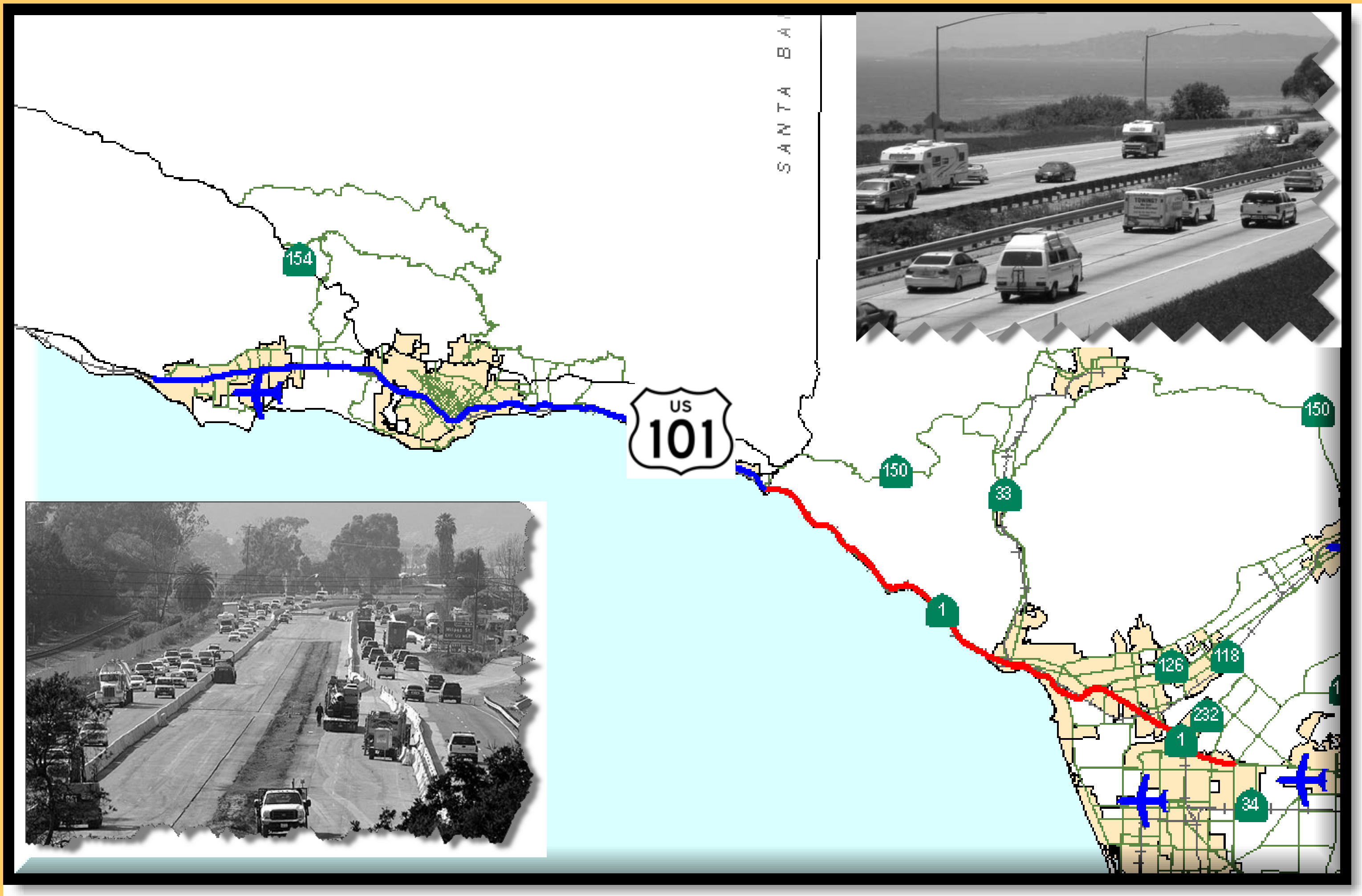
CORRIDOR SYSTEM MANAGEMENT PLAN (CSMP)
FINAL

U.S.101 - Santa Barbara/Ventura Corridor

(From Winchester Canyon Creek in Santa Barbara County to Rice Avenue in Ventura County - PM 0.00/27.2 and PM 20.26/R43.62)



State of California
Department of Transportation

District 5 and District 7
November 2010

This Corridor System Management Plan (CSMP) has been developed to support the regional transportation planning process in Santa Barbara and Ventura counties.

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Table of Contents

Appendices

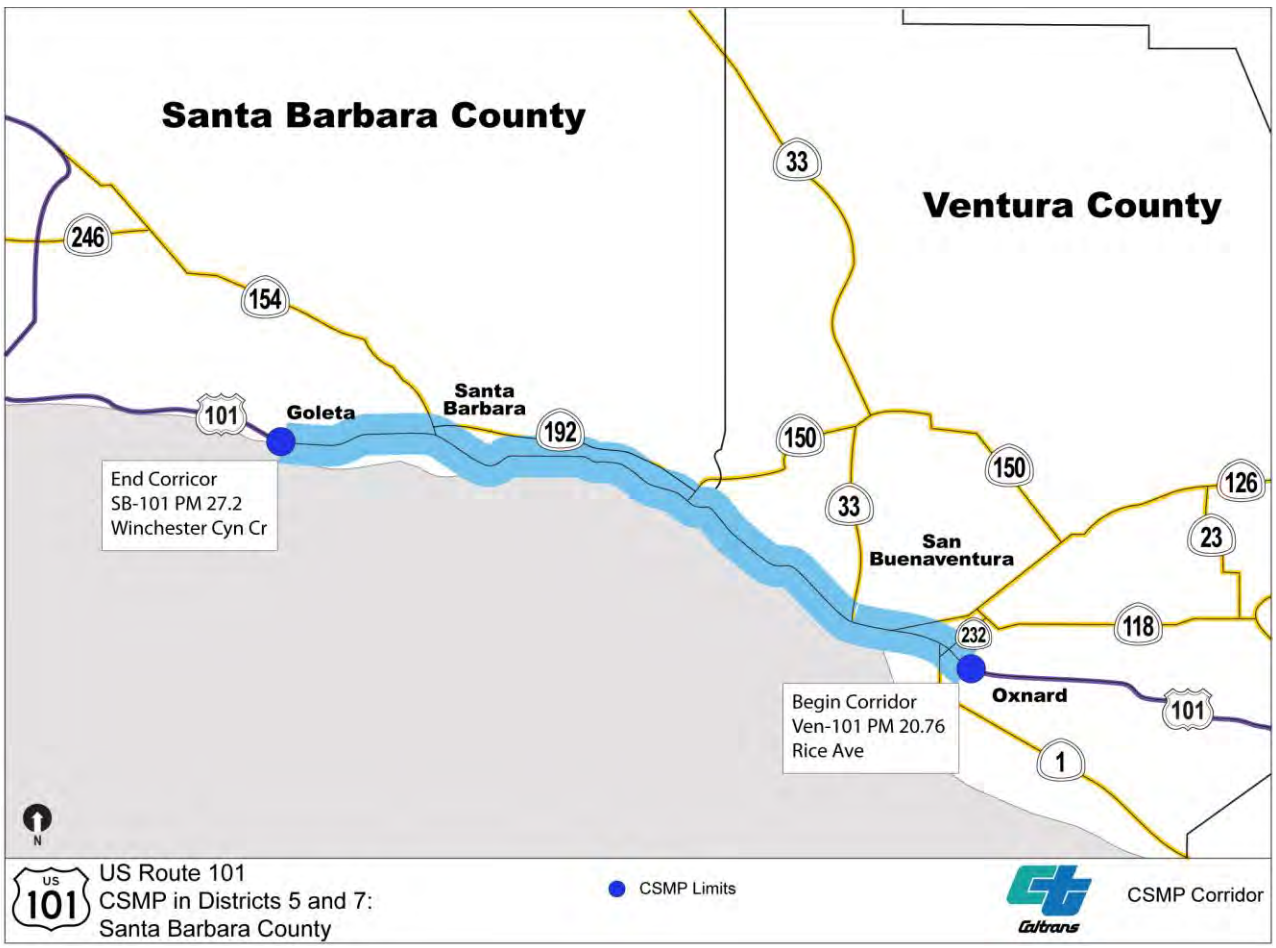
List of Figures

List of Tables

EXECUTIVE SUMMARY

The objectives of the US-101 Corridor System Management Plan (CSMP) are to improve safety on the transportation system, reduce travel time or delay on all modes, reduce traffic congestion (both recurrent and non-recurrent), improve connectivity between modes and facilities, improve travel-time reliability, and expand mobility options along the corridor in a cost-effective manner. CSMPs are also meant to identify distressed pavement conditions and identify actions to address the pavement deficiencies. A new tool, a traffic simulation model, was also developed to support the development of the CSMP. The managed transportation network for the US-101 CSMP includes the portion of US-101 that begins at the Rice Avenue interchange in Ventura County (VEN PM 20.76) to the Winchester Canyon Drive (SB PM 27.20) in Santa Barbara County as indicated in **Figure E-1.**

Figure E-1 US-101 CSMP Corridor



The development of a CSMP requires cooperative planning among Caltrans, the regional planning agencies, counties, cities, and service providers along any given corridor. The CSMP is an approach that recognizes the concerns of all the major stakeholders and seeks solutions that balance needs and objectives. The US-101 CSMP has been a collaborative effort between the two Caltrans districts that govern the Santa Barbara and Ventura County regions, the Santa Barbara County Association of Governments, and the Ventura County Transportation Commission. The US-101 CSMP process also gained input from over twenty other organizations including representatives from the two counties, several cities and unincorporated communities in the corridor, transit service providers, and a number of other interested parties.

The CSMP approach includes explicit consideration of management and operations in the planning and programming of transportation improvements. The CSMP is also multimodal and uses detailed information to understand how a corridor functions both currently and in the future.

Existing Conditions

The US-101 corridor has a mixed urban, suburban and semi-rural character with dramatic scenic beauty. US-101 serves as the main connection between the communities serving commute, interregional, school, personal business and leisure travel. Employment is concentrated in the northern end of the corridor in and near the cities of Santa Barbara and Goleta. Housing is concentrated in the southern end of the corridor in and near the cities of Ventura and Oxnard. This includes the University of California Santa Barbara campus, which also attracts a large number of trips during the peak commute periods. As a result, there is more commute period traffic congestion northbound along the US-101 corridor in the morning and southbound in the evening.

The corridor is also the primary coastal route between Southern California, the Central Coast, and Northern California and is an important transportation link for long-distance travel for both business and leisure. In addition, it is a critical route for freight movement by truck and rail and is a strategic corridor for Vandenberg Air Force Base's military transport, spaceport and national defense operations.

US-101 and many of the major parallel streets in each county are at or near capacity during some part of the peak commute periods. Although the existing level of congestion on the freeway on an average weekday during non-peak periods when there are no major incidents is moderate, small variations in traffic volume or incidents can greatly increase congestion and delay. Congestion and delay can be seen on a daily basis at numerous bottleneck locations along the route where the existing roadway characteristics cannot accommodate the volume of traffic or the complex weaving and merging patterns of the traffic. Because of the scenic beauty in the corridor and the attraction of the corridor beaches, the traffic on the weekends, during the summer, or for special events can be much more congested.

There have been significant efforts to provide alternative modes of travel for commute and non-commute travel in the two counties. These include local and express bus service, demand-responsive paratransit services, bicycle routes, multi-use trails, ridesharing services, employer-based flexible work schedules, and other trip reduction programs. Intercity passenger rail service is also provided by Amtrak, but the existing service schedule does not offer a meaningful option for commute travel. A vast majority of passenger travel is by automobile.

Future Conditions

Congestion in the future will not be uniform throughout the corridor, but will likely focus on a few major bottleneck points. Increasing capacity will significantly help to decrease the amount and frequency of corridor delay. The improvements underway in Santa Barbara County south of downtown Santa Barbara and the proposed addition of the high-occupancy vehicle (HOV) lanes will reduce the congestion at most of the bottlenecks between downtown Santa Barbara and the Ventura County line. A more detailed description of each of these programmed projects is provided in Section 2.1.2 of the main body of the report and in **Appendix D**.

Even with added capacity, congestion is expected to remain. The main location of congestion in Santa Barbara County in 2023, after the programmed widenings are complete, will be in the core area of Santa Barbara between San Marcos Pass Road (SR 154) and Milpas Street. The most significant bottleneck in both directions will be near Mission Street and Las Positas Road. For southbound traffic, the bottlenecks in this area will restrict the flow of traffic and thus the portion of the corridor south of downtown Santa Barbara will operate with very little congestion.

The main locations of congestion in Ventura County will be in the southern half of the corridor in the cities of Ventura and Oxnard. Traffic analysis has identified these bottlenecks as:

- The lane drop at the SR-126 interchange for southbound traffic will emerge as a significant problem for the corridor in the future.

- Bottlenecks at Victoria Avenue and Vineyard Avenue for southbound traffic will continue in the future. This congestion will be lessened because the bottleneck at SR-126 will reduce the flow of traffic to the south.

- For northbound traffic, the main problems will be at Rice Avenue and Johnson Drive at the south end of the corridor. The future congestion at these bottlenecks will restrict the amount of traffic that can get through, which will lessen congestion in the rest of the corridor in Ventura County.

Evaluation of Management and Operation Strategies

A wide variety of operations and management strategies were evaluated to determine which would improve corridor operation in the future (2023). Each of the packages demonstrated significant potential for reducing congestion. The strategies were grouped into four packages for analysis. Three packages were evaluated using models that simulate traffic flow on the freeway and the parallel roadways. Because the models do not include collisions or other incidents, the fourth package was evaluated using a special model that analyzes the benefits of using freeway service patrol. The four packages are:

- **Transit and Transportation Demand Management –** strategies designed to reduce the number of trips made by automobiles during the peak commute periods by increasing transit services in the peak and by encouraging a reduction in automobile use for commute trips during peak hours.

  Results: The total daily reduction in vehicle trips from the Transit and Transportation Demand Management (TDM) package would be about 7,200 trips. Of that total, roughly two-thirds would be from the TDM programs tested and one-third from transit enhancements.

- **Ramp Metering –** strategies designed to manage the flow of traffic on US-101 by metering the flow from ramps onto the freeway.

  Results: The analysis revealed that ramp metering can improve the traffic flow on the freeway, reduce bottlenecks, and reduce overall delay when the right conditions exist. The results can be realized without significant negative impacts on local arterials. The modeling also suggests that the improved productivity of the freeway will result in a better alternative for longer trips thereby minimizing diversion of trips to parallel frontage roads and local roads.

- **Minor Physical Capacity Enhancements –** strategies to improve the efficiency of US-101 by relieving bottleneck points or improving alternative routes.

  Results: The package tested could reduce delay northbound in the morning by approximately 24 percent in both counties. Southbound in the evening the reduction remains 24 percent in Santa Barbara County but rises to 36 percent in Ventura County. Smaller reductions would also result in the non-commute directions.

- **Incident Management –** strategies to improve the safety of the corridor and reduce the amount of congestion by reducing the impact of collisions and other incidents.

  Results: This program could reduce vehicular delays on US-101 by approximately 160,000 vehicle hours annually. This could grow to over 400,000 vehicle hours annually by 2023.

Although the CSMP did not specifically examine any strategies directed specifically at goods movement, all of the strategies will produce benefits for goods movement by improving corridor travel times and reliability.

Recommendations

Corridor Management Strategies include a primary set of strategies and capital improvements that respond to the major corridor mobility challenges to better manage the corridor network. Through collaboration and partnerships, there are currently capital projects within the corridor that address existing deficiencies. The CSMP takes it one step further by looking at conceptual recommendations that will prolong the investments now being made in the corridor and enhance the long-range vision. The CSMP recommends the following:

- **Measurement of Traffic Speeds and Volumes –** Add equipment on US-101 and local roads to provide continuous measurement of traffic speeds and volumes by lane at least every two miles. Both Santa Barbara and Ventura Counties have the capability to monitor speeds for all portions of the freeway system in the corridor.

- **Pavement Management –** Continue cost-effective maintenance of the roadway to ensure safe and comfortable driving. This would include continued implementation of the pavement management system of Caltrans and the local jurisdictions.

- **Transit/Rail –** The stakeholder agencies in the corridor should continue to support the improvement of transit service if financially feasible, particularly to serve commute trips. Increasing express bus frequency and/or adding new services in the future could shift dependence on single occupancy vehicles, taking advantage of the new HOV lanes being built as part of currently programmed projects. Enhancing passenger rail service between Santa Barbara County and Ventura County to better suit commuter demand may also reduce trips along US-101. **Continued coordination between the current operators of both the transit lines, rail services in the counties, and the regional partners will be pursued.**

- **Addition of Park and Ride Lots –** The addition of park-and-ride lots at mode-transfer locations along the corridor is supported. Park-and-ride facilities can serve a variety of alternatives to driving alone, including carpooling, vanpooling, express bus, bicycling, and passenger rail.

- **Continued Support for Transportation Demand Management Programs –** It is recommended that rideshare incentives, individualized marketing, and flexible work schedules continue to be funded and/or supported by both counties and Caltrans. In addition, it is recommended that there continue to be efforts to plan, fund and implement safe facilities for using non-motorized modes, particularly as a mode of access to commute alternatives such as transit services.

- **Ramp Metering –** Corridor stakeholder agencies should develop and implement a ramp metering plan to maximize the productivity of the freeway. When combined with other recommended strategies, ramp metering facilitates better utilization of capacity on the freeway and local arterials. Caltrans should pursue ramp metering by increasing the capacity of on-ramps and installing ramp-metering hardware on all ramps reconstructed as part of interchange reconstruction or as stand-alone projects. Where ramp metering is implemented, traffic flow should be monitored on the mainline lanes of the freeway to provide the information necessary to determine appropriate metering rates. Detectors should be installed on on-ramps to monitor queue length so that metering rates can be adjusted to prevent spillback to local arterials.

- **Operational Improvements –** Improvements such as auxiliary lanes and ramp extensions should be considered along the corridor as indicated in Section 6.4.1.

- **Freeway Service Patrol (FSP) –** It is recommended that freeway service patrol be continued in Santa Barbara County and considered along the corridor in Ventura County in the future if congestion on US-101 worsens, the rate of collisions increases, and the service is financially feasible.

1. INTRODUCTION

1.1 Definition of the US-101 CSMP Corridor

The US-101 Corridor System Management Plan (CSMP) represents a thorough analysis of the system performance and management options that can improve the current and future performance of the corridor. The corridor covers fifty miles of US-101 from the Rice Avenue interchange in Ventura County (VEN PM 20.76) to Winchester Canyon Drive (SB PM 27.20) in Santa Barbara County, as indicated in **Figure 1-1**. While the emphasis in the CSMP is on US-101, it is recognized that US-101 does not function independently. The analysis includes assessment of major local parallel roads, local road intersections, signal controls, rail lines, transit services, park-and-ride lots, pedestrian and bike lanes, demand management programs, and intelligent transportation system (ITS) programs, as well as freeway on-ramps and off-ramps.

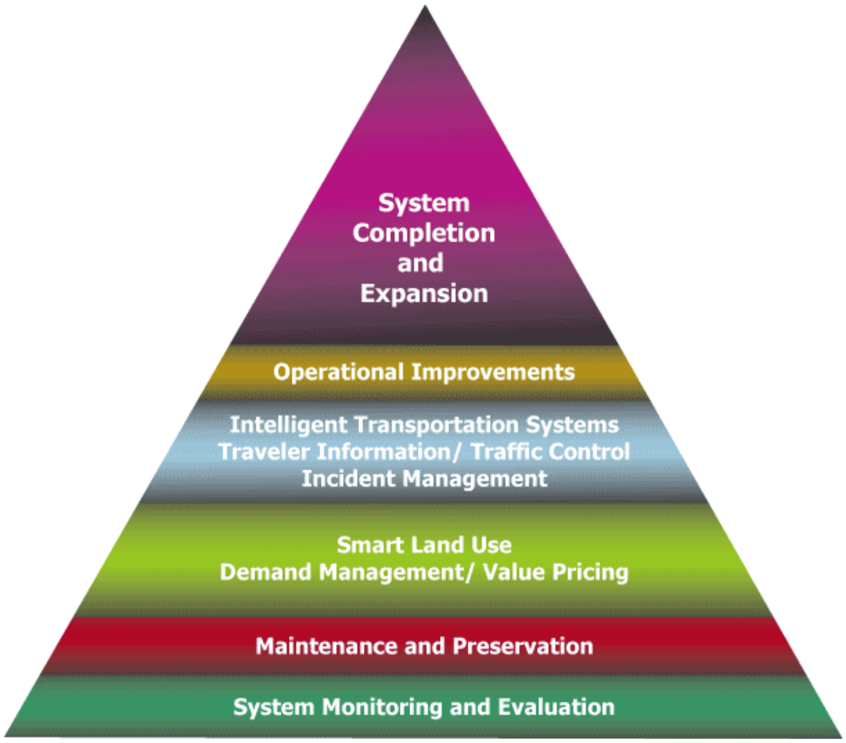
US-101 runs almost the entire length of California and is a major inter-regional route connecting San Francisco and Los Angeles. It is the only viable alternative route for commuters and freight between Santa Barbara and Ventura Counties. US-101 is one of two north-south highways that connect the Los Angeles basin, with a population of 13 million, and the great San Francisco Bay Area, with a population of 6.7 million. The other north-south highway, Interstate 5 (I-5), is periodically closed due to inclement weather, and US-101 serves as the primary north-south option during those periods. US-101 is on the National Highway System and is a Focus Route on the California Highway System (these route designations are important in qualifying US-101 for special funding) The Pacific Ocean and the steep coastal mountains physically constrain travel options. There are few local parallel routes to serve as significant alternatives to the freeway and those routes are operating close to capacity in the peak hour.

1.2 Purpose and Characteristics of a CSMP

A CSMP utilizes an associated set of analytical tools and performance monitoring systems to optimize performance of major transportation corridors. Caltrans and its partner agencies have recently adopted a system management approach to corridor management, as illustrated in **Figure 1-2**. One of the key elements of this approach is an increased focus on specific strategies and investments as methods for sustaining corridor mobility and productivity. System management is the monitoring of system performance and the implementation of policies, strategies, and technologies to improve corridor performance.

Figure 1-1 US-101 CSMP Corridor – Regional Context

Figure 1-2 System Management Pyramid



One purpose of developing a CSMP is to satisfy the requisite of the Corridor Mobility Improvement Account (CMIA), which explains that a system management plan must be prepared for each corridor receiving funding under the account. The ultimate purpose of the CSMP is to serve as a tool for efficiently and effectively optimizing the safety, mobility, productivity and reliability of the existing transportation system through the investment of capacity improvements being added by the CMIA project. The US-101 CSMP provides an assessment of current performance, identifies the causes of congestion, presents the best mix of improvements for preserving the performance of the corridor, recommends a system for monitoring the performance of the corridor, and offers forecasting and simulation tools for evaluating additional management options.

The CMIA project will add capacity on US-101 between Mobil Pier Road in Ventura County (PM R39.8) to south of Casitas Pass Road in Santa Barbara County (PM 2.2), as shown in **Figure 1-1**. This 6.0-mile project will eliminate at-grade crossings and will widen the roadway to three lanes in each direction with a new lane in each direction that will serve as an HOV lane.[1] The project will also include Intelligent Transportation Systems (ITS) infrastructure, pedestrian access, and bicycle lane improvements. The CMIA project will significantly reduce delays, improve safety, and facilitate both goods movement and regional and inter-regional travel. Construction is to begin in 2011. A

[1] A High Occupancy Vehicle (HOV) lane is a travel lane that is restricted during specified hours of the day for use by only high-occupancy vehicles (generally two or more people per vehicle) and other vehicles allowed by state law including motorcycles and some hybrid vehicles.

system management approach ensures the longevity of existing and future transportation facilities and services provided by the CMIA project and other programmed investments in the corridor.

1.3 Study Approach

The first step in developing this CSMP was to prepare a comprehensive assessment of existing corridor characteristics and performance to identify where congestion, safety problems, or other mobility problems might be addressed through system management strategies. The second step was to apply a model system for forecasting travel flows for future years. The travel forecasting and simulation models were developed to identify the locations of future congestion, bottlenecks, and system inefficiency where system management strategies might be effective. The models were also designed to evaluate the potential benefits from system management strategies. The analysis for this CSMP is based on performance data collected between 2006 and 2009.

Improvement strategies considered in the CSMP were modeled with a combination of travel demand forecasting models and a hybrid simulation model. The travel demand model provided forecasts of future-year vehicle trips by origin and destination. The hybrid simulation model replicated the movement of individual vehicles in traffic in response to the characteristics of the roadway, the volume of traffic using the roadway network, and traffic control methods. The travel demand models maintained in TransCAD by the Santa Barbara County Association of Governments (SBCAG) and the Ventura County Transportation Commission (VCTC) were used to produce estimates of vehicular travel patterns for the AM and PM peak periods. These travel patterns were used as input to the hybrid simulation model. The travel demand models were used to produce inputs for 2008 and for two forecast years: the expected opening year for the CMIA project on US-101 (2013) and ten years after the expected opening year (2023). The travel demand model produces estimates of flows between origin-destination pairs and the volume on links in the network based on existing and projected socioeconomic and land-use data. The travel demand models were used to assess any mode shifts that resulted from the improvement strategies as well as any route-choice changes to or from parallel arterials not covered in the hybrid simulation model. The details of the modeling methodology are provided in **Appendix A**.

A new hybrid simulation model was developed for the corridor using the TransModeler simulation software. The simulation model is referred to as a hybrid model because it uses different levels of detail for simulation portions of the networks depending on how critical the portions are to the evaluation of strategies. Microscopic (micro) simulation was used for US-101 and the ramp intersections immediately adjacent to the freeway. Important intersecting and parallel arterials that could be used for connecting to US-101 or as alternative routes were modeled with less detailed mesoscopic (meso) simulation. This hybrid approach allowed the project team to evaluate the benefits and impacts of alternative system management strategies for the entire 50-mile corridor.

1.4 Study Team

The CSMP is being led jointly by Caltrans Districts 5 and 7, with District 7 taking an overall leadership role consistent with the responsibility for delivering the CMIA project to construction. SBCAG and the VCTC also participated as charter agencies. The commitment of these agencies is expressed in a charter agreement included as **Appendix B**. Each of these agencies was represented on the Project Coordination Team that met monthly, providing overall project coordination and guidance. A stakeholder group was formed for broader representation of other jurisdictions and agencies in the two counties. The stakeholder group included cities and several unincorporated communities in the corridor, transit service providers, and a number of other interested parties. The stakeholder group provided input to the Project Coordination Team at key decision points throughout the project. Three subcommittees of the stakeholder group provided a review of products during the project: (1) a Technical Subcommittee reviewed all modeling documents and products, (2) a Transit and TDM Subcommittee reviewed the ways in which these management options were integrated in to the CSMP, and (3) a Traffic Operations Subcommittee reviewed the need for and evaluation of traffic operations strategies. A full list of stakeholder participants is provided in **Appendix C**.

1.5 Organization of this Report

The report is organized into six chapters. Chapter 2 describes the transportation and land-use characteristics of the corridor. Chapter 3 identifies corridor management strategies already in use. Chapter 4 describes the current travel patterns on US-101, including traffic volumes, variation in volumes by time of day and day of the week, vehicle occupancy, and vehicle type (auto, truck, etc.). Chapter 5 presents a baseline assessment of corridor performance for existing conditions and for the two forecast years considered in the project: 2013 and 2023. The discussion of baseline corridor assessment includes the identification and causes of major bottlenecks on US-101. Chapter 6 describes improvement scenarios that were analyzed and evaluated for their potential benefits in maintaining or improving the performance of the corridor. Chapter 7 lists the recommendations for the project including monitoring activities and strategies to pursue.

2. CORRIDOR DESCRIPTION

2.1 Transportation Facilities and Services

2.1.1 US-101

US-101 and its relationship to other roadways and transportation infrastructure and services in the CSMP corridor are illustrated in **Figure 2-1** for Santa Barbara County and in **Figure 2-2** for Ventura County. US-101 is on the Interregional Road System (IRRS) as a designated Focus Route.[2] The U.S. Department of Defense has identified US-101 as a Strategic Highway Network (STRAHNET) route.[3] It is part of a network of linked highways deemed essential to national defense for facilitating the movement of troops and equipment to airports, ports, rail lines, and military bases. The highway is a State Highway Extra Legal Load (SHELL) roadway and is designated for use by larger trucks.[4] It is also listed on the National Highway System, which means that it connects rural areas to growing urban centers and is critical for moving people, goods, services, and technology. US-101 also plays a larger role in the state economy by serving as a secondary route to Interstate 5, by connecting the Los Angeles Basin to Northern California. Approximately 6.7 percent of the traffic along this corridor is attributed to trucks.

While most of US-101 in the corridor study limits is a six-lane freeway, about 16 miles between Mussel Shoals and Milpas Street is a four-lane freeway. In a portion of this four-lane section, there are three median openings that provide access to the communities of Mussel Shoals and La Conchita and to the industrial site known as Tank Farm.

To help describe the characteristics of US-101 in the corridor, eight segments have been defined. The segments are illustrated in **Figure 2-1** and **Figure 2-2** and described below. **Table 2-1** and **Table 2-2** identify the roadway characteristics for each of the segments for the southbound and northbound directions.

2.1.2 Santa Barbara County Segments

Goleta Segment (PM 27.1 to PM 19.9) – This segment is from the northern-most limit of the corridor to Turnpike Road. Most of the segment is in the city of Goleta. There are two main parallel routes: Hollister Avenue and Cathedral Oaks Road. The major attractions in this segment include a business area along Hollister Avenue, the Santa Barbara Municipal Airport, a retail/commercial corridor on Calle Real, and the University of California, Santa Barbara.

City of Santa Barbara Segment (PM 19.9 to PM 11.2) – This segment is from Turnpike Road to East Cabrillo Boulevard and covers the core area of the city of Santa Barbara and an unincorporated portion of Santa Barbara County. This is the highest volume segment of US-101 within Santa Barbara County. It serves the core area of the city. There is no distinct parallel route but it connects to all major arterials within the city of Santa Barbara.

Montecito/Summerland/Carpinteria Segment (PM 11.2 to PM 2.5) – This segment is from East Cabrillo Boulevard to Casitas Pass Road. As described by its name, this segment covers most of the communities of Summerland and Carpinteria and is the major roadway

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[2] http://www.leginfo.ca.gov/cgi-bin/displaycode?section=shc&group=00001-01000&file=163-164.56
[3] http://www.globalsecurity.org/military/facility/strahnet.htm
[4] Corridor Mobility Improvement Account Nomination SB/VEN 101 HOV, December 29, 2006

serving the commuting traffic between the two counties. SR-192 and two minor streets, Jameson Lane and Via Real, run parallel to this segment of US-101 and serve local traffic.

CMIA Project Segment – Santa Barbara County (SB-PM 2.5 to VEN-PM 43.4) – This segment is from Casitas Pass Road to the Ventura County line. This includes all of the CMIA project area within Santa Barbara County. Similar to the Montecito/Summerland/Carpinteria Segment, it acts as the only route serving the commuting traffic between the two counties.

2.1.3 Ventura County Segments

CMIA Project Segment – Ventura County (PM 43.4 to PM 40.9) – This segment is from the Santa Barbara County line to the Old Pacific Coast Highway intersection (at the Mussel Shoals community). It is the only portion of US-101 that is not a freeway as it has three at-grade intersections at Tank Farm, Santa Barbara Avenue (La Conchita), and Old Pacific Coast Highway (Mussel Shoals). The traffic interruptions from these three intersections will be resolved because this section is a core part of the CMIA project area in Ventura County.

Coastal Segment (PM 40.9 to PM 32.6) – This segment is from the Old Pacific Coast Highway intersection (at the Mussel Shoals community) to the Solimar (SR-1) interchange. SR-1 is the only parallel route to this US-101 segment; however, the majority of commuting traffic between the two counties uses the US-101 segment and SR-1 serves recreational purposes **City of Ventura Segment (PM 32.6 to PM 25.9) –** This segment is from the Solimar (SR-1) interchange to Telephone Road and covers the core area of the city of Ventura. The major parallel route is Main Street, which passes through the core business area of Ventura and is surrounded by residential areas. Major connectors are SR-33 (Ojai Freeway) at the northern end and SR-126 (Santa Paula Freeway) at the southern end.

Oxnard Segment (PM 25.9 to PM 20.0) – This segment is from Telephone Road to Rice Avenue, which is the southern-most limit of the CSMP corridor and is mostly within the city of Oxnard. Oxnard Boulevard is the major connector between the city and US-101. There is no distinct alternative route to this US-101 segment, which serves traffic both within the southern part of the corridor and to and from areas to the south, including Los Angeles County.

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Figure 2-1 Transportation Infrastructure and Services in the US-101 CSMP Corridor in Santa Barbara County

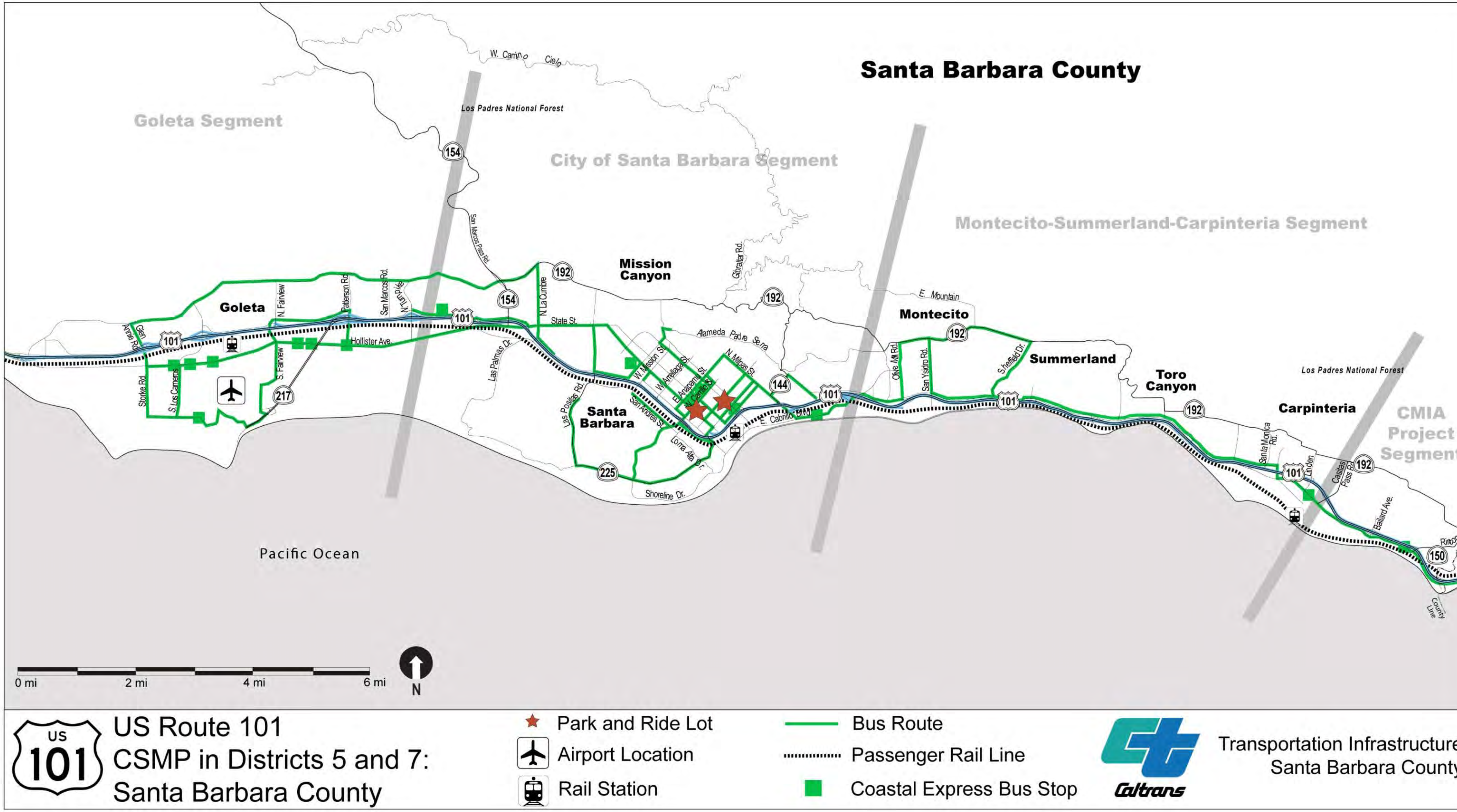


Figure 2-2 Transportation Infrastructure and Services in the US-101 CSMP Corridor in Ventura County

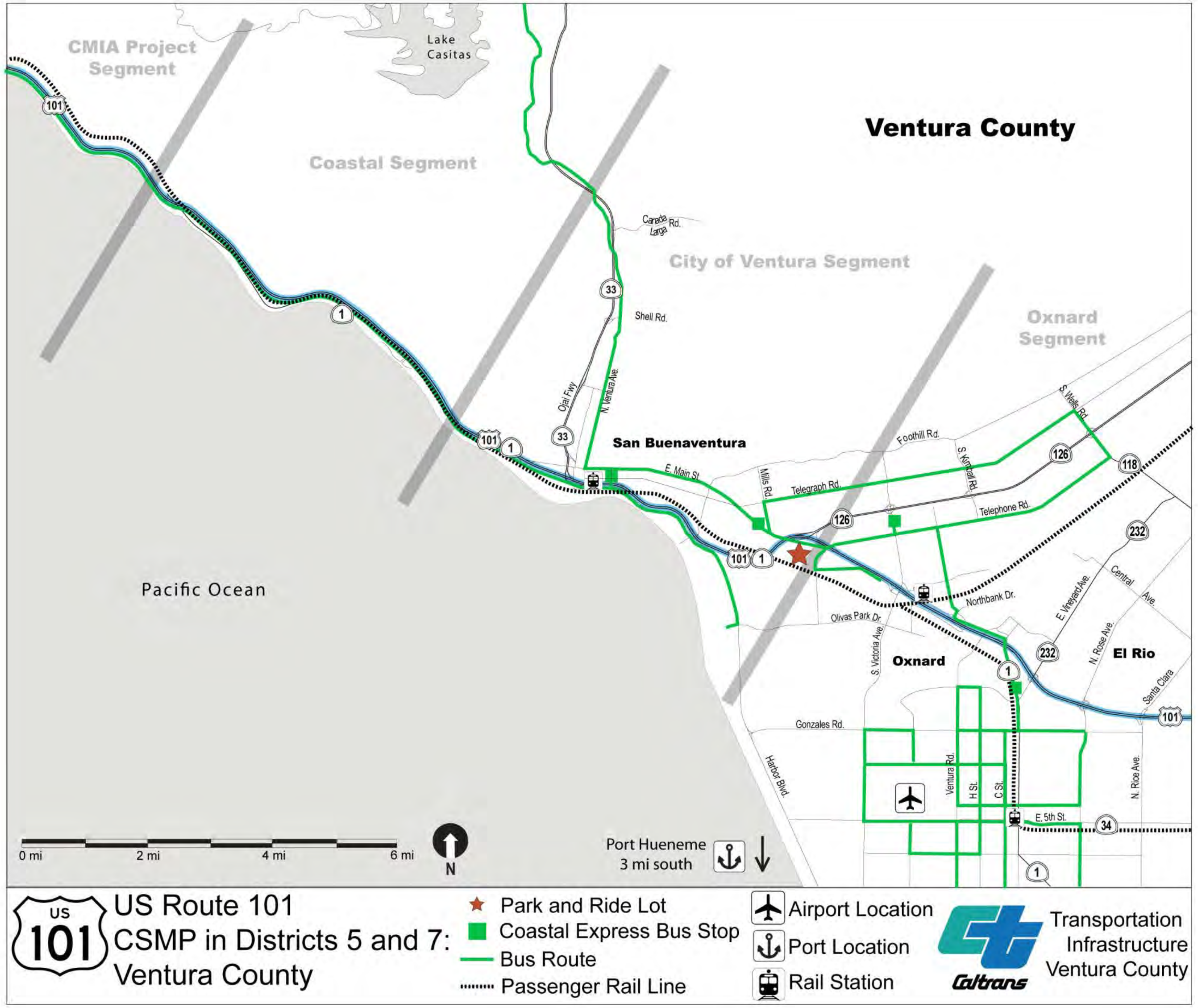


Table 2-1 US-101 Corridor by Operational Characteristics (Southbound)

Segment	Operational Characteristics	Post Mile
Santa Barbara County		
Goleta Segment		
Hollister Ave Off-ramp to Fairview Ave On-ramp	2 Travel Lanes	27.120 to 22.360
Fairview Ave On-ramp to Turnpike Rd On-ramp	3 Travel Lanes	22.360 to 19.870
Santa Barbara Segment		
Turnpike Rd On-ramp to Milpas St Off-ramp	3 Travel Lanes	19.870 to 12.859
Las Positas Rd On-ramp to Mission St Off-ramp	Weaving	16.320 to R15.900
Milpas St Off-ramp to Hot Springs/Cabrillo Blvd Interchange	2 Travel Lanes	12.859 to 11.250
E Cabrillo Blvd Left-hand Off-ramp	Left-hand Off-ramp	11.620
Montecito/Summerland/Carpinteria Segment		
E Cabrillo Blvd Left-hand On-ramp to Casitas Pass Rd On-ramp	2 Travel Lanes	11.250 to 2.457
Olive Mill Rd On-ramp to San Ysidro Rd Off-ramp	Weaving	10.340 to 10.120
N Jameson Ln/Sheffield Dr Left-hand Off-ramp	Left-hand Off-ramp	9.070
N Jameson Ln/Sheffield Dr Left-hand On-ramp to Evans St Off-ramp	Weaving	8.850 to R8.450
Santa Claus Ln On-ramp to Carpinteria Ave Off-ramp	Weaving	4.700 to 3.630
Reynolds Ave On-ramp to Linden Ave Off-ramp	Weaving	3.480 to 3.170
CMIA Segment – Santa Barbara County		
Casitas Pass Rd On-ramp to South of Bates Rd On-ramp	2 Travel Lanes	(SB) 2.457 to (VEN) s/o 43.421
Ventura County		
CMIA Segment – Ventura County		
South of Bates Rd On-ramp to Old Pacific Coast Hwy Intersection	2 Travel Lanes	s/o 43.421 to 40.890
Tank Farm	At-Grade Intersection	42.200
Santa Barbara Ave (La Conchita)	At-Grade Intersection	41.470
Old Pacific Coast Hwy (Mussel Shoals)	At-Grade Intersection	40.890
Coastal Segment		
Old Pacific Coast Hwy Intersection to North of Seacliff (SR-1) Off-ramp	2 Travel Lanes	40.890 to n/o 39.178
North of Seacliff (SR-1) Off-ramp	Lane Add	n/o 39.178
North of Seacliff (SR-1) Off-ramp to Solimar (SR-1) On-ramp	3 Travel Lanes	n/o 39.178 to 32.592
Ventura Segment		
Solimar (SR-1) On-ramp to SR-33 Off-ramp	3 Travel Lanes	32.592 to 30.910
SR-33 Off-ramp	High Volume/Diverging	30.910
SR-33 Off-ramp to SR-33 On-ramp	2 Travel Lanes	30.910 to 30.548
SR-33 On-ramp to SR-126 Off-ramp	3 Travel Lanes	30.548 to 26.721
SR-126 Off-ramp	High Volume/Diverging	26.721
SR-126 Off-ramp to Telephone Rd On-ramp	2 Travel Lanes	26.721 to 25.860
Oxnard Segment		
Telephone Rd On-ramp to North of Johnson Dr Off-ramp	3 Travel Lanes	25.860 to n/o 23.582
NB Victoria Ave On-ramp Johnson Dr Off-ramp	Weaving	24.509 to 23.582
North of Johnson Dr Off-ramp	Lane Add	n/o 23.582
North of Johnson Dr Off-ramp to North of SB Vineyard Ave On-ramp	4 Travel Lanes	n/o 23.582 to n/o 22.031
Johnson Dr On-ramp to Oxnard Blvd Off-ramp	Weaving	23.501 to 22.831
North of SB Vineyard Ave On-ramp	Lane Drop	n/o 22.031
North of SB Vineyard Ave On-ramp to Rice Ave On-ramp	3 Travel Lanes	n/o 22.031 to 20.032
NB Vineyard Ave On-ramp to Rose Ave Off-ramp	Weaving	21.780 to 21.185

Table 2-2 US-101 Corridor by Operational Characteristics (Northbound)

Segment	Operational Characteristics	Post Mile
Ventura County		
Oxnard Segment		
Rice Ave Off-ramp to North of NB Vineyard Ave On-ramp	3 Travel Lanes	20.037 to n/o 21.966
North of NB Vineyard Ave On-ramp	Lane Add	n/o 21.966
North of NB Vineyard Ave On-ramp to North of Johnson Dr Off-ramp	4 Travel Lanes	n/o 21.966 to n/o 23.611
Oxnard Blvd On-ramp to Johnson Dr Off-ramp	Weaving	22.918 to 23.611
North of Johnson Dr Off-ramp	Lane Drop	n/o 23.611
North of Johnson Dr Off-ramp to Telephone Rd Off-ramp	3 Travel Lanes	n/o 23.611 to 25.859
Ventura Segment		
Telephone Rd Off-ramp to E Main St/S Mills Rd Off-ramp	3 Travel Lanes	25.859 to 26.463
E Main St/S Mills Rd Off-ramp to SR-126 On-ramp	2 Travel Lanes	26.463 to 26.597
SR-126 On-ramp to SR-33 Off-ramp	3 Travel Lanes	26.597 to 30.798
SR-126 On-ramp	High Volume/Merging	26.597
S Oak St On-ramp to SR-33 Off-ramp	Weaving	30.329 to 30.798
SR-33 Off-ramp	High Volume/Diverging	30.798
SR-33 Off-ramp to SR-33 On-ramp	2 Travel Lanes	30.798 to 30.998
SR-33 On-ramp to Solimar (SR-1) Off-ramp	3 Travel Lanes	30.998 to 32.573
Coastal Segment		
Solimar (SR-1) Off-ramp to North of Seacliff (SR-1) On-ramp	3 Travel Lanes	32.573 to n/o 39.340
North of Seacliff (SR-1) On-ramp	Lane Drop	n/o 39.340
North of Seacliff (SR-1) On-ramp to Old Pacific Coast Hwy Intersection	2 Travel Lanes	n/o 39.340 to 40.890
CMIA Segment – Ventura County		
Old Pacific Coast Hwy Intersection to South of Bates Rd Off-ramp	2 Travel Lanes	40.890 to s/o 43.454
Old Pacific Coast Hwy (Mussel Shoals)	At-Grade Intersection	40.890
Santa Barbara Ave (La Conchita)	At-Grade Intersection	41.470
Tank Farm	At-Grade Intersection	42.200
South of Bates Rd Off-ramp	Lane Add	s/o 43.454
Santa Barbara County		
CMIA Segment – Santa Barbara County		
South of Bates Rd Off-ramp to North of Rincon Rd On-ramp	3 Travel Lanes	(VEN) s/o 43.454 to (SB) n/o 1.180
Bates Rd On-ramp to Rincon Rd Off-ramp	Weaving	0.390 to 0.590
North of Rincon Rd On-ramp	Lane Drop	n/o 1.180
North of Rincon Rd On-ramp to Casitas Pass Rd Off-ramp	2 Travel Lanes	n/o 1.180 to 2.520
Montecito/Summerland/Carpinteria Segment		
Casitas Pass Rd Off-ramp to E Cabrillo Blvd Left-hand Off-ramp	2 Travel Lanes	2.520 to 11.240
San Ysidro Rd On-ramp to Olive Mill Rd Off-ramp	Weaving	10.150 to 10.410
E Cabrillo Blvd Left-hand Off-ramp	Left-hand Off-ramp	11.240
Santa Barbara Segment		
E Cabrillo Blvd Left-hand Off-ramp to Milpas St On-ramp	2 Travel Lanes	11.240 to 12.865
Salinas St On-ramp to S Milpas St Off-ramp*	Weaving	12.120 to 12.570
Milpas St On-ramp to Turnpike Rd Off-ramp	3 Travel Lanes	12.865 to 19.900
Milpas St On-ramp to Laguna St/Garden St Off-ramp	Weaving	12.865 to 13.387
Garden St On-ramp to Bath St Off-ramp	Weaving	13.611 to 13.965

Segment	Operational Characteristics	Post Mile
Castillo St On-ramp to W Carrillo St Off-ramp	Weaving	R14.280 to R14.630
W Carrillo St On-ramp to W Arrellaga St Off-ramp	Weaving	R14.890 to R15.320
W Arrellaga St On-ramp to W Mission St Off-ramp	Weaving	R15.400 to R15.650
Goleta Segment		
Turnpike Rd Off-ramp to North of Fairview Ave On-ramp	3 Travel Lanes	19.900 to n/o 22.480
North of Fairview Ave On-ramp	Lane Drop	n/o 22.480
North of Fairview Ave On-ramp to Hollister Ave On-ramp	2 Travel Lanes	n/o 22.480 to 27.100
Los Carneros Rd On-ramp to Storke Rd Off-ramp	Weaving	23.900 to 24.650

* Will be corrected under the US-101 Milpas to Hot Springs project

2.1.4 Planned and Programmed Corridor Improvements

Numerous projects are programmed or are planned for the corridor in addition to the CMIA project. The major capacity improving projects on US-101 are illustrated in Figure 2-3 and Figure 2-4 and are listed in **Appendix D**. One of these projects began in 2008 shortly after most of the baseline data was collected for the CSMP. The project, currently under construction, will add a third southbound lane between the Milpas Street and Hot Springs/Cabrillo interchanges; add a northbound auxiliary lane between the Hot Springs/Cabrillo on-ramp and Salinas Street off-ramp; add a continuous third northbound lane from the Salinas Street off ramp over the Milpas Street bridge; construct a roundabout at Coast Village/Old Coast Highway/Hot Springs intersection, construct a new undercrossing at Cacique Street, construct sidewalls and multi-use path between the Andre Clark Bird Refuge and the tennis courts along Old Coast Highway. Work is scheduled for completion in 2012. The Cathedral Oaks project in Goleta is also currently in construction to replace the bridges at the Hollister Avenue overcrossing. In Ventura County a project to reconstruct the interchange of US-101 with Rice Avenue is currently under construction. Recent projects completed in Ventura County are the widening of the Santa Clara River Bridge and reconstruction of the SR-1/US-101 interchange. Both projects relieved a major bottleneck on US-101 in Oxnard.

Programmed improvements include modernization of US-101 between Mobil Pier Road in Ventura County (PM R39.8) to south of Casitas Pass Road in Santa Barbara County (PM 2.2). This project spans the border between the two counties and is being funded under the Prop 1B Corridor Mobility Improvement Account (CMIA). The 6.0-mile project will widen the freeway to three lanes in each direction with the new lane serving as an HOV lane and eliminate three at-grade crossings. The project will also include ITS infrastructure, pedestrian access, and bicycle improvements. The project will significantly reduce delays, improve safety, and facilitate both goods movement and regional and interregional travel. Construction on the CMIA project is to begin in 2011. The Linden & Casitas Pass Interchanges project (PM 2.2 – PM 3.4) is also programmed to reconstruct two interchanges and replace the Carpinteria Creek Bridge. Other programmed improvements include HOV lane construction projects in each county. The most significant of these projects is the South Coast 101 HOV Project, which will add an HOV lane in each direction between the end of the CMIA project in Ventura (PM 2.2) and ends at the Salinas ramps (PM 12.2), a project funded by the Measure A sales tax program in Santa Barbara

County. The HOV lane addition will result in a continuous HOV lane in each direction for roughly 10 miles.

The model networks used to evaluate both baseline future conditions ("Year of CMIA Project Opening" for 2013 and "Ten Years after Opening" for 2023) and improvement strategies were coded to reflect projects that are already in place in 2008 and programmed for implementation by 2023. Programmed projects were identified from the Transportation Improvement Programs and Capital Improvement Programs for each county. In addition, the Measure A list for Santa Barbara was also included. These programmed projects for the US-101 corridor in Santa Barbara and Ventura are included as **Appendix D**.

Although the CSMP assumes that the South Coast 101 HOV lane project is built in 2023, the project is currently in the environmental phase of project development and the CSMP simulation model calibration was based on the same set of raw data used in the SB 101 HOV Study (traffic counts, speeds, truck percentages), but supplemented with some additional data collected by DKS.

Other differences between the modeling performed for the CSMP and that performed for the South Coast 101 HOV Study are:

1. The technical analysis for the CSMP is corridor wide while the South Coast 101 HOV Lane project is project specific in nature;
2. The level of model calibration and supporting operational analysis is more rigorous in the South Coast 101 HOV lane study. Its findings dictate and supersede the planning level analysis of the CSMP when there are apparent differences;
3. The planning level analysis of the CSMP looked at a large corridor with limited modeling refinement whereas the South Coast 101 HOV study involved a much more focused area, detailed analysis and greater refinement;
4. Some of the assumptions in the South Coast 101 HOV Lane project were different from the assumptions made for the CSMP and different software packages were used.

A more detailed discussion of the differences in the modeling approach for the CSMP and the South Coast 101 HOV study can be found in Appendix "A."

2.1.5 Parallel and Connecting Roadways

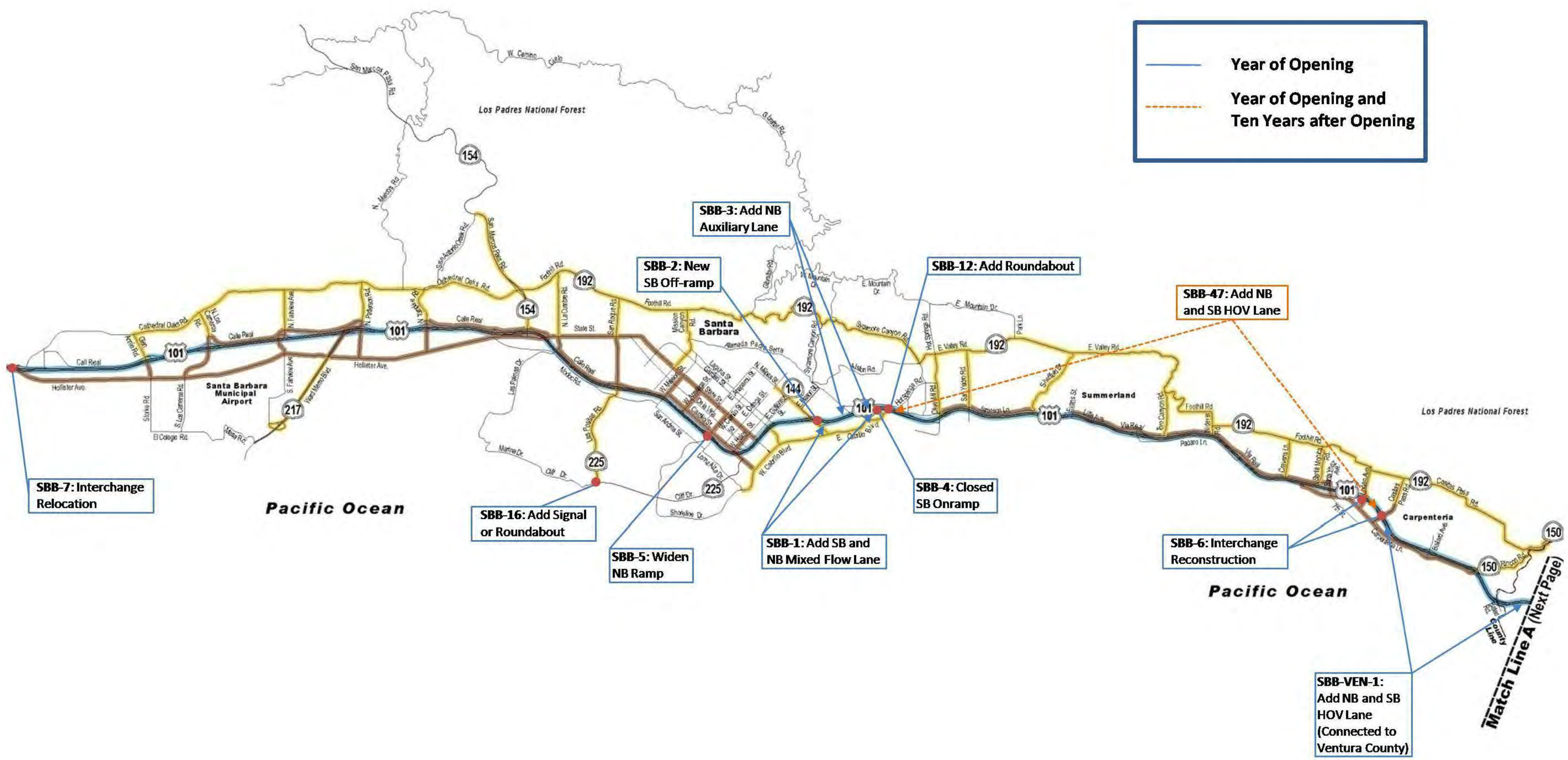
Good alternatives to US-101 are limited within the corridor in both counties. Parallel roads that have the potential to serve as alternatives for short trips are illustrated in **Figure 2-1** and **Figure 2-2** and listed in

Table 2-3. If there is significant congestion or a collision or other incident blocks lanes of the freeway, drivers tend to divert to these parallel roads to bypass the congested segments of US-101. Most of these alternate routes now operate at or near capacity during peak commute hours and are unable to accommodate diverted traffic.

Table 2-3 Parallel Arterials

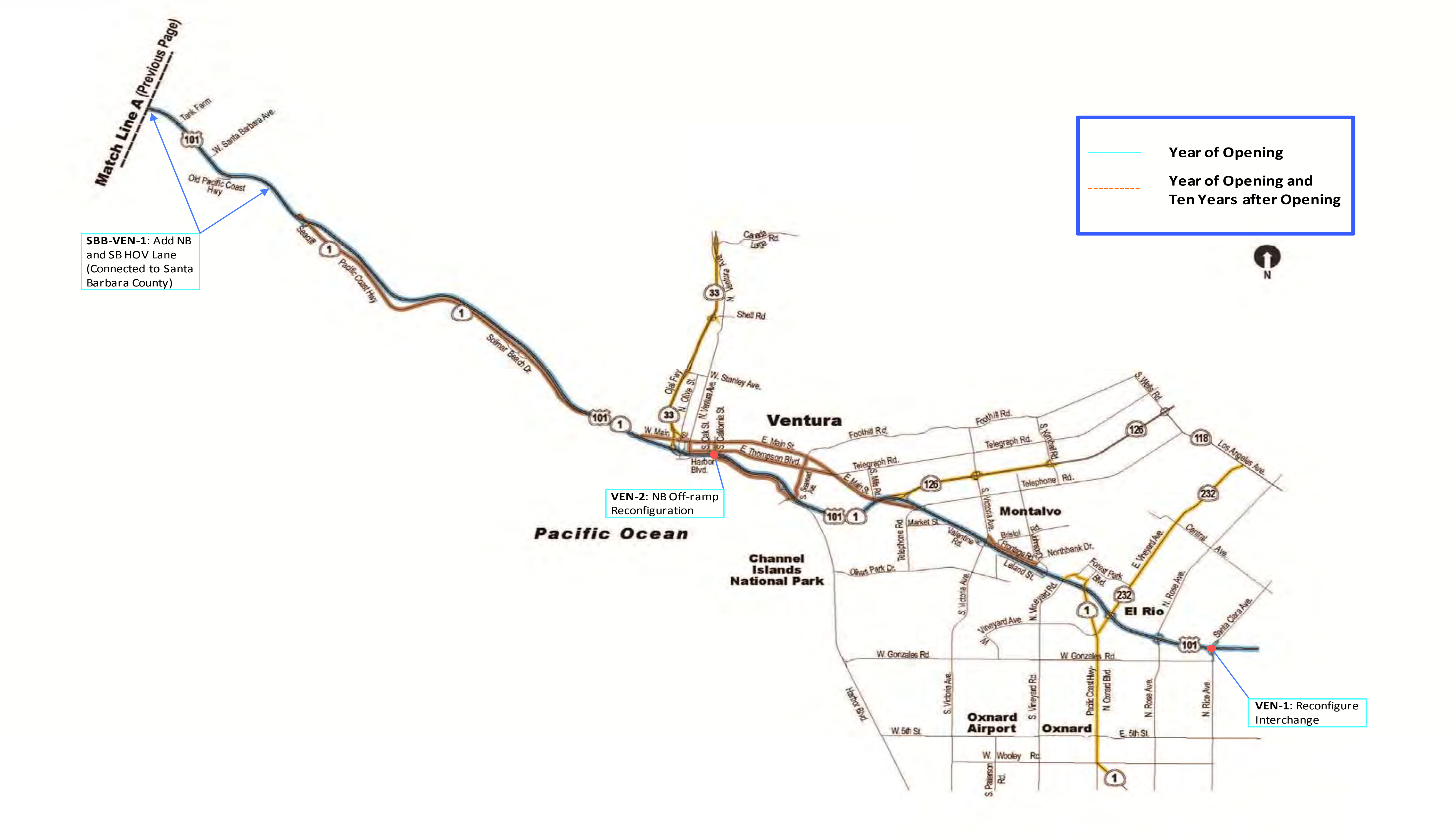
Parallel Arterials	From	To	Approximate Length (miles)
Santa Barbara County			
Hollister Avenue Cathedral Oaks Road SR-192	The Northern End	State Street	9.1
	Winchester Canyon Road	SR-154	6.8
	SR-154	SR-150	21.2
Calle Real	Winchester Canyon Road	Storke Road	1.8
	Los Carneros Road	Patterson Avenue	2.7
	Turnpike Road	State Street	2.0
	La Cumbre Road	Mission Street	2.0
Modoc Road	Hollister Avenue	Mission Street	3.1
State Street	La Cumbre Road	Gutierrez Street	3.9
Castillo Street	Mission Street	SR-225	1.9
Jameson Line	Olive Mill Road	Sheffield Drive	1.5
Via Real	Evan Street	Santa Ynez Avenue	4.7
Carpinteria Avenue	US-101S Exit	SR-150	3.3
Ventura County			
SR-1 (Pacific Coast)	Seacliff	Solimar	6.6
Main Street	SR-33	Telephone Road	5.1
Thompson Boulevard	Ventura Avenue	E Main Street	2.5

Figure 2-3 Major Projects Programmed or in Construction on US-101 in Santa Barbara County



Note: Code numbers refer to projects described in Appendix D. Some of the projects included are alrready under construction.

Figure 2-4 Major Projects Programmed or in Construction on US-101 in Ventura County



Note: Code numbers refer to projects described in Appendix D. Some of the projects included are alrready under construction.

2.1.6 Park-and-Ride Facilities

Park-and-ride lots provide more convenient opportunities for commuters in Santa Barbara County and Ventura County to use carpool, vanpool or express bus service. Park-and-ride lots work best when located in areas where mode-transfer opportunities are available. Two existing park-and-ride lots are in reasonably close proximity to US-101 and two additional locations have been given some consideration as future lots. Existing and possible future parking lots are listed in **Table 2-4** and **Table 2-5** and illustrated in **Figure 2-1**and **Figure 2-2** for in Santa Barbara County and Ventura County, respectively.

Table 2-4 Existing and Future Park-and-Ride Lots-Santa Barbara County

City	Location
Santa Barbara	
Carrillo Park-and-Ride Lot	W. Carrillo Street and Castillo Street
Potential Sites for New Facilities	
Bailard Park-and-Ride Lot	US-101 and Bailard Avenue

Table 2-5 Existing and Future Park-and-Ride Lots-Ventura County

City	Location
Ventura	
Ventura Park-and-Ride Lot	Army National Guard adjacent to US-101 and SR-126
Potential Sites for New Facilities	
SR-33 Park-and-Ride Lot	US-101 and SR-33

2.1.7 Public Transportation[5]

Passenger Rail

Amtrak Rail is a national rail system that provides intercity passenger train service. In the study corridor, its single track rail line is used daily for intercity passenger and freight service, as illustrated in **Figures 2-1 and 2-2**. The Pacific Surfliner provides service five times a day, seven days a week, in each direction. The Coast Starlight route provides service once a day, seven days a week, in each direction. Bicycle storage improvements have been recommended to better support multimodal travel and should be implemented. Amtrak stations are in Goleta, Santa Barbara, Carpinteria, Ventura and Oxnard.

MetroLink Commuter Rail is a regional commuter rail system serving Southern California. Within the corridor, the Ventura County Line serves stations in Oxnard and Ventura; the Oxnard station is a joint Amtrak/Metrolink station where travelers can transfer between systems. Metrolink has three daily weekday round trips from Ventura County to Los Angeles. Metrolink ridership on the Ventura Line increased during the last part of April and the first part of May, 2008, averaging just over 4,200 boardings per day.

The Santa Barbara County Association of Governments and the Ventura County Transportation Commission are working with Caltrans to improve passenger rail service along the corridor that is technically and financially feasible. Both agencies participate in the Los Angeles-San Diego Rail Corridor Agency (LOSSAN), a rail corridor agency whose charge includes promoting passenger rail service enhancements to the Union Pacific Coast Rail line paralleling US-101.

Bus Transit

The major bus transit routes in the study corridor are illustrated in **Figures 2-1 and 2-2**. The Santa Barbara Metropolitan Transit District, a public transit agency, provides express, local and shuttle bus service on 26 routes in the southern portion of Santa Barbara County. Of the 7 million passengers per year, most are within Santa Barbara City limits and represent 97 percent of all transit usage in the US-101 CSMP project study area. Seven routes use US-101 for at least a portion of their service. Routes 7, 8, 12X, 15X, and 24X provide service between Goleta and Santa Barbara and Routes 20 and 21X provide service between Santa Barbara and Carpinteria. Numerous other routes provide service on parallel arterials.

The Ventura Intercity Service Transit Authority (VISTA) provides bus service among the cities in Ventura County on seven regular bus routes and two general public dial-a-ride services. The Vista Highway 101/Conejo Connection serves commuters in western Ventura County along US-101, including the city of Ventura and the city of Oxnard, seven days a week.

Gold Coast Transit (GCT) operates seventeen scheduled, fixed-route bus services and ACCESS paratransit service within 91 square miles of western Ventura County, including service between the city of Ventura and city of Oxnard and between major origins and destinations within each city.

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[5] Schedules for transit services are subject to change.

VISTA Coastal Express began service in 2001 and is jointly funded and administered by SBCAG and VCTC. Annual boardings in the agencies fiscal year 2005/2006 were 147,629, a 30-percent increase from fiscal year 2004/2005. It serves commuters between Ventura, Carpinteria, Santa Barbara, and Goleta, seven days a week. The service extends to University of California in Santa Barbara (UCSB) for the northbound direction during the morning peak period and for the southbound direction during the afternoon peak period.

Within the study corridor, Greyhound operates five buses every day, seven days a week in both directions, between the city of Santa Barbara and the city of Oxnard. In addition, the Thruway Motor Coach also provides bus service from the city of Santa Barbara to the city of Oxnard once a day, southbound only.

2.1.8 Bicycle and Pedestrian Facilities

There is a serious commitment by the US-101 CSMP partner agencies to promote bicycling and walking. The Caltrans Chief Deputy Director signed a directive titled “Complete Streets” in October 2008 to ensure that travelers of all ages and abilities can safely and efficiently travel along and across a network of complete streets. This directive recognizes bicycle, pedestrian, and transit modes as integral elements of transportation system. Santa Barbara and Ventura Counties and most of the cities within the counties have planned and implemented bicycle programs to support non-motorized auto alternatives, including adopting Bicycle Transportation Plans that cover a comprehensive bikeway network of existing and planned routes. **Table 2-6** lists the status of local bicycle plans for the larger cities in the corridor in both counties. VCTC provides bicycle racks and bicycle storage compartments on all of the VISTA buses. Bicycle racks are also available on some of Amtrak’s Pacific Surfliner trains and many Metrolink trains. Bicycle lanes are currently available on US-101 between the Mobil Pier undercrossing and the Santa Barbara Ventura County line. Bicycle and pedestrian improvements are being incorporated into the CMIA project.

Table 2-6 Status of Local Bicycle Plans

	Bicycle Transportation Plan	Adopted by Local Agency	Approved by Caltrans	Plan Expires
City of Goleta	2005 Interim Bicycle Transportation Plan	February 22, 2005	April 15, 2005	FY 10/11
City of Santa Barbara	City of Santa Barbara Bicycle Master Plan (October 1998) with Exhibit A Supplement	December 17, 2003	July 21, 2004	FY 08/09
County of SB	Bicycle Master Plan 2005	January 11, 2005	April 14, 2005	FY 10/11
City of Oxnard	City of Oxnard Bicycle Pedestrian Facilities Master Plan	September 24, 2002	December 20, 2002	FY 07/08
City of San Buenaventura	City of San Buenaventura General Bikeway Plan	January 24, 2005	April 27, 2005	FY 10/11

According to the Caltrans-District 5 2004 *Bicycle Map*[6] in Santa Barbara County, within the CSMP limits on US-101 in Santa Barbara County, bicyclists are prohibited. In Ventura County, bicyclist are allowed to use US-101 only between the Santa Barbara county line (PM 43.622) and the Pacific Coast Highway (PM 38.976). Bicyclist are allowed in both directions in this segment.

Detailed bikeway network maps for the US-101 CSMP study corridor are provided in **Appendix E**. Programmed pedestrian/bicycle projects are included in the programmed project list provided in **Appendix D**.

2.1.9 Other Support Facilities

Airports

Several airports are within or near the study area as shown in **Figure 2-1** and **Figure 2-2.** The Santa Barbara Airport, in the northern portion of the study corridor, is owned and operated by the City of Santa Barbara and served by two fixed-base operators and thirty aviation service companies. It is a small hub airport with 180,000 annual aircraft operations of commercial and general aviation flights. Five commercial airlines serve nine major non-stop cities and over 200 one-stop destinations. There are 194 private aircraft at the Santa Barbara Airport.

The Oxnard Airport is in the southern portion of the study corridor in Ventura County. It is classified as a non-hub commercial service airport, with commuter flights currently serving numerous destinations through Los Angeles International Airport by SkyWest Airlines only (a commuter division of United Airlines). The airport has a contract air traffic control tower that handles approximately 100,000 arrivals and/or departures a year and is home to over 180 individual aircraft. As of February 2007, two full-service, fixed-base operators and two flight schools are headquartered at the airport.

The Camarillo Airport is adjacent to US-101, about three miles south of the study corridor in Ventura County. It is a general aviation reliever airport for the Los Angeles area, supporting a wide range of general aviation activity. The airport exclusively serves privately-operated general aviation and executive aircraft with no scheduled commercial service. In addition, it is home to nearly twenty aviation-related businesses and hosts some fifteen non-aviation businesses that provide a range of services.

The Santa Paula Airport is about twelve miles east of the southern portion of the study corridor in Ventura County. The airport is a privately-owned, public-use airport that handles approximately 97,000 arrivals and/or departures a year and is home to approximately 260 individual aircraft. The airport primarily serves the local community and provides hangar space for pilots of nearby communities. As of February 2007, Santa Paula Airport operated without a central tower and with no fixed-base operator headquartered at the airfield.

Ports

The Port of Hueneme is in Ventura County in the City of Port Hueneme as shown in **Figure 2-2**. The Oxnard Harbor District, an independent special district (business enterprise) and a political subdivision of the State of California, owns and operates the commercial Port of Hueneme. It is the only deep-water harbor between Los Angeles and

[6] http://www.dot.ca.gov/dist05/planning/maps/bikeguide.pdf

San Francisco and plays a significant role in the local economy. The port serves as the western U.S. distribution point for many imported vehicles. The port is the shipping point for agricultural products because it has the largest refrigerated fruit terminal within North America. In all, over $7 billion in cargo value moves through the Port of Hueneme each year.

There are also numerous marinas in both Ventura and Santa Barbara Counties. While they do not have shipping operations, they do support the local fishing industry and tourism. Marinas served directly by the US-101 corridor include:

Santa Barbara County

- Santa Barbara Marina
- Santa Barbara Sailing Club
- Santa Barbara Yacht Club

Ventura County

- Bahia Cabrillo Marina and Yacht Club
- Anacapa Isle Marina and Yacht Club
- Channel Islands Marina
- Pacific Corinthian Marina
- Peninsula Yacht Anchorage
- Vintage Marina
- Ventura County Small Boat Marina
- Ventura Harbor Village and Pierpoint Bay Yacht Club
- Ventura Isle Marina and Yacht Club
- Ventura West Marina

2.2 Goods Movement

US 101 is California's major north-south coastal route between Los Angeles and San Francisco, and is a vital asset to the nation, state and local economies. Its close proximity to two of the nation's largest cities make it an essential route for national and international goods movement, commerce, trade, tourism, and other important industrial activities. In addition, US 101 is a strategic corridor for Vandenberg Air Force Bases military transport, spaceport and national defense operations.

The movement of goods is essential to the wellbeing of residents, businesses, and institutions in the US-101 corridor. All rely on goods movement for the supply of food, clothing, building materials, business supplies, and just about everything else used in everyday life. Most goods movement in the US-101 corridor is by truck, but some is by air or by railroad. The Union Pacific Railroad moves freight on lines that run parallel to US-101 throughout the corridor. The Ventura County Railroad operates just over twelve miles of track on four branches and connects the Union Pacific lines with the industrial areas of south Oxnard and the Port of Hueneme. Trucks also move goods to and from these industrial areas and deliver almost all of the goods to businesses in the corridor.

US-101 is the main coastal route between Southern California, the Central Coast, and Northern California and serves trucking operations that supply residents and businesses all along the route. Trucking transports farm products and other goods produced in the corridor to market or to ports for shipment out of the region. US-101 is also an important alternate route for goods movement if I-5 is closed for any reason.

Truck traffic on all state highways is monitored by Caltrans, which classifies truck traffic by number of axles (from 2 to 5 or more). Near the Ventura-Santa Barbara County line there are approximately 6,300 commercial truck trips per day, which represents about 9.5 percent of the total traffic volume. Approximately 44 percent of the commercial trucks on this segment contain 5 or more axles.[7]

2.3 Land Use Characteristics

2.3.1 Demographics and Employment Characteristics

Estimates of the current population, number of households, and employment in the two portions of the US-101 Corridor are listed in **Table 2-7** for the Santa Barbara Portion of the Corridor and in **Table 2-8** for the Ventura County portion of the corridor. The two tables also present estimates of growth expected for each of these values for the two forecasts years 2013 and 2023. Population and employment characteristics in Santa Barbara County are derived from the SBCAG regional travel model,[8] and the same information is extracted in Ventura County from the Southern California Association of Governments (SCAG) regional travel model. The two portions of the corridor currently have approximately the same population but there are approximately 14,000 more jobs in the Santa Barbara portion of the corridor. Growth in population, households, and jobs is expected to be greater in the Ventura County portion of the corridor.

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[7] Caltrans Truck Report for 2007.

[8] The method used to derive estimates for the two forecast years for the project and modifications made to the forecasts from the SBCAG model are described in Appendix A.

Table 2-7 Population and Employment Characteristics in Santa Barbara County

Category	US-101 Corridor in Santa Barbara County			Santa Barbara County		
	2008	2013	2023	2008	2013	2023
Population	188,000	(+3.5%)	(+8.1%)	425,000	(+5.2%)	(+12.0%)
Households	68,000	(+2.0%)	(+4.9%)	143,000	(+3.7%)	(+8.7%)
Total Employment	125,000	(+6.0%)	(+13.7%)	215,000	(+6.2%)	(+14.3%)

Data Source: SBCAG Travel Demand Model

Table 2-8 Population and Employment Characteristics in Ventura County

Category	US-101 Corridor in Ventura County			Ventura County		
	2008	2013	2023	2008	2013	2023
Population	192,000	(+7.7%)	(+20.1%)	842,000	(+6.9%)	(+14.1%)
Households	63,000	(+10.6%)	(+22.8%)	269,000	(+8.1%)	(+15.1%)
Total Employment	111,000	(+10.5%)	(+19.6%)	362,000	(+9.3%)	(+18.4%)

Data Source: SCAG Travel Demand Model

2.3.2 Parks and Recreational Areas

The Santa Barbara County Park Department maintains more than 900 acres of parks and open spaces, 84 miles of trails and coastal access easements, and the grounds surrounding county buildings. Ventura County Parks is a Department of the General Services Agency and is charged with the planning, development, maintenance and operations of various recreation facilities. Many recreation facilities are provided by private enterprise through long-term leases managed by the department. Major parks and recreational facilities in the US-101 Corridor are shown in **Figure 2-5** for Santa Barbara County and **Figure 2-6** for Ventura County.

Channel Islands National Park encompasses five islands close to the mainland. The islands are accessible by park concessionaire boats that depart from Ventura, Channel Island (Oxnard), and Santa Barbara harbors. Public airplane transportation is also available year-round by park concessionaire Channel Islands Aviation from Camarillo Airport to Santa Rosa Island, one of the five islands.

Figure 2-5 Major Parks and Coastal Zone in Santa Barbara County

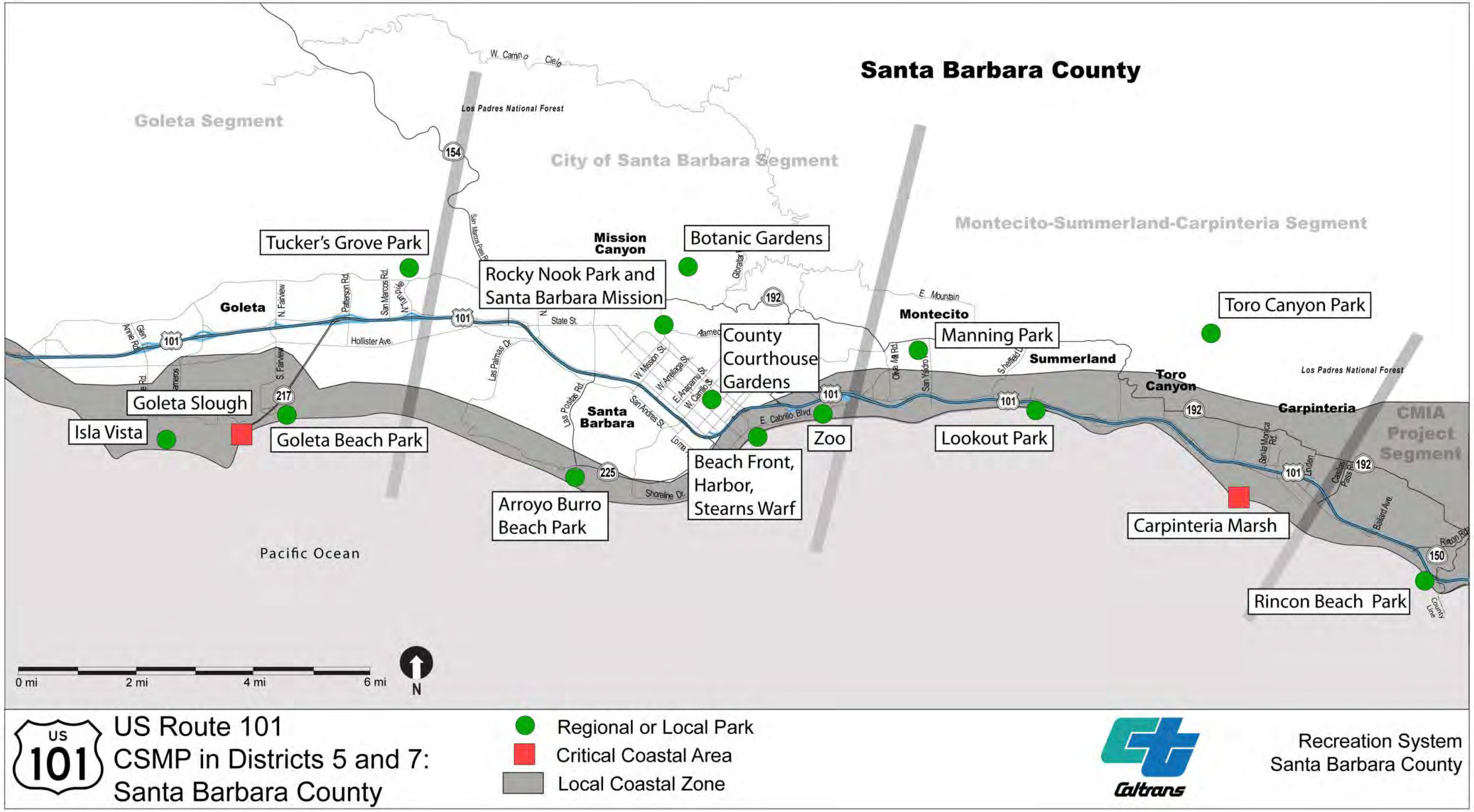
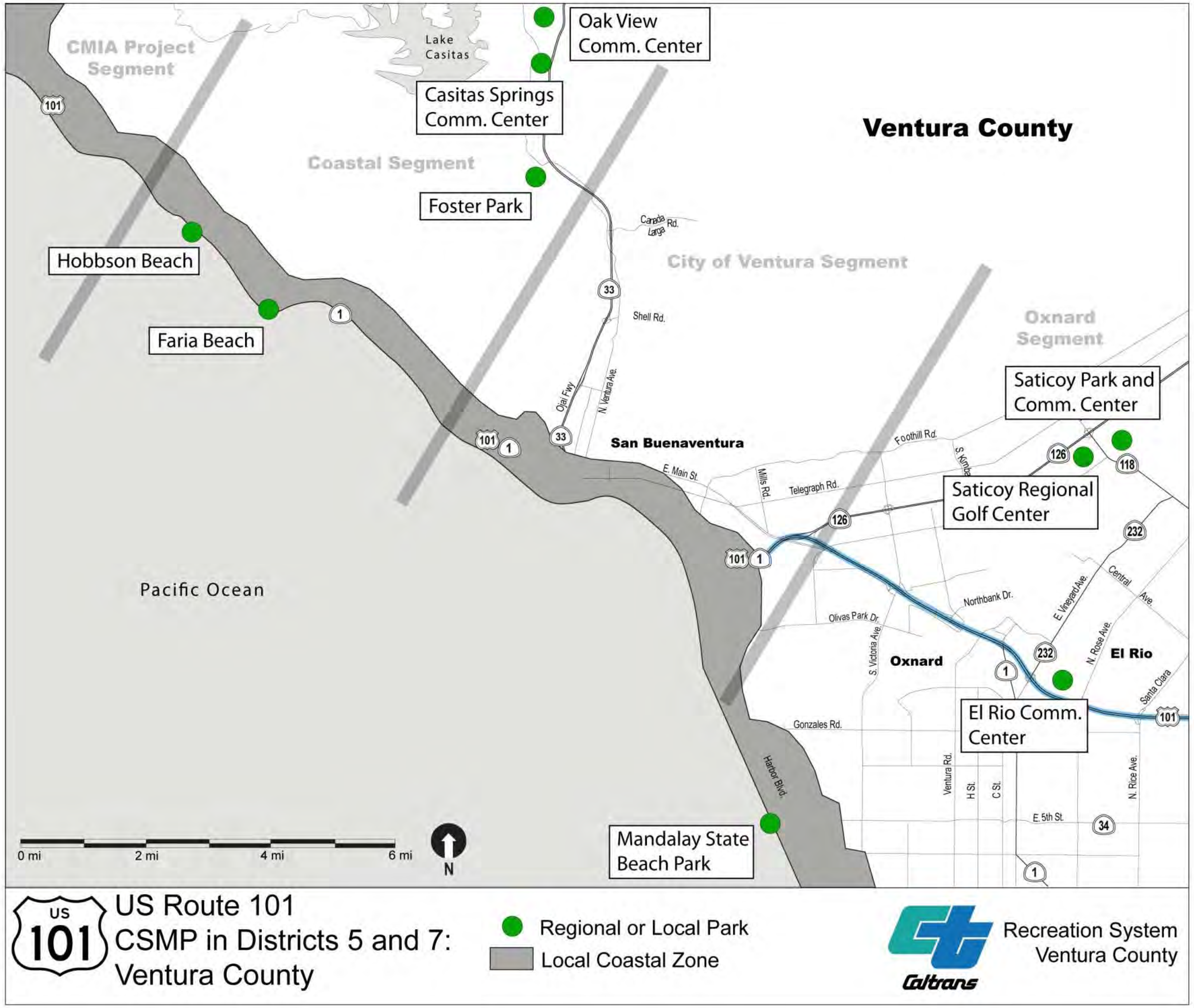


Figure 2-6 Major Parks and Coastal Zone in Ventura County



2.3.3 Schools

University of California, Santa Barbara (UCSB)

UCSB has a 1,055 acre campus on the Santa Barbara coast with an enrollment of roughly 21,000 students. Access to UCSB campus is through the Highway 217 exit on southbound US-101 and Storke Road/Glen Annie Road on northbound US-101.

Westmont College

Westmont College, in Santa Barbara, has an enrollment of 1,328 students. The campus is approximately three miles from US-101 and can be accessed via the Olive Mill Road US-101 exit.

Community Colleges

There are two community colleges in the Ventura County portion of the study area. Ventura College is a 112-acre campus in the city of Ventura and has an enrollment of 13,524 students. Oxnard College, in the city of Oxnard, has easy access from US-101 and SR-1. Oxnard College had an enrollment of roughly 7,700 students in the fall of 2008. Its existing 118-acre campus will undergo a major reconstruction over the next decade as part of a Measure S bond-funded project.

Santa Barbara Community College District is comprised of Santa Barbara City College, the Continuing Education Division, and the Goleta Valley Adult Education Center. The combined enrollment is roughly 20,000.

County School Districts

There are 10 county school districts are in the CSMP study corridor. They are listed below:

Santa Barbara County

- Carpinteria Unified School District
- Cold Spring School District
- Goleta Union School District
- Hope School District
- Montecito School District
- Santa Barbara School District
- Vista del Mar Union School District

Ventura County

- Oxnard School District
- Rio School District
- Ventura Unified School District

2.3.4 Coastal Zone

The coastal zone includes intertidal and near-shore waters, wetlands, bays and estuaries, riparian habitat, certain wood and grasslands, streams, lakes, and habitat for rare or endangered plants or animals. The US-101 CSMP Corridor runs along the Pacific Coast, which requires sensitivity of potential transportation improvements to environmentally sensitive areas.

The Critical Coastal Areas program is an innovative program that fosters collaboration among local stakeholders and government agencies to better coordinate resources and focus efforts on coastal watersheds in critical need of protection from polluted runoff. **Figure 2-5** illustrates the Critical Coastal Areas identified along the CSMP study corridor by a statewide, multi-agency Critical Costal Areas Committee.

- The Goleta Slough covers about 45 square miles and includes seven creeks. The area of Goleta Slough that is below mean high water is a State Marine Park, and the area above mean high water is an Ecological Reserve.
- The Carpinteria Marsh is a 230-acre estuary in the City of Carpinteria. The marsh is the remnant of larger bay or estuary that formed in the Carpinteria Valley.
- Mugu Lagoon/ Revelon Slough located at the mouth of the Calleguas Creek watershed just south of the US-101 corridor in Ventura County is one of the few remaining significant saltwater wetland habitats in Southern California.

3. CURRENT CORRIDOR MANAGEMENT STRATEGIES

The goal of a CSMP is to define how a travel corridor is performing, understand why it is performing that way, and recommend system management strategies to address problems within the context of a long-range planning vision. Guided by the system management pyramid, as shown in **Figure 1-2**, a CSMP seeks to incorporate operational analysis into more traditional transportation planning processes at the corridor level. This is accomplished by conducting comprehensive performance assessments, analysis, and evaluations. Facilitating performance-based decision making is a key objective of a CSMP. The following sections describe current management strategies for the US-101 CSMP corridor.

3.1 US-101

There are already a set of management strategies in place for US-101, and more are under development. These existing and emerging management strategies are:

3.1.1 Incident Management Strategies

Incident management on the Santa Barbara County US-101 segment is provided primarily by the Freeway Service Patrol (FSP), which is jointly managed by SBCAG and the California Highway Patrol (CHP) with assistance from Caltrans. During commute periods (6:30 to 9:30 AM and 4:30 to 7:30 PM), tow trucks cover the US-101 corridor from Patterson Avenue to the Ventura County line. The tow trucks are dispatched by CHP to collisions and vehicle breakdowns for emergency assistance and removal of vehicles to a safe place. The program began in March 2006 and is well received by the public as it acts to reduce non-recurring congestion as well as chances of further collisions. The overall 2008 FSP performance summary for the three Santa Barbara FSP beats is summarized in **Table 3-1**. The FSP program has not been implemented in Ventura County.

Table 3-1 Summary of Santa Barbara FSP Performance

Annual FSP Assists (2008)	1,215
Annual Delay Savings in Vehicle-Hours (2008)	186,128
FSP Annual Benefit-to-Cost Ratio (2008)	14.91

Source: DKS Associates (2009)

3.1.2 Intelligent Transportation System

A travel information system is under development on both the Santa Barbara County and the Ventura County US-101 segments. VCTC installed a wireless solar-powered traffic speed monitoring system along US-101 in Ventura County under its Congestion Management Program (CMP). Speed data generated from this system is used for posting real-time travel speeds along the corridor on changeable message signs for public viewing on the Internet as well as to help pinpoint traffic hazards for improving emergency response to traffic incidents. SBCAG captures speed data using Speed Info Doppler radar devices, and the information is posted on the SBCAG web site.

Traffic operation centers in Los Angeles, Ventura County and San Luis Obispo monitor all US-101 segments in Ventura County and Santa Barbara County, respectively, and feed information to the media about collisions and incidents that will affect traffic flow. The traffic operations center in San Luis Obispo operates during the hours of 6:00 AM to 6:00 PM Monday through Friday. In Santa Barbara County along the US 101 corridor, vehicle sensors, detectors and television cameras have been installed. It is anticipated that by late 2010, the servers will be activated and able to transmit information from the ITS devices to the TMC in District 5. Future installation of ITS devices is dependant on timing and funding.

3.1.3 Ramp Metering

Currently in the US-101 CSMP corridor, the southbound ramp is metered at Garden Street and the northbound ramp is metered at Carrillo Street. Both metered ramps are in Santa Barbara County. The *2009 Ramp Meter Plan* developed by Caltrans listed the Ventura County segment of the US-101 CSMP corridor as a segment to implement ramp metering in the next 10 years.

3.2 Parallel and Connecting Roadways

A Bureau of Transportation Statistics survey in 2007 indicates that Santa Barbara County operates 51 signalized intersections under central system control. None of these have the capability for Transit Signal Priority or Emergency Vehicle Priority to alter signal timing to give priority to approaching transit or emergency vehicles. All the cities in Santa Barbara County within the CSMP study area have synchronized traffic signal systems for some but not all of their major streets.

Ventura County has some interconnected signals and video detection. All public railroad crossings have signal preemption with emergency battery backup. The city of Oxnard uses a BiTrans signal system and SCOOT.[9] The city's signal synchronization extends to 60 percent of the system with red-light enforcement cameras rotated at 11 instrumented intersections. The city also has limited fire department signal preemption.

3.3 Public Transportation – Passenger Rail, Bus and Paratransit

In Santa Barbara County, in the 2006 -07 fiscal year, 9,739,272 rides were provided on public transit. Santa Barbara Metropolitan Transportation District (SBMTD) serves south Santa Barbara County and provides the majority of rides throughout the county. The SBMTD fleet operates a fleet of 103 vehicles and 26 routes. SBMTD's Easy Lift also provides a curbside-to-curbside transportation alternative to the fixed-route transit system for senior citizens and people with disabilities who live along the south coast of Santa Barbara County. Easy Lift provided 65,550 trips in fiscal year 2006-07. Amtrak is the only current provider of passenger rail in Santa Barbara County. Amtrak's Pacific Surfliner and Cost Starlight trains provide a total of four daily trips daily through Santa Barbara.

Ventura County uses an advanced transit system of both fixed route, dial-a-ride and paratransit services supported by fully deployed cutting-edge technologies that include automated vehicle location systems, automated passenger counters, and smart card readers. Remote terminal outlets can also be used to pay for smart cards, which then allow value to be added automatically to the card when next used on a bus. VCTC has implemented a GO Ventura card that makes smooth transfers from one bus to another and from one system to another throughout the region. The NextBus system predicts the expected arrival times of each vehicle at all bus stops and displays the actual location of

[9] Split Cycle Offset Optimization Technique is an adaptive signal timing system that responds automatically to fluctuations in traffic flow as determined by detector loops in the roadway

buses on maps. All fixed-route public transit systems in Ventura County, except for the Ojai Trolley, have implemented NextBus. Bike racks are also available in Metrolink Stations.

3.4 Goods Movement

Addressing goods movement in the corridor requires a comprehensive understanding of how goods are transported in the Central Coast. The Association of Monterey Bay Area Governments (AMBAG), in partnership with Caltrans and the regional transportation agencies of Santa Barbara County, San Luis Obispo County, San Benito County, and Santa Cruz County, have undertaken a commodity flow study in the Central Coast to analyze and identify goods-movement needs. The study is to be completed in late 2010.

While goods movement brings economic benefits to the region, it can also have an adverse impact on air quality, noise congestion, and public health. Goods movement results in higher percentages of nitrogen oxide (NOx) emissions and particulate matter (PM2.5) than passenger vehicles. With legislation such as Assembly Bill (AB) 32 and Senate Bill (SB) 375, transportation and land use planners will need to examine the impacts of goods movement on air quality. Several initiatives are underway that likely will strongly influence the options for reducing truck emissions over the next decade. The California Air Resources Board (CARB) is in the process of adopting new rules that would require lower emission rates applied to existing trucks already on the road.

3.5 Demand Management Strategies

In Santa Barbara County, Traffic Solutions serves as the rideshare agency and Transportation Demand Management (TDM) program. Traffic Solutions' goals include reducing traffic congestion and vehicle miles driven and improving the quality of life for residents and visitors. Its primary objectives are to provide county-wide transportation service and information, develop new programs, educate the public on their choices, and promote cooperative relationships among resident stakeholders of Santa Barbara County. The existing TDM strategies in Santa Barbara County include:

- County employees who regularly participate in the TDM program can earn up to two additional vacation days per year.
- The FlexWorkSB program aims to reduce traffic congestion and improve air quality by implementing employer-based flexwork programs that encourage telework, compressed workweeks, and flexible schedules.
- Traffic Solution manages a Web-based carpool match service to provide potential carpoolers with contact information of other commuters with a similar commute pattern. In FY 2005, the carpool match list service eliminated an estimated 1.15 million vehicle miles traveled in Santa Barbara County.
- Traffic Solutions offers several vanpool incentive programs, including a New Rider Rebate and a Quick Start subsidy, and acts as a liaison between vanpool companies and groups of commuters.
- The Curb Your Commute program began as part of the TDM for the Milpas to Hot Springs Operational Improvement project. This program will be extended for various phases of US-101 highway construction.

The Ventura County Transportation Commission serves as the sponsor for Ventura County's commute assistance program. The goal of the program is to promote alternatives to driving alone, including various other commuting options such as telecommuting and "smart work" strategies such as flex-time or compressed work schedules. The 2009 Ventura County CMP includes a chapter on TDM activities and how they are currently implemented. They include:

- Rideshare matching services provided by VCTC's Commuter Services Department. This service is available at www.ridematch.info/service.asp.
- VCTC's Guaranteed Ride Home Program provides a free taxi ride or rental car in the event of an emergency to all registered with the program who carpool, vanpool, or take the bus or train.
- Park-and-ride lots have made carpooling and vanpooling easier for commuters as they provide a central place to carpool or ride to public transit where available.
- VCTC encourages the adoption of local TDM ordinances to reduce vehicle trips by other modes of travel. The City of Ventura has adopted all seven elements of the TDM ordinance and City of Oxnard has adopted four elements of the TDM ordinance.

3.6 Land-Use

3.6.1 Local Planning

Land-use planning is under the jurisdiction of local agencies. Each individual city within the corridor has an adopted General Plan that defines the city's approach to land-use management. A county-wide General Plan defines the program for unincorporated areas in each county and defines the approach by which the cities' programs will be coordinated. The General Plan, which is mandated by California State law, sets forth the goals, policies, and programs a county will implement to manage future growth and land uses. The plans define land uses for future years on land-use maps to be used to guide the public and decision makers regarding appropriate uses if and when development occurs in the future. The last major update to the General Plan in Santa Barbara County was 2009 and in Ventura County was 2005. General Plan amendments are considered each year.

In addition, the state-mandated Congestion Management Program (CMP) for each county contains an element that identifies the land-use impacts on the regional transportation system. The state CMP legislation enacted in 1991 attempted to reduce future congestion by directly addressing the issue of land use and transportation. It required county-based Congestion Management Agencies (CMAs) to develop a mechanism to determine and mitigate impacts from new land uses on the regional road network. In addition, this legislation was designed to provide incentives for land-use strategies that reduce vehicle trips and vehicle miles traveled (VMT). Examples of such strategies include infill housing, transit-oriented development, and mixed land uses.

CMP land use programs for the two counties were designed to address transportation impacts associated with land development decisions and to promote regional information sharing, while acknowledging that land-use decisions are the purview of local jurisdictions. This is accomplished in the counties in a number of ways, but the two most effective elements to the land-use analysis program are the CMP impact thresholds, which are used in the California Environmental Quality Act

(CEQA) review process, and the semi-annual submittal of development activity from local agency planning staff. The purpose of this CMP element is to provide congestion-related information to local planning staff as they review development proposals and to identify possible future problems in meeting the level-of service standards established by the CMP. The CMP element consists of a traffic analysis using a computerized traffic model. The land-use assumptions are developed consistent with the land-use policies and programs of the individual cities and the county. The CMP establishes project-specific CMP impact thresholds for highways and intersections that are used in the review CEQA review process. The most recent CMPs were adopted in both counties in 2009.

With legislation such as AB 32 and SB 375, transportation and land use planning will need to examine the impacts that land-use and transportation policy have on air quality. AB 32 established statewide goals for reduction of greenhouse gases and SB 375 established a program for the development of regional Sustainable Community Strategies that will result in the attainment of the portion of the greenhouse gases reduction target allocated to the region. The development of the Sustainable Community Strategies has just started for Santa Barbara and Ventura Counties. Santa Barbara County's is being developed by SBCAG and Ventura County's by SCAG. Caltrans has initiated a California Interregional Blueprint that will integrate the regional planning for greenhouse gas reductions with the Caltrans' interregional multimodal transportation plan. CSMP strategies that would result in reduced greenhouse gases would support the Regional Blueprints and the California Interregional Blueprint.

3.6.2 Local Coastal Program

Local Coastal Programs (LCP) required by the 1972 Coastal Zone Management Act (CZMA) are basic planning tools used by local governments, and certified by the Coastal Commission, to guide development in the coastal zone. LCPs contain the ground rules for future development and protection of coastal resources in the 75 California coastal cities and counties. LCPs specify the appropriate location, type, and scale of new or changed uses of land and water. Each LCP includes a land-use plan and measures to implement the plan (such as zoning ordinances). Prepared by local government, these programs govern decisions that determine the short-term and long-term conservation and use of coastal resources. The boundaries of the local coastal zone were illustrated in **Figure 2-5 and Figure 2-4.**

4. CORRIDOR TRAVEL PATTERNS

The CSMP analysis used a variety of data and tools to describe travel in the US-101 corridor. Data on traffic volumes, vehicle type, vehicle occupancy, and use of alternative modes for a three-year period from 2006 to 2009 were assembled from available sources to define existing conditions. In addition, the project team collected new data to fill gaps in understanding of corridor travel. Once existing conditions were explained, the project team successfully calibrated and validated a baseline simulation model to test management strategies in future-year conditions. The project team produced future-year forecasts off the "Baseline Year" (roughly 2008) for the "Year of CMIA Project Opening" (roughly 2013) and "Ten Years after Opening" (roughly 2023).

An analysis of historic traffic volumes and patterns in the corridor indicates that the economic recession that began in 2008 resulted in a lower volume of traffic and congestion in the period represented by the calibration data than had been experienced in prior years. Traffic volumes on US-101 were lower, which resulted in less congestion. This understanding of traffic trends was used to adjust the future-year simulation models. The characterization of the corridor travel patterns in this section and performance in subsequent section uses the variety of data collected and assembled between 2006 and 2008 to represent the existing conditions and the baseline year for the simulation model results to characterize travel in the two forecast years.

The forecasts for the two future years assume that capital roadway projects that have funding and are expected to be completed by those dates will be completed and therefore are reflected in the model networks[10]. These forecasts were initially identified as 2015 and 2025, but because the calibration data reflect a temporary drop in volumes due to the recession, the conditions in the 2015 and 2025 forecast are likely to occur earlier (2013 and 2023). The forecasts also reflect some adjustments by the project team to produce simulation models for the forecast years that can be accommodated by the network without a complete operational breakdown of the network. These adjustments were made by moving some of the volume for select origin-destination pairs out of the peak period. These adjustments were designed to reflect the peak spreading that would naturally occur but is not captured in the travel demand forecasting model or the simulation model. Unless otherwise indicated by adjustments, the models used assume that all travel forecast for the peak periods will occur in those periods regardless of the level of congestion. In reality, some travelers will chose to travel outside of the peak periods if congestion becomes too great. The adjustments made resulted in the following overall reductions in the "Ten Year after Opening Models":

- Santa Barbara AM 0.3 %
- Santa Barbara PM 8.5 %
- Ventura AM 1.2 %
- Ventura PM 2.3 %

As a result of these adjustments, the forecast are also likely to be representative of an earlier year than originally intended. A summary of the final number of trips in the models and the percentage changes from the calibration year are shown in **Table 4-1**. The table illustrates the significant growth in traffic volumes that is reflected in the future year models.

[10] The baseline for this modeling effort did not include all the TDM, FSP, transit and rail projects identified in the Measure "A" program for Santa Barbara County. It was determined by the TDM/Transit subcommittee that these programs would be tested in the scenario analysis since both counties have different funding sources.

Table 4-1 Comparison of Total Trips by Forecast Year for the US-101 CSMP Corridor

Model	Total Simulation Vehicle Trips			Percent Growth from Calibration Data	
	Base Year Calibration Data (2008)	Year of CMIA Opening (2013)	10 Years After Opening (2023)	Year of CMIA Opening (2013)	10 Years After Opening (2023)
Santa Barbara AM	136,000	144,000	156,000	5.8%	14.9%
Santa Barbara PM	167,000	178,000	198,000	6.8%	18.6%
Total Santa Barbara	**303,000**	**322,000**	**354,000**	**6.3%**	**17.0%**
Ventura AM	153,000	165,000	183,000	7.7%	19.3%
Ventura PM	193,000	205,000	240,000	6.1%	24.4%
Total Ventura	**346,000**	**370,000**	**423,000**	**6.8%**	**22.1%**

Notes: Total Vehicle Trips are derived from the simulation models by summing trips from all origins to all destinations for all vehicle classes, and all hours in the 3-hour peak period.

4.1 Freeway Travel Patterns

A 2002 survey indicated that during the peak commute periods there is a heavy flow of trips between residences in Ventura County and jobs in Santa Barbara County. The survey indicated that more than 15,000 vehicles a day commute along US-101, northbound from Ventura County to Santa Barbara County during the AM peak period and southbound from Santa Barbara to Ventura County during the PM peak period. This pattern is captured in the travel models for both counties and the simulation models developed for the CSMP project.

4.2 Freeway Volumes

Table 4-2 illustrates average annual daily traffic volumes (AADT) for the study corridor in 2007, the last full year before the economic recession. Unlike many other major freeways in California, the study corridor has only four Caltrans continuously monitoring flow detectors and all are in Ventura County. As a result, the AADT estimates for the study corridor are based primarily on Caltrans count stations. These counts are taken periodically but not on a continuous basis like the PeMS counts.

Table 4-2 Estimates of Annual Average Daily Traffic in 2007

Segment	Segment Description	AADT	Peak Month	Peak Hour
Santa Barbara County				
Goleta Segment				
SB PM 26.907-24.786	Hollister Avenue to Storke Road	33,000	35,000	3,450
SB PM 24.786-23.711	Storke Road to Los Carneros Road	63,000	68,000	5,500
SB PM 23.711-22.533	Los Carneros Road to Fairview Avenue	77,000	81,000	7,500
SB PM 22.533-21.414	Fairview Avenue to SR-217	90,000	97,000	8,800
SB PM 21.414-20.062	SR-217 to Turnpike Road	113,000	120,000	11,000
Santa Barbara Segment				
SB PM 20.062-18.924	Turnpike Road to El Sueno Road	120,000	127,000	11,700
SB PM 18.924-18.364	El Sueno Road to SR-154 (San Marcos Pass Road)	120,000	127,000	11,700
SB PM 18.364-17.784	SR-154 (San Marcos Pass Road) to La Cumbre Road	132,000	140,000	11,400
SB PM 17.784-16.552	La Cumbre Road to SR-225 (Las Positas Road)	137,000	142,000	12,100
SB PM 16.552-15.733	SR-225 (Las Positas Road) to Mission Street	138,000	143,000	12,200
SB PM 15.733-14.758	Mission Street to Carrillo Street	126,000	137,000	12,900
SB PM 14.758-14.187	Carrillo Street to Castillo Street	111,000	122,000	11,100
SB PM 14.187-13.485	Castillo Street to Garden Street	98,000	109,000	9,800
SB PM 13.485-12.754	Garden Street to Milpas Street	105,000	121,000	10,500
SB PM 12.754-11.407	Milpas Street to East Cabrillo Boulevard	94,000	109,000	9,500
Montecito/Summerland/Carpinteria Segment				
SB PM 11.407-10.536	East Cabrillo Boulevard to Olive Mill Road	86,000	102,000	8,600
SB PM 10.536-10.023	Olive Mill Road to San Ysidro Road	91,000	110,000	9,500
SB PM 10.023-9.003	San Ysidro Road to Sheffield Drive	86,000	103,000	8,900
SB PM 9.003-8.264	Sheffield Drive to Evans Avenue	83,000	100,000	9,000
SB PM 8.264-7.138	Evans Avenue to Padaro Lane	79,000	95,000	8,500
SB PM 7.138-5.283	Padaro Lane to South Padaro Lane	78,000	95,000	8,600
SB PM 5.283-3.773	South Padaro Lane to Santa Monica Road	75,000	90,000	8,500
SB PM 3.773-3.059	Santa Monica Road to Linden Avenue	75,000	91,000	8,800
SB PM 3.059-2.64	Linden Avenue to Casitas Pass Road	70,000	84,000	7,700
CMIA Segment – Santa Barbara County				
SB PM 2.64-1.622	Casitas Pass Road to Bailard Avenue	70,000	83,000	7,800
SB PM 1.622-0.634	Bailard Avenue to SR-150 (Rincon Road)	66,000	74,000	5,600
SB PM 0.634-0	SR-150 (Rincon Road) to the County Line	66,000	72,000	7,700
Ventura County				
CMIA Segment – Ventura County				
VEN PM 43.622-40.890	The County Line to Old Pacific Coast Highway	65,000	71,000	5,500
Coastal Segment				
VEN PM 40.890-38.976	Old Pacific Coast Highway to SR-1(Seacliff)	65,000	71,000	5,500
VEN PM 38.976-32.7	SR-1 (Seacliff) to SR-1 (Solimar)	67,000	73,000	5,600
Ventura Segment				
VEN PM 32.7-30.906	SR-1 (Solimar) to SR-33	71,000	78,000	5,800
VEN PM 30.906-30.147	SR-33 to California Street	96,000	104,000	8,600
VEN PM 30.147-29.45	California Street to Vista Del Mar Drive	116,000	126,000	10,100
VEN PM 29.45-28.452	Vista Del Mar Drive to Seaward Avenue	119,000	129,000	10,100
VEN PM 28.452-26.39	Seaward Avenue to SR-126	122,000	133,000	10,100

Segment	Segment Description	AADT	Peak Month	Peak Hour
VEN PM 26.39-25.966	SR-126 to Telephone Road	90,000	95,000	7,300
Oxnard Segment				
VEN PM 25.966-24.645	Telephone Road to Victoria Avenue	119,000	127,000	9,600
VEN PM 24.645-23.45	Victoria Avenue to Johnson Drive	136,000	143,000	10,900
VEN PM 23.45-22.729	Johnson Drive to SR-1 (Oxnard Boulevard)	153,000	161,000	12,200
VEN PM 22.729-22.006	SR-1 (Oxnard Boulevard) to Vineyard Avenue	131,000	137,000	10,400
VEN PM 22.006-21.01	Vineyard Avenue to Rose Avenue	141,000	147,000	11,100
VEN PM 21.01-20.077	Rose Avenue to Rice Avenue	131,000	137,000	10,400

Source: Caltrans Traffic Data Branch Annual Census of Traffic - http://traffic-counts.dot.ca.gov/2007all/r101i.htm

4.3 Time-of-Day and Day-of-Week

While the AADT volumes are a useful indication of traffic load on the corridor, variations by time of day and day of the week can explain where and why congestion occurs on particular roadway segments and at particular times. The day-of-week traffic profiles show that, on average, traffic volumes are highest on Fridays. Thursdays and Saturdays are also slightly higher than average (see **Figure 4-1**). This can be attributed to recreational usage of the study area.

The southern and northern portions of the study corridor, near Oxnard and Santa Barbara, have a similar traffic pattern with clear peaks during the AM and PM peak periods on Thursdays, Fridays, and Saturdays, with the PM peak volume higher than the AM peak. In both areas mid-day traffic is fairly heavy as well. In contrast, the segment connecting the two counties peaks much more heavily during commute hours and has a clear peak direction of flow. Northbound traffic is the peak direction during the AM peak period and southbound traffic is the peak direction during the PM peak period. This pattern indicates that many more people are commuting from Ventura County to Santa Barbara County than from the other direction. Hourly traffic time-of-day profiles for US-101 are shown in **Figure 4-2.** These were crafted from weekday counts conducted at the six count locations along the corridor.

Figure 4-1 Day of Week Variations in US-101 Average Daily Volumes

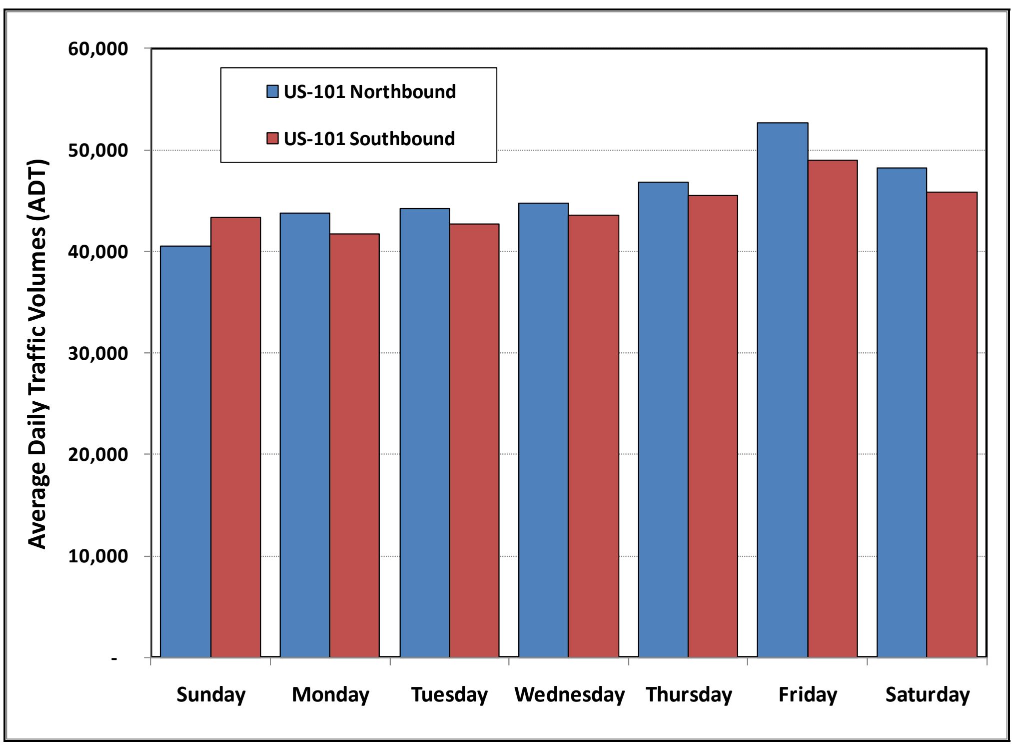
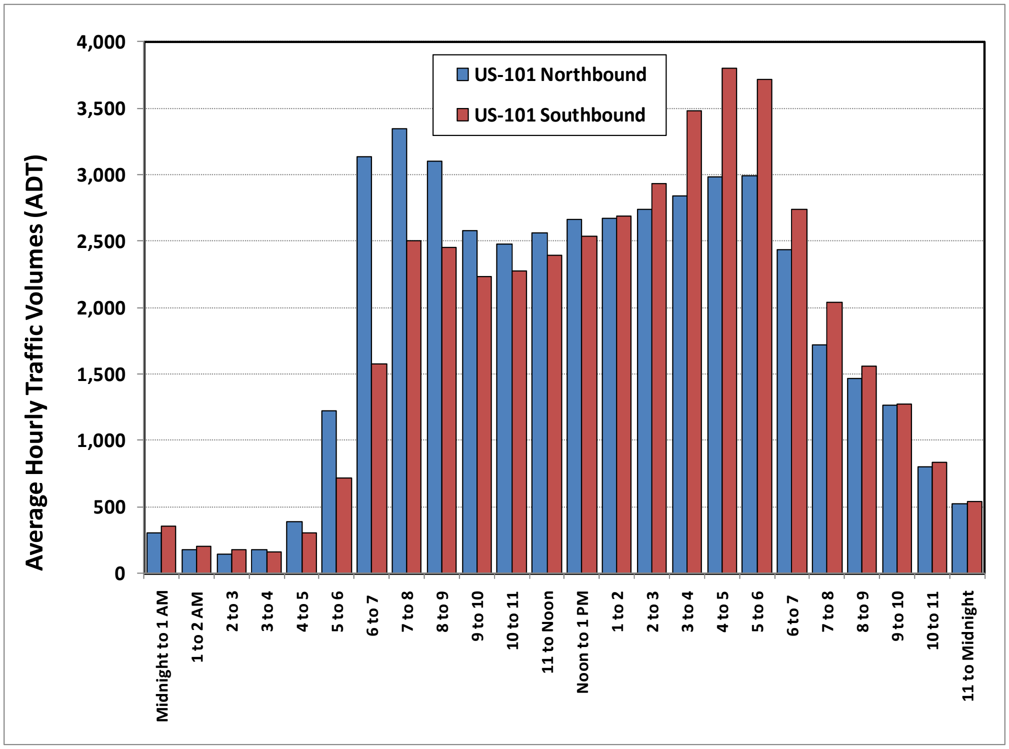


Figure 4-2 Time-of-Day Variations in US-101 Average Daily Traffic Volumes



4.4 Vehicle Occupancy

The average number of people in vehicles on a highway is an important indicator of how efficiently the highway is being used. The more people per vehicle, the fewer vehicles there are on the road. Although there are no HOV lanes in the study corridor at present, the number of people per vehicle is important to determine the potential demand for an HOV lane. There was limited information on vehicle occupancy for the corridor and therefore special counts were taken. The project team collected counts at seven locations during the two-hour AM peak (7 to 9 AM) and the two-hour PM peak (4 to 6 PM) in April 2008. The results from the counts are shown in **Table 4-3** . The counts varied significantly. The highest percentages are for one-person vehicles in the more urban areas of the corridor, with the exception of US-101 at SR-150. This location has the highest percentage of one-person vehicles, but it is in a fairly low-density portion of the corridor. A vehicle occupancy survey conducted as part of the South Coast 101 HOV Study[11] found one-person vehicles to be about 79 percent in the AM peak hour and about 74 percent in the PM peak hour.

Table 4-3 Average Vehicle Occupancy Summary

Count Location	Segment	One Person	2 or more People
Santa Barbara County			
US-101 at Storke Road	Goleta Segment	76%	24%
US-101 at Carrillo Street	City of Santa Barbara Segment	83%	17%
US-101 at SR-150	Montecito/Summerland/Carpinteria Segment	85%	15%
Ventura County			
US-101 at Bates Road	CMIA Segment	71%	29%
US-101 at Oak Street	City of Ventura Segment	77%	23%
US-101 at Victoria Avenue	Oxnard Segment	83%	17%
US-101 at Rice Avenue	Oxnard Segment	81%	19%

[11] Dowling Associates, ***Existing Conditions Report***, prepared for Caltrans District 5, December 15, 2008, page 33.

4.5 Trucks

The number of trucks, particularly heavy-duty trucks, can significantly affect highway operation. Large trucks cannot accelerate or decelerate as fast as passenger cars or small trucks, which can result in differences in speed when there is congestion or when there are significant grades in a corridor. Trucks also merge into traffic from an on-ramp more slowly and can increase congestion more than a passenger vehicle. In a hilly section of freeway, a heavy-duty track can have the same impact on traffic as six passenger vehicles. Estimates of the percentage of trucks in the mainline lanes of the freeway were available from various sources, but there was little information about the percentage of trucks using on-ramps during peak hours when their impact on congestion would be greatest. To fill in this gap in the data, classification counts were conducted by the project team at all on-ramps in both Santa Barbara and Ventura Counties on three days during April and May of 2008. The counted vehicles were organized into 13 vehicle classification categories. The US-101 classification counts were used to re-estimate the vehicle mix parameters for the US-101 CSMP simulation model inputs. **Table 4-4** shows the fleet mix for the 1.3 million vehicles counted.

Table 4-4 Summary of Vehicle Classification on US-101

Vehicle Classification	Percent of Total Santa Barbara County	Percent of Total Ventura County
Motorcycles - 2 Axles	0.2%	0.6%
Passenger Cars - 2 Axles	81.7%	74.9%
Pickup Trucks, Vans - 2 Axles	15.9%	16.2%
Buses	0.2%	0.6%
Single Unit - 2 Axles, 6 Tires	1.3%	5.3%
Single Unit Truck - 3 Axles	0.1%	0.4%
Single unit - 4 Axles	0.0%	0.0%
Single Unit - 4 Axles or Less	0.4%	1.3%
Double Unit - 5 Axles	0.1%	0.7%
Double Unit - 6 Axles or More	0.0%	0.0%
Multi-Unit - 5 Axles or Less	0.0%	0.1%
Multi-Unit - 6 Axles	0.0%	0.0%
Multi-Unit - 7 Axles or More	0.0%	0.0%
Total Trucks	1.9%	7.8%

Caltrans also maintains a database of truck volumes and percentages on the state system. The most recent available Truck Report is from 2007. **Table 4-5** shows the published truck volumes and percentages on US-101 in Ventura and Santa Barbara Counties in 2007. Truck percentages in the corridor range from about 4 percent to just under 10 percent. It should be noted that the percentage varies much more than the actual truck volumes. A vehicle classification count at SR-150, collected as part of the South Coast 101 HOV Study,[12] found mainline volumes to be in this range

[12] Dowling Associates, ***Existing Conditions Report***, prepared for Caltrans District 5, December 15, 2008, page 22.

as well. The truck percentages observed at ramps appear to be significantly lower than truck percentages for the mainline facilities. This can be explained in part by "through" trucks that use US-101 but neither enter nor exit the highway at any of the observed ramps. Since US-101 is a major inter-regional highway linking Southern California to Central and Northern California, it is likely that a large percentage of heavy vehicles using the highway are traveling between different regions of California and thus would not enter or exit the highway at local ramps. It should also be noted that, according to the 2007 Truck Report, nearly one-half of the reported trucks are two-axle vehicles, of which some could overlap with the "Pickup Trucks, Vans – 2 Axles" category in **Table 4-4.** This category represents approximately 16 percent of the vehicles observed at local ramps.

Table 4-5 Daily Truck Percentages in 2007

Segment	Segment Description	AADT	Trucks	Percent Trucks
Santa Barbara County				
Goleta Segment				
SB PM 26.907-24.786	Hollister Avenue to Storke Road	33,000	3,234	9.80%
SB PM 24.786-23.711	Storke Road to Los Carneros Road	63,000	5,733	9.10%
SB PM 23.711-22.533	Los Carneros Road to Fairview Avenue	77,000	N/A	N/A
SB PM 22.533-21.414	Fairview Avenue to SR-217	90,000	4,707	5.23%
SB PM 21.414-20.062	SR-217 to Turnpike Road	113,000	4,678	4.14%
Santa Barbara Segment				
SB PM 20.062-18.924	Turnpike Road to El Sueno Road	120,000	N/A	N/A
SB PM 18.924-18.364	El Sueno Road to SR-154 (San Marcos Pass Road)	120,000	4,968	4.14%
SB PM 18.364-17.784	SR-154 (San Marcos Pass Road) to La Cumbre Road	132,000	5,465	4.14%
SB PM 17.784-16.552	La Cumbre Road to SR-225 (Las Positas Road)	137,000	5,672	4.14%
SB PM 16.552-15.733	SR-225 (Las Positas Road) to Mission Street	138,000	5,670	4.11%
SB PM 15.733-14.758	Mission Street to Carrillo Street	126,000	N/A	N/A
SB PM 14.758-14.187	Carrillo Street to Castillo Street	111,000	N/A	N/A
SB PM 14.187-13.485	Castillo Street to Garden Street	98,000	N/A	N/A
SB PM 13.485-12.754	Garden Street to Milpas Street	105,000	5,555	5.29%
SB PM 12.754-11.407	Milpas Street to East Cabrillo Boulevard	94,000	5,621	5.98%
Montecito/Summerland/Carpinteria Segment				
SB PM 11.407-10.536	East Cabrillo Boulevard to Olive Mill Road	86,000	5,564	6.47%
SB PM 10.536-10.023	Olive Mill Road to San Ysidro Road	91,000	N/A	N/A
SB PM 10.023-9.003	San Ysidro Road to Sheffield Drive	86,000	8,256	9.60%
SB PM 9.003-8.264	Sheffield Drive to Evans Avenue	83,000	7,968	9.60%
SB PM 8.264-7.138	Evans Avenue to Padaro Lane	79,000	N/A	N/A
SB PM 7.138-5.283	Padaro Lane to South Padaro Lane	78,000	N/A	N/A
SB PM 5.283-3.773	South Padaro Lane to Santa Monica Road	75,000	N/A	N/A
SB PM 3.773-3.059	Santa Monica Road to Linden Avenue	75,000	N/A	N/A
SB PM 3.059-2.64	Linden Avenue to Casitas Pass Road	70,000	N/A	N/A
CMIA Segment – Santa Barbara County				
SB PM 2.64-1.622	Casitas Pass Road to Bailard Avenue	70,000	6,720	9.60%
SB PM 1.622-0.634	Bailard Avenue to SR-150 (Rincon Road)	66,000	6,336	9.60%

Segment	Segment Description	AADT	Trucks	Percent Trucks
SB PM 0.634-0	SR-150 (Rincon Road) to the County Line	66,000	6,382	9.67%
Ventura County				
CMIA Segment – Ventura County				
VEN PM 43.622-40.890	The County Line to Old Pacific Coast Highway	65,000	N/A	N/A
Coastal Segment				
VEN PM 40.890-38.976	Old Pacific Coast Highway to SR-1(Seacliff)	65,000	N/A	N/A
VEN PM 38.976-32.7	SR-1 (Seacliff) to SR-1 (Solimar)	67,000	N/A	N/A
Ventura Segment				
VEN PM 32.7-30.906	SR-1 (Solimar) to SR-33	71,000	6,553	9.23%
VEN PM 30.906-30.147	SR-33 to California Street	96,000	7,354	7.66%
VEN PM 30.147-29.45	California Street to Vista Del Mar Drive	116,000	N/A	N/A
VEN PM 29.45-28.452	Vista Del Mar Drive to Seaward Avenue	119,000	N/A	N/A
VEN PM 28.452-26.39	Seaward Avenue to SR-126	122,000	7,918	6.49%
VEN PM 26.39-25.966	SR-126 to Telephone Road	90,000	5,589	6.21%
Oxnard Segment				
VEN PM 25.966-24.645	Telephone Road to Victoria Avenue	119,000	5,962	5.01%
VEN PM 24.645-23.45	Victoria Avenue to Johnson Drive	136,000	N/A	N/A
VEN PM 23.45-22.729	Johnson Drive to SR-1 (Oxnard Boulevard)	153,000	6,380	4.17%
VEN PM 22.729-22.006	SR-1 (Oxnard Boulevard) to Vineyard Avenue	131,000	N/A	N/A
VEN PM 22.006-21.01	Vineyard Avenue to Rose Avenue	141,000	7,445	5.28%
VEN PM 21.01-20.077	Rose Avenue to Rice Avenue	131,000	N/A	N/A

5. COMPREHENSIVE CORRIDOR PERFORMANCE ASSESSMENT

The previous sections of this report describe transportation facilities and services in the corridor as well as existing programs to manage growth and transportation operations. These sections also presented the current use of the transportation system in terms of current traffic volumes, vehicle occupancy, and vehicle type. This section summarizes the performance of US-101 in safely and effectively accommodating the travel demand within the study corridor. This assessment is the basis for determining which management strategies might improve the performance of the transportation system. The following selected performance measures are used to quantify the freeway's performance:

- **Mobility** quantifies how traffic congestion deters free movement, in terms of vehicular delays.
- **Safety** evaluates collision rates in the corridor to determine the highest concentrations of collisions and to compare collision rates to county-wide and state-wide average rates.
- **Productivity** gauges the freeway's loss in efficiency in moving vehicles as a result of traffic congestion.
- **Pavement Condition** describes how well the freeways pavement is performing.

While all four of the measures are evaluated for baseline conditions in the period from 2006 to 2009, mobility and productivity are also evaluated for the two forecast time frames—"Year of CMIA Project Opening (2013)" and "Ten Years after CMIA Opening (2023)." The forecast year assessments are used to determine the need for management strategies after programmed investments are made. The "Ten Years after CMIA Opening (2023)" assessment is used as the baseline for comparison of improvement scenarios.

The first three performance measures are significantly affected by bottlenecks on the highway so this section begins with a discussion of the bottlenecks affecting US-101. For the purpose of the CSMP, a bottleneck is defined as any point in the mainline lanes of US-101 where capacity is constrained to a volume less than the demand during the peak-flow periods. Because flow through the bottleneck is less than the demand approaching it, the bottleneck causes an upstream queue of vehicles that move at less than free-flow speed as they wait to get through. The queue produces delay, but also often results in higher speeds downstream because the bottleneck meters the flow of vehicles at a lower rate than the total demand at the bottleneck point. The existence of one bottleneck may also hide another upstream where the original queue forms. It can also hide the potential for a downstream bottleneck if an improvement relieves the original bottleneck and allows flow downstream at a higher rate. As a result, solving one bottleneck often results in the emergence of a new bottleneck upstream or simply moves the bottleneck downstream. These effects are illustrated in the description of changes in bottleneck locations in future years described in Section 5.4.

5.1 Identification of US-101 Bottlenecks

5.1.1 Locations of Existing Bottlenecks

The bottleneck analysis for the US-101 CSMP used a variety of data sources from the three-year period 2006 to 2009. Because of the significant reduction in traffic volumes and congestion caused by the economic recession of 2008, only the locations and probable causes of bottlenecks were identified.

Through the Highway Congestion Monitoring Program (HICOMP), Caltrans measures congestion occurring on urban area freeways and presents the results in an annual report. The HICOMP report defines recurrent congestion as a condition lasting for 15 minutes or longer where travel demand exceeds freeway capacity and vehicular speeds are 35 miles per hour (mph) or less during peak commute periods on a typical incident-free weekday. The HICOMP report is the most reliable source of information about bottlenecks for the corridor for the period representing "existing" conditions. It provided information for all parts of the corridor in both counties for 2006 and 2007, when the congestion in the corridor was at its peak and before the economic recession. Other data sources were used to verify the bottleneck points, help identify the cause of the congestion, and calibrate the baseline simulation model.

Additional information on bottleneck points was provided in special data-collection efforts that support projects in Santa Barbara County. These projects included the addition of a mixed-flow lane northbound between S. Salinas Street and Milpas Avenue and an auxiliary lane between the E. Cabrillo Boulevard and S. Salinas Street; both projects are already under construction. Special counts and travel time observations were also taken to support the planning and design for the addition of HOV lanes in both directions between Casitas Pass Road and Hot Springs Road. This additional travel time information was collected using tachometer runs with a floating car taking the measurements. In Ventura County, data on speed were available from an automated speed monitoring system funded and operated by VCTC that records data for travel-time estimates shown on dynamic message signs on US-101. Nine days of data from January 2009 were captured from the system and analyzed. In addition, floating-car tachometer travel-time data were collected by Caltrans in 2007. In this type of travel-time data collection times are record and specific locations along the route by data collectors in a vehicle in the traffic stream.

The project team also collected freeway mainline counts and floating-car tachometer travel-time data and videotaped traffic on US-101 at 8 locations in Santa Barbara County and 9 locations in Ventura County where bottlenecks were suspected. The videotaping was conducted in June 2009 and captured a 24-hour period at each location. The videotaping was used to confirm bottleneck locations and to help explain the case of the bottlenecks.

Bottlenecks were substantiated by data from one or more of the data sources described above. Information about the cause of the congestion at these bottleneck points is provided in **Appendix F**. Additional congested locations were identified by project stakeholders. The bottleneck locations and additional congested locations are identified in **Figures 5-1 through 5-4** and summarized in **Tables 5-1, Table 5-2 and 5-3**. These additional congested locations are given consideration in the analysis of future conditions and in the evaluation of improvement scenarios.

Table 5-1 AM US-101 Bottleneck Summary

Number	County	Direction	Bottleneck Causality	Period	Consistent with Observed Data from	Approximate Post Mile
Bottlenecks in Santa Barbara Northbound AM						
City of Santa Barbara Segment						
SA1	SBB	NB	Weaving Btw Mission St/Las Positas Rd	AM	HICOMP 06 and 07, Caltrans 06	16.0
SA2	SBB	NB	Weaving between Coast Village Rd/E Cabrillo Blvd/S Salinas St	AM	HICOMP 06 and 07, Probe 4-08, Probe 12-08	12.0
Montecito/Summerland/Carpinteria Segment						
SA3	SBB	NB	Merging @ N. Padaro Ln On-ramp	AM	HICOMP 06 and 07, Probe 4-08, Probe 12-08	7.3
SA4	SBB	NB	Merging @ Via Real and Linden Ave On-ramps	AM	HICOMP 06 and 07, Probe 4-08, Probe 12-08	3.0
CMIA Project Segment						
SA5	SBB	NB	Lane Drop north of SR-150 On-ramp	AM	Probe 4-08	1.2
Bottlenecks in Santa Barbara Southbound AM						
City of Santa Barbara Segment						
SA6	SBB	SB	Diverging @ W Carrillo St Off-ramp	AM	Probe 4-08, Probe 12-08	14.9
Goleta Segment						
SA7	SBB	SB	Diverging @ Fairview Ave Off-ramp	AM	Probe 4-08, Probe 12-08	22.7
Bottlenecks in Ventura Northbound AM						
CMIA Project Segment						
VA1	VEN	NB	Open Access To 3 Communities	AM	Probe 12-08	40.8
Coastal Segment						
VA2	VEN	NB	Lane Drop north of SR-1 On-ramp	AM	Probe 12-08	39.3
Oxnard Segment						
VA3	VEN	NB	Lane Drop between Johnson Dr Off and On-ramps	AM	HICOMP 06 and 07, Probe 12-08	23.7
Bottlenecks in Ventura Southbound AM						
Oxnard Segment						
VA4	VEN	SB	Lane Drop south of Vineyard Ave Off-ramp and Merging @ E Vineyard Ave On-ramp	AM	Probe 12-08	21.8

Note:

Caltrans 06 = Tachometer runs in November 2006
HICOMP 06 and 07 = Highway Congestion Monitoring Program 2006 and 2007
Probe 4-08 = Tachometer runs in April 2008
Probe 12-08 = Tachometer runs in December 2008
Speed Sensor 09 = Speed detectors in Ventura County from January 2009

Table 5-2 PM US-101 Bottleneck Summary

Number	County	Direction	Bottleneck Causality	Period	Consistent with Observed Data from	Approximate Post Mile
Bottlenecks in Santa Barbara Northbound PM						
City of Santa Barbara Segment						
SP1	SBB	NB	Weaving Btw Mission St/Las Positas Rd	PM	HICOMP 06 and 07, Probe 08, Probe 09, Caltrans 06	16.0
SP2	SBB	NB	Weaving between Coast Village Rd/S Salinas St	PM	HICOMP 06, Caltrans 06	12.0
Bottlenecks in Santa Barbara Southbound PM						
CMIA Project Segment						
SP3	SBB	SB	Weaving Btw Casitas Pass Rd/Bailard Ave	PM	HICOMP 06	2.0
Montecito/Summerland/Carpinteria Segment						
SP4	SBB	SB	Merging @ Olive Mill Rd On-ramp	PM	HICOMP 06 and 07, Probe 4-08, Probe 12-08	10.3
City of Santa Barbara Segment						
SP5	SBB	SB	Weaving Btw Garden St/Milpas St	PM	HICOMP 06 and 07, Probe 4-08, Probe 12-08, Caltrans 06	12.9
SP6	SBB	SB	Weaving Btw San Marcos Pass Rd/La Cumbre Rd	PM	HICOMP 06 and 07, Probe 4-08, Probe 12-08	18.0
Goleta Segment						
SP7	SBB	SB	Merging @ SR 217 On-ramps	PM	HICOMP 06	21.2
Bottlenecks in Ventura Northbound PM						
Oxnard Segment						
VP1	VEN	NB	Lane Drop Btw Johnson Dr Off and On-ramps	PM	HICOMP 06 and 07	23.5
VP2	VEN	NB	Merging @ Rose Ave On-ramps	PM	HICOMP 06 and 07, Speed Sensor	21.0
Bottlenecks in Ventura Southbound PM						
Oxnard Segment						
VP3	VEN	SB	Weaving Btw E Vineyard Ave/Rose Ave	PM	Probe 12-08	21.1
VP4	VEN	SB	Merging @ Victoria Ave On-ramps	PM	Speed Sensor 09	24.5
City of Ventura Segment						
VP5	VEN	SB	Diverging @ SR-126 Off-ramp	PM	Probe 12-08	26.7

Note:

Caltrans 06 = Tachometer runs in November 2006
HICOMP 06 and 07 = Highway Congestion Monitoring Program 2006 and 2007
Probe 4-08 = Tachometer runs in April 2008
Probe 12-08 = Tachometer runs in December 2008
Speed Sensor 09 = Speed detectors in Ventura County from January 2009

Table 5-3 US-101 Summary of Other Identified Locations of Congestion

Number	County	Direction	Bottleneck Causality	Period	Source of Information	Approximate Post Mile
Other Locations of Congestion in Santa Barbara Northbound						
CS1	SBB	NB	Off-ramp to North Glen Annie Road and Storke Road	AM & PM	Caltrans District 5	24.3
CS2	SBB	SBB	Lane Drop at Fairview Avenue	AM & PM	Caltrans District 5	22.4
CS3	SBB	SBB	North of Las Positas Road	PM	Caltrans District 5	17.0
CS4	SBB	SBB	Weaving between San Ysidro Road On-ramp and Olive Mill Road Off-ramp	AM	Caltrans District 5	10.3
Other Locations of Congestion in Santa Barbara Southbound						
CS5	SBB	SB	At Sheffield Drive	PM	Caltrans District 5	8.9
CS6	SBB	SB	San Ysidro Road Off-ramp	PM	Caltrans District 5	9.9
CS7	*SBB*	*SB*	Weaving between Mission Street Off-ramp and Carrillo Street Off-ramp	AM	Caltrans District 5	15.5
CS8	*SBB*	*SB*	Weaving between Las Positas Road On-ramp and Mission Street Off-ramp	AM	Caltrans District 5	16.0
Other Locations of Congestion in Ventura Northbound						
CV1	*VEN*	*NB*	On-ramp at SR 126	AM & PM	VCTC and Caltrans District 7	26.4
CV2	*VEN*	*NB*	Victoria Avenue	AM & PM	VCTC	24.6
CV3	*VEN*	*NB*	Vineyard Avenue	AM & PM	VCTC	22.0
CV4	*VEN*	*NB*	Rice Avenue	AM & PM	VCTC	20.0
Other Locations of Congestion in Ventura Southbound						
CV5	*VEN*	*SB*	Rice Avenue	AM & PM	VCTC	20.0
CV6	*VEN*	*SB*	Telephone Avenue	AM & PM	Caltrans District 7	25.9
CV7	*VEN*	*SB*	La Conchita and Mussel Shoals area	PM	VCTC	41.0

Figure 5-1 AM US-101 Bottleneck Summary for Santa Barbara County

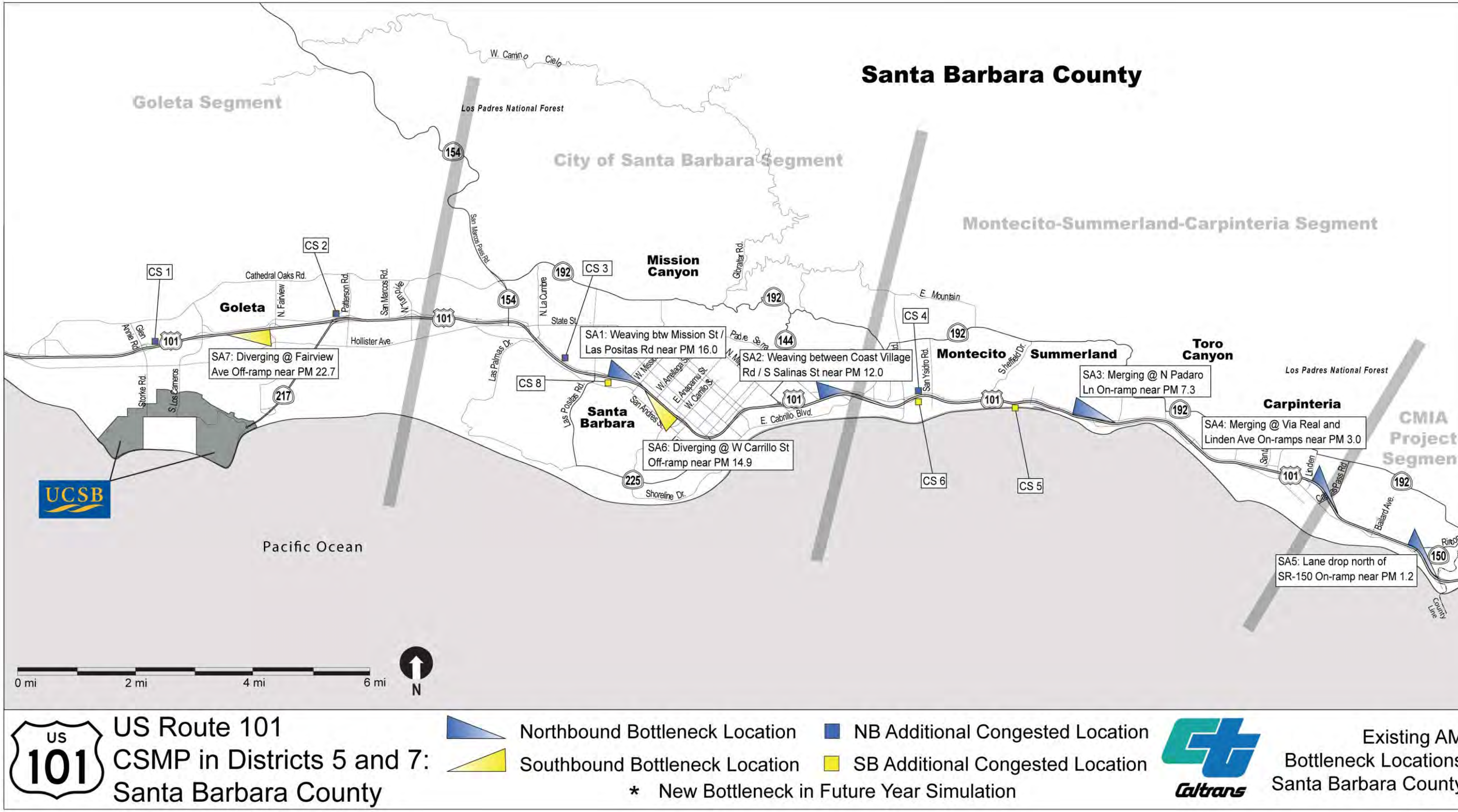


Figure 5-2 AM US-101 Bottleneck Summary for Ventura County

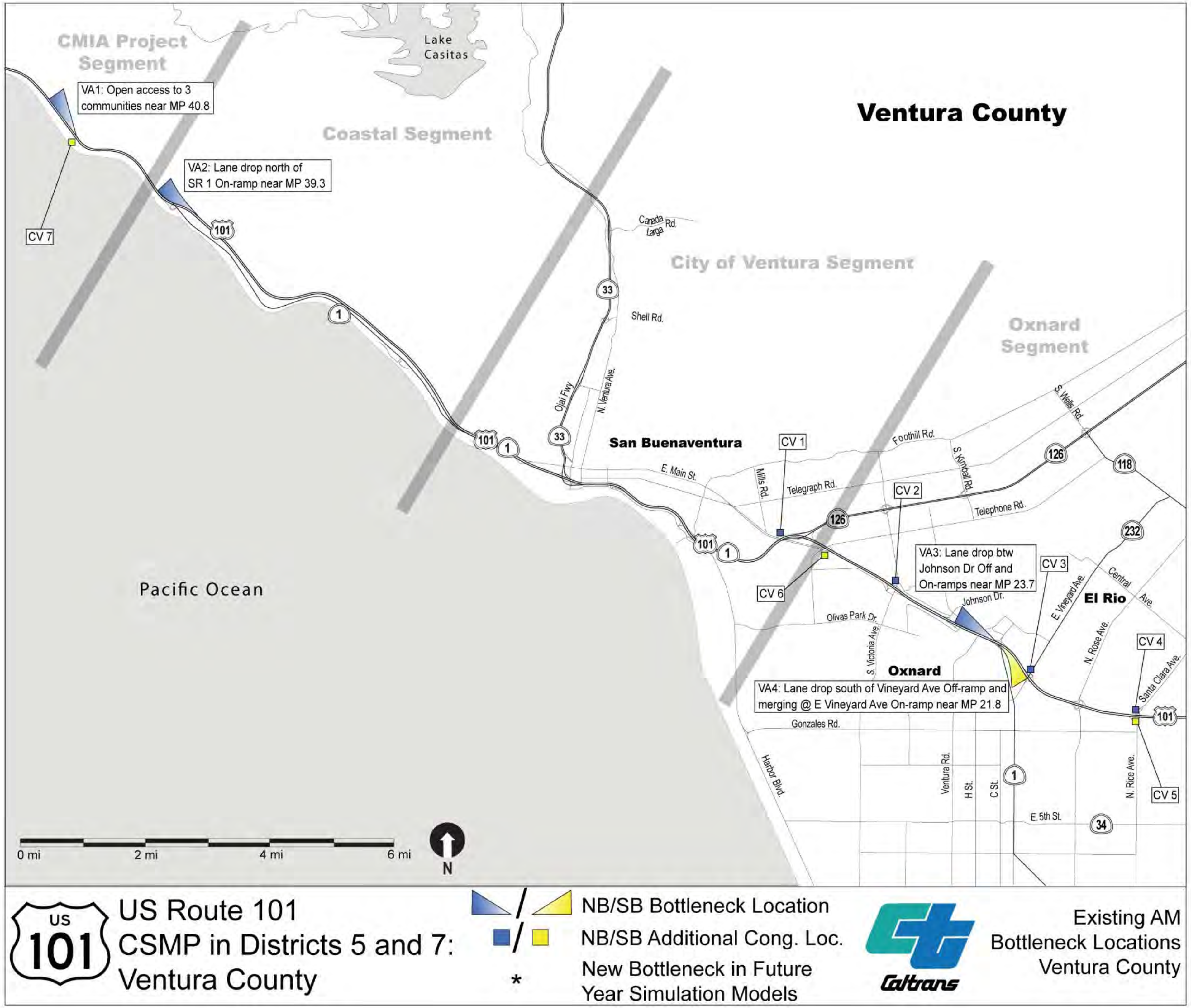


Figure 5-3 PM US-101 Bottleneck Summary for Santa Barbara County

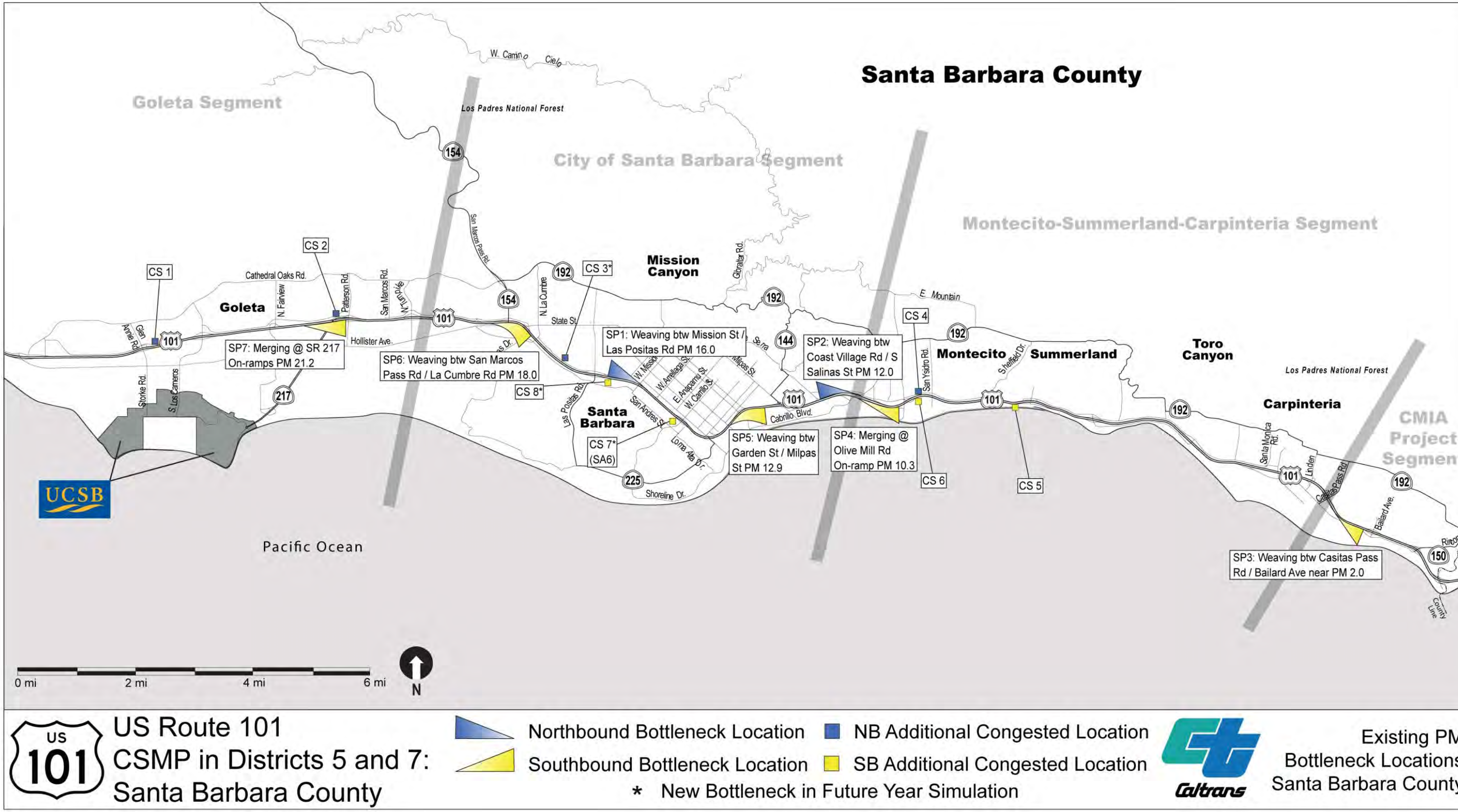
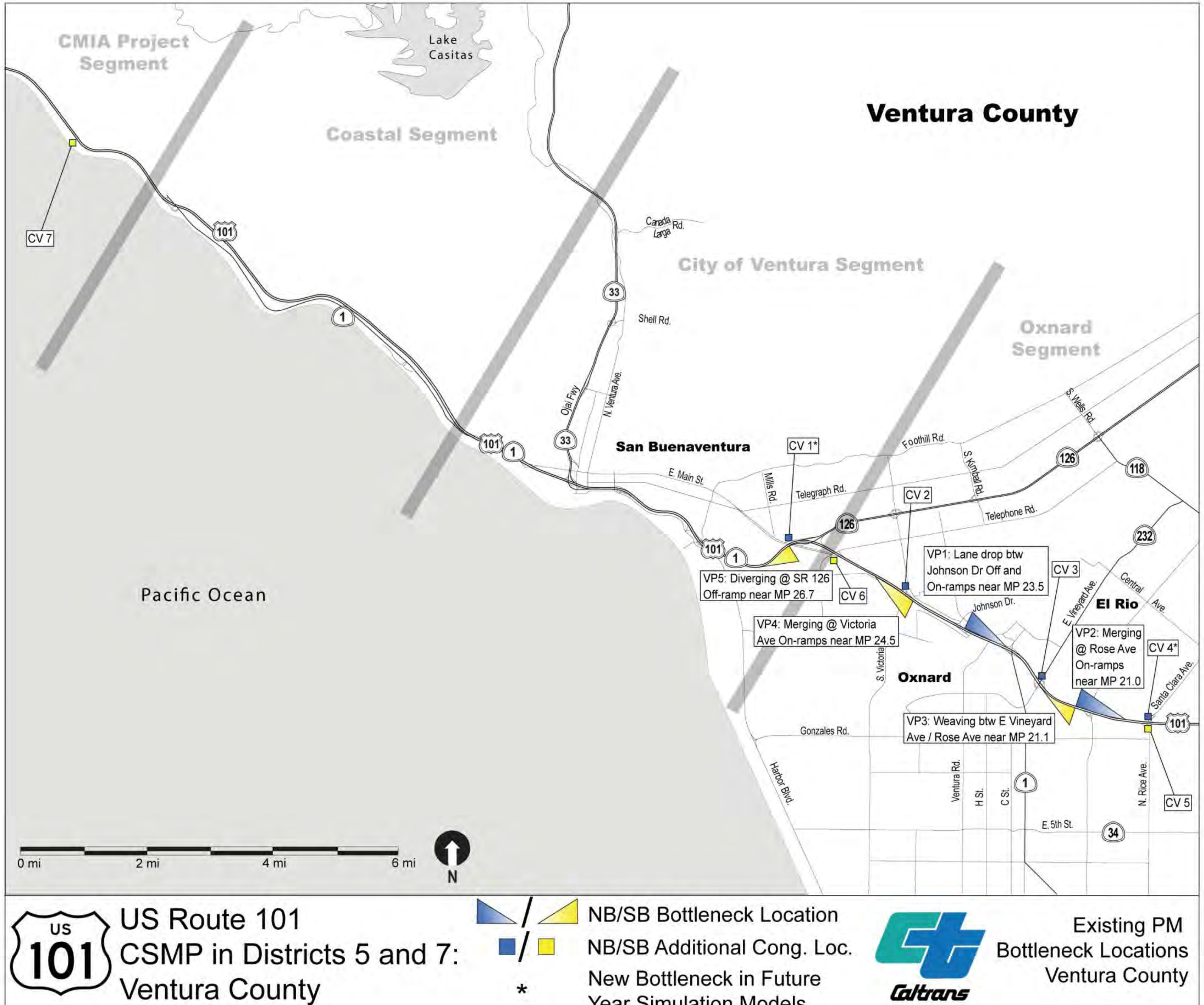


Figure 5-4 PM US-101 Bottleneck Summary for Ventura County



5.2 US-101 Performance

5.2.1 Mobility

Mobility is measured in terms of delay resulting from congestion in the system. Delay is calculated as the difference in travel time between congested conditions and free-flow conditions. In Santa Barbara County, US-101 corridor congestion accounts for about 13.6 percent of the AM peak period travel time and about 19.2 percent of the PM peak period travel time for an average of about 16.4 percent of all travel time lost to congestion. In Ventura County, 16.5 percent of the overall AM peak period travel time and 17.7 percent of the overall AM peak period travel time in the US-101 corridor is estimated to result from congestion for an average of about 17.1 percent of all travel time lost to congestion.

Table 5-4 US-101 Peak Period Delay as a Percentage of Travel Time (2008)

Facility Group	Delay as a Percentage of Total Travel Time	
	AM Peak Period	**PM Peak Period**
Santa Barbara County		
Northbound	15.6%	15.4%
Southbound	10.9%	22.2%
Total*	**13.6%**	**19.2%**
Ventura County		
Northbound	16.3%	19.2%
Southbound	16.7%	16.4%
Total*	**16.5%**	**17.7%**

* Note: totals are the volume-weighted average of the two time periods

5.2.2 Safety

Knowing the number, frequency, and location of traffic collisions is a key to developing an effective CSMP because traffic collisions are a primary cause of non-recurrent congestion and lack of reliability in travel time. Recurrent congestion is also a primary cause of collisions in the US-101 corridor. In this section on safety, the locations of traffic collisions are presented along with statistics on collision frequency, severity, and incident type.

Safety performance generally measures the number of collisions or collision rates computed from the Caltrans Traffic Accident Surveillance and Analysis System (TASAS). Average US-101 freeway collision rates for "Fatalities," "Fatalities and Injuries," and "Total" (which also includes "Property Damage Only" collisions) are shown in **Table 5-5** for the period from July 2006 through June 2009.

Table 5-5 US-101 Collision Data (July 2006 – June 2009) by Segment

Segment Name	Post Mile Limits	Number of Collisions	Actual Collision Rates			Statewide Average Rates		
			Fatalities	Fatalities & Injuries	Total	Fatalities	Fatalities & Injuries	Total
Goleta *(Southbound)*	SB-PM 27.1 to SB-PM 19.9	**188**	0.011	0.22	**0.69**	0.008	0.24	**0.73**
Goleta *(Northbound)*		**231**	0.011	0.24	**0.85**	0.008	0.24	**0.73**
City of Santa Barbara *(Southbound)*	SB-PM 19.9 to SB-PM 11.2	**774**	0.005	0.40	**1.42**	0.011	0.35	**1.09**
City of Santa Barbara *(Northbound)*		**511**	0.005	0.29	**0.94**	0.011	0.35	**1.09**
Montecito/Summerland Carpinteria *(Southbound)*	SB-PM 11.2 to SB-PM 2.5	**298**	0.000	0.27	**0.81**	0.009	0.26	**0.78**
Montecito/Summerland Carpinteria *((Northbound)*		**507**	0.003	0.41	**1.37**	0.009	0.26	**0.78**
CMIA Project to Santa Barbara County Line *(Southbound)*	SB-PM 2.5 to VEN-PM 43.4	**55**	0.012	0.20	**0.64**	0.008	0.22	**0.68**
CMIA Project to Santa Barbara County Line *(Northbound)*		**72**	0.000	0.31	**0.84**	0.008	0.22	**0.68**
CMIA Project Segment *(Southbound)*	VEN-PM 43.4 to VEN-PM 40.9	**42**	0.006	0.16	**0.41**	0.020	0.35	**0.82**
CMIA Project Segment *(Northbound)*		**32**						
Coastal Segment *(Southbound)*	VEN-M 40.9 to VEN-PM 32.6	**148**	0.003	0.15	**0.43**	0.007	0.18	**0.51**
Coastal Segment *(Northbound)*		**108**						
City of Ventura Segment *(Southbound)*	VEN-PM 32.6 to VEN-PM 25.9	**256**	0.007	0.23	**0.70**	0.010	0.30	**0.96**
City of Ventura Segment *(Northbound)*		**286**						
City of Oxnard Segment *(Southbound)*	VEN-PM 25.9 to VEN-PM 20.0	**455**	0.001	0.29	**1.02**	0.011	0.35	**1.13**
City of Oxnard Segment *(Northbound)*		**514**						

US-101 collision rates for the Santa Barbara portion of the CSMP corridor were generally higher than the statewide average for facilities of the same type. All four of the segments had total overall collision rates higher than average rates, although for three segments one direction was lower than the statewide average. The highest overall collision rates were southbound in the City of Santa Barbara Segment and northbound in the Montecito/Summerland/Carpinteria Segment. These two segments also had the highest combined rates of fatalities and injuries. In the Ventura County portion of the corridor, the overall collision rates were lower than the state-wide averages for facilities of the same type for all categories of collisions and in all four of the corridor segments. The City of

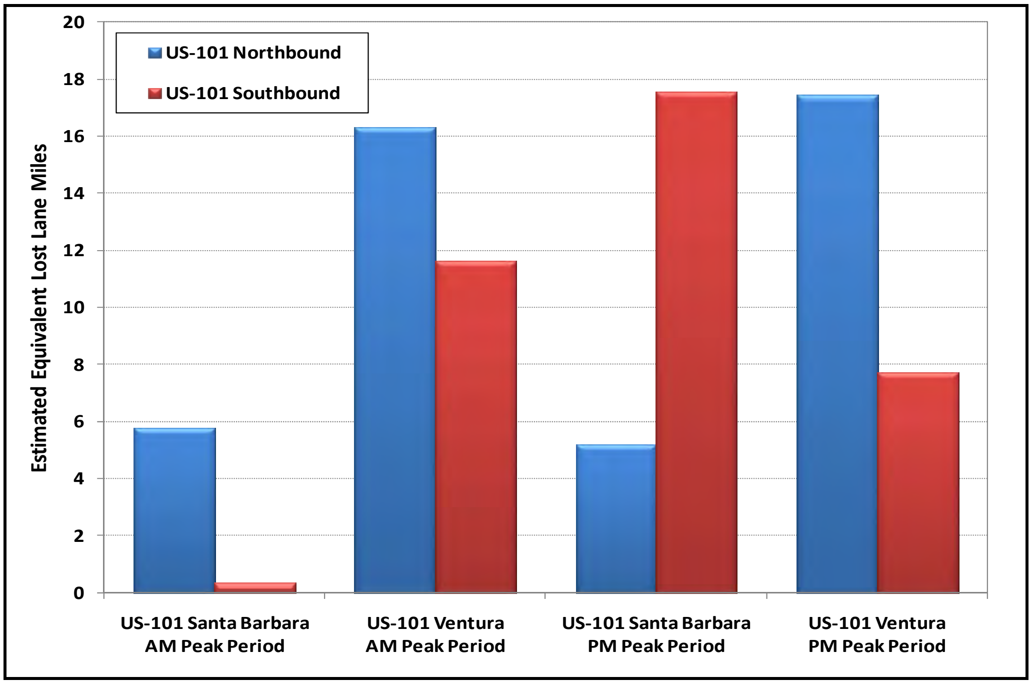
Oxnard Segment had the highest overall collision rate and the highest combined rate of fatalities and injuries.

5.2.3 Productivity

Productivity is a system efficiency measure. Productivity is generally defined as the ratio of output (or service) per unit of input. For corridor analysis, productivity is defined as the percent utilization of a facility or mode under peak conditions. The highway productivity performance measure is calculated as actual volume divided by the capacity of the highway. For highways, productivity is particularly important because where the need for capacity is greatest; we often get the lowest "production" from the transportation system. On some corridors throughput can decline as much as 50 percent during peak periods, and congested urban corridors typically lose 25 percent of their capacity during rush hour.[13]

As traffic flow increases to the capacity limits of a roadway, speeds often decline rapidly at merge/weave locations (e.g., at on-ramps) and throughput drops dramatically. This loss in throughput is the lost productivity of the system. For reporting purposes, this lost productivity is converted into "equivalent lost lane-miles." These lost lane-miles represent a theoretical level of capacity that must be added in order to achieve maximum productivity. **Figure 5-5** shows the US-101 productivity losses in "Lost Lane Miles" estimated using the Ventura and Santa Barbara (existing conditions) CSMP simulation model. In Ventura County, US-101 northbound suffers significantly more productivity losses than US-101 southbound in both AM and PM peak periods. In Santa Barbara County, the majority of lost lane miles occur in the southbound direction in the PM peak period.

Figure 5-5 Equivalent Lost Lane Miles



Note: Productivity loss is measured only for speeds below 35 miles per hour.

[13] Caltrans, *Corridor System Management Plans (CSMPs) Guidelines for Completing CSMP Milestones* (Page A-6).

5.2.4 Pavement Condition

The condition of the roadway pavement (or ride quality) can influence traffic performance. Poor or rough pavement conditions can decrease the mobility, reliability, safety, and productivity of the corridor, while smooth pavement can have the opposite effect. It is possible for a roadway section to have structural distress without affecting ride quality. Likewise, a roadway section may exhibit poor ride quality, while the pavement remains structurally adequate. The distress type is defined as Major, Minor, and Poor Ride Quality, and these pavement conditions are described as follows:[14]

- **Major Structural Distress** indicates the pavement has severe cracking and may also have a poor ride. This type of distressed pavement is remedied by rehabilitation or reconstruction projects.
- **Minor Structural Distress** indicates the pavement has moderate cracking and may have a poor ride. This type of distressed pavement is remedied by Capital Preventive Maintenance (CAPM) or rehabilitation projects.
- **Poor Ride Quality (Only)** indicates the pavement exhibits few cracks but has a poor ride condition.

Pavement roughness is generally defined as an expression of irregularities in the pavement surface that adversely affect the ride quality of a vehicle (and thus the user). Roughness is an important pavement characteristic because it affects not only ride quality but also vehicle delay costs, fuel consumption, and maintenance costs. The International Roughness Index (IRI) is one of the most prevalent measures used to quantify pavement roughness or present pavement serviceability.

Caltrans has proposed various projects to address the condition on US-101 within the corridor. Areas of major distress could be remedied by rehabilitation or reconstruction, while minor distress could be remedied by asphalt concrete overlays and/or rehabilitation. Projects addressing these deficiencies would be programmed under the Pavement Preservation Program through the State Highway Operation and Protection Program (SHOPP). Preventive maintenance strategies are also routinely used to extend the service life of pavement that is still in a state of good repair. These strategies typically include the placement of seal coats such as slurry seals, chip seals, and open grade friction courses but there are other strategies. Maintenance State Forces also performs routine maintenance activities such as digouts, grader blankets, and crack sealing. Together these activities make up the coordinated effort implemented by Caltrans to keep the system pavement in good repair.

Efforts by maintenance staff and small construction contracts has regularly addressed the worst situations by filling or overlaying damaged Portland concrete slabs with asphalt concrete. These are viewed as temporary solutions meant to hold the pavement together until a full rehabilitation project can be programmed.

[14] "*2007 State of the Pavement*" State of California, Department of Transportation, Division of Maintenance (August 8, 2008). Page 4

Pavement Condition within Ventura County

Pavement type in the Ventura County portion of the corridor is mostly rigid with asphalt concrete overlay in some sections. The latest pavement condition survey was done in 2006, reported in 2007 and the results are shown in **Table 5-6** . Pavement in the Ventura portion of the US-101 CSMP corridor is mostly in distress condition and/or of poor ride quality.

Table 5-6 Characteristics of Pavement Condition in Ventura Portion of the Corridor

Distress Type	Lane-Miles	Percent of Total Lane Miles
Major Structural Distress	33	26.4%
Minor Structural Distress	12	9.6%
Poor Ride Quality Only	39	31.2%

Total Project Lane-miles was approximately 125 miles.
Total Distress Lane-miles was 84 miles

District 7 has proposed various projects to improve the condition on US-101 within the corridor. Project EA 00343, the reconstruction of the Rice Avenue interchange, is already under construction and will include pavement rehabilitation between Post Mile 19.4 and Post Mile 20.6. The work is to be completed by early in 2013. Project EA 25180 will provide pavement rehabilitation between Post Mile 12.6 and Post Mile 37.0 at an expected cost of $68 million. It is already in design and construction is scheduled to begin in the spring of 2011. Project EA 4y0601 between Post Mile 21 and Post Mile 29 is a highway maintenance project slated for funding in 2010/2011. Project EA 4Y6301 from Post Mile 4.1 to Post Mile 24 will also be completed at a cost of $0.6 million. Project EA 25190 will provide pavement rehabilitation in the same area as the CMIA HOV lane project EA 26070 and will cover from Post Mile 39.9 to Post Mile 43.6. Construction and pavement rehabilitation is to be completed by 2015. Project EA 17480 is a drainage project that will occur just before the CMIA project between Post Mile 41.9 and Post Mile 42.1 at a cost of roughly $2.43 million.

District 7 maintenance staff has regularly addressed the worst situations by filling or overlaying damaged Portland concrete slabs with asphalt concrete. In addition, Director's Order projects have been approved recently to address similar situations. These are viewed as temporary solutions meant to hold the pavement together until a full rehabilitation project can be programmed.

Pavement Condition within Santa Barbara County

Similar to Ventura County, pavement type in the Santa Barbara County portion of the corridor is mostly rigid with asphalt concrete overlay in some sections. The latest pavement condition survey was done in 2006 with the results shown in **Table 5-7**. Approximately 41 percent of pavement in the Santa Barbara portion of the US-101 CSMP corridor is in a distress condition and/or of poor ride quality.

Table 5-7 Characteristics of Pavement Condition in Santa Barbara County Portion of the Corridor

Distress Type	Lane-Miles	Percent of Total Lane Miles
Major Structural Distress	30	22.5 %
Minor Structural Distress	12	9.0 %
Poor Ride Quality Only	13	9.0 %

Total Project Lane-miles was approximately 133 miles.
Total Distress Lane-miles was 55 miles

5.3 Arterial Performance

5.3.1 Level of Service

Performance of arterial streets is generally a function of how well intercessions along the arterial operate, and the Level of Service (LOS) for an intersection is described in terms of delay per vehicle. The LOS criteria for signalized intersections is shown in **Table 5-8**. The 2007 Traffic Trends Report for Santa Barbara County illustrates PM peak hour LOS at Congestion Management Program (CMP) network intersections in Goleta, Santa Barbara, and Carpinteria areas.[15] The information is illustrated in **Figure 5-6**. The figures present peak hour LOS with some intersections near US-101 generally at LOS C or D, except for one intersection SB on/off ramps and Mission Street operating at LOS E or F.

The 2009 Ventura County CMP, adopted on July 10, 2009, lists LOS for intersections included in the CMP monitoring during AM and PM peak periods. **Figure 5-9** indicates that all intersections near US-101 are currently meeting the agency adopted LOS E" minimum standard. All are operating at LOS D or better.

Table 5-8 LOS Criteria for Signalized Intersections

Level of Service	Stopped Delay per Vehicle (sec)
A	≤ 10.0
B	10.1 to 20.0
C	20.1 to 35.0
D	35.1 to 55.0
E	55.1 to 80.0
F	>80.0

Source: Highway Capacity Manual, Special Report 209, TRB, Washington, DC (2000).

[15] SBCAG uses the Intersection Capacity Utilization (ICU) method for calculation of intersection level of service.

Figure 5-6 Intersection LOS-Santa Barbara County

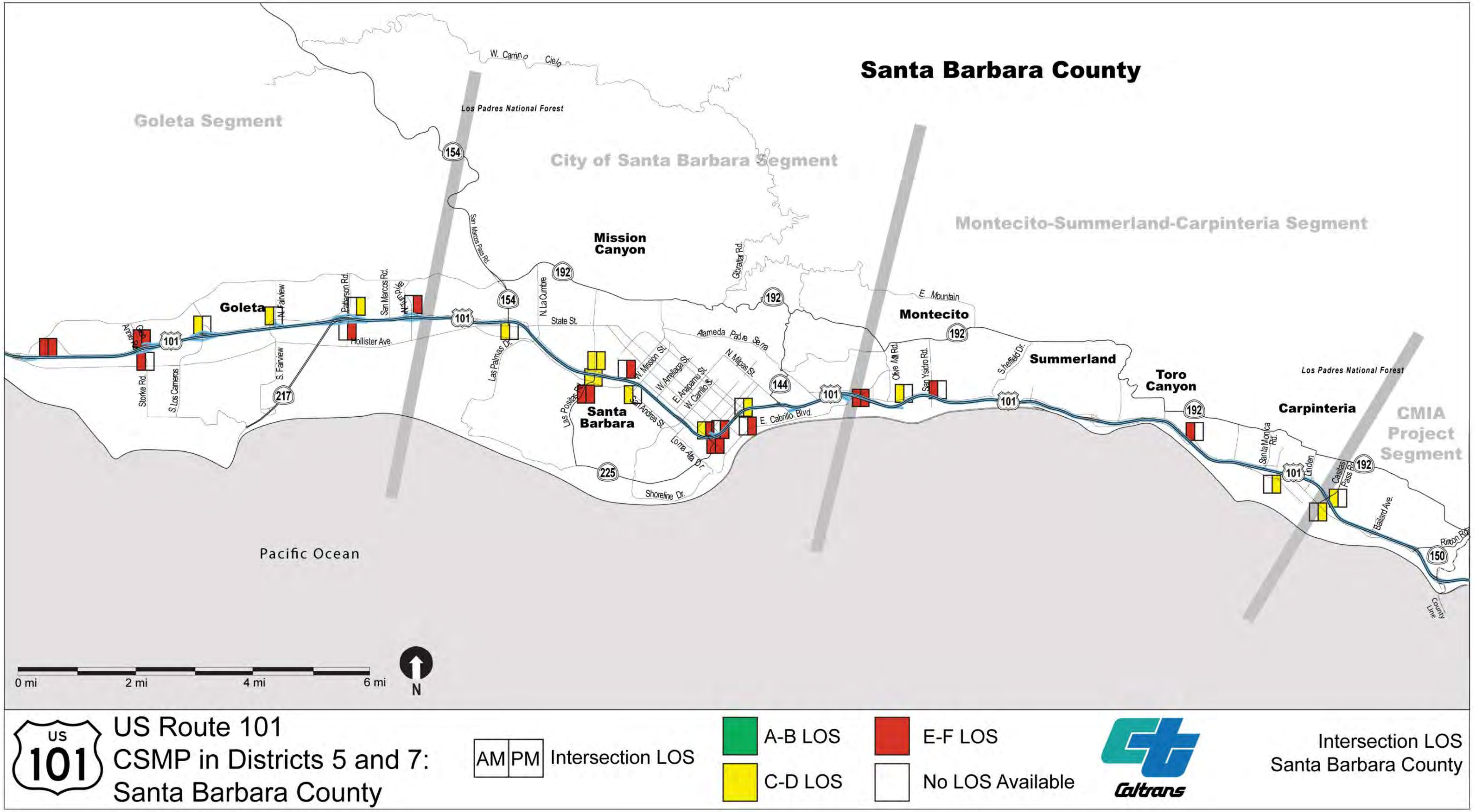
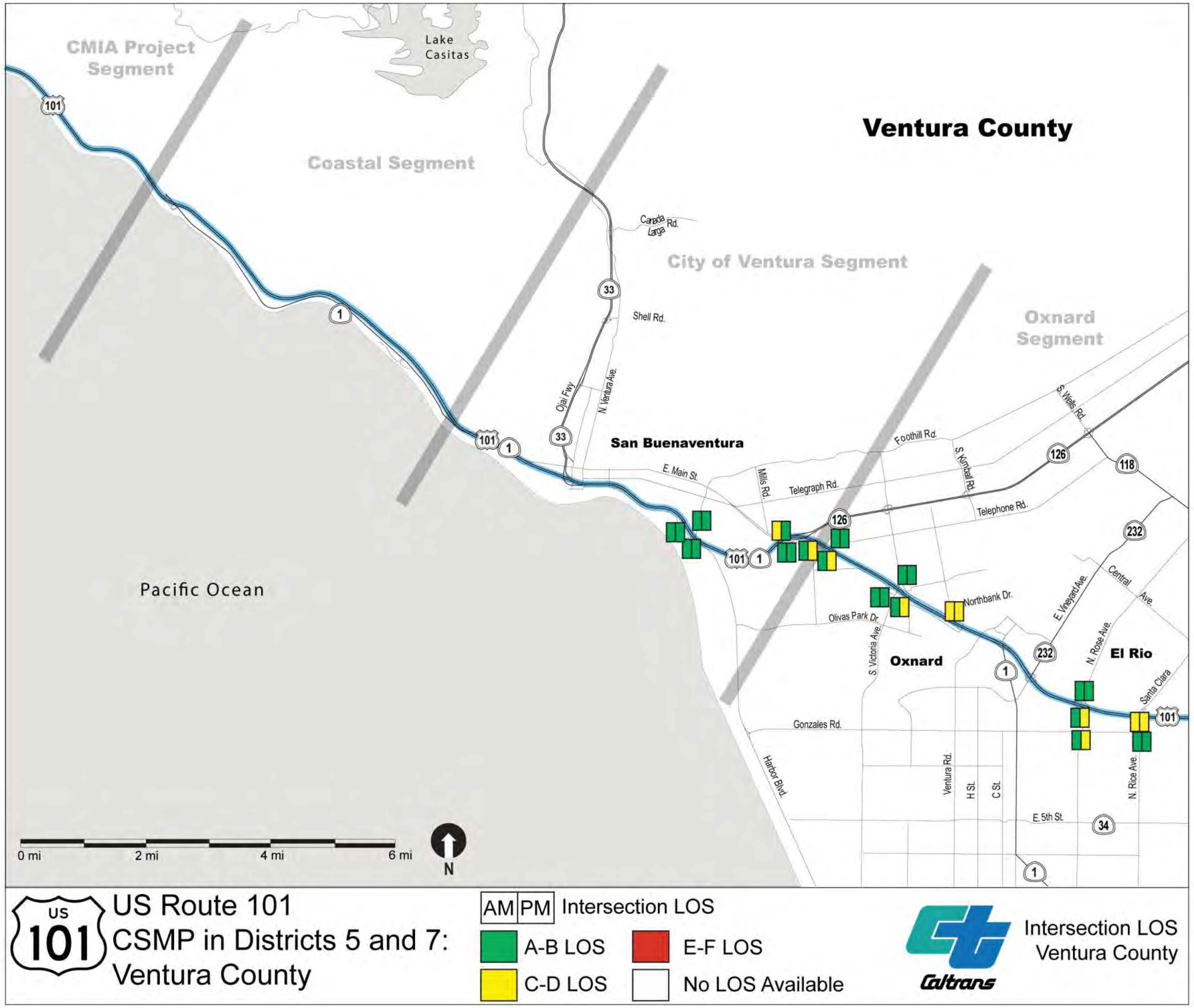


Figure 5-7 Intersection LOS-Ventura County



5.4 Forecast Conditions for the US-101 Corridor

The project team produced future-year baseline forecasts for the "Year of CMIA Project Opening" (2013) and for "Ten Years after Opening" (2023). These forecasts for the future years assume that all projects that have funding and are expected to be completed by those dates will be completed and are reflected in the model networks. These projects are identified in **Appendix D**. These forecasts were initially identified as 2015 and 2025, but because the calibration data reflect a temporary drop in volumes due to the recession, the conditions in the forecasts are likely to occur earlier. The forecasts also reflect some adjustments by DKS to produce simulation models for the forecast years that can be accommodated by the network without a complete operational breakdown of the network. These adjustments were made by moving some of the volume for select origin-destination pairs out of the peak period. As a result of these adjustments, the forecasts are also likely to be representative of an earlier year than originally intended and so the forecast years of 2013 and 2023 were used. A summary of the final number of trips in the models and the percentage changes from the calibration year are shown in **Table 4-1**. The table illustrates the significant growth in traffic volumes that is reflected in the future year models.

5.4.1 Analysis of Bottlenecks and Locations of Congestion in Forecast Years

The effects of the forecast growth on bottlenecks were assessed from the simulation model results. Existing bottleneck locations as well as a summary of the expected changes in bottlenecks by county, time period, and direction are provided below.

Santa Barbara AM Northbound

The predominant flow of traffic in the northbound direction in the AM peak is to jobs in or near downtown Santa Barbara, Goleta and UC Santa Barbara, which result in existing bottlenecks south of the downtown Santa Barbara area. There are currently five northbound bottleneck points in Santa Barbara in the AM peak and four (SA2-SA5) of them are south of downtown Santa Barbara:

- SA 1 – Between the Mission Street on-ramp and Las Positas off-ramp
- SA 2 – Between the Coast Village Road on-ramp and the S. Salinas Street off-ramp
- SA 3 – Near the N. Padaro Lane on-ramp
- SA 4 – Near the Via Real and Linden Avenue on-ramps
- SA 5 – Near the SR-150 (Rincon Road) on-ramp

The Milpas to Hot Springs project began in 2009 will add a mixed-flow lane northbound between S. Salinas Street and Milpas Avenue and an auxiliary lane between the E. Cabrillo Boulevard and S. Salinas Street before the "Year of CMIA Project Opening (2013)." The CMIA project will also add an HOV lane from Mobil Pier Road in Ventura County to Casitas Pass Road in Santa Barbara County and close the at-grade crossings in that section. There will also be interchange reconstruction at Linden Avenue and Casitas Pass Road and Via Real will be extended to provide a connection between Linden Avenue and Bailard Avenue. The effect of the improvements will be to almost completely eliminate the first three bottlenecks listed above, but a single bottleneck will remain at the Linden Avenue interchange that will also engulf the bottleneck near SR-150 (Rincon Road). An additional major improvement made prior to the "Ten Years after Opening (2023)" will include the addition of an HOV lane between Casitas Pass Road and Hot Springs Road. This improvement will almost completely eliminate the bottleneck point south of E. Cabrillo Boulevard (SA 3-5) but the bottleneck just south of S. Salinas Street will re-emerge and a major new bottleneck will emerge at the weaving area between Mission Street on-ramp and Las Positas off-ramp.

Santa Barbara AM Southbound

The predominant flow of traffic in the southbound direction in the AM peak is to jobs in or near downtown Santa Barbara and so the existing bottlenecks are north of the downtown. There are currently two southbound bottleneck points in Santa Barbara in the AM peak period and both are north of downtown Santa Barbara:

- SA 6 – At the W. Carrillo Street off-ramp
- SA 7 – At the Fairview Avenue off-ramp

No improvements are programmed in the segment where the bottlenecks currently exist and so the growth in traffic will increase the congestion at these two bottleneck points in the two future forecast years. Improvements are programmed south of downtown Santa Barbara, but they will not address the existing southbound bottlenecks in the AM period. These improvements are described in the discussion of southbound PM peak bottlenecks.

Santa Barbara PM Northbound

The existing bottleneck locations are at the following locations:

- SP1 – Between the Mission Street on-ramp and Las Positas off-ramp
- SP2 – Between the Coast Village Road on-ramp and the S. Salinas Street off-ramp

The proposed South Coast 101 HOV project improvements, when constructed will eliminate existing bottleneck points within the project limits. Bottleneck SP1 is likely to be the most significant source of congestion on US-101 in Santa Barbara in the "10 Years after Opening" forecast year. Improvements are programmed south of downtown Santa Barbara, but they will not address the existing northbound bottleneck in the PM period. These improvements were described in the discussion of northbound AM peak bottlenecks.

Santa Barbara PM Southbound

The predominant flow of traffic in the southbound direction in the PM peak is from jobs in or near downtown Santa Barbara and so the bottleneck points are mostly south of the downtown, although there is also a significant bottleneck at the SR-217 northbound on-ramp to US-101 southbound due to traffic primarily generated from UC Santa Barbara. The bottlenecks that have been identified are as follows:

- SP3 – Between Casitas Pass Road and Bailard Avenue
- SP4 – Olive Mill Road on-ramp
- SP5 – Garden Street on-ramp and Milpas Street off-ramp

- SP6 – San Marcos Pass Road On-ramp and La Cumbre Road off-ramp
- SP7 – SR-217 on-ramp

The 2008Milpas to Hot Springs project will add a mixed-flow lane southbound between Milpas Avenue and the Hot Springs/Cabrillo Interchange one-quarter of a mile past Cabrillo Boulevard before the "Year of CMIA Project Opening." The CMIA project will also add an HOV lane from Casitas Pass Road in Santa Barbara County to Mobil Pier Road in Ventura County and close the at-grade crossings in that section. There will also be interchange reconstruction at Linden Avenue and Casitas Pass Road, and Via Real will be extended to provide a connection between Linden Avenue and Bailard Avenue. The effect of the improvements will be to reduce the bottlenecks from Milpas Street south when built, but increases in travel demand will result in re-emergences of all but possibly the one between Casitas Pass Road and Bailard Avenue. Because of the forecasted demand increases, the congestion at the weaving area between the Las Positas Road on-ramp and the Mission Street off-ramp will become more pronounced in the "Ten Years after Opening" because there is no additional improvement project in the area north of downtown Santa Barbara. This bottleneck may actually meter the flow downstream somewhat as a result. It should be noted that this segment of US-101 carries the highest volume of daily traffic in Santa Barbara County. An additional major improvement made prior to the "Ten Years after Opening" will include the addition of an HOV lane between Hot Springs Road and Casitas Pass Road.

Ventura AM Northbound

The predominant flow of traffic in the northbound direction in the AM peak is from Ventura County to jobs in the City of Ventura and jobs in and near downtown Santa Barbara. The bottlenecks that have been identified are as follows:

- VA1 – At-grade crossing between Mobil Pier Road and the Santa Barbara County Line
- VA2 – Lane drop north of the SR-1 (Pacific Coast Highway)
- VA 3 – Lane drop near Johnson Drive

Only three improvements are programmed in Ventura County on US-101 in the forecast time frame of the CSMP: the CMIA project, which will add an HOV lane in each direction from Mobil Pier Road in Ventura County to Casitas Pass Road in Santa Barbara County and close the at-grade crossings in that section; reconfiguration of the Rice Avenue/Santa Clara Avenue interchange with US-101; and reconfiguration of the northbound California Street Off-ramp. The CMIA project will eliminate the first two bottlenecks listed above (VA1 and VA 2) but will not affect the third bottleneck (VA3). The congestion at the bottleneck at Johnson Drive will increase as growth produces more traffic in the two forecast years.

Ventura AM Southbound

The predominant flow of traffic in the southbound direction in the AM peak is to jobs in Ventura, Oxnard, Camarillo, Thousand Oaks and Los Angeles County. Only one bottleneck currently exists in the southbound direction in the AM period:

- VA4 Vineyard Avenue ramps

None of the programmed projects in Ventura County will address this bottleneck (a lane drop south of the Vineyard Avenue off-ramp and merging at the East Vineyard Avenue on-ramp) and so the congestion at the bottleneck is expected to increase in both of the forecast years.

Ventura PM Northbound

The predominant flow of traffic in the northbound direction in the PM peak is from jobs in Ventura, Oxnard, Camarillo, Thousand Oaks and Los Angeles County. Two bottlenecks are listed as follows.

- VP1 – Between the Johnson Drive off-ramp and on-ramp
- VP2 – At the Rose Avenue on-ramp

None of the programmed projects in Ventura County will address these bottlenecks and so the congestion at the bottlenecks is expected to increase in both of the forecast years. A third bottleneck location is also likely to emerge at the SR-126 interchange in the "10 Years after Opening" forecast year. The bottleneck at the Rose Avenue on-ramp (VP1) is likely to meter the northbound flow and, as a result, the congestion at the two downstream bottlenecks will be moderate. If the bottleneck at Rose Avenue is addressed with a capacity expansion, some increase in congestion would be expected at one or both of the downstream bottlenecks.

Ventura PM Southbound

The predominant flow of traffic in the southbound direction in the PM peak is from jobs in Santa Barbara County and in Ventura. This represents the heaviest period and direction of congestion in Ventura County. There are three bottleneck locations southbound in the PM period.

- VP3 – Between Vineyard Avenue and Rose Avenue
- VP4 – At the Victoria Avenue on-ramps
- VP5 – At the SR-126 off-ramp

None of the programmed projects in Ventura County will address these bottlenecks and so the congestion at the bottlenecks is expected to increase in both of the forecast years. The bottleneck at the SR-126 off-ramp (VP5) is expected to be the worst in the entire US-101 CSMP corridor in the "Ten Years after Opening" forecast year in terms of both total delay and duration. This bottleneck may have the effect of metering flow and, as a result, the congestion at the two downstream bottlenecks will be moderate. If the bottleneck at SR-126 is addressed with a capacity expansion, some increase in congestion would be expected at one or both of the downstream bottlenecks. The bottleneck at SR-126 will also be so severe that it will mask other bottlenecks upstream including one at the Seaward Avenue interchange.

6. EVALUATION OF CORRIDOR MANAGEMENT STRATEGIES

6.1 Improvement Options Considered

The US-101 Corridor is a multimodal corridor that serves the needs of many different trip types for people with a wide variety of mobility requirements and options. Chapter 5 described performance degradation for the future forecast years 2013 and 2023 (forecast years were based on 2008 baseline conditions). The project team considered a number of solution options and chose to evaluate four scenarios. These scenarios with their individual elements and solution options are as follows:

Transit and TDM Enhancement to Reduce Vehicle Trips

- Enhanced Commuter-Friendly Passenger Rail Service – if feasible, this would include revisions of the existing Amtrak passenger rail schedules to shift two trips into the AM peak period from Ventura County to Santa Barbara County and two trips into the PM peak period from Santa Barbara County to Ventura County.
- Expanded Express Bus and Local Bus Service - (beyond what is assumed in the baseline) – if feasible, this would include a tripling of Coastal Express service using the SBCAG model An increase of local bus service to commuter-oriented rail and express bus stations and stops.
- Enhanced TDM Program – commuter-oriented ridesharing incentives, individualized marketing, and flexible work schedules for employers in Santa Barbara County, as proposed in *101 In Motion*.

Flow Management to Increase Vehicle Throughput

- Ramp Metering – ramp metering in all locations where there is adequate storage and where metering will be effective.

Minor Physical Capacity Enhancements to Improve Roadway Flow and Throughput

- Auxiliary lanes on US-101 (or other spot widening) – previously identified locations plus new ones identified by the project team based on baseline simulation results.
- Spot Widening on Arterials or Connecting of Arterials – arterial improvements identified previously plus new ones identified by the project team based on baseline simulation results.

Incident Management

- Freeway Service Patrol – an assessment of enhanced Freeway Service Patrol (FSP) using reported results from applications in other parts of California.

The first three scenarios were evaluated using a combination of tools, including the simulation model, to test how each affected the performance of the roadway system. Incident Management, the fourth scenario, was evaluated using only off-model tools and data because the simulation model does not include incidents. Each scenario is described in greater detail later in this chapter along with evaluation results. Although the CSMP did not specifically examine any strategies directed specifically at goods movement, all of the strategies will produce benefits for goods movement by improving corridor travel times and reliability. Additional details of the results from the first three scenarios are available in **Appendix G**, which summarizes measures of effectiveness by segment.

One of the most useful measures of effectiveness is “delay as a percentage of freeway travel time.” **Table 6-1** provides a summary of the results of the three scenarios that were tested with the simulation model as well as the baseline values for 2023. The higher the percentage, the more congested the facility. As an example, the 22.3 percent value for 2023 Baseline for the Northbound AM in Santa Barbara County means that 22.3 percent of the vehicle hours of travel on the freeway are the result of delay. The Transit and TDM scenario for 2023 reduces the percentage to 17.2 percent.

These estimates of delay are based on the simulation modeling for each year. As indicated in Section 5.4, the models for 2013 and 2023 reflect a total travel demand in the system constrained by the ability of the model network to accommodate the trips without gridlock. As a result, the reductions in delay for the scenarios tested in 2023 may not be fully realized if there is latent demand that reemerges. The estimates of delay reduction presented in this chapter should therefore be viewed as optimistic assessments of the potential benefits from the scenarios.

Table 6-1 Effect of Scenarios[16] on Delay as a Percentage of Freeway Travel Time

	AM Peak		PM Peak	
	Northbound	**Southbound**	**Northbound**	**Southbound**
Santa Barbara County				
2023 Baseline	**22.3%**	**12.6%**	**35.1%**	**29.7%**
2023 Transit and TDM	17.2%	12.6%	33.8%	17.2%
2023 Ramp Metering	20.8%	13.6%	31.9%	27.2%
2023 Minor Capacity	18.0%	11.7%	35.4%	21.1%
Ventura County				
2023 Baseline	**17.3%**	**26.0%**	**32.1%**	**48.0%**
2023 Transit and TDM	15.7%	25.0%	32.0%	40.6%
2023 Ramp Metering	16.2%	24.8%	32.4%	48.6%
2023 Minor Capacity	13.6%	12.6%	23.6%	39.9%

[16] This table represents results of the 2023 baseline and three scenarios evaluated using the simulation model.

6.2 Transit and TDM Enhancements to Reduce Vehicle Trips

6.2.1 Rail, Transit and TDM

The CSMP based the Transit and TDM scenario on identified enhancements in commuter-friendly passenger rail service between Santa Barbara County and Ventura County, increases in express bus services, and a variety of employer-based TDM activities designed to reduce vehicle trips for commuters to jobs in Santa Barbara County. These enhancements reflect elements of *101 In Motion* and became the core of the Transit and TDM scenario tested for the CSMP because they benefit commuters between the two counties. The enhancement strategies directed at inter-county commute trips were evaluated for their impact on vehicle trips and the use of US-101.

The Transit and TDM scenario included three recommended strategies: enhanced commuter-friendly rail service, expanded express bus and local bus service, and an enhanced TDM program.

- Commuter-Friendly Rail Service: Current Amtrak service is not convenient for most commuters between the two counties. In this scenario, commute period service was assumed to be the result of a rescheduling of existing Amtrak service to provide better service in the commute periods with no addition of trains or daily round trips. The CSMP analysis tested a rescheduling of existing Amtrak service to provide two adjusted northbound trips in the AM peak commute period and two adjusted southbound trains in the PM peak commute period that would service the existing Amtrak stations located in Goleta, Santa Barbara, Carpinteria, Ventura, and Oxnard. The schedule assumed northbound trains arriving in Santa Barbara at 7:40 AM and 8:45 AM and southbound trains leaving at 4:35 PM and 5:25 PM. The adjusted commute period trips are also assumed to be reflective of Amtrak service currently serving the corridor and not Metrolink-style commuter rail service. Reduced cost and reliable service were combined to estimate that modified Amtrak service would generate a 285 vehicle-trip reduction.
- Expanded Express Bus and Local Bus Service: The impacts and benefits of expanded transit service in future forecast years were estimated using the SBCAG model for local bus service within Santa Barbara County and for express bus service between Ventura County and Santa Barbara County. Frequencies in the model were first updated to reflect 2009 schedules for transit express (VISTA Coastal Express) and local routes for the baseline forecast year model. Then the 2009 express service frequencies were tripled and 2009 local service was doubled for sensitivity to be included in the CSMP US-101 Transit and TDM scenario.

  The SBCAG travel demand model showed that an enhanced express and local bus service could reduce 200 vehicle-trips in the AM peak hour and 200 vehicle-trips in the PM peak hour. Existing vehicle counts show that the AM peak period (6:00 AM to 9:00 AM) is 281 percent of the AM peak hour. Peak hour vehicle trip reductions were calculated based on the existing peak-period to peak hour percentages. This translates into 562 trips in the AM period and 572 trips in the PM period.

The effects of improvements in local bus service in Ventura County were estimated using a baseline forecast of transit trips in the county from the SCAG regional model and service frequency elasticity. **Table 6-2** lists the trip reducing forecasting inputs, assumptions and methodology for Ventura County local transit improvements. The number of vehicle trips reduced on US-101 was estimated based on the percentage of local person trips with Ventura County that use the freeway by direction in the peak period.

Table 6-2 Vehicle Trip Reductions from Ventura County Local Transit Improvements

Ventura County Peak Period Transit Trips[1]	8,419
Ventura County Drive-alone Peak Period Trips[1]	637,141
Local Headway Reduction (Doubling Local Transit Service)	-50%
Out of Vehicle (Wait Time) Elasticity[2]	0.50
Increase in Peak Period Ridership	2,105
Percent of New Transit Riders from Drive-Alones[3]	50%
Drive-alone Peak Period Trip Reductions	1,052
Drive-alone Peak Period Trip Reduction Factor (%)	0.17%
Ventura "Ten Years after Opening" Drive-alone Trips (AM Peak Period)[4]	145,872
Ventura "Ten Years after Opening" Drive-alone Trips (PM Peak Period)[4]	174,941
AM Peak Period Drive-alone Vehicle Trip Reductions	241
PM Peak Period Drive-alone Vehicle Trip Reductions	289

1) Source: SCAG Travel Demand Model, CHAPTER 6 – MODE CHOICE, Table 6-6
2) Source: http://www.vtpi.org/tranelas.pdf (page 10)
3) Source: http://www.ecy.wa.gov/climatechange/2008CATdocs/091808_cat_tran_ghg_analysis.pdf
4) Source: DKS Associates, 2010
5) Factors for freeway use and direction based on simulation model trip patterns

- Enhanced TDM Program: The enhanced TDM program only applies to Santa Barbara County. The elements of the enhanced TDM program are derived from *101 In Motion* and include ridesharing incentives, individualized marketing and flexible work schedules.
    - Ridesharing incentives reduce trips by offering financial incentives to carpoolers and vanpoolers. This strategy would reduce 185 peak hour vehicle trips entering the major generators in the AM and 185 peak hour vehicle trips exiting in the PM. As described in the Local and Express Bus section; peak period vehicle trip reductions were calculated based on the existing peak-period to peak-hour percentages. This translates into 520 trips in the AM period and 529 trips in the PM period.
    - Individualized marketing reduces trips by working with individual commuters to understand current travel behavior and to develop personalized advice on how to use alternative modes, make better chain trips, change timing of trips to avoid congested periods, etc. This strategy

also reduces trips by targeted marketing campaigns to build or increase ridership on specific transit improvements. This strategy would reduce 150 peak hour vehicle trips entering the employment areas in the AM and 150 peak hour vehicle trips exiting in the PM. Using the peak hour to peak period conversion; this strategy would reduce 422 vehicle trips in the AM peak period and 430 vehicle trips in the PM peak period.

- Flexible work schedules reduce trips by implementation of compressed work weeks (3/36, 4/40, and 9/80), telecommuting part-time, and flex-time commuting. Flexible schedules have the benefit of moving peak commute trips to off-peak times and also eliminating commute trips. The *Flex Work Santa Barbara Phase 2 Report* projects that 1,421 commute trips per day will be eliminated from the peak periods for the South 101 analysis. This translates to a vehicle trip reduction of 711 northbound trips in the AM peak period and a vehicle trip reduction of 711 southbound trips in the PM peak period. The TDM strategies' vehicle trip reductions reported in the *101 In Motion* study are evaluated for 2030. The combined 2030 vehicle trip reductions will be applied to the CSMP US-101 Transit and TDM scenario for the "Ten Years after CMIA Opening" model runs.

Once the effects of the transit service improvements and TDM programs had been estimated, they were translated into changes in vehicle trips in the simulation model for each county. The simulation model was then run with the modified hourly trip tables to identify the effects of the transit service improvements and TDM programs on roadway system performance. The vehicle-trip reductions shown in **Table 6-3** were applied to each hour block.

Table 6-3 Vehicle Trip Reductions for the Santa Barbara Microsimulation Model

Strategy	Peak Period	Vehicle-Trip Reductions					
		Total	Hour 1	Hour 2	Hour 3	Row	Column
Passenger Rail Service	AM	285	0	140	145	South	CBD
	PM	285	0	157	128	CBD	South
Local and Express Bus Service	AM	562	155	200	208	All	All
	PM	572	209	200	163	All	All
Ridesharing Incentives	AM	520	143	185	192	South	CBD
	PM	529	193	185	151	CBD	South
Individualized Marketing	AM	422	116	151	155	South	CBD
	PM	430	157	151	122	CBD	South
Flexible Work Schedule	AM	711	196	252	263	South	CBD
	PM	711	196	252	263	CBD	South

Source: DKS Associates, 2010

6.2.2 Effects on US-101 Traffic Volume and Delay

The combined effect of the Transit and TDM scenario is very positive in the peak commute direction—northbound in the AM and southbound in the PM. Overall, the transit and TDM strategies together reduced AM and PM peak period drive-alone vehicle trips by over 7,200 for Ventura and Santa Barbara Counties combined, as indicated in **Table 6-4**. The estimates of trip reductions were based primarily on work performed for *101 In Motion*, but with modifications to reflect the differences in the strategies that were tested. The method used for the analysis is described in **Appendix A**. Achieving the results in Table 6-2 may require the addition of parking spaces at existing park-and ride locations or the addition of new lots to support the transit and TDM enhancements. The need for additional spaces was not analyzed as part of this CSMP, but should be a part of any subsequent analysis of transit and TDM strategies.

Table 6-4 Vehicle Trip Reductions from Transit and TDM Strategies

Peak Period	Santa Barbara County	Ventura County	Santa Barbara and Ventura Counties
AM Peak Period	2,500	1,100	3,600
PM Peak Period	2,500	1,100	3,600
AM & PM Peaks	5,000	2,200	7,200

The effects of the trip reductions on traffic volume and delay on US-101 were determined using the corridor simulation model. In Santa Barbara County, the strategies result in a 5 percent reduction in freeway traffic (as measured by the number of vehicle miles traveled) and a 53 percent reduction in freeway delay. In Ventura County, the strategies produce a 4 percent reduction in freeway VMT and a 30 percent reduction in delay.

Although the Transit and TDM scenario produced significant benefits in almost all segments, the segments where delay was reduced the most were the City of Santa Barbara Segment and the City of Ventura Segment. In both cases, the strategy significantly reduced congestion at most of the major bottlenecks in the 2023 baseline. The specific locations where the Transit and TDM scenario had the most significant effect are identified below.

Santa Barbara County – Northbound

- The biggest bottleneck at Mission Street/Las Positas Road is reduced from 90 minutes to 60 minutes in the AM peak.[17]
- Bottlenecks at Coast Village Road/E. Cabrillo Boulevard/S. Salinas Street, N. Padaro Lane, Via Real/Linden Avenue, and SR-150 are all reduced significantly in the AM peak.

Santa Barbara County– Southbound

- The scenario almost completely eliminates the bottlenecks with only minor bottlenecks remaining north of downtown Santa Barbara in the PM peak. Bottlenecks reduced include Olive Mill Road, Garden Street/Milpas Road, Carrillo Street/Mission Street, Las Positas Road/Mission Street, San Marcos Pass Road/La Cumbre Road, and SR-217.

Ventura County – Northbound

- The scenario reduces the bottlenecks at Johnson Drive but almost completely eliminates the bottlenecks at the SR-1 on-ramp and the La Conchita area during the AM peak.

Ventura County– Southbound

- Transit and TDM will reduce the bottleneck at SR-126 in the PM peak, but in doing so may increase the bottlenecks at Victoria Avenue and Vineyard Avenue/Rice Avenue.

6.3 Flow Management to Increase Vehicle Throughput

6.3.1 Ramp Metering

When freeways are congested because demand exceeds capacity, ramp meters can mitigate or minimize the impact of bottlenecks. This can be achieved by smoothing the entry of cars onto the freeway at the ramp. Ramp metering can help avoid a breakdown in mainline traffic flow by splitting up platoons of vehicles arriving from nearby signalized intersections and reducing turbulence in the merge area on the freeway. Spreading a thirty-second burst of vehicles over a full minute may result in only very short delays on the ramp while maintaining freeway speeds. By controlling the entry of vehicles onto the freeway, ramp metering may also reduce collisions in merge areas.

Metering effectively transfers excess demand (and delays) from mainline freeway bottlenecks to on-ramps, which, from a system perspective, may be a more efficient distribution of congestion. It is important to note that for metering to be most effective, it must be implemented not only at the on-ramp nearest a bottleneck, but also system-wide at multiple on-ramps upstream of the bottleneck. By controlling and re-distributing the entry of vehicles onto the freeway over time, ramp metering can delay the onset, reduce the maximum length, and hasten the dispersal of queues. These benefits may be increased when the safety effects of ramp metering are also taken into account.

Ramp metering can reduce stop-and-go driving behavior and can result in fewer rear-end collisions. By reducing turbulence at merge points, it can also result in fewer side-swipe and merge-related collisions. In many cases where metering has been implemented, collision rate reductions of 20 percent to 40 percent have been reported.[18] Fewer collisions mean fewer injuries and fatalities, a decrease in costly property damage, and a reduction in non-recurring delay.

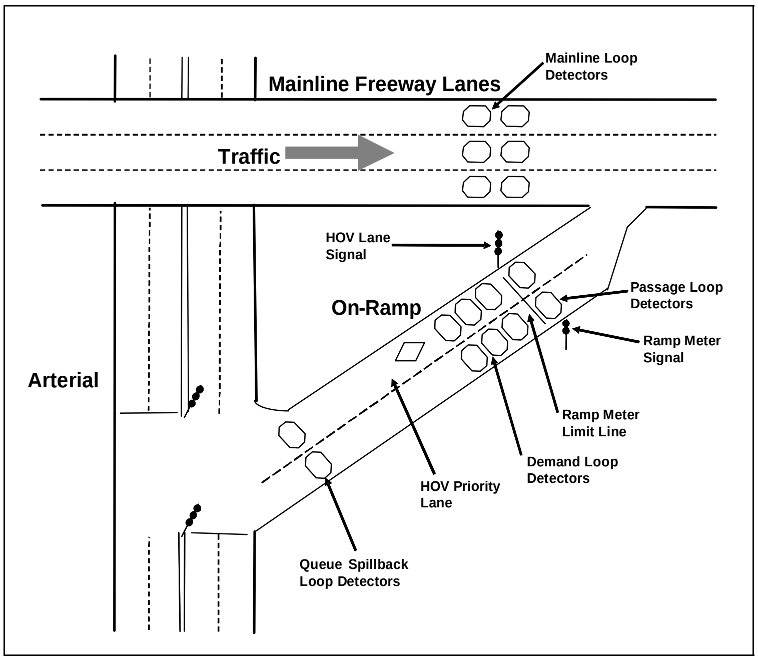
The transfer of excess demand (and delay) by ramp metering leads to queues forming on the ramps. Local jurisdictions are often concerned about the potential for these queues to

[18] Freeway Management and Operations Handbook, FHWA, 2003 (revised 2006)

spill back and disrupt operations on local streets. However, this impact can be mitigated effectively through design and operating considerations.

Metering systems most commonly implemented by Caltrans include provisions to detect and respond to these queues. **Figure 6-1** illustrates a typical ramp metering equipment layout that includes queue spillback detectors near the upstream end of the ramp. If a queue is detected at this point, the ramp meter can be programmed to increase the metering rate or even turn green for a continuous period to "flush" the queue and prevent spillback onto local streets.

Figure 6-1 Typical Ramp Meter Layout



A second potential impact of ramp metering is trip diversion. Trip diversion, or space redistribution, occurs when drivers choose other routes, largely in response to the delay at the ramp meters, either by selecting a different on-ramp or avoiding the freeway altogether. Though ramp delays may lead some drivers to seek alternative paths, the amount of such diversion is expected to be limited because any ramp delay is relatively short. And while metering may lead to the diversion of some shorter trips, it may also encourage drivers making longer trips to stay on the freeway. The mainline operational improvements and ramp delays associated with ramp metering may also discourage "ramp-hopping" where vehicles exit the freeway upstream of a bottleneck and re-enter just downstream.

6.3.2 On-Ramp Design Requirements

For ramp metering to be most effective, on-ramps must meet a variety of design requirements related to acceleration distance, meter capacity (the number of vehicles that can be served at the ramp meter based on a maximum of 900 vehicles per hour per lane [vphpl]), and storage. A preliminary assessment of the freeway on-ramps along the study corridor revealed that many ramps have geometric constraints or limitations that may impact the effectiveness of ramp metering.

These ramps must be evaluated for the type and feasibility of geometric improvements, which include extending or realigning the ramp to provide additional acceleration distance, widening or extending the ramp to provide additional storage, and potentially widening the ramp at the meter to provide an HOV preferential lane and/or additional lane capacity. Because maximum metering rate is 900 vphpl, ramps with demands greater than 900 vphpl would require an additional lane at the meter limit line.

6.3.3 Effects of Ramp Metering on US-101 Traffic Volume and Delay

The analysis of ramp metering for the US-101 corridor revealed that the strategy can improve the traffic flow on the freeway, reduce bottlenecks, and reduce overall delay when the right conditions exist. The analysis also suggests that this can be accomplished without negative impacts on local arterials and that the improved productivity of the freeway will result in a better alternative for longer trips, thereby minimizing diversion of trips to parallel alternatives. Major bottlenecks that are expected to emerge in each county by 2023 will impact the potential effectiveness of ramp metering southbound in the PM peak period and possibly northbound in both periods in Ventura County. Because these bottlenecks are at locations that cannot be effectively mitigated by ramp metering and the bottlenecks themselves will meter flow downstream, the effectiveness of ramp metering may be limited for these segments.

The analysis of ramp metering indicated that an effective program would not necessarily include metering at all ramps. Under the forecast conditions for 2023, metering would not be required at some ramps because they are downstream of the corridor bottlenecks or too far from bottlenecks to have an effect. The segments where metering probably will not be necessary are the Goleta Segment and the Coastal Segment in either direction. Southbound metering will probably not be required in the Montecito/Summerland/Carpinteria Segment or either of the CMIA Project Segments. Ramp metering could be beneficial in all of the other segments in both directions during the AM peak, the PM peak, or both.

In some segments, the effectiveness of ramp metering will be limited because some ramps do not have adequate capacity for metering. They are either too short or they do not have enough lanes. During high ramp demand times, metering of these ramps would result in spillback into the adjacent intersections and so the metering would have to be discontinued. For some ramps, this would only affect the highest point in the peak period, but for other high-demand ramps, this might be the case during the entire peak period. Insufficient ramp capacity may limit the effectiveness of metering on most of the older ramps that have not been reconstructed, but the following ramps have the most serious limitations and were not included in the testing of the ramp metering scenario:

City of Santa Barbara Segment

- Milpas Street: Northbound PM
- Garden Street: Northbound PM
- W. Arrellaga Street: Northbound PM
- W. Mission Street: Northbound AM and PM
- Calle Real/Las Positas Road: Northbound and Southbound PM
- San Marcos Road: Southbound PM
- W. Mission Street: Southbound AM

City of Ventura Segment

- SR 33: Southbound PM
- Seaward Avenue: Southbound PM

Oxnard Segment

- Rose Avenue: Northbound AM
- Oxnard Boulevard: Northbound AM
- Telephone Road: Southbound AM and PM
- Victoria Avenue: Southbound PM
- Johnson Road: Southbound PM
- Vineyard Avenue : Southbound PM
- Rice Avenue: Southbound AM and PM (may be addressed by reconstruction current in progress)

Other ramps also have limited capacity, and the test of the scenario indicated that at some point during the peak periods metering would have to be suspended because the ramp queue would exceed the full length of the ramp and would potentially interfere with intersection operations. Those ramps are identified in the description of how ramp metering would affect bottlenecks presented below.

A very large bottleneck, like the one projected southbound at SR-126 in the PM peak in 2023, will in effect function as the meter for traffic downstream in the Oxnard Segment. As a result, metering might not be of use in that segment unless the bottleneck at SR-126 is relieved with a capacity improvement. Based on the preliminary assessment, it is unclear whether the delay reduction in the Oxnard Segment is the result of ramp metering or the bottleneck at SR-126. Additional analysis would be required to determine whether ramp metering would benefit the Oxnard Segment.

The most significant reductions in delay from ramp metering will be the City of Santa Barbara Segment, the City of Ventura Segment, and the Oxnard Segment, although the reductions in these segments are often the result of metering in upstream segments. The specific locations where ramp metering will have the greatest impact on bottlenecks are identified below.

Santa Barbara County– Northbound

- Ramp metering reduces the bottleneck at Coast Village Road/E. Cabrillo Boulevard/S. Salinas Street in the AM peak and the bottleneck at Mission Street/Las Positas Road in both the AM and PM peak.
- Baseline ramp capacity at the following ramps was inadequate to allow the most effective metering without significant queue spillback into the ramp intersection during at least some portion of the AM or PM peak period:
  - NB on-ramp at Bailard Avenue
  - NB on-ramp at Linden Avenue
  - NB on-ramp at Salinas Street
  - NB on-ramp at Milpas Avenue
  - NB on-ramp at Castillo Street

Santa Barbara County – Southbound

- Metering can virtually eliminate a bottleneck at Las Positas Road in the AM peak.

- Metering reduces the bottlenecks at Las Positas Road/Mission Street and at Olive Mill Road in the PM peak
- Baseline ramp capacity at the following ramps was inadequate to allow the most effective metering without significant queue spillback into the ramp intersection during at least some portion of the AM or PM peak period:
  - SB on-ramp at Las Positas Rd
  - SB on-ramp at Mission Street
  - SB on-ramp at Carrillo Street

Ventura County – Northbound

- Metering reduces the bottleneck at Johnson Drive during the AM peak.
- In the PM peak the most significant bottleneck is at the beginning of the corridor (between Rice Avenue and Vineyard Avenue) and metering could not be tested in the model upstream of this bottleneck.
- Baseline ramp capacity at the following ramps was inadequate to allow the most effective metering without significant queue spillback into the ramp intersection during at least some portion of the AM or PM peak period:
  - NB on-ramp at (NB) Rice Avenue
  - NB on-ramp at (NB) Rose Avenue
  - NB on-ramp at (SB) Rose Avenue
  - NB on-ramp at (NB) Vineyard Avenue
  - NB on-ramp at (SB) Vineyard Avenue
  - NB on-ramp at Johnson Drive
  - NB on-ramp at Victoria Avenue
  - NB on-ramp at Main Street

Ventura County– Southbound

- The size and extent of the bottleneck at SR-126 in the PM peak limits the effectiveness of ramp metering. Metering will reduce the duration of the bottleneck but the bottleneck itself meters the flow for the downstream bottlenecks.
- Three major bottlenecks—SR-126, Victoria Avenue and Vineyard Avenue—are all reduced but still significant in the PM peak.
- Baseline ramp capacity at the following ramps was inadequate to allow the most effective metering without significant queue spillback into the ramp intersection during at least some portion of the AM or PM peak period:
  - SB on-ramp at Thompson Blvd/Chestnut Street
  - SB on-ramp at Monmouth Way
  - SB on-ramp at Seaward Avenue
  - SB on-ramp at (SB) Vineyard Avenue
  - SB on-ramp at (NB) Vineyard Avenue

6.4 Minor Physical Capacity Enhancements to Improve Roadway Flow and Throughput

6.4.1 Minor Physical Capacity Enhancements Evaluated

The minor physical enhancements tested in this improvement scenario were for projects that are not already programmed and that could directly affect the operation of US-101. These plans are the combination of suggestions from US-101 CSMP Traffic Operations Subcommittee (which includes Caltrans District 5, Caltrans District 7, SBCAG, and VCTC) and from DKS and are based on results of the baseline simulation models. The improvements that were tested are identified below and their locations are shown in **Figure 6-2 and 6-3**.

Santa Barbara

US-101 Northbound

- SB-NB-2: Add an auxiliary lane from W. Arrellaga Street on-ramp to W. Mission Street off-ramp
- SB-NB-3: Add an auxiliary lane from Las Positas Road/Calle Real on-ramp to S Hope Avenue off-ramp
- SB-NB-4: Add an auxiliary lane from Fairview Avenue on-ramp to Los Carneros Road off-ramp
- SB-NB-5: Add an auxiliary lane from Los Carneros Road on-ramp to Storke Road off-ramp

US-101 Southbound

- SB-SB-1: Add an auxiliary lane from Las Palmas Drive on-ramp to Las Positas Road off-ramp
- SB-SB-2: Add an auxiliary lane from Las Positas Road on-ramp to W. Mission Street off-ramp[19]

Arterials

- SB-SB-5: Expand State Street/Hollister Avenue from San Marcos Pass Road to Turnpike Road to be 4 lanes all the way

Ventura County

US-101 Northbound

- VEN-NB-1: Add an auxiliary lane from SB Rose Avenue on-ramp to Vineyard Avenue off-ramp
- VEN-NB-2: Add a lane from the lane-drop at Johnson Drive to Victoria Avenue off-ramp
- VEN-NB-3: Extend the acceleration lane from Main Street on-ramp

[19] Caltrans District 5 investigated an auxiliary lane at this location but found that one could not be added without creating a non-standard horizontal clearance at the Junipero pedestrian crossing.

US-101 Southbound

- VEN-SB-1: Add an auxiliary lane from Seaward Avenue on-ramp to SR-126 off-ramp
- VEN-SB-2: Add a lane from SB Victoria Avenue on-ramp to Auto Center Drive/Johnson Drive off-ramp
- VEN-SB-3: Add a lane from the lane-drop at Vineyard Avenue to Rose Avenue off-ramp

Figure 6-2 Minor Physical Capacity Enhancements Tested in Santa Barbara County

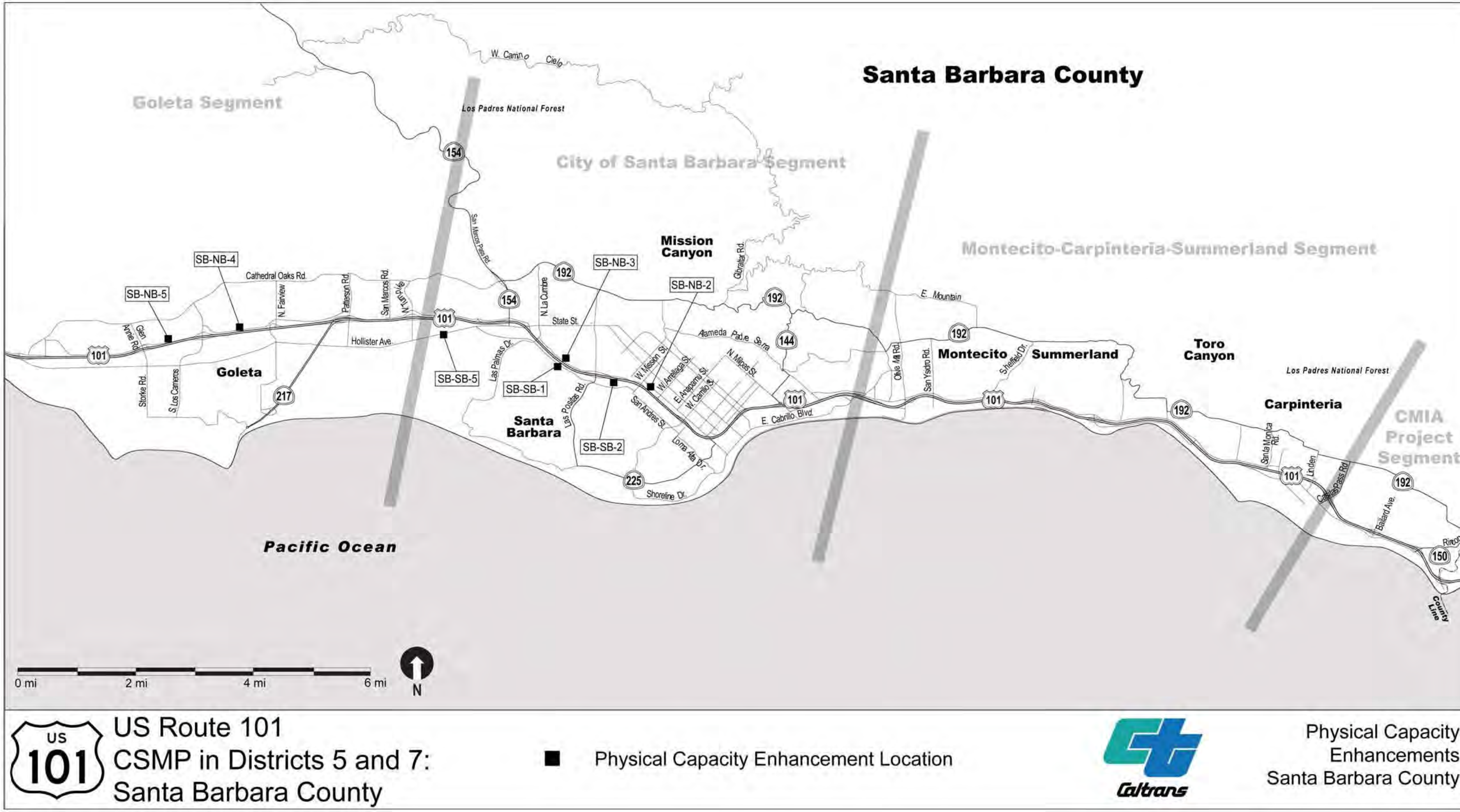
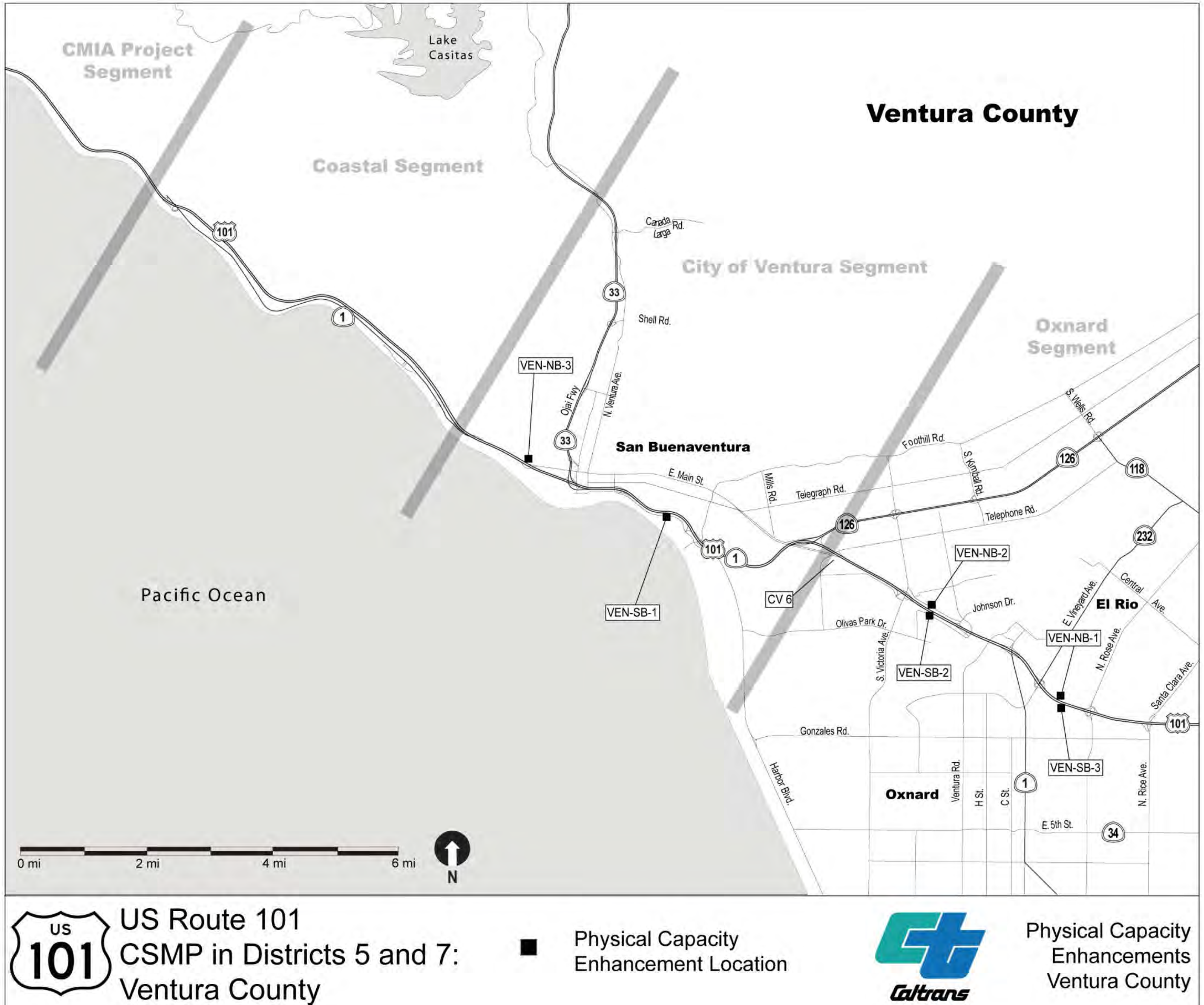


Figure 6-3 Minor Physical Capacity Enhancements Tested in Ventura County



6.4.2 Effects of Minor Physical Improvement on US-101 Traffic Volume and Delay

The simulation analysis indicates that minor physical improvements can significantly impact delay. In the peak directions, the improvements could reduce freeway delay by 24 to 36 percent. The most significant benefits will be in the City of Santa Barbara Segment, the City of Ventura Segment and the Oxnard Segment. The most benefits of the improvements tested are described below.

Santa Barbara County– Northbound

- Adding an auxiliary lane from W. Arrellaga Street on-ramp to the W. Mission off-ramp (SB-NB-2) and adding an auxiliary lane from the Las Positas Road/Calle Real on-ramp to the S. Hope Avenue off-ramp (SB-NB-3) significantly reduces bottlenecks and congestion points between Castillo Street and at Las Positas Road.

Santa Barbara County– Southbound

- Adding an auxiliary lane from the Las Palmas Drive on-ramp to the Las Positas off-ramp (SBB-SB – 1) reduces the bottleneck near Las Palmas Drive.
- Adding an auxiliary lane from the Las Positas Road on-ramp to the West Mission Street off-ramp (SBB-SB -2) reduces the congestion point near Las Positas Road.

Ventura County – Northbound

- Adding an auxiliary lane from the Rose Avenue on-ramp to the Vineyard Avenue off-ramp (VEN-NB-1) will significantly reduce the bottleneck between Rice Avenue and Vineyard Road. It will also allow traffic through that was being metered by the bottleneck and this will increase congestion somewhat downstream particularly at Victoria Avenue and at SR-126.
- Adding a lane from the lane-drop at Johnson Drive to the Victoria Avenue off-ramp (VEN-NB-2) will maintain the level of service at the bottleneck near Johnson Drive when more traffic is allowed through the Vineyard Avenue bottleneck.
- Extending the acceleration lane from the Main Street on-ramp (VEN-NB-3) will maintain the level of service at the bottleneck near the SR-126 on-ramp when more traffic is allowed through the Vineyard Avenue bottleneck.

Ventura County– Southbound

- Adding an auxiliary lane from the Seward Avenue on-ramp to the SR-126 off-ramp (VEN-SB-1) will reduce the bottleneck near SR-126.
- Adding a lane from the southbound Victoria Avenue on-ramp to the Johnson Drive off-ramp (VEN-SB-2) will almost completely eliminate the bottleneck near Victoria Avenue.
- Adding a lane from the lane-drop at Vineyard Avenue to the Rose Avenue off-ramp (VEN-SB-3) will almost completely eliminate the bottleneck near Rose Avenue.

6.5 Incident Management

Incident management on the Santa Barbara County US-101 segment is provided primarily by the Freeway Service Patrol (FSP). The FSP program is jointly managed by SBCAG and the California Highway Patrol (CHP) with assistance from Caltrans. During commute periods (6:30 to 9:30 AM and 4:30 to 7:30 PM), FSP tow trucks rove US-101 from Patterson Avenue to the Ventura County line. The trucks come across collisions through their roving operations or are dispatched to collisions by CHP; they also respond to vehicle breakdowns for emergency assistance and removal of vehicles to a safe place. The Santa Barbara FSP program began in March 2006 and is well received by the public as it acts to reduce non-recurring congestion as well as the chances of further collisions.

For the US-101 CSMP efforts, current (2008) levels of Santa Barbara FSP service were assumed to remain constant for forecasting FSP delay savings benefits for two future year scenarios, "CMIA Opening Year" and "10 Years after CMIA Opening." The forecasted annualized FSP performance measures for the Santa Barbara FSP program are listed in **Table 6-5**. The delay savings per assist and per tow truck hour increase significantly from 2008 to "Ten Years after Opening" because congestion is expected to increase significantly on US-101 in Santa Barbara County over that time period.

Table 6-5 US-101 Santa Barbara County FSP Measures of Effectiveness

Measure of Effectiveness	Baseline 2008	Opening Year	Ten Years after Opening
Annual FSP Tow Truck Hours (FSP-tow-truck-hours)	2,952	2,952	2,952
Annual FSP Assists (assists/year)	1,215	1,271	1,442
Delay Savings Per Assist (VHT/Assist)	108	115	143
Delay Savings Per Tow Truck Hour (VHT/FSP-hour)	44	49	70
Annual Delay Savings (VHT/year)	130,800	145,700	206,400
Annual User Benefit ($/Year)	1,702,200	1,897,000	2,686,500
Annual FSP Costs ($/Year)	225,500	225,500	225,500
Annual Benefit-to-Cost Ratio	7.5	8.4	11.9

Ventura County does not presently have FSP. The benefits of implementing modest FSP service in Ventura County was estimated using the delay-savings estimates produced by the Caltrans Freeway Service Patrol Evaluation Model (FSPE) on the US-101 Santa Barbara FSP beats[20] near the Santa Barbara/Ventura County border and the US-101 Los Angeles FSP beats near the Los Angeles/Ventura County border. The forecasted annualized FSP performance measures for the two modeled Ventura County FSP beats are shown in **Table 6-6**. The delay savings per assist and per tow truck hour increase even more in Ventura County than in Santa Barbara County from 2008 to "Ten Years after Opening" because the percentage increase in congestion on US-101 is expected to be greater in Ventura County.

[20] A "beat" is an area on the freeway covered by a particular FSP vehicle.

Table 6-6 US-101 Ventura County FSP Measures of Effectiveness

Measure of Effectiveness	Baseline 2008[a]	Opening Year	Ten Years After Opening
Annual FSP Tow Truck Hours (FSP-tow-truck-hours)	4,000	4,000	4,000
Annual FSP Assists (assists/year)	2,113	2,250	2,471
Delay Savings Per Assist (VHT/Assist)	30	41	78
Delay Savings Per Tow Truck Hour (VHT/FSP-hour)	15	25	52
Annual Delay Savings (VHT/year)	59,700	98,600	207,300
Annual User Benefit ($/Year)	777,600	1,283,200	2,698,600
Annual FSP Costs ($/Year)	250,300	250,300	250,300
Annual Benefit-to-Cost Ratio	3.1	5.1	10.8

[a] Ventura County did not have Freeway Service Patrol in 2008. The values in this column indicate the value that the service could have had in that year.

Under current conditions in the US-101 CSMP corridor (combined Santa Barbara and Ventura Counties), the FSP program could reduce vehicular delays on US-101 by about 160,000 vehicle hours annually. This could grow to over 400,000 vehicle hours each year in the ten years after CMIA opening. Likewise, more aggressive expansions to the FSP program on US-101 would increase the delay savings from incident-related delays.

7. RECOMMENDED CORRIDOR SYSTEM MANAGEMENT STRATEGIES

7.1 US-101 Management

7.1.1 Surveillance and Monitoring

A core element of effective corridor management is surveillance and monitoring. Without current information about traffic flows and transportation system performance, application of management strategies is limited. The US-101 CSMP has been hampered by a lack of continuous data collection because existing freeway loop detectors and other real-time flow monitoring systems have not been activated to transmit data from the field sensors to the Transportation Management Center (TMC) in Santa Barbara County. By late 2010, it is anticipated that servers will be working and able transmit information to the TMC in District 5. However, the current lack of data has made the quantification of existing performance deficiencies difficult and severely limits the application of management strategies that require real-time knowledge of vehicle flow patterns, vehicle speeds, and other characteristics that define system performance. Significant improvement in surveillance and monitoring is recommended to support the additional strategies recommended below. Support for continuous evaluation of system performance and the effectiveness of management strategies that are implemented is also recommended.

1. Continued installation of freeway mainline detectors for each lane at least every two miles to support freeway management strategies such as ramp metering.
2. Continued installation and future activation of speed detection and other ITS elements in Santa Barbara County to support traveler information systems (such as 511 and Changeable Message Signs with expected travel times to select destinations), FSP (identifying locations where an incident has stopped or slowed traffic in one or more lanes. Future detection located), and real time data collection on the local street system should be analyzed mainline. This would entail future expansion of the detector system to locate detectors on the freeway mainlines at least every two miles apart.

7.1.2 Ramp Metering

Ramp metering will be an important element for managing the US-101 Corridor. When combined with other recommended strategies, ramp metering will increase productivity by accommodating more vehicle and passenger trips on the freeway and reducing load on local arterials. Caltrans should pursue ramp metering with the following actions:

1. Seek opportunities to increase the capacity of on-ramps to accommodate storage of metered vehicles and to allow for HOV bypass of meters wherever interchange reconstruction is undertaken in the corridor.
2. Install ramp-metering hardware on all ramps that are rebuilt along with interchange reconstruction or as stand-alone projects.
3. Seek opportunities to lengthen merge areas for ramps wherever roadway construction occurs on US-101.

4. Implement vehicle-flow monitoring on the mainline lanes of the freeway at least every two miles to provide the information necessary to determine appropriate metering rates.
5. Install queue spillback detectors wherever ramp metering equipment is installed on on-ramps to allow for monitoring of queue spillback to local arterials.
6. Improve ramp capacity where metering could cause spillback onto local arterials.
7. Whenever there are two lanes on the ramp and there is sufficient ramp capacity for effective metering in a single lane without spillback onto local arterials, then one lane of the ramp should be designated as an HOV priority lane. This HOV priority lane would allow eligible vehicles to bypass metering or be metered at a faster rate.

7.1.3 Minor Physical Capacity Improvements

Numerous minor physical capacity improvements have been identified and evaluated in the CSMP that could increase the productivity of US-101 and reduce traffic volumes on local parallel arterials. The stakeholder agencies in the corridor should continue to pursue funding of these minor capacity improvements in combination with other management strategies to avoid major capacity increases or to delay them as long as possible.

Additionally, it is recommended that the local jurisdictions consider the existing level of connectivity and possibly even the construction of new frontage roads for proposed future commercial and residential development along the US-101 corridor. Other plausible strategies include the expansion of existing parallel roadways to reduce congestion and help preserve the mobility gains of the US-101 CMIA investment.

7.1.4 Incident Management

Collisions and incidents are a major source of delay in the US-101 CSMP corridor. Reducing the time required to clear these collisions and incidents and restore full flow on the freeway in turn reduces delay, diversion of freeway traffic to local arterials, and the likelihood of additional collisions. Freeway Service Patrol (FSP) has proven to be a cost-effective strategy that reduces the impact of collisions and other incidents on US-101 in Los Angeles and Santa Barbara Counties. Consideration of a level of FSP coverage similar to that currently being provided on US-101 in Santa Barbara County is recommended on US-101 in Ventura County for future years if congestion and collision rates increase and there are financial resources to implement the service. The continuous monitoring of mainline flow and speeds would also improve the identification of collisions and other incidents and increase the effectiveness of FSP by reducing the response time.

In addition, the Traffic Accident Surveillance and Analysis System (TASAS) is a reasonable and credible measure of safety on state facilities. TASAS data can be used to identify higher than normal collision areas of US-101 in the CSMP corridor and should be monitored regularly to insure that safety is a key measure when funding future corridor improvements.

7.2 Parallel and Connecting Roadways

7.2.1 System Capacity Improvements

Several key capacity improvements have been identified and evaluated in the CSMP that will have a significant benefit in overall system performance by improving connectivity on the local arterial system and allowing more short trips to be made without using the freeway. These short trips have an inordinate impact on freeway performance when the flow on the freeway is heavy because vehicles cause turbulence when entering and sometimes exiting the freeway for only a short trip on the freeway.

7.2.2 Signal Coordination

Most of the delay on local arterials is at intersections. Signal timing that maintains flow on arterials and that responds directly to real-time demand can significantly reduce arterial delay, accommodate more short trips on arterials, and reduce flow and delay on the freeway. The jurisdictions along the major arterial routes should give serious consideration to adaptive or traffic-responsive signal operation where it is not currently used to allow for response to changing traffic conditions during the day or from day to day. Consideration should also be given to the automatic introduction of “incident-response plans” to accommodate diverted traffic when there is an incident that blocks one or more lanes on US-101.

7.3 Public Transportation

Public transportation is an important element of mobility in the US-101 CSMP corridor. For many, public transportation is the most affordable option and, for some, the only option for travel. For others, public transportation is a convenient and cost effective way to get to work or to serve other transportation needs. Public transportation has been supported in both counties as an element of a peak-period management strategy to reduce overall vehicular travel in the corridor and to reduce the load on an already congested roadway system.

The long-range planning for the corridor by SBCAG and VCTC demonstrates a continued commitment to public transportation. The *101 In Motion* blueprint for US-101 in Santa Barbara County recommended strategies that increase express bus service and improve opportunities for commuters to use passenger rail service in the corridor for commute trips. The plan also recommended increasing local bus service, where feasible, to meet the mobility needs of local travelers and as a mode of access to and from the more regional transit modes, such as express bus and passenger rail. In Ventura County, the ***2009*** *Congestion Management Plan* identified increased bus service as an important part of maintaining mobility in the county and as an efficient means of commuting to Santa Barbara and Los Angeles Counties.

Continued development of public transit options in the US-101 corridors is recommended as a key element of a strategy to reduce vehicular travel while maintaining mobility. By taking advantage of existing or programmed infrastructure, strategies can maximize the productivity of past and future transportation investments. Adding express bus frequency or new services, where feasible, that can use the new HOV lanes that will be added by the CMIA project and the South Coast 101 HOV Project in Santa Barbara will help increase the productivity of those investments and reduce overall congestion in the corridor. Enhancing the attractiveness and convenience of passenger rail service between Santa Barbara County and Ventura County through modification of schedules to suit commuters or by increasing the frequency of trips between the counties will increase the productivity of the rail service and reduce trips on US-101. Improving local bus service to the passenger rail stations or adding capacity to parking at the stations will make the service more convenient and attract users.

With the growing popularity and capabilities of Web-enabled cell phones, the transit agencies should continue to develop Web-based applications that allow users to view transit routes, bus and rail transit stops, fares and schedules by cell phone or by Web-browsers from conventional computers. In addition, the local transit agencies should seek to expand the application of NextBus technology in the corridor.

7.4 Park-and-Ride

Park-and-ride facilities can serve a variety of alternatives to driving alone, including carpooling, vanpooling, express bus and passenger rail. The communities in the US-101 CSMP corridor are still largely auto-oriented and park-and-ride offers a convenient connection between home and alternative modes. Because there are currently so few park-and-ride lots in the corridor, the addition of at least one lot in each county is recommended. Although no specific locations have been identified, the preference would be for a mode-transfer location that could also serve passenger rail and express bus routes. If additional park-and-ride lots or additional spaces in exiting lots are needed to achieve success for the enhanced transit or TDM strategies, the cost of these lots or spaces should be included in any additional evaluation of the strategies.

7.5 Demand Management

The most effective demand management strategies in an overall approach to management in the US-101 CSMP corridor would be employer–based incentives designed to reduce peak-period trips. Because most of the major employments sites in the corridor are in Santa Barbara, the strategies recommended in *101 In Motion* and evaluated in this CSMP would appear to have the greatest potential effectiveness. These include rideshare incentive, individualized marketing and flexible work schedules. It is recommended that efforts to fund these programs be continued by both counties and supported by Caltrans. It is also recommended that there be continued efforts to plan, fund and implement safe facilities for use of non-motorized modes, particularly as a mode of access to commute alternatives such as transit services.

APPENDIX A
Modeling Approach

Overview

Improvement strategies considered in the CSMP were modeled with a combination of travel demand forecasting models and a hybrid simulation model as illustrated in the diagram in **Figure 1**. The travel demand models maintained in TransCAD by the Santa Barbara Council of Associated Governments (SBCAG) and the Ventura County Transportation Commission (VCTC) were used to produce estimates of vehicular travel patterns for the AM and PM peak periods. These travel patterns were used as input to the hybrid simulation model. The travel demand models were used to produce inputs for 2008 and for two forecast years: the expected opening year for the CMIA project on US-101 (2013) and ten years after the expected opening year (2023). The travel demand model produces estimates of flows between origin-destination pairs and the volume on links in the network based on existing and projected socioeconomic and land use data. The travel demand models were used to assess any mode shifts that resulted from the improvement strategies as well as any route-choice changes to or from parallel arterials not covered in the hybrid simulation model.

Travel Demand Forecasting

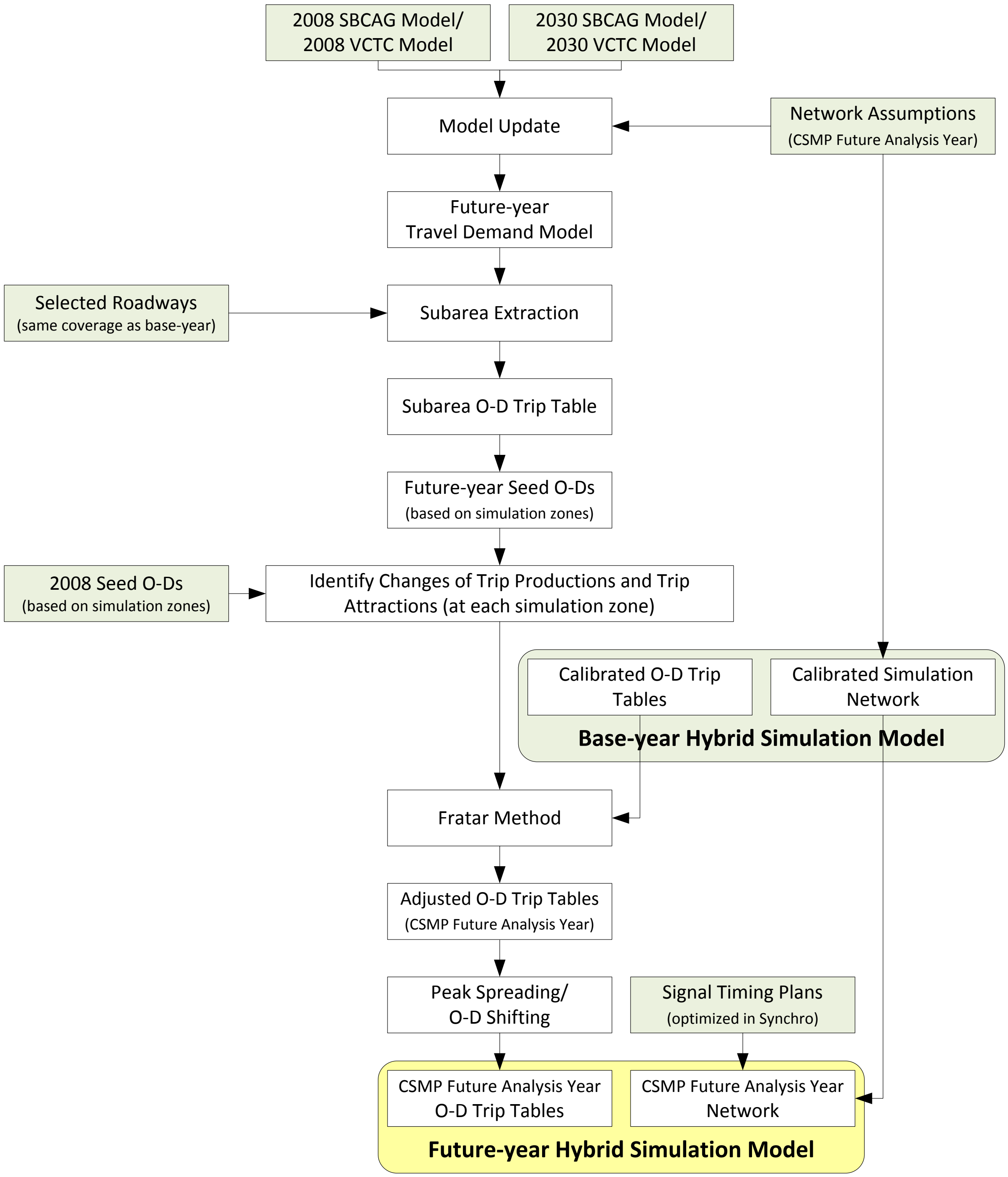
Two available travel models were used to create travel demand model inputs for the hybrid simulation models: (1) the Santa Barbara Council of Associated Governments (SBCAG) travel demand model and (2) the Ventura County Transportation Commission (VCTC) travel demand model. Each is described below. Although the regional travel demand model maintained by the Southern California Association of Governments (SCAG) was not used in creating the hybrid simulation models, it was used to aid in forecasting transit utilization and transportation demand management (TDM) benefits and it is referenced in those sections accordingly.

SBCAG Model

The SBCAG model has been available since 2004 and includes all of Santa Barbara County as well as the portion of Ventura County within the CSMP corridor. There are 281 traffic analysis zones (TAZs) and approximately 11,000 directed links and 4,000 nodes. The base-year is 2000 and the future-year is 2030. The future-year is based on the Regional Growth Forecast 2000-2030 (prepared by SBCAG in March 2002). The model is available for average daily traffic (ADT), AM peak hour (8:00-9:00 AM), PM peak hour (5:00-6:00 PM), and midday hour (1:00-2:00 PM). There is a mode-choice component that estimates the split between auto (1, 2, and 3+ persons in a car), bus, walk, and bike trips; but there is no truck component in the model. The current SBCAG model has been developed in the TransCAD software.

A specialized version of the SBCAG model was used to create the travel model inputs. Dowling Associates refined the SBCAG model for the US-101 corridor for a previous work effort focusing on the South Coast 101 HOV Study in Santa Barbara County. For clarity purposes, this refined SBCAG model will be referred to as the 101-HOV model.

Figure 1 Model Framework for the US-101 CSMP



The 101-HOV model has a refined roadway and transit network for the US-101 corridor. Freeway interchange and ramp configurations were refined to better reflect the freeway's geometry and configuration. Centroid connectors were relocated to better replicate traffic loading from minor streets and collectors onto the major arterials. Network coding reasonableness checks were performed on roadway segment and intersection network coding. No changes were made to the model's zonal structure, the zonal socioeconomic and land use data, study years modeled, time-of-day factors, or other model parameters.

While the CSMP was being prepared, SBCAG was adjusting its regional growth forecasts reflecting a slower pace of growth in the county. A new model update is planned using these new regional forecasts but was not available in time to be used in the US 101 CSMP development. To account for slowed growth rates, DKS used the SBCAG 2030 forecast to represent 2040 when interpolating to the 2008, 2013 and 2023 socioeconomic/land use data set for the SBCAG model. To illustrate this method, US-101 CSMP year 2008 input socioeconomic/land use data were interpolated as "SBCAG year 2000" plus 8/40 of the growth between the "SBCAG 2000" and the "SBCAG 2030/2040" datasets.

VCTC Model

The VCTC model was recently updated and made available in March 2009. The model is windowed from the Southern California Association of Governments (SCAG) regional model and additional detail was added to the portion of the network in Ventura County. The VCTC model does not include roadways in Santa Barbara County. The base-year is 2007 and the future-year is 2030. The future-year is based on the Southern California Association of Governments Regional Transportation Plan (SCAG RTP). The model produces a two-hour AM peak period and a three hour PM peak period, as well as a 19-hour off-peak period. The AM peak, PM peak and off-peak period volumes are combined producing average daily traffic (ADT) volume forecasts.

Although there is a mode choice component in the model, transit ridership and/or vehicle occupancy are not forecasted by the model. There is no truck or commercial freight component in the model. Vehicle trips are the only forecasted travel mode. The VCTC was developed using the TransCAD modeling software.

For both the VCTC and the SBCAG models, the socioeconomic/land use data for study year 2008 were developed using straight-line interpolation between the socioeconomic/land use data for each county model calibration year and the first forecast year after 2008 from the travel forecasting model for each county.

Additionally, cordon (or external vehicle trip) vectors were linearly interpolated to 2008 estimates. External vehicle trip data are inputs to the auto-mode trip table generation process. As such, these inputs were updated to be consistent with other model parameters and input data. The external trip data may be subsequently adjusted if the model's traffic volumes do not match actual 2008 traffic counts at the model's gateways. Likewise, special generators were straight-line interpolated to 2008.

Future Year Conditions and Forecasting

Year 2013 was selected to reflect year of CMIA opening and 2023 was selected to reflect ten years after CMIA opening. Although 2013 might be a year or two beyond the actual opening date for the CMIA project, the timing of the CMIA project is somewhat uncertain and 2013 will be close to but after the CMIA opening.

The models networks for each year were coded to reflect the projects that are already in place (2008) and programmed for implementation by each forecast year: 2013 and 2023. Programmed projects were determined by the STIP and the RTIP, CIP, RTP and SRTP for each county. In addition, some Measure "A" projects for Santa Barbara County were included. A listing of programmed projects for the US 101 corridors for Santa Barbara and Ventura is included in Appendix E of this report.

Straight-line interpolation for the CSMP forecast years (2013 and 2023) was performed using the 2008 socioeconomic/land use data and the first model forecast year after the CSMP forecast year from the travel forecasting models**.** Likewise, the cordon (or external vehicle trip) vectors and special generators were linearly interpolated in the travel demand models.

As was done for the socio-economic and cordon trip data, straight-line interpolations were used to update the costs for each CSMP forecast year using the traveler costs for 2008 and the first model forecast year after the CSMP forecast year from the travel forecasting models.

The model system that was used to assess future performance in the corridor and to test improvement options was designed to represent average annual weekday conditions in the absence of any significant events that would change the demand or the operation of the facilities. The model system represented conditions without accidents or incidents that would block lanes or hinder flow. They represented reasonably good weather conditions that do not cause any reduction in system performance. Finally, the models represented a set of average forecast conditions that might influence traveler mode or route choice such as gasoline price, parking costs, or transit fares. Any seasonal fluctuations in these factors were not captured by the model system.

Fluctuation in the conditions identified above can have a significant effect on the performance of the transportation systems in the corridor. Some sensitivity testing of alternative conditions was performed to assess potential benefits of improvement options under more extreme operating conditions. The simulation model has the capability to test the impact of disruption from accidents, incidents, or adverse weather conditions on system performance. These features were used to analyze some of the more promising improvement options under these conditions. There was also some sensitivity testing of factors such as gasoline price.

One noticeable impact from the occurrence of unusual conditions in the corridor is degradation in the reliability of the system performance. This may show up in increased variation in travel times and in the amount of time a traveler must allow to ensure that trips are on time. Although the model system does not produce estimates of this variation in performance characteristics, DKS used baseline information on travel-time reliability to provide forecasts of variation and reliability for future conditions based on the expected volumes and level of service.

In the simulation model, existing traffic signalization and timing were used to represent 2008. Traffic simulation for future years was based on existing signalization and programmed signal improvements. All signal timing was assumed to be fixed-time and the timing for each signal was optimized using TransModeler.

Adjustment of the Forecasted Demands

Forecast demand cannot be used directly for simulation if it creates unrealistic gridlocks in the system. In such cases, an adjustment is needed to refine the forecasted demands to a level that can reasonably be accommodated by the network. A typical regional travel demand model, like the SBCAG and VCTC models, allows volumes greater than capacities (V/C ratio > 1). As a result, the travel demand model network can accommodate any level of demand even though the demand may be well over the capacity of the system. A simulation model, in contrast, replicates the complexity of traffic operations in a much more detailed manner and does not allow volumes greater than capacities, because individual vehicles are dynamically simulated. If the demand exceeds the capacity, vehicles will queue and can create gridlocks in the network. Once gridlocks happen, the simulation results are not meaningful. An error in approximating demands for some O-D pairs could distort the congestion pattern throughout the corridor. Because of limitations of the travel demand forecasting model, an adjustment was made to the forecasted O-D trip tables to account for temporal (peak spreading) and spatial (O-D shifting) distribution of O-D demands. In this modeling effort, the adjustments included the following:

- Capping trip productions at each simulation zone to roadway capacities at each entry point
- Shifting O-D demands to adjacent zones
- Shifting O-D demands to adjacent hours
- Shifting O-D demands outside of the peak period

The adjustments made resulted in the following overall reductions in the "Ten Year after Opening Models":

- Santa Barbara AM 0.3 %
- Santa Barbara PM 8.5 %
- Ventura AM 1.2 %
- Ventura PM 2.3 %

Simulation of Traffic Flows and Operations

The hybrid simulation methodology used in the project modeled the roadway network at different levels of fidelity in a single run. Some parts of the network were mesoscopically simulated while some were microscopically simulated simultaneously.

For the microscopic simulation part of the network, the highest detail was required to simulate complex driving behavior. Vehicle movements in this part of the network were modeled to the degree that replicates how individual vehicles react with nearby vehicles and the roadway geometry and traffic controls. The movements of individual vehicles were dictated by car-following and lane-changing logic.

For the mesoscopic simulation part of the network, less detail was required than the microscopic simulation part. That is because vehicle movements in this part of the network were modeled as platoons, sometimes called traffic cells or streams. While the mesoscopic simulation tracks the identity of individual vehicles, vehicle movements are based on aggregate speed-density relationships, not by car-following theory as on the microscopic portions of the network.

In general, all selected freeway segments and ramps were modeled using microscopic fidelity. The microscopic segments include:

- US-101
  - from Santa Barbara Post Mile 27.20 (Hollister Avenue) to Ventura Post Mile 20.76 (Rice Avenue)
- All on-/off-ramps along US-101
  - from Santa Barbara Post Mile 27.20 (Hollister Avenue) to Ventura Post Mile 20.76 (Rice Avenue)

Generally, the selected arterial segments were modeled at the mesoscopic fidelity. The mesoscopic segments include (sorted from north to south):

Segments in Santa Barbara County:

- Cathedral Oaks Road
  - from Glen Annie Road to San Marcos Pass Road
- SR-192
  - from San Marcos Pass Road to SR-150
- Casitas Pass Road
  - from Carpinteria Avenue to SR-192 (Casitas Pass Road)
- Hollister Avenue
  - from the northern end at US-101 to State Street
- State Street
  - from Calle Real (west of N La Cumbre Road) to E Gutierrez Street
- Calle Real
  - from N Los Carneros Road to N Patterson Avenue
  - from N Turnpike Road to State Street
  - from N La Cumbre Road to W Mission Street
- Castillo Street
  - from W Mission Street to W Cabrillo Boulevard
- N Milpas Street
  - from E Cabrillo Boulevard to E Ortega Street
- S Salinas Street
  - from US-101 to E Mason Street
- Cabrillo Boulevard
  - from Loma Alta Drive to US-101 (west of Hot Springs Road)
- Old Coast Highway
  - from S Salinas Street to Hot Spring Road

- Coast Village Road
    - from E Cabrillo Boulevard to Olive Mill Road
- Hot Springs Road
    - from Coast Village Road to Olive Mill Road
- Jameson Line
    - from Olive Mill Road to Sheffield Drive
- Via Real
    - from Evan Street to Santa Ynez Avenue
- Carpinteria Avenue
    - from US-101S Exit (west of Santa Monica Road) to SR-150 (Rincon Road)
- SR-150 (Rincon Road)
    - from US-101/Carpinteria Avenue to SR-192 (Casitas Pass Road)
- SR-217
    - from US-101 to S Fairview Avenue
- SR-154
    - from US-101 to San Antonio Creek Road
- SR-225 (Las Positas Road)
    - from US-101 to Cliff Drive
- Connectors between the above roadways and US-101 ramps
- Roadways connected to a ramp intersection and one intersection next to the ramp

Segments in Ventura County:

- SR-1 (Pacific Coast)
    - from Seacliff to US-101 (east of Solimar Beach Drive)
- Main Street
    - from US-101 (west of SR-33) to Telephone Road
- E Thompson Boulevard
    - from N Ventura Avenue to E Main Street/Telegraph Road
- Harbor Boulevard
    - from S California Street to S Seaward Avenue
- Frontage Road
    - from S Victoria Avenue to Johnson Drive
- SR-33 (Ojai Freeway)
    - from US-101/N Olive Street to Canada Larga Road
- SR-126
    - from US-101 to S Kimball Road
- SR-1 (Pacific Coast Highway – N Oxnard Boulevard)
    - from US-101/N Ventura Road to W Wooley Road
- SR-232 (E Vineyard Ave)
    - from SR-1 to SR-118
- Connectors between the above roadways and US-101 ramps
- Roadways connected to a ramp intersection and one intersection next to the ramp such as N Rice Avenue/Santa Clara Avenue, N Rose Avenue, etc.

TransModeler was used for hybrid simulation modeling. TransModeler is the only commercial software package in the market that can do hybrid modeling. Both microscopic and mesoscopic portions reside in the same model and results are generated from the same run.

Based on the two existing travel demand models and jurisdiction differences between the areas in Santa Barbara County and Ventura County, two hybrid simulation models were developed to model US-101 corridor: (1) US-101 Hybrid Simulation Model in Santa Barbara, and (2) US-101 Hybrid Simulation Model in Ventura. These two models were separated near the county line where there is only one link in the models. A consistency check was made during calibration to make sure that the two models are consistent.

As shown in **Figure 2**, the travel demand models were updated to the existing conditions (2008) in TransCAD. Next, the US-101 corridor study area was selected and saved as the base network for the interface models: the US-101 corridor subarea in Santa Barbara County from the SBCAG model and the US-101 corridor in Ventura County from the VCTC model. Each subarea network in the interface models was then refined in terms of roadways, zones, and intersections closely matching the level of detail necessary for simulation modeling. Along with the interface model networks, O-D trip tables matching the interface networks were extracted from the regional travel demand models. The extracted subarea O-D trip tables were then updated to more closely match observed counts. These interface models are the final product of the extraction and refinement process; as their name suggests, they serve as the interface between the travel demand models and the simulations model, functionally bridging the gap such that the simulation models can seamlessly use the forecasted travel demands from the travel demand models. Subsequently, the interface models were further refined for the purpose of simulation in TransModeler. These refinements include using temporal count profiles to account for peak spreading and O-D shifting, and adding more roadway details. The final product of this methodology is the base year hybrid simulation model. As the name suggests, the hybrid simulation model is a hybrid or blending of a mesoscopic model and a microscopic model. The methodology's individual processes were described in the Base-year Simulation Model Report.

The basic approach in the development of the hybrid simulation models was to refine the regional travel demand models, extract the interface models, and construct the simulation models. **Figure 3** shows the relationship between a travel demand model and an interface model. Grey lines indicate links in the regional travel demand model; blue lines indicate links in the subarea, which were extracted to become the interface model. The interface model and the simulation model replicate the same geographic areas; that is, the interface networks and the simulation networks share the same boundaries or cordons. A key difference is that the interface model behaves (or model traffic) like the static travel demand model. As such, the interface model is well suited to bridge the gap between the travel demand model and the simulation model.

Figure 4 illustrates the relationship between the interface model and the simulation model. The top part shows the interface model where each link is specified to be either microscopic links (in green) or mesoscopic links (in blue). These links are then imported to TransModeler to become the simulation model. As shown in the bottom part, the simulation model is laid on top of an aerial photo. Network details such as lanes and connectors are then checked to represent the network in more detailed. As shown in the magnified portion, lanes and connectors are well represented in the simulation model.

Figure 2 Development of Base-year Hybrid Simulation Model

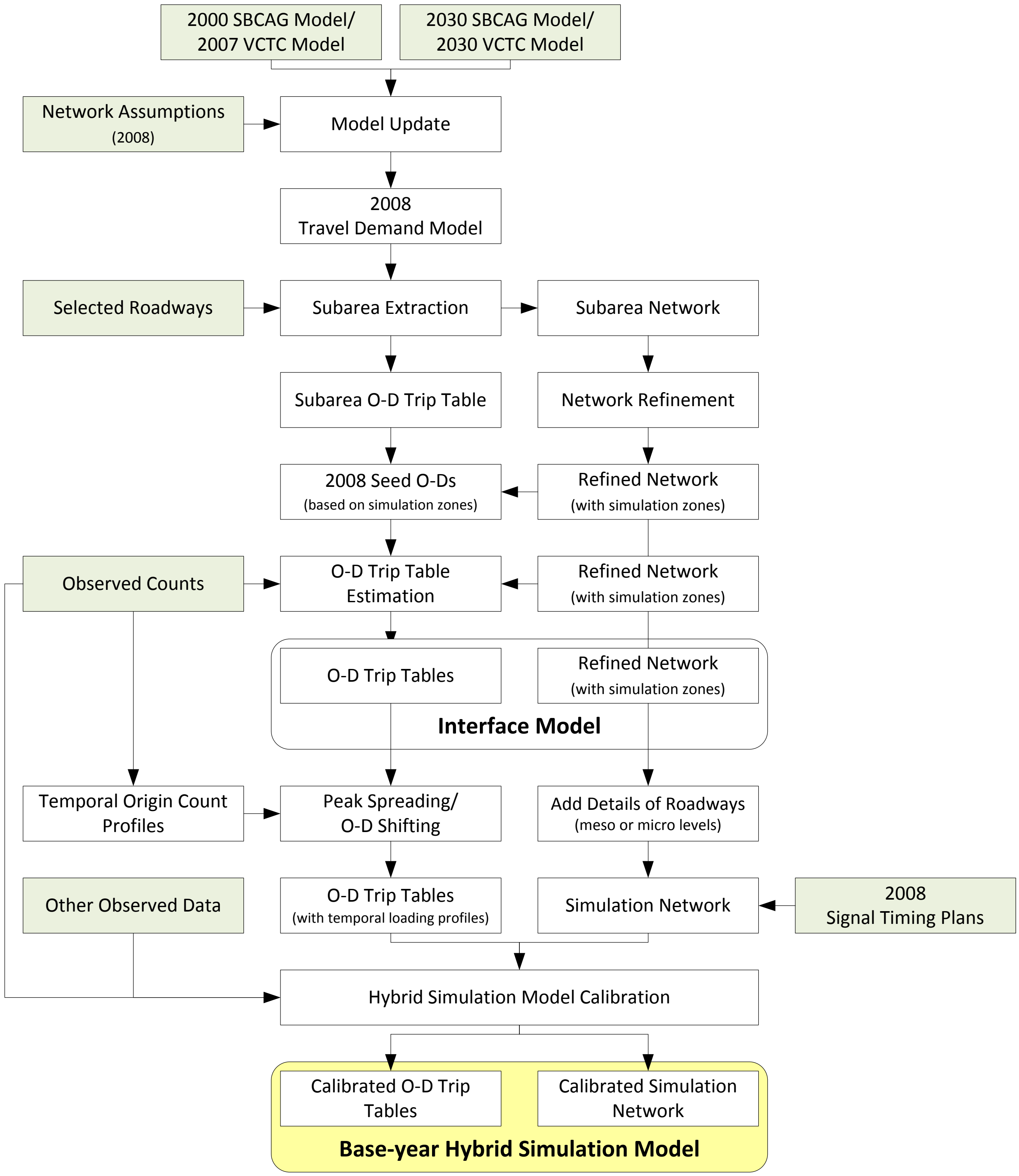
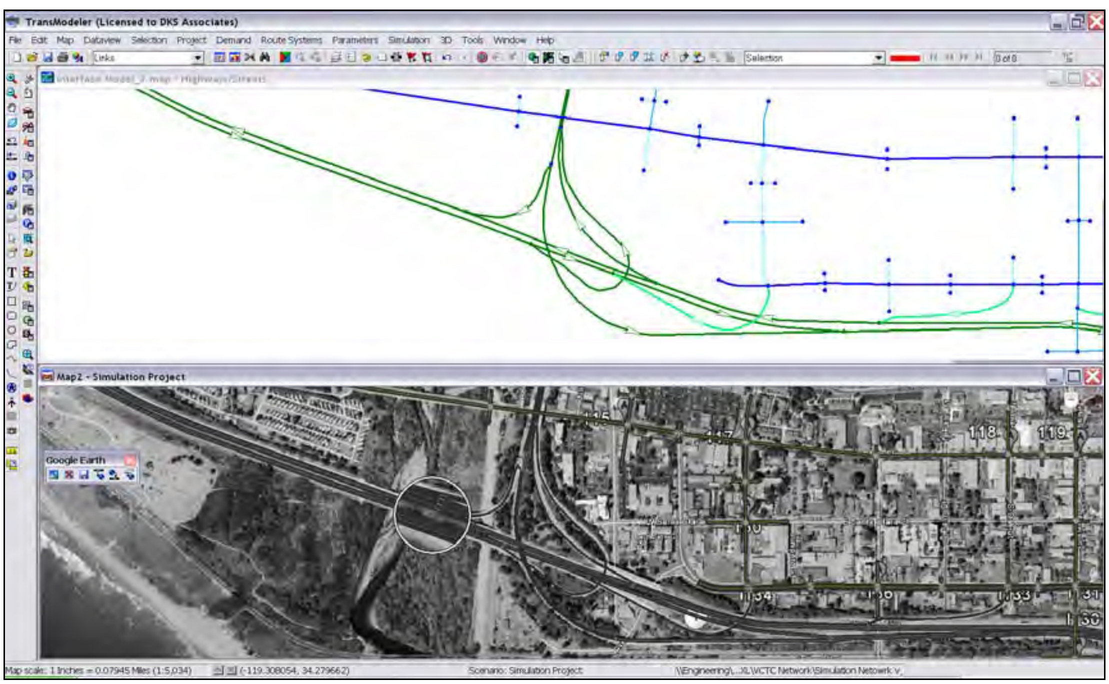


Figure 3 Relationship between Travel Demand Model and Interface Model

Figure 4 Relationship between Interface Model and Hybrid Simulation Model



Difference in Modeling Approach for the US-101 CSMP and the South Coast 101 HOV Study

There are differences between the modeling performed for the US-101 CSMP and that performed for the South Coast 101 HOV Study. The technical analysis for the CSMP is planning level and intended to provide decision makers with a long-range planning tool for future detailed analysis. The South Coast 101 HOV lane project analysis is specific to CEQA and is project specific in nature. Overall data can be shared between each analysis, however the planning level analysis of the CSMP is bigger picture with a corridor wide approach.

The level of calibration and supporting operational analysis and modeling refinement in the South Coast HOV Traffic Study is more rigorous than in the CSMP. The South Coast HOV Traffic Study analysis is a project level study and since it is within the corridor, its findings dictate and supersede over the planning level analysis of the CSMP when there are apparent differences. This planning level analysis looked at a large corridor with limited modeling refinement, where the South Coast HOV Study involved a much more focused and detailed analysis.

A major area of difference between the South Coast 101 HOV Traffic Study and this modeling effort were the projects included in the baseline model. The South Coast 101 HOV Traffic Study assumed all Measure "A" program alternative mode projects. The CSMP analysis did not assume all the projects in the Measure "A" program (such as rail, express bus, and FSP) but rather analyzed those projects as a scenario. It was determined by the TDM/Transit subcommittee that these programs would be tested in the scenario analysis since both Santa Barbara and Ventura counties have different funding sources.

Similarly, both the CSMP and South Coast 101 HOV Study used travel demand forecasts from the SBCAG regional model. Both also used consistent versions of that model for 2000 and 2030 as a starting point for developing project forecasts. Forecasts for the CSMP were developed for 2008, 2013 and 2023 by extrapolating from the SBCAG trip tables for 2000 and 2030. Because of changes in the land use and growth forecasts by SBCAG after the initiation of the CSMP project, the 2030 model output was used to represent 2040 land use and growth conditions. The South Coast101 HOV Traffic Study prepared forecasts for 2020, 2025 and 2040.

The simulation of the corridor was performed in different software packages for the two efforts. The CSMP used TransModeler, which models part of the network with microscopic simulation (freeway lanes and ramps) and part of the corridor with mesoscopic simulation (major parallel and crossing arterials and freeways). The South Coast 101 HOV Traffic Study used FREQ, to simulate mainline traffic.

The area covered by the simulation also differed. The CSMP covered roughly 25 miles in Santa Barbara County and 25 miles in Ventura County in two separate but related models. The South Coast 101 HOV Traffic Study simulated 14.5 miles for 2025 and 27.5 miles for 2020 and 2040 primarily within Santa Barbara County. The CSMP simulation covered the entire AM and PM entire peak period (6:00 to 9:00 AM and 3:00 to 6:00 PM) whereas the SB 101 HOV Study modeled a window of time greater than six hours for each AM and PM peak period.

The CSMP simulation model calibration was based on the same set of raw data used in the SB 101 HOV Study (traffic counts, speeds, truck percentages), but supplemented with some additional data collected by DKS. Additional calibration for the CSMP was also conducted using the ODME function in TransModeler to calibrate the 2008 TransModeler model trip tables to match the ramp counts reasonably closely. The ODME function was used to revise hourly trip tables from origin zones to destination zones.

A final area of difference is that the CSMP only used a long-term forecast (2023) with the HOV lane included as proposed. There was no model run without the HOV lane. The South Coast 101 HOV Traffic Study prepared forecast for 2025 with the HOV and another forecast with the added lane being mixed-flow.

Estimation of Trip Reduction Benefits of Transit and TDM Strategies

Method for Estimating Impacts and Benefits from Transit Services

Passenger Rail Service

The effects of passenger rail service were estimated using an estimate produced as part of the *101 In Motion* study, adjusted to reflect differences between the service tested in the CSMP and that tested in the *101 In Motion* study. Adjustments were made to account for differences in service reliability and fare. Both the *101 In Motion* study and the *Santa Barbara Commuter Rail* study evaluated additional commuter-friendly passenger rail service between Oxnard and Goleta for 2030. The analysis for these reports tested two additional northbound trips in the AM peak commute period and two additional southbound trains in the PM peak commute period servicing the existing Amtrak stations located in Goleta, Santa Barbara, Carpinteria, Venture and Oxnard. For the CSMP the additional commute period service was assumed to be the result of a rescheduling of existing Amtrak service to provide better service in the commute periods with no addition of trains or daily round trips. The additional commute period trips are also assumed to be Amtrak service like that currently serving the corridor and not Metrolink-style commuter rail service as was assumed in the *101 In Motion* study. The schedule tested in the CSMP analysis assumed northbound trains arriving in Santa Barbara at 7:40 AM and 8:45 AM. Southbound trains would leave at 4:35 PM and 5:25 PM. The 2030 ridership forecasts for *101 In Motion* estimated the passenger rail would generate 460 boardings and alightings per average weekday. Based on an estimated average vehicle occupancy rate in the peak commute period of 1.2, ridership forecasts translate to a vehicle trip reduction of 385 northbound trips in the AM peak commute period and 385 southbound trips in the PM peak commute period.

The vehicle-trip reductions in the *101 In Motion* study and *Santa Barbara Commuter Rail* study were estimated based on a passenger rail service like Metrolink. The CSMP US-101 Transit and TDM scenario assumed a modified version of the Amtrak intercity rail service. Project stakeholders suggested that the *101 In Motion* study's vehicle-trip reductions be re-estimated to reflect Amtrak pricing and reliability. Existing analysis shows Amtrak pricing is approximately 15% more than Metrolink pricing for the 10-ride pass and the monthly pass. The *Journal of Public Transportation, Vol 7, No. 2, 2004* suggests a price elasticity of -0.6 to -0.9 over a five- to ten-year period. Assuming the midpoint, a price elasticity of -0.75 would reduce the forecasted vehicle trips by 11.3%. Existing analysis also shows Metrolink trains arrive on-time more frequently than Amtrak trains. A case study in Chicago attributed a ridership increase of 16.7% to improving service reliability. Reduced cost and reliable service were combined to estimate that modified Amtrak service would generate a 285 vehicle-trip reduction (73.9% of what was assumed in the *101-In-Motion* study).

Express and Local Bus Service

The impacts and benefits of transit service in future forecast years were estimated using the SBCAG model for local bus service within Santa Barbara County and for express bus service between Ventura County and Santa Barbara County. Frequencies in the model were first updated to reflect 2009 schedules for transit express (VISTA Coastal Express) and local routes for the baseline forecast year model. Then the 2009 express service frequencies were tripled and 2009 local service was doubled for sensitivity to be included in the CSMP US-101 Transit and TDM scenario. The SBCAG travel demand model showed that an enhanced express and local bus service could reduce 200 vehicle-trips in the AM peak hour and 200 vehicle-trips in the PM peak hour. Existing vehicle counts show that the AM peak period (6:00 AM to 9:00 AM) is 281 percent of the AM peak hour. Existing vehicle counts also show that the PM peak period (4:00 AM to 7:00 AM) is 286 percent of the PM peak hour. Hence, for year “Ten Years after CMIA Opening,” the CSMP US-101 Transit and TDM scenario, vehicle-trip tables were reduced by 562 trips (281 percent x 200) in the AM period and 572 trips (286 percent x 200) in the PM period

The effects of improvements in local bus service in Ventura County were estimated using a baseline forecast of transit trips in the county from the SCAG regional model and a service-frequency elasticity. Table 1 lists the trip reducing forecasting inputs, assumptions and methodology for Ventura County local transit improvements. The number of vehicle trips reduced on US-101 was estimated based on the percentage of local person trips with Ventura County that use the freeway by direction in the peak period.

Table 1 Vehicle Trip Reductions from Ventura County Local Transit Improvements

Ventura County Peak Period Transit Trips[1]	8,419
Ventura County Drive-alone Peak Period Trips[1]	637,141
Local Headway Reduction (Doubling Local Transit Service)	-50%
Out of Vehicle (Wait Time) Elasticity[2]	0.50
Increase in Peak Period Ridership	2,105
Percent of New Transit Riders from Drive-Alones[3]	50%
Drive-alone Peak Period Trip Reductions	1,052
Drive-alone Peak Period Trip Reduction Factor (%)	0.17%
Ventura "Ten Years after Opening" Drive-alone Trips (AM Peak Period)[4]	145,872
Ventura "Ten Years after Opening" Drive-alone Trips (PM Peak Period)[4]	174,941
AM Peak Period Drive-alone Vehicle Trip Reductions	241

PM Peak Period Drive-alone Vehicle Trip Reductions	289

1) Source: SCAG Travel Demand Model, CHAPTER 6 – MODE CHOICE, Table 6-6
2) Source: http://www.vtpi.org/tranelas.pdf (page 10)
3) Source: http://www.ecy.wa.gov/climatechange/2008CATdocs/091808_cat_tran_ghg_analysis.pdf
4) Source: DKS Associates, 2010
5) Factors for freeway use and direction based on simulation model trip patterns

Method for Estimating Impacts and Benefits from TDM Programs

All of the TDM programs evaluated were identified in the *101 In Motion* study for Santa Barbara County and all represented Santa Barbara County-based programs. No Ventura-based programs were evaluated, but all of the Santa Barbara County-based programs will affect commuters from Ventura County to Santa Barbara County and these effects were taken into account. The effects of the *101 In Motion* TDM programs had already been estimated as part of that study and these effects were used directly in the CSMP.

A combination of three TDM strategies was recommended in the *101* In Motion study: ridesharing incentives, individualized marketing, and flexible work schedules. The method used to translate the results from the *101 In Motion* study to the CSMP corridor is described below for each strategy.

Ridesharing Incentives
This strategy reduces trips by offering financial incentives to carpoolers and vanpoolers. As documented in the *101 In Motion Report,* this strategy would reduce 185 peak hour vehicle trips entering the major generators in the AM and 185 peak hour vehicle trips exiting in the PM. As described in the Local and Express Bus section; peak period vehicle trip reductions were calculated based on the existing peak-period to peak-hour percentages. This translates into 520 trips in the AM period and 529 trips in the PM period.

Individualized Marketing
This strategy reduces trips by working with individual commuters to understand current travel behavior and to develop personalized advice on how to use alternative modes, make better chain trips, change timing of trips to avoid congested periods, etc. This strategy also reduces trips by targeted marketing campaigns to build or increase ridership on specific transit improvements. As documented the *101 In Motion* study, this strategy would reduce 150 peak hour vehicle trips entering the employment areas in the AM and 150 peak hour vehicle trips exiting in the PM. Using the peak hour to peak period conversion; this strategy would reduce 422 vehicle trips in the AM peak period and 430 vehicle trips in the PM peak period.

Flexible Work Schedule
This strategy reduces trips by implementation of compressed work weeks (3/36, 4/40, and 9/80), “telecommuting” part-time, and flex-time commuting. Flexible schedules have the benefit of moving peak commute trips to off-peak times and also eliminating commute trips. The *Flex Work Santa Barbara Phase 2 Report* projects that 1,421 commute trips per day will be eliminated from the peak periods for the South 101 analysis. This translates to a vehicle trip reduction of 711 northbound trips in the AM peak period and a vehicle trip reduction of 711 southbound trips in the PM peak period.

The TDM strategies' vehicle trip reductions reported in the *101 In Motion* study are evaluated for 2030. The combined 2030 vehicle trip reductions will be applied to the CSMP US-101 Transit and TDM scenario for the "Ten Years after CMIA Opening" model runs.

Estimation of the Effects of Transit and TDM Strategies on Roadway System Performance

Once the effects of the transit service improvements and TDM programs had been estimated, they were translated into changes in vehicle trips in the simulation model for each county. The simulation model was then run with the modified hourly trip tables to identify the effects of the transit service improvements and TDM programs on roadway system performance. The AM and PM peak period vehicle trip reductions were converted into three one-hour blocks, based on existing vehicle count data. Also, the associated network TAZs were index into one of four districts: CBD, South of CBD, North of CBD, and Other; the same districts used in the *101 In Motion* study**.** The index process provided a method to select specific trips from the trip tables based on district to district (row to column) travel. **Table 1** shows the hourly vehicle trip reductions for each strategy categorized by row (origin) and column (destination) district for each strategy. The vehicle-trip reductions shown in **Table 2** were applied to each hour block using the same algorithm as used in the *101 In Motion* study. Because the trip reduction would be primarily from converting single occupancy drivers to other alternative modes, the vehicle trip reductions were subtracted from the SOV volumes in the model.

Table 2 Vehicle Trip Reductions for the Santa Barbara Microsimulation Model

Strategy	Peak Period	Vehicle-Trip Reductions					
		Total	Hour 1	Hour 2	Hour 3	Row	Column
Passenger Rail Service	AM	285	0	140	145	South	CBD
	PM	285	0	157	128	CBD	South
Local and Express Bus Service	AM	562	155	200	208	All	All
	PM	572	209	200	163	All	All
Ridesharing Incentives	AM	520	143	185	192	South	CBD
	PM	529	193	185	151	CBD	South
Individualized Marketing	AM	422	116	151	155	South	CBD
	PM	430	157	151	122	CBD	South
Flexible Work Schedule	AM	711	196	252	263	South	CBD
	PM	711	196	252	263	CBD	South
Source: DKS Associates, 2010							

Method for Modeling Ramp Metering

To quantify the impact of ramp metering, the future-year baseline (2023) hybrid simulation models were modified by adding a ramp metering feature. As agreed by the Project Coordination Team, a ramp metering system called SATMS (Semi-Actuated Traffic Management System) was used in this study. Unfortunately, a default TransModeler version could not be used to model this specific ramp metering system. A special plug-in was developed by CLR Analytics and Caliper and provided by Caltrans Headquarters to link with the default TransModeler version.

The control logic inside SATMS can be described as a local traffic responsive control operated according to real-time detector data at the upstream of the metered on-ramp. The control logic is based on demand capacity control. Every 30 seconds, SATMS determines an appropriate metering rate. If the freeway is not congested, the metering rate will be adaptively determined. If the freeway is congested, the pre-defined rate will be used. In addition, the queue override control logic was enabled at every metered ramp. If there was a queue at the queue detector, the metering rate that was determined by the SATMS would be overridden by the maximum rate (for example, 900 vph for a one-lane on-ramp that is operated under the one-car per green rule). For more detailed information, please refer to the TransModeler Plug-in User Manual SATMS Ramp Metering Control.

Ramp metering was only modeled if it provided a benefit and did not result in the ramp queue extending beyond the end into the intersection of the ramp and the nearest street. The simulation model was coded with a queue spillback detector that automatically discontinued the metering of the ramp if the queue reached the detector. Metering was not tested at some ramps because it would not affect a bottleneck point and at other ramps because the ramp flow rate was too great to ever allow metering in the peak period without spillback. **Table 3** identifies which ramps were never tested because they would not affect bottlenecks (A), which ramps were beneficial and had adequate capacity for the period (B), which ramps were beneficial but had queue spillback to the ramp intersection during some part of the period (C), and which ramps were not tested because they did not have adequate storage capacity to be effective.

Table 3a Summary of Ramp Metering Limitations in 2023 Simulation – Southbound Santa Barbara County

On-ramps	Post Mile	Period	
		AM Peak	PM Peak
Santa Barbara County			
SB on from Hollister Ave	26.720	A	A
SB on from Storke Rd	24.570	A	A
SB on from Los Carneros Rd	23.450	A	A
SB on from Fairview Ave	22.360	A	A
SB on from SR-217	21.193	A	A
SB on from Patterson Ave	20.850	A	A
SB on from Turn Pike Rd	19.870	A	A
SB on from San Marcos Pass Rd	18.175	A	D
SB on from Las Palmas Dr	17.533	B	B
SB on from Las Positas Rd	16.320	C	D
SB on from W Mission St	15.640	D	C
SB on from W Carrillo St	14.640	C	C
SB on from Castillo St	14.080	B	B
SB on from Garden St	13.357	B	B
SB on from S Milpas St	12.410	A	A
SB on from Olive Mill Rd	10.340	B	A
SB on from S Jameson Ln	9.640	A	A
SB on from Sheffield Dr (Left Ramp)	8.850	A	A
SB on from Wallace Ave/Evans St	7.870	A	A

SB on from N Padaro Ln	7.000	A	A
SB on from Santa Claus Ln/S Padaro Ln	4.700	A	A
SB on from Reynolds Ave	3.480	A	A
SB on from SR-224	2.457	A	A
SB on from Bailard Ave	1.510	A	A
SB on from SR-150	0.480	A	A

A = Not metered because of light traffic on mainline
B = Metered and the queue spillback control is not active
C = Metered and the queue spillback control is active at some points of time
D = Not metered because the existing ramp capacity is not sufficient (or too long queue)

Table 3b Summary of Ramp Metering Limitations in 2023 Simulation – Southbound Ventura County

On-ramps	Post Mile	Period	
		AM Peak	PM Peak
Ventura County			
SB on from Bates Rd	43.421	A	A
SB on from Seacliff (SR-1)	39.044	A	A
SB on from Solimar (SR-1)	32.592	B	B
SB on from SR-33s	30.548	A	D
SB on from E Thompson Blvd/Chestnut St/Harbor Blvd	29.838	C	C
SB on from SB Seaward/WB Harbor	28.643	C	C
SB on from Seaward Ave	28.322	C	D
SB on from Telephone Rd	25.860	D	D
SB on from SB Victoria Ave	24.782	B	D
SB on from NB Victoria Ave	24.509	B	D
SB on from Johnson Dr	23.501	B	D
SB on from Oxnard Blvd	22.323	B	B
SB on from SB Vineyard Ave	22.031	C	B
SB on from NB Vineyard Ave	21.780	C	D
SB on from SB Rose Avenue	21.055	B	B
SB on from NB Rose Ave	20.941	B	B
SB on from Rice Ave	20.032	D	D

A = Not metered because of light traffic on mainline
B = Metered and the queue spillback control is not active
C = Metered and the queue spillback control is active at some points of time
D = Not metered because the existing ramp capacity is not sufficient (or too long queue)

Table 3c Summary of Ramp Metering Limitations in 2023 Simulation – Northbound Ventura County

On-ramps	Post Mile	Period	
		AM Peak	PM Peak
Ventura County			
NB on from NB Rice Ave	20.047	B	C
NB on from SB Rice Ave	20.150	B	B
NB on from NB Rose Ave	20.979	D	C
NB on from SB Rose Ave	21.080	B	C
NB on from NB Vineyard Ave	21.966	C	A
NB on from SB Vineyard Ave	22.179	C	A
NB on from Oxnard Blvd	22.918	D	A
NB on from Johnson Dr / North Bank Dr	23.712	C	A
NB on from Victoria Ave	24.797	C	A
NB on from SR-126W	26.597	A	A
NB on from E Main St	26.925	C	A
NB on from Seaward Ave	28.604	A	A
NB on from S Oak St	30.329	B	A
NB on from SR-33S	30.998	A	A
NB on from W Main St	31.646	A	A
NB on from Seacliff (SR-1)	39.340	B	A

A = Not metered because of light traffic on mainline
B = Metered and the queue spillback control is not active
C = Metered and the queue spillback control is active at some points of time
D = Not metered because the existing ramp capacity is not sufficient (or too long queue)

Table 3d Summary of Ramp Metering Limitations in 2023 Simulation – Northbound Santa Barbara County

On-ramps	Post Mile	Period	
		AM Peak	PM Peak
Santa Barbara County			
NB on from Bates Rd	0.390	B	B
NB on from Rincon Rd (Rte 150)	1.180	B	B
NB on from Bailard Ave	1.810	C	B
NB on from Casitas Pass Rd	2.940	B	B
NB on from Linden Ave/ Ogan Rd	3.040	C	B
NB on from Santa Monica Rd	3.930	B	B
NB on from S Padaro Ln	5.500	B	B
NB on from N Padaro Ln	7.300	B	B
NB on from Ortega Hill Rd/ Evans Ave	8.440	B	B
NB on from N Jameson Ln/ Sheffield Dr	9.110	B	B
NB on from San Ysidro Rd/Eucalyptus Ln	10.150	B	B
NB on from Coast Village Rd/ E Cabrillo Blvd	11.520	B	B
NB on from S Salinas St	12.120	C	B
NB on from S Milpas St	12.865	C	D
NB on from Garden St	13.611	B	D
NB on from Castillo St (SR-225)	14.280	B	C
NB on from W Carrillo St	14.890	C	C
NB on from W Arrellaga St	15.400	B	D
NB on from W Mission St	15.757	D	D
NB on from Calle Real/ Las Positas Rd	16.710	B	D
NB on from S Hope Ave	17.500	B	B
NB on from State St (SR-154)	18.230	A	A
NB on from El Sueno Rd	18.990	A	A
NB on from Turnpike Rd	20.207	A	A
NB on from Patterson Ave	21.261	A	A
NB on from Fairview Ave	22.480	A	A
NB on from Los Carneros Rd	23.900	A	A
NB on from Storke Rd	24.900	A	A
NB on from Calle Real/ Hollister Ave	27.100	A	A

A = Not metered because of light traffic on mainline
B = Metered and the queue spillback control is not active
C = Metered and the queue spillback control is active at some points of time
D = Not metered because the existing ramp capacity is not sufficient (or too long queue)

Modeling the Benefits of Minor Physical Capacity Enhancements to Improve Roadway Flow and Throughput

A set of minor physical capacity enhancements was modeled using the hybrid simulation model. The enhancements were added to the baseline simulation network for 2023. The minor physical enhancements tested in this improvement scenario were for projects that are not already programmed and that could directly affect the operation of US-101. These plans are the combination of suggestions from US-101 CSMP Traffic Operations Subcommittee (which includes Caltrans District 5, Caltrans District 7, SBCAG, and VCTC) and from DKS and are based on results of the baseline simulation models. The improvements that were tested are identified below.

Santa Barbara

US-101 Northbound

- SB-NB-2: Add an auxiliary lane from W Arrellaga Street on-ramp to W Mission Street off-ramp
- SB-NB-3: Add an auxiliary lane from Las Positas Road/Calle Real on-ramp to S Hope Avenue off-ramp
- SB-NB-4: Add an auxiliary lane from Fairview Avenue on-ramp to Los Carneros Road off-ramp
- SB-NB-5: Add an auxiliary lane from Los Carneros Road on-ramp to Storke Road off-ramp

US-101 Southbound

- SB-SB-1: Add an auxiliary lane from Las Palmas Drive on-ramp to Las Positas Road off-ramp
- SB-SB-2: Add an auxiliary lane from Las Positas Road on-ramp to W Mission Street off-ramp

Arterials

- SB-SB-5: Expand State Street/Hollister Avenue from San Marcos Pass Road to Turnpike Road to be 4 lanes all the way

Ventura County

US-101 Northbound

- VEN-NB-1: Add an auxiliary lane from SB Rose Avenue on-ramp to Vineyard Avenue off-ramp
- VEN-NB-2: Add a lane from the lane-drop at Johnson Drive to Victoria Avenue off-ramp
- VEN-NB-3: Extend the acceleration lane from Main Street on-ramp

US-101 Southbound

- VEN-SB-1: Add an auxiliary lane from Seaward Avenue on-ramp to SR-126 off-ramp

- VEN-SB-2: Add a lane from SB Victoria Avenue on-ramp to Auto Center Drive/Johnson Drive off-ramp
- VEN-SB-3: Add a lane from the lane-drop at Vineyard Avenue to Rose Avenue off-ramp

APPENDIX B
US-101 CSMP Charter

Charter for Development and Implementation of Corridor System Management Plan US 101 from Winchester Canyon in Santa Barbara County to Rice Avenue in Ventura County

This Charter is between the California Department of Transportation, Districts 5 and District 7 (hereinafter, Districts), Ventura County Transportation Commission (VCTC) &, Santa Barbara County Association of Governments (SBCAG). This Charter is intended to act solely as a guide to the respective obligations, intentions and policies of the partners and Districts to use in new development for US 101 between Winchester Canyon and Rice Avenue. This Charter addresses the principles and practices, system management process, roles and responsibilities and commitment of the responsible partners. This Charter is not designed to authorize funding for the project effort, nor is it a legally binding contract. It is the intent of this Charter to establish a mutual cooperative effort between Districts and partners for the improvement of US 101.

Purpose

The purpose of this charter is to document the commitment of Caltrans (Districts 5 and 7), to cooperate in the development and implementation of a Corridor System Management Plan (CSMP) covering the US 101 corridor in southern Santa Barbara and northern Ventura Counties.

This charter will also document the intent to involve all transportation partners, including jurisdictional authorities, to offer support and assistance in both developing and implementing this CSMP.

This charter formalizes the commitment by all of the transportation partners to the concept for joint development and ongoing implementation of the CSMP for corridor management and performance measurement. Initial efforts will include but not be limited to scoping the effort and developing a workplan. Continued outreach and involvement of local agencies, modal operators and other stakeholders is the intent of this Charter.

Main Objective

The main objective of the CSMP is to manage the corridor using the established principles and practices of system and corridor management, and performance measurement for sustained corridor performance. The plan will be used as an integral tool for managing the corridor and expediting the delivery of projects to achieve the highest mobility benefits, across all jurisdictions and modes, for both regional and interregional travelers.

CSMP Products

The CSMP will assess the corridor's current performance and identify congestion causes by testing alternative improvement scenarios. It will then propose the best options for the following: improvements, strategies and actions to restore throughput, travel times, reliability, safety and corridor preservation. The CSMP will be developed using existing data, studies and plans as appropriate.

Collaboration
Developing a CSMP is complementary to, and consistent with, federal provisions for a continuing, cooperative and comprehensive planning process among transportation partners. This effort supports federal congestion management system (CMS) requirements for Transportation Management Areas (TMAs) as well as provisions for the state congestion management program (CSMP) and SAFETEA-LU. These both support increased emphasis on system and corridor management, and performance measurement, in both metropolitan transportation plans and real-time traveler information.

Roles and Responsibilities
It is understood that all transportation partners, and other key stakeholders, will meet regularly, including technical advisory committee meetings, to address the following activities and decisions:

- Agreement to a work plan, timeline, and roles and responsibilities for developing the CSMP and identification of resources needed
- Review draft products to include initial performance assessments and technical documents
- Coordinate corridor planning and evaluation efforts, and share information relating to corridor performance measurement and improvement
- Identify opportunities for heightening the awareness and understanding of the mobility benefits of system and corridor management by the public, local agencies and other jurisdictional authorities

Commitment
In signing this charter, SBCAG, VCTC and Districts agree in concept to the development and implementation of a Corridor System Management Plan (CSMP) covering the US 101 corridor in northern Ventura and southern Santa Barbara Counties.

In addition, the transportation partners will seek to involve local agencies and jurisdictional authorities for support and assistance in both developing and implementing the CSMP.

All parties agree that the department, regional agencies, local jurisdictional authorities and modal operators are all partners in developing an effective CSMP to guide corridor management for the highest productivity, reliability, safety and preservation based on performance assessment and measurement. The plan shall be developed such that improvement needs and projects identified in the CSMP to restore and improve corridor productivity will be eligible candidates for all categories of federal, state, regional and local funding as applicable.

All parties also agree that this corridor's productivity can only be restored and improved through a collaborative planning and management effort of all the transportation partners. They also acknowledge that restoring the corridor's productivity is vital to the state, regional and local economies, and quality of life and safety for all travelers. Community support is critical to the successful implementation of the plan and the partners agree to involve the public and other stakeholders in the development of the CMSP as appropriate.

Approved:

Douglas R. Failing, District 7 Director
California Department of Transportation

Richard L. Krumholz, District 5 Director
California Department of Transportation

Jim Kemp, Executive Director
Santa Barbara County Association of Governments

Darren Kettle, Executive Director
Ventura County Transportation Commission

APPENDIX C
Stakeholder Participants

Stakeholder Participants

First Name	Last Name	Organization
David	Lively	California Department of Transportation
Pat	Weston	Caltrans Headquarters DOTP
John	Wolf	Caltrans Headquarters Traffic Operations
Kelly	Egan	Caltrans Headquarters DOTP
Steve	Hague	Caltrans Headquarters Traffic Operations
Al	Arana	Caltrans Headquarters DOTP
Nancy	Knofler	Caltrans Headquarters Traffic Operations
Aaron	Cabaccang	Caltrans Headquarters DOTP
Diane	Jacobs	Caltrans Headquarters Transportation System Information
Elhami	Nasr	Caltrans District 7 Planning
Shefa	Bhuiyan	Caltrans District 7 Planning
Melissa	Joshi	Caltrans District 7 Planning
Rick	Holland	Caltrans District 7 Planning
Chuma	Obiora	Caltrans District 7 Planning
Jim	McCarthy	Caltrans District 7 Planning
Wilford	Melton	Caltrans District 7 Planning
Rebecca	Sanchez	Caltrans District 7 Planning
Marco	Ruano	Caltrans District 7 Operations
Afsaneh	Razavi	Caltrans District 7 Operations
Kirk	Patel	Caltrans District 7 Operations
Ashraf	Hanna	Caltrans District 7 Office of Freeway Operations
Richard	Khaw	Caltrans District 7 Operations
Allen	Chen	Caltrans District 7 Operations
Linda	Wright	Caltrans District 7
Ravi	Ghate	Caltrans District 7
Dale	Benson	Caltrans District 7
Jeff	Aragaki	Caltrans District 7

First Name	Last Name	Organization
Jonathan	Osborn	Caltrans District 7
Behdad	Sepjani	Caltrans District 7 Operations
Jennifer	Piecul	Caltrans District 7 Operations
Claudia	Espino	Caltrans District 5 Planning and Programming Division
Larry	Newland	Caltrans District 5 Planning and Programming Division
Aileen	Loe	Caltrans District 5 Planning and Local Assistance Division
Brandy	Rider	Caltrans District 5 Planning and Local Assistance Division
Scott	Eades	Caltrans District 5
Jeff	Berkman	Caltrans District 5
Darryle	Murphy	Caltrans District 5
Pat	Mickelson	Caltrans District 5
Melissa	Streder	Caltrans District 5
Samia	Maximous	Ventura County Transp. Comm.
Steve	DeGeorge	Ventura County Transp. Comm.
Ed	Webster	Ventura County Transp. Comm.
Vic	Kamhi	Ventura County Transp. Comm.
William	Yim	Santa Barbara County Association of Governments
Mike	Powers	Santa Barbara County Association of Governments
Gregg	Hart	Santa Barbara County Association of Governments
Fred	Luna	Santa Barbara County Association of Governments
Jim	Kemp	Santa Barbara County Association of Governments
Steve	Vandenburgh	Santa Barbara County Association of Governments
Scott	Spaulding	Santa Barbara County Association of Governments
Kent	Epperson	Santa Barbara County Association of Governments
Chandra	Chandrashaker	City of Ventura
Jason	Samonte	City of Oxnard
Jay	Spurgin	City of Thousand Oaks
Ken	High	Breakers Way Property Owners Association

First Name	Last Name	Organization
Doug	Otto	Breakers Way Property Owners Association
Mike	Bell	Community of La Conchita
Philip	Law	SCAG
Debra	Varnado	Ventura Council of Governments
Joanna	Capelle	Metrolink (SCRRA)
Alex	Herrera	City of Ventura
Nancy	Francis	County of Ventura
Nazir	Lalani	County of Ventura
Dale	Lipp	City of Carpinteria
Steve	Wagner	City of Goleta
Scott	McGolpin	County of Santa Barbara
John	McInnes	County of Santa Barbara
Matt	Dobberteen	County of Santa Barbara
Steve	Mass	Santa Barbara MTD
Sherrie	Fisher	Santa Barbara MTD
Steve	Brown	Gold Coast Transit
Chuck	McQuary	Gold Coast Transit
Helene	Buchman	Gold Coast Transit
Roc	Pulido	Camarillo Transit
Martin	Erickson	Oxnard Harbors and Beaches Dial A Ride
Roy	Myers	Thousand Oaks Transit
George	Amoon	City of Goleta
Tom	Fox	City of Camarillo
Thang	Tran	City of Camarillo
Paul	Casey	
Rob	Dayton	City of Santa Barbara
Jason	Samonte	City of Oxanrd
Bill	Dvorak	Kimley Horn and Associates

First Name	Last Name	Organization
Alyssa	Phaneuf	Kimley Horn and Associates
Judy	Willens	Ventura County APCD
Tom	Mericle	City of Ventura

APPENDIX D
Programmed Projects

*Note: the programmed projects listed in this appendix do not include all Measure “A” programmed projects.

Santa Barbara County Programmed Projects, US-101 Corridor

Project ID	Project Name	Description	Year of Imp	Funding Source	RTIP	Report/Study
US 101						
SBB-VEN-1	Add Carpool lane (Mobil Pier Road to Casitas Pass)	Add HOV lane on US 101 from Mobile Pier Road to Casitas Pass Rd	2011	2006 Bond, 2009 FTIP		SBCAG RTP
SBB-1	US 101 Widening (Milpas to Hotsprings)	Add 1 Mixed Flow lane (SB Milpas to Cabrillo; NB Salinas to Milpas)	2011	Measure D, 2009 FTIP, 2008 RTIP; STIP Augmentation	X	SBCAG RTIP
SBB-2	Milpas Ave Offramp	Add new Milpas Ave SB loop off-ramp	2011	Measure D, 2009 FTIP, 2008 RTIP; STIP Augmentation	X	SBCAG RTIP
SBB-3	Auxiliary Lane Construction	Add NB Aux-Lane from Cabrillo to Salinas	2011	Measure D, 2009 FTIP, 2008 RTIP; STIP Augmentation	X	SBCAG RTIP
SBB-4	Cabrillo Avenue Southbound onramp	Close Cabrillo Southbound onramp permanently	2010	Measure D, 2009 FTIP, 2008 RTIP; STIP Augmentation	X	SBCAG RTIP
SBB-5	US 101 Carillo NB ramp	Widen Ramp to two lanes - tapering to one before merge, Install ramp metering	2009	2008 RTIP, 2009 FTIP	X	SBCAG RTP
SBB-6	US 101 Linden & Casitas Pass Interchange	Reconstruct Linden Ave & Casitas Pass Interchanges and extend Via Real to connect between Bailard and Linden	2013	2008 RTIP, 2009 FTIP, 2006 STIP	X	SBCAG RTIP
SBB-7	US 101/ Hollister Avenue Interchange	Relocate Interchange and overhead to align with Cathedral Oaks Road	2012	2008 RTIP, SHOPP, HBRR, STIP, 2009 FTIP	X	SBCAG RTIP
Arterial						
SBB-8	Local Road Improvements and Interchange Modifications	Road improvements and interchange modifications at Ekwill and Folwer Roads to provide alternative east/west route to improve operation of Hollister.	2011	2009 FTIP, 2008 RTIP; STIP	X	SBCAG RTIP
SBB-9	Cacique St Undercrossing	Construct Cacique Street undercrossing	2011	Measure D, 2009 FTIP, 2008 RTIP; STIP Augmentation	X	SBCAG RTIP
SBB-10	Bridge Replacement at Milpas Street	Replace bridge on US 101 at Milpas Street	2011	Measure D, 2009 FTIP, 2008 RTIP; STIP Augmentation	X	SBCAG RTIP
SBB-11	Cabrillo/Hot Springs Interchange Reconstruction	Reconstruct Cabrillo/Hot Springs Interchange	2011	Measure D, 2009 FTIP, 2008 RTIP; STIP Augmentation	X	SBCAG RTIP
SBB-12	Construct Roundabout	Construct Roundabout: Hot Springs/Old Coast Highway/Coast Village Rd	2011	Measure D, 2009 FTIP, 2008 RTIP; STIP Augmentation	X	SBCAG RTIP
SBB-13	Ellwood Freeway Crossing	Construct bridge over US 101 with termini at Hollister and Calle Real. Add Class 2 Bike Lanes and sidewalk.	2012	2008 RTIP, SHOPP, HBRR, STIP, 2009 FTIP	X	SBCAG RTIP

Project ID	Project Name	Description	Year of Imp	Funding Source	RTIP	Report/Study
Other Highways						
SBB-14	Arroyo Parida Creek Bridge	Replace Bridge on State Route 192 near Capinteria and increase sight distance by raising slope of road approaching bridge	2010	SHOPP		
SBB-15	SR 192 Improvements	Widen shoulder and drainage maintenance on SR 192 from Alamar Ave. to Mission Canyon Rd	2008	SHOPP	X	SBCAG RTP
SBB-16	SR 225/ Las Positas & Cliff Dr. Intersection Improvements	Improvements at SR 225/ Las Positas & Cliff Dr. Intersection to improve capacity	2012	2004 STIP, RIP, 2009 FTIP, 2008 RTIP	X	SBCAG RTIP
SBB-17	SR 154 Improvements	Construct e/bound scenic turnout at PM28.4, Construct e/bound left turn lane and w/bound right turn lane on SR 154 into Vista Point, PM21.6 Construct w/bound right turn lane from SR 154 to Paradise Rd. PM 8.3-10 Construct w/bound passing lane between Santa Ynez River Bridge & SR154/ SR246 junction, PM8.1 Extend left turn lane from SR 154 to SR 246	2009	Measure D	X	SBCAG RTP
ST/RDS						
SBB-18	Operational Improvements	Operational Improvements on Evans Ave and Ortega Hill Rd. (Lille-Coville) to improve downtown circulation	2007	1998 RTIP, 1996 STIP, Amend. 96S-31, 2007 FTIP, 2009 FTIP	X	
SBB-19	Reconstruct El Colegio	Reconstruct El Colegio to enhance capacity from Camino Corto to UCSB West Gate	2008	UCSB contribution, 1990 LRDP contributions		
SBB-20	A)101 On Ramp to Evans B) Covile to Greenwell and Greenwell to on-ramp.	Improves downtown circulation, facilitates multimodal transportation, and delineates bike lanes and parking.	2009	Measure D, STIP, RSTP, Transportation Impact Mitigation Fees, 2008 RTIP	X	
Transit						
SBB-21	UPRR Improvements	Create New Double Track/Sidings in Santa Barbara and Ventura Co.	2013	2008 STIP, 2009 FTIP	X	SBCAG RTP
SBB-22	UPRR Improvements	Improve Sidings in Santa Barbara County	2013	2008 STIP, 2009 FTIP	X	
SBB-23	Goleta Rail Station Improvements	Countywide Improvements to reduce congestion, improve safety and operations	2011	2007 STIP, 2009 FTIP; CMIA	X	SBCAG RTP
SBB-24	Rail Improvements	Add rail capacity/tracks	2010	Federal earmark, 2009 FTIP		
SBB-25	Commuter transit service from Ventura County to South Coast Subregion	Increase commuter bus transit service from Ventura County to South Coast Subregion in Santa Barbara County	2010	Measure D		SBCAG RTP
ITS/TDM						
SBB-26	Implement 511 Travelers Information Hotline	Provides information regarding traffic and weather conditions, train schedules, other assistance countywide	2020	Measure D, Central Coast ITS, SAFE		SBCAG RTP
SBB-27	101/154 (north and south) CMS	Install CMS; Operational Improvements; Traffic Surveillance	2008	2008 RTIP	X	Central Coast ITS Strategic Plan

Project ID	Project Name	Description	Year of Imp	Funding Source	RTIP	Report/Study
SBB-28	Operational Service Improvements on 101-Ventura County Line to Garden St-Part A	PM 0 to 13.5- Install TMS field elements VCL to Garden St. (microwave vehicle detection system in cunjuction with vehicle sensor nodes and CCTV)	2010	SHOPP, 2009 FTIP		Central Coast ITS Strategic Plan
SBB-29	Opeartional Service Improvements on 101-Ventura County Line to Garden St-Part B	PM 13.5 to 27.5- Install TMS field elemnets Garden St to Winchester Canyon (microwave vehicle detection system in conjunction with vehicle sensor nodes and CCTV)	2010	SHOPP		Central Coast ITS Strategic Plan
SBB-30	South Coast ITS improvements on Hwy 101	South coast ITS improvements on hwy 101 for traffic monitoring and traveler information	2007/2008	Federal earmark, 2009 FTIP		
Ped/Bikes						
SBB-31	Hollister Corridor Circulation Improvement	Landscaped raised medians along Hollister Corridor in Goleta (in Old Town area), and left turn channelization	2010	Local Measure D, STIP, Developer Impact Fees, RDA, FTIP		SBCAG RTP
SBB-32	Pedestrian Walkway Construction: Loma Alta between Canon Paridido and Coronel Place	Construction of pedestrian walkway on Loma Alta between Canon Peridio and Coronel Place	2009	STIP 2004, 2009 FTIP, 2008 RTIP		
SBB-33	Construct Class I Bike Path	Construct Class I Bike path connecting western Carpinteria Avenue to Santa Claus Lane	2010	2006 STIP, 1999 RTIP adjust, RSTP local, 2004 FTIP	X	
SBB-34	Carpinteria Bluffs Trail	Construct trail south of Carpinteria Ave. from Carpinteria City Hall to US 101 Interchange	2009	2004 FTIP, 2009 FTIP, STIP-TE	X	SBCAG RTIP
SBB-35	San Jose Creek Bikeway	Construct class I bike path from north of Calle Real to Hollister	2011	2009 FTIP, RSTP	X	SBCAG RTIP
SBB-36	San Jose Creek Bikeway	Construct class I bike path from Hollister to the Atascadero Creek bikeway	2011	TCSP at $234,358 (2006/07), STIP-TE at $200,000 (2009/10), and RSTP at $23,000 (2004/05)	X	
SBB-37	San Jose Creek Bikeway	Contruct class I bike path from Cathedral Oaks to south end Merida Drive	2011	STP		
SBB-38	Construct Class I Bike Path	Construct Class I bike path along San Pedro Creek to create access between Fowler and Atascadero	2008/09	CREF		
SBB-39	Pershing Park Multi-purpose pathway Location	Los Banos Municipal Pool/Cabrillo Bikeway to Santa Barbara City College Bluffs bike path: Construct Class I bike path, lower Westside Commuter Path	2007	TSM, STIP-TE, 2004 FTIP, 2009 FTIP	X	SBCAG RTIP
SBB-40	Mission St. Bike Improvements	Widen Mission St. bikeway, widen Mission St, install bike lanes under Hwy 101	2009	CMP, STIP-TE, 2004 FTIP, 2009 FTIP, STIP, RSTP	X	SBCAG RTIP
SBB-41	Cliff Dr- San Andreas Pedestrian Walkway	Construct Cliff Dr- San Andreas pedestrian walkway	2011	2006 STIP, TE, 2009 FTIP	X	SBCAG RTIP
SBB-42	Safe Routes to School Program	Increase pedestrian and bicycle safety near the schools within the South Coast Subregion		Measure A, state and federal taxes		Measure A Project List
SBB-43	Construct Bike/Pedestrian Facilities	Construct Bike/Ped tunnel at Cabrillo underpass	2011	Measure D, 2009 FTIP, 2008 RTIP; STIP Augmentation	X	SBCAG RTIP

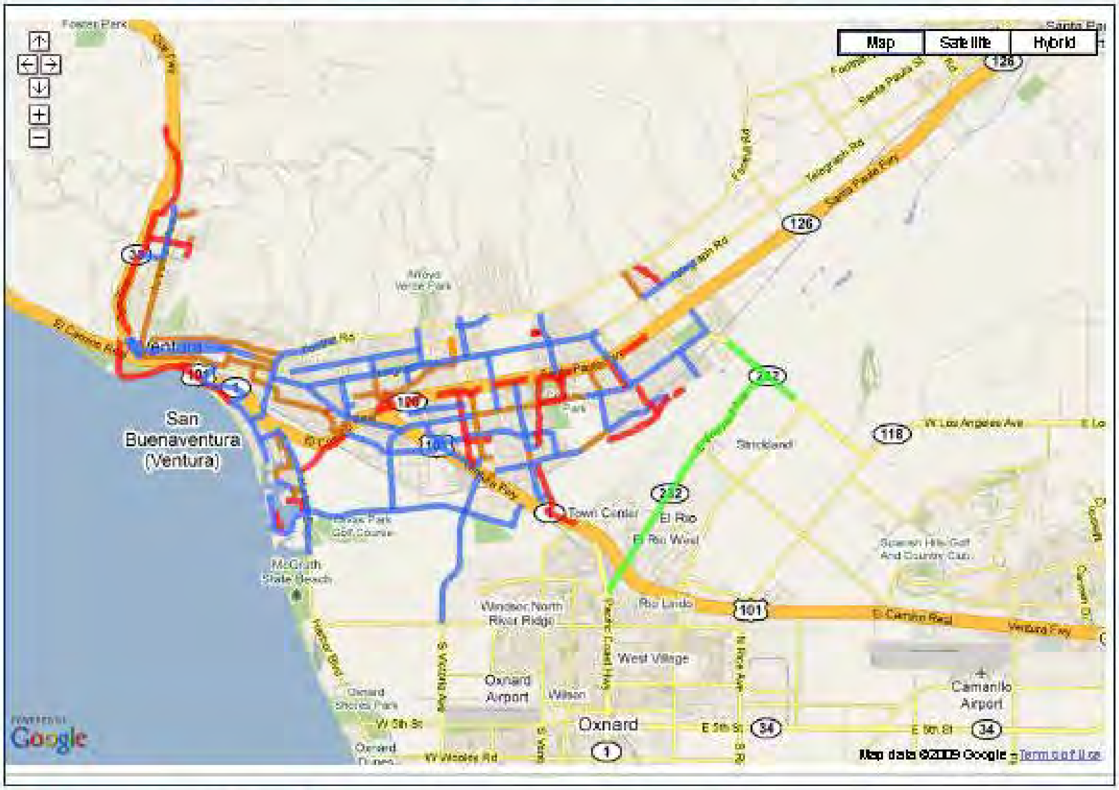
Ventura County Programmed Projects, US-101 Corridor

Project ID	Project Name	Description	Year of Imp	Funding Source	RTIP	Report/Study
US 101						
SBB-VEN-1	HOV Lane addition near La Conchita	From Mobil Pier Rd to Santa Barbara County Line add HOV lanes in each direction plus ITS features; extend acceleration and deceleration lanes and close 3 median openings; add pedestrian undercrossing in La Conchita	2014	Corridor Mobility, State Cash - IIP	X	2008 RTIP
VEN-1	Rice Ave/ US 101 Interchange Reconfiguration	Reconfigure Interchange at Oxnard and Rice Ave	2009	SAFETEA-LU, TEA 21, STP Local, Regional, City Funds, Trade Corridor Program	X	2008 RTIP
VEN-2	Reconfigure California St Offramp	Reconfigure NB California St offramp to terminate at Oaks St instead of the current California St location	2010	Traffic Congestion Relief	X	2008 RTIP
Arterial						
VEN-3	Rose Ave/Central Ave Intersection Improvements	Add new through right-turn lane in both directions on Rose; add new left-turn lane on Rose SB; lengthen existing turn lane on Rose NB	2009	STP LOCAL- Regional, County	X	2008 RTIP
Transit						
VEN-4	Regional Rideshare Program	Implement Regional Rideshare Program	2013	CMAQ	X	2008 RTIP
Ped/Bikes						
VEN-5	East Ventura Blvd Enhancement	Landscape enhancement, pedestrian and bicycle facilities on E. Ventura Blvd from Nyland Ave to Almond Dr	2010	STP- Regional, City Funds	X	2008 RTIP
VEN-9	Rail Grade Separation	In Oxnard at Rice Ave railroad grade separation	2013	City Funds	X	2008 RTIP
VEN-10	Oxnard Blvd/Rose Ave Bicycle and Pedestrian Facilities	Oxnard Blvd 5th St Oxnard Blvd/Rose Ave construct new bicycle and pedestrian facilities	2010	CMAQ, City Funds	X	2008 RTIP
VEN-6	California St Pedestrian Bridge	Pedestrian enhancements of California St. Bridge over US 101	2010	CMAQ, City Funds	X	2008 RTIP
VEN-11	Route 126 Bike Path	Phase 2 bike path (Class I) crossing the Harmon Barranca	2010	CMAQ, City Funds	X	2008 RTIP
TDM						
VEN-7	Signal Synchronization	Citywide signal synchronization at various locations	2010	CMAQ, City Funds	X	2008 RTIP
VEN-8	Expand Traffic Signal Coordination	Expand Traffic Signal Coordination System	2009	STP Local- Regional, City Funds	X	2008 RTIP

APPENDIX E
Bicycle Facilities

Ventura Bike Map

Ventura | Thousand Oaks | Oxnard | Simi Valley | Camarillo | Moorpark



Class 1: Bike Path or Trail
A separate right-of-way for bicycles, often fenced and found along flood control channels and the beach.

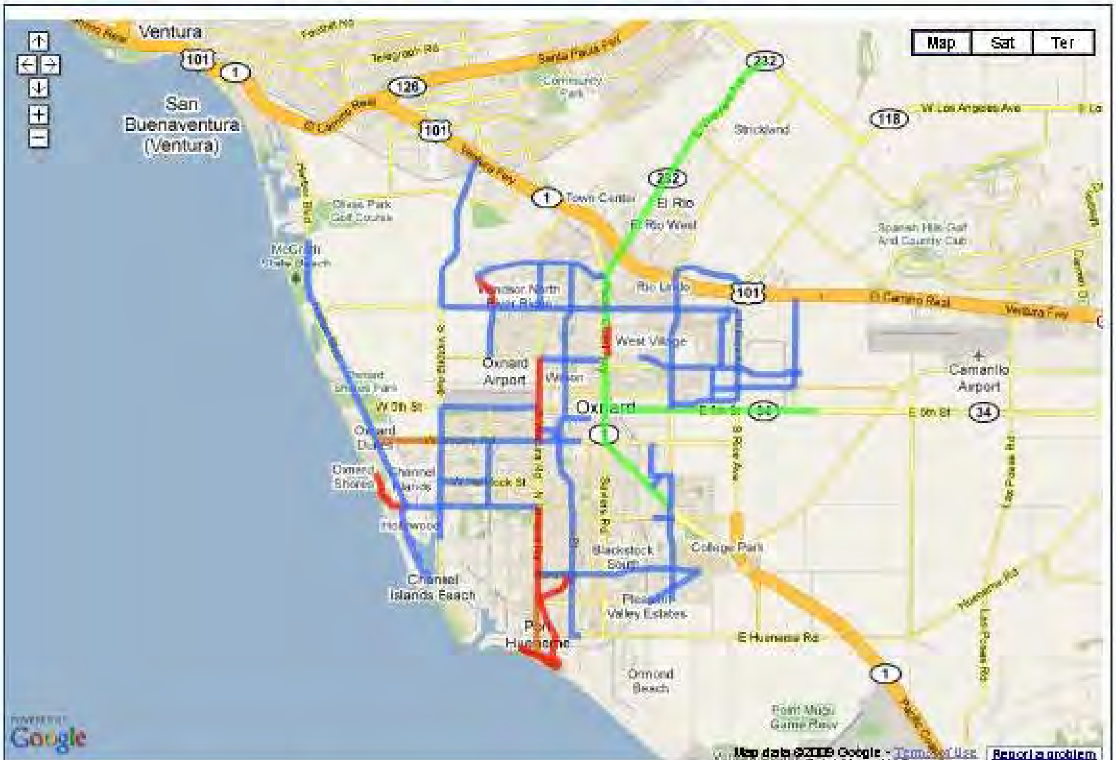
Class 2: Bike Lane
A restricted right-of-way, most ofted designated by a painted line and signs on the road.

Class 3: Bike Route
A travel lane shared by bicycles and motor vehicles designated by signs only.

Unsigned State Routes
Bicycles permitted

Oxnard Bike Map

Ventura | Thousand Oaks | Oxnard | Simi Valley | Camarillo | Moorpark



View Larger Map

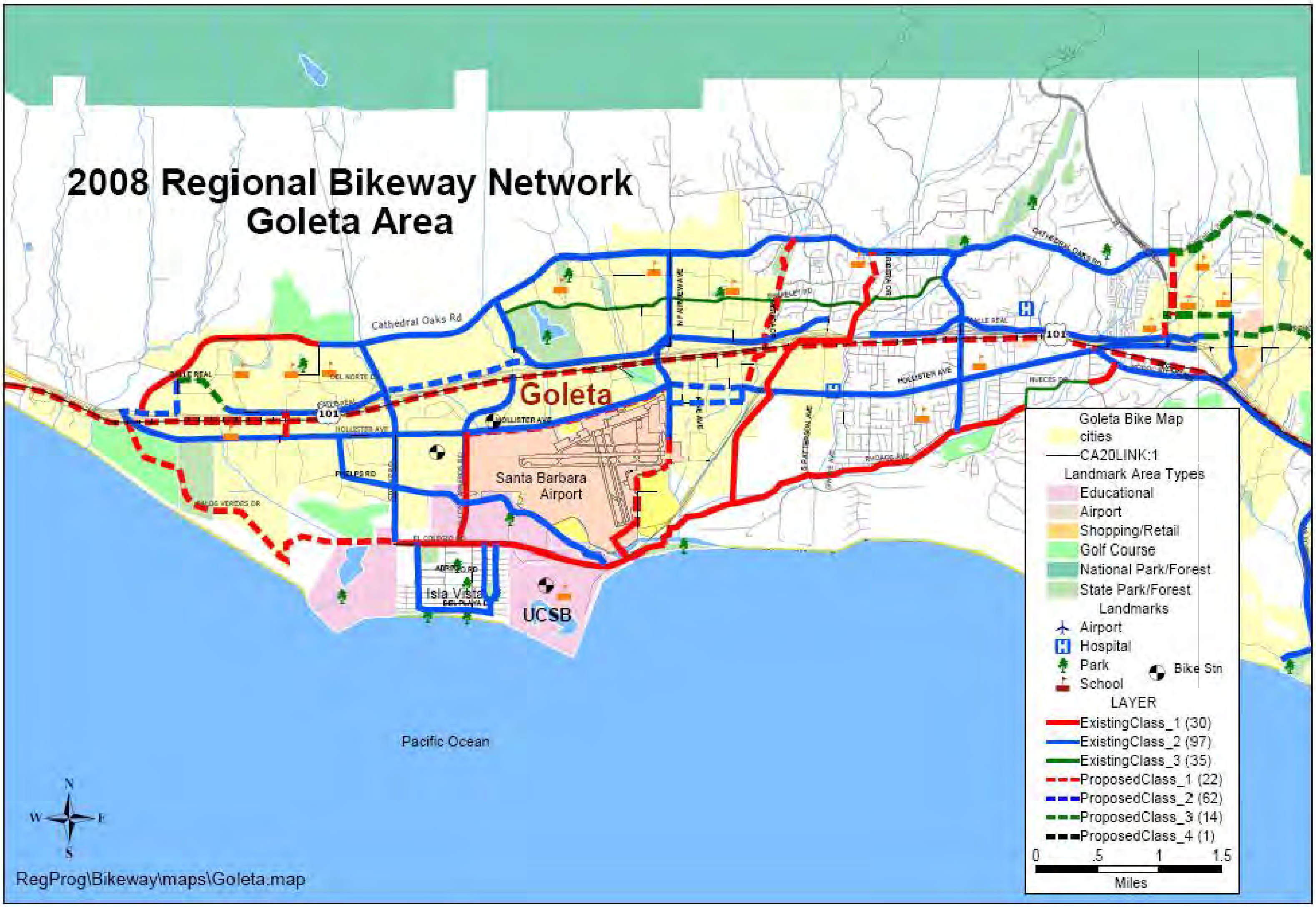
Class 1: Bike Path or Trail
A separate right-of-way for bicycles, often ferced and found along flood control channels and the beach.

Class 2: Bike Lane
A restricted right-of-way, most ofted designated by a painted line and signs on the road.

Class 3: Bike Route
A travel lane shared by bicycles and motor vehicles designated by signs only.

Unsigned State Routes
Bicycles permitted


2008 Regional Bikeway Network
Santa Barbara Area
Santa Barbara Bike Map
Landmark Area Types
Educational
Airport
Shopping/Retail
Golf Course
National Park/Forest
State Park/Forest
Landmarks
Airport
Hospital
Park
School
Bike Stn
Biz Center
LAYER
ExistingClass_1 (30)
ExistingClass_2 (97)
ExistingClass_3 (35)
ProposedClass_1 (22)
ProposedClass_2 (62)
ProposedClass_3 (14)
ProposedClass_4 (1)
Miles
Santa Barbara
Pacific Ocean
Hollister
Cliff Dr
SB City College
RegProg\Bikeway\Santa barbara map.pdf


2008 Regional Bikeway Network
Goleta Area
Cathedral Oaks Rd
Goleta
Santa Barbara
Airport
Isla Vista
UCSB
Pacific Ocean
Goleta Bike Map
cities
CA20LINK:1
Landmark Area Types
Educational
Airport
Shopping/Retail
Golf Course
National Park/Forest
State Park/Forest
Landmarks
Airport
Hospital
Park
Bike Stn
School
LAYER
ExistingClass_1 (30)
ExistingClass_2 (97)
ExistingClass_3 (35)
ProposedClass_1 (22)
ProposedClass_2 (62)
ProposedClass_3 (14)
ProposedClass_4 (1)
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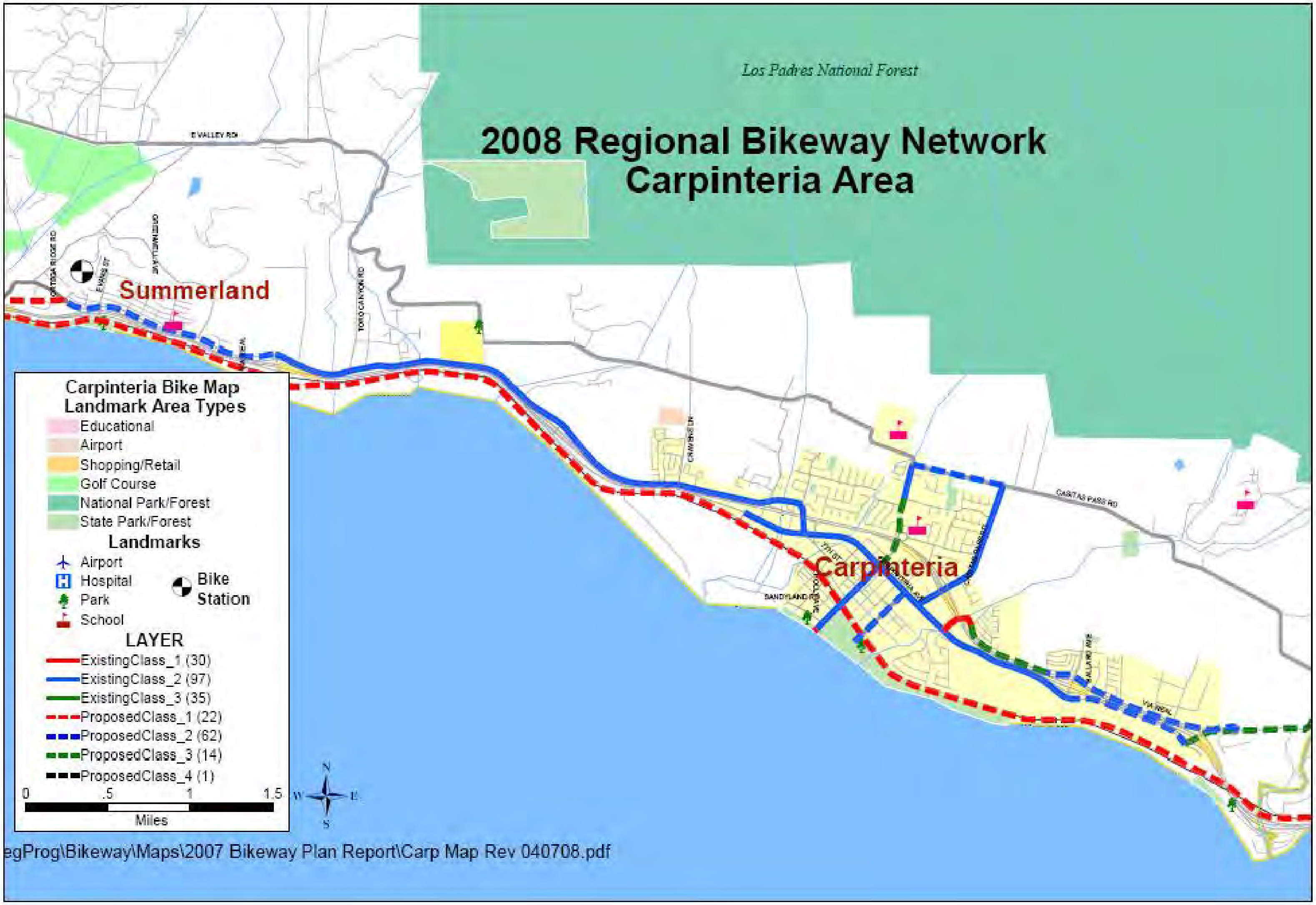
Los Padres National Forest
2008 Regional Bikeway Network
Carpinteria Area
Summerland
Carpinteria
E VALLEY RD
TORO CANYON RD
SANDYLAND RD
CASITAS PASS RD
VIA REAL
Carpinteria Bike Map
Landmark Area Types
Educational
Airport
Shopping/Retail
Golf Course
National Park/Forest
State Park/Forest
Landmarks
Airport
Hospital
Park
School
Bike Station
LAYER
ExistingClass_1 (30)
ExistingClass_2 (97)
ExistingClass_3 (35)
ProposedClass_1 (22)
ProposedClass_2 (62)
ProposedClass_3 (14)
ProposedClass_4 (1)
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egProg\Bikeway\Maps\2007 Bikeway Plan Report\Carp Map Rev 040708.pdf

APPENDIX F
Cause of Performance Degradation at Existing Bottlenecks

1.1.1 Santa Barbara County Bottlenecks and Causes

AM Peak Northbound

SA1 Mission St On-ramp and Las Positas Off-ramp

Figure 1 details the weaving movements between the Mission Street on-ramp and the Las Positas Road off-ramp. A bottleneck occurs along this segment as a result of traffic volumes entering and exiting US-101 and merging with mainline traffic within a short distance.

Figure 1 Weaving between Mission St On-ramp and Las Positas Rd Off-ramp

SA2 Coast Village Road On to S Salinas Street Off-ramp

Figure 2 is an aerial photograph showing the segment of US-101 between Coast Village on-ramp and S Salinas Street off-ramp. Weaving between the two ramps in a short distance is the primary reason for the bottleneck at this location.

Figure 2 Northbound US-101 at Salinas Street

SA3 Padaro Lane On-ramp

Figure 3 shows the Padaro Lane on-ramp in detail. Merging at the on-ramp, acceleration lane distance and high mainline and ramp merging volumes are the main reasons for the bottleneck at this location.

Figure 3 Northbound US-101 at Padaro Lane On-ramp

SA4 Via Real and Linden Avenue On-ramps

Figure 4 shows the Via Real and Linden Avenue on-ramps in detail. Merging into the mainline for the two on-ramps, lack of auxiliary lane between the two on-ramps, distance between the two on-ramps and horizontal curve site distance issues result in reduced speeds in the location and are the cause for the bottleneck at this location.

Figure 4 Northbound US-101 at Via Real On-ramp and Linden Avenue On-ramp

SA5 SR-150 On-ramp

Figure 5 is an aerial of the SR 150 on-ramp to northbound US-101. As demonstrated in the figure, a lane drop occurring north of the SR 150 on-ramp resulting in the number of mainline lanes decreasing from 3 to 2 would result in a bottleneck at this location.

Figure 5 Northbound US-101 at Lane Drop North of SR-150 On-ramp

AM Peak Southbound

SA6 W Carrillo Street Off-ramp

Figure shows the W Carrillo Street off-ramp in detail. Near this interchange, a bottleneck forms dues to divergent traffic onto the W Carrillo Street off-ramp and from potential queuing from the intersections at W Carrillo Street

Figure 6 Southbound US-101 at W Carrillo Street Off-ramp

SA7 Fairview Avenue Off-ramp

Figure 7 provides an aerial of the Fairview Avenue interchange with US-101. As shown in the figure, the diverging movements associated with the Fairview Avenue off-ramp result in a bottleneck near the interchange.

Figure 7 Southbound US-101 at Fairview Ave Off-ramp

PM Peak Northbound

SP1 Mission St On-ramp and Las Positas Off-ramp

Figure 8 details the weaving movements between the Mission Street on-ramp and the Las Positas Road off-ramp. A bottleneck occurs along this segment as a result of traffic volumes entering and exiting US-101 and merging with mainline traffic within a short distance.

Figure 8 Weaving between Mission St On-ramp and Las Positas Rd Off-ramp

SP2 Coast Village Road/E. Cabrillo Boulevard On-ramp to S Salinas Street Off-ramp

Figure 9 is an aerial photograph showing the segment of US-101 between the Coast Village Road/E. Cabrillo Boulevard on-ramp and S Salinas Street off-ramp. Weaving between the two ramps in a short distance is the primary reason for the bottleneck at this location.

Figure 9 Northbound US-101 at Salinas Street

PM Peak Southbound

SP3 Casitas Pass Road On to Bailard Avenue Off-ramp

Figure 10 is an aerial photograph showing the segment of US-101 between Casitas Pass Road on-ramp and Bailard Avenue off-ramp. Weaving between the two ramps within this curve segment is the primary reason for the bottleneck at this location.

Figure 10 Northbound US-101: Casitas Pass Rd On-ramp and Bailard Ave Off-ramp

SP4 Olive Mill Rd On-ramp

Figure 11 shows the on-ramp merging movement at the Olive Mill Road on-ramp. Due to the on-ramp volumes merging with mainline volumes, a bottleneck occurs near this location.

Figure 11 Southbound US-101 at Olive Mill Rd On-ramp

SP5 Garden St On-ramp and Milpas St Off-ramp

Figure 12 shows the weaving area between the Garden Street on-ramp and the Milpas Street off-ramp. A bottleneck and reduced travel speeds occur on this segment as a result of the short distance between the two ramps and the associated weaving movements.

Figure 12 Southbound US-101: Garden St On-ramp and Milpas St Off-ramp

SP6 San Marcos Pass Rd On-ramp and La Cumbre Rd Off-ramp

Figure 13 shows the weaving area between the San Marcos Pass Road on-ramp and the La Cumbre Road off-ramp. A bottleneck and reduced travel speeds occur on this segment as a result of the short distance between the two ramps, the associated weaving movements, and the horizontal curve site distance restrictions.

Figure 13 Southbound US-101: San Marcos Pass Road On-Ramp to La Cumbre Road Off-ramp.

SP7 SR-217 On-ramp

Figure 14 shows the on-ramp merging movement at the SR-217 on-ramp. Due to the on-ramp volumes merging with mainline volumes at this curve segment, a bottleneck occurs near this location.

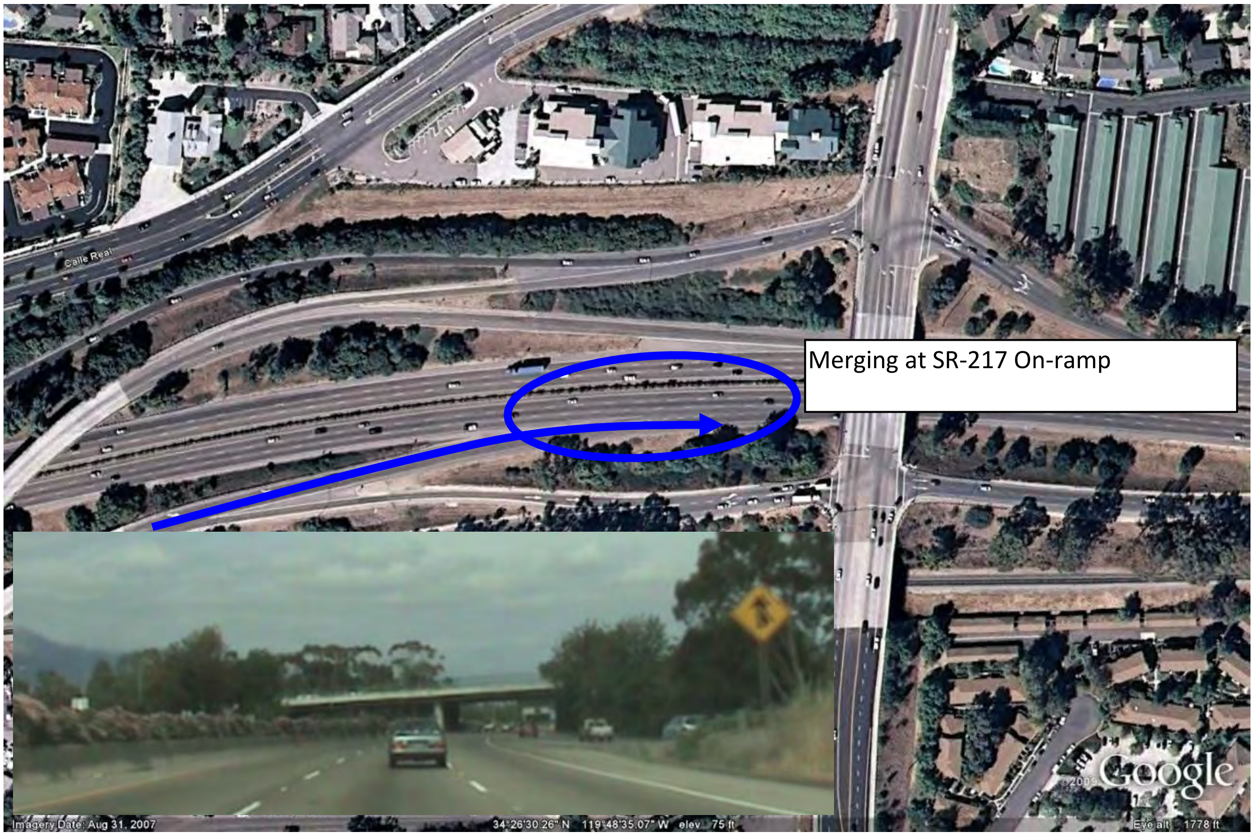


Figure 14 Southbound US-101 at SR-217 On-ramp

1.1.2 Ventura County Bottlenecks and Causes

AM Peak Northbound

VA1 La Conchita Community

Figure 15 shows the access points near La Conchita. Open access to three areas, Mussel Shoals, La Conchita, and a tank farm north of La Conchita all contribute to a decrease in travel speeds and bottlenecks in this area.

Figure 15 Northbound US-101 at La Conchita

VA2 SR-1 On-Ramp

Figure 16 is an aerial depicting the SR 1 on-ramp south of Mussel Shoals. North of the SR 1 on-ramp, a lane drop contributes to a bottleneck along this stretch of US-101.

Figure 16 Northbound US-101 at SR-1 On-Ramp

VA3 Johnson Drive On and Off Ramps

As shown in **Figure 17**, a lane drop from four lanes to three lanes occurs between the Johnson Drive off-ramp and on-ramp. This reduction in mainline capacity results in a bottleneck for this segment.

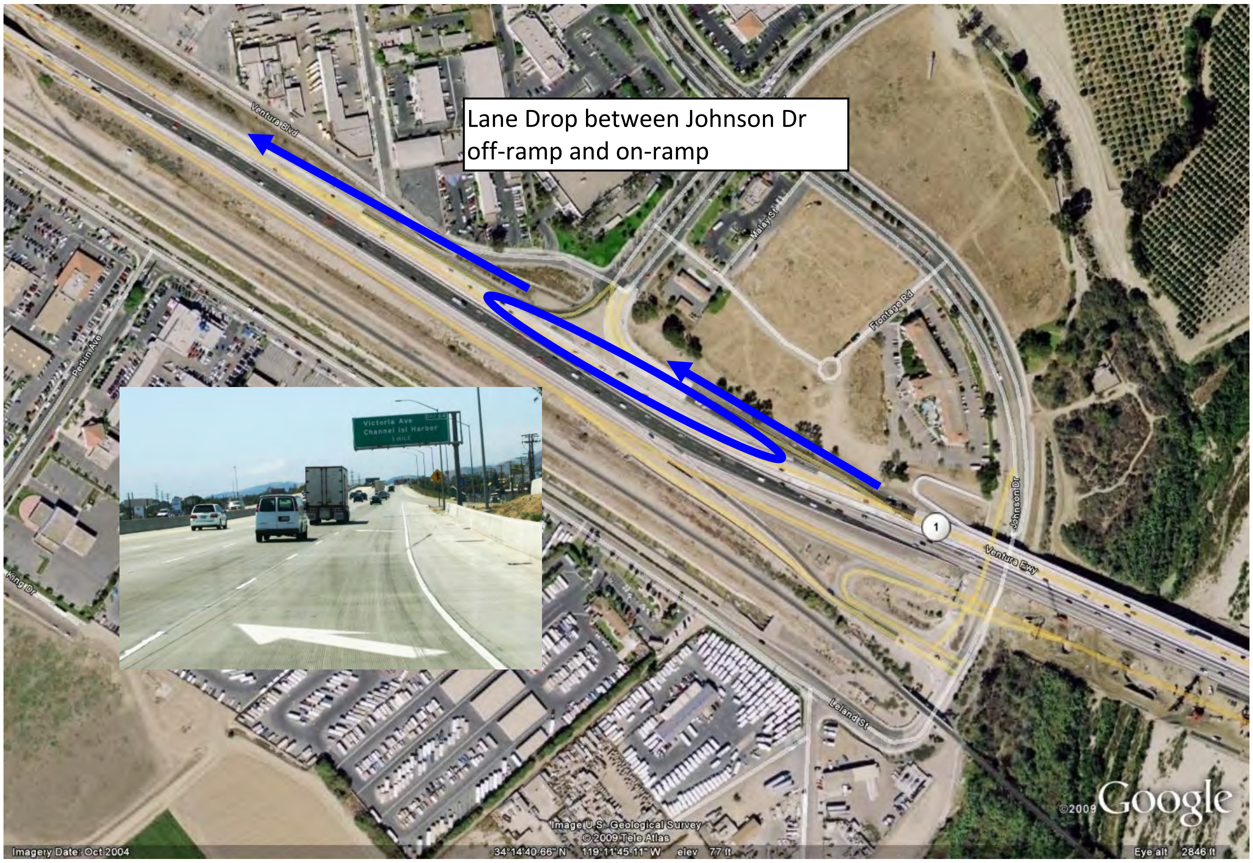


Figure 17 Northbound US-101 at Johnson Drive On and Off Ramps

AM Peak Southbound

VA4 Vineyard Avenue Ramps

Figure 18 shows the interchange at US-101 and SR 232/Vineyard Ave. At this interchange, a lane drop occurs south of the Vineyard Avenue off-ramp while traffic from the E Vineyard Avenue on-ramp merges with mainline US-101 traffic. These two influences result in bottlenecks near the Vineyard Avenue interchange.

Figure 18 Southbound US-101 at Vineyard Avenue On and Off Ramps

PM Peak Northbound

VP1 Johnson Drive Off and On-Ramps

As shown in **Figure 19**, a lane drop from four lanes to three lanes occurs between the Johnson Drive off-ramp and on-ramp. This reduction in mainline capacity results in a bottleneck for this segment.

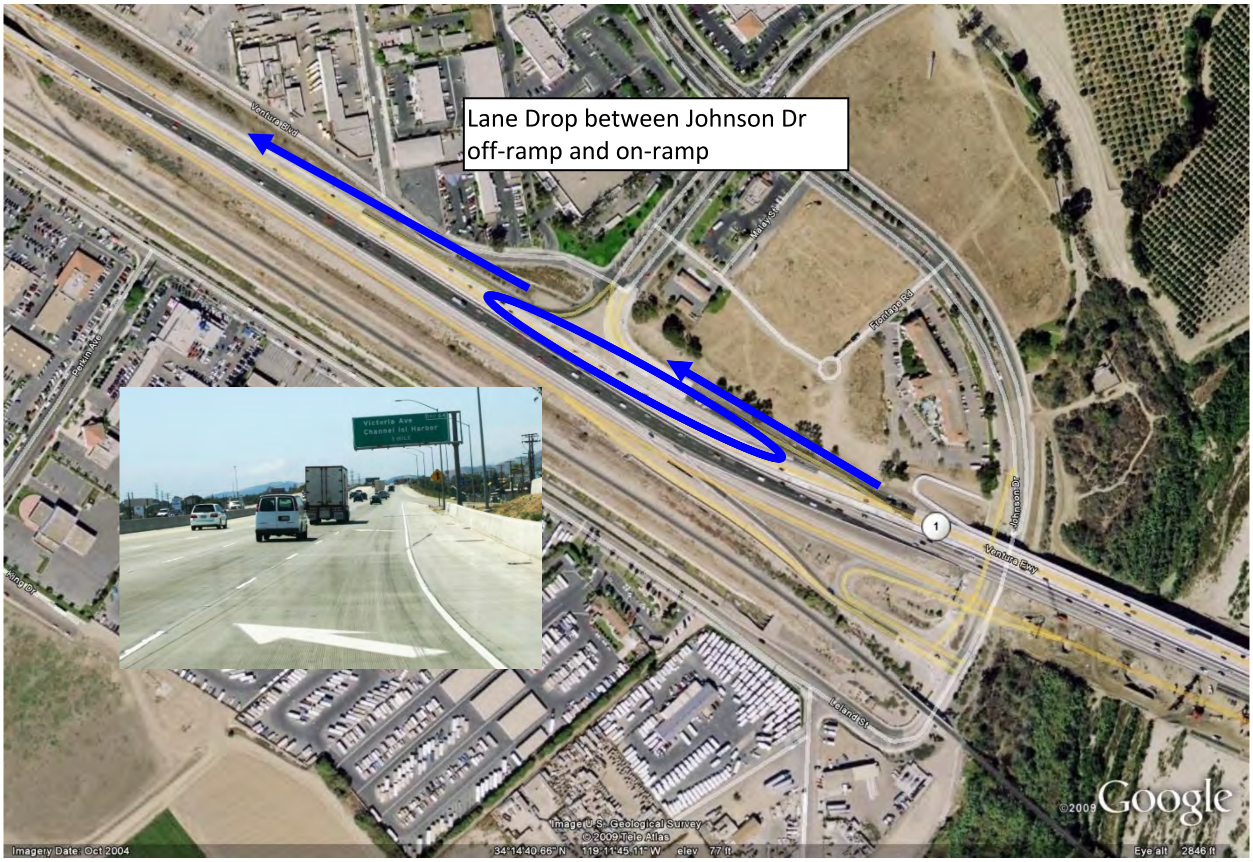


Figure 19 Northbound US-101 at Johnson Drive On and Off Ramps

VP2 Rose Avenue On-Ramp

Figure 20shows the interchange at US-101 and Rose Avenue. A bottleneck occurs near this interchange as a result of the proximity of the two Rose Avenue on-ramps, the high volume of traffic on the on-ramps, and the associated merging movements between vehicles from the on-ramps and the mainline traffic.

Figure 20 Northbound US-101 at Rose Avenue On-ramps

PM Peak Southbound

VP3 E Vineyard Ave On-ramp and N Rose Ave Off-ramp

Figure 21 illustrates US-101 between the E Vineyard Avenue on-ramp and the N Rose Avenue off-ramp. Weaving and the short distance between these two ramps contribute to a bottleneck at this location during the PM peak period.

Figure 21 Southbound US-101 between E Vineyard Ave On-ramp and N Rose Ave Off-ramp

VP4 Victoria Avenue On-ramps

Figure 22 shows the interchange of US-101 at Victoria Avenue. Two high-volume on-ramps within close proximity increase the number of merging movements resulting in a bottleneck at this location.

Figure 22 Southbound US-101 at Victoria Avenue On-ramps

VP5 SR-126 Off-ramp

Figure 23 shows the US-101 interchange with SR 126. The diverging SR 126 off-ramp results in a bottleneck due to the increased vehicular movements.

Figure 23 Southbound US-101 at SR-126 Off-ramp

APPENDIX G
Measures of Effectiveness
For 2023 Baseline and Scenarios

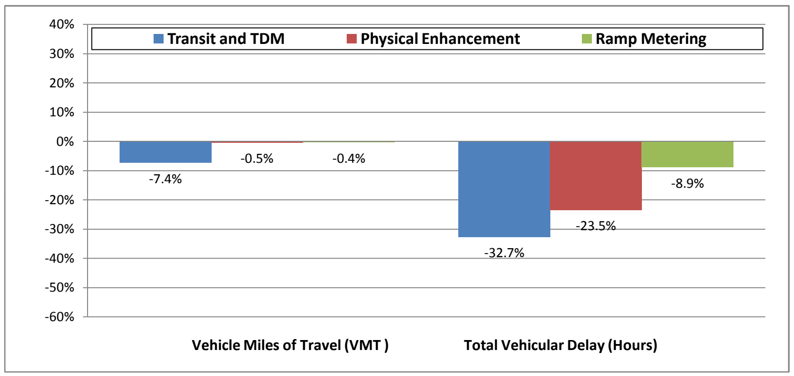
List of Tables:

Table 1 Santa Barbara "Ten Years after Opening" AM Corridor Performance Summary

Santa Barbara 2023 AM Corridor Performance	US-101 Northbound Freeways								US-101 Southbound Freeways							
	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering
Average Flow Rates (Vehicles per hour)																
Total Peak Period	3,299	3,052	3,285	3,287	0%	-8%	0%	0%	2,736	2,729	2,708	2,745	0%	0%	-1%	0%
Vehicle Miles of Travel (VMT)																
Total Peak Period	282,912	261,945	281,512	281,891	0%	-7%	0%	0%	238,885	238,224	236,508	239,653	0%	0%	-1%	0%
Vehicle Hours of Travel (VHT)																
Total Peak Period	5,285	4,597	4,987	5,166	0%	-13%	-6%	-2%	3,997	3,986	3,920	4,058	0%	0%	-2%	2%
Total Vehicular Delay (Hours)* **																
Total Peak Period	1,177	792	900	1,072	0%	-33%	-24%	-9%	502	501	460	551	0%	0%	-8%	10%
Delay as Percent of VHT																
Total Peak Period	22.3%	17.2%	18.0%	20.8%	0%	-23%	-19%	-7%	12.6%	12.6%	11.7%	13.6%	0%	0%	-7%	8%

Notes:

* Freeway statistics include mainline and ramps except "flow rate" which is mailine only.
**Arterial reports the directional arterial values on parallel arterials only.
*** Delay is measured relative to freeflow speed.



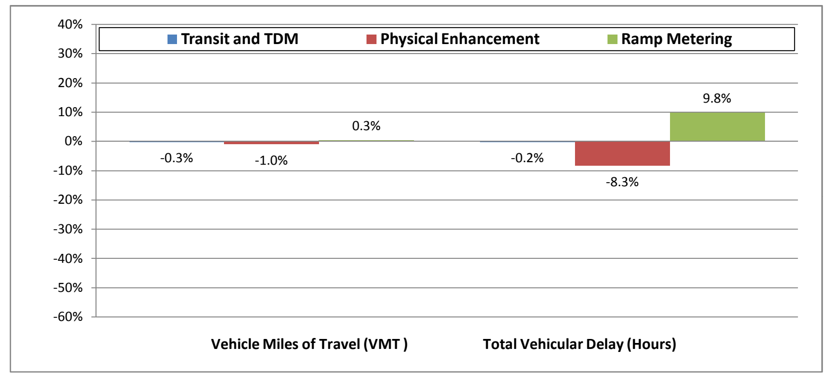


Table 2 Santa Barbara "Ten Years after Opening" AM Corridor Performance for CMIA Project Segment - Northbound and Goleta Segment - Southbound

Santa Barbara 2023 AM Corridor Performance	US-101 Northbound Freeways, CMIA Project Segment – Santa Barbara County								US-101 Southbound Freeways, Goleta Segment							
	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering
Average Flow Rates (Vehicles per hour)																
Total Peak Period	3,205	2,945	3,194	3,194	0%	-8%	0%	0%	2,546	2,534	2,541	2,556	0%	0%	0%	0%
Vehicle Miles of Travel (VMT)																
Total Peak Period	26,042	23,928	25,965	25,967	0%	-8%	0%	0%	65,672	65,332	65,491	65,912	0%	-1%	0%	0%
Vehicle Hours of Travel (VHT)																
Total Peak Period	477	397	468	491	0%	-17%	-2%	3%	1,080	1,080	1,079	1,089	0%	0%	0%	1%
Total Vehicular Delay (Hours)* **																
Total Peak Period	100	51	92	115	0%	-49%	-8%	15%	108	113	110	114	0%	5%	2%	5%
Delay as Percent of VHT																
Total Peak Period	20.9%	12.8%	19.6%	23.5%	0%	-39%	-6%	12%	10.0%	10.5%	10.2%	10.5%	0%	5%	2%	4%

Notes:

* Freeway statistics include mainline and ramps except "flow rate" which is mailine only.
**Arterial reports the directional arterial values on parallel arterials only.
*** Delay is measured relative to freeflow speed.

Table 3 Santa Barbara "Ten Years after Opening" AM Corridor Performance for Montecito/Summerland/Carpinteria Segment - Northbound and City of Santa Barbara Segment - Southbound

Santa Barbara 2023 AM Corridor Performance	US-101 Northbound Freeways, Montecito/Summerland/Carpinteria Segment								US-101 Southbound Freeways, City of Santa Barbara Segment							
	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering
Average Flow Rates (Vehicles per hour)																
Total Peak Period	3,732	3,359	3,719	3,716	0%	-10%	0%	0%	3,887	3,870	3,862	3,890	0%	0%	-1%	0%
Vehicle Miles of Travel (VMT)																
Total Peak Period	100,933	90,938	100,599	100,506	0%	-10%	0%	0%	100,208	99,800	99,647	100,294	0%	0%	-1%	0%
Vehicle Hours of Travel (VHT)																
Total Peak Period	1,795	1,557	1,823	1,816	0%	-13%	2%	1%	1,764	1,749	1,714	1,805	0%	-1%	-3%	2%
Total Vehicular Delay (Hours)* **																
Total Peak Period	344	249	377	371	0%	-28%	10%	8%	293	283	251	332	0%	-3%	-14%	13%
Delay as Percent of VHT																
Total Peak Period	19.1%	16.0%	20.7%	20.4%	0%	-17%	8%	7%	16.6%	16.2%	14.6%	18.4%	0%	-2%	-12%	11%

Notes:

* Freeway statistics include mainline and ramps except "flow rate" which is mailine only.
**Arterial reports the directional arterial values on parallel arterials only.
*** Delay is measured relative to freeflow speed.

Table 4 Santa Barbara "Ten Years after Opening" AM Corridor Performance for City of Santa Barbara Segment - Northbound and Montecito/Summerland/Carpinteria Segment - Southbound

Santa Barbara 2023 AM Corridor Performance	US-101 Northbound Freeways, City of Santa Barbara Segment								US-101 Southbound Freeways, Montecito/Summerland/Carpinteria Segment							
	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering
Average Flow Rates (Vehicles per hour)																
Total Peak Period	3,981	3,724	3,963	3,971	0%	-6%	0%	0%	2,223	2,227	2,181	2,233	0%	0%	-2%	0%
Vehicle Miles of Travel (VMT)																
Total Peak Period	100,398	93,983	100,014	100,147	0%	-6%	0%	0%	59,688	59,786	58,592	59,942	0%	0%	-2%	0%
Vehicle Hours of Travel (VHT)																
Total Peak Period	2,062	1,736	1,759	1,913	0%	-16%	-15%	-7%	944	948	928	950	0%	0%	-2%	1%
Total Vehicular Delay (Hours)* **																
Total Peak Period	598	365	300	452	0%	-39%	-50%	-24%	84	87	84	87	0%	4%	0%	3%
Delay as Percent of VHT																
Total Peak Period	29.0%	21.0%	17.1%	23.6%	0%	-28%	-41%	-19%	8.9%	9.2%	9.1%	9.2%	0%	3%	1%	2%

Notes:

* Freeway statistics include mainline and ramps except "flow rate" which is mailine only.
**Arterial reports the directional arterial values on parallel arterials only.
*** Delay is measured relative to freeflow speed.

Table 5 Santa Barbara "Ten Years after Opening" AM Corridor Performance for Goleta Segment - Northbound and CMIA Project Segment - Southbound

Santa Barbara 2023 AM Corridor Performance	US-101 Northbound Freeways, Goleta Segment								US-101 Southbound Freeways, CMIA Project Segment – Santa Barbara County							
	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering
Average Flow Rates (Vehicles per hour)																
Total Peak Period	2,171	2,076	2,155	2,160	0%	-4%	-1%	-1%	1,551	1,550	1,486	1,574	0%	0%	-4%	2%
Vehicle Miles of Travel (VMT)																
Total Peak Period	55,540	53,096	54,934	55,271	0%	-4%	-1%	0%	13,317	13,306	12,778	13,505	0%	0%	-4%	1%
Vehicle Hours of Travel (VHT)																
Total Peak Period	951	907	937	946	0%	-5%	-1%	0%	210	209	200	214	0%	0%	-4%	2%
Total Vehicular Delay (Hours)* **																
Total Peak Period	135	128	131	134	0%	-6%	-3%	-1%	17	17	16	19	0%	-1%	-10%	8%
Delay as Percent of VHT																
Total Peak Period	14.2%	14.1%	14.0%	14.2%	0%	-1%	-1%	0%	8.2%	8.2%	7.8%	8.7%	0%	-1%	-5%	6%

Notes:

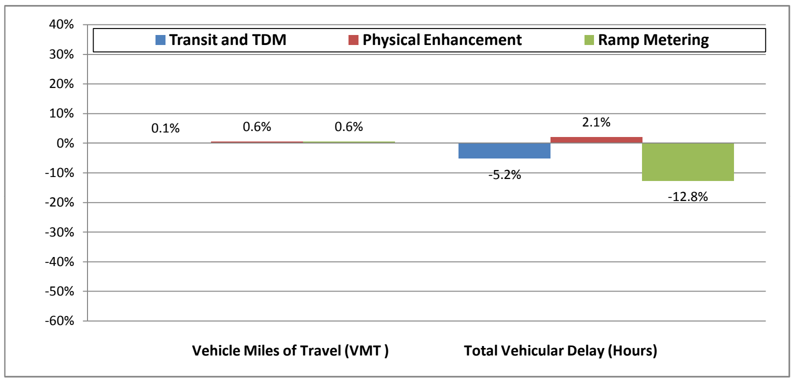
* Freeway statistics include mainline and ramps except "flow rate" which is mailine only.
**Arterial reports the directional arterial values on parallel arterials only.
*** Delay is measured relative to freeflow speed.

Table 6 Santa Barbara "Ten Years after Opening" PM Corridor Performance Summary

Santa Barbara 2023 PM Corridor Performance	US-101 Northbound Freeways								US-101 Southbound Freeways							
	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering
Average Flow Rates (Vehicles per hour)																
Total Peak Period	3,511	3,514	3,537	3,531	0%	0%	1%	1%	3,807	3,605	3,837	3,770	0%	-5%	1%	-1%
Vehicle Miles of Travel (VMT)																
Total Peak Period	304,418	304,728	306,150	306,160	0%	0%	1%	1%	331,897	314,802	334,480	328,816	0%	-5%	1%	-1%
Vehicle Hours of Travel (VHT)																
Total Peak Period	6,847	6,728	6,918	6,565	0%	-2%	1%	-4%	6,910	5,564	6,200	6,614	0%	-19%	-10%	-4%
Total Vehicular Delay (Hours)* **																
Total Peak Period	2,401	2,276	2,450	2,093	0%	-5%	2%	-13%	2,053	955	1,307	1,802	0%	-53%	-36%	-12%
Delay as Percent of VHT																
Total Peak Period	35.1%	33.8%	35.4%	31.9%	0%	-3%	1%	-9%	29.7%	17.2%	21.1%	27.2%	0%	-42%	-29%	-8%

Notes:

* Freeway statistics include mainline and rPMps except "flow rate" which is mailine only.
**Arterial reports the directional arterial values on parallel arterials only.
*** Delay is measured relative to freeflow speed.



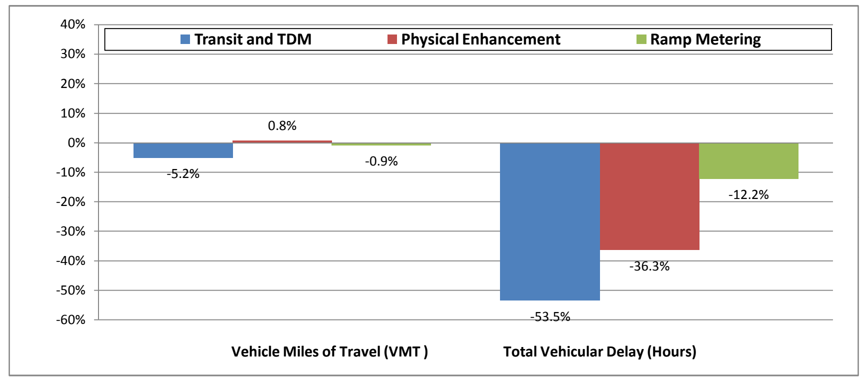


Table 7 Santa Barbara "Ten Years after Opening" PM Corridor Performance for CMIA Project Segment - Northbound and Goleta Segment - Southbound

Santa Barbara 2023 PM Corridor Performance	US-101 Northbound Freeways, CMIA Project Segment – Santa Barbara County								US-101 Southbound Freeways, Goleta Segment							
	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering
Average Flow Rates (Vehicles per hour)																
Total Peak Period	2,489	2,487	2,492	2,496	0%	0%	0%	0%	2,722	2,670	2,732	2,702	0%	-2%	0%	-1%
Vehicle Miles of Travel (VMT)																
Total Peak Period	20,403	20,372	20,424	20,441	0%	0%	0%	0%	70,949	69,633	71,223	70,488	0%	-2%	0%	-1%
Vehicle Hours of Travel (VHT)																
Total Peak Period	321	321	322	322	0%	0%	0%	0%	1,281	1,238	1,282	1,257	0%	-3%	0%	-2%
Total Vehicular Delay (Hours)* **																
Total Peak Period	24	24	25	25	0%	1%	2%	3%	225	201	222	207	0%	-11%	-1%	-8%
Delay as Percent of VHT																
Total Peak Period	7.5%	7.6%	7.6%	7.7%	0%	1%	2%	3%	17.5%	16.2%	17.3%	16.5%	0%	-7%	-1%	-6%

Notes:

* Freeway statistics include mainline and ramps except "flow rate" which is mailine only.
**Arterial reports the directional arterial values on parallel arterials only.
*** Delay is measured relative to freeflow speed.

Table 8 Santa Barbara "Ten Years after Opening" PM Corridor Performance for Montecito/Summerland/Carpinteria Segment - Northbound and City of Santa Barbara Segment - Southbound

Santa Barbara 2023 PM Corridor Performance	US-101 Northbound Freeways, Montecito/Summerland/Carpinteria Segment								US-101 Southbound Freeways, City of Santa Barbara Segment							
	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering
Average Flow Rates (Vehicles per hour)																
Total Peak Period	3,303	3,296	3,300	3,310	0%	0%	0%	0%	4,618	4,404	4,680	4,603	0%	-5%	1%	0%
Vehicle Miles of Travel (VMT)																
Total Peak Period	89,344	89,165	89,287	89,518	0%	0%	0%	0%	119,648	114,286	121,208	119,255	0%	-4%	1%	0%
Vehicle Hours of Travel (VHT)																
Total Peak Period	1,496	1,489	1,487	1,498	0%	0%	-1%	0%	3,204	2,141	2,495	2,994	0%	-33%	-22%	-7%
Total Vehicular Delay (Hours)*																
Total Peak Period	212	207	203	211	0%	-2%	-4%	0%	1,441	457	710	1,237	0%	-68%	-51%	-14%
Delay as Percent of VHT																
Total Peak Period	14.1%	13.9%	13.7%	14.1%	0%	-2%	-3%	0%	45.0%	21.3%	28.5%	41.3%	0%	-53%	-37%	-8%

Notes:

* Freeway statistics include mainline and ramps except "flow rate" which is mailine only.
**Arterial reports the directional arterial values on parallel arterials only.
*** Delay is measured relative to freeflow speed.

Table 9 Santa Barbara "Ten Years after Opening" PM Corridor Performance for City of Santa Barbara Segment - Northbound and Montecito/Summerland/Carpinteria Segment - Southbound

Santa Barbara 2023 PM Corridor Performance	US-101 Northbound Freeways, City of Santa Barbara Segment								US-101 Southbound Freeways, Montecito/Summerland/Carpinteria Segment							
	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering
Average Flow Rates (Vehicles per hour)																
Total Peak Period	4,703	4,732	4,736	4,721	0%	1%	1%	0%	4,084	3,767	4,106	4,010	0%	-8%	1%	-2%
Vehicle Miles of Travel (VMT)																
Total Peak Period	118,970	119,652	119,810	119,435	0%	1%	1%	0%	109,839	101,425	110,437	107,891	0%	-8%	1%	-2%
Vehicle Hours of Travel (VHT)																
Total Peak Period	3,670	3,561	3,745	3,361	0%	-3%	2%	-8%	1,907	1,702	1,898	1,849	0%	-11%	0%	-3%
Total Vehicular Delay (Hours)* **																
Total Peak Period	1,931	1,812	1,994	1,615	0%	-6%	3%	-16%	323	240	307	294	0%	-26%	-5%	-9%
Delay as Percent of VHT																
Total Peak Period	52.6%	50.9%	53.2%	48.0%	0%	-3%	1%	-9%	16.9%	14.1%	16.1%	15.9%	0%	-17%	-5%	-6%

Notes:

* Freeway statistics include mainline and ramps except "flow rate" which is mailine only.
**Arterial reports the directional arterial values on parallel arterials only.
*** Delay is measured relative to freeflow speed.

Table 10 Santa Barbara "Ten Years after Opening" PM Corridor Performance for Goleta Segment - Northbound and CMIA Project Segment - Southbound

Santa Barbara 2023 PM Corridor Performance	US-101 Northbound Freeways, Goleta Segment								US-101 Southbound Freeways, CMIA Project Segment – Santa Barbara County							
	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering
Average Flow Rates (Vehicles per hour)																
Total Peak Period	2,886	2,875	2,942	2,926	0%	0%	2%	1%	3,682	3,443	3,700	3,649	0%	-6%	0%	-1%
Vehicle Miles of Travel (VMT)																
Total Peak Period	75,701	75,539	76,630	76,765	0%	0%	1%	1%	31,460	29,458	31,613	31,183	0%	-6%	0%	-1%
Vehicle Hours of Travel (VHT)																
Total Peak Period	1,359	1,356	1,364	1,385	0%	0%	0%	2%	517	483	525	513	0%	-7%	1%	-1%
Total Vehicular Delay (Hours)*																
Total Peak Period	234	232	229	243	0%	-1%	-2%	4%	64	58	69	64	0%	-9%	8%	0%
Delay as Percent of VHT																
Total Peak Period	17.2%	17.1%	16.8%	17.6%	0%	0%	-2%	2%	12.4%	12.0%	13.2%	12.5%	0%	-3%	6%	1%

Notes:

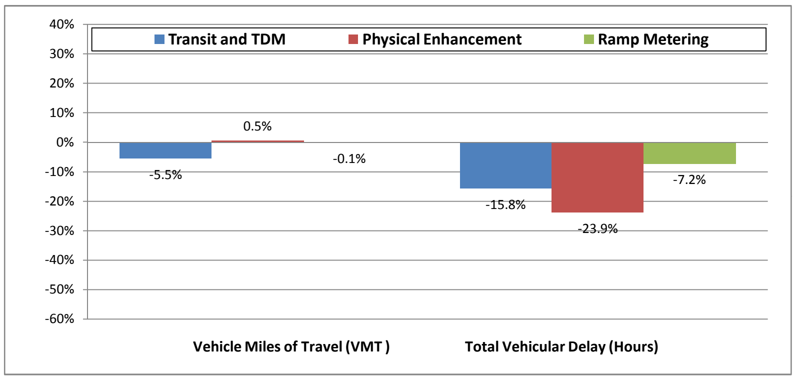
* Freeway statistics include mainline and ramps except "flow rate" which is mailine only.
**Arterial reports the directional arterial values on parallel arterials only.
*** Delay is measured relative to freeflow speed.

Table 11 Ventura "Ten Years after Opening" AM Corridor Performance Summary

Ventura 2023 AM Corridor Performance	US-101 Northbound Freeways								US-101 Southbound Freeways							
	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering
Average Flow Rates (Vehicles per hour)																
Total Peak Period	3,851	3,632	3,870	3,849	0%	-6%	0%	0%	2,438	2,452	2,439	2,440	0%	1%	0%	0%
Vehicle Miles of Travel (VMT)																
Total Peak Period	278,189	262,864	279,648	277,867	0%	-6%	1%	0%	181,316	182,325	181,309	181,180	0%	1%	0%	0%
Vehicle Hours of Travel (VHT)																
Total Peak Period	4,885	4,533	4,703	4,819	0%	-7%	-4%	-1%	3,579	3,553	3,028	3,518	0%	-1%	-15%	-2%
Total Vehicular Delay (Hours)* **																
Total Peak Period	843	710	641	782	0%	-16%	-24%	-7%	930	888	382	871	0%	-4%	-59%	-6%
Delay as Percent of VHT																
Total Peak Period	17.3%	15.7%	13.6%	16.2%	0%	-9%	-21%	-6%	26.0%	25.0%	12.6%	24.8%	0%	-4%	-51%	-5%

Notes:

* Freeway statistics include mainline and ramps except "flow rate" which is mailine only.
**Arterial reports the directional arterial values on parallel arterials only.
*** Delay is measured relative to freeflow speed.



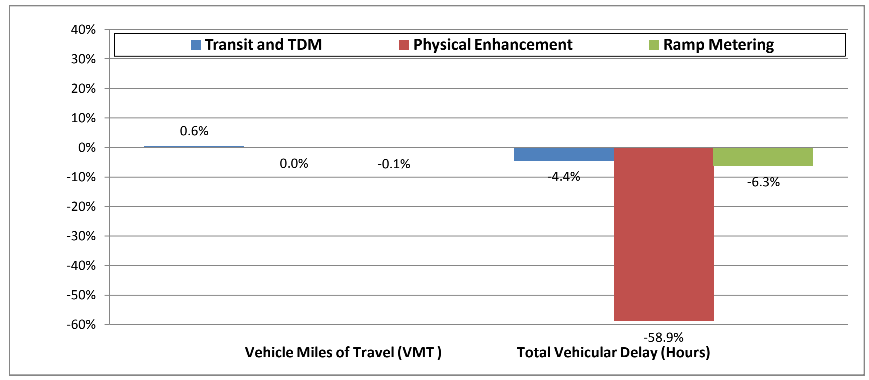


Table 12 Ventura "Ten Years after Opening" AM Corridor Performance for Oxnard Segment - Northbound and CMIA Project Segment - Southbound

Ventura 2023 AM Corridor Performance	US-101 Northbound Freeways, Oxnard Segment								US-101 Southbound Freeways, CMIA Project Segment – Ventura County							
	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering
Average Flow Rates (Vehicles per hour)																
Total Peak Period	4,555	4,509	4,623	4,499	0%	-1%	1%	-1%	1,477	1,474	1,478	1,479	0%	0%	0%	0%
Vehicle Miles of Travel (VMT)																
Total Peak Period	87,592	86,685	88,880	86,417	0%	-1%	1%	-1%	10,101	10,082	10,112	10,117	0%	0%	0%	0%
Vehicle Hours of Travel (VHT)																
Total Peak Period	1,712	1,640	1,563	1,637	0%	-4%	-9%	-4%	150	150	151	151	0%	0%	1%	1%
Total Vehicular Delay (Hours)*																
Total Peak Period	413	355	247	356	0%	-14%	-40%	-14%	6	6	6	7	0%	6%	14%	18%
Delay as Percent of VHT																
Total Peak Period	24.1%	21.6%	15.8%	21.8%	0%	-10%	-35%	-10%	3.7%	3.9%	4.2%	4.3%	0%	6%	13%	17%

Notes:

* Freeway statistics include mainline and ramps except "flow rate" which is mailine only.
**Arterial reports the directional arterial values on parallel arterials only.
*** Delay is measured relative to freeflow speed.

Table 13 Ventura "Ten Years after Opening" AM Corridor Performance for City of Ventura Segment - Northbound and Coastal Segment - Southbound

Ventura 2023 AM Corridor Performance	US-101 Northbound Freeways, City of Ventura Segment								US-101 Southbound Freeways, Coastal Segment							
	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering
Average Flow Rates (Vehicles per hour)																
Total Peak Period	3,890	3,666	3,898	3,886	0%	-6%	0%	0%	1,441	1,449	1,451	1,445	0%	1%	1%	0%
Vehicle Miles of Travel (VMT)																
Total Peak Period	82,109	77,569	82,345	82,062	0%	-6%	0%	0%	35,714	35,891	35,939	35,805	0%	0%	1%	0%
Vehicle Hours of Travel (VHT)																
Total Peak Period	1,364	1,277	1,356	1,366	0%	-6%	-1%	0%	561	566	568	567	0%	1%	1%	1%
Total Vehicular Delay (Hours)* **																
Total Peak Period	171	149	160	174	0%	-13%	-6%	2%	50	53	54	55	0%	4%	7%	9%
Delay as Percent of VHT																
Total Peak Period	12.5%	11.7%	11.8%	12.7%	0%	-7%	-6%	2%	9.0%	9.3%	9.5%	9.7%	0%	4%	6%	8%

Notes:

* Freeway statistics include mainline and ramps except "flow rate" which is mailine only.
**Arterial reports the directional arterial values on parallel arterials only.
*** Delay is measured relative to freeflow speed.

Table 14 Ventura "Ten Years after Opening" AM Corridor Performance for Coastal Segment - Northbound and City of Ventura Segment - Southbound

Ventura 2023 AM Corridor Performance	US-101 Northbound Freeways, Coastal Segment								US-101 Southbound Freeways, City of Ventura Segment							
	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering
Average Flow Rates (Vehicles per hour)																
Total Peak Period	3,392	3,078	3,388	3,420	0%	-9%	0%	1%	2,772	2,781	2,787	2,768	0%	0%	1%	0%
Vehicle Miles of Travel (VMT)																
Total Peak Period	84,021	76,252	83,925	84,693	0%	-9%	0%	1%	61,819	61,935	62,191	61,641	0%	0%	1%	0%
Vehicle Hours of Travel (VHT)																
Total Peak Period	1,392	1,244	1,372	1,396	0%	-11%	-1%	0%	1,023	1,025	1,020	1,037	0%	0%	0%	1%
Total Vehicular Delay (Hours)* **																
Total Peak Period	190	154	172	185	0%	-19%	-10%	-3%	124	124	116	140	0%	0%	-7%	13%
Delay as Percent of VHT																
Total Peak Period	13.7%	12.4%	12.5%	13.2%	0%	-10%	-8%	-3%	12.1%	12.1%	11.4%	13.5%	0%	0%	-6%	12%

Notes:

* Freeway statistics include mainline and ramps except "flow rate" which is mailine only.
**Arterial reports the directional arterial values on parallel arterials only.
*** Delay is measured relative to freeflow speed.

Table 15 Ventura "Ten Years after Opening" AM Corridor Performance for CMIA Project Segment - Northbound and Oxnard Segment - Southbound

Ventura 2023 AM Corridor Performance	US-101 Northbound Freeways, CMIA Project Segment – Ventura County								US-101 Southbound Freeways, CMIA Project Segment – Oxnard Segment							
	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering
Average Flow Rates (Vehicles per hour)																
Total Peak Period	3,569	3,261	3,573	3,602	0%	-9%	0%	1%	3,824	3,859	3,797	3,828	0%	1%	-1%	0%
Vehicle Miles of Travel (VMT)																
Total Peak Period	24,467	22,359	24,498	24,695	0%	-9%	0%	1%	73,682	74,417	73,068	73,616	0%	1%	-1%	0%
Vehicle Hours of Travel (VHT)																
Total Peak Period	418	371	412	420	0%	-11%	-1%	0%	1,845	1,812	1,290	1,763	0%	-2%	-30%	-4%
Total Vehicular Delay (Hours)* **																
Total Peak Period	68	52	62	67	0%	-24%	-9%	-2%	749	705	206	669	0%	-6%	-73%	-11%
Delay as Percent of VHT																
Total Peak Period	16.3%	14.0%	15.1%	15.9%	0%	-14%	-8%	-3%	40.6%	38.9%	16.0%	38.0%	0%	-4%	-61%	-7%

Notes:

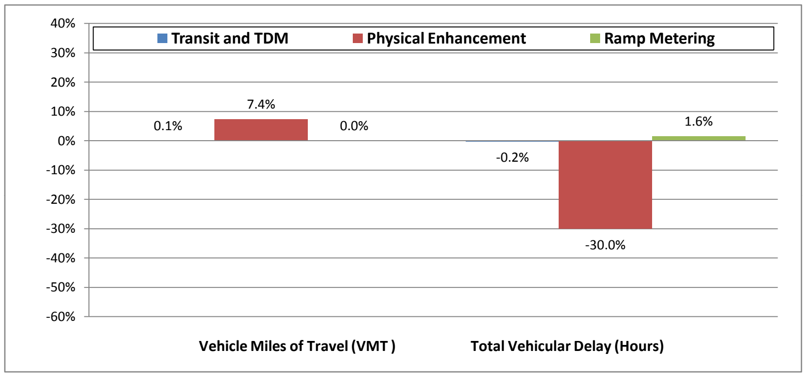
* Freeway statistics include mainline and ramps except "flow rate" which is mailine only.
**Arterial reports the directional arterial values on parallel arterials only.
*** Delay is measured relative to freeflow speed.

Table 16 Ventura "Ten Years after Opening" PM Corridor Performance Summary

Ventura 2023 PM Corridor Performance	US-101 Northbound Freeways								US-101 Southbound Freeways							
	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering
Average Flow Rates (Vehicles per hour)																
Total Peak Period	3,477	3,482	3,739	3,477	0%	0%	8%	0%	4,231	4,074	4,479	4,197	0%	-4%	6%	-1%
Vehicle Miles of Travel (VMT)																
Total Peak Period	256,221	256,495	275,103	256,331	0%	0%	7%	0%	307,700	296,692	327,021	305,276	0%	-4%	6%	-1%
Vehicle Hours of Travel (VHT)																
Total Peak Period	5,519	5,519	5,259	5,548	0%	0%	-5%	1%	8,610	7,267	7,923	8,642	0%	-16%	-8%	0%
Total Vehicular Delay (Hours)* **																
Total Peak Period	1,772	1,768	1,240	1,800	0%	0%	-30%	2%	4,137	2,951	3,163	4,202	0%	-29%	-24%	2%
Delay as Percent of VHT																
Total Peak Period	32.1%	32.0%	23.6%	32.4%	0%	0%	-27%	1%	48.0%	40.6%	39.9%	48.6%	0%	-15%	-17%	1%

Notes:

* Freeway statistics include mainline and rPMps except "flow rate" which is mailine only.
**Arterial reports the directional arterial values on parallel arterials only.
*** Delay is measured relative to freeflow speed.



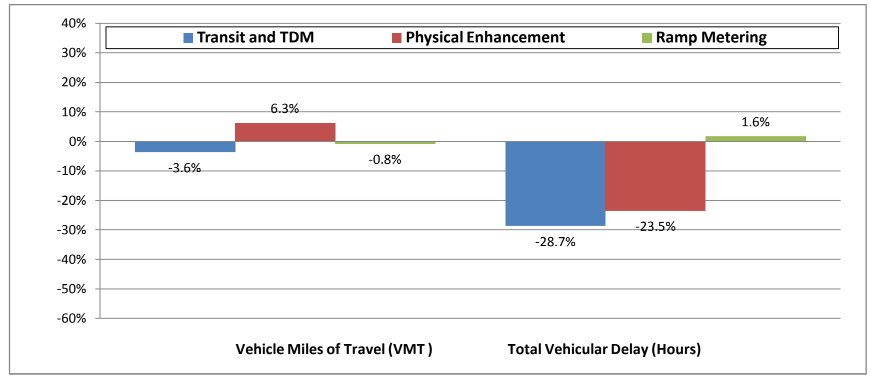


Table 17 Ventura "Ten Years after Opening" PM Corridor Performance for Oxnard Segment - Northbound and CMIA Project Segment - Southbound

Ventura 2023 PM Corridor Performance	US-101 Northbound Freeways, Oxnard Segment								US-101 Southbound Freeways, CMIA Project Segment – Ventura County							
	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering
Average Flow Rates (Vehicles per hour)																
Total Peak Period	4,740	4,737	5,257	4,727	0%	0%	11%	0%	3,773	3,507	3,772	3,773	0%	-7%	0%	0%
Vehicle Miles of Travel (VMT)																
Total Peak Period	91,898	91,750	101,516	91,664	0%	0%	10%	0%	25,809	23,987	25,802	25,805	0%	-7%	0%	0%
Vehicle Hours of Travel (VHT)																
Total Peak Period	2,584	2,584	2,068	2,660	0%	0%	-20%	3%	414	382	416	417	0%	-8%	0%	1%
Total Vehicular Delay (Hours)* **																
Total Peak Period	1,216	1,218	560	1,295	0%	0%	-54%	7%	46	40	47	48	0%	-14%	3%	5%
Delay as Percent of VHT																
Total Peak Period	47.0%	47.1%	27.1%	48.7%	0%	0%	-42%	3%	11.0%	10.3%	11.3%	11.6%	0%	-6%	2%	5%

Notes:

* Freeway statistics include mainline and ramps except "flow rate" which is mailine only.
**Arterial reports the directional arterial values on parallel arterials only.
*** Delay is measured relative to freeflow speed.

Table 18 Ventura "Ten Years after Opening" PM Corridor Performance for City of Ventura Segment - Northbound and Coastal Segment - Southbound

Ventura 2023 PM Corridor Performance	US-101 Northbound Freeways, City of Ventura Segment								US-101 Southbound Freeways, Coastal Segment							
	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering
Average Flow Rates (Vehicles per hour)																
Total Peak Period	4,027	4,006	4,304	4,036	0%	-1%	7%	0%	3,724	3,455	3,714	3,694	0%	-7%	0%	-1%
Vehicle Miles of Travel (VMT)																
Total Peak Period	87,770	87,321	93,532	88,028	0%	-1%	7%	0%	92,308	85,659	92,074	91,588	0%	-7%	0%	-1%
Vehicle Hours of Travel (VHT)																
Total Peak Period	1,727	1,716	1,919	1,678	0%	-1%	11%	-3%	1,537	1,422	1,556	1,525	0%	-8%	1%	-1%
Total Vehicular Delay (Hours)* **																
Total Peak Period	443	438	553	389	0%	-1%	25%	-12%	217	196	239	214	0%	-9%	10%	-1%
Delay as Percent of VHT																
Total Peak Period	25.6%	25.5%	28.8%	23.2%	0%	0%	12%	-9%	14.1%	13.8%	15.4%	14.1%	0%	-2%	9%	0%

Notes:

* Freeway statistics include mainline and ramps except "flow rate" which is mailine only.
**Arterial reports the directional arterial values on parallel arterials only.
*** Delay is measured relative to freeflow speed.

Table 19 Ventura "Ten Years after Opening" PM Corridor Performance for Coastal Segment - Northbound and City of Ventura Segment - Southbound

Ventura 2023 PM Corridor Performance	US-101 Northbound Freeways, Coastal Segment								US-101 Southbound Freeways, City of Ventura Segment							
	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering
Average Flow Rates (Vehicles per hour)																
Total Peak Period	2,406	2,435	2,521	2,406	0%	1%	5%	0%	4,247	4,161	4,713	4,165	0%	-2%	11%	-2%
Vehicle Miles of Travel (VMT)																
Total Peak Period	59,602	60,315	62,444	59,585	0%	1%	5%	0%	90,839	89,128	101,609	89,049	0%	-2%	12%	-2%
Vehicle Hours of Travel (VHT)																
Total Peak Period	933	944	985	935	0%	1%	6%	0%	3,800	1,998	3,731	3,678	0%	-47%	-2%	-3%
Total Vehicular Delay (Hours)* **																
Total Peak Period	81	81	93	83	0%	0%	15%	3%	2,489	712	2,260	2,393	0%	-71%	-9%	-4%
Delay as Percent of VHT																
Total Peak Period	8.7%	8.6%	9.4%	8.9%	0%	-1%	9%	3%	65.5%	35.6%	60.6%	65.1%	0%	-46%	-8%	-1%

Notes:

* Freeway statistics include mainline and ramps except "flow rate" which is mailine only.
**Arterial reports the directional arterial values on parallel arterials only.
*** Delay is measured relative to freeflow speed.

Table 20 Ventura "Ten Years after Opening" PM Corridor Performance for CMIA Project Segment - Northbound and Oxnard Segment - Southbound

Ventura 2023 PM Corridor Performance	US-101 Northbound Freeways, CMIA Project Segment – Ventura County								US-101 Southbound Freeways, CMIA Project Segment – Oxnard Segment							
	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering	Baseline	Transit and TDM	Physical Enhancement	Ramp Metering
Average Flow Rates (Vehicles per hour)																
Total Peak Period	2,473	2,496	2,569	2,488	0%	1%	4%	1%	5,097	5,056	5,553	5,099	0%	-1%	9%	0%
Vehicle Miles of Travel (VMT)																
Total Peak Period	16,952	17,109	17,611	17,054	0%	1%	4%	1%	98,745	97,918	107,536	98,835	0%	-1%	9%	0%
Vehicle Hours of Travel (VHT)																
Total Peak Period	275	275	286	275	0%	0%	4%	0%	2,859	3,465	2,220	3,022	0%	21%	-22%	6%
Total Vehicular Delay (Hours)* **																
Total Peak Period	33	31	35	32	0%	-7%	6%	-4%	1,385	2,003	617	1,547	0%	45%	-55%	12%
Delay as Percent of VHT																
Total Peak Period	12.0%	11.2%	12.2%	11.5%	0%	-7%	2%	-4%	48.5%	57.8%	27.8%	51.2%	0%	19%	-43%	6%

Notes:

* Freeway statistics include mainline and ramps except "flow rate" which is mailine only.
**Arterial reports the directional arterial values on parallel arterials only.
*** Delay is measured relative to freeflow speed.