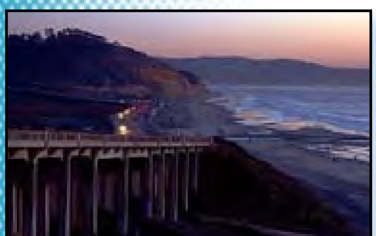


The Interstate 5 San Diego North Coast Corridor System Management Plan

Draft

August 2010

ES

Executive Summary

Introduction

Planned and constructed in the 1960s and 1970s and frequently referred to as the "Gateway to San Diego", Interstate 5 (I-5) has been the primary portion of San Diego County for the last 40 years. However since that time there have been many changes to the area's population, travel patterns, surrounding land use, and travel demand. Those changes combined with projected changes in the future, require a new transportation vision be developed for the next 40 years.

The region recognizes that in order to meet the future demand in the Coastal North County, a multimodal approach is needed. To be successful, this new approach must be responsive to a variety of needs, constraints and objectives;

- Different customers have different mobility needs
- Physical Corridor Constraints
- Existing Land use & transportation facilities
- Regional & Community sustainability & livability objectives
- Limitations in Transportation funding
- Optimal use of all transportation options

In order to address these issues and ensure the future of the region's transportation system the California Department of Transportation (Caltrans), working with its regional partners, has initiated a Corridor System Management Plan (CSMP) for the North Coast Corridor (NCC). CSMPs are intended to help maximize the mobility, reliability, safety, accessibility, and productivity of the transportation system and prioritize projects, strategies, and actions. Maximizing the performance of a corridor's transportation system is contingent on all of its components working together, including modal systems (transit, local roadways, highways, and bicycle and pedestrian routes) and land use.

The new vision must do more than add new pavement; it must maximize the utilization of existing facilities, move people (not vehicles), provide reliable transportation options, improve coastal access, provide flexible foundation for further improvements, and be integrated with land use and activity centers.

Where is the I-5 CSMP Corridor?

The corridor is approximately 27 miles long and is home to more than half a million people. The longitudinal limits of the travel shed are defined by:

- The entry point for the U.S. Marine Base Camp Pendleton at Vandergrift Boulevard at the north and;
- SR 52 at the south, just below the I-5 and I-805 merge, the primary access points for the important business centers of Sorrento Mesa, University Towne Center, and the Golden Triangle.

For the lateral limits of the travel shed:

- The Pacific Ocean coastline is the west limit and
- The east limit is an approximate midpoint between the I-5 and I-15.

The corridor passes through the cities Oceanside, Carlsbad, Encinitas, Solana Beach, Del Mar, and the northern part of the City of San Diego. It is important to note, the entire segment of I-5 in this CSMP is located within the coastal zone and the facility crosses six coastal lagoons. These natural and scenic resources are unique for an urban freeway and are important assets to the region.

What is a CSMP?

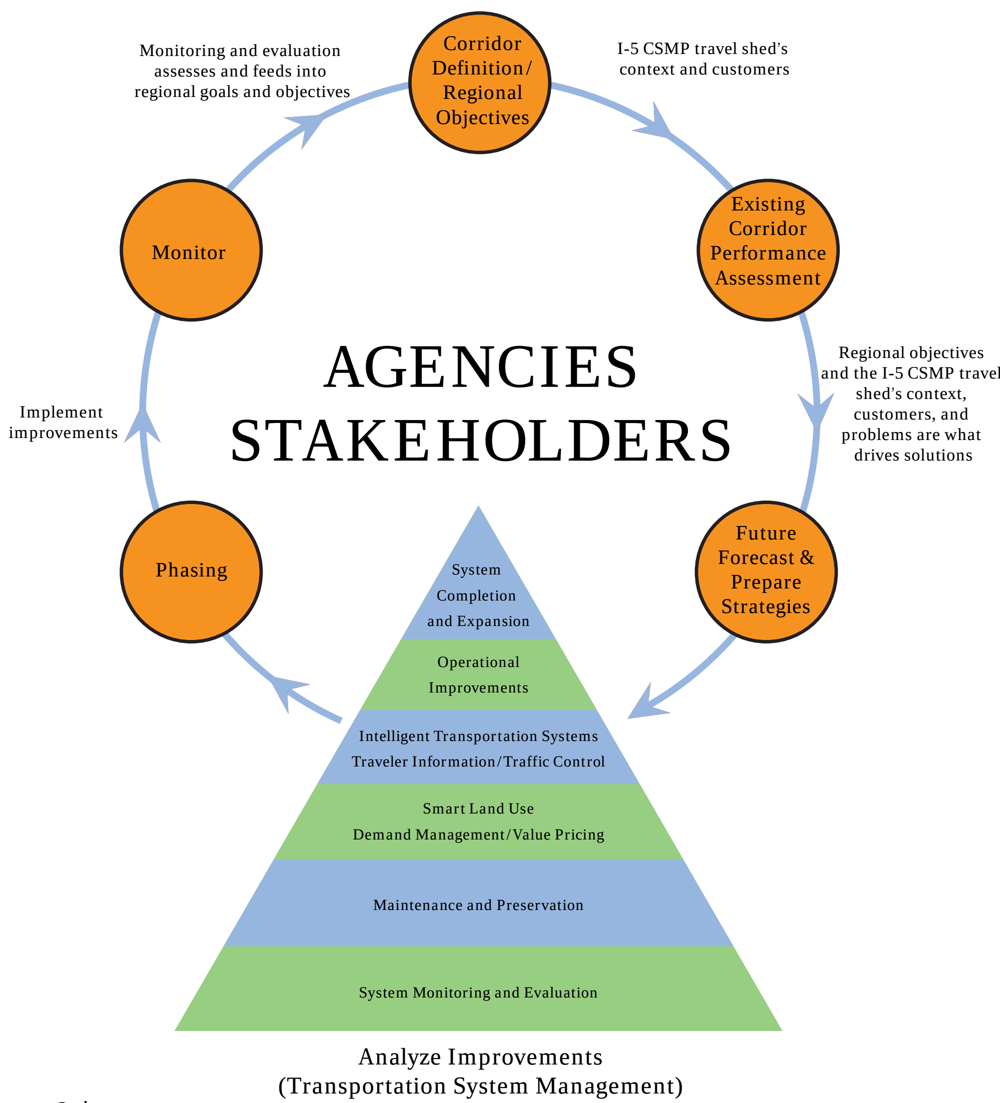
The intent of CSMPs is to develop a comprehensive transportation development and management strategy by assessing existing corridor conditions, objectives and constraints, plus identify and analyze potential solutions using performance based analysis. The development of CSMPs requires several components:

- Defining a corridor and transportation network that includes not only highways and major local roads but rail service, bus service, intelligent transportation systems (ITS), carpool/vanpool, and key bicycle and pedestrian facilities;
- Assessing the corridor's performance through easy to understand measures such as mobility, reliability, productivity, safety, and preservation;
- Forecasting future travel conditions using simulation tools;
- Preparing and analyzing how corridor management strategies will impact those future travel conditions;
- Preparing a series of recommendations and a 20-year implementation plan for managing, operating, monitoring, and improving the corridor system performance; and

- Developing a monitoring strategy that allows the CSMP to be periodically updated based on continuous analysis and performance monitoring that take deployed improvements and changes in travel demand into consideration

The goal of this approach is to develop an integrated and balanced approach to transportation that not only maximizes the efficiency and productivity of the transportation system but also maximizes the cost effectiveness of new investments. The following figure represents the various strategies the region has at its disposal to address mobility needs. It's important to point out that infrastructure expansion, although still important, is not the only strategy to address system performance. Operational improvements, ITS deployments, preservation, and smart land use work together with infrastructure expansion to make the transportation system more efficient.

Figure ES.1 I-5 CSMP Process Flow Chart



Source: Caltrans

Finally, the mobility strategies developed within the CSMP needs to be supportive of the policies, objectives, and performance measures set by the Regional Transportation Planning Agency. In the case of I-5 those are set by the San Diego Association of Governments' (SANDAG) within the Regional Transportation Plan. The overall regional objective is that mobility strategies are balanced and also address issues of sustainability, livability, mobility, efficiency, equity, accessibility, and reliability.

Corridor Characteristics

Before a new mobility strategy can be developed, a good understanding of who the users are, what are their mobility needs, how will those needs change over the next 20 years, and what corridor constraints and opportunities will affect the development of the region's multi-modal vision.

I-5 Services Local Trips

Regional arterials primarily service local and sub-regional trips, but gaps in the system limit their ability to serve as a north-south alternative to I-5. This is due to topography, environmental constraints, and decisions to discontinue certain routes. These constraints influence drivers to utilize I-5 for their local trips that in other urban areas would be handled by local roads.

Population and Jobs are Growing

The population in San Diego County has more than doubled since I-5 was planned and constructed, with the population of the five main cities in the travel shed increasing by nearly 400 percent. Since the 1970s, nationally significant industries have been established in Oceanside, Carlsbad, Del Mar, and the Golden Triangle communities of the City of San Diego. Rising population in neighboring counties also affects the I-5 NCC transportation system. Growth in neighboring regions increases the number of trips through this travel shed and to destinations within it. In addition, job growth has experienced an even more dramatic increase at over 1000 percent. I- 5 was not designed with this population or job growth in mind. Projections estimate that over the next 25 years, housing in the travel shed is expected to increase by approximately 30,000 units. In the I-5 CSMP travel shed, Vehicle Miles Traveled (VMT) is expected to increase by approximately 30 percent over the next 20 years, with or without improvements.

Vehicles Miles Traveled Grew Faster Than the Population

Not only has the population increased in the region, but the total amount of VMT has outpaced the rise in population, this is due to changes in lifestyles and improvements in living standards such as households with dual income and households owning multiple vehicles. While the U.S. population grew by 80 percent over the last 50 years, VMT on state highways throughout the nation grew 400 percent over the same period. The FHWA predicts another 130 percent increase by 2050.

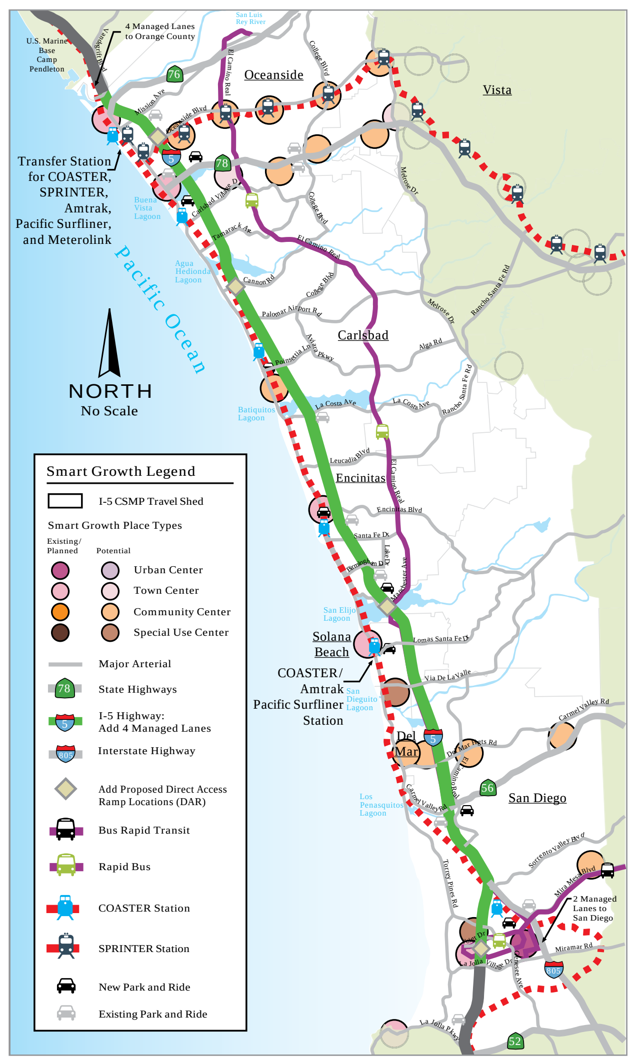
Goods Movement is Increasing

The I-5 CSMP corridor is part of a 1,350 mile network connecting goods movement between Mexico, the United States, and Canada. Approximately 12,000 trucks utilize I-5 in the North Coast Corridor on a daily basis. The transportation facilities in the I-5 CSMP travel shed support the local, regional, and interregional movement of goods that bolster the County's $142 billion economy and the interstate and international commerce critical to California's economic success. Freight rail service in the I-5 CSMP travel shed are run by the Burlington Northern Santa Fe Railway (BNSF). Within this corridor, BNSF Railway provides off-peak freight rail services from the Port of San Diego's two marine terminals to the Los Angeles area, with 4 to 8 freight train sets, totaling approximately 240 to 320 freight cars per day.

Land use

Historical land use decisions promoted low density, single land uses. This resulted in an extensive road and highway network to connect these uses. At the time of these land use decisions, most of the population growth in the corridor occurred before local and regional commuter rail service was in place, resulting in a vehicle-oriented land use pattern. The ability to change the land use development pattern in this travel shed is constrained because most of the population growth has already occurred. In an effort to better integrate local land use decisions with the regional

Figure ES.2 Smart Growth Map



Source: SANDAG, Caltrans District 11

transportation system, SANDAG has developed a smart growth policy for the region. The Smart Growth Concept Map (Figure ES.2) shows where 23 of the region's 196 existing and future Smart Growth opportunity areas are located within the I-5 CSMP travel shed. Most of these are located around existing COASTER and SPRINTER transit stations and in the commercial cores of the travel shed's communities. Currently a large proportion of residence in the cities of Oceanside, Carlsbad, and Encinitas are five or more miles from the nearest COASTER station. Smart Growth encourages cities to develop dense and compact land use patterns around centralized areas that are a nexus for different transportation modes, and also serve as community centers. It is expected that the Smart Growth plan will increase population densities from 6.1 persons per developable acre to 7.4 by the year 2030. While this densification will improve the viability of transit in some areas, many others will continue to be automobile dependent due to past land use decisions.

Employment Center

From 1970 to 2004, the number of jobs in the travel shed has an increase by approximately 379,000 jobs. This was predominantly due to major job centers being planned and built in the Sorrento Mesa and Del Mar Heights areas of San Diego, Carlsbad, and Oceanside. The travel shed accounts for 23 percent of the 1.45 million jobs in San Diego County, with many of those jobs in high income industries such as high technology, biotechnology, and medical fields.

Major Tourist Destination

The I-5 CSMP travel shed is home to a world renowned coastline with more than 2 million visitors a year. Also, several unique facilities and special events are located in the corridor placing additional demands on the transportation facilities. The San Diego Fairgrounds and the Del Mar Racetrack host a three-week summer fair, followed by a month-long horse racing season, and numerous other special events throughout the year. Also within the corridor is LegoLand, a major commercial recreation facility in the City of Carlsbad. In 2006, approximately 32.2 million visitors came to San Diego, which equated to approximately 2 million visitors a month with that amount increasing to 4 million visitors a month during the summer season. Nearly 70 percent of people visiting San Diego do so by car, as it is an attractive destination for nearby markets in southern California, Arizona, and other western states.

These trips create a high volume of weekend travel and consist of a higher proportion of high-occupancy vehicles (HOV).

Demand Up, Funding Down

Despite the increase in transportation demand transportation funding has not kept pace. In addition, the purchasing power of the traditional funding sources such as gasoline tax has decreased over time because of increased fuel efficiency and rising construction costs. In 2007, it was estimated that there was an identified need of $531 billion for transportation improvements nationally and only $188 billion of identified funding.

Existing Transportation Elements & Their Performance

The new mobility vision needs to first assess the performance of the existing transportation system those components include:

- I-5;
- Vanpool and Carpools;
- Public and Private Bus Service;
- Regional and Intercity Rail Services – Passenger and Freight;
- The Bicycle and Pedestrian System;
- Regional Arterials; and
- Transportation Management System (TMS)

The objectives of the performance analysis are to identify and analyze the causes of traffic congestion on the I-5 CSMP corridor and provide a sound technical basis for developing and evaluating improvement strategies for the corridor. The measures used to assess the corridor performance will include:

Travel Time, which is defined as the amount of time it takes for a vehicle to traverse between two points on a corridor. For the I-5 CSMP corridor, this travel time is the time to traverse the 27-mile corridor on the I-5 freeway. The travel time assessment includes both weekday and weekend travel times;

Reliability captures the relative predictability of the public's travel time. Unlike mobility, which measures how many people are moving at what rate, reliability focuses on how much mobility varies from day to day, and measures the amount of additional time that is needed to guarantee an on time arrival;

Duration of congestion & resulting Delay is defined as the total observed travel time less the travel time under non-congested conditions, and is reported as vehicle-hours of delay. Congestion delay occurs when travel speeds along the roadway decline below 35 mph for a period of 15 minutes or more during a "typical" midweek a.m. or p.m. commute period;

Connectivity (Bike & Peds) is measured by route gaps and route connections across I-5 and between adjacent cities;

Frequency (Transit) measures the number of available service runs for passenger rail; and

Safety captures the safety characteristics in the corridor, including crashes (fatality, injury, and property damage).

I-5:

Carrying over 80 percent of the trips made each day in the travel shed, I-5 is the backbone of the I-5 CSMP transportation system. This is due in part to it being the only roadway that runs the entire length of the travel shed. Over the next 20 years, vehicle trips on I-5 are expected to increase from 700,000 to more than 1,000,000.

Table 4.8 presents the I-5's past, present, and future projected Annual Average Daily Traffic (AADT) numbers at three locations in the corridor: south, middle, and north.

From 1970 to 2006, AADT increased 200 to 400 percent, depending on the highway segment. The largest increase in travel demand is seen near the Sorrento Valley employment center at the segment identified as I-805 to Carmel Mountain Road.

Table ES.3 Annual Average Daily Traffic (AADT) Travel Shed I-5 Segments

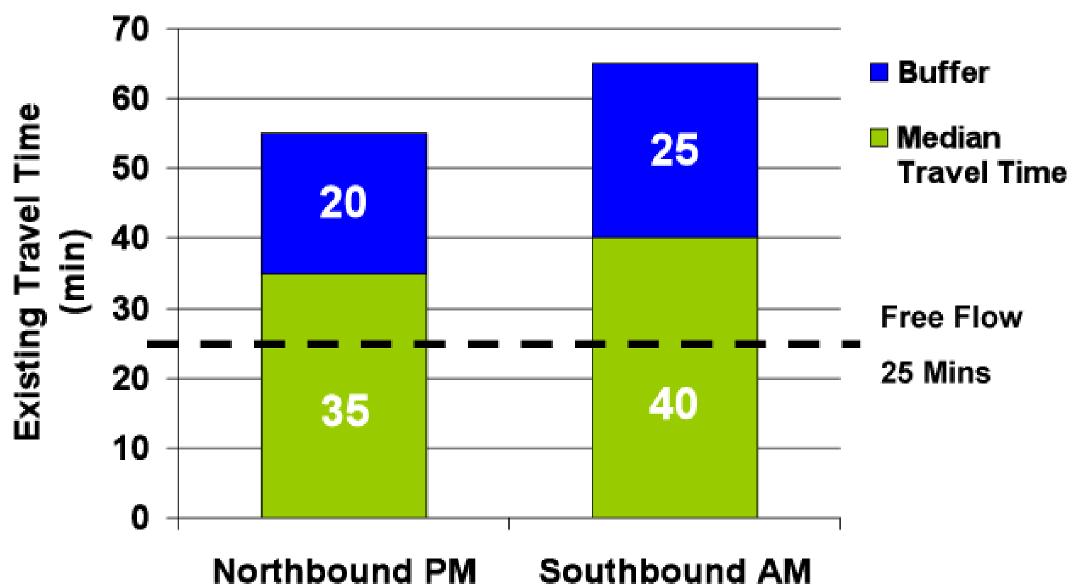
Segment	1970	2006	2030	Percent Change 1970 to 2006	Percent Change 2006 to 2030
I-805 to Carmel Mountain Road	48,000	265,000	408,500	452%	54%
Encinitas Boulevard to Leucadia Boulevard	43,000	198,000	298,000	360%	51%
Oceanside Boulevard to Mission Avenue	54,000	181,300	289,000	236%	59%

Source: Caltrans District 11, I-5 North Coast Draft Project Report: EA 11-235800, February 2008; SANDAG Series 10 Regional Forcast, December 2003

Increased demand correlates to increase delay which impacts people's quality of life by reducing the time available for family, friends, and other personal activities, but delay also impacts economic productivity by increasing labor costs, reducing production, and discouraging expansion and relocations of businesses. It is estimated that in 2008 the region lost $52 million in productivity due to Vehicle Hours of Delay (VHD). Weekday peak period VHD is estimated to increase to 19,000 hours by 2030 if no improvements are implemented.

Another important performance measure to monitor is the reliability of a traveler's trip. Figure ES.4 presents average travel and buffer times for a person to travel through the I-5 NCC. The bottom green portion of the graphs represents the average weekday (T-Th) travel times, and the top dark-blue portion of the graphs represent the "buffer time" from April 2007. The buffer time is the extra time that would be added to a person's daily commute to ensure an on-time arrival, 95% of the time.

Figure ES.4 Median Travel and Buffer Times



Source: PeMS, 2007

It is important to note that the median travel times displayed in Figure ES.4 do not consider the effects of incidents, weather, and special events on traffic.

Maintaining adequate capacity through the I-5 travel shed and freight system is vital not only to the region's future success, but also impacts the success of other regions, states, and countries.

The Safety analysis shows that, for weekdays in 2006, there were nearly 14 incidents a day, although this is below the statewide average, it's important to point out incidents like these cause congestion and delay further reducing the reliability of the facility. As I-5 demand increases over the study duration of 2030, the affect of each incident will cause larger travel times and delay in the corridor.

Vanpools and Carpools

SANDAG's vanpool and carpool programs (RideLink) help employers, employees, and students in the I-5 travel shed use alternative modes of transit to commute to school or work. The goal of this program is to increase the use of this transportation demand management strategy to decrease demand on the roadway system during peak congestion hours. There are more than 550 vanpools enrolled in SANDAG's Regional Vanpool Program, serving 4,200 passengers (186 vanpools with destinations in the I-5 CSMP travel shed, serving approximately 1,500 persons per day). The program provides a $400 monthly subsidy per vanpool. Within the I-5 CSMP travel shed, vanpooling has steadily increased due to increasing congestion on the highway.

Public and Private Bus Service

Existing public bus service in the I-5 CSMP travel shed is primarily a feeder system to other travel modes rather than a viable travel option for regional and intercity trips. Traffic congestion on the highways and on regional arterials increased travel times for the buses traveling in the corridor, making it unattractive to travelers for longer trips. As a result, the long-range express commuter routes have been discontinued in the I-5 CSMP corridor. NCTD operates the BREEZE bus service, transporting passengers in the north San Diego County region from Oceanside to Del Mar. BREEZE buses also serve the Camp Pendleton Marine Corps Base. The BREEZE serves 35,000 to 40,000 passengers daily. COASTER Connection Shuttles link commuters from the COASTER stations to job and activity centers. The shuttles available in the I-5 CSMP travel shed are the Carlsbad Poinsettia and the Sorrento Valley COASTER Connection. South of the travel shed, the MTS Route 992 provides service between the Santa Fe Station in downtown San Diego and the San Diego International Airport

Pedestrian and Bicycle Routes

Bicycle and pedestrian routes throughout the I-5 CSMP travel shed are part of a regional network that connects many of its activity centers, attractions, town centers, and multimodal transit stations. But like the regional arterial street system, the bicycle and pedestrian system also has gaps both in its east-west and north-south routes, particularly where the trails meet the highway. By closing these gaps, there is an opportunity to convert a higher share of community and intercommunity vehicle trips to bicycle and pedestrian trips and an opportunity to connect people to trail systems that lead to the coastline, activity centers, and transit centers. As such, the bicycle and pedestrian system are the subject of planning efforts by both SANDAG and local cities.

Los Angeles-San Diego-San Luis Obispo (LOSSAN) Rail Corridor

The LOSSAN rail corridor provides a viable transportation alternative to highway travel through San Diego County and to points north. The LOSSAN rail corridor is the nation's second busiest and is shared between Amtrak's Pacific Surfliner intercity service, COASTER and Metrolink commuter rail operations, and freight services operated by BNSF Railway and Union Pacific. Some services have experienced significant growth over the years. For example, annual COASTER ridership has more than tripled since service began in 1995. Currently half of the rail corridor is single track, resulting in conflicts, when opposing trains meet near a single-track section. These are interspersed throughout the corridor, creating multiple bottlenecks. This configuration requires passenger and freight service operators to share a single-track line, which limits service, the current headways, current ridership, current reliability issues are summed up in Table ES.5:

Table ES.5 Regional Commuter and Intercity Rail Service Performance

Train	Rail Route	Runs	Stops[a]	Headways	Travel Time	Ridership
COASTER	Oceanside to Downtown San Diego	22-26	6	30 minutes	57 minutes	1.5 million
SPRINTER	Oceanside to Escondido	20	7	30 minutes	53 minutes	TBD
Amtrak Pacific Surfliner	Downtown San Diego to Los Angelis	22-24	3	60-90 minutes	2 hours 45 minutes	2.5 million
Metrolink	Orange County Line: Oceanside to Los Angelis	22	1	60 minutes	2 hours	113,904[b]
Metrolink	Inland Empire Orange County Line: Oceanside to San Bernardino	24	1	30 minutes to 5 hours	2 hours 25 minutes	113,904[b]

Source: California State Rail Plan 2005-2006 to 2015-2016; Metrolink March 2006; Metrolink web site.
[a] Stops in the SDNCC travel shed.
[b] Total ridership for both lines.

Regional Arterials

Regional arterial roads link cities to major transportation facilities and each other within the I-5 CSMP travel shed, providing the roadway infrastructure for local and sub-regional vehicular trips. In several places, these roadways have gaps that limit their ability to serve as a north-south alternative to I-5. Although the system has deficiencies, one important characteristic is that they represent the only significant facility by which east-west trips can be made. They are utilized not only during daily commutes, but even more heavily for weekend and tourism related trips.

Transportation Management System (TMS)

As a transportation management solution, TMS involves information processing and electronic communications tools to better manage the region's highways, roads, transit, incidents and emergency responses, special events, commercial vehicle operations, and traveler information.

The TMS process in the I-5 CSMP travel shed involves three main components:

- Information gathering through ramp meters, closed circuit televisions (CCTV), and vehicle detection systems (VDS);
- Advanced transportation management systems located at Transportation Management Centers (TMC) to process and disseminate data to outside sources; and
- Communication technologies to disseminate information from the TMC to field elements and traveler information systems.

Developing a vision

Because of the variety and intensity of customer demands on this system, an improvement strategy that addresses only one travel mode will be unable to meet future demand.

Improvements Must be Balanced with Community Impacts

Even if funding was not a constraint, transportation improvements must be balanced with community impacts and other quality of life standards as well as integrated with land use decisions. Moving forward with this balanced approach SANDAG and Caltrans have linked transportation improvements to coastal access and resource enhancements projects through the adoption of:

- The Regional Comprehensive Plan (RCP) and Smart Growth Opportunity Areas map that promote pedestrian-friendly development near transit stations to encourage more walking, biking and transit trips, and preserve open space and natural habitat areas.
- The Environmental Mitigation Program (EMP) funds coastal resource enhancement projects as part of specific transportation projects.
- The Public Works Plan (PWP) provides the vehicle to implement a comprehensive program to protect, restore, and enhance sensitive coastal resources along the North Coast Corridor and to mitigate potential resource impacts caused by implementation of the transportation improvements.
- The Environmental Impact Report/Environmental Impact Study (EIR/EIS) describes the project's purpose and need, proposed alternatives, existing environment that could be affected, the potential impacts from each alternative, proposed avoidance, and mitigation measures.

Further, this collaborative effort would help to:

- Expand coastal access;
- Improve water quality;
- Support lagoon restoration;
- Jump-start habitat creation; and
- Meet corridor transportation needs

The transportation facilities within the I-5 CSMP travel shed will be supported and supplemented with new auxiliary lanes, acceleration/deceleration lanes, managed lanes, improved arterial lane connections, Rail/Transit improvements, ITS/TMS improvements, and increased monitoring. Together, these improvements will facilitate the flow of people not vehicles, and give travelers more timely information about travel options, plus maximize the efficiency of existing transportation systems.

Vision Scope

Planned improvements for the I-5 CSMP travel shed are shown in Figure ES.3. Note that many of the corridor arterial, TMS, and bicycle and pedestrian improvements are not shown in this figure but are described in Chapter 7. The improvements include:

- Rail double tracking, bridge replacements, and other improvements to allow for reduced headways and increased passenger and freight service;
- Bus Rapid Transit and infrastructure improvements to support it;
- The addition of auxiliary lanes at high traffic volume locations to improve traffic flow by minimizing conflicts created by vehicles merging on and off of the I-5;

- The modification of local highway interchanges in key locations to improve traffic flow between on/off-ramps and the highway;
- The possible addition of one GP lane in each direction from the I-5/I-805 merge to SR 78;
- The addition of 2 managed lanes in each direction from La Jolla Village Drive to Harbor Drive, as well as direct access ramps;
- Arterial improvements to improve access to the coastline, jobs, housing, transit, and activity centers;
- Synchronization and priority of signals on regional arterials;
- Bicycle and pedestrian improvements that improve connectivity and provide alternative travel options; and
- TMS improvements that help maximize performance of the facilities in the corridor and help travelers make informed and effective decisions.
- Interchange Connector Improvements to I-5/SR-56 and I-5/SR-78

Table ES.6 presents a summary of estimated cost associated with the proposed improvements.

Table ES.6 Summary of I-5 Improvement Costs

Improvement	Cost
Freeway Improvement Costs	$3.3 - 4.4 billion
Add Missing Connectors at 5/56, 5/78 Interchanges	$350,000,000
Regional Arterials	$745,000,000
Rail	$2.8 billion
Bus	$310,000,000
Bike & Pedestrian Enhancements*	TBD
Transportation Management Systems	$36,000,000
TOTAL	**$7.5 - $8.6 billion**

- Bike & Pedestrian Enhancement costs to be updated upon completion of regional bike plan

Source: I-5 CSMP

LOSSAN Expansion: The 2030 RTP calls for a fully double tracked corridor by 2030; currently, over 50% of the San Diego rail corridor is single track. To help achieve this goal and as part of this CSMP effort, a study was commissioned to analyze and prioritize potential rail investments in the San Diego County portion of the LOSSAN corridor, presented in detail in The San Diego – LOSSAN Corridor Project Prioritization Analysis (Cambridge Systematics, 2009). The rail analysis quantified operational improvements and other benefits and impacts of potential rail projects, and then prioritized the implementation of these projects to support phased expansion of rail capacity. Rail demand forecasts in 2030 show that with double tracking the corridor, approximately 20,000 passengers can be served daily.

Table ES.7 presents the service expansion plans for rail in the I-5 CSMP corridor. These plans nearly double the number of trains in the corridor over the next 20 years. In order to accommodate this growth, improvements are needed on the corridor.

Table ES.7 Service Plans - Number of Weekday Trains

	Existing	Near-Term Service Expansion	Mid-Term Service Expansion	Long-Term Service Expansion
Amtrak	22 - 24	26	32	36
COASTER	22 - 26	30	36	54
Metrolink	16	16	16	20
BNSF	5 - 7	7	9	9
Total	65 - 73	79	93	119

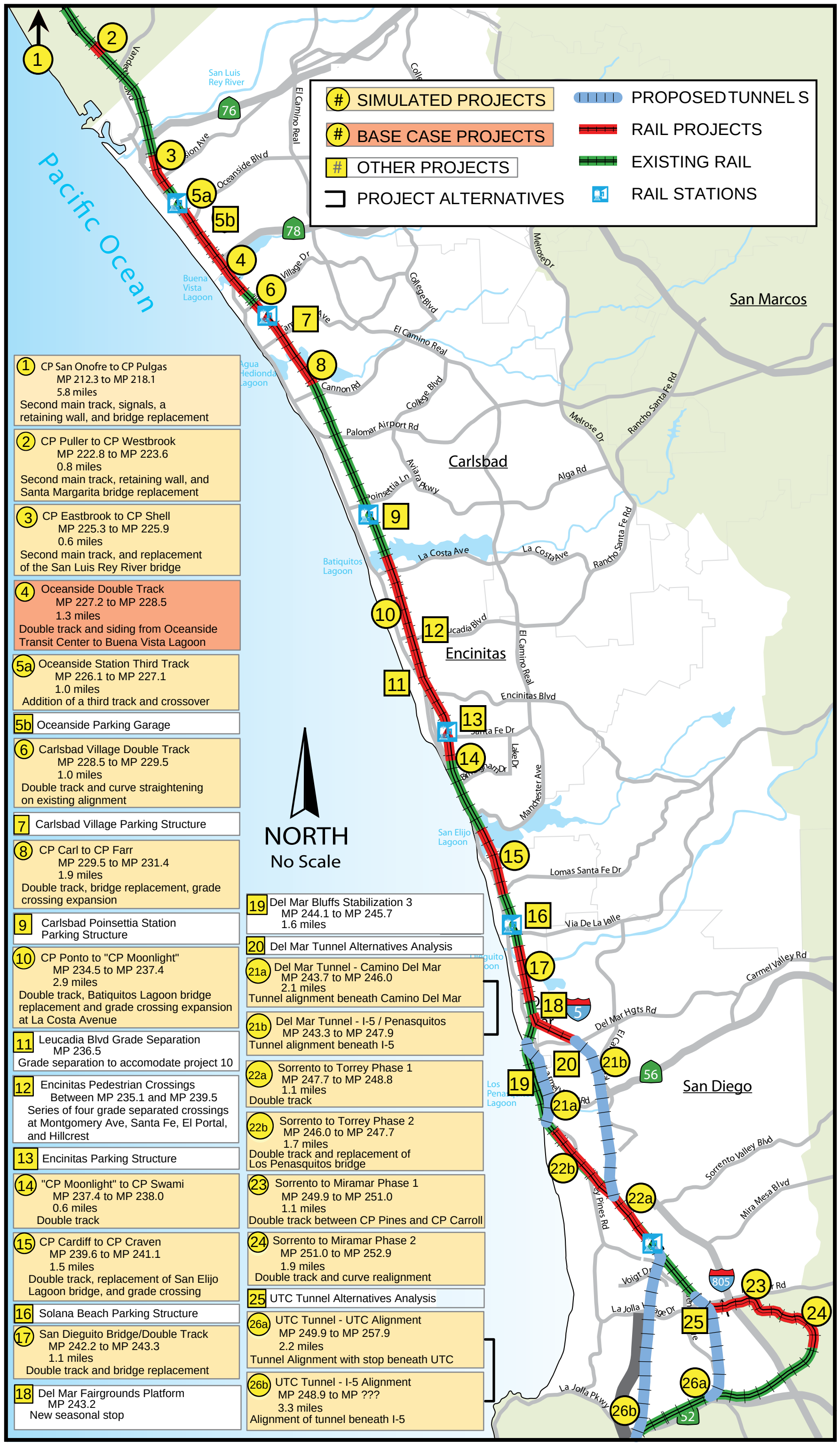
Source: Caltrans, The San Diego - LOSSAN Corridor Project Prioritization Analysis, prepared by Cambridge Systematics

1. Near-term service expansion, which equates roughly to year 2015, would expand service to 79 trains each weekday. This expansion would provide 6 to 14 more trains per day compared to 2008, with most service expansion for peak-period COASTER operations and a.m. and mid-day Amtrak operations.

2. Mid-term service expansion, which equates roughly to year 2025, would expand service to 93 trains each weekday. This expansion would provide 20 to 28 more trains than 2008, with more service throughout the day for all operators, except Metrolink. COASTER trains would run approximately every 25 minutes in the peak-direction, and every 90 minutes in the mid-day and evenings. Amtrak would have consistent hourly service in both directions throughout the day. BNSF would add a second manifest train in the mid-day.

3. Long-term service expansion, which equates roughly to year 2030, would expand service to 119 trains each weekday. This expansion would provide about 50 more trains than 2008, with more service throughout the day for all operators, except BNSF. As envisioned in the 2030 RTP, COASTER trains would run about every 20 minutes in the peak direction, and about every 60 minutes in the mid-day and evenings. Amtrak would have consistent hourly service in both directions, with additional trips in peak intercity travel hours.

Figure ES.8 Proposed I-5 North Coast Rail Improvements Map



Source: I-5 CSMP LOSSAN Rail Study, 2009

Interstate 5 North Coast Corridor

To create both a balanced transportation system that meets regional goals and prepares a management plan for maximizing system investments. Managed lanes are the proposed solution to improve mobility and the quality of life on I-5 because they:

- Provide long-term flexible tools and techniques to actively manage traffic congestion through pricing, vehicle eligibility and access to the managed lanes.
- Facilitate different trip types by responding to changes in travel demand created by different customers traveling at different times of day, different days of the week and using different travel modes.
- Provide travelers with an option that will allow them to have more reliable trip times even as travel demand continues to increase.
- Incentivize the use of Carpools and Bus Rapid Transit by making trip times for transit systems faster and more predictable.

These benefits are possible because the system will be managed to remain free flowing to traffic at all hours.

The varying mobility and congestion challenges in the corridor also call for a variety of improvement types. With respect to the I-5 freeway facility, this includes auxiliary lanes, general-purpose (GP) lanes, traffic operational improvements, HOV/Managed lanes, and direct access ramps (DAR).

These improvements have been analyzed under the following scenarios:

- ***2030 No Build Scenario –*** The existing freeway facilities with improvements including projects programmed to be constructed by 2030 and projects currently under construction.
- ***2030 8+4 Scenario –*** Includes an extension of the two HOV/managed lanes (one northbound and one southbound) from La Jolla Village Drive to the merge/diverge with I-805 HOV/managed lanes. Four HOV/managed lanes (two northbound and two southbound) from the I-5/I-805 junction to the project limits at Harbor Drive in the City of Oceanside. The 8+4 alternative maintains the current configuration of eight general purpose lanes throughout the corridor with the addition of new auxiliary lanes.
- ***2030 10+4 Scenario –*** Includes an extension of the two HOV/managed lanes (one northbound and one southbound) proposed from La Jolla Village Drive to the merge/diverge with I-805 HOV/managed lanes. Four HOV/managed lanes (two northbound and two southbound) from the I-5/I-805 junction to the project limits at Harbor Drive in the City of Oceanside. Plus two additional general-purpose lanes are proposed between Del Mar Heights and State Route 78.

Figure ES.9 Illustration of the Corridor with the Incorporation of ML and Auxiliary Lanes

Source: Caltrans District 11

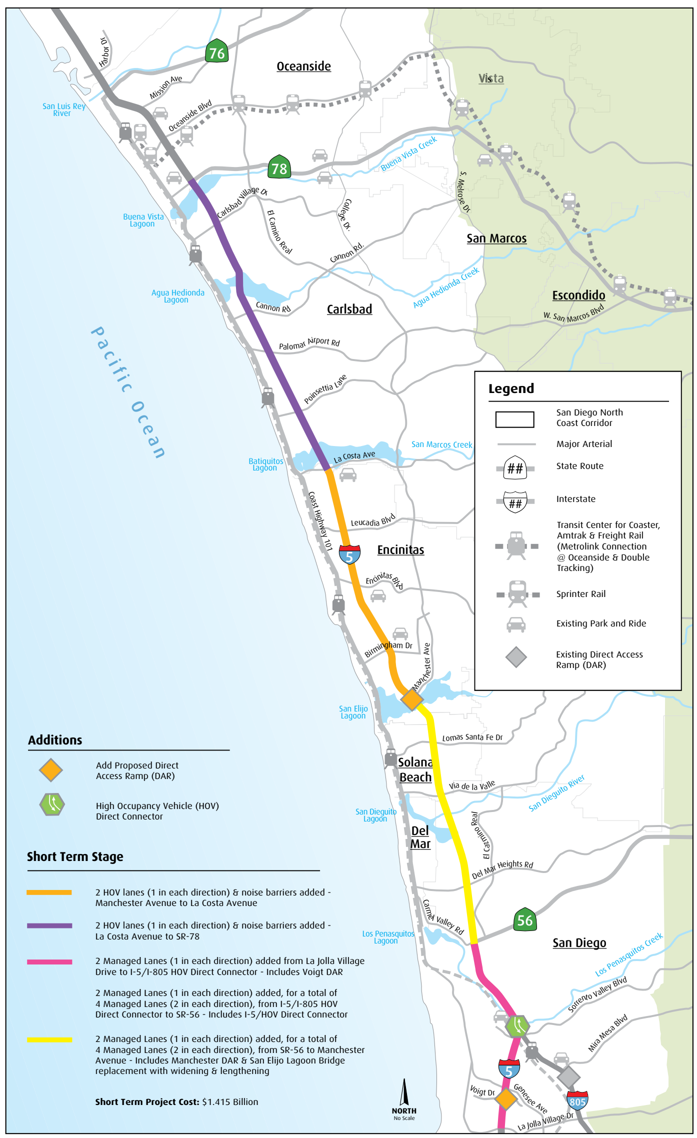
Whichever build scenario is selected, given the project's size, complexity, and cost, the proposed improvements would need to be built in phases. As of this report's publication, the improvements would be constructed in three major stages. These are summarized below and presented in Figures ES.10 through ES.12. The ultimate improvement staging will be determined during the design phase. Using the 8+4 Buffer as an example the following costs can be assumed.

Short Term

- Two HOV lanes and noise barriers from Manchester to La Costa Avenue
- Two HOV lanes and noise barriers from La Costa Avenue to SR-78
- Two managed lanes from La Jolla Village Dr to SR 56, including Voigt DAR and I-5/I-805 HOV Connector
- Two managed lanes from SR 56 to Manchester (four managed lanes total), including Manchester DAR and San Elijo Lagoon Bridge replacement with widening and lengthening

Short Term Cost – $ 1.4 billion

Figure ES.10 I-5 North Coast Corridor HOV/Managed Lanes Project Construction: Short Term Staging Map



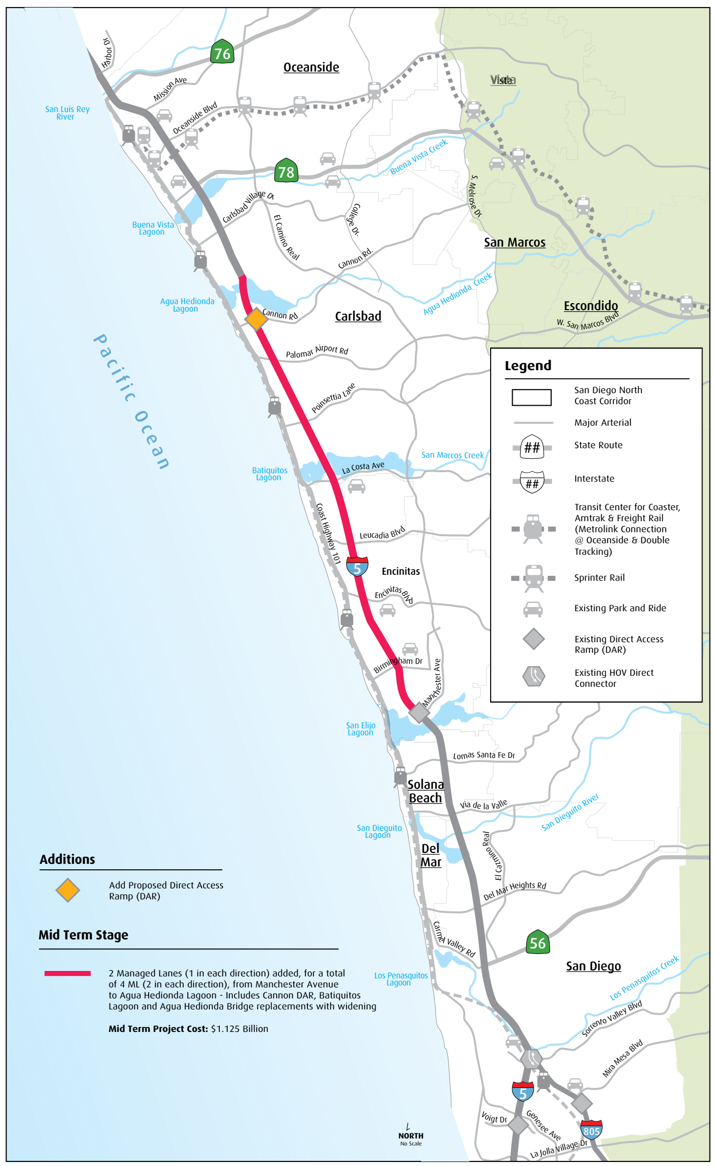
Source: Caltrans District 11, May 2010

Mid Term

- Two managed lanes from Manchester to Agua Hedionda Lagoon (four managed lanes total), including Cannon DAR, Batiquitos Lagoon and Agua Hedionda Bridge replacements with widening

Mid Term Cost – $ 1.1 billion

Figure ES.11 I-5 North Coast Corridor HOV/Managed Lanes Project Construction: Mid Term Staging Map



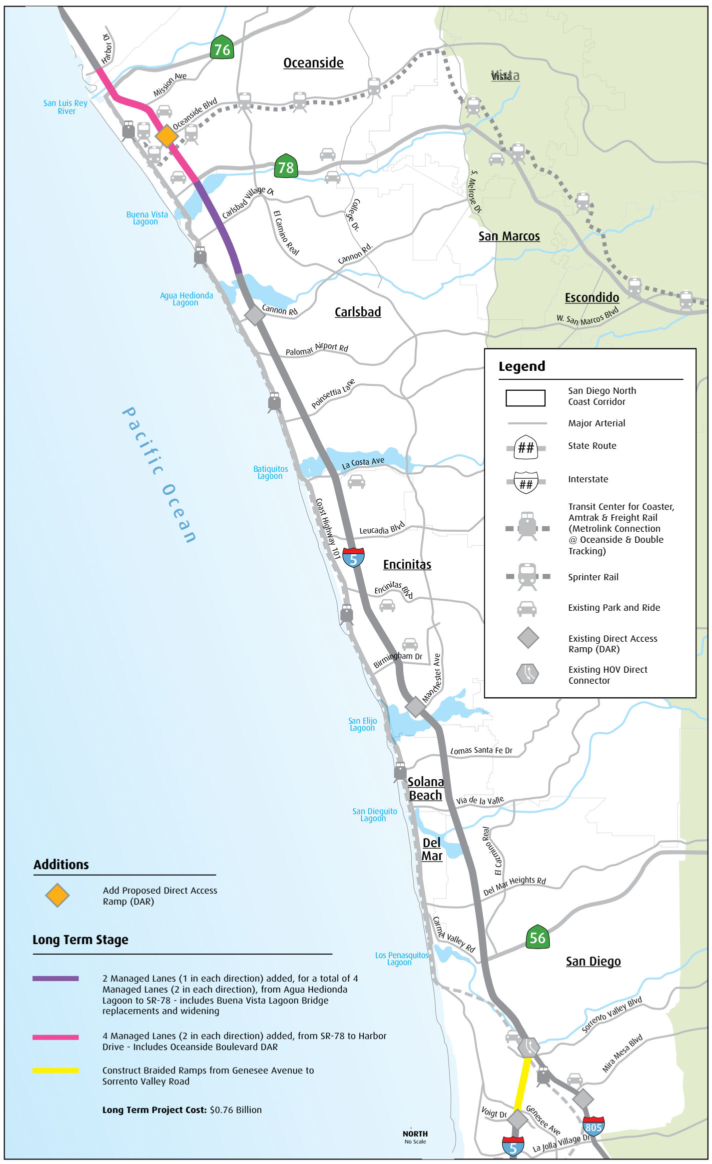
Source: Caltrans District 11, May 2010

Long Term

- Two managed lanes from Agua Hedionda Lagoon to SR 78 (four managed lanes total)
- Four managed lanes from SR 78 to Harbor Drive, including Oceanside Blvd DAR and Buena Vista Lagoon Bridge replacements and widening
- Construct braided ramps from Genesee to Sorrento Valley

Long Term Cost – $0.8 billion

Figure ES.12 I-5 North Coast Corridor HOV/Managed Lanes Project Construction: Long Term Staging Map



Source: Caltrans District 11, May 2010

Monitoring / Analyses of these Improvements

This CSMP was built on nearly 20 years of planning for the I-5 North Coast Corridor including the consideration of regional visions and plans, inclusion of regional and corridor stakeholders, several corridor and modal studies, and voter approved programs and measures. The CSMP analysis approach is based on the premise that well planned investments throughout the system yield significant improvements in corridor performance, including mobility, safety, productivity, accessibility, and reliability.

Based on these proposed improvements, two specific analyses were completed:

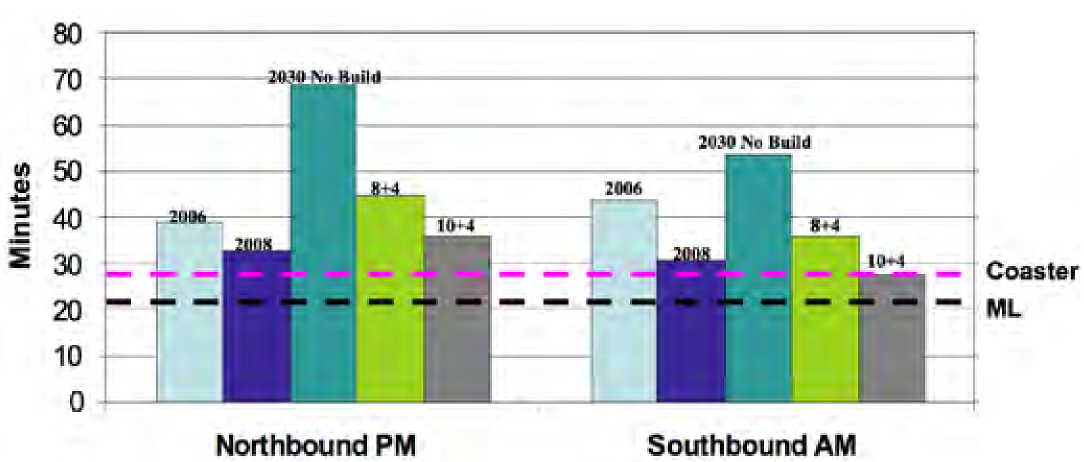
- LOSSAN Corridor Project Prioritization Analysis - A study that analyzed and prioritized potential rail investments in the San Diego County portion of the LOSSAN corridor; and
- Highway Analyses – Which performed micro-simulation analyses, on the existing, and future conditions for the proposed freeway scenarios.

Travel Time and Reliability

The managed lanes would operate at reliable, free-flow conditions throughout the day at around a 24 to 26 minute travel time.

On a typical weekday under free-flow or un-congested conditions, the average travel time for the I-5 (from Harbor Drive to La Jolla Village Drive) is approximately 23 to 25 minutes, at an average speed of 65 to 70 mph. As shown in Figure ES.13, the average northbound afternoon peak-period travel time in the 2030 No Build Scenario is estimated to be over 69 minutes.

Figure ES.13 Average Peak Corridor Travel Times



Source: PeMS and I-5 CSMP Microsimulation Modeling Results

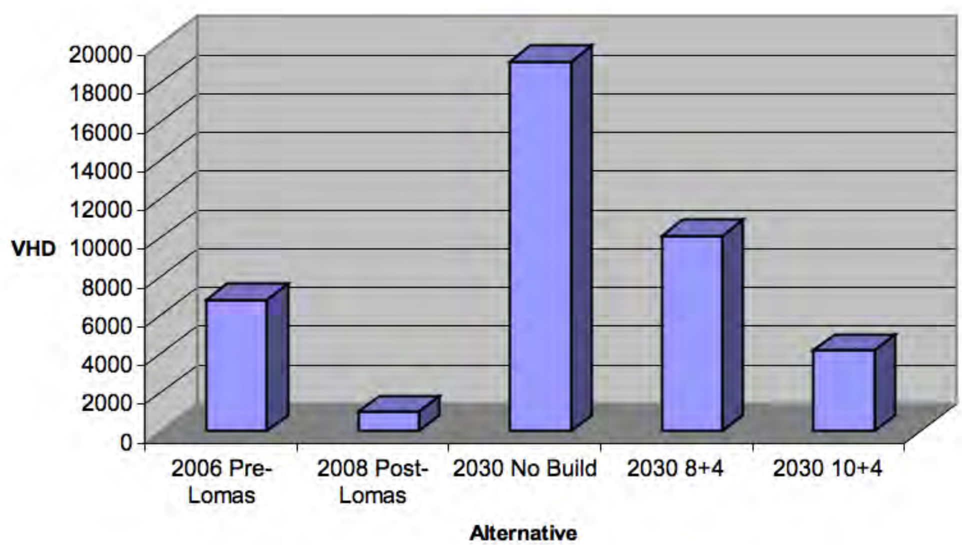
This is 36 minutes longer than the peak in 2008. The 8+4 Scenario peak travel time is estimated to be 45 minutes. This is nearly a 24-minute time savings, relative to the 2030 No-Build. The 10+4 scenario results in the most significant peak travel time savings of nearly 33 minutes, relative to the 2030 No-Build. It is important to note that the effects of incidents, weather, and special events can significantly increase travel the travel times shown in Figure ES.13.

With respect to the Managed Lanes it would operate at a reliable and free-flowing condition throughout the day with a 24 to 26 minute travel time for the 10+4 and 8+4 Scenarios, respectively. Which will provide an attractive option to the traveling public that would save about 10 minutes over general purpose lanes in the 10+4 and 20 minutes in the 8+4 alternatives.

Delay

Delay along I-5 was calculated as the difference between the travel time under congested conditions and the travel time at un-congested conditions (greater than 35 mph). Caltrans defines the congested speed threshold as 35 mph since this is the speed range at which traffic flow breaks down and becomes stop and go.

Figure ES.14 I-5 Northcoast Corridor Total Peak Period (6-10 am & 3-7 pm) Vehicle Hours of Delay (<35 mph)



Source: PeMS and I-5 CSMP Microsimulation Modeling Results

Each of the scenarios improve VHD over the No Build scenario with a 73 percent reduction with the 8+4 Scenario, and an 87 percent reduction with the 10+4 Scenario in the morning peak (southbound) direction. The afternoon peak period northbound delay savings are 25 percent, and 69 percent, respectively. The 10+4 Scenario shows the most significant improvement, with approximately 4,400 hours saved in the morning peak period southbound and over 7,700 hours saved in the afternoon peak period northbound on a typical day. In addition to the hours saved, the proposed improvement scenarios also help alleviate local arterial congestion by attracting traffic back to I-5 that would otherwise use local roads to make its trips. This is shown by the increase of VMT in the traffic models, which correlates to more people utilizing the facility.

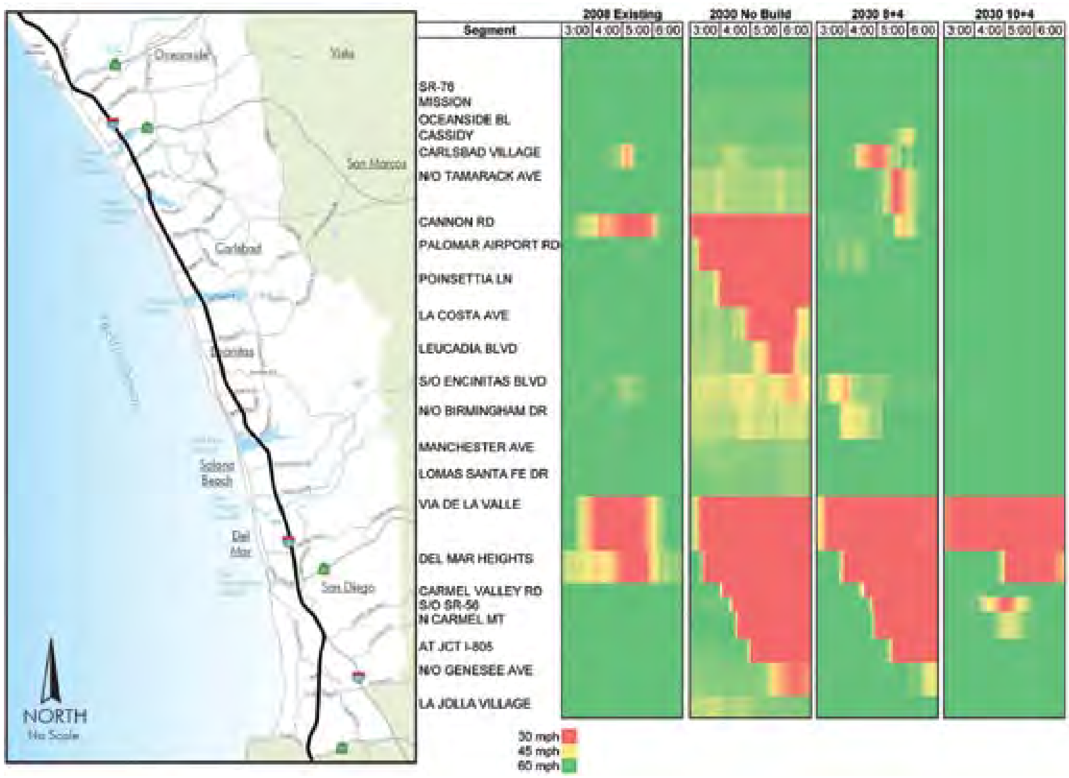
Speed and Duration of Congestion

Without improvements, the I-5 freeway's future performance will degrade to more than 15 hours of congestion a day in 2030 during a typical work week, with free flow conditions only occurring in the middle of the night, which will constrain the region from meeting travel demands for local, regional, and interregional trips.

Speed contours were developed for the peak periods from the analyses to show the estimated speeds through the corridor and to present the bottleneck locations along the corridor. The scale for the speeds moves from red to yellow to green as the speeds increase from low values (30 mph or less) to high. Figures ES.15 and ES.16 present the speed diagrams for the scenarios.

As shown in Figure ES.15, bottlenecks occur in the afternoon northbound at Via De La Valle and Cannon Road in 2008. By 2030 No Build, the afternoon bottlenecks are still located at Via De La Valle and Cannon Road with the time duration and the extent of the bottlenecks considerably longer. It is anticipated that the Cannon Road queue will extend beyond Encinitas Boulevard at its peak and the Via De La Valle bottleneck to La Jolla Village Drive. Neither of the p.m. bottlenecks return to free flow within the analysis period; the queue still extends back to approximately Genesee Ave at 7:00 p.m. It is unlikely the Via De La Valle bottleneck will clear before 9:00 p.m., representing over six hours of "peak" conditions northbound in the afternoon in 2030.

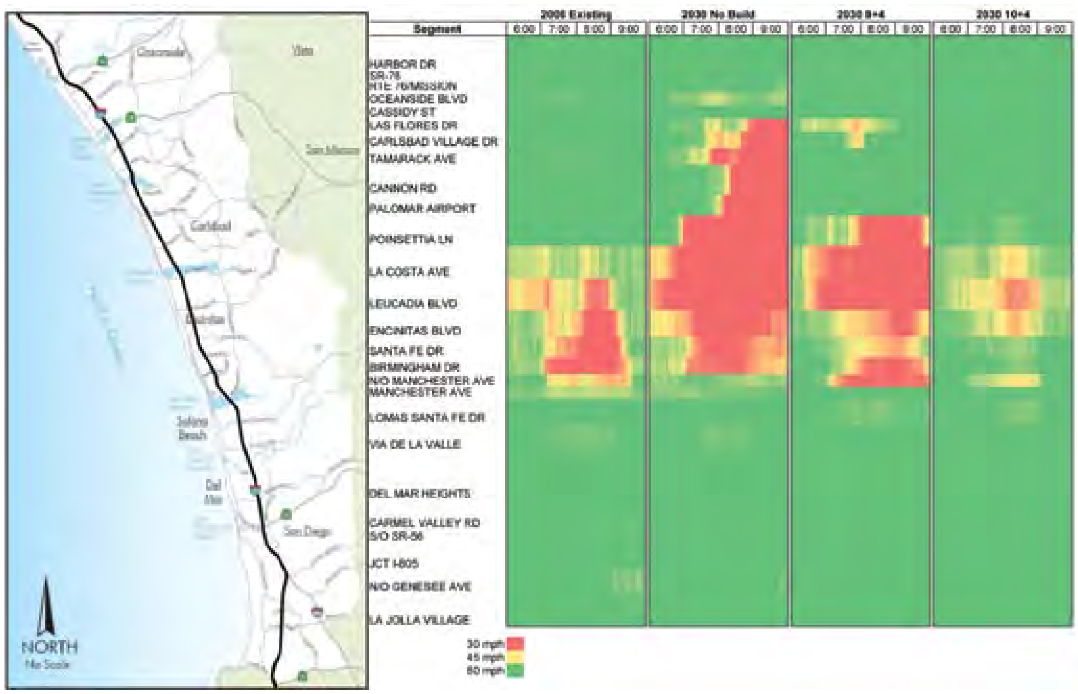
Figure ES.15 I-5 CSMP Corridor Freeway Bottlenecks Northbound P.M. Peak Period Weekday



Source: I-5 CSMP Microsimulation Modeling Results

The bottleneck occurring northbound in the afternoon located at Via De La Valle remains, extending back to Genesee Ave., but has a shorter duration in the 8+4 Scenario. In addition, the bottleneck at Cannon Road in the p.m. northbound is eliminated, with minor bottlenecks of brief duration and extents appearing at Las Flores Drive and Cassidy Street. Initially the proposed facility will provide improved capacity on opening day but will gradually become congested as the region's population increases. Bottlenecks and unstable traffic flow north of Via De La Valle return to free-flow conditions northbound in the afternoon peak period in the 10+4 Scenario. A bottleneck still remains in the 10+4 Scenario northbound at Via De La Valle but the queue does not extend beyond Carmel Valley Road, with it extending to only Del Mar Heights Road most of the time. There is also a minor bottleneck for approximately 30 minutes south of SR-56.

Figure ES.16 I-5 CSMP Corridor Freeway Bottlenecks Southbound A.M. Peak Period Weekday



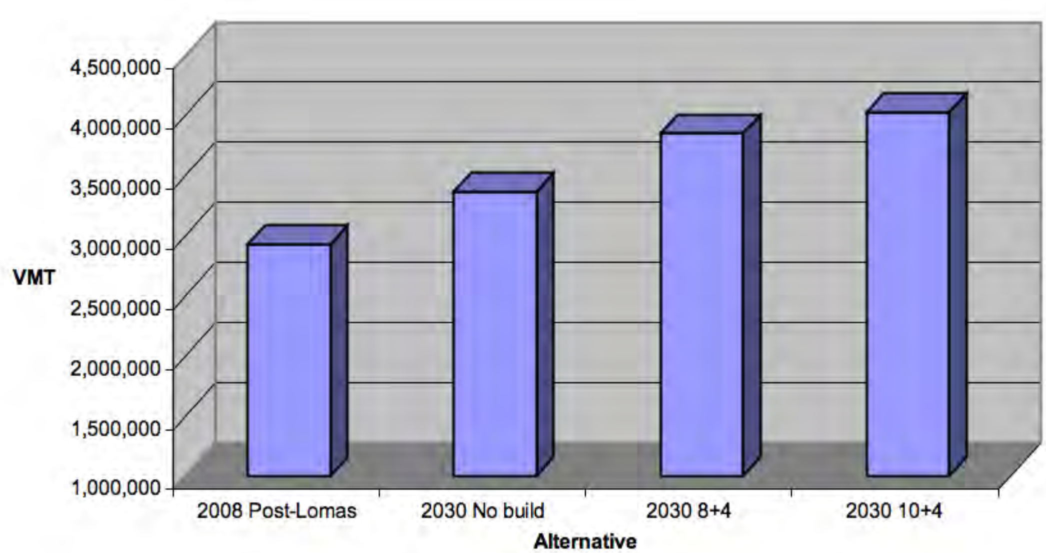
Source: I-5 CSMP Microsimulation Modeling Results

Figure ES.16 shows the bottlenecks along I-5 southbound for the morning peak periods. By 2030, southbound congestion is estimated to increase considerably, particularly north of Manchester Avenue. The a.m. bottleneck at Manchester Avenue is anticipated to expand to additional bottlenecks at Leucadia Boulevard and Tamarack Avenue, and extend back to Cassidy Street with no sign of returning to free-flow conditions during the mid-day. As shown, the extent and duration of the weekday southbound bottlenecks at Manchester Boulevard and Leucadia Boulevard for the 8+4 Scenario are reduced and the 10+4 Scenario results in the elimination of all major bottlenecks in the southbound direction in the morning peak period. A minor bottleneck still remains in the 10+4 Scenario southbound at Leucadia Boulevard with areas of unstable traffic flow between Manchester Avenue and Poinsettia Lane. The 10+4 Scenario is the only one that returns traffic flow to free-flow conditions for most of the analysis periods.

Vehicle Miles Traveled (VMT)

Due to population growth in Sandiego and surrounding counties VMT is expected to increase by nearly 20%, even if a No-Build alternative is selected. The 8+4 and 10+4 scenarios are estimated to increase VMT by an additional 3.9 and 4.2 percent, respectively. Despite these increases in VMT, VHD is estimated to decrease in both scenarios, and vehicle-hours traveled (VHT) on I-5 is estimated to decrease by four to fifteen percent.

Figure ES.17 I-5 Northcoast Corridor Total Peak Period (6-10am & 3-7pm) Vehicle Miles Traveled (VMT)



Source: I-5 CSMP Microsimulation Modeling Results

Implementation Plan

The vision for this CSMP is to maximize the I-5 CSMP corridor's mobility, reliability, safety, accessibility, and productivity through performance-based analyses that prioritizes projects, strategies, and actions. Maximizing the corridor's transportation system performance is contingent on all of the corridor's components working together, including the modal systems (transit, local roadways, highways, and bicycle and pedestrian routes) and land use.

The CSMP analysis was intended to help select balanced, phased, and multimodal transportation investments that would serve the variety and intensity of travel demands placed on it now and in the future. The phasing plan for the ultimate scenario selected will need to be periodically updated as many variables will change due to external forces that are difficult to predict or may change over time such as land use, economic situation, improvements to the transportation system, etc.

In addition, an ongoing cycle of implementation, evaluation, and adjustments will be needed to ensure that the transportation system continues to meet regional goals and makes efficient use of investments in the corridor.

Before any improvement plan is implemented, the region will hold public hearings in each of the project's affected cities, during this time the public is encouraged to come out to view and comment on the proposed projects. After the hearings and the comment period are closed a thorough review of all comments will be conducted, after taking public input into consideration, a preferred alternative will be chosen. The selected alternative will go through an approval process with various stakeholders, then the project's phasing plan must be matched with funding availability and other regional priorities. The CSMP will be updated once the preferred alternative is selected and a financial plan is in place. The region has identified partial or full funding for 12 of the 40 projects associated with the LOSSAN Corridor. The region has also identified funding for extending HOV Lanes from Manchester Ave. to SR-78, these HOV Lanes are common in all build alternatives. It is estimated that construction can begin as early as 2013. The CSMP is considered to be a performance driven "living document" that will need to be updated once performance data is available for each improvement implemented.

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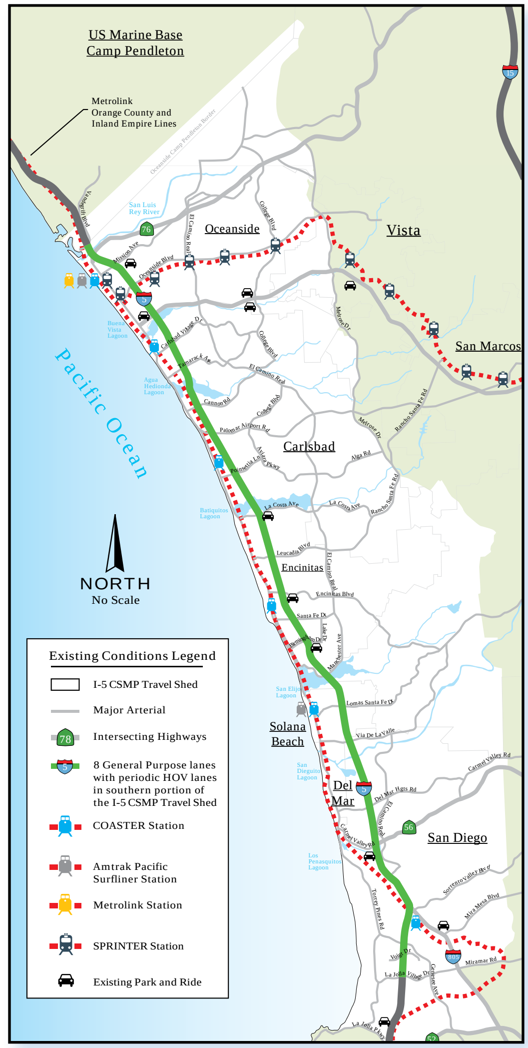
Chapter:

1 The CSMP Process in San Diego

Overview

This document contains the Corridor System Management Plan (CSMP) for the I-5 corridor in San Diego. The CSMP I-5 corridor extends along I-5 between La Jolla Village Drive in San Diego and the Wire Mountain Road overpass in Camp Pendleton, approximately 27 miles; the corridor also includes I-805 between Miramar Road/La Jolla Village Drive and I-5/I-805 interchange in San Diego, approximately 2.3 miles. The plan is multimodal and intended to maximize the transportation system performance in the travel shed (white area on map),



Source: Rand McNally: The Thomas Guide, 2006.

This I-5 CSMP is part of an immediate effort to develop CSMPs for corridors with capital projects being funded by the California Transportation Commission's (CTC) Proposition 1B Corridor Mobility Improvement Account (CMIA), a bond measure passed by voters in 2006. In addition, due to the timing of this CSMP effort, this document is also intended to serve as the San Diego North Coast Corridor (SDNCC) I-5 Business Plan. As such, this CSMP was tailored to the include additional information on the travel shed's stakeholders, context, customers, and transportation system, beyond the requirements of the CTC's guidelines for CSMPs.

Organization of this Report

This document will follow the process shown in Figure 1.1. The pyramid represents comprehensive management strategies for a transportation system in which infrastructure expansion, although still important, is not the only strategy to address system performance. Operational improvements, intelligent transportation systems (ITS) deployments, preservation, and smart land use work together with infrastructure expansion to make the transportation system more efficient.

The focus of this CSMP is on system management in order to achieve the highest productivity, mobility, reliability, accessibility, and safety in the corridor for the future.

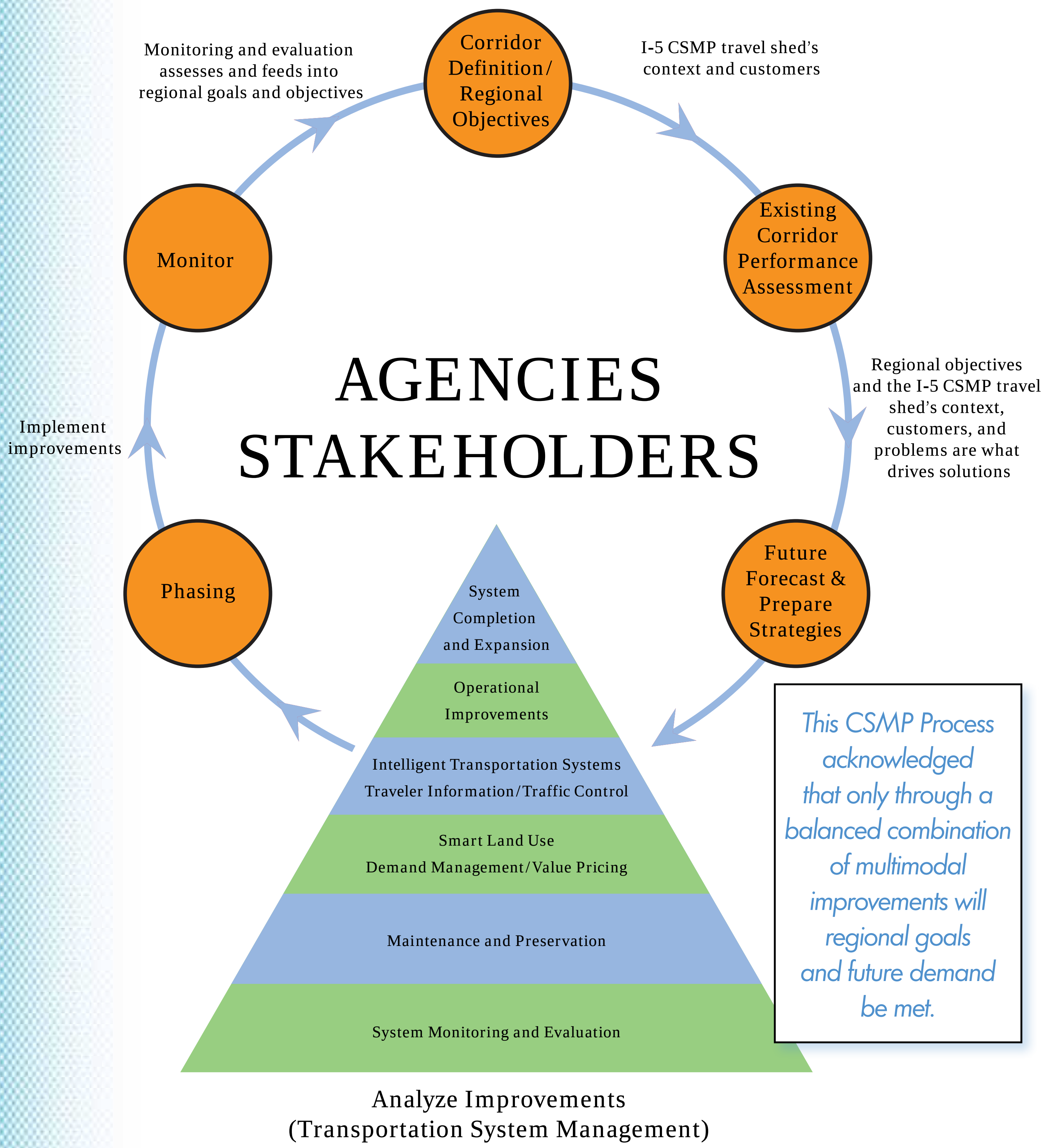
This document is organized as follows:

- This section, **Chapter 1,** outlines the context of this report, describes the CSMP process, introduces the stakeholders and background on I-5 corridor planning, and provides an overview of the analysis approach.
- **Chapter 2** provides an overview of the corridor definition and inventory.
- **Chapter 3** details the land uses and natural environment in the corridor.
- **Chapter 4** presents the trip characteristics in the travel shed, focusing on the customers who use the corridor.
- **Chapter 5** contains the existing conditions performance assessment.
- **Chapter 6** presents the results of the initial I-5 North Coast Corridor analysis.
- **Chapter 7** contains the planned improvements for a multimodal future in the corridor.
- **Chapter 8** presents the results from the CSMP analyses and a proposed implementation plan for corridor improvements and performance monitoring.
- **Appendix A** presents a glossary of commonly used terms and acronyms.

Corridor System Management Plan Process

The California Department of Transportation (Caltrans) initiated a new and innovative approach to system and operations planning by developing Corridor System Management Plans (CSMP) for congested urban corridors. CSMPs are intended to help maximize the mobility, reliability, safety, accessibility, and productivity of the transportation system and prioritize projects, strategies, and actions. Maximizing corridor transportation system management is contingent on all of the corridor components working together, including the modal systems (transit, local roadways, highways, bicycle and pedestrian routes) and the land uses within the corridor travel shed.

Figure 1.1 CSMP Process Flow Chart



This CSMP Process acknowledged that only through a balanced combination of multimodal improvements will regional goals and future demand be met.

A CSMP is a tool for a unified, multimodal, and multijurisdictional guide for implementation of improvements, system management, performance measurement, and monitoring.

CSMPs are intended to lay the groundwork for a corridor vision by assessing existing corridor conditions, identifying and analyzing potential solutions, and identifying the appropriate outcomes. The development of CSMPs require several components:

- Defining the CSMP corridor extents and transportation network, including state highways, major local streets and roads, rail and bus transit service, intelligent transportation systems (ITS), carpool/vanpool, and key bicycle and pedestrian facilities;
- Involving key stakeholders through all stages of plan development;
- Determining and summarizing existing corridor performance and management through assessments of mobility, reliability, productivity, safety, and preservation, as well as causes of performance degradation;
- Forecasting future travel conditions using simulation tools;
- Preparing and analyzing corridor management strategies for the future; and
- Preparing final CSMP recommendations and a 10-year implementation plan for managing, operating, monitoring, and improving the corridor system performance.

By including these components in the CSMP, it will result in a strategy that not only maximizes the efficiency and productivity of the transportation system but also maximizes the cost effectiveness of new investments.

CSMPs are intended to be "living" documents that are updated based on more detailed analyses and ongoing performance monitoring that take deployed improvements and changes in travel demand into consideration (e.g., does a project generate a new problem elsewhere on the transportation system). In the case of this I-5 CSMP, future updates will include analysis of a more integrated and phased implementation plan, some of which will result from the I-5 Corridor Public Works Plan (PWP).

SDNCC System Management Planning Process and Stakeholders

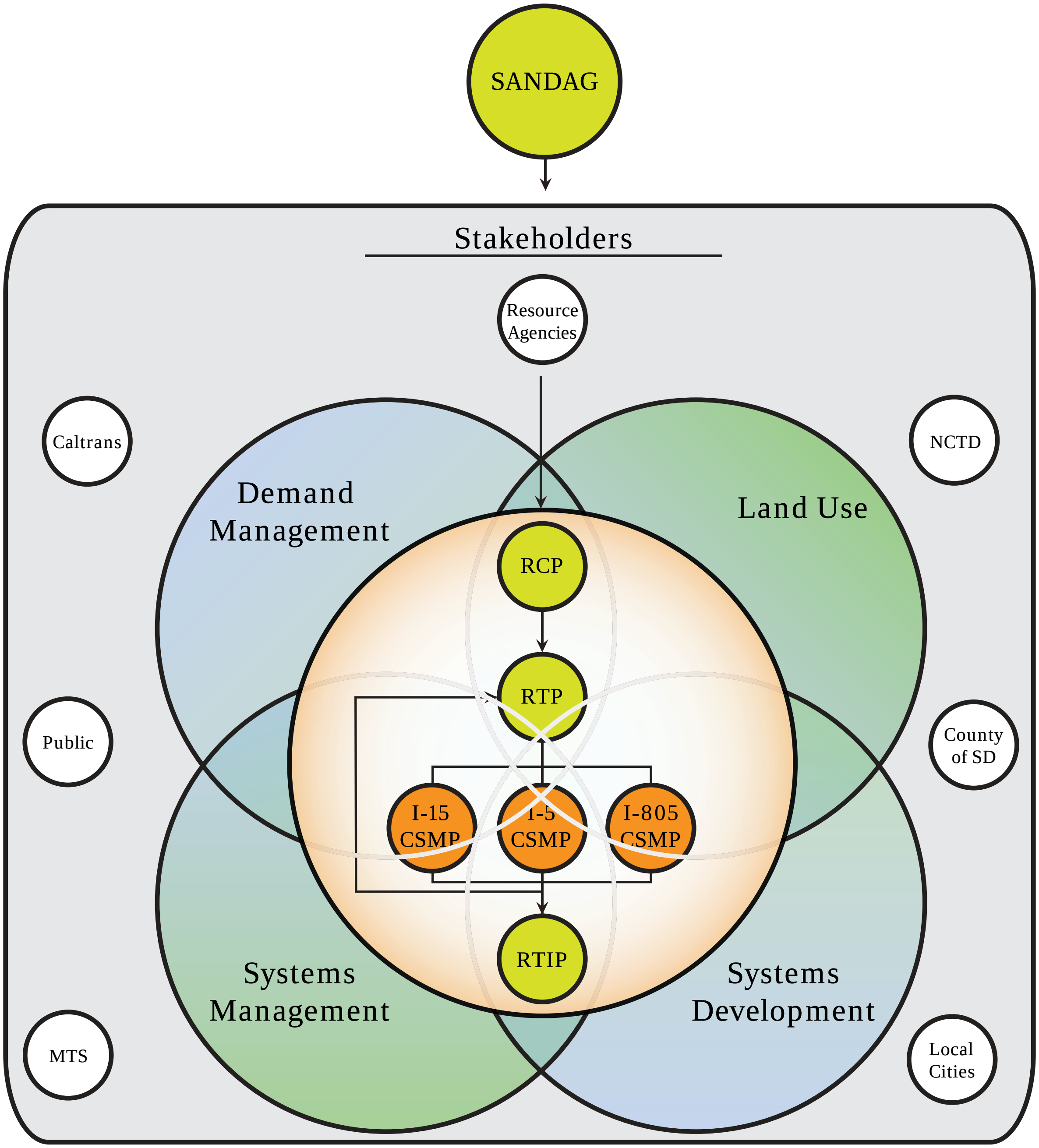
The region must plan for the transportation needs for over 1 million new residents, 465,000 new jobs, and 290,000 new homes expected over the next 20 years.

This I-5 CSMP was built upon an adopted regional vision, inclusion of regional and corridor stakeholders, and maintains the existing foundation from the regional plans; validating that the CSMP will meet regional objectives. Figure 1.2 presents the stakeholders and demonstrates how the CSMP is consistent with this regional vision, including: system development, systems management, demand management, and land use.

As the Metropolitan Planning Organization (MPO), SANDAG is responsible for establishing the region's overall transportation and land use plan. The development of effective CSMPs requires the involvement of Caltrans staff, local and regional partner agency staff, and management. In this case, the CSMP was built on nearly 20 years of planning and decision-making regionally and for the I-5 North Coast Corridor, including Caltrans and San Diego Association of Governments (SANDAG), as shown in Figure 1.3. The phasing plan in these CSMPs will be integrated with the RTIP.

The region began studying I-5 corridor specific needs with the initiation of the North Coast Transportation Study in 1997. The region's voters approved a 40-year extension of the County's Transportation Sales Tax Measure (Transnet) in 2004, a .5 cent sales tax for regional transportation purposes which included adoption of a specific list of highway and transit improvements that would be partially funded through the program, including the I-5 Managed Lanes and Los Angeles-San Diego-San Luis Obispo Rail Corridor (LOSSAN) double track improvements being discussed in this CSMP.

Figure 1.2 CSMP Process within Regional Context



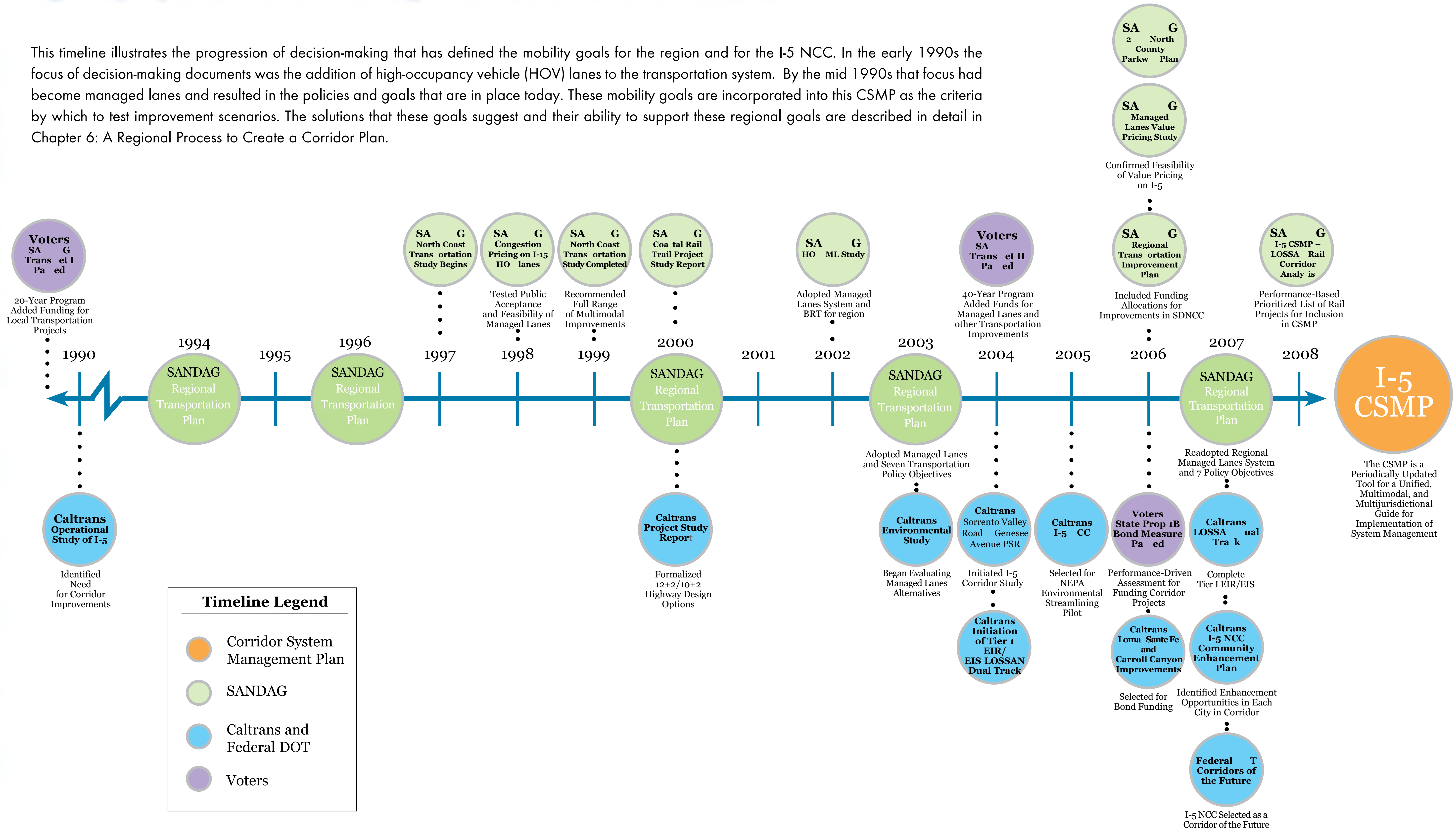
SANDAG

Corridor System Management Plan

RCP	Regional Comprehensive Plan
RTP	Regional Transportation Plan
RTIP	Regional Transportation Implementation Plan
MTS	San Diego Metropolitan Transit System
NCTD	North San Diego County Transit Development

Figure 1.3 I-5 CSMP: Corridor Planning and Stakeholder Involvement Timeline

This timeline illustrates the progression of decision-making that has defined the mobility goals for the region and for the I-5 NCC. In the early 1990s the focus of decision-making documents was the addition of high-occupancy vehicle (HOV) lanes to the transportation system. By the mid 1990s that focus had become managed lanes and resulted in the policies and goals that are in place today. These mobility goals are incorporated into this CSMP as the criteria by which to test improvement scenarios. The solutions that these goals suggest and their ability to support these regional goals are described in detail in Chapter 6: A Regional Process to Create a Corridor Plan.



Analysis Approach

Corridor Definition

The corridor is contained within one MPO, allowing for consistency with stakeholders, regional context, policies and objectives, and performance measures.

The analysis of the corridor began with defining the corridor. This involved balancing the size of the corridor so it is large enough to understand how and why it functions the way it does, but not so large that the effort becomes too complex and unwieldy. In the case of the I-5 CSMP, the logical termini of the transportation facilities are defined by Camp Pendleton, a 16-mile undeveloped area between two urban regions on the north of the shed, and the primary access points for the Golden Triangle/University Towne Centre (UTC)/Sorrento Valley Area (this includes the Mira Mesa/Carroll Canyon Interchange on I-805; the Sorrento Valley, Genesee, and La Jolla Village interchanges on I-5; and the Sorrento Valley COASTER Station) on the south. The southern limit is also appropriate because it includes the junction of I-5 and I-805 which represents a significant traffic split for north-south traffic traveling through the corridor. In establishing the appropriate lateral limits of the shed, the Pacific Ocean is used as the western limit and the eastern limit was extended far enough east to capture those users who would use the I-5 corridor instead of the I-15 corridor for their north-south trips.

Identify Relevant Policies and Performance Objectives

This CSMP was developed based on the policies, objectives, and performance measures for the regional transportation system set within the Regional Transportation Plan and provided the evaluation criteria for the existing conditions performance and improvements to the transportation resources within this corridor. These measures include:

Sustainability

- Limits natural resource impacts.
- Discourages sprawl.
- Improves air quality and reduces greenhouse gas emissions.
- Improves water quality and helps restore lagoons.
- Maximizes throughput.

Policies and performance measures for the regional transportation system set by SANDAG provided the evaluation criteria for improvements to transportation resources within this travel shed.

Livability

- Limits right-of-way impacts.
- Connects communities.
- Reduces noise.
- Provides coastal access.

Mobility

- Supports goods movement.
- Decreases travel times.
- Provides modal options.
- Is supported by land use.

Efficiency

- Manages traffic congestion.
- Has available resources/funding.
- Provides good value (throughput per dollar).

Equity

- Serves various demographic groups.
- Serves various user groups.

Accessibility

- Encourages High-Occupancy Vehicle (HOV) ridership.
- Encourages transit ridership.
- Supports regional network managed lanes.

Reliability

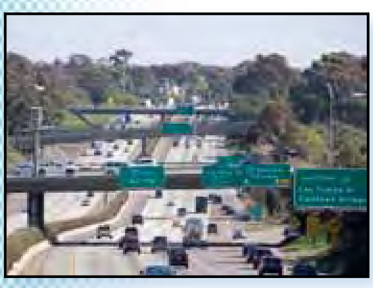
- Provides consistency in travel times.
- Provides travel options.
- Informs travelers of travel options.

Existing Corridor Performance Assessment

Next, this CSMP analysis describes the existing conditions of the corridor, including:

- The existing transportation systems in the travel shed;
- Its context in terms of land uses and natural environment; and
- The customers who are served by the transportation system and the travel demand they create for local, regional, and interregional trips.

The Freeway portion of the travel shed was assessed using:



- Travel time;
- Delay;
- Reliability;
- Facility efficiency/productivity; and
- Safety.

Passenger Rail performance was measured by:

- Travel time;
- On-time performance;
- Headways;
- Passenger counts; and
- Farebox cost recovery rate.

Freight Rail performance was measured by:

- Throughput (number of car loads); and
- Average train speed.

Regional Arterial Street performance was measured by:

- Number of completed roads;
- Connectivity to activity centers, coastline, and transit;
- Capacity of roadway to accommodate demand; and
- Roadway infrastructure to facilitate bus transit trips.

Bus performance was measured by:

- Farebox cost recovery; and
- Headways.

Pedestrian and Bicycle System performance was measured by:

- Route gaps;
- Route barriers; and
- Route connectivity to transit modes and activity centers.

This performance analysis helps to describe the I-5 corridor transportation patterns and identifies the problems within the travel shed that improvement scenarios should address.

Future Forecasts and Analyze Improvements

The CSMP analysis approach is based on the premise that well planned investments throughout the system yield significant improvements in systemwide performance, including mobility, safety, productivity, accessibility, and reliability. Based on the existing conditions analysis, previous planning efforts, and forecast of future conditions, investment strategies were identified using the transportation management pyramid in Figure 1.1. These were then evaluated against the performance measures that support regional goals. Improvements include:

- Highway lanes;
- Arterial roadway;
- Goods movement;
- Regional transit system including bus and passenger rail improvements;
- Bike and pedestrian trail system;
- Intelligent transportation systems;
- Transportation demand management; and
- Integration of land use and transportation.

Implementation and Monitoring Plan

An ongoing cycle of implementation, evaluation, and adjustments is envisioned to ensure that the transportation system continues to meet regional goals and makes efficient use of investments in the transportation system.

The analyses resulted in a balanced, multimodal, phased transportation implementation plan to serve the variety and intensity of travel demands placed on it now and anticipated in the future. Project priorities reflected in this phasing scenario were based on criteria and assumptions that include:

- Level of available funding;
- Type of funding available;
- Regional priorities;
- Transportation benefits;
- Environmental benefits and impacts; and
- Construction impacts to the transportation system and travel shed's communities.

The phasing plan developed in this CSMP will need to be periodically updated as many of these variables will change over time due to external forces that are difficult to predict or may change over time such as land use, economic situation, improvements to the transportation system, etc. As, such this CSMP will be updated in light of new and available system performance data. This implementation plan includes information on ongoing analysis of the transportation system's performance that will be needed to establish if the improvements are meeting regional goals.

Chapter:

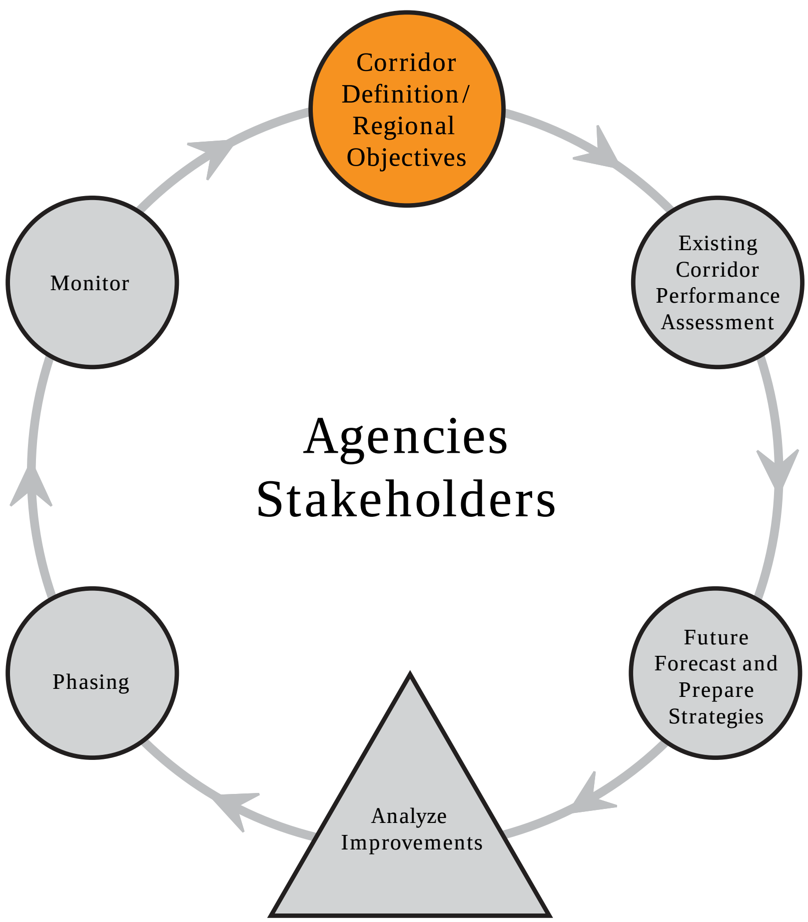
2 The Transportation System

Overview

This chapter provides a description of the I-5 CSMP corridor (Figure 1, Corridor Definition), introducing the travel shed and its transportation system. This includes a definition of the corridor within the county, the corridor limits, and the transportation elements within the corridor that have a major impact on corridor mobility, reliability, and productivity. These include roadways, rail and bus transit, carpool/vanpool, ITS/operational elements, and bicycle and pedestrian facilities. The following two chapters supplement this chapter providing the characteristics of travel in the corridor, including:

- Chapter 3, which describes the context created by the travel shed's existing land uses and natural environment; and
- Chapter 4, identifies the customers of this transportation system and their demand for travel through the corridor.

Figure 2.1 The Corridor System Management Plan Process Diagram



(Transportation System Management Pyramid)

The I-5 CSMP Travel Shed

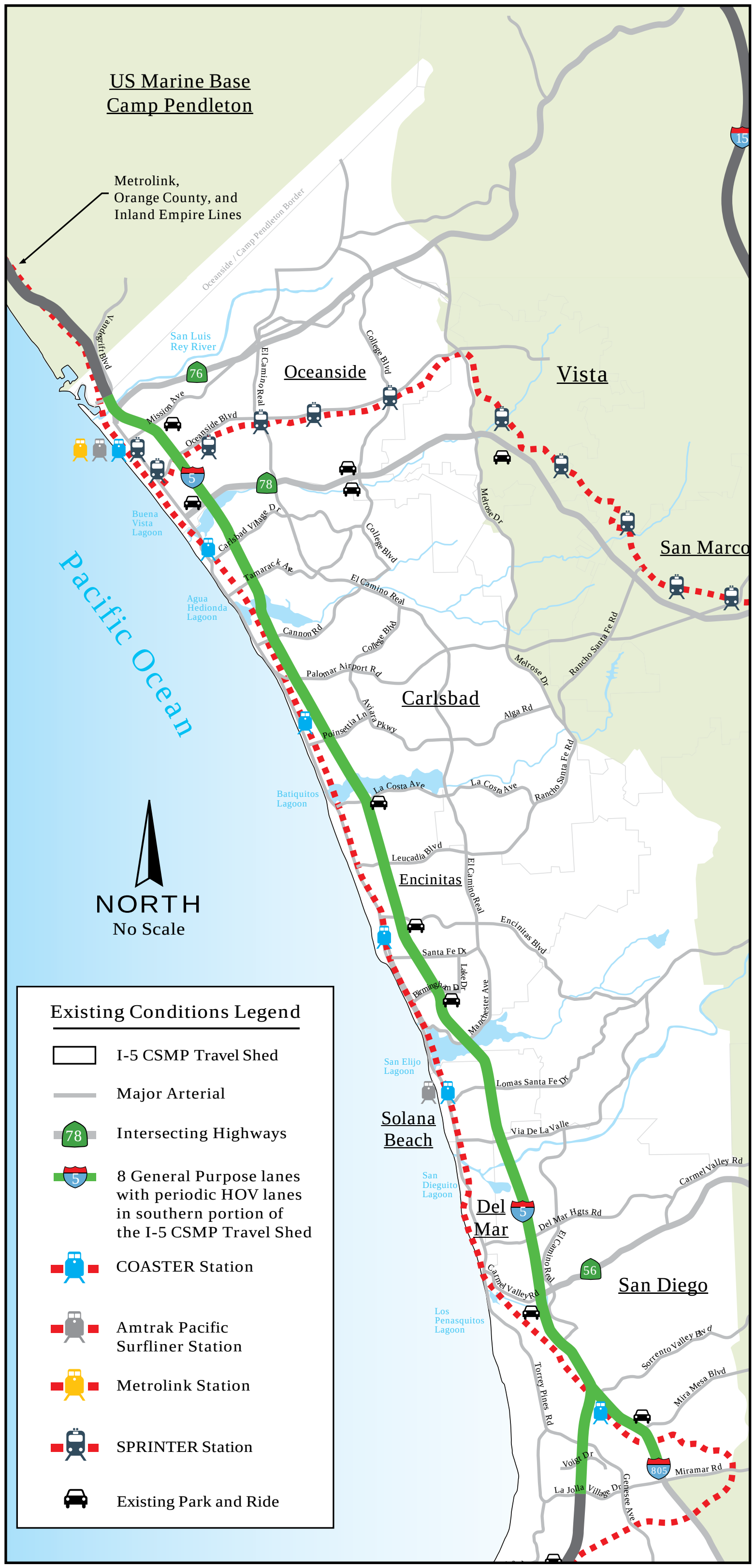
The I-5 CSMP travel shed is part of a regional transportation system that is planned by SANDAG. Since this CSMP travel shed falls within the purview of one MPO, there is the opportunity to have a unified vision and easier consensus for its improvements. As shown in Figure 2.2, three CSMPs are being developed: I-5 North Coast Corridor, I-15, and I-805. A portion of the I-5 and I-805 travel shed boundaries overlap.

Defining the I-5 CSMP corridor involved determining the logical termini of the travel shed, considering characteristics of traffic volumes and origin and destination patterns, land uses, terrain, modes of travel, and route junctions. Figure 2.3 shows the extents of the I-5 CSMP corridor.

Figure 2.2 San Diego County CSMP Travel Sheds

Source: Travel Sheds defined in I-15 Final Project Report, February 2003 and I-805 Corridor System Management Plan, July 31, 2008; Rail Routes come from USGS 1995 digital orthophotographs, SanGIS, 1992 digital orthophotographs, SANDAG, 1997. IMPlan, 1995. Points of Entry found in SANDAG's At the Crossroads, July 2002.

Figure 2.3 Map of I-5 CSMP Travel Shed Extents



Source: Rand McNally: The Thomas Guide, 2006.

The I-5 corridor is one of only two north-south travel routes in the county, I-15 being the other. Additionally, the topography of the region limits alternative routes. Therefore, it is critical that these two corridor facilities work together and be managed in order to maximize the transportation system performance.

The I-5 CSMP travel shed is approximately 30 miles long and is home to more than one-half million people. The logical termini of the I-5 CSMP transportation facilities are defined by 1) the entry point for the U.S. Marine Base Camp Pendleton at Vandegrift Boulevard at the north, a 16 mile undeveloped area between two urban regions, and 2) SR 52 at the south, just below the I-5 and I-805 merge, the primary access points for the important business centers of Sorrento Mesa, University Towne Center, and the Golden Triangle (this includes the Mira Mesa/Carroll Canyon Interchange on I-805, the Sorrento Valley, Genesee, and La Jolla Village Interchanges on I-5, and the Sorrento Valley COASTER Station). This southern limit is also appropriate because it includes the junction of I-5 and I-805 which represents a significant traffic split for north-south traffic traveling through the corridor. For the lateral limits of the I-5 CSMP travel shed, the Pacific Ocean coastline is the western limit and the eastern limit is an approximate midpoint between the I-5 and I-15, including travelers who would likely use the I-5 corridor instead of the I-15 corridor for their north-south trips.

The travel shed includes the cities of Oceanside, Carlsbad, Encinitas, Solana Beach, Del Mar, and the northern part of the City of San Diego. The communities that lie within the City of San Diego and are in the travel shed are: Fairbanks Ranch, Torrey Pines, Carmel Valley, Torrey Hills, University City, and part of La Jolla.

Within the I-5 CSMP travel shed, the major components of the transportation system include:

- I-5;
- Transportation Management System (TMS);
- Regional Arterials;
- Regional and Intercity Rail Services – Passenger and Freight;
- Public and Private Bus Service;
- Vanpool and Carpools; and
- Bicycle and Pedestrian Routes.

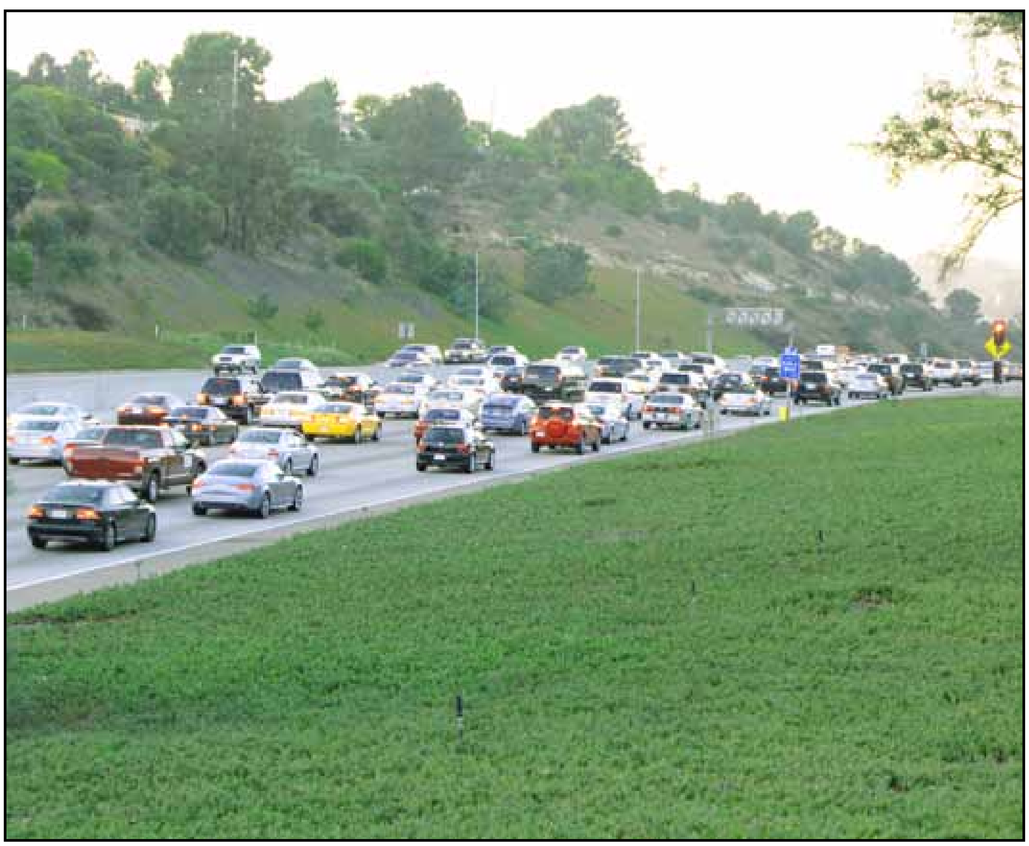
Interstate 5

> *Carrying over 80 percent of the trips made each day in the travel shed, I-5 is the backbone of the I-5 CSMP travel shed and is frequently referred to as the "Gateway to San Diego."*

The portion of I-5 represented in this CSMP is approximately 30 miles long and is the primary transportation mode in the corridor. This is due in part to it being the only roadway that runs the entire length of the travel shed. It is part of a 1,350-mile Interstate that connects Mexico to Canada. Planned and constructed in the 1960s and 1970s, I-5 was part of a national initiative started in the 1930s to implement an interstate system to serve national defense and to create intercontinental routes. At the northern edge of the travel shed, it connects to Camp Pendleton, the second largest Marine Corps Base in the country. Approximately 20 miles south beyond the corridor extents, it connects to the San Ysidro Port of Entry (Mexico), one of the country's most heavily crossed borders.

I-5 has not only retained its original purpose, but tremendous growth in population, jobs, and tourism over the past 40 years has made it a heavily used transportation corridor for local and regional trips. I-5 is frequently referred to as the "Gateway to San Diego," not only because it has historically been the primary transportation facility that visitors use to enter the region, but also because the facility's coastal location results in many scenic views which in many ways are the trademark of the region.

Figure 2.4 Interstate 5



The entire segment of I-5 in this CSMP is located within the coastal zone and the facility crosses six coastal lagoons. These natural and scenic resources are not only very unique for an urban freeway, they are important assets to the region and are important elements to address in developing transportation improvements in the corridor.

I-5's existing configuration is eight general purpose lanes, four northbound and four southbound, that are separated by a median. The freeway includes 16 local street interchanges, and five freeway interchanges (SR 76, SR 78, SR 56, I-805, and SR 52). Improvements to the I-5 in the last 40 years have focused on the interchange with the I-805 merge, which was completed in 2007, and on the addition of high-occupancy vehicle (HOV) lanes in the southern portion of the travel shed. In addition, operational improvements such as changeable message signs, ramp meters, and traveler information have been made to the freeway to improve carrying capacity and system management.

According to the 2007 Caltrans Traffic and Vehicle Data Systems Unit annual traffic volumes reports, the I-5 CSMP corridor carries an annual average daily traffic (AADT) varying between 134,000 and 244,000 vehicles. The lowest volumes are experienced at the northern end of the corridor while the highest volumes are seen in Solana Beach between Del Mar Heights Road and Manchester Avenue. The percentage of trucks increases from approximately four percent at the southern end of the corridor to six percent at the northern end.

Transportation Management System (TMS)

As a transportation management solution, TMS involves information processing and electronic communications tools to better manage the region's highways, roads, transit, incidents and emergency responses, special events, commercial vehicle operations, and traveler information. The design of TMS follows intelligent transportation system's (ITS) logical process of information gathering, processing, and dissemination with the goal of alleviating congestion, improving safety, and enhancing productivity. This process uses both wireless and data line technologies as a means of communication.

TMS in the I-5 North Coast CSMP travel shed will be an integral part of a larger regional Intermodal Transportation Management System (IMTMS). IMTMS is another element of the ITS architecture for the region. IMTMS will link together the region's main transportation management systems through a regional open system network. This physical network will be accessible by all participating agencies in San Diego County. Regional transportation data will then made available to traveler information services, such as the 511 call-in or web access service and California Traffic Data Warehouse collection sites such as Performance Measurement System (PeMS).

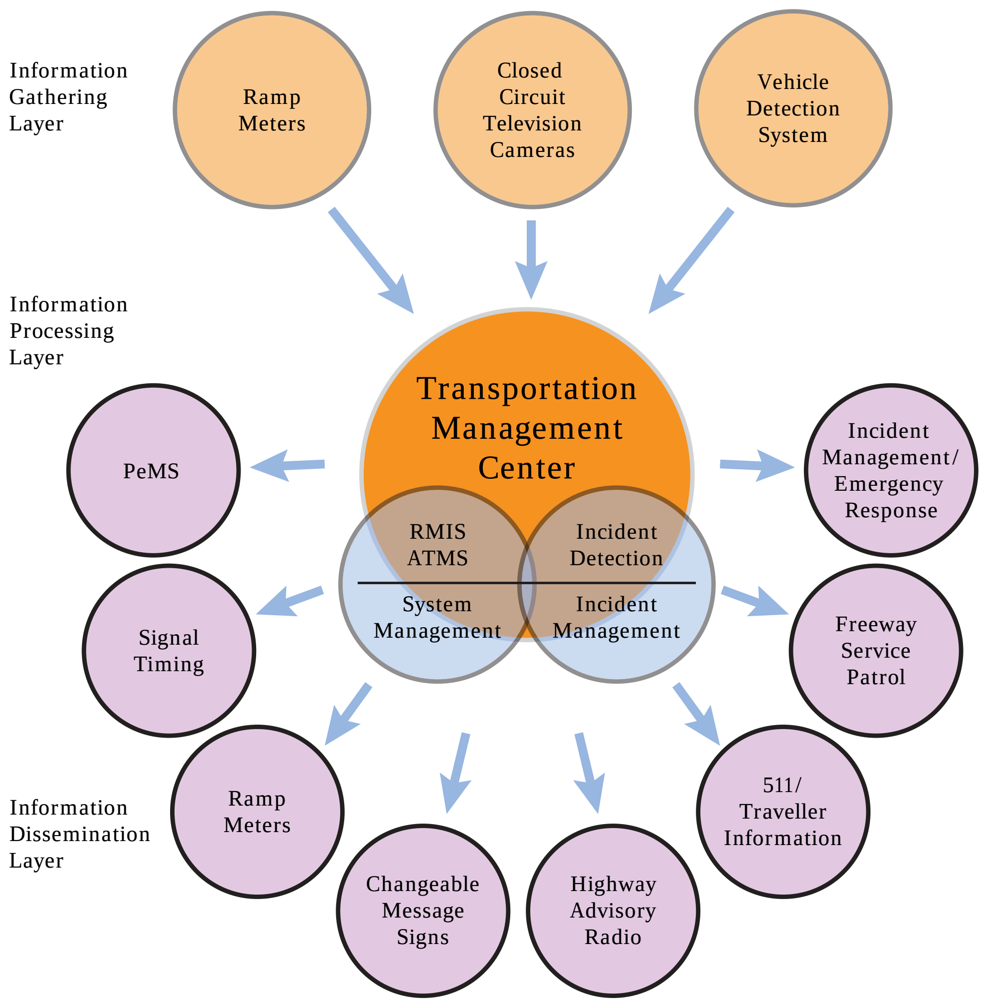
How TMS Works

The TMS process in the I-5 CSMP travel shed involves three main components:

- Information gathering through ramp meters, closed circuit televisions (CCTV), and vehicle detection systems (VDS);
- Advanced transportation management systems located at Transportation Management Centers (TMC) to process and disseminate data to outside sources; and
- Communication technologies to disseminate the information from the TMC to field elements and traveller information systems.

Figure 2.5 illustrates the TMS process of information gathering, processing, and dissemination, and is followed by a discussion of each.

Figure 2.5 Intelligent Transportation System



Information Gathering

VDS are electronic data acquisition instruments used to collect and send information about real-time traffic data such as speed, volume, and occupancy, throughout the San Diego region. These instruments include inductive loop detectors, magnetic detectors, radar detectors, and CCTV cameras. They are generally installed every one-third mile to one mile along the highway. Detectors are used to continuously monitor the flow of traffic and generally report data every 30 seconds to the TMC via telephone line, fiber optic cable, or through wireless communication.

The detectors are a key component in helping traffic managers determine levels of congestion, speed, flow, delay, travel time, bottlenecks, and other performance measures. Figure 2.6 shows the installation of loop detectors into the pavement.

Figure 2.6 Information Gathering Devices

Information Processing

The data from the VDS is sent to data processing and decision-making centers called Transportation Management Centers (TMC). The San Diego TMC, operational 7 days a week and 24 hours a day since November 1996, integrates Caltrans traffic operations, maintenance, and California Highway Patrol communications in a unified, co-located communication and command center. The TMC provides the communication, surveillance, and information technology necessary for coordinated transportation management on state highways during normal commute periods, as well as special events and major incidents such as large wild fires. In the event of an emergency, the TMC is designed with the latest technologies to survive earthquakes, power outages, and communication disruptions.

The Operations Branch of the TMC is charged with providing real-time traffic management activities on the highway, including monitoring traffic conditions and initiating effective responses to help mitigate traffic impacts arising from incidents, emergencies, events, and other unusual occurrences.

In order for the TMC to provide traffic management, various wired and wireless communication lines currently transmit the data collected by the VDS within the travel shed to computer systems called Advanced Traffic Management System (ATMS) and Ramp Metering Information System (RMIS) located within the TMC. These computer systems process the data received and help traffic managers make adjustments to the traffic control system, such as, increasing or decreasing the rate of ramp metering at specific on-ramps within a specified time. Currently the Department leases dedicated phone lines that transmit the some data collected by the VDS. These dedicated phone lines are proposed to be replaced by fiber optic cables owned by the Department with the construction of the North Coast Managed Lanes project resulting in a savings in operational costs.

Information Dissemination

The third component of TMS in the region is the communication infrastructure and electronic technologies used to disseminate information to travelers. The TMC processes the information it receives from field elements through ATMS and RMIS presenting the transportation manager with a graphical depiction of current conditions. This allows transportation managers to make adjustments to the electronic management solutions throughout the travel shed, such as changing the rate of discharge for ramp metering lights or disseminating information to travelers so they can make travel decisions via changeable message signs (CMS).

In the I-5 CSMP travel shed, TMS tools include:

- Ramp Meters;
- VDS;
- CMS;

- CCTV;
- Highway Advisory Radio (HAR);
- 511; and
- Freeway Service Patrol (FSP).

Ramp Meters

The primary objective of ramp metering is to reduce congestion and the overall travel time on both highway and surface streets. Ramp metering reduces congestion by maintaining more consistent highway throughput; therefore increasing the capacity of the highway. HOV lanes at ramps also provide incentives for increased use of carpools, vanpools, and public transit. Secondary benefits include the reduction of both congestion-related accidents and air pollution. Studies have shown that ramp metering can reduce annual freeway delay by 10 percent.

Figure 2.7 Ramp Meter at Highway On-Ramp

Changeable Message Sign (CMS)

A CMS is primarily used to give motorists real-time traffic safety and guidance information about planned and unplanned events that significantly impact congestion. This information helps motorists make educated decisions about the routes they use. A CMS may be used to display messages for advance notice of upcoming roadwork and special events that will adversely affect travel. A CMS may also be used to display safety-related messages associated with approved safety and STAR (Statewide Traffic Action Response) campaigns. The travel time between destinations can also be displayed on a CMS. CMS are installed along the highways before motorists reach major traveler "decision points" such as highway-to-highway interchanges or recurrent bottlenecks. They provide travelers with real-time traffic information and help travelers make informed travel choices.

Figure 2.8 Changeable Message Sign

Closed Circuit Television (CCTV)

CCTV systems allow traffic operations managers to monitor traffic flow, verify and manage incidents, and monitor traffic controls and ramp meters. The system servers two key functions: 1) to provide surveillance coverage of the freeways and arterials, and 2) to monitor and aid in the management of major incidents and planned events. Proper CCTV coverage provides agencies with the ability to visually monitor traffic in real time. In recent years, extensive use of the Department's CCTVs have been done by the various local television media channels.

Highway Advisory Radio (HAR)

HAR is a low-power FCC-licensed, noncommercial radio station operated by Caltrans. Its purpose is to transmit localized traffic and road information to motorists. HAR stations are installed along the highways before motorists reach major traveler "decision points" such as highway-to-highway interchanges or recurrent bottlenecks. They provide travelers with real-time traffic information and help travelers make informed travel choices.

511

Existing ITS analysis in the I-5 CSMP corridor is robust due to the 0.5 mile spacing of vehicle detection devices.

A recent addition in 2007, the 511 phone and web service is available throughout San Diego County, on nearly all landline and cellular phones. 511 provides up-to-the-minute information on traffic conditions; incidents and driving times; schedule, route, and fare information for San Diego public transit; carpool and vanpool referrals; bicycling information; and more. 511 is available 24 hours a day, 7 days a week.

Freeway Service Patrol (FSP)

In addition to these tools which give travellers information, the TMC also uses Freeway Service Patrols (tow trucks) as an incident management tool to clear any incidents that may cause delays on the freeway, such as a disabled vehicle.

Existing Condition of TMS

To date, 66 vehicle detection systems, 49 ramp meters, 6 changeable message signs, and 4 CCTVs have been installed along I-5 in the travel shed. With the addition of more detection and communications components, traffic managers will receive more accurate traffic pattern information, which then allows them to make more informed decisions about how best to alleviate congestion, improve safety, and stabilize trip times.

Regional Arterials

Regional arterial roads link cities to major transportation facilities and each other within the travel shed, providing the roadway infrastructure for local and subregional vehicular trips. These streets also provide the infrastructure for bus, pedestrian, and bicycle routes as well.

The configuration of the arterials in the I-5 travel shed are viable for local or sub-regional trips, but they are not a functional alternative to the I-5 for regional and interregional trips.

North-South Regional Arterials

The two main north-south arterials in the travel shed that could function as alternative routes to I-5 are the Coast Highway and El Camino Real. Prior to the construction of I-5, the Coast Highway was the main north-south travel route. When I-5 was constructed, the State relinquished the Coast Highway to the cities. With the addition of local traffic calming strategies, pedestrian improvements, and the revitalization of historic commercial activity centers in many of the travel shed's coastal cities, the Coast Highway functions more as a pedestrian-oriented "Main Street" rather than a viable alternative route to I-5 for regional trips.

El Camino Real is the second primary north-south arterial roadway in the travel shed. Although located throughout the travel shed, El Camino Real is not continuous, preventing it from being a functional alternative to I-5 for regional trips, as well as for some local trips. El Camino Real is most viable as an alternative route in the northern area of the travel shed. It has four to six lanes beginning near SR 76 in Oceanside and travels south through the City of Carlsbad to the City of Encinitas. In Encinitas, El Camino Real terminates at its intersection with Manchester Avenue. To the south of San Elijo Lagoon, El Camino Real appears as a local street, however this southern portion is not generally used as a regional route.

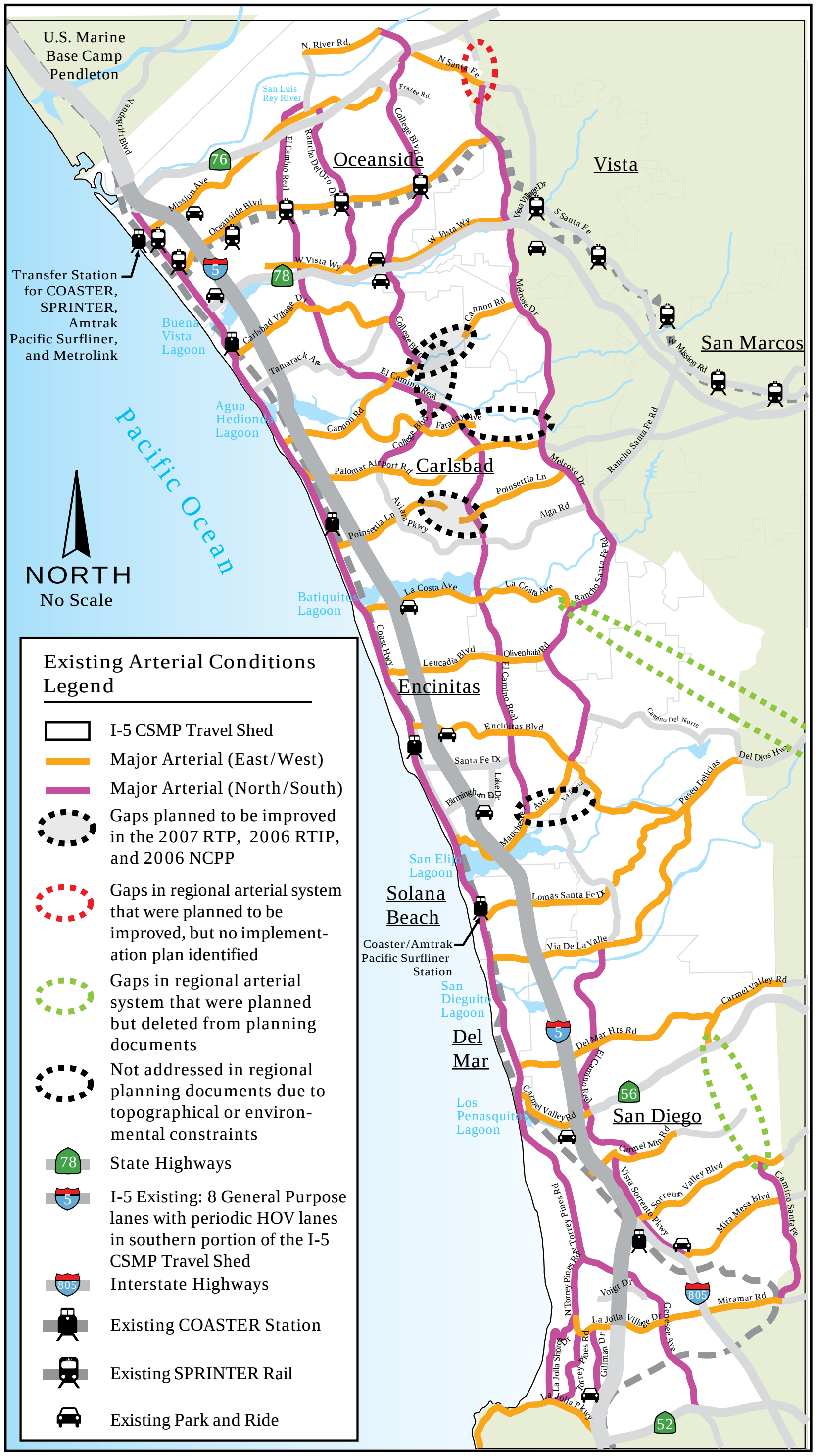
The 2030 Regional Transportation Plan: Pathways to the Future (2030 RTP), adopted November 2007 identifies the principal roads of the regional arterial network. The North-South arterials within the I-5 CSMP travel shed are included in Table 2.1. The table includes arterial highways and local collector roads, and shows the number of lanes. More detailed information on the regional arterial roadways can be found in Chapter 5, including number of lanes by segment, AADT, and level-of-service (LOS) of the roadway.

East-West Regional Arterials

The I-5 CSMP's east-west regional arterials provide routes for travel between I-5 and the travel shed's cities, neighborhoods, job centers, and other destinations. The East-West arterials are also included in Table 2.1.

Figure 2.9 Arterial Roadways Map

In the I-5 CSMP travel shed, regional arterials serve local and subregional trips. In several places, these roadways have gaps that limit their ability to serve either as a north-south alternative to I-5 or to function as a complete regional system.



Source: SANDAG's 2030 San Diego Regional Transportation Plan: Pathways for the Future, November 2007, Technical Appendix A.

Table 2.1 I-5 CSMP Regional Arterials

Arterials	Roadway Type	Direction	Lanes
Coast Highway	Highway	North-South	4
El Camino Real	Highway	North-South	2-6
Vandegrift Boulevard	Local Collector	North-South	4
N. Torrey Pines Road	Local Collector	North-South	2-6
La Jolla Shores Drive	Local Collector	North-South	2-3
Torrey Pines Road	Local Collector	North-South	4
Gilman Drive	Local Collector	North-South	4
Genesse Avenue	Local Collector	North-South	4
Vista Sorrento Parkway	Local Collector	North-South	4
Rancho del Oro Drive	Local Collector	North-South	2
College Boulevard	Local Collector	North-South	2-6
Melrose Drive	Local Collector	North-South	4
Rancho Santa Fe Road	Local Collector	North-South	4-6
North River Road	Local Collector	North-South	4
Mission Avenue	Local Collector	North-South	4
North Santa Fe Avenue	Local Collector	North-South	2
Oveanside Boulevard	Local Collector	North-South	2-4
West Vista Way	Local Collector	North-South	4
Carlsbad Village Drive	Local Collector	East-West	4
Cannon Road	Local Collector	East-West	2-4
Faraday Avenue	Local Collector	East-West	2-4
Palomar Airport Road	Local Collector	East-West	6
Poinsettia Lane	Local Collector	East-West	2-4
La Costa Avenue	Local Collector	East-West	2-4
Leucadia Boulevard	Local Collector	East-West	2-4
Olivenhain Road	Local Collector	East-West	3-6
Encinitas Boulevard	Local Collector	East-West	4
Manchester Avenue	Local Collector	East-West	2-4
Lomas Santa Fe Drive	Local Collector	East-West	4
Paseo Delicias	Local Collector	East-West	4
Via de la Valle	Local Collector	East-West	2
Del Mar Heights Road	Local Collector	East-West	4
Carmel Valley Road	Local Collector	East-West	2
Carmel Mountain Road	Local Collector	East-West	4-6
Sorrento Valley Boulevard	Local Collector	East-West	4
Mira Mesa Boulevard	Local Collector	East-West	6
La Jolla Village Drive	Local Collector	East-West	4
Mirimar Road	Local Collector	East-West	6
La Jolla Parkway	Local Collector	East-West	4

Source: Regional Arterials were identified in SANDAG's 2030 San Diego Regional Transportation Plan: Pathways for the Future, November 2007; Lanes identified in the Functional Classification Data, 2007; Caltrans, District 11.

Regional and Intercity Rail: Passenger and Freight

The I-5 CSMP travel shed has two rail lines within its boundaries. One runs north-south parallel to the I-5 and the other runs east-west along the SR 78 connecting Oceanside to Escondido. The north-south San Diego Northern Railway (SDNR) is part of the larger multijurisdictional Los Angeles-San Diego-San Luis Obispo (LOSSAN) rail corridor. This line supports north-south commuter, intercity, and freight rail services. The portion of this rail line within the I-5 CSMP travel shed is owned by the North County Transit District (NCTD) and is a predominately single track. This configuration requires passenger and freight service operators to share the single track line.

Nearly half of the rail corridor is single-track, resulting in conflicts when trains in opposing directions meet near a single-track section; and is where most of the existing freight and passenger rail delay occurs. These are interspersed throughout the corridor, creating multiple bottlenecks. The single-track sidings also limit the length of trains that can be operated in the corridor.

The east-west rail line that runs from Oceanside to Escondido is also owned by NCTD. Like its north-south counterpart, it also supports freight services and commuter services. The SPRINTER light rail service began operations in March 2008 and seven of its 15 stations are in the northern area of the I-5 CSMP travel shed.

Figure 2.10 presents the existing rail services in the I-5 CSMP travel shed and include:

North-South

- Freight Rail (BNSF).
- COASTER Commuter (NCTD).
- Metrolink (SCRRA).
- Pacific Surfliner (Amtrak).

East-West

- Freight Rail (BNSF).
- SPRINTER Commuter (NCTD).

To help the region coordinate rail service needs, legislation was enacted in 2003 to give SANDAG authority to consolidate the planning, project development, and construction responsibilities for the region's transit system (SB 1703). Operational responsibilities remain with the Metropolitan Transit System (MTS) and NCTD. Since then, SANDAG has begun the process of creating a unified set of priorities and comprehensive regional solutions to better integrate transportation with land use planning and determine long-term rail improvements.

Figure 2.10 Existing Rail Transit Map

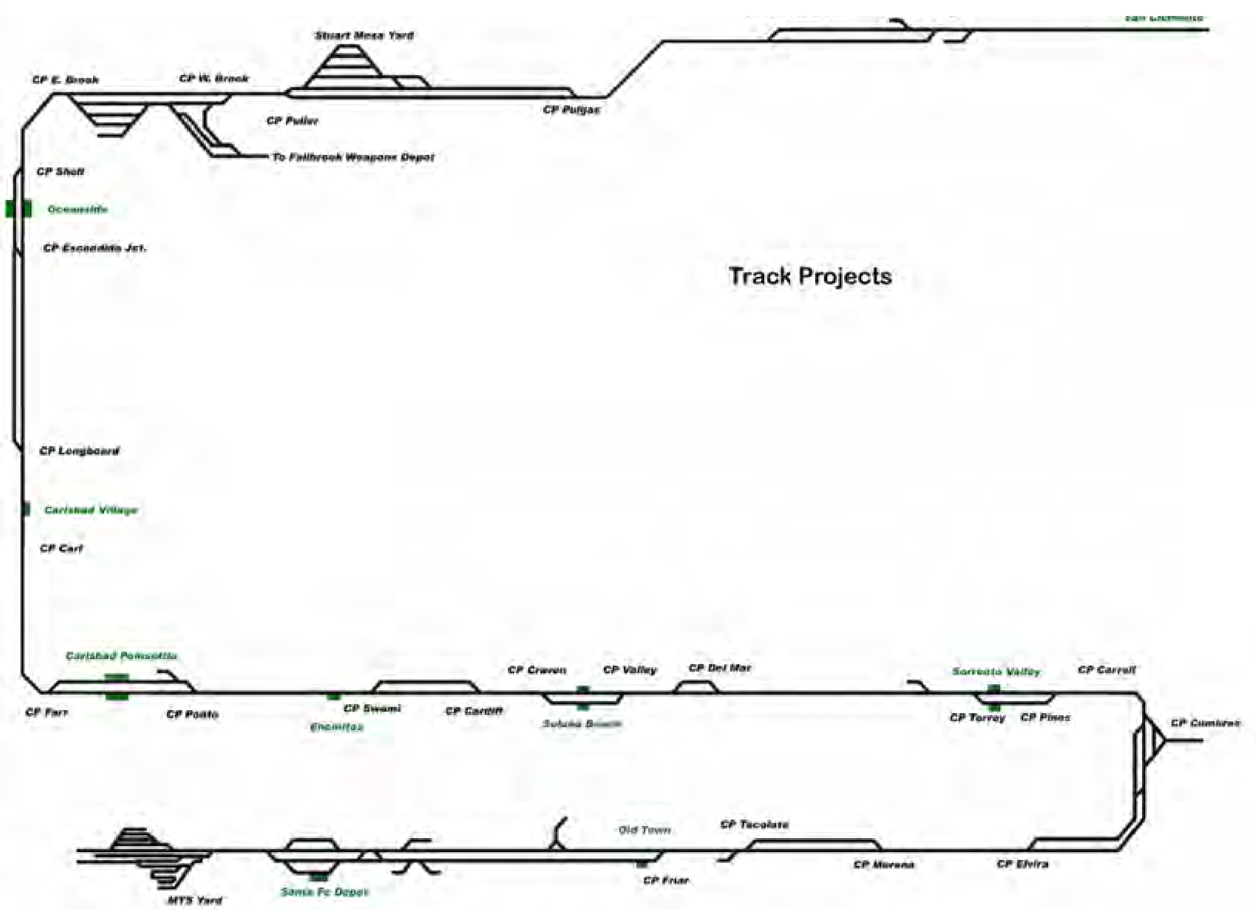
Source: Rand McNally: The Thomas Guide, 2006.

Figure 2.11 presents the current configuration of the LOSSAN rail track. A single line reflects portions of the corridor that are single tracked. A double line indicates double track, with approximately half of the corridor being single track. Starting in the top right corner of the diagram is the San Diego/Orange County line. Moving to the left is the rail corridor through Camp Pendleton. Turning south, the first station stop in green is Oceanside station. The graphic terminates at the MTS yard, just south of the Santa Fe Depot.

Passenger Rail Service

The I-5 CSMP corridor's north-south COASTER passenger rail service began in 1995, although the coastal rail corridor has been in operation since the 1880s and Amtrak has been providing intercity rail service since 1974. The COASTER runs

Figure 2.11 Existing LOSSAN Track Configuration



Source: Caltrans, The San Diego – LOSSAN Corridor Project Prioritization Analysis, prepared by Cambridge Systematics.

along the coastline from Oceanside to downtown San Diego. Its route serves eight stations within the I-5 CSMP travel shed: Oceanside, Carlsbad Village, Carlsbad Poinsettia, Encinitas, Solana Beach, and Sorrento Valley, and the transit centers in Old Town and downtown San Diego, located south of the travel shed.

The NCTD provides 22 to 26 COASTER runs on weekdays, with train sets of five cars. Trains operate on 34-minute headways during morning and afternoon peak periods. During the midday for three hours, the COASTER service is not available so the track can be used for freight rail. The COASTER's average operating travel time between Oceanside and downtown San Diego is 57 minutes. The first southbound weekday train leaves Oceanside at 5:18 a.m. and the last weekday southbound train leaves Oceanside at 5:30 p.m. The first weekday northbound train leaves San Diego at 6:33 a.m. and the final weekday northbound train leaves downtown San Diego at 6:46 p.m. The COASTER runs less frequently on Saturdays, and does not provide service on Sundays except during football and baseball seasons for home games at Qualcomm Stadium and Petco Park, respectively.

The Oceanside Transit Center is the northern terminus for the COASTER. It is also the western terminus for the SPRINTER, the NTCD's east-west commuter rail service which began service in March 2008. The SPRINTER runs on a 22-mile rail line from the Oceanside Transit Center to the Escondido Transit Center, with service every one-half hour to stations along the SR 78 corridor. The trains run in one- or two-unit sets.

There are seven SPRINTER stations in Oceanside and western Vista that are within the I-5 CSMP travel shed. These are the Oceanside Transit Center, Coast Highway, Crouch Street, El Camino Real, Rancho del Oro, College Boulevard, and Melrose Drive stations.

The SPRINTER's first eastbound train from Oceanside to Escondido departs at 5:03 a.m. and the last eastbound train departs at 8:33 p.m. The first westbound train from Escondido to Oceanside departs at 4:30 a.m. and the last westbound train departs at 7:33 p.m. In March 2008, the SPRINTER was reporting approximately 8,000 riders per day.

Many passenger rail customers arrive at the COASTER and SPRINTER commuter rail stations by car. To accommodate parking demand at the train stations, SANDAG initiated a Parking Demand Study and a Smart Parking Pricing Study to determine how to maximize the use of these parking lots to encourage transit ridership. One result of the Parking Demand Study was NCTD's addition of 130 new parking spaces at the Carlsbad Village Station in June 2008. Table 2.2 presents the number of parking spaces available at the rail transit stations.

In addition to the passenger rail transit services provided by the COASTER and the SPRINTER, Metrolink, and Amtrak provide rail service in the I-5 CSMP travel shed. The Metrolink commuter rail service on the SDNR rail line is operated by the Southern California Regional Rail Authority (SCRRA). This service began in 1994 and connects the Oceanside Transit Station at the northern end of the I-5 CSMP travel shed to Orange County and the Inland Empire (San Bernardino County). Metrolink operates 16 trains on weekdays, serving the Oceanside Transit Station. It operates on the LOSSAN rail corridor between Los Angeles and Oceanside.

Table 2.2 Transit Station Parking

Station	Number of Parking Spaces
COASTER	
Sorrento Valley	122
Solano Beach	299
Encinitas	292
Carlsbad Poinsettia	384
Carlsbad Village	374
Oceanside Transit Center	659
SPRINTER	
Oceanside Transit Center[a]	625
Coast Highway	72
Crouch Street	94
El Camino Real	119
Rancho Del Oro	80
College Boulevard	138
Melrose Drive	214

Source: COASTER Parking: San Diego Metropolitan, Daily Business Report, February 24, 2003; Smart Parking Pricing Project, SANDAG (FY 2002 COASTER Station Parking Counts); SPRINTER: Bruce Smith, Chief Rail Engineer, NCTD, July 19, 2008.

[a] Oceanside Transit Center serves both COASTER and SPRINTER Lines.

Amtrak's Pacific Surfliner route provides passenger rail service from downtown San Diego to Los Angeles and Santa Barbara/San Luis Obispo via the LOSSAN rail corridor. As the second busiest intercity rail corridor in the country, ridership on the Pacific Surfliner currently exceeds 2.8 million passengers annually, and has a daily weekday ridership of approximately 7,000 passengers across the entire route (including connector buses). Amtrak operates 22 Pacific Surfliner runs on weekdays, mainly on five-car train sets. The existing ridership capacity on an average weekday is 7,000 seated passengers. The trains operate on headways of 60 to 90 minutes on weekdays, serving three stations along the San Diego rail segment: Oceanside, Solana

Beach, and downtown San Diego. The average operating travel time between Los Angeles and downtown San Diego is 2 hours 45 minutes, and 60 minutes between San Diego and Oceanside.

Freight Rail

The I-5 CSMP corridor is part of a larger regional goods movement system that not only facilitates traditional regional goods, but also interstate and international goods arriving via the Port of San Diego and the Mexican ports of entry at Tecate and Otay Mesa (see Figure 2.12 Regional Freight Rail Map). Both the north-south and east-west rail lines are shared between passenger rail and freight rail services. Freight rail services in the I-5 CSMP travel shed are run by the Burlington Northern Santa Fe Railway (BNSF).

Within this corridor, BNSF Railway provides off-peak freight rail services from the Port of San Diego's two marine terminals to the Los Angeles area, with 4 to 8 freight train sets, totaling approximately 240 to 320 freight cars per day. These north-south trains transport motor vehicles, lumber, chemicals, petroleum, agricultural products, cement, and aggregate.

BNSF Railway provides off-peak freight rail services of 4 to 8 freight train sets, totaling approximately 240 to 320 freight cars per day.

On the east-west rail line, BNSF is authorized to operate up to five nights a week between the hours of 10:00 p.m. and 4:00 a.m. Currently, it is operating two to three nights per week on Fridays, Sundays, and either Tuesdays or Wednesdays. On these days, between 25 to 100 rail cars travel this line within approximately three hours. BNSF has a shared-use agreement stating that commuter and intercity trains shall be dispatched with first priority over any BNSF train.

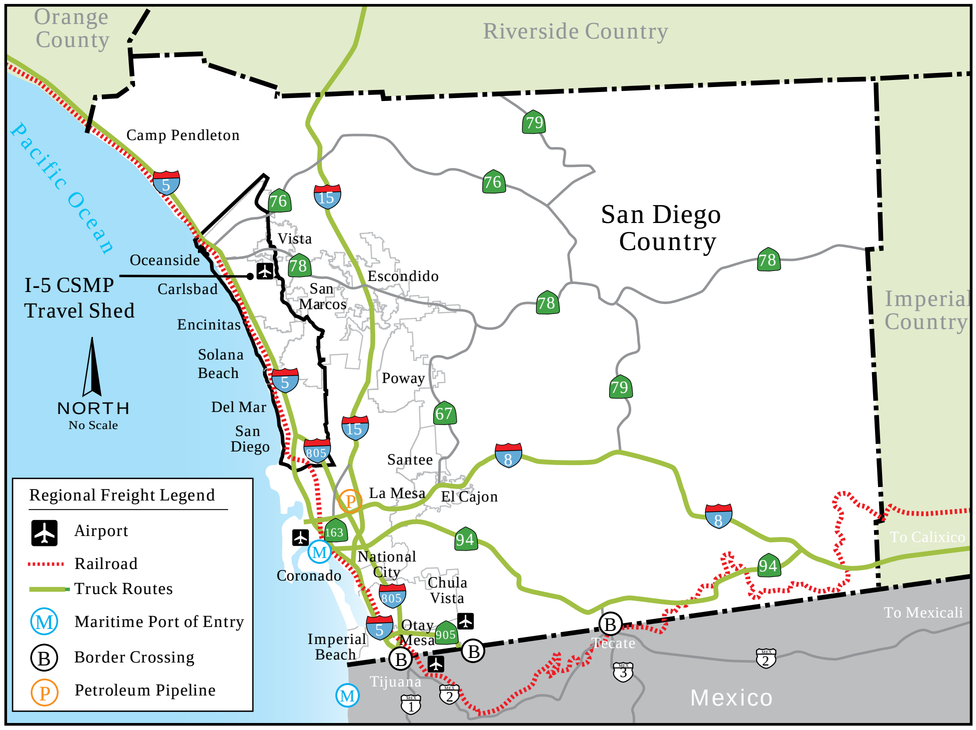
Tables 2.3 and 2.4 show how these passenger and freight rail services schedule their shared use of the north-south and east-west lines. The number of stops shown are those that occur within the I-5 CSMP travel shed boundaries.

Public and Private Bus Service

Public bus and shuttle services operated by the NCTD and the MTS offer local and regional travel options within the I-5 CSMP corridor (see Figures 2.13 and 2.14). They also connect to the rail services and activity centers located throughout the travel shed. Private bus services such as Greyhound, MexiCoach, and Cloud Nine Shuttles use I-5 to service local, regional, national, and international travel.

NCTD operates the BREEZE bus service, transporting passengers in the north San Diego County region from Oceanside to Del Mar. BREEZE buses also serve the Camp Pendleton Marine Corps Base. The BREEZE serves 35,000 to 40,000 passengers daily.

Figure 2.12 Regional Freight Rail Map



Source: Caltrans District 11; Rail Routes: USGS 1995 digital orthophotographs, SanGIS, 1992 digital orthophotographs, SANDAG, 1997. IMPlan, 1995.

COASTER Connection Shuttles link commuters from the COASTER stations to job and activity centers. The shuttles available in the I-5 CSMP travel shed are the Carlsbad Poinsettia and the Sorrento Valley COASTER Connection. South of the travel shed, the MTS Route 992 provides service between the Santa Fe Station in downtown San Diego and the San Diego International Airport.

NCTD also operates LIFT, a service providing Americans with Disabilities Act (ADA) paratransit service for passengers who are unable to access the fixed route services.

MTS provides transit services in the southern portion of the I-5 CSMP travel shed serving the San Diego communities of Fairbanks Ranch, Torrey Pines, Carmel Valley, Torrey Hills, University City, and La Jolla.

Existing public bus service in the I-5 CSMP travel shed is primarily a feeder system to other travel modes rather than a viable travel option for regional and intercity trips. Traffic congestion on the highways and on regional arterials increased travel times for the buses traveling in the corridor, making it unattractive to travelers for longer trips. As a result, the long-range express commuter routes have been discontinued in the I-5 CSMP corridor.

Table 2.3 LOSSAN Corridor Existing Service Windows

Passenger Rail Services	Runs	Stops in Travel Shed	Monday to Friday Service Hours	Monday to Friday Nonservice Hours	Saturday to Sunday[a] Service Hours
Oceanside SB	11 to 13	6	6:33 a.m. to 7:45 p.m.	10:45 a.m. to 12:45 p.m.	11:15 a.m. to 11:45 p.m.
Downtown San Diego NB	11 to 13	6	5:18 a.m. to 6:35 p.m.	12:02 p.m. to 2:50 p.m.	9:45 a.m. to 8:35 p.m.
Los Angeles SB	11 to 12	2	6:05 a.m. to 12:50 p.m.	12:25 p.m. to 2:00 p.m.	6:05 a.m. to 12:50 p.m.
Downtown San Diego NB	11 to 12	2	6:10 a.m. to 11:59 p.m.	1:25 p.m. to 3:00 p.m.	6:10 a.m. to 11:05 p.m.
Los Angeles SB	7 to 17	1	5:45 a.m. to 8:28 p.m.	9:55 a.m. to 11:41 a.m.	8:43 a.m. to 10:43 p.m.
Oceanside NB	7 to 17	1	4:10 a.m. to 7:25 p.m.	11:38 a.m. to 1:48 p.m.	6:27 a.m. to 7:36 p.m.
San Bernardino SB	7 to 22	1	4:52 a.m. to 8:28 p.m.	–	7:30 a.m. to 10:43 p.m.
Oceanside NB	7 to 22	1	4:10 a.m. to 7:51 p.m.	–	6:27 a.m. to 7:00 p.m.
BNSF Freight Rail Service Run times on shared rail pulling 160 rail cars/day	4	7	11:00 a.m. to 2:00 p.m. 6:00 p.m. to 5:00 a.m.	5:00 a.m. to 11:00 a.m. 2:00 p.m. to 6:00 p.m.	11:00 a.m. to 2:00 p.m. 6:00 p.m. to 5:00 a.m.

Source: California State Rail Plan 2005-2006 to 2015-2016; Metrolink Schedule: September 4, 2007; Amtrak Surfliner Schedule: May 12, 2008; NCTD COASTER Schedule: March 28, 2008; NCTD SPRINTER Schedule: July 12, 2008.

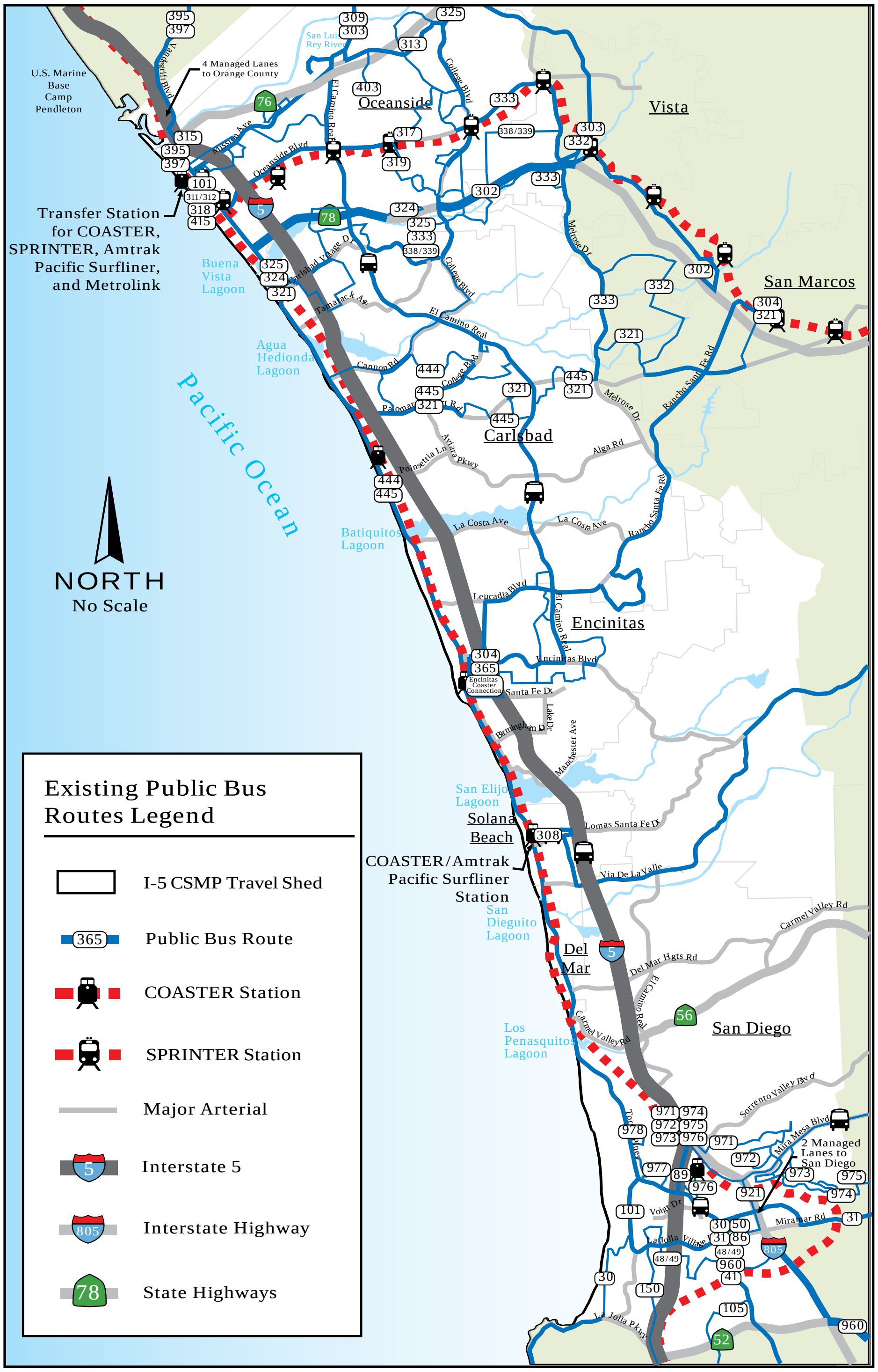
[a] COASTER runs Sundays for Padres baseball games only.

Table 2.4 SPRINTER Corridor Existing Service Windows

Passenger Rail Services	Runs	Stops in Travel Shed	Monday to Friday Service Hours	Monday to Friday Nonservice Hours	Saturday to Sunday Service Hours
Escondido WB	25 to 34	7	5:03 a.m. to 9:26 p.m.	8:33 a.m. to 5:33 p.m.	4:56 a.m. to 9:26 p.m.
Oceanside EB	25 to 34	7	4:03 a.m. to 8:26 p.m.	7:33 p.m. to 4:33 p.m.	4:33 a.m. to 8:26 p.m.
BNSF Freight Rail Service Run times on shared rail pulling 160 rail cars/day	5	0	10:00 p.m. to 4:00 a.m.	4:00 a.m. to 10:00 p.m.	10:00 p.m. to 4:00 a.m.

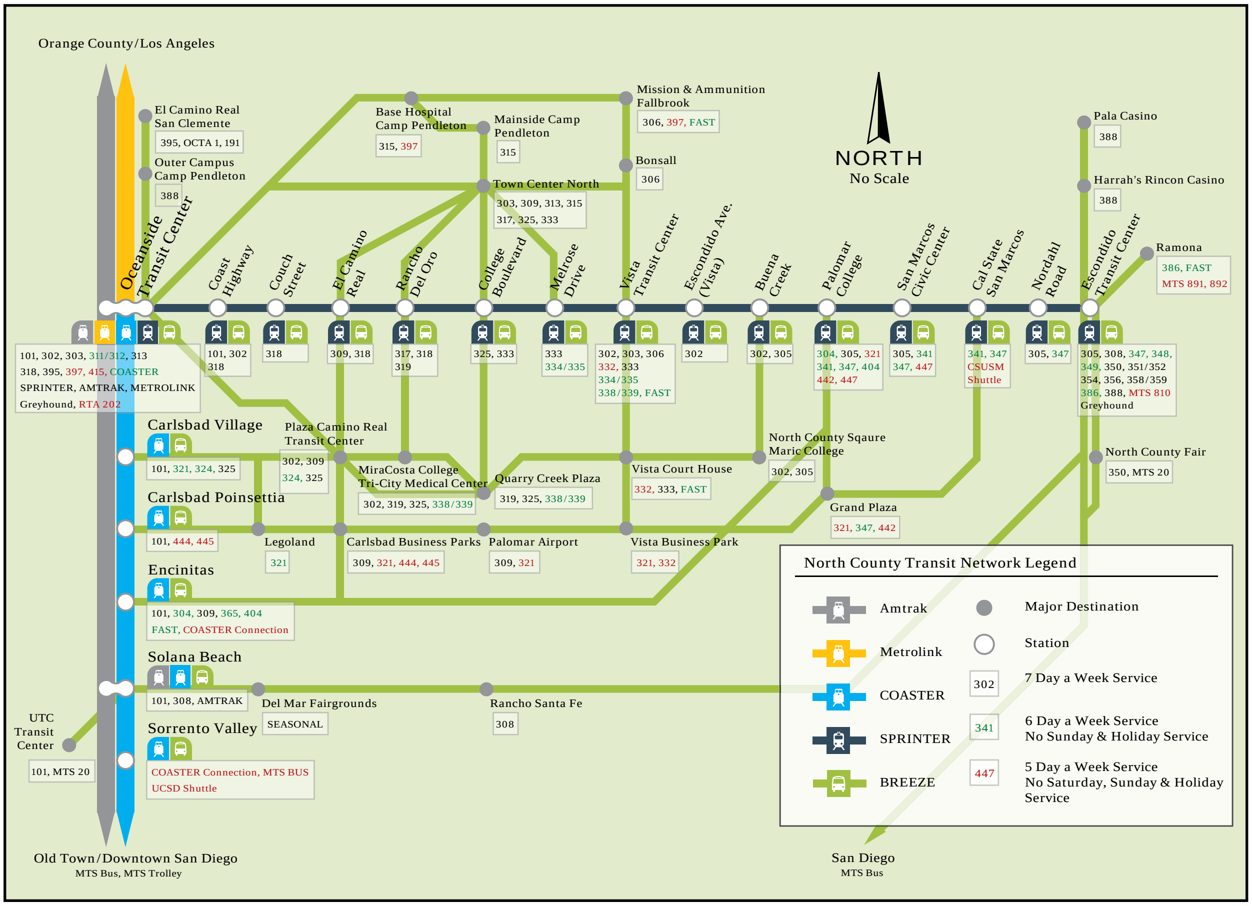
Source: California State Rail Plan 2005-2006 to 2015-2016; Metrolink Schedule: September 4, 2007; Amtrak Surfliner Schedule: May 12, 2008; NCTD COASTER Schedule: March 28, 2008; NCTD SPRINTER Schedule: July 12, 2008.

Figure 2.13 Public Bus Routes Map



Source: 2006 Rand McNally – The Thomas Guide, NCTD Route Maps, 2008; MTS Route Maps, 2007.

Figure 2.14 North County Transit District Network



Source: NCTD Route Maps, 2008.

North-south regional bus transit in the I-5 CSMP travel shed is provided on regional arterial streets. Key bus routes that travel on regional arterials that also serve as alternative routes to the I-5 are:

- Route 101, providing local bus service on Coast Highway between Oceanside and San Diego from 5 a.m. to 10:30 p.m.; and
- Route 309, providing local bus service on El Camino Real between Oceanside and Encinitas from 4:30 a.m. to 11 p.m.

East-west local bus services enhance access to coastal communities west of I-5 and provide alternative access to passenger rail services. BREEZE bus routes and schedules have been realigned to closely integrate with SPRINTER service.

It should be noted that several fixed bus routes have been eliminated due to ongoing state funding issues. The elimination of the State Transit Assistance fund, derived from the State sales tax on gasoline, and declining revenues from the State Transportation Development Act, one-quarter of a percent of the sales tax assessed in the region, means that additional routes are proposed to be altered or eliminated, taking effect in June 2009. As of March 2009, MTS Routes 30, 41, 86, 105, 150, and 921 are tentatively proposed for service reduction or elimination; NCTD has announced the elimination of routes 311/312, 324, 338/339, 341/442, 348, 349A/B, 365, and 397.

Existing public bus service in the I-5 CSMP travel shed is primarily a feeder system to other travel modes.

Vanpools and Carpools

SANDAG's vanpool and carpool programs (RideLink) help employers, employees, and students in the I-5 travel shed use alternative modes of transit to commute to school or work. The goal of this program is to increase the use of this transportation demand management strategy to decrease demand on the roadway system during peak congestion hours.

There are more than 550 vanpools enrolled in SANDAG's Regional Vanpool Program, serving 4,200 passengers (186 vanpools with destinations in the I-5 CSMP travel shed, serving approximately 1,500 persons per day). The program provides a $400 monthly subsidy per vanpool. Within the I-5 CSMP travel shed, vanpooling has steadily increased due to increasing congestion on the highway.

Carpooling within the I-5 CSMP travel shed is supported through the RideLink system and through the existing system of Park and Ride parking lots. RideLink matches commuters interested in forming a carpool. Park and Ride parking lots are free lots intended to facilitate the transfer of drivers from single-occupant vehicles (SOVs) to carpools, vanpools, or regional transit. The existing nine Park and Ride lots located within the I-5 CSMP travel shed along major arterial streets and adjacent to highway on-ramps provide convenient access to the transportation system (see Table 2.5).

Currently 186 vanpools with destinations in the I-5 CSMP travel shed, serving approximately 1,500 persons per day.

The Bicycle and Pedestrian System

Bicycle and pedestrian routes throughout the I-5 CSMP travel shed are part of a regional network that connects many of its activity centers, attractions, town centers, and multimodal transit stations. Like regional arterial streets, these routes traverse local boundaries, so they have both local and regional significance. As such, the bicycle and pedestrian system are the subject of planning efforts by both SANDAG and the local cities. The regional route corridors identified in SANDAG's 2030 RTP that run through this travel shed are:

- Coastal Rail Trail – Connecting Oceanside, Carlsbad, Encinitas, Solana Beach, Del Mar, and San Diego and part of the planned 900 mile Pacific Coast Bike Route running from the borders of Mexico to Oregon. The functionality of this route impacts a much larger system beyond this travel shed's own boundaries, much like the I-5 CSMP's highway within the travel shed impacts interstate and international commerce.
- Camp Pendleton Trail – Connecting Oceanside to San Clemente.
- San Luis Rey River Trail – Connecting North Oceanside from the coast to eastern Oceanside.
- El Camino Real – Connecting San Luis Rey River Trail, Oceanside, Carlsbad, Encinitas, and Solana Beach.
- Inland Rail Trail – Connecting Escondido, San Marcos, Vista, Oceanside, and adjacent unincorporated areas.

Table 2.5 Park and Ride Lots for Carpools and Vanpools

Location	Number of Parking Spaces
City of Oceanside	
NW corner of SR 78 and I-5	130
SE corner of Mission Avvenue and I-5	43
NW corner of College Boulevard and SR 78	32
SW corner of College Boulevard and SR 78	50
City of Carlsbad	
SE corner of La Costa Avenue and I-5	115
City of Encinitas	
SE corner of Birmingham Drive and I-5	56
SE corner of Encinitas Boulevard and I-5	27
City of Solana Beach	
SW corner Carmel Valley Road and I-5	50
City of San Diego	
NE corner Mira Mesa Boulevard and I-805	53

Source: Caltrans, District 11, 2008.

Within the I-5 CSMP travel shed, bicycle and pedestrian routes provide connections to public beaches, activity centers, attractions, town centers, and multimodal centers.

- Palomar Airport Road/San Marcos Boulevard – Connecting Carlsbad to San Marcos.
- La Costa Avenue/Rancho Santa Fe Road – Connecting Encinitas to San Marcos.
- Mid County Bikeway – Connecting Del Mar, San Diego, Rancho Santa Fe, and Escondido.
- SR 56 Bikeway – Connecting coastal San Diego and Poway.
- Central Coast Corridor – Connecting Torrey Pines, La Jolla, Pacific Beach, Mission Beach, Mission Bay, Point Loma, and Downtown San Diego.

These existing primary bike and pedestrian routes are shown in Figure 2.15. The routes are determined and maintained by each individual city and connect to other bicycle and pedestrian systems.

The California Highway Design Manual classifies bikeways in to three categories: 1) Class I Bikeway (bike path), which provides a completely separated right-of-way for the exclusive use of bicycles and pedestrians with crossflow by motorists minimized;

2) Class II Bikeway (bike lane), which provides a striped lane for one-way bike travel on a street or highway; and 3) Class III Bikeway (bike route), which provides for shared use with pedestrian or motor vehicle traffic. In addition, SANDAG's Regional Bicycle Master Plan contains two nontraditional bicycle lane options, including Bicycle Boulevards and Cycle Tracks.

To create a unified bicycle system for the region, SANDAG initiated the development of a Regional Bicycle Master Plan (RBMP) in May 2008. This RBMP will lay the foundation for SANDAG to:

- Define the network of regionally significant bicycle routes, facilities, and necessary support programs;
- Identify gaps in the existing bicycle route network and recommend specific improvements to fill the gaps;

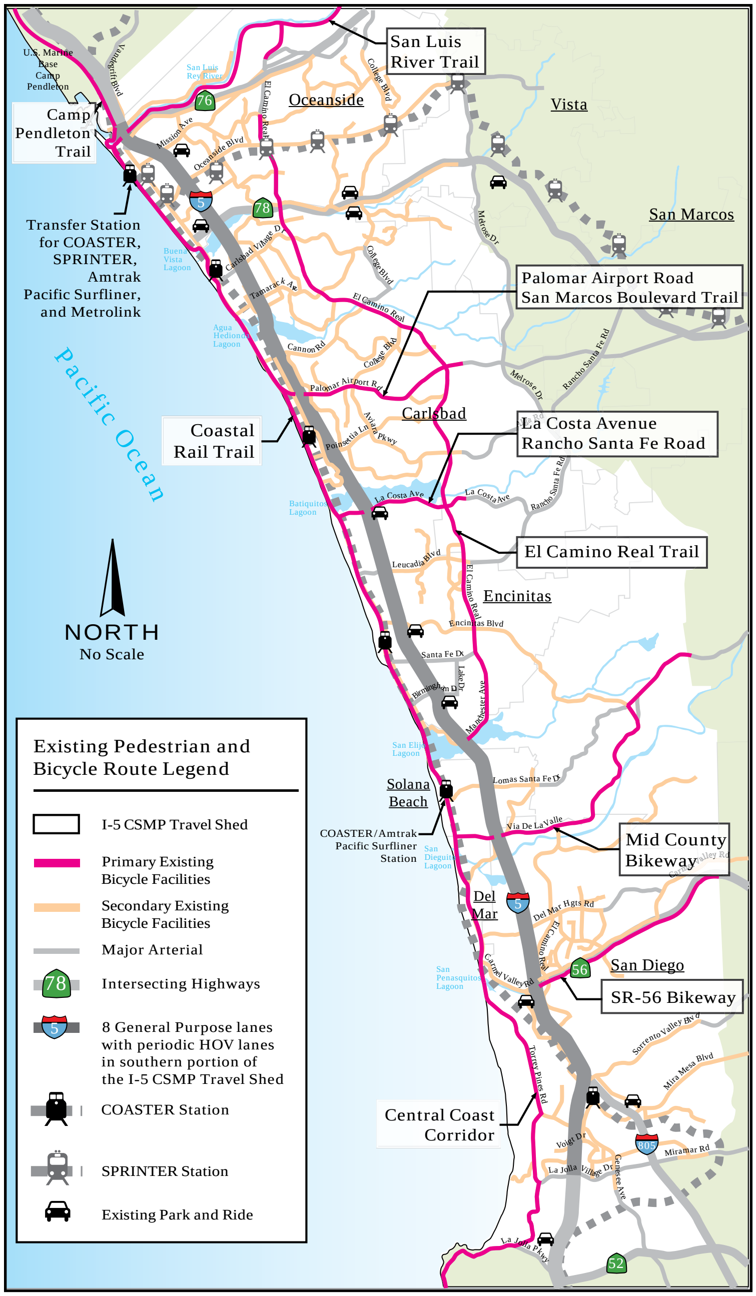
- Develop cost estimates to complete construction of the regional bicycle route network;
- Develop a funding strategy to build and maintain the regional bicycle route network;
- Provide a design manual focusing on bicycle-friendly designs for all streets and roadways through new technologies, standards, guidelines, and innovative treatments on all new roadways and multi-use paths; and
- Provide policy direction and identify programs to assist local jurisdictions in improving safety, education, and awareness about bicycle travel.

In regard to the pedestrian route system, SANDAG seeks to:

- Encourage local agencies to develop pedestrian master plans for their jurisdictions that incorporate guidance from SANDAG's Planning and Designing for Pedestrians, Model Guidelines for the San Diego Region;
- Promote participation in Safe Routes to School programs; and
- Promote implementation of Safe Routes to Transit improvements.

It should however be noted that the RBMP and the RTP's recommendations are regional in focus, concentrating on policies and programs for countywide implementation and providing a framework for local decision-makers to plan specific routes, facilities, and improvements. This is because implementation of bicycle and

Figure 2.15 Pedestrian and Bicycle Routes



Source: SANDAG's 2030 San Diego Regional Transportation Plan: Pathways for the Future, November 2007; San Diego Regional Bicycle Plan: Map Alta Planning + Design 6/12/08: El Camino Gap from Subarea Map 3.

pedestrian facilities is largely the responsibility of local governments. Table 2.6 shows the regional bicycle corridors within the I-5 CSMP travel shed as called for in the RBPM.

In addition, the RBMP has identified several gaps in the regional bicycle system. Many of these gaps are currently detailed in existing planning documents for future completion but are not currently detailed in any specific project. Several of the regional trails are incomplete and have no plans identified for future completion. Since bicycle trails are generally maintained by the local cities, Caltrans has no control in making sure these trails are completed. However, any proposed Caltrans project in the area of a planned bicycle path will help the region improve or complete the path, as applicable. These trails are detailed in Table 2.7.

In addition, local roads cross the I-5 a total of 37 times in the travel shed, 22 of the pedestrian crossings are non-standard and 15 are standard.

Table 2.6 Regional Bicycle Corridors in the I-5 CSMP Travel Shed

Direction	Corridor	Start	End	Existing Classification	Planned Classification	Miles
N/S	Camp Pendleton Trail	Northern boundary of County of San Diego	San Luis Rey River Trail, Oceanside	Restricted access/freeway shoulder	Class I	18.9
N/S	Coastal Rail Trail	San Luis Rey River Trail, Oceanside	Bayshore Bikeway, San Diego	Class I Class II Class III	Class I	38.8
					Enhanced Class II	2.9
					Bicycle Boulevard	1.2
N/S	Central Coast Corridor	Coastal Rail Trail, Del Mar	Bayshore Bikeway, San Diego	Class I Class II	Class I	10.0
					Class II	7.2
					Bicycle Boulevard	3.3
					Enhanced Class II	2.1
N/S	El Camino Real Corridor	San Luis Rey River Trail, Oceanside	Coastal Rail Trail, Encinitas	Class II	Class II	19.4
					Bicycle Boulevard	0.6
E/W	Encinitas - San Marcos Corridor	Coastal Rail Trail, Encinitas	Inland Rail Trail, San Marcos	Class II	Class I	8.0
					Class II	5.2
N/S	Gilman Connector	Central Coast Corridor, San Diego	Coastal Rail Trail	Class II	Class II	2.0
E/W	Inland Rail Trail	Coastal Rail Trail, Oceanside	I-15 Bikeway, Escondido	Class II	Class I	13.3
					Enhanced Class II	7.4
E/W	Mid-County Bikeway Corridor	Coastal Rail Trail, Del Mar	Escondido - Inland Rail Trail	Class II	Class I	0.7
					Class II	2.0
					Enhanced Class II	14.3
					Enhanced Class III	0.2
E/W	Mira Mesa Corridor	Coastal Rail Trail, San Diego	I-15 Bikeway	Class II	Class II	5.9
N/S	Vista Way Connector	San Luis River Rey Trail	Inland Rail Trail		Enhanced Class II	4.6
E/W	SR 52 Bikeway	Coastal Rail Trail, San Diego	I-15 Bikeway		Class I	13.7
E/W	SR 56 Bikeway	Coastal Rail Trail, San Diego	I-15 Bikeway, San Diego	Class I	Class I	10.7

Source: SANDAG Regional Bicycle Master Plan.

Table 2.7 Gaps in the Regional Bicycle System

	Unbuilt with Plan			Unbuilt No Plan		
	Miles	Planned Facility	Jurisdiction	Miles	Jurisdiction	Total Gap
Coastal Rail Trail	0.2	Class I	Oceanside	–	–	2.8
	2.6	Class I	San Diego	–	–	
Camp Pendleton Trail	–	–	–	10.3	Unincorporated	10.3
San Luis Rey River Trail	7.5	Class I	Unincorporated	0.7	Oceanside	15.6
	7.4	Class II	–	–	–	
El Camino Real	0.9	Class II	Encinitas	1.2	Oceanside	2.7
	0.6	Class III	–	–	–	
Polamar Airport Road/ San Marcos Boulevard	–	–	–	0.7	Carlsbad	0.7
La Costa Avenue/ Rancho Santa Fe Road	0.4	Class I	San Marcos	–	–	0.4
SR 52 Bikeway	8.5	Class I	San Diego	–	–	8.5

Source: SANDAG Regional Bicycle Master Plan.

Chapter: 3

The Travel Shed's Context

Overview

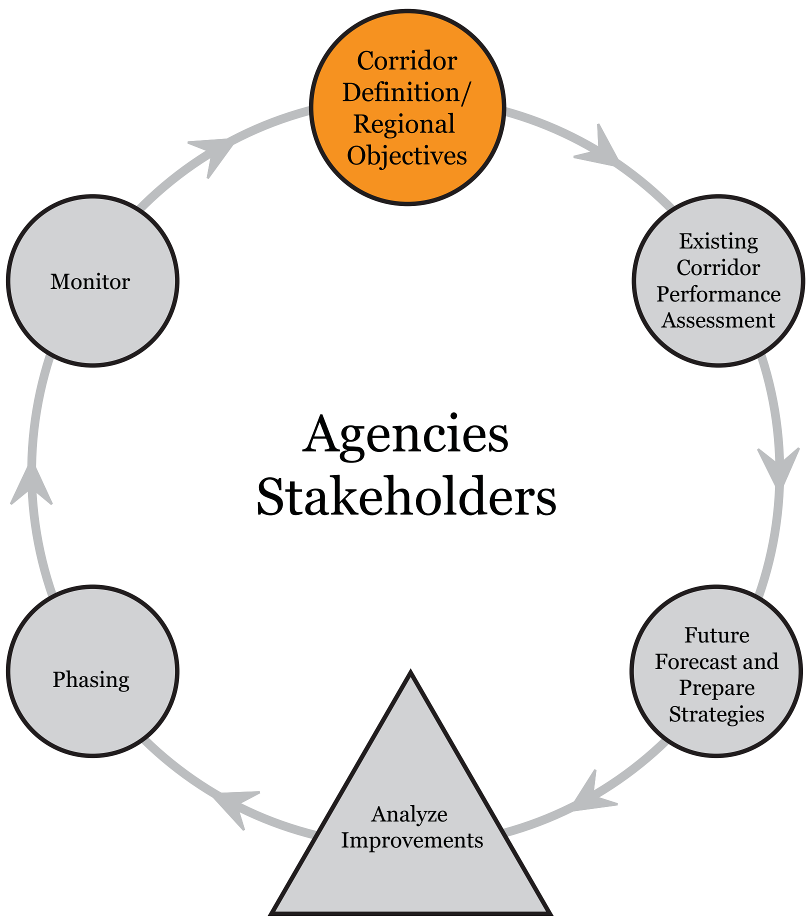
This chapter focuses on the context created by the land uses and the natural environment within the I-5 CSMP travel shed. This, in combination with Chapter 4, describes how the relationships between land use, the natural environment, and the transportation system in the corridor affects the existing travel patterns and what changes may happen in the future.

This chapter is organized into the following sections:

- Land Use in the Travel Shed; and
- Natural Environment.

For the purposes of the CSMP process, this chapter further describes the characteristics of the travel shed (see Figure 3.1).

Figure 3.1 The Corridor System Management Plan Process Diagram



(Transportation System Management Pyramid)

Land Use in the Travel Shed

This section describes the land uses in the I-5 CSMP corridor and is organized as follows:

- Land Use: Past and Present;
- Population;
- Housing;
- Employment Centers; and
- Recreation and Tourism.

These sections contain relationships between the land uses and the travel shed's transportation patterns. It also compares the existing land uses with future growth projections in population, housing, jobs, and tourism.

Land Use: Past and Present

Most of the population growth in the corridor occurred before local and regional commuter rail service were in place, resulting in a vehicle-oriented land use pattern.

Land use policy and decisions are made at the regional level and at the local level by the individual cities within the I-5 CSMP travel shed. Local plans and zoning codes define where commercial, housing, industrial, civic, and recreational uses are located and whether those uses can be mixed. Historical land use decisions promoted low density, single land uses. This resulted in an extensive road and highway network to connect these uses. At the time of these land use decisions, regional passenger rail services were not widely supported and provided.

Prior to the 1960s and 1970s when I-5 was constructed, the Coast Highway was the major north-south regional roadway for the I-5 CSMP travel shed. In the early 1970s, the travel shed was sparsely populated, had relatively few job centers, and large areas of undeveloped land existed east of I-5.

Once I-5 was constructed and in operation, its presence supported a number of regional economic and land development decisions throughout the 1970s to 1990s. These decisions resulted in the land use patterns that are present today. During this same time period, traffic congestion increased and available land to develop decreased. The remaining undeveloped land is primarily located east of I-5.

As described in Chapter 2, passenger rail services for local and regional trips began in the mid-1990s with the addition of the north-south COASTER commuter rail service connecting downtown San Diego to the north coastal communities extending to Oceanside. In 2008, the SPRINTER rail commuter service was added to provide east-west service connecting Escondido, San Marcos, Vista, and Oceanside. The availability of these transit services, coupled with the decrease in remaining, undeveloped land started an examination of how to better integrate local land uses and regional transportation resources.

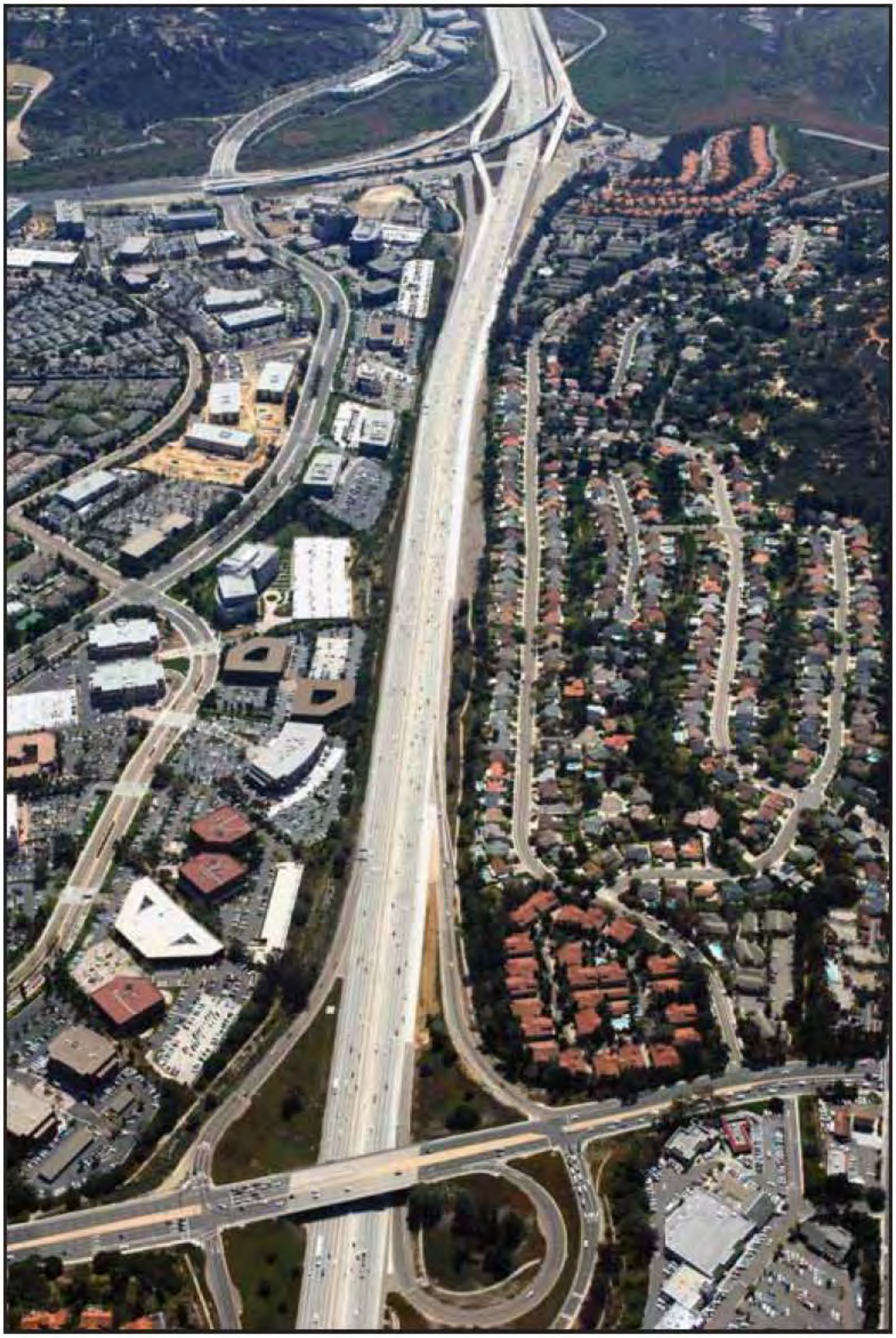
With the addition of the COASTER and SPRINTER passenger rail services in the travel shed, there is an opportunity to implement Smart Growth policies and measures.

Termed Smart Growth, the goal is to improve the regional transportation system's performance while meeting local needs for housing and economic development. One element of Smart Growth is to cluster higher density development around transit routes and centers. This pattern of development results in walkable, transit-oriented districts where people can live, work, and play. It reduces the demand for auto trips and creates more vital communities that include housing, jobs, and amenities. Smart Growth is described further later in this chapter.

Figure 3.2 is an example of how separation of land uses can negatively affect transportation in the I-5 CSMP corridor. In this case, low-density, single-use land development patterns dominate the Del Mar Heights area of the City of San Diego where it abuts I-5. As shown, homes are located beyond a convenient walking distance from employment and shopping centers, with some of the housing located on one side of I-5 and employment located on the other. This results in limited access between the two uses (freeway overpasses) and travel conflicts of those wanting to access I-5 versus cross over.

Overall, the San Diego region has gotten 40 good years out of the transportation facilities in the I-5 CSMP corridor. However, it is now time for a new plan for the corridor that addresses the increase in transportation demand, based upon the current and anticipated future land uses and objectives of the region.

Figure 3.2 Example of Land Use Patterns Along I-5



Del Mar Heights and Carmel Valley Arterials crossing I-5 Looking South.

Population

The ability to change the land use development pattern in this travel shed is constrained because most of the population growth has already occurred.

This section describes the population growth in the I-5 CSMP corridor, the resulting land development and how it affects travel patterns, and the projected future growth in population in the corridor.

Typically, a major capacity transportation investment such as the I-5 freeway is planned to accommodate 20 to 30 years of population growth. However, I-5 has absorbed nearly 40 years of population growth, outpacing regional population growth. As shown in Table 3.1, the I-5 CSMP travel shed grew by 369 percent from 1970 to 2006, while the San Diego region grew by 125 percent. This rate of population growth is not projected to continue, estimated to be 23 percent from 2006 to 2030. The population within the I-5 CSMP travel shed is approximately 16 percent of the three million people who live in San Diego County.

In 2005, most of the population of the I-5 CSMP travel shed was located in the northern portion, as well as along its coastline, arterial roads, and north of SR 56. In 2030, the population is anticipated to increase in Carlsbad and Oceanside and within the City of San Diego's limits along SR 56, including Pacific Highlands Ranch and Torrey Highlands. Figure 3.3 presents a comparison of population densities between 2005 and 2030 (projected).

Table 3.1 Population Matrix for Travel Shed's Coastal Cities

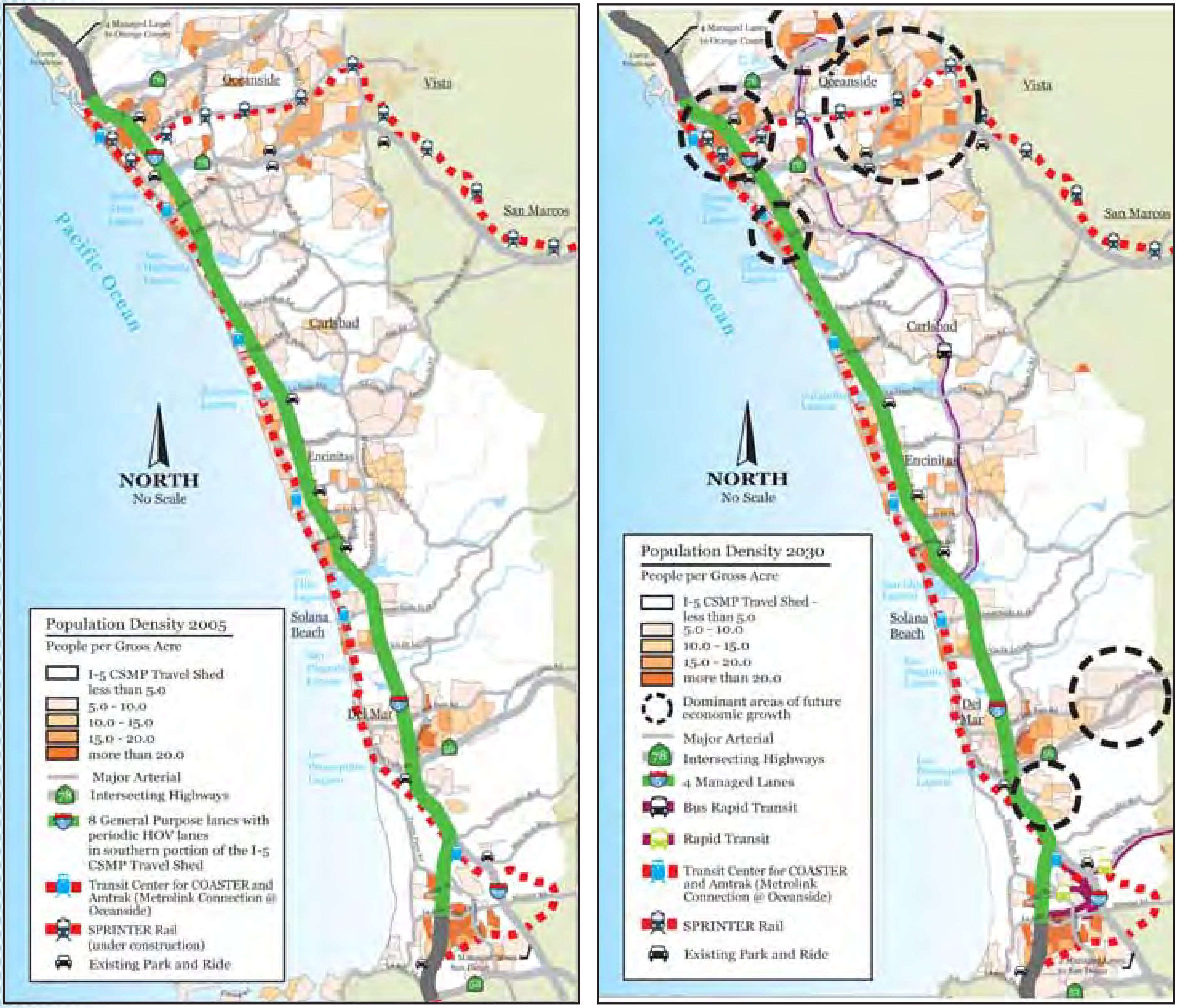
Jurisdiction	1970	2006	2030[d]	Percent Change 1970 to 2006	Percent Change 2006 to 2030
Oceanside	40,494	174,925	208,561	332%	19%
Carlsbad	14,944	98,607	128,772	560%	30%
Encinitas	17,210[a]	62,815	71,025	265%	13%
Solana Beach	5,744[b]	13,327	13,674	132%	2%
San Diego[c]	23,315	141,435	181,642	422%	49%
Del Mar	3,956	4,524	4,720	14%	4%
I-5 CSMP Travel Shed	**105,663**	**495,633**	**608,394**	**369%**	**23%**
San Diego County	1,357,854	3,066,820	3,855,085	125%	26%

[a] Census Tracts 174, 175, 176, 177.
[b] Census Tract 173.
[c] Selected Census Tracts in the northern portions of the City of San Diego.
[d] SANDAG, Series 10 Final Regional Growth Forecast (December 2003).

Note: City of San Diego is only for communities within the travel shed. I-5 North Coast Corridor Draft Project Report, 2007.

Figure 3.3 Comparison of Population Densities

2005 | **Estimated 2030**



Source: Caltrans/SANDAG Synthesis Paper.

In surrounding regions, population growth is increasing at even higher rates than in San Diego.

Rising population in neighboring counties also affects the transportation system in the I-5 CSMP corridor. Growth in neighboring regions increases the number of trips through this travel shed and to destinations within it. Population increases are highest in regions where housing is more affordable, such as in Riverside County and Tijuana, Baja Mexico as shown below in the Table 3.2. Pass-through destinations include the City of San Diego and the International Border south of the travel shed, as well as Orange County and Los Angeles County to the north.

Given the San Diego region's status as a major tourism destination, population growth outside the region will continue to affect traffic within the I-5 CSMP travel shed, despite future land use policies and patterns. Pass-through traffic from other regions will continue to be dominated by vehicle-oriented travel since the primary transportation system connectors between the regions are freeways and interregional highways and arterials.

Table 3.2 County Population Change
1970 to 2030 (millions)

Jurisdiction	1970	2006	2030	Percent Change 1970 to 2006	Percent Change 2006 to 2030
Orange County	1.42	3.10	3.55	118%	15%
Riverside County	0.46	1.85	3.14	302%	70%
Imperial County	0.07	0.17	0.27	143%	59%
Tijuana, BC	0.34	1.43	2.54	321%	78%
San Diego County	**1.36**	**3.07**	**3.86**	**126%**	**26%**

Source: SANDAG Current Population and Housing Estimates (January 2006; U.S. Census Bureau, 1995; I-5 North Coast Corridor Draft Project Report, 2007; "Tijuana, Basic Information," Paul Ganser, 1999.

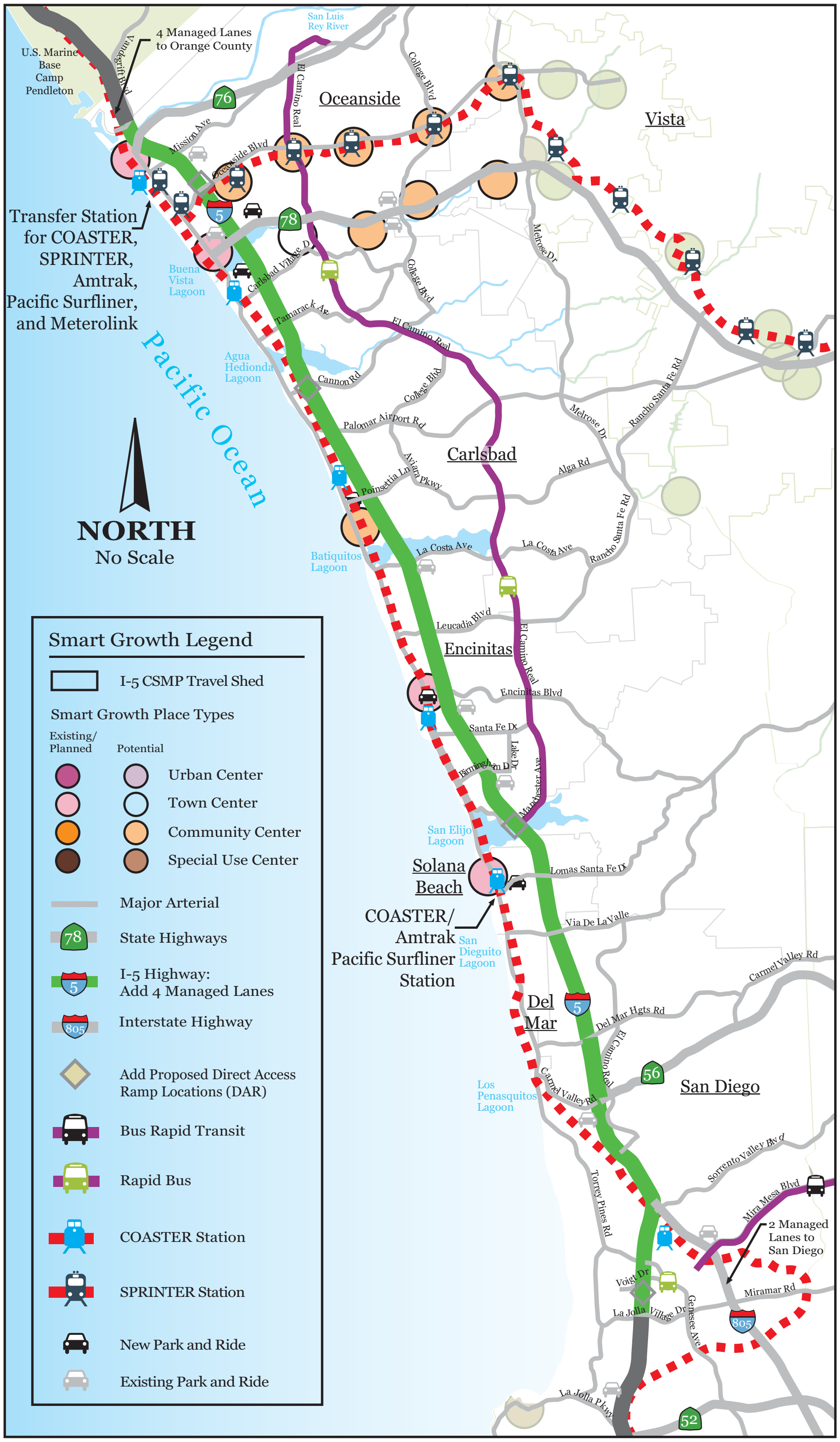
Smart Growth

In an effort to better integrate local land use decisions with the regional transportation system, SANDAG has developed a smart growth policy for the region. The Smart Growth Concept Map (Figure 3.4) shows where 23 of the region's 196 existing and future Smart Growth opportunity areas are located within the I-5 CSMP travel shed. Most of these are located around existing COASTER and SPRINTER transit stations and in the commercial cores of the travel shed's communities. This plan encourages cities to develop dense and compact land use patterns around centralized areas that are a nexus for different transportation modes, and also serve as community centers.

SANDAG's Smart Growth Concept Map includes land use densities for seven place types ranging from 20 to 75 dwelling units per acre. Four of these types are located in the I-5 CSMP travel shed: Urban Center, Town Center, Community Center, and Special Use Center. Characteristics and examples of these place types in the travel shed are as follows:

- Urban Center: 40 to 75 dwelling units per acre;
- Travel Shed's Urban Centers: San Diego, University City (La Jolla UTC area);
- Town Center: 20 to 45 dwelling units per acre;
- Travel Shed's Town Centers: Downtown Oceanside, Encinitas Transit Center, Solana Beach COASTER Station;
- Community Center: 20 to 45 dwelling units per acre;
- Travel Shed's Community Centers: Downtown Del Mar, around all SPRINTER stations between Oceanside and Escondido, and within San Diego at Pacific Highlands, Torrey Highlands, and Torrey Pines (Del Mar Heights Road and Mango Drive);
- Special Use Center: Residential use is optional; and
- Travel Shed's Special Use Centers: Potential New COASTER Station at Del Mar Fairgrounds, University of California, San Diego.

Figure 3.4 Smart Growth Concept Map



Source: 2006 Rand McNally – The Thomas Guide; SANDAG Pathways for the Future 2030 San Diego Regional Transportation Plan, November 2007.

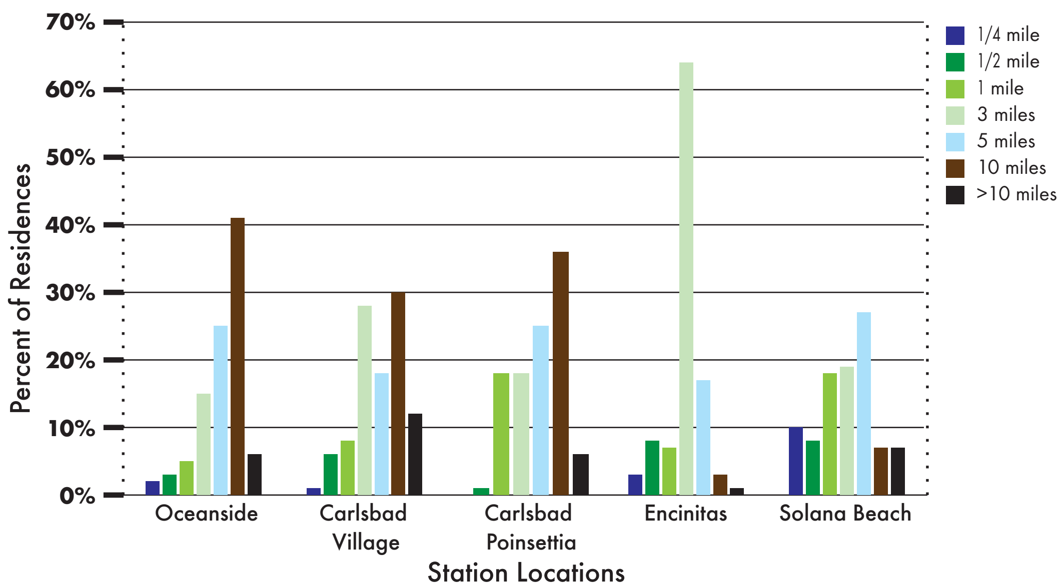
The largest proportion of residences in the Cities of Oceanside, Carlsbad, and Encinitas are five or more miles from the nearest COASTER station.

To implement Smart Growth development in these locations, three challenges will need to be overcome:

- Many communities oppose higher density development in their cities;
- Redevelopment rather than new development will likely be implemented because the area is largely built out; and
- Many of the existing land development regulations for these areas require lower density development.

A typical transit-oriented land use pattern is a one-quarter-mile radius of mixed-use, higher density development located around a transit station. Figure 3.5 shows the distance of residences from COASTER stations within the I-5 CSMP travel shed. Only the City of Solana Beach has 10 percent of its residences within a one-quarter-mile radius from a COASTER station. Oceanside, Carlsbad, and Encinitas have less than five percent of residences within a one-quarter-mile radius of a COASTER station.

Figure 3.5 Distance of Residences from COASTER Stations



Housing

Lower density land uses tend to result in vehicle trips over longer distances since housing, jobs, and recreational resources are located apart from one another. Higher density development typically results in shorter distance trips via walking, bicycling, bus and rail transit, and shorter auto trips since uses are located closer to each other. In addition, home prices also impact commute patterns. In 2007 the median cost of a home in the San Diego region was $489,000. Whereas, the median home price in most of the I-5 CSMP corridor was 50 to 75 percent higher (Carlsbad $688,000, Encinitas $736,000, Solana Beach $845,000, Del Mar $1,225,000, Carmel Valley $786,000) with the exception of Oceanside at $449,000. These high home prices tend to cause people working in the travel shed to live outside the area (e.g., Riverside County), further taxing the transportation system.

The west side of the I-5 CSMP travel shed is fairly compact, with a low-density residential pattern that is typical of older coastal communities. Suburban, low-density, less compact housing dominates the east side of the I-5 CSMP travel shed. Commercial uses and employment sites tend to be separated from residences and are concentrated along the I-5 and major arterials as well as in activity centers in the northeastern and southern portions of the travel shed.

The I-5 CSMP travel shed contains 18 percent of the 1.1 million housing units in San Diego County. Over the next 25 years, housing in the travel shed is expected to increase by an additional 15 percent (approximately 30,000 units). This is comparable to the estimated regional increase of 23 percent, or approximately 250,000 units. Most of the future housing is anticipated to be low density, master-planned communities in eastern Carlsbad and Oceanside, and the northern portion of the City of San Diego. Table 3.3 shows the housing distribution and estimated growth by 2030 in the I-5 CSMP travel shed.

Tables 3.4 and 3.5 show that there are nearly twice as many single-family homes than multifamily homes in the I-5 CSMP travel shed. Multifamily buildings generally increase the density of an area, stated in persons per acres. Of the approximately 30,000 housing units to be added to the travel shed over the next 25 years, more than one-half are planned to be single-family housing units. Most of the estimated 13,000 multifamily units added to the travel shed will be located in Carlsbad, Oceanside, and the City of San Diego. This follows trends similar to the rest of Southern California and most of the State. However, San Diego County overall is anticipating a higher growth in multifamily housing than most other parts of the State, as shown in Figure 3.6.

Single-family homes currently outnumber multifamily homes approximately 2 to 1 in the I-5 CSMP travel shed.

Table 3.3 Housing Distribution
2005 to 2030

Jurisdiction	2005	2030	Percent Change
Oceanside	62,320	69,160	11%
Carlsbad	39,396	49,450	26%
Encinitas	25,395	27,211	7%
Solana Beach	6,590	6,682	1%
San Diego	48,182	56,426	17%
Del Mar	2,567	2,611	2%
Other Jurisdictions	18,550	22,105	19%
I-5 CSMP Travel Shed	**203,000**	**233,645**	**15%**
San Diego County	1,102,818	1,354,088	23%

Source: SANDAG, Series 10 Regional Forecast, December 2003.

Table 3.4 Single Family Housing Distribution
2005 to 2030

Housing Units	2005	2030	Percent Change
Oceanside	40,814	43,827	7%
Carlsbad	27,735	35,132	27%
Encinitas	19,086	20,031	5%
Solana Beach	4,307	4,371	1%
San Diego	25,816	29,391	14%
Del Mar	1,702	1,731	2%
Other Jurisdictions	13,077	15,332	17%
I-5 CSMP Travel Shed	**132,537**	**149,815**	**13%**
San Diego County	667,757	778,262	17%

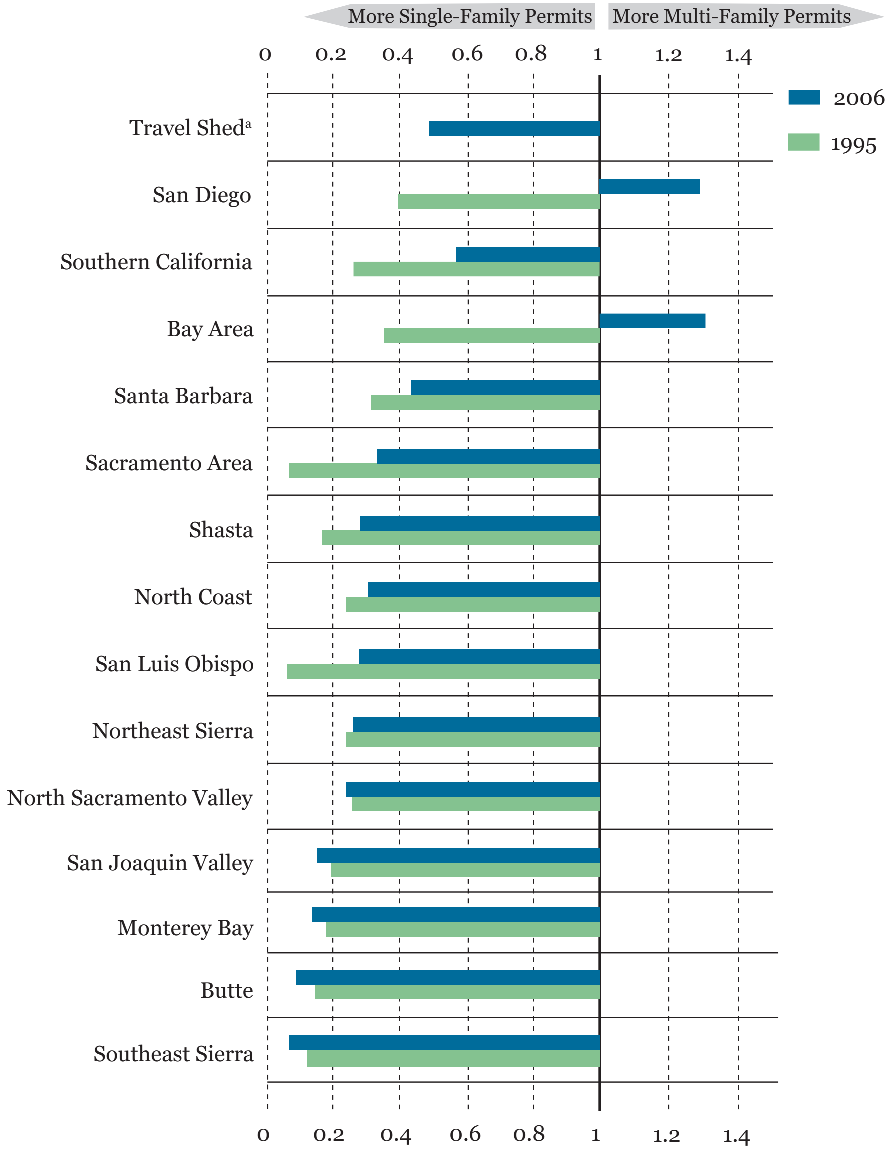
Source: SANDAG, Series 10 Regional Forecast, December 2003.

Table 3.5 Multifamily Housing Distribution
2005 to 2030

Housing Units	2005	2030	Percent Change
Oceanside	18,010	21,547	20%
Carlsbad	10,343	12,905	25%
Encinitas	5,526	6,387	16%
Solana Beach	2,243	2,267	1%
San Diego	22,336	27,005	21%
Del Mar	865	880	2%
Other Jurisdictions	4,726	5,977	26%
I-5 CSMP Travel Shed	**64,049**	**76,968**	**20%**
San Diego County	387,978	527,221	36%

Source: SANDAG, Series 10 Regional Forecast, December 2003.

Figure 3.6 Ratio of Single Housing Units



Source: Construction Industry Board, California Building Permit Date by Building Category, 1995 and 1996.

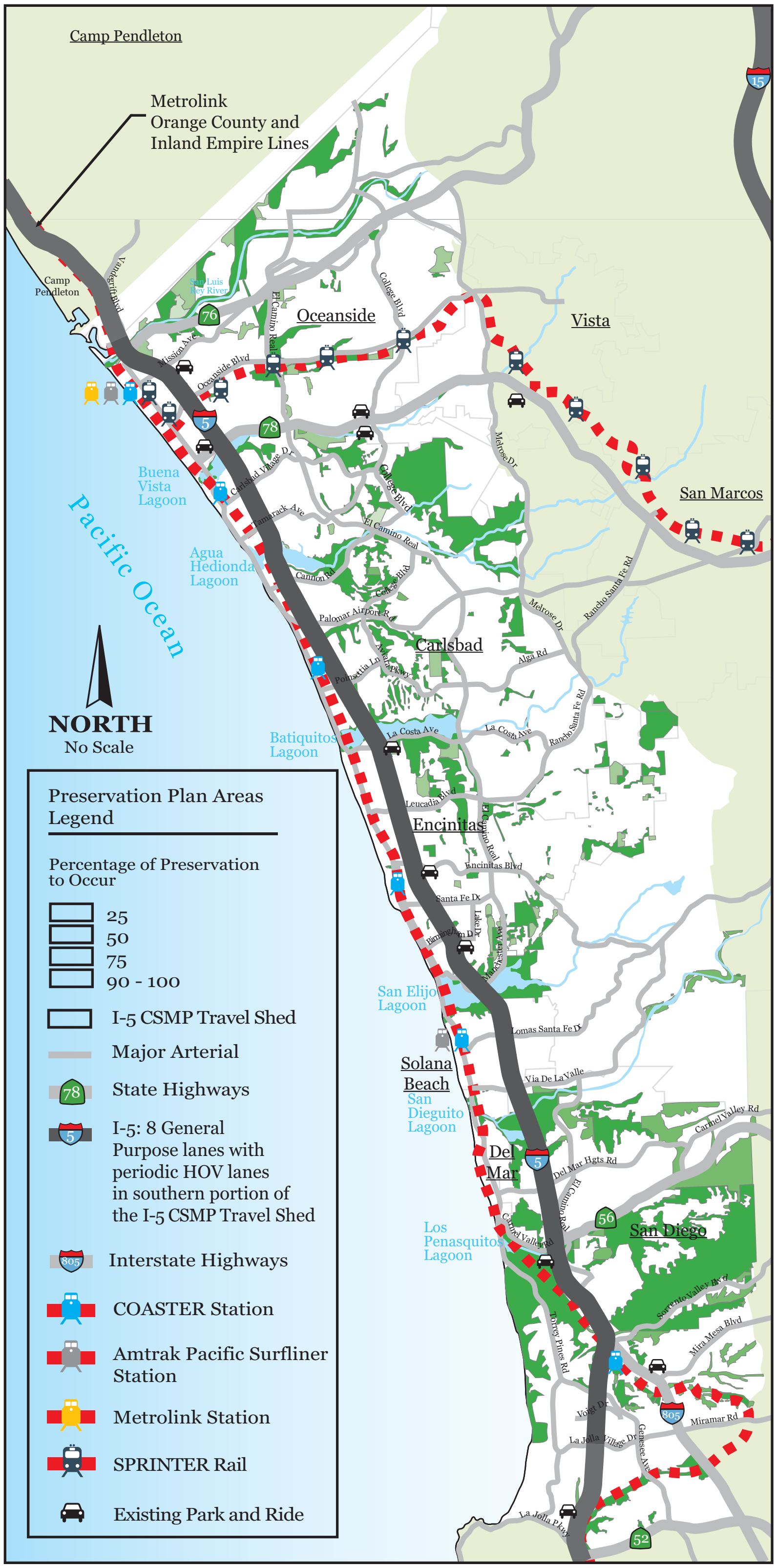
[a] Travel Shed numbers are for 2005.

The undeveloped areas in the I-5 CSMP travel shed that are not designated for future development are part of three regional habitat conservation plans:

- Multiple Species Conservation Program, (MSCP);
- Multiples Species Conservation Program, North County subarea; and
- Multiple Habitat Conservation Program, (MHCP).

Figure 3.7 shows the MSCP land in the travel shed. The shades of green represent the percentage of land to be preserved.

Figure 3.7 Preservation Areas



Source: Multiple Habitat Conservations program and Multiple Species Conservations Program.

Note: Preservation area boundary lines under 90 percent are subject to change.

Table 3.6 deducts these conservation areas from the gross acres of the I-5 CSMP travel shed to determine the net available land for development. As shown, there is a relatively small amount of developable land remaining in the travel shed, roughly nine percent. Given this, the opportunity to change the travel pattern through green-field development is minimal because the majority of the land is already developed.

Table 3.6 Acreage in the Travel Shed

District Name	Gross Acres	MSCP Acres	Non-MSCP Acres	Remaining Acres (Developable Land Currently Available)
Coastal	11,066	1,500	9,566	279
Inland	79,736	12,113	67,624	9,058
La Jolla/UCSD	5,680	1,666	4,015	210
University City	4,935	593	4,342	55
Sorrento Valley	9,798	4,069	5,730	555
I-5 CSMP Travel Shed (Minus Camp Pendleton)	**111,215**	**19,941**	**91,277**	**10,157**

Source: Caltrans, District 11.

Table 3.7 shows the population density of the travel shed for the years 2005 and 2030. Within the travel shed, density ranges between 0 to 10 persons per gross acre excluding the MSCP land. The overall population density average is 6.1 persons per developable acre, excluding MSCP land. By the year 2030, the overall population density is projected to increase to 7.4 persons per developable acre. Future population growth is not anticipated to significantly change the I-5 CSMP travel shed's density.

Table 3.7 Population Density in the Travel Shed

District Name	Non-MSCP Acres	Population 2005	Population 2030	Net Density 2005	Net Density 2030
Coastal	9,566	80,386	95,466	8.4	10.0
Inland	67,623	342,062	425,745	5.1	6.3
La Jolla/USCD	4,014	17,687	21,473	4.4	5.3
University City	4,342	44,933	51,460	10.3	11.9
Sorrento Valley	5,729	13,830	9,124	2.4	3.3
I-5 CSMP Travel Shed (Minus Camp Pendleton)	**91,274**	**498,898**	**603,268**	**6.1**	**7.4**

Source: Caltrans, District 11.

Employment Centers

Over the past 20 years, the San Diego region has made a concerted effort to diversify its economy so that its economic health is not dependent on only a few industries. To diversify, the region implemented a successful strategy to add new industries such as high technology, biotechnology, and tourism, while retaining manufacturing, construction, and military/defense industries. The I-5 CSMP travel shed is a good example of the success of that diversification.

In the early 1970s when I-5 was built, data shows that there were very few jobs in the I-5 CSMP travel shed (see Table 3.8). From 1970 to 2004, the number of jobs in the travel shed grew by 1,358 percent, an increase of approximately 379,000 jobs. This was predominantly due to major job centers being planned and built in the Sorrento Mesa and Del Mar Heights areas of San Diego, Carlsbad, and Oceanside, as shown in Table 3.8 and Figure 3.9. The travel shed accounts for 23 percent of the 1.45 million jobs in San Diego County, with many of those jobs in high income industries such as high technology, biotechnology, and medical fields. In contrast, during the next 25 years from 2004 to 2030, job growth in this travel shed is expected to increase by 26 percent, or approximately 82,000 jobs. This data compares to the overall projected regional increase of 26 percent, or approximately 375,000 jobs during the next 25 years.

Table 3.8 Employment Matrix for I-5 CSMP Travel Shed

1970 to 2030

Jurisdiction	1970	2004	2030	Percent Change 1970 to 2004	Percent Change 2004 to 2030
Oceanside[a]	12,040	39,850	62,409	231%	57%
Carlsbad	1,779	54,347	79,188	2,955%	46%
Encinitas[b]	3,151	25,012	29,736	694%	19%
Solana Beach	1,050	9,416	10,314	797%	9%
San Diego (City)[c]	2,832	185,807	214,976	6,461%	16%
Del Mar[d]	1,004	4,335	4,232	332%	-2%
Total	**21,856**	**318,767**	**400,855**	**1,358%**	**26%**

Sources: Comprehensive Planning Organization's Initial Employment Survey, June 1970; HUD State of the Cities Data System, 2007; California Employment Development Department; and, I-5 North Coast Corridor Draft Project Report 2007.

[a] Includes job counts from Vista subregional area.

[b] San Dieguito subregional area included what would become Encinitas and Solana Beach where they incorporated in 1986; therefore, data not available for individual cities for 1970. 1970 employment number is for the San Dieguito subregional area and split between cities according to 2004 proportions.

[c] 1970 employment number is for San Diego is comprised of University subregional area.

[d] 1970 employment number for Del Mar is for Del Mar/Mira Mesa subregional area.

The I-5 CSMP travel shed accounts for 23 percent of the 1.45 million jobs in San Diego County, with many of those jobs in high paying industries such as biotechnology.

In 2004, the number of jobs in Carlsbad was 54,347, an increase of 2,955 percent since 1970 and roughly 69 percent of the number of jobs predicted in 2030 (see Table 3.8). Similar growth has occurred in Oceanside, with a 231 percent increase in jobs since 1970. Additionally, a large number of global firms have established headquarters in Carlsbad ranging from golfing companies such as Callaway, Taylormade, Acushnet, and Ashworth, to numerous biotechnical, and pharmaceutical companies. Accommodating clients and employees from all over the country and the world, the companies have spurred additional jobs in the tourism sectors for new hotels and amenities.

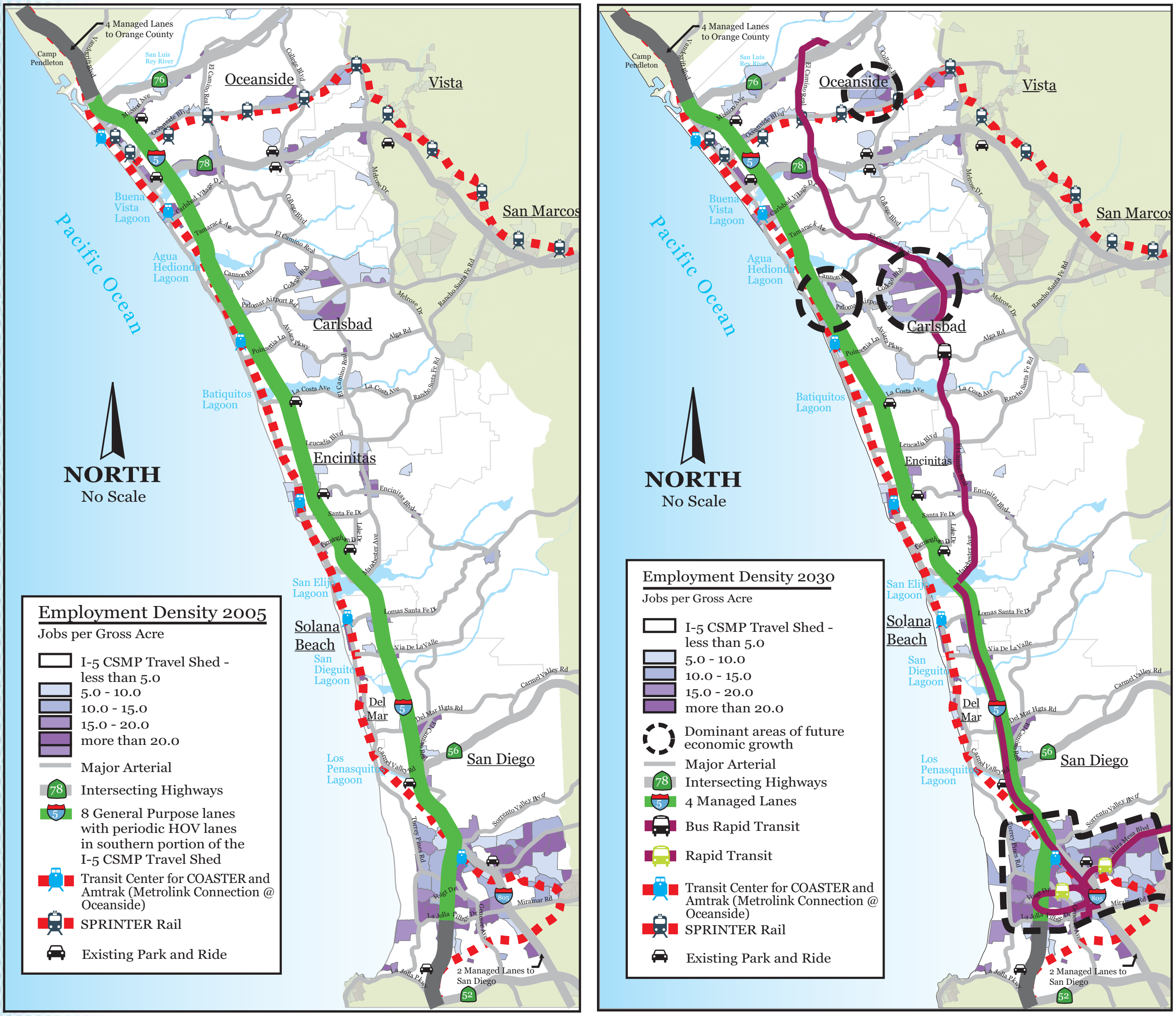
Adjacent to the northern boundary of the I-5 CSMP travel shed, U.S. Marine Corps Base Camp Pendleton has been the largest employer in North San Diego County for more than 60 years. As the second largest U.S. Marine Corps Base in the country, it has a population of 60,000 military and civilian personnel occupying the base, and creates an annual economic impact exceeding $2.3 billion. Additionally, with military base closures across the country over the past 15 years and worldwide military activities, the Base's significance as an employer and as a travel destination has only increased in recent years.

Job growth in the southern portion of the travel shed has built on the success of two institutions: the Scripps Institute of Oceanography and the University of California, San Diego. The Scripps Institute of Oceanography was established in La Jolla in 1907. In the 1960s the University of California, San Diego (UCSD) was founded. Since that time, the combination of these institutions quickly attracted medical research and high-technology businesses to this area.

The job growth in the southern area of the I-5 CSMP travel shed, particularly Sorrento Valley, exceeds the job growth in the northern area. In 2004, there were 185,807 jobs in the City of San Diego's communities within the travel shed. In contrast, the number of jobs for the five cities to the north of San Diego within the I-5 CSMP travel shed was 132,960, approximately 30 percent less. The southern portion of the travel shed provides more than 22 percent of the region's jobs and generates over 34 percent of the region's earnings. Planned expansion of the Golden Triangle is estimated to support an additional 100,000 (direct, indirect, and induced) jobs in the County. Located in the Golden Triangle area, Qualcomm provides an excellent example of the change in employment in the I-5 CSMP corridor over the past 20 years. Established in 1985, Qualcomm has grown from its original seven founders to employing over 6,000 people locally.

Figure 3.8 Comparison of Employment Densities

2005 | **Estimated 2030**



Source: Caltrans/SANDAG Synthesis Paper.

Since most of the estimated job growth in the corridor has already occurred, there are fewer opportunities in the future to influence the location of major job centers in the I-5 CSMP travel shed. Therefore, existing commuter patterns will likely continue. Although the ratio of jobs to housing (1.5) is favorable within this travel shed, the data does not accurately reflect the regional and interregional commuting pattern generated by this travel shed's employment centers. According to 2000 Census data, nearly 50 percent of the travel shed's residents commute to employments centers outside of its boundaries. More information on the types of trips and patterns are discussed in Chapter 4.

According to the 2000 Census data, nearly 50 percent of the travel shed's residents commute to employment centers outside of its boundaries.

Recreation and Tourism

The I-5 CSMP travel shed has an abundance of year around and seasonal recreation and tourism activities which are major travel destinations for both local residents and tourists. These include the public beaches and lagoons along the coast, Legoland, Carlsbad Flower Fields, San Diego County Fairgrounds, and the Del Mar Race Track. Figure 3.9 shows some of the key recreation and tourism locations within the I-5 CSMP corridor.

Tourism in the region has steadily increased since 1991. In 2006, approximately 32 million visitors came to San Diego, with about 4 million visitors a month during the summer season, when beaches and special events venues attract increased numbers of visitors. Many of the recreational and tourism locations in the corridor are not directly served by rail transit or other nonauto modes, making I-5 and the arterial street systems the predominant means of access, either by car or bus. Nearly 70 percent of people visiting San Diego do so by car.

Figure 3.9 Key Recreation and Tourism Destinations

Source: 2006 Rand McNally – The Thomas Guide.

Natural Environment

The second component of the physical context of the I-5 CSMP travel shed is its natural environment. The I-5 CSMP travel shed is home to numerous world renowned public beaches, coastal bluffs, and six lagoons that are part of river valley systems. Similar to the land development patterns, protection of this natural environment also has a role in defining the travel patterns within the I-5 CSMP travel shed. The natural environment has influenced, and will continue to influence, the shape of the I-5 CSMP's transportation system plans.

Coastal Beaches and Bluffs

Highway, rail, and regional arterial road improvements are constrained by environmentally sensitive areas adjacent to them and existing land use patterns.

The I-5 CSMP travel shed has approximately 30 miles of coastline where beaches and sandstone bluffs meet the Pacific Ocean. The travel shed's coastline is historically, culturally, aesthetically, and economically important to the coastal communities in the travel shed and the region as a whole. Maintenance of scenic views, coastal community character, the coastal environment, and public access to the beaches and parks are all important considerations in the travel shed.

The biological and recreational values of the travel shed's coastline are in its ecological diversity and beauty. Onshore, the tidal environments are important habitats for birds of all sizes, from gulls to sandpipers, as well as for spawning fish, such as the grunion. Offshore, the travel shed's coast is home to a remarkable and sensitive underwater environment, including reefs, kelp forests, and a section of ocean in the La Jolla area that has been designated by the State of California as an "Area of Special Biological Significance." Additionally, the travel shed's coast boasts many scenic public beaches that are renown recreational locations for residents and visitors, including La Jolla Shores, Torrey Pines State Beach, Del Mar Beach, Cardiff State Beach, San Elijo State Beach, Moonlight State Beach, Leucadia State Beach, Carlsbad State Beach, and Oceanside City Beach. These beaches offer popular locations for surfing, swimming, tide pooling, camping, hiking, fishing, sports, and relaxation.

Lagoons

Significant natural resources such as the coastline and lagoon system create opportunities to incorporate educational centers, views, and aesthetics into transportation improvements.

Although southern California is generally known for its coastline and beaches, San Diegans also identify strongly with other features of the natural environment, such as the State's protected lagoons. The lagoons provide additional beauty, create a buffer area for many of these seaside communities, and define their points of entry. Additionally, the coastal lagoons provide important stopping points for migratory birds on the Pacific flyway, and provide habitat for fish and endangered species. Many key transportation facilities traverse the lagoons in the I-5 CSMP travel shed and affect the quality of the lagoons, as do the lagoons affect the potential enhancement of the transportation system.

The Southern California Wetlands Recovery Project, a partnership consisting of Federal and state agencies, nonprofit partners, scientists, and elected officials, recognizes six lagoons as important coastal wetland in its Work Plan and Wetland Inventory: the Buena Vista, Batiquitos, San Elijo, San Dieguito, and Los Peñasquitos (see Figure 3.9). Moreover, the California Coastal Commission classifies three of these six lagoons as Critical Coastal Area; specifically Batiquitos, San Elijo, and Los Peñasquitos lagoons. The Critical Coastal Areas (CCA) Program is an innovative program to foster 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.

Los Peñasquitos Lagoon: City of San Diego, City of Del Mar

Los Peñasquitos Lagoon is a broad expanse of coastal salt marsh habitat adjacent to the Torrey Pines State Reserve. The lagoon provides flood relief by allowing high flows to spread out and enter the larger water courses. It also filters runoff by slowing the flow of water and allowing sediment loads, nutrients, and toxins to drop out and be absorbed by the vegetation prior to reaching the Pacific Ocean. The lagoon provides wildlife habitat for migratory birds, endangered species, and nursery grounds for many fish species. The Los Peñasquitos Lagoon is the closest lagoon to the only two Areas of Special Biological Significance located within San Diego: the San Diego Marine Life Refuge and the San Diego-La Jolla Ecological Reserve.

In March 1983, the successful Los Peñasquitos Lagoon Enhancement Program was implemented through cooperation of the California Coastal Commission and the Coastal Conservancy with assistance from the Los Peñasquitos Lagoon Foundation. Additionally, wetland acquisition has been achieved through State purchase of approximately 200 acres of former San Diego Gas and Electric utility land and approximately 20 acres of valuable wetland in Sorrento Valley.

Recently, the North Torrey Pines Road Bridge, shown below, was replaced. During construction, 72 pilings were removed and replaced by only two. This joint project of the City of San Diego and Caltrans improved the tidal flow within the lagoon.

Figure 3.10 Los Peñasquitos Lagoon

San Dieguito Lagoon: City of San Diego, City of Del Mar, and County of San Diego

The San Dieguito River and Lagoon provide similar wetland functions as the Los Peñasquitos Lagoon. In 2006, a large restoration project by Southern California Edison began to restore approximately 150 acres of wetlands that were filled and used for agriculture or other uses. San Dieguito Lagoon includes the main San Dieguito River channel, several large tidal channels, and a lagoon west of I-5. The restoration project will add another large lagoon west of I-5 and salt marsh habitat off the main river channel both east and west of I-5. The salt marsh habitat currently fringes the main channels and lagoons with larger expanses of middle to upper salt marsh.

Figure 3.11 San Dieguito Lagoon

San Elijo Lagoon: City of Solana Beach, City of Encinitas, and County of San Diego

San Elijo Lagoon west of I-5 is primarily a salt marsh. East of I-5, the lagoon is a freshwater and brackish water marsh. Similar to the other lagoons, water quality improvement, flood relief, and habitat for wildlife are important functions of this lagoon. The lagoon is part of the San Elijo Lagoon Ecological Reserve, a county and state regional park of nearly 1,000 acres of diverse habitat including six plant communities, coastal strand, salt marsh, brackish/freshwater marsh, riparian scrub, coastal sage scrub, and mixed chaparral that host a wide variety of fauna.

Recreational and educational uses in the reserve abound with access to over seven miles of trails via eight trailheads. The San Diego County Department of Parks and Recreation opened a new Nature Center building that includes an exhibit room, ranger office, multipurpose room, assembly and observation areas, public restrooms, and storage. Exhibits educate the public about the reserve, including its rich plant and animal communities, its history, and the various natural and human influences that affect this sensitive ecosystem.

The San Elijo Lagoon Enhancement Plan (County of San Diego 1996) identified several opportunities for enhancement and restoration, mostly by reducing the sedimentation problem and improving tidal exchange and circulation. Recent management to maintain the inlet open to tidal flushing has substantially improved habitat quality relative to the stagnant conditions that previously developed when the inlet was closed for prolonged periods. A long-term financial endowment has been established to actively fund maintenance of the inlet opening.

Figure 3.12 San Elijo Lagoon

San Elijo Lagoon: City of Solana Beach, City of Encinitas, and County of San Diego - Cont.

The preparation of Environmental Documents detailing restoration strategies for the San Elijo Lagoon are currently underway under the leadership of the US Army Corps of Engineers, the California Department of Fish and Game, and the County of San Diego. These strategies will include recommendations for lengthening the I-5 bridge over the lagoon to help improve tidal flow, plus other strategies to be included in the ultimate design of the I-5 Northcoast project. Caltrans is working with these agencies on a continuous basis to develop comprehensive mitiagation plans for the Northcoast corridor. It is expected that the draft documents the San Elijo Lagoon restoration will be available for public review by the spring of 2011.

Batiquitos Lagoon: City of Encinitas, City of Carlsbad

Batiquitos Lagoon is a large, primarily open water lagoon with salt marsh at its perimeter. The lagoon improves water quality and provides flood relief. Additionally, its large open water portions provide a place for migratory waterfowl, a wildlife corridor along its slopes, and an aquatic habitat provided by eelgrass.

The Batiquitos Lagoon was selected as a mitigation site during the expansion of the Port of Los Angeles to meet the requirements of various permitting agencies. In November 1987, the Port of Los Angeles, the City of Carlsbad, and six other agencies signed a Memorandum of Agreement to form the Batiquitos Lagoon Enhancement Project to restore the lagoon and open a tidal inlet to the ocean. In 1990, the EIR and EIS were completed for the project with restoration work beginning in September 1994 and ending in the spring of 1997.

Figure 3.13 Batiquitos Lagoon

Agua Hedionda Lagoon: City of Carlsbad

The Agua Hedionda Lagoon is an important cultural, economic, and environmental resource that provides critical habitat for migratory and resident birds and fish. The lagoon serves as a nursery habitat for commercially and recreationally significant coastal and resident species. Local stakeholders prepared the Agua Hedionda Watershed Management Plan (WMP) to preserve, restore, and enhance the watershed's natural functions and features. As the watershed faces additional stress from development, the WMP provides a foundation for successfully addressing past degradation and guide decision makers towards the most beneficial management practices for a healthy watershed.

The outer Agua Hedionda Lagoon was originally dredged in 1954 as part of the Encina Power Station construction and has been subject to routine maintenance dredging since then. Dredging is a vital tool used to maintain the health of this lagoon by allowing tidal flushing improving the water quality that supports animal and plant life, and providing the Encina Power Station with an adequate volume of seawater for cooling purposes. The power plant is located on the south shore of the outer basin of Agua Hedionda Lagoon, within a hundred yards of the Pacific Ocean. Other existing uses within the outer lagoon include aquaculture farming and marine research through the Hubbs Fish Hatchery.

Figure 3.14 Agua Hedionda Lagoon

Buena Vista Lagoon: City of Carlsbad, City of Oceanside

The Buena Vista Lagoon is a freshwater lagoon that is not connected to the ocean, except through tidal weirs. The Buena Vista Lagoon is a combination of freshwater marsh, brackish marsh, and open water habitat that supports a variety of sensitive and migratory birds. The cattails in the marsh provide habitat and absorb nutrients in the water that flows into the lagoon, improving water quality. The lagoon provides some flood relief due to its size; however, the tide gates decrease this benefit in the western basin.

The Lagoon is California's first Ecological Reserve and is owned by the California Department of Fish and Game (CDFG). Pedestrians, hikers, birdwatchers, and cyclists take advantage of the numerous viewpoints and trails around its shore. Fishing is also a prominent activity in the lagoon and surrounding areas.

Restoration is planned and an Environmental Impact Report/Environmental Impact Statement (EIR/EIS) is in the draft stages. The lead agencies pursuant to the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA) are CDFG and the United States Fish and Wildlife Service, respectively. The Buena Vista Lagoon Restoration Project would restore approximately 200 acres of wetland habitat to a predominantly tidal saltwater system. However, the fresh-water habitat at the lagoon's upper (easterly) end would be protected as well as enhanced. Potential infrastructure modifications that may be considered include the existing bridges over the lagoon: I-5, the railroad, and Coast Highway, along with culverts and/or a weir.

Figure 3.15 Buena Vista Lagoon

Chapter:

4

Customers in the Travel Shed

Overview

Trip Types

- Local Trips
- Commuter Trips
- Interregional Trips
- Recreation and Tourism Trips
- Goods Movement Trips

Trip Generators

Travel Demand

- I-5
- Travel Demand on I-5
- Regional Arterials
- Rail
- Local and Regional Bus
- Modal Splits

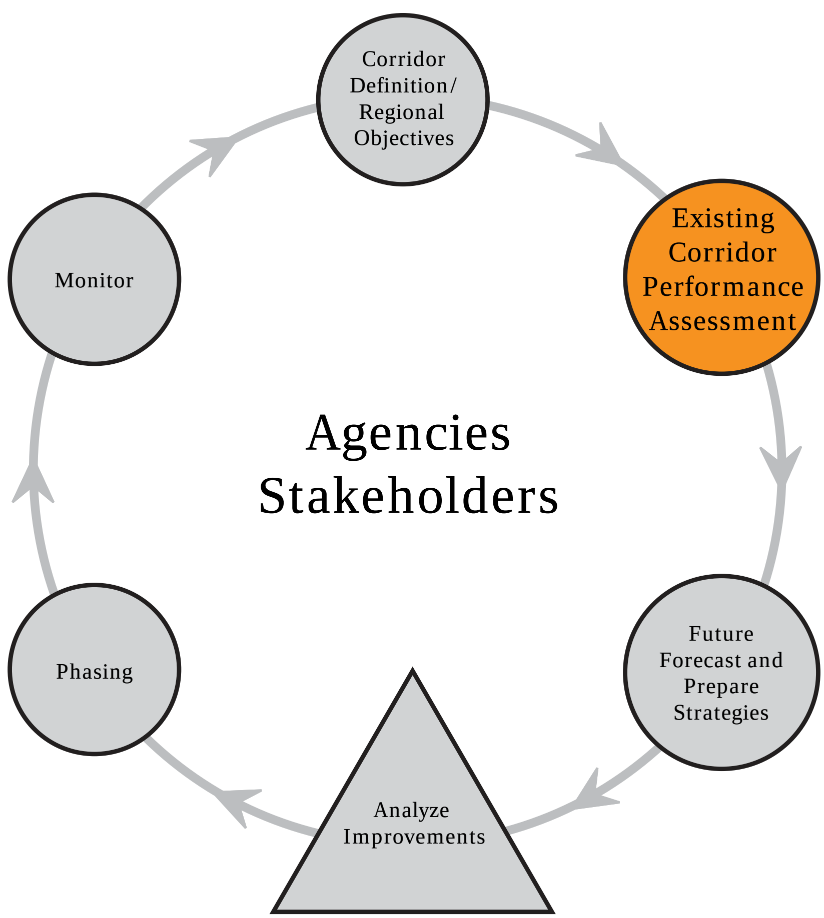
Overview

This chapter focuses on the customers who use the I-5 CSMP travel shed's transportation system. It presents: 1) the types of trips customers make; 2) the activity centers that generate trips; 3) the travel demand customers place on each of the transportation system's travel modes; and 4) the connectivity of those modes to each other. The analysis supports the conclusion that a combination of improvements will be needed to provide a balanced system to meet the many travel needs of the I-5 CSMP's transportation system's customers. This chapter presents:

- Trip Types;
- Trip Generators; and
- Travel Demand.

For the purposes of the CSMP process, this chapter continues describing the characteristics of the travel shed (see Figure 4.1).

Figure 4.1 The Corridor System Management Plan Process Diagram



(Transportation System Management Pyramid)

Trip Types

The I-5 CSMP travel shed supports five different trip types, including local trips, commuter trips, interregional trips, recreational trips, and goods movement trips. In total, these different trip types result in approximately 2.5 million person trips daily within this travel shed. This is roughly 23 percent of the 11 million daily trips that occur within San Diego County. Travel demand in San Diego County is projected to increase to more than 13.7 million trips per day over the next 25 years, an increase of 25 percent. By 2030, this travel shed is projected to facilitate 3.27 million daily person trips, a 30 percent increase.

Local Trips

Sixty percent of trips in the I-5 CSMP travel shed remain inside of it.

Local trips are typically short trips to community or neighborhood services. Of the 2.5 million trips daily in the travel shed, 60 percent (1.5 million) of those trips are internal (i.e., they remain within the travel shed). Many local trips are made on I-5 due to the lack of continuous north-south arterials throughout the length of the travel shed. More than 60 percent of the trips on portions of I-5 are less than five miles in length during the peak travel periods, affecting the performance of I-5. Termed Smart Growth, the goal is to improve the regional transportation system's performance while meeting local needs for housing and economic development. One element of Smart Growth is to cluster higher density development around transit routes and centers. This pattern of development results in walkable, transit-oriented districts where people can live, work, and play. It reduces the demand for auto trips and creates more vital communities that include housing, jobs, and amenities. Smart Growth is described further later in this chapter.

Commuter Trips

Commuter trips connect people to large employment centers within the travel shed. Peak hours for commuting to and from employment centers are between the hours of 6:00 a.m. and 9:00 a.m. during the morning and between 4:00 p.m. and 7:00 p.m. in the evening. Within the I-5 CSMP travel shed, the commuter trips are predominately southbound in the morning and northbound in the evening. However, the directional split on I-5 itself is reducing over time and is only 50 to 60 percent in 2008, depending on the location within the corridor.

Large employment centers in the I-5 CSMP travel shed also attract commuter trips from other parts of the San Diego region and surrounding counties. As described in Chapter 3, sizeable job growth has occurred in the southern portion of the travel shed in Sorrento Valley and University City, as well as in the northern portion in Carlsbad and Oceanside.

Figure 4.2 Regional I-5 CSMP Travel Shed Travel Boundary Map

Source: Caltrans, District 11; Sandag Regional Tranportation Model, Series 10

> *According to 2000 Census data, 76 percent of commuters in the I-5 CSMP travel shed drive alone to work.*

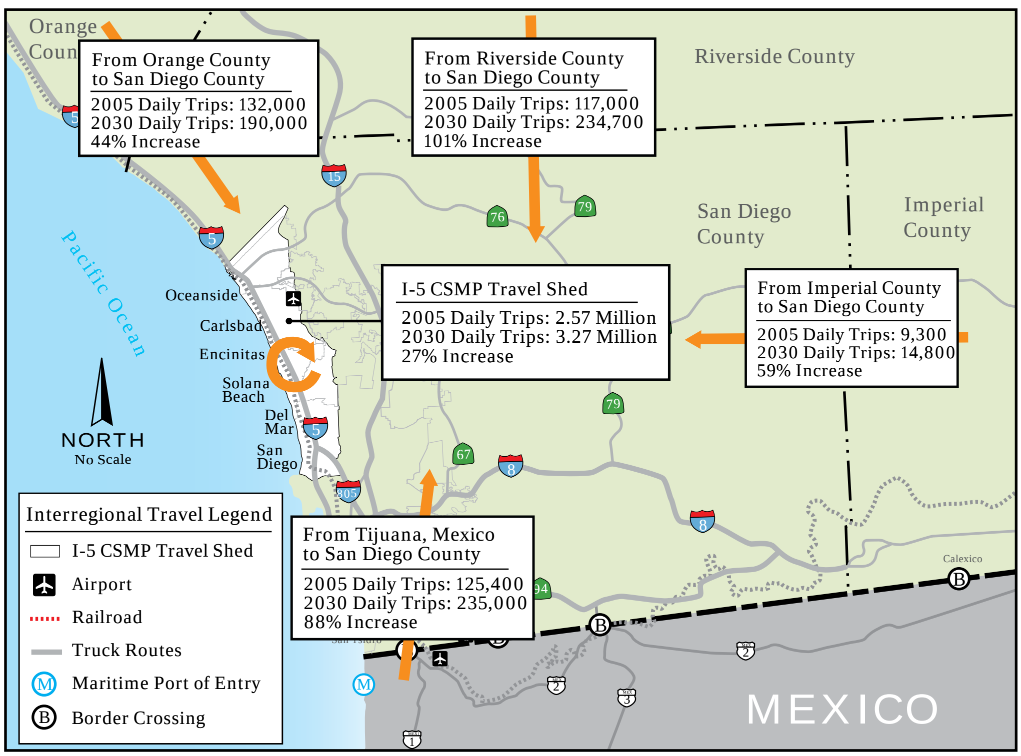
For the purposes of this discussion, 2000 Census data were used to assess commuter travel patterns in the I-5 CSMP travel shed, focusing on commuter trips with an origin inside of the travel shed. In 2000, the travel shed had approximately 216,000 workers. This number included residents in the cities of Oceanside, Carlsbad, Encinitas, Solana Beach, Del Mar, and the portion of the City of San Diego within this travel shed's boundaries. Of this number, 13,800 stated that they worked from home, with the remaining 182,200 workers commuting to their jobs, most traveling alone by car to get to work, as seen in Table 4.1. This Census data is consistent with field data from 2006 which shows that during the a.m. peak travel period, the I-5 is used for more than 75 percent of the trips.

Table 4.1 shows that the average commute time in the travel shed was approximately 25 minutes in 2000, which is two minutes less than commute times throughout California, but nearly identical to average commute times throughout the country. Table 4.1 also shows that approximately 10 percent of commuters carpooled or vanpooled and three percent of commuters used public transportation in 2000.

Interregional Trips

Interregional trips are longer trips that have either an origin or a destination outside of San Diego County. Since I-5 is a portion of a larger Interstate system, large volumes of interregional trips are made through the I-5 CSMP travel shed every day. Of the trips that use the I-5 freeway during the peak hours, 17 to 27 percent are traveling the extents of the corridor (Orange County to south of the I-5/I-805 interchange). As shown in Figure 4.3, interregional trips are anticipated to grow by approximately 78 percent by 2030 from Orange County, Riverside County, and Tijuana, Mexico.

Figure 4.3 Interregional Travel into the I-5 CSMP Travel Shed



Source: Caltrans, District 11; Sandag Regional Tranportation Model, Series 10

Table 4.1 Comparison of Travel Shed's Commute Characteristics

2000

Location	Workers 16 Years and Older	Mean Travel Time to Work (minutes)	Drove Alone to Work		Carpool-Vanpool		Public Transportation		Traveled by Other Mode		Worked at Home	
Carlsbad	39,296	28.0	30,738	78%	3,246	8%	833	2%	1,211	3%	3,268	8%
Del Mar	2,449	21.8	1,919	78%	112	5%	0	0%	143	6%	275	11%
Encinitas	31,374	26.8	24,152	77%	2,689	9%	917	3%	1,171	4%	2,445	8%
Oceanside	72,108	30.4	52,880	73%	11,779	16%	2,682	4%	2,099	3%	2,658	4%
Solana Beach	6,915	23.5	5,178	75%	469	7%	216	3%	443	6%	609	9%
San Diego, SDNCC	63,895	21.6	49,820	78%	4,235	6%	1,128	2%	439	.7%	4,550	7%
SDNCC Travel Shed	**216,037**	**25.4**	**164,687**	**76%**	**22,530**	**10%**	**5,776**	**3%**	**5,506**	**2%**	**13,805**	**7%**
California	14,525,322	27.7	10,432,462	72%	2,113,313	15%	736,037	5%	686,474	5%	557,036	4%
United States	128,279,228	25.5	97,102,050	76%	15,634,051	12%	6,067,703	5%	5,291,201	4%	4,184,223	3%

Source: SANDAG, constructed from U.S. Census Bureau's 2000 Census Summary File 3.

Recreation and Tourism Trips

The travel shed's many recreational and tourism destinations attract people from a variety of locations and distances. As an example, the travel shed has approximately 30 miles of beaches which draw nearly one-half of the annual beach users in the San Diego region (Table 4.2). These trips create a high volume of weekend travel in the travel shed and consist of a higher proportion of high-occupancy vehicles (HOV). Recent field counts show the volumes on some sections of I-5 are higher on the weekend and as much as 50 percent of the traffic is HOV. Year round destinations within the I-5 CSMP travel shed include Legoland, averaging over one million visitors per year, the public beaches, and the lagoons. The travel shed also includes seasonal venues such as Carlsbad Flower Fields, the San Diego County Fairgrounds, and the Del Mar Race Track. The San Diego Fairgrounds are open for three weeks a year from mid-June to July 4th and average 56,000 visitors daily. However, the San Diego County Fairgrounds has expanded its schedule as part of its plan to become a special events venue 365 days of the year. The Del Mar Racetrack is open for six weeks in the summer and averages 17,000 visitors daily.

Tourism locations such as the San Diego County Fairgrounds and Del Mar Racetrack are not directly served by rail; however, shuttles have been run to these locales from the Solana Beach Train Station. For the Fairgrounds, NCTD operates a BREEZE bus from the Solana Beach Station to the Fair's West Gate entrance. A private shuttle is provided by the Del Mar Thoroughbred Club for its patrons to the Del Mar Racetrack. In general, though, access to most of the recreational activities in the I-5 CSMP travel shed is provided by the I-5 freeway and the arterial road systems resulting in large volumes of automobile traffic on I-5.

This travel shed provides coastal access to public beaches, which draw more than two million visitors a year. Unless the beachgoer lives within the coastal community, the I-5 corridor facilities are needed for access.

Table 4.2 Beach Usage in I-5 CSMP Travel Shed

Location	Annual Beach Usage
Carlsbad	639,810
Oceanside	415,319
La Jolla	395,402
La Jolla Shores	176,348
Encinitas	116,053
Del Mar	180,063
Torrey Pines	78,347
Total North Coast Beach Usage	2,001,342
Other County Beaches	2,271,825

Source: San Diego Convention and Visitors Bureau, 2006 Visitors Profile Study.

Goods Movement

A significant amount of international, regional and inter-regional goods are moved through San Diego County by several modalities, including ship, trucking, rail and airplane. At the present time approximately 97% of all the goods moved through the San Diego region utilize trucking on the local roadway system. The San Diego North Coast Corridor's highway is at the beginning link in a chain of roadways that deliver goods to all points north and east for the State as well as the country (see Truck Flow Map, Figure 4.4).

For this reason, the performance of highway within this travel shed affects both interstate and international commerce.

Figure 4.4 Truck Flow Map - U.S. Origins and Destinations That Utilize the I-5 Northcoast Corridor

The I-5 freeway serves as a critical link between intermodal centers in San Diego County and the rest of Southern California. Approximately 12,000 trucks use the travel shed's portion of I-5 on a daily basis. While a considerable portion of these trucks serve interregional goods movement, a portion also serve the local and regional trucking needs of the San Diego metropolitan area. San Diego's regional freight flows in 2007 were dominated by domestic shipments: inbound16 flows originating in other regions or states of the United States (including the rest of California) represented 38 percent of total freight volume (59.9 out of 154.7 million tons); outbound flows with destination in other regions or states accounted for 26 percent of the total.

Goods Movement - Regional and National Priorities

Highway and rail trips in the I-5 CSMP travel shed move goods and support the County's $142 billion economy. As an international trucking trade route between Mexico, the United States, and Canada, I-5 is part of a 1,350-mile corridor that was designated as one of only six "Corridors of the Future" by the Federal Government (see Figure 4.4A). The goal of this designation is to recognize and improve the corridors that are essential to the country's interstate and international commerce.

SANDAG's 2030 RTP anticipates that trucking volumes will double between now and 2030.

Figure 4.4A Federal "Corridors of the Future"

Source: U.S. Department of Transportation.

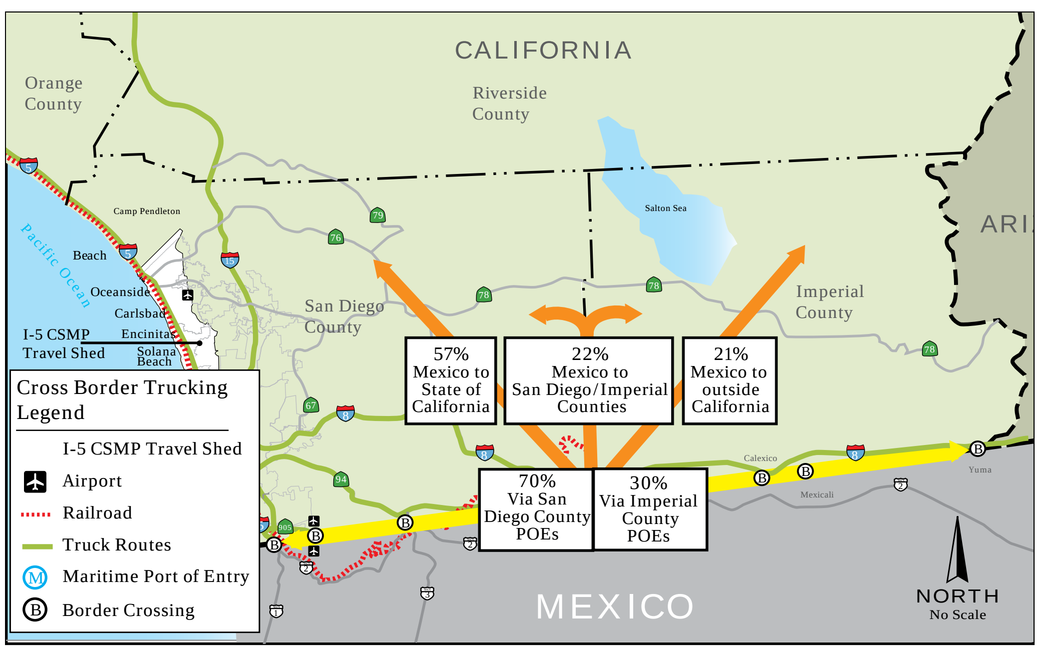
Goods Movement: Ports of Entry

Since the North America Free Trade Agreement was enacted in the early 1990s, nearly 800 more maquiladora factories have been established along the U.S.-Mexico border. According to the San Diego County Regional Comprehensive Plan, this has caused an increase of 192 percent in the amount of goods crossing into the U.S. from Mexico. Of the goods crossing the U.S.-Mexico border in California, 70 percent cross at San Diego's Ports of Entry (POE's), while 30 percent cross at Imperial County's POE.

Major goods movement activities occur at the three ports of entry at the International border with Mexico and San Diego's two marine terminals. Goods movement across the three land POE's at the U.S.-Mexico border, San Ysidro, Otay Mesa, and Tecate accounted for more than $36 billion in trucking trade in 2005. As shown in Figure 4.5, more than 78 percent of the U.S.-Mexico border truck trade on I-5 and I-15 is headed for destinations outside of San Diego County. Figures 4.5A and 4.5B further illustrate the widepread origins and destinations of freight movement between the United States and Mexico which crosses at our regional POE's.

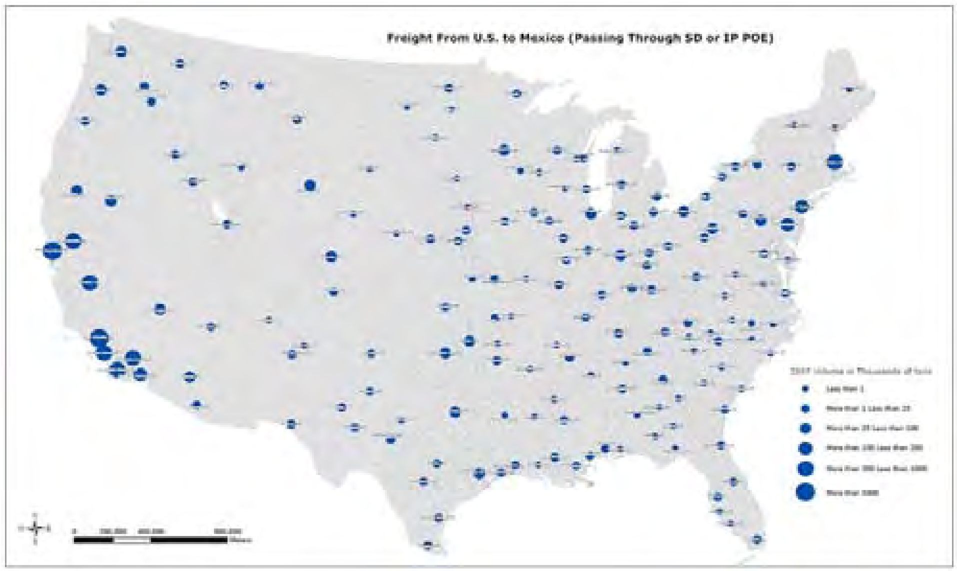
Figure 4.5 Interregional, Interstate, and International Goods Movement Map

Source: 2003 Commercial Vehicle Border Crossing Study: Caltrans, District 11;



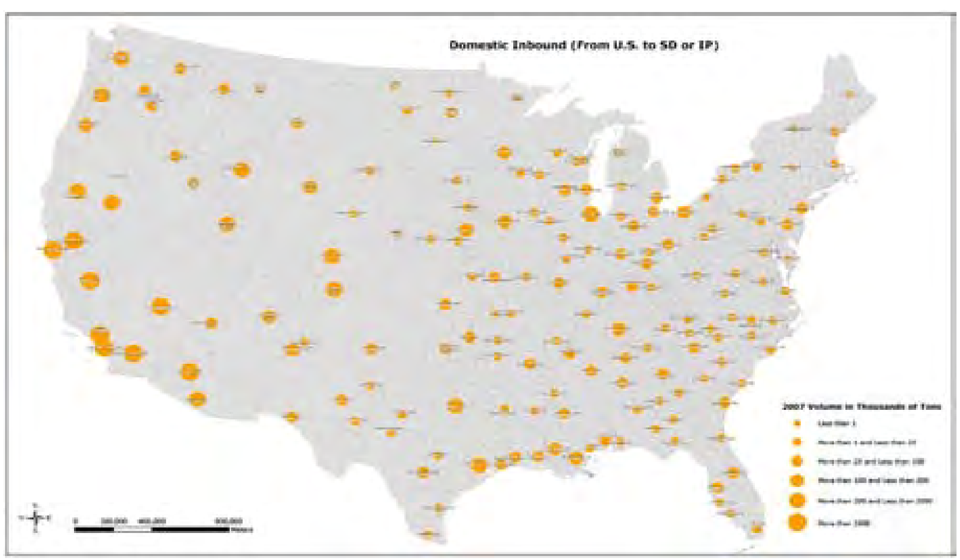
Source: Caltrans District 11/Sandag

Figure 4.5A Origins of US Freight Passing Into Mexico Across Our Regional Ports of Entry



Goods movement in the region begins at the port of entries with Mexico and the maritime and air terminals. From there, goods are transferred by trucks and rails to points north and east.

Figure 4.5B Destinations of Mexican Freight Passing Into The U.S. Across Our Regional Ports of Entry



In 2007, over 89 percent of the 8.3 million tons of U.S. exports to Mexico through the San Diego region originated outside San Diego and Imperial Counties. Similarly, of the 6.2 million tons of Mexican imports through the region's POEs, only about 10 percent remained within the region, while the rest was shipped across the nation.

Goods Movement is Increasing

In 2007, 1.2 million trucks transported 13.2 million tons of goods, valued over $49 billion, across the San Diego region's border crossings. Trucks are expected to remain the main mode of transportation for goods movement "into" the region, growing at an average annual rate of 2.4 percent in volume and 4 percent in value. Ttruck traffic crossing the region's POEs are expected to increase nearly fourfold by the year 2050.

The LOSSAN rail corridor within the Northcoast travelshed also provides a direct freight rail linkage between the San Diego region's two marine terminals and intermodal facilities in Los Angeles County. However, according to the Southern California Association of Governments' *Goods Movement Truck and Rail Study,* it is currently more cost effective to use roadway trucking over rail for goods movements trips shorter than 500-700 miles, due to drayage rates, extra handling, and fuel costs. The breakeven mileage for intermodal versus truck transport is approximately 700-1000 miles.

It is anticipated that roadway facilities, including the I-5 CSMP Corridor, will continue to serve the majority of goods movement in and through the San Diego region.

Accordingly, trucks currently transport over 97 percent of the total volume of freight within the region; with rail, shipping and aircraft carry the remaining 3%. Based on current economics it is expected that these percentages will remain relatively stable into the forseeable future.

Within the I-5 CSMP travel shed, improvements to the highway and railway systems will help meet increasing demand for additional goods movement. These improvements are connected to a wider range of improvements for all modes of goods movement being planned by the 2008 Goods Movement Action Plan, a multi-county effort for Southern California. Maintaining an adequate and flexible freight carrying capacity through the I-5 CSMP travel shed and the freight system as a whole is vital not only to the region's future success, but also the success of other regions, states, and countries.

Good Movement: A Regional Vision

The Goods Movement Action Plan (GMAP) outlines criteria to identify and prioritize freight system projects that will provide adequate future capacity and mitigate congestion. Future expansion and improvements must meet criteria for throughput, efficiency, connectivity, and cost-effectiveness.

As the regional goods movement system includes key facilities outside the boundaries of the I-5 CSMP travel shed, planned improvements to the regional goods movement system are ranked for the GMAP according to cost effectiveness, whether the project serves freight system needs, and whether it develops freight network integration.

Planned Improvements to Goods Movement Facilites

As the region's role in global trade becomes becomes clearer, future economic and land use studies will better define how the region can integrate the infrastructure needed to keep pace with goods movement. One of the primary goods movement concerns is the increasing amount of congestion due to the economic and population growth in the region, and the lack of infrastructure to meet the region's needs.

A freight movement study conducted by the Federal Highway Administration in 2007 compared peak period traffic congestion on the national highway system in 2002 to the congestion predicted for 2035 (see Figures 4.5C and 4.5D); and studied the costs and delays associated with this congestion. These potential for future costs and delays were found to be of national concern, and helped to identify I-5 in San Diego as a federal "Corridor of the Future."

As part of a strategy to address these concerns, the GMAP includes managed lanes for the I-5 Northcoast freeway corridor, as well as double tracking of the rail lines within the travel shed.

Improvements to the logistical infrastructure for goods movement within the I-5 corridor will help relieve bottlenecks and capacity constraints so that existing and future freight demands can be better served. Further, these improvements will optimize efficiency and connectivity so that the region's individual freight components work together to serve the overall goods movement needs, through increased capacity, efficiency, and connectivity.

I-5 is the beginning link in a chain of roadways that delivers goods to points north and east for the state as well as the country. For this reason, the performance of the highway within this travel shed impacts interstate and international commerce.

Figure 4.5C Peak Period Congestion on High-Volume Portions of the National Highway Sytem: 2002

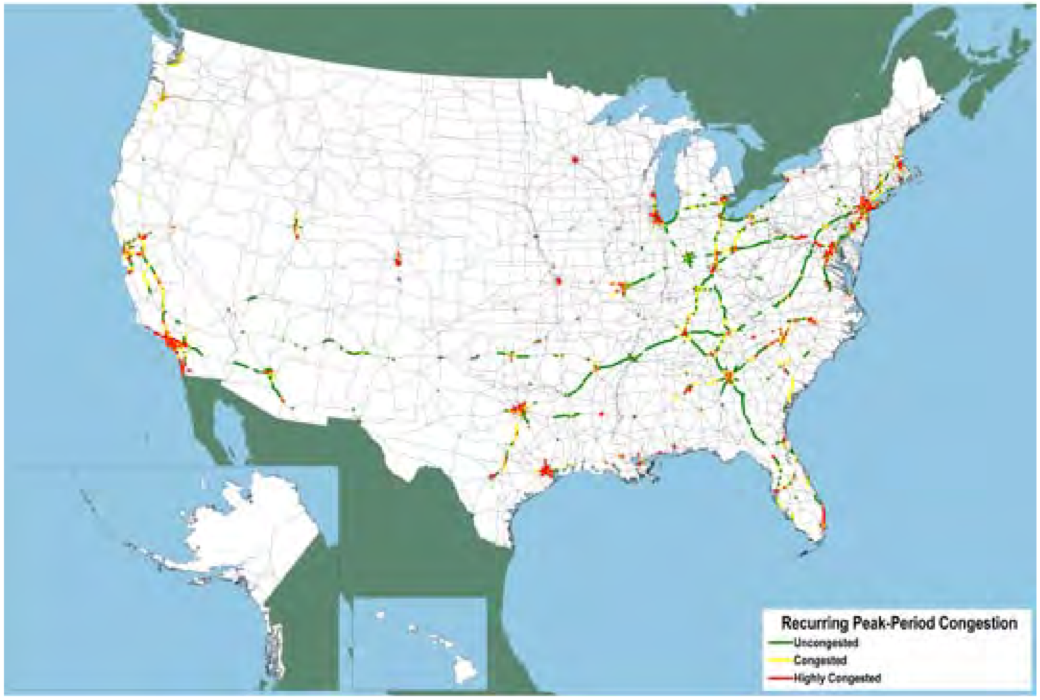
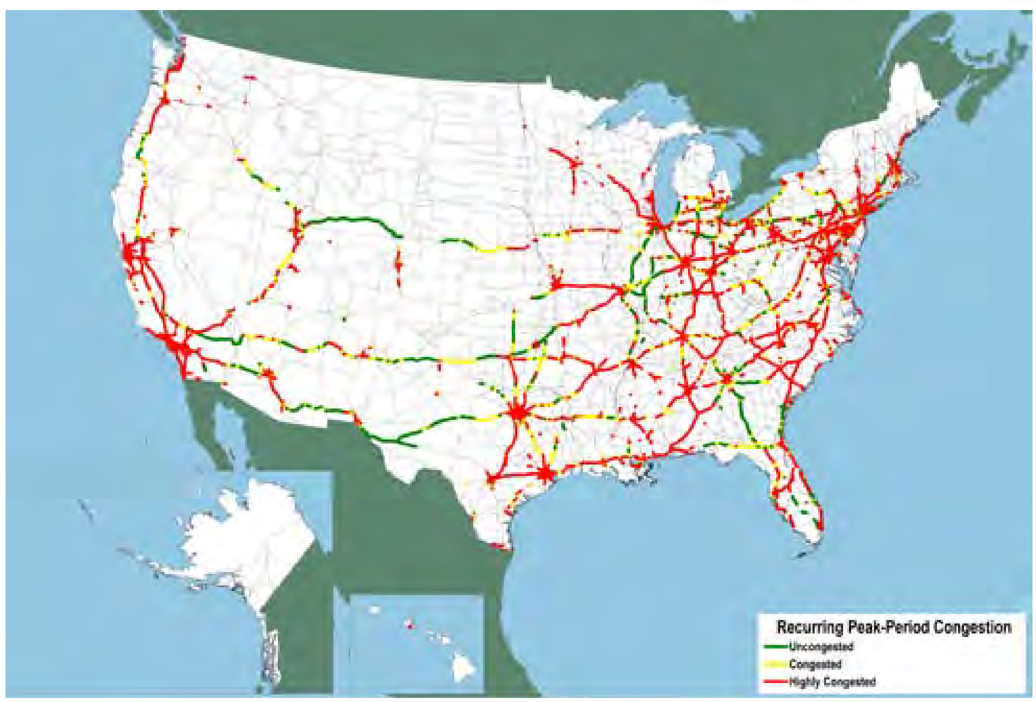


Figure 4.5D Peak Period Congestion on High-Volume Portions of the National Highway Sytem: 2035



Source for Figs. 4.5 C,D: U.S. Department of Transportation, Federal Highway Administration, Office of Freight Management and Operations, Freight Analysis Framework, 2007

Marine Terminals

The Port of San Diego's two marine terminals, the National City Marine Terminal and the 10th Avenue Marine Terminal in downtown San Diego, moved approximately three million metric tons of cargo in 2005, generating $24 million in revenue. The I-5 CSMP corridor's highway and rail facilities are critical to moving goods from these terminals to Los Angeles and beyond, including Mexico and Canada.

Capacity Constraints and Challenges to Regional Goods Movement

This CSMP acknowledges that there are important challenges to goods movement in the region. In general, land costs and land use conflicts are costly challenges to increasing the existing freight footprint. Some examples of local freight movement issues include:

• Lack of direct freeways to Otay Mesa POE, Port of San Diego, rail yards, and intermodal facilities;

• Lack of dedicated truck lanes or truck bypass routes;

• I-5, I-805, and I-15 are nearing traffic capacity levels;

• If a regional goal is to not increase truck traffic, it will be important to preserve the existing freight capacity at the Port of San Diego and on the regional freight corridors;

• Need for a reconfigured rail yards and improved intermodal facilities including train storage tracks, warehouses, etc;

• Shared rail capacity on the MTS-owned facilities from downtown to the Mexican border to the south and from downtown to the City of Santee to the east, limits the hours of service for freight movements;

• Single track sections of the freight rail system on the Los Angeles to San Diego (LOSSAN) corridor which is an impediment to expanded and safer freight and passenger ops on the line.

Towards a Sustainable Freight System

The reliable movement of goods and services is the lifeblood of the regional and national economy. The regional transportation planning and the regional prosperity strategies acknowledge that freight facilitation is an integral part of the economic growth and sustainability of the Region.

Freight movement, however, is often viewed as a double-edge sword. On one hand, it is recognized as a catalyst to the local, regional and national economy, but on the other hand freight movement is often viewed as a burden to local facilities, contributing to delays, accidents, and other environmental impacts. The two views are indeed real and present continuing challenges to regions that host goods movement and frieght operations.

Trip Generators

Trips are generated by travel to and from various activity centers within the travel shed. With this information, design parameters can be developed so that connectivity is facilitated and not hindered.

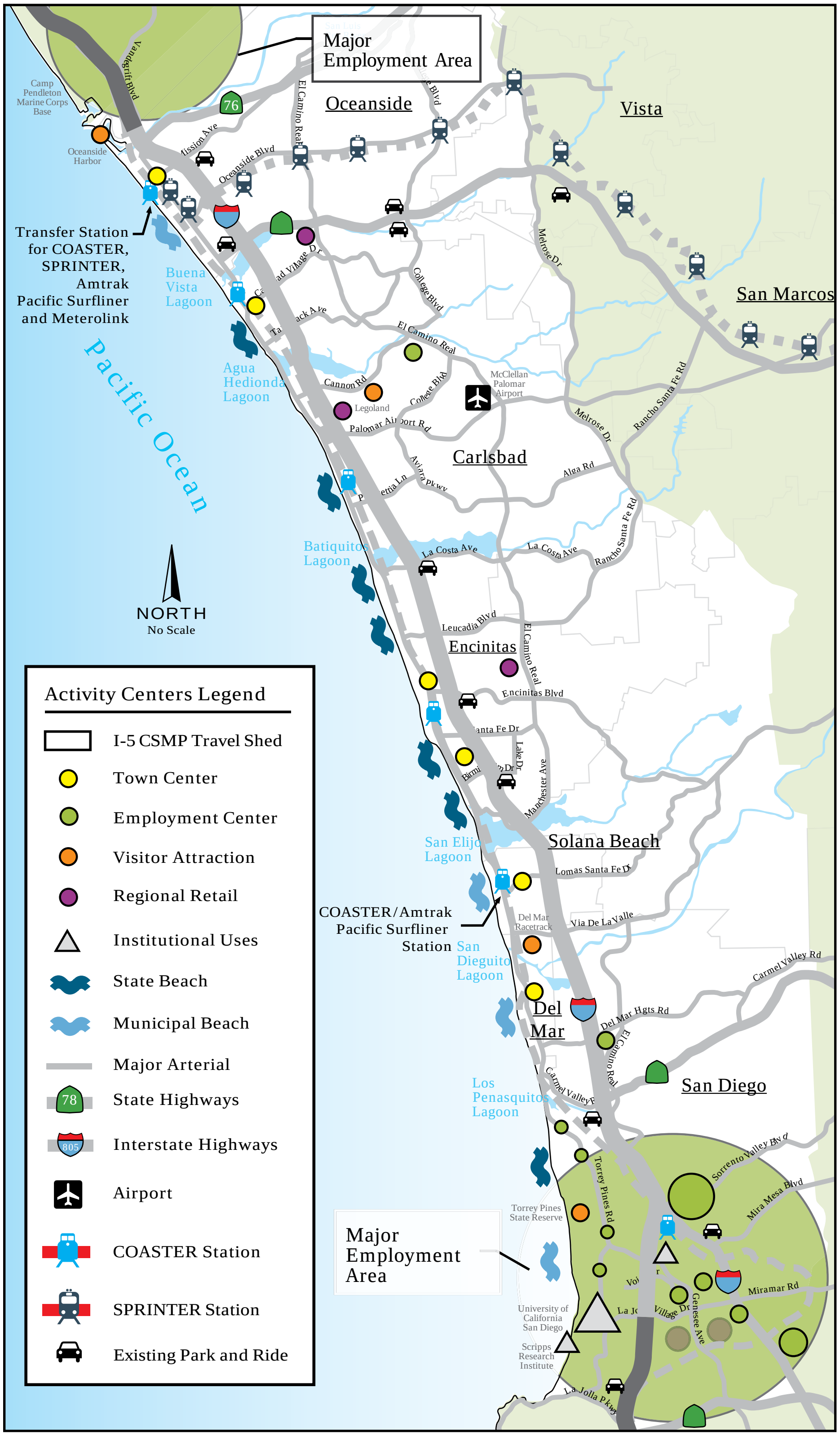
Trips are generated by travel to and from various activity centers within the travel shed. These activity centers include:

- Town centers that provide local services and generate local trips;
- Employment centers that provide jobs and generate commuter trips;
- Visitor attractions that create local, regional, and interregional tourism trips;
- Regional retail that creates regional trips;
- Institutional uses that create local, regional, and interregional trips; and
- Public beaches that create recreational trips.

Along with these destinations, customers also have origins and destinations outside of the I-5 CSMP travel shed for commuter, recreation, and goods movement trips. The locations of the major activity centers in the travel shed are illustrated in Figure 4.6.

Where activity centers are located in relationship to the transportation infrastructure and how they are linked, influence the transportation mode customers select. In addition, it also influences the type and scope of improvements that may need to be constructed to solve a transportation problem. For example, the I-5/Via De La Valle interchange is the primary access to the City of Del Mar, but it also is the primary access to the Del Mar Fairgrounds and nearby beaches. In addition, the Mid-County Bikeway utilizes Via De La Valle to cross I-5, linking the river valley to the east with the beaches to the west. However, compared to nearby interchanges to the south, the Via De La Valle interchange does not provide access to a major employment center. With this type of information, design parameters can be developed so that connectivity is facilitated not hindered.

Figure 4.6 Activity Center Map



Source: 2006 Rand McNally – The Thomas Guide. Caltrans, the California Department of Finance, and SANDAG.

Table 4.3 Connectivity of I-5 Interchanges to Activity Centers and Other Travel Modes

Interchanges	Town Centers	Employment Centers	Visitor Attraction	Regional Retail	Institutional Uses	Public Beach	Transit Centers
SR 76	●		●		●		●
Mission Avenue	●				●		●
Oceanside Boulevard	●			●		●	●
Cassidy Street				●		●	
Vista Way/SR 78				●		●	
Las Flores Drive	●			●		●	●
Carlsbad Village Drive	●	●		●		●	●
Tamarack Avenue							●
Cannon Road		●	●	●			
Palomar Airport Road		●	●	●		●	●
Poinsettia Lane						●	●
La Costa Avenue						●	
Leucadia Boulevard	●			●		●	
Encinitas Boulevard	●			●		●	●
Santa Fe Drive	●						●
Birmingham Drive	●						●
Manchester Avenue				●		●	
Lomas Santa Fe Drive	●					●	●
Via De La Valle	●		●			●	
Del Mar Heights Road	●	●				●	
Carmel Valley Road	●	●				●	
Ted Williams Parkway/SR 56						●	
Carmel Mountain Road							
I-805		●		●			
Sorrento Valley Road		●					
Genesee Avenue		●					
La Jolla Village Drive		●			●	●	
Nobel Drive					●		
Gilman Drive					●		
La Jolla Parkway/SR 52					●	●	

Source: Regional arterials were identified on Mapquest and in field research; Activity centers located with Rand McNally – The Thomas Guide, 2006.

Table 4.4 Connectivity of LOSSAN Corridor Passenger Rail Services to Activity Centers and Travel Modes

COASTER	Town Centers	Employment Centers	Visitor Attraction	Regional Retail	Institutional Uses	Public Beach	Transit Centers
Oceanside	●		●			●	●
Carlsbad Village	●			●		●	
Carlsbad Poinsettia		●	●	●		●	
Encinitas	●			●		●	
Solana Beach	●		●			●	●
Sorrento Valley		●					
Pacific Surfliner							
Oceanside	●		●			●	●
Solana Beach	●		●			●	●
Metrolink – OC Line							
Oceanside	●		●			●	●
Metrolink – IEOC Line							
Oceanside	●		●			●	●

Source: Metrolink Schedule: September 4, 2007; Amtrak Surfliner Schedule: May 12, 2008; NCTD COASTER Schedule: March 28, 2008; NCTD SPRINTER Schedule: July 12, 2008; Activity centers identified with Rand McNally – The Thomas Guide, 2006.

Table 4.5 Connectivity of SPRINTER Corridor Passenger Rail to Activity Centers and Travel Modes

SPRINTER	Town Centers	Employment Centers	Visitor Attraction	Regional Retail	Institutional Uses	Public Beach	Transit Centers
Oceanside Transit Center	●		●		●	●	●
Coast Highway	●		●		●	●	
Crouch Street							
El Camino Real	●			●			
Rancho Del Oro							
College Boulevard							
Melrose Drive							

Source: Metrolink Schedule: September 4, 2007; Amtrak Surfliner Schedule: May 12, 2008; NCTD COASTER Schedule: March 28, 2008; NCTD SPRINTER Schedule: July 12, 2008; Activity centers identified with Rand McNally – The Thomas Guide, 2006.

Table 4.6 Connectivity of Public Bus Routes to Activity Centers and to Other Travel Modes

Bus Routes	Town Centers	Employment Centers	Visitor Attraction	Regional Retail	Institutional Uses	Public Beach	Transit Centers
395	●	●	●			●	●
397	●	●	●			●	●
309		●		●		●	●
303		●					●
325		●		●			●
313	●						●
403							
315		●	●			●	●
317							
333				●			●
319							●
338/339							●
303				●			●
332							●
302							●
324	●					●	●
101	●			●	●	●	●
311/312	●					●	●
318	●					●	●
415	●					●	●
321	●			●		●	●
304	●			●	●	●	
444	●		●	●		●	●
445	●		●	●		●	●
365	●			●			●
308	●					●	●
972		●					●
973		●					●
978		●					●

continued on next page

Table 4.6 Connectivity of Public Bus Routes to Activity Centers and to Other Travel Modes (continued)

Bus Routes	Town Centers	Employment Centers	Visitor Attraction	Regional Retail	Institutional Uses	Public Beach	Transi Center
921		●		●			
30		●		●	●		●
50		●		●	●		●
31		●		●	●		●
86		●		●	●		●
48/49		●		●	●		●
41		●		●			●
105		●		●			●
960		●		●			●
150		●		●	●		●

Source: NCTD Route Maps, 2008; MTS Route Maps, 2007; Activity Centers Identified with Rand McNally – The Thomas Guide, 2006.

Table 4.7 Connectivity of Regional Bicycle and Pedestrian Trails to Activity Centers and Other Travel Modes

Bike/ Pedestrian Trails	Town Centers	Employment Centers	Visitor Attraction	Regional Retail	Institutional Uses	Public Beach	Transit Centers
Coastal Rail Trail	●		●		●	●	●
Camp Pedleton Trail	●	●				●	●
San Luis Rey River Trail		●					
El Camino Real Trail	●	●		●			●
Palomar Airport Road/ San Marcos Boulevard Trail			●	●		●	
La Costa Avenue/ Rancho Santa Fe Road Trail						●	
Mid-County Bikeway	●		●			●	
SR 56 Bikeway		●					
Central Coast Corridor			●		●	●	

Source: 2030 Regional Transportation Plan: Pathways for the Future, SANDAG. Rand McNally – The Thomas Guide, 2006.

The following four tables (4.3 through 4.7) provide an overview of how the transportation infrastructure serves the key activity centers in the I-5 CSMP travel shed.

Travel Demand

This section provides an estimate of the current and future demand for travel in the I-5 CSMP travel shed. The projected future demands are developed by the regional planning agency (e.g., SANDAG) through the use of computer models that consider the relationships between forecasts of demographic, economic, and financial data; interregional commutes; land use; and changes to the transportation system networks. The model captures the linkage between employment and residential locations by using travel times from the transportation model to determine probabilities of where people might live relative to where current and future employment opportunities could be located, and the time spent commuting. Modern regional transportation models typically have four steps: 1) trip generation; 2) trip distribution; 3) mode choice; and 4) trip assignment. A key feature of the SANDAG regional transportation model is that it uses a 5th step to feed travel time data back into steps 1 through 3 (feedback loops).

Currently, more than 700,000 vehicle-trips occur on I-5 within the travel shed on an average weekday.

The demand for the scenarios assumes the land uses and populations described in Chapters 3 and 4, utilized the Series 10 regional forecasting model, and each scenario included a common set of improvements. These common improvements

Table 4.8 Annual Average Daily Traffic (AADT), Travel Shed I-5 Segments

Segment	1970	2006	2030	Percent Change 1970 to 2006	Percent Change 2006 to 2030
I-805 to Carmel Mountain Road	48,000	265,000	408,500	452%	54%
Encinitas Boulevard to Leucadia Boulevard	43,000	198,000	298,000	360%	51%
Oceanside Boulevard to Mission Avenue	54,000	181,300	289,000	236%	59%

Source: Caltrans District 11, I-5 North Coast Draft Project Report: EA 11-235800, February 2008; SANDAG Series 10 Regional Forecast, December 2003.

included:

- Double tracking of rail lines from Oceanside to central San Diego;
- Twenty-minute peak-period headways for commuter rail service;
- Commuter rail service extended through mid-day hours;
- MTS Trolley Mid-Coast Extension of service from Old Town to University City;
- SuperLoop Bus Rapid Transit (BRT) service in University Community;
- Enhanced bus service on El Camino Real;
- Additional Park and Ride facilities;
- Bicycle and pedestrian routes connecting across highways;
- Implementation of TDM technologies resulting in a five percent reduction in traffic; and
- HOV extension from Via de la Valle to Manchester Avenue and improvements to Lomas Santa Fe interchange.

Interstate 5

Carrying approximately 80 percent of the daily trips made in the I-5 CSMP travel shed, the I-5 freeway is the backbone of its transportation system. The travel demand analysis of this mode addresses:

Vehicle Miles Traveled will continue to grow regardless of if improvements are completed or not.

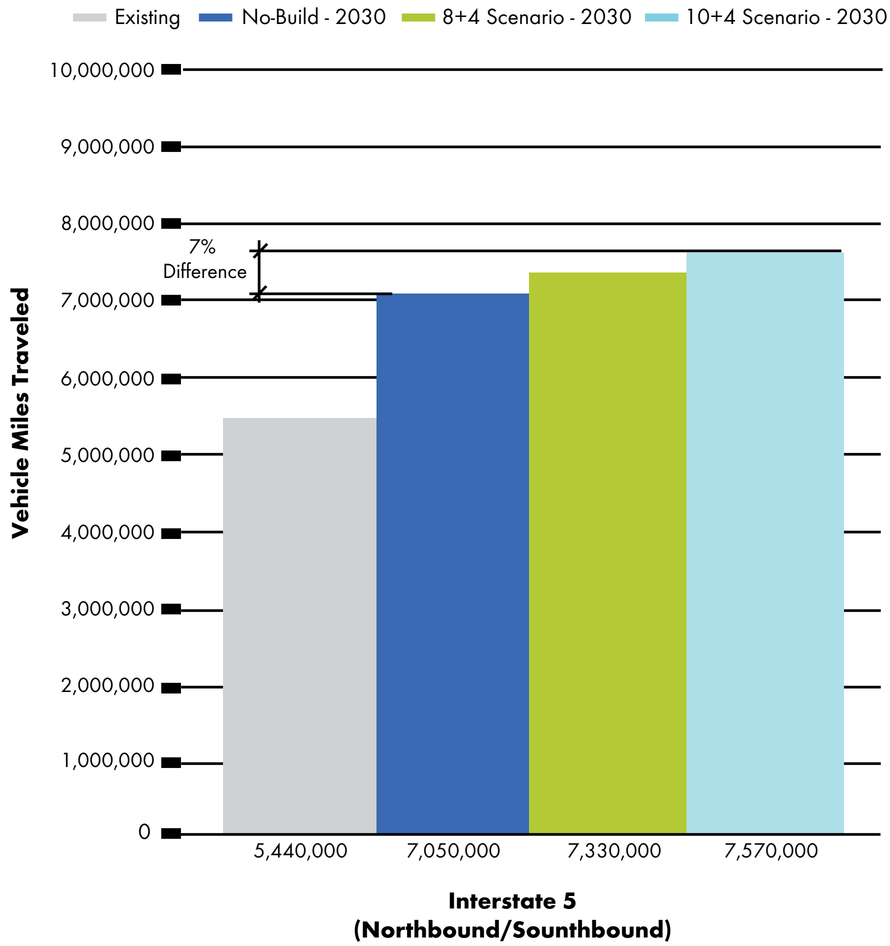
- Travel Demand on I-5;
- Vehicle Miles Traveled;
- Weekend Travel Demand and HOV Usage; and
- Connectivity of the I-5 to Activity Centers and Other Travel Modes.

Travel Demand on I-5

Over the next 20 years, vehicle trips on I-5 are expected to increase from 700,000 to more than 1,000,000. Table 4.8 presents the I-5's past, present, and future projected Annual Average Daily Traffic (AADT) numbers at three locations in the corridor: south, middle, and north. From 1970 to 2006, AADT increased 200 to 400 percent, depending on the highway segment. The largest increase in travel demand on I-5 is nearest to the Sorrento Valley employment center at the segment identified as I-805 to Carmel Mountain Road. The rate of growth in AADT for the next 20 years is forecasted to increase at a much slower pace than the previous 30 years.

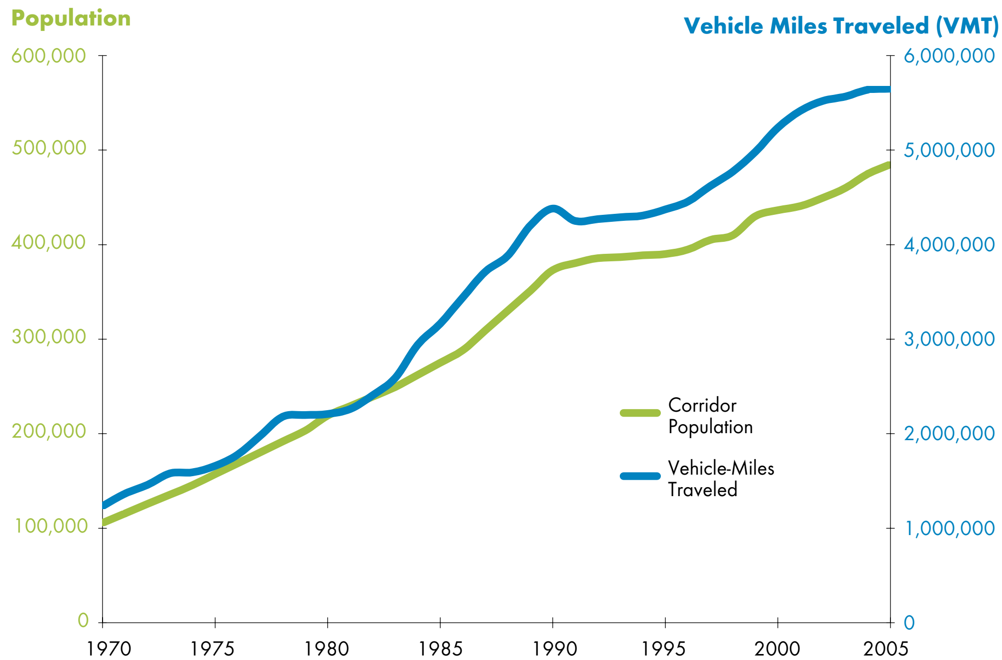
Figure 4.7 Vehicle Miles Traveled

In 1960 the average American drove 20.6 miles per day, by 2001 that number had increased to 32 miles.



Source: Caltrans, District 11.

Figure 4.8 I-5 North Coast Corridor Population and Travel
1970 to 2005



Source: Caltrans, District 11.

> Travel demand is consistent between weekdays and weekends even though the trip types and customers are different.

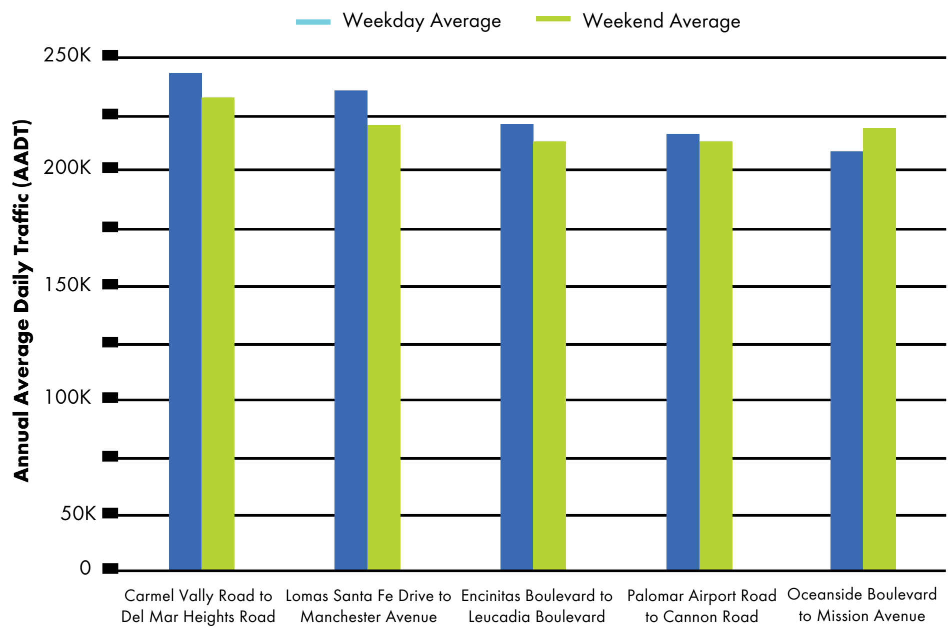
Vehicle Miles Traveled

Vehicle Miles Traveled (VMT) is a measure of travel on highways. Figure 4.7 compares existing VMT against two future scenarios. The difference in VMT between current conditions and 2030 no build is nearly 30 percent in the next 20 years. However, the increase in VMT between the 2030 no build option and the 2030 improvement of adding four managed lanes and two general purpose lanes is only seven percent. This comparison of both future conditions shows that future VMT is not a function of whether I-5 is improved. Rather, it is a function of customer demand.

Figure 4.8 shows that in the I-5 CSMP corridor during the late 1980s and early 1990s, demand for travel (measured as VMT) grew at a much faster rate than population. That is consistent with what happened throughout the region and the nation. This increase in travel can be related to changes in society including increased affluence and number of households with two incomes. These changes not only resulted in an increase in work related trips but also an increase in the number of discretionary

Figure 4.9 Annual Average Daily Traffic: I-5 CSMP Travel Shed

2006



Source: Caltrans, District 11.

trips and family related trips such as taking children to school, day care, soccer practice, or eating out. Frequently, many of the family related trips are chained together during the work related trip. Referred to as "trip chaining" these trips also impact the viability of carpooling.

Increased affluence not only resulted in the type, location, and size of stores changing (i.e., Wal-Mart and Starbucks), but also results in people having more choices and more choices resulted in more and longer trips. In support of these trends nationwide studies found:

- In 1950 women made up 28 percent of the workforce, by 2007 that number had increased to 48 percent of the workforce;
- In 1960 the average American drove 20.6 miles a day, by 2001 that number had increased to 32 miles;
- From 1983 to 2001 the number of shopping trips per household almost doubled;
- The average grocery store was 0.46 miles from the home in 1940, but by 1990 that had doubled to 0.8 miles; and
- The number of shopping trips per week almost doubled from 1970 to 1990.

These changes not only resulted in an unplanned demand on an already taxed transportation system, but they impacted trip patterns in unforeseeable ways. These changes highlight the many factors that impact travel demands as well as the importance of a flexible transportation system that can adapt to unplanned changes in technology or society.

Weekend Travel Demand and HOV Usage

Travel demand on I-5 was also analyzed to compare weekday versus weekend travel. Figure 4.9 shows that the travel demand is consistent even though the trip types and customers are different. This illustrates that the combination of jobs, tourism, and regional retail can result in fairly consistent travel demand seven days a week. As discussed previously, these weekend trips generally result in higher HOV usage which has been observed as high as 60 percent.

Regional Arterials

The COASTER currently carries 6,000 passengers a day and operates at 50 to 60 percent of capacity.

Regional arterial roads facilitate regional and subregional trips for automobiles, bus transit, and pedestrian and bicycle trips. The Average Daily Traffic (ADT) values for the I-5 CSMP travel shed's regional arterials have been included in the existing conditions performance assessment in Chapter 5, Tables 5.1 to 5.3.

Rail

Three types of rail services, intercity passenger, regional commuter, and freight, share two predominantly single lines in the I-5 CSMP travel shed. One line runs north-south parallel to I-5 and another runs east-west parallel to SR 78.

Passenger Rail Service Demand

Demand for passenger service is addressed by intercity and regional commuter services.

Amtrak and Metrolink

Amtrak's Pacific Surfliner route provides north-south passenger rail service from San Diego to Los Angeles on the LOSSAN Rail Corridor, using the San Diego Northern Railway line within the travel shed. The existing ridership (Boardings + Alightings) for Fiscal Year 2008 for the stations within the I-5 CSMP corridor was approximately 912,000, with 488,000 boardings and alightings at Solana Beach and approximately 326,000 at Oceanside.

Metrolink, operated by the SCRRA, provides two commuter passenger services that connect to the Oceanside Transit Center. Daily ridership on the Metrolink connections from Oceanside is 1,450. These services connect to Orange and Los Angeles counties and the Inland Empire in San Bernardino County.

COASTER and SPRINTER

Annual COASTER ridership has more than tripled since service began in 1995. Its annual ridership exceeds 1.5 million passengers. Daily weekday ridership was approximately 6,000 passengers, with a capacity of 10,000 to 12,000 seated passengers. Rail demand forecasts in 2030 show that with double tracking the corridor, approximately 20,000 passengers can be served daily.

The SPRINTER runs 22 miles adjacent to the SR 78 corridor. Daily ridership in 2008 was 8,000 and forecasts predict 20,000 riders in 2020. Like the COASTER, the SPRINTER shares its rail line with freight operations.

Freight Rail Service Demand

In the I-5 CSMP corridor, BNSF provides off-peak freight rail service from the Port of San Diego to the Los Angeles area during midday and evening operating windows. BNSF currently runs four to eight freight trains during a 24-hour operating day, moving bulk goods and automobiles from the region's two marine terminals. Demand for goods movement by rail is anticipated to increase due to regional and national demand for bulk commodities such as lumber, steel, cement, and paper, as well as the import of automobiles arriving at the Port of San Diego's National City Marine Terminal. However it is unlikely that the number of trains will increase but rather the length of the trains will increase, thus leaving the number of trains the same in 2030 but increasing the capacity of goods transported.

Local and Regional Bus

NCTD operates 26 buses in the travel shed with a ridership of approximately 7,000,000. MTS operates approximately 15 buses in the travel shed with an annual MTS ridership of 2,600,000 in the travel shed, excluding a few routes where ridership information was not available.

The current public bus transit system in the I-5 CSMP travel shed is composed of the following services:

- NCTD BREEZE fixed route bus service, comprising the majority of transit service in the travel shed, as well as special BREEZE bus service to and from local events within and outside of the travel shed;
- MTS fixed route bus service in the southern portion of the travel shed, servicing the University of California San Diego (UCSD) and University Towne Center (UTC), and MTS and NCTD connect at these 2 locations;

- NCTD/MTS COASTER Connection shuttle bus service, scheduled to meet up with train times at select NCTD COASTER commuter rail stations to transport passengers to places of employment;
- NCTD LIFT parabus transit service, providing curb-to-curb transit service within three-quarters of a mile from BREEZE fixed routes for transit riders with disabilities, compliant with the Americans with Disabilities Act (ADA); and
- MTS Access parabus transit service, providing curb-to-curb transit service within three-quarters of a mile from MTS fixed routes.

For north to south regional bus routes, Route 101 provides all-day local bus service on Coast Highway. Route 309 provides all-day local bus service on El Camino Real from Oceanside to Encinitas.

Numerous east-west local and regional transit services enhance access to coastal communities west of I-5 and provide alternative access to COASTER commuter rail services. Fixed-route or employer-based shuttles from COASTER stations to activity centers enhance access and expand the market for commuter rail services in the travel shed.

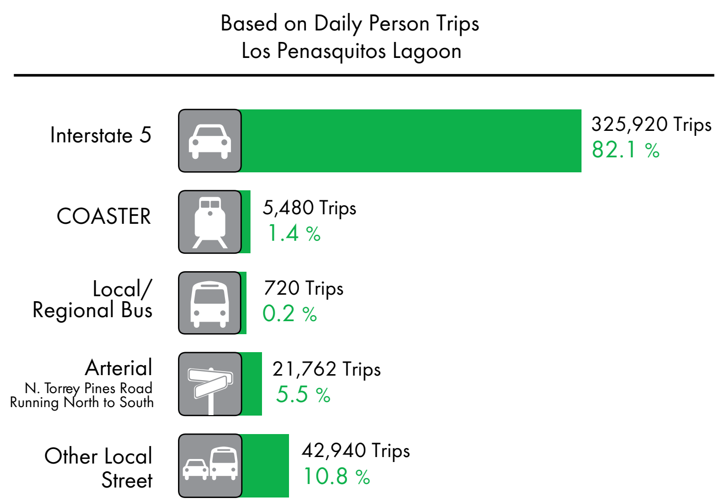
Local COASTER shuttles operate at the Carlsbad Poinsettia Station and the Sorrento Valley Station to provide access to nearby commercial and employment centers. Connector shuttles operate on local and regional arterial streets, as well as highway facilities, thus also experiencing peak hour congestion. However, the lack of these shuttles would significantly reduce the viability of the COASTER as a modal option for these areas due to the distance between employment centers and stations.

MTS operates the Sorrento Valley COASTER Connection (SVCC) that provides short distance shuttle connections on four routes between the Sorrento Valley COASTER Station and businesses in the Sorrento Valley, Sorrento Mesa, Carroll Canyon, Carroll Mesa/Campus Point, Torrey Pines and University City. The shuttles provide service for approximately 1,000 passengers daily Monday through Friday.

Modal Splits

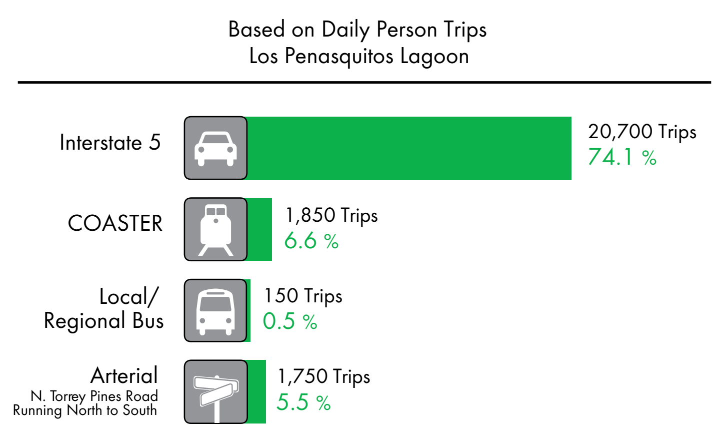
A variety of factors including the trip types, generators, overall demand, and connectivity, influence the modal split for the I-5 CSMP travel shed. Figures 4.10 and 4.11 show how travel demand is split among the travel modes at the Los Penasquitos Lagoon location in two time frames: a daily average and a morning peak period. As shown in the figures, customers make the majority of their trips using I-5, approximately 80 percent of the daily mode share and approximately 75 percent during the a.m. peak period. During the peak period when the COASTER is operational, the mode share of rail increases. The proportion of demand on the other modes remains nearly constant between the morning peak and daily time frames.

Figure 4.10 Daily Mode Share



Source: Caltrans, District 11.

Figure 4.11 A.M. Peak Mode Share



Source: Caltrans, District 11.

Chapter:

5 Transportation System Performance

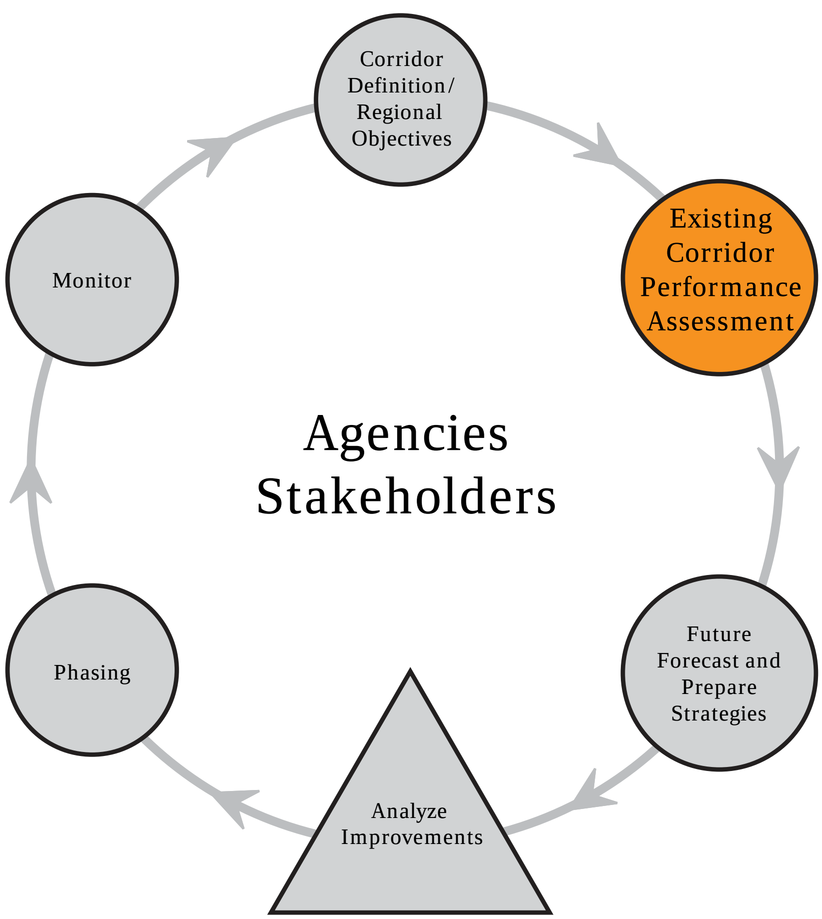
Overview

The purpose of this chapter is to assess the performance of the transportation systems in the I-5 CSMP corridor. This performance assessment includes the following:

- I-5 System Performance;
- Regional Arterial Roadway System Performance;
- Rail Service System Performance;
- Bus, Vanpools, and Carpools System Performance; and
- Bike and Pedestrian Routes System Performance.

This analysis fulfills the second step of the CSMP development process shown in Figure 5.1, to assess the existing corridor transportation system performance.

Figure 5.1 The Corridor System Management Plan Process Diagram



(Transportation System Management Pyramid)

I-5 System Performance

The I-5 existing conditions analysis timeframe is after improvements to the I-5/I-805 merge were completed and before the Lomas Santa Fe interchange improvements began.

The performance of the I-5 freeway was analyzed using a variety of data sources and analysis methods, such as:

- Performance Measurement Systems (PeMS) – a historical traffic data collection, processing, and analysis tool based on data from the highway's existing detection systems;
- FREQ12, a macroscopic and deterministic traffic modeling computer program for estimating future travel times, delay, and queuing (location, length, and duration) based on forecasted future volumes;
- Probe vehicle/tach run data; and
- Field observations.

The objectives of the performance analysis are to identify and analyze the causes of traffic congestion on the I-5 CSMP corridor and provide a sound technical basis for identifying and evaluating improvement strategies for the corridor. The I-5 freeway performance analysis focused on the following key elements:

- Mobility describes how well the corridor moves people and freight, in terms of travel time and delay;
- Reliability captures the relative predictability of the public's travel time;
- Productivity measures lost capacity due to congestion;
- Safety captures the safety characteristics in the corridor, including crashes (fatality, injury, property damage); and
- Bottleneck identification and causality.

This performance assessment is based on the analysis from two efforts: the I-5 North Coast Corridor Project Report and the I-5/I-805 Corridor System Management Plan Existing Conditions Technical Report (ECTR). The I-5 North Coast Corridor Project assessment forms the basis of what is contained in this section. The CSMP ECTR analysis results were used to supplement or update the assessment.

The I-5 existing conditions analysis uses 2006/2007 data gathered mostly through the existing PeMS detection system as described in Chapter 2. This timeframe is after improvements to the I-5/I-805 merge were completed and before the Lomas Santa Fe interchange improvements began. Where future performance is evaluated, it is for the years 2015 and 2030. This Chapter contains the baseline for the CSMP. Chapter 8 contains an assessment of some of the performance measures to 2008.

Mobility

Mobility describes how well the corridor moves people and freight. The mobility performance measures are both readily measurable and straightforward for documenting existing conditions, and are readily forecasted making these useful for future scenario comparisons. The measures used to quantify mobility were travel time and delay.

Travel Time

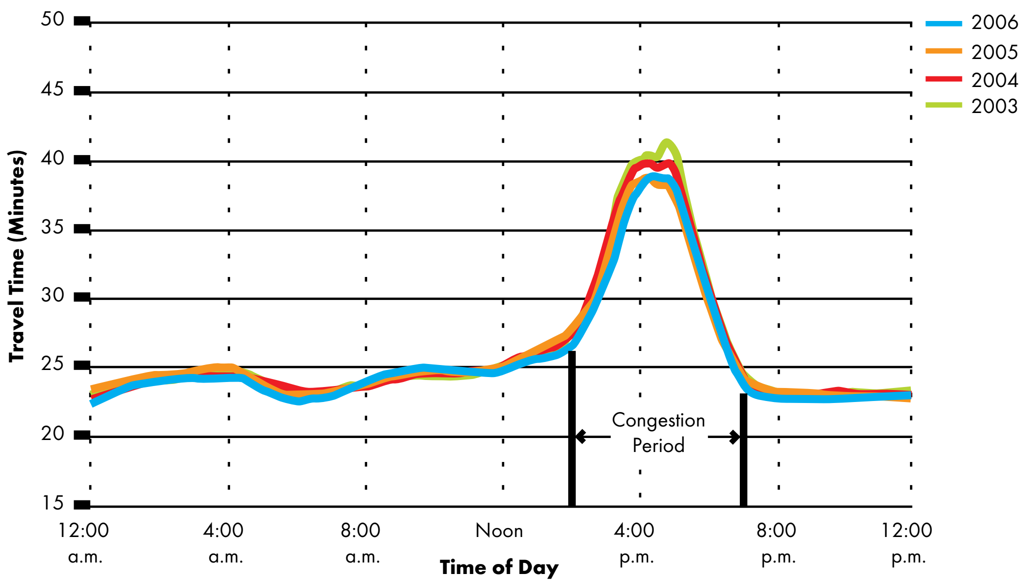
Weekday off-peak average travel time is 23 to 25 minutes. The peak-period travel time average is 41 minutes.

Travel time is defined as the amount of time for a vehicle to traverse between two points on a corridor. For the I-5 CSMP corridor, this travel time is the time to traverse the 27-mile corridor on the I-5 freeway. The travel time assessment includes both weekday and weekend travel times.

On a typical weekday during off-peak hours, the average travel time for the I-5 is approximately 23 to 25 minutes, at an average speed of 65 to 70 mph. Figures 5.2 and 5.3 show the travel times for the years 2003 to 2006 by time of day and direction of travel. The southbound morning peak-period travel time was 44 minutes, the northbound afternoon peak-period travel time was 38 minutes.

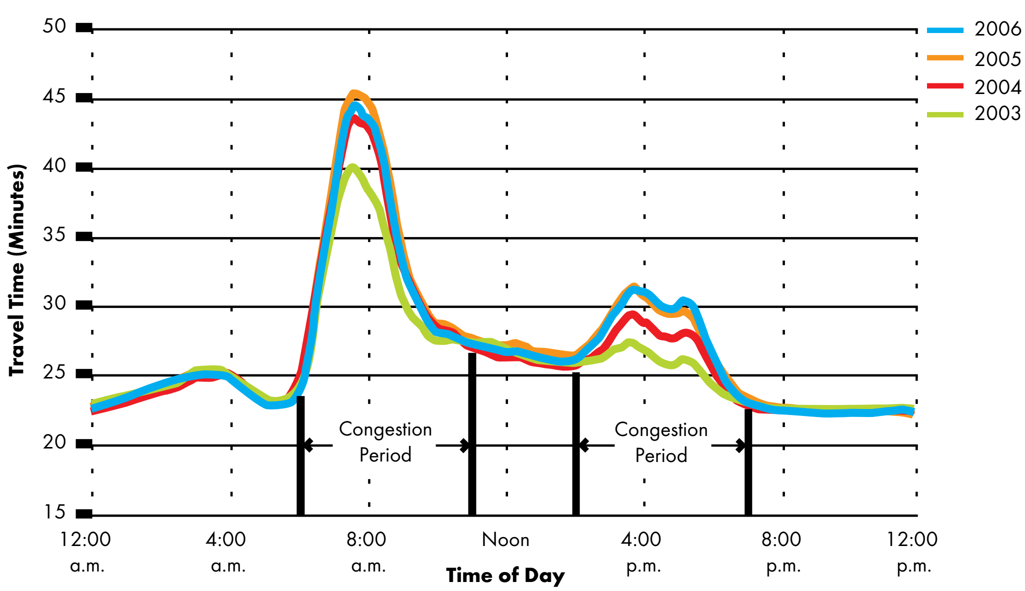
Unlike the northbound direction which has one peak-period, the southbound direction shows two peak-periods (Figure 5.3). During the southbound morning peak-period, travel times are degraded from approximately 6:00 a.m. to 11:00 a.m. on weekdays. In 2006, the average travel time for southbound travelers in the morning peak-period was 44 minutes. Additionally, southbound travel times do not fully recover to free flow conditions during the middle of the day. A second, lesser p.m. peak-period begins at 2 p.m. with degraded service lasting for roughly four hours and travel time increasing to 32 minutes. Since these times are averages, incidents can increase these delays on any given day.

Figure 5.2 Average Weekday Travel Time *27-Mile Trip Northbound I-5 from La Jolla Village Drive to Harbor Drive*



Source: Draft Project Report, I-5 North Coast Corridor 2008.

Figure 5.3 Average Weekday Travel Time *27-Mile Trip Southbound I-5 from Harbor Drive to La Jolla Village Drive*



Source: Draft Project Report, I-5 North Coast Corridor 2008.

I-5 freeway travel times change on the weekend as a result of trips for recreation and tourism, as well as interregional trips. As discussed previously, popular destinations in the I-5 CSMP corridor includes local beaches, Legoland amusement park, the Del Mar Racetrack, and the Del Mar Fairgrounds, as well as travel to destinations north and south of the travel shed. This demand results in a southbound peak into the region on Saturday and a northbound peak out of the region on Sunday. Table 5.1 shows that while peak travel times are not as severe as weekdays, the duration of the congested period is longer, with I-5 travelers experiencing some delay throughout the weekend days and most evenings.

Table 5.1 Average Travel Time Comparison (2006)

Direction/Day	Peak Travel Time (min)	Peak (time)	Congest Period (time)
Northbound			
Weekday	38	4:30 p.m.	2:00–7:00 p.m.
Saturday	25	5:00 p.m.	10:00 a.m.–7:00 p.m.
Sunday	29	5:00 p.m.	11:00 a.m.–9:00 p.m.
Southbound			
Weekday	44	7:30 a.m.	6:00–11:00 a.m.
	32	3:30 p.m.	2:00–7:00 p.m.
Saturday	35	12:30 p.m.	9:00 a.m.–8:00 p.m.
Sunday	24	1:00 p.m.	9:00 a.m.–3:00 p.m.

Source: Caltrans, District 11.

Delay

Delay is defined as the total observed travel time less the travel time under noncongested conditions, and is reported as vehicle-hours of delay. Delay is calculated by using the following formula:

$$\text{(Vehicles Affected per Hour)} \times \text{(Distance)} \times \text{(Duration)} \times \left[\frac{1}{\text{(Congested Speed)}} - \frac{1}{\text{35 mph}} \right]$$

Where the vehicles affected depends on the methodology used. Some methods assume a fixed-flow rate (e.g., 2,200 vehicles per hour per lane), while others use a measured or estimated flow rate. The distance is the length under which the congested speed prevails, the duration is the hours of congestion experienced below the threshold speed, and 35 mph can be free-flow speed in some cases.

In either case, both field observation and the regional travel demand model have indicated that as freeway delay increases, people may seek alternative travel routes such as side streets and parallel arterials in an attempt to minimize their travel times. This often leads to greater congestion on those adjacent facilities. VMT during the weekday peak periods on the I-5 freeway is estimated to increase by about fourteen percent with the 8+4 Scenario. However, this is offset by a decrease in vehicle hours of delay of 47 percent and decreases in VMT on the parallel roadways of Pacific Coast Highway and El Camino Real of 17 and ten percent, respectively. In addition, it is anticipated that some of this increase in VMT is from the ability of some of the off-peak trips to shift back into the peak periods due to improved travel times. VMT on I-5 in the 10+4 scenario is estimated to increase by nearly 20 percent over the 2030 No Build. However, this VMT is off-set by a 78 percent improvement in peak period delay on the I-5 freeway in the travel shed and a fourteen to 22 percent decrease in VMT on El Camino Real and Pacific Coast Highway, respectively.

There are two data sources used to report travel delay in this report:

1. **Caltrans Statewide HICOMP.** The results of the data collection are "recurrent" average daily vehicle-hours of delay (DVHD) on mainline freeways. Recurrent delay is the day-to-day congestion experienced by travelers when the number of vehicles traveling along a stretch of roadway exceeds the capacity of that roadway. Delay in the context of the HICOMP occurs when travel speeds along the road decline below 35 mph for a period of 15 minutes or more during a "typical" midweek a.m. or p.m. commute period. The data is collected by driving specially equipped "probe" vehicles along congested freeway segments during peak travel periods. When speeds drop below 35

Figure 5.4 San Diego Area A.M. and P.M. Congestion Maps

Source: 2006 Statewide Highway Congestion Monitoring Program (HICOMP).

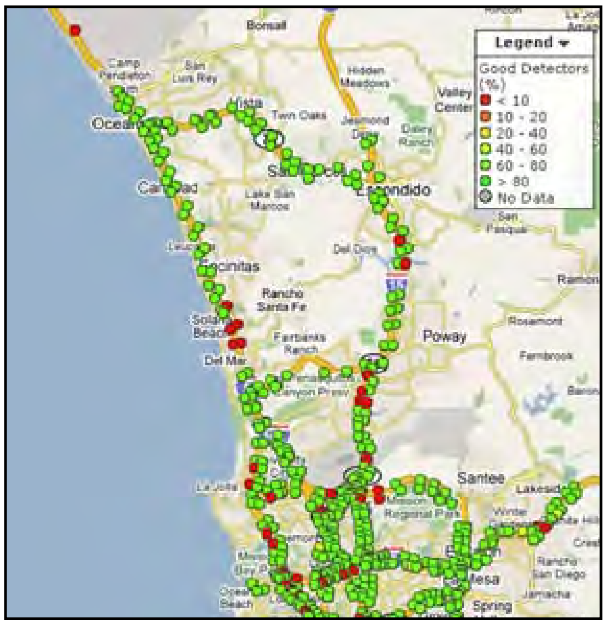
Note: These maps are representative of congestion for the times indicated on the indicated freeway segments during peak rush hours on incident-free weekdays. Weekends, holidays, and days in which traffic is influenced by accidents, special events, and lane closures are not reflected on these maps. Congestion delay is defined as the difference in travel time between 35 mph and the lower congested speed.

mph, delay is recorded by the probe vehicle. Analysis procedures are used to aggregate this delay to an average DVHD for the corridor.

2. **Freeway PeMS.** PeMS provides real-time and historical freeway traffic data, such as speeds and volumes. This data source provides both recurrent and non-recurrent vehicle-hours of delay statistics at various time scales; and provides congestion characteristics by hour, time period, day-of-week, and month-of-year.

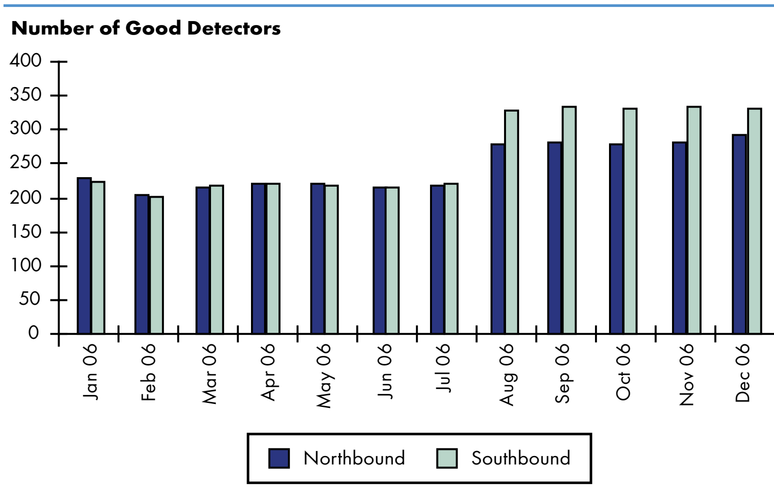
Figure 5.4 illustrates maps of the San Diego region's congested freeway segments,

Figure 5.5 Sample PeMS Sensor Location and Data Quality



Source: I-5/I-805 Corridor System Management Plan Existing Conditions Technical Report (ECTR). PeMS, 2008.

Figure 5.6 Daily PeMS Data Quality

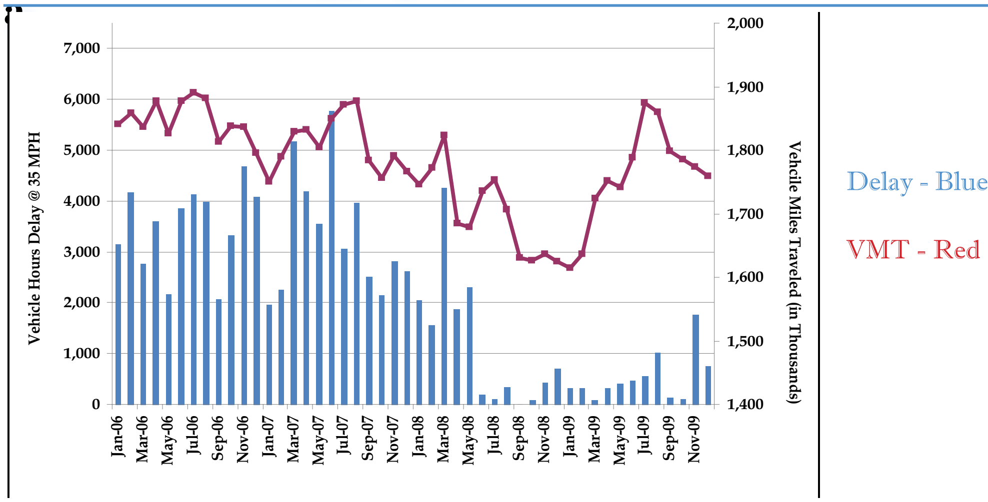


Source: I-5/I-805 Corridor System Management Plan Existing Conditions Technical Report (ECTR). PeMS, 2008.

along with the time period of congestion, from the 2006 HICOMP Report.

Figure 5.5 is a sample screenshot showing the available PeMS detection along the I-5 CSMP corridor as well as northern San Diego on a given day. The green dots represent "good" data, while red dots represent "bad" data. Figure 5.6 shows the number of "good" data for each month in 2006. Data quality for operational sensors varies by day and by location. Having detection covering a range of years, seasons, and locations on the corridor adds another dimension to the analysis,

Figure 5.7 I-5 Northbound and Southbound Peak Period Vehicle Hours of Delay (<35mph) and VMT



Northbound

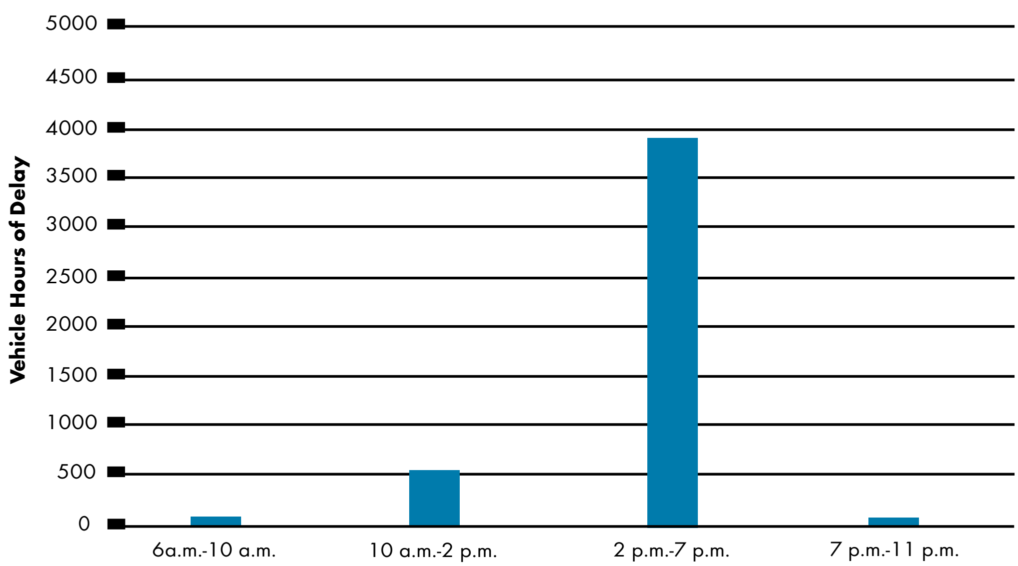
Southbound

Source: I-5/I-805 Corridor System Management Plan Existing Conditions Technical Report (ECTR). PeMS, 2008.

particularly trend and seasonal and time-of-day variations.

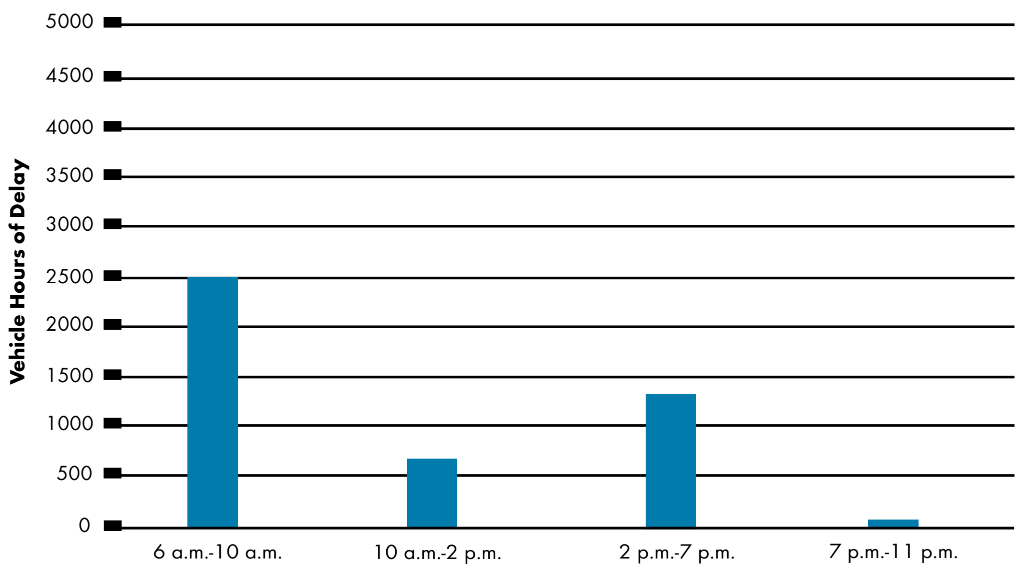
Delay information was extracted from the PeMS database. Figure 5.7 contains northbound and southbound graphs of the weekday delay separated into the a.m. and p.m. peak-periods by month. Monthly delay is presented for Tuesday to Thursday data only. Both show a wide variation in the peak-period delays. Variation is common, and the amount of variation is an important characteristic that is discussed later in the section concerning travel time reliability. The a.m. peak direction is southbound and the p.m. peak direction is northbound, which is consistent with the direction of

Figure 5.8 Average Vehicle-Hours of Delay by Time of Day
Northbound I-5 from La Jolla Village Drive to Harbor Drive, 2006 (Weekday)



Source: Caltrans, District 11.

Figure 5.9 Average Vehicle-Hours of Delay by Time of Day
Southbound I-5 from Harbor Drive to La Jolla Village Drive, 2006 (Weekday)



Source: Caltrans, District 11.

travel to the City of San Diego in the a.m. and from the City of San Diego in the p.m.

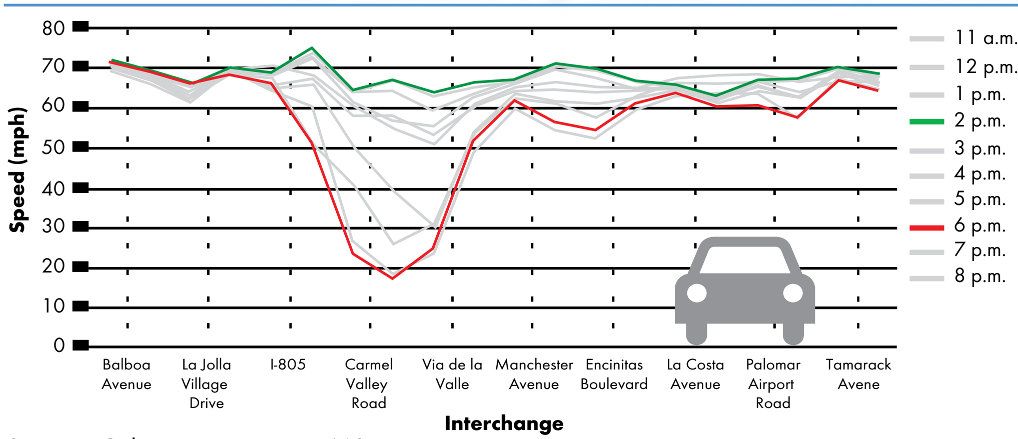
Figures 5.8 and 5.9 show the average delay on I-5 on a typical weekday. More than 9,000 VHD occurred on I-5 in this travel shed on an average weekday in 2006; that is more than one year of one person's life. Delay not only impacts people's quality of life by reducing the time available for family, friends, and other personal activities, but delay also impacts economic productivity by increasing labor costs, reducing production, and discouraging expansion and relocations of businesses. In 2008 the cost of one hour of delay for passenger vehicles is estimated at $18.00/hour and $79.00/hour for commercial vehicles. Using those values in the I-5 CSMP corridor resulted in an estimated loss in productivity valued at $52 million year.

In the northbound direction, the majority of the delay occurs between 2:00 p.m. and 7:00 p.m. In contrast, delay in the southbound direction is distributed between morning, *More than 9,000 VHD occurred on I-5 in this travel shed on an average weekday in 2006; that is more than one year of one person's life.*

midday, and afternoon peak-periods. The morning period shows the highest number of hours of delay of the three time frames.

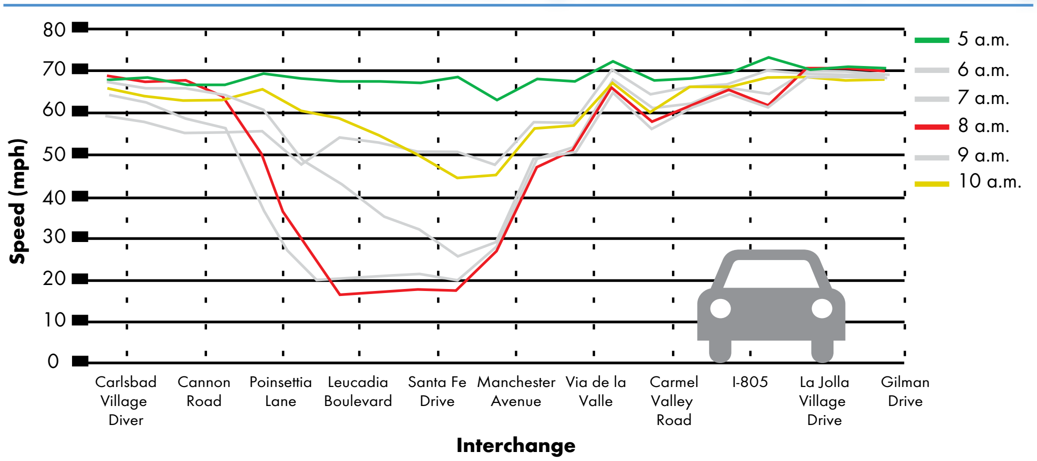
As discussed previously, the San Diego region is considered to be a tourist destination and has unique travel patterns; often traffic congestion is higher on weekends, holidays, and summer months when travel to public beaches, attractions, and special event venues place additional demand on the system. For example, using PeMS data for May 1-21, 2007 showed southbound average daily VHD at approximately 6,000 for Monday through Wednesday. On Thursdays, VHD increased to approximately 9,000 hours and Friday it was 12,000 hours of delay. For August 1-21, 2007, VHD for Thursday and Friday increased to 11,000 and 15,000, respectively.

Figure 5.10 Average Speeds by Interchange *Northbound I-5 October 2006 (Weekdays)*



Source: Caltrans District 11, PeMS

Figure 5.11 Average Speeds by Interchange *Southbound I-5 October 2006 (Weekdays)*



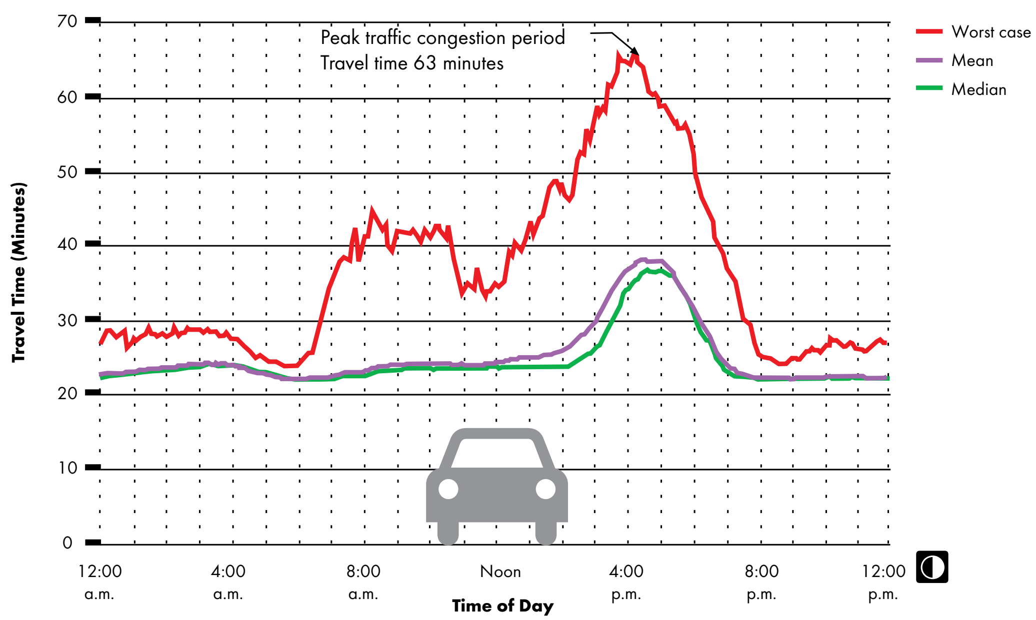
Source: Caltrans District 11, PeMS

Figures 5.10 and 5.11 show average weekday speeds of vehicles traveling northbound on I-5 by time-of-day and by interchange in October 2006. As shown in Figure 5.10, traveling northbound at 6:00 p.m. vehicle speeds dropped from 68 mph before the I-805 merge to just under 20 mph near Carmel Valley Road. This degraded speed continues nearly to the Manchester Avenue exit, a distance of approximately six miles. Between 2 p.m. and 6 p.m., at the peak of afternoon congestion, vehicle speeds slowed by nearly 45 miles per hour. Figure 5.15 shows that southbound travel speeds decreased from approximately 68 mph to 18 mph at 8:00 a.m., the peak of the morning commute. The decrease in speed occurred for approximately 12 miles, beginning at the Cannon Road exit. It did not recover until past the Via de la Valle exit. Between 6 a.m. and 10 a.m., at the peak of morning congestion, vehicle speeds slowed by nearly 50 miles per hour.

Travel Time Reliability

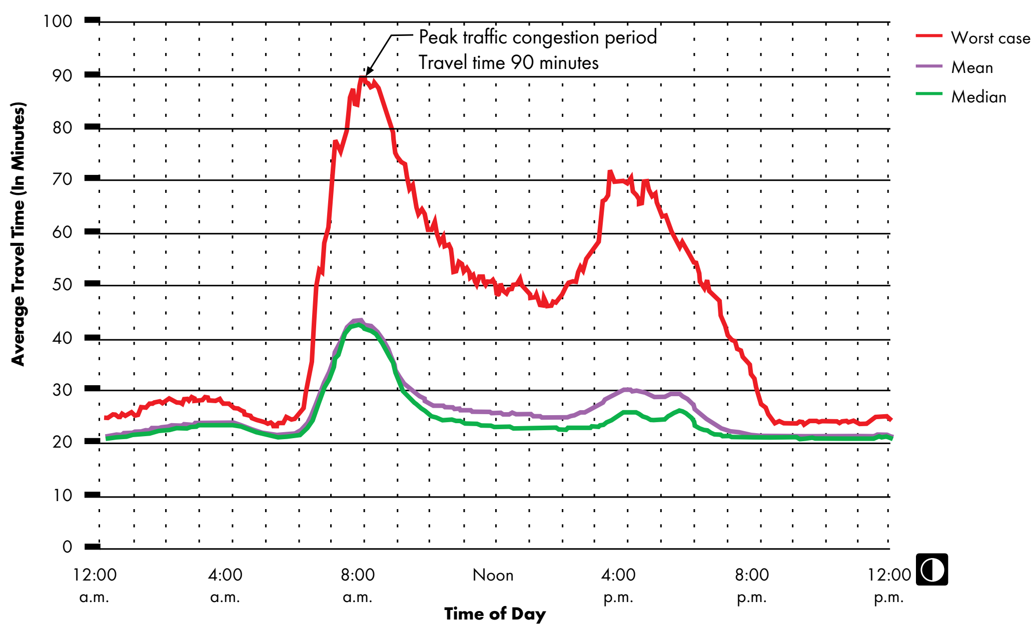
Reliability captures the relative predictability of the public's travel time. Unlike mobility, which measures how many people are moving at what rate, the reliability measure focuses on how much mobility varies from day to day. Reliability measures the amount of additional time that is needed to guarantee an on time arrival. Figures

Figure 5.12 2006 Travel Time Variability - Weekday Northbound I-5 from La Jolla Village Drive to Harbor Drive



Source: Caltrans District 11, PeMS, April 2006

Figure 5.13 2006 Travel Time Variability - Weekday Southbound I-5 from Harbor Drive to La Jolla Village Drive



Source: Caltrans District 11, PeMS

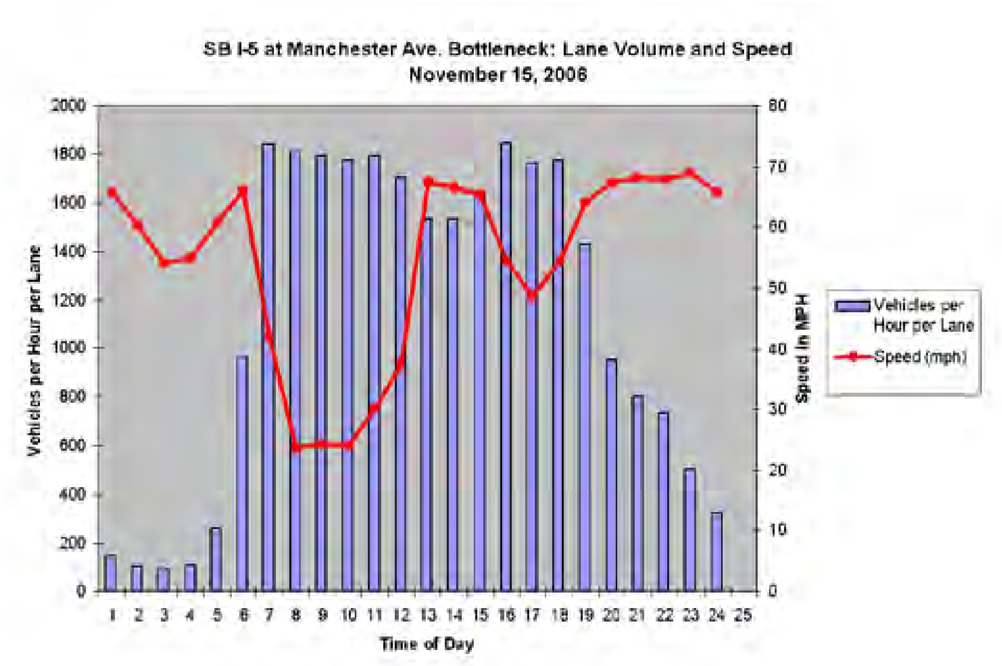
5.12 and 5.13 on the next page show the variation in travel times on the I-5 on a typical weekday. The red line in both figures shows the "worst case" scenario when the maximum amount of additional time must be added to the average trip to compensate for travel delays.

Figures 5.12 and 5.13 worst case scenarios show that from 6 a.m. to 8 p.m. trip times were unreliable. During the afternoon peak period in the northbound direction, it took an additional 23-25 minutes to have an on time arrival for a trip that would take 38-40 minutes in the peak period. During the morning peak in the southbound direction, an additional 45 minutes would need to be added to guarantee an on time arrival for a trip that would take 42 minutes in the peak period.

Facility Efficiency

The freeway performance measures discussed previously (travel time, delay, and reliability) focused on the experiences of the user; this performance measure evaluates the amount of lost capacity on the highway caused by congestion. As demand on a facility begins to exceed the optimal carrying capacity of 2,100 to 2,400 vehicles per lane per hour (vplph), travel speeds drop and congestion begins to form. As this occurs, the carrying capacity of the facility also drops. During congested periods this capacity

Figure 5.14 Bottleneck Lane Volume and Speed Comparison



Source: Caltrans District 11, PeMS

can drop by as much as 25 percent (1600 to 1800 vplph). This difference in carrying capacity is referred to as "Lost Efficiency." This loss occurs during the time when demand is the highest and therefore significantly increases the congestion over what would be expected. The concept of reducing or eliminating this "Lost Efficiency" is a goal of the system management strategies proposed later in the CSMP.

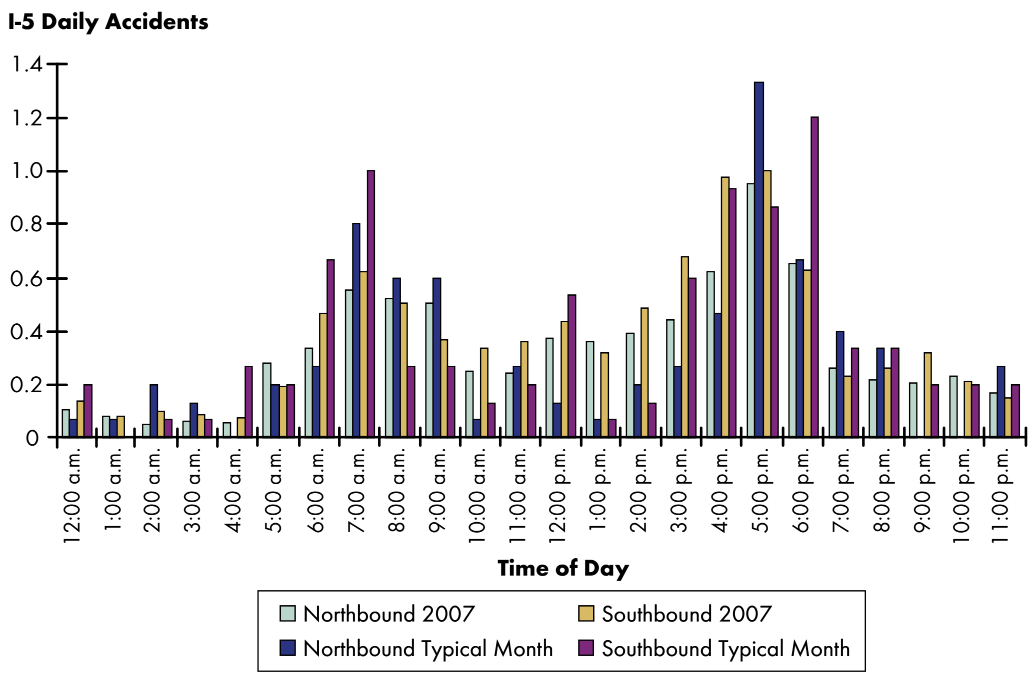
Figure 5.14 shows a comparison of travel speeds and volumes at Manchester Avenue during an average day in 2006. The areas of concern are during the periods of congestion when speeds drop below 55 mph. At this location the carrying capacity during these congested periods drops to below 1800 vehicles per lane per hour, which is 20 percent below the optimal carrying capacity of 2200. This lost efficiency is typical of what occurs throughout a highly urbanized corridor.

Safety

For the safety performance assessment, accident rates from the Traffic Accident Surveillance and Analysis System (TASAS) and the number of accidents and accident rates from the California Highway Patrol (CHP) accident database available through PeMS were used. Table 5.2 provides data for I-5 accident rates and compares those against statewide average rates. The time period used is from April 1, 2005 through March 31, 2008. As shown, I-5 accident rates are below the statewide average rates for all accident types.

There are a multitude of safety analyses that can be run through PeMS, including accidents by location, duration, and time. The safety assessment in this report is

Figure 5.15 I-5 Accidents by Time of Day



Source: I-5/I-805 Corridor System Management Plan Existing Conditions Technical Report (ECTR). PeMS, 2007.

Table 5.2 Accident Rates (April 2005 - March 2008)

Segment	I-5 CSMP Actual Accident Rates (per million vehicle miles)			Statewide Average Accident Rates (per million vehicle miles)		
	F[a]	F+I[b]	Total[c]	F[a]	F+I[b]	Total[c]
I-5 Northbound	0.003	0.25	0.65	0.010	0.32	1.03
I-5 Southbound	0.004	0.28	0.76	0.004	0.28	0.76

Source: Traffic Accident Surveillance and Analysis System (TASAS) - Transportation Systems Network (TSN).

Notes: (a) Fatal.
(b) Fatal plus injuries.
(c) All reported accidents (includes property damage only accidents).

Table 5.3 CHP/PeMS Incident Query *2006*

I-5 CSMP Corridor	Weekday	Weekday/Holiday	Total
Northbound	1,618	618	2,236
Southbound	1,743	582	2,325
Both directions	3.361	1,200	4,561
Number of days	250	115	365
Incidents per days	13.4	10.4	12.4

Source: Caltrans District 11, PeMS data.

intended to characterize the overall accident history and trends in the corridor that are readily apparent. Table 5.3 shows reported incidents on the I-5 in 2006. For weekdays in 2006, there were nearly 14 incidents a day, any of which could cause congestion and delay. Northbound weekend travel had a higher number of incidents than southbound weekend travel. In contrast, weekday southbound travel had more incidents than northbound weekday travel. As I-5 demand increases over the study duration of 2030, the affect of each incident will cause larger travel times and delay on the facility.

Figure 5.15 illustrates the accidents by time of day for 2007 data. The figure shows that the number of accidents along I-5 increases during the commute periods; there also is a small peak during the lunch hour. In addition, aggregation of the crash data by week for 2007 indicates that the highest number of crashes occurred the final week of November. This week included the tail end of Thanksgiving weekend. However, the data showed that there does not appear to be any significant variation in crashes for unfamiliar drivers during the summer months; with the lowest number of crashes occurring the last week of August and first week of September. The distribution of accidents along the corridor in 2007 were also assessed using the CHP PeMS accident data. A higher proportion of the accidents occur at the I-5/I-805 interchange. This can be expected due to the high volume of weaving traffic.

Bottleneck Identification and Causality

Studies show that the impact of nonrecurrent congestion can be equal to or greater than recurrent delay.

The causes of congestion are generally categorized as recurrent or nonrecurrent. Recurrent congestion is defined as a regularly occurring condition lasting for 15 minutes or longer where travel demand exceeds freeway design capacity. This typically means freeway speeds were 35 mph or less on a typical incident-free day. Recurrent congestion is also caused by operational issues creating an overload of the outside lanes, causing traffic in that lane to slow. Through traffic that was in the outside lane merges into the adjacent lane to avoid the slowing, but in doing so potentially overloads that adjacent lane. This cascading of traffic eventually causes the entire facility to slow. Overloading of outside lanes is generally related to merging and diverging traffic associated with entrance and exit ramps or in areas of steep grades which cause larger vehicles such as trucks in the outside lanes to slow.

I-5 in this area is a relatively modern facility, interchange spacing is adequate with a few exceptions (such as the spacing of local interchanges adjacent to I-5/SR 78), and most of the entrance ramps are metered. However, as discussed in Chapters 2 through 4, the location of particular activity centers combined with the lack of parallel arterials result in several interchanges with very high demand. Examples of these interchanges include Genesee Avenue (existing peak-period demand to and from the north averages 2,000 vph), Manchester Avenue (existing peak-period demand to and from the north averages 1,500 vph), and Palomar Airport Road (existing peak-period demand both to and from the north and the south averages 1,500 to 2,000 vph).

Nonrecurrent congestion is defined as backups caused by special circumstances, such as accidents, weather, stalled vehicles, construction activities, special events, etc. As the total demand for a facility grows and approaches the carrying capacity of the facility, vehicle densities increase and the system becomes much more sensitive to operational deficiencies or incidents. Consequently, the frequency and duration of congestion can increase at a faster rate than the increase in demand as the system

It is estimated that for every one minute of delay caused by an incident, there are four minutes of delay caused by the resulting congestion.

approaches capacity.

Factors leading to nonrecurrent congestion are as follows:

- Traffic Incidents: These events disrupt the normal flow of traffic, usually by physical impediment in the travel lanes. Events such as vehicular crashes, break downs, and debris in travel lanes are the most common form of traffic incidents. It is estimated that for every one minute of delay caused by an incident, there are four minutes of delay caused by the resulting congestion.

- Work Zones: Construction activities on the roadway result in physical changes to the highway environment. These changes may include a reduction in the number or width of travel lanes, lane "shifts," lane diversions, lane reduction, or elimination of shoulders, speed reductions, and even temporary roadway closures.

- Weather: Environmental conditions can lead to changes in driver behavior that affect traffic flow.

- Special Events: Demand fluctuations caused by special events in an area produce traffic flows in the vicinity of the events radically different from "typical" patterns. Special events occasionally cause "surges" in traffic demand that overwhelm the system.

The ability to clear nonrecurrent congestion depends on having incident response strategies that are effective and available. Currently, Caltrans has service vehicles available 24 hours a day which are deployed to aid in incidents which lead to non-recurring congestion.

Bottleneck Congestion Analysis

Both recurrent and nonrecurrent types of congestion cause bottlenecks in the I-5 CSMP transportation system. A bottleneck is said to terminate where speeds increase from 30 to 50 mph, often in a very short distance; this location is associated with the open end of the bottle where vehicles are able to return to free-flow speeds after being choked through the bottleneck.

To identify the reasons for the increased travel times and delays discussed above, bottlenecks were analyzed along the I-5 corridor. PeMS was used to detect weekday bottlenecks on I-5 for 2006 and 2007. Recurrent weekday northbound and southbound bottlenecks are depicted in the following illustrations. The bottlenecks in these illustrations represent an average weekday and may not have occurred every day. Further, some improvement projects were completed on I-5, such as extending the existing HOV lane from Via De La Valle to Manchester Avenue and adding several auxiliary lane improvements. Future bottleneck estimates were produced using FREQ12, as described earlier in this section.

The bottleneck illustrations are color coded as follows:

- Yellow represents a bottleneck where there is persistent slowing;
- Red represents areas of traffic speeds below 35 miles per hour (mph);
- Blue represents areas where speeds are unstable and could become a potential bottleneck; and
- Green represents free flow speeds.

The bottlenecks on the I-5 CSMP corridor have two main causes: constraints on the system created by the physical conditions of the freeway (steep uphill grades, large numbers of trucks, visual site distance constraints, limited weaving and merging distances, etc.) and lane loss (not enough lanes to carry the traffic volumes at a given time of day). Arterial streets parallel to the freeway do not often provide viable alternatives to I-5 for many local trips or regional trips.

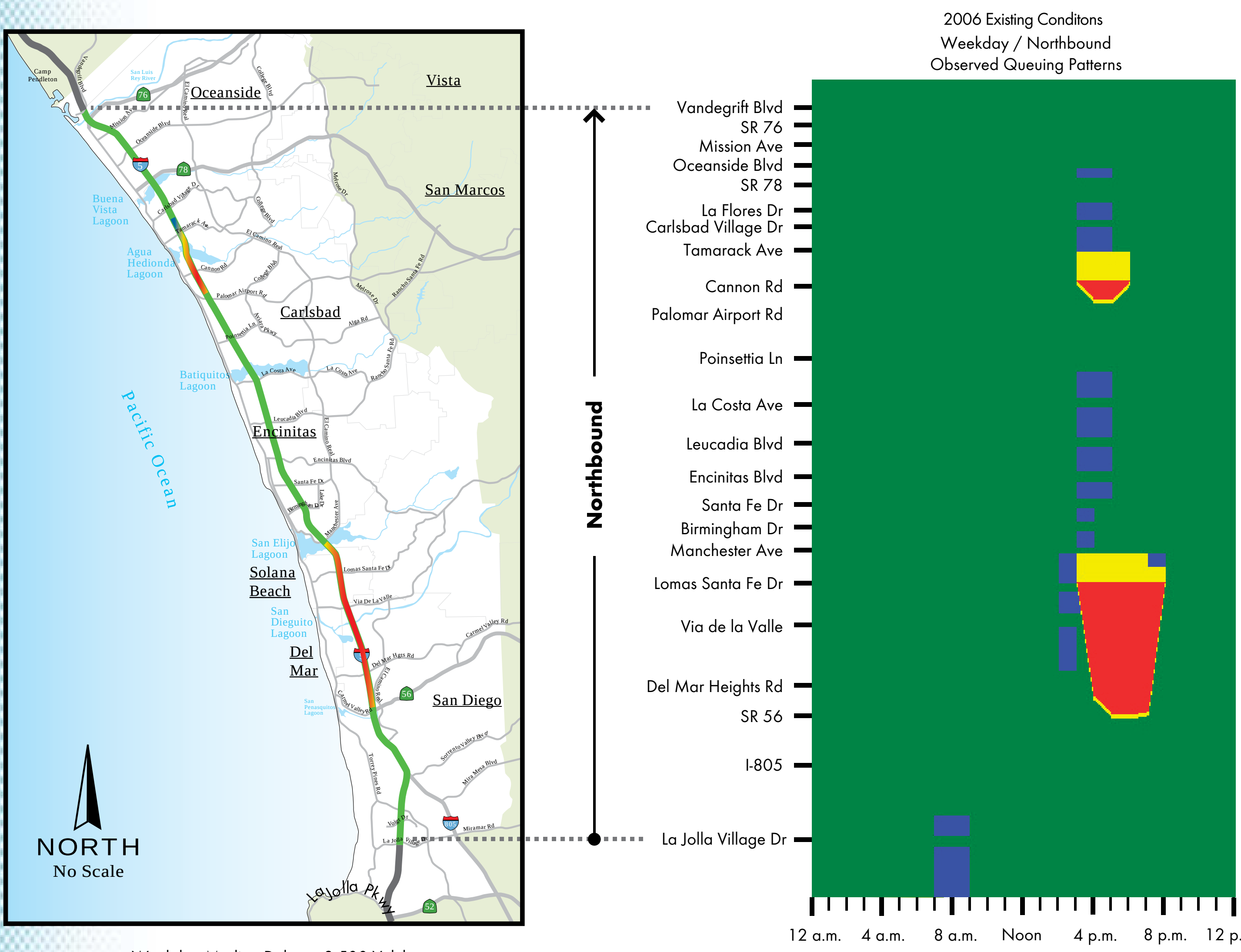
2006 Northbound Bottlenecks

Figure 5.16 presents the northbound existing weekday bottlenecks for 2006. No northbound bottlenecks occurred in the a.m. peak hours. Bottlenecks occurred in the afternoon and were located at:

- Lomas Santa Fe Drive;
- Manchester Avenue; and
- Cannon Road.

The first northbound p.m. bottleneck may be attributed to the high volume of vehicles entering I-5 northbound freeway at Lomas Santa Fe, as well as the slowing that may result from motorists being able to view the congestion approaching Manchester.

Figure 5.16 2006 I-5 Freeway Corridor Bottlenecks *Weekday Northbound*

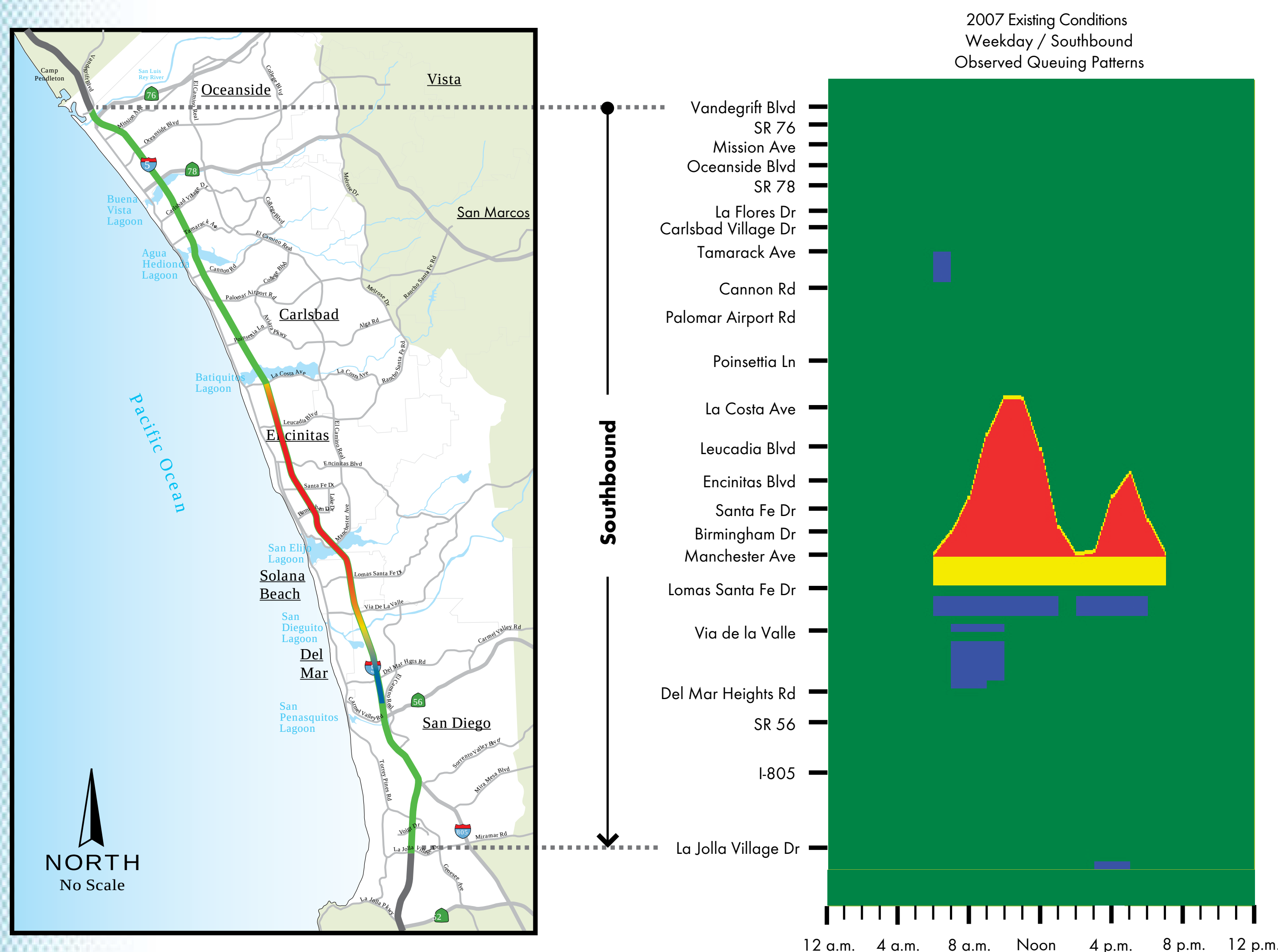


Weekday Median Delay = 3,500 Veh-hrs
A.M. Peak Period Travel Time = 25 min.
P.M. Peak Period Travel Time = 38 min.

Legend: Free Flow; Queue (less than 35 mph); Bottleneck (persistent slowing); Unstable Area (potential bottleneck)

Source: Caltrans, District 11 FREQ Study

Figure 5.17 2007 I-5 Freeway Corridor Bottlenecks *Weekday Southbound*



Legend: Free Flow; Queue (less than 35 mph); Bottleneck (persistent slowing); Unstable Area (potential bottleneck)

Weekday Median Delay = 4,700 Veh-hrs
A.M. Peak Period Travel Time = 41 min.
P.M. Peak Period Travel Time = 30 min.

Source: Caltrans, District 11 FREQ Study

The Manchester and Cannon bottlenecks are likely a result of the on-ramp volumes and grades at these locations.

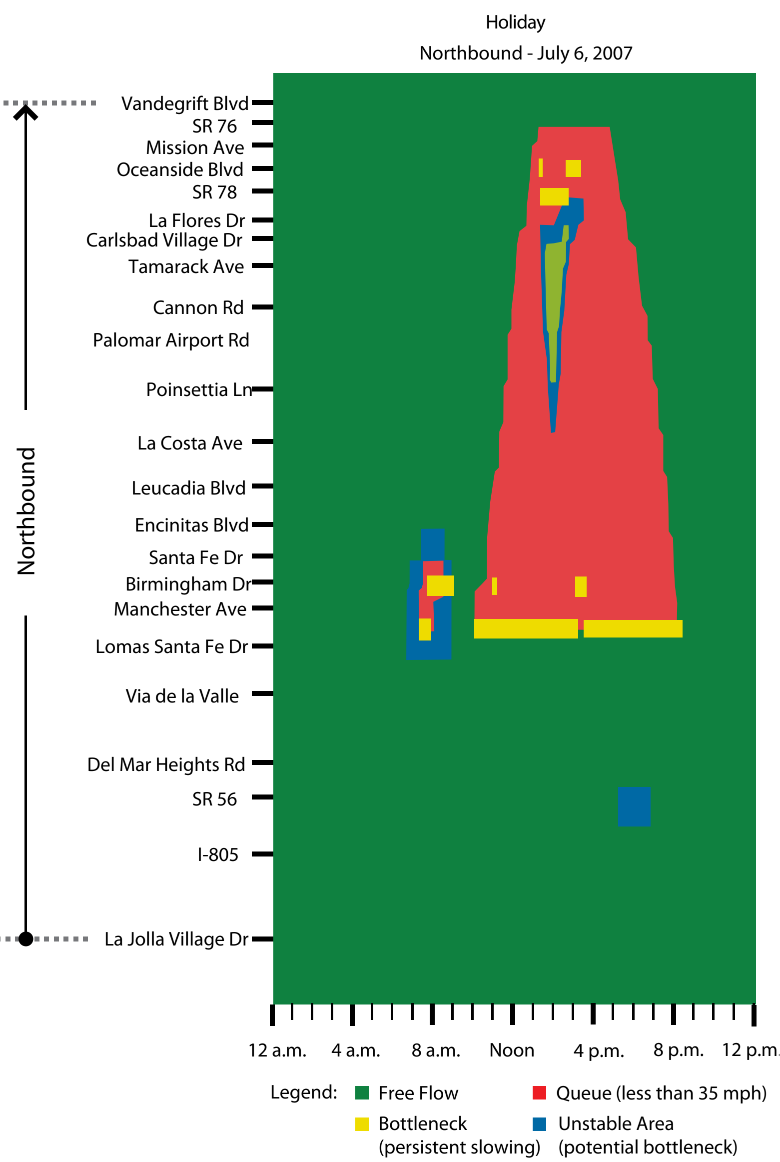
Traveling northbound, congestion occurs about 5 hours in the afternoon peak hours.

2007 Southbound Bottlenecks

Figure 5.17 presents the I-5 southbound bottlenecks. Analysis showed 2007

Figure 5.18 2007 I-5 Holiday/Seasonal Bottlenecks *Southbound July 6, 2007*

16,000 vehicle-hours of delay



Source: Caltrans, District 11 PeMS

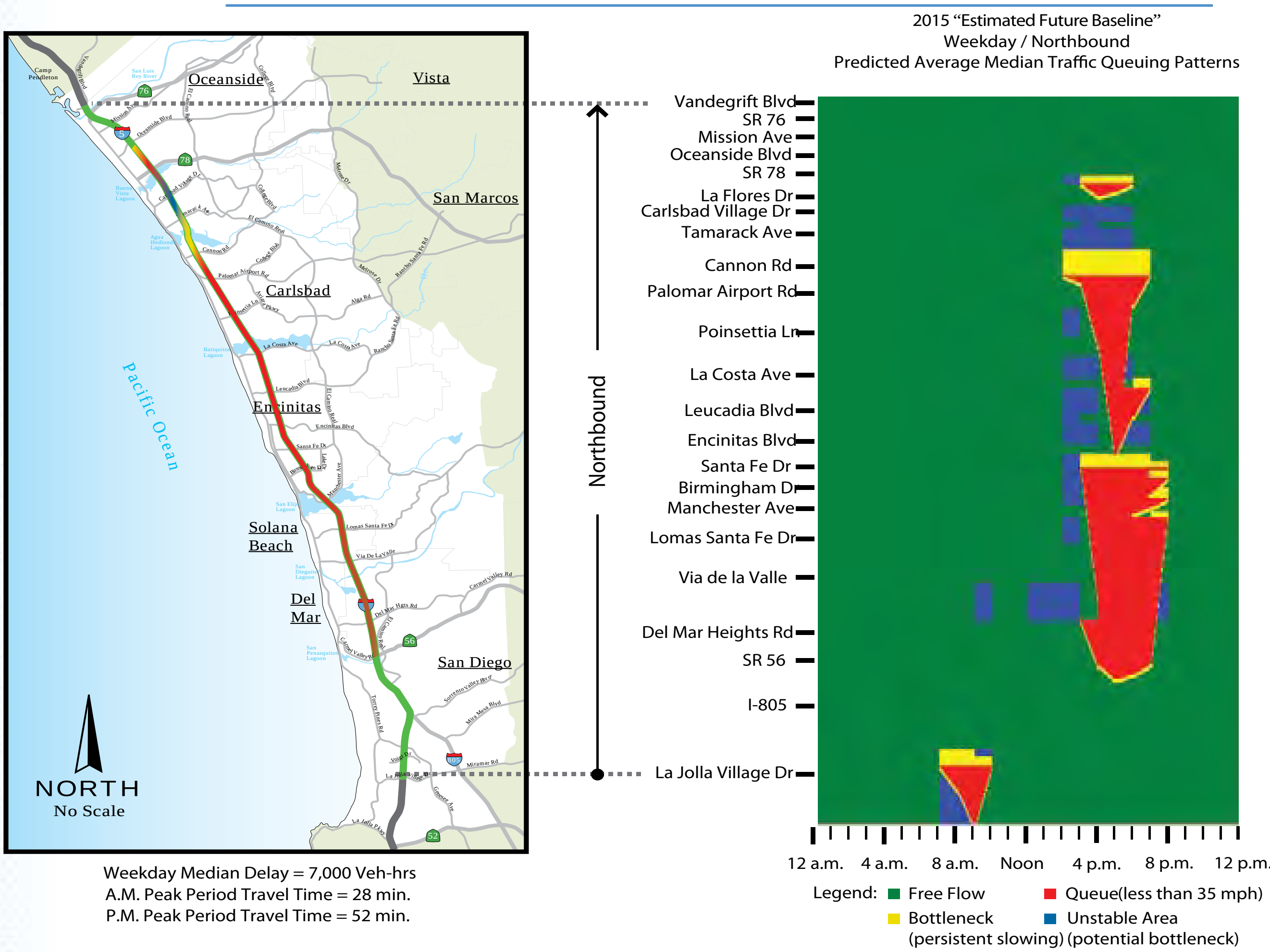
southbound I-5 bottlenecks occurred throughout the day and were typically found at:

- Via de la Valle;
- Manchester Avenue; and
- Lomas Santa Fe Drive.

These bottlenecks are in close proximity to one another and often overlap. This analysis was completed after the I-5/I-805 Bypass improvements were made in 2007. This bottleneck is essentially one long bottleneck and is due to the heavy on-ramp demand from Manchester Avenue - which is essentially a continuation of El Camino Real, a major parallel arterial - in addition to the steep grade ahead and the large percentage of trucks that slow down before reaching the top of the hill.

Traveling southbound, congestion occurs about 5 hours in the morning peak hours and from 0 - 3 hours in the afternoon, depending on varying daily conditions.

Figure 5.19 2015 I-5 Freeway Corridor Bottlenecks *Northbound Weekday*



Weekday Median Delay = 7,000 Veh-hrs
A.M. Peak Period Travel Time = 28 min.
P.M. Peak Period Travel Time = 52 min.

Source: Caltrans, District 11 FREQ Study

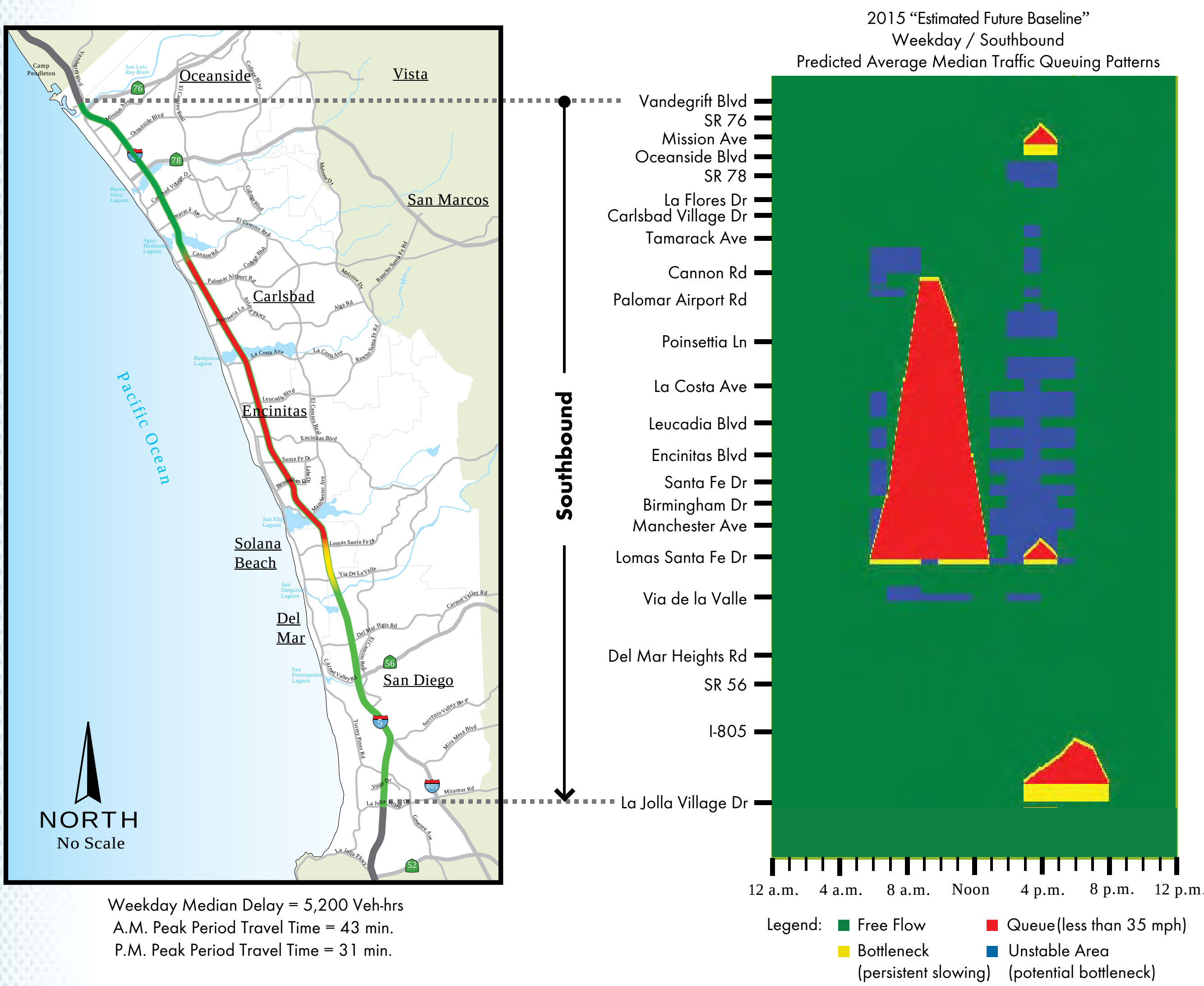
2006 Holiday/Seasonal Bottlenecks

The San Diego region is generally considered to be a tourist destination and as such it has unique travel patterns. Figure 5.18 maps the location of bottlenecks that result from an example of seasonal or holiday trip demand on I-5 for Friday, July 6, 2007, two days after the fourth of July holiday. The data showed a nearly 20-mile long queue and more than 16,000 hours of vehicle delay.

2015 Northbound Weekday

As shown in Figure 5.19, a recurring morning bottleneck may appear in the vicinity of La Jolla Village Drive/Genesee Drive by 2015. Afternoon bottlenecks may also be present near Oceanside Boulevard, SR 78, between Tamarack Avenue and Cannon Road, and in the vicinity of Santa Fe Drive/Encinitas Boulevard. The queue that builds up behind this last bottleneck may be present from 3:00 p.m. to nearly

Figure 5.20 2015 I-5 Freeway Corridor Bottlenecks *Southbound Weekday*



Weekday Median Delay = 5,200 Veh-hrs
A.M. Peak Period Travel Time = 43 min.
P.M. Peak Period Travel Time = 31 min.

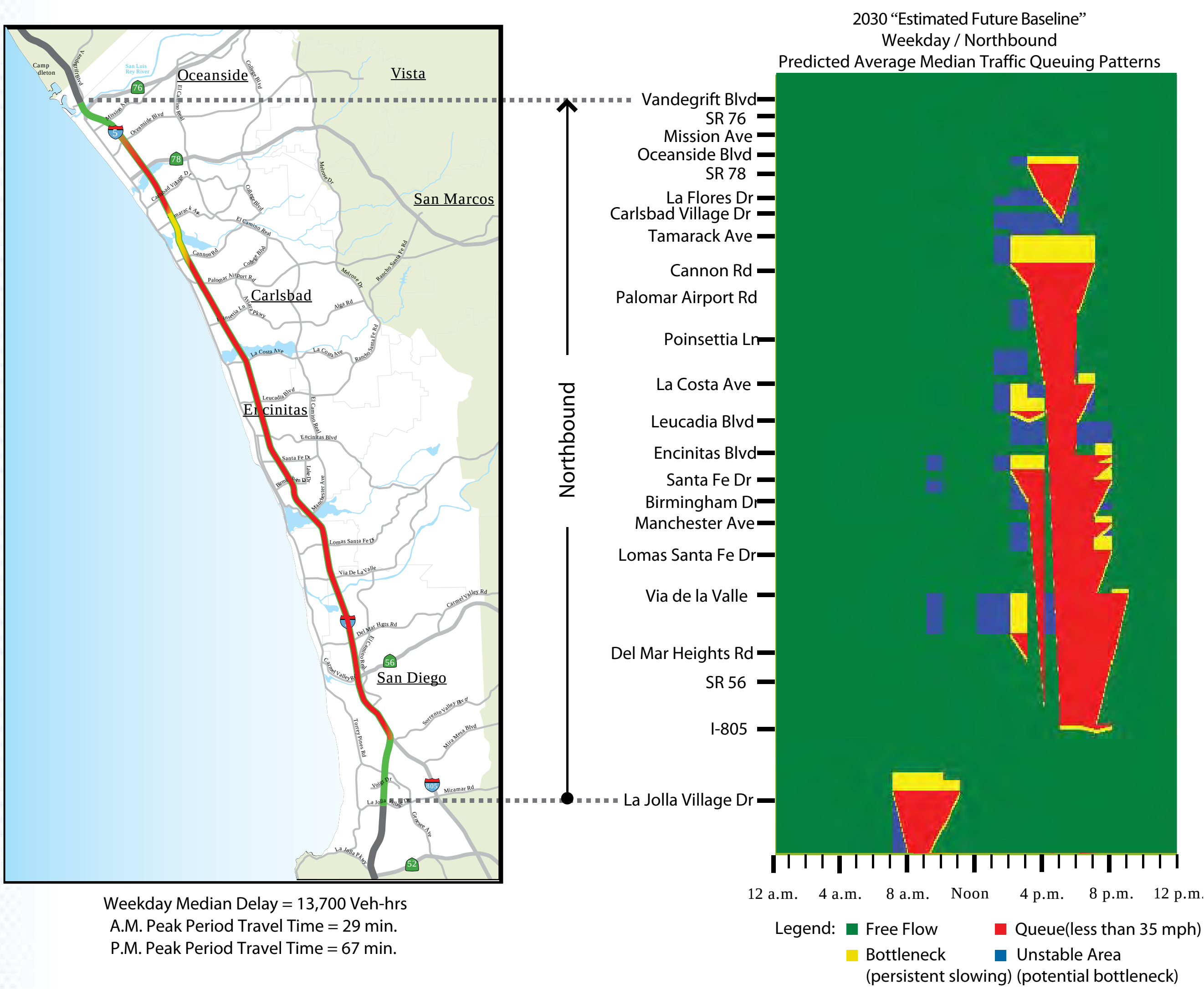
Source: Caltrans, District 11 FREQ Study

8:00 p.m. and extend south of the SR-56 junction.

The entire corridor between Del Mar Heights Road and SR-78 may be aproaching capacity in 2015, and will be highly dependent on careful ramp metering management to maintain traffic flow. The typical daily Vehicle Hours of Delay (VHD) are projected to be 7,000 vehicle hours, as compared to 3,500 vehicle hours in 2006. Projected weekday travel time in the afternoon will be 52 minutes, compared with 38 minutes for 2006. In the morning, projected travel time will be 25 minutes, compared with 24 minutes for 2006.

2015 Southbound Weekday

Figure 5.21 2030 I-5 Freeway Corridor Bottlenecks *Northbound Weekday*



Weekday Median Delay = 13,700 Veh-hrs
A.M. Peak Period Travel Time = 29 min.
P.M. Peak Period Travel Time = 67 min.

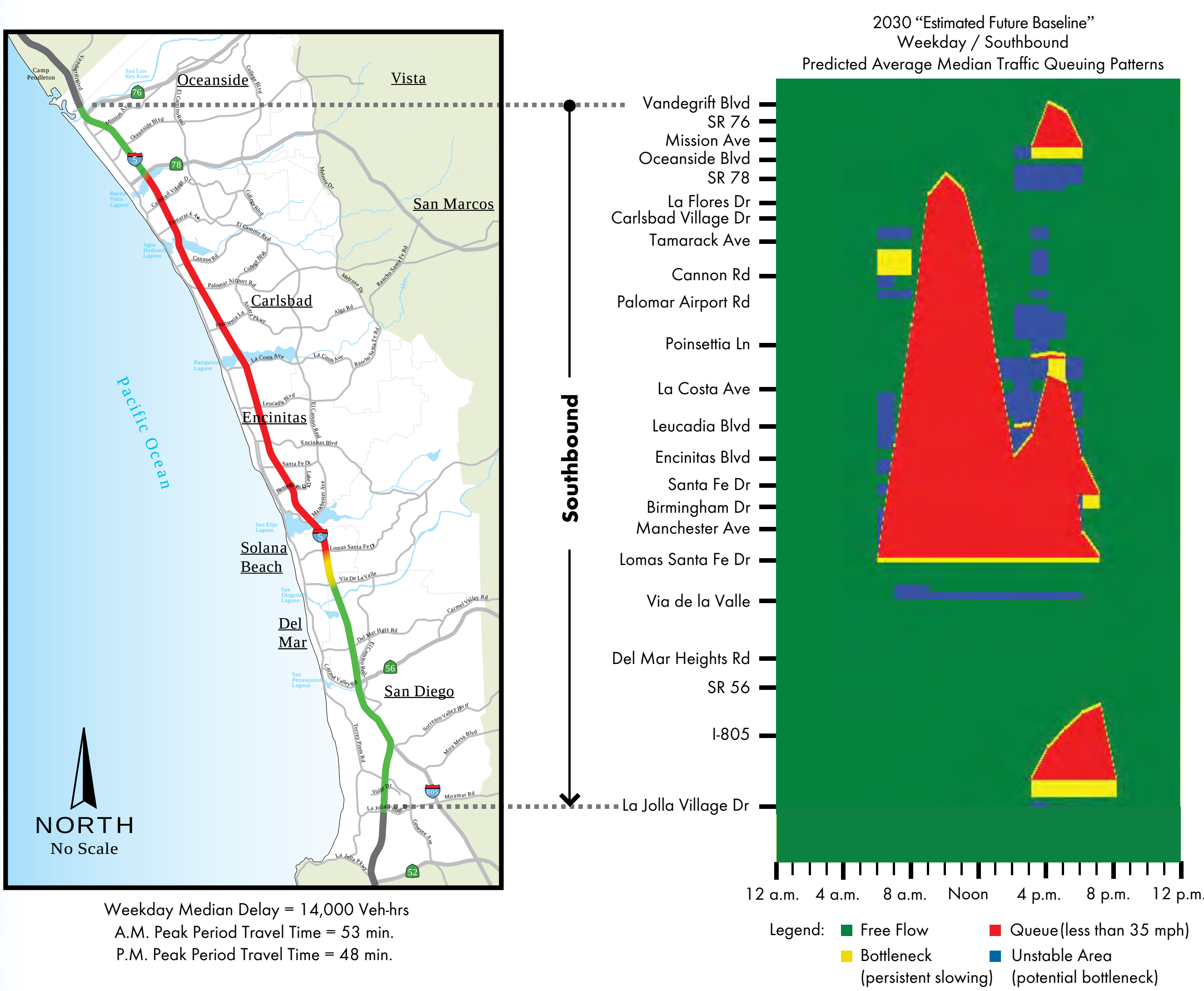
Source: Caltrans, District 11 Study

By 2015, the existing unstable area between Manchester Drive and Lomas Santa Fe is projected to develop into a pronounced bottleneck that will run all morning long. The queue is projected to extend up to Cannon Road on a recurring basis and some days be even longer. During the afternoon peak-period the entire corridor Between SR-76 and Via De La Valle will be approaching capacity and will be dependent on careful ramp metering manaagement to maintain reasonable traffic flows.

In the morning peak-period, the typical travel time is projected to be 43 minutes, compared to 41 minutes in 2007. For the afternoon peak-period, travel time is anticipated to be 31 minutes, compared with 30 minutes in 2007. And the daily vehicle hours of delay may also increase from 4,700 hours of delay in 2007 to 5,200 vehicle hours of delay in 2015.

2030 Northbound Weekday

Figure 5.22 2030 I-5 Freeway Corridor Bottlenecks
Southbound Weekday



Weekday Median Delay = 14,000 Veh-hrs
A.M. Peak Period Travel Time = 53 min.
P.M. Peak Period Travel Time = 48 min.

Source: Caltrans, District 11 Study

As shown in Figure 5.21, various northbound bottlenecks are projected to occur throughout the corridor between 7:30 a.m. and 8:30 p.m. in 2030. These bottlenecks overlap each other and create additional unstable areas and longer queues. Average travel times are estimated to range from 29 minutes in the morning peak-period to 67 minutes in the afternoon peak-period. These compare to 2006 travel times of 25 and 38 minutes, respectively. In 2030, congestion conditions would occur 3.5 hours in the a.m. peak hours and 6.5 hours in the p.m. peak hours, creating more than 10 hours a day of "peak" congestion conditions. In 2030, total vehicle hours of delay per day are projected to be 13,700 hours compared with 3,500 for 2006.

2030 Southbound Weekday

As visible in Figure 5.22, southbound bottlenecks and congestion are projected to occur throughout most of the corridor between 6:00 a.m. and 8:00 p.m. by 2030. The largest bottleneck is expected to occur between Via de la Valle and Manchester Avenue. The typical peak period travel time on weekdays is estimated to be 53 minutes in the morning and 48 minutes in the afternoon, compared to 44 minutes and 32 minutes, respectively, in 2007 (pre-Lomas I/C improvements). In 2030, congestion in the southbound direction may be continuous from morning to afternoon and run for more than 14 hours a day. It is projected that in 2030, the typical daily vehicle hours of delay may be as much as14,000, compared with 4,700 in 2007. This is comparable to having the worst existing seasonal/holiday-type traffic conditions conditions occurring on a routine daily basis in the future (see also Figure 5.18).

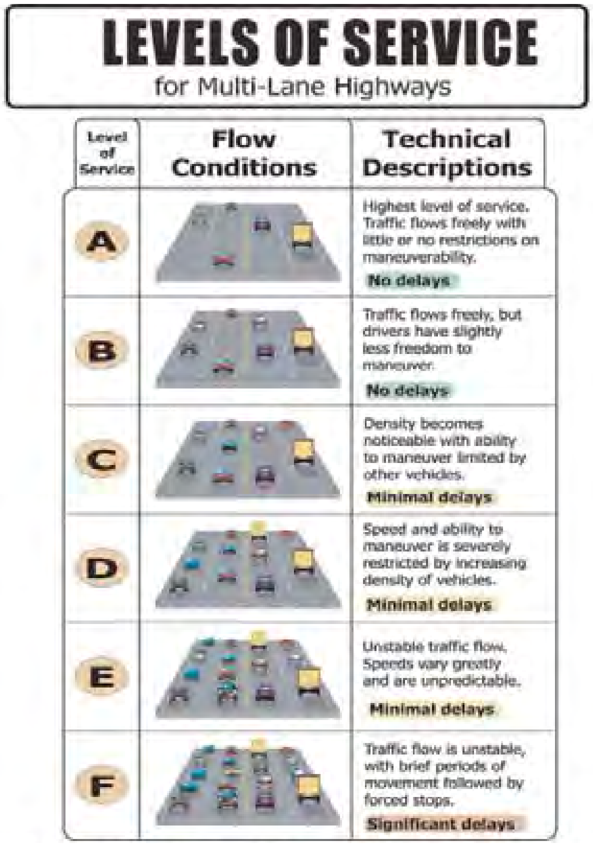
Regional Arterial Systems Performance

Regionally designated arterial roads in the I-5 CSMP travel shed were organized into three categories: 1) north-south arterials that are alternative routes for the I-5; 2) other north-south arterials; and 3) east-west arterials.

Performance of these regional arterial roads was measured by:

- Capacity of roadway to accommodate demand;
- Number of completed roads;

Figure 5.23 Level of Service for Multi-Lane Highways



Source: 2000 HCM, Exhibit 21-3, Speed-Flow Curves with LOS Criteria for Multi-Lane Highways.

- Connectivity to activity centers, coastline, and transit; and
- Roadway infrastructure to facilitate bus transit trips.

This section focuses on the regional arterial system's level of service (LOS), as well as gaps that were identified in the arterial system. Connectivity and bus transit on arterial facilities were discussed in previous chapters.

Level of Service (LOS)

LOS is a qualitative measure that describes operational conditions, generally in terms of speed and travel time, freedom to maneuver, traffic interruptions, and comfort and

Table 5.4 I-5 Regional Arterials *North-South Highway Alternatives*

Arterials	From	To	Lanes	ADT (in Thousands)	LOS
Coast Highway	SR 76	Carmel Valley Road	4	22	E
El Camino Real	Douglas Drive	Mesa Drive	2-4	20	C
El Camino Real	Mesa Drive	Via Las Rosas	4	32	E
El Camino Real	Via Las Rosas	Vista Way	4-6	39	E
El Camino Real	Vista Way	SR 78	6	50	E
El Camino Real	SR 78	Plaza Drive	4-6	44	E
El Camino Real	Plaza Drive	Marron Road	4-6	37	E
El Camino Real	Marron Road	Cannon Road	4-6	30	E
El Camino Real	Cannon Road	Aviara Parkway	4-6	34	E
El Camino Real	Aviara Parkway	La Costa Avenue	4-6	45	E
El Camino Real	La Costa Avenue	Olivenhain Road	6	35	E
El Camino Real	Olivenhain Road	Encinitas Boulevard	6	45	E
El Camino Real	Encinitas Boulevard	Santa Fe Drive	6	30	E
El Camino Real	Santa Fe Drive	Manchester Avenue	4-6	21	C
El Camino Real	Via de la Valle	High Bluff Drive	6	14	A
El Camino Real	High Bluff Drive	Carmel Mountain Road	6	27	B

Source: Regional Arterials were identified in the SANDAG Pathways for the Future 2030 San Diego Regional Transportation Plan November 2007, Appendix 7; ADTs volumes are from SANDAG; LOS information determined using the City of San Diego's 1998 Traffic Impact Study Manual. Lanes identified in the Functional Classification Data, Caltrans, District 11.

Table 5.5 I-5 Regional Arterials *North-South Local Collector Roads*

Arterials	From	To	Lanes	ADT (in Thousands)	LOS
Vandegrift Boulevard	N. River Road	Camp Pendleton	4	19	C
N. Torrey Pines Road	Carmel Valley Road	Callan Drive	2	23	C
N. Torrey Pines Road	Callan Drive	Genesee Avenue	4-6	31	E
N. Torrey Pines Road	Genesee Avenue	La Jolla Village Drive	4-6	18	C
La Jolla Shores Drive	N. Torrey Pines Road	Torrey Pines Road	2-3	19	F
Torrey Pines Road	La Jolla Village Drive	La Jolla Parkway	4	24	D
Gilman Drive	La Jolla Village Drive	I-5	4	16	B
Genesee Avenue	Torrey Pines Road	I-5	4	39	F
Genesee Avenue	I-5	Campus Point	4	33	F
Genesee Avenue	Campus Point	La Jolla Village Drive	4	27	E
Genesee Avenue	La Jolla Village Drive	SR 52	4	32	F
Vista Sorrento Parkway	Carmel Mountain Road	Mira Mesa Boulevard	4	16	B
Rancho del Oro Drive	SR 76	SR 78	2	12	F
College Boulevard	Vandegrift Boulevard	SR 76	2-6	48	E
College Boulevard	SR 76	Oceanside Boulevard	2-6	34	F
College Boulevard	Oceanside Boulevard	Thunder Drive	2-6	45	F
College Boulevard	Thunder Drive	Barnard Drive	2-6	28	E
College Boulevard	Barnard Drive	SR 78	2-6	3	A
Melrose Drive	N. Santa Fe Avenue	Oceanside Boulevard	4	21	C
Melrose Drive	Oceanside Boulevard	Live Oak Road	4	30	E
Melrose Drive	Live Oak Road	Sycamore Avenue	4	20	C
Melrose Drive	Sycamore Avenue	Faraday Avennue	4	6	B
Melrose Drive	Faraday Avenue	Rancho Santa Fe Road	4	12	B
Rancho Santa Fe Road	Melrose Drive	Olivenhain Road	4-6	13	B

Source: Regional Arterials were identified in the SANDAG Pathways for the Future 2030 San Diego Regional Transportation Plan November 2007, Appendix 7; ADTs volumes are from SANDAG; LOS information determined using the City of San Diego's 1998 Traffic Impact Study Manual. Lanes identified in the Functional Classification Data, Caltrans, District 11.

Table 5.6 I-5 Regional Arterials *East-West Local Collector Roads*

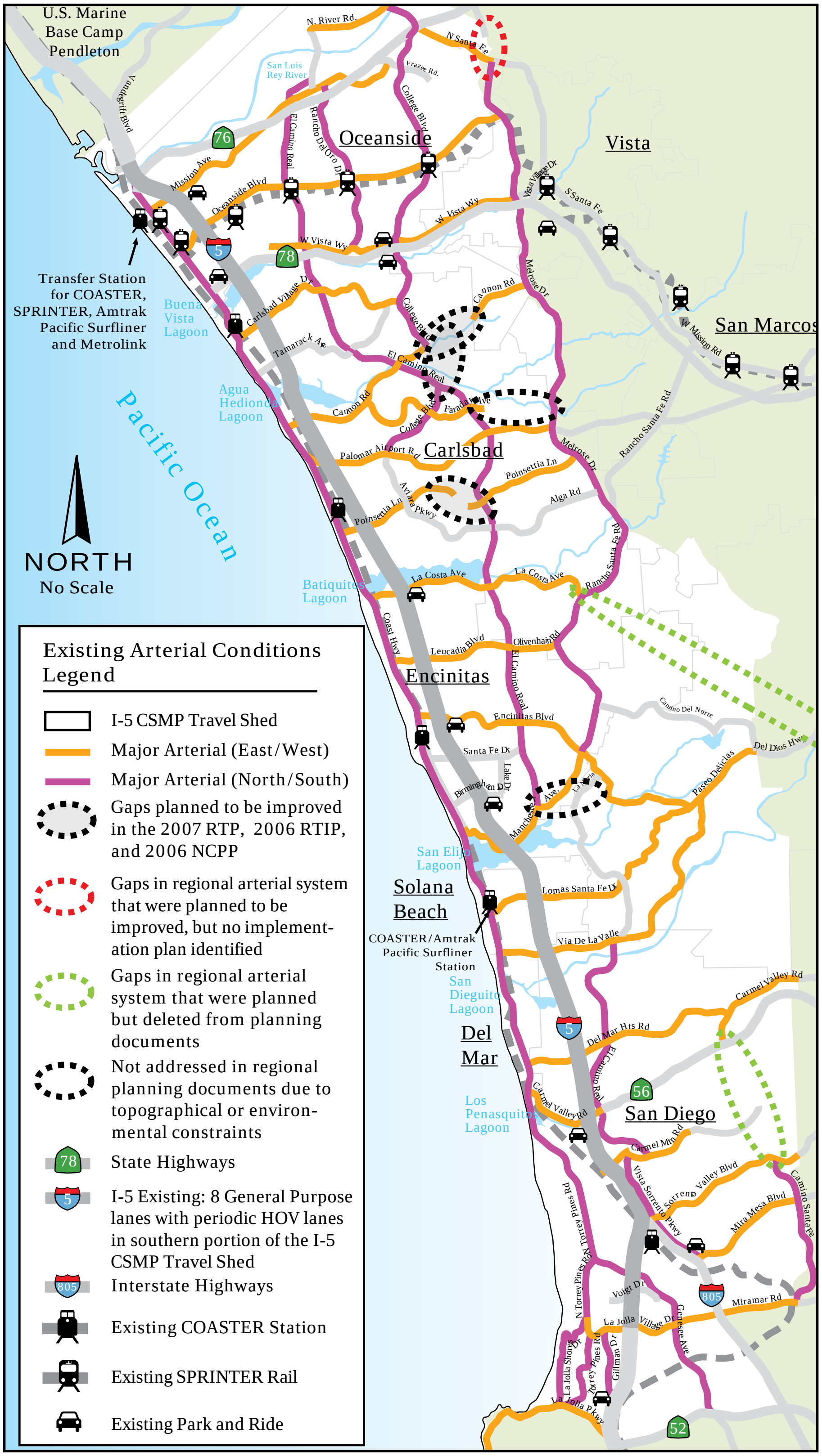
Arterials	From	To	Lanes	ADT (in Thousands)	LOS
North River Road	Douglas Drive	College Drive	4	18	C
North River Road	College Drive	Vandegrift Boulevard	4	30	E
North River Road	Vandergrift Boulevard	SR 76	4	9	A
Mission Avenue	Coast Highway	I-5	4	19	C
Mission Avenue	I-5	Barness Avenue	4	32	F
Mission Avenue	Barness Avenue	El Camino Real	4	23	D
North Santa Fe Avenue	SR 76	Melrose Drive	2	19	F
Oceanside Boulevard	Coast Highway	I-5	2	17	C
Oceanside Boulevard	I-5	Crouch Street	4	31	F
Oceanside Boulevard	Crouch Street	Melrose Drive	4	27	D
West Vista Way	Coast Highway	Rancho Del Oro Drive	4	20	C
West Vista Way	Rancho Del Oro Drive	College Boulevard	4	13	B
West Vista Way	College Boulevard	Thunder Drive	4	27	D
Carlsbad Village Drive	Carlsbad Boulevard	Jefferson Street	4	16	B
Carlsbad Village Drive	Jefferson Street	Harding Street	4	24	D
Carlsbad Village Drive	Harding Street	I-5	4	34	F
Carlsbad Village Drive	I-5	Monroe Street	4	19	C
Carlsbad Village Drive	Monroe Street	College Boulevard	4	10	A
Cannon Road	Carlsbad Boulevard	I-5	2	10	C
Cannon Road	I-5	Legoland Drive	4	25	D
Cannon Road	Legoland Drive	College Boulevard	4	16	B
Faraday Road	Cannon Road	Camino Hills Drive	2	8	B
Faraday Road	Camino Hills Drive	El Camino Real	4	14	B
Faraday Road	El Camino Real	Orion Street	4	6	A
Palomar Airport Road	Carlsbad Boulevard	Avenida Encinitas	6	12	A
Palomar Airport Road	Avenida Encinas	I-5	6	27	C
Palomar Airport Road	I-5	College Boulevard	6	50	E
Palomar Airport Road	College Boulevard	Camino Vida Roble	6	39	C
Palomar Airport Road	Camino Vida Roble	El Camino Real	6	31	B
Palomar Airport Road	El Camino Real	Melrose Drive	6	50	E
Poinsettia Lane	Carlsbad Avenue	Avenida Encinas	2	7	E
Poinsettia Lane	Avenida Encinas	I-5	4	22	D
Poinsettia Lane	I-5	Batiquitos Drive	4	27	D
Poinsettia Lane	Batiquitos Drive	Aviara Parkway	4	19	C
Poinsettia Lane	Aviara Parkway	Melrose Drive	4	4	B

Table 5.6 I-5 Regional Arterials *East-West Local Collector Roads (continued)*

Arterials	From	To	Lanes	ADT (in Thousands)	LOS
La Costa Avenue	Coast Highway	I-5	2-4	10	E
La Costa Avenue	I-5	El Camino Real	4	30	E
La Costa Avenue	El Camino Real	Rancho Santa Fe	4	14	E
Leucadia Boulevard	Coast Highway	Orpheus Avenue	2	15	F
Leucadia Boulevard	Orpheus Avenue	El Camino Real	4	32	E
Olivenhain Road	El Camino Real	Rancho Santa Fe Road	3-6	39	C
Encinitas Boulevard	Coast Highway	I-5	4	21	C
Encinitas Boulevard	I-5	El Camino Real	4	36	E
Encinitas Boulevard	El Camino Real	Rancho Santa Fe Road	4	26	D
Manchester Avenue	San Elijo Avenue	I-5	2	78	F
Manchester Avenue	I-5	El Camino Real	4	26	D
Lomas Santa Fe Avenue	Coast Highway	Solana hills Drive	4	16	B
Lomas Santa Fe Avenue	Solana Hills Drive	Marina View	4	30	E
Lomas Santa Fe Avenue	Marina View	Highland Road	4	11	A
Paseo Delicias	Camino del Norte	Via de la Valle	2		
Via de la Valle	Coast Highway	Paseo Delicias	2-4	18	E
Del mar Heights Road	I-5	Carmel Valley Road	4	17	C
Carmel Valley Road	N. Torrey Pines Road	El Camino Real	2	20	F
Carmel Mountain Road	Sorrento Valley Road	El Camino Real	4-6	20	B
Sorrento Valley Boulevard	Sorrento Valley Road	Lopez Canyon Park Road	4	19	C
Mira Mesa Boulevard	I-805	Vista Sorrento Parkway	6	54	C
Mira Mesa Boulevard	Vista Sorrento Parkway	Scranton Road	6	78	F
La Jolla Village Drive	Torrey Pines Road	La Jolla Scenic Drive	4	39	F
La Jolla Village Drive	La Jolla Scenic Drive	Gilman Drive	4	29	E
La Jolla Village Drive	Gilman Drive	Villa La Jolla Drive	4	43	F
La Jolla Village Drive	Villa La Jolla Drive	I-5	4	60	F
La Jolla Village Drive	I-5	Towne Centre Drive	4	43	F
La Jolla Village Drive	Towne Centre Drive	I-805	4	63	E
Miramar Road	I-805	Nobel Drive	6	51	F
La Jolla Parkway	Torrey Pines Road	La Jolla Scenic Drive	4	44	F
La Jolla Parkway	La Jolla Scenic Drive	I-5	4	62	F

Source: Regional Arterials were identified in the SANDAG Pathways for the Future 2030 San Diego Regional Transportation Plan November 2007, Appendix 7; ADTs volumes are from SANDAG; LOS information determined using the City of San Diego's 1998 Traffic Impact Study Manual. Lanes identified in the Functional Classification Data, Caltrans, District 11.

Figure 5.24 Existing Arterial Conditions Gap Map



Source: SANDAG's 2030 San Diego Regional Transportation Plan: Pathways for the Future, November 2007, Technical Appendix A.

convenience. Safety is not included in the measures that establish service levels for arterials.

Six levels of service are defined using the letters A to F. LOS A represents the best operating conditions and LOS F represents the worst. Each LOS represents a range of operating conditions and the driver's perception of those conditions. LOS standards defined by the City of San Diego for its roads were applied to the regional arterial streets in this travel shed as shown in Figure 5.23. Tables 5.4 through 5.7 present the LOS for the arterials in the travel shed.

Gaps

Several regional arterials in the I-5 CSMP corridor have gaps in their roadways. These gaps are typically caused by topographical changes, environmental constraints, and decisions at the local level to discontinue certain routes, such as SA-680 and Carmel Country in the I-5 CSMP travel shed.

More specifically, Figure 5.24 provides the locations where four different types of gaps in the regional arterial system occur. The four gap types are regional arterials that are:

1. Planned to be improved (2030 RTP, 2006 RTIP, and 2006 North County Parkway Plan);
2. Planned, but no implementation plan identified;
3. Were planned but deleted from planning documents; and
4. Not addressed in regional planning documents due to topographical or environmental constraints.

Rail Service System Performance

The 60-mile San Diego Northern Railway (SDNR) serves as the primary railroad supporting intercontinental, intercity, regional, passenger, and freight rail services in San Diego County. Within the travel shed the north-south rail line is owned by the North County Transit District (NCTD), and is part of a larger multijurisdictional Los Angeles-San Diego-San Luis Obispo (LOSSAN) Rail Corridor. The east-west rail line that runs from Oceanside to Escondido is also owned by NCTD. The western portion of this line is within the I-5 CSMP travel shed. The passenger and freight rail services that run on the north-south and east-west rail lines include:

Figure 5.25 Existing Rail Map

Source: Caltrans District 11, NCTD, SANDAG.

- Amtrak Pacific Surfliner;
- Metrolink;
- COASTER;
- SPRINTER; and
- Freight Rail – BNSF.

Track availability and the number of services using a single line are important in the performance of the rail line. All are affected by use of a predominantly single track rail corridor and because the track is publicly owned, priority is normally given to passenger trains. Chapter 2 illustrates the complexity and constraints of this shared use.

Rail operating speeds and reliability are limited by the single track within the I-5 CSMP travel shed.

Figure 5.25 shows where the current north-south rail line is single tracked and where it has a passing track (approximately 47 percent has a passing track).

In addition to track availability and the number of services using a single rail line, passenger rail performance is measured by:

- Number of service runs;
- Travel time;
- On-time performance (OTP);
- Headways;
- Number of stops;
- Passenger counts; and
- Farebox recovery rate (proportion of revenue generated through fares to the cost of operating expenses).

Amtrak Passenger Rail

Amtrak's Pacific Surfliner provides intercity passenger rail service from San Diego to Los Angeles to San Luis Obispo on the LOSSAN Rail Corridor, using the San Diego Northern Railway line within the travel shed. The Pacific Surfliner also stops at the Old Town Station south of the I-5 CSMP travel shed on a limited basis.

- Number of Service Runs: Amtrak operates 22 Pacific Surfliner runs on weekdays, mainly on five-car train sets.
- Travel Time: The average travel time is 2 hours and 45 minutes from downtown San Diego to Union Station in Los Angeles.
- On-time Performance (OTP): OTP on the Pacific Surfliner route averaged 84 percent from October 2008 to September 2009.
- Headways: Trains operate on 60 to 90 minute headways on weekdays, serving

three stations along the San Diego Northern segment: downtown San Diego, Solana Beach, and Oceanside, the last two of which are in the travel shed.

- Number of Stops: Two in the travel shed.
- Passenger Counts: Approximately 5,000 daily for the travel shed.
- Farebox recovery ratio: TBD.

Metrolink Passenger Rail

The Southern California Regional Rail Authority (SCRRA) operates the Metrolink commuter rail service on the San Diego Northern from Oceanside to Los Angeles and San Bernardino via Orange County. The Orange County line runs from Oceanside to Los Angeles Union Station. The Inland Empire-Orange County Line runs from Oceanside to the Inland Empire. These lines also connect to four other Los Angeles County lines: the 91, Ventura County, Antelope County, and Riverside.

- Number of Service Runs: 10 for the Orange County Line and 6 for the Inland Empire's North and Southbound Runs.
- Travel Time: 2 hours from the Oceanside Transit Center to Union Station in LA, and 2 hours and 25 minutes for the Oceanside to San Bernardino line.
- On-time Performance: During 2006, the Orange County line arrived on-time at the stations 91 to 98 percent of the time.
- Headways: For the Orange County line there are 60-minute headways and the typical headways for the Inland Empire Line-Orange County Line are 30 minutes.
- Number of Stops: 1 in the travel shed for both Metrolink lines.
- Passenger Counts: 1,450 daily at Oceanside Transit Center.
- Farebox recovery rate: TBD.

COASTER Passenger Rail

The COASTER provides north-south passenger rail services between Oceanside and downtown San Diego.

- Number of Available Service Runs: 22 to 26 North and Southbound runs.
- Travel Time: 57 minutes between Oceanside and downtown San Diego.
- On-time Performance: During 2006, the COASTER arrived on-time at the stations 81 to 98 percent of the time.
- Headways: 30-45 minute headways during a.m. and p.m. peak periods with less frequent service mid-day. There is no service after 8:00 p.m. most evenings, except weekends and special events.

- Number of Stops: 6 stops in the travel shed.
- Passenger Counts: 1.5 million riders annually.
- Farebox recovery ratio: The COASTER from July 2007 to July 2008 had a recovery ratio of 39.2 percent.

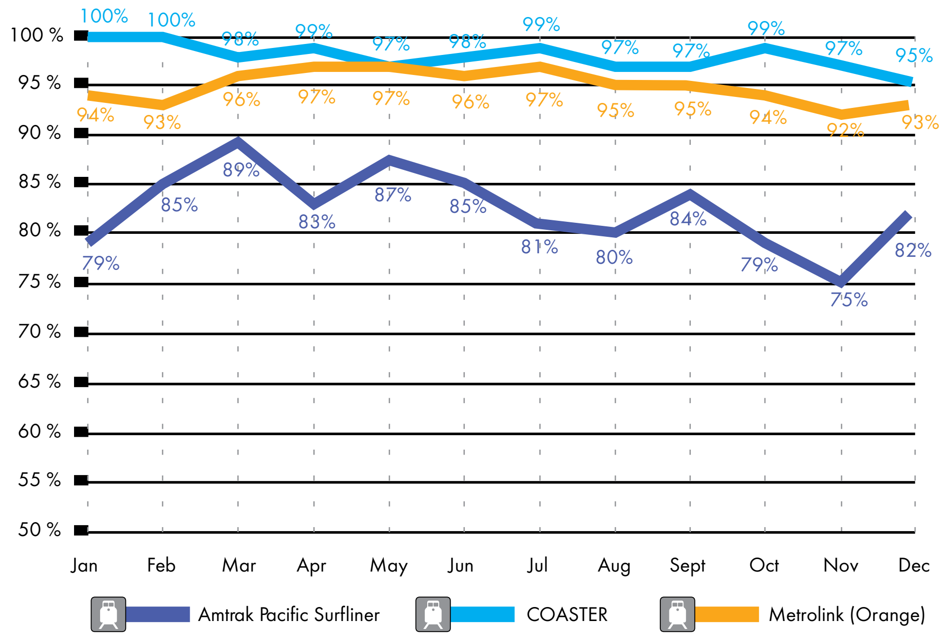
Parking at the COASTER stations also affects the ability of passengers to use a given facility. According to the Seamless Door to Door Travel: Smart Transit Parking Pilot Project, there are over 350 parking spaces for passengers riding the COASTER at each station, with the exception of the Solana Beach and Encinitas COASTER stations which have approximately 290 parking spaces each and Sorrento Valley which has minimal parking (shuttle buses to/from employment centers). On average, these station parking lots are at or exceed capacity by 8:00 a.m., with the exception of the Oceanside station parking lot which generally averages 70 percent of its capacity.

SPRINTER

The SPRINTER is the east-west service in the travel shed and is also operated by NCTD. Within the travel shed it has seven stops, six in Oceanside and one in Vista. It runs from the Oceanside Transit Center to the Escondido Transit Center. More units can be linked together in order to provide additional capacity as demand increases over time and for special events. Due to the recent opening of this service, other performance measures such as on-time arrivals, safety, and parking availability are not yet available.

- Number of Service Runs: 20 in two unit sets.
- Travel Time: 57 minutes for a complete run.
- On-time Performance: Data not available at this time.
- Headways: 30 minutes.
- Number of Stops: 7 stops in the travel shed.
- Passenger Counts: Annual numbers are not yet available as the service has not operated a full year. Current daily average is approximately 8,000 riders.
- The farebox recovery ratio: The SPRINTER's farebox recovery ratio was 10.7 percent for three months of Fiscal Year 2008.

Figure 5.26 On-Time Performance LOSSAN Rail



Source: SANDAG, 2010.

Table 5.7 Regional Commuter and Intercity Rail Service Performance

Train	Rail Route	Runs	Stops[a]	Headways	Travel Time	Ridership
COASTER	Oceanside to Downtown San Diego	22-26	6	30 minutes	57 minutes	1.5 million
SPRINTER	Oceanside to Escondido	20	7	30 minutes	53 minutes	TBD
Amtrak Pacific Surfliner	Downtown San Diego to Los Angelis	22-24	3	60-90 minutes	2 hours 45 minutes	2.5 million
Metrolink	Orange County Line: Oceanside to Los Angelis	22	1	60 minutes	2 hours	113,904[b]
Metrolink	Inland Empire Orange County Line: Oceanside to San Bernardino	24	1	30 minutes to 5 hours	2 hours 25 minutes	113,904[b]

Source: California State Rail Plan 2005-2006 to 2015-2016; Metrolink March 2006; Metrolink web site.

[a] Stops in the SDNCC travel shed.

[b] Total ridership for both lines.

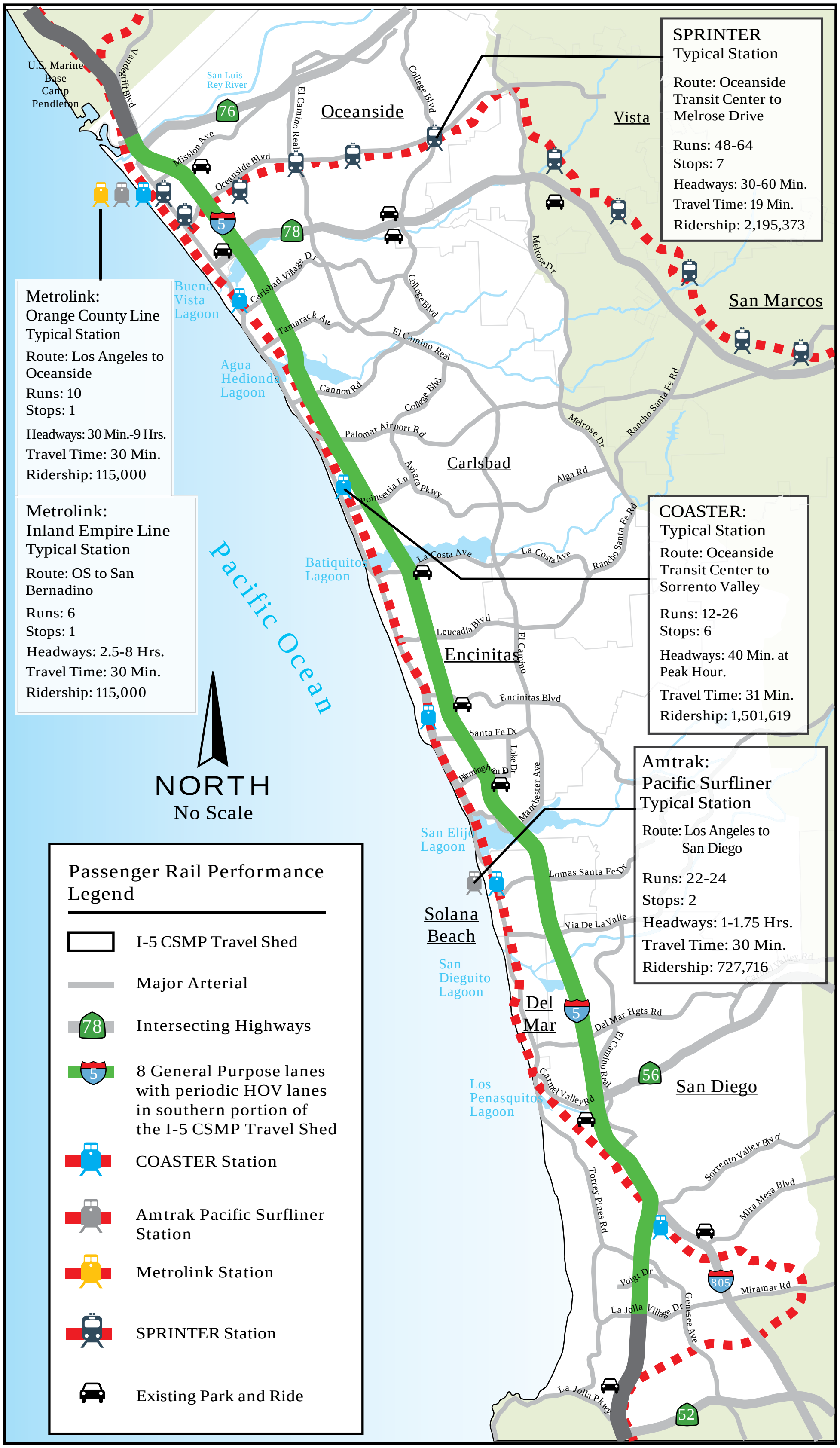
Table 5.8 Current Passenger Rail Parking Capacity

Station	Rail Services[a]	Number of Parking Spaces	Daily Occupancy Rates
LOSSAN Corridor in Travel Shed			
Sorrento Valley	C	N/A	N/A
Solana Beach	C, A	249	96%
Encinitas	C	220	100%
Carlsbad Poinsettia	C	316	96%
Carlsbad Village	C	265	96%
Oceanside Transit Center	C, S, M, A	625	69%
SPRINTER			
Oceanside Transit Center	C, S, M, A	625	69%
Coast Highway	S	72	N/A
Crouch Street	S	94	N/A
El Camino Real	S	119	N/A
Rancho Del Oro	S	80	N/A
College Boulevard	S	138	N/A
Melrose Drive	S	214	N/A

Source: COASTER Parking: SANDAG North County COASTER Station Access Study Part 1: Parking Demand Forecast July 2002; SPRINTER: Bruce Smith, Chief Rail Engineer, NCTD, July 19,2008.

[a] Rail Services abbreviated as follows: C for COASTER, S for SPRINTER, M for Metrolink, and A for Amtrak Pacific Surfliner.

Figure 5.27 Passenger Rail Performance



Source: 2006 Rand Mc Nally - The Thomas Guide.

Freight Rail

The Burlington Northern and Santa Fe (BNSF) Railway provides off-peak freight rail service from the Port of San Diego to the Los Angeles area ports and trucking services during midday and evening operating windows. During a 24-hour operating day, it moves bulk goods and automobiles from the region's two marine terminals. Freight rail service performance in the LOSSAN Corridor is constrained by the off-peak operating windows and the shared-use agreement giving passenger rail trains track priority over BNSF railway trains.

For LOSSAN freight rail services, the performance measures are:

- Number of Train Runs: 4.
- Throughput (Number of Carloads): 35,000.
- Train Length: 4,400 feet during the day.
- Service Hours: Midday and evening hours.
- Average Train Speed: 20 mph.

The following Figures and Tables summarize some of this information:

- Figure 5.26: On-Time Performance of the LOSSAN Corridor. This figure provides a month by month comparison of the percentage of time that Amtrak, the COASTER, and Metrolink were on time in 2006.
- Table 5.7: Regional and Intercity Passenger Rail Services Performance.
- Table 5.8: Current Passenger Rail Parking Capacity.
- Figure 5.27: Passenger Rail Performance Map.

Bus, Vanpools, and Carpools System Performance

Bus System Performance

Bus service in the I-5 CSMP is provided by public agencies and private services. Public bus service is run by NCTD in the northern part of the travel shed and by MTS in the southern part. Local service is mostly limited to routes along regional arterials and a few circulator routes in higher density neighborhoods and employment centers. Private services such as Greyhound, airport shuttle buses, and tourist buses to Mexico also serve demand in the travel shed.

Peak period congestion on I-5 discourages use of bus services. This has led to the cancellation of some public bus services, such as the commuter express bus.

Table 5.9 Current Park and Ride Lots for Car and Vanpools

Location	Number of Parking Spaces	Daily Occupancy Rate
City of Oceanside		
NW corner of SR 78 and I-5	130	100%
SE corner of Mission Avenue and I-5	43	85%
NW corner of College Boulevard and SR 78	32	88%
SW corner of College Boulevard and SR 78	50	60%
City of Carlsbad		
SE corner of La Costa Avenue and I-5	115	83%
City of Encinitas		
SE corner of Birmingham Drive and I-5	56	50%
SE corner of Encinitas Boulevard and I-5	27	50%
City of Solana Beach		
SW corner of Carmel Valley Road and I-5	50	60%
City of San Diego		
NE corner of Mira Mesa Boulevard and I-805	53	100%

Source: Caltrans, District 11.

Both private and public bus system performance and ridership are tied to the performance on I-5 and the regional arterials. If these roadways are congested, it discourages use of bus services, particularly as an alternative to the automobile. The impact of I-5's performance has influenced cancellation of some public bus services, such as commuter express bus.

Information on the bus system in the I-5 CSMP travel shed is contained in Chapter 2, as well as a discussion about bus routes and the activity centers they are connected to in Chapter 4. For bus services the performance measures are:

- Headway: Generally 30 minutes for peak-periods with some buses having 15 minute headways.
- Farebox Recovery: 19.6 percent for NTCD and 29.8 percent for MTS.

Vanpool and Carpool Systems Performance

The performance of vanpools and carpools in the I-5 CSMP travel shed, much like bus performance, is directly tied to the performance of I-5 and the arterial roadway system. Because these services experience the same traffic congestion as single occupancy vehicles, there may be limited benefit to using them.

There are several Park and Ride lots throughout the travel shed which provide parking spaces for vanpool and carpool users. Table 5.9 shows the number of spaces for each Park and Ride lot and the occupancy rates for those lots. Many Park and Ride lots have reached or are close to reaching full capacity.

Bicycle and Pedestrian Performance

The number of users traveling on the bicycle and pedestrian system is not available; therefore, bicycle and pedestrian performance is measured by route gaps and route connections between cities. A map showing the gaps in the current bicycle and pedestrian system is provided in Chapter 2, Figure 2.12.

Chapter:

6

A Regional Process to Create a Corridor Plan

Overview

Regional Policies and Performance Measures for the Future Transportation System

Constraints and Opportunities

- Constraints
- Opportunities

History

Improvement Scenarios

- No-Build
- Highway Emphasis
- Mobility Enhanced
- Transit Emphasis

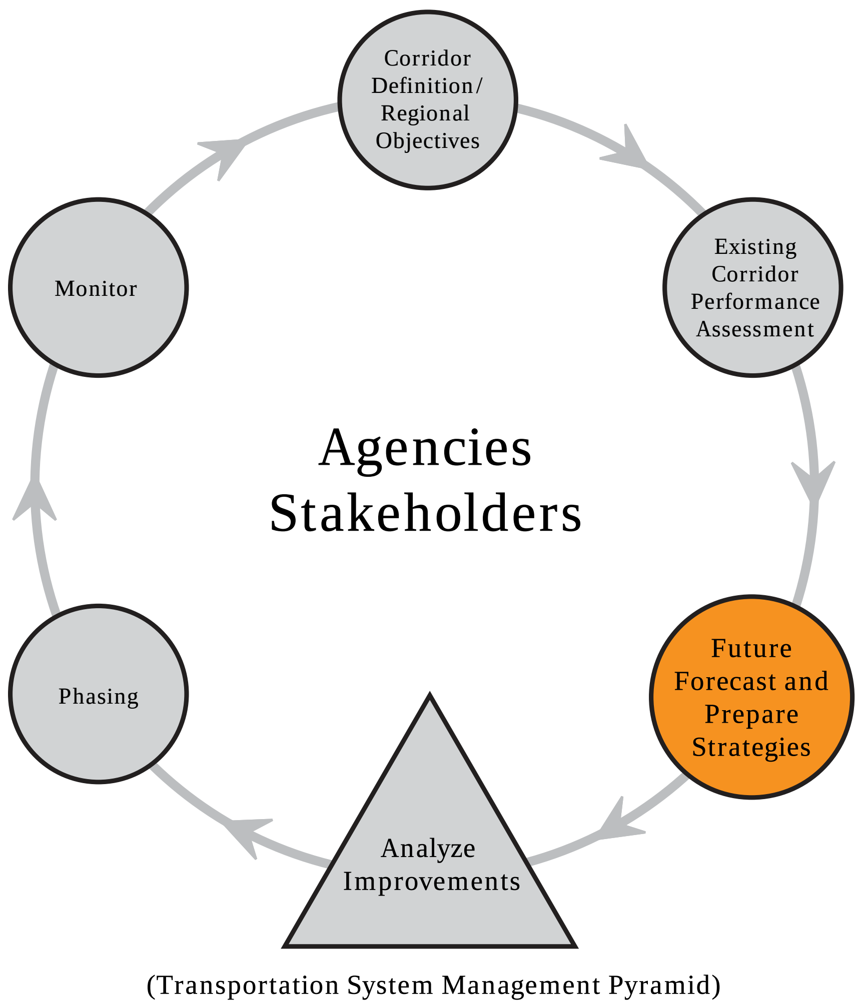
Scenario Evaluation

Overview

Building on the corridor definition and existing performance assessment in Chapters 2 through 5, this chapter provides a review of regional policies and performance measures for the future transportation system, a forecast of future conditions, identifies corridor improvement scenarios, and evaluates the scenarios against regional goals. Thirteen multimodal improvement scenarios were evaluated. The improvement scenario that best supported regional goals and corridor system management performance was identified through this process with each transportation component detailed in Chapter 7: A Multimodal Future. It is also included in the Draft Environmental Impact Report being prepared for the I-5 North Coast Corridor Project.

This chapter fulfills the third and fourth steps in the CSMP process illustrated in Figure 6.1.

Figure 6.1 The Corridor System Management Plan Process Diagram



Regional Policies and Performance Measures for the Future Transportation System

Improvement scenarios were evaluated based on their ability to support the current seven regional transportation goals in the 2030 Regional Transportation Plan: Pathways for the Future.

Since the I-5 CSMP corridor is essential to the regional transportation system, the 2030 Regional Transportation Plan (RTP) provided the goals, policies, objectives, and performance measures against which improvement scenarios were identified and evaluated.

As shown in the timeline in Chapter 1 (Figure 1.3), the regional policies and performance measures were developed through a continual process of stakeholder involvement, including a RTP update every four years. The following measures were used as the evaluation criteria for the improvement scenarios:

Sustainability

- Avoids natural resource impacts.
- Discourages sprawl.
- Improves air quality and reduces greenhouse gas emissions.
- Improves water quality and lagoons.
- Maximizes people throughput.

Livability

- Limits right-of-way impacts.
- Connects communities.
- Reduces noise.
- Provides coastal access.

Mobility

- Supports goods movement.
- Decreases travel times.
- Provides modal options.
- Is supported by land use.

Efficiency

- Manages traffic congestion.
- Has available resources/funding.
- Provides good value (throughput per $).

Equity

- Serves various demographic groups.
- Serves various user groups.

Accessibility

- Encourages high-occupancy vehicle (HOV) ridership.
- Encourages transit ridership.
- Supports regional network of managed lanes.

Reliability

- Provides consistency in travel times.
- Provides travel options.
- Informs travelers.

Constraints and Opportunities

The CSMP analysis approach is based on the premise that well planned investments throughout the system yield significant improvements in systemwide performance, including mobility, safety, productivity, accessibility, and reliability.

The following summarizes some of the key observations, constraints, and opportunities from the forecast of future conditions, performance assessment, corridor definition, and transportation system gaps in the I-5 CSMP travel shed. These help form the basis for the improvement scenarios.

Constraints

- Without improvements, the I-5 freeway's future performance will degrade to more than 15 hours of congestion a day in 2030, with free flow conditions only occurring in the middle of the night, which will constrain the region from meeting travel demands for local, regional, and interregional trips.
- Highway performance is currently constrained by the lack of a supporting north-south arterial street system.
- I-5 is constrained by natural features such as lagoons and river valley systems.
- Gaps in the system and congestion constrain the regional arterial roadway system's ability to facilitate regional as well as local trips of all transportation modes.
- Farebox recovery rates constrain the operational budgets of transit services.
- The ability to change the land use development pattern in this travel shed is

constrained because most of the available land has already been permitted to developers for master planned communities.

- Because of the variety and intensity of customer demands on this system, an improvement strategy that addresses only one travel mode will be unable to meet future demand.

Opportunities

- There is an opportunity to improve transportation performance and connectivity by expanding options for local trips via system improvements to passenger rail, regional arterial roadways, bus routes, and pedestrian and biking routes.
- There is an opportunity for targeted highway improvements to address specific highway bottlenecks and result in reduced congestion and better performance.
- There is an opportunity to improve travel time reliability and better meet users' expectations by reducing nonrecurring congestion through improved incident management.
- The investment in an intelligent transportation system (ITS) detection and monitoring system on I-5 creates an opportunity for accurate performance assessment.
- There is an opportunity to improve both passenger and freight rail services by providing a second track.
- With the addition of the COASTER and SPRINTER passenger rail services in the travel shed, there is an opportunity to implement Smart Growth measures and policies.
- Improving modal options to access recreational areas and job centers will continue to be an opportunity to positively affect local, regional, and interregional trip patterns.
- Since HOV ridership increases significantly during the weekend, there is an opportunity to develop improvements that help the highway respond to changing customer demand between weekdays and weekends.

History

As discussed in Chapter 1, the specific improvement scenarios for the I-5 CSMP corridor were developed as part of multiple efforts over two decades with significant stakeholder input. Even though some improvement options were previously evaluated and deemed not viable, they were re-examined during this CSMP process to determine their ability to support the regional goals for the transportation system. This re-evaluation of previously considered improvement scenarios was done to acknowledge that regional paradigms have shifted regarding transit, highway expansion, and Smart Growth initiatives. Because paradigms have changed, this evaluation tested whether these scenarios may be more effective now compared to when they were originally considered.

In the early 1990s, an operational study for the North Coast portion of I-5 examined deficiencies in its operations and suggested that it be improved to meet future demand. Building on the study, the North Coast Transportation Study (a Federal Major Investment Study between 1997 and 2000) evaluated the appropriate set of modal solutions in the travel shed. The North Coast Transportation Study addressed existing and future deficiencies of I-5, transit, rail, and arterial systems. Ultimately, it recommended a multimodal program of improvements to meet the short and long-term transportation needs of this travel shed.

Between 2000 and 2002, in response to the North Coast Transportation Study, SANDAG conducted a regional study of HOV and Managed Lanes options. It formally adopted a Managed Lane System and Bus Rapid Transit (BRT) Program for the region in its MOBILITY 2030. Shortly thereafter, an Environmental Study was initiated for Managed Lanes on I-5.

In late 2006, voters in San Diego approved TransNet 2, a 40-year extension of the one-half-cent sales tax to provide funding towards managed lanes and other regional transportation improvements. One year later voters passed the State of California's Proposition 1B to provide additional funds for transportation projects throughout the State. In that same year, SANDAG released the I-5 managed lanes Value Pricing Study which confirmed the feasibility of value pricing managed lanes. In 2007, SANDAG reconfirmed its commitment to a regional system of managed lanes. Additionally, a Tier 1 environmental document was completed that included alternatives, scopes, and costs for increasing the capacity of the LOSSAN corridor from San Diego to Orange County. Additionally, in 2007, Caltrans worked with each local agency in the corridor to identify Community Enhancement opportunities that could be constructed in the corridor as part of the transportation improvements.

Improvement Scenarios

Improvement scenario identification and analyses were performed under the context of the transportation management pyramid in Figure 1.1 and to acknowledge that regional paradigms have shifted.

These improvements included:

- Highway improvements to test the ability of General Purpose Lanes to increase capacity;
- Highway improvements to test the ability of managed lanes and HOV lanes to support a variety of regional goals;
- Transit improvements to provide a connected network of convenient and reliable travel options;
- Arterial street improvements to facilitate local travel, bus transit, and highway access;
- Pedestrian and bicycling system improvements to connect routes where they intersect to I-5, and that lead to the coast, and transit and activity centers;
- Technology to maximize the capacity of existing facilities by managing traffic flow, informing travelers, and monitoring system performance;
- Operational improvements to maximize the capacity of existing facilities; and
- Community and natural resource enhancements that respect the uniqueness of each of the communities that comprise the I-5 CSMP travel shed.

The CSMP evaluation process acknowledged that only through a balanced combination of multimodal improvements will regional goals and future demand be met.

From these broad categories, the preceding studies, existing and future performance assessments, and the transportation management pyramid, a range of transportation improvement scenarios were derived. Each scenario included a common set of improvements. These common improvements included:

- Double tracking of rail lines from Oceanside to central San Diego;
- Twenty-minute peak-period headways for commuter rail service;
- Commuter rail service extended through midday hours;
- MTS Trolley Mid-Coast Extension of service from Old Town to University City;
- SuperLoop BRT service in University Community;
- Enhanced bus service on El Camino Real;
- Additional Park and Ride facilities;
- Bicycle and pedestrian routes connecting across highways;
- Implementation of transportation demand management (TDM) strategies resulting in a five percent reduction in traffic; and
- HOV extension from Via de la Valle to Manchester Avenue and improvements to Lomas Santa Fe interchange.

The evaluation process paired each scenario with the consistent set of multimodal improvements. These pairings were then placed on a continuum starting from the "No-build" option, and progressing to options that emphasized the highway, enhanced mobility and emphasized transit. Each pairing of multimodal improvements and scenario was then evaluated in terms of how it could support regional goals. It was especially important in the I-5 CSMP travel shed to make sure that any scenario chosen supports not only the corridor but also the region, because the I-5 CSMP corridor is one of only two options in the region for north south regional traffic.

No-Build

This scenario assumes only the common set of improvements and no additional highway or multimodal improvements. It leaves the highway in its current configuration of eight general purpose lanes (four in each direction), separated by a median with intermittent HOV and auxiliary lanes.

Highway Emphasis

In addition to the common set of improvements, these two highway improvements scenarios relied on additional general-purpose lanes to address forecasted travel demand. The variations include:

- Highway Emphasis: Add eight general purpose lanes and zero HOV lanes; and
- Highway Expansion: Add two general purpose lanes and zero HOV lanes.

Mobility Enhanced

The mobility-based scenarios focused on multimodal options such as HOV and managed lanes. The addition of HOV lanes represented the means to encourage carpooling, while managed lanes represented both a way to encourage carpooling and creating resources that are more flexible. All managed lanes scenarios would be compatible with any future Bus Rapid Transit the region proposes for the North Coast Corridor. The variations considered in this category are:

- Elevated Highway Version 1: Add four general purpose lanes on an elevated structure and two HOV lanes at grade;
- Elevated Highway Version 2: Add two general purpose lanes at grade, add four General Purpose Lanes on an elevated structure, and add two HOV lanes at grade;
- HOV 1: Add two general purpose lanes and two HOV lanes;
- HOV 2: Add four general purpose lanes and two HOV lanes;

- HOV 3: Add two HOV lanes;
- Managed Lanes 1: Managed lanes with a moveable barrier – add three managed lanes or four managed lanes;
- Managed Lanes 2 (10+4): Add two general purpose lanes and four managed lanes; and
- Managed Lanes 3 (8 GP + 4 ML): Add four managed lanes.

Transit Emphasis

The transit emphasis scenarios evaluated two variations of improving the highway right-of-way for transit services. These improvements are:

- Transit Emphasis: Add two BRT Lanes via transit-only lanes and additional transit improvements.
- Transit Rail on Highway: Add elevated monorail or other existing right-of-way expansion to accommodate passenger rail services.

Scenario Evaluation

To create both a balanced transportation system that meets regional goals and to prepare a management plan for maximizing system investments, an Analysis Sheet was created for the comparative evaluation of improvement scenarios. Figure 6.2 provides the comprehensive analysis showing the improvements and how they supported regional goals. The comparative Analysis Sheet is organized into three primary categories:

- Thirteen improvement scenarios are shown at the top of the page;
- Seven regional goals are shown along the left-hand side of the page; and
- The Bottom Line score is shown along the bottom of the page providing the cumulative totals for how each scenario supported regional goals (supported, yielded no net change, or did not support regional goals).

A summary regarding each improvement scenario's ability to support regional goals follows. This comparative evaluation underscores that the I-5 CSMP travel shed has an important role in the overall regional transportation system in helping the region meet SANDAG's transportation goals. It also supports the conclusion of the earlier North Coast Transportation Study and RTPs that only through a combination of improvements will future transportation demand and regional goals be met. Since all of the build-scenarios included features to improve water quality, inform travelers, and improve coastal access through increased bike and pedestrian facilities, these goals did not significantly effect the evaluation of the scenarios.

A group of scenarios that evaluated elevating the highway or transit were also considered to reduce right-of-way needs. These alternatives did not compare as well as the at-grade solution for the same mode, typically because of the added cost of structures, value, and noise impacts. In addition, although not a specific regional system goal, the elevated scenarios would have a significant visual impact from a coastal context

Alternatives that focused on expansion of the general purpose lanes (GP) performed reasonably well on the mobility related goals such as decreasing travel time, supporting goods movement, and maximizing vehicle throughput. However, it is anticipated that the 10 GP scenario would provide some short term congestion relief, but it would likely return as regional growth and latent demand utilized the new capacity. It is estimated that it would require doubling the existing capacity (16 GP) to provide adequate capacity for 2030 projected demand. The GP alternatives did poorly in most of the other objectives. Relative to other scenarios, these scenarios did relatively poor in promoting alternative mode use, reducing sprawl, and assisting the region to obtain air quality and greenhouse gas emission objectives.

The HOV scenarios performed better than the GP-based scenarios for the regional goals of providing travel options and increasing carpooling. The HOV scenarios not only provide an incentive for carpools and vanpools, but it would increase available capacity in the GP lanes from shifting into the HOV lanes. However, trip chaining (e.g., daycare or school drop-offs and pickup to and from work) may reduce the feasibility of commuter HOV for potential carpoolers). In the 8 GP + 2 HOV scenario, the HOV lanes would initially be at approximately 75 percent capacity during the weekday peak-hour commutes. During summer and weekend peaks the demand would approach 100 percent capacity. Although the 8 GP + 2 HOV alternative would carry more persons trips than the 10 GP scenario, the 8 GP + 2 HOV scenario does not have the needed capacity to accommodate projected increases in demand.

HOV lanes by themselves do not have the needed capacity to accommodate projected increases in demand on I-5.

An 8 GP + 4 HOV scenario was also evaluated and while this scenario would provide sufficient HOV capacity for the 20-year design life, these lanes would be operating below their capacity for most of their design life.

For the transit emphasis scenarios, the corridor characteristics discussed in Chapters 2, 3, and 4 limit the modal shift from the interstate to the new transit system. Consequently, these scenarios would not serve enough demand to reduce I-5 congestion, accommodate projected future demand, and meet other regional mobility goals. However, these alternatives did perform well in discouraging sprawl and serving various demographic groups.

Managed Lanes and their active traffic management measures are the most supportive solution to meet expected travel demand for the I-5 CSMP travel shed.

The evaluations of the GP, HOV, and transit scenarios point out that each have specific attributes that are good, but by themselves each also has significant limitations. Managed lanes are typically a highway within a highway, where typically two lanes in each direction are separated by a barrier from the GP lanes. These lanes allow real-time operational strategies to be used to manage traffic congestion. They are therefore able to respond quickly to changing conditions by employing three key operational strategies – pricing, vehicle eligibility, and access control. A more detailed discussion of managed lanes is discussed in Chapter 7.

Evaluation of the managed lanes scenario identifies that this option addresses some of the limitations of the other scenarios while maintaining some of their key attributes. First, the combination of managed lanes and congestion pricing provide users with a faster and more reliable travel option. Buses, carpools (HOV+2), motorcycles, and emergency vehicles will have free access to these lanes. Drivers with fewer than two occupants can choose to pay to access the lanes through the region's FasTrak program. FasTrak pricing for the managed lanes will change according to traffic conditions to regulate demand for the lanes and keep them congestion free – even during peak hours. This approach allows excess capacity not being utilized by HOV or transit, to be fully utilized while still providing a travel time incentive to carpools and transit. Consequently, not only does this scenario meet the regional objectives related to improving reliability of travel times and maximizing throughput, it also accomplishes this while providing an incentive for transit and carpool use.

Second, the operations of these lanes can shift to address changes in volume or the characteristics of the demand. This is especially important in the I-5 CSMP corridor where the types of users change through the course of a day, over a typical week, and even throughout the year.

The flexibility provided by the managed lanes can also be used to accommodate goods movement or the expansion of BRT in the corridor. Therefore, when evaluated against key regional objectives, managed lanes provided the best combined performance compared to other evaluated scenarios.

Chapter 7: A Multimodal Future, provides a detailed description of the improvement scenario that best met regional goals.

Figure 6.2 Analysis of Improvement Options and Regional Goals

Improvement Options

Multimodal Consistent Features:

Double tracking of rail lines from Oceanside to central San Diego; 20-minute peak-period headways for commuter rail services; commuter rail service extended through midday hours; MTS Trolley Mid-Coast Extension of service from Old Town to University City; Superloop Bus Rapid Transit (BRT) service from Old Town to University City; enhanced bus service in the El Camino Real corridor; additional Park and Ride facilities; bicycle and pedestrian routes connecting across freeways; and implementation of Transportation Demand Management (TDM) technologies resulting in five percent reduction in traffic. Highway improvements include the Lomas Sante Fe Interchange and HOV extension from Via de la Valle to Manchester Avenue.

Highway Design Variations:	Existing Condition	Highway Emphasis Add 8 GP Add 0 HOV	Highway Expansion Add 2 GP Add 0 HOV	HOV: Elevated Hwy#1 Add 4 GP Add 2 HOV	HOV: Elevated Hwy#2 Add 2&4 GP Add 2 HOV	HOV: Highway Expansion Add 2 GP Add 2 HOV	HOV: Highway Expansion Add 4 GP Add 2 HOV	HOV: Highway Expansion Add 0 GP Add 2 HOV	HwyExpansion Managed Lanes Movable Barrier Add 3ML or 4ML	Highway Expansion Add 0 GP Add 2ML	Highway Expansion Add 4ML	Transit Emphasis	Transit-Rail on Hwy Elevated or at Grade
	EXISTING: 8 GP + 2 Partial HOV	TOTAL 16 GP + 0 HOV	TOTAL 10 GP + 0 HOV	TOTAL 12 GP + 2 HOV	TOTAL 14 GP + 2 HOV	TOTAL 10 GP + 2 HOV	TOTAL 12 GP + 2 HOV	TOTAL 8 GP + 2 HOV	TOTAL 8 GP + 3ML/4ML	TOTAL 10 GP + 4ML	TOTAL 8 GP + 4ML	TOTAL 8 GP + 2 BRT	TOTAL 8 GP
Sources:	Draft EIR/S	2000 - 2003 RTP	2000 North Coast Transportation Study	2000 North Coast Transportation Study	2000 North Coast Transportation Study	2000 North Coast Transportation Study	2000 North Coast Transportation Study	2000 North Coast Transportation Study	2000 North Coast Transportation Study	Draft EIR/S	Draft EIR/S	2003 Regional Transportation Study	LOSSAN
Continuum:	← No Build →	← Highway Emphasis →		← Mobility Emphasis →								← Transit Emphasis →	

Regional Goals

Regional Goals	Existing Condition	Highway Emphasis Add 8 GP Add 0 HOV	Highway Expansion Add 2 GP Add 0 HOV	HOV: Elevated Hwy#1	HOV: Elevated Hwy#2	HOV: Hwy Exp. Add 2 GP Add 2 HOV	HOV: Hwy Exp. Add 4 GP Add 2 HOV	HOV: Hwy Exp. Add 0 GP Add 2 HOV	HwyExpansion Managed Lanes	Hwy Exp. Add 0 GP Add 2ML	Hwy Exp. Add 4ML	Transit Emphasis	Transit-Rail on Hwy
Livability													
Right of Way Impacts	Support	Unsupportive	Limited	Limited	Unsupportive	Unsupportive	Unsupportive	Limited	Unsupportive	Unsupportive	Unsupportive	Limited	Support
Community Connectivity	Unsupportive	Support	Limited	Support	Support	Limited	Support	Unsupportive	Support	Support	Limited	Unsupportive	Unsupportive
Noise	Limited	Unsupportive	Limited	Unsupportive	Unsupportive	Unsupportive	Unsupportive	Limited	Unsupportive	Unsupportive	Unsupportive	Limited	Limited
Coastal Access	Unsupportive	Support	Limited	Support	Support	Support	Support	Limited	Support	Support	Support	Limited	Limited
Mobility													
Supports Goods Movement	Unsupportive	Support	Unsupportive	Support	Support	Limited	Limited	Limited	Support	Support	Support	Unsupportive	Unsupportive
Decreases Travel Times	Unsupportive	Support	Unsupportive	Support	Limited	Limited	Limited	Unsupportive	Limited	Limited	Limited	Unsupportive	Limited
Provides modal options	Unsupportive	Unsupportive	Unsupportive	Limited	Limited	Limited	Limited	Limited	Limited	Support	Support	Limited	Support
Does Land Use support alternative	Unsupportive	Support	Limited	Limited	Limited	Limited	Limited	Limited	Limited	Support	Support	Unsupportive	Unsupportive
Efficiency													
Does it Manage Congestion	Unsupportive	Unsupportive	Unsupportive	Unsupportive	Unsupportive	Unsupportive	Unsupportive	Unsupportive	Limited	Support	Support	Limited	Limited
Resource Availability	Support	Unsupportive	Support	Unsupportive	Unsupportive	Limited	Unsupportive	Support	Unsupportive	Unsupportive	Limited	Support	Limited
Value = Throughput/$	Unsupportive	Unsupportive	Unsupportive	Unsupportive	Unsupportive	Limited	Limited	Limited	Limited	Support	Support	Limited	Limited
Equity													
Serves various demographic groups	Unsupportive	Unsupportive	Unsupportive	Limited	Limited	Limited	Limited	Limited	Limited	Support	Support	Support	Support
Serves various user groups	Unsupportive	Unsupportive	Unsupportive	Limited	Limited	Limited	Limited	Limited	Limited	Support	Support	Support	Unsupportive
Accessibility													
HOV Ridership	Unsupportive	Unsupportive	Unsupportive	Limited	Limited	Limited	Limited	Limited	Support	Support	Support	Unsupportive	Unsupportive
Double digit Transit Ridership	Limited	Unsupportive	Limited	Limited	Limited	Limited	Limited	Limited	Limited	Limited	Limited	Limited	Support
Supports regional network of Managed Lanes	Unsupportive	Unsupportive	Limited	Limited	Limited	Limited	Limited	Limited	Support	Support	Support	Unsupportive	Unsupportive
Reliability													
Consistency in travel times	Unsupportive	Support	Unsupportive	Limited	Limited	Limited	Limited	Unsupportive	Support	Support	Support	Support	Support
Provide options	Unsupportive	Unsupportive	Unsupportive	Limited	Limited	Limited	Limited	Limited	Support	Support	Support	Support	Support
Inform Travelers	Unsupportive	Support	Support	Support	Support	Support	Support	Support	Support	Support	Support	Support	Support
Sustainability													
Natural Resource Impacts	Limited	Unsupportive	Support	Limited	Unsupportive	Support	Limited	Support	Support	Limited	Support	Support	Support
Discourage Sprawl	Limited	Unsupportive	Unsupportive	Unsupportive	Unsupportive	Unsupportive	Unsupportive	Limited	Limited	Limited	Limited	Support	Support
Air Quality and Greenhouse gas emissions	Unsupportive	Limited	Unsupportive	Unsupportive	Limited	Unsupportive	Unsupportive	Unsupportive	Limited	Limited	Limited	Unsupportive	Limited
Water Quality and Lagoons	Unsupportive	Support	Support	Support	Support	Support	Support	Support	Support	Support	Support	Support	Support
Maximize Throughput	Unsupportive	Support		Limited	Limited	Limited	Limited	Unsupportive	Limited	Support	Support	Limited	Support

● Support – High Performance ○ Limited – Net Change Neutral ● Unsupportive – Low Performance ▭ Studied in I-5 Draft Environmental Report

Chapter:

7 A Multimodal Future

Overview

Goods Movement

Freeway

Regional Arterials

Transit

Bicycle and pedestrian

Transportation Management System

Overview

As outlined in Chapter 6: A Regional Process to Create a Corridor Plan, improvements were selected based on their ability to support regional goals provided in SANDAG's 2030 RTP. These goals include increasing sustainability, serving a wide array of people, encouraging transit, providing flexibility in the system, and improving how the highway is managed. To achieve these goals, as well as address the variety and intensity of travel demands described in detail in Chapter 4: Customers in the Travel Shed, a variety of improvements are required. This chapter includes discussions for the following improvements:

A variety of transportation challenges and demand requires a variety of improvements.

- Freeway;
- Regional Arterials;
- Transit;
- Bicycle and Pedestrian Improvements;
- Goods Movement; and
- Transportation Management Systems (TMS).

This chapter fulfills the third step in the CSMP process illustrated in Figure 7.1.

Figure 7.1 The Corridor System Management Plan Process Diagram

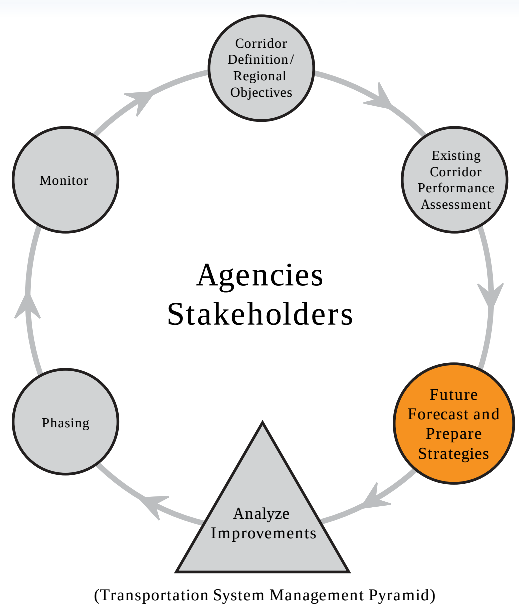
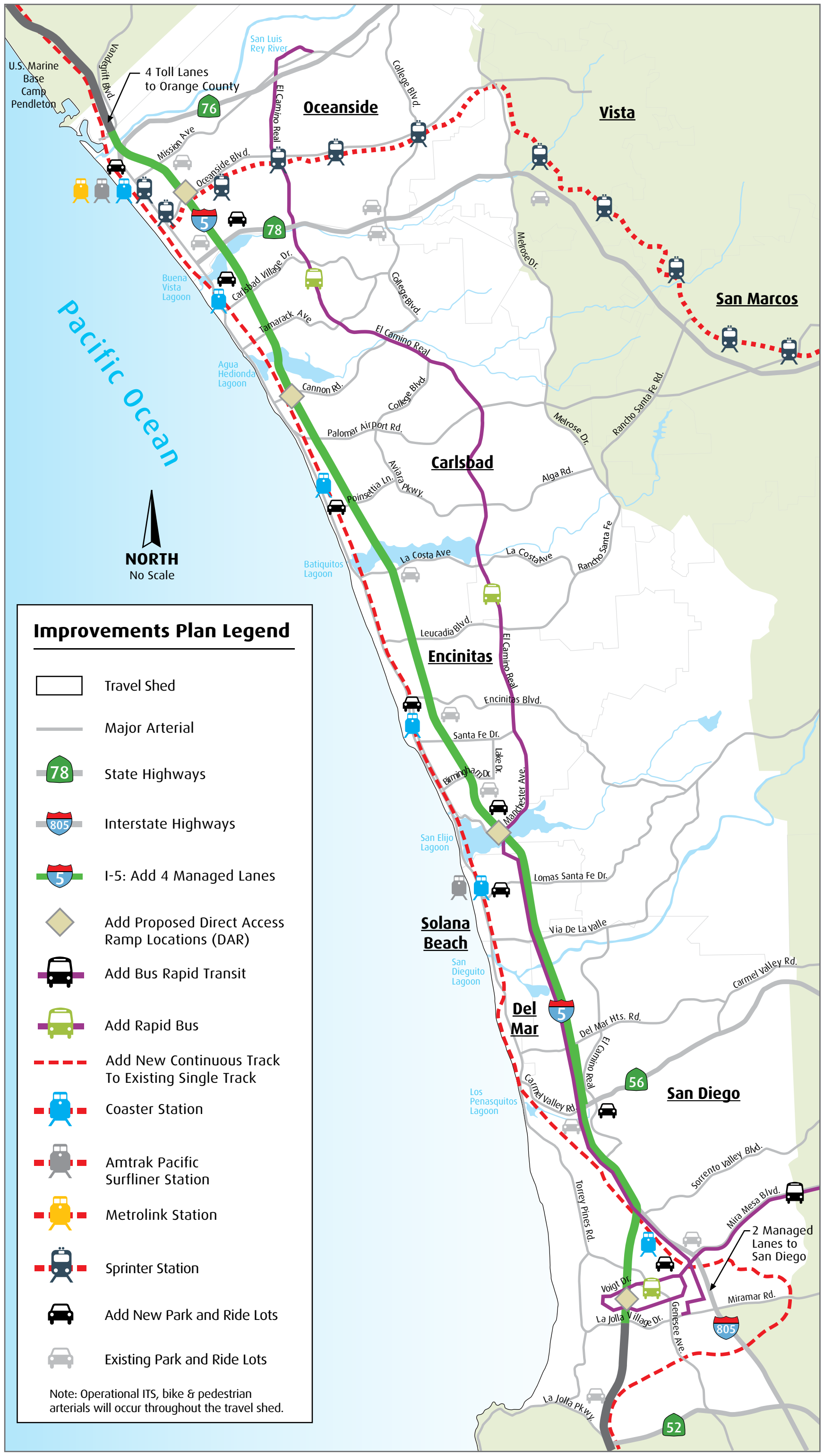


Figure 7.2, the I-5 CSMP Improvements Map, shows many of the key planned/possible improvements in the I-5 CSMP travel shed. Note that many of the corridor arterial, TMS, and bicycle and pedestrian improvements are not shown in this figure but are discussed in their respective sections in this chapter.

This CSMP describes a multimodal transportation system improvement plan, including improvements to the highway, rail, bus, regional arterials, ITS, and bike and pedestrian routes.

Figure 7.2 The I-5 CSMP Improvements Map



Source: Rand McNally: The Thomas Guide, 2006.

Population and Jobs are Growing

The population in San Diego County has increased by more than 100 percent since I-5 was planned and constructed in the 1970s, with the population of the five main cities in the I-5 CSMP travel shed increasing by more than 400 percent. Job growth has followed suit. Since the 1970s, nationally significant industries have been established in Oceanside, Carlsbad, Del Mar, and the Golden Triangle community of the City of San Diego. I-5 was not designed with this population or job growth in mind. Projections estimate that both population and job growth will continue to rise steadily in the I-5 CSMP travel shed which will only exacerbate the existing congestion problems.

As stated previously, the available undeveloped land in the I-5 CSMP travel shed is predominately east of I-5 and most is already permitted as master planned communities. This means there is little opportunity to affect travel demand and behavior within the shed because current development patterns are expected to continue within the master planned communities. As land becomes more scarce within the travel shed, more people will likely commute from further away for employment within the I-5 CSMP travel shed. This means land use outside the I-5 CSMP travel shed will also affect travel patterns within the I-5 CSMP travel shed.

Vehicles Miles Traveled is Growing Faster Than the Population

Not only has the population increased in the region, but the total amount of vehicle miles traveled (VMT) has outpaced the rise in population. While the U.S. population grew by 80 percent over the last 50 years, VMT on state highways throughout the nation grew 400 percent over the same period. The FHWA predicts another 130 percent increase by 2050. In the I-5 CSMP travel shed, VMT is expected to increase by approximately 50 percent over the next 20 years.

Demand Up, Funding Down

Despite the increase in transportation demand, transportation funding has not kept pace. In addition, the purchasing power of the traditional funding sources such as the gasoline tax has decreased over time because of increased fuel efficiency and rising construction costs. In 2007, it was estimated there was an identified need of $531 billion for transportation improvements nationally and only $188 billion of identified funding.

Improvements Must be Balanced with Community Impacts

Transportation improvements must be balanced with community impacts and other quality of life standards, as well as integrated with land use decisions.

Even if funding were fully available, at a regional level, there is agreement that transportation improvements must be balanced with community impacts and other quality of life standards as well as integrated with land use decisions. Further, advanced transportation strategies have evolved allowing transportation resources to be more effectively managed to maximize efficiency and improve reliability.

The I-5 CSMP Travel Shed Contains Several Major Tourist Destinations

The I-5 CSMP travel shed is home to a world renown coastline with more than 2 million visitors a year. Also, several unique special events and facilities are located in the corridor placing unusual demands on the transportation facilities. The San Diego Fairgrounds and the Del Mar Racetrack host a three-week summer fair, followed by a month-long horse racing season, and numerous other special events throughout the year. LegoLand, a major commercial recreation facility in the City of Carlsbad, also hosts special events. In 2006, approximately 32.2 million visitors came to San Diego, which equated to approximately 2 million visitors a month with that amount increasing to 4 million visitors a month during the summer season. Nearly 70 percent of people visiting San Diego do so by car, as it is an attractive destination for nearby residents in southern California, Arizona, and other western states.

A New Vision

After 40 years of growth; changes in travel patterns, surrounding land use, travel demand, and transportation funding availability; the importance of the facility at the local and national levels; and the importance of addressing other aspects of "quality of life" a new vision for the I-5 CSMP travel shed was needed. The new vision must do more than add new pavement; it must maximize the utilization of existing facilities, move people (not vehicles), provide reliable transportation options, improve coastal access, provide flexible foundation for further improvements, and be integrated with land use and activity centers.

To accommodate the additional people and jobs the region expects to absorb in the next 20 years the region developed a 20-year regional transportation plan (RTP). The RTP attempts to find a balance between transit and highway investments that could provide congestion reduction in the urban core and urban fringe, while at the same time providing viable travel choices during peak hours when most of the traffic congestion occurs. The 2030 RTP system focuses on developing a network of fast, flexible, reliable, safe, and convenient transportation services that connect us to the region's major employment and activity centers; and a flexible system of managed lanes which can be dedicated to carpools and vanpools, high-quality regional transit services, and fee-paying patrons wanting reliable travel times. This balanced approach not only reduces congestion but also reduces the demand that solo drivers place on the transportation network by boosting transit ridership and providing travel time incentives to carpools and vanpools.

The new vision for the I-5 CSMP was developed consistent with the RTP, following CSMP guidance and the Transportation System Management pyramid (Figure 1.1), and utilizing the region's Congestion Management System (CMS) Toolbox. The CMS toolbox contains a menu of traditional and innovative congestion mitigation strategies for use by agencies in the region to improve mobility. The purpose of Chapter 7 is to decide, given the unique needs and constraints of the corridor, how these tools and guidance should be used to develop this new vision for the I-5 CSMP travel shed.

The CMS Toolbox contains congestion mitigation strategies within the following categories: transit strategies; land use strategies; travel demand management (TDM); transportation systems management (TSM); and capital strategies.

Even with completion of the managed lanes system and the planned transit improvements, some degree of congestion can still be expected to return in the I-5 CSMP corridor over time. This will occur for several reasons:

- Growth in interregional demand from outside the corridor;
- Continued regional growth within and beyond the 2030 time frame;
- Build out of previously approved land uses and difficulty in achieving public support for increased densities;
- Limited funding, right of way limitations, and environmental concerns in the corridor;
- Limited arterial options in the corridor; and
- Historic land use patterns dictate that vehicles will remain a key component of future travel in the corridor.

Freeway Improvements

The varying mobility and congestion challenges in the corridor also calls for a variety of types of improvements. With respect to the I-5 freeway facility, this includes auxiliary lanes, general purpose (GP) lanes, intrenched improvements, managed lanes, and direct access ramps (DAR). These are described further in this section.

Auxiliary Lanes

Auxilary lanes maximize the carrying capacity of the facility by reducing the turbulence cause by traffic entering and exiting the freeway at interchanges.

The addition of auxiliary lanes maximize the carrying capacity of the facility by reducing the turbulence caused by traffic entering and leaving the freeway at interchanges. This turbulence is especially acute where ramp volumes are high and/or weaving distances are short. As freeway volumes increase, the carrying capacity of the main lanes becomes less stable and can be easily impacted by this turbulence. In the case of the I-5 corridor, entrance and exit volumes are especially heavy because of the high number of short local trips using the freeway due to the limited parallel arterials.

In the I-5 CSMP corridor, the following auxiliary lanes currently exist and will be maintained regardless of which alternative is selected by the I-5 North Coast Corridor Widening Project Report:

- Sorrento Valley Road to Carmel Valley Road;
- Via de la Valle to Lomas Santa Fe;
- Palomar Airport Road to Cannon Road;
- Southbound Mission Avenue to SR 76; and
- SR 76 to Harbor Drive.

In addition, new auxiliary lanes will be added in the following locations:

- La Jolla Village Drive to Genesee Avenue;
- Del Mar Heights Road to Via de la Valle;
- Lomas Santa Fe to Manchester;
- Manchester Avenue to Birmingham Drive;
- Birmingham Drive to Santa Fe Drive;
- Santa Fe Drive to Encinitas Boulevard;
- Encinitas Boulevard to Leucadia Boulevard;
- Leucadia Boulevard to La Costa Avenue;

- La Costa Avenue to Poinsettia Lane;
- Poinsettia Lane to Palomar Airport Road;
- Cannon Road to Tamarack Avenue;
- Carlsbad Village Drive to Las Flores Drive; and
- Northbound Mission Avenue to SR 76.

Figure 7.5 shows an illustration of auxiliary lanes (AUX), with general purpose (GP), managed lanes (ML), and shoulders (SHLD).

Figure 7.5 Illustration of the Corridor with the Incorporation of ML and Auxiliary Lanes

Source: Caltrans District 11.

General Purpose (GP) Lanes

General purpose (GP) lanes are the primary lanes of a freeway that are continuously open to most vehicles at all times, and are not reserved or managed to facilitate carpooling, transit use, or goods movement. GP lane operations do not change in relation to traffic congestion, demand, or time of day. Historically, GP lanes were synonymous with the definition of a freeway: available to anyone, at any time, for any length of trip. Their constraint is they cannot be managed to encourage use of other travel modes or respond to changes in traffic conditions such as increased demand, weather, special events, or incidents.

The resulting traffic pattern for GP lanes is common in most urban and suburban areas. During peak periods, one direction of the highway may be congested, while the other direction may have lanes that are under utilized. Often the result of congestion is longer and less reliable trip times due to the inability to efficiently use the available resources.

The traffic analysis of the I-5 (discussed in more detail in Chapter 8) determined that, even with the addition of auxiliary lanes and managed lanes (discussed later in this section), congestion is anticipated in the existing GP lanes in the 2030 horizon year. Based on FREQ analysis of the projected volumes, the 2030 horizon year travel times in the GP lanes during the northbound afternoon peak hour are anticipated to be 45 minutes (for the 8+4 scenario) and 36 minutes (for the 10+4 scenario), versus 69 minutes for the No Build scenario. The 2030 horizon year travel times in the GP lanes during the southbound morning peak hour are anticipated to be 36 minutes (for the 8+4 scenario) and 28 minutes (for the 10+4 scenario), versus 54 minutes for the No Build scenario. While the addition of GP lanes was estimated to reduce travel time to 36 minutes in the highest volume peak hour (northbound in the afternoon), the additional GP lane does have additional impacts and costs. A decision on whether the benefits of the additional GP lanes outweigh those costs and impacts will be addressed as part of the ongoing environmental process.

Its important to point out that the even though some congestion may occur in the 20-year horizon year (or beyond) in the 8+4 alternative, the level of congestion would be significantly less than if no improvements were constructed.

Interchange Improvements

Local interchange ramps would undergo modifications to facilitate the widening of the I-5 North Coast Corridor Widening Project. In most cases, the ramps would retain their current basic configuration, such as full or partial cloverleaf and diamond. Often the improvements include the addition of ramp lanes and/or alignment changes to bring the ramps to current design standards to improve the handling of foreseeable traffic volumes and accessibility needs. Additionally, most ramps would have high-occupancy vehicle (HOV) bypass lanes. Tables 7.1 and 7.2 show the interchange improvements.

Managed Lanes

Managed lanes are a highway-within-a-highway, where lanes in each direction are separated from the general purpose lanes to serve traffic demand and maintain reliable travel times.

Managed lanes are an innovative highway concept that provides a transportation resource that responds to changing demand and changing regional policies. Most simply defined, Managed Lanes are a highway-within-a-highway, where lanes in each direction are separated from the GP Lanes. Other key components of managed lanes are:

- The facility incorporates a high degree of operational flexibility so that over time operations can be actively managed to respond to growth and changing needs;
- The operation of and demand on the facility is managed using a combination of tools and techniques in order to continuously achieve an optimal condition, such as free-flow speeds and reliable travel times; and
- The principal management strategies can be categorized into three groups: pricing, vehicle eligibility, and access control.

Managed lanes provide flexibility in the overall highway facility, allowing for

Table 7.1 Interchange Lane Improvements

Interchange	Location	Existing Number of Lanes			I-5 North Coast Corridor Project Number of Lanes		
		SOV Lanes	HOV Lanes	Total Lanes	SOV Lanes	HOV Lanes	Total Lanes
Genesee Avenue	Genesee Avenue to SB I-5	1	0	1	2	1	3
	Genesee Avenue to NB I-5	1	0	1	2	1	3
Roselle Street	Roselle Street to SB I-5	1	0	1	2	1	3
Del Mar Heights Road	EB Del Mar Heights Road to SB I-5	1	1	2	2	1	3
	WB Del Mar Heights Road to SB I-5	1	0	1	2	1	3
	Del Mar Heights Road to NB I-5	2	0	2	2	1	3
Via de la Valle	WB Via de la Valle to SB I-5	1	0	1	2	0	2
	EB Via de la Valle to SB I-5	1	1	2	2	1	3
	EB Via de la Valle to NB I-5	1	0	1	2	0	2
Birmingham Drive	Birmingham Drive to SB I-5	2	0	2	2	1	3
	Birmingham Drive to NB I-5	1	0	1	2	1	3
Santa Fe Drive	Santa Fe Drive to SB I-5	1	1	2	2	1	3
	Santa Fe Drive to NB I-5	1	0	1	2	1	3
Encinitas Boulevard	Encinitas Boulevard to SB I-5	1	1	2	2	1	3
	Encinitas Boulevard to NB I-5	1	0	1	2	1	3
Leucadia Boulevard	Leucadia Boulevard to NB I-5	1	1	2	2	1	3
La Costa Avenue	La Costa Avenue to NB I-5	1	1	2	2	1	3
Palomar Airport Road	EB Palomar Airport Road to SB I-5	1	1	2	2	1	3
Tamarack Avenue	Tamarack Avenue to NB I-5	1	0	1	2	0	2
Carlsbad Village Drive	Carlsbad Boulevard to SB I-5	1	0	1	2	0	2
	Carlsbad Boulevard to NB I-5	1	0	1	2	0	2
Oceanside Boulevard	Oceanside Boulevard to SB I-5	2	0	2	2	1	3
Mission Avenue	EB Mission Avenue to SB I-5	1	1	2	2	1	3
	Mission Avenue to NB I-5	1	0	1	2	0	2
SR 76	SR 76 to SB I-5	2	0	2	2	1	3
	SR 76 to NB I-5	2	0	2	2	1	3
Harbor Drive	Harbor Drive to SB I-5	1	0	1	2	1	3
	Harbor Drive to NB I-5	1	0	1	2	0	2

Table 7.2 Interchange Lane Geometry Improvements

Interchange	Location	Proposed Lane Geometry Modifications
Del Mar Heights Road	I-5 SB Ramps	Ramp adjustments to remove free right turn capabilities
	I-5 NB Ramp	Convert NB left/through/right lane to a shared through right-turn lane, add a second left-turn lane (creating dual right and dual lefts)
Via De La Valle	I-5 SB Ramps	Ramp adjustments to remove free right-turn capabilities
	I-5 NB Ramps	Ramp adjustments to remove free right-turn capabilities
Encinitas Boulevard	I-5 SB Ramp	Addition of an exclusive SB left-turn lane (creating dual left-turn lanes)
		Addition of an exclusive SB right-turn lane (creating dual right-turn lanes)
Palomar Airport Road	I-5 SB Ramps	Ramp adjustments to remove free right-turn capabilities, addition of a WB right-turn lane (creating dual right-turn lanes)
Tamarack Drive	I-5 SB Ramp	Addition of a WB left-turn lane (creating dual lefts)
	I-5 NB Ramp	Addition of a NB right-turn lane (creating dual right-turn lanes)
Carlsbad Village Drive	I-5 SB Ramp	Convert the SB shared left/through/right lane to a shared right/though lane, add an exclusive SB left-turn lane (creating a single left-turn lane and dual right-turn lanes)
	I-5 NB Ramp	Separate NB left-turn lane, convert right-turn lane to a shared left/through/right lane
Oceanside Boulevard	I-5 SB Ramp	Convert SB through/right turn-lane into two separate lanes
Mission Avenue	I-5 SB Ramps	Remove EB to SB on-ramp, add dual EB left-turn lanes, convert SB through/left to an exclusive left-turn lane (creating dual lefts), convert the exclusive SB right-turn lane to a shared through right-turn lane
	I-5 NB Ramp	Remove NB to EB free right-turn lane, add a second EB left-turn lane (creating dual lefts), add SB dual left-turn lanes
SR 76	I-5 NB Ramp	Ramp adjustments to remove free right-turn capabilities, addition of a second NB left-turn lane (creating dual lefts)
Harbor Drive	I-5 SB Ramp	Ramp adjustments to remove free right-turn capabilities
		Convert outside WB through lane into an exclusive right-turn lane
		Convert inside WB through lane into a shared through/right-turn lane
	I-5 NB On-Ramp	Re-alignment of NB to WB off-ramp to align with San Rafael intersection (EB right turn will be controlled by signal and will no longer be a free right turn)
		Convert NB shared through/right-turn lane into an exclusive through lane, eliminating the NB right-turn movement

system and corridor management on a continuing basis throughout the day or as needs change over time. The managed lanes facility provides additional highway capacity in a constrained corridor that helps minimize impacts to the environment and surrounding communities.

The distinction between managed lanes and other traditional forms of freeway lane management is the philosophy of "active management."

Lane management strategies have been used for decades throughout the nation to improve traffic flow on freeway facilities. The distinction between managed lanes and other traditional forms of freeway lane management is the philosophy of "active management." Under this philosophy, the region proactively manages demand and available capacity on the facility by applying new strategies or modifying existing strategies.

The region defines from the outset the performance objectives for the managed lanes and the kinds of actions that will be taken once pre-defined performance thresholds are met. The following provides some examples of how demand can be managed to meet performance objectives:

- Raising the price for access to the facility in order to maintain a speed of 60 mph or higher; and
- Raising the occupancy requirement to use an HOV lane so that bus operating speeds of 50 mph or more can be maintained.

How Managed Lanes Operate

As stated previously, managed lanes are a set of lanes where operational strategies are implemented in response to changing traffic conditions. Managed lanes employ three key operational strategies – pricing, vehicle eligibility, and access control.

- *Pricing* - Managed lanes pricing charges motorists a higher premium for travel during the most congested times or to offer a lower premium for traveling in the off-peak period. This is unlike traditional toll roads, which charge motorists the same price regardless of the characteristics of their trip. As demand for the available capacity within the managed lanes increases, often during peak periods, the price paid by single occupant vehicles increases. By raising or lowering the price to access the managed lanes, drivers can be "encouraged" or "discouraged" from using them so that free flow conditions are maintained within the managed lanes.
- *Vehicle Eligibility* - Vehicle eligibility allows certain vehicles to access the managed lanes and restricts others. Vehicle eligibility may vary by time of day, day of week, or occupancy of the vehicle and may change over the life of the facility as conditions or policy objectives change. This could involve vehicle occupancy (drive alone, two or more, or three or more passengers) or vehicle type (motorcycles, trucks, hybrid vehicles, etc.).

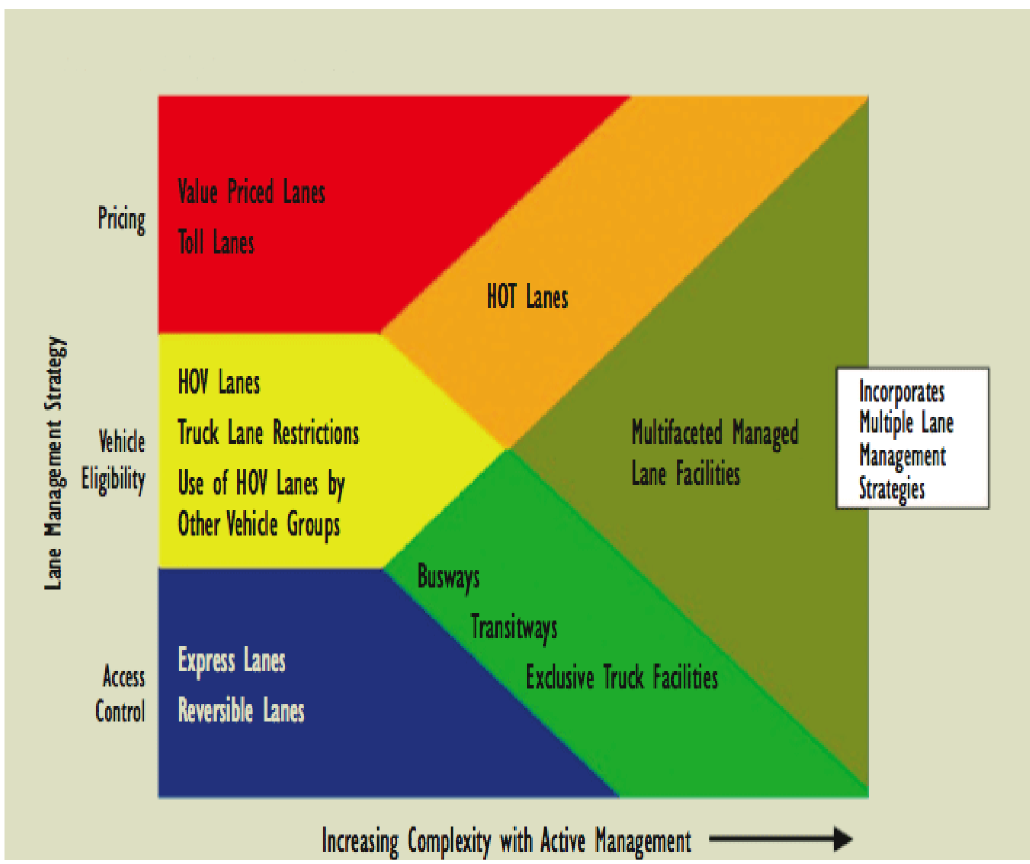
Managed Lanes employ three key operational strategies – pricing, vehicle eligibility, and access control.

- *Access Control* - Access control is used to limit entry to a facility based upon congestion levels or operational conditions, such as an incident or roadway maintenance needs. Access is not necessarily restricted by type of user, although it may be in situations where access ramps are provided exclusively for bus or carpool use.

Figure 7.6 presents this managed lanes applications concept. On the left of the diagram are the applications of a single operational strategy-pricing, vehicle eligibility, or access control. As you move to the right on the diagram, the more complicated managed lane applications blend more than one of these strategies:

- **Combined pricing and eligibility –** HOT lanes where higher occupancy vehicles such as buses, vanpools, and carpools are given free or discounted passage and all other vehicles are tolled.
- **Combined vehicle eligibility and access control –** Examples include exclusive busways, transitways, or truck facilities serving a specific type of

Figure 7.6 Managed Lanes Applications



Source: Managed and Priced Lanes: Summary of Workshop Results. Federal Highway Administration and Transportation Research Board, Key Biscayne, FL, USA, November 2003.

vehicle, with barrier separation and limited access points.

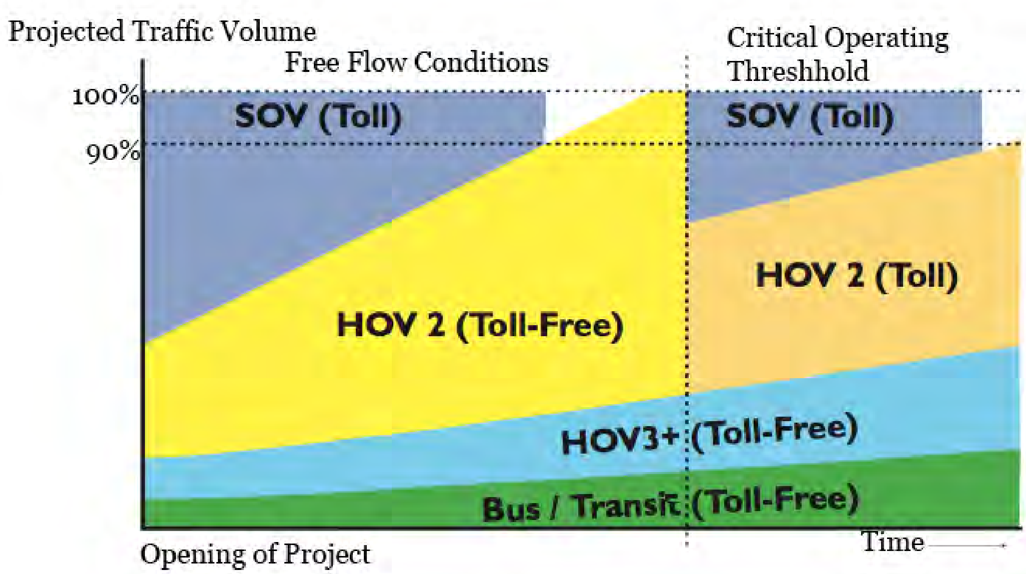
- **Multifaceted managed lanes –** Integrates all strategies for an actively managed facility that incorporates a high degree of operational flexibility.

Managing lanes using these strategies helps to ensure:

- Travelers experience reliable travel times;
- Travel lanes are used efficiently to allow for free-flow conditions for longer periods of time; and
- Future transit service is provided with infrastructure should the need arise.

Figure 7.7 depicts the stage at which various strategies could be enacted over time so that free flow conditions can be maintained. For instance, SOVs are permitted access when the project opens provided capacity is available and they pay the access price. Through the use of variable pricing, which sets the premium according to the level of congestion, the number of SOVs that use the facility is never allowed to exceed the "critical operating threshold," or the traffic volume at which operations become congested. As time goes on and HOV volumes grow, less capacity is available to SOVs so the access price increases. At some point HOV and transit demand could exceed capacity requiring the region to change vehicle eligibility rules.

Figure 7.7 Options and Users of Managed Lanes



Source: Federal Highway Administration, Managed Lanes A Primer, August 2008.

Managed Lanes in the I-5 North Coast CSMP Travel Shed

Managed lanes in the I-5 North Coast CSMP are planned to be part of a network of connected and free-flowing HOV and actively managed lanes throughout the San Diego County region.

Adding needed capacity to I-5 is challenging because of the urban setting, increased construction/right-of-way costs, and community/environmental concerns. Generally, managed lanes provide opportunities for more efficient use of newly constructed lanes, and reduced and reliable travel times for users. The differing types of managed lanes can include reversible lanes, congestion pricing, moveable barriers, ingress restrictions, hours of operation, etc. The type of managed lanes to be implemented is also dependent on the type of existing and projected traffic patterns. Locally, the managed lane concept is being successfully implemented in San Diego on I-15 and in Orange County on SR 91.

Studies of currently operating MLs indicate that travelers of all income levels recognize the benefit of paying for more reliable trip times. For example, in an 800-person telephone survey of I-15 Express Lane users completed in 2001, eighty percent of the lowest income motorists using the I-15 corridor agreed with the statement that, "People who drive alone should be able to use the I-15 Express Lanes for a fee." Despite equity concerns that have been raised in locations without high occupancy toll (HOT) lanes, low income users in San Diego were more likely to support the statement than the highest income users.

In April 2006, SANDAG completed a two year effort, referred to as the I-5 North Coast Managed Lanes Value Pricing Study, to determine the feasibility of using congestion pricing as demand management tool in this corridor. The study looked at the various factors that could impact feasibility such as:

- Demand;
- Access;
- Pricing strategies;
- Impacts to adjacent traffic;
- Technology needs;
- Public attitudes;
- Potential revenue; and
- Equity.

Study activities included both technical and public outreach investigations. Findings from this study validated the feasibility of using congestion pricing in the corridor under either the 8+4 or 10+4 alternatives. The study tested various pricing strategies and ultimately recommended a dynamic skewed per mile pricing strategy – similar to what is being developed on the I-15 corridor. Under these scenarios, 2030 revenue projections could be in the range $10 million to $20 million per year and that the facility can easily sell unused capacity in both 2017 and 2030 based on the current values of time associated with I-15 and without applying access restrictions. The study also concluded that there was general support among a broad base of stakeholders for the use of value pricing in the corridor.

By supporting transit, carpooling, and congestion pricing, the managed lanes concept creates a facility that can help maximize the throughput of people and goods through the travel shed. Managed lanes would provide a reliable, limited access facility for transit users, carpoolers, and anyone else whose trip demands require such reliability. From a corridor perspective, all users of I-5 benefit from congestion relief provided in the managed and general-purpose lanes. It should be noted that first priority for demand in the managed lanes facility would be given to transit, followed by HOV users, with the remaining capacity sold to single occupant vehicles.

Managed lanes provide options to travelers, which increase trip reliability and the capacity of the highway.

Managed lanes in the travel shed are planned to be part of a network of connected and free-flowing HOV and actively managed lanes throughout the San Diego County region, a key strategy outlined in SANDAG's RTP. It includes plans for HOV/managed lanes on major north-south highways, including I-5, and envisions a robust transit network. In the travel shed, the use of managed lanes lays the foundation to meet a number of important regional and I-5 North Coast CSMP transportation objectives, including:

- Increasing vehicle and people moving capacity;
- Builds infrastructure that promotes transit and ridesharing;
- Using available and unused capacity;
- Improving trip time and/or reliability for travel modes;
- Providing greater choices in serving multimodal needs;
- Increasing funding opportunities for new mobility improvement through tolls; and
- Supporting community land use and development goals for major areas of employment and key recreational and tourist sites.

While some of the long-term goals listed above, such as providing greater choices in serving multi-modal needs, may take a while to fully realize, managed lanes can be used in the interim to address current traffic demands. In this way, managed lanes have the flexibility, from an operational standpoint, not only to meet the current traffic needs on the highway, but also to influence mode uses.

Figure 7.8, Regional Managed Lanes Map, shows the vision for the managed lanes for the region. The regional vision articulated in the 2030 RTP is to have a connected network of managed lanes on I-5, I-805, and I-15.

Managed Lanes Pricing in the I-5 North Coast CSMP Corridor

Pricing is allowed on I-5 through Assembly Bill 574 (AB 574), which authorizes the San Diego Association of Governments (SANDAG) to conduct, administer, and operate a value pricing and transit development demonstration program on a maximum of two transportation corridors in San Diego County. This law also authorizes the SANDAG program to use pricing strategies indefinitely by deleting the four-year limitation provision.

According to AB 574 the revenue generated from the program shall be available to SANDAG for the direct expenses related to the operation (including collection

Figure 7.8 Proposed Regional Managed Lanes Map

Source: Rand McNally: The Thomas Guide, 2006.

and enforcement), maintenance, and administration of the demonstration program. Administrative expenses shall not exceed three percent of the revenues. All remaining revenue generated by the demonstration program shall be used in the corridor from which the revenue was generated exclusively for preconstruction, construction, and other related costs of high-occupancy vehicle facilities and the improvement of transit service, including, but not limited to, support for transit operations pursuant to an expenditure plan adopted by SANDAG.

Studies of currently operating managed lanes projects indicate that travelers of all income levels recognize the benefit of paying for more reliable trip times.

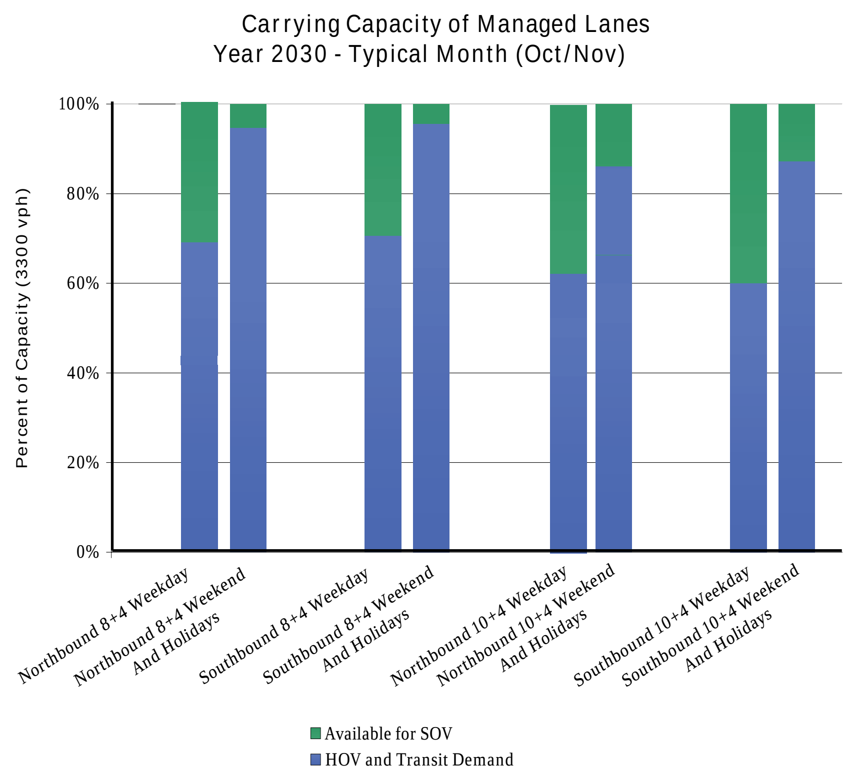
Managed Lanes Carrying Capacity in the I-5 North Coast CSMP Corridor

The focus of the managed lane facility will be to move people rather than vehicles, primarily through transit and HOV use. The I-5 North Coast CSMP facility will have two managed lanes in each direction. Each lane will have the capacity to handle 1,650 vehicles per hour, thus resulting in a total capacity increase of 3,300 vehicles per hour for the facility for each direction. During the weekday peak periods , I-5 in the North Coast area is currently experiencing HOV use of 13-20 percent. On the weekends that percentage increases to over 50 percent. It is anticipated that with the addition of the managed lanes facility, weekday HOV use will increase by 2030. Figure 7.9, Carrying Capacity of Managed Lanes, illustrates the expected capacity of the managed lanes facility to accommodate use by single-occupant vehicles through congestion pricing. It is anticipated that with the 8+4 configuration an average of 950 single-occupant vehicles in each direction per peak period and an average of 1,200 single-occupant vehicles in each direction per peak period for the 10+4 configuration would pay to use the managed lanes facility.

Weekend Demand in the I-5 CSMP Travel Shed

As discussed in Chapter 5: Transportation System Performance, the I-5 CSMP travel shed experiences high demands on weekends for recreational and tourism trips. The most notable travel occurs on Saturday in the southbound direction, and secondly, on Sunday in the northbound direction. Additionally, since these trips are for tourism and recreation, a higher proportion of vehicles are HOV users. As stated in Chapter 4: Customers in the Travel Shed, HOV use on the weekend has been observed as high as 60 percent. Due to this unusually high proportion of weekend HOV use in comparison to weekday HOV use, it is uncertain that the managed lanes facility would have available capacity to sell to single-occupant vehicles during weekend peak travel times. However, since the managed lanes facility provides additional capacity in the corridor, the GP lanes should experience some degree of congestion relief on the weekends.

Figure 7.9 Carrying Capacity of Managed Lanes



Source: Caltrans District 11

Direct Access Ramps (DAR) in I-5 CSMP Travel Shed

Five Direct Access Ramps (DARs) and 15 ingress/egress areas would allow access for eligible vehicles to the managed lanes. The five DARs would allow HOV/Fastrak traffic to enter and exit the managed lanes at overcrossings either at or near Voigt Drive (San Diego), Carroll Canyon Road (I-805 San Diego), Manchester Avenue (Encinitas), Cannon Road (Carlsbad), and Oceanside Boulevard (Oceanside); general purpose traffic would access the freeway at these locations from the existing interchange but not the DAR. The Manchester Avenue DAR would also include a park-and-ride and BRT facility. Any tolls for SOV would be paid electronically when applicable vehicles with transponders travel under overhead suspended scanners.

The location of these DARs were chosen based on several factors including: activity center locations within the travel shed, major origin and destinations locations exist, and the ability to space DARs on average four to five miles apart. (see Table 7.3) As an example, Cannon Road was chosen as a location for one of the DARs because of the large regional retail center, LEGOLAND® Amusement Park, and access to the coast. Several of the DAR locations were chosen because of their proximity to transit centers, including Oceanside Boulevard, Manchester Avenue, and Carroll Canyon Road. Voigt Drive was chosen due to its proximity to several hospitals and a major university campus.

Table 7.3 Direct Access Ramp Location

DAR Location	Activity Center
Voigt Drive - San Diego	University, Hospital
Carroll Canyon Road - I-805 San Diego	Employment Center, Transit Center
Manchester Avenue - Encinitas	Regional Retail, Public Beach, Transit Center
Cannon Road - Carlsbad	Employment Center, LEGOLAND®, Regional Retail, Airport
Oceanside Boulevard - Oceanside	Town Center, Regional Retail, Public Beaches, Transit Center

DAR locations were selected based on proximity to activity centers, major origin and destination locations, transit centers, hospitals, and major universities, as well as spacing.

The location and design of access points impacts the operating conditions within the managed lanes facility and affects the managing agency's ability to readily modify its operating strategies. Direct access ramps improve safety by eliminating the need for drivers to weave through four lanes of general purpose lanes to access the managed lanes. DARs also make trip times more reliable, as high-occupancy vehicles and paying single-occupancy vehicles are queued through a separate ramp that brings them directly into the flow of the managed lanes.

In addition, users could also access the managed lanes via the general purpose lanes via ingress/egress areas. As applicable vehicles approach the access area, drivers would see an electronic sign with the current toll. Travelers in the managed lanes would also be able to leave these lanes at access areas, and be tolled the appropriate amount. See Table 7.4 for ingress/egress locations where managed lane traffic is allowed to enter and exit the managed lanes.

Two options currently being studied in the Draft EIR/EIS I-5 North Coast Corridor Project are separating the managed lanes from general purpose lanes by a fixed, concrete barrier such as three-foot concrete wall or by a buffer of double yellow lines with additional space on either side. For the concrete barrier alternatives, a required standard shoulder width would result in a relatively larger project "footprint" area than the buffer alternatives. Figures 7.10 through 7.13 show typical configurations of the ingress and egress points for both the barrier and buffer scenarios.

The barrier separation provides operational advantages over the buffer separation in that the barrier separation provides:

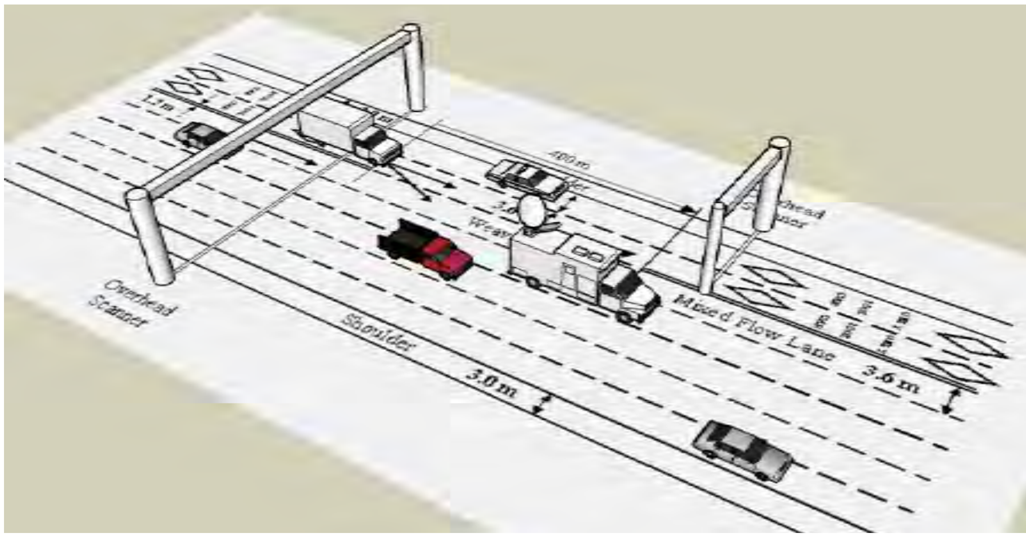
- Relatively unimpeded managed lane flow without interference from general purpose traffic lanes;
- Easier law enforcement;
- Incident management;
- Lower managed lane violation rates;
- A higher level of driver comfort resulting in higher capacity;
- The ability to modify the managed lanes for reversing traffic directions for evacuation purposes; and
- Possible automated highway systems usage.

Table 7.4 Managed Lane Ingress/Egress and DAR Locations

	NB Ingress/Egress	SB Ingress/Egress
La Jolla Village Drive	x	x
Voigt DAR	x	x
Carmel Valley Road	x	x
Lomas Santa Fe Drive	x	x
Manchester Avenue DAR	x	x
Birmingham Drive	x	x
Poinsettia Lane	x	x
Cannon Road DAR	x	x
Tamarack Drive		x
SR 78	x	x
Oceanside Boulevard DAR	x	x
Harbor Drive	x	x

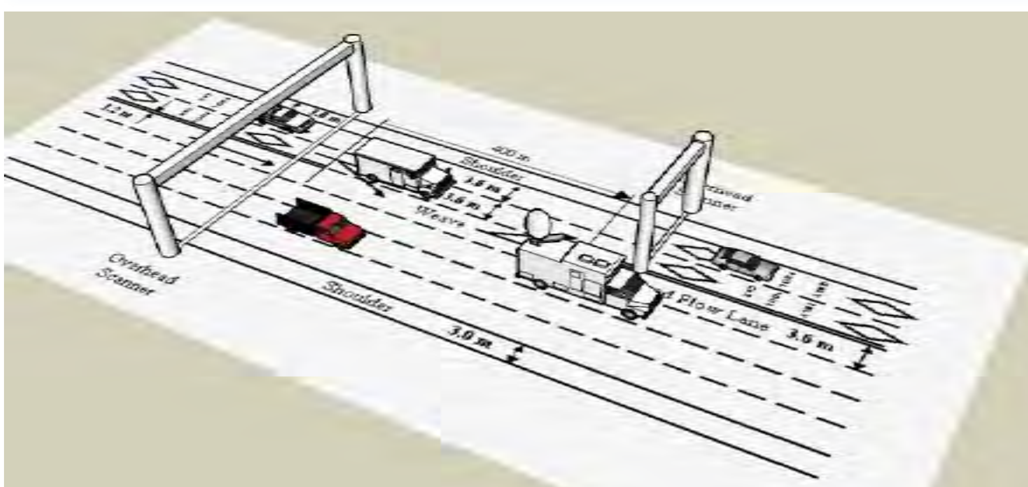
DARs improve safety by eliminating the need for drivers to weave through four lanes of general purpose lanes to access the new managed lanes by providing a direct entry point to the managed lanes.

Figure 7.10 HOV/Managed Lane Typical Ingress/ Egress for the 10 + 4 with Buffer Alternative (not to scale)



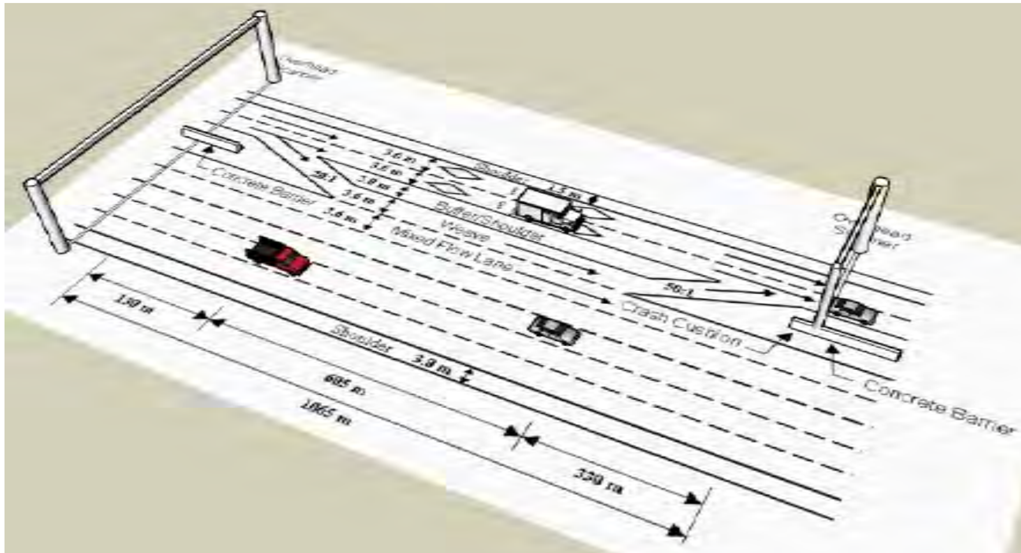
Source: Caltrans District 11

Figure 7.11 HOV/Managed Lane Typical Ingress/ Egress for the 8 + 4 with Buffer Alternative (not to scale)



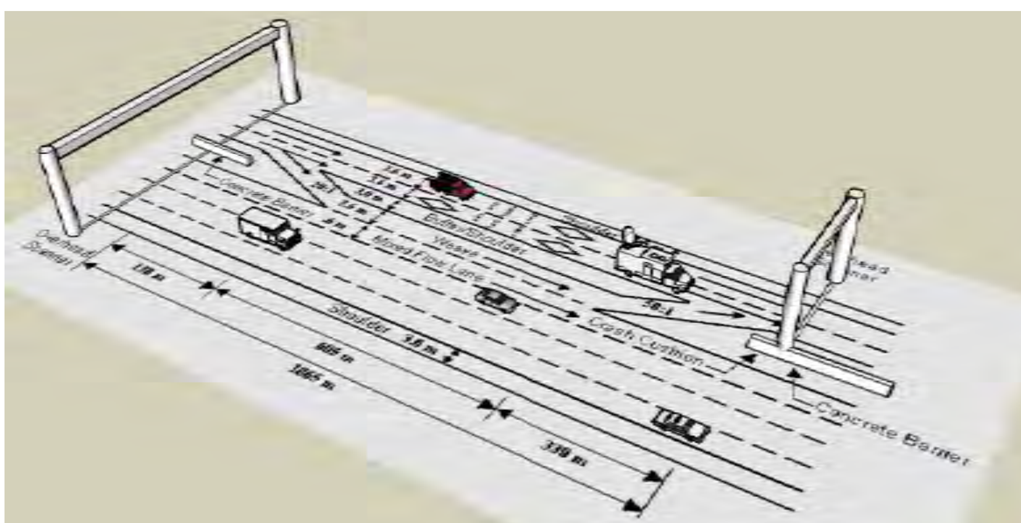
Source: Caltrans District 11

Figure 7.12 HOV/Managed Lane Typical Ingress/ Egress for the 10 + 4 with Barrier Alternative (not to scale)



Source: Caltrans District 11

Figure 7.13 HOV/Managed Lane Typical Ingress/ Egress for the 8 + 4 with Barrier Alternative (not to scale)



Source: Caltrans District 11

Funding

The following tables show the staging and cost for the freeway improvements.

Table 7.5 Freeway Improvement Costs

Stage A	Cost
HOV Lanes	
Construct 2 HOV lanes from Manchester Road to La Costa Road	$175 Million
Construct 2 HOV lanes from Cannon Road to South of Buena Vista Lagoon	$66 Million
Managed Lanes	
Construct 4 new managed lanes from I-5/I-805 to SR 56	$178 Million
Construct 4 new managed lanes from SR 56 to Leucadia Boulevard	$1.105 Billion
Construct 4 new managed lanes from Leucadia Boulevard to Vandergrift Boulevard	$1.592 Billion
DAR Structure	
Construct DAR at Voight	$26 Million
Construct DAR at Manchester Avenue	$27 Million
Construct DAR at Cannon Road	$19 Million
Construct DAR at Oceanside Boulevard	$19 Million
Bridge	
Optional Median Bridge Closure at San Elijo Lagoon	$2.2 Million
Highway Widening and Ramp Improvements	
Construct braided ramps from Genesee Avenue to Sorrento Valley Road	$9.2 Million
TOTAL	**$3.218 Billion**

Regional Arterials

The arterial streets throughout the travel shed provide the infrastructure for people to directly access the region's coastline, job centers, residential neighborhoods, community centers, transit centers, and other destinations by car, bus, bicycle or walking. They also provide access to interchanges that connect the projected one million daily trips made on I-5 by 2030 to these regionally significant destinations.

Regional Arterial Planning

Since the regional arterial system affects local travel, access to regionally significant resources, and highway and transit connections, it is the subject of planning at three levels – state, regional, and city. Cities are responsible for planning, maintaining and improving the streets within their jurisdictional boundaries. SANDAG as the regional planning organization is responsible for the overall vision of the regional arterial system. Caltrans is involved in decisions about the arterials because they are the main connections on to and off of the highways. Because these arterials are key points in the regional network, is is critical that this planning be integrated between the three levels.

Local Planning Documents

At the local level, the circulation or transportation elements of each city's General and Community Plans govern the regional arterials and highway/arterial interchanges. With a typical planning horizon of 15 to 20 years, city General and Community Plans set goals and policies for the arterials by identifying major roadway and system improvements.

With a significant number of the travel shed's city General and Community Plans approaching their planning horizons, elected officials from the cities of Carlsbad, Del Mar, Encinitas, Escondido, Oceanside, San Marcos, Solana Beach, Vista, and the County of San Diego, with the assistance of SANDAG, Caltrans, and the North County Transit District, produced the North County Parkway Plan study in late 2006 as a collaborative sub-regional arterial system planning effort.

To develop the North County Parkway Plan, participating agencies identified 44 arterial system improvements, including highway/arterial interchange projects, that would support regional mobility goals and objectives in North San Diego County. These proposed improvements were then prioritized using the following criteria: congestion relief, cost-effectiveness, project-readiness, environmental compatibility, transit vision-supportiveness, and multi-agency cooperation. Ultimately, 20 of the 44 evaluated projects were located in the I-5 CSMP travel shed, including five of the top ten projects. These five projects were:

- El Camino Real widening from Palomar Airport Road to SR 78;
- El Camino Real widening from Olivenhain Road to Palomar Airport Road;
- El Camino Real widening from Manchester Avenue to Santa Fe Avenue;
- Via de la Valle widening from Jimmy Durante Boulevard to Coast Highway; and
- Encinitas Boulevard widening from Calle Magdalena to Via Cantebria.

Consideration was also made for arterial improvements based on the need to support additional traffic that may access and utilize I-5 due to the improvements on the freeway. An assessment of the available capacity to accommodate the potential additional demand was considered, particularly the east-west arterial facilities that serve I-5 freeway access.

State Planning Documents

Because arterials feed the interchanges that connect to state routes, they are also the subject of highway planning by the California Department of Transportation. As such, highway/arterial interchange improvements are included in the Caltrans Highway Interchange Operations Report. In addition, as part of the I-5 North Coast Corridor Widening Project, Caltrans analyized interchanges and E/W arterials to determine what improvemnts were needed to serve traffic getting to and coming from the freeway. The improvements this analysis identified are included in the Caltrans I-5 North Coast Corridor Widening Project Report. It is also important to note that improvements to aterials that will be undertaken in the I-5 North Coast Corridor Widneing Project will not require new right of way be, the project must be in consisten with the circulation element of the city's general plan, and that the project was needed because improvments to I-5 result in a significant degrading of LOS when compared to the no build scenario. The improvements would typically be needed because of localized growth such as has occurred in Sorrento Valley.

Regional Planning Documents

At the regional level, SANDAG has issued two policy documents and an implementation document that address the regional arterial street system. Policy documents are the 2030 RTP and the Regional Transit Vision (RTV), and the implementation document is the Regional Transportation Improvement Program (RTIP).

As the long-range transportation plan for the region, the 2030 RTP states two priorities related to arterials:

- Complete the regional arterial system by closing any existing gaps to enhance the capacity of these roadways; and

- Implement traffic signal coordination, traffic detection systems, transit priority measures, and management systems in order to optimize the arterial network and integrate its operations with other transportation modes.

As regional arterials are generally the primary routes for bus transit between communities and neighboring cities, SANDAG's RTV also influences planning for arterials. The RTV calls for a network of convenient, reliable, fast, and safe services that interconnect the region, resulting in reduced congestion on the region's highways and streets. The RTV also identifies four categories of transit service for implementation, three of which are bus services that rely on regional arterial routes. To make these transit services possible, the RTV calls for implementation of transit priority measures on regional arterials, such as signal priority or queue-jumper lanes for transit vehicles, and recommends grade-separated transitways , including two in this travel shed. The RTV's vision and recommendations have been incorporated into the 2030 RTP's arterial system and transit policies, and have influenced the selection of the planned improvements in the RTP.

The plan that incrementally implements the improvements envisioned in the RTV and RTP is SANDAG's RTIP. The RTIP, updated every two years with a program period of four years, prioritizes and programs Federal, state, and local funding for the RTP's arterial, transit, bikeway, and highway projects.

Vision for Regional Arterials

SANDAG's 2030 RTP responds to the constraints on regional arterial expansion by advocating their completion where possible and implementing improvements that focus on transit, intelligent transportation systems (ITS), and transportation demand management (TDM) to increase the efficiency of the existing resources. The regional vision also highlights the role of arterials in improving regional transit services such as transit priority treatments, signal timing improvements, and new transit options such as Artetial Rapid Bus and Bus Rapid Transit on key arterials.

The Key Arterial Streets in the I-5 CSMP Travel Shed

Controlled by local cities, but crossing over each city's jurisdictional lines, these roadways provide the infrastructure for local and sub-regional travel. As discussed earlier in Chapters 2 and 4, regional arterials are grouped into those that travel north-south parallel to the highway, and those that travel east-west perpendicular to it.

Regional North-South Arterials

Among the 11 north-south regional arterials in the travel shed, 3 are highlighted here because of their significance: Coast Highway, El Camino Real, and Melrose Avenue.

Prior to the installation of I-5 in its current configuration, the Coast Highway was the primary north-south route for regional and interregional travel. Running the length of the travel shed's coastline, this road was relinquished to the control of each individual city it runs through after construction of I-5. Now, with the addition of traffic calming strategies, pedestrian improvements, and revitalization of historic commercial activity centers, Coast Highway is treated as the "main street," for five of the travel shed's six cities.

El Camino Real runs from SR 76 in Oceanside to Manchester Avenue in Encinitas and from Via de la Valle south to Carmel Mountain Road. There is no connection from Manchester Avenue to Via de la Valle. Both portions of El Camino Real have absorbed significant population and job growth in the last 40 years, both of which are projected to continue increasing in the future.

Extending along the northeastern border of the travel shed, Melrose Drive also provides a north-south route between Carlsbad and Oceanside, and becomes Rancho Santa Fe Road in Encinitas. Beyond these three main arterial roadways, the I-5 is the only other viable north-south roadway alternative.

Regional East-West Arterials

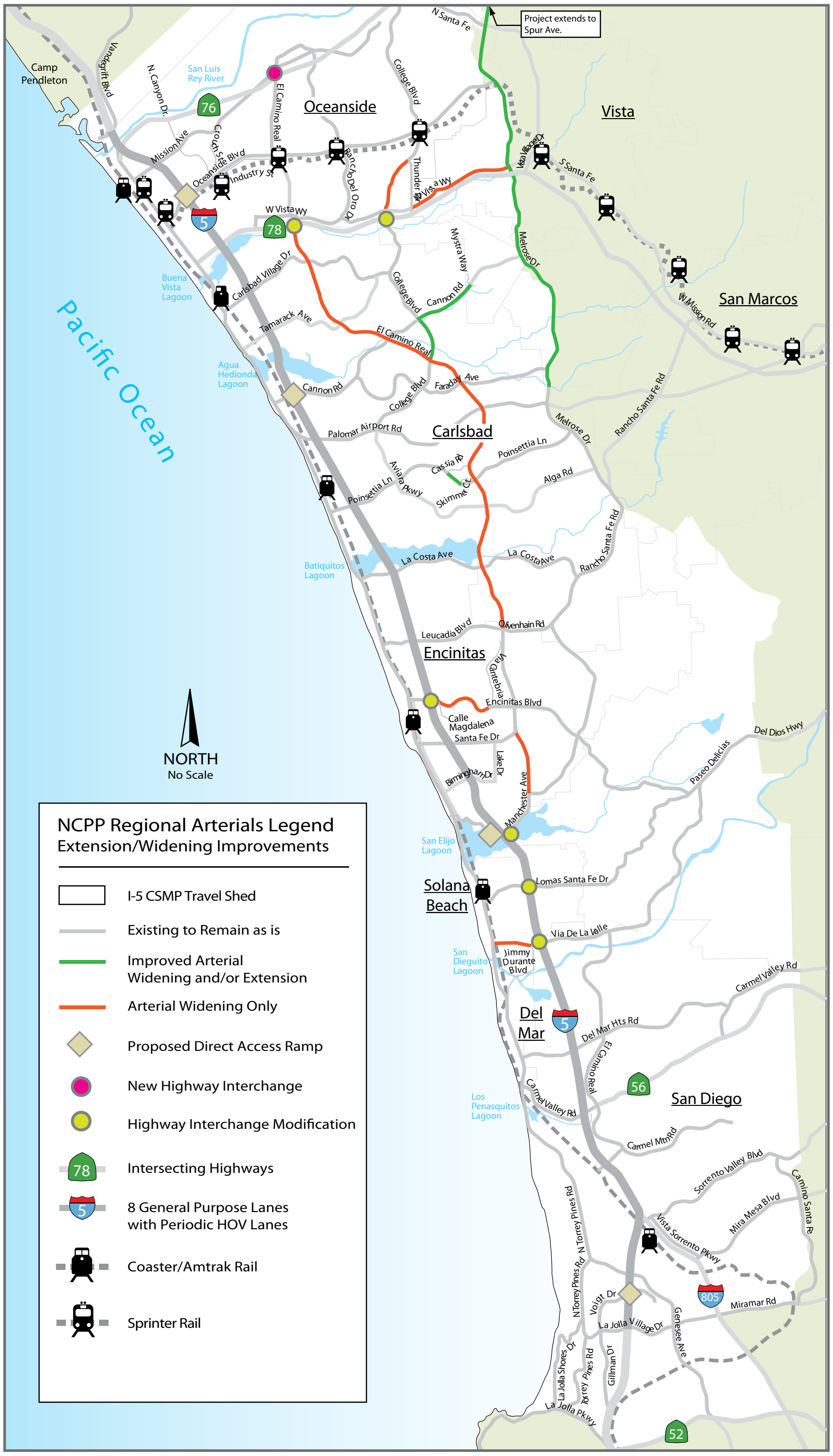
The east-west arterials connect communities in the travel shed to the coastline, job centers east of the highway, north-south regional arterials, transit stations and centers, I-5, and other destinations. Of the 26 east-west arterials that cross I-5, 14 have highway interchanges. Oceanside Boulevard, Cannon Road, Manchester Avenue, and Voigt Drive are all major feeder routes between the highway and/or job, housing, and recreation hubs.

Planned Improvements to the Regional Arterials System

The improvements from the North County Parkway Plan are identified in Figure 7.14 Regional Arterial Improvements Map and in the funding tables 7.6 to 7.11. Costs are estimated to range between $735 million to $745 million.The improvements are organized by city, and within each city by type of improvement. The types of planned arterial system improvements include roadway expansion and improvements; and interchange improvements.

Figure 7.14 Regional Arterial Improvements Map

The I-5 North Coast CSMP travel shed transportation system includes both north-south and east-west regional arterials that service local vehicle trips. Widening/extension and interchange improvements from the North County Parkway Plan are highlighted.



Source: Rand McNally: The Thomas Guide, 2006. SANDAG, North County Parkway Plan.

Table 7.6 Regional Arterial Improvement Costs: City of Oceanside

Improvement	Location and Description
Roadway Expansion and Improvements	Melrose Drive: Between Spur Avenue and Oceanside Boulevard
	College Boulevard: Between Thunder Drive and SR 78
Interchanges	College Boulevard: SR 78 Interchange improvement
	El Camino Real: SR 76 Interchange improvement
	El Camino Real: SR 78 Interchange improvement

Table 7.7 Regional Arterial Improvement Costs: City of Carlsbad

Improvement	Location and Description
Roadway Expansion and Improvements	Cannon Road: Between College Boulevard and Mystra Way
	College Boulevard: Between El Camino and Cannon Road
	El Camino Real: Between Olivenhain Road and Palomar Airport Road
	El Camino Real: Between Palomar Airport Road and SR 78
	Poinsettia Lane: Between Cassia Road and Skimmer Court
Interchanges	None

Table 7.8 Regional Arterial Improvement Costs: City of Vista

Improvement	Location and Description
Roadway Expansion and Improvements	Melrose Drive: Between Vista/County Limit and SR 78
	Melrose Drive: Between SR 78 and Vista/Carlsbad Limit
	West Vista Way: Between Thunder Drive and N. Melrose Drive
Interchanges	None

Table 7.9 Regional Arterial Improvement Costs: City of Encinitas

Improvement	Location and Description
Roadway Expansion and Improvements	Encinitas Boulevard: Between Calle Magdalena and Via Cantebria
	El Camino Real: Between Santa Fe Avenue and Manchester Avenue
Interchanges	Encinitas Boulevard: I-5 Interchange improvement
	Manchester Ave.: I-5 Interchange improvement

Table 7.10 Regional Arterial Improvement Costs: City of Solana Beach

Improvement	Location and Description
Roadway Expansion and Improvements	None
Interchanges	Lomas Santa Fe Avenue: I-5 Interchange improvement

Table 7.11 Regional Arterial Improvement Costs: City of Del Mar

Improvement	Location and Description
Roadway Expansion and Improvements	Via de la Valle: Between Jimmy Durante Boulevard and Coast Highway
Interchanges	Via de la Valle/I-5: Interchange Improvements

TOTAL **$735 - $745,000,000**

Transit

Currently, bus and rail transit service in the travel shed is primarily provided by the North County Transit District (NCTD) and the Metropolitan Transit System (MTS). Several bus and rail service enhancements are proposed in the 2030 RTP.

Regional Vision for Transit

The RTP transit benchmarks are to achieve a greater than 10 percent transit mode share during peak periods and to provide competitive transit travel times to major job centers and services that are accessible to people of all income levels and differing physical capabilities.

The regional vision for transit is established in regional planning efforts, such as SANDAG's RTP and SANDAG's 2008-2012 Coordinated Public Transit – Human Services Transportation Plan (Coordinated Plan), which includes the components of the Short-Range Transit Plan. These plans emphasize a transit system that is combined with smart land use decisions to maximize the role of public transportation in addressing regional mobility needs. It is also intended to reduce greenhouse gas emissions by reducing vehicle dependence and achieve increased ridership on transit modes.

The 2030 RTP identifies and funds critical long-term improvements to the regional transit system. Its transit benchmarks are to achieve a greater than 10 percent transit mode share during peak periods and to provide competitive transit travel times to major job centers and services that are accessible to people of all income levels and differing physical capabilities. In addition to adding routes and increasing service frequency, the 2030 RTP's transit element also includes implementing Intelligent Transportation Systems (ITS) and Transportation Demand Management (TDM) improvements to maximize transit efficiency and use.

The 2030 RTP envisions the regional transit system to be composed of five types of fixed-route transit service to serve the travel needs in the region, all of which are applicable to the I-5 CSMP travel shed:

- **Intercity Rail** services for long-distance tripmaking between regional cities such as Los Angeles and San Diego. Improvements for intercity rail services include: additional service and decreasing AMTRAK travel times between Los Angeles and downtown San Diego from 2 hours and 40 minutes to 2 hours.
- **Commuter Rail and Bus Rapid Transit (BRT)** services for long-distance tripmaking, with high operating speeds achieved by long station spacing (four to five miles on average) and dedicated rights-of-way for transit that bypass congested areas. Improvements for the Commuter Rail (COASTER) include: 20 minute peak and 60 minute off peak service and station improvements. Improvements for BRT include: I-5 BRT operating from Oceanside to University Towne Center via El Camino Real and I-5, new BRT vehicles, new BRT transit stations, traffic signal priority and queue jumper lanes, and transit-only lanes.

The 2030 RTP envisions the regional transit system to be composed of five types of fixed-route transit service modes to serve the different travel needs in the region: Intercity Rail, Commuter Rail and BRT, Light Rail and Arterial Rapid Bus, Local Bus, and Shuttle Bus.

- **Light Rail and Arterial Rapid Bus** services for medium distance tripmaking, with station spacing of three-quarters to one mile on average and a variety of transit priority measures to maximize operating speeds in high volume arterial corridors. Improvements to light rail and arterial rapid bus include: new vehicles, SuperLoop UCSD/UTC shuttle route, Sorrento Mesa Transit Guideway, Mid-Coast light rail in the Golden Triangle area, traffic signal priority and queue jumper lanes, new transit stations, and transit-only lanes.
- **Local Bus** services for shorter-distance tripmaking within communities with frequent station spacing. Improvements for local bus services include: new vehicles, traffic signal priority and queue jumper lanes, transit only lanes, and improved stations.
- **Shuttle Bus** services for intra-community tripmaking and distributors for commuter rail, bus rapid transit, light rail, and arterial rapid bus services in regional employment centers and high-density residential/commercial areas. These services also include vanpools and airport shuttle services.

Significant changes have been made to local transit services in recent years that have resulted in improved system cost-effectiveness and service levels in the urban core areas that have strong transit -supportive land uses. Additional investment is included in the 2030 RTP to bring existing bus services in key travel corridors, such as the Highway 101 corridor, up to the service goal of 15 minutes or better all-day service frequencies. In addtions, the plan includes significant capital investments to rehabilitate and expand the carrying capacity of the region's existing rail network.

Planning for local bus and shuttle bus services is based on ridership and funding levels that change rapidly due to external factors. Therefore many of the envisioned improvements for these services are considered hardscape improvements such as new transit-only lanes and signal priority rather than increased services. These improvements will allow for increases in services if they are warranted based on ridership numbers in the future but will also make existing services more efficient in the mean time.

Four of the service types utilize bus services because of their flexibility in route and schedule. Therefore, bus transit is critical to the envisioned regional transit system that provides all-day services and includes a network of faster, limited stop services that provide regional connectivity. The system also aims for a superior customer experience by providing amenities such as safe access to transit, improved transit shelter design and lighting, and real-time transit information.

The implementation of HOV or managed lanes on freeways could also provide a congestion-free lane for buses and carpools making commuting by bus a much more reliable and attractive option. Similarly, improvements to the regional arterials will also improve bus performance and viability as an alterative to car use (e.g., *Transit services in the I-5 CSMP Corridor are essential to the functionality of the regional transportation system.*

dedicated lanes that bypass congested intersections and traffic signal prioritization). This prioritization of bus transit is one component of bus rapid transit (BRT), which is a centerpiece of the region's transit vision. Further, the bus system has the advantage of being flexible; bus routes can be modified or added relatively easily, as nearly any road is a possible route.

The region also envisions that improvements to the LOSSAN rail corridor (managed by the Los Angeles - San Diego - San Luis Obispo Corridor Agency), such as double tracking, bridge replacemetns, and station improvements, will also provide a potential solution to congestion on freeways and arterials by allowing for more trains for commuters and faster travel times between downtown San Diego and Los Angeles. These rail improvements are not only envisioned to help commuters, but also improve goods movement by allowing for more railcars to be added to the freight trains.

While the transit services discussed in this CSMP are for the I-5 CSMP Corridor, all the transit services in the corridor are an integral part of the larger regional system and connect to other services in order to provide a comprehensive public transportation system. For example, the BRT proposed for the I-5 CSMP will connect to the planned Super Loop and I-805 BRT at the transit center in University City. These connections are essential for commuters to connect to locations beyond each route's service area. It is also important to note that the conventional rail services in the corridor function as a feeder system to the proposed high speed rail in Los Angeles. While it is anticipated that the high speed rail will operate along the I-15 corridor and not in the I-5 CSMP corridor in San Diego County, it is expected that these trains will accommodate approximately 1,000 people per train and thus reduce traffic demand on the I-5 CSMP corridor for commuters between Los Angeles and San Diego. Travel time to Los Angeles via the Inland Empire route on high-speed rail is mandated to be no longer than one hour and 20 minutes. As such, the services that exist in the I-5 CSMP corridor are essential to the functionality of the regional transportation system.

Improvements to the bus transit system in the travel shed focus on increasing ridership and improving mobility.

Planned Improvements to the Bus Transit System

Of the $57.7 billion in major project expenditures for the regional transportation system, the 2030 RTP Reasonably Expected Revenue Scenario allocates $17.8 billion for transit capital improvements, including bus transit, and operations. The 2030 RTP introduces new bus services including arterial rapid bus and bus rapid transit, as well as upgrades to existing local bus services. Together, these services will provide a range of bus options to serve the different travel needs of people in the region. These transit investments in the I-5 CSMP travel shed are focused in the more developed arterial corridors and in communities where pedestrian-friendly, smart growth projects are in development or are planned for the future.

Improvements to the bus transit system in the I-5 CSMP travel shed focus on increasing ridership and improving mobility. With the addition of rapid bus systems and improvements to the regional arterials, the bus system in the travel shed could:

- Operate all-day on 15-minute or better headways during operating hours;
- Provide a network of timed transfer points between buses and rail;
- Provide shuttle service from key transit routes to nearby destinations and activity centers;
- Offer streamlined local transit services for faster trips; and
- Provide improved transit stops and stations.

Bus transit improvement types throughout the travel shed are listed below. Figures 7.15-7.17 show the planned improvements on the bus route map. For a detailed description of the improvements and their costs, please refer to Tables 7.12-7.15.

- Transit and bus rapid transit priority measures;
- Improved/new transit stations and centers;
- Vehicles for new transit services;
- Transit programs for seniors;
- Rapid bus services; and
- Park-and-ride lot improvements.

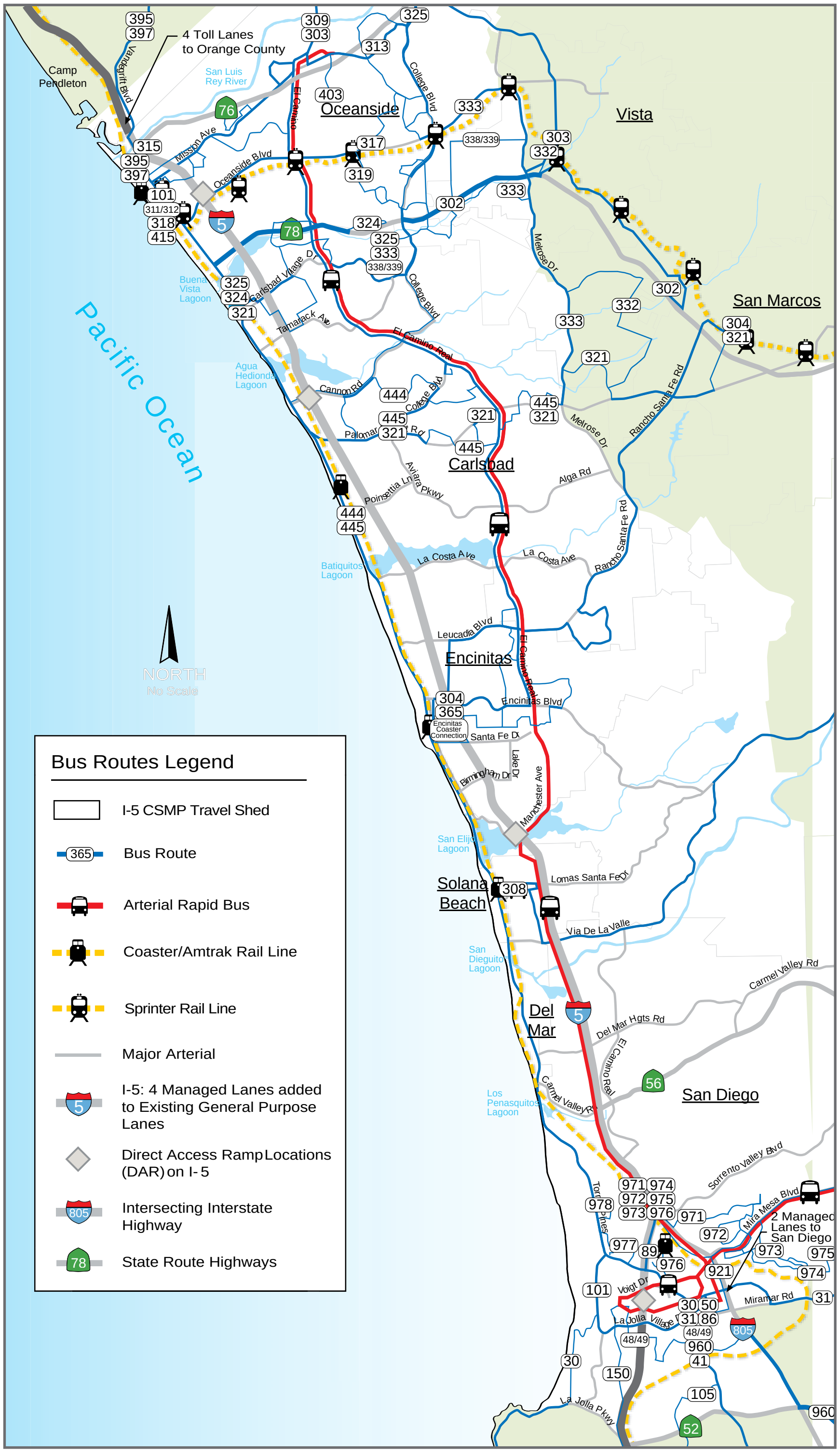
The 2030 RTP's Reasonably Expected Revenue Scenario proposes $5.4 billion in rail transit improvements in the San Diego region, of which $3.8 billion is earmarked for the I-5 North Coast CSMP Corridor.

Planned Improvements to the Rail Transit System

In addition to the Bus Transit improvements, the 2030 RTP Reasonably Expected Revenue Scenario plans improvements to rail transit in the I-5 CSMP. The 2030 RTP introduces new light rail services in the "Mid-Coast" area around University City and the Golden Triangle, as well as improvements to the coastal rail corridor between Orange County and downtown San Diego.

The Mid-Coast Trolley is an 11-mile extension to the existing San Diego Trolley system that will start just north of the Old Town Transit Center and travel parallel to I-5 north to Gilman Drive. Three stations are proposed in this section at Tecolote Road, Clairemont Drive, and Balboa Avenue. The extension will run north along I-5 to UCSD and continue to its terminus at UTC in the University City area. There are five stations proposed in this segment at University Center Lane, UCSD West, UCSD

Figure 7.15 Bus Routes Improvement Map



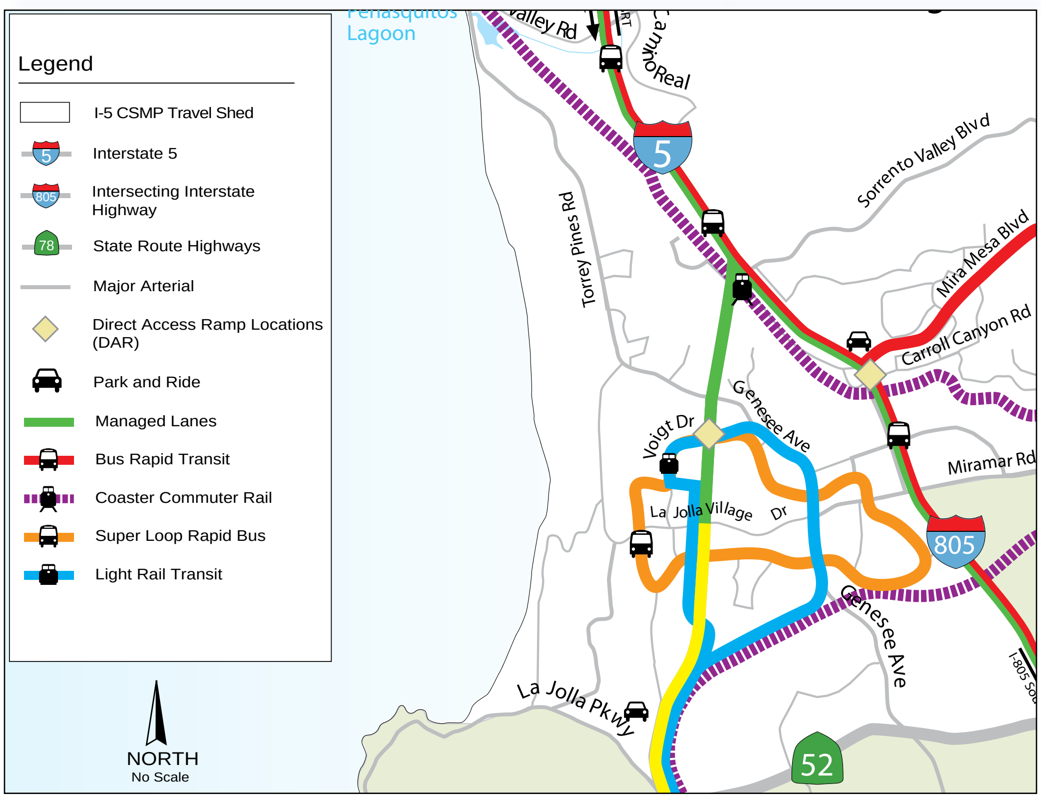
Source: Rand McNally: The Thomas Guide, 2006. NCTD Route Maps, MTS Route Maps.

> *The addition of rapid bus services will provide commuters with more choices and help alleviate peak hour congestion on I-5.*

Figure 7.16 Transit Routes Connectivity Improvements in Oceanside Map

Source: Rand McNally: The Thomas Guide, 2006. NCTD Route Maps, MTS Route Maps.

Figure 7.17 Transit Routes Connectivity in Sorrento Valley Area Map



Source: Rand McNally: The Thomas Guide, 2006. NCTD Route Maps, MTS Route Maps.

East, Executive Drive, and the UTC Transit Center. The Mid-Coast Trolley will connect to the Superloop Bus at the UTC Transit Center.

The 2030 RTP's Reasonably Expected Revenue Scenario proposes $5.4 billion in rail transit improvements in the San Diego region, of which $3.8 billion is earmarked for the I-5 CSMP travel shed, including two rail tunnels, double-tracking, curve straightening, bridge replacements, and rail vehicles. Improvements to the rail transit system in the travel shed focus on increasing ridership and improving mobility. Planned rail infrastructure improvements will permit the Coaster to operate with 20-minute headways equating to as many as 54 trains per day versus the existing 26 trains per day.

In order for the transit service improvements to be effective, many infrastructure projects must also be completed.

In 2009, the major rail capacity and station improvement projects were identified and prioritized for future funding opportunities (Table 7.16) by SANDAG, Caltrans, NCTD, BNSF Railway, and Amtrak. The highest ranking projects included seven track capacity projects along the LOSSAN corridor. In July 2009, SANDAG programmed more than $19 million for the design of these projects and later received $12 million in federal stimulus funds for two improvements.

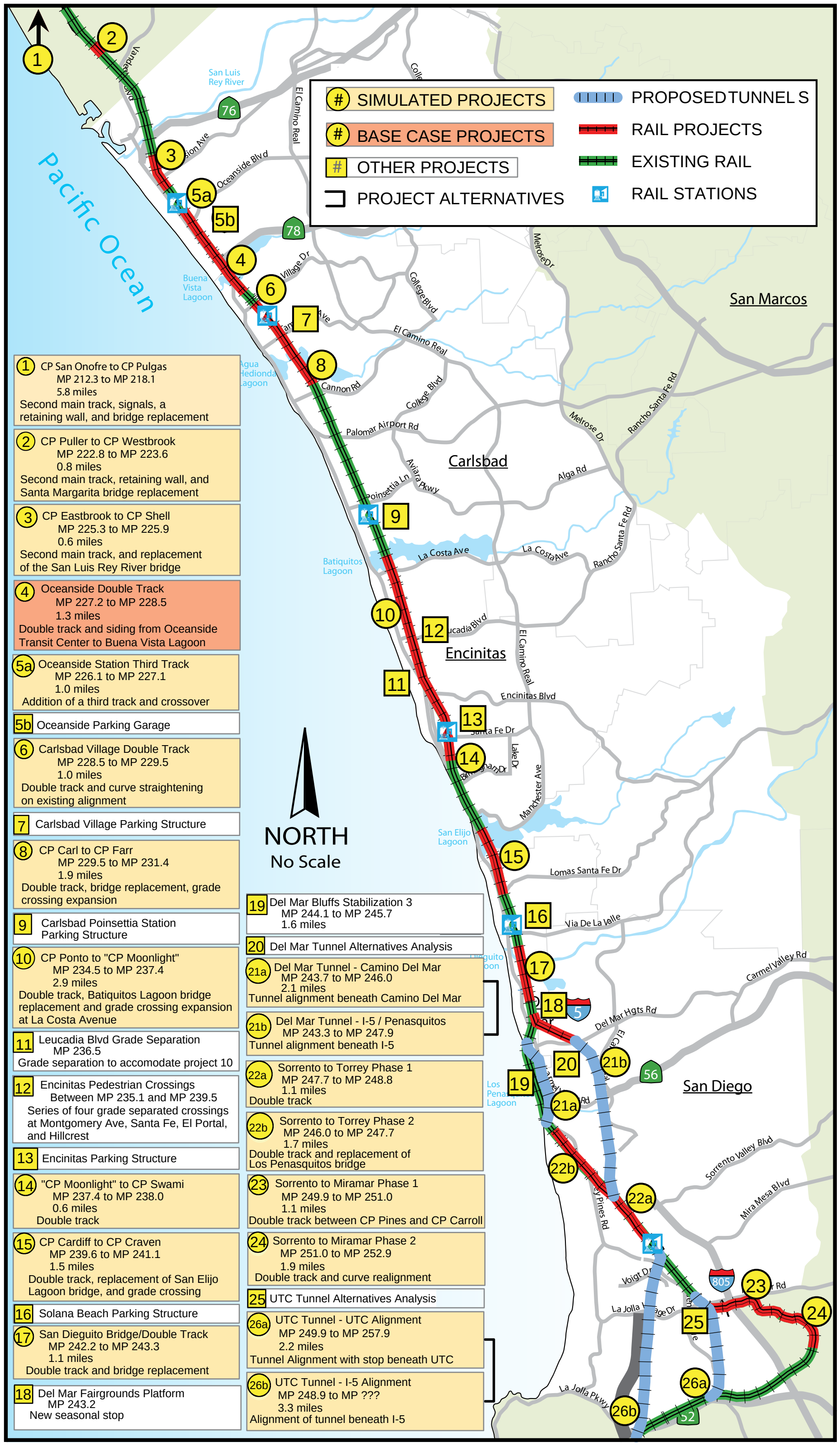
For a description of the rail transit improvements and their costs, please refer to Table 7.15 - 7.16. Figure 7.18 shows the improvements on the Proposed Rail Improvement Map.

Planned Improvements to Infrastructure

The effectiveness of the transit service improvements is also dependent on the completion of several infrastructure projects. For rail transit this includes double tracking the majority of the rail corridor, replacement of several bridges, and a new tunnel at University Towne Center. For bus transit, completion of the I-5 managed lanes project and transit only lanes on arterial roadways is essential. Without these improvements the transit system's ability to handle capacity beyond the existing conditions is severely limited. These infrastructure improvements provide the ability to accommodate increased demand for transit service in the future.

In addition to these improvements, additional parking is needed at transit centers. The region has planned enhanced park-and-ride locations at Carmel Valley Road and La Costa Avenue. Additionally, parking structures are planned at the Oceanside, Carlsbad Village, Poinsettia, Encinitas, and Solana Beach transit centers. This increase in availability should provide the ability to accommodate parking demand at the transit centers and stations.

Figure 7.18 Proposed I-5 North Coast Rail Improvements Map



Source: Rand McNally: The Thomas Guide, 2006.

Table 7.12 Bus Regional Improvement Costs

Improvement	Location and Description	Cost
Transit Priority Measures/ Enhancements	Signal priority, queue jumper lanes, transit-only lanes, grade separations, and other improvements to arterial streets for existing local bus service	$25,000,000
Arterial BRT Transit Priority Improvements	Signal priority, queue jumper lanes, transit-only lanes, grade separations, and other improvements to arterial streets for new arterial BRT and rapid bus routes	$18,000,000
Improved/New Major Transit Stations and Centers	Includes new arterial BRT corridor stations, new arterial stations, improved existing regional stations, and parking	$194,000,000
Vehicles for New Transit Services	Includes standard buses, arterial corridor BRT vehicles, regional BRT vehicles	$17,000,000
TOTAL		**$254 Million**

Table 7.13 Bus I-5 CSMP Travel Shed Improvement Costs

Improvement	Location and Description	Cost
New Arterial Rapid Bus Service	Oceanside to UTC via El Camino Real/I-5	$52,000,000
Park-and-Ride Improvements	Enhanced Park and Ride at Carmel Valley Road	$2,500,000
	Enhanced Park and Ride at La Costa Avenue	$1,950,000
TOTAL		**$56,450,000**

Table 7.14 Bus City Improvement Costs

City	Location and Description	Cost
San Diego	Super Loop UCSD/UTC Shuttle Route	completed
TOTAL		

* - Note: Partially complete; first phase of Route 201 Super Loop opened in 2009

Table 7.15 Rail City Improvement Costs

City	Location and Description	Cost
San Diego	Mid-Coast Light Rail*	
TOTAL		

* Mid-Coast Light Rail costs are not included as part of the I-5 North Coast Corridor Project.

Table 7.16 Rail Planned Improvement Costs

Project		Description	Cost
1	CP San Onofre to CP Pulgas	Double track; signals; retaining wall; bridge replacement	$33,000,000
2	CP Puller to CP Westbrook (Santa Margarita)	Double track; replacement of Santa Margarita Bridge; retaining wall	$50,000,000
3	CP Eastbrook to CP Shell (San Luis Rey)	Double track; San Luis Rey River Bridge replacement	$45,000,000
4	Oceanside Double Track	Double track; siding extension, from Oceanside station to Buena Vista Lagoon	$12,100,000
5a	Oceanside Station 3rd Track	Addition of a third track and crossover	$8,200,000
5b	Oceanside Parking Garage	Addition of a parking garage	$23,017,109
6	Carlsbad Village Station Double Track	Double track; curve straightening on existing alignment	$28,000,000
7	Carlsbad Village Parking Structure	Addition of a parking structure	$18,758,599
8	CP Carl to CP Farr	Double track; bridge replacement; two grade crossings	$18,000,000
9	Carlsbad Poinsettia Parking Structure	Addition of a parking structure	$21,000,000
10	CP Ponto to CP "Moonlight"	Double track; Batiquitos Lagoon Bridge replacement; grade crossing expansion	$43,000,000
11	Leucadia Blvd Grade Separation	Grade separation at Leucadia Boulevard	$150,000,000
12	Encinitas Pedestrian Crossings	Grade separated crossings at Montgomery, Santa Fe, El Portal, and Hillcrest	$12,000,000
13	Encinitas Station Parking Structure	Addition of a parking structure	$18,000,000
14	CP "Moonlight" to CP Swami	Double track	$20,000,000
15	CP Cardiff to CP Craven	Double track; replace San Elijo Lagoon Bridge, grade crossing at Chesterfield	$60,000,000
16	Solana Beach Parking Structure	Addition of a parking structure	$25,000,000
17	San Dieguito Bridge/Double Track	Double track, replacement of San Dieguito Bridge	$76,000,000
18	Del Mar Fairgrounds Permanent Seasonal Platform	Add stop when fair is in session	N/A
19	Del Mar Bluffs Stabilization Phase 3	Replace track bed support that has eroded, protect the bluff face, and reinforce the bluff toe	$26,369,397
20	Del Mar Tunnel Alternatives Analysis	Conduct study of tunnel alignment options	$1,257,683
21a	Del Mar Tunnel-Camino Del Mar alignment	Tunnel and double track beneath City of Del Mar; at-grade double track from 243.7 to 247.9	$429,614,918
21b	Del Mar Tunnel-I-5 Penasquitos alignment	Alignment of tunnel and double track underneath I-5	$659,135,217
22a	Sorrento Valley Double Track	Double track between CP Carmel Mountain and CP Torrey	$29,000,000
22b	Penasquitos Double Track	Double track between CP Sorrento and CP Torrey and replacement of Los Penasquitos bridge	N/A
23	Sorrento to Miramar Phase 1	Double track between Sorrento and Miramar (CP Pines to CP Carroll)	$23,000,000
24	Sorrento to Miramar Phase 2	Extend double track from Phase I; curve realignment	$98,742,100
25	UTC Tunnel Alternatives Analysis	Conduct study of tunnel alignment options	$2,515,366
26a	UTC Tunnel-UTC Alignment	Alignment of tunnel and stop beneath University Towne Center	$435,500,054
26b	UTC Tunnel-I-5 Alignment	Alignment of tunnel underneath I-5	$517,891,957
TOTAL			**$2.8 Billion**

Bicycle and Pedestrian

Bicycle and pedestrian system improvements in the I-5 CSMP travel shed are part of creating a balanced transportation system that provides functional travel options beyond using a vehicle to access the coastline, activity centers, and transit resources.

A lack of connected and continuous bicycle and pedestrian routes across the I-5 freeway is a major gap in the existing system. These gaps prevent connectivity to transit centers, schools, and activity and recreation centers. By completing realignments, extensions, and new routes, connectivity across and along the highway can be improved and the viability of biking and walking as an alternate mode of transportation in these communities will increase significantly.

For example, the Coastal Rail Trail, one of the main north-south bicycle and pedestrian routes is located west of I-5 and currently lacks connections to several east-west routes in the corridor. Enhancing east-west access to the Coastal Rail Trail has the potential to provide for greater bicycle and pedestrian use throughout the travel shed.

Improvements to the bicycle and pedestrian routes in the travel shed may also:

- Remove local vehicle trips from arterial streets and highways;
- Make transit more convenient and safe by having connected and continuous routes that can be used to travel to transit stations;
- Reduce noise and air pollution by reducing vehicle use; and
- Improve public health by encouraging people to use more physically active modes of travel such as walking and bicycling.

Regional Vision for the Bicycle and Pedestrian System

SANDAG's 2030 RTP supports bicycle and pedestrian access to the regional transportation network through land use and street design standards that make bicycling and walking safer, as well as more practical and attractive. The desired result is that these more local modes of transportation become a larger part in the region's transportation system. To help achieve this result, the RTP calls for two actions: transportation facilities be designed to encourage bicycle and walking trips, and not be a barrier; and development of a unified bicycle system throughout the region by creating stronger route connections to local and regional activity centers, transit facilities, and other regional non-motorized transportation systems.

To create a unified bicycle system for the region, SANDAG initiated the development of a Regional Bicycle Master Plan (RBMP) in May 2008. This RBMP will lay the foundation for SANDAG to:

- Define the network of regionally significant bicycle routes, facilities, and necessary support programs;
- Identify gaps in the existing bicycle route network and recommend specific improvements to fill the gaps;
- Develop cost estimates to complete construction of the regional bicycle route network;
- Develop a funding strategy to build and maintain the regional bicycle route network;
- Provide a design manual focusing on bicycle-friendly designs for all streets and roadways through new technologies, standards, guidelines, and innovative treatments on all new roadways and multi-use paths; and
- Provide policy direction and identify programs to assist local jurisdictions in improving safety, education, and awareness about bicycle travel.

In regard to the pedestrian route system, SANDAG seeks to:

- Encourage local agencies to develop pedestrian master plans for their jurisdictions that incorporate guidance from SANDAG's Planning and Designing for Pedestrians, Model Guidelines for the San Diego Region;
- Promote participation in Safe Routes to School programs; and
- Promote implementation of Safe Routes to Transit improvements.

It should however be noted that the RBMP and the RTP's recommendations are regional in focus, concentrating on policies and programs for countywide implementation and providing a framework for local decision-makers to plan specific routes, facilities, and improvements. This is because implementation of bicycle and pedestrian facilities is largely the responsibility of local governments.

Like the regional arterial street system, the bicycle and pedestrian system also has gaps both in its east-west and north-south routes, particularly where the trails meet the highway. By closing these gaps, there is an opportunity to convert a higher share of community and intercommunity vehicle trips to bicycle and pedestrian trips and an opportunity to connect people to trail systems that lead to the coastline, activity centers, and transit centers.

Providing solutions that address these service gaps is essential to developing a seamless multimodal transportation network. Potential first and last mile solutions include enhanced pedestrian and bicycle route networks around transit stations and the use of innovative mobility concepts such as Segways, electric bicycles and electric vehicles, short-haul vanpooling, and car sharing.

To improve the bicycle and pedestrian system in the travel shed, Caltrans initiated an intensive stakeholder involvement program to develop the I-5 CSMP with a goal of increasing community connectivity to the coastline, activity centers, and transit centers. For two years, stakeholders from the I-5 CSMP travel shed's six coastal communities were invited to work with the project team to identify and prioritize meaningful design enhancements which resulted in the I-5 North Coast Corridor Enhancement Plan. This process ultimately resulted in the 25 enhancements discussed later in this section. These enhancements include projects that both improve local connections in the bicycle and pedestrian systems, as well as enhance the environment for the pedestrian through revegetation of the natural environment and integrating aesthetic treatments into individual projects.

These context-sensitive design enhancements not only improve pedestrian and bicycle connectivity throughout these important routes, but also compliment and support them through new artwork, new parks or park improvements, and revegetation of wetlands. These complimentary enhancements were selected for their ability to both preserve scenic, aesthetic, historic, and environmental resources, while improving safety and mobility.

Planned Enhancements to the Bicycle and Pedestrian Facilities

This section describes the planned bicycle and pedestrian route enhancements as documented in the I-5 North Coast Corridor 2007 Community Enhancement Plan. These projects respond to three goals to: 1) improve east-to-west and north-to-south regional bikeway facilities that are continuous and interconnected; 2) implement local bikeway and pedestrian enhancements in the corridor cities, and 3) focus improvements on pedestrian and bicycle trails to support transit centers that serve rail, bus, and vanpools.

There are five types of planned bicycle and pedestrian enhancements:

- Underpass Trail Connections;
- Streetscape Enhancements;
- Suspension Bridges under the Highway;
- Park and Ride Facility Enhancements; and
- Overpass Enhancements.

O - City of Oceanside

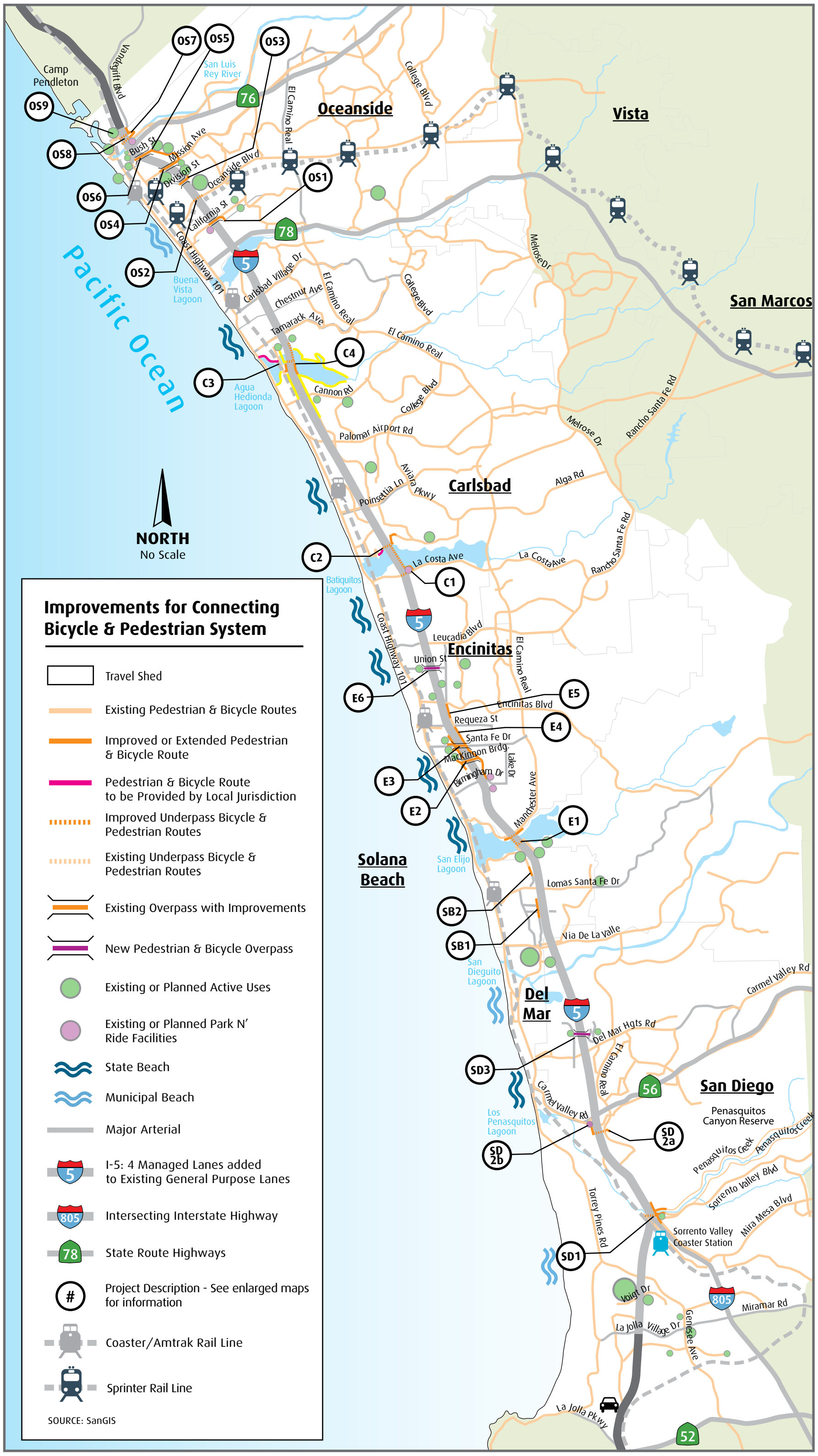
C - City of Carlsbad

E - City of Encinitas

SB - City of Solana Beach

SD - City of San Diego

Figure 7.19 Bike and Pedestrian Facilities



Source: Rand McNally: The Thomas Guide, 2006. SanGIS.

Figure 7.19 shows a comprehensive map of these enhancements for the I-5 CSMP travel shed. This comprehensive map is then followed by enlarged maps for each city, providing detailed descriptions of how each improvement helps to remove existing gaps in the system, connect uses on the east and west sides of the highway, and enhance access to the coast, transit centers, and other destinations.

Table 7.17 Pedestrian And Bicycle Route Systems With Proposed Enhancements

Facility Type	Existing Bicycle Facilities	Future Bicycle Facilities	Existing Pedestrian Facilities	Future Pedestrian Facilities
Non-Standard	35	11	22	6
Standard	4	27	15	26
Enhanced	0	1	0	5

As noted in Table 7.17 above, local roads cross the I-5 a total of 37 times in the travel shed, 22 of the crossings are non-standard and 15 are standard). The region is endeavoring to reduce bicycle and pedestrian obstructions to crossing this freeway. To facilitate this, 16 crossings will have Class II bike lanes added to the shoulder of the intersection and 10 crossing will have Class III bike routes added to the shoulder of the intersection. Additionally, sidewalks will be added to 26 crossings so that they will be 10- to 12-feet wide on each side of the street, with five of those sidewalks being at least 17-feet wide. The five enhanced facilities include California Street, Brooks Street, Mission Avenue, and Bush Street in Oceanside, and MacKinnon Avenue in Encinitas. These facilities have been proposed for improved pedestrian access to the schools and parks in the area.

Table 7.18 presents the costs for the proposed bicycle and pedestrian enhancements from the I-5 North Coast Community Enhancement Plan.

Figure 7.20 Planned Bicycle and Pedestrian Enhancements: City of San Diego

Note: This map, and the maps on the following pages, are from the Planned Enhancement map and are zoomed in to each specific city.
Source: Rand McNally: The Thomas Guide, 2006.

SD 2a **Carmel Valley Bicycle/Pedestrian Trail Connection –** This new trail underpass will connect the SR 56 Regional Bicycle Trail to Carmel Valley Road, leading to Torrey Pines State Park and is part of completing the Sea-to-Sea Trail from the Salton Sea to the Pacific Ocean.

SD 2b **Enhanced Park and Ride at Carmel Valley Road –** This project provides a new trailhead at the park-and-ride lot at Carmel Valley Road to link to Torrey Pines State Reserve, its trails and the trails along Los Penasquitos Lagoon west of the highway. This project connects to the new Carmel Valley trail that helps complete the SR 56 Bicycle Trail that is part of completing the Sea-to-Sea Trail from Salton Sea to Pacific Ocean.

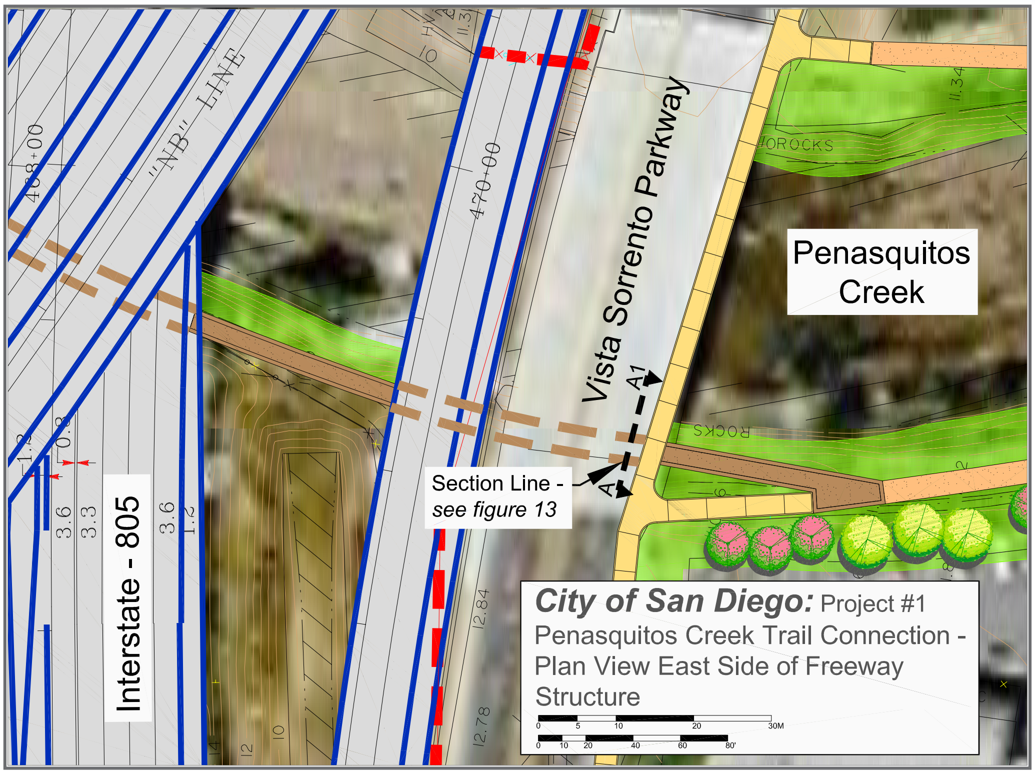
SD3 **Pedestrian Overpass Connection North of Del Mar Heights Road –** This overpass connects the neighborhoods east of the highway to Del Mar Elementary School and to the roadway that connects to the Pacific Ocean on its west side.

SD1 **Penasquitos Creek Trail Connection –** This project provides connecting trails between the Sorrento Valley Coaster Station on the west side of the highway to commercial uses and Penasquitos Canyon Reserve and trails on its east side.

Example 1: Underpass Leading to Trail Connection

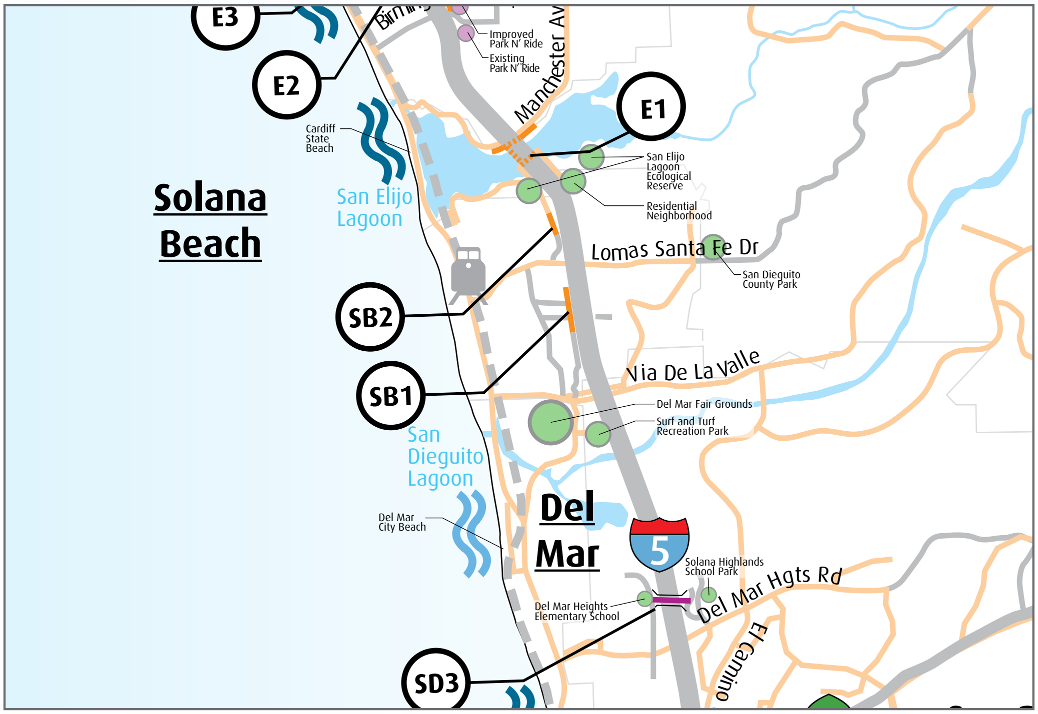
In this example, a trail connection would be constructed within the City of San Diego under the highway structures from Penasquitos Creek to Sorrento Valley Road to create better linkage between the Sorrento Valley Coaster Station and the residential and commercial developments near Sorrento Valley Road on the west side of the highway and the existing commercial uses, as well as trails at Penasquitos Creek Canyon Reserve, on the east.

Figure 7.21 Penasquitos Creek Trail Enhancement, Plan View



Source: I-5 North Coast Community Enhancement Plan.

Figure 7.22 Planned Bicycle and Pedestrain Enhancements: City of Solana Beach



Source: Rand McNally: The Thomas Guide, 2006.

SB2 **Trailhead at Solana Hills Drive –** On west side of I-5, this trailhead improves neighborhood access to trails near San Elijo Lagoon Ecological Reserve Trails.

SB1 **Streetscape Enhancements on Ida Avenue –** Improves north to south streetscape along the west side of the highway.

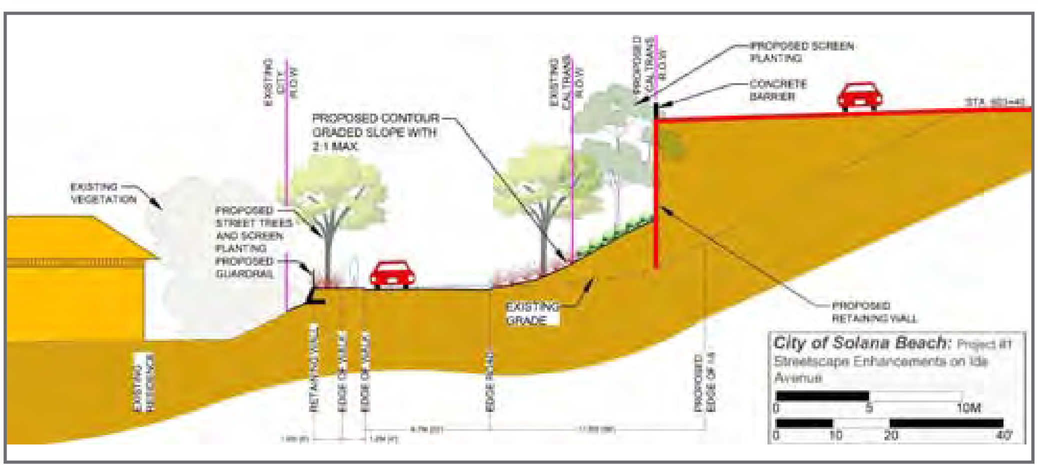
Example 2: Streetscape Enhancements

In this example, streetscape enhancements would be constructed in Solana Beach along Ida Avenue from Academy Drive to south of Genevieve Street. The improvements would enhance the existing street, and would accommodate a sidewalk on the west side, and travel lanes in both directions. The improvements would provide curbs, a sidewalk for pedestrians, landscaping, and screen planting between the neighborhood and the highway.

Figure 7.23 Ida Avenue Streetscape Enhancement Plan

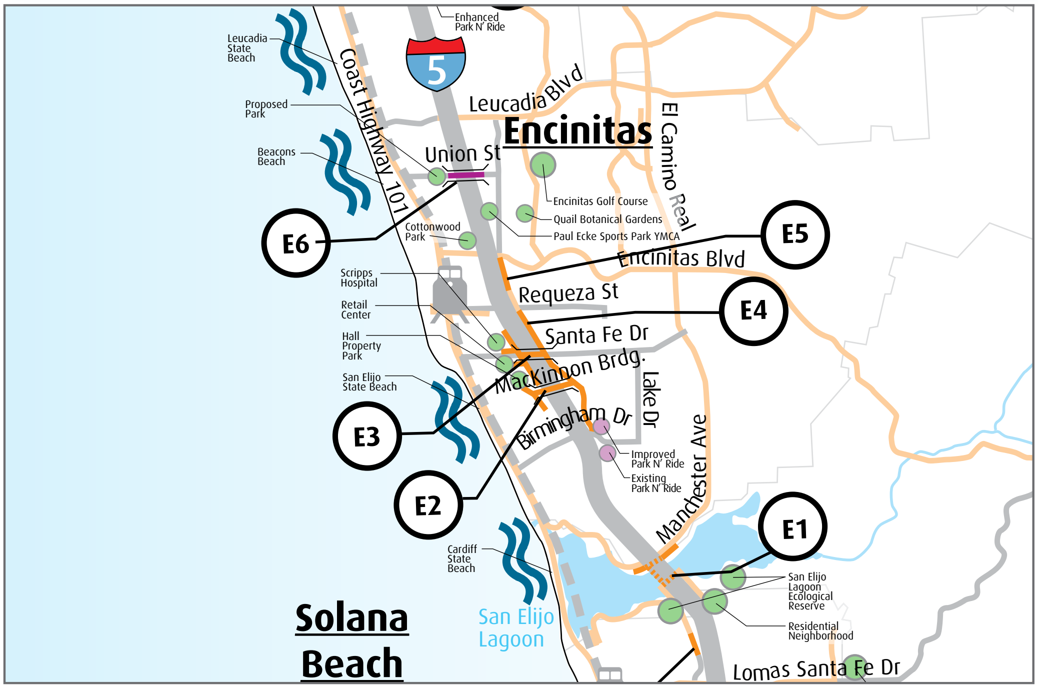
Source: I-5 North Coast Community Enhancement Plan.

Figure 7.24 Ida Avenue Streetscape Enhancement Plan, Section



Source: I-5 North Coast Community Enhancement Plan.

Figure 7.25 Planned Bicycle and Pedestrian Enhancements: City of Encinitas



Source: Rand McNally: The Thomas Guide, 2006. Blue is enhancements that will improve coastal access.

E1 **Manchester Avenue Pedestrian Bridge and Trail –** This project provides streetscape improvements along Manchester Avenue and a bridge suspended from the bottom of the highway from Manchester south to trails that flank the highway. This bridge will connect lagoon trails and residents on both sides of the highway to trails and a possible park-and-ride lot on its east side. The project will provide improved coastal access via its connection to Manchester Avenue.

E2 **Villa Cardiff Drive Improvements –** Improves trails, bridge, and park-and-ride lot to enhance access to San Elijo State Beach via Birmingham Drive and San Elijo Avenue.

E3 **Hall Property Park Trail Connecting to Santa Fe Drive –** This project improves pedestrian routes along I-5 and Santa Fe Drive Bridge, connecting uses on its east to retail uses, Scripps Hospital, and Hall Property Park on its west. This project enhances access to San Elijo State Beach via Birmingham Drive and San Elijo Avenue.

E4 **Trail Connecting Santa Fe Drive, Requeza Street with Wetland Revegetation –** In addition to restoring wetlands, this project provides a new trail along the east side of I-5 between the bend in Regal Road to Requeza Street. This enhancement is part of a new north-south linear park between Encinitas and Birmingham Drive, linking commercial and residential uses to a variety of uses on the west side of I-5 via the improved pedestrian bridge at Santa Fe Drive.

E5 **Trail Connecting Requeza Street to Encinitas Boulevard –** In addition to restoring wetlands, this project completes the north end of the existing trail along the east side of I-5 between Requeza Street and Encinitas Boulevard, which completes north-south pedestrian connectivity between Encinitas and Birmingham Drive and creates access to pedestrian bridges that lead to a variety of uses and the coast west of I-5.

E6 **Union Street Pedestrian Overpass, Trail Connection, and Wetland Revegetation –** In addition to adding a small park and enhancing wetlands, this project adds a new bridge over I-5 at Union Street connecting west side uses such as a new small park and Cottonwood Creek to residential neighborhoods, Paul Ecke YMCA Sports Park, Quail Botanical Garden, and Encinitas Ranch Golf Course. This new bridge also improves access west to Beacons Beach/ Leucadia State Beach.

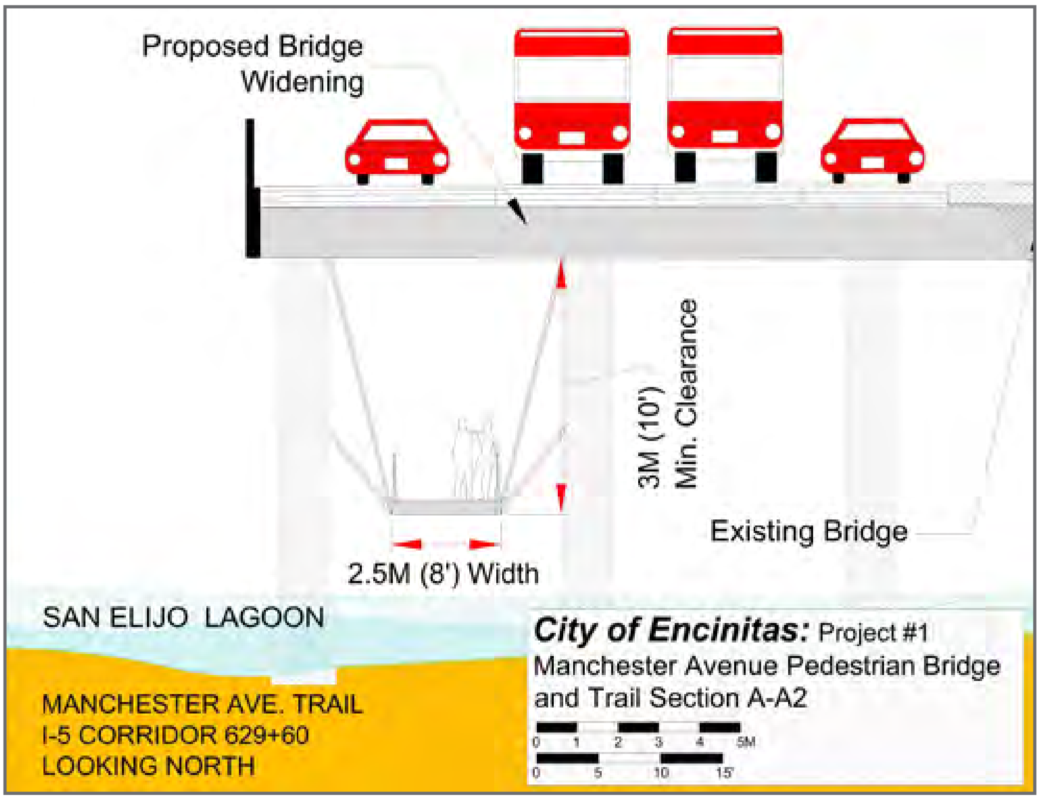
In addition, the City of Encinitas Bikeway Master Plan Update from 2005 also proposes the addition of several Class II bikeways. These proposed bikeways are as follows:

- **Manchester Ave from Encinitas Blvd to El Camino Real –** This segment will complete the Class II bikeway on Manchester Ave. The segment between El Camino Real and Traber Ranch Road will likely require right of way acquisition due to limited roadway width. This is part of a popular cycling route.
- **El Camino Real from Tennis Club Drive to Manchester Ave –** This is the sole remaining segment of El Camino Real that does not have Class II lanes.
- **Coast Highway 101 between K Street and Cardiff State Beach –** This segment upgrades the southernmost section of Coast Highway 101, which is made up of an unorganized arrangement of official and unofficial bikeway facilities. This is the only bikeway connection between Encinitas and Solana Beach.
- **Coast Highway 101 between D Street and La Coasta Avenue –** This segment upgrades the northern section of Coast Highway 101 from a Class III to a Class II.

Example 3: Suspension Bridge Under Highway

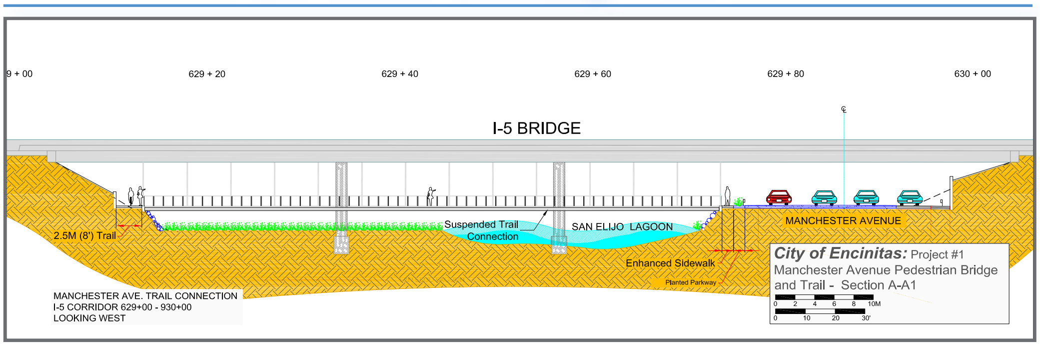
In this example, a new trail, streetscape improvements and suspended walkway would be constructed in Encinitas under the I-5 bridge at Manchester Avenue across San Elijo Lagoon connecting the trail segments and residents on both sides of the highway to trails and a possible park-and-ride lot on its east side.

Figure 7.26 I-5 Suspension Bridge at Manchester Avenue Enhancement Plan, Section Looking North



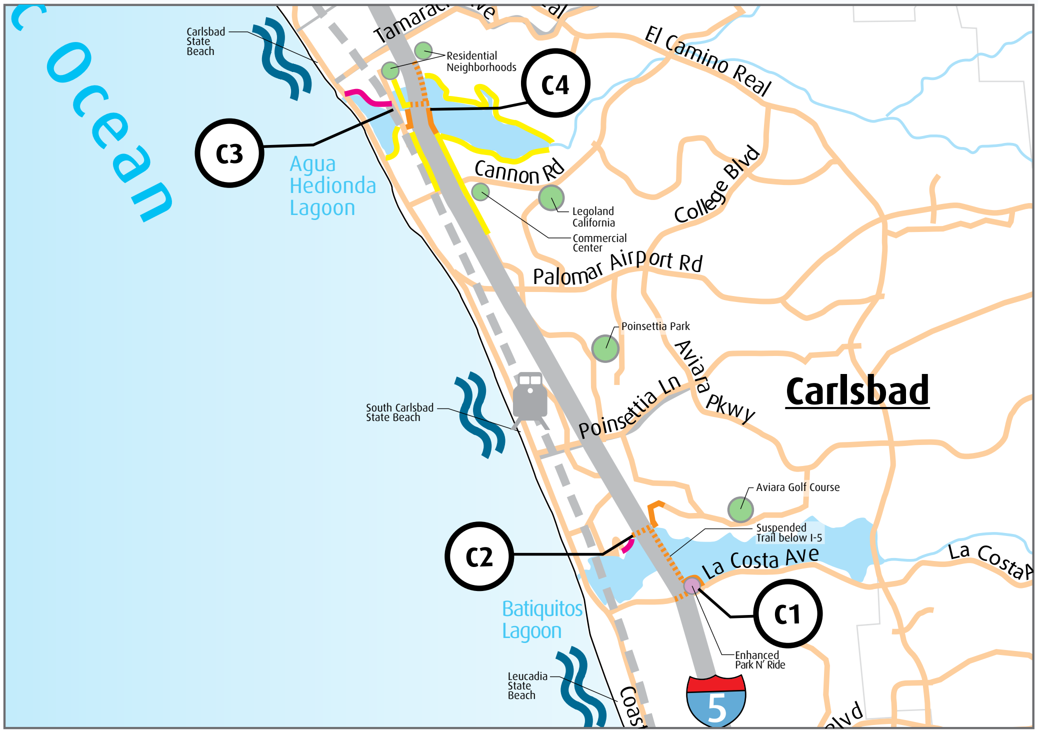
Source: I-5 North Coast Community Enhancement Plan.

Figure 7.27 I-5 Suspension Bridge Enhancement, Elevation Looking West



Source: I-5 North Coast Community Enhancement Plan.

Figure 7.28 Planned Bicycle and Pedestrian Enhancements: City of Carlsbad



Source: Rand McNally: The Thomas Guide, 2006. Blue text designates enhancements that will improve coastal access.

C1 Park and Ride Enhancement/Nature Center at La Costa Avenue – This project improves the existing Park and Ride lot on the east side of I-5 including landscaping, lighting, and a Nature Center Facility for Batiquitos Lagoon and trails.

C2 Trail on East Side of I-5 at Batiquitos Lagoon – This project provides a new suspended pedestrian bridge running north-south under I-5 connecting a new trail that runs east-west along the lagoon to a trail that runs north-south along the east side of I-5. However, a gap remains between this improvement and San Pacifico Trail and Avenida Encinitas, which could enhance access to South Carlsbad State Beach.

C3 Trail on West Side of I-5 at Agua Hedionda Lagoon – This project provides a new section of trail that runs adjacent to the west side of I-5, that could connect to the Coastal Rail Trail and a future trail at Agua Hedionda Lagoon. This project will provide access to existing and proposed trails that could provide access to Carlsbad State Beach if completed.

C4 Trail on East Side of I-5 at Agua Hedionda Lagoon – This project involves a suspended pedestrian underpass running north-south under I-5 that will connect to a loop trail around Agua Hedionda Lagoon and to trails west of the highway that access Carlsbad State Beach.

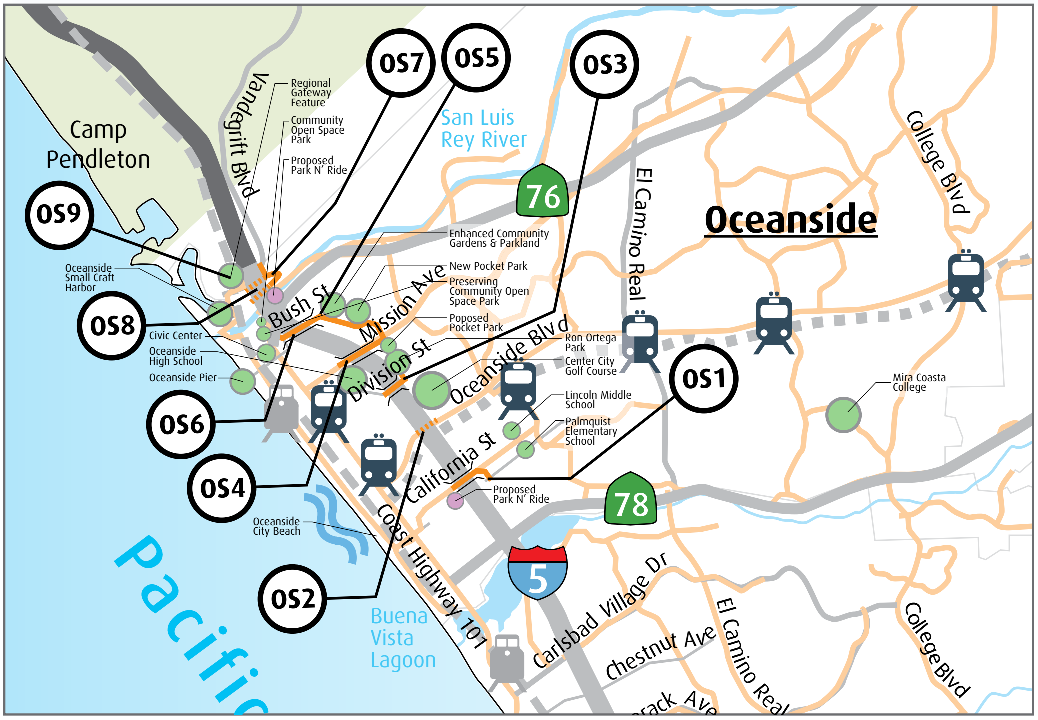
Example 4: Enhanced Park and Ride with Nature Center

In this example, a nature center, lagoon viewing overlooks, interpretive displays, and additional parking would be added to the park-and-ride lot adjacent to La Costa Avenue on the east side of I-5 in Carlsbad.

Figure 7.29 La Costa Avenue Park and Ride Enhancement Plan with Nature Center Site Plan

Source: I-5 North Coast Community Enhancement Plan.

Figure 7.30 Planned Bicycle and Pedestrian Enhancements: City of Oceanside



Source: Rand McNally: The Thomas Guide, 2006. Blue text designates enhancements that will improve coastal access.

OS1 **Pocket Park and Pedestrian Access at California Street –** In addition to a new pocket park on the west side of highway and new landscaping and hardscaping, this project improves existing trails and the California Street Bridge by connecting the residential neighborhood on the east side to two schools on the west side and to the trails on both sides of the highway. A connecting trail on the western side links residential neighborhoods from both sides of I-5 to Oceanside City Beach via California Street.

OS2 **Oceanside Boulevard Pedestrian Streetscape Enhancement –** These streetscape improvements will enhance the sidewalks north and south of Oceanside Boulevard under the highway to connect residential and commercial uses. Fencing will also improve safety by separating people from the Sprinter rail tracks and enhance access to Oceanside City Beach.

OS3 **Enhancements to Division Street Overpass –** This project enhances an overpass and adds streetscape improvements to both sides of I-5 to better connect residences and a new pocket park on the west side to Ron Ortega Recreational Park, a Shopping Center, and residences on its east side. This project includes adding a roundabout on its east side at the entrance to Ron Ortega Park and will improve routes that lead to Oceanside City Beach via Division Street and Mission Avenue.

OS4 **Enhanced Pedestrian Overpass Connection on Mission Avenue –** This project improves the overpass, streetscape, crosswalk, and landscaping connecting Oceanside High School, commercial and residential uses on the west of the highway to an existing park, new parks, and commercial and residential uses on its east side. It improves access to Oceanside City Beach via Mission Avenue.

OS5 **Enhanced Pedestrian Overpass Connection on Bush Street –** This project improves streetscapes and a bridge at Bush Street, which connects residential uses and an enhanced community garden on the west side to commercial uses, residential uses, a new pocket park, and an enhanced community garden on the east side of the highway. These enhancements will improve the streets that lead to Oceanside City Beach.

OS6 **Community Open Space Park –** This project provides a new city park at the Family Recovery Center.

OS7 **Parking/Staging Area at SR 76 –** In addition to providing a new park-and-ride lot , new trailhead for Creekside Recreation Trail, wetland revegetation, and removal of an abandoned highway bridge, this project provides a new trail under I-5 connecting to the San Luis Rey Bicycle Path, improving access to the San Luis Rey River Trails, Oceanside City Beach, and the Oceanside Small Craft Harbor.

OS8 **Pedestrian Underpass Improvements at San Luis Rey River –** This project enhances a tunnel and trail under I-5 connecting residential uses and will provide access to the San Luis Rey River Trails, the Oceanside City Beach, and the Oceanside Small Craft Harbor.

OS9 **Regional Gateway Feature at Harbor Drive –** This project adds an entry element for the region and improves streetscape along Harbor Drive, in addition to potentially including a bio-detention basin.

In addition to these planned projects, the City of Oceanside Bicycle Master Plan calls for the completion of Class II facilities on El Camino Real and several other regional arterial roads, such as Melrose Drive.

Example 5: Enhanced Pedestrian Overpass

In this example, wider and more direct sidewalk amenities would be constructed in Oceanside and would allow a safer connection for pedestrians. The highway ramp alignment at Mission Avenue would be modified to create a better connection between Oceanside High School, commercial and residential uses on the west side of the highway to an existing park, new parks, and commercial uses on the east side. This enhancement will eliminate a conflict between Oceanside High School students crossing the ramps as pedestrians, and vehicles accelerating toward the freeway.

Figure 7.31 Mission Avenue Bridge Enhancement, Site Plan

Source: I-5 North Coast Community Enhancement Plan.

Table 7.18 Bicycle and Pedestrian Enhancement

City of San Diego

SD1: Penasquitos Creek Trail Connection
SD2a: Carmel Valley Bicycle/Pedestrian Trail Connection
SD2b: Enhanced Park and Ride at Carmel Valley Road
SD3: Pedestrian Overpass Connection North of Del Mar Heights Road

City of Solana Beach

SB1: Streetscape Enhancements on Ida Avenue
SB2: Trailhead at Solana Hills Drive

City of Encinitas

E1: Manchester Avenue Pedestrian Bridge and Trail
E2: Villa Cardiff Drive Improvements
E3: Hall Property Park Trail Connection to Santa Fe Drive
E4: Trail Connecting Santa Fe Drive to Requeza Street
E5: Trail Connecting Requeza Street to Encinitas Boulevard
E6: Union Street Pedestrian Overpass and Trail Connection

City of Carlsbad

C1: Park n' Ride Enhancement/Nature Center at La Costa Avenue
C2: Trail on East Side of I-5 at Bataquitos Lagoon
C3: Trail on West Side of I-5 at Agua Hedionda Lagoon
C4: Trail on East Side of I-5 at Agua Hedionda Lagoon

City of Oceanside

OS1: Pocket Park and Pedestrian Access at California Street
OS2: Oceanside Boulevard Pedestrian Streetscape Enhancement
OS3: Enhancements to Division Street Overpass
OS4: Enhanced Pedestrian Overpass Connection on Mission Avenue
OS5: Enhanced Pedestrian Overpass Connection on Bush Street
OS6: Community Open Space Park
OS7: Parking/Staging Area at SR 76
0S8: Pedestrian Underpass Improvements at San Luis Rey River
OS9: Regional Gateway Feature at Harbor Drive

Note: Total Bike/Ped Costs TBD upon completion of Regional Bicyle Plan

Source: Draft I-5 Northcoast Community Enhancement Plan, 2007

Transportation Management System

This section describes the Transportation Management System (TMS) improvement plan for the I-5 North Coast CSMP travel shed and how it integrates with the regional vision for TMS. It is important to note that any project which involves TMS elements is considered an Intelligent Transportation System (ITS) project. ITS manages congestion using the synergy of historical traffic data, real time traffic control, and advanced communications networks to help system users to make informed and time and cost effective decisions.

As a transportation management solution, TMS involves information processing and electronic communications tools to better manage the region's highways, roads, transit, incidents and emergency responses, special events, commercial vehicle operations, and traveler information. The design of TMS follows ITS's logical process of information gathering, processing, and dissemination with the goal of alleviating congestion, improving safety, and enhancing productivity.

TMS in the I-5 North Coast CSMP travel shed is an integral part of a larger regional Intermodal Transportation Management System (IMTMS). IMTMS is another element of the ITS architecture for the region. IMTMS links together the region's main transportation management systems through a regional open system network accessible by all participating agencies in San Diego County. Regional transportation data are made available to traveler information services, such as the 511 call-in or web access service and California Traffic Data Warehouse collection sites such as the Performance Measurement System (PeMS).

Regional Vision for TMS

In its 2030 RTP, SANDAG envisions a robust TMS system that promotes mobility, efficiency, accessibility, reliability, sustainability, and equity. It commits the region to preserve TMS existing transportation resources and manage the regional transportation system with increasing efficiency.

As part of the Regional IMTMS Network, TMS in the San Diego region has the goal of better managing the region's highways, roads, transit, incidents and emergency response, special events, commercial vehicle operations, and traveler information through the use of electronic communications and information processing tools. Additionally, a multi-regional effort is underway to interconnect TMCs throughout Southern California.

San Diego County has been designated by Congress as part of a national ITS demonstration corridor along with six other Southern California counties. SANDAG administers the demonstration project on behalf of the 22 agencies that make up this important multi-regional effort to build a Southern California ITS Network.

Planned Improvements for TMS

To achieve the goal of building a robust, regionally connected TMS network, new TMS components need to be installed and integrated with existing TMS elements, as well as address current system gaps.

Planned TMS Highway Improvements

Several detection and communication components of the TMS system are being planned, including:

- Twenty-seven miles of new fiber optic cable;
- Five new changeable message signs (CMS);
- Fourteen new closed circuit television (CCTV) cameras;
- Two new highway advisory radio (HAR);
- New vehicle detection systems (VDS) at five locations;
- Ramp meters at 15 locations; and
- Corridor-wide ramp metering system.

SANDAG's vision for the region's TMS system includes half mile placement of detection devices on state highways, providing traffic managers with a real time picture of the transportation system. Additionally, all on-ramps in the travel shed will have ramp meters, creating consistent and even traffic flow for the corridor. These and the other improvements will complete a TMS system for the travel shed. Drivers and traffic managers will make more educated decisions for managing traffic and result in more reliable trip times. In addition, the information available from the TMS system will enable traffic forecasters and planners to better plan for future corridor improvements.

Figure 7.34, shows planned information gathering elements such as ramp meters and VDS, as well as the information dissemination improvements via installation of fiber optic cable, CMS, HAR, and CCTV.

Figure 7.32 Planned TMS Components Map

Planned TMS components for the I-5 CSMP travel shed include fiber optic cable, changeable message signs, highway advisory radio, ramp meters, detection loops, and CCTV.

Source: Rand McNally: The Thomas Guide, 2006. Caltrans District 11.

TMS Improvements for Regional Arterials

Since the regional arterial streets in the travel shed also experience congestion and bottlenecks, and provide the infrastructure for bus transit services, TMS improvements are also planned for transportation facilities beyond the I-5. These TMS improvements for regional arterials include queue jumper transit-only lanes for bus transit.

Currently, each jurisdiction (the County, various regional cities, and Caltrans) manages their traffic signals and associated hardware and software independently of other neighboring or regional jurisdictions. SANDAG is deploying the Regional Arterial Management System (RAMS) to enhance inter-jurisdictional coordination of traffic signals along major streets/arterial corridors throughout the San Diego region. The RAMS project provides the ability to view other agencies' traffic signal timing plans and coordinates these timing plans across jurisdictions. It will allow for the management of regional arterial traffic and coordinates freeway/arterial interchanges (ramp meters). RAMS will allow jurisdictions to develop, propose, and implement traffic signal timing plans spanning multiple jurisdictions for day-to-day, planned special event, and emergency conditions.

Other Regional TMS Projects

The TMS improvements on the highway will dovetail with other regional TMS improvements under consideration. These include: smart parking, congestion and value pricing, smart vehicles, a regional wireless data network, universal transportation accounts, and integrated corridor management.

Integrated Corridor Management (ICM)

Integrated Corridor Management (ICM) is a broad-based transportation management strategy that coordinates information between the transit, highway, and arterial systems to improve mobility and safety. ICM applies advanced technology and uses a collaborative, cooperative, and coordinated approach to management of the transportation system. ICM helps reduce travel times for commuters within the corridor, helps public transportation become a more reliable option, increases the use of HOVs, and increases traveler throughput within the corridor. ICM approaches have a secondary benefit as they can improve safety and reduce response times to corridor incidents through inclusion of incident management plans.

Smart Parking

Smart parking is a sophisticated parking information and management system making use of web technologies, wireless telecommunications, and a parking sensor network that will deliver new services to the citizens of San Diego. As the first step toward a regional parking management system, drivers who park at selected COASTER stations will be able to obtain parking space availability information in real time and, if desired, reserve a predetermined parking space for an additional service fee. The deployment of a parking management and payment system, in coordination with the existing FasTrak® and Compass Card Programs, will enable SANDAG to experiment with coordinated pricing for travel and explore ways to balance transportation demand by increasing value to transit users.

Congestion and Value Pricing on Managed Lanes, Connectors, and Ramps

Building on the initial success of the I-15 managed lanes and dynamic toll projects, this project will extend and enhance the portfolio of dynamic pricing mechanisms that SANDAG currently employs for demand management. Pricing infrastructure will be extended to cover selected connectors and a network of ramp meters in the region. Using a range of pricing strategies and mechanisms, SANDAG will offer commuters a wider range of new choices that will make trips more reliable and quick. See the managed lanes section of this chapter for more information.

Smart Vehicles

Passenger vehicles are being equipped with the latest advances in technology, enabling development of groundbreaking safety and mobility applications along with new management tools. The U.S. DOT's IntelliDrive$_{SM}$ is developing a wireless communication network between vehicles, roadside elements, and transportation management systems, taking advantage of the emerging artificial intelligence and the capabilities of modern vehicles. The ability to exchange and collect data from vehicles will provide significant improvements in safety, delivery of traveler information, and the real-time management of the transportation system. This project would conduct field operational tests of parking guidance, probe, payment, and traveler information applications.

Regional Wireless Data Network

This project will involve the planning, design, and implementation of a regionwide, high-speed wireless data service capable of supporting the full range of transportation technology projects defined for the region. While primarily designed to support applications such as smart vehicles, enhanced arterial data collection, public access to WiFi on transit vehicles, and a wide range of other advanced transportation technology projects, this network will also provide opportunities to increase public safety and develop public-private partnerships to deliver these technologies.

Universal Transportation Account

Universal transportation accounts will deliver increased value and convenience by providing transportation service users with streamlined and flexible choices for the payment of transportation service fees such as tolls, parking fees, and transit tickets. By building on the current FasTrak® and Compass Card Programs and by integrating the computer systems for tolling, transit, and parking payments, this project would provide users with a single account to manage transportation expenses. The project will also test the use of new public-private partnerships and managed-service approaches to transportation system delivery, operation, and management.

Benefits of TMS Improvements

As more TMS components are installed throughout the I-5 CSMP travel shed, transportation system managers will be able to provide a safer, less congested and more reliable transportation system. Further, TMS improvements will:

- Meet increased travel demand in the future;
- Reduce travel times for commuters;
- Make better use of the existing roadway infrastructure;
- Reduce overall fuel use and car emissions by keeping traffic flowing;
- Make public transportation a more attractive option;
- Increase the use of HOVs and increase person throughput within the corridor;
- Increase safety and reduce response times to corridor incidents;
- Increase productivity for public transit; and
- Increase efficiency through ramp metering.

TMS Improvements Costs

The following table shows the planned TMS improvements with their associated costs. It is important to note that as the infrastructure for TMS is added, additional costs for computer technology and operations are necessary.

Table 7.19 TMS Improvements Costs

Improvement	Cost
Fiber Optic Cables	$12,056,000
Changeable Message Signs	$2,250,000
Closed-Circuit TV	$840,000
Highway Advisory Radio	$60,000
Vehicle Detection Systems	$375,000
Ramp Meters	$15,000,000
Smart Parking, Smart Vehicles, Regional Wireless Network, Universal Transportation Account*	
Congestion and Value Pricing on Managed Lanes	See ML Section
Integrated Corridor Management	$2,000,000
System Support such as Computer Software	$1,000,000
El Camino Real Signal Timing Improvements	$1,000,000
Palomar Airport Road/San Marcos Boulevard Signal Timing Improvements	$1,000,000
Oceanside Boulevard Signal Timing Improvements	$1,000,000
Mission Avenue Signal Timing Improvements	$1,000,000
TOTAL	**$37,600,000**

* Smart Parking, Smart Vehicles, Regional Wireless Network, Universal Transportation Account are regional improvements and are not included as part of the I-5 North Coast Corridor Project costs. These costs would be included as part of the SANDAG regioal TMS vision.

Summary of Planned Projects

Four projects have already been completed since 2006 to improve the travel needs of the corridor.

- An auxiliary lane in both directions from Via de la Valle to Lomas Santa Fe Drive to provide a longer distance for drivers to merge on and off the highway;
- An HOV lane in each direction was extended on I-5 from Via de la Valle to just south of Manchester Avenue to better accommodate through traffic; and
- Two new loop-style on-ramps at Lomas Santa Fe to better direct traffic onto the highway and improve local traffic flow;
- A double track project in the City of Oceanside was completed.

The GP lanes will be supported and supplemented with new auxiliary lanes, acceleration/deceleration lanes, managed lanes, improved arterial lane connections, transit improvements, ITS/TMS improvements, and increased monitoring. Together, these improvements will facilitate traffic flow by minimizing complicated maneuvers between lanes, help travelers have more timely information about travel options, increase access to highway entrances and exits, and improve transportation system performance.

In summary, planned improvements for the I-5 CSMP travel shed include:

- The incremental addition of auxiliary lanes at high traffic volume locations to improve traffic flow by minimizing conflicts created by vehicles merging on and off of the I-5;
- The incremental modification of local highway interchanges in key locations to improve traffic flow between on/off-ramps and the highway;
- The possible addition of one GP lane in each direction from the I-5/I-805 merge to SR 78, depending on the outcome of the Draft EIS/EIR for the I-5 North Coast Project;
- The addition of 2 managed lanes in each direction from La Jolla Village Drive to Harbor Drive, as well as direct access ramps;
- Arterial improvements to improve access to the coastline, jobs, housing, transit, and activity centers;
- Synchronization and priority of signals on regional arterials;
- Bus Rapid Transit and infrastructure improvements to support it;
- Rail double tracking, bridge replacements, and other improvements to allow for

reduced headways and increased passenger and freight service;

- Bicycle and pedestrian improvements that improve connectivity and provide alternative travel options; and
- TMS improvements that help maximize performance of the facilities in the corridor and help travelers make informed and effective decisions.

Table 7.20 Summary of I-5 CSMP Improvement Costs

Improvement	Cost
Freeway Improvement Costs	$3.3 - 4.4 billion
Add Missing Connectors at 5/56, 5/78 Interchanges	$350,000,000
Regional Arterials	$745,000,000
Rail	$2.8 billion
Bus	$310,000,000
Bike & Pedestrian Enhancements*	TBD
Transportation Management Systems	$36,000,000
TOTAL	**$7.5 - $8.6 billion**

- Bike & Pedestrian Enhancement costs to be updated upon completion of regional bike plan

Chapter:

8 Alternatives Analysis and Implementation Plan

Overview

Analysis Approach

LOSSAN Operational Plan

CSMP Highway Analyses

Implementation Plan

Overview

The CSMP analysis approach is based on the premise that well planned investments throughout the system yield significant improvements in corridor performance, including mobility, safety, productivity, accessibility, and reliability. Based on the existing conditions analysis, previous planning efforts, regional planning goals and objectives, and forecast of future conditions, investment strategies were identified consistent with the transportation management pyramid in Figure 1.1. These were then evaluated against the performance measures that support regional goals as described in Chapter 6.

Maximizing corridor transportation system management is contingent on all of the corridor components working together, including the modal systems (transit, local roadways, highways, bicycle and pedestrian routes) and the land uses within the corridor travel shed.

The purpose of this chapter is to fulfill the remaining elements of the CSMP process as shown in Figure 8.1:

- Preparing and analyzing corridor management strategies under future demand; and
- Preparing an implementation plan for phasing, managing, operating, monitoring, and improving the corridor system performance.

Figure 8.1 The Corridor System Management Plan Process Diagram

The analyses is intended to result in a balanced, multimodal, phased transportation implementation plan that serves the variety and intensity of travel demands placed on it now and anticipated in the future. In addition, CSMPs are intended to be "living" documents that are updated based on ongoing analyses and performance monitoring that take deployed improvements, changes in travel demand, and other external factors into consideration (e.g., does a project generate a new problem elsewhere on the transportation system, funding, land use changes, changes to regional priorities, etc.).

Analysis Approach

This CSMP was built on nearly 20 years of planning for the I-5 North Coast Corridor including the consideration of regional visions and plans, inclusion of regional and corridor stakeholders, several corridor and modal studies, and voter approved programs and measures. One of the key planning elements the CSMP study builds upon is the I-5 North Coast Freeway Operations Report Prepared for the *I-5 North Coast Corridor Project*. The CSMP utilized the next generation of analysis tools and methods, as well as updated land use and traffic demands from the regional travel demand model. In addition, it was found that the over-arching findings from the CSMP effort were similar to the *I-5 North Coast Freeway Operations Report* analyses.

This chapter includes summary results for two specific efforts:

- San Diego – LOSSAN Corridor Project Prioritization Analysis – A study that analyzed and prioritized potential rail investments in the San Diego County portion of the LOSSAN corridor; and
- CSMP Highway Analyses – Existing conditions and microsimulation analyses which assessed the existing and future conditions for the freeway scenarios. It includes a brief assessment of changes in traffic conditions from the CSMP existing conditions year of 2006 to the microsimulation model base year of 2008, and the scenario analyses (2030 No Build, 8+4, and 10+4 scenarios). These are described in detail later in this chapter.

The intent is for the results from the CSMP to also be integrated with SANDAG's regional transportation planning activities. Finally, an ongoing cycle of implementation, evaluation, and adjustments is envisioned to ensure that the transportation system within the I-5 CSMP travel shed continues to meet regional goals and makes efficient use of transportation investments.

Performance Measures

Having effective analysis tools and performance measures that estimate the impacts of transportation improvements enables planners to compare and prioritize investment strategies and communicate the benefits to decision-makers. Each of the analysis efforts were structured around this concept of performance-based planning. Table 8.1 presents the measures utilized for the CSMP highway analyses and LOSSAN Project Priotization.

Table 8.1 Summary of Performance Measures or Criteria for Analysis Efforts

	CSMP Highway Analyses	LOSSAN Project Prioritization
Performance Measures	• Travel time • Delay • Speed • Duration of congestion • Reliability • VMT	• Project cost • Project delivery • Travel time • Delay cost • On-time performance • Reliability • Fuel consumption • At-grade crossing time • Proximity to sensitive areas • Emissions • Risk exposure

SANDAG Regional Travel Demand Model – Series 10 vs Series 11 Comparison

The primary planning analysis tool that is used for a majority of the planning studies in San Diego County is the SANDAG Regional Travel Model. It is a typical, state of the practice, four step travel demand model that produces estimates of travel demand on the transportation system in San Diego. The I-5 North Coast Corridor Project has relied on SANDAG's Regional Transportation Model to develop supporting traffic forecasts for the project. The traffic forecasts for the I-5 North Coast Corridor project have been prepared using SANDAG's Series 10 and Series 11 Regional Transportation Models.

SANDAG routinely refines the regional travel model as new data and resources become available to perform updates. The most recent update of the regional model was completed in early 2009 and is referred to as Series 11, the prior version was known as Series 10. There were many refinements made to the regional model as part of this update. The more important of these appear below in Table 8.2.

Table 8.2 Summary of Refinements for Series 10 Versus Series 11 Models

	Series 10	Series 11
Base Year	2000	2003
Mode Choice	9 modes	16 modes
Tolling	Speed reductions	Mode choice congestion pricing
RTP	2003	2007
Platform	UNIX	Windows XP
Software	Tranplan	TransCAD

As the Series 11 version of the model forms the basis for the regional demand estimates that drive the operations models being used for the I-5 CSMP, it is important to establish that these demand estimates (traffic volumes) are consistent with those from the earlier version of the regional model that was used for the Draft Environmental Impact Statement (DEIS). The approach to accomplish this is to compare the current SANDAG model (Series 11) forecasts to the earlier model forecasts (Series 10) used for the DEIS. If the comparison shows that there are no major differences between the two sets of forecasts, then it follows that conclusions reached using the Series 11 version of the model will not be fundamentally different than those reached using the Series 10 version.

Approach

One of the ways of comparing model outputs is to look at screenlines. Screenlines are often used in traffic analyses to determine how much volume is entering or exiting a particular area as they capture all of the traffic that moves across a real or perceived barrier (e.g., a lagoon that has limited crossings). With that in mind, nine screenlines were developed that captured the regional travel demand patterns in the region and within the I-5 North Coast corridor, six were located on I-5 and three were located where traffic flows into and out of the corridor from the east. The traffic volumes were compared on these screenlines from both versions of the model for the I-5 Project No Build and I-5 Project Build (10+4) conditions. In addition, the traffic volumes on I-5 exclusively at these same locations were compared between the two model versions to specifically address the consistency of the traffic forecasts.

The other indicator of travel demand is vehicle miles of travel (VMT). Total VMT was calculated for each of the two scenarios for each version of the model. VMT was then summarized for the primary study area (limits of the microsimulation model for the CSMP highway analyses) and the secondary study area (limits of the travel shed), as shown in Figure 8.2.

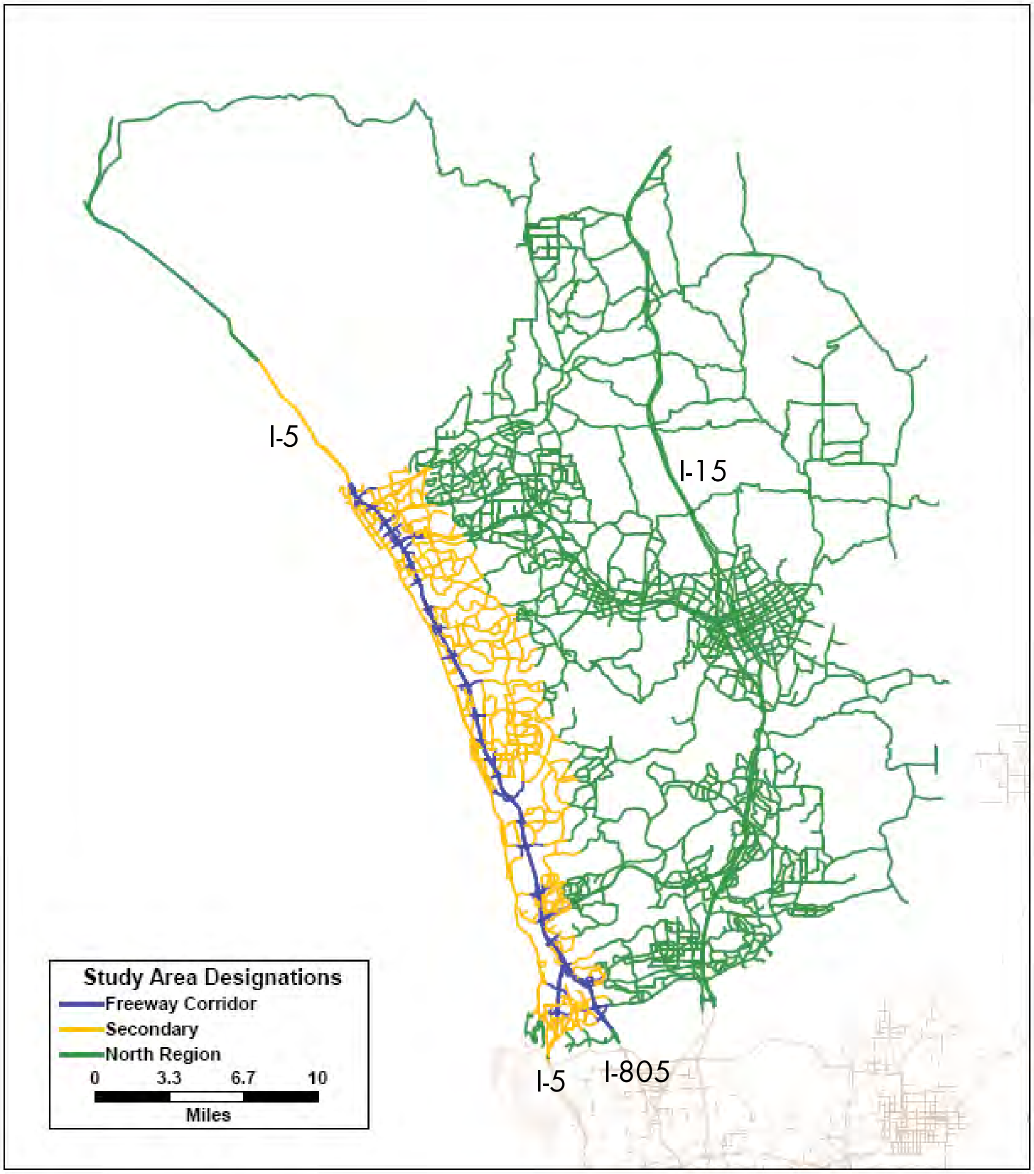
For this analysis, a difference of ten percent or more across all screenlines in aggregate or in total VMT within the study area would constitute a significant difference. This was based upon information contained within the U.S. DOT's *Model Validation and Reasonableness Checking Manual*. A difference of less than ten percent would establish that the two model versions were consistent, and therefore valid for the CSMP highway analyses. A target of ten percent was chosen as it is well within fluctuations of traffic that are observed in the field.

Results

The following contains the key findings for the volume and VMT comparisons:

- 2030 No Build Comparison
  - Traffic entering/exiting from the north of the corridor is estimated to be roughly the same in both versions of the model. This shows that the external trip demands to/from the north of the model area are nearly identical between the two versions;
  - Overall traffic for all screenlines is within seven percent; and
  - I-5 freeway traffic for all screenlines is within one percent.
- 2030 Build 10+4 Comparison
  - Traffic entering/exiting from the north of the corridor shows a slight increase (three percent) in the Series 11 version;
  - Overall traffic for all screenlines is within eight percent; and
  - I-5 freeway traffic for all screenlines is within seven percent.
- VMT Comparison
  - Within the primary study area (blue roadways on Figure 8.2), the two versions of the model produce nearly identical levels of traffic for the 2030 No Build (within 1%) and within 7 percent for the 10+4 Scenario; and
  - The VMT is within ten percent for the larger secondary study area also (blue and yellow roadways on Figure 8.2), between eight and nine percent for both.

Figure 8.2 Northcoast Travel Shed Areas - Corridor, Secondary, Regional



The comparison of traffic volumes and VMT shows that the differences between the SANDAG Series 10 and Series 11 Regional Transportation Models are minimal. The variation that is seen could be due to a number of factors (e.g., changes in forecasted development patterns). The intent of this analysis is not to understand how changes in the models and the data that drive the models contribute to the differences in the forecasted traffic volumes. Rather, this analysis is focused on determining whether or not SANDAG Series 10 traffic volumes are compatible with the Series 11 traffic volumes.

LOSSAN Operational Plan

LOSSAN Overview

The Los Angeles – San Diego – San Luis Obispo (LOSSAN) rail corridor provides a viable transportation alternative to highway travel through San Diego County and to points north. The LOSSAN rail corridor is the nation's second busiest and is shared between Amtrak's Pacific Surfliner intercity service, COASTER and Metrolink commuter rail operations, and freight services operated by BNSF Railway and Union Pacific.

Given the rail corridor's proximity to I-5 through urbanized and environmentally sensitive areas, it is particularly important that systemwide transportation improvements are considered as demand for travel in the corridor increases. The identification of adjacent highway and rail projects could potentially lead to coordinated efforts that reduce resource expenditures and minimize impacts to surrounding areas.

The 2030 RTP calls for a fully double tracked corridor by 2030; currently, over 50% of the San Diego rail corridor is single track. To help achieve this goal and as part of this CSMP effort, a study was commissioned to analyze and prioritize potential rail investments in the San Diego County portion of the LOSSAN corridor, presented in detail in *The San Diego – LOSSAN Corridor Project Prioritization Analysis (Cambridge Systematics, 2009)*. The rail analysis quantified operational improvements and other benefits and impacts of potential rail projects, and then prioritized the implementation of these projects to support phased expansion of rail capacity. In addition, this performance-based, prioritized list could be used as future funding opportunities become available such as the American Recovery and Reinvestment Act, which will dedicate $8 billion to high speed and intercity rail projects nationwide.

Description of Analysis

A Rail Prioritization Working Group (RPWG) comprised of representatives from Amtrak, BNSF, Caltrans District 11, Caltrans Division of Rail, NCTD and SANDAG was established to guide the study direction. Forty rail improvements projects were identified for evaluation and prioritization, including track (i.e., double-tracking, tunnel improvements, etc.) and non-track projects (i.e., station parking, grade separation projects, etc.). These projects were selected from existing corridor documentation as well as the new RPWG submissions and other stakeholder requests. The list of projects, as well as additional information about the individual projects and how they were selected can be found in the San Diego – *LOSSAN Corridor Project Prioritization Analysis*.

Rail projects were analyzed and then prioritized through a rigorous process that considered rail performance, construction and operating costs, project delivery, and a range of other environmental, safety, community and performance criteria. The analysis included the simulation of dozens of combinations of rail projects and service scenarios. The simulation model platform used for the project was the Rail Traffic Controller© (RTC) software developed by Berkeley Simulation Software, which is used by Class I railroads for operation and planning purposes including BNSF, NCTD and Metrolink. RTC model train schedules for 2008 service were developed based on existing BNSF, COASTER, Amtrak, and Metrolink schedules. Future train schedules were based on the Metrolink Service Expansion Program Final Model Operational Findings (OCTA, October 31, 2007). For mid- and long-term test cases, slight schedule modifications were made to optimize train meets.

This simulation effort was combined with review of prior corridor documents and expert input from RPWG participants. With project information in-hand, prioritization proceeded in a step-wise manner by first identifying the projects needed to support near-term service expansion. This step was followed by identifying additional projects needed to support mid-term service expansion, and finally long-term service expansion.

Evaluation Criteria

Several performance measures were used in prioritizing the LOSSAN improvement projects. Each project was analyzed based on their relative performance in six criteria: Project Cost, Project Delivery, Rail, Roadway, Environmental, and Safety. Each criterion was populated by specific evaluation measures and subject to a scoring and weighting system developed through an iterative process that incorporated input and feedback from RPWG members. Table 8.3 summarizes the measures, evaluation criteria, and weights.

Table 8.3 Evaluation Criteria and Weights

Performance Category	Evaluation Criteria	Category Weights	
		Track	Other
Project Cost	Total Project Cost Operating Cost	25%	35%
Project Delivery	Funding Status Project Status Impacts on Existing Service Community Support	20%	25%
Rail Performance	Freight Train Accommodation Travel–Time Savings Passenger Rail Delay Cost Passenger Rail OTP Dispatch Variation Fuel Cost	40%	–
Roadway Performance	Station Area Congestion At-Grade Crossing Time	5%	10%
Environmental	Emissions Proximity to Protected Areas	10%	20%
Safety	Risk Exposure	–	10%

Source: Caltrans, *The San Diego – LOSSAN Corridor Project Prioritization Analysis, prepared by Cambridge Systematics,* 2009.

As shown in Table 8.3 above, the performance evaluation included:

- **Project Cost** evaluates the total project cost and resulting operating cost savings of each project.
- **Project Delivery** measures the ability to rapidly implement a project including project funding status, where at in development (e.g.., planning, design, construction, etc.), complexity, and timing considerations.
- **Rail performance,** the most heavily weighted measure, includes freight and passenger rail performance for track projects only including rail capacity, travel time savings, reliability, on-time performance, and fuel consumption.
- **Roadway performance** measures a project's impact on roadway conditions along the corridor such as congestion around stations and grade conflicts/ separations.
- **Environmental** performance criteria measure a project's potential environmental effects, including rail-related emissions and proximity to sensitive areas.
- **Safety** performance criterion measures safety impacts to users and affected parties, awarding projects that alleviate risk exposure.

Summary of Results

Table 8.4 presents the service expansion plans for rail in the I-5 CSMP corridor. These plans nearly double the number of trains in the corridor over the next 20 years. In order to accommodate this growth, improvements are needed on the corridor.

Table 8.4 Service Plans – Number of Weekday Trains

	Existing	Near-Term Service Expansion	Mid-Term Service Expansion	Long-Term Service Expansion
Amtrak	22 – 24	26	32	36
COASTER	22 – 26	30	36	54
Metrolink	16	16	16	20
BNSF	5 – 7	7	9	9
Total	65 – 73	79	93	119

Source: Caltrans, *The San Diego – LOSSAN Corridor Project Prioritization Analysis, prepared by Cambridge Systematics,* 2009.

1. **Near-term service expansion,** which equates roughly to year 2015, would expand service to 79 trains each weekday. This expansion would provide 6 to 14 more trains per day compared to 2008, with most service expansion for peak-period COASTER operations and a.m. and mid-day Amtrak operations.

2. **Mid-term service expansion,** which equates roughly to year 2025, would expand service to 93 trains each weekday. This expansion would provide 20 to 28 more trains than 2008, with more service throughout the day for all operators, except Metrolink. COASTER trains would run approximately every 25 minutes in the peak-direction, and every 90 minutes in the mid-day and evenings. Amtrak would have consistent hourly service in both directions throughout the day. BNSF would add a second manifest train in the mid-day.

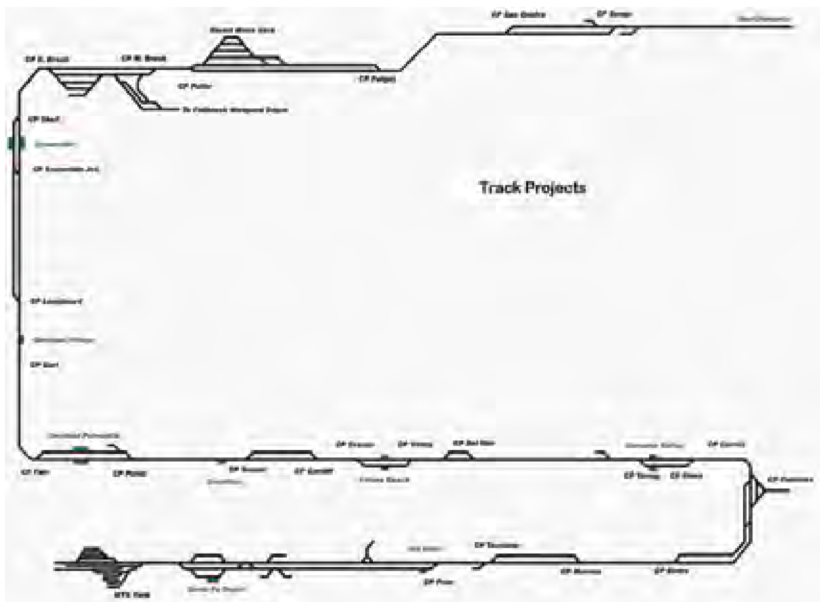
3. **Long-term service expansion,** which equates roughly to year 2030, would expand service to 119 trains each weekday. This expansion would provide about 50 more trains than 2008, with more service throughout the day for all operators, except BNSF. As envisioned in the 2030 RTP, COASTER trains would run about every 20 minutes in the peak direction, and about every 60 minutes in the mid-day and evenings. Amtrak would have consistent hourly service in both directions, with additional trips in peak intercity travel hours.

Based on agency input and RTC simulation results, each project received a score based on its relative performance in each evaluation category. Projects were selected for near-term, mid-term, and long-term prioritization based on these scores. The following presents the phased rail corridor improvements from the analysis. For complete scoring results, please refer to the *San Diego – LOSSAN Corridor Project Prioritization Analysis* report.

Existing

Figure 8.3 presents a diagram of the current state of the rail corridor: A single line reflects portions of the corridor that are single tracked. A double line indicates double track, with approximately half of the corridor being single track. Starting in the top right corner of the diagram is the San Diego/Orange County line. Moving to the left is the rail corridor through Camp Pendleton. Turning south, the first station stop in green is Oceanside station. The graphic terminates at the MTS yard, just south of the Santa Fe Depot.

Figure 8.3 Existing LOSSAN Rail Corridor

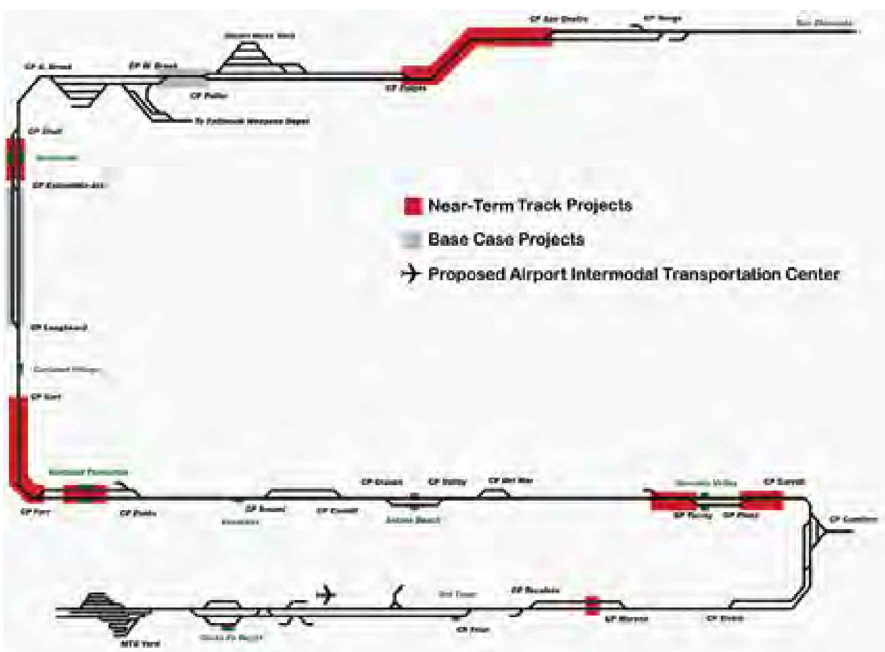


Source: Caltrans, *The San Diego – LOSSAN Corridor Project Prioritization Analysis,* prepared by Cambridge Systematics, 2009.

Near Term – 2015

The first phase is the near-term phase, which roughly equates to 2015. These projects are the highest ranking projects based on the LOSSAN CSMP analysis: Starting at the top of Figure 8.4, or northern part of the corridor, the first project in red is the San Onofre to Pulgas double track project (#1), which will add 5.8 miles of double track to the corridor and replace bridges in this area of Camp Pendleton. Projects #5a and #5c are additional short "stub" tracks needed to hold commuter trains at Oceanside station to address a weekday parking problem at the station. Next is a section of double track in south Carlsbad (#8), followed by a third track at the Poinsettia COASTER station (#35) that will allow Amtrak and freight trains, which are not stopping now, to be able to continue through the area without slowing. There are two double tracking projects to the north and south of the Sorrento Valley COASTER station (#22a and 23). Last, crossover tracks in the City of San Diego segment near Old Town will allow for more flexibility in the system.

Figure 8.4 Track Projects to Support Near-Term Service Expansion



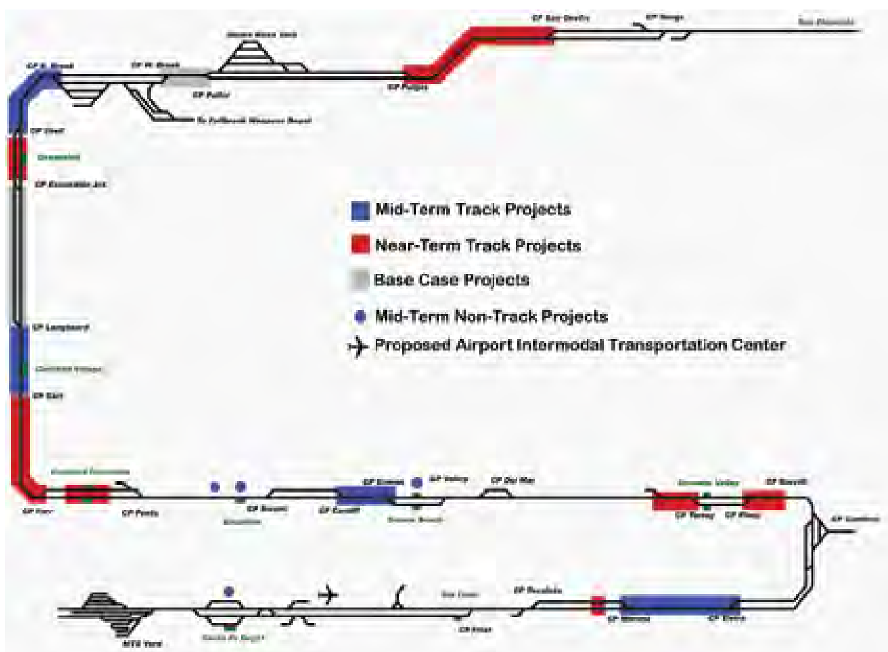
Source: Caltrans, *The San Diego – LOSSAN Corridor Project Prioritization Analysis,* prepared by Cambridge Systematics, 2009.

These projects would add about 10 miles of double track to the corridor and will improve on-time performance, reliability, and operational flexibility. Train capacity would increase from 73 trains to 79, however, there will be an additional operating cost of $1 million annually. The total capital cost is $145 million.

Mid Term – 2025

The mid-term projects are shown in blue in Figure 8.5 and build upon the first phase of projects in red. These projects include another 6 miles of double tracking in the Cities of Oceanside, Carlsbad, Encinitas, and San Diego (#3, #6, #15, and #27). Also included are a pedestrian crossing in Encinitas and station parking expansion at Encinitas, Solana Beach, and downtown San Diego (#12, #13, #16, and #33), shown as blue dots on the chart. By 2025, capacity increases by another 14 trains, costing an additional $2 million in annual operations. This service expansion also will require additional train sets and layover track. The total capital cost for this phase is $285 million.

Figure 8.5 Track Projects to Support Near-Term Service Expansion



Source: Caltrans, *The San Diego – LOSSAN Corridor Project Prioritization Analysis,* prepared by Cambridge Systematics, 2009.

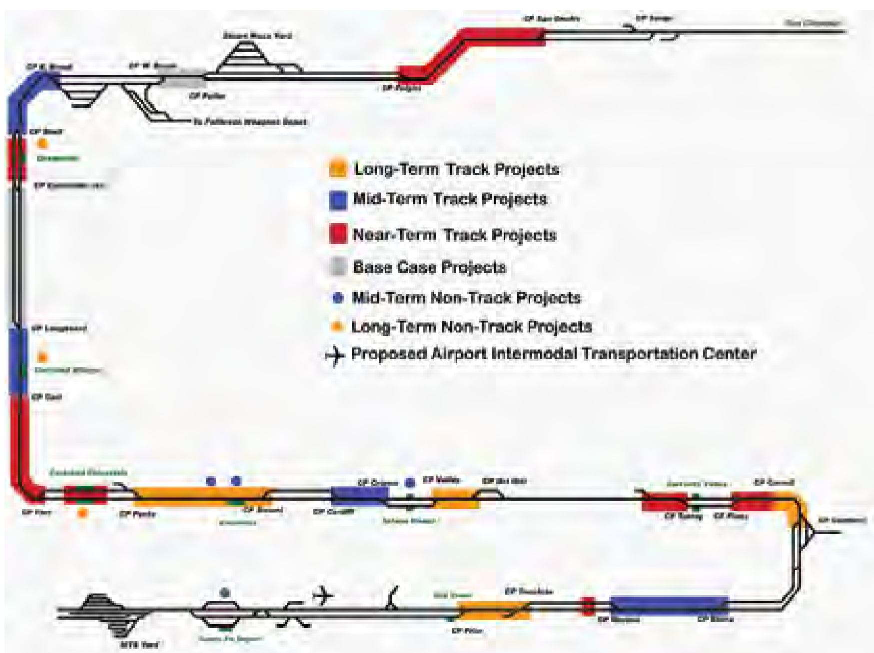
Long Term – 2030

Figure 8.6 presents the long-term (roughly 2030) service expansion and is shown in orange and together with current double tracking and the near- and mid-term phases, results in 56 miles of the 60 mile corridor being double tracked. These include:

- #10 – CP Ponto to CP Moonlight
- #14 – CP Moonlight to CP Swami
- #17 – San Dieguito Bridge/Double Track
- #24 – Sorrento to Miramar Phase II
- #29 – CP Tecolote to CP Friar

The remaining sections of single track would be at the Orange County border, which is dependent upon future improvements in Orange County, and the City of Del Mar, pending analysis of two potential tunnel options through that portion of the corridor.

Figure 8.6 Track Projects to Support Long-Term Service Expansion



Source: Caltrans, *The San Diego – LOSSAN Corridor Project Prioritization Analysis,* prepared by Cambridge Systematics, 2009.

Additional nontrack projects include additional station parking at Oceanside (#5b), Carlsbad Village (#7), and Carlsbad Poinsettia (#9), and additional equipment, and layover facilities. Total capital cost for the long-term phase is $360 million. This increases the capacity of the corridor to 119 trains each weekday, which requires an additional $5 million in annual operating costs.

The identification of these rail projects was only a first step in the implementation of expanded rail services in the San Diego – LOSSAN Corridor. A number of additional steps will be necessary to carry out this vision of increased corridor service.

CSMP Highway Analyses

Overview and Analysis Approach

Comprehensive modeling increases the likelihood of CSMP success and helps minimize unintended investment consequences.

One of the objectives of this analysis is to develop 2008, 2015, and 2030 future year models of the I-5 CSMP travel shed for both the a.m. and p.m. peak periods to be used as the basis for the assessment of roadway improvement scenarios. The a.m. and p.m. peak periods were determined as 6 a.m. to 10 a.m. and 3 p.m. to 7 p.m., respectively. For the analysis of the I-5 CSMP travel shed, the microscopic component of TransModeler was utilized. The TransModeler microsimulation model was selected due to its compatibility with TransCAD travel demand model and because it supports the evaluation of various traffic improvement strategies including freeway ramp metering, traffic signal coordination, and managed lane operations.

Microscopic computer simulation models simulate the movement of individual vehicles, based on theories of car-following and lane-changing. Typically, vehicles enter a transportation network using a statistical distribution of arrivals (a stochastic process) and are tracked through the network over small time intervals (e.g., seconds). Typically, upon entry, each vehicle is assigned a destination, a vehicle type, and a driver type. In many microscopic simulation models, the traffic operational characteristics of each vehicle are influenced by vertical grade, horizontal curvature, and other factors based on relationships developed in prior research. The primary means of calibrating and validating microscopic simulation models is through the adjustment of driver sensitivity or behavior factors.

TransModeler was used to analyze the 2008, No Build, and 2030 project scenarios described in more detail below. Both TransModeler and the Freeway Performance Measurement System (PeMS) were used to determine existing performance for 2008 conditions.

Performance Measures

As described previously, the CSMP analysis approach is based on the premise that well planned investments throughout the system yield significant improvements in corridor performance, including mobility, safety, productivity, accessibility, and reliability. Mobility describes how well the corridor moves people and freight. The mobility performance measures are both readily measurable and straightforward for documenting current conditions, and are readily forecast making them useful for future comparisons. Two primary measures are typically used to quantify mobility: travel time/speed and delay. For the purposes of this effort, the following measures were used to assess the corridor performance. Not all the measures are utilized for each analysis comparison and some involve different analysis approaches or methods:

- Travel time;
- Delay;
- Speed/duration of congestion;
- Reliability; and
- Vehicle miles traveled (VMT).

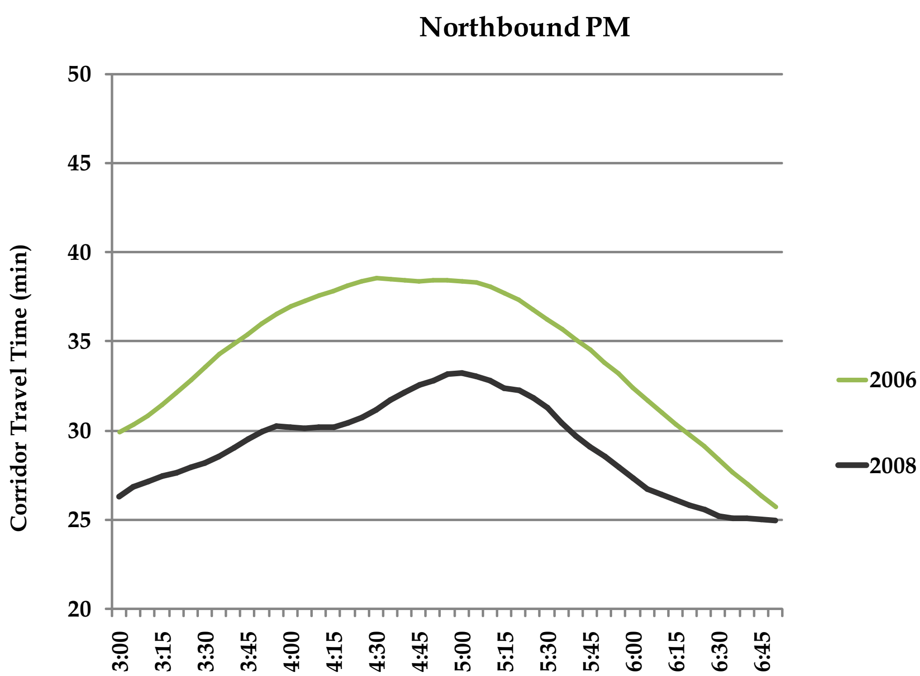
2006 Base Year to 2008 Simulation Model Base Year Conditions

The first step in the I-5 CSMP study was to perform an existing conditions analysis for the base year for development of the microsimulation model. This analysis was for various years between 2004 and 2008, with 2008 being selected for the base year for the microsimulation model. The following section compares how the corridor traffic conditions have changed from the 2006 I-5 North Coast Corridor Project base year to the microsimulation model base year of 2008.

Travel Time

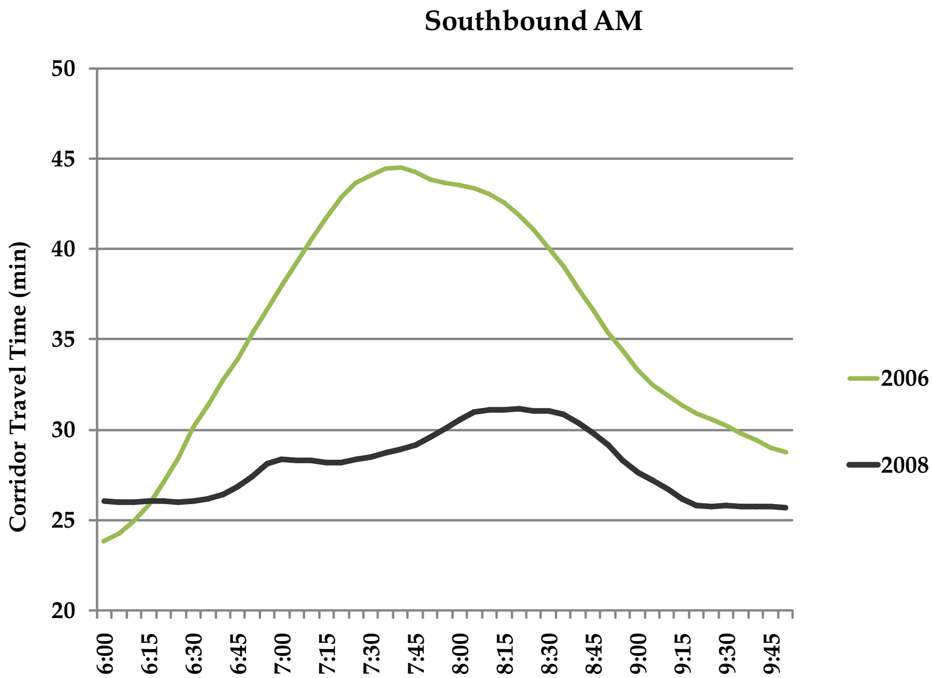
Figure 8.7 presents typical travel times northbound during the four-hour afternoon peak period (3:00 to 7:00 p.m.) for 2006 versus 2008. The 2006 values are from PeMS and 2008 values are from the 2008 base year simulation model which was calibrated to 2008 PeMS and data counts/observations. The 2006 typical day travel time was obtained from PeMS by selecting the median day of nine non-incident days in March and April 2006. The 2008 typical day travel time was obtained from the average of nine simulation model runs, which was calibrated against floating car runs completed over two days in October 2008. Southbound morning peak period (6:00 to 10:00 a.m.) travel times are shown in Figure 8.8. The a.m. peak direction is southbound and the p.m. peak direction is northbound, which is consistent with the direction of travel to downtown San Diego in the a.m. and from downtown in the p.m. Peak travel times decreased from 38 to 33 minutes northbound and from 44 to 31 minutes southbound, a 14 percent and 30 percent reduction, respectively.

Figure 8.7 Typical Weekday PM Travel Times for I-5 Northbound From La Jolla Village Drive to Harbor Drive – 2006 to 2008



Source: PeMS, 2006 and 2008.

Figure 8.8 Typical Weekday AM Travel Times for I-5 Southbound From La Jolla Village Drive to Harbor Drive – 2006 to 2008

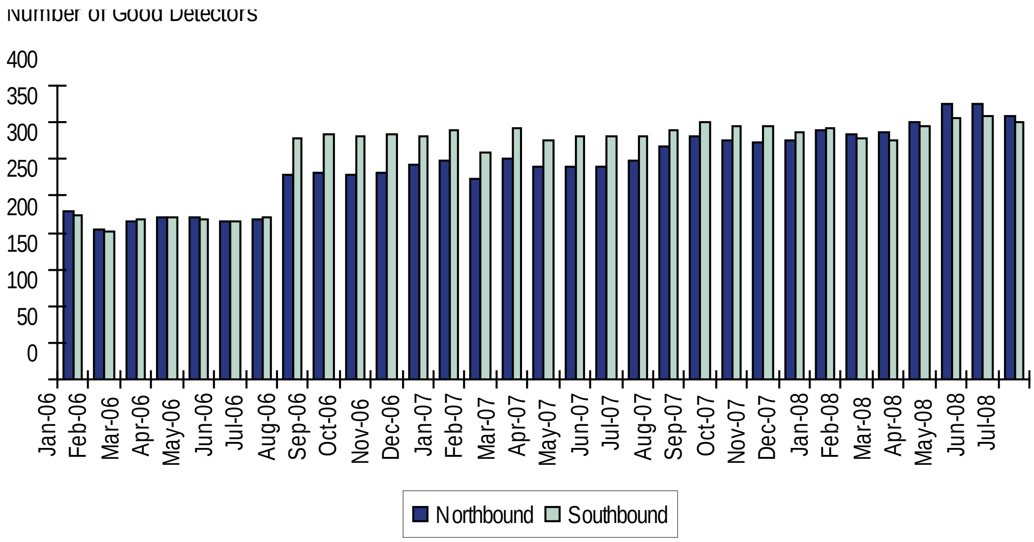


Source: PeMS, 2006 and 2008.

Delay

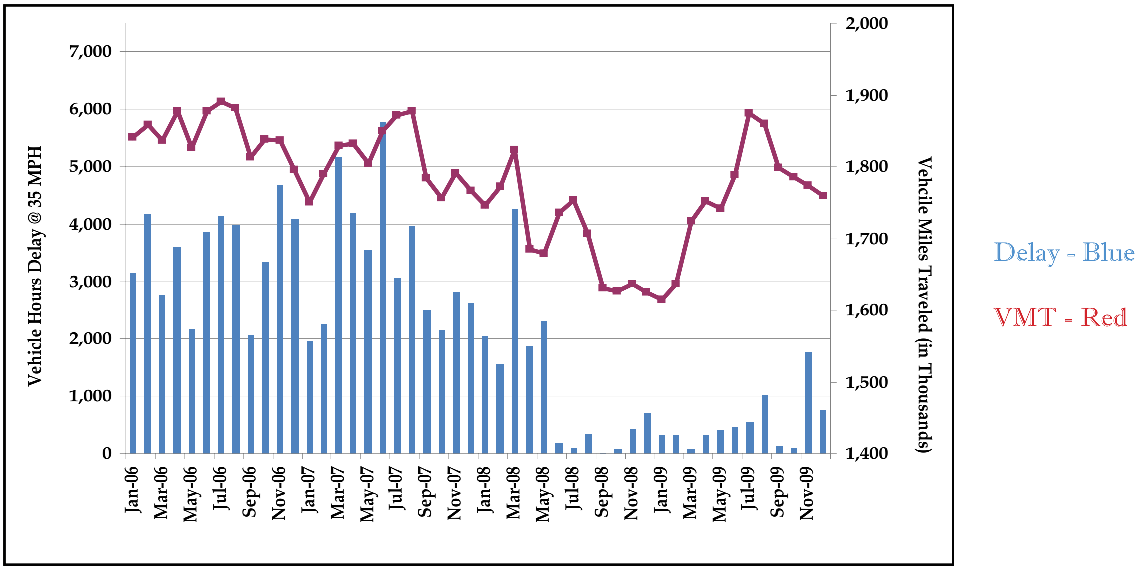
In August 2006 approximately 150 new detectors went on-line along the I 5 corridor improving the corridor coverage and data availability. Figure 8.9 shows the number of "good" detectors for each month between 2006 and 2008. Data quality for operational sensors varies by day and by location. Having detection covering a range of years, seasons, and locations on the corridor helps add another dimension to the analysis, particularly concerning seasonal and time-of-day variations. In addition, this level of data provides the ability to adequately reflect general traffic trends along the corridor without extremely costly data collection requirements.

Figure 8.9 PeMS Data Quality – 2006 to 2008



Figures 8.10 and 8.11 are northbound and southbound graphs of the weekday delay including a.m. and p.m. peak-periods. Delays presented represent the difference in travel time between actual conditions and free-flow conditions at 35 mph. Monthly delay is presented by Tuesday to Thursday data representing a typical weekday. The graphs illustrate the wide variation in delay across the months from January 2006 through July 2008. Variation is common on I-5 in the I-5 freeway corridor, and the amount of variation is an important characteristic concerning travel time reliability. Both figures show that delay has been decreasing consistently starting in the summer of 2007 through to mid-2008 when the analysis was performed.

Figure 8.10 I-5 Northbound PM Peak Period Vehicle Hours of Delay (<35 mph) and VMT– 2006 to 2009



Source: *I-5/I-805 Corridor System Management Plan Existing Conditions Technical Report (ECTR)*. PeMS, 2008.

Figure 8.11 I-5 Southbound AM Peak Period Vehicle Hours of Delay (<35 mph) and VMT – 2006-2009

Source: I-5/I-805 Corridor System Management Plan Existing Conditions Technical Report (ECTR). PeMS, 2008

Speed and Duration of Congestion

As described in Chapter 5, a bottleneck is said to terminate where speeds increase from 30 to 50 miles per hour, often in a very short distance; this location is associated with the open end of a bottle where vehicles are able to return to free-flow speeds after being choked through the bottleneck. Speed contours were developed for the peak periods from the microsimulation analyses to show the estimated speeds at different locations along the corridor. The scale for the speeds moves from red to yellow to green as the speeds increase from low values (30 mph or less) to high.

Figure 8.12 presents the northbound morning and afternoon bottlenecks for 2008. Similar to 2006 conditions shown in Figure 5.16, no northbound bottlenecks

Figure 8.12 2008 I-5 Freeway Corridor Bottlenecks - Weekday (T-Th) Northbound

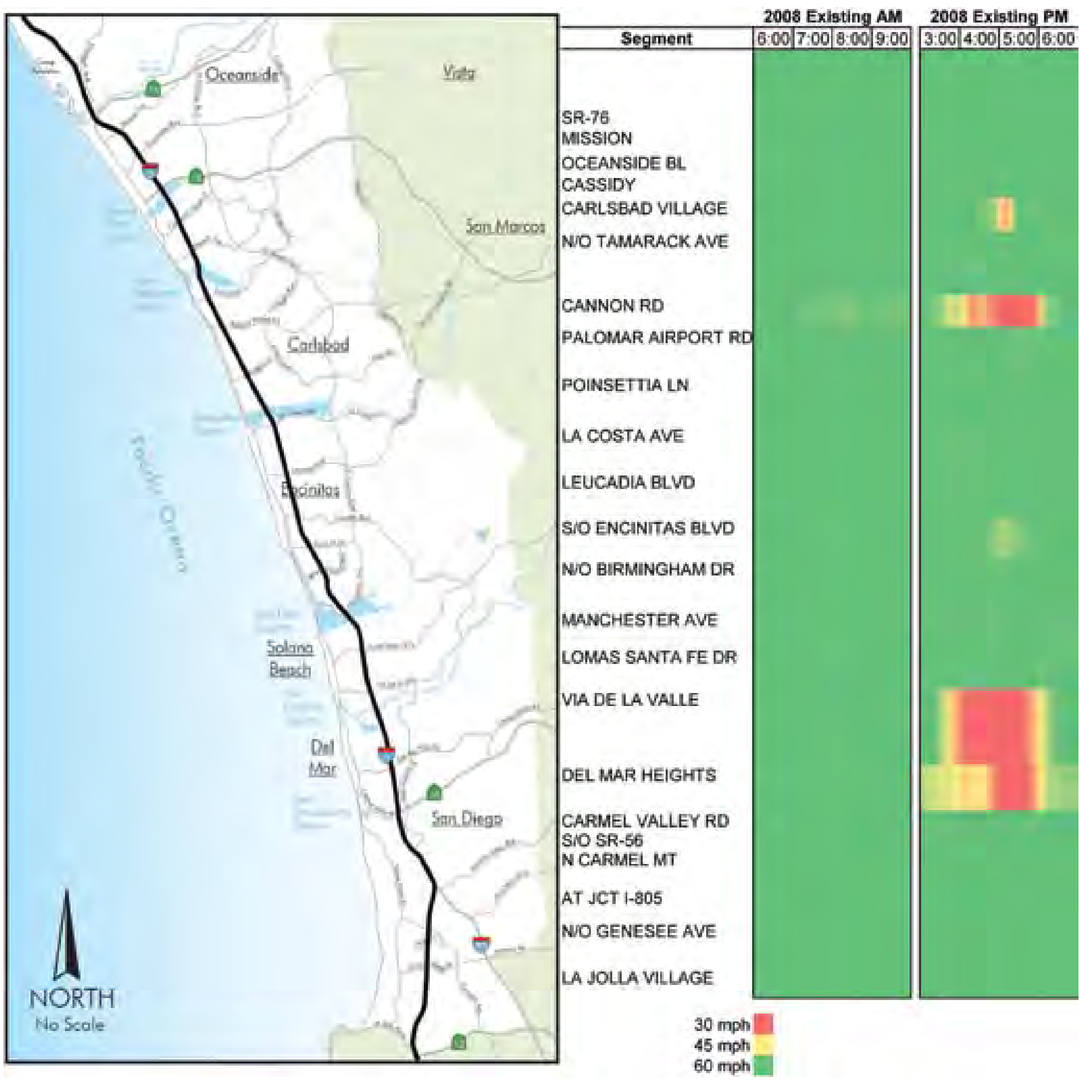
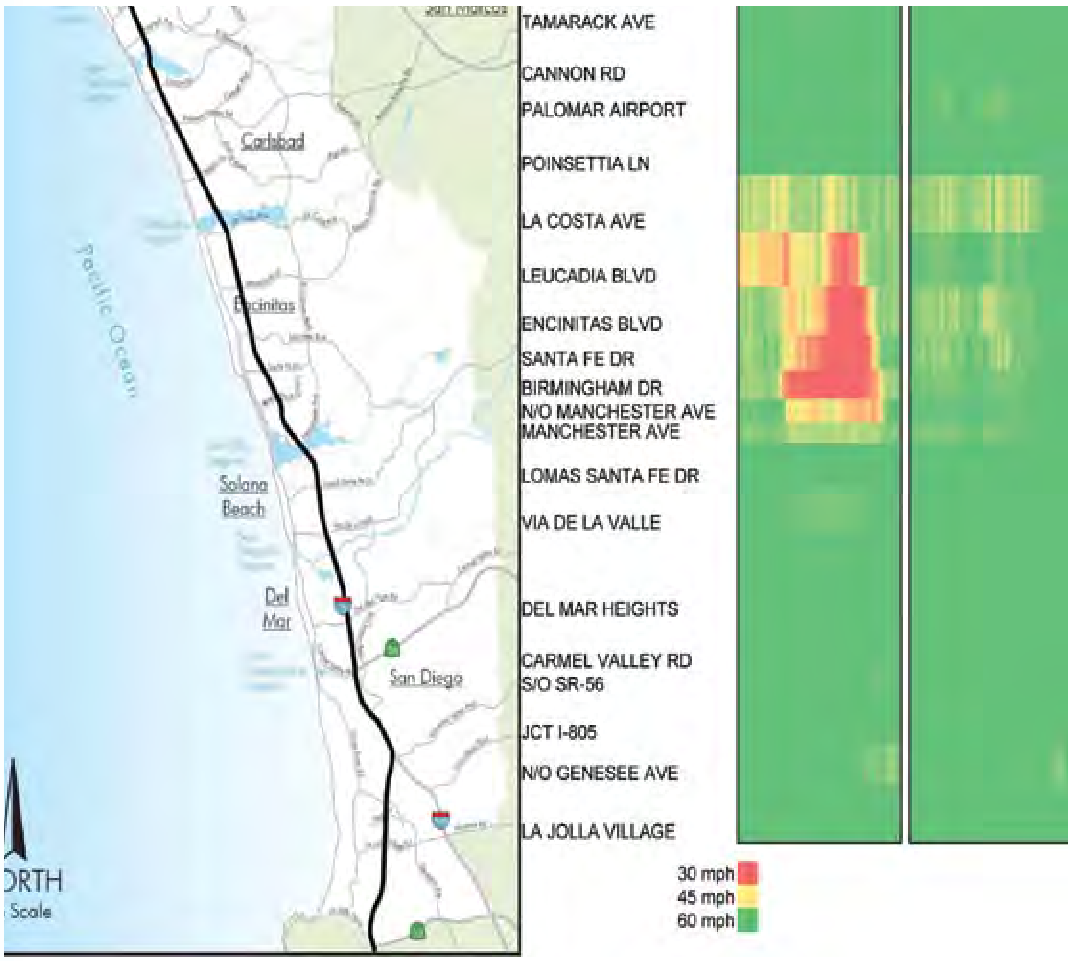


Figure 8.13 2008 I-5 Freeway Corridor Bottlenecks - Weekday (T-Th) Southbound



Note: typical weekday T-Th, Oct/Nov

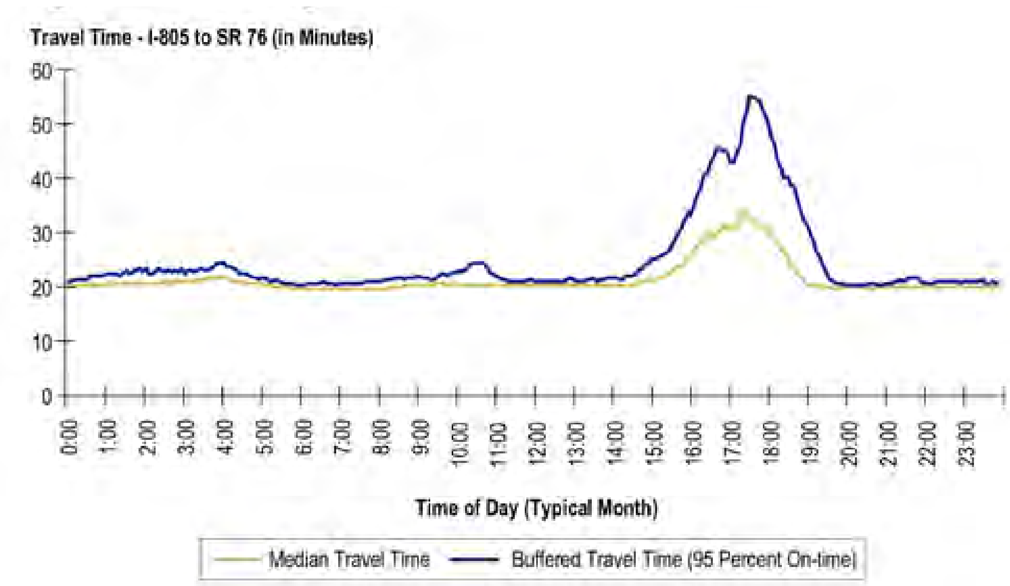
Speed and Duration of Congestion

As described in Chapter 5, a bottleneck is said to terminate where speeds increase from 30 to 50 miles per hour, often in a very short distance; this location is associated with the open end of a bottle where vehicles are able to return to free-flow speeds after being choked through the bottleneck. Speed contours were developed for the peak periods from the microsimulation analyses to show the estimated speeds at different locations along the corridor. The scale for the speeds moves from red to yellow to green as the speeds increase from low values (30 mph or less) to high.

Figure 8.12 presents the northbound morning and afternoon bottlenecks for 2008. Similar to 2006 conditions shown in Figure 5.16, no northbound bottlenecks occurred in the a.m. peak hours. Bottlenecks occurred in the afternoon at Via De La Valle and Cannon Road. The Manchester Avenue bottleneck that occurred in 2006 shifted south to Via De La Valle and decreased in duration. This is likely a result of extending the HOV lane from Via De La Valle to Manchester Avenue and adding several auxiliary lane improvements. Both the Via De La Valle and Cannon p.m. bottlenecks may be attributed to the high on-ramp volumes and grades at these locations. The Via De La Valle bottleneck is also restrained by the weave that occurs between the end of the HOV lane and the lane drop to Manchester. In both cases, the bottlenecks occur only within the afternoon peak period, with approximately 2 hours a day of "peak" conditions.

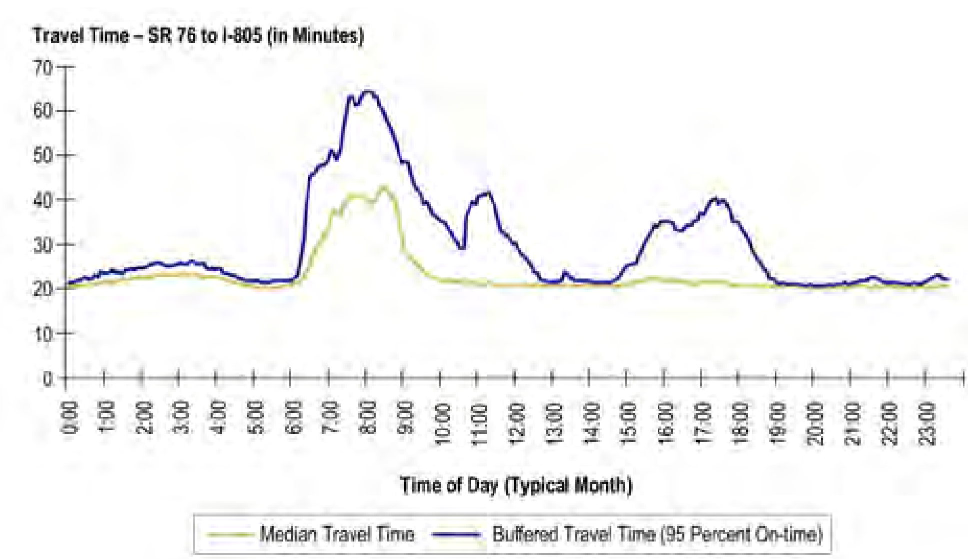
Figure 8.13 shows the bottlenecks along I-5 southbound for the morning and afternoon peak periods in 2008. A bottleneck at Manchester Avenue remained in 2008, when compared to the 2007 conditions in Figure 5.17. However, the time duration of the bottleneck does not extend into the mid-day period as it did in previous years; the peak conditions are approximately 2 hours long on a weekday in 2008. This bottleneck is due to the on-ramp demand from Manchester Avenue and the grade. The bottleneck reduction is likely a result of extending the HOV lane from Via De La Valle to Manchester Avenue and adding several auxiliary lane improvements. Not shown in the figure is a slowdown some drivers experience when approaching Genesee Avenue caused by heavy off-ramp volumes. The slow down generally occurs in the right most lane and can also cause friction in the lane next to it. Because the figure shows the average speed across all lanes, this phenomena does not appear in the figure but does appear in the model. No southbound bottlenecks occurred in the p.m. peak periods, although some slowing occurs between Poinsettia Lane and Manchester Avenue.

Figure 8.14 2007 Northbound I-5 Buffered Travel Time



Source: PeMS, 2007.

Figure 8.15 2007 Southbound I-5 Buffered Travel Time



Source: PeMS, 2007.

Reliability

Reliability captures the relative predictability of the public's travel time. Unlike the average travel time, which measures how many people are moving at what rate, the reliability measure focuses on how much their mobility varies from day to day.

The "Buffer Time Index" (BTI) was used to estimate reliability for the CSMP existing conditions analysis. The Buffer Time Index is defined as the extra time (or time cushion) that travelers must add to their average travel time when planning trips to ensure on-time arrival. On-time arrival assumes the 95th percentile of travel time distribution. Two sources were used:

- **San Diego Region 511** was used to present the average travel time along the corridor; and
- **PeMS** was used to calculate the Buffer Time Index. Since there are PeMS sensors producing reasonable data at various points along the corridor – in both directions and including free-flow sections, as well as severely congested sections – it was deemed useful to use the PeMS sensors reporting observed data to estimate the reliability indicator.

Figure 8.14 and Figure 8.15 show the buffered travel times compared against median travel times for I-5 between I-805 and SR 76 during the typical month, northbound and southbound.

The shortest time to traverse the I-5 corridor between I-805 and SR 76 is 20 minutes. Little congestion is experienced on northbound I-5 before the p.m. peak period, hence, the median travel time and buffered travel time are both not much greater

Table 8.5 2006 to 2008 I-5 Performance Comparison

Performance Measure	2006	2008
Peak Travel Time		
– A.M. Southbound	44 minutes	31 minutes
– P.M. Northbound	39 minutes	33 minutes
Duration of Congestion		
– A.M. Southbound	Manchester extending to La Costa Ave (5.5 hours in A.M., 10 hours mid-day and P.M.)	Manchester extending to La Costa Ave (2 hours)
– P.M. Northbound	Manchester extending to SR 56 (5 hours)	Via De La Valle extending to Carmel Valley Rd (2 hours)
	Cannon extending to Palomar Airport Rd (3 hours)	Cannon extending to Palomar Airport Rd (2 hours)

Source: PeMS, 2007

than 20 minutes. The travel time is much different during the p.m. peak-period. The greatest travel time is experienced at approximately 17:30, when the median time increased to 35 minutes and the buffered time increased to 55 minutes, which is almost three times the shortest travel time.

There is more variation in the southbound travel times than in the northbound. Peaks are experienced in both the a.m. and p.m. periods. The highest peak occurs around 8:00 a.m., when the median travel time doubles to just over 40 minutes and the buffered travel time more than triples to 65 minutes. The median travel time remains close to the shortest travel time of 20 minutes throughout the day, while the buffered travel time increases during the lunch period and again during the p.m. peak-period. The p.m. peak is less severe than the a.m. peak: buffered travel time increases to 40 minutes, twice the shortest travel time.

2006 to 2008 Comparison Summary

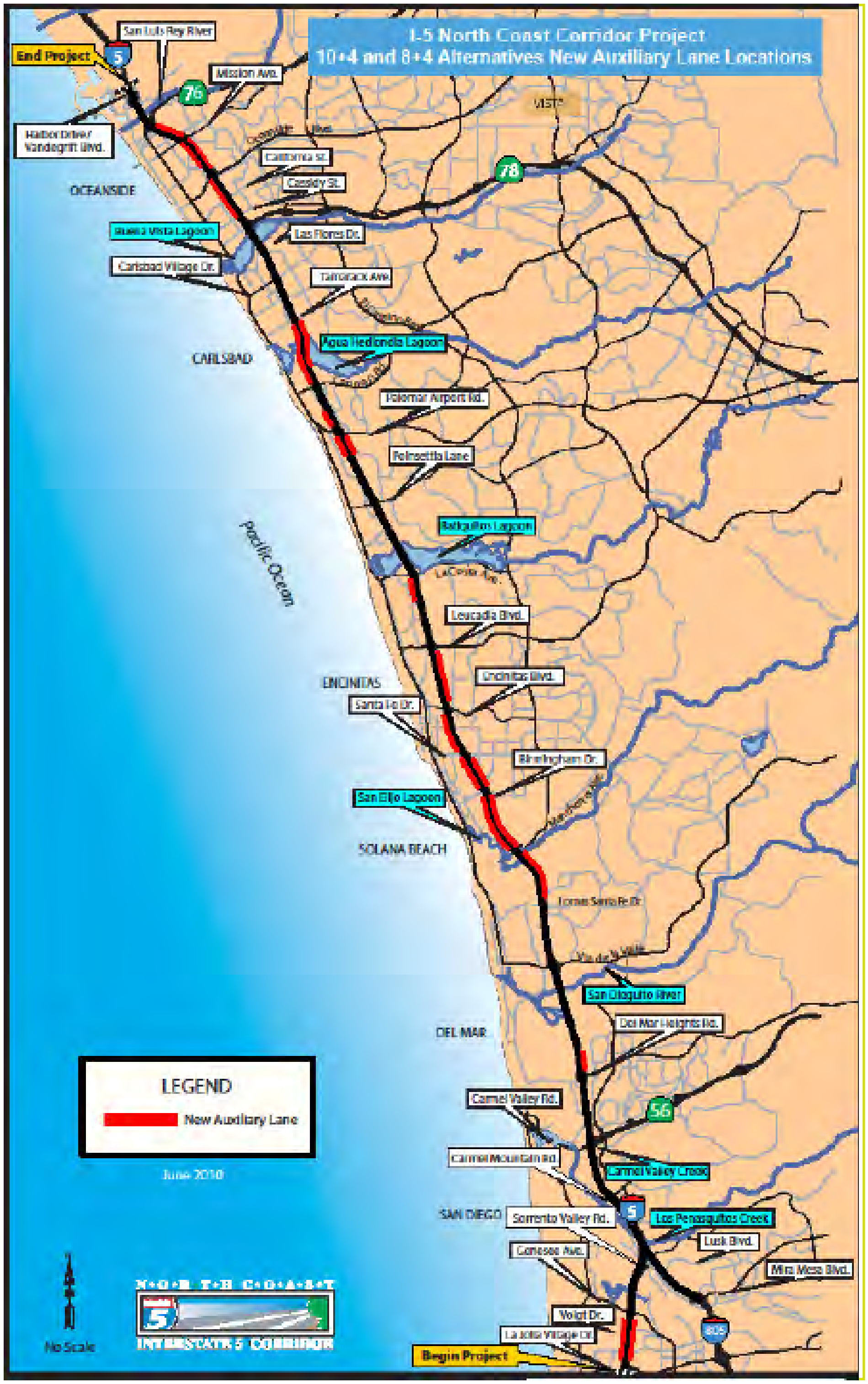
Table 8.5 presents a summary comparison for the performance of the I-5 freeway from the CSMP base year of 2006 to the microsimulation model base year of 2008. These reductions in travel time, delay, congestion extents and duration are likely a result of extending the HOV lane from Via De La Valle to Manchester Avenue, adding several auxiliary lane improvements, increases in gasoline prices, and/or the economic downturn that occurred during this period between 2006 and 2008.

Scenario Analysis

Three scenarios were analyzed for the CSMP highway analyses as described below. In addition, some of the measures were compared to 2006 and/or 2008 conditions to demonstrate changes in performance over time or as a result of the improvements.

- 2030 No Build Scenario – The existing freeway facilities with improvements including projects programmed to be constructed by 2030 and projects currently under construction.
- 2030 8+4 Scenario – Includes an extension of the two HOV/managed lanes (one northbound and one southbound) proposed under the I-5 mid-coast project north of La Jolla Village Drive to the merge/diverge with I-805 HOV/managed lanes. Four HOV/managed lanes (two northbound and two southbound) continue north in the I-5 median from the I-5/I-805 junction to the project limits at Harbor Drive in the City of Oceanside. The 8+4 alternative maintains the current

Figure 8.16 2030 Scenarios - New Auxiliary Lanes 8+4 and 10+4 Proposed Improvements



Source: Caltrans *I-5 North Coast Corridor Project.*

configuration of eight general purpose lanes throughout the corridor with the addition of new auxiliary lanes as shown in Figure 8.16. Five Direct Access Ramps (DARs) and 15 ingress/egress areas would allow access for eligible vehicles to the managed lanes. The five DARs would allow managed lane only traffic to enter and exit the managed lanes directly at or near Voigt Drive, Carroll Canyon Road, Manchester Avenue, Cannon Road, and Oceanside Boulevard (as shown in Figure 7.2). The Manchester Avenue DAR would also include a park-and-ride and BRT facility. However, the 8+4 scenario managed lane access would involve the following changes compared to the 10+4: a northbound managed lane opening at Via De La Valle, the removal of the northbound managed lane opening at Lomas Santa Fe, and an additional southbound managed lane opening at Leucadia.

Table 8.6 Summary of Scenario Improvements for 2030 Phasing Analysis

		2030	
Improvement	**No Build**	**8+4**	**10+4**
I-5/SR-56 (Additional Connectors)	Included	Included	Included
I-5/SR-78 (Additional Connectors)	Included	Included	Included
Direct Access Ramps (DARs)	Not Included	Included	Included
Carroll Canyon Improvements	Included	Included	Included
I-5 HOV South of I-805	Not Included	Included	Included
Transit Assumptions	Series 11	Series 11	Series 11
Ramp Meters	Included	Included	Included
Genesee Interchange Improvements	Included	Included	Included
Additional Auxiliary Lanes	Not Included	Included	Included
Managed Lanes	Not Included	4	4
Additional General Purpose Lanes	Not Included	Not Included	2

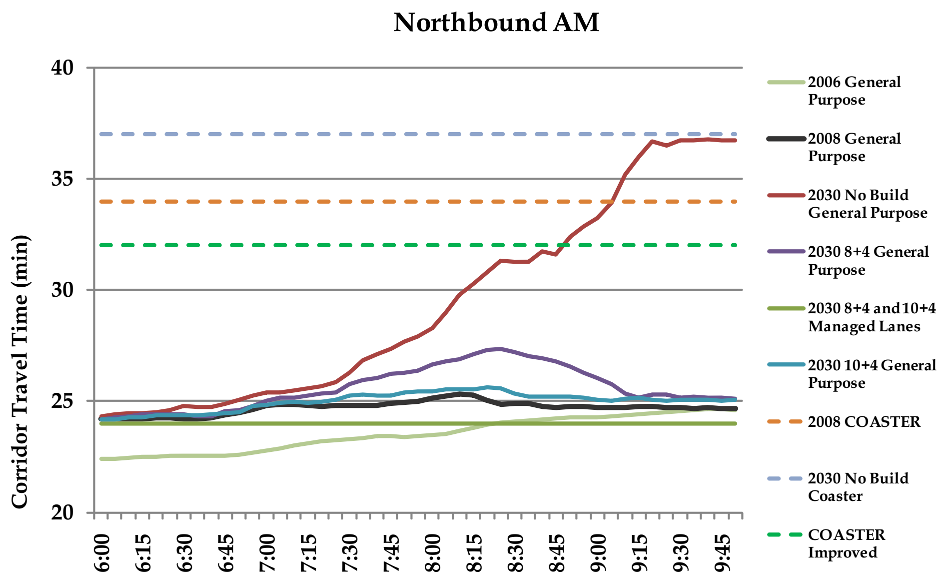
Travel Time

Travel time is reported as the amount of time for a vehicle or person to traverse between two points on a corridor. For the I-5 CSMP corridor, this travel time is the time to traverse the 27-mile corridor on the I-5 freeway.

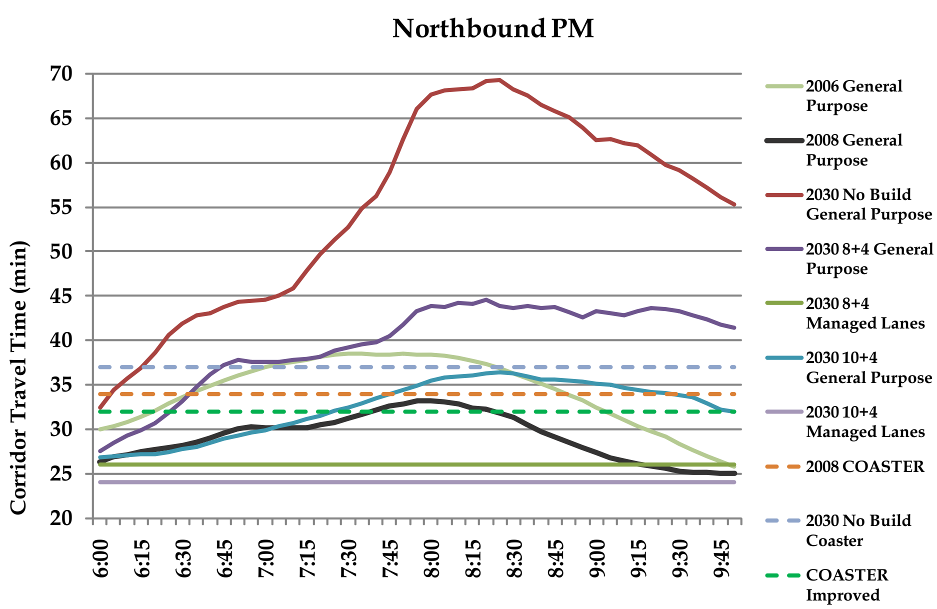
Figure 8.17 shows the travel times (in minutes) for the years 2006, 2008, and 2030 (No Build, 8+4 and 10+4 Scenarios) for the peak periods for the northbound direction. 2006 and 2008 are based on actual data whereas 2030 is based on modeled data. Also included are the COASTER train travel times from Oceanside to Sorrento Valley station in 2008 and estimated in 2030 for both the No Build and Combination #1 Scenario. On a typical weekday under free-flow or uncongested conditions, the average travel time for the I-5 (from Harbor Drive to La Jolla Village Drive) is approximately 23 to 25 minutes, at an average speed of 65 to 70 mph. The northbound morning travel time is estimated to be 37 minutes at its peak in the 2030 No Build Scenario, 11 minutes higher than the existing morning peak, with the other scenarios operating at or near free-flow. Both the 8+4 and 10+4 Scenarios will significantly reduce the travel time northbound in the morning peak with 8+4 down to 26 minutes and 10+4 to 25 minutes. The managed lanes in both improvement scenarios will operate at free-flow conditions of 24 minutes. It is anticipated that there will be congested periods throughout the mid-day in the 2030 if the improvements are not implemented as evidenced by the morning travel time still at 37 minutes at 10:00 a.m. and the afternoon peak at 32 minutes at 3:00 p.m.

The northbound afternoon peak-period travel time in the 2030 No Build Scenario is estimated to be over 69 minutes. This is 36 minutes longer than the peak in 2008, or a 109 percent increase. The 8+4 Scenario peak travel time is estimated to be 45 minutes. This is nearly a 24 minute time savings (35 percent reduction). The 10+4 scenario results in the most significant peak travel time savings of nearly 33 minutes or a 47 percent reduction. The 36 minute afternoon peak in the 10+4 Scenario is higher than the 2008 peak of 33 minutes but less than the 2006 peak of 38 minutes. The managed lanes would operate at reliable, free-flow conditions throughout the day at around a 24 to 26 minute travel time for the 10+4 and 8+4 Scenarios, respectively. In addition, travel time is still estimated to be 55 minutes at 7:00 p.m. in the 2030 No Build Scenario indicating evening congestion will likely continue well after 8:00 p.m. The 8+4 Scenario is also estimated to have congestion extending beyond the p.m. peak period with a travel time of 41 minutes at 7:00 p.m.

Figure 8.17 Typical Weekday Travel Times for I-5 Northbound From La Jolla Village Drive to Harbor Drive



Note: Typical Weekday T-Th, Oct/Nov



Note: COASTER travel times are daily averages from Sorrento Valley to Oceanside stations.
Sources: PeMS and NCTD.

Northbound COASTER travel times are also estimated to improve as a result of the I-5 rail CSMP corridor improvements between Sorrento Valley and Oceanside stations with a travel time savings of about 5 minutes on average, from 37 minutes to 32 minutes (16 percent savings). In addition, on-time performance is estimated to improve from 53 percent without improvements to nearly 100 percent with LOSSAN Combination #1 improvements. In addition, the COASTER travel times are lower and more reliable in the afternoon peak period than the 2030 No Build and 8+4 Scenarios.

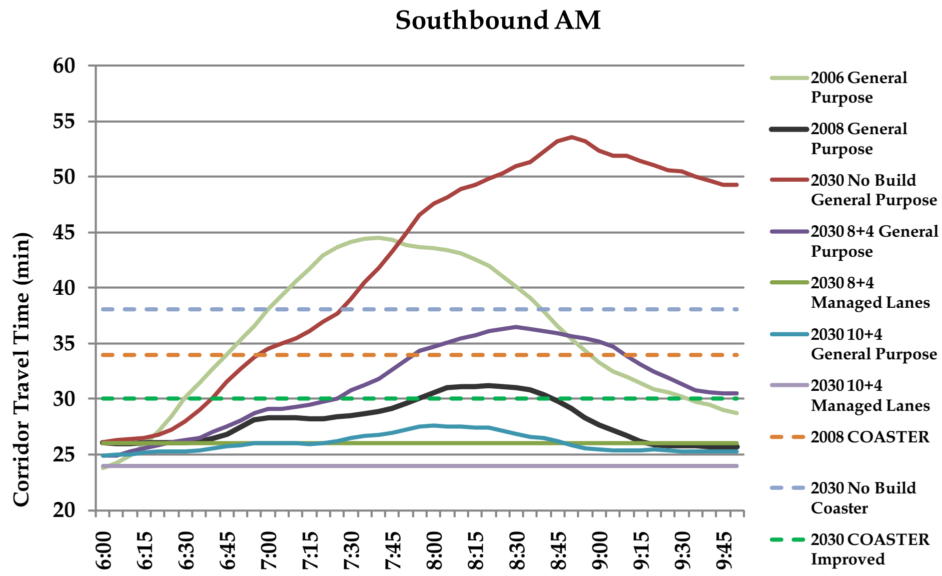
The managed lanes would operate at reliable, free-flow conditions throughout the day at around a 24 to 26 minute travel time.

Figure 8.18 presents the travel times (minutes) for the years 2006, 2008, and 2030 (No Build, 8+4, and 10+4 Scenarios) for the peak periods for the southbound direction. By 2030, the southbound morning peak travel time is estimated to be nearly 54 minutes and the southbound afternoon peak travel time is nearly 40 minutes. This corresponds to a 23 minute (72 percent) and a 13 minute (44 percent) increase over 2008 conditions, respectively. The 2030 8+4 Scenario morning peak travel time southbound is 36 minutes, a 32 percent reduction from the No Build Scenario. The 10+4 Scenario is estimated to have the most significant improvement in peak travel time with a 48 percent reduction (26 minute savings), down to under 28 minutes. The 10+4 Scenario travel time of 28 minutes is better than both the 2006 and 2008 conditions of 44 and 31 minutes, respectively. In addition, the 10+4 Scenario is the only scenario where the southbound morning congestion is contained within the four hour peak period. It is anticipated that there will be congested periods throughout the mid-day in the 2030 No Build Scenario with only the 8+4 and 10+4 Scenarios returning to free-flow for a portion or all of the mid-day. The managed lanes would operate at free-flow or mostly free-flow conditions at a peak of 26 minutes in the 8+4 Scenario and 24 minutes in the 10+4 Scenario.

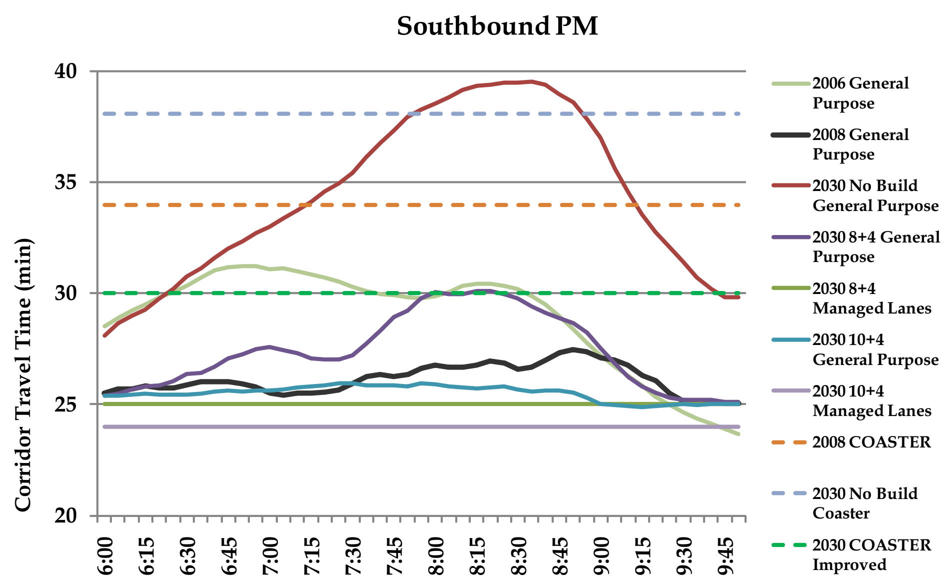
In the afternoon, each of the 2030 build scenarios will improve travel times in the corridor ranging from ten to nearly fourteen minutes (24 to 34 percent savings) with the 10+4 scenario improving to conditions better than 2006 and 2008. Also, the 10+4 scenario returns travel time to free-flow conditions within the 3:00 to 7:00 p.m. analysis period. Whereas, the 2030 8+4 Scenarios has extended periods of congestion beyond the peak periods and higher travel times.

COASTER travel times southbound are also estimated to improve by eight minutes between Oceanside and Sorrento Valley stations as a result of the I-5 CSMP corridor improvements, from 38 minutes to 30 minutes (21 percent savings). On-time performance is estimated to improve from 39 percent in the No Build to nearly 100 percent with LOSSAN Combination #1 improvements. The COASTER travel time with improvements are lower and more reliable in both the morning and afternoon peak periods than the 2030 No Build, Phase 1, and 8+4 Scenarios.

Figure 8.18 Typical Weekday Travel Times for I-5 Southbound From Harbor Drive to La Jolla Village Drive



Note: Typical Weekday T-Th, Oct/Nov



Note: COASTER travel times are daily averages from Oceanside to Sorrento Valley stations.
Sources: PeMS and NCTD.

Table 8.7 presents a summary of the travel times contained in Figures 8.17 and 8.18.

Table 8.7 Typical Weekday Peak Travel Time Summary (Minutes)

			2030				COASTER		
Time/Direction	**2006**	**2008**	**No Build**	**8 + 4 GP**	**10 + 4 GP**	**Managed GP**	**2008**	**2030 No Build**	**2030 Improved**
A.M. Peak Period									
– Northbound	25	26	37	26	25	24	34	37	32
– Southbound	44	31	54	36	28	24 – 26	34	38	30
P.M. Peak Period									
– Northbound	38	33	69	45	36	24 – 26	34	37	32
– Southbound	31	27	40	30	26	24 – 25	34	38	30

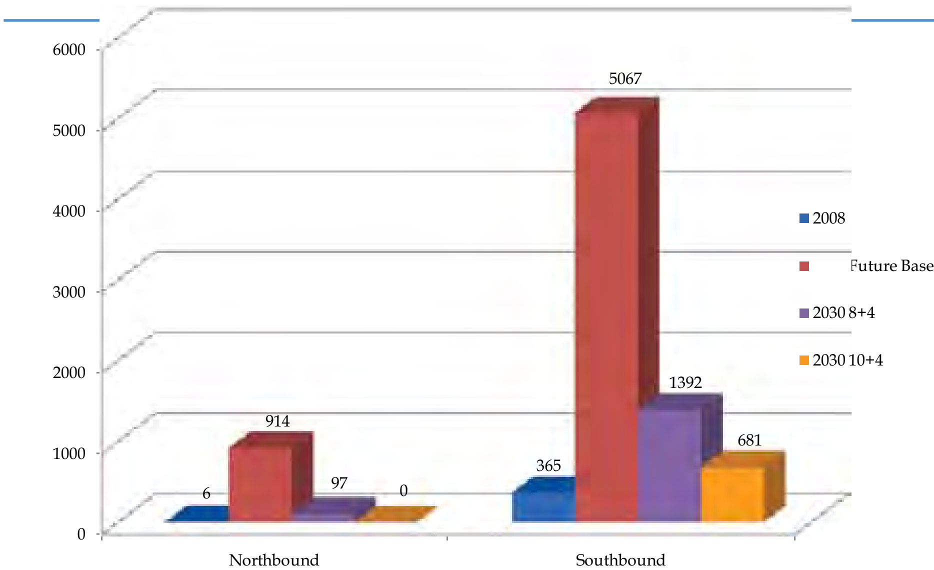
Delay

The 8+4 and 10+4 scenarios will reduce severe delay (delay associated with speeds less than 35 mph) by 25 to 87 percent during the peak periods in the peak travel directions.

For this effort, simulated delay along I-5 was calculated as the difference between the travel time under congested conditions and the travel time at uncongested conditions (greater than 35 mph). Caltrans defines the congested speed threshold as 35 mph since this is the speed range at which traffic flow breaks down and becomes stop and go. If the vehicle speed is higher than or equal to 35 mph, the vehicle experiences no delay; otherwise, delay is calculated, and then is further aggregated into delay in vehicle-hours of delay (VHD).

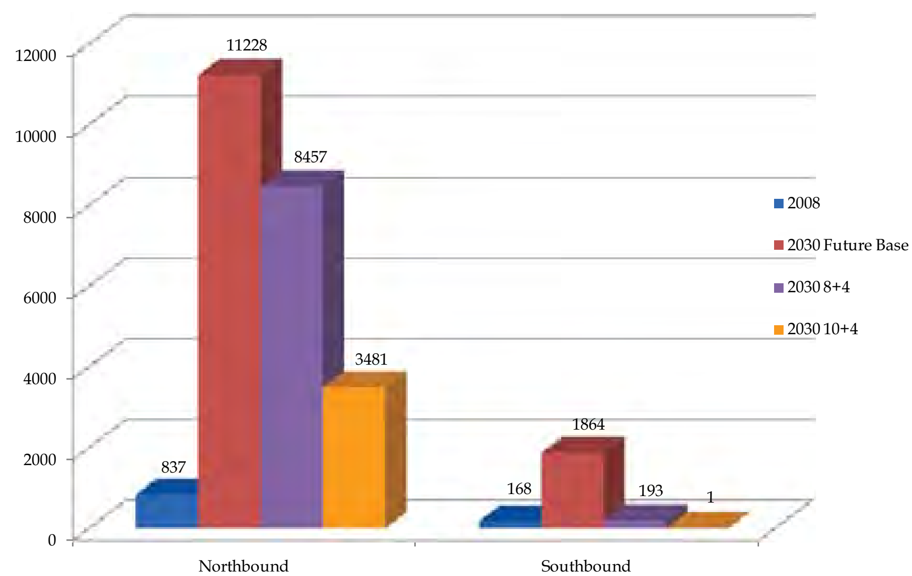
Figures 8.19 and 8.20 compare the average modeled delay on I-5 for the 2008 and 2030 scenarios, in the morning (6:00-10:00 a.m.) and afternoon (3:00–7:00 p.m.) peak periods, respectively. It is clearly shown that delay will increase in both directions and peak periods in the 2030 No Build Scenario. Delay will increase sharply in the non-peak direction; however, the peak direction will still experience significantly more delay than the non-peak direction. In the non-peak northbound direction in the morning peak period, the total delay will increase from 6 VHD in 2008 to over 910 VHD in 2030. In the southbound direction, the total delay will increase from over 360 VHD in 2008 to about 5,070 VHD in 2030. Each of the scenarios improve VHD over the No Build scenario with a 73 percent reduction with the 8+4 Scenario, and an 87 percent reduction with the 10+4 Scenario in the morning peak (southbound) direction. The afternoon peak period northbound delay savings are 25 percent, and 69 percent, respectively. None of the improvement scenarios return VHD to existing 2008 conditions. However, the 10+4 Scenario shows the most significant improvement, with approximately 4,400 hours saved in

Figure 8.19 Typical Weekday, AM Peak Period 35 MPH Vehicle Hours of Delay (VHD) for I-5 Northbound and Southbound From La Jolla Village Drive to Harbor Drive



Note: Typical Weekday T-Th, Oct/Nov

Figure 8.20 Typical Weekday, PM Peak Period 35 MPH Vehicle Hours of Delay (VHD) for I-5 Northbound and Southbound From La Jolla Village Drive to Harbor Drive



the morning peak period southbound and over 7,700 hours saved in the afternoon peak period northbound on a typical day. Table 8.8 presents a summary comparison of the 35 mph delay for the scenarios. Similarly, 60 mph delay is presented in Table 8.9. This represents delay less than free-flow conditions.

Table 8.8 Peak Period 35 MPH Vehicle Hours of Delay Summary (in hours)

Time/Direction	2008	2030 No Build	2030 8 + 4	2030 10 + 4
A.M. Peak Period				
– Northbound	6	910	100	0
– Southbound	360	5,070	1,390	680
P.M. Peak Period				
– Northbound	840	11,230	8,460	3,480
– Southbound	170	1,860	190	1

Table 8.9 Peak Period 60 MPH Vehicle Hours of Delay Summary (in hours)

Time/Direction	2008	2030 No Build	2030 8 + 4	2030 10 + 4
A.M. Peak Period				
– Northbound	130	2,180	640	240
– Southbound	1,580	7,950	3,420	1,300
P.M. Peak Period				
– Northbound	2,280	15,080	11,410	5,230
– Southbound	730	4,390	1,250	400

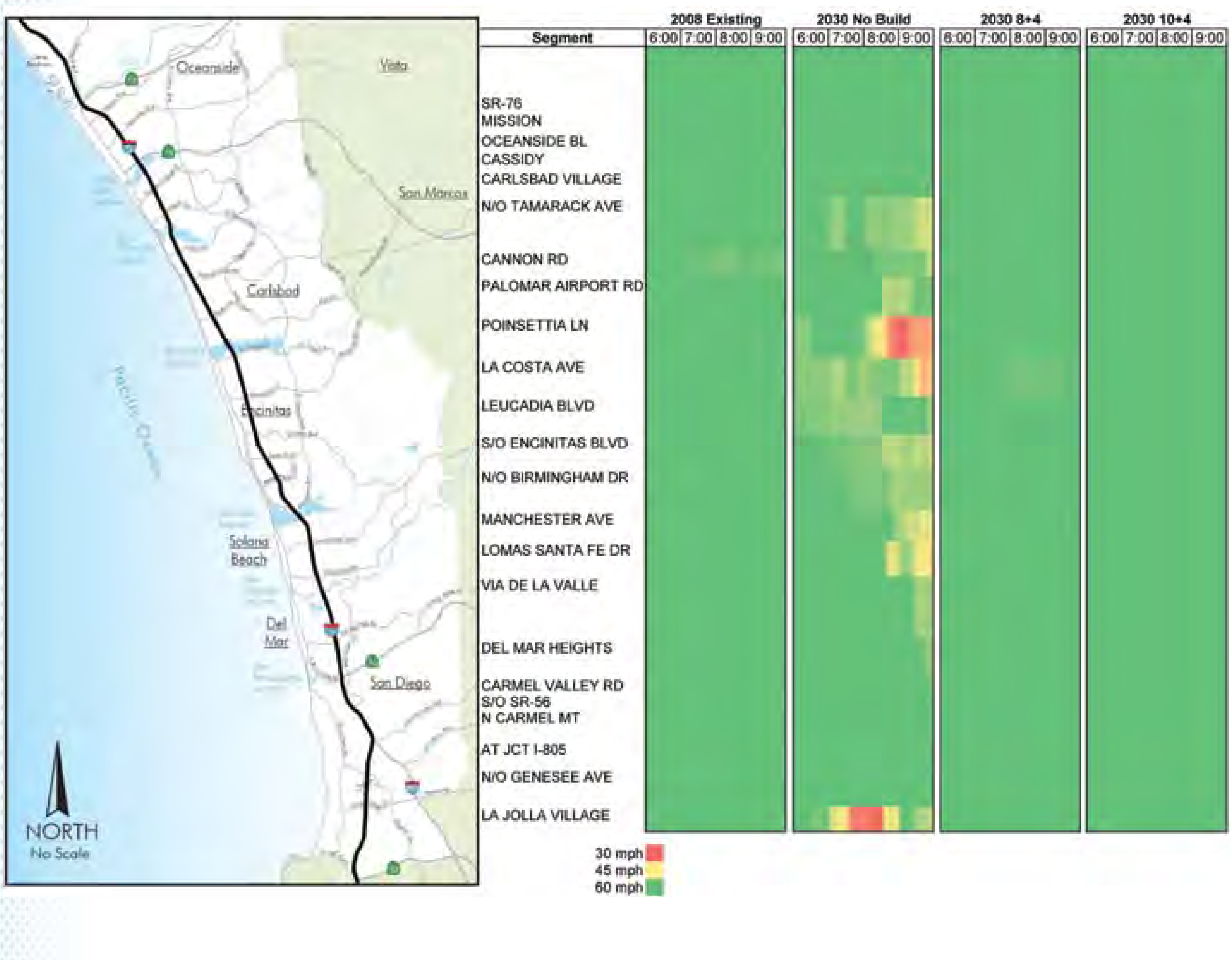
Speed and Duration of Congestion

As described in Chapter 5, a bottleneck is said to terminate where speeds increase from 30 to 50 miles per hour, often in a very short distance; this location is associated with the open end of a bottle where vehicles are able to return to free-flow speeds after being choked through the bottleneck. Speed contours were developed for the peak periods from the microsimulation analyses to show the estimated speeds at different locations along the corridor. The scale for the speeds moves from red to yellow to green as the speeds increase from low values (30 mph or less) to high. The following presents the bottleneck analyses for the four scenarios, northbound then southbound.

Northbound Morning Peak Period Bottlenecks

Figure 8.21 presents the northbound morning bottlenecks for 2008, 2030 No Build, and the 2030 Scenarios. Similar to 2006 conditions shown in Figure 5.16, no northbound bottlenecks occurred in the 2008 a.m. peak period. By 2030, traffic is slowing and two bottlenecks appear in the off-peak northbound direction in the morning, one at Poinsettia Lane in Carlsbad and the other at La Jolla Village Drive in San Diego. The northbound a.m. Poinsettia Lane and La Jolla Village Drive bottlenecks are both a result of on-ramp vehicles merging with heavy downstream off-ramp volumes in the right lane. The 8+4 Scenario improves conditions in a.m. peak period northbound, eliminating the bottlenecks and returning most of the corridor to free-flow conditions in the morning northbound. The 10+4 Scenario returns the northbound direction in the morning peak to free-flow conditions.

Figure 8.21 I-5 Freeway Corridor Bottlenecks Northbound A.M. Peak Period Weekday



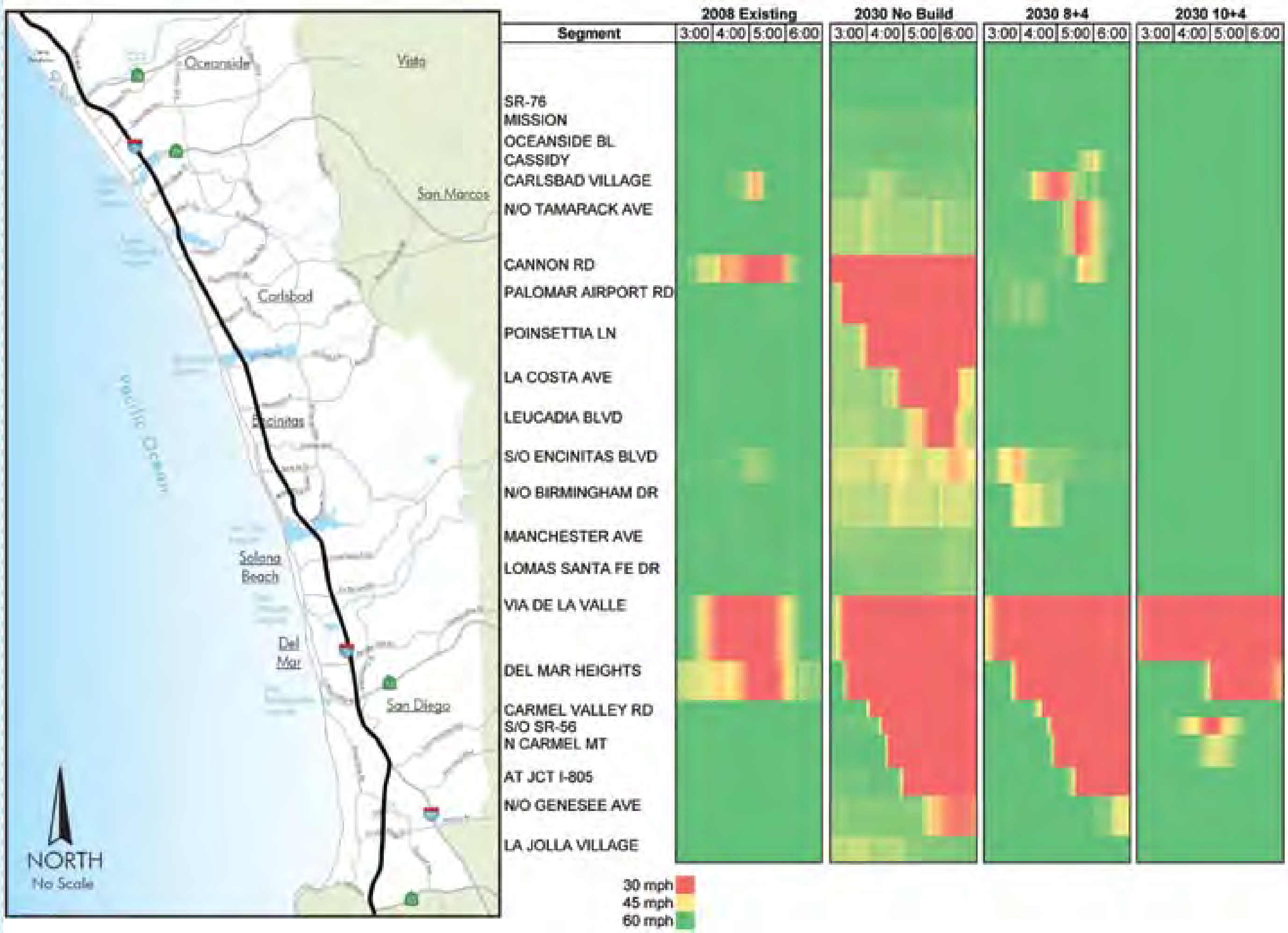
Northbound Afternoon Peak Period Bottlenecks

As shown in Figure 8.22, bottlenecks occur in the afternoon at Via De La Valle and Cannon Road in 2008. The Manchester Avenue bottleneck that occurred in 2006 shifted south to Via De La Valle and decreased in duration. This was likely a result of extending the HOV lane from Via De La Valle to Manchester Avenue, adding several auxiliary lane improvements, and other factors such as higher gasoline prices and the economic downturn. Both the Via De La Valle and Cannon p.m. peak period bottlenecks may be attributed to the high on-ramp volumes and grades at these locations. The Via De La Valle bottleneck is also restrained by the weave that occurs between the end of the HOV lane and the lane drop to Manchester. In both cases, the bottlenecks occur only within the afternoon peak period, with approximately 2 hours a day of "peak" conditions. By 2030 No Build, the afternoon bottlenecks are still located at Via De La Valle and Cannon Road with the time duration and the extent of the bottlenecks considerably longer. It is anticipated that the Cannon Road queue will extend beyond Encinitas Boulevard at its peak and the Via De La Valle bottleneck to La Jolla Village Drive. Neither of the p.m. bottlenecks return to free flow within the analysis period; the queue still extends back to approximately Genesee Ave at 7:00 p.m. It is unlikely the Via De La Valle bottleneck will clear before 9:00 p.m., representing over six hours of "peak" conditions northbound in the afternoon in 2030. Both the Via De La Valle and Cannon p.m. bottlenecks that existed in 2008, grow due to an increase in mainline and on-ramp volumes combined with the grades at these locations. Additionally, the design of the planned SR-56 interchange includes an increase in the number of lanes up to Via De La Valle but the last of the additional lanes is dropped at the Via De La Valle off-ramp; this design exacerbates the bottleneck at Via De La Valle.

It is unlikely the Via De La Valle bottleneck will clear before 9:00 p.m., representing over six hours of "peak" conditions northbound in the afternoon in 2030.

The bottleneck occurring northbound in the afternoon located at Via De La Valle remains, extending back to Genesee Ave., but has a shorter duration. In addition, the bottleneck at Cannon Road in the p.m. northbound is eliminated, with minor bottlenecks of brief duration and extents appearing at Las Flores Drive and Cassidy Street. The addition of the managed lane in the 8+4 scenario does not mitigate the problem; the volume in the general purpose lane are still high up to Lomas Santa Fe Drive and Manchester Avenue (metered by the bottleneck at Via De La Valle). The Via De La Valle bottleneck remains at the end of the analysis period in the 8+4 Scenario (beyond 7:00 p.m.). However, it is anticipated to clear earlier than the 2030 No Build Scenario.

Figure 8.22 I-5 FreewayCorridor Bottlenecks Northbound P.M. Peak Period Weekday



The bottlenecks and unstable traffic flow north of Via De La Valle return to free-flow conditions northbound in the afternoon peak period. A bottleneck still remains in the 10+4 Scenario northbound at Via De La Valle but the queue does not extend beyond Carmel Valley Road, with it extending to only Del Mar Heights Road most of the time. There is also a minor bottleneck for approximately 30 minutes south of SR-56. The Via De La Valle p.m. northbound bottleneck is caused by high on-ramp and mainline volumes as well as the grade at this location. The minor bottleneck south of SR-56 is caused by the weave between the general purpose lanes and managed lanes.

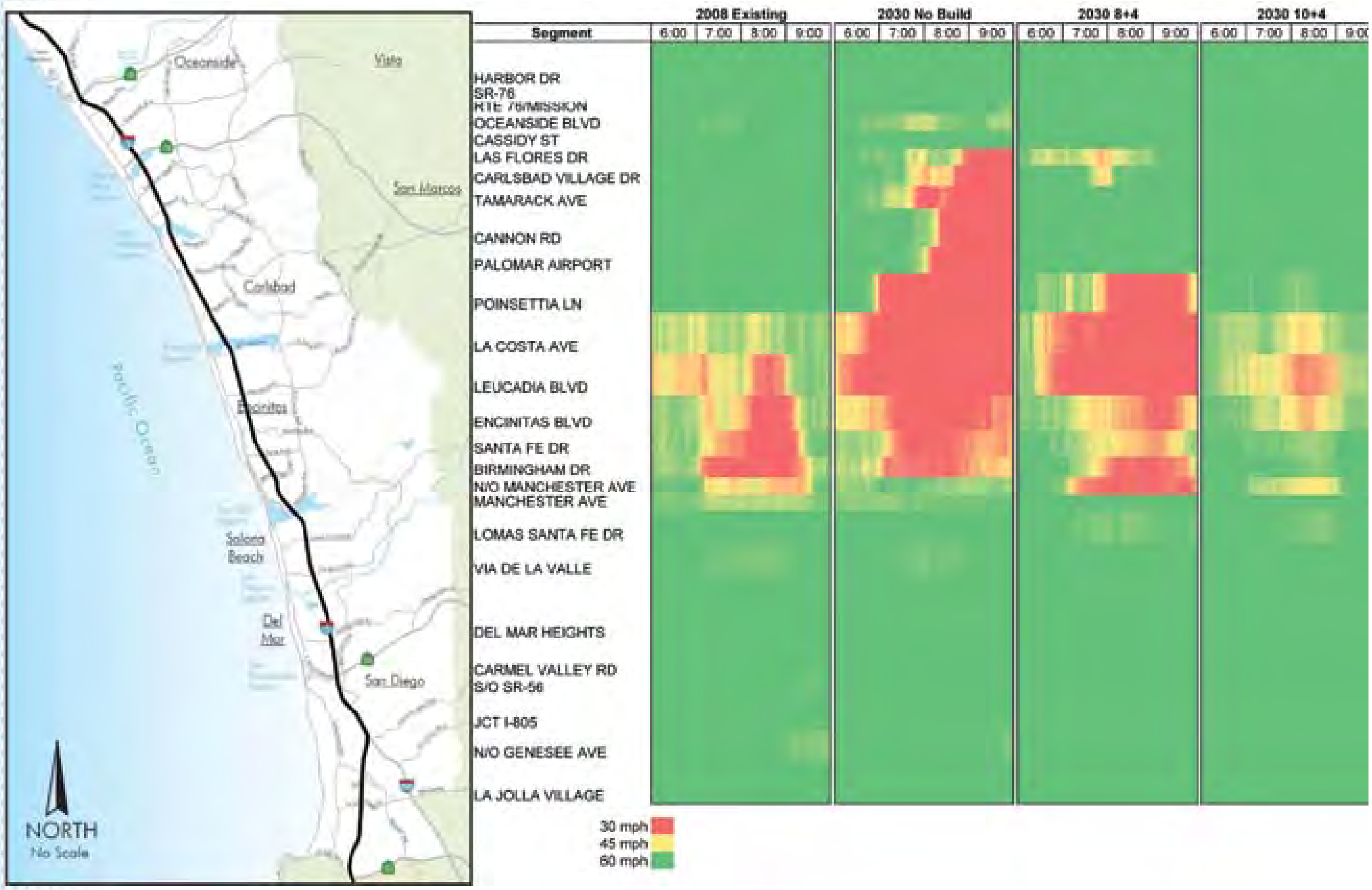
Southbound Morning Peak Period Bottlenecks

Figure 8.23 shows the bottlenecks along I-5 southbound for the morning peak periods in 2008, 2030 No Build, 2030 8+4, and 2030 10+4 Scenarios. The bottleneck at Manchester Avenue remained in 2008, when compared to the 2007 conditions in Figure 5.17. However, the time duration of the bottleneck does not extend into the mid-day period as it did in previous years; the peak conditions are approximately 2 hours long on a weekday in 2008. This bottleneck is due to the on-ramp demand from Manchester Avenue and the grade. The bottleneck reduction is likely a result of extending the HOV lane from Via De La Valle to Manchester Avenue, adding several auxiliary lane improvements, and external factors such as higher gasoline prices and the economic downturn. Not shown in the figure is a slowdown some drivers experience when approaching Genesee Avenue caused by heavy off-ramp volumes. The slow down generally occurs in the right most lane and can also cause friction in the lane next to it. Because the figure shows the average speed across all lanes, this phenomena does not appear in the figure but does appear in the simulation model. By 2030, southbound congestion is estimated to increase considerably, particularly north of Manchester Avenue. The a.m. bottleneck at Manchester Avenue is anticipated to expand to additional bottlenecks at Leucadia Boulevard and Tamarack Avenue, and extend back to Cassidy Street with no sign of returning to free-flow conditions during the mid-day. The southbound a.m. bottleneck is caused by increasing volume, as more and more vehicles enter the facility heading south. The auxiliary lane and HOV lane south of Manchester Avenue alleviate the congestion, from that point south. The congestion noticed at the Genesee Avenue off-ramp in the model but not shown in the 2008 bottleneck figure is alleviated by the planned Genesee Avenue interchange improvements.

The 10+4 Scenario is the only one that returns traffic flow to free-flow conditions for most of the analysis periods.

As shown in Figure 8.23, the extent and duration of the weekday southbound bottlenecks at Manchester Boulevard and Leucadia Boulevard for the 8+4 Scenario are reduced and are due to the high on-ramp volumes. The 10+4 Scenario results in the elimination of all major bottlenecks in the southbound direction in the morning peak period. A minor bottleneck still remains in the 10+4 Scenario southbound at Leucadia Boulevard. with areas of unstable traffic flow between Manchester Avenue and Poinsettia Lane However, the 10+4 Scenario is the only one that returns traffic flow to free-flow conditions for most of the analysis periods. The minor bottleneck at Leucadia Boulevard is caused by high on-ramp volumes.

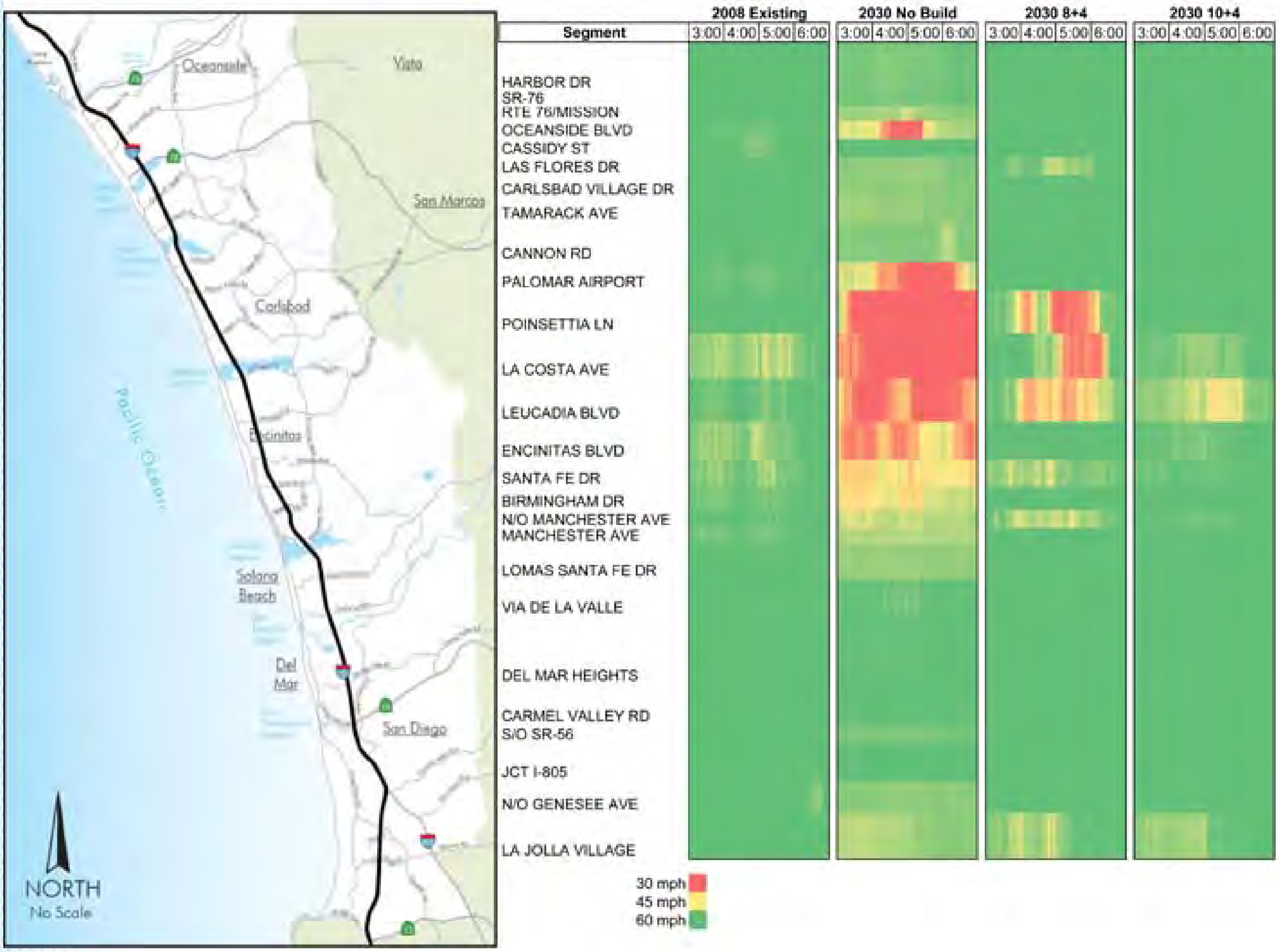
Figure 8.23 I-5 Freeway Corridor Bottlenecks Southbound A.M. Peak Period Weekday



<u>Southbound Afternoon Peak Period Bottlenecks</u>

As shown in Figure 8.24, no southbound bottlenecks occur in the 2008 p.m. peak period, although some slowing occurs between Poinsettia Lane and Manchester Avenue. The 2030 afternoon peak period is estimated to have multiple bottlenecks including Encinitas Boulevard, Leucadia Boulevard., La Costa Avenue, Poinsettia Lane, extending back to Cannon Road. In addition, a bottleneck appears at Oceanside Boulevard southbound in the afternoon peak for over 2 hours, extending back to SR-76. The La Costa Avenue/ Poinsettia Lane bottleneck is estimated to last beyond the end of the afternoon peak period (7:00 p.m.). The p.m. bottlenecks between Encinitas Boulevard and Poinsettia Lane may be attributed to the same phenomena as the a.m. bottleneck – volume. The bottleneck at Oceanside Boulevard is caused by heavy volume exiting at SR-78. In the 8+4 Scenario, the weekday southbound afternoon bottlenecks are significantly reduced and contained within the peak period. Bottlenecks that remain are located at Leucadia Boulevard, La

Figure 8.24 I-5 Freeway Corridor Bottlenecks Southbound P.M. Peak Period Weekday



Costa Avenue and Poinsettia Lane. All of the southbound afternoon bottlenecks are estimated to be eliminated with the 10+4 Scenario with some unstable traffic flow between Leucadia Blvd and La Costa Avenue for about an hour during the peak.

Table 8.10 presents a summary of the bottlenecks contained in Figures 8.21 through 8.24.

Reliability

Table 8.10 2030 Scenarios - Bottleneck Comparison

Duration of Congestion	2030 No Build	2030 8 + 4 Scenario	2030 10 + 4 Scenario
A.M. Northbound	• Poinsettia Ln extending to Leucadia (45 minutes) • La Jolla Village Dr extending to SR 52 (1 hour)	• No bottlenecks	• No bottlenecks
P.M. Northbound	• Via De La Valle extending to La Jolla Village Drive (entire peak period, as well as into the evening) • Cannon Road extending beyond Encinitas Blvd (entire peak period, as well as into the evening)	• Via De La Valle extending to Genesee Ave (entire peak period, as well as into the evening) • Las Flores Dr and Cassidy St extending to Cannon (1 hour)	• Via De La Valle extending to Carmel Valley Rd (entire peak period, as well as into the evening)
A.M. Southbound	• Manchester Ave extending to beyond Leucadia Blvd (2 hours) • Leucadia Blvd extending beyond Tamarack Ave (entire peak period, as well as into the mid-day) • Tamarack Ave extending back to Cassidy Street (2 hours during peak, as well as into the mid-day)	• Manchester Ave extending to Birmingham (3 hours) • Encinitas Blvd to Leucadia Blvd (2 hours) • Leucadia Blvd extending to Palomar Airport (over 3 hours during peak, as well as into the mid-day)	• Leucadia Blvd extending to La Costa Ave (1 hour)
P.M. Southbound	• Encinitas Blvd extending beyond Leucadia Blvd (2 hours) • Leucadia Blvd extending beyond La Costa Ave (3 hours) • La Costa Ave extending beyond Poinsettia Ln (entire peak period, as well as into the evening) • Poinsettia Lane extending back to Cannon Road (entire peak period, as well as into the evening) • Oceanside Blvd extending back to SR-76 (2 hours)	• Leucadia Blvd extending to La Costa Ave (1-2 hours) • La Costa Ave extending to Poinsettia Ln (over 1 hour) • Poinsettia Lane extending back to Palomar Airport (2 hours)	• No bottlenecks

Reliability captures the relative predictability of the public's travel time. Unlike the average travel time, which measures how many people are moving at what rate, the reliability focuses on how much their mobility varies from day to day. For the existing conditions discussed previously, the "Buffer Index" was used to estimate reliability. The Buffer Index is defined as the extra time (or time cushion) that travelers must add to their average travel time when planning trips to ensure on-time arrival 95 percent of the time. Unfortunately, this measure is difficult to capture in analyzing future conditions in a demand model or microsimulation model. However, one of the key benefits of the managed lanes is the ability to provide more reliable travel times. The managed lanes will be operated to ensure a reliable travel time for those who need it. The simulation analyses showed a travel time of between 24 and 26 minutes for both the 8+4 and 10+4 Scenarios. In addition, it is anticipated that the 10+4 Scenario would provide additional reliability benefits over the 8+4 Scenario. Generally, the greater the number of lanes, the more reliable a facility will be. One of the significant impacts on reliability are incidents. If an incident occurs that blocks lanes of traffic, the more lanes that are available for vehicles to travel around the incident, the faster any congestion that occurs as a result of the incident will be cleared.

Vehicle Miles Traveled (VMT)

Vehicle-miles traveled is calculated by multiplying the number of vehicles by the miles traveled in a given area or on a given road facility during the specified time period. Comparison profiles for microsimulation modeled VMT on the I-5 freeway between existing 2008 and 2030 Future Year Scenarios are presented in Figures 8.25 and 8.26, for the a.m. and p.m. peak periods, respectively. Each of the scenarios shows an incremental increase in VMT over the prior scenario. In the case of the existing 2008 to 2030 No Build, the VMT increase is mostly demand driven, based on the anticipated population growth in the corridor. For each of the improvement scenarios over the 2030 No Build, the VMT increases are likely a result in the increase in capacity on I-5 and vehicles shifting to the freeway and their travel back into the peak period, or earlier hours within the peak period, as a result of the improved travel speeds and reduced congestion.

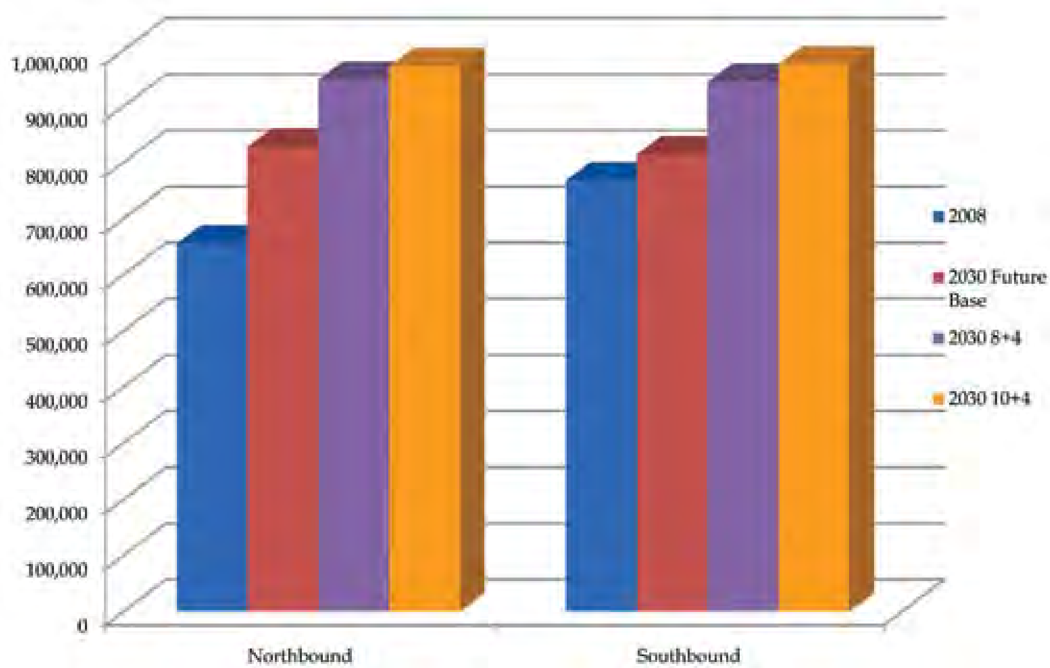
While VMT increases are not necessarily desirable due to the potential emissions and fuel consumption impacts, these increases are offset by decreases in VMT on local arterial roadways, reduced delay, improved speeds, and reductions in the duration of congestion or extents of the peak periods. For instance, a VMT analysis was performed on key roadways in the I-5 CSMP travel shed. As shown in Table 8.11, VMT is estimated to decrease on the key parallel arterials to I-5.

For the I-5 CSMP travel shed (yellow secondary roadways in Figure 8.2), VMT is estimated to increase from 12.3 million-VMT in 2008 to 14.7 million-VMT in 2030, a nearly 20 percent increase. The 8+4 and 10+4 scenarios are estimated to increase VMT to 15.26 and 15.29 million-VMT, a 3.9 and 4.2 percent increase, respectively. Despite these increases in VMT, VHD is estimated to decrease as discussed previously. In addition, on the I-5 freeway specifically, despite the VMT increases shown in Figures 8.25 and 8.26, vehicle-hours traveled (VHT) is estimated to decrease by four to fifteen percent with 81,600 vehicle hours in 2030 No Build, 78,200 vehicle hours for the 8+4 Scenario, and 70,800 vehicle hours for the 10+4 Scenario.

2030 Scenario Analysis Summary

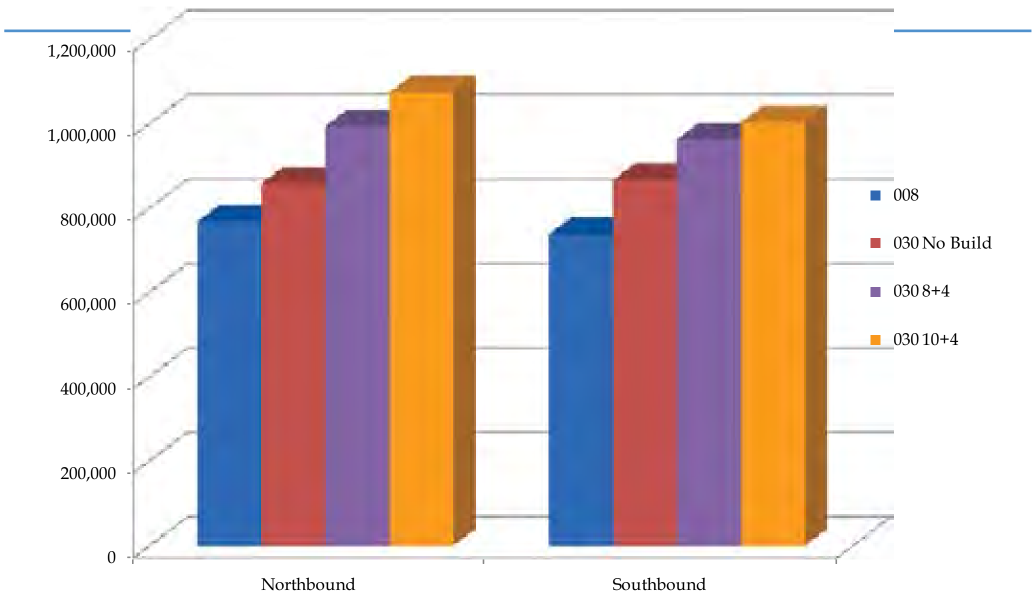
The following table summarizes the key performance measure findings by scenario:

Figure 8.25 Morning Peak Period Vehicle Miles Traveled (VMT) on I-5 Northbound and Southbound Between La Jolla Village Drive and Harbor Drive



Note: Typical Weekday T-Th, Oct/Nov

Figure 8.26 Afternoon Peak Period Vehicle Miles Traveled (VMT) on I-5 Northbound and Southbound Between La Jolla Village Drive and Harbor Drive



Note: Typical Weekday T-Th, Oct/Nov

Table 8.11 VMT Comparison on Key Parallel Arterials

Pacific Coast Highway	2008 Base/Existing	2030 No Build	2030 8 + 4	2030 10 + 4
Oceanside	6,886	9,077	7,837	7,739
Carlsbad	9,707	16,662	12,207	10,997
Encinitas	14,942	24,143	17,261	14,852
Solana Beach	5,417	8,226	5,837	4,777
Del Mar	6,610	9,459	8,036	7,138
San Diego	32,921	42,055	40,203	39,905
Total	76,482	109,621	91,381	85,407
El Camino Real				
Oceanside	25,648	30,923	29,246	28,852
Carlsbad	80,336	103,172	91,955	89,819
Encinitas	22,202	27,329	24,787	22,843
Rancho Santa Fe	2,854	4,574	2,488	1,840
San Diego	15,376	21,963	19,838	17,831
Total	146,418	187,960	168,314	161,186

Source: SANDAG Regional Transportation Model; VMT shown is AM peak period.

- **2030 8+4 Scenario –** Northbound morning peak period travel times are estimated to return to mostly free-flow conditions under this scenario. The 8+4 Scenario northbound afternoon peak travel time is estimated to be 45 minutes (a nearly 24 minute time savings). The 8+4 Scenario southbound morning peak travel time is 36 minutes, a 17 minute reduction from the No Build Scenario. The southbound afternoon travel time is estimated to decrease to 30 minutes, a nearly 10 minute reduction. The managed lanes would operate at reliable, free-flow conditions throughout the day at around a 24 to 26 minute travel time. VMT during the weekday peak periods on the I-5 freeway is estimated to increase by about fourteen percent with the 8+4 Scenario. However, this is offset by a decrease in vehicle hours of delay of 47 percent and decreases in VMT on the parallel roadways of Pacific Coast Highway and El Camino Real of 17 and ten percent, respectively. In addition, it is anticipated that some of this increase in VMT is from the ability of some of the off-peak trips to shift back into the peak periods due to improved travel times. The bottleneck occurring northbound in the afternoon located at Via De La Valle remains in the 8+4 but has a shorter extent and duration. The northbound bottleneck at Cannon Road is eliminated, with minor bottlenecks of brief duration and extents appearing at Las Flores Drive and Cassidy Street. The 8+4 Scenario improves conditions both the a.m. and p.m. peak periods southbound, reducing the duration and extent of the bottlenecks.
- **2030 10+4 Scenario –** Travel times in the morning peak period are estimated to return to mostly free-flow conditions in the 10+4 Scenario. The 10+4 scenario results in the most significant northbound afternoon peak travel time savings of nearly 33 minutes. The 36 minute peak is higher than the 2008 peak of 33 minutes but less than the 2006 peak of 41 minutes. The 10+4 Scenario is estimated to have the most significant improvement in southbound morning peak travel time with a 26 minute savings, down to under 28 minutes. This is better than both the 2006 and 2008 conditions of 48 and 31 minutes, respectively. During the afternoon peak period, the southbound travel time nearly returns to free-flow with peak travel times of 26 minutes. In addition, the 10+4 Scenario is the only scenario where the southbound morning congestion is contained within the four hour peak periods and travel times return to uncongested conditions about earlier than the other scenarios. The managed lanes would operate at reliable, free-flow conditions throughout the day at around a 24 to 25 minute travel times. VMT on I-5 in the 10+4 scenario is estimated to increase by nearly 20 percent over the 2030 No Build. However, this VMT is off-set by a 78 percent improvement in peak period delay on the I-5 freeway in the travel shed and a fourteen to 22 percent decrease in VMT on El Camino Real and Pacific Coast Highway, respectively. In addition, it is anticipated that some of this increase in VMT is from the ability of some of the off-peak trips to shift back into the peak periods due to improved travel times. The northbound afternoon peak period bottlenecks and unstable traffic flow north of Via De La Valle return to free-flow conditions in the 10+4 Scenario. A bottleneck still remains in the 10+4 Scenario northbound at Via De La Valle but the queue does not extend beyond Carmel Valley Road, to Del Mar Heights Road most of the time. There is also a minor bottleneck for approximately 30 minutes south of SR-56 during the afternoon peak period northbound. The 10+4 Scenario

Table 8.12 2030 Scenario I-5 Weekday Peak Period Performance Comparison

Performance Measure	2030 No Build	2030 8 + 4 General Purpose	2030 10 + 4 General Purpose	2030 Managed Lanes
Travel Time				
– A.M. Northbound	37 minutes	26 minutes	25 minutes	24 minutes
– A.M. Southbound	54 minutes	36 minutes	28 minutes	24–26 minutes
– P.M. Northbound	69 minutes	45 minutes	36 minutes	24–26 minutes
– P.M. Southbound	40 minutes	30 minutes	26 minutes	24–25 minutes
Vehicle Hours of Delay (35 MPH VHD)				
– A.M. Northbound	910 hours	100 hours	0 hours	0 hours
– A.M. Southbound	5,070 hours	1,390 hours	680 hours	0 hours
– P.M. Northbound	11,230 hours	8,460 hours	3,460 hours	0 hours
– P.M. Southbound	1,860 hours	190 hours	1 hours	0 hours
Total A.M. & P.M. Peak	19,070 hours	10,140 hours	4,160 hours	0 hours
Duration of Congestion				
– A.M. Northbound	• Poinsettia Ln (45 minutes) • La Jolla Village Dr (1 hour)	• No bottlenecks	• No bottlenecks	• No bottlenecks
– A.M. Southbound	• Manchester Ave (2 hours) • Leucadia Blvd (entire peak period plus mid-day) • Tamarack Ave (2 hours during peak plus mid-day)	• Manchester Ave (3 hours) • Encinitas Blvd (2 hours) • Leucadia Blvd (over 3 hours during peak plus mid-day)	• Leucadia Blvd (1 hour)	• No bottlenecks
– P.M. Northbound	• Via De La Valle (entire peak period plus evening) • Cannon Road (entire peak period plus evening) • Encinitas Blvd (2 hours)	• Via De La Valle (entire peak period plus evening) • Las Flores Dr (1 hour)	• Via De La Valle (entire peak period plus evening)	• No bottlenecks
– P.M. Southbound	• Leucadia Blvd (3 hours) • La Costa Ave (entire peak period plus evening) • Poinsettia Lane (entire peak period plus evening) • Oceanside Blvd (2 hours)	• Cassidy St (1 hour) • Leucadia Blvd (1-2 hours) • La Costa Ave (over 1 hour) • Poinsettia Lane (2 hours)	• No bottlenecks	• No bottlenecks
I-5 Vehicle Miles Traveled				
– A.M. and P.M. Peak Period on I-5 Freeway	3,364,000	3,845,000	4,020000	
– 24 Hour Daily in I-5 Travel Shed	14,678,000	15,257,000	15,288,000	

results in the elimination of all major bottlenecks in the southbound direction in the morning and afternoon peak periods. A minor bottleneck still remains at Leucadia Boulevard, with areas of unstable traffic flow between Manchester Avenue and Poinsettia Lane. However, the 10+4 Scenario is the only scenario that returns southbound traffic flow to free-flow conditions for most of the morning and afternoon analysis periods.

In addition, two managed lanes are needed for the I-5 CSMP travel shed to provide additional HOV carrying capacity for weekends. As discussed in Chapter 4, on some sections of I-5, as much as 50 percent of the traffic is HOV due to the significant amount of tourism activities in or near the corridor.

Implementation Plan

Vision

The vision for this CSMP is to maximize the I-5 CSMP corridor's mobility, reliability, safety, accessibility, and productivity through performance-based analyses that prioritizes projects, strategies, and actions. Maximizing the corridor's transportation system management is contingent on all of the corridor's components working together, including the modal systems (transit, local roadways, highways, and bicycle and pedestrian routes) and land use. The analyses resulted in a balanced, multimodal, phased transportation implementation plan that serves the variety and intensity of travel demands placed on it now and anticipated in the future.

The phasing plan for the ultimate scenario selected will need to be periodically updated as many variables will change due to external forces that are difficult to predict or may change over time such as land use, economic situation, improvements to the transportation system, etc. As, such this CSMP will need to be updated regularly in light of new and available system performance data.

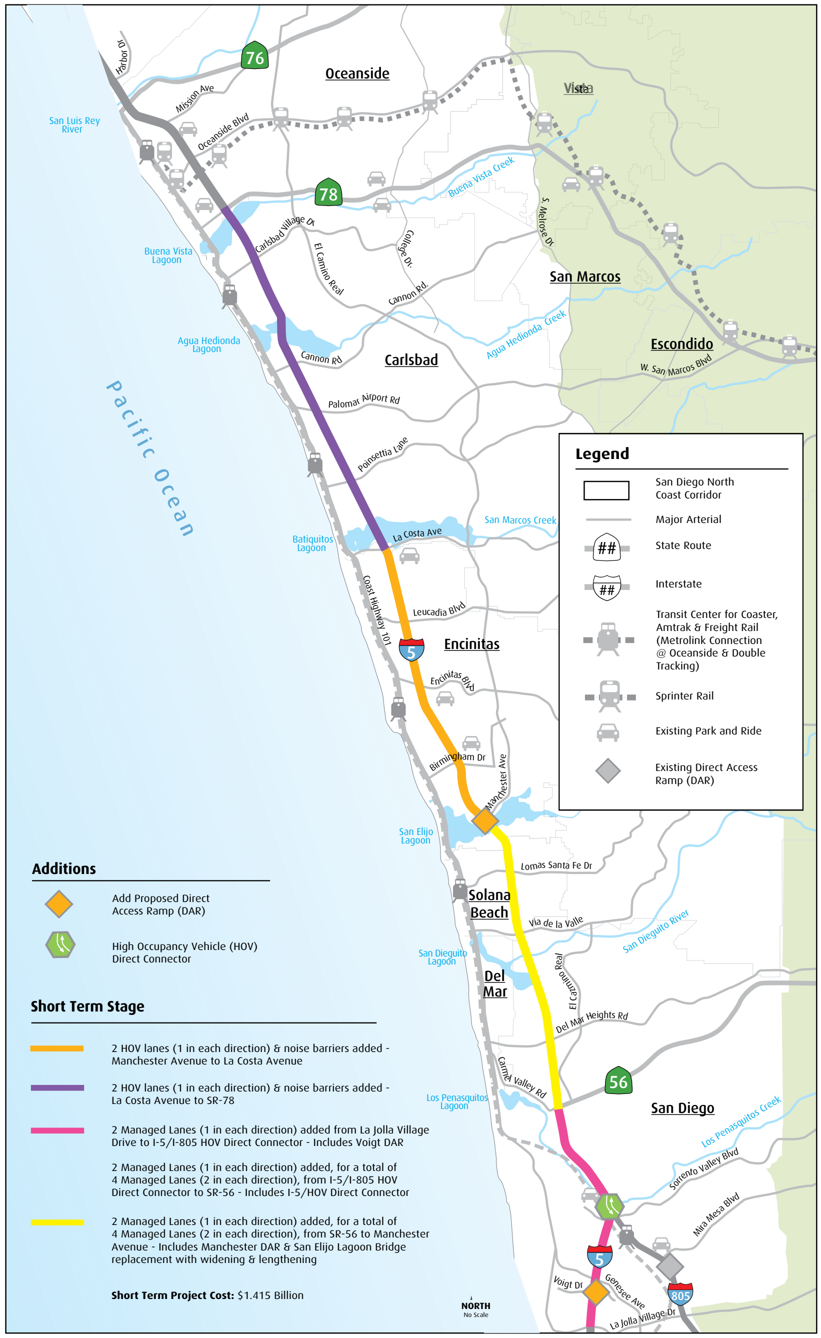
Phasing Plan

Whichever scenario is selected, given the project's size, complexity, and cost, the I-5 North Coast Corridor Project improvements would need to be built in phases. As of this report's publication, the improvements would be constructed in three major stages. These are summarized below and presented in Figures 8.27 through 8.29. Given costs are based upon the 8+4 with Buffer; the ultimate improvement staging will be determined during the design phase.

Short Term

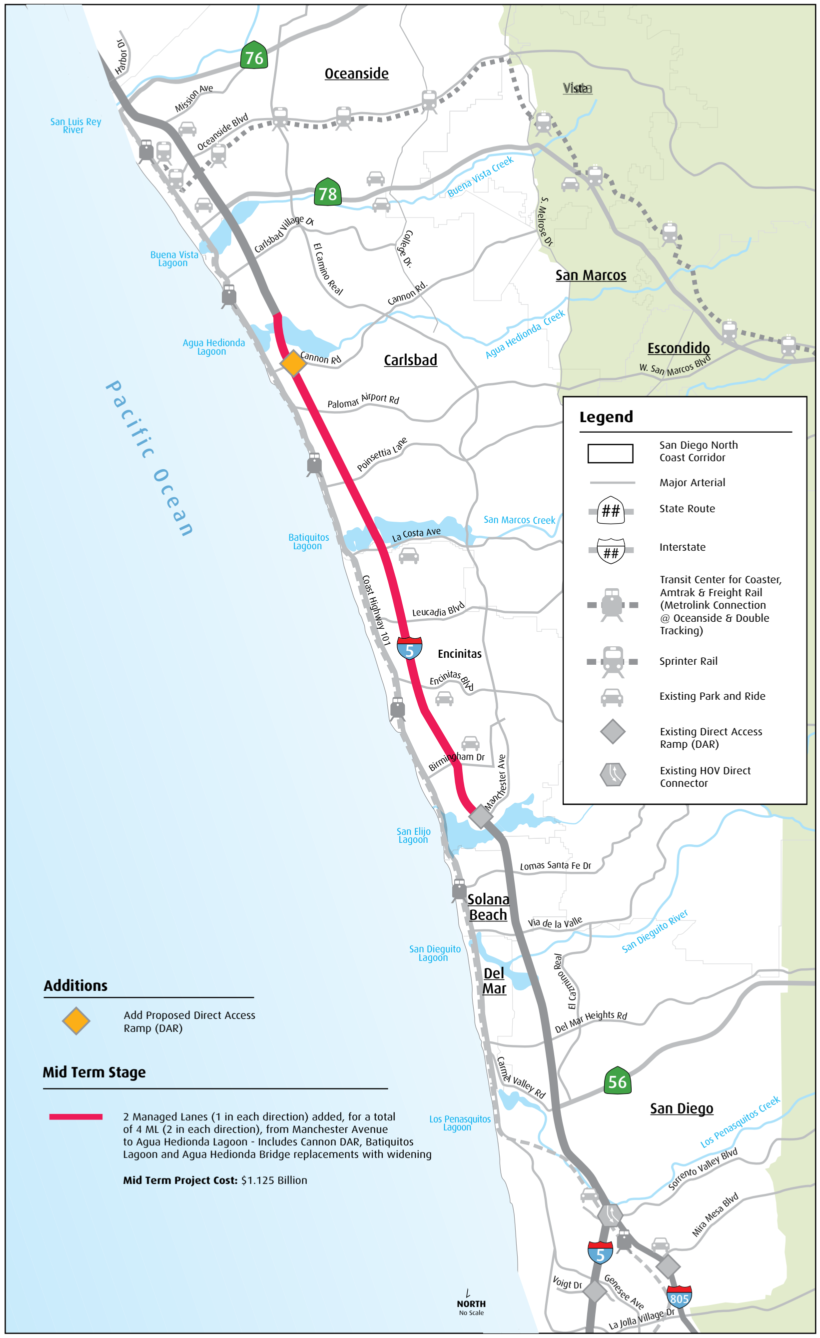
- Two HOV lanes and noise barriers from Manchester to La Costa Avenue

Figure 8.27 I-5 North Coast Corridor HOV/Managed Lanes Project Construction: Short-Term Staging Map



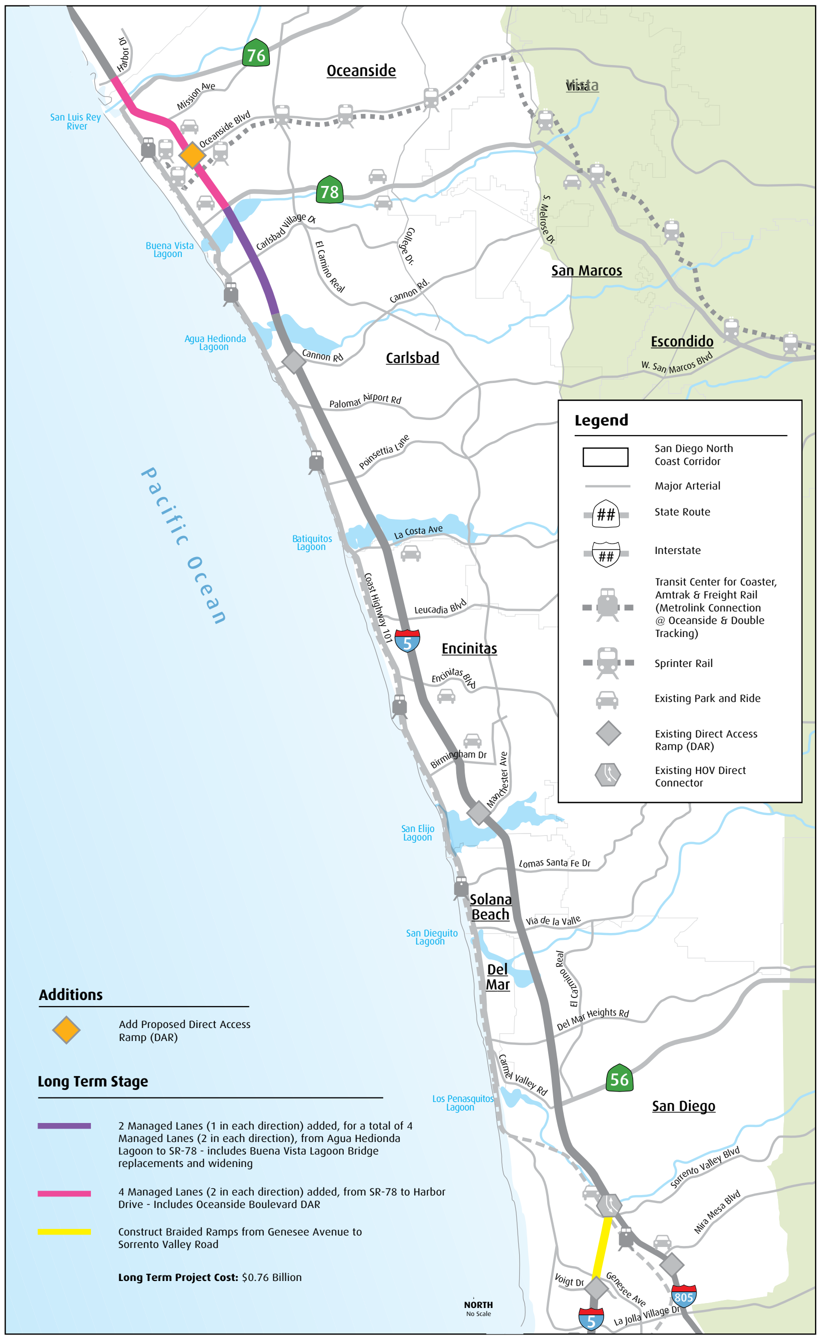
Source: Caltrans, 5/25/10

Figure 8.28 I-5 North Coast Corridor HOV/Managed Lanes Project Construction: Mid-Term Staging Map



Source: Caltrans, 5/25/10

Figure 8.29 I-5 North Coast Corridor HOV/Managed Lanes Project Construction: Long-Term Staging Map



Source: Caltrans, 5/25/10

- Two HOV lanes and noise barriers from La Costa Avenue to SR-78
- Two managed lanes from La Jolla Village Dr to SR 56, including Voigt DAR and I-5/I-805 HOV Connector
- Two managed lanes each direction from SR 56 to Manchester (four managed lanes total), including Manchester DAR and San Elijo Lagoon Bridge replacement with widening and lengthening

Short-Term Cost – $ 1.415 billion

Mid Term

- Two managed lanes from Manchester to Agua Hedionda Lagoon (four managed lanes total), including Cannon DAR, Batiquitos Lagoon and Agua Hedionda Bridge replacements with widening

Mid-Term Cost – $ 1.125 billion

Long Term

- Two managed lanes from Agua Hedionda Lagoon to SR 78 (four managed lanes total)
- Four managed lanes from SR 78 to Harbor Drive, including Oceanside Blvd DAR and Buena Vista Lagoon Bridge replacements and widening
- Construct braided ramps from Genesee to Sorrento Valley

Long-Term Cost – $0.76 billion

The above estimated staging costs are based upon the 8+4 w/ Buffer alternative for a total cost of $3.3 billion. Cost estimates for other alternative are listed below:

8+4 w/Buffer = $3.3 billion	8+4 w/Barrier = $4.0 billion
10+4 w Buffer = $3.5 billion	10+4 w? Barrier = $4.4 billion

Phase 1 Analysis Overview

Regardless of the ultimate staging, it is likely the initial improvement will be an HOV

Monitoring Plan

An ongoing cycle of implementation, evaluation, and adjustments is needed to ensure that the transportation system continues to meet regional goals and makes efficient use of investments in the corridor. For instance, performance monitoring should be conducted every two to three years or as major projects are delivered. The actual performance versus modeled results could be compared and the recommendations modified for the remaining or newly identified potential transportation improvements, as appropriate. It is recommended that the following performance monitoring be conducted:

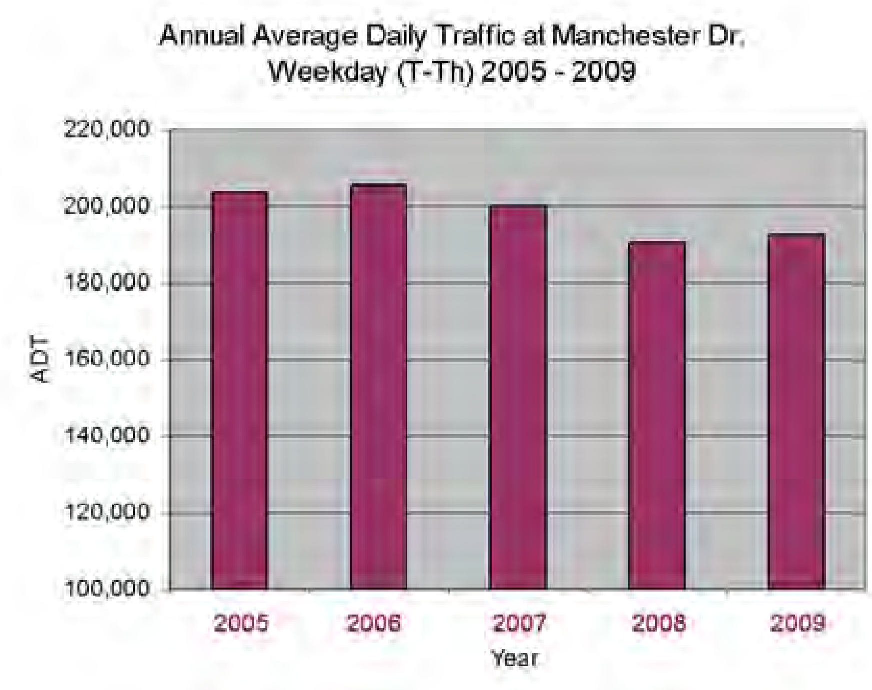
- Average daily traffic (ADT);
- Vehicle miles traveled (VMT);
- Travel time
  - Travel time;
  - Reliability/buffer travel time;
- Delay;
  - Vehicle hours of delay (VHD); and
  - VHD versus VMT to Investment.

In conducting the performance monitoring, it is important that the analysis be performed within a consistent time period each year. A typical month and day or days of the week should be established and utilized for comparison purposes. The I-5/I-805 Corridor System Management Plan Existing Conditions Technical Report (ECTR) contains an explanation and approach for identifying these, whcih include factors such as seasonality (school and vacation schedules) and day of the week flucuations in traffic. The typical month was decided upon using two factors: data availability, and typical delay along the corridor. The typical month was then compared to the yearly medians and averages for other performance measures to ensure it was a reasonable representation for a given year. The typical day also was chosen based on peak-period volumes. For the ECTR, the typical month was determined to be November but since Thanksgiving is a major traveling holiday, the month leading up to it was utilized - October 16, 2007 to November 15, 2007. Tuesday through Thursday data should be used to represent the typical weekday traffic. In addition, any day within the typical month that has missing detector data and any detectors that operate less than one-half of the typical month should be removed from the analysis. The performance monitoring below contains examples, some for the northbound direction only. The monitoring should be performed for both directions and in some cases combined into a total northbound and southbound (e.g., VMT).

Average Daily Traffic (ADT)

Average Daily Traffic (ADT) is the total volume of traffic on a highway segment, divided by the number of days the volume represents and is a measure of the facility throughput. According to the 2008 California Department of Transportation Traffic Data Branch annual traffic volumes, the CSMP I 5 corridor carries an annual average daily traffic (AADT) varying between 143,000 (south of the I-805 junction with I-5) and 288,000 vehicles (Carmel Mountain Road). For monitoring purposes ADT information can be obtained from PeMS either at specific locations along the corridor or for the entire corridor (divide by the corridor length). Figure 8.32 presents an example of northbound I-5 corridor average weekday traffic at a single location (in this case between the ramps at Manchester Drive) for each year from 2005 through 2009 (Tuesdays through Thursdays).

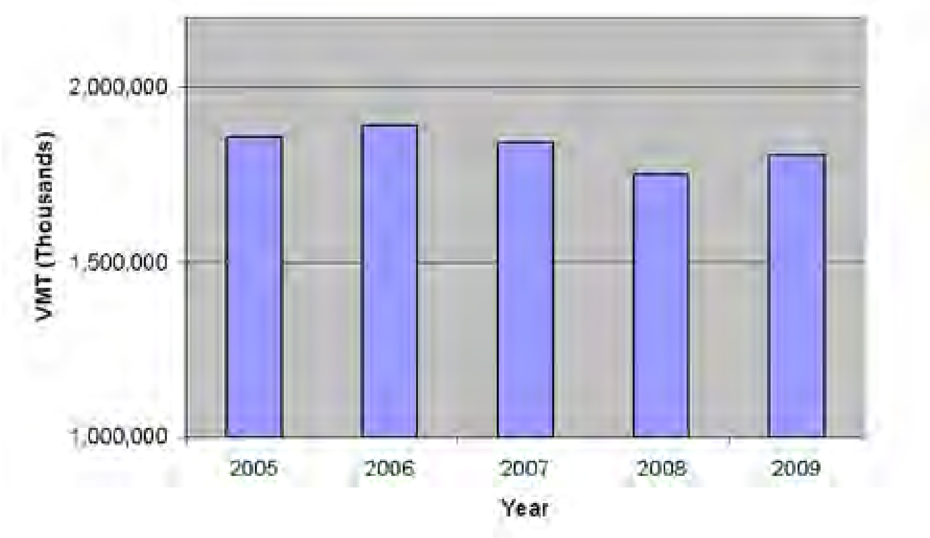
Figure 8.32 Average Daily Weekday (T-Th) Traffic on I-5 at Manchester Dr., NB & SB



Vehicle Miles Traveled (VMT)

On roadways, vehicle miles traveled (VMT) is a measurement of the total miles traveled in a given area for a specified time period. For monitoring purposes VMT information can be obtained from PeMS. Total VMT northbound for the years 2006 through 2009 in millions of vehicle miles is presented in Figure 8.33. Both ADT and VMT measures are indicators of the demand within the corridor. A reduction in VMT has been noted on the I-5 freeway corridor and other freeways around the county since 2008, attributed primarily to the recent economic recession.

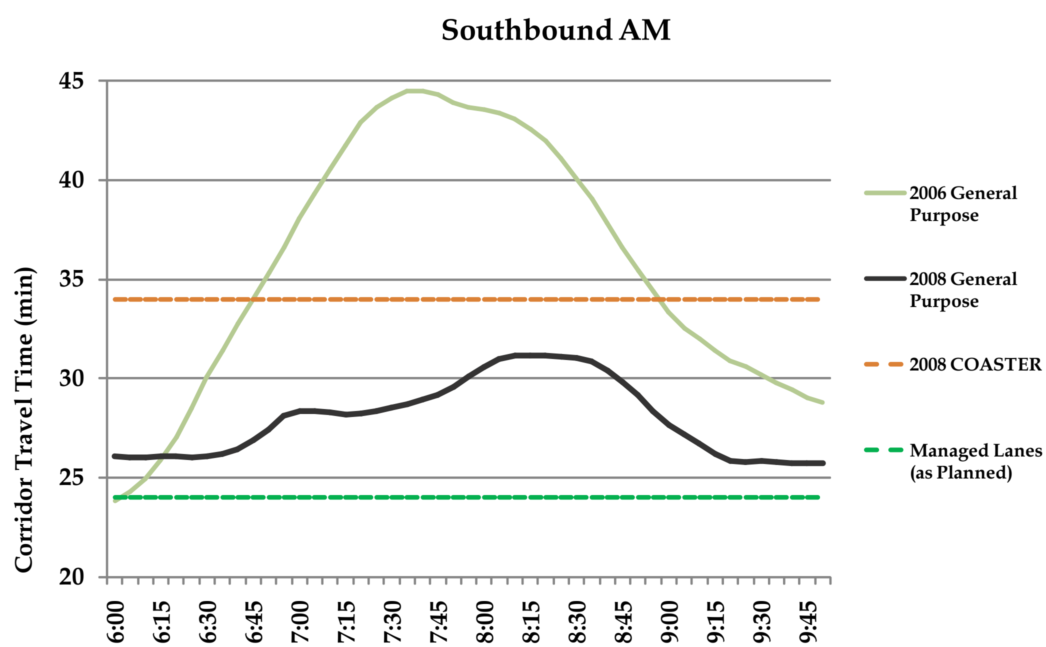
Figure 8.33 Annual Vehicle Miles Traveled Total VMT I-5 Northbound



Travel Time

Travel time is defined as the amount of time for a vehicle to traverse between two points on a corridor. For the I-5 corridor, this travel time is the time to traverse the 27-mile corridor or in the case of rail transit, the travel time for the COASTER from Sorrento Valley to Oceanside stations. Figure 8.34 presents travel time southbound during the morning peak period. This should be generated for an entire 24 hour average weekday.

Figure 8.34 Typical Morning Peak Travel Times for I-5 Southbound From La Jolla Village Drive to Harbor Drive

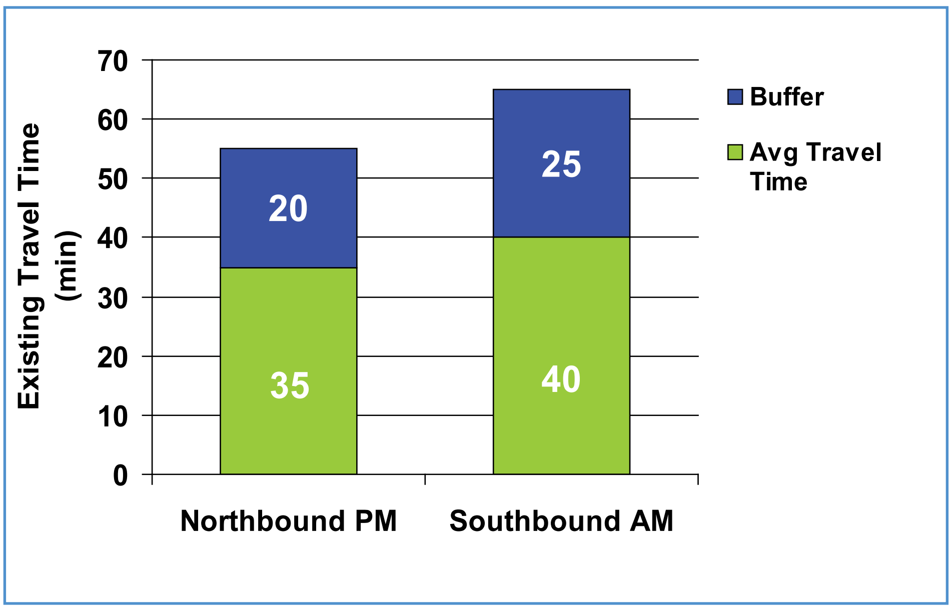


Typical Weekday T-Th, Oct/Nov

Travel Time Reliability

Another important performance measure to monitor is the reliability of the traveler's trip. This is information that can be derived from PeMS. Figure 8.35 gives an example of this measure. The bottom green portion of the graphs show the median weekday travel times taken over a time period; the top darker-blue portion of the graphs represents the "buffer time" described previously in this chapter. The buffer time is the extra time that would need to be added to a person's daily commute down the corridor to ensure they arrive on-time 95% of the time. For purposes of annual monitoring, buffer times should be evaluated for the same time periods for each year (i.e., "all weekdays during the months of October/November", etc.) in order to minimize the effects of seasonal or daily fluctuations.

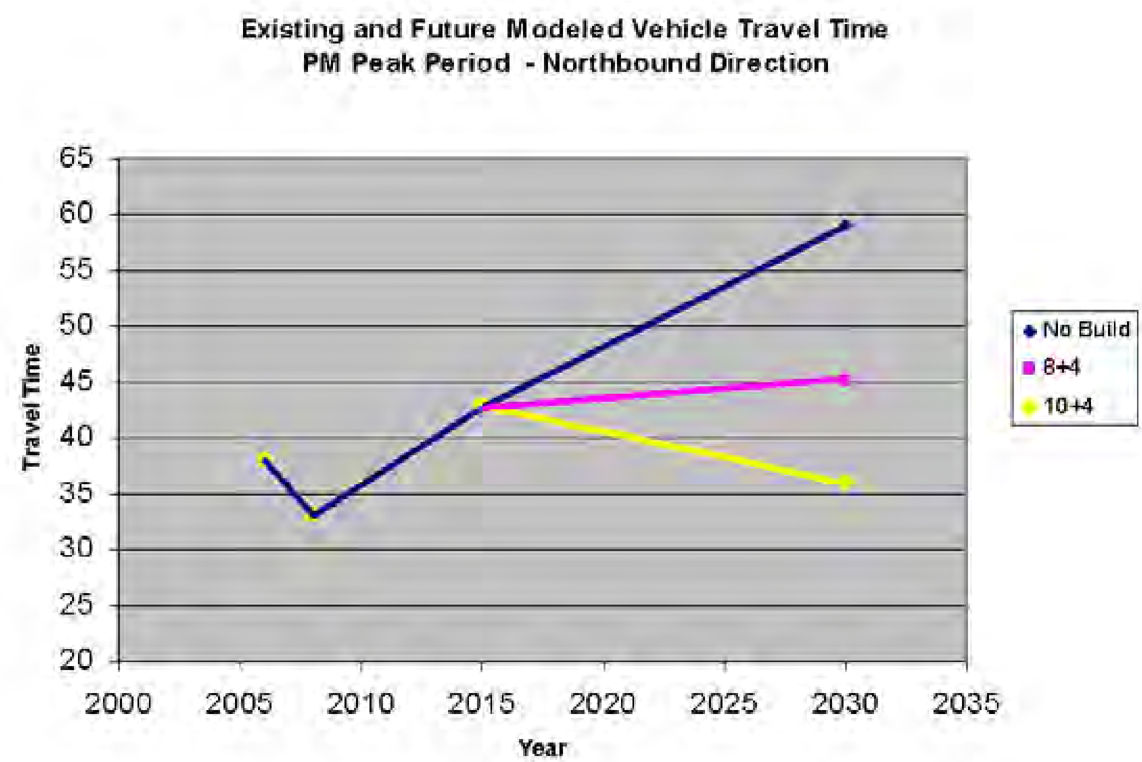
Figure 8.35 Median and Buffer Travel Times (Minutes)



Source: Caltrans District 11, PeMS April 2007

Another travel time measure for monitoring purposes would involve tracking the actual travel times against those estimated for future years through the microsimulation modeling analysis. Figure 8.36 presents the peak travel times with and without investments over time for the afternoon peak period northbound.

Figure 8.36 Existing and Future Typical Weekday Modeled Travel Times for I-5 Northbound PM Peak Period

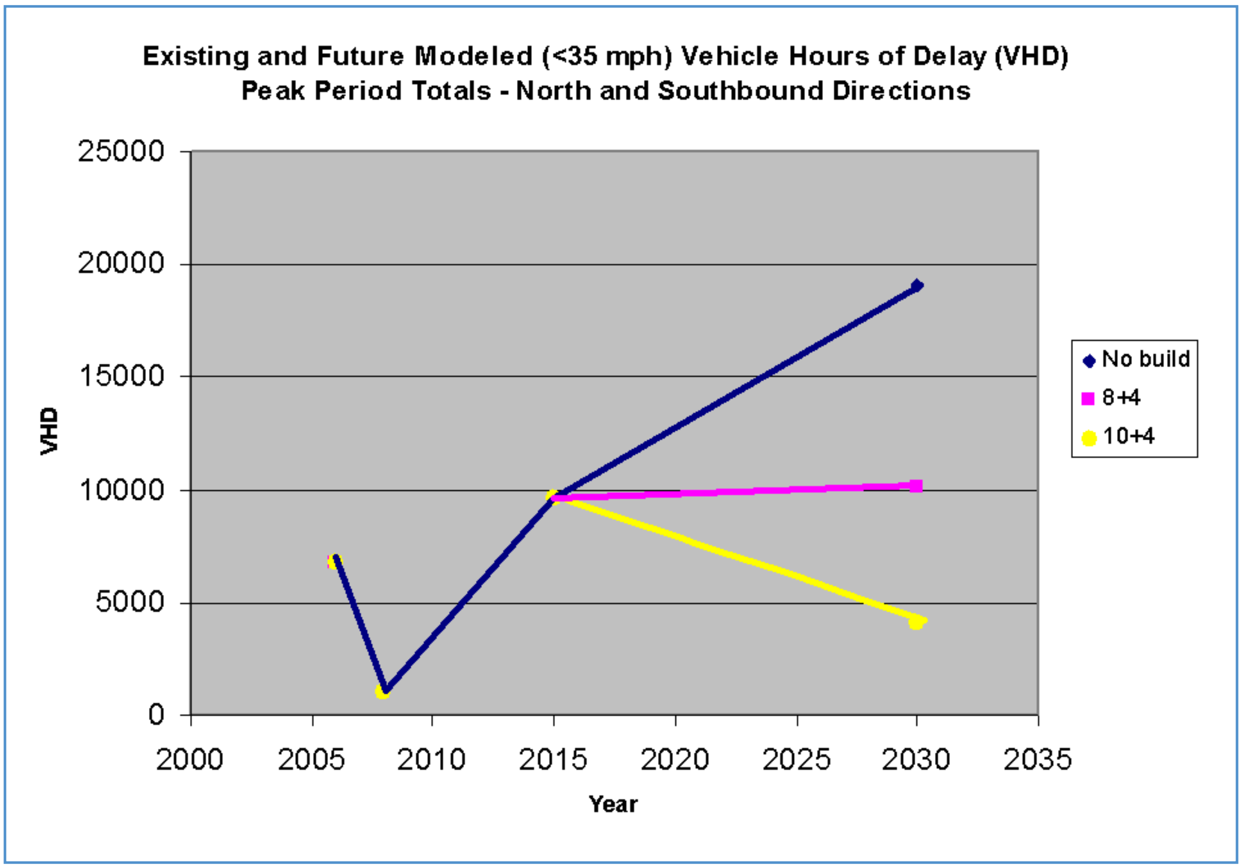


Vehicle Delay

Vehicle Delay is defined as the sumation of all the time spent by vehicles operating below optimal free flow speeds; delay can be further defined to account only for time spent by vehicles operating below speeds of "severe congestion." The most common speed used to define severe freeway congestion in the state of California is 35 mph.

Figure 8.37 present the existing and future modeled vehicle hours of severe congestion delay during the peak AM and PM peak periods for both directions.

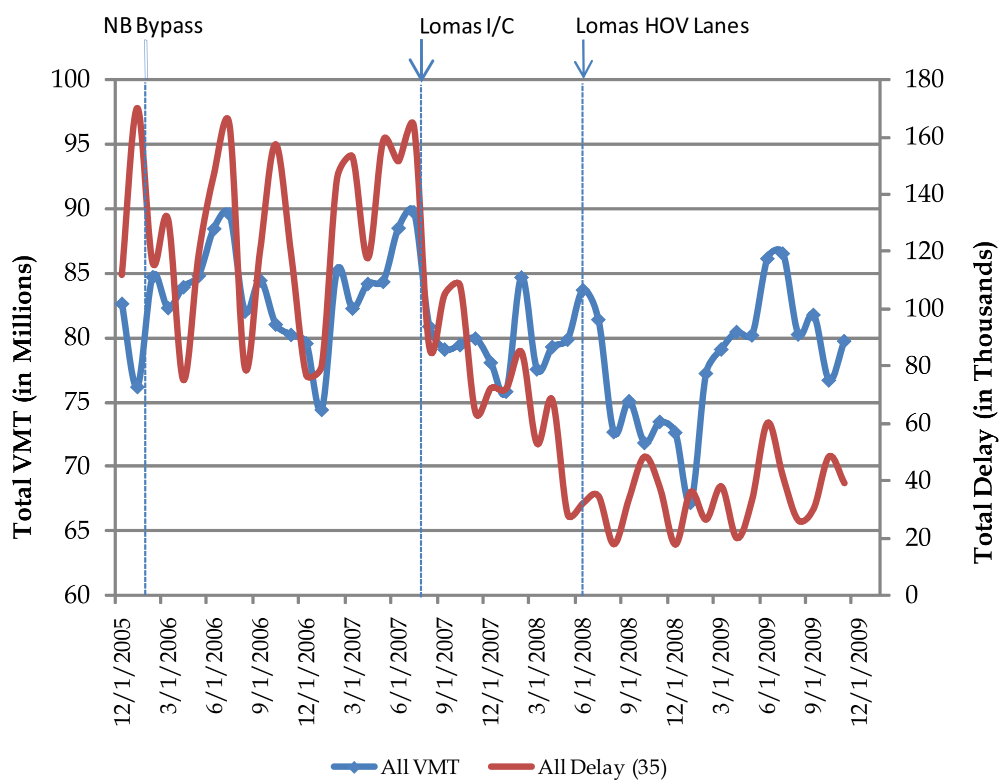
Figure 8.37 Existing and Future Modeled Freeway Congestion: Vehicle Hours of Severe Delay (<35 mph)



Combining historical weekly Vehicle Hours of Delay (VHD) and Vehicle Miles Traveled (VMT) into one chart is another way to compare how the freeway is performing over time. Overlaying a timeline of recent investments helps illustrate how ongoing construction projects have helped improve freeway performance.

Figure 8.38 shows how severe vehicle delays on northbound I-5 have remained relatively low while freeway volumes increased during 2009, following the opening of interchange improvments and HOV lanes in the vicinity of Lomas Santa Fe Drive in 2008.

Figure 8.38 Total Monthly Delay (Severe <35 MPH) and VMT With Investments Over Time I-5 Northbound Direction



The CSMP approach is based on the premise that well planned and multi-modal investments throughout the transportation system will yield significant improvements in corridor transportation performance, including mobility, safety, productivity, accessibility, and reliability. Based on the existing conditions analyses, previous planning efforts, regional planning goals and forecasted future conditions, several investment strategies have been identified that are consistent with the CSMP planning process. These strategies have been evaluated using the performance measures previously described in this report.

The vision for this CSMP is to maximize the transportation goals for I-5 Northcoast corridor through the performance-based analyses of specific projects, strategies, and actions. Maximizing the corridor's transportation system management is predicated upon all of the corridor's related components working together, including the various modal systems of transit, local roadways, highways, bicycle and pedestrian routes, and also through a better coordinated multi-agency land use effort. It is hoped that the analyses in this CSMP report will have resulted in a balanced, multimodal, and phased transportation implementation plan that will serve the wide variety of stakeholders in the region in meeting their travel needs both now and in the future.