N·O·R·T·H C·O·A·S·T
INTERSTATE 5 CORRIDOR

I-5 North Coast Traffic Report

A Summary of Traffic Reports

Prepared for the I-5 North Coast Corridor Project

CALIFORNIA DEPARTMENT OF TRANSPORTATION
DISTRICT 11 - SAN DIEGO, CA
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1 Introduction

This Traffic Report provides a summary of nine traffic related studies and reports (listed below) that have been completed in support of the I-5 North Coast Corridor Project. The Traffic Report presents an overview of existing traffic conditions and future year traffic conditions for the proposed alternatives discussed in the Project Report.

This Report is divided into 5 chapters. The introduction, purpose, and scope are presented in Chapter 1. A brief Project description and the proposed Project alternatives are described in Chapter 2. Freeway operations, HOV/Managed Lanes, and the Managed Lane Value Pricing Study are discussed in Chapter 3. The operations of the freeway ramps and interchanges for the Project alternatives are presented in Chapter 4. Chapter 5 discusses the impacts of the proposed Direct Access Ramps (DAR) on the local circulation system and provides a brief summary about the local roadway segments.

The Traffic Report summarizes the following nine technical reports:

Freeway Operations Report
Freeway Interchanges Operations Report
Local Circulation System Operations Report
Traffic Demand Forecasting Report
Area of Influence Analysis Report
Methodologies and Standards Report
Existing Conditions Data Collection Report
Existing Conditions Report
I-5 North Coast Managed Lanes Value Pricing Study

The *Freeway Operations Report* contains an assessment of freeway operations for the existing conditions and the proposed alternatives, and a comparison of the operations of the proposed Project alternatives. The following freeway operations were analyzed in detail for the existing conditions and proposed alternatives for the AM and PM time peaks: travel times for the freeway corridor, Level of Service at various freeway segments, and weaving conditions between ramp junctures along the Project corridor. In addition to the AM and PM time peak analyses, daily vehicle-hours of delay, Average Daily Traffic, Vehicle Miles Traveled and weekend traffic are presented for the main lanes. HOV/Managed Lanes operations are also presented.

Wilson & Company, an engineering consulting firm, was contracted by SANDAG/Caltrans to aid in the development of traffic forecasting, gathering of existing traffic conditions, traffic analysis of freeway interchange intersections, and to determine impacts to adjacent local street intersections and roadway segments caused by the proposed Project. The results of Wilson & Company are contained in seven of the nine Technical Reports. The Project area and its area of influence are defined in the *Area of Influence Analysis Report* (Technical Report No. 1). The *Existing Conditions Data Collection Report* and the *Existing Conditions Report* (Technical Report Nos. 2 and 4, respectively) describe the existing conditions. The "existing conditions" are used as a baseline, acting as the initial source of comparison for the traffic forecasts. Guidelines and procedure for operational analysis is described in the *Methodologies and Standards Report* (Technical Report No. 3). The *Traffic Demand Forecasting Report* (Technical Report No. 5) contains traffic volume forecasting for all alternatives in the Year 2030 and for the 10+4 alternative in the Year 2015. The *Freeway Interchanges Operations Report* (Technical Report No. 6) describes the operations of the freeway ramp intersections including considerations for ramp metering at the freeway ramp/local road interchanges for the proposed alternatives. The effect each proposed alternative has on specific local roads due to the influence of the proposed Direct Access Ramps is contained in the *Local Circulation System Operations Report* (Technical Report No. 7).

Parsons Brinckerhoff, an engineering consulting firm contracted by SANDAG, investigated the technical and financial feasibility of allowing single occupancy vehicles to use the High Occupancy Vehicle (HOV)/managed lanes on the I-5 corridor for a specified toll charge. The results are contained in the *I-5 North Coast Managed Lanes Value Pricing Planning Study*. Part of the study included an assessment of the position of the local community in a public survey regarding the construction HOV lanes in the Project area and their use as revenue generating managed lanes.

All the data and technical information contained in this Report were extracted from the nine Technical Reports. For more detailed information, the reader should refer to the nine Technical Reports (Appendix A-I).

2 Project Description

The Project limits of the I-5 North Coast Corridor span approximately 27 miles between La Jolla Village Drive and Harbor Drive. The Project limits are delineated in Figure 1.1. Within the Project limits, the existing I-5 freeway consists of eight (8) general purpose lanes with 27 separate interchanges. The existing I-5 has two HOV lanes (one lane in each direction) between the I-5/I-805 junction and the Via de la Valle undercrossing. Auxiliary lanes exist between interchanges at various locations along the freeway. The existing conditions represent the year 2006. Currently an HOV extension project is under construction to extend the existing northbound and southbound HOV lanes along I-5 from the north end of the San Dieguito River Bridge to the south end of the San Elijo Lagoon Bridge. This project is scheduled for completion in 2009.

The following alternatives for the Project are presented and considered in the Draft Environmental Impact Statement (EIS):

10+4 with Buffer Alternative
10+4 with Barrier Alternative
8+4 with Buffer Alternative
8+4 with Barrier Alternative
No-Build Alternative

The four "Build" alternatives propose to construct up to four High Occupancy Vehicle (HOV)/Managed lanes and up to two additional main lanes, depending on the alternative. Auxiliary lanes located between freeway on and off ramps would be constructed to facilitate weaving movements in various sections of the Project limits. The project also includes four Direct Access Ramps (DAR) that would allow local traffic to enter and exit the median HOV/managed lanes from and to proposed overcrossings without having to access the main traffic lanes. The DARs are proposed to be located near Voigt Drive (City of San Diego), Manchester Avenue (City of Encinitas), Cannon Road (City of Carlsbad), and Oceanside Boulevard (City of Oceanside). A new park and ride facility is also proposed for the Manchester Avenue DAR area.

For a complete project description, the reader should refer to the Project Report.

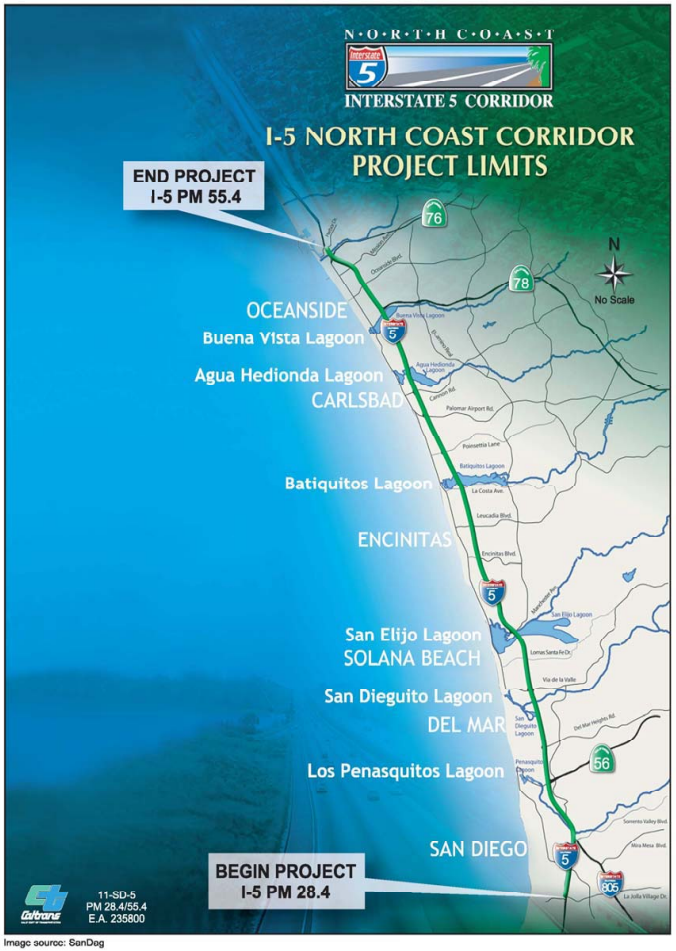

Figure 1.1 Project Location Map

3 Freeway Operations

The *Freeway Operations Report* contains an assessment of freeway operations for the existing conditions and the proposed alternatives, and a comparison of the operations of the proposed Project alternatives. The following freeway operations were analyzed in detail for the existing conditions and proposed alternatives for the AM and PM time peaks: travel times for the freeway corridor, Level of Service at various freeway segments, and weaving conditions between ramp junctures along the Project corridor. In addition to the AM and PM time peak analyses, daily vehicle-hours of delay, Average Daily Traffic, Vehicle Miles Traveled and weekend traffic are presented for the main lanes. HOV/Managed Lanes operations are also presented.

3.1 Historical Traffic Trends

Historical traffic trends along the I-5 corridor are presented in terms of Annual Average Daily Traffic (AADT). Caltrans-Office of Traffic Operations provided historical AADT for the I-5 corridor. Table 3.1 summarizes AADT traffic trends at seven freeway segments along the I-5 corridor for the Years 1970, 1975, 1980, 1985, 1990, 1995 and 2000. The listed freeway segments were selected to represent the entire I-5 corridor with at least one segment in each affected city traversed by the Project. Table 3.1 indicates that I-5 freeway (within the project area) had an increase in AADT during the years identified.

Table 3.1 I-5 Annual Average Daily Traffic (AADT)

Location		1970	1975	1980	1985	1990	1995	2000
From	To	ADT	ADT	ADT	ADT	ADT	ADT	ADT
La Jolla Village Drive	Genesee Ave	53,000	49,000	59,000	89,000	122,000	129,000	145,000
I-5 / I-805 Junction	Carmel Valley Road	48,000	75,000	103,000	155,000	219,000	213,000	254,000
Via de la Valle	Lomas Santa Fe	48,000	69,000	96,000	140,000	189,000	189,000	215,000
Encinitas Blvd	Leucadia Blvd	43,000	62,000	81,000	116,000	162,000	168,000	198,000
Palomar Airport Road	Cannon Road	44,500	61,000	79,000	109,000	156,000	159,000	190,000
SR-78	Oceanside Blvd	56,000	71,000	90,000	119,000	159,000	156,000	197,000
Mission Ave	SR-76	49,000	59,000	72,000	101,000	137,000	126,000	156,000

3.2 Existing Traffic Conditions

Traffic volumes for the year 2006 were used to determine existing freeway conditions within the Project limits. Current freeway operations were assessed by examining travel times, recurrent bottleneck locations, Level of Service (LOS), ramp weaving, and delay. Bottleneck locations and travel times for the existing conditions in this section were established using real time freeway loop detector data from Performance Measurement System (PeMS). The existing volumes are a compilation of volumes collected by several sources (Caltrans, UC Berkeley, and local agencies) from 2004 through 2006. The result is a hybrid traffic census representing the year 2006.

3.2.1 Travel Times

Recent (2003-2005) and existing (2006) data extracted from the PeMS database provided a comparison of average weekday freeway travel times along specific segments of the I-5 for the years 2003, 2004, 2005 and 2006. The results are the average weekday travel times for the northbound and southbound directions shown in Figures 3.1 and 3.2 below. These two figures represent the average time to travel the entire project area. For example, in Figure 3.1 if in the year 2005 a trip that started at 3:30 pm from La Jolla Village Drive and ended northward at Harbor Drive would take an average of 34 minutes.

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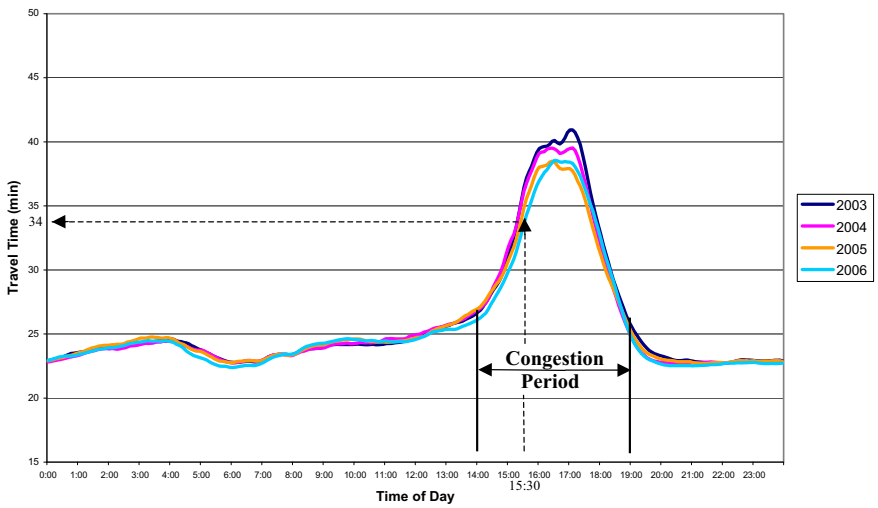

Figure 3.1 I-5 Northbound Weekday Traffic Average Travel Time: La Jolla Village Drive to Harbor Drive

For all years in the northbound direction, there is an increase in travel time between 2 pm and 7 pm, for a total peak period of congestion of 5 hours. The trends for average travel time in respect to time of day from 2003 to 2005 have remained consistent. Figure 3.1 also shows a slight decrease in

average travel time from about 40 minutes to 38 minutes between the years 2003 to 2006. The slight decrease in average PM peak travel time shown in Figure 3.1 may be explained by influences of past construction activities in the corridor.

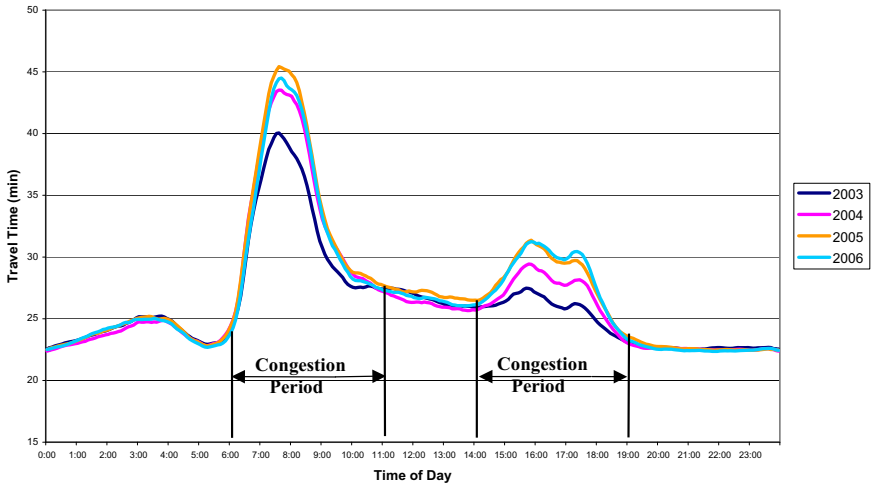

Figure 3.2 I-5 Southbound Weekday Traffic Average Travel Time: Harbor Drive to La Jolla Village Drive

The overall basic southbound trends illustrated by Figure 3.2 are similar from 2003 through 2006 with increasing AM and PM peak hour average travel times in each successive year. The average travel time during the southbound AM peak at 8:00 am has increased 5 minutes from 40 minutes in 2003 to 45 minutes in 2006. The average travel time during southbound PM peak has increased about 5 minutes from 26 minutes in 2003 to 31 minutes in 2006. The peak period of congestion has spread by about 30 minutes for both the AM and PM peaks.

Figure 3.2 illustrates that the AM peak is the primary directional peak with an average travel time in 2006 of 45 minutes. The PM peak has a much smaller travel time of about 32 minutes in 2006. Figure 3.2 is depicting a pattern of continuous congestion between 6:00 am and 7:00 pm.

3.2.2 Bottlenecks, Delay, and Duration of Congestion

A bottleneck is a persistent drop in speed between two locations on a freeway. A bottleneck can have a number of causes, including a change in capacity (like a reduction of the number of lanes), a visual distraction, an incident, a weaving section, etc. Bottlenecks can cause increased average travel time and congestion along the I-5 corridor. There are two classifications of bottlenecks: non-recurrent and recurrent. A non-recurrent bottleneck is due to an unforeseen event, such as an accident. A recurrent bottleneck is due to daily and predictable traffic patterns like those occurring during traffic rush-hour.

PeMS was utilized to detect weekday peak hour bottlenecks on the I-5 corridor within the Project limits for the year 2005. Summaries of the most recurrent weekday northbound and southbound bottlenecks are in Tables 3.2 and 3.3, respectively. Excluding weekends and holidays, there are a total of 247 weekdays in a calendar year. Bottlenecks in Tables 3.2 and 3.3 were identified by PeMS as occurring 20% of the time or more for the 2005 calendar year. The analysis performed was for main lanes only and excludes HOV lanes. PeMS uses 35 miles per hour as the reference speed for the delay associated with bottlenecks.

Table 3.2 2005 Northbound I-5 Weekday Bottlenecks

Bottleneck Number	Location	Peak Hour	Average Queue Length (mi)	Average Delay (veh-hrs)	Average Duration (hrs)
1	Carmel Valley Road	PM	5.0	723	2.6
1	Via de la Valle	PM	4.7	2,900	3.3
1	Lomas Santa Fe	PM	6.7	1,486	1.0
2	Leucadia Blvd	PM	2.9	369	0.9
3	Cannon Road	PM	3.7	986	2.0

Table 3.3 2005 Southbound I-5 Weekday Bottlenecks

Bottleneck Number	Location	Peak Hour	Average Queue Length (mi)	Average Delay (veh-hrs)	Average Duration (hrs)
4	Via de la Valle	AM	7.3	1,037	0.8
4	Manchester Ave	AM	6.0	1,671	1.8
4	Birmingham Dr	AM	4.5	441	0.6
5	Oceanside Blvd	PM	2.9	518	1.3
6	Manchester Ave	PM	5.3	1,274	1.4
6	Birmingham Dr	PM	4.1	204	0.4

Bottlenecks with the same bottleneck number listed in the tables above are in close proximity to one another and thus overlap each other.

3.2.3 Weekend Travel Traffic

During the year, a significant number of visitors to and from San Diego County use the I-5 corridor as their primary route of travel for both work and leisure, resulting in an influx of mid-day traffic on weekends. PeMS was used to examine average travel times on Saturday and Sunday using recent 2003-2006 average travel times on the I-5 within the Project limits. Travel on Saturday differs significantly than travel on Sunday. The most notable travel occurs on Saturday in the southbound direction, and secondly, on Sunday in the northbound direction. On Saturday in the southbound direction, the average travel time trend indicates an increased travel time period from 9:00 AM to 8:00 PM. On Sunday, work-related travel appears to be reduced, likely due to Sunday closure of the industrial/commercial sector, and the average travel time trend indicates an increased travel time period from 1:00 PM to 8:00 PM.

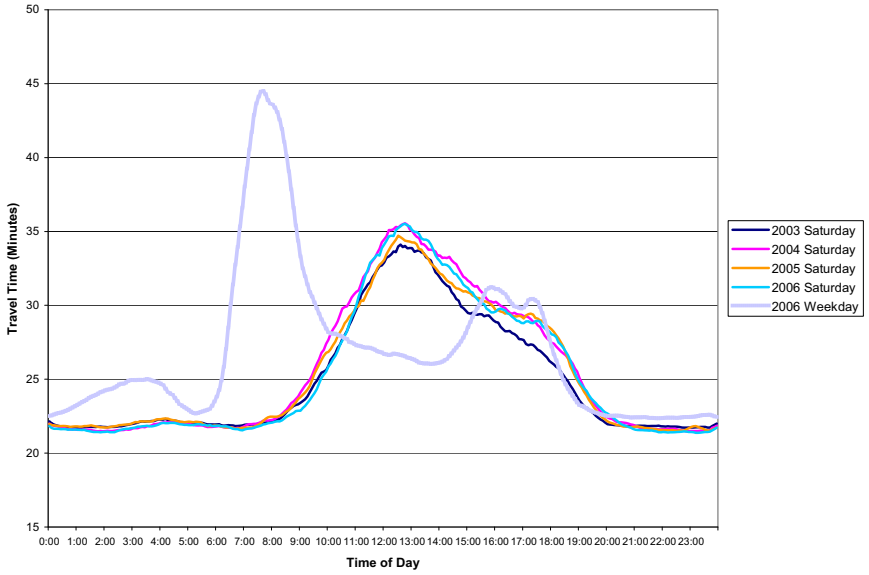

Figure 3.3 I-5 Southbound Saturday Traffic Average Travel Time: Harbor Drive to La Jolla Village Drive

Figures 3.3 – 3.6 represent the average travel time for the entire project area at any time of the day on Saturday and Sunday. The longest weekend average travel times exhibit a directional trend in the southbound direction on Saturday and in the northbound direction on Sunday. The figures are presented to depict this directional trend.

Figure 3.3 depicts the average travel time for the southbound direction along the corridor on a Saturday. The increase in average travel time occurs all day long beginning in the morning at 9 AM and ending at 8 PM. The peak average travel time occurs between 12 PM to 1 PM. The graph also shows that the peak average travel time has increased from years 2003 to 2006 along the corridor from 33 minutes to 35 minutes.

Figure 3.3 also shows the 2006 weekday average travel time. The weekday average travel time shows two distinct peak travel times, one in the early morning (44 minutes) and the second in the evening (31 minutes), corresponding to the AM and PM weekday "rush hours."

Comparing the 2006 weekday and Saturday average travel times for the I-5 southbound, Saturday does not contain an AM time peak, which occurs on weekdays. The southbound Saturday average travel time exceeds the weekday average travel time between the 10:30 AM and 3:30 PM mid-day time period.

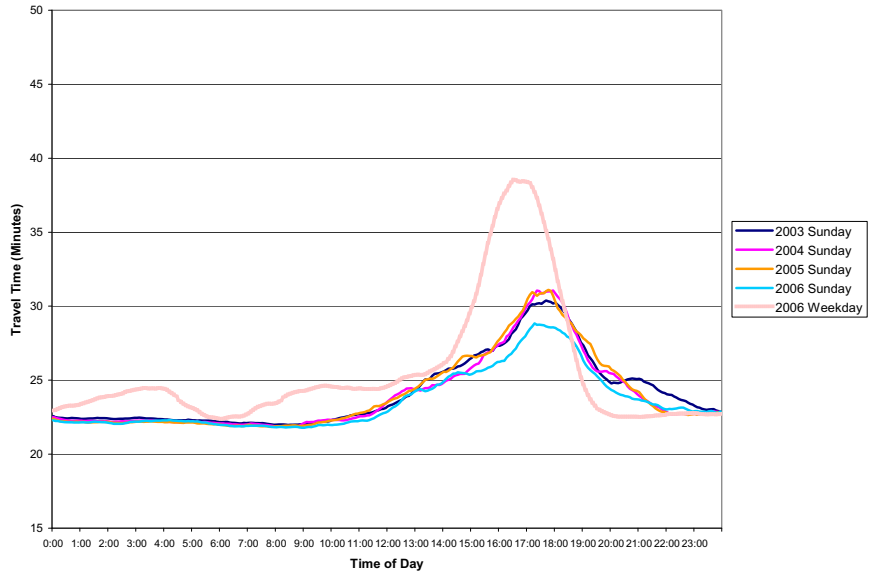

Figure 3.4 I-5 Northbound Sunday Traffic Average Travel Time: La Jolla Village Drive to Harbor Drive

Figure 3.4 shows the northbound Sunday average travel time versus time of day. The increase in average travel time occurs between the hours of 1 PM to 8 PM. The peak average travel time occurs between 5 PM to 6 PM. The graph also indicated that there is a downward trend for the average travel time in the corridor between the years of 2003 to 2006. The peak average travel time was reduced from 32 minutes to 28 minutes, which may be attributed to past construction activities. For the year 2006, the difference between the northbound weekday peak average travel time and the northbound Sunday peak average travel time is about 10 minutes.

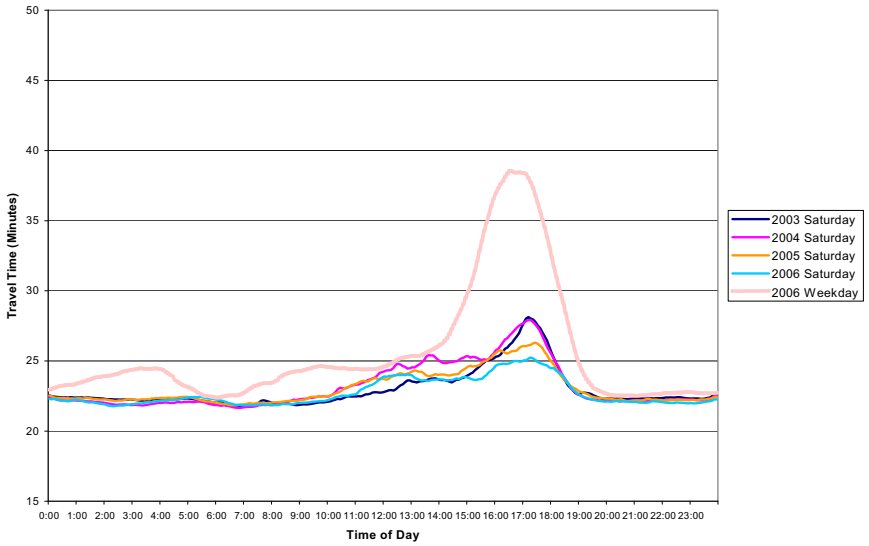

Figure 3.5 I-5 Northbound Saturday Traffic Average Travel Time:

La Jolla Village Drive to Harbor Drive

Figure 3.5 illustrates the northbound Saturday average travel time versus the time of day. The graph indicates that on Saturdays, an increase in average travel time occurs between the hours of 11 AM to 7 PM and that the peak average travel time occurs between 5 PM to 6 PM. The Figure also shows that the peak average travel time between the years 2003 to 2006 was reduced from 28 minutes to 25 minutes, which may be attributed to past construction activities.

Comparing figure 3.4 and 3.5, the northbound Sunday average travel time has a higher peak than northbound Saturday average travel time, an indication of more commuters using the I-5 northbound on Sundays than northbound on Saturdays.

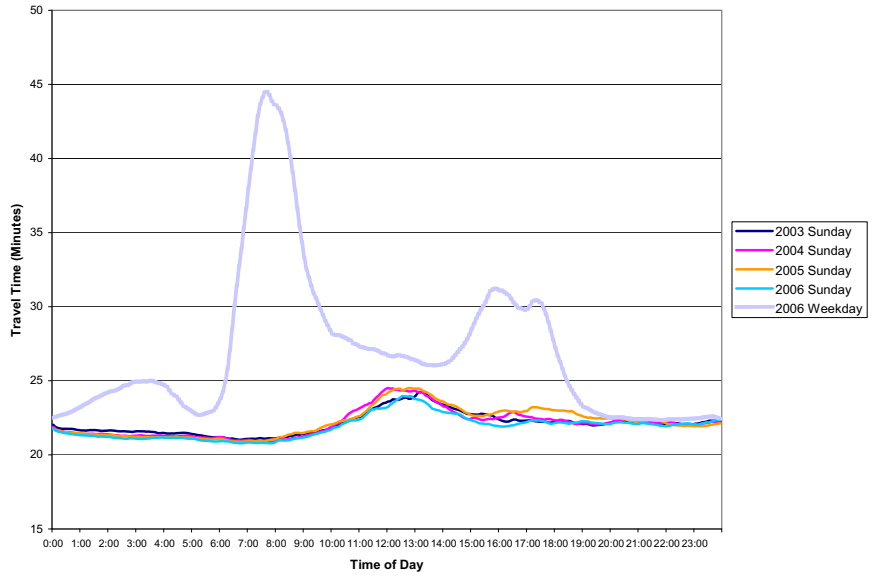

Figure 3.6 I-5 Southbound Sunday Traffic Average Travel Time:

Harbor Drive to La Jolla Village Drive

In figure 3.6, the southbound Sunday average travel time is mostly free-flow traffic. There is a slight increase in average travel time between the hours of 11 AM to 3 PM, which can be attributed to inter-regional traffic. The peak occurs between 12 PM and 1 PM. The trend for the southbound Sunday average travel time in the corridor has remained almost the same for the years 2003 to 2006. There is only a slight decrease in travel time of about 1 minute for these years.

Unlike figure 3.3 the graph in figure 3.6 shows at any time the 2006 Sunday average travel time does not exceed the 2006 weekday average travel time. The traffic trend for the weekday and Sunday for the southbound direction is different. The weekday has distinct AM and PM peak, while Sunday has a slight peak in the afternoon.

3.3 Future Traffic Conditions

3.3.1 Forecasted Traffic

Wilson & Company produced the *Traffic Demand Forecasting Report* (Technical Report No. 5), which provides information on future year traffic forecasts within the project limits. Five different traffic scenarios were modeled using the SANDAG Series 10 Transportation Model to produce future year traffic forecasts, as follows:

1. *No-Build (Year 2030).*
2. *10+4 without Direct Access Ramps (Year 2030).*
3. *10+4 with Direct Access Ramps (Year 2030).*
4. *8+4 with Direct Access Ramps (Year 2030).*
5. *10+4 with Direct Access Ramps (Year 2015).*

SANDAG's Series 10 Transportation Model does not differentiate the design details for buffer or barrier alternatives to generate the forecasted traffic volumes. For example, the 2030-year 10+4 alternative with DAR traffic forecast is used for both buffer and barrier versions. Both barrier and buffer alternatives propose the same HOV/managed lane ingress and egress points and DAR locations.

Forecasting traffic data contained in the Technical Report No. 5 are for the 2030-year Project alternatives and the 2015-year 10+4 alternative with DAR Project alternative. The report includes traffic exhibits for each alternative (including 10+4 alternative with and without DARs for the forecasted 2030-year alternative) illustrating ADT and peak hour volumes and turning movements for the freeway (includes main lanes, HOV/managed lanes, and bypass), ramp junctures, and local roads that are within the Project's area of influence.

The 2030-year traffic forecasts for the proposed alternatives (No Build, 8+4, and 10+4) have an average corridor demand range of 54% to 74% greater than the existing volumes. A list of forecasted 2030-year I-5 ADT at select locations along the Project corridor compared to the existing conditions is presented below.

Table 3.4 I-5 Annual Average Daily Traffic (AADT)

Location		Existing/2006 ADT	2030 No Build ADT	2030 8+4 ADT	2030 10+4 ADT
From	To				
La Jolla Village Drive	Genesee Ave	169,900	249,590	255,250	262,150
I-5 / I-805 Junction	Carmel Valley Road	281,400	412,640	425,750	434,250
Via de la Valle	Lomas Santa Fe	203,600	326,940	342,950	354,250
Encinitas Blvd	Leucadia Blvd	190,500	294,300	315,150	326,850
Palomar Airport Road	Cannon Road	188,500	290,100	309,850	320,350
SR-78	Oceanside Blvd	192,900	303,800	319,150	323,300
Mission Ave	SR-76	156,800	246,500	258,000	259,200

The No Build alternative demand on the I-5 freeway is 4% to 11% less than the 10+4 alternative and 1% to 8% less than the 8+4 alternative. The No Build scenario shows less demand than the 2030-year Build alternatives as a result of trip diversion to roadways that parallel the I-5 corridor.

The 2030-year traffic scenario for the 8+4 alternative with DAR has a 16% greater average ADT in the HOV lanes than the 2030-year traffic scenario for the 10+4 alternative with DAR. The result is attributed to having a more congested mainline on I-5, thereby causing more use of the HOV/managed lanes. The total corridor ADT (main line, HOV/managed lanes, and bypass) for the 8+4 alternative is about 3% less than the 10+4 alternative.

3.3.2 Vehicle-Miles Traveled (VMT)

Vehicle-miles traveled (VMT) is the average traffic in a freeway segment multiplied by the total distance of that freeway segment. Existing VMT values from PeMS were compared with forecasted VMT values for the year 2030 within the project limits from La Jolla Village Drive to Harbor Drive for a total distance of 27 miles.

Figure 3.7 compares the VMT values from PeMS in the northbound and southbound directions for existing conditions and the forecasted 2030 conditions for the no-build, 8+4, and 10+4 alternatives. In the northbound direction, the VMT for existing conditions, no-build, 8+4, and 10+4 alternatives are approximately 1,987,000, 3,986,000, 4,255,000, and 4,360,000, respectively. In the southbound direction, the VMT for existing conditions, no-build, 8+4, and 10+4 alternatives are approximately 2,284,000, 4,159,000, 4,358,000, and 4,489,000, respectively. The total existing VMT in the northbound and southbound directions for existing conditions, no-build, 8+4, and 10+4 alternatives are approximately 4,271,000, 8,145,000, 8,613,000, and 8,849,000, respectively.

The forecasted VMT for the year 2030 will increase for the no-build and build alternatives when compared to the existing VMT. The VMT increases incrementally between these alternatives due to the additional forecasted traffic that more lanes can provide.

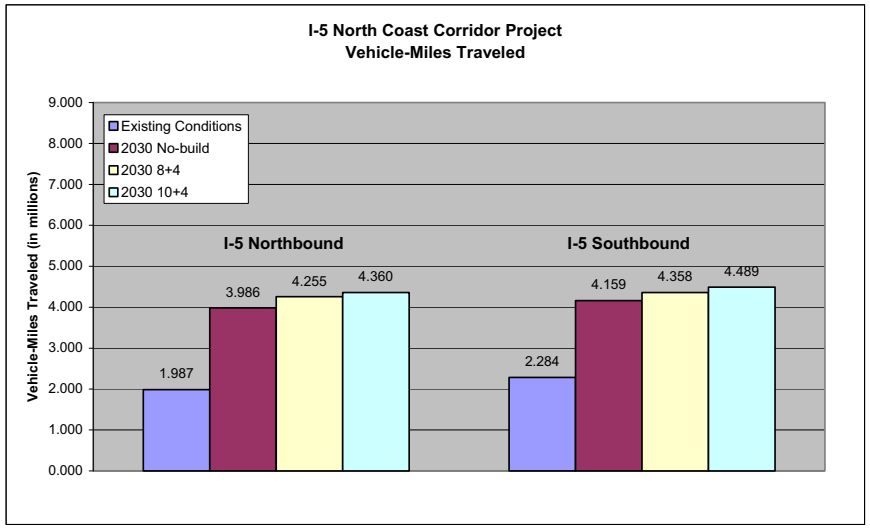

Figure 3.7.1 I-5 Northbound and Southbound Vehicle-Miles Traveled (VMT).

3.3.3 Travel Times

Travel times on the general purpose lanes for each Project alternative were estimated using the traffic computer model FREQ12 version 3.01. FREQ12 is a macroscopic and deterministic traffic modeling computer program developed by Dr. Adolf May, Professor Emeritus of Civil Engineering, through the Institute of Transportation Studies at the University of California, Berkeley. The program contains a method for predicting and illustrating the location, extent, and duration of traffic congestion in freeway systems based on actual or forecasted traffic volumes and actual or hypothetical geometric configurations. FREQ12 creates graphical illustrations and numerical outputs of real and predicted performance measures, bottleneck locations, and queuing patterns. FREQ12 version 3.01 was applied to generate hypothetical performance measures for the I-5 within the Project limits for the "No Build", "8+4", and "10+4" conditions in various future years.

Figures 3.8 through 3.11 illustrate the predicted AM and PM peak hour travel times for the corridor in the northbound and southbound directions for existing conditions and each project alternative in various years.

3.3.3.1 Existing Travel Time

- ***Off-Peak Periods:***

The average existing travel time to travel the project area in the northbound or southbound direction during off-peak hours and in free flow conditions is about 23 to 25 minutes, with an average speed of 65 to 70 mph.

- ***Peak Periods:***

The existing average travel time to travel the project area in the southbound direction is 44 minutes in the AM peak period and 32 minutes in the PM peak period, with average speeds of 37 and 51 mph, respectively. The existing average travel time to travel the project area in the northbound direction is 24 minutes in the AM peak period and 39 minutes in the PM peak period, with average speeds of 67 and 42 mph, respectively.

3.3.3.2 Future Travel Time

- ***No Build Alternative:***

In the Year 2030- No Build Alternative, the average travel time to travel the project area in the southbound direction would be 90 minutes in the AM peak period and 120 minutes in the PM peak period, with average speeds of 18 and 13 mph, respectively. The average travel time to travel the project area in the northbound direction would be 35 minutes in the AM peak period and 120 minutes in the PM peak period, with average speeds of 46 and 13 mph, respectively.

- ***8+4 Alternative:***

In the Year 2030- 8+4 Alternative, the average travel time to travel the project area in the southbound direction would be 63 minutes in the AM peak period and 37 minutes in the PM peak period, with average speeds of 26 and 44 mph, respectively. The average travel time to travel the project area in the northbound direction would be 26 minutes in the AM peak period and 65 minutes in the PM peak period, with average speeds of 62 and 25 mph, respectively.

- ***10+4 Alternative:***

In the Year 2030- 10+4 Alternative, the average travel time to travel the corridor in the southbound direction would be 35 minutes in the AM peak period and 30 minutes in the PM peak period, with average speeds of 46 and 54 mph, respectively. The average travel time to travel the project area in the northbound direction would be 25 minutes in the AM peak period and 30 minutes in the PM peak period, with average speeds of 65 and 54 mph, respectively. In the Year 2030 with the 10+4 Alternative, the average travel time to travel the project area in the northbound and southbound directions in the AM and PM peak hours would be the same as existing conditions or less, suggesting that the current conditions would possibly be maintained, and possibly improved.

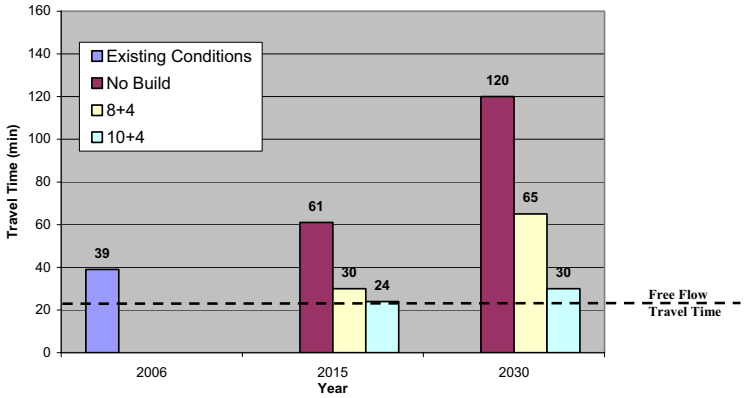

Figure 3.8 I-5 Northbound General Purpose Lanes PM Peak Hour Travel Times (minutes)

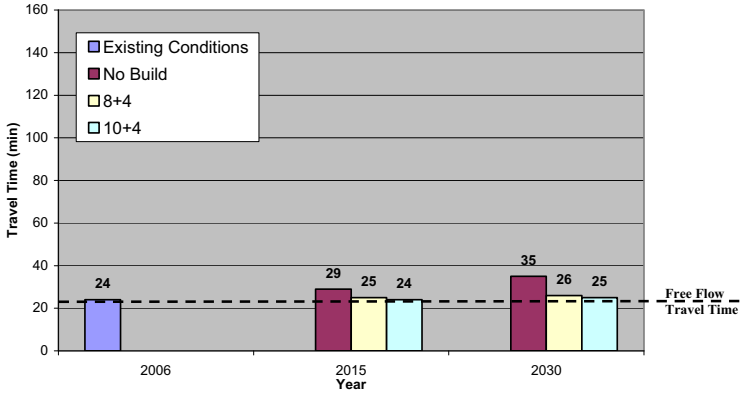

Figure 3.9 I-5 Northbound General Purpose Lanes AM Peak Hour Travel Times (minutes)

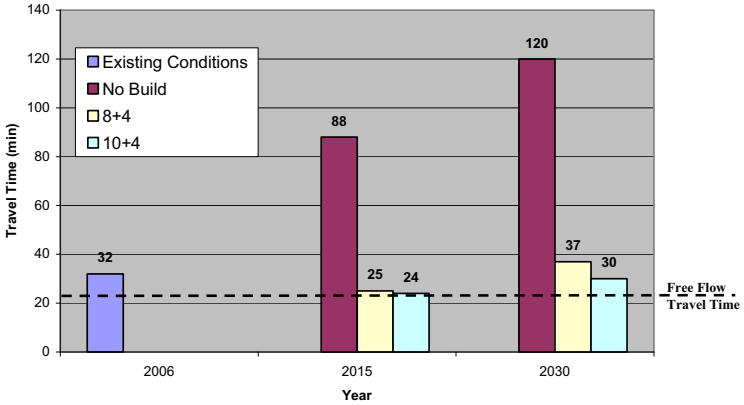

Figure 3.10 I-5 Southbound General Purpose Lanes PM Peak Hour Travel Times (minutes)

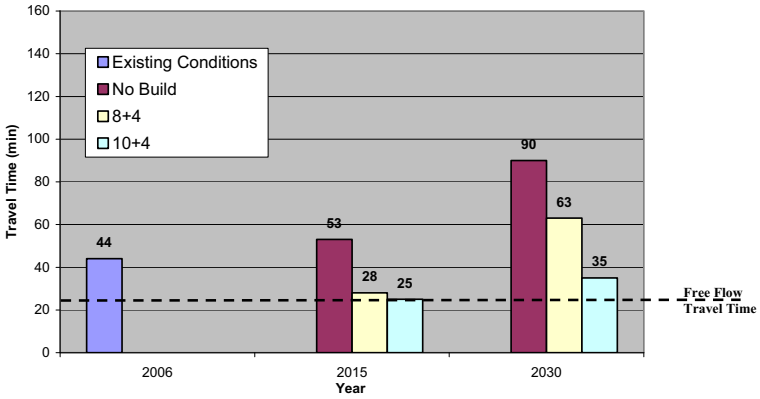

Figure 3.11 I-5 Southbound General Purpose Lanes AM Peak Hour Travel Times (minutes)

3.3.3 Bottlenecks and Total Delay

Weekday bottlenecks and total delays (vehicle hours) for the existing conditions in the Year 2006 and each Project alternative in the Years 2015 and 2030 were estimated using the traffic computer model FREQ12 version 3.01. FREQ12 uses 35 miles per hour as the reference speed for the delay associated with bottlenecks.

Tables 3.5 to 3.17 list the predicted weekday bottleneck locations, average queue length, average duration, and total delay for the corridor in the northbound and southbound directions for the existing conditions and each project alternative in various years. The total weekday delay values are also illustrated in Figures 3.12 and 3.13. There is no predicted bottleneck or congestion in the northbound direction for the 10+4 Alternative in the Year 2015.

The total weekday delay for existing conditions in the northbound and southbound directions are 3500 and 5700 vehicle hours, respectively. The predicted total weekday delay in the northbound and southbound directions for the No Build Alternative in the Year 2030 would be 35,000 and 80,000 vehicle hours, respectively. The predicted total weekday delay in the northbound and southbound directions for the 8+4 Alternative in the Year 2030 would be 14,500 and 20,200 vehicle hours, respectively. The predicted total weekday delay in the northbound and southbound directions for the 10+4 Alternative in the Year 2030 would be 200 and 3,700 vehicle hours, respectively. Figures 3.12 and 3.13 indicate that with the implementation of 10+4 Alternative, in the Year 2030 the existing conditions would be maintained and possibly improved.

Table 3.5 2006 Northbound I-5 Weekday Bottlenecks and Total Delay

Bottleneck Location	Peak Hour	Average Queue Length (mi)	Total Delay (veh-hrs)	Average Duration (hrs)
Lomas Santa Fe Dr.	PM	4.5	3,500	5
Cannon Road	PM	1.0		3

Table 3.6 2006 Southbound I-5 Weekday Bottlenecks and Total Delay

Bottleneck Location	Peak Hour	Average Queue Length (mi)	Total Delay (veh-hrs)	Average Duration (hrs)
Manchester Ave	AM	5.5	5,700	5
Manchester Ave	PM	5.5		5

Table 3.7 Northbound I-5 Predicted Weekday Bottlenecks and Total Delay "No Build/2015"

Bottleneck Location	Peak Hour	Average Queue Length (mi)	Total Delay (veh-hrs)	Average Duration (hrs)
La Jolla Village Dr.	AM	2.0	12,200	4
Del Mar Heights Rd.	PM	4.0		5
Cannon Rd.	PM	16.0		6
Oceanside Blvd	PM	1.0		2.5

Table 3.8 Southbound I-5 Predicted Weekday Bottlenecks and Total Delay "No Build /2015"

Bottleneck Location	Peak Hour	Average Queue Length (mi)	Total Delay (veh-hrs)	Average Duration (hrs)
Manchester Ave	AM	12.0	36,000	5.5
Manchester Ave	PM	16.5		9
Via de la Valle	AM	1.5		2

Table 3.9 Northbound I-5 Predicted Weekday Bottlenecks and Total Delay "8+4 Alt./2015"

Bottleneck Location	Peak Hour	Average Queue Length (mi)	Total Delay (veh-hrs)	Average Duration (hrs)
Lomas Santa Fe Dr.	PM	0.5	250	2
Encinitas Blvd	PM	0.5		2
Carlsbad Village Dr.	PM	1.0		3

Table 3.10 Southbound I-5 Predicted Weekday Bottlenecks and Total Delay "8+4 Alt.//2015"

Bottleneck Location	Peak Hour	Average Queue Length (mi)	Total Delay (veh-hrs)	Average Duration (hrs)
Lomas Santa Fe Dr.	AM	2.0	450	3
Via de la Valle	AM	1.0		2.5
Carmel Valley Rd.	AM	0.5		2

Table 3.11 Southbound I-5 Predicted Weekday Bottlenecks and Total Delay "10+4 Alt./2015"

Bottleneck Location	Peak Hour	Average Queue Length (mi)	Total Delay (veh-hrs)	Average Duration (hrs)
Carmel Valley Rd.	AM	0.5	50	1.5

Table 3.12 Northbound I-5 Predicted Weekday Bottlenecks and Total Delay "No Build/2030"

Bottleneck Location	Peak Hour	Average Queue Length (mi)	Total Delay (veh-hrs)	Average Duration (hrs)
La Jolla Village Dr	AM	2.0	35,000	4.5
Del Mar Heights Rd.	AM	1.5		2.5
Del Mar Heights Rd.	PM	7.5		9
Oceanside Blvd	PM	23.0		6

Table 3.13 Southbound I-5 Predicted Weekday Bottlenecks and Total Delay "No Build /2030"

Bottleneck Location	Peak Hour	Average Queue Length (mi)	Total Delay (veh-hrs)	Average Duration (hrs)
Tamarack Ave.	AM	2	80,000	2
Manchester Ave	AM	17		5.5
Manchester Ave	PM	25		10
Via de la Valle	AM	19		5.5
La Jolla Village Dr.	PM	2.5		4

Table 3.14 Northbound I-5 Predicted Weekday Bottlenecks and Total Delay "8+4 Alt./2030"

Bottleneck Location	Peak Hour	Average Queue Length (mi)	Total Delay (veh-hrs)	Average Duration (hrs)
Lomas Santa Fe Dr.	PM	6.5	14,500	7
Encinitas Blvd	PM	1.0		3.5
Carlsbad Village Dr.	PM	7.0		5
Oceanside Blvd	PM	0.5		2.5

Table 3.15 Southbound I-5 Predicted Weekday Bottlenecks and Total Delay "8+4 Alt./2030"

Bottleneck Location	Peak Hour	Average Queue Length (mi)	Total Delay (veh-hrs)	Average Duration (hrs)
Carlsbad Village Dr.	AM	5.0	20,200	5.5
Carlsbad Village Dr.	PM	5.0		6.5
Lomas Santa Fe Dr.	AM	17.0		5.5
Lomas Santa Fe Dr.	PM	17.0		7
Del Mar Heights Rd.	AM	21.0		5
Del Mar Heights Rd.	PM	21.0		1.5
Carmel Valley Rd.	PM	1.0		2
La Jolla Village Dr.	PM	2.0		3.5

Table 3.16 Northbound I-5 Predicted Weekday Bottlenecks and Total Delay "10+4 Alt./2030"

Bottleneck Location	Peak Hour	Average Queue Length (mi)	Total Delay (veh-hrs)	Average Duration (hrs)
Carlsbad Village Dr.	PM	1.0	200	3
Oceanside Blvd	PM	1.0		3

Table 3.17 Southbound I-5 Predicted Weekday Bottlenecks and Total Delay "10+4 Alt./2030"

Bottleneck Location	Peak Hour	Average Queue Length (mi)	Total Delay (veh-hrs)	Average Duration (hrs)
Del Mar Heights Rd.	AM	6.5	3,700	4
Del Mar Heights Rd.	PM	5.0		1.5
Carmel Valley Rd.	AM	4.0		2
Carmel Valley Rd.	PM	2.0		2
La Jolla Village Dr.	PM	2.0		4

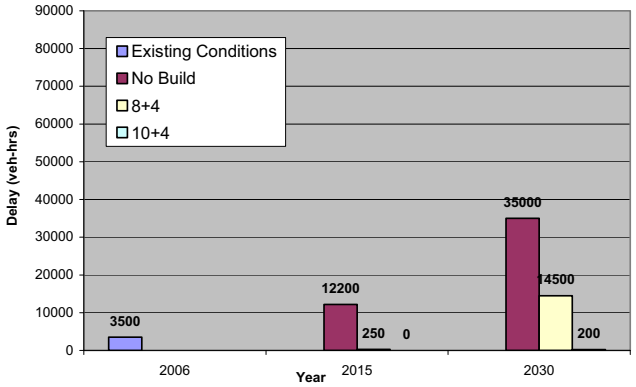

Figure 3.12 I-5 Northbound Weekday Daily Vehicle-Hours of Delay

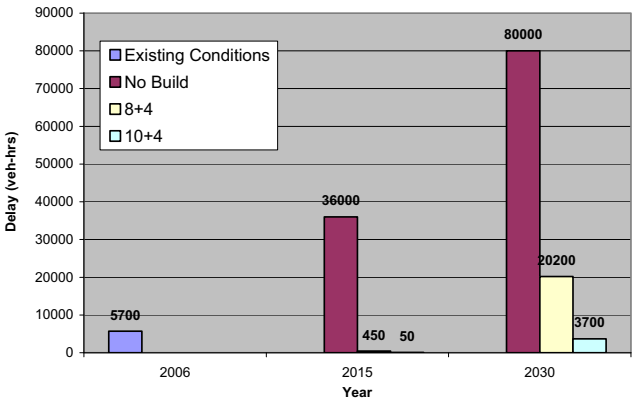

Figure 3.13 I-5 Southbound Weekday Daily Vehicle-Hours of Delay

3.3.3.1 Duration of Congestion

The duration of congestion for the existing conditions and each Project alternative in the Years 2015 and 2030 were estimated using the traffic computer model FREQ12 version 3.01.

Tables 3.18 and 3.19 list the predicted duration of congestion for the corridor in the northbound and southbound directions for the existing conditions and each project alternative in various years. The duration of congestion for the existing conditions in the northbound direction is about 5 hours in the PM peak hours (no congestions in the AM peak hours). In the southbound direction the duration of congestion is about 5 hours in the AM peak hours and 5 hours in the PM peak hours.

In the Year 2030 with the No Build Alternative, the duration of congestion in the northbound direction would be about 4.5 hours in the AM peak hours and 9 hours in the PM peak hours. The duration of congestion in the southbound direction would be about 5.5 hours in the AM peak hours and 10 hours in the PM peak hours.

In the Year 2030 with the 10+4 Alternative, the duration of congestion in the northbound direction would be about 3 hours in the PM peak hours (no predicted congestion in the AM peak hours). The duration of congestion in the southbound direction would be about 5 hours in the AM peak hours and 3 hours in the PM peak hours, which indicates that with the implementation of the 10+4 Alternative the existing conditions would be maintained and possibly improved in the Year 2030.

Table 3.18 I-5 Northbound AM and PM Peak Hour Congestion

Alternative	Year	AM PEAK HOUR			PM PEAK HOUR		
		Congestion		Duration (hrs)	Congestion		Duration (hrs)
		Begin	End		Begin	End	
Existing Conditions	2006	--	--	0	14:00	19:00	5
No Build	2015	7:30	11:30	4	14:00	20:00	6
	2030	7:30	12:00	4.5*	12:00	21:00	9
8+4	2015	--	--	0	16:00	19:00	3
	2030	--	--	0	14:00	21:00	7
10+4	2015	--	--	0	--	--	0
	2030	--	--	0	16:00	19:00	3

Table 3.19 I-5 Southbound AM and PM Peak Hour Congestion

Alternative	Year	AM PEAK HOUR			PM PEAK HOUR		
		Congestion		Duration (hrs)	Congestion		Duration (hrs)
		Begin	End		Begin	End	
Existing Conditions	2006	6:30	11:30	5	14:00	19:00	5
No Build	2015	6:30	12:00	5.5*	12:00	21:00	9
	2030	6:30	12:00	5.5*	12:00	22:00	10
8+4	2015	8:00	11:00	3	--	--	0
	2030	6:30	12:00	5.5*	12:00	19:00	7
10+4	2015	8:30	10:00	1.5	--	--	0
	2030	8:00	13:00	5	16:00	19:00	3

* Congestion would continue through the AM and PM peak hours

3.4 Freeway Level of Service

Level of Service (LOS) is a qualitative measure describing operational conditions within a traffic stream, generally in terms of such service measures as speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience. Six LOS are defined, with letters designating each level, from A to F, with LOS A representing the best operating conditions and LOS F the worst. Each LOS represents a range of operating conditions and the driver's perception of those conditions. Safety is not included in the measures that establish service levels. Figure 3.14 provides a general description of each LOS.

Main lane LOS was calculated for the existing conditions and each project alternative in the future using the HCS2000 version 4.1d software program, developed by McTrans. The program utilizes the methodology contained in the Highway Capacity Manual (HCM) for a Basic Freeway Segment

to calculate results. The northbound and southbound directional LOS for both the AM and PM peak hours for the Project (existing conditions and all proposed alternatives) are summarized in Tables 3.20 and 3.21, respectively.

	Definition	Typ. Illustration
A	Represents a free-flow operation. Vehicles are almost completely unimpeded in their ability to maneuver within the traffic stream.	
B	Represents reasonably free-flow operation. The ability to maneuver within the traffic stream is slightly restricted.	
C	Represents a traffic flow with speeds near or at free-flow speed of the freeway. Ability to maneuver within the traffic stream is noticeably restricted.	
D	Represents speeds that begin to decline with increased density. Ability to maneuver within the traffic stream is noticeably limited.	
E	Represents operation at its capacity. Vehicles are closely spaced within the traffic stream and there are virtually no useable gaps to maneuver.	
F	Represents a breakdown of vehicle flow. This condition exists within queues forming behind the breakdown points.	

Figure 3.14 Level of Service (LOS) Description

Table 3.20 Northbound I-5 Estimated General Purpose Lane LOS Summary

Freeway Segment		Existing LOS		2030 No Build LOS		2030 8+4 LOS		2030 10+4 LOS		2015 10+4 LOS	
From	To	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
La Jolla Village Drive	Genesee Avenue	E	C	E	D	E	D	F	E	E	D
Genesee Avenue	Sorrento Valley Road	D	D	D	C	C	D	D	D	C	D
Sorrento Valley Road	I-5 / I-805 Junction	B	B	B	B	B	C	B	C	B	C
I-5 / I-805 Junction	Carmel Valley Road	C	C	C	C	C	C	C	D	C	C
Carmel Valley Road	Del Mar Heights Road	C	D	C	D	D	F	D	E	C	C
Del Mar Heights Road	Via de la Valle	C	D	F	F	D	F	E	F	D	F
Via de la Valle	Lomas Santa Fe	D	F	E	F	E	F	D	F	D	E
Lomas Santa Fe	Manchester Avenue	D	F	E	F	D	F	D	F	C	E
Manchester Avenue	Birmingham Drive	D	E	E	F	D	F	D	E	C	D
Birmingham Drive	Santa Fe Drive	D	E	E	E	D	F	D	E	C	D
Santa Fe Drive	Encinitas Blvd	D	E	E	E	D	F	D	E	C	D
Encinitas Blvd	Leucadia Blvd	D	F	E	F	D	F	D	E	C	D
Leucadia Blvd	La Costa Avenue	D	F	F	F	D	F	D	E	C	D
La Costa Avenue	Poinsettia Lane	D	F	F	F	D	F	D	E	C	D
Poinsettia Lane	Palomar Airport Road	D	E	F	E	D	F	D	E	C	D
Palomar Airport Road	Cannon Road	D	E	E	E	D	F	D	D	C	D
Cannon Road	Tamarack Avenue	D	F	E	F	D	F	C	E	C	D
Tamarack Avenue	Carlsbad Village Drive	D	F	D	F	D	F	C	E	C	D
Carlsbad Village Drive	Las Flores Drive	D	F	D	F	C	F	C	E	C	D
Las Flores Drive	SR-78	D	F	E	F	D	F	E	F	C	F
SR-78	California Street	C	C	D	D	D	D	E	F	D	D
California Street	Oceanside Blvd	C	C	E	E	D	E	E	F	D	D
Oceanside Blvd	Mission Avenue	D	D	E	D	D	D	E	E	D	D
Mission Avenue	SR-76	C	C	D	C	D	C	D	D	C	C
SR-76	Harbor Drive	D	C	E	C	D	C	E	C	D	C

Table 3.21 Southbound I-5 Estimated General Purpose Lane LOS Summary

Freeway Segment		Existing LOS		2030 No Build LOS		2030 8+4 LOS		2030 10+4 LOS		2015 10+4 LOS	
From	To	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Harbor Drive	SR-76	B	C	C	D	C	D	C	D	C	C
SR-76	Mission Avenue	C	B	D	D	C	D	D	D	C	C
Mission Avenue	Oceanside Blvd	C	C	E	E	D	D	D	E	D	D
Oceanside Blvd	Cassidy Street	D	C	F	F	C	C	D	D	C	C
Cassidy Street	SR-78	D	C	F	F	E	D	F	E	D	D
SR-78	Las Flores Drive	D	C	F	F	E	D	D	D	D	C
Las Flores Drive	Carlsbad Village Drive	D	C	F	E	E	D	D	D	D	C
Carlsbad Village Drive	Tamarack Avenue	D	C	F	E	E	D	E	D	D	C
Tamarack Avenue	Cannon Road	E	D	F	F	F	F	F	D	D	C
Cannon Road	Palomar Airport Road	D	C	F	E	E	D	D	D	D	C
Palomar Airport Road	Poinsettia Lane	E	D	F	F	E	E	D	D	D	C
Poinsettia Lane	La Costa Avenue	E	D	F	F	E	E	D	D	D	D
La Costa Avenue	Leucadia Blvd	E	D	F	F	F	E	E	D	D	D
Leucadia Blvd	Encinitas Blvd	F	D	F	F	F	E	E	D	D	C
Encinitas Blvd	Santa Fe Drive	E	D	E	F	E	E	D	D	D	C
Santa Fe Drive	Birmingham Drive	E	D	E	F	E	E	D	D	D	C
Birmingham Drive	Manchester Avenue	F	D	F	F	F	E	E	D	D	C
Manchester Avenue	Lomas Santa Fe	F	E	F	F	F	F	F	E	D	D
Lomas Santa Fe	Via de la Valle	F	E	F	F	F	F	F	E	E	D
Via de la Valle	Del Mar Heights Road	E	D	E	E	F	D	F	E	F	D
Del Mar Heights Road	Carmel Valley Road	D	D	F	E	F	D	F	E	C	B
Carmel Valley Road	I-5 / I-805 Junction	D	D	F	E	E	D	F	D	C	C
I-5 / I-805 Junction	Roselle Street	C	C	D	B	B	B	D	B	D	D
Roselle Street	Genesee Avenue	D	D	E	D	D	D	E	D	D	D
Genesee Avenue	La Jolla Village Drive	C	D	C	F	D	F	F	F	D	F

According to the LOS data summarized in Table 3.20, the existing northbound traffic conditions in the AM and PM peak hours generally exhibit a LOS rating of D or better, with the exception of a few LOS ratings of F in the PM peak hour. According to the LOS data summarized in Table 3.21, the existing southbound traffic conditions exhibit generally exhibit a LOS rating of D in both the AM and PM peak hours, with the exception of a few LOS ratings of F in the AM peak hour.

In the Year 2030-No Build Alternative, the northbound traffic conditions in the AM peak hour generally exhibit LOS ratings of D and E with the exception of a few LOS ratings of F. The majority of the northbound traffic conditions in the PM peak hour exhibit a LOS rating of F. The majority of the southbound traffic conditions exhibit LOS ratings of F in the AM and PM peak hours. The year 2030 No Build scenario has a lower overall LOS in the AM and PM peak hours, when compared to the existing conditions.

In the Year 2030-8+4 Alternative, the northbound traffic conditions in the AM peak hour generally exhibit a LOS rating of D while majority of the PM peak hour exhibit a LOS rating of F (Del Mar Heights Rd to SR 78). The southbound AM and PM peak hours will be similar to the LOS ratings of the existing conditions with the exception of a few segments where the LOS ratings degrade to F. With the 8+4 Alternative, the corridor will degrade in the AM and PM peak hours when compared to the existing conditions; however the AM and PM peak hour conditions will have a better level of service when compared to the year 2030 No Build scenario.

In the Year 2030-10+4 Alternative, the LOS ratings in the AM and PM peak hours for both the northbound and southbound directions will be very similar to the LOS ratings for the existing conditions, suggesting that the current LOS would possibly be maintained, and possibly improved in a few locations.

The data in Tables 3.20 and 3.21 indicate that in the year 2030, the I-5 southbound and northbound traffic conditions and freeway operations will deteriorate in both the AM and PM peak hours if no improvements are made.

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3.5 HOV/Managed Lanes

3.5.1 Description of Existing High Occupancy Vehicle (HOV) Lanes

HOV lanes are separate freeway lanes designated for multiple high occupancy vehicles, transit, low emission vehicles, motorcycles, and other permitted vehicles only. The purpose of HOV lanes is to reduce congestion on the main lanes, increase the person-moving capacity of the facility, decrease travel time, and to help reduce air pollution.

I-5 currently has two 6-mile long HOV lanes that operate in the northbound and southbound directions. The HOV lanes operate between the I-5/I-805 junction and the Via de la Valle undercrossing. The existing conditions represent the year 2006. Currently an HOV extension project is under construction to extend the existing northbound and southbound HOV lanes along I-5 from the north end of the San Dieguito River Bridge to the south end of the San Elijo Lagoon Bridge. This project is scheduled for a completion date of July 2011.

3.5.1.1 Existing HOV Traffic Volumes

The existing average weekday AM and PM peak hour HOV volumes on the segment of I-5 between I-5/I-805 Junction and Lomas Santa Fe Drive indicated that the average weekday peak hour morning and afternoon HOV lane traffic volumes in the northbound direction are 300 and 1,100 vehicles, respectively and along the southbound direction are 1200 and 350, respectively. The collected field data indicates that the vehicle distribution of users in this HOV lane in both the AM and PM peak hours is dominated by passenger cars (over 90%).

3.5.2 Future HOV/Managed Lanes

The 8+4 and 10+4 build alternatives propose to construct a total of four HOV/Managed lanes, two in each direction of travel. The four HOV/Managed lanes would traverse most of the Project limits on the I-5, from the I-5/I-805 merge to Harbor Drive in Oceanside, totaling a distance of approximately 27 miles. The HOV/Managed lanes would be separated from the main lanes by either a painted buffer or permanent concrete barrier, depending on the alternative chosen.

3.5.2.1 Description of HOV/Managed Lanes

HOV/Managed lanes are limited-access, barrier or buffer-separated freeway lanes that provide free or reduced cost access to qualifying HOVs, and also allow single occupancy vehicles (SOV) to gain access to HOV lanes by paying a toll. The tolls change throughout the day according to real-time traffic conditions to manage the number of vehicles in the HOV/Managed lanes and to maintain traffic volumes consistent with uncongested levels of service even during peak travel periods. Access to the lanes may be provided at intermittent points. The separation and the limited access points are important tools for managing traffic flows on HOV/Managed lanes.

Level of Service C (1650 vehicles per hour per lane) would be maintained on the HOV/Managed lanes for the I-5 corridor within project limits for both 8+4 and 10+4 build alternatives. The HOV/Managed lanes capacity would be approximately 3300 vehicles per hour (two HOV lanes) along the corridor, except the segment between La Jolla Village Drive and I-5/I-805 junction where the capacity would be approximately1650 vehicle per hour (one HOV lane).

3.5.2.2 Weekday HOV Volumes on the HOV/Managed Lanes

A list of select I-5 freeway segments within the Project limits and their respective weekday peak hour HOV volumes are compiled in Tables 3.22 and 3.23. The two tables provide a brief summary of weekday peak hour HOV traffic volumes for each alternative through each of the five cities traversed by the Project. SOV volumes are not included in the tables. Due to the fact that 8+4 alternative has four (4) general purpose lanes and 10+4 alternative has five (5) general purpose lanes, the general purpose lanes for the 8+4 alternative would be more congested, therefore the HOV/Managed lanes would attract more traffic. Consequently, the overall predicted traffic volumes in the Year 2030, on the HOV/Managed lanes with 8+4 alternative would be higher than the 10+4 alternative.

Table 3.22 Weekday Northbound HOV Volumes (SOV Volumes Not Included)

Freeway Segment		Existing*		2030 No Build*		2030 8+4		2030 10+4	
From	To	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
La Jolla Village Drive	Genesee Avenue	X	X	X	X	1,600	1,530	1,500	1,280
I-5 / I-805 Junction	Carmel Valley Road	300	1,100	1,920	1,620	2,000	2,540	1,880	2,450
Carmel Valley Road	Lomas Santa Fe	300	1,100	1,580	1,230	1,640	2,130	1,520	2,040
Santa Fe Drive	La Costa Avenue	X	X	X	X	2,120	2,470	1,900	2,270
La Costa Avenue	Cannon Road	X	X	X	X	2,030	2,180	1,820	2,170
SR-78	Oceanside Blvd	X	X	X	X	1,900	2,240	1,700	2,100

Table 3.23 Weekday Southbound HOV Volumes (SOV Volumes Not Included)

Freeway Segment		Existing*		2030 No Build*		2030 8+4		2030 10+4	
From	To	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Oceanside Blvd	SR-78	X	X	X	X	2,570	2,030	2,170	1,650
Cannon Road	La Costa Avenue	X	X	X	X	2,460	2,380	2,080	1,920
La Costa Avenue	Santa Fe Drive	X	X	X	X	2,410	2,330	2,050	1,880
Lomas Santa Fe	Carmel Valley Road	1,200	350	1,030	1,010	2,400	2,030	2,050	1,640
Carmel Valley Road	I-5 / I-805 Junction	1,200	350	1,500	1,480	2,800	2,430	2,450	2,040
Genesee Avenue	La Jolla Village Drive	X	X	X	X	1,500	1,850	1,120	1,460

3.5.2.3 Weekday-Peak Hour HOV/Managed Lanes Utilization and Tolling Capacity

The *Traffic Demand Forecasting Report* (Technical Report No. 5) prepared by Wilson & Company provides predicted HOV volumes for 8+4 and 10+4 alternatives in the Year 2030. Tables 3.24 and 3.25 present the demand weekday peak hour HOV volumes for 8+4 and 10+4 alternatives in the Year 2030 and compare them with the HOV/Managed lanes capacity.

There is a directional trend to the HOV demand volume between the northbound and southbound directions. The demand volume in the northbound direction is higher during the PM peak hour and lower during the AM peak hour. In contrast, the demand volume in the southbound direction is lower during the PM peak hour and higher during the AM peak hour.

The approximate tolling capacity for the HOV/managed lanes would the difference between the HOV/Managed Lanes capacity volume and the HOV demand volume. The tolling capacities along the corridor would vary per changes in demand volumes throughout the AM and PM peak periods. Tables 9.3 and 9.4 show the predicted Year 2030 average tolling capacities and HOV demand volumes in the AM and PM peak periods for the 8+4 and 10+4 alternatives. The segments listed in Tables 3.24 and 3.25 were selected to represent the entire I-5 corridor within the project limits.

Table 3.24 Weekday Northbound 2030 HOV Demand and Tolling Capacity Volumes (VPH)

Freeway Segment		2030 HOV/Managed Lanes Capacity- 8+4 & 10+4	2030 8+4 HOV Demand		2030 8+4 Tolling Capacity		2030 10+4 HOV Demand		2030 10+4 Tolling Capacity	
From	To		AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
La Jolla Village Drive	Genesee Avenue	1650	1,600	1,530	50	120	1,500	1,280	100	370
I-5 / I-805 Junction	Carmel Valley Road	3300	2,000	2,540	1,300	760	1,880	2,450	1,420	850
Carmel Valley Road	Lomas Santa Fe	3300	1,640	2,130	1,660	1,170	1,520	2,040	1,780	1,260
Santa Fe Drive	La Costa Avenue	3300	2,120	2,470	1,180	830	1,900	2,270	1,400	1,030
La Costa Avenue	Cannon Road	3300	2,030	2,180	1,270	1,120	1,820	2,170	1,480	1,130
SR-78	Oceanside Blvd	3300	1,900	2,250	1,400	1,050	1,700	2,100	1,600	1,200

Table 3.25 Weekday Southbound 2030 HOV Demand and Tolling Capacity Volumes (VPH)

Freeway Segment		2030 HOV/Managed Lanes Capacity- 8+4 & 10+4	2030 8+4 HOV Demand		2030 8+4 Tolling Capacity		2030 10+4 HOV Demand		2030 10+4 Tolling Capacity	
From	To		AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Oceanside Blvd	SR-78	3300	2,490	2,000	810	1,300	2,100	1,625	1,200	1,675
Cannon Road	La Costa Avenue	3300	2,470	2,300	830	1,000	2,080	1,850	1,220	1,450
La Costa Avenue	Santa Fe Drive	3300	2,410	2,350	890	950	2,060	1,890	1,240	1,410
Lomas Santa Fe	Carmel Valley Road	3300	2,520	2,220	780	1,080	2,160	1,800	1,140	2,160
Carmel Valley Road	I-5 / I-805 Junction	3300	2,400	2,030	900	1,270	2,050	1,640	1,250	1,660
Genesee Avenue	La Jolla Village Drive	1650	980	1,470	670	180	1,050	890	600	760

3.5.2.4 Weekend HOV/Managed Lanes Utilization and Tolling Capacity

Wilson & Company completed a study to determine the proportion of HOV in the I-5 weekend traffic stream. The study concluded that the overall proportion of HOV to single occupancy vehicles (SOV) was approximately 60:40. The weekend SOV and HOV volumes are presented in Tables 3.26 and 3.27.

The existing HOV to SOV proportions for a typical weekend along the northbound direction for the 10:00-10:30 AM, 1:00-1:30 PM, and 4:00-4:30 PM were 63:37, 54:46, and 64:36. The overall proportion for the northbound direction was 61:39. In the southbound direction the HOV proportions were 57:43, 55:44, and 65:35. The overall proportion for the southbound direction was 59:41. The predicted 2030 weekend HOV to SOV proportion would be consistent with the current proportion. Due to high existing HOV traffic in the existing I-5 weekend traffic stream during the weekend peak periods, no predicted weekend tolling capacity is expected in the Year 2030.

Table 3.26 I-5 NB Weekend HOV Summary- Sunday, May 11, 2008

TIME	ALL LANES				
	SOV	HOV-2	UTD*	TOTAL	HOV:SOV
10:00-10:30 AM	1,049	1,796	4,848	7,693	63:37
1:00-1:30 PM	1,425	1,663	5,800	8,888	54:46
4:00-4:30 PM	1,727	3,109	3,853	8,689	64:36
TOTAL	4,201	6,568	14,501	25,270	61:39

* UTD = UNABLE-TO-DETERMINE

Table 3.27 I-5 SB Weekend HOV Summary- Saturday, May 10, 2008

TIME	ALL LANES				
	SOV	HOV-2	UTD*	TOTAL	HOV:SOV
10:00-10:30 AM	2,233	2,955	2,987	8,175	57:43
1:00-1:30 PM	1,968	2,372	3,889	8,229	55:45
4:00-4:30 PM	1,488	2,810	4,242	8,540	65:35
TOTAL	5,689	8,137	11,118	24,944	59:41

UTD = UNABLE-TO-DETERMINE

3.6 I-5 North Coast Managed Lanes Value Pricing Study

A central component of the proposed 8+4 and 10+4 alternatives is the four HOV/managed lanes (two in each direction) to be located in the median of the I-5. The HOV/managed lanes are expected to operate at a high level of service for carpools, bus transit, vanpools, and others regardless of the traffic conditions of the main lanes. To optimize the capacity of the HOV lanes and help alleviate congestion of the main lanes, it has been suggested to allow Single Occupancy Vehicles (SOV) to use the HOV lanes for a predetermined toll charge. This Chapter briefly summarizes the *I-5 North Coast Value Pricing Planning Study Concept Plan* performed by Parsons Brinckerhoff, which explores the viability of HOV/managed lanes along the I-5 North Coast Corridor. The report is contained in Appendix I.

Parsons Brinckerhoff Consultants performed a study investigating the technical, financial, and feasibility of HOV/managed lanes on the I-5 corridor between the Cities of San Diego and Oceanside. Subjects of interest examined by the Value Pricing Study included traffic operations (traffic demand, HOV/managed lane access, impacts to main lane traffic), pricing strategies (fixed/flat rate, preset variable rate, dynamic variable rate), electronic toll collection requirements, potential revenue, equity, and performance monitoring requirements. A community outreach survey was also conducted to assess the interest of the general public, local agencies, and key stakeholders towards HOV lanes and their use as managed lanes.

Table 3.28 is a summary of the estimated HOV/managed lane revenue for the proposed 2030-year 8+4 and 10+4 alternatives. A higher toll rate is anticipated for single occupancy vehicles in the south end of the Project due to the larger traffic demand.

Table 3.28 I-5 HOV/Managed Lanes Estimated Annual Revenue

Location	2030 8+4 Estimated Revenue*	2030 10+4 Estimated Revenue*
South of SR-56	$6.656	$4.329
South of Via de la Valle	$6.274	$3.983
South of Manchester Ave	$2.076	$1.154
North of Encinitas Blvd	$2.421	$1.478
South of Palomar Airport Rd	$1.203	$0.837
North of Carlsbad Village Dr	$0.882	$0.629
North of SR-76	$0.227	$0.225
Total	$19.739	$12.636

*Estimated revenue in millions of dollars

The Value Pricing study contains the following information:

- Value pricing for the I-5 managed lanes is feasible for both the 8+4 and 10+4 Alternatives and for both barrier-and buffer-separated design treatments.
- There is sufficient demand to justify a managed lane facility.
- Access will need to be controlled through any designated ingress and egress points along I-5 main lanes and direct access ramps (DAR) with local streets.
- The public is favorable to lane management.

3.7 Interchange to Interchange Weaving Analysis

Weaving sections exist on freeways between closely spaced ramps or interchanges. They are very common on urban freeways. Weaving can be a source of lane and facility breakdown when weaving adversely affects traffic operations. A traffic weave analysis provides a theoretical assessment of potential traffic impacts and lane breakdowns between ramp junctures as vehicles enter and exit the freeway. The LOS D method (Chapter 500 of the HDM) was used to analyze interchange to interchange weaving operations for the existing conditions and the proposed alternatives for both the northbound and southbound directions during the AM and PM peak hours.

A summary of the weaving conditions in the northbound and southbound directions for the existing conditions and the future year traffic scenarios examined by the Project are contained in Tables 3.29 and 3.30, respectively. Freeway segments with the word "over" denote a segment that failed. Segments marked "under" are operating at or better than LOS D according to the LOS D method.

3.7.1 Project Corridor Weaving Improvements

The proposed 8+4 and 10+4 alternatives preserve most of the existing auxiliary lanes, acceleration lanes, and deceleration lanes within project limits. In certain locations, acceleration lanes and deceleration lanes are extended to create auxiliary lanes between interchanges. Table 3.31 contains a summary of the I-5 northbound and southbound roadway improvements (i.e. auxiliary, acceleration, and deceleration lanes) included in the proposed 8+4 and 10+4 alternatives to facilitate traffic weaving.

Table 3.29 Northbound LOS D Weaving Conditions (Unconstrained Ramp Demand Volumes)

Freeway Segment		Existing		2030 No Build		2030 8+4		2030 10+4		2015 10+4	
From	To	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
La Jolla Village Drive	Genesee Avenue	Over	Under	Over	Under	Over	Under	Over	Under	Over	Under
Del Mar Heights Road	Via de la Valle	Under	Over	Under	Over	Under	Over	Under	Over	Under	Under
Via de la Valle	Lomas Santa Fe	Over	Over	Under	Over	Under	Over	Under	Over	Under	Over
Lomas Santa Fe	Manchester Avenue	Under	Over	Under	Over	Under	Over	Under	Over	Under	Under
Manchester Avenue	Birmingham Drive	Under	Over	Over	Over	Under	Over	Under	Over	Under	Under
Birmingham Drive	Santa Fe Drive	Under	Over	Over	Over	Under	Over	Under	Under	Under	Under
Santa Fe Drive	Encinitas Blvd	Under	Over	Over	Over	Under	Over	Under	Over	Under	Under
Encinitas Blvd	Leucadia Blvd	Under	Over	Over	Over	Under	Over	Under	Over	Under	Under
Leucadia Blvd	La Costa Avenue	Under	Over	Over	Over	Under	Over	Under	Over	Under	Over
La Costa Avenue	Poinsettia Lane	Over	Over	Over	Over	Under	Under	Under	Under	Under	Under
Poinsettia Lane	Palomar Airport Road	Over	Over	Over	Over	Over	Over	Over	Over	Over	Over
Palomar Airport Road	Cannon Road	Under	Over	Under	Over	Under	Over	Under	Over	Under	Over
Cannon Road	Tamarack Avenue	Under	Over	Over	Over	Under	Over	Under	Over	Under	Under
Tamarack Avenue	Carlsbad Village Drive	Under	Over	Under	Over	Under	Over	Under	Over	Under	Under
Carlsbad Village Drive	Las Flores Drive	Under	Over	Over	Over	Under	Over	Under	Under	Under	Under
Las Flores Drive	SR-78	Over	Over	Over	Over	Under	Over	Under	Over	Under	Over
SR-78	California Street	Under	Under	Under	Under	Under	Under	Under	Under	Under	Under
California Street	Oceanside Blvd	Under	Under	Over	Under	Under	Over	Under	Under	Under	Under
Oceanside Blvd	Mission Avenue	Under	Over	Over	Over	Over	Over	Over	Over	Under	Over
Mission Avenue	SR-76	Under	Over	Over	Over	Under	Over	Under	Over	Under	Over
SR-76	Harbor Drive	Over	Under	Over	Under	Over	Under	Over	Under	Over	Under

Table 3.30 Southbound LOS D Weaving Conditions (Unconstrained Ramp Demand Volumes)

Freeway Segment		Existing		2030 No Build		2030 8+4		2030 10+4		2015 10+4	
From	To	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Harbor Drive	SR-76	Under	Under	Under	**Over**	Under	**Over**	Under	**Over**	Under	**Over**
SR-76	Mission Avenue	Under	Under	**Over**	**Over**	**Over**	Under	**Over**	**Over**	**Over**	Under
Mission Avenue	Oceanside Blvd	Under	Under	**Over**	**Over**	Under	Under	Under	Under	Under	Under
Oceanside Blvd	Cassidy Street	Under	Under	**Over**	**Over**	Under	Under	Under	Under	Under	Under
Cassidy Street	SR-78	**Over**	**Over**	**Over**	**Over**	Under	Under	Under	Under	Under	Under
SR-78	Las Flores Drive	**Over**	**Over**	**Over**	**Over**	Under	Under	**Over**	Under	Under	Under
Las Flores Drive	Carlsbad Village Drive	Under	Under	**Over**	**Over**	**Over**	Under	Under	Under	Under	Under
Carlsbad Village Drive	Tamarack Avenue	**Over**	Under	**Over**	**Over**	**Over**	**Over**	**Over**	Under	Under	Under
Tamarack Avenue	Cannon Road	**Over**	Under	**Over**	**Over**	**Over**	Under	Under	Under	Under	Under
Cannon Road	Palomar Airport Road	**Over**	Under	**Over**	Under	**Over**	**Over**	**Over**	**Over**	**Over**	Under
Palomar Airport Road	Poinsettia Lane	**Over**	Under	**Over**	**Over**	**Over**	**Over**	**Over**	**Over**	**Over**	**Over**
Poinsettia Lane	La Costa Avenue	**Over**	Under	**Over**	**Over**	**Over**	**Over**	Under	**Over**	Under	Under
La Costa Avenue	Leucadia Blvd	**Over**	Under	**Over**	**Over**	**Over**	**Over**	**Over**	**Over**	Under	Under
Leucadia Blvd	Encinitas Blvd	**Over**	Under	**Over**	**Over**	**Over**	**Over**	**Over**	Under	Under	Under
Encinitas Blvd	Santa Fe Drive	**Over**	Under	**Over**	**Over**	**Over**	**Over**	Under	Under	Under	Under
Santa Fe Drive	Birmingham Drive	**Over**	**Over**	**Over**	**Over**	**Over**	**Over**	Under	Under	Under	Under
Birmingham Drive	Manchester Avenue	**Over**	**Over**	**Over**	**Over**	**Over**	Under	Under	Under	Under	Under
Manchester Avenue	Lomas Santa Fe	**Over**	**Over**	**Over**	**Over**	**Over**	**Over**	Under	Under	Under	Under
Lomas Santa Fe	Via de la Valle	**Over**	**Over**	**Over**	**Over**	**Over**	**Over**	**Over**	Under	Under	Under
Via de la Valle	Del Mar Heights Road	**Over**	**Over**	**Over**	**Over**	Under	Under	**Over**	Under	Under	Under
Genesee Avenue	La Jolla Village Drive	**Over**	**Over**	**Over**	**Over**	Under	**Over**	Under	**Over**	Under	**Over**

Table 3.31 Proposed Project Corridor Weaving Improvements

Freeway Segment		Proposed 8+4 Alternative		Proposed 10+4 Alternative	
From	To	Northbound	Southbound	Northbound	Southbound
La Jolla Village Drive	Genesee Avenue	Auxiliary Lane	Auxiliary Lane	Auxiliary Lane	Auxiliary Lane
Genesee Avenue	Roselle Street / Sorrento Valley Road	Braided Ramps	Braided Ramps	Braided Ramps	Braided Ramps
Roselle Street / Sorrento Valley Road	Carmel Valley Road	Maintain Existing Facility & Bypass	Maintain Existing Facility & Bypass	Maintain Existing Facility & Bypass	Maintain Existing Facility & Bypass
Carmel Valley Road	Del Mar Heights Road	Extend Bypass Facility	Extend Bypass Facility	Extend Bypass Facility	Extend Bypass Facility
Del Mar Heights Road	Via de la Valle	700 m Merge Lane & Decrease Main Lanes from 6 to 4	Auxiliary Lane	700 m Merge Lane & Decrease Main Lanes from 6 to 5	Auxiliary Lane
Via de la Valle	Lomas Santa Fe	No Improvement (Maintain Existing Auxiliary Lane)	No Improvement (Maintain Existing Auxiliary Lane)	No Improvement (Maintain Existing Auxiliary Lane)	No Improvement (Maintain Existing Auxiliary Lane)
Lomas Santa Fe	Manchester Avenue	Auxiliary Lane	Auxiliary Lane	Auxiliary Lane	Auxiliary Lane
Manchester Avenue	Birmingham Drive	Auxiliary Lane	Auxiliary Lane	Auxiliary Lane	Auxiliary Lane
Birmingham Drive	Santa Fe Drive	Auxiliary Lane	Auxiliary Lane	Auxiliary Lane	Auxiliary Lane
Santa Fe Drive	Encinitas Blvd	No Improvement (No Aux Lane)	Auxiliary Lane	No Improvement (No Aux Lane)	Auxiliary Lane
Encinitas Blvd	Leucadia Blvd	Auxiliary Lane	No Improvement (No Aux Lane)	Auxiliary Lane	No Improvement (No Aux Lane)
Leucadia Blvd	La Costa Avenue	No Improvement (No Aux Lane)	No Improvement (No Aux Lane)	No Improvement (No Aux Lane)	No Improvement (No Aux Lane)
La Costa Avenue	Poinsettia Lane	No Improvement (Additional Main Lane (5) & Maintain 450 m Diverge Lane)	No Improvement (Additional Main Lane (5) & Decrease Merge Lane to 300 m)	No Improvement (Maintain 450 m Diverge Lane)	Decrease Merge Lane to 300 m
Poinsettia Lane	Palomar Airport Road	No Improvement (Decrease Main Lanes: 5 to 4)	No Improvement (Additional Main Lane)	800 m Diverge Lane	Extend Merge Lane to 900 m
Palomar Airport Road	Cannon Road	No Improvement (Maintain Existing Auxiliary Lane)	No Improvement (Maintain Existing Auxiliary Lane)	No Improvement (Maintain Existing Auxiliary Lane)	No Improvement (Maintain Existing Auxiliary Lane)
Cannon Road	Tamarack Avenue	Auxiliary Lane	Auxiliary Lane	Auxiliary Lane	Auxiliary Lane
Tamarack Avenue	Carlsbad Village Drive	No Improvement (No Aux Lane)	No Improvement (No Aux Lane)	No Improvement (No Aux Lane)	No Improvement (No Aux Lane)
Carlsbad Village Drive	Las Flores Drive	No Improvement (Increase Main Lanes: 4 to 5)	No Improvement (Decrease Main Lanes: 5 to 4)	No Improvement (Increase Main Lanes: 5 to 6)	No Improvement (Decrease Main Lanes: 6 to 5)

Table 3.31 Proposed Project Corridor Weaving Improvements (continued)					
Freeway Segment		Proposed 8+4 Alternative		Proposed 10+4 Alternative	
From	To	Northbound	Southbound	Northbound	Southbound
Las Flores Drive	SR-78	No Improvement (Main lanes: 5-6-4)	No Improvement (Main lanes: 4-6-5)	No Improvement (Decrease Main Lane: 6 to 4)	No Improvement (Increase Main Lane: 4 to 6)
SR-78	California St / Cassidy St	No Improvement (Increase Main Lanes: 4 to 6)	No Improvement (Decrease Main Lanes: 6 to 4)	No Improvement (Increase Main Lanes: 4 to 6)	No Improvement (Decrease Main Lanes: 6 to 4)
California St / Cassidy St	Oceanside Blvd	No Improvement (Decrease Main Lanes: 6 to 5)	No Improvement (Increase Main Lanes: 5 to 6)	No Improvement (Decrease Main Lanes: 6 to 5)	No Improvement (Increase Main Lanes: 5 to 6)
Oceanside Blvd	Mission Avenue	No Improvement (Decrease Main Lanes: 5 to 4)	No Improvement (Increase Main Lanes: 4 to 5)	No Improvement (Decrease Main Lanes: 5 to 4)	No Improvement (Increase Main Lanes: 4 to 5)
Mission Avenue	SR-76	Auxiliary Lane	No Improvement (Maintain Existing Auxiliary Lane)	Auxiliary Lane	No Improvement (Maintain Existing Auxiliary Lane)
SR-76	Harbor Drive	No Improvement (Maintain Existing Auxiliary Lane)	Extend Existing Auxiliary Lane	No Improvement (Maintain Existing Auxiliary Lane)	Extend Existing Auxiliary Lane

3.7.2 Ramp Meter Rates

It is anticipated that, under future year conditions, all freeway on ramp locations within the Project limits will be metered. The following two tables, Tables 3.32 and 3.33, summarize the northbound and southbound existing freeway ramp meter rates for the interchanges within the Project limits. The tables also contain recommended 2030-year meter rates for these on ramps in conjunction with the 8+4 and 10+4 design alternatives. The future ramp meter rates listed for the two design alternatives in each table were developed from the previously described LOS D weaving results. It is anticipated that these meter rates may improve projected freeway operations while simultaneously not overloading surface streets with excessive queue lengths. The 2030-year meter rates in Tables 3.32 and 3.33 are recommended meter rates for the proposed 8+4 and 10+4 design alternatives. Actual future meter rates would be based on actual freeway operations and field measurements.

Table 3.32 Northbound Ramp Meter Rates

Interchange	AM Peak			PM Peak		
	Existing On Ramp Volumes	2030 8+4 On Ramp Volumes	2030 10+4 On Ramp Volumes	Existing On Ramp Volumes	2030 8+4 On Ramp Volumes	2030 10+4 On Ramp Volumes
La Jolla Village Dr WB to I-5	460	640 (640)	640 (640)	370	500 (500)	500 (500)
La Jolla Village Dr EB to I-5	740	660 (660)	670 (670)	950	1050 (1000)	1050 (1000)
Genesee Avenue	1120	230 (230)	230 (230)	1840	1600 (1400)	1650 (1450)
Carmel Mountain Road	350	720 (670)	720 (670)	400	960 (910)	960 (910)
Carmel Valley Road	1160	360 (310)	390 (340)	1080	500 (450)	520 (470)
SR-56 WB to I-5 NB Bypass	DNE*	1730 (1530)	1730 (1530)	DNE*	1150 (1000)	1150 (1000)
Del Mar Heights Road	1040	1050 (975)	1300 (1225)	1640	1350 (1250)	1390 (1290)
Via de la Valle WB to I-5	470	400 (400)	460 (460)	400	520 (470)	530 (480)
Via de la Valle EB to I-5	320	410 (410)	430 (430)	600	690 (640)	720 (670)
Lomas Santa Fe WB to I-5	700	460 (460)	470 (470)	950	460 (410)	470 (420)
Lomas Santa Fe EB to I-5		480 (480)	490 (490)		530 (480)	550 (500)
Manchester Avenue	160	220 (220)	240 (240)	170	190 (190)	200 (200)
Birmingham Drive	580	500 (500)	530 (530)	450	430 (380)	430 (380)
Santa Fe Drive	480	560 (560)	590 (590)	590	670 (620)	700 (650)
Encinitas Blvd	640	770 (770)	800 (800)	880	960 (910)	1000 (950)
Leucadia Blvd	560	780 (780)	850 (850)	650	870 (820)	900 (850)
La Costa Avenue	660	820 (820)	850 (850)	660	870 (820)	900 (850)
Poinsettia Lane	480	820 (820)	900 (900)	420	750 (700)	820 (770)
Palomar Airport Road	1100	1720 (1620)	1750 (1650)	1800	2170 (1970)	2200 (2000)
Cannon Road	700	870 (870)	880 (880)	1050	1300 (1250)	1320 (1270)
Tamarack Avenue	520	530 (530)	540 (540)	410	640 (590)	650 (600)
Carlsbad Village Drive	480	590 (590)	600 (600)	550	660 (610)	670 (620)
Las Flores Drive	370	490 (390)	500 (400)	610	750 (600)	780 (630)
SR-78	1820	2490	2480	1850	2550	2620
California Street	200	250 (250)	250 (250)	180	280 (280)	300 (300)
Oceanside Blvd	450	490 (440)	500 (450)	440	580 (480)	600 (500)
Mission Avenue	400	790 (750)	800 (750)	300	450 (400)	450 (400)
SR-76	1600	2150 (1950)	2200 (2000)	950	1650 (1550)	1650 (1550)

volumes are in vehicles per hour
xxx (xxx) = on ramp peak hour volume (on ramp meter rate)
xxx = on ramp peak hour volume only

Table 3.33 Southbound Ramp Meter Rates

Interchange	AM Peak			PM Peak		
	Existing On Ramp Volumes	2030 8+4 On Ramp Volumes	2030 10+4 On Ramp Volumes	Existing On Ramp Volumes	2030 8+4 On Ramp Volumes	2030 10+4 On Ramp Volumes
Harbor Drive	930	1200 (1100)	1200 (1100)	1600	2000 (1850)	2000 (1850)
SR-76	1560	2400 (2100)	2500 (2200)	910	1780 (1680)	1900 (1800)
Mission Avenue WB to I-5	850	1400 (1350)	1450 (1400)	710	1560 (1510)	1600 (1550)
Mission Avenue EB to I-5	370			450		
Oceanside Blvd	1150	1220 (1170)	1300 (1250)	830	950 (900)	1000 (950)
Cassidy Street	370	430 (380)	450 (400)	290	390 (340)	420 (370)
SR-78	2110	3120	3600	2360	2040	2500
Las Flores Drive	230	310 (260)	330 (280)	180	230 (180)	250 (200)
Carlsbad Village Drive	570	660 (585)	730 (655)	620	740 (690)	750 (700)
Tamarack Avenue	850	870 (795)	900 (825)	560	830 (780)	850 (800)
Cannon Road	320	540 (465)	600 (525)	600	860 (810)	950 (900)
Palomar Airport Road WB to I-5	750	2150 (1950)	2200 (2000)	1000	2250 (1950)	2300 (2000)
Palomar Airport Road EB to I-5	280	390 (340)	400 (350)	340	490 (440)	500 (450)
Poinsettia Lane	620	750 (700)	800 (750)	690	1030 (955)	1100 (1025)
La Costa Avenue	890	1050 (975)	1150 (1075)	720	830 (780)	900 (850)
Leucadia Blvd	580	780 (730)	900 (850)	520	780 (730)	900 (850)
Encinitas Blvd	680	760 (710)	800 (750)	720	850 (800)	900 (850)
Santa Fe Drive	460	580 (530)	600 (550)	420	490 (490)	500 (500)
Birmingham Drive	1000	860 (810)	900 (850)	440	440 (440)	450 (450)
Manchester Avenue	1200	1300 (1200)	1350 (1250)	1050	1130 (1080)	1170 (1120)
Lomas Santa Fe WB to I-5	700	370 (320)	390 (340)	690	370 (320)	390 (340)
Lomas Santa Fe EB to I-5		430 (380)	430 (380)		410 (360)	410 (360)
Via de la Valle WB to I-5	670	790 (740)	800 (750)	520	740 (690)	750 (700)
Via de la Valle EB to I-5	910	980 (930)	980 (930)	760	810 (760)	820 (770)
Del Mar Heights Road WB to I-5	900	790 (740)	790 (740)	600	580 (530)	600 (550)
Del Mar Heights Road EB to I-5	630	1190 (1115)	1250 (1175)	540	770 (720)	800 (750)
Carmel Valley Road	1320	1400 (1300)	1400 (1300)	1000	1050 (1000)	1050 (1000)

Table 3.33 Southbound Ramp Meter Rates (continued)

Interchange	AM Peak			PM Peak		
	Existing On Ramp Volumes	2030 8+4 On Ramp Volumes	2030 10+4 On Ramp Volumes	Existing On Ramp Volumes	2030 8+4 On Ramp Volumes	2030 10+4 On Ramp Volumes
SR-56 WB to I-5 SB Bypass	2000	4000 (3500)	4000 (3500)	1400	2000 (1800)	2000 (1800)
Carmel Mountain Road	DNE*	1120 (1045)	1120 (1045)	DNE*	880 (830)	880 (830)
Roselle Street	1150	1330 (1280)	1330 (1280)	1780	1800 (1700)	1800 (1700)
Genesee Avenue	600	480 (430)	540 (490)	1700	2100 (2000)	2100 (2000)

volumes are in vehicles per hour
xxx (xxx) = on ramp peak hour volume (on ramp meter rate)
xxx = on ramp peak hour volume only
*DNE (Does Not Exist) – southbound Carmel Mountain Road on ramp does not exist under existing conditions
**No ramp meter, on ramp traffic is free flow

3.7.2.1 Weaving with Ramp Metering

LOS D weaving was reassessed using recommended future ramp meter rates as presented in Tables 3.34 and 3.35 for the northbound and southbound directions, respectively. Freeway segments with the word "over" denote a segment that failed, exceeding the LOS D weaving limits. Segments marked "under" are operating at a LOS of D or possibly better according to the LOS D method.

Table 3.34 Northbound LOS D Weaving Conditions with Ramp Metering

Freeway Segment		2030 8+4		2030 10+4	
From	To	AM Peak	PM Peak	AM Peak	PM Peak
La Jolla Village Drive	Genesee Avenue	**Over**	Under	**Over**	Under
Del Mar Heights Road	Via de la Valle	**Under**	**Over**	Under	**Over**
Via de la Valle	Lomas Santa Fe	Under	**Over**	Under	**Over**
Lomas Santa Fe	Manchester Avenue	Under	**Over**	Under	**Over**
Manchester Avenue	Birmingham Drive	Under	**Over**	Under	**Under**
Birmingham Drive	Santa Fe Drive	Under	**Over**	Under	Under
Santa Fe Drive	Encinitas Blvd	Under	**Under**	Under	**Over**
Encinitas Blvd	Leucadia Blvd	Under	**Under**	Under	**Under**
Leucadia Blvd	La Costa Avenue	Under	**Over**	Under	**Over**
La Costa Avenue	Poinsettia Lane	Under	Under	Under	Under
Poinsettia Lane	Palomar Airport Road	**Over**	**Over**	**Over**	**Over**
Palomar Airport Road	Cannon Road	Under	**Over**	Under	**Over**
Cannon Road	Tamarack Avenue	Under	**Under**	Under	**Under**
Tamarack Avenue	Carlsbad Village Drive	Under	**Over**	Under	**Under**
Carlsbad Village Drive	Las Flores Drive	Under	**Under**	Under	Under
Las Flores Drive	SR-78	Under	**Over**	Under	**Over**
SR-78	California Street	Under	Under	Under	Under
California Street	Oceanside Blvd	Under	**Over**	Under	Under
Oceanside Blvd	Mission Avenue	**Under**	**Over**	**Over**	**Over**
Mission Avenue	SR-76	Under	**Over**	Under	**Over**
SR-76	Harbor Drive	**Over**	Under	**Over**	Under

*Segments that improved from "over" to "under" are designated in bold green text

Table 3.35 Southbound LOS D Weaving Conditions with Ramp Metering

Freeway Segment		2030 8+4		2030 10+4	
From	To	AM Peak	PM Peak	AM Peak	PM Peak
Harbor Drive	SR-76	Under	**Over**	Under	**Over**
SR-76	Mission Avenue	**Over**	Under	**Over**	**Over**
Mission Avenue	Oceanside Blvd	Under	Under	Under	Under
Oceanside Blvd	Cassidy Street	Under	Under	Under	Under
Cassidy Street	SR-78	Under	Under	Under	Under
SR-78	Las Flores Drive	Under	Under	**Under**	Under
Las Flores Drive	Carlsbad Village Drive	**Under**	Under	Under	Under
Carlsbad Village Drive	Tamarack Avenue	**Over**	**Over**	**Under**	Under
Tamarack Avenue	Cannon Road	**Under**	Under	Under	Under
Cannon Road	Palomar Airport Road	**Over**	**Over**	**Over**	**Over**
Palomar Airport Road	Poinsettia Lane	**Over**	**Over**	**Over**	**Over**
Poinsettia Lane	La Costa Avenue	**Under**	**Under**	Under	**Over**
La Costa Avenue	Leucadia Blvd	**Under**	**Under**	**Under**	**Under**
Leucadia Blvd	Encinitas Blvd	**Under**	**Under**	**Under**	Under
Encinitas Blvd	Santa Fe Drive	**Under**	**Under**	Under	Under
Santa Fe Drive	Birmingham Drive	**Under**	**Under**	Under	Under
Birmingham Drive	Manchester Avenue	**Under**	Under	Under	Under
Manchester Avenue	Lomas Santa Fe	**Under**	**Under**	**Under**	Under
Lomas Santa Fe	Via de la Valle	**Under**	**Under**	**Under**	Under
Via de la Valle	Del Mar Heights Road	Under	Under	Under	Under
Genesee Avenue	La Jolla Village Drive	Under	**Over**	Under	**Over**

*Segments that improved from "over" to "under" are designated in bold green text

4 Freeway Interchange Operations

The *Freeway Interchange Operations Report* (Technical Report No. 6) prepared by Wilson & Company provides operations analysis for fifty one (51) interchange ramp intersections and twenty five (25) arterial intersections within close proximity to the I-5 North Coast corridor. Figure 4.1 displays the study area intersections for the I-5 North Coast Corridor. The study area intersections are identified by a letter/number combination.

The forecasted traffic volumes for the Years 2015 and 2030 were used to provide the analysis results. The following sections summarize key aspects of the traffic performance and the methodologies that were utilized in this study:

4.1 Ramp intersection capacity analysis (ILV Method)
4.2 Intersection operations analysis (HCM Method)
4.3 Ramp metering analysis (CMP Method)

To improve capacity and alleviate congestion at the interchanges, it has been recommended to make modifications to a number of existing interchanges within the project limits. Table 4.5 is a list of the existing interchanges and their proposed modifications associated with the Project improvements that apply to both the 8+4 and 10+4 alternatives.

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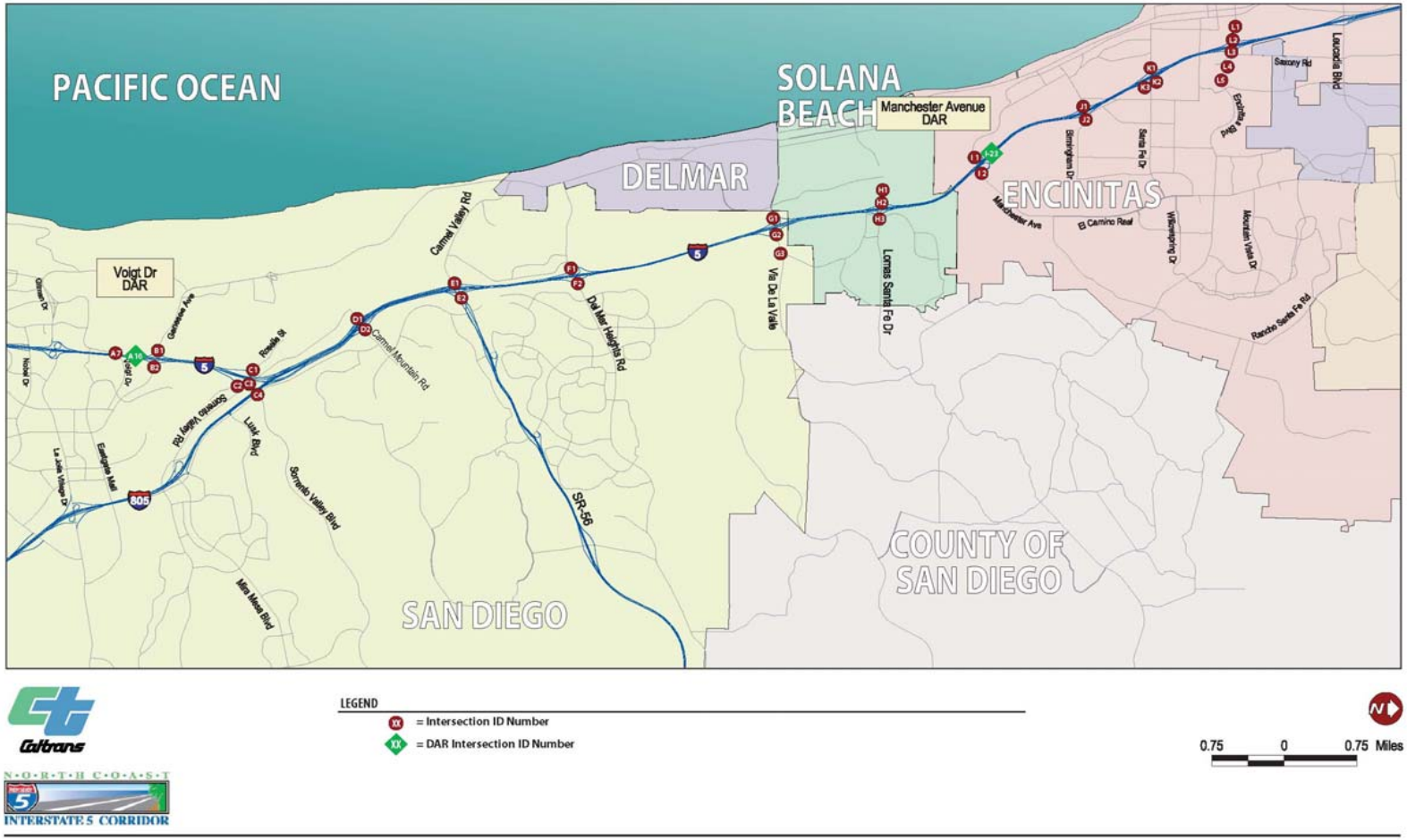

Figure 4.1 Study Area Intersections (Page 1of 2)

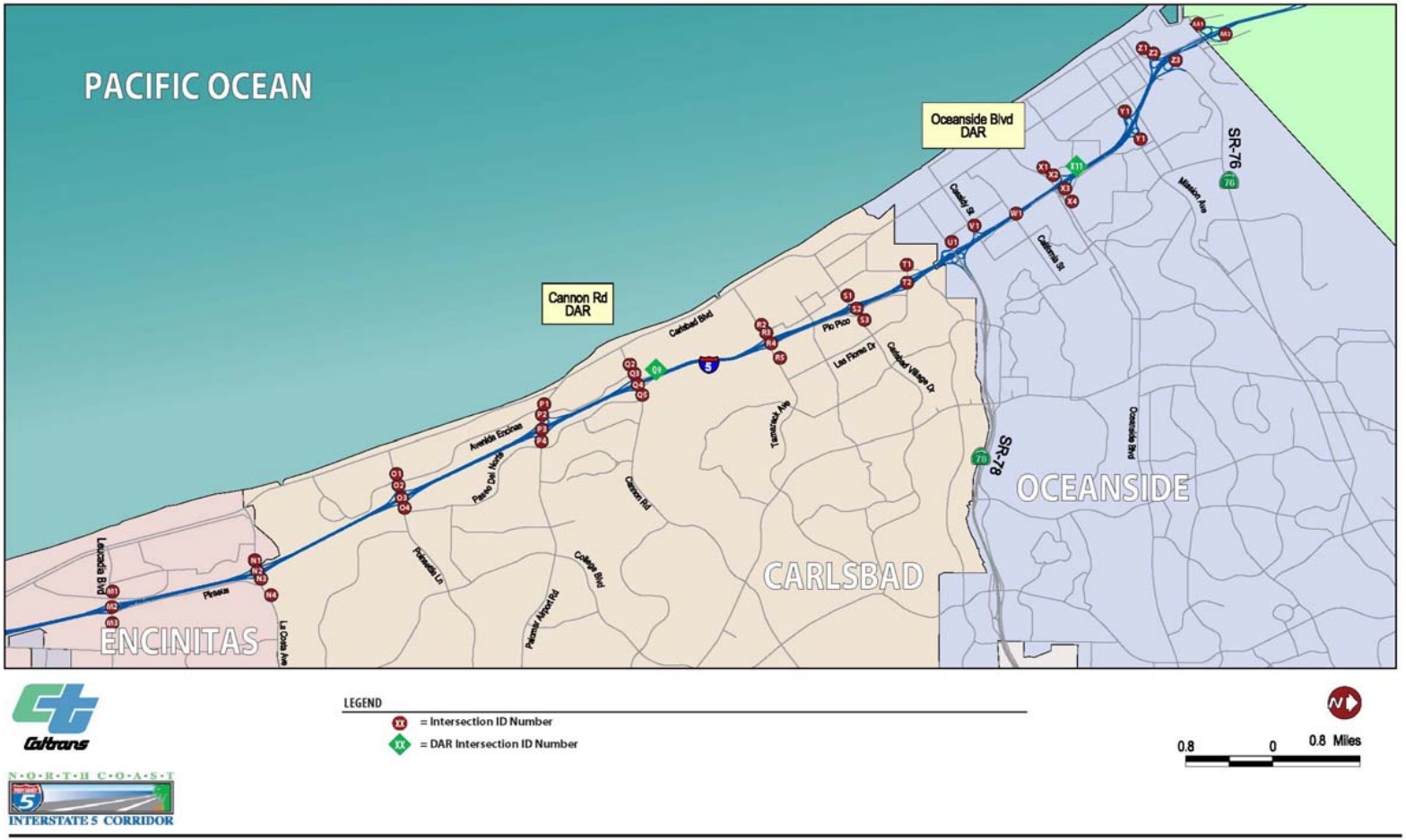

Figure 4.1 Study Area Intersections (Page 2 of 2)

Table 4.1 ILV Ramp Intersection Capacity Analysis – AM Peak Hour

Interchange	ID	Location	Existing		Year 2015 10+4 with DAR		Year 2030 No-Build		Year 2030 10+4 without DAR			Year 2030 10+4 with DAR			Year 2030 8+4 with DAR		
			ILV/Hour	Capacity	ILV/Hour	Capacity	ILV/Hour	Capacity	ILV/Hour	Capacity	Δ	ILV/Hour	Capacity	Δ	ILV/Hour	Capacity	Δ
La Jolla Village Dr	A5	La Jolla Village Dr / I-5 SB Ramps	1,063	Under	1,013	Under	1,217	At	1,297	At	80	1,183	Under	-34	1,083	Under	-134
	A6	La Jolla Village Dr / I-5 NB Ramps	**1,843**	**Over**	913	Under	1,048	Under	1,205	At	157	1,050	Under	2	975	Under	-73
Genesee Ave	B1	Genesee Ave / I-5 SB Ramps	1,496	At	1,383	At	1,377	At	1,373	At	**-4**	1,352	At	**-25**	1,102	Under	-275
	B2	Genesee Ave / I-5 NB Ramps	**1,782**	**Over**	1,912	Over	1,403	At	**1,733**	**Over**	**330**	**1,557**	**Over**	**154**	**1,508**	**Over**	105
Carmel Mtn Rd	D1	Carmel Mtn Rd / I-5 SB Ramps Bypass	N/A	N/A	1,440	At	**1,705**	**Over**	**1,705**	**Over**	**0**	**1,705**	**Over**	**0**	1,090	Under	-615
	D2	Carmel Mtn Rd / I-5 NB Ramps Bypass	N/A	N/A	1,240	At	1,455	At	1,455	At	**0**	1,455	At	**0**	1,065	Under	-390
Carmel Valley Rd	E1	Carmel Valley Rd / I-5 SB Ramps	1,142	Under	1,160	Under	1,220	At	1,180	Under	**-40**	1,180	Under	**-40**	885	Under	-335
	E2	Carmel Valley Rd / I-5 NB Ramps	1,413	At	725	Under	922	Under	913	Under	**-9**	913	Under	**-9**	795	Under	-127
Del Mar Heights Rd	F1	Del Mar Heights Rd / I-5 SB Ramps	883	Under	980	Under	1,070	Under	1,047	Under	**-23**	1,047	Under	**-23**	948	Under	-122
	F2	Del Mar Heights Rd / I-5 NB Ramps	1,111	Under	1,490	At	**1,610**	**Over**	**1,650**	**Over**	**40**	**1,650**	**Over**	**40**	1,488	At	-122
Via De La Valle	G2	Via De La Valle / I-5 SB Ramps	896	Under	953	Under	1,010	Under	1,017	Under	**7**	1,017	Under	**7**	1,005	Under	-5
	G3	Via De La Valle / I-5 NB Ramps	1,058	Under	1,320	At	1,370	At	1,385	At	**15**	1,385	At	**15**	1,370	At	0
Lomas Santa Fe Dr	H2	Lomas Santa Fe / I-5 SB Ramps	1,402	At	1,035	Under	1,030	Under	1,100	Under	**70**	1,100	Under	**70**	1,045	Under	15
	H3	Lomas Santa Fe / I-5 NB Ramps	1,236	At	1,258	At	1,393	At	1,415	At	**22**	1,415	At	**22**	1,500	At	107
Manchester Ave	I1	Manchester Blvd / I-5 SB Ramps	N/A	N/A	870	Under	N/A	N/A	816	Under	**N/A**	1,103	Under	**N/A**	1,005	Under	N/A
	I2	Manchester Blvd / I-5 NB Ramps	991	Under	924	Under	1,380	At	1,098	Under	**-282**	1,060	Under	**-320**	1,029	Under	-351
Santa Fe Dr	K2	Santa Fe Dr / I-5 NB Ramps	1,017	Under	813	Under	843	Under	1,063	Under	220	953	Under	110	877	Under	34
Encinitas Blvd	L2	Encinitas Blvd / I-5 SB Ramps	1,409	At	1,250	At	**1,635**	**Over**	1,460	At	**-175**	1,415	At	**-220**	1,375	At	-260
	L3	Encinitas Blvd / I-5 NB Ramps	1,174	Under	1,120	Under	1,380	At	1,330	At	**-50**	1,300	At	**-80**	1,270	At	-110
Leucadia Blvd	M2	Leucadia Blvd / I-5 SB Ramps	809	Under	940	Under	750	Under	1,010	Under	**260**	1,000	Under	**250**	875	Under	125
	M3	Leucadia Blvd / I-5 NB Ramps	770	Under	1,053	Under	123	Under	1,159	Under	**1036**	1,270	At	**1147**	1,055	Under	932
La Costa Ave	N1	La Costa Ave / I-5 SB Ramps	1,030	Under	1,255	At	1,270	At	1,345	At	**75**	1,345	At	**75**	1,375	At	105
	N2	La Costa Ave / I-5 NB Ramps	939	Under	1,110	Under	940	Under	1,210	At	**270**	1,210	At	**270**	1,150	Under	210
Poinsettia Ln	O2	Poinsettia Ln / I-5 SB Ramps	675	Under	660	Under	690	Under	750	Under	**60**	750	Under	**60**	700	Under	10
	O3	Poinsettia Ln / I-5 NB Ramps	764	Under	1,100	Under	1,030	Under	1,275	At	**245**	1,275	At	**245**	1,170	Under	140
Palomar Airport Rd	P2	Palomar Airport Road / I-5 SB Ramps	1,181	Under	1,180	Under	1,185	Under	1,370	At	**185**	1,250	At	**65**	1,210	At	25
Palomar Airport Rd	P3	Palomar Airport Road / I-5 NB Ramps	**1,568**	**Over**	2,003	Over	**2,118**	**Over**	**2,405**	**Over**	**287**	**2,233**	**Over**	**115**	**2,227**	**Over**	109
Cannon Rd	Q3	Cannon Rd / I-5 SB Ramps	837	Under	995	Under	1,160	Under	1,285	At	**125**	1,150	Under	**-10**	1,090	Under	-70
	Q4	Cannon Rd / I-5 NB Ramps	838	Under	1,045	Under	1,230	At	1,285	At	**55**	1,200	Under	**-30**	1,115	Under	-115
Tamarack Ave	R3	Tamarack Ave / I-5 SB Ramps	1,052	Under	910	Under	1,075	Under	960	Under	**-115**	960	Under	**-115**	930	Under	-145
	R4	Tamarack Ave / I-5 NB Ramps	1,137	Under	975	Under	1,240	At	1,060	Under	**-180**	1,060	Under	**-180**	1,050	Under	-190
Carlsbad Village Dr	S1	Carlsbad Blvd / I-5 SB Ramps	909	Under	960	Under	1,195	Under	1,105	Under	**-90**	1,105	Under	**-90**	1,025	Under	-170
	S2	Carlsbad Blvd / I-5 NB Ramps	1,136	Under	1,165	Under	1,300	At	1,315	At	**15**	1,315	At	**15**	1,275	At	-25
Oceanside Blvd	X2	Oceanside Blvd / I-5 SB Ramps	1,349	At	1,290	At	1,490	At	**1,630**	**Over**	**140**	1,480	At	**-10**	1,410	At	-80
	X3	Oceanside Blvd / I-5 NB Ramps	911	Under	930	Under	1,035	Under	1,075	Under	**40**	1,015	Under	**-20**	1,005	Under	-30
Mission Ave	Y1	Mission Ave / I-5 SB Ramps	653	Under	1,110	Under	830	Under	1,310	At	**480**	1,310	At	**480**	1,210	At	380
	Y2	Mission Ave / I-5 NB Ramps	1,356	At	1,114	Under	995	Under	1,317	At	**322**	1,296	At	**301**	1,277	At	282

Table 4.1 ILV Ramp Intersection Capacity Analysis – AM Peak Hour

Interchange	ID	Location	Existing		Year 2015 10+4 with DAR		Year 2030 No-Build		Year 2030 10+4 without DAR			Year 2030 10+4 with DAR			Year 2030 8+4 with DAR		
			ILV/Hour	Capacity	ILV/Hour	Capacity	ILV/Hour	Capacity	ILV/Hour	Capacity	Δ	ILV/Hour	Capacity	Δ	ILV/Hour	Capacity	Δ
SR-76	**Z2**	SR 76 / I-5 SB Ramps	842	Under	1,430	At	1,350	At	**1,645**	**Over**	**295**	**1,645**	**Over**	**295**	**1,585**	**Over**	235
SR-76	**Z3**	SR 76 / I-5 NB Ramps	930	Under	1,405	At	**1,630**	**Over**	**1,555**	**Over**	**-75**	**1,555**	**Over**	**-75**	**1,520**	**Over**	-110
Harbor Dr	**AA1**	Harbor/ I-5 SB Ramps	1,186	Under	1,130	Under	1,340	At	1,285	At	**-55**	1,285	At	**-55**	1,385	At	45
	AA2	Harbor/ I-5 NB Ramps	907	Under	1,492	At	1,345	At	**1,620**	**Over**	**275**	**1,620**	**Over**	**275**	**1,560**	**Over**	215

Source: Wilson & Company, August 2007

Notes:

Bold Letters: *Indicate intersections operating Over capacity*

Δ: *Indicates the change in ILV/Hour from the Year 2030 Build scenario to the Year 2030 No-Build Scenario*

Green Cells: *Indicate that the ramp intersection level of operation improves from over capacity under the Year 2030 No-Build scenario to at or under capacity under the highlighted Year 2030 Build scenario*

Red Cells: *Indicate that the signalized ramp intersection level of operation changes from under or at capacity under the Year 2030 No-Build scenario to over capacity in the highlighted Year 2030 Build condition*

N/A: *Intersection does not exist*

Table 4.2 ILV Ramp Intersection Capacity Analysis – PM Peak Hour

Interchange	ID	Location	Existing		Year 2015 10+4 with DAR		Year 2030 No-Build		Year 2030 10+4 without DAR			Year 2030 10+4 with DAR			Year 2030 8+4 with DAR		
			ILV/Hour	Capacity	ILV/Hour	Capacity	ILV/Hour	Capacity	ILV/Hour	Capacity	Δ	ILV/Hour	Capacity	Δ	ILV/Hour	Capacity	Δ
La Jolla Village Dr	**A5**	La Jolla Village Dr / I-5 SB Ramps	808	Under	630	Under	937	Under	872	Under	-65	792	Under	-145	720	Under	-217
	A6	La Jolla Village Dr / I-5 NB Ramps	1,293	At	670	Under	872	Under	1,058	Under	186	947	Under	75	768	Under	-104
Genesee Ave	**B1**	Genesee Ave / I-5 SB Ramps	1,416	At	**2,095**	**Over**	**1,815**	**Over**	**2,070**	**Over**	**255**	**1,815**	**Over**	**0**	**2,375**	**Over**	560
Genesee Ave	**B2**	Genesee Ave / I-5 NB Ramps	**1,603**	**Over**	**2,232**	**Over**	1,460	At	**2,133**	**Over**	**673**	**1,753**	**Over**	**293**	**2,030**	**Over**	570
Carmel Mtn Rd	**D1**	Carmel Mtn Rd / I-5 SB Ramps Bypass	**N/A**	N/A	1,413	At	**1,625**	**Over**	**1,630**	**Over**	**5**	**1,630**	**Over**	**5**	**1,630**	**Over**	5
	D2	Carmel Mtn Rd / I-5 NB Ramps Bypass	**N/A**	N/A	**1,725**	**Over**	**1,955**	**Over**	**2,005**	**Over**	**50**	**2,005**	**Over**	**50**	**2,005**	**Over**	50
Carmel Valley Rd	**E1**	Carmel Valley Rd / I-5 SB Ramps	1,123	Under	890	Under	955	Under	950	Under	**-5**	950	Under	**-5**	948	Under	-7
	E2	Carmel Valley Rd / I-5 NB Ramps	1,388	At	838	Under	838	Under	903	Under	**65**	903	Under	**65**	868	Under	30
Del Mar Heights Rd	**F1**	Del Mar Heights Rd / I-5 SB Ramps	947	Under	1,015	Under	1,075	Under	1,095	Under	**20**	1,095	Under	**20**	1,115	Under	40
	F2	Del Mar Heights Rd / I-5 NB Ramps	1,371	At	1,310	At	**1,528**	**Over**	1,495	At	**-33**	1,495	At	**-33**	1,445	At	-83
Via De La Valle	**G2**	Via De La Valle / I-5 SB Ramps	882	Under	958	Under	1,060	Under	1,107	Under	**47**	1,107	Under	**47**	1,070	Under	10
	G3	Via De La Valle / I-5 NB Ramps	968	Under	1,225	At	1,293	At	1,367	At	**74**	1,367	At	**74**	1,335	At	42
Lomas Santa Fe Dr	**H2**	Lomas Santa Fe / I-5 SB Ramps	**1,515**	**Over**	1,310	At	1,295	At	1,405	At	**110**	1,405	At	**110**	1,315	At	20
	H3	Lomas Santa Fe / I-5 NB Ramps	1,343	At	1,355	At	1,438	At	1,433	At	**-5**	1,433	At	**-5**	1,470	At	32
Manchester Ave	**I1**	Manchester Blvd / I-5 SB Ramps	**N/A**	N/A	475	Under	**N/A**	N/A	728	Under	**N/A**	708	Under	**N/A**	653	Under	N/A
	I2	Manchester Blvd / I-5 NB Ramps	1,232	At	1,137	Under	1,495	At	1,287	At	**-208**	1,232	At	**-263**	1,182	Under	-313
Santa Fe Dr	**K2**	Santa Fe Dr / I-5 NB Ramps	617	Under	823	Under	912	Under	1,143	Under	231	960	Under	48	860	Under	-52
Encinitas Blvd	**L2**	Encinitas Blvd / I-5 SB Ramps	**1,565**	**Over**	**1,525**	**Over**	**1,635**	**Over**	**1,765**	**Over**	**130**	**1,730**	**Over**	**95**	**1,635**	**Over**	0
	L3	Encinitas Blvd / I-5 NB Ramps	1,413	At	1,350	At	1,500	At	**1,540**	**Over**	**40**	1,500	At	**0**	1,440	At	-60
Leucadia Blvd	**M2**	Leucadia Blvd / I-5 SB Ramps	825	Under	1,140	Under	1,038	Under	1,218	At	**180**	1,210	At	**172**	875	Under	-163

Table 4.2 ILV Ramp Intersection Capacity Analysis – PM Peak Hour

Interchange	ID	Location	Existing		Year 2015 10+4 with DAR		Year 2030 No-Build		Year 2030 10+4 without DAR			Year 2030 10+4 with DAR			Year 2030 8+4 with DAR		
			ILV/Hour	Capacity	ILV/Hour	Capacity	ILV/Hour	Capacity	ILV/Hour	Capacity	Δ	ILV/Hour	Capacity	Δ	ILV/Hour	Capacity	Δ
	M3	Leucadia Blvd / I-5 NB Ramps	1,066	Under	1,120	Under	1,215	At	1,160	Under	**-55**	1,250	At	**35**	1,205	At	-10
La Costa Ave	N1	La Costa Ave / I-5 SB Ramps	814	Under	960	Under	1,075	Under	1,080	Under	**5**	1,080	Under	**5**	1,045	Under	-30
	N2	La Costa Ave / I-5 NB Ramps	1,018	Under	1,275	At	1,025	Under	1,390	At	**365**	1,390	At	**365**	1,315	At	290
Poinsettia Ln	O2	Poinsettia Ln / I-5 SB Ramps	868	Under	992	Under	1,070	Under	1,160	Under	**90**	1,160	Under	**90**	1,090	Under	20
	O3	Poinsettia Ln / I-5 NB Ramps	823	Under	1,102	Under	1,193	Under	1,290	At	**97**	1,290	At	**97**	1,185	Under	-8
Palomar Airport Rd	P2	Palomar Airport Road / I-5 SB Ramps	857	Under	1,083	Under	1,190	Under	1,325	At	**135**	1,210	At	**20**	1,175	Under	-15
	P3	Palomar Airport Road / I-5 NB Ramps	**1,780**	**Over**	**2,207**	**Over**	**2,343**	**Over**	**2,662**	**Over**	**319**	**2,443**	**Over**	**100**	**2,373**	**Over**	30
Cannon Rd	Q3	Cannon Rd / I-5 SB Ramps	223	Under	990	Under	1,010	Under	1,290	At	**280**	1,115	Under	**105**	1,020	Under	10
	Q4	Cannon Rd / I-5 NB Ramps	1,002	Under	1,148	Under	1,240	At	1,425	At	**185**	1,257	At	**17**	1,230	At	-10
Tamarack Ave	R3	Tamarack Ave / I-5 SB Ramps	903	Under	915	Under	1,175	Under	1,035	Under	**-140**	1,035	Under	**-140**	1,015	Under	-160
	R4	Tamarack Ave / I-5 NB Ramps	1,044	Under	1,025	Under	1,390	At	1,140	Under	**-250**	1,140	Under	**-250**	1,100	Under	-290
Carlsbad Village Dr	S1	Carlsbad Blvd / I-5 SB Ramps	1,185	Under	1,230	At	**1,620**	**Over**	**1,665**	**Over**	**45**	1,390	At	**-230**	1,380	At	-240
	S2	Carlsbad Blvd / I-5 NB Ramps	1,178	Under	1,300	At	1,395	At	1,465	At	**70**	1,465	At	**70**	1,425	At	30
Oceanside Blvd	X2	Oceanside Blvd / I-5 SB Ramps	1,150	Under	1,255	At	1,290	At	1,350	At	**60**	1,375	At	**85**	1,275	At	-15
	X3	Oceanside Blvd / I-5 NB Ramps	1,171	Under	1,340	At	1,285	At	**1,523**	**Over**	**238**	1,465	At	**180**	1,375	At	90
Mission Ave	Y1	Mission Ave / I-5 SB Ramps	818	Under	1,095	Under	1,150	Under	1,275	At	**125**	1,225	At	**75**	1,195	Under	45
	Y2	Mission Ave / I-5 NB Ramps	1,419	At	**1,700**	**Over**	750	Under	**2,152**	**Over**	**1402**	**1,837**	**Over**	**1087**	**1,817**	**Over**	1067
SR-76	Z2	SR 76 / I-5 SB Ramps	667	Under	1,290	At	1,325	At	1,450	At	**125**	1,450	At	**125**	1,375	At	50
	Z3	SR 76 / I-5 NB Ramps	860	Under	**1,580**	**Over**	**1,895**	**Over**	**1,755**	**Over**	**-140**	**1,755**	**Over**	**-140**	**1,660**	**Over**	-235
Harbor Dr	AA1	Harbor/ I-5 SB Ramps	**1,935**	**Over**	**1,650**	**Over**	**2,390**	**Over**	**1,845**	**Over**	**-545**	**1,845**	**Over**	**-545**	**1,845**	**Over**	-545
	AA2	Harbor/ I-5 NB Ramps	620	Under	940	Under	1,040	Under	1,145	Under	**105**	1,145	Under	**105**	1,070	Under	30

Source: Wilson & Company, August 2007

Notes:

Bold Letters: *Indicate intersections operating Over capacity*

Δ: *Indicates the change in ILV/Hour from the Year 2030 Build scenario to the Year 2030 No-Build Scenario*

Green Cells: *Indicate that the ramp intersection level of operation improves from over capacity under the Year 2030 No-Build scenario to at or under capacity under the highlighted Year 2030 Build scenario*

Red Cells: *Indicate that the signalized ramp intersection level of operation changes from under or at capacity under the Year 2030 No-Build scenario to over capacity in the highlighted Year 2030 Build condition*

N/A: *Intersection does not exist*

Table 4.3 Intersection Peak Hour Delay and Level of Service – AM Peak Hour

Interchange	ID	Key Intersection	Existing		Year 2015 10+4 with DAR		Year 2030 No-Build		Year 2030 10+4 without DAR			Year 2030 10+4 with DAR			Year 2030 8+4 with DAR		
			Delay (Sec)	LOS	Delay (Sec)	LOS	Delay (Sec)	LOS	Delay (Sec)	LOS	Δ	Delay (Sec)	LOS	Δ	Delay (Sec)	LOS	Δ
La Jolla Village Dr	A4	La Jolla Village Dr / Villa La Jolla	**69.9**	**E**	170.1	**F**	**187.8**	**F**	**192.9**	**F**	5.1	**170.3**	**F**	-17.5	**165.4**	**F**	-22.4
	A5	La Jolla Village Dr / I-5 SB Ramps	17.5	B	22.0	C	24.1	C	33.5	C	9.4	22.7	C	-1.4	22.7	C	-1.4
	A6	La Jolla Village Dr / I-5 NB Ramps	26.9	C	12.2	B	17.1	B	**83.0**	**F**	65.9	28.9	C	11.8	16.2	B	-0.9
Genesee Ave	B1	Genesee Ave / I-5 SB Ramps	**81.9**	**F**	47.0	D	**105.9**	**F**	**99.7**	**F**	-6.2	**86.1**	**F**	-19.8	**80.7**	**F**	-25.2
	B2	Genesee Ave / I-5 NB Ramps	**135.5**	**F**	44.2	D	43.4	D	**70.2**	**E**	26.8	**60.0**	**E**	16.6	41.1	D	-2.3
Roselle St	C1	Roselle St / I-5 SB On Ramp **	**-**	**F**	-	**F**	**-**	**F**	**-**	**F**	-	**-**	**F**	-	**-**	**F**	-
	C2	Roselle St / I-5 NB Off Ramp*	**162.2**	**F**	155.8	**F**	**-**	**F**	**-**	**F**	-	**-**	**F**	-	**-**	**F**	-
	C3	Roselle St / Sorrento Valley Blvd	**100.9**	**F**	5.4	A	20.5	C	23.7	C	3.2	23.7	C	3.2	24.7	C	4.2
	C4	Sorrento Valley Rd / Sorrento Valley Blvd	**285.0**	**F**	206.9	**F**	**393.3**	**F**	**416.3**	**F**	23.0	**416.0**	**F**	22.7	**326.0**	**F**	-67.3
Carmel Mtn Rd	D1	Carmel Mtn Rd I-5 / Bypass SB Ramps	**N/A**	N/A	50.6	D	**89.5**	**F**	**89.5**	**F**	0.0	**89.5**	**F**	0.0	**89.5**	**F**	0.0
	D2	Carmel Mtn Rd I-5 / Bypass NB Ramps	**N/A**	N/A	25.6	C	26.8	C	26.8	C	0.0	26.8	C	0.0	26.8	C	0.0
Carmel Valley Rd	E1	Carmel Valley Rd / I-5 SB Ramps	34.9	C	18.8	B	17.1	B	20.7	C	3.6	18.9	B	1.8	16.6	B	-0.5
	E2	Carmel Valley Rd / I-5 NB Ramps	23.5	C	13.9	B	16.1	B	19.5	B	3.4	17.3	B	1.2	19.1	B	3.0
Del Mar Heights Rd	F1	Del Mar Heights Rd / I-5 SB Ramps	10.9	B	16.8	B	13.5	B	12.3	B	-1.2	13.0	B	-0.5	17.4	B	3.9
	F2	Del Mar Heights Rd / I-5NB Ramps	31.3	C	46.3	D	**117.7**	**F**	**129.2**	**F**	11.5	**129.2**	**F**	11.5	**116.2**	**F**	-1.5
Via De La Valle	G1	Via De La Valle / I-5 SB Ramps	14.8	B	11.5	B	33.8	C	14.4	B	-19.4	14.4	B	-19.4	8.4	A	-25.4
	G2	Via De La Valle / I-5 NB Ramps	21.3	C	24.6	C	27.1	C	28.4	C	1.3	28.4	C	1.3	24.3	C	-2.8
	G3	Via De La Valle / Jimmy Durante Blvd	**72.3**	**E**	47.8	D	**66.2**	**E**	52.8	D	-13.4	52.8	D	-13.4	54.8	D	-11.4
Lomas Santa Fe Dr	H1	Lomas Santa Fe / Dr Solana Hills	16.4	B	25.5	C	21.9	C	22.6	C	0.7	22.6	C	0.7	21.8	C	-0.1
	H2	Lomas Santa Fe Dr / I-5 SB Ramps	35.4	D	16.9	B	14.4	B	17.5	B	3.1	17.5	B	3.1	14.3	B	-0.1
	H3	Lomas Santa Fe Dr / I-5 NB Ramps	29.4	C	33.1	C	34.4	C	37.2	D	2.8	37.2	D	2.8	31.4	C	-3.0
Manchester Ave	I1	Manchester Ave / I-5 NB Ramps	23.0	C	18.2	B	24.9	C	30.7	C	5.8	24.0	C	-0.9	16.4	B	-8.5
	I2	Manchester Ave * / I-5 SB Ramps	24.2	C	23.1	C	15.8	B	24.0	C	8.2	22.7	C	6.9	18.9	B	3.1
Birmingham Dr	J1	Birmingham Dr ** / I-5 SB Ramps	**-**	**F**	-	**F**	**-**	**F**	**-**	**F**	-	**-**	**F**	-	**-**	**F**	-
	J2	Birmingham Dr * / I-5 NB Ramps	**-**	**F**	-	**F**	**-**	**F**	**-**	**F**	-	**-**	**F**	-	**-**	**F**	-
Santa Fe Dr	K1	Santa Fe Dr ** / I-5 SB Ramps	**-**	**F**	-	**F**	**-**	**F**	**-**	**F**	-	**-**	**F**	-	**-**	**F**	-
	K2	Santa Fe Dr / I-5 NB On Ramp	8.1	A	9.8	A	9.7	A	6.0	A	-3.7	5.9	A	-3.8	5.8	A	-3.9
	K3	Santa Fe Dr / I-5 NB Ramps	47.6	D	52.1	D	44.0	D	53.6	D	9.6	53.1	D	9.1	50.6	D	6.6
Encinitas Blvd	L1	Encinitas Blvd / Driveway	43.2	D	17.8	B	21.5	C	18.6	B	-2.9	21.5	C	0.0	23.8	C	2.3
	L2	Encinitas Blvd / I-5 SB Ramps	**64.3**	**E**	33.7	C	30.9	C	39.7	D	8.8	39.0	D	8.1	34.4	C	3.5
	L3	Encinitas Blvd / I-5 NB Ramps	32.1	C	21.5	C	24.7	C	24.8	C	0.1	20.3	C	-4.4	20.2	C	-4.5
	L4	Encinitas Blvd / Saxony Rd	15.3	B	13.9	B	22.9	C	19.8	B	-3.1	19.1	B	-3.8	19.2	B	-3.7
	L5	Encinitas Blvd / Calle Magdallena	10.1	B	7.8	A	7.5	A	8.9	A	1.4	8.0	A	0.5	8.4	A	0.9
Leucadia Blvd	M1	Leucadia Blvd / Orpheus Ave	14.4	B	20.5	C	13.8	B	11.0	B	-2.8	11.0	B	-2.8	12.1	B	-1.7
	M2	Leucadia Blvd / I-5 SB Ramps	24.4	C	24.1	C	20.1	C	26.4	C	6.3	26.4	C	6.3	19.6	B	-0.5

Table 4.3 Intersection Peak Hour Delay and Level of Service – AM Peak Hour

Interchange	ID	Key Intersection	Existing		Year 2015 10+4 with DAR		Year 2030 No-Build		Year 2030 10+4 without DAR			Year 2030 10+4 with DAR			Year 2030 8+4 with DAR		
			Delay (Sec)	LOS	Delay (Sec)	LOS	Delay (Sec)	LOS	Delay (Sec)	LOS	Δ	Delay (Sec)	LOS	Δ	Delay (Sec)	LOS	Δ
	M3	Leucadia Blvd/Piraeus St / I-5 NB Ramps	17.7	B	33.9	C	32.9	C	33.7	C	0.8	33.7	C	0.8	24.6	C	-8.3
La Costa Ave	N1	La Costa Ave / I-5 SB Ramps	26.4	C	36.3	D	34.1	C	42.5	D	8.4	42.5	D	8.4	45.1	D	11.0
	N2	La Costa Ave / I-5 NB Ramps	14.3	B	32.2	C	16.6	B	28.2	C	11.6	28.2	C	11.6	23.8	C	7.2
	N3	La Costa Ave / Park and Ride	2.8	A	6.6	A	11.2	B	6.9	A	-4.3	6.9	A	-4.3	7.3	A	-3.9
	N4	La Costa Ave / Piraeus	8.4	A	23.9	C	33.3	C	29.0	C	-4.3	29.0	C	-4.3	30.1	C	-3.2
Poinsettia Ln	O1	Poinsettia Ln / Avenida Encinas	43.1	D	34.1	C	51.8	D	28.1	C	-23.7	28.1	C	-23.7	32.3	C	-19.5
	O2	Poinsettia Ln / I-5 SB Ramps	13.4	B	15.6	B	17.3	B	15.0	B	-2.3	15.0	B	-2.3	18.3	B	1.0
	O3	Poinsettia Ln / I-5 NB Ramps	10.3	B	18.8	B	14.4	B	15.4	B	1.0	15.8	B	1.4	19.1	B	4.7
	O4	Poinsettia Ln / Paseo Del Norte	33.4	C	34.6	C	**56.5**	**E**	47.6	D	-8.9	47.6	D	-8.9	41.5	D	-15.0
Palomar Airport Rd	P1	Palomar Airport Rd / Avenida Encinas	52.5	D	49.1	D	**117.2**	**F**	**136.5**	**F**	19.3	**104.7**	**F**	-12.5	**93.4**	**F**	-23.8
	P2	Palomar Airport Rd / I-5 SB Ramps	27.3	C	19.0	B	**88.5**	**F**	**248.0**	**F**	159.5	23.7	C	-64.8	15.6	B	-72.9
	P3	Palomar Airport Rd / I-5 NB Ramps	**68.2**	**E**	76.2	**E**	**98.9**	**F**	**148.8**	**F**	49.9	**99.9**	**F**	1.0	**102.6**	**F**	3.7
	P4	Palomar Airport Rd / Paseo del Norte	**58.4**	**E**	80.3	**F**	**137.1**	**F**	**187.8**	**F**	50.7	**133.3**	**F**	-3.8	**104.9**	**F**	-32.2
Cannon Rd	Q2	Cannon Rd / Avenida Encinas	35.7	D	35.1	D	39.1	D	43.3	D	4.2	37.7	D	-1.4	42.5	D	3.4
	Q3	Cannon Rd / I-5 SB Ramps	27.1	C	39.7	D	45.0	D	**77.8**	**E**	32.8	48.4	D	3.4	34.6	C	-10.4
	Q4	Cannon Rd / I-5 NB Ramps	25.2	C	22.4	C	34.6	C	37.0	D	2.4	37.5	D	2.9	44.7	D	10.1
Cannon Rd	Q5	Cannon Rd / Paseo Del Norte	13.5	B	66.9	**E**	**76.8**	**E**	**85.1**	**F**	8.3	**176.0**	**F**	99.2	**175.3**	**F**	98.5
Tamarack Ave	R2	Tamarack Ave / Jefferson St	30.9	C	38.1	D	53.3	D	41.6	D	-11.7	41.6	D	-11.7	44.0	D	-9.3
	R3	Tamarack Ave / I-5 SB Ramps	14.0	B	18.9	B	17.8	B	14.1	B	-3.7	14.1	B	-3.7	19.1	B	1.3
	R4	Tamarack Ave / I-5 NB Ramps	10.5	B	20.2	C	22.5	C	14.6	B	-7.9	14.6	B	-7.9	17.1	B	-5.4
	R5	Tamarack Ave / Pio Pico Dr	9.2	A	16.2	B	14.1	B	11.1	B	-3.0	11.1	B	-3.0	13.7	B	-0.4
Carlsbad Village Dr	S1	Carlsbad Village Dr / I-5 SB Ramps	16.8	B	22.1	C	13.7	B	20.7	C	7.0	20.7	C	7.0	16.8	B	3.1
	S2	Carlsbad Village Dr / I-5 NB Ramps	46.0	D	33.9	C	30.2	C	33.0	C	2.8	33.0	C	2.8	35.6	D	5.4
	S3	Carlsbad Village Dr / Pio Pico Dr	47.8	D	27.4	C	32.1	C	24.7	C	-7.4	24.7	C	-7.4	23.8	C	-8.3
Las Flores Dr	T1	Las Flores Dr * / *I-5 SB Ramps	4.3	A	12.9	B	9.4	A	11.1	B	1.7	11.1	B	1.7	9.2	A	-0.2
	T2	Las Flores Dr ** / I-5 NB Ramps	23.9	C	29.4	C	19.3	B	37.1	D	17.8	37.1	D	17.8	20.8	C	1.5
SR-78	U1	SR-78 / I-5 SB On-Ramps	24.4	C	34.5	C	13.2	B	12.3	B	-0.9	13.9	B	0.7	14.0	B	0.8
Cassidy St	V1	Cassidy St ** / I-5 SB Ramps	-	A	5.6	A	-	**F**	7.9	A	-	7.9	A	-	-	A	-
California	W1	California St * / I-5 NB Ramps	8.3	A	8.5	A	8.9	A	9.1	A	0.2	8.9	A	0.0	8.9	A	0.0
Oceanside Blvd	X1	Oceanside Blvd / Vine St	16.3	B	20.0	B	14.5	B	17.3	B	2.8	17.7	B	3.2	20.1	C	5.6
Oceanside Blvd	X2	Oceanside Blvd / I-5 SB Ramps	40.4	D	37.0	D	47.7	D	**76.1**	**E**	28.4	51.8	D	4.1	52.2	D	4.5
	X3	Oceanside Blvd / I-5 NB Ramps	22.3	C	30.8	C	33.4	C	30.0	C	-3.4	26.4	C	-7.0	25.0	C	-8.4
	X4	Oceanside Blvd / State Tree Dr	8.3	A	16.4	B	9.2	A	11.8	B	2.6	19.2	B	10.0	25.7	C	16.5
Mission Ave	Y1	Mission Ave / I-5 SB Ramps	16.4	B	25.5	C	19.6	B	36.1	D	16.5	27.7	C	8.1	25.9	C	6.3
	Y2	Mission Ave / I-5 NB Ramps	-	A	19.7	B	-	**F**	26.5	C	-	25.4	C	-	23.5	C	-
SR-76	Z1	Hill St / North Coast Highway	13.0	B	22.7	C	18.6	B	19.9	B	1.3	19.9	B	1.3	25.1	C	6.5

Table 4.3 Intersection Peak Hour Delay and Level of Service – AM Peak Hour

Interchange	ID	Key Intersection	Existing		Year 2015 10+4 with DAR		Year 2030 No-Build		Year 2030 10+4 without DAR			Year 2030 10+4 with DAR			Year 2030 8+4 with DAR		
			Delay (Sec)	LOS	Delay (Sec)	LOS	Delay (Sec)	LOS	Delay (Sec)	LOS	Δ	Delay (Sec)	LOS	Δ	Delay (Sec)	LOS	Δ
	Z2	SR-76 / I-5 SB Ramps	6.2	A	6.7	A	7.8	A	9.5	A	1.7	9.5	A	1.7	10.9	B	3.1
	Z3	SR-76 / I-5 NB Ramps	10.2	B	32.6	C	51.2	D	45.7	D	-5.5	44.3	D	-6.9	40.4	D	-10.8
Harbor Dr	AA1	Harbor Dr / I-5 SB Ramps	17.8	B	37.4	D	25.2	C	42.2	D	17.0	42.2	D	17.0	48.9	D	23.7
	AA2	Harbor Dr / I-5 NB On-Ramps	12.6	B	16.7	B	43.8	D	18.9	B	-24.9	18.9	B	-24.9	23.5	C	-20.3

Source: Wilson & Company, August 2007

Notes:
Bold Letters: *Indicate an intersection operating at E or F*
N/A: *Intersection does not exist*
*** *Four-way Stop Control*
**** *Two-way Stop Control*
- *Intersections in which a delay could not be computed due to HCM constraints*
Δ: *Indicates change in average intersection delay from the Year 2030 Build scenario to the Year 2030 No-Build scenario*
Green Cells: *indicate that an intersection operating at LOS D, E or F under the Year 2030 No-Build scenario would operationally improve by 15% or greater reduction in delay under the respective Year 2030 Build scenario*
Red Cells: *Indicate an intersection which operates at a LOS E or F under the highlighted scenario and have an increase in total delay greater than two seconds over the Year 2030 No-Build scenario.*

Table 4.4 Intersection Peak Hour Delay and Level of Service – PM Peak Hour

Interchange	ID	Key Intersection	Existing		Year 2015 10+4 with DAR		Year 2030 No-Build		Year 2030 10+4 without DAR			Year 2030 10+4 with DAR			Year 2030 8+4 with DAR		
			Delay (Sec)	LOS	Delay (Sec)	LOS	Delay (Sec)	LOS	Delay (Sec)	LOS	Δ	Delay (Sec)	LOS	Δ	Delay (Sec)	LOS	Δ
La Jolla Village Dr	A4	La Jolla Village Dr / Villa La Jolla	**58.3**	**E**	64.6	**E**	**102.2**	**F**	**94.2**	**F**	-8.0	**95.6**	**F**	-6.6	**71.9**	**E**	-30.3
	A5	La Jolla Village Dr / I-5 SB Ramps	13.9	B	15.7	B	11.3	B	12.3	B	1.0	11.9	B	0.6	16.9	B	5.6
	A6	La Jolla Village Dr / I-5 NB Ramps	14.8	B	9.7	A	18.6	B	30.8	C	12.2	11.8	B	-6.8	14.7	B	-3.9
Genesee Ave	B1	Genesee Ave / I-5 SB Ramps	**58.4**	**E**	77.3	**E**	**103.1**	**F**	**138.2**	**F**	35.1	**101.4**	**F**	-1.7	**107.8**	**F**	4.7
	B2	Genesee Ave / I-5 NB Ramps	**65.0**	**E**	92.2	**F**	**121.0**	**F**	**176.5**	**F**	55.5	**121.0**	**F**	0.0	**123.0**	**F**	2.0
Roselle St	C1	Roselle St / I-5 SB On Ramp **	**-**	**F**	-	**F**	**-**	**F**	**-**	**F**	-	**-**	**F**	-	**-**	**F**	-
Roselle St	C2	Roselle St / I-5 NB Off Ramp*	**111.2**	**F**	104.8	**F**	**-**	**F**	**-**	**F**	-	**-**	**F**	-	**-**	**F**	-
	C3	Roselle St / Sorrento Valley Blvd	**63.8**	**E**	5.8	A	**75.8**	**E**	**78.6**	**E**	2.8	**78.6**	**E**	2.8	**61.7**	**E**	-14.1
	C4	Sorrento Valley Rd / Sorrento Valley Blvd	**298.4**	**F**	159.5	**F**	**613.9**	**F**	**635.3**	**F**	21.4	**635.3**	**F**	21.4	**539.6**	**F**	-74.3
Carmel Mtn Rd	D1	Carmel Mtn Rd / I-5 Bypass SB Ramps	N/A	N/A	45.1	D	**73.4**	**E**	**96.2**	**F**	22.8	**96.2**	**F**	22.8	**96.2**	**F**	22.8
	D2	Carmel Mtn Rd / I-5 Bypass NB Ramps	N/A	N/A	55.7	**E**	**76.1**	**E**	**78.1**	**E**	2.0	**78.1**	**E**	2.0	**78.1**	**E**	2.0
Carmel Valley Rd	E1	Carmel Valley Rd / I-5 SB Ramps	30.3	C	24.9	C	17.2	B	17.6	B	0.4	16.1	B	-1.1	20.6	C	3.4
	E2	Carmel Valley Rd / I-5 NB Ramps	20.6	C	16.4	B	16.2	B	16.9	B	0.7	15.8	B	-0.4	16.9	B	0.7
Del Mar Heights Rd	F1	Del Mar Heights Rd / I-5 SB Ramps	15.4	B	11.3	B	13.9	B	12.5	B	-1.4	12.4	B	-1.5	14.8	B	0.9
	F2	Del Mar Heights Rd / I-5 NB Ramps	41.8	D	44.2	D	**85.6**	**F**	**80.5**	**F**	-5.1	**80.5**	**F**	-5.1	**78.4**	**E**	-7.2
Via De La Valle	G1	Via De La Valle / I-5 SB Ramps	31.0	C	13.5	B	19.5	B	15.2	B	-4.3	15.2	B	-4.3	21.7	C	2.2

Table 4.4 Intersection Peak Hour Delay and Level of Service – PM Peak Hour

Interchange	ID	Key Intersection	Existing		Year 2015 10+4 with DAR		Year 2030 No-Build		Year 2030 10+4 without DAR			Year 2030 10+4 with DAR			Year 2030 8+4 with DAR		
			Delay (Sec)	LOS	Delay (Sec)	LOS	Delay (Sec)	LOS	Delay (Sec)	LOS	Δ	Delay (Sec)	LOS	Δ	Delay (Sec)	LOS	Δ
	G2	Via De La Valle / I-5 NB Ramps	11.1	B	25.2	C	33.0	C	37.1	D	4.1	37.1	D	4.1	36.9	D	3.9
Via De La Valle	G3	Via De La Valle / Jimmy Durante Blvd	32.6	C	37.9	D	50.1	D	46.3	D	-3.8	46.3	D	-3.8	47.2	D	-2.9
Lomas Santa Fe Dr	H1	Lomas Santa Fe Dr / Solana Hills	17.3	B	26.1	C	21.7	C	20.4	C	-1.3	20.4	C	-1.3	21.3	C	-0.4
	H2	Lomas Santa Fe Dr / I-5 SB Ramps	46.3	D	24.0	C	21.5	C	32.5	C	11.0	32.5	C	11.0	23.7	C	2.2
	H3	Lomas Santa Fe Dr / I-5 NB Ramps	35.6	D	31.7	C	31.8	C	31.1	C	-0.7	31.1	C	-0.7	28.7	C	-3.1
Manchester Ave	I1	Manchester Ave / I-5 NB Ramps	20.5	C	138.5	F	38.3	D	35.5	D	-2.8	28.6	C	-9.7	10.3	B	-28.0
	I2	Manchester Ave * / I-5 SB Ramps	30.2	C	33.9	C	44.3	D	34.8	C	-9.5	28.4	C	-15.9	25.7	C	-18.6
Birmingham Dr	J1	Birmingham Dr ** / I-5 SB Ramps	103.6	F	-	F	-	F	-	F	-	-	F	-	-	F	-
	J2	Birmingham Dr * / I-5 NB Ramps	97.4	F	-	F	-	F	-	F	-	-	F	-	-	F	-
Santa Fe Dr	K1	Santa Fe Dr ** / I-5 SB Ramps	-	F	-	F	-	F	-	F	-	-	F	-	-	F	-
	K2	Santa Fe Dr / I-5 NB On Ramp	10.5	B	6.4	A	9.9	A	9.3	A	-0.6	9.4	A	-0.5	5.4	A	-4.5
	K3	Santa Fe Dr I-5 / NB Ramps	23.0	C	62.0	E	26.4	C	22.8	C	-3.6	22.6	C	-3.8	19.9	B	-6.5
Encinitas Blvd	L1	Encinitas Blvd / Driveway	49.2	D	23.2	C	27.5	C	30.3	C	2.8	34.2	C	6.7	29.2	C	1.7
	L2	Encinitas Blvd / I-5 SB Ramps	143.3	F	52.1	D	53.5	D	93.4	F	39.9	97.5	F	44.0	76.8	E	23.3
Encinitas Blvd	L3	Encinitas Blvd / I-5 NB Ramps	43.4	D	20.6	C	24.7	C	32.4	C	7.7	22.8	C	-1.9	20.3	C	-4.4
	L4	Encinitas Blvd / Saxony Rd	23.3	C	18.2	B	17.1	B	25.0	C	7.9	17.3	B	0.2	17.5	B	0.4
	L5	Encinitas Blvd / Calle Magdalena	17.1	B	11.8	B	14.3	B	16.2	B	1.9	12.6	B	-1.7	12.9	B	-1.4
Leucadia Blvd	M1	Leucadia Blvd / Orpheus Ave	15.2	B	29.0	C	24.9	C	20.1	C	-4.8	20.2	C	-4.7	14.3	B	-10.6
	M2	Leucadia Blvd / I-5 SB Ramps	21.1	C	24.8	C	17.8	B	24.4	C	6.6	24.0	C	6.2	15.0	B	-2.8
	M3	Leucadia Blvd/Piraeus / St I-5 NB Ramps	20.7	C	25.4	C	21.9	C	20.7	C	-1.2	20.7	C	-1.2	18.7	B	-3.2
La Costa Ave	N1	La Costa Ave / I-5 SB Ramps	27.2	C	34.8	C	28.8	C	29.5	C	0.7	29.5	C	0.7	31.2	C	2.4
	N2	La Costa Ave / I-5 NB Ramps	16.3	B	50.6	D	35.6	D	49.1	D	13.5	49.1	D	13.5	40.8	D	5.2
	N3	La Costa Ave / Park and Ride	2.8	A	6.6	A	9.3	A	5.9	A	-3.4	5.9	A	-3.4	5.3	A	-4.0
	N4	La Costa Ave / Piraeus	9.1	A	12.6	B	70.5	E	25.7	C	-44.8	25.7	C	-44.8	45.3	D	-25.2
Poinsettia Ln	O1	Poinsettia Ln / Avenida Encinas	37.0	D	35.0	C	48.5	D	63.2	E	14.7	63.2	E	14.7	51.7	D	3.2
	O2	Poinsettia Ln / I-5 SB Ramps	15.7	B	22.3	C	20.9	C	27.0	C	6.1	27.0	C	6.1	25.3	C	4.4
	O3	Poinsettia Ln / I-5 NB Ramps	14.7	B	23.9	C	27.3	C	29.7	C	2.4	29.7	C	2.4	26.5	C	-0.8
Poinsettia Ln	O4	Poinsettia Ln / Paseo Del Norte	51.9	D	55.8	E	59.1	E	68.2	E	9.1	68.2	E	9.1	56.0	E	-3.1
Palomar Airport Rd	P1	Palomar Airport Rd / Avenida Encinas	88.7	F	73.0	E	71.1	E	94.6	F	23.5	93.0	F	21.9	76.7	E	5.6
	P2	Palomar Airport Rd / I-5 SB Ramps	10.9	B	16.1	B	95.8	F	223.6	F	127.8	17.6	B	-78.2	17.6	B	-78.2
	P3	Palomar Airport Rd / I-5 NB Ramps	50.3	D	111.5	F	127.3	F	183.5	F	56.2	145.4	F	18.1	121.6	F	-5.7
	P4	Palomar Airport Rd / Paseo del Norte	116.8	F	255.7	F	243.3	F	287.6	F	44.3	269.6	F	26.3	225.7	F	-17.6
Cannon Rd	Q2	Cannon Rd / Avenida Encinas	112.2	F	28.1	C	38.8	D	38.2	D	-0.6	33.3	C	-5.5	43.3	D	4.5
	Q3	Cannon Rd / I-5 SB Ramps	17.0	B	22.2	C	33.3	C	45.7	D	12.4	31.8	C	-1.5	36.4	D	3.1
	Q4	Cannon Rd / I-5 NB Ramps	34.2	C	19.1	B	26.5	C	52.2	D	25.7	24.3	C	-2.2	29.4	C	2.9
	Q5	Cannon Rd / Paseo Del Norte	15.2	B	35.6	D	21.8	C	27.8	C	6.0	94.4	F	72.6	100.3	F	78.5

Table 4.4 Intersection Peak Hour Delay and Level of Service – PM Peak Hour

Interchange	ID	Key Intersection	Existing		Year 2015 10+4 with DAR		Year 2030 No-Build		Year 2030 10+4 without DAR			Year 2030 10+4 with DAR			Year 2030 8+4 with DAR		
			Delay (Sec)	LOS	Delay (Sec)	LOS	Delay (Sec)	LOS	Delay (Sec)	LOS	Δ	Delay (Sec)	LOS	Δ	Delay (Sec)	LOS	Δ
Tamarack Ave	R2	Tamarack Ave / Jefferson St	31.7	C	34.1	C	49.8	D	42.8	D	-7.0	42.8	D	-7.0	45.2	D	-4.6
	R3	Tamarack Ave / I-5 SB Ramps	14.2	B	23.6	C	20.1	C	17.0	B	-3.1	17.0	B	-3.1	20.2	C	0.1
	R4	Tamarack Ave / I-5 NB Ramps	15.8	B	22.5	C	29.5	C	19.2	B	-10.3	19.2	B	-10.3	19.7	B	-9.8
Tamarack Ave	R5	Pio Pico Dr / Tamarack Ave	9.6	A	15.6	B	15.2	B	10.1	B	-5.1	10.1	B	-5.1	15.2	B	0.0
Carlsbad Village Dr	S1	Carlsbad Village Dr / I-5 SB Ramps	20.6	C	24.1	C	40.3	D	31.1	C	-9.2	31.1	C	-9.2	28.9	C	-11.4
	S2	Carlsbad Village Dr / I-5 NB Ramps	49.2	D	33.4	C	32.5	C	45.8	D	13.3	45.8	D	13.3	39.3	D	6.8
	S3	Pio Pico Dr / Carlsbad Village	30.7	C	33.2	C	**56.2**	**E**	38.9	D	-17.3	38.9	D	-17.3	39.5	D	-16.7
Las Flores Dr	T1	Las Flores Dr ** / I-5 SB Ramps	12.5	B	102.2	**F**	44.7	D	**64.3**	**E**	19.6	**-**	**F**	-	**60.0**	**E**	15.3
	T2	Las Flores Dr ** / I-5 NB Ramps	**-**	**F**	-	**F**	**-**	**F**	**-**	**F**	-	**-**	**F**	-	**-**	**F**	-
SR-78	U1	SR-78 / I-5 SB On-Ramps	48.9	D	70.3	**E**	12.6	B	11.9	B	-0.7	13.2	B	0.6	12.6	B	0.0
Cassidy St	V1	Cassidy St ** / I-5 SB Ramps	**-**	A	6.4	A	**-**	**F**	13.6	B	-	13.6	B	-	**-**	A	-
California	W1	California St * / I-5 NB Ramps	8.3	A	8.9	A	9.0	A	9.4	A	0.4	9.3	A	0.3	9.2	A	0.2
Oceanside Blvd	X1	Oceanside Blvd / Vine St	36.5	D	10.8	B	9.6	A	14.5	B	4.9	12.0	B	2.4	12.4	B	2.8
	X2	Oceanside Blvd / I-5 SB Ramps	41.8	D	50.2	D	37.5	D	51.9	D	14.4	48.7	D	11.2	42.7	D	5.2
	X3	Oceanside Blvd / I-5 NB Ramps	36.1	D	46.0	D	40.7	D	**72.7**	**E**	32.0	43.1	D	2.4	42.3	D	1.6
	X4	Oceanside Blvd / State Tree	16.7	B	28.2	C	19.9	B	26.8	C	6.9	42.6	D	22.7	41.1	D	21.2
Mission Ave	Y1	Mission Ave / I-5 SB Ramps	29.7	C	30.5	C	**77.9**	**E**	**61.2**	**E**	-16.7	**55.9**	**E**	-22.0	53.8	D	-24.1
	Y2	Mission Ave / I-5 NB Ramps	**-**	A	30.8	C	**-**	**F**	33.4	C	-	32.2	C	-	31.3	C	-
SR-76	Z1	Hill St / North Coast Highway	22.6	C	39.1	D	50.6	D	51.2	D	0.6	51.2	D	0.6	50.3	D	-0.3
	Z2	SR-76 / I-5 SB Ramps	5.1	A	7.5	A	39.5	D	8.4	A	-31.1	8.4	A	-31.1	7.4	A	-32.1
	Z3	SR-76 / I-5 NB Ramps	8.3	A	74.3	**E**	**79.8**	**E**	**110.8**	**F**	31.0	**105.8**	**F**	26.0	**90.5**	**F**	10.7
Harbor Dr	AA1	Harbor Dr / I-5 SB Ramps	49.2	D	58.0	**E**	**150.1**	**F**	43.2	D	-106.9	43.2	D	-106.9	48.9	D	-101.2
	AA2	Harbor Dr / I-5 NB On-Ramps	7.5	A	15.8	B	12.4	B	18.9	B	6.5	18.9	B	6.5	23.5	C	11.1

Source: Wilson & Company, August 2007

Notes:

Bold Letters: *Indicate an intersection operating at E or F*

N/A: *Intersection does not exist*

* *Four-way Stop Control*

** *Two-way Stop Control*

\- *Intersections in which a delay could not be computed due to HCM constraints*

Δ: *Indicates change in average intersection delay from the Year 2030 Build scenario to the Year 2030 No-Build scenario*

Green Cells: *indicate that an intersection operating at LOS D, E or F under the Year 2030 No-Build scenario would operationally improve by 15% or greater reduction in delay under the respective Year 2030 Build scenario*

Red Cells: *Indicate an intersection which operates at a LOS E or F under the highlighted scenario and have an increase in total delay greater than two seconds over the Year 2030 No-Build scenario.*

Table 4.5 Proposed Interchange Improvements

Interchange	ID	Location	Proposed Lane Geometry Modifications
Del Mar Heights Rd	F1	I-5 SB Ramps / Del Mar Heights Rd	Ramp adjustments to remove free right turn capabilities
	F2	I-5 NB Ramps / Del Mar Heights Rd	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	G2	I-5 SB Ramps / Via De La Valle	Ramp adjustments to remove free right turn capabilities
	G3	I-5 NB Ramps / Via De La Valle	Ramp adjustments to remove free right turn capabilities
Encinitas Blvd	L2	I-5 SB Ramps / Encinitas Blvd	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 Rd	P2	I-5 SB Ramps / Palomar Airport Rd	Ramp adjustments to remove free right turn capabilities, addition of a WB right turn-lane (creating dual right turn-lanes)
Tamarack Dr	R3	I-5 SB Ramps / Tamarack Ave	Addition of a WB left turn-lane (creating dual lefts)
	R4	I-5 NB Ramps/ Tamarack Ave	Addition of a NB right turn-lane (creating dual right turn-lanes)
Carlsbad Village Dr	S1	I-5 SB Ramps / Carlsbad Village Dr	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).
Carlsbad Village Dr	S2	I-5 NB Ramps/ Carlsbad Village Dr	NB left turn-lane separated, right turn-lane converted to a shared left/through/right lane
Oceanside Blvd	X1	I-5 SB Ramps / Oceanside Blvd	Convert SB through/right turn-lane into two separate lanes
Mission Ave	Y1	I-5 SB Ramps / Mission Ave	Remove EB to SB on-ramp, add dual EB left turn-lanes, convert southbound through/left to an exclusive left turn-lane (creating dual lefts), convert the exclusive southbound right turn-lane to a shared through right turn-lane.
	Y2	I-5 NB Ramps/ Mission Ave	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	Z3	I-5 NB Ramps / SR-76	Ramp adjustments to remove free right turn capabilities, addition of a second NB left-turn lane (creating dual lefts)
Harbor Dr	AA1	I-5 SB Ramps / Harbor Dr	Ramp adjustments to remove free right turn capabilities
			Convert outside westbound through lane into an exclusive right-turn lane
			Convert inside westbound through lane into a shared through/right-turn lane
	AA2	I-5 NB On-Ramps / Harbor Dr	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 northbound shared through/right-turn lane into an exclusive through lane, eliminating the northbound right turn movement.

The report also contains recommendations to widen key freeway interchange on-ramps to provide additional storage capabilities. The on-ramp locations and the additional on ramp lanes provided by the proposed 8+4 and 10+4 alternatives are listed in Table 4.6.

Table 4.6 Ramp Storage Improvements

Interchange	ID	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	B1	Genesee Ave to SB I-5	1	0	1	2	1	3
	B2	Genesee Ave to NB I-5	1	0	1	2	1	3
Roselle Street	C1	Roselle St to SB I-5	1	0	1	2	1	3
Del Mar Heights Road	F1	EB Del Mar Heights Rd to SB I-5	1	1	2	2	1	3
	F1	WB Del Mar Heights Rd to SB I-5	1	0	1	2	1	3
	F2	Del Mar Heights Rd to NB I-5	2	0	2	2	1	3
Via de la Valle	G2	WB Via de la Valle to SB I-5	1	0	1	2	0	2
	G2	EB Via de la Valle to SB I-5	1	1	2	2	1	3
	G3	EB Via de la Valle to NB I-5	1	0	1	2	0	2
Birmingham Drive	J1	Birmingham Dr to SB I-5	2	0	2	2	1	3
	J2	Birmingham Dr to NB I-5	1	0	1	2	1	3
Santa Fe Drive	K1	Santa Fe Dr to SB I-5	1	1	2	2	1	3
	K2	Santa Fe Dr to NB I-5	1	0	1	2	1	3
Encinitas Blvd	L2	Encinitas Blvd to SB I-5	1	1	2	2	1	3
	L3	Encinitas Blvd to NB I-5	1	0	1	2	1	3
Leucadia Blvd	M3	Leucadia Blvd to NB I-5	1	1	2	2	1	3
La Costa Ave	N2	La Costa Ave to NB I-5	1	1	2	2	1	3
Palomar Airport Road	P2	EB Palomar Airport Road to SB I-5	1	1	2	2	1	3
Tamarack Ave	R4	Tamarack Ave to NB I-5	1	0	1	2	0	2
Carlsbad Village Drive	S1	Carlsbad Blvd to SB I-5	1	0	1	2	0	2
	S2	Carlsbad Blvd to NB I-5	1	0	1	2	0	2
Oceanside Blvd	X2	Oceanside Blvd to SB I-5	2	0	2	2	1	3
Mission Avenue	Y1	EB Mission Ave to SB I-5	1	1	2	2	1	3
	Y2	Mission Ave to NB I-5	1	0	1	2	0	2
SR-76	Z2	SR-76 to SB I-5	2	0	2	2	1	3
	Z3	SR-76 to NB I-5	2	0	2	2	1	3
Harbor Drive	AA1	Harbor Dr to SB I-5	1	0	1	2	1	3
	AA2	Harbor Dr to NB I-5	1	0	1	2	0	2

With the implementation of the improvements listed in tables 4.5 and 4.6, the 2030-year Build scenarios (proposed 8+4 and 10+4 alternatives) would have the following benefits when compared to the 2030-year No Build scenario: 1) improved interchange ramp intersection operations, 2) improved traffic operations at intersections nearby and adjacent to the freeway ramps, 3) additional interchange ramp storage, and 4) improved traffic operations on parallel and intersecting arterial roadways.

The 2030-year Build scenarios would also provide additional capacity to accommodate the forecasted demand; however, potential impacts to traffic operations associated with the forecasted traffic volumes of the Project have been identified in tables below.

4.1 Ramp Intersection Capacity Analysis (ILV Method)

The results of the Intersecting Lane Vehicles (ILV) analyses predict that both the 8+4 and 10+4 2030-year proposed alternatives would experience increased capacity at certain ramp interchanges when compared to the No-Build scenario. Table 4.7 is a list of the ramp interchange intersections at which the interchange operations would improve from *over* capacity in the Year 2030 No-Build scenario to *at* or *under* capacity in the Year 2030 Build scenarios. The improved intersections in Table 4.7 are marked with an "X".

Table 4.7 Summary of Ramp Interchange Intersections Improving to "At" or "Under" Capacity

Interchange	ID	Location	AM Peak			PM Peak		
			2030 10+4 without DAR	2030 10+4 with DAR	2030 8+4 with DAR	2030 10+4 without DAR	2030 10+4 with DAR	2030 8+4 with DAR
Carmel Mtn Rd	D1	Carmel Mtn Rd / I-5 SB Ramps Bypass			X			
Del Mar Heights Rd	F2	Del Mar Heights Rd / I-5 NB Ramps			X	X	X	X
Encinitas Blvd	L2	Encinitas Blvd / I-5 SB Ramps	X	X	X			
Carlsbad Village Dr	S1	Carlsbad Village Dr / I-5 SB Ramps					X	X

The (ILV) analyses also predict traffic impacts at a number of ramp intersections with Build scenarios, when compared to the Year 2030 No-Build Scenario. The ramp locations in the year 2030 where the Build scenario(s) operate at *over* capacity and the No-Build scenario operates at *under* or *at* capacity are indicated in Table 4.8 with an "X".

Table 4.8 Project Ramp Interchange Intersections Operating at Over Capacity (ILV Method)

Interchange	ID	Location	AM Peak			PM Peak		
			2030 10+4 without DAR	2030 10+4 with DAR	2030 8+4 with DAR	2030 10+4 without DAR	2030 10+4 with DAR	2030 8+4 with DAR
Genesee Ave	B2	Genesee Ave / I-5 NB Ramps	X	X	X	X	X	X
Encinitas Blvd	L3	Encinitas Blvd / I-5 NB Ramps				X		
Oceanside Blvd	X2	Oceanside Blvd / I-5 SB Ramps	X					
	X3	Oceanside Blvd / I-5 NB Ramps				X		
Mission Ave	Y2	Mission Ave / I-5 NB Ramps				X	X	X
SR-76	Z2	SR-76 / I-5 SB Ramps	X	X	X			
Harbor Dr	AA2	Harbor Dr / I-5 SB Ramps	X	X	X			

4.2 Intersection Operations Analysis (HCM Method)

According to the (HCM) methodologies, in the Year 2030, the project would improve the level of service and reduce delays at a number of ramp and adjacent intersection locations. Table 4.9 is a list of the ramp and adjacent intersections operating at level of service D, E or F in the Year 2030 No Build conditions. These intersections would improve in operation by a 15% or greater reduction in overall intersection delay in the Year 2030 Build scenarios when compared to the Year 2030 No Build scenario. The intersections with reduced delay in Table 4.9 are marked with an "X".

Table 4.9 Summary of Improved Intersections with Reduced Delay of 15% (HCM Method)

Interchange	ID	Location	AM Peak			PM Peak		
			2030 10+4 without DAR	2030 10+4 with DAR	2030 8+4 with DAR	2030 10+4 without DAR	2030 10+4 with DAR	2030 8+4 with DAR
La Jolla Village Dr	A4	Villa La Jolla / La Jolla Village Dr						X
	A6	I-5 NB Ramps / La Jolla Village Dr						
Genesee Ave	B1	I-5 SB Ramps / Genesee Ave		X	X			
Roselle St	C3	Roselle St / Sorrento Valley Blvd						X
	C4	Sorrento Valley Rd / Sorrento Valley Blvd			X			
Via De La Valle	G3	Jimmy Durante Blvd / Via De La Valle	X	X	X			
Manchester Ave	I1	I-5 SB Ramps / Manchester Ave					X	X
	I2	I-5 NB Ramps / Manchester Ave				X	X	X
La Costa Ave	N4	La Costa Ave / Piraeus				X	X	X
Poinsettia Ln	O1	Avenida Encinas / Poinsettia Ln	X	X	X			
	O4	Paseo Del Norte / Poinsettia Ln	X	X	X			
Palomar Airport Rd	P1	Palomar Airport Rd / Avenida Encinas			X			
	P2	I-5 SB Ramps / Palomar Airport Rd		X	X		X	X
	P4	Palomar Airport Rd / Paseo Del Norte			X			
Cannon Rd	Q3	I-5 SB Ramps / Cannon Rd			X			
Tamarack Ave	R2	Tamarack Ave / Jefferson						
Carlsbad Village Dr	S1	I-5 SB Ramps / Carlsbad Village Dr				X	X	X
	S3	Carlsbad Vilalge Dr / Pio Pico Dr				X	X	X
Oceanside Blvd	X2	I-5 SB Ramps / Oceanside Blvd						
Mission Ave	Y1	I-5 SB Ramps / Mission Ave				X	X	X
SR-76	Z2	I-5 SB Ramps / SR-76				X	X	X
	Z3	I-5 NB Ramps / SR-76			X			
Harbor Drive	AA1	I-5 SB Ramps / Harbor / Vandegrift				X	X	X
	AA2	I-5 NB Ramps / Harbor / Vandegrift	X	X	X			

In the year 2030 there are a number of ramps and adjacent intersections located throughout the Project corridor in the Build scenarios that will experience an increase in delay, to differing degrees, when compared to the No-Build scenario. The ramps and adjacent intersections identified in Table 4.10 as intersections impacted by the Project are consistent with SANDAG's 2002 Congestion Management Program (CMP) guidelines. The impacted intersections in Table 4.10 are marked with an "X".

Table 4.10 Summary of Impacted Intersections (HCM Method)

Interchange	ID	Location	AM Peak			PM Peak		
			2030 10+4 without DAR	2030 10+4 with DAR	2030 8+4 with DAR	2030 10+4 without DAR	2030 10+4 with DAR	2030 8+4 with DAR
La Jolla Village Dr	A4	Via La Jolla / La Jolla Village Dr	X					
	A6	I-5 NB Ramps / La Jolla Village Dr	X					
Genesee Ave	B1	I-5 SB Ramps / Genesee Ave				X		X
	B2	I-5 NB Ramps / Genesee Ave	X	X		X		
Roselle St	C1	Roselle St / I-5 SB On Ramp	X	X	X	X	X	X
	C2	Roselle St / I-5 NB Off Ramp	X	X	X	X	X	X
	C3	Roselle St / Sorrento Valley Blvd				X	X	
	C4	Sorrento Valley Rd / Sorrento Valley Blvd	X	X		X	X	
Carmel Mtn Rd	D1	I-5 Bypass SB Ramps / Carmel Mtn Rd				X	X	X
Del Mar Heights Rd	F2	I-5 NB Ramps / Del Mar Heights Rd	X	X				
Birmingham Dr	J1	I-5 SB Ramps / Birmingham Dr	X	X	X	X	X	X
	J2	I-5 NB Ramps / Birmingham Dr	X	X	X	X	X	X
Santa Fe Dr	K1	I-5 SB Ramps / Santa Fe Dr	X	X	X	X	X	X
Encinitas Blvd		I-5 SB Ramps / Encinitas Blvd				X	X	X
Poinsettia Lane	O1	Avenida Encinas / Poinsettia Lane				X	X	
	O4	Paseo Del Norte / Poinsettia Lane				X	X	
Palomar Airport Rd	P1	Avenida Encinas / Palomar Airport Rd	X			X	X	X
	P2	I-5 SB Ramps / Palomar Airport Rd	X			X		
	P3	I-5 NB Ramps / Palomar Airport Rd	X		X	X	X	
	P4	Paseo del Norte / Palomar Airport Rd	X			X	X	
Cannon Rd	Q3	I-5 SB Ramps / Cannon Rd	X					
	Q5	Paseo Del Norte / Cannon Rd	X	X	X		X	X
Las Flores Dr	T1	I-5 SB Ramps / Las Flores Dr				X	X	X
	T2	I-5 NB Ramps / Las Flores Dr				X	X	X
Oceanside Blvd	X2	I-5 SB Ramps / Oceanside Blvd	X					
	X3	I-5 NB Ramps / Oceanside Blvd				X		
SR-76	Z3	I-5 NB Ramps / SR-76				X	X	X

4.3 Ramp Metering Analysis (CMP Method)

There are a total of 58 freeway on-ramps along the I-5 corridor within the project limits. Currently 23 of the freeway on-ramps are metered. Ramp meter delay values for most of the existing metered ramps are less than 5 minutes. In the Year 2030 build scenarios, all the freeway on-ramps will be metered and would result in additional delays at a number of interchange locations. Tables 4.11 and 4.12 show calculated ramp meter delays for the existing year, year 2015/2030 Build, and year 2030 No Build scenario under AM and PM peak hour conditions. Ramp meter delay values are quantified as follows:

- < 5 minutes – indicates minimal queuing potential
- 5 – 15 minutes – indicates moderate queuing potential wherein a queue would begin to build on the ramp
- 15 – 25 minutes – indicates significant queuing potential wherein a queue would begin to exceed the ramp storage length
- 25 minutes – indicates very significant queuing potential with possible diversion of traffic

All the results presented in tables 4.7 and 4.8 were completed assuming 5/56 northbound connectors will be constructed under all future conditions.

A **red highlight** in the tables indicates a ramp delay that would show either of the following:

- Increase from less than 15 minutes in the Year 2030 No Build scenario to over 15 minutes in the Year 2030 Build scenarios or
- From less than 25 minutes in the Year 2030 No Build scenario to over 25 minutes in the Year 2030 Build scenarios.

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Table 4.11 Peak Hour Ramp Meter Delay – AM Peak Hour

Interchange	ID	Location	Delay* (min/veh)						Queue Length Exceeds Ramp Storage					
			2005 Existing	Year 2015 10+4 With DAR	Year 2030 No-Build	Year 2030 10+4 without DAR	Year 2030 10+4 With DAR	Year 2030 8+4 With DAR	2005 Existing	Year 2015 10+4 With DAR	Year 2030 No-Build	Year 2030 10+4 without DAR	Year 2030 10+4 With DAR	Year 2030 8+4 With DAR
La Jolla Village Dr	A5	WB La Jolla Village Dr to SB I-5	Not Metered	<5	<5	<5	<5	<5	Not Metered					
	A6	WB La Jolla Village Dr to NB I-5	Not Metered	<5	<5	<5	<5	<5	Not Metered					
	A5	EB La Jolla Village Dr to SB I-5	Not Metered	<5	15-25	5-15	<5	<5	Not Metered		X	X		
	A6	EB La Jolla Village Dr to NB I-5	Not Metered	<5	<5	<5	<5	<5	Not Metered					
Genesee Ave	B1	Genesee Ave to SB I-5	Not Metered	<5	<5	15-25	<5	<5	Not Metered			X		
	B2	Genesee Ave to NB I-5	Not Metered	>25	5-15	>25	>25	>25	Not Metered	X	X	X	X	X
Roselle St	C1	Roselle St to SB I-5	Not Metered	<5	<5	<5	<5	<5	Not Metered					
Carmel Mtn Rd	D1	Carmel Mtn Rd to SB I-5 Bypass	Not Metered	<5	<5	<5	<5	<5	Not Metered	X		X	X	X
	D2	Carmel Mtn Rd to NB I-5 Bypass	Not Metered	<5	<5	<5	<5	<5	Not Metered			X	X	
Carmel Valley Rd*	E1	Carmel Valley Rd to SB I-5	<5	<5	<5	<5	<5	<5				X	X	X
	E2	Carmel Valley Rd to NB I-5	Not Metered	<5	<5	<5	<5	<5	Not Metered					
Del Mar Heights Rd	F1	EB Del Mar Heights Rd to SB I-5	<5	<5	<5	<5	<5	<5			X			
	F1	WB Del Mar Heights Rd to SB I-5	<5	<5	5-15	<5	<5	<5			X			
	F2	Del Mar Heights Rd to NB I-5	Not Metered	<5	15-25	<5	<5	<5	Not Metered		X			
Via De La Valle	G2	WB Via De La Valle to SB I-5	<5	<5	>25	<5	<5	<5			X	X	X	X
	G3	WB Via De La Valle to NB I-5	<5	<5	<5	<5	<5	<5						
	G2	EB Via De La Valle to SB I-5	Not Metered	<5	<5	<5	<5	<5						
	G3	EB Via De La Valle to NB I-5	Not Metered	<5	5-15	<5	<5	<5	Not Metered		X			
Lomas Santa Fe Dr	H2	WB Lomas Santa Fe to SB I-5	<5	<5	<5	5-15	5-15	5-15				X	X	X
	H3	WB Lomas Santa Fe to NB I-5	N/A	<5	<5	<5	<5	<5	N/A		X			
	H2	EB Lomas Santa Fe to SB I-5	Not Metered	<5	<5	<5	<5	<5	Not Metered		X			
	H3	EB Lomas Santa Fe to NB I-5	N/A	<5	5-15	<5	<5	<5	N/A		X			
Manchester Ave	I1	Manchester Blvd to SB I-5	15-25	<5	15-25	5-15	<5	<5	X		X	X	X	X
	I2	Manchester Blvd to NB I-5	Not Metered	<5	>25	5-15	<5	<5	Not Metered		X	X		
Birmingham Dr	J1	Birmingham Dr to SB I-5	<5	<5	<5	<5	<5	<5						
	J2	Birmingham Dr to NB I-5	Not Metered	<5	<5	<5	<5	<5	Not Metered					
Santa Fe Dr	K1	Santa Fe Dr to SB I-5	<5	<5	<5	<5	<5	<5						
	K2	Santa Fe Dr to NB I-5	Not Metered	<5	5-15	<5	<5	<5	Not Metered		X			
Encinitas Blvd	L2	Encinitas Blvd to SB I-5	<5	<5	<5	<5	<5	<5						
	L3	Encinitas Blvd to NB I-5	Not Metered	<5	5-15	<5	<5	<5	Not Metered		X			

Table 4.11 Peak Hour Ramp Meter Delay – AM Peak Hour

Interchange	ID	Location	Delay* (min/veh)						Queue Length Exceeds Ramp Storage					
			2005 Existing	Year 2015 10+4 With DAR	Year 2030 No-Build	Year 2030 10+4 without DAR	Year 2030 10+4 With DAR	Year 2030 8+4 With DAR	2005 Existing	Year 2015 10+4 With DAR	Year 2030 No-Build	Year 2030 10+4 without DAR	Year 2030 10+4 With DAR	Year 2030 8+4 With DAR
Leucadia Blvd	M2	Leucadia Blvd to SB I-5	5-15	<5	>25	<5	<5	<5	X		X			
	M3	Leucadia Blvd to NB I-5	Not Metered	<5	5-15	<5	<5	<5	Not Metered		X			
La Costa Ave	N1	La Costa Ave to SB I-5	<5	<5	<5	<5	<5	<5						
La Costa Ave	N2	La Costa Ave to NB I-5	Not Metered	<5	<5	<5	<5	<5	Not Metered		X			
Poinsettia Ln	O2	Poinsettia Ln to SB I-5	<5	<5	<5	<5	<5	<5						
	O3	Poinsettia Ln to NB I-5	Not Metered	<5	15-25	<5	<5	<5	Not Metered		X			
Palomar Airport Rd	P2	WB Palomar Airport Road to SB I-5	<5	<5	<5	<5	<5	<5						
	P2	EB Palomar Airport Road to SB I-5	<5	>25	>25	>25	>25	>25		X	X	X	X	X
Palomar Airport Rd	P3	Palomar Airport Road to NB I-5	Not Metered	<5	15-25	<5	<5	<5	Not Metered		X	X		
Cannon Rd	Q3	Cannon Rd to SB I-5	<5	<5	<5	>25	<5	<5				X		
	Q4	Cannon Rd to NB I-5	Not Metered	<5	15-25	<5	<5	<5	Not Metered		X	X		
Tamarack Ave	R3	Tamarack Ave to SB I-5	<5	<5	<5	<5	<5	<5			X			
	R4	Tamarack Ave to NB I-5	Not Metered	<5	<5	<5	<5	<5	Not Metered					
Carlsbad Village Dr	S1	Carlsbad Blvd to SB I-5	<5	<5	<5	5-15	5-15	5-15				X	X	X
	S2	Carlsbad Blvd to NB I-5	Not Metered	<5	5-15	<5	<5	<5	Not Metered		X			
Las Flores Dr	T1	Las Flores Dr to SB I-5	<5	<5	<5	5-15	5-15	5-15				X	X	X
	T2	Las Flores Dr to NB I-5	Not Metered	5-15	15-25	5-15	5-15	15-25	Not Metered	X	X	X	X	X
Cassidy St	U2	Cassidy St to SB I-5	<5	<5	<5	5-15	5-15	5-15				X	X	X
California	W1	California St to NB I-5	Not Metered	<5	5-15	<5	<5	<5	Not Metered		X			
Oceanside Blvd	X2	Oceanside Blvd to SB I-5	5-15	<5	>25	<5	<5	<5	X		X	X		
	X3	Oceanside Blvd to NB I-5	Not Metered	<5	<5	5-15	<5	<5	Not Metered			X		
Mission Ave	Y1	EB Mission Ave to SB I-5	<5	<5	<5	<5	<5	<5						
	Y1	WB Mission Ave to SB I-5	<5	N/A	<5	N/A	N/A	N/A		N/A		N/A	N/A	N/A
	Y2	Mission Ave to NB I-5	Not Metered	<5	>25	<5	<5	<5	Not Metered		X	X	X	
SR-76	Z2	SR 76 to SB I-5	Not Metered	<5	>25	<5	<5	<5	Not Metered		X			X
	Z3	SR 76 to NB I-5	Not Metered	<5	<5	<5	<5	<5	Not Metered		X			
Harbor Dr	AA1	Harbor Dr to SB I-5	Not Metered	<5	<5	<5	<5	<5	Not Metered		X			
	AA2	Harbor Dr to NB I-5	Not Metered	<5	>25	<5	<5	<5	Not Metered		X			

Table 4.12 Peak Hour Ramp Meter Delay – PM Peak Hour

Interchange	ID	Location	Delay* (min/veh)						Queue Length Exceeds Ramp Storage					
			2005 Existing	Year 2015 10+4 With DAR	Year 2030 No-Build	Year 2030 10+4 without DAR	Year 2030 10+4 With DAR	Year 2030 8+4 With DAR	2005 Existing	Year 2015 10+4 With DAR	Year 2030 No-Build	Year 2030 10+4 without DAR	Year 2030 10+4 With DAR	Year 2030 8+4 With DAR
La Jolla Village Dr	A5	WB La Jolla Village Dr to SB I-5	< 5	5-15	<5	>25	<5	15-25		X		X		X
	A6	WB La Jolla Village Dr to NB I-5	5-15	<5	>25	<5	<5	<5	X		X			
	A5	EB La Jolla Village Dr to SB I-5	<5	<5	<5	>25	<5	<5			X	X		
	A6	EB La Jolla Village Dr to NB I-5	<5	<5	5-15	<5	<5	<5			X	X		
Genesee Ave	B1	Genesee Ave to SB I-5	Not Metered	<5	<5	<5	<5	<5	Not Metered			X		
	B2	Genesee Ave to NB I-5	Not Metered	<5	<5	<5	<5	<5	Not Metered					
Roselle St	C1	Roselle St to SB I-5	Not Metered	<5	<5	<5	<5	<5	Not Metered					
Carmel Mtn Rd	D1	Carmel Mtn Rd to SB I-5 Bypass	Not Metered	<5	<5	<5	<5	<5	Not Metered			X	X	X
	D2	Carmel Mtn Rd to NB I-5 Bypass	Not Metered	<5	<5	<5	<5	<5	Not Metered			X	X	X
Carmel Valley Rd*	E1	Carmel Valley Rd to SB I-5	Not Metered	<5	<5	<5	<5	<5	Not Metered					
	E2	Carmel Valley Rd to NB I-5	<5	<5	<5	<5	<5	<5	X					
Del Mar Heights Rd	F1	EB Del Mar Heights Rd to SB I-5	<5	<5	<5	<5	<5	<5						
	F1	WB Del Mar Heights Rd to SB I-5	<5	<5	<5	<5	<5	<5						
	F2	Del Mar Heights Rd to NB I-5	<5	<5	<5	<5	<5	<5						
Via De La Valle	G2	WB Via De La Valle to SB I-5	<5	<5	<5	<5	<5	<5				X	X	X
	G3	WB Via De La Valle to NB I-5	<5	<5	<5	<5	<5	<5						
	G2	EB Via De La Valle to SB I-5	<5	5-15	<5	15-25	15-25	15-25		X		X	X	X
	G3	EB Via De La Valle to NB I-5	<5	<5	<5	<5	<5	<5						
Lomas Santa Fe Dr	H2	WB Lomas Santa Fe to SB I-5	<5	5-15	<5	5-15	5-15	5-15		X		X	X	X
	H3	WB Lomas Santa Fe to NB I-5	N/A	<5	<5	<5	<5	<5	N/A					
	H2	EB Lomas Santa Fe to SB I-5	<5	<5	5-15	<5	<5	<5	X		X			
	H3	EB Lomas Santa Fe to NB I-5	N/A	<5	<5	5-15	5-15	5-15	N/A			X	X	X
Manchester Ave	I1	Manchester Blvd to SB I-5	< 5	<5	<5	5-15	<5	<5				X	X	X
	I2	Manchester Blvd to NB I-5	<5	<5	<5	5-15	<5	<5						
Birmingham Dr	J1	Birmingham Dr to SB I-5	<5	<5	<5	<5	<5	<5						
	J2	Birmingham Dr to NB I-5	Not Metered	<5	<5	<5	<5	<5	Not Metered					
Santa Fe Dr	K1	Santa Fe Dr to SB I-5	<5	<5	<5	<5	<5	<5						
	K2	Santa Fe Dr to NB I-5	Not Metered	<5	<5	<5	<5	<5	Not Metered					
Encinitas Blvd	L2	Encinitas Blvd to SB I-5	<5	<5	<5	<5	<5	<5						

Table 4.12 Peak Hour Ramp Meter Delay – PM Peak Hour

Interchange	ID	Location	Delay* (min/veh)						Queue Length Exceeds Ramp Storage					
			2005 Existing	Year 2015 10+4 With DAR	Year 2030 No-Build	Year 2030 10+4 without DAR	Year 2030 10+4 With DAR	Year 2030 8+4 With DAR	2005 Existing	Year 2015 10+4 With DAR	Year 2030 No-Build	Year 2030 10+4 without DAR	Year 2030 10+4 With DAR	Year 2030 8+4 With DAR
	L3	Encinitas Blvd to NB I-5	Not Metered	<5	>25	<5	<5	<5	Not Metered		X			
Leucadia Blvd	M2	Leucadia Blvd to SB I-5	5-15	<5	>25	<5	<5	<5	X		X			
	M3	Leucadia Blvd to NB I-5	5-15	<5	>25	<5	<5	<5	X		X			
La Costa Ave	N1	La Costa Ave to SB I-5	<5	<5	<5	<5	<5	<5						
	N2	La Costa Ave to NB I-5	<5	<5	<5	<5	<5	<5						
Poinsettia Ln	O2	Poinsettia Ln to SB I-5	<5	<5	<5	<5	<5	<5						
	O3	Poinsettia Ln to NB I-5	<5	<5	<5	<5	<5	<5						
Palomar Airport Rd	P2	WB Palomar Airport Road to SB I-5	15-25	<5	<5	<5	<5	<5	X					
Palomar Airport Rd	P2	EB Palomar Airport Road to SB I-5	Not Metered	>25	>25	>25	>25	>25	Not Metered	X	X	X	X	X
	P3	Palomar Airport Road to NB I-5	5-15	<5	>25	5-15	<5	<5	X		X	X		
Cannon Rd	Q3	Cannon Rd to SB I-5	<5	<5	<5	5-15	<5	<5				X		
	Q4	Cannon Rd to NB I-5	<5	<5	>25	5-15	<5	<5	X		X	X		
Tamarack Ave	R3	Tamarack Ave to SB I-5	Not Metered	<5	5-15	<5	<5	<5	Not Metered		X			
	R4	Tamarack Ave to NB I-5	Not Metered	<5	5-15	<5	<5	5-15	Not Metered		X	X	X	X
Carlsbad Village Dr	S1	Carlsbad Blvd to SB I-5	Not Metered	<5	>25	<5	<5	<5	Not Metered		X	X	X	X
	S2	Carlsbad Blvd to NB I-5	Not Metered	<5	<5	<5	<5	<5	Not Metered		X	X	X	X
Las Flores Dr	T1	Las Flores Dr to SB I-5	Not Metered	<5	<5	5-15	5-15	15-25	Not Metered			X	X	X
	T2	Las Flores Dr to NB I-5	Not Metered	5-15	>25	5-15	5-15	5-15	Not Metered	X	X	X	X	X
Cassidy St	U2	Cassidy St to SB I-5	Not Metered	<5	<5	5-15	5-15	5-15	Not Metered	X		X	X	X
California	W1	California St to NB I-5	Not Metered	<5	<5	<5	<5	<5	Not Metered					
Oceanside Blvd	X2	Oceanside Blvd to SB I-5	Not Metered	<5	>25	5-15	<5	<5	Not Metered		X	X		
	X3	Oceanside Blvd to NB I-5	Not Metered	<5	<5	5-15	<5	5-15	Not Metered			X	X	X
Mission Ave	Y1	EB Mission Ave to SB I-5	Not Metered	<5	>25	<5	<5	<5	Not Metered		X			
	Y1	WB Mission Ave to SB I-5	Not Metered	N/A	<5	N/A	N/A	N/A	Not Metered	N/A		N/A	N/A	N/A
	Y2	Mission Ave to NB I-5	Not Metered	<5	<5	5-15	5-15	5-15	Not Metered			X	X	X
SR-76	Z2	SR 76 to SB I-5	Not Metered	<5	<5	<5	<5	<5	Not Metered					
	Z3	SR 76 to NB I-5	Not Metered	<5	>25	<5	<5	<5	Not Metered		X			
Harbor Dr	AA1	Harbor Dr to SB I-5	Not Metered	<5	>25	<5	<5	<5	Not Metered		X			
	AA2	Harbor Dr to NB I-5	Not Metered	<5	15-25	<5	<5	15-25	Not Metered		X			X

5 Local Roadway Segmental Analysis and Direct Access Ramps

5.1 Local Roadway Segmental Analysis

Forecasted average daily traffic (ADT) for the Years 2015 and 2030 were used to perform arterial roadway segment analysis. A total of 125 individual roadway segments (94 east-west and 31 north-south) were evaluated. The Forecasted ADTs for various build scenarios and no build scenario were compared to the respective roadway classification capacity threshold. The roadway segments were then identified as being *under* or *over* the capacity threshold.

Table 5.1 displays existing arterial roadway capacities and the forecasted daily traffic volumes in the Years 2015 and 2030 for each proposed build scenarios and no build scenario. The ADT for roadway segments that would improve from *over* to *under* capacity in the Year 2030 Build scenarios, when compared to the Year 2030 No Build scenario are highlighted in green. The ADT for roadway segments that would operate *under* capacity in the Year 2030 No Build scenario and would operate *over* capacity in various Year 2030 Build scenarios are highlighted in red. With the Year 2030 10+4 and 8+4 scenarios, several of the north/south arterial segments would have less traffic and would operate under the capacity threshold when compared to the No Build scenario. The east/west arterials would experience a mixture of improved operations and impacted operations as shown in Table 5.1.

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Table 5.1 Arterial Roadway Segment Capacity Analysis (CMP Method)

Street	From	To	Year 2030			Average Daily Volume					
			Lanes	Arterial Class	Threshold	2005 Existing	Year 2015 10+4 w/ DAR	Year 2030 No-Build	Year 2030 10+4 w/o DAR	Year 2030 10+4 w/ DAR	Year 2030 8+4 w/ DAR
North/South Network Facilities											
El Camino Real	Ronald Parkard Pk	Carlsbad Village Dr	6	Prime	55,000	56,100	54,700	59,000	54,900	54,500	56,700
	Olivenhain Rd	Mountain Vista Rd	6	Prime	55,000	42,865	42,800	55,000	43,000	42,900	48,100
	Mountain Vista Rd	Encinitas Blvd	6	Prime	55,000	39,644	47,500	60,000	49,000	48,900	53,900
Coast Highway	Leucadia Blvd	Encinitas Blvd	4	Major	35,000	24,000	28,800	35,000	30,000	29,700	32,700
	Santa Fe Dr	Lomas Santa Fe Dr	4	Major	35,000	26,000	26,600	35,000	28,000	27,000	33,600
	Jimmy Durante Blvd	Del Mar Heights Rd	4	Major	35,000	29,000	31,300	35,000	32,900	31,800	36,600
East/West Network Facilities											
Sorrento Valley Blvd	Camino Santa Fe	Camino Ruiz	4	Major	35,000	25,000	33,100	35,000	34,600	34,600	35,000
Via De La Valle	I-5	San Andres Dr	4	Major	35,000	31,700	34,400	33,000	34,700	34,900	35,500
Manchester Ave	El Camino Real	Rancho Santa Fe	2	Second	12,000	9,030	9,170	13,000	9,200	9,200	11,100
Leucadia Blvd	I-5	Saxony Rd	4	Major	35,000	29,541	36,300	31,000	40,300	40,300	38,100
Cannon Road	Paseo Del Norte	Legoland Dr	4	Major	35,000	27,700	35,200	32,000	35,900	36,600	37,000

Notes:
Green Cells: *Indicate segments which operate over capacity for the Year 2030 No-Build scenario and under capacity for the Year 2030 Build scenario*
Red Cells: *Indicate segments which operate under capacity for the Year 2030 No-Build Scenario and over capacity under the Year 2030 Year 2030 Build scenario*

5.2 Direct Access Ramps

The *Local Circulation System Operations Report* (Technical Report No. 7, August 2007) by Wilson & Company was prepared in response to requests by the local jurisdictions in the cities of San Diego, Solana Beach, Encinitas, Carlsbad, and Oceanside through San Diego Association of Governments (SANDAG). The report was prepared to identify and evaluate the impacts of the DARs on the local circulation system within each of the four DAR areas of influence. The DAR areas of influence establish the extent of potentially affected roadway segments and intersections in the vicinity of each of the four proposed DAR locations. These roadway segments and intersections are the focus of the local circulation system impact assessment presented in Technical Report No. 7. The report also included a comparison of the peak hour traffic operations in the year 2030 for the 10+4 without DAR and 10+4 with DAR traffic scenarios within the DAR areas of influence.

Figure 5.1 is a map of the Project Area indicating each of the four DAR areas of influence. The DAR study area intersections (DAR intersections and arterial intersections within the DAR areas of influence) examined in Technical Report No. 7 are identified by a letter/number combination label beginning in alphabetical order running from south (Voigt DAR) to north (Oceanside DAR). As shown in the figure, the DAR study area includes a total of 16 interchange intersections and 53 arterial related intersections for a total of 69 intersections. A proposed DAR at Lusk Boulevard (San Diego) was removed from this project and would be built as a separate alternative project.

5.2.1 DAR Areas of Influence

The Project's DAR areas of influence were determined by performing preliminary model runs of the 2030-year 10+4 with DAR and 2030-year No Build design scenarios using SANDAG's Series 10 Transportation Model (see *Area of Influence Analysis Report*, Technical Report No. 1). The area of influence determined by the model runs allows for identification of intersections where potential traffic impacts influenced by the proposed DARs may occur. These model runs were performed by Wilson & Company prior to Caltrans issuing their 2030-year 10+4 Alternative with DAR traffic forecast, which was used to develop the traffic forecasts for the other design alternatives. The roadway segments and signalized intersections in Table 5.2 were identified using a threshold of 50 or more peak hour trips (500 or more daily trips) as established by SANDAG's CMP. A summary of the number of roadway segments and signalized intersections within only the area of influence of the DARs is presented in Table 5.2, that is also shown in Figure 5.1.

Table 5.2 DAR Facilities Area of Influence

Direct Access Ramp	Local Jurisdiction	Number of Roadway Segments	Number of Signalized Intersections
Oceanside Blvd	City of Oceanside	10	12
Cannon Road	City of Carlsbad	11	16
Manchester Ave	City of Encinitas	23	23
Voigt Drive	City of San Diego	9	18
	Total	53	69

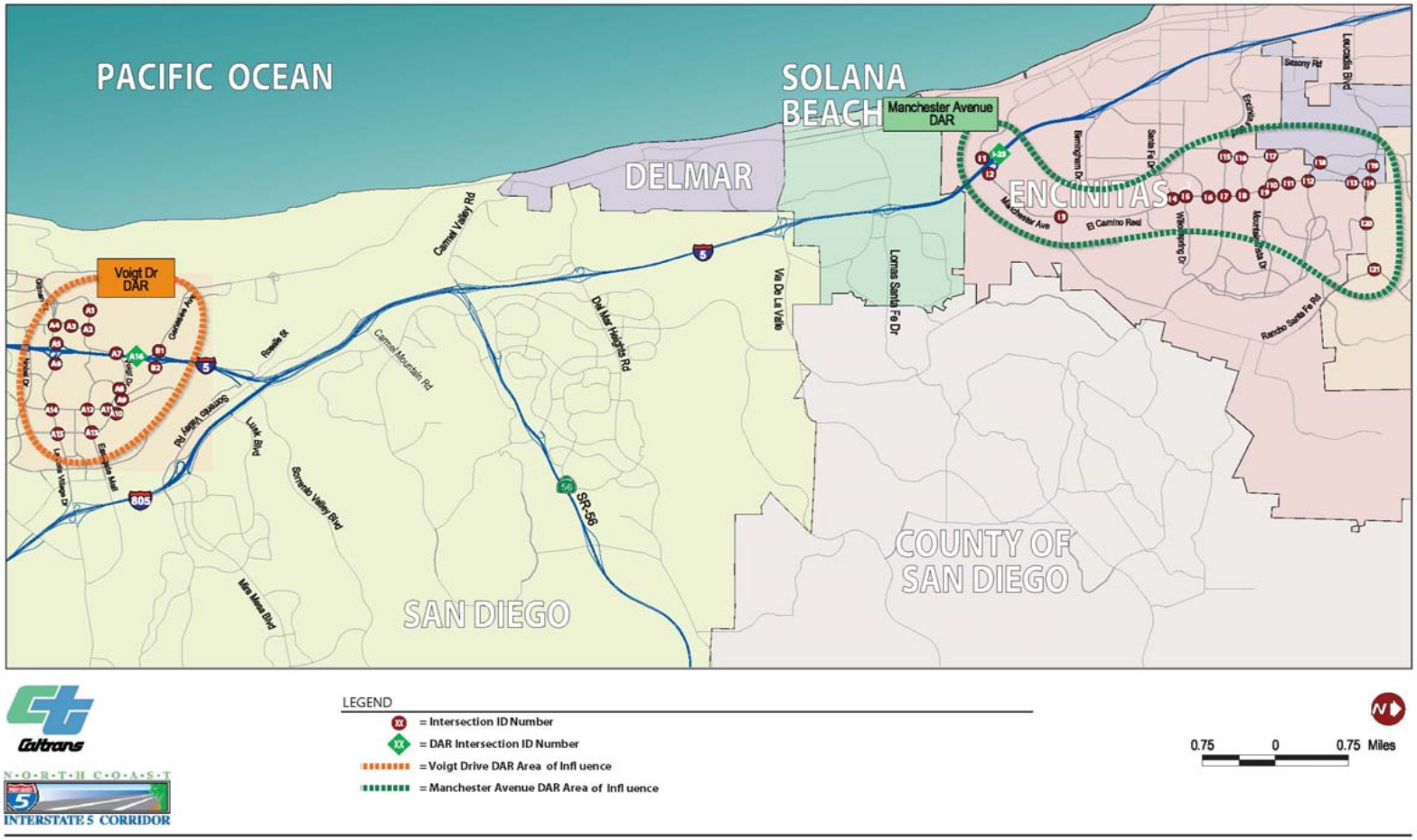

Figure 5.1 DAR Area of Influence (Page 1 of 2)

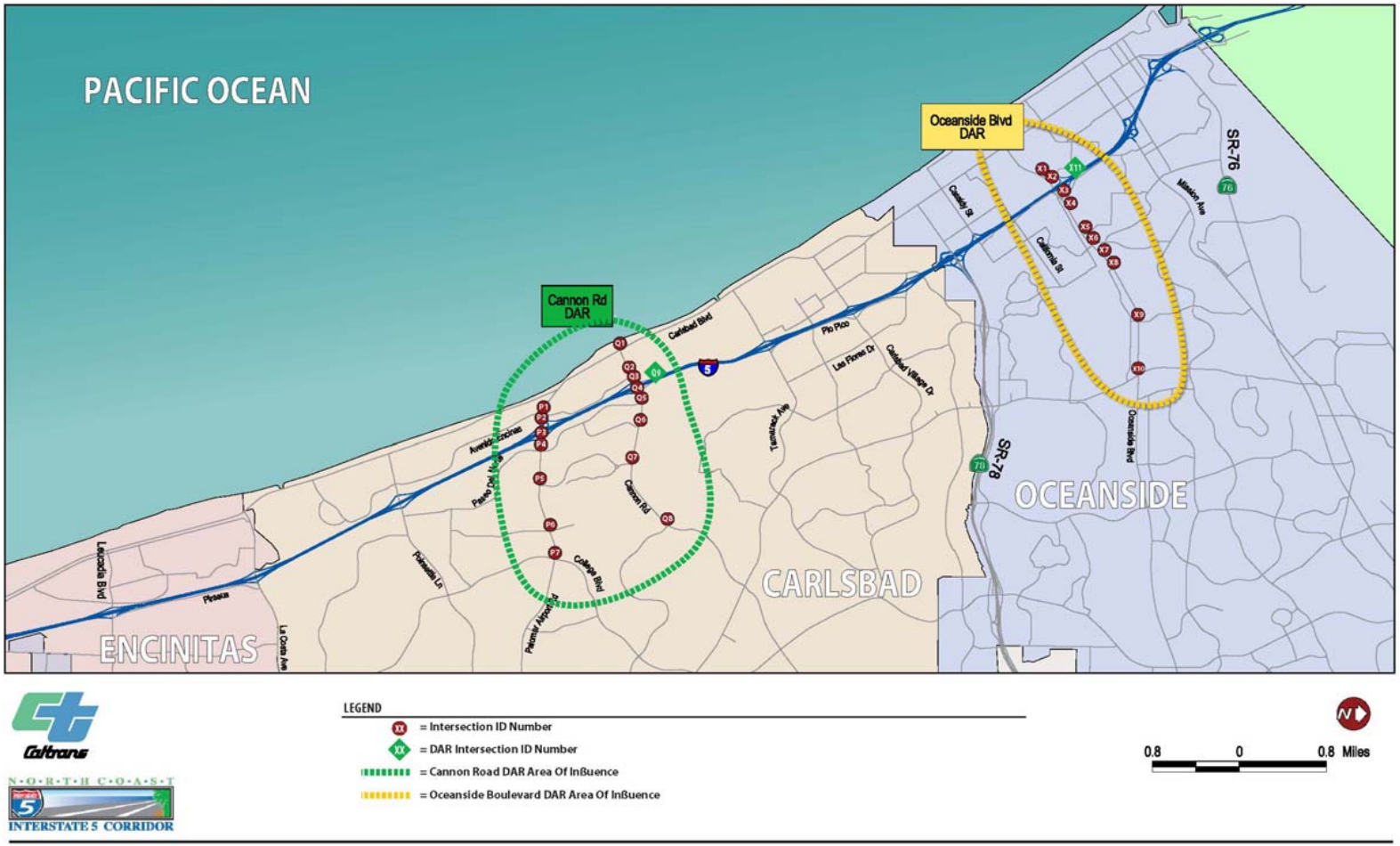

Figure 5.1 DAR Area of Influence (Page 2 of 2)

5.2.2 DAR Year 2030 Traffic Analysis

5.2.2.1 DAR Intersection Analysis

With the addition of the four DARs, some of the intersections located within the DAR areas of influence would have improved level of service and reduced delay. The following is a list of the improved intersections:

- La Jolla Village Drive / I-5 NB Ramps
- Palomar Airport Road / I-5 SB Ramps
- Cannon Road / I-5 SB Ramps
- Oceanside Blvd / I-5 SB Ramps
- Cannon Road / Avenida Encinas
- Cannon Road / I-5 NB Ramps
- Oceanside Blvd / I-5 NB Ramps

The construction and implementation of the four DARs would result in traffic impacts at the following six (6) intersections:

- Gilman Drive / Voigt Drive
- Carlsbad Boulevard / Cannon Road
- Paseo Del Norte / Cannon Road
- Faraday Avenue / Cannon Road
- Crouch Street / Oceanside Boulevard
- Industry Street / Oceanside Boulevard

With the addition of the four DARs, the following improvements are recommended at the noted intersections, which would be necessary to mitigate traffic impacts:

- Gilman Drive/Voigt Drive – Signalize intersection; Provide two westbound left-turn lanes and a single eastbound left-turn lane.
- Carlsbad Boulevard/Cannon Road – Modify signal phasing to include a northbound right-turn overlap phase.
- Paseo Del Norte/Cannon Road – Provide an eastbound right-turn lane; modify signal phasing to include an eastbound right-turn overlap phase.
- Faraday Avenue/Cannon Road - Re-stripe northbound shared right/through/left-lane to a through/right shared-lane; provide a second westbound left-turn lane.
- Crouch Street/Oceanside Boulevard – Re-stripe the northbound through-lane to a shared left/through lane.
- Industry Street/Oceanside Boulevard – Either signalize intersection, or restrict the northbound and southbound left turn movements by channelizing the median.

5.2.2.2 Roadway Segmental Analysis

The addition of the four DARs would result in traffic impacts at the following three (3) roadway segments:

- Cannon Road, between Paseo Del Norte and Legoland Drive
- Oceanside Boulevard, between I-5 and North Canyon Drive
- Oceanside Boulevard, between North Canyon Drive and El Camino Real

With the addition of the four DARs, the following improvements are recommended at the noted roadway segments, which would be necessary to mitigate traffic impacts:

- Cannon Road, between Paseo Del Norte and Legoland Drive – Widen from a four-lane Major roadway to a six-lane Prime arterial.
- Oceanside Boulevard, between I-5 and North Canyon Drive – Widen from a four-lane Major roadway to a six-lane Prime arterial.
- Oceanside Boulevard, between North Canyon Drive and El Camino Real – Widen from a four-lane Major roadway to a six-lane Prime arterial.

It should be noted that the above improvement on Cannon Road is not consistent with the designated roadway classification in City of Carlsbad Circulation Element. In a similar manner, the improvements identified for Oceanside Boulevard are also not consistent with the City of Oceanside Circulation Element. Therefore, the improvements listed above for the three roadway segments of Cannon Road and Oceanside Boulevard are not proposed by the I-5 NCCP.