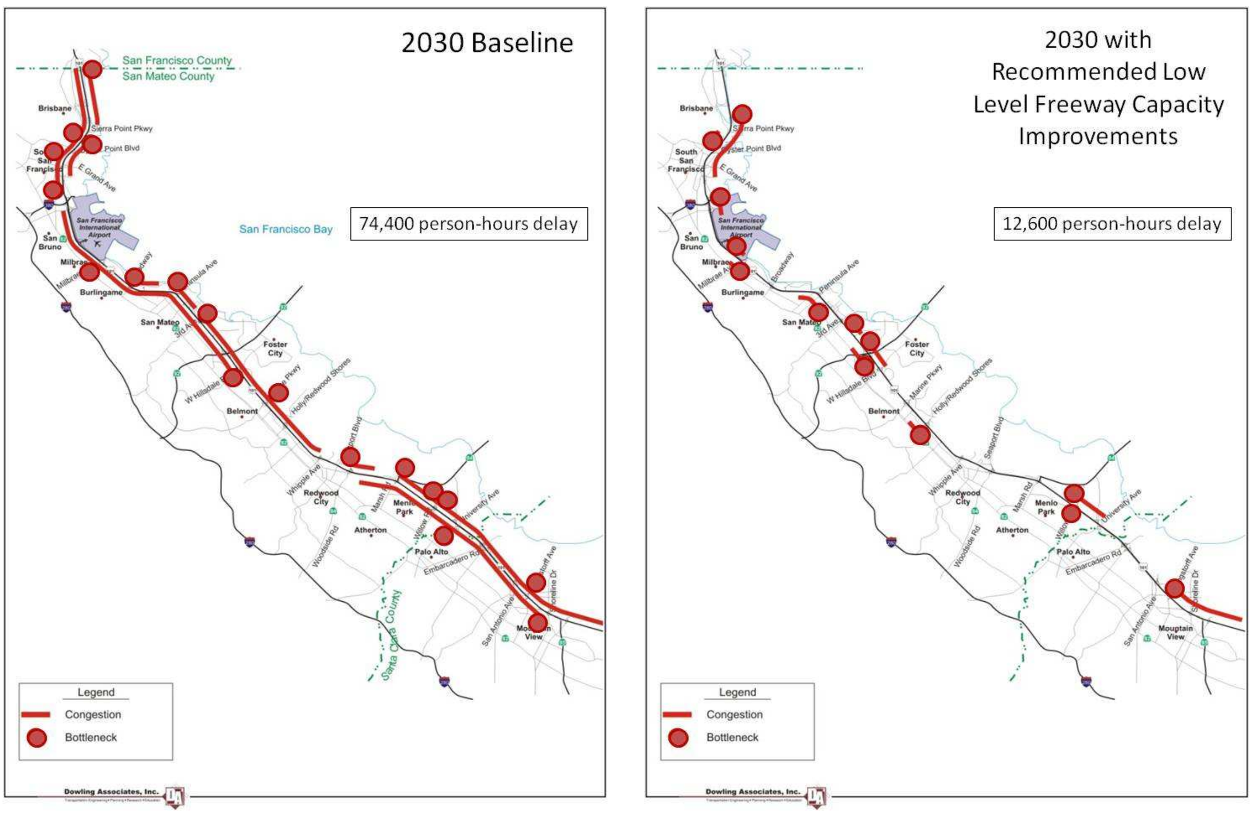

Figure 5.3.2. US 101 Freeway Bottleneck and Queues Comparison for 2030 (Long Term)
Source: San Mateo US 101 Freeway Corridor Technical Analysis – Exhibit 116.

Figure 5.3.2 provides a graphical comparison of freeway bottleneck locations and queues for the 2030 baseline versus with recommended low level improvements, to demonstrate the benefits of the proposed improvements.

The freeway mobility performance in 2030 with baseline improvements is tabulated in Table 5.3.5

- The peak period demand as measured in terms of vehicle-miles traveled (VMT) is forecasted to increase by 41% over existing 2009 levels.
- Peak period vehicle-hours traveled (VHT) is forecasted to increase by 80% over existing 2009 conditions.

- Peak period vehicle-hours of delay (VHD) is forecasted to increase by 176% over existing 2009 conditions.
- The average speed of peak period travel would drop by 22% from current conditions to approximately 36 mph.

The freeway performance shown in Table 5.3.5 includes the 2015 baseline and 2015 with improvements as shown in Table 5.3.4.

Freeway Mobility Performance Measures	**2009 (Existing)**	**2015 (Base)**	**2015 Recommendations MOE**	**(Diff)**	**2030 (Base)**	**2030 Low Level Recommendations MOE**	**(Diff)**
Vehicle Miles of Travel (VMT)	3,502,424	4,870,341	5,035,396	3%	4,947,243	5,349,363	8%
Vehicle Hours of Travel (VHT)	75,990	109,637	84,336	-23%	137,029	92,578	-32%
Vehicle Hours of Delay (VHD)	22,107	34,709	6,868	-80%	60,917	10,280	-83%
Mean Vehicle Speed (mph)	46	44	60	34%	36	58	60%
Person Miles of Travel (PMT)	4,284,762	5,967,535	6,168,686	3%	6,062,655	6,552,775	8%
Person Hours of Travel (PHT)	92,897	134,276	103,321	-23%	167,703	113,374	-32%
Person Hours of Delay (PHD)	26,978	42,468	8,418	-80%	74,431	12,562	-83%
Unreliability - Buffer Index	205%	206%	199%	-4%	212%	199%	-6%
Safety - Annual Collisions	690	831	552	-34%	1,022	645	-37%
Productivity - Lost Lane-Miles	428	591	350	-41%	847	494	-42%

Table 5.3.5. Summary of US 101 Freeway Performance.
Source: *San Mateo US 101 Freeway Corridor Technical Analysis* – Exhibit 118 (FREQ Model Results).
Note: Annual collisions are computed based on ADT's estimated using the C/CAG Model.

The recommended low level 2030 improvements would cause the following mobility impacts:

- Peak period VHT would be significantly reduced from the 2030 base, but would still exceed current (2009) levels by 22%.
- Peak period VHD would be significantly reduced over the 2030 base level, and would be less than the current 2009 levels by 53%.
- Average speed of peak period travel would be about 58 mph compared to the current mean speed of 46 mph.

Long term 2030 with recommended low level improvements would yield similar ranges of improvements when compared to 2030 baseline. Analysis shows that the vehicle-hours of delay (VHD) would be reduced by approximately 83%, while VMT would be increased by approximately 8%.

Travel time reliability would be improved with the recommended projects, by approximately 6%. As freeway congestion is relieved, collision rates would be reduced, resulting increased safety along the corridor with an estimated 37% reduction in collisions. Similarly, productivity would be improved by 42% as congested lane-miles would be reduced.

Funding

It is unlikely that funding will be found in the short term to fund all recommended freeway capacity improvements for the short term. Thus the short term list of freeway capacity improvements is also the long term list of recommended improvements. Should additional funding be located, then the long term improvements described in Table 5.3.4 can be implemented.

Note that the cost effectiveness analysis considered only freeway mainline mobility improvement benefits and the costs associated only with the freeway mainline capacity improvements. Interchange projects can also have safety and local access benefits not considered here, which may increase both the estimated cost of the projects and their benefits.

Consideration of HOV and Express Lanes

The corridor does not currently have sufficient right-of-way in San Mateo County to allow the addition of a continuous HOV lane or an express lane between Whipple Avenue and the San Francisco County Line. Establishing such a lane requires an extensive investigation into the costs and feasible options for creating a continuous HOV lane and possible conversion to express lane in each direction on the US 101 freeway. MTC, Caltrans D4, C/CAG and SMCTA, are currently preparing evaluation of various options, including conversion, for constructing HOV/express lanes in San Mateo County.

Effects of US 101 Improvements on Other Roadways in San Mateo County

The mainline improvements would likely result in a shift in demand from parallel surface streets and the I-280 freeway to US 101. The effect could be on the order of a 7% to 13% increase in forecasted peak hour traffic on US 101. The effects of this shift, in terms of reducing congestion on surface streets, I-280, and other parallel facilities, have not been quantified as a part of this analysis. However, in an attempt to graphically show these effects, difference plots of baseline volumes versus volumes with the 2015 recommended improvements in place are shown Figure 5.3.3.

The figure contains two illustrations, one, on the left shows the volume differences for the freeways, the second one, on the right, shows the volume differences on surface streets only (which allows the differences to be plotted on a larger scale to better visualize how the recommended 101 improvements impact traffic on other local routes). As shown in these exhibits, there are noticeable traffic volume reductions on major parallel routes such as I-280, and El Camino Real, throughout the majority of the county. Similar trends but with higher volume reductions would be expected for 2030 with the recommended improvements, with similar effects in terms of volumes reduction, on major parallel routes within the county.

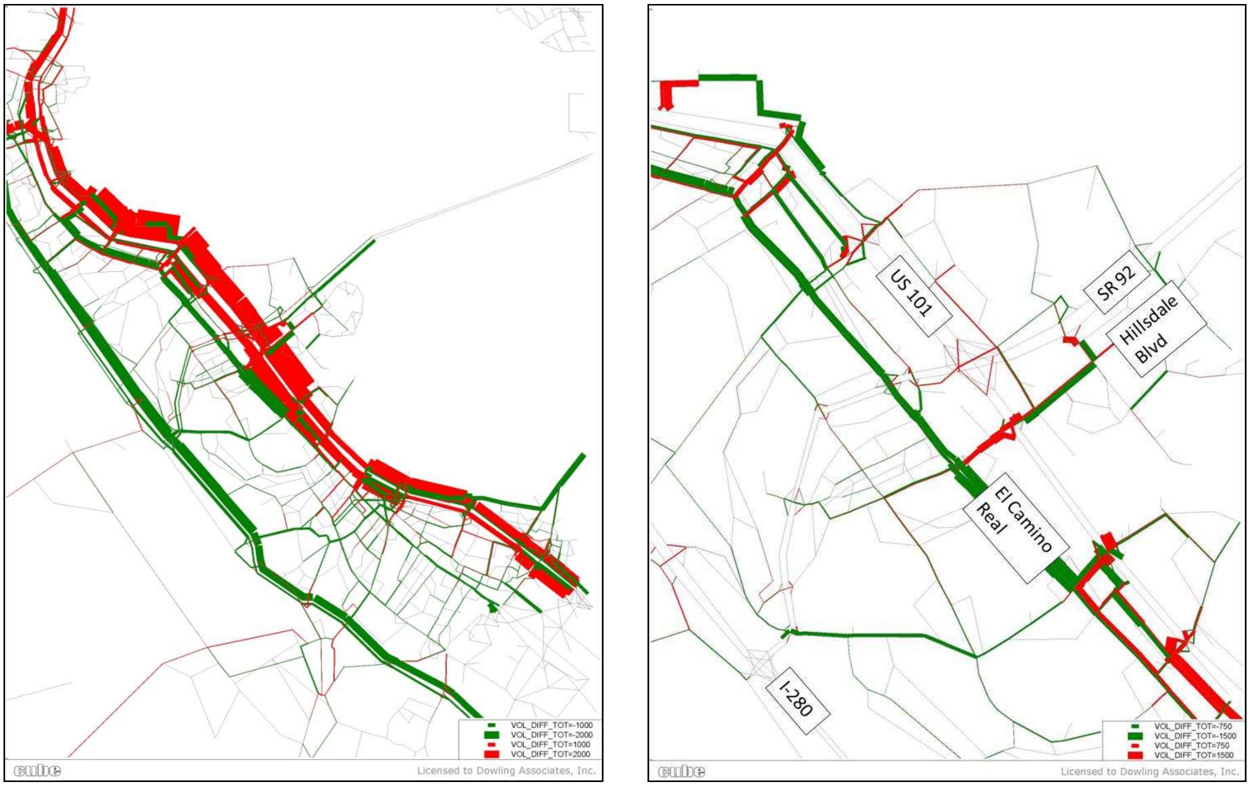

Figure 5.3.3. Volume Difference Plot – 2015 with Recommended Improvements versus 2015 Baseline Conditions – AM and PM Peak Volumes Combined.
Source: *San Mateo US 101 Freeway Corridor Technical Analysis* – Exhibit 119.

VTP 2035 Recommended Strategies
The Santa Clara Valley Transportation Plan 2035 builds on recommendations already found in the 2005 VTP 2030, and include the need to study county gateways and vital highway corridors, obtain greater utility from existing highway infrastructure, and develop an express lane network. As a result, part of the work in developing VTP 2035 Highway Projects involved an evaluation of the county gateways and key corridors within the county to increase efficiency, identify, define and prioritize improvements that relieve congestion, alleviate bottlenecks and enhance safety.

VTP 2035 includes an array of express lane projects that have resulted from planning studies conducted by VTA between 2000 and 2008. VTA currently has the statutory authority to build and operate two express lane corridors within the county. Figure 5.3.4 shows the main portion of express lanes in Santa Clara County as envisioned, with as top two corridors SR 85 and Highway 101.

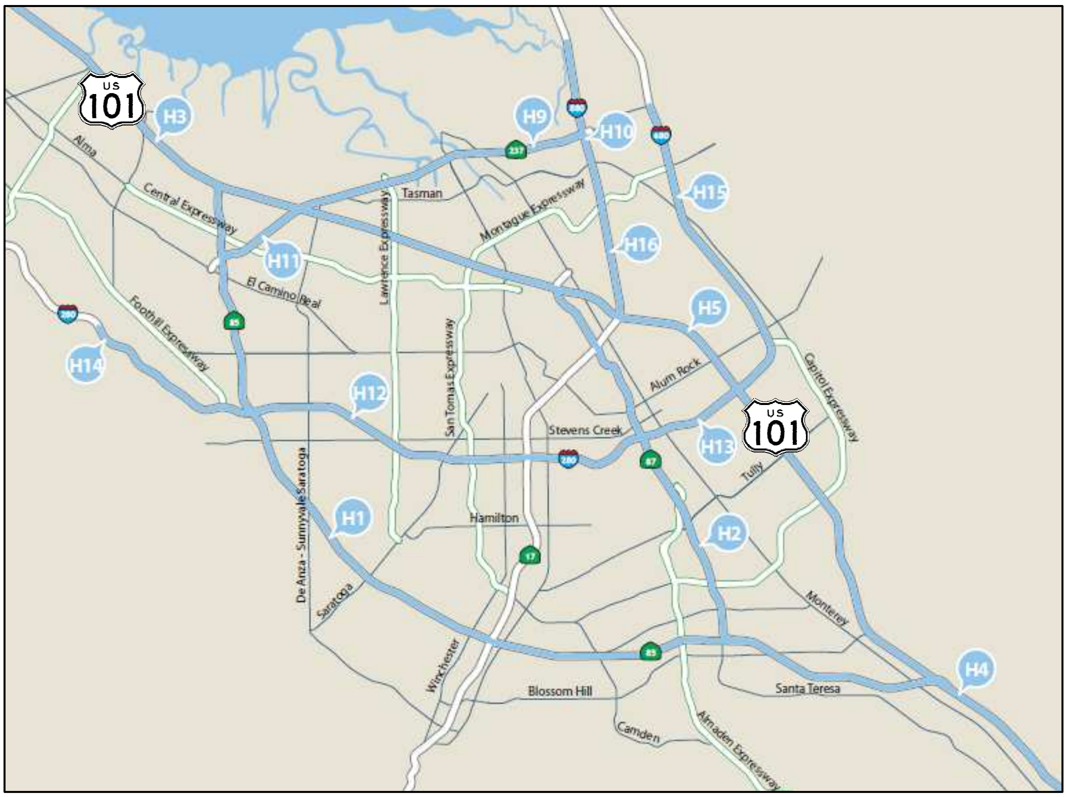

Figure 5.3.4. Express lane network as envisioned in Santa Clara County.
Source: *VTP 2035* – Figure 2-1.

H3: *US 101 Express Lanes: San Mateo County line to SR 85 in Mountain View (Conversion)*
H4: *US 101 Express Lanes: SR 85 (San Jose) to Cochrane Rd. (Conversion)*
H5: *US 101 Express Lanes: SR 85 in Mountain View to SR 85 in San Jose (Conversion)*

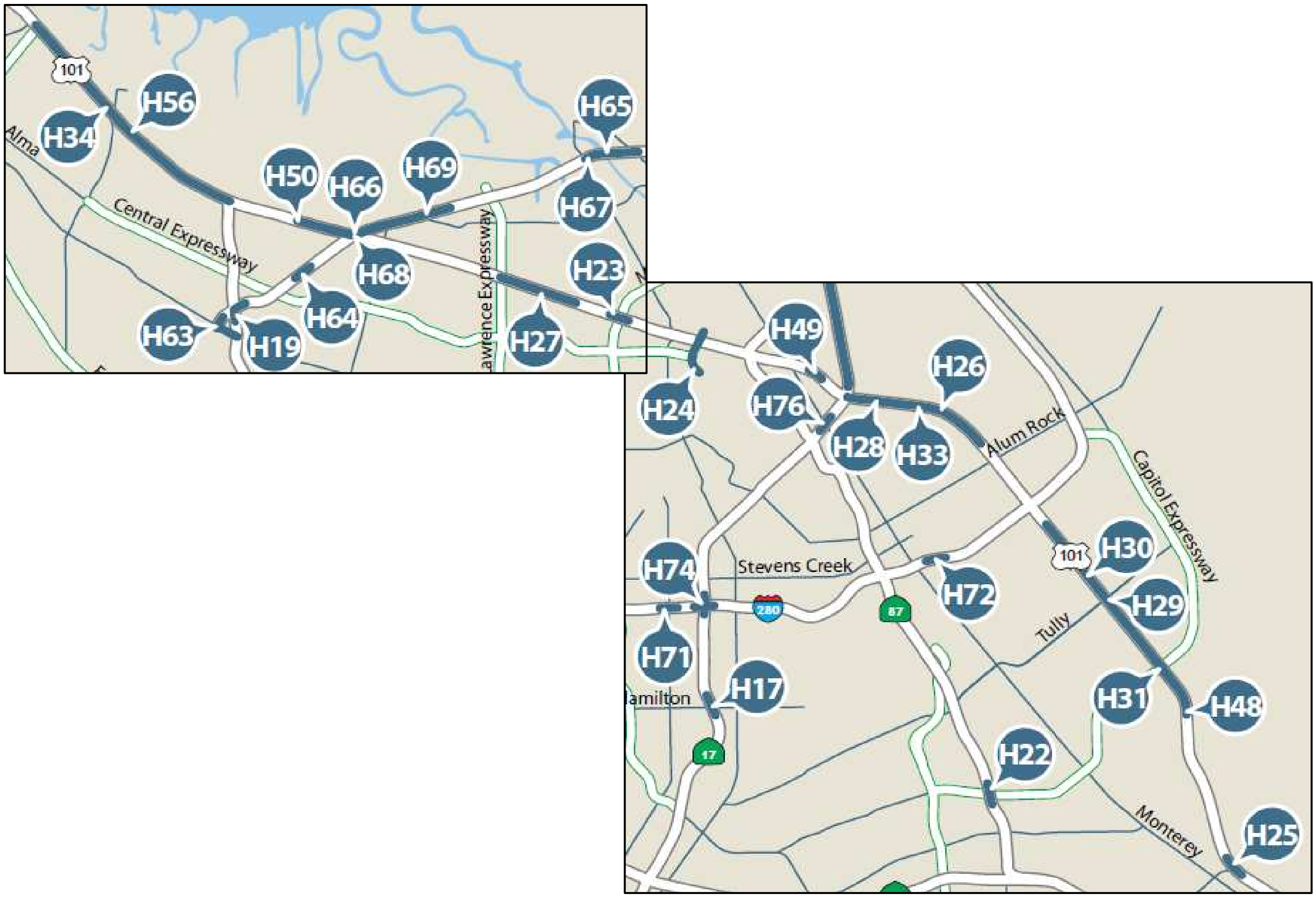

Figure 5.3.5. Constrained Highway Projects in Santa Clara County on and near US 101.
Source: *VTP 2035* – Figure 2-2.

H34: US 101 *Auxiliary Lanes: SR 85 to Embarcadero Road*
H56: US 101 *Southbound Improvements: San Antonio Road to Charleston Road/Rengstorff Avenue*
H50: US 101 *Southbound Auxiliary Lane improvement: Ellis Street to SR 237*
H66: SR 237/*Mathilda Avenue and US 101/Mathilda Avenue Interchange Improvements*
H68: SR 237 *Westbound to Northbound US 101 Ramp Improvements*
H27: US 101 *Southbound Auxiliary Lane: Great America Parkway to Lawrence Expressway*
H23: US 101/*Montague Expressway/San Tomas Expwy./Mission College Boulevard Interchange improvements*
H24: US 101/*Trimble Road/De La Cruz Boulevard/Central Expressway Interchange improvements*
H49: US 101/*Zanker Road/Skyport Dr./Fourth Street Interchange improvements*
H28: US 101/*Old Oakland Road Interchange improvements*
H33: US 101 *Southbound Auxiliary lane widening: I-880 to McKee*
H26: US 101/*Mabury Road/Taylor Street Interchange improvements*
H29: US 101 *Southbound widening: Story Road to Yerba Buena Road*
H30: US 101/*Capitol Expressway Interchange improvements (incl. new northbound on-ramp from Yerba Buena)*
H48: US 101/*Hellyer Avenue Interchange improvements*
H25: US 101/*Blossom Hill Road Interchange improvements*

The VTP 2035 Highways project list includes 16 projects designed to improve the efficiency of the existing highway, including auxiliary lane and ramp metering projects. VTA has promoted ramp metering in the Bay Area, and Santa Clara County is currently home to close to half of all ramp meters in the nine-county Bay Area region.

Santa Clara County has an extensive expressway system, with some of them functioning along US 101. The Santa Clara County expressways are recognized as the first example in the State of California of a 'self-help' county; locally funded and started in the 1960's expressways provide an important transportation function within the county. As shown in Figure 5.3.6, one expressway with constraint projects is found parallel to US 101 (Central Expressway), while another is found between US 101 and I-880 (San Tomas/Montague Expressway), providing alleviation to traffic at their interchange; both expressways include (right-lane) HOV lanes. The Capitol Expressway (not shown) is partially found east of US 101 between the interchange of the Capitol Expressway with US 101 and I-680. Most of the HOV lanes on Capitol will be removed to make place for a light-rail extension. Improvements are underway for San Tomas/Montague and Capitol expressways. Lawrence and Oregon/Page Mill Expressway, situated perpendicular to US 101, have interchanges with US 101.

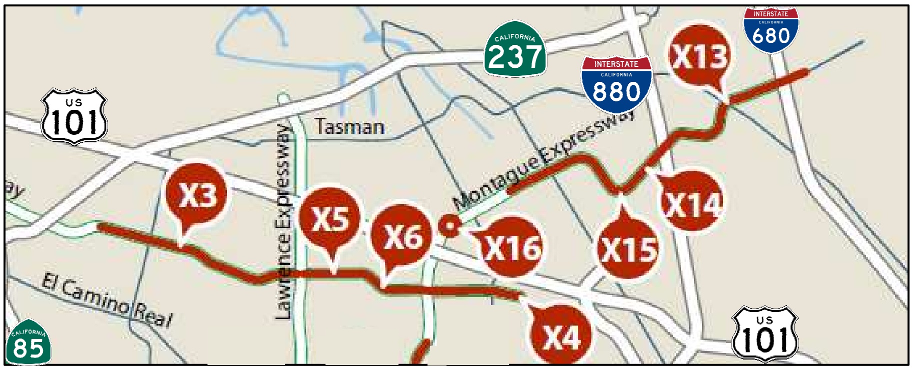

Figure 5.3.6. Constrained Expressway Projects in Santa Clara County along US 101.
Source: VTP 2035 – Figure 2-3.

X3: *Auxiliary Lanes between Mary and Lawrence*
X5: *Convert HOV Queue Jump Lane at Bowers*
X6: Six *Lanes from Lawrence Expressway to San Tomas Expressway*
X4: *Convert Measure B HOV Lane (De La Cruz to San Tomas Expressway)*
X16: *Mission College At-Grade Improvements*
X15: *Trimble Road Flyover*
X14: *Eight Lanes from Lick Mill to Trade Zone*
X13: *Eight Lanes from Trade Zone to Park Victoria*

Improvements also include coordination of expressway signals with signals on perpendicular streets, electronic information signs, advisory radio, cable TV feeds, automatic traffic counts and a web page. These improvements are intended to work together to reduce delay on and around the expressways.

5.4 San Mateo US 101 Smart Corridor Implementation

During emergencies, increasing the ability of surface streets to carry traffic parallel and away from the freeway would benefit freeway operations. This option involves optimizing and integrating local agency signal operations with the freeway management center in a manner so as to facilitate the exchange of information between the centers and facilitate local agency response to incidents on the freeway (and vice versa). This includes the installation and use of changeable message signs on key city streets feeding the freeway to direct drivers to alternate routes in the event of a serious freeway incident. This 'flush plan' to achieve local optimization during normal operations is currently being implemented in the SM-101 Smart Corridor project.

The Smart Corridors project will be implementing Intelligent Transportation System (ITS) Technology such as:

— Traveler information dissemination signage
— Route guidance
— Signal coordination
— Vehicle detection
— CCTV cameras
— Caltrain at-grade rail crossing advanced warning equipment
— Ramp metering

The Smart Corridor project includes a possible future TMC (Traffic Management Center) to connect with Caltrans TMC. The project covers US 101 and SR 82 (El Camino Real) from the I-380 interchange to the Santa Clara County line.

Surface street management and operations options include actions on the freeway as well as local streets to reduce or eliminate freeway cut-through traffic on local streets. A beneficial outcome of these options would be improved local traffic detection, signal optimization and management for local operations. Integrated arterial, highway, and transit operational data can lead to real-time corridor system management.

5.5 Non-Freeway Strategies to Support Future Mobility in the US 101 South Corridor

With the US 101 freeway facility as the focus of this CSMP, it is recommended that the next generation of CSMPs include additional analysis to more comprehensively look at the land use, local arterial, transit, ITS, and bicycle and pedestrian components of the corridor. Although not absent from this report, we recognize that future studies and more detailed analysis in these areas will be needed.

With AB 32, SB 375, and SB 391, Caltrans is committed to work with stakeholders in the US 101 South corridor towards a multi-modal, integrated transportation system, one that can be improved on with real-time strategies that guide the decisions that the traveling public makes before and during their trips.

Caltrans Deputy Directive 64-R1 on “Complete Streets” emphasizes the important goal of integrating all components of the transportation system. Caltrans views all transportation improvements (new and retrofit) as opportunities to improve the safety, access, and mobility for all travelers and recognizes bicycle, pedestrian, and transit modes as integral elements of the transportation system. Caltrans’ Complete Streets policy further encourages regional and local agencies to include bicycle, pedestrian, and transit elements in their regional and local planning documents, including transportation plans and General Plans.

Many of these goals can be found at the county level as well. For VTA the vision is to provide “sustainable, accessible, community-focused transportation options that are innovative, environmentally responsible and promote the vitality of our region,” and that “VTA will invest resources and services in areas with greatest need to enhance the quality of life of all residents, including vulnerable populations. VTA will provide a selection of transportation modes to attract choice riders, as well as promote the economic vitality of our region.” Similarly, San Mateo County shows in its General Plan that transportation planning must proceed “in concert with land use planning and must address both developmental and environmental considerations.”

Land Use
Caltrans promotes land uses that encourage bicycle, pedestrian, and transit travel. A State program has been established to encourage local agencies to participate in blueprint visioning planning with participating MPOs/RTPAs (Metropolitan Planning Organizations/Regional Transportation Planning Agencies) to provide streetscapes that incorporate land use and traffic measures that increase the safety of intersections for pedestrians, bicyclists, transit, and motorists.

With SB 375 Sustainable Community Strategies, the State aims to address growth through planning that takes advantage of the existing transportation system and of opportunities for infill, Transit-Oriented Development (TOD), and mixed-use development. MTC's Resolution 3434 provides a similar TOD policy approach, addressing multiple goals: improving the cost-effectiveness of regional investments in new transit expansions, easing the Bay Area's chronic housing shortage, creating vibrant new communities, and helping preserve regional open space. The policy ensures that transportation agencies, local jurisdictions, members of the public and the private sector work together to create development patterns that are more supportive of transit.

The option of modifying the land use decisions of stakeholder agencies in the corridor is an option that all local agencies are aware of. These options include balanced jobs and housing growth, transit oriented developments, and green-house gas neutral developments. The implementation of these options by local agencies – for instance with the Grand Boulevard Initiative and the areas surrounding the Bi-County Transportation Study – will be integral to the long term success of managing the transportation corridor.

Transit
Where transit is generally understood by this single term, in reality each mode found within transit has its own characteristics. In this first generation CSMP, a distinction is only made between mass-transit and local transit modes with limited recommended strategies. Transit is one of the transportation options in the US 101 corridor where capacity improvements appear feasible. Further studies are required to determine where these capacity improvements can best be achieved and which type of transit works best.

Mass-transit
A term used particularly for rail services such as BART and Caltrain, mass-transit involves large-scale transit services, involving several hundreds of passengers per transit vehicle. Building on the transit innovation that Caltrain developed with its "Baby Bullet" service, a proven strategy recommendation is to optimize mass-transit services by better fitting it to passengers' needs. The Baby Bullet service that started in 2004 entails a transit specialization that attracted a 53% higher Caltrain ridership in five years time (2004 – 2009) without any major-scale infrastructure changes, a first-order achievement. A continuing increase in ridership was visible until the economic downturn in 2008/2009. Still, ridership remains higher than any point in time prior to the service innovations during the years shown in Table 5.5.1. The Caltrain example shows that speedier delivery with fewer stops attracts additional passengers interested in travelling the longer distance. By shortening the trip time by 33%, longer-distance Caltrain passengers can receive a benefit for the downsides of transit that may not be addressable – such as the last mile between transit stop and origin/destination – a benefit large enough for many to overcome the choice to use a car.

Caltrain Average Weekday Ridership by year *Survey done every February.*[1]	
1997	26,043
1998	27,967
1999	27,591
2000	31,291
2001	35,609
2002	30,961
2003	27,191
2004	25,550
2005	28,393
2006	32,031
2007	33,841
2008	36,993
2009	39,122
2010	36,778

Table 5.5.1. Caltrain Average Weekday Ridership.
Source: *Caltrain.*

Focusing on the actual door-to-door trip in which transit can be a major component, mass-transit in particular should be fast wherever possible, reliable, and connecting well to other transit modes at its stops. A completed transit network, with vital connections mentioned for mass-transit in Section 2.5, will then attract the largest number possible of long-distance transit users. When High-Speed Rail is added to this CSMP corridor, it too will play its role best when well-connected to the other transit modes.

Local service

Despite mass-transit being more attractive in larger numbers to travelers along longer stretches of US 101, specific local service by VTA, SamTrans, and Muni can still play important roles in the US 101 corridor. In those areas where congestion occurs frequently, a certain reduction in the number of drivers by providing specific local transit services may provide a beneficial outcome.

There are several regional transit improvement options that can redirect single occupant vehicle (SOV) and HOV demand to transit, thus reducing freeway and surface street congestion. Transit improvement options for the CSMP analysis were taken from the currently planned transit improvement and are described and evaluated in MTC's Transportation 2035 Plan for the San Francisco Bay Area (2009).

Shuttles

Private companies have been setting up company shuttles in recent years, picking up employees at specific urban locations (for example, the Mission District and Noe Valley in San Francisco) and driving them directly to the location of employment (for example, on the Peninsula). Besides company shuttles run by Google, Yahoo, Genentech, and Apple, SamTrans also offers free BART and community shuttles, helping diminish the pressure on US 101. Special airport shuttles, some from as far away as Sonoma County, transport airport passengers in public vanpools.

Bicycle

The general recommendation for bicycling is to continue work on a bicycle network that facilitates local bicycle use. The bicycle circulation strategy for San Mateo County, for instance, consists of "completing and maintaining a system of primary routes, lanes, and paths connecting San Mateo County residents to major regional destinations such as colleges and universities, parks, libraries, business districts, regional shopping centers and major employers." In the VTP2035, the Valley Transportation Authority views the bicycle network as "an essential component of a fully integrated, multimodal, countywide transportation system. VTA is committed to improving bicycling conditions to enable and encourage people of all ages to bike to work, school, errands and for recreation." Completing the local bicycle network in light of US 101 requires special attention to the cross-over bridges connecting cities and neighborhoods on both sides of the freeway.

For longer distances, the general recommendation calls for improving the connectivity to facilities that enable bicyclists to more easily overcome drawbacks to using alternative modes, such as overcoming distance to a transit stop (also known in transit as first- and last-mile problem). Opportunities to broaden Park & Ride for bicyclists and to enlarge onboard bicycle capacity on Caltrain and other transit providers should be explored.

There are positive signs in the goal of completing local and regional bicycle networks. For example, VTA adopted a $33 million Bicycle Expenditure Program (BEP) to fund the Tier 1 projects in the Countywide Bicycle Plan over a ten-year period. Tier 1 projects include bicycle/pedestrian bridges, major trails, and on-street bikeway improvements.

Pedestrian

Complete Streets calls for further coordination between pedestrian infrastructure initiatives, with special attention asked for intersection and interchange designs. Participation with local, regional, State agencies, and tribal governments to plan and fund effective bicycle, pedestrian and transit networks is one requirement and aids in further completing the network. At the county level that willingness is present, such as is visible with VTA's recommendation in the VTP2035 to provide "connectivity in road, bike and pedestrian networks so travelers can choose among many routes and modes linking their origins and destinations" and that calls out for "integrated 24/7 bicycle and pedestrian networks." The San Mateo General Plan also mentions that pedestrian travel is an important component of the overall circulation system. In addition to being a portion of every trip made by automobile, bicycle, bus, or train, pedestrian travel can be the means of making entire trips.

Another strategy recommendation is to expand the Safe Routes to School to implement a comprehensive, age-appropriate approach to school traffic safety, including school facilities planning and coordination among those responsible for education, transportation, and land use planning to maximize safety for children walking to and from schools.

Importance of non-freeway alternatives

Without having the opportunity to increase capacity on US 101 to fully meet future demands, meeting transportation needs will rely heavily on management innovations, ITS (and other options), and alternative modes.

In Table 5.5.2, the various non-highway improvement projects of most relevance are shown for the San Mateo US 101 corridor from T2035. This is followed by the list of Santa Clara non-highway projects from T2035 surrounding US 101 in Table 5.5.3.

Other Modes	Description
Bike and Pedestrian Plan (230430)	Implement plan
Ferry Terminal at Redwood City (22120)	Construct ferry terminal
Ferry Service (22726)	South San Francisco to Oakland/Alameda
Construct Bayshore Intermodal Facility (22226)	Will house Caltrain, Muni light rail, Muni, and SamTrans buses
Caltrain station upgrades (21623)	Platforms, pedestrian tunnels, parking
Caltrain grade separations (21626)	Measure A sales tax project
Expand the Palo Alto Caltrain Station and Bus Transit Center (21787)	Expand Transit Center
Extend Caltrain to Transbay Terminal (22008)	Plans, specs, engineering, right-of-way, environ.
Extend Caltrain to Transbay Terminal Phase 2A (21342)	Replace terminal, extend tracks
Extend Caltrain to Transbay Terminal Phase 2B(230290)	Replace terminal, extend tracks
Caltrain Operations and Capital Improvements (22481)	Rolling stock, station improvements
Dumbarton Bridge Commuter Rail (21618)	Right of way, design, environmental phases only
Bus Rapid Transit (BRT) – El Camino (21923)	Implement a new BRT corridor in the Alameda and El Camino Real.
Improve Stations for Dumbarton Rail Corridor (22615)	Redwood City, Menlo Park, East Palo Alto
Expand Caltrain Express service (21619)	Safety elements signal communication, train control
Electrify Caltrain (21627)	Tamien to San Francisco
Shuttle to Caltrain (22268)	Major Activity Centers to stations
SamTrans Ops and Capital Improvements (94666)	Rolling stock, etc.
High Speed Rail infrastructure (230649)	ACE, BART, Caltrain, MUNI, VTA
High Speed Rail Corridor improvements (230710)	Fund reserve

Table 5.5.2. Non-Highway Improvement Projects in SM US 101 Corridor.
Source: *San Mateo US 101 Freeway Corridor Technical Analysis* – Exhibit 105.

List of Santa Clara County VTA non-highway projects T2035

Improve US 101/Tennant Avenue interchange, including constructing a new bridge parallel to existing bridge over US 101, widening Tennant Avenue from 2 lanes to 4 lanes with bicycle lanes and sidewalks, and adding a new northbound loop on-ramp (21720)
Implement bicycle and pedestrian improvements in North San Jose (230641)
Expand the Palo Alto Caltrain Station and Bus Transit Center (21787)
Implement the Mineta San Jose International Airport automated people-mover service (21922)
Extend BART from Fremont (Warm Springs) to San Jose/Santa Clara (21921)
Implement Bus Rapid Transit (BRT) on Monterey Highway (230547)
Double-track segments of the Caltrain line between San Jose and Gilroy (21760)
Implement Bus Rapid Transit (BRT) in the Alameda and El Camino Real corridors (21923)
Implement Bus Rapid Transit (BRT) in the Santa Clara-Alum Rock Corridor with the potential to convert to light-rail in the future (22014)
Construct U.S. 101/Mabury Road/Taylor Street interchange near BART station (22965)
Widen Berryessa Road from U.S. 101 to I-680 to provide access to planned Berryessa BART station (230458)
Implement Caltrain grade separation program in Santa Clara County (22808)
Implement the Zero Emissions Bus (ZEB) program (230551)
Electrify Caltrain line from Tamien Station to Gilroy (230534)
Extend Charcot Avenue over I-880 as a new 2-lane roadway with bicycle and pedestrian improvements to connect to North San Jose employment center (230449)
Improve bicycle/pedestrian safety at I-280/Oregon-Page Mill interchange (22854)

Table 5.5.3. Non-Highway Improvement Projects in Santa Clara County US 101 South CSMP Corridor. Source: *T2035.*

5.6 Areas for Further Study

The US 101 South CSMP Working Group has identified several areas for future study:

- Developing an ITS plan for the corridor
- Additional focusing on Transit and non-highway improvements
- Identifying proactive Demand Management Strategies and related performance measurements
- Accident Response Improvement
- SR 92/US 101 Interchange Area Study
- Peninsula Avenue Interchange
- Candlestick/Harney Way Interchange
- Functioning of Santa Clara Expressways in relation to US 101
- Supporting statewide and regional programs such as GO California and the Sustainable Communities Strategy
- Supporting the Smart Corridor implementation, and
- Encouraging increased utilization of I-280
- Including the US 101 freeway in San Francisco County and Santa Clara County South of SR 85

The stakeholders of the US 101 South CSMP corridor are committed to continue working together on these mutual goals for corridor system management.