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EXECUTIVE SUMMARY

The purpose of this document is to analyze the existing conditions of Interstate 15 (I-15) corridor with the latest available data. It is the first phase of a two phase approach to evaluate the conditions of the corridor. The second phase will use microsimulation (through the urban areas) as a validation tool.

Corridor Description

The study corridor has a total length of 239 miles beginning at the Riverside/San Diego County Line and terminates at the California/Nevada State Line. The corridor passes through cities of Temecula, Murrieta, Wildomar, Lake Elsinore, Corona, Norco, and Eastvale in the County of Riverside. Within the County of San Bernardino, the corridor passes through cities of Ontario, Fontana, Rancho Cucamonga and through the high desert cities of Hesperia, Victorville, Apple Valley, and Barstow. The I-15 corridor varies from a six to eight-lane freeway facility in the urbanized areas and four to six-lane facility in rural areas. The corridor has nine major freeway-to-freeway interchanges at:

I-15 Freeway to Freeway Junctions

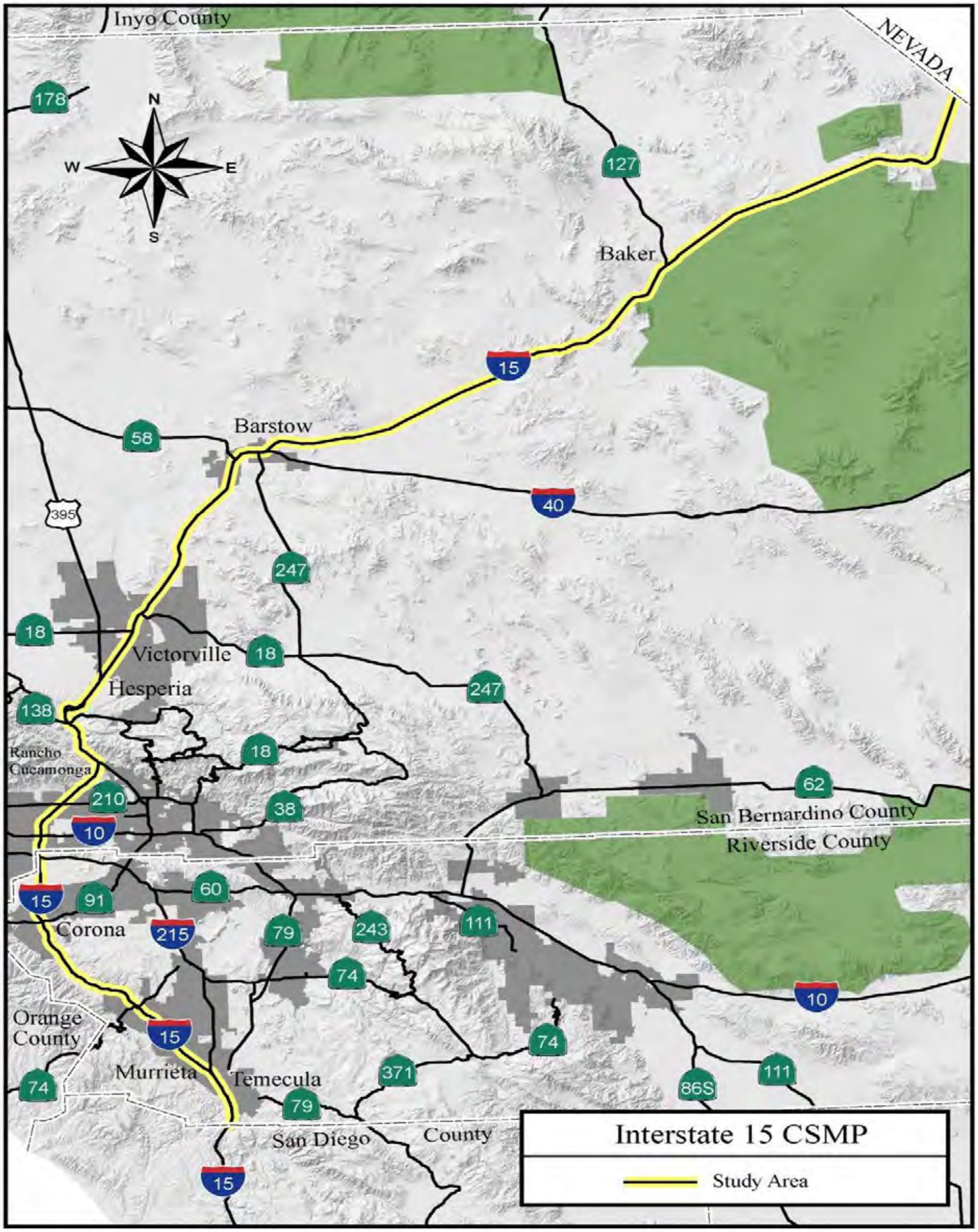
Route	Location
I-215	City of Murrieta
SR-91	City of Corona
SR-60	City of Ontario
I-10	City of Ontario
SR-210	City of Rancho Cucamonga
I-215	Devore
US-395	City of Hesperia
SR-58	City of Barstow
I-40	City of Barstow

I-15 is part of the National Highway System (NHS), the Strategic Highway Corridor Network of National Defense (STRAHNET), and the Freeway and Expressway System (F&E).

The corridor is a primary link for the Inland Empire and the High Desert to major economics centers and geographic regions of the Greater Los Angeles area and San Diego. It is a significant goods movement corridor between the Ports of Los Angeles and Long Beach, Ontario and Southern California Logistics Airports, States to the east, and the border crossings with Mexico; it also serves as a conduit for recreation travel to San Diego, Las Vegas and other destinations.

In 2008, Average Daily Traffic ranged from nearly 214,000 vehicles near the Riverside/San Bernardino County Line to 37,000 near the California/Nevada State Line. Traffic is forecasted to increase about 40 percent to approximately 299,000 at the Riverside/San Bernardino County Line, and about 86 percent to approximately 69,000 vehicles per day by 2035 near the California/Nevada State Line. The growing population and relatively affordable housing market in Riverside and San Bernardino Counties, along with increasing employment opportunities in the Greater Los Angeles, Orange County, and San Diego County areas, and increasing goods movement and recreational traffic have increased demand on the corridor in the last decade and are expected to continue into the future.

Exhibit ES-1: I-15 Study Corridor



Corridor-Wide Performance and Trends

In order to identify how well or poorly the corridor is performing, the existing conditions of the I-15 corridor were analyzed using the performance measures of mobility, reliability, productivity, and safety. These performance measures were based on data from 2008 to 2010 with a focus on the 2008 base model year. The following discussion briefly summarizes the results of each performance measure. The detailed discussion can be found in Section 3 of this document, *Comprehensive Performance Assessment*.

- Mobility –In Riverside County in 2010, northbound delay (554,000 vehicle-hours) exceeded southbound delay (369,000 vehicle-hours) by 33 percent. However, in San Bernardino County in 2010, southbound delay (831,000 vehicle-hours) was 5 percent greater than northbound delay (787,000 vehicle-hours). Travel times for the facility remained steady between 2008 and 2010.

- Reliability – this measure captures the degree of predictability in travel time and focuses on how travel time varies from day to day. The variability of peak hour travel time has remained steady between 2008 and 2010 on the facility. The variability is greater between south Corona (Cajalco Road) and Ontario (I-10) than on the rest of the route during weekdays.

- Productivity – this measure reflects the reduction in effective capacity due to merging and weaving activities in equivalent lost lane-miles. In Riverside County, productivity was unstable as lost lane-miles declined from 8.6 in 2008 to 5.7 in 2009, then increased to 9.5 in 2010. Similarly, in San Bernardino County, productivity was unstable as lost lane-miles declined from 6.6 in 2008 to 6.1 in 2009, then increased to 8.1 in 2010.

- Safety – reported accident data must be used for this measure and the latest year of available data is 2010. The number of accidents that occurred on the corridor declined in the northbound direction in both counties from 2008 to 2010 from about 2,000 in 2008 to 1,500 by 2010. In the southbound direction the number of accidents decreased from 2,000 in 2008 to 1,500 in 2009, but then increased in 2010 to 1,600. From 2008 to 2010, the rate of fatalities and injuries for this corridor is lower compared to other state highway facilities with similar operating characteristics. The accident rate for I-15 (0.48) is lower than the rate on similar facilities (0.95)

The following Exhibit ES-2 summarizes the current performance of the I-15 corridor.

Exhibit ES-2: I-15 Corridor-Wide Analysis

Riverside County										
Year	Mobility				Reliability		Safety		Productivity	
	Total Annual Delay (Vehicle Hours)[1]		Average Peak Hour Travel Time (Minutes)[2]		Peak Hour Travel Time Variability (Percent)[2]		Annual Accidents[3]		Average Daily Lost Productivity (Lane-Miles)[1]	
	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB
2008	589,029	265,231	52	53	20%	9%	723	782	4.0	4.6
2009	538,875	289,294	52	51	15%	3%	568	547	1.9	3.8
2010	553,840	368,982	50	50	15%	7%	551	610	4.9	4.6

San Bernardino County										
Year	Mobility				Reliability		Safety		Productivity	
	Total Annual Delay (Vehicle Hours)[1]		Average Peak Hour Travel Time (Minutes)[2]		Peak Hour Travel Time Variability (Percent)[2]		Annual Accidents[3]		Average Daily Lost Productivity (Lane-Miles)[1]	
	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB
2008	569,557	577,096	23	22	10%	5%	1,296	1,217	5.0	1.6
2009	379,917	510,816	23	22	5%	0%	1,036	976	4.6	1.5
2010	787,380	831,053	24	23	15%	2%	996	1,009	5.3	2.8

[1] Accounts for weekdays during peak and non-peak periods
[2] Accounts for weekdays only
[3] Accounts for weekdays and weekends

Bottleneck Identification and Causality Analysis

By definition (HCM2000), a bottleneck is where traffic demand exceeds the capacity of the roadway facility. In most cases, the cause of a bottleneck is related to a sudden reduction in capacity (such as lane drops, roadway geometry, heavy merging and weaving, and driver distractions) or a surge in demand (from ramps or connectors) that the facility cannot accommodate. The cause of each bottleneck along the corridor was identified through the Performance Measurement System (PeMS) and field observations in 2011. These causes are summarized in Exhibit ES-3. Speed contour data is used as well to validate the bottleneck locations.

Exhibit ES-3: Summary of I-15 2010 Bottleneck Causes[4]
Riverside County
Northbound Bottlenecks

Bottleneck Location	Active Period		Causality Summary
	AM	PM	
Rancho California On		X	Close proximity of two on ramps (E-N, W-N)
Winchester On		X	Close proximity of two on ramps (E-N, W-N)
Weirick On	X		High volume on ramp
2nd St. Lane Drop	X		Lane drop between 2nd St. off ramp and bridge
6th St. On	X		High volume on ramp and roadway geometry of horizontal and vertical alignment
Between Bellegrave OC and Cantu-Galleano Off		X	Roadway geometry of horizontal alignment
Riv/SBd County Line	X	X	Merging and weaving; Lane drop 0.5 mile south of Jurupa Ave.

[4] PeMS

Riverside County
Southbound Bottlenecks

Bottleneck Location	Active Period		Causality Summary
	AM	PM	
Cajalco On	X		High volume on ramp
0.5 mile north of Ontario Off		X	Roadway geometry of horizontal and vertical alignment
0.5 mile south of Magnolia On		X	Roadway geometry of horizontal and vertical alignment
Magnolia Off	X		Merging and Weaving from SR 91 connectors (E-S, W-S) to Magnolia off ramp

San Bernardino County
Southbound Bottlenecks

Bottleneck Location	Active Period		Causality Summary
	AM	PM	
Jurupa Off		X	Merging and Weaving from I-10 connectors (E-S, W-S) to Jurupa off ramp
Baseline Off	X		Lane drop between Baseline off ramp and bridge

San Bernardino County
Northbound Bottlenecks

Bottleneck Location	Active Period		Causality Summary
	AM	PM	
I-15/I-215 IC		X	Horizontal alignment and grade, high traffic volume, and decision point/ merge with I-215

Mobility and safety performance statistics were presented for each bottleneck area as well as for the entire corridor. This allows for the relative contribution of each bottleneck area to the degradation of the corridor to be gauged.

Mobility by Bottleneck Area – PeMS data was used to calculate delay for each bottleneck area. Section 4, Exhibits 4-7 through 4-10 shows the vehicle-hours of delay experienced by each bottleneck area during the peak periods in the each direction. The percentages assigned to each bottleneck area are the number of weekdays the bottleneck occurs. As depicted in Exhibit 4-7, the bottleneck at Weirick experienced the most delay with slightly over 100,000 vehicle-hours of delay.

Causality

By definition, a bottleneck is a condition where traffic demand exceeds the capacity of the roadway facility. In many cases, the cause of the bottlenecks is attributed to such conditions such as a sudden reduction in capacity, roadway geometry, heavy merging and weaving, or a surge in demand that the facility cannot accommodate. Some of the contributing causes of the bottleneck locations are related to:

- Cross weaving traffic at interchanges
- Heavy ramp volumes merging on to the mainline facility when mainline traffic is already heavy
- Platoon merging from the on-ramp
- Horizontal or vertical geometric changes in a roadway

A detailed description of the causality of each bottleneck location is provided in Section 5 of this report. The bottleneck locations identified in Exhibits ES-3 will be used for the I-15 micro-simulation model calibration process.

Planned Corridor System Management Strategies

As one of the major corridors in Southern California, I-15 has been the focus of many efforts to identify potential alternatives for improvement. Projects on the state highway system with funding are identified in the Southern California Association of Government's (SCAG's) Regional Transportation Improvement Program (RTIP) and in the State Highway Operations Protection Program (SHOPP).

In the table below, the first project is funded through the Project Approval and Environmental Document Phase (PA & ED) and the last two projects are fully funded. The focus of this a study is corridor-wide capacity increasing alternative; thus, local interchange projects are excluded from consideration because they tend to improve access more than mainline operations.

2008 Regional Transportation Improvement Program (RTIP) Projects

County	Post Miles	Location	Project
Riv	0.0-6.6	Temecula	Widen to 1 HOV/6 mixed-flow lanes each direction, I-215 to Winchester Rd. & 1 HOV/5 mixed-flow lanes each direction, Winchester Rd. to Riv/SD County Line
Riv	8.7-52.3	Temecula/ Murrieta/ Lake Elsinore/ Norco/ Corona	2 HOT lanes each direction from SBd County Line to SR-74 & 1 mixed-flow lane each direction from SBd/Riv County Line to SR-74 & 1 HOV lane each direction from SR-74 to I-15/215
SBd	14.0-16.4	Devore	Add 1 mixed-flow lane from Glen Helen Parkway to the 15/215 IC & add truck bypass lane/auxiliary lanes & improve Kenwood IC

Next Steps

Subsequent to this Comprehensive Performance Assessment, alternative investment strategies will be modeled and evaluated to understand their relative benefits to the corridor. The results from this evaluation will form a recommended implementation plan that identifies existing and potential funding opportunities.

1. INTRODUCTION

This document represents the fifth and sixth milestones of the Riverside/San Bernardino County Interstate 15 Corridor System Management Plan (CSMP). It is the initial step in the completion of the existing conditions comprehensive performance assessment. Once finalized, it will be a critical component of the CSMP.

These two milestones are the Comprehensive Performance Assessment and the Causality of Performance Degradation. They build upon previously developed milestone reports.

The main purpose of the Comprehensive Performance Assessment is to detail the performance of the corridor so that future investment decisions can be vetted and tested to ensure reasonable returns on investment for public funds. This report presents performance measurement findings, indentifies bottlenecks that lead to less than optimal performance, and diagnoses the cause for these bottlenecks. Following this report, alternative investment strategies will be modeled and evaluated to understand their relative benefits.

This report and the associated CSMP should be updated regularly since corridor performance can vary dramatically over time due to changes in demand patterns, economic conditions, and delivery of projects and strategies among other variables. Such changes could influence the conclusions of the CSMP and the relative priorities in investments. Therefore, updates should probably occur no less than every two to three years.

Following this introduction, the report is organized into four sections:

- Corridor Description
  This section describes the corridor, including the roadway facility, major interchanges and relative demands at these interchanges, rail and transit services along the freeway facility, major intermodal facilities around the corridor, non-motorized facilities, and special event facilities/trip generators. This section includes a subsection on corridor demand profiles.

- Corridor-wide Performance and Trends
  This section presents multiple years of performance data for the defined CSMP corridor. Statistics are included for the mobility, reliability, safety, and productivity performance measure. Wherever possible, this section has been expanded from the preliminary performance assessment by adding performance results through December 2010. A new section on pavement conditions on the freeways was also added.

- <u>Bottleneck Identification and Analysis</u>
  This section identifies the locations of bottlenecks, or choke points, on the freeway facility. These bottlenecks are generally the major cause of mobility and productivity performance degradations and are often related to safety degradations as well. This section has also been augmented. It now has performance results for delay and safety by major —bottleneck area”. This addition allows for the relative prioritization of bottlenecks in terms of their contribution to corridor performance degradation.

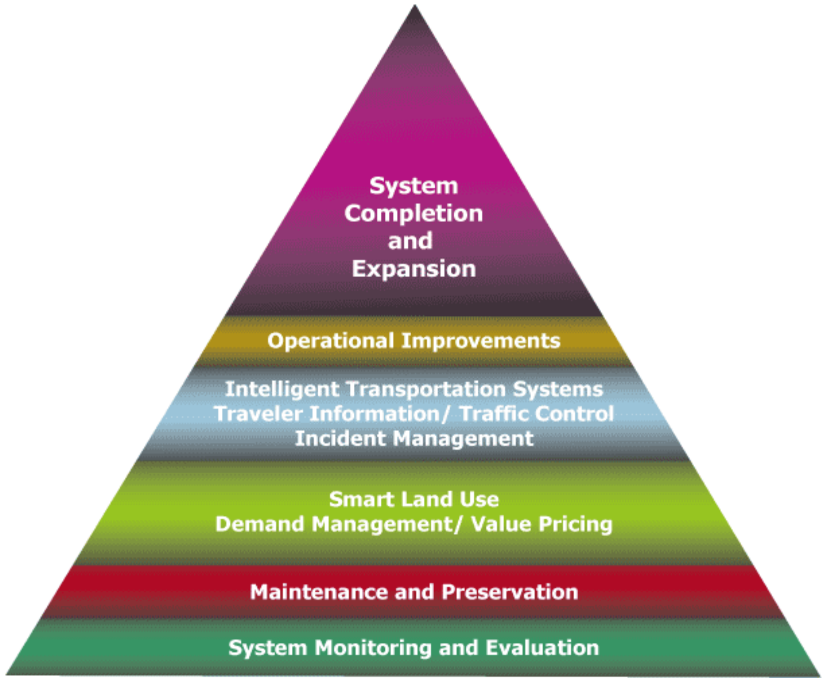
- <u>Causality Analysis</u>
  This section diagnoses the bottlenecks identified in Section 4 and identifies the cause of each bottleneck through additional data analysis and significant field observation. This section and the Bottleneck Identification and Analysis section provide valuable input to selecting projects to address the critical bottlenecks. Moreover, they provide the baseline against which micro-simulation models will be validated. Finally, this section represents the sixth milestone of the CSMP development process.

The remainder of this introduction provides some background on system management, a framework that eventually led to the CSMP requirement. It also includes a discussion on data sources and the state of detection on the I-15 freeway facility.

Background

Over the last few years, Caltrans and its stakeholders and partner agencies have been developing and committing to a framework called —System Management” which is depicted in Exhibit 1-1. System management aims to get the most of our transportation infrastructure through a variety of strategies, not just through the traditional and increasingly expensive expansion projects. It relies on extensive and continuous system monitoring and evaluation as the foundation of identifying problems, evaluating solutions (and combinations thereof), and eventually funding the most promising strategies. This report represents the first version of this foundation and should be updated on a regular basis as conditions on the corridor evolve.

Exhibit 1-1: System Management Pyramid



The base of the system management ―pyramid" is ―System Monitoring and Evaluation". It is the foundation of all other decisions, and it includes identifying problems, evaluating solutions, and eventually funding the most promising strategies. This document represents the first version of this foundation for the I-15 corridor.

Existing Data Sources

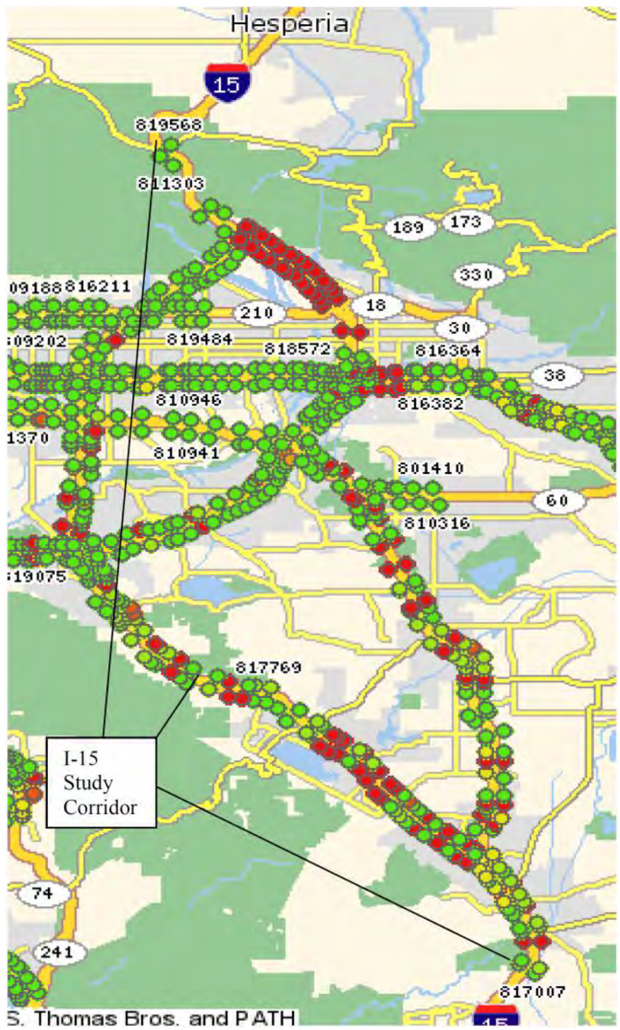
The available data analyzed for the comprehensive performance assessment includes the following sources:

- Mobility Performance Report (MPR) (2009)
- Caltrans Highway Congestion Monitoring Program (HICOMP) report and data files (2008)
- Caltrans Freeway Performance Measurement System (PeMS)
- Caltrans District 8 probe vehicle runs (electronic tachometer runs)
- Caltrans Traffic Accident Surveillance and Analysis System (TASAS) from PeMS
- Various traffic study reports
- Aerial photographs (Microsoft Virtual Earth and Google Earth) and Caltrans photologs
- Internet (e.g., RTA, Omnitrans, and Metrolink transit websites).

Freeway Detection Status

There are a total of 421 detectors on northbound and 354 detectors on southbound I-15 refer to Appendix A for exact locations of existing detectors. Exhibit 1-2 depicts the I-15 freeway facility with the detectors in place as of April 2011. Exhibit 1-2 illustrates the availability of detection south of SR-138 and the absence of detection north of SR-138 to Nevada State line. Future detectors are planned north of SR-138 as referenced in Appendix B. As noted by the green color dots, the majority of existing detectors south of SR-138 were functioning well.

Exhibit 1-2: I-15 Sensor Status



Exhibits 1-3 and 1-4 illustrate the “good and bad” detectors by day, for the I-15 in Riverside and San Bernardino County. What is considered good detectors are those where useable data can be collected, and bad detectors are ones where useable data cannot be collected. Approximately 63 percent of those detectors are “good” and 37 percent are identified as “bad” detectors.

Exhibit 1-3: Percentage of Good & Bad Detection on Northbound I-15

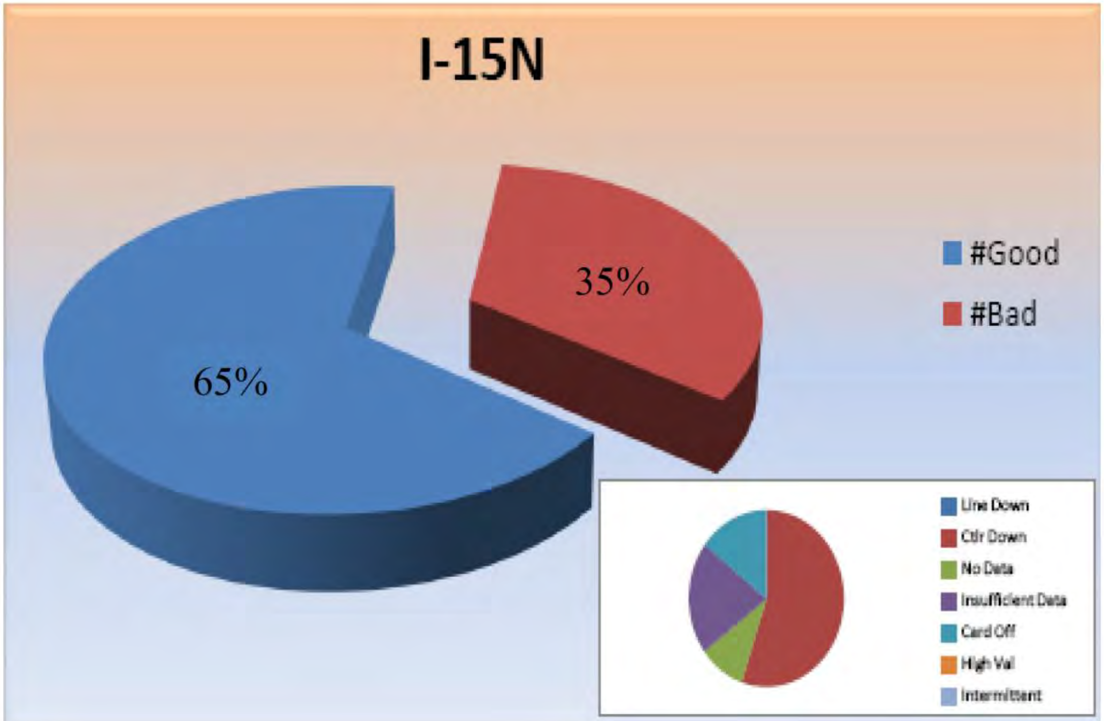
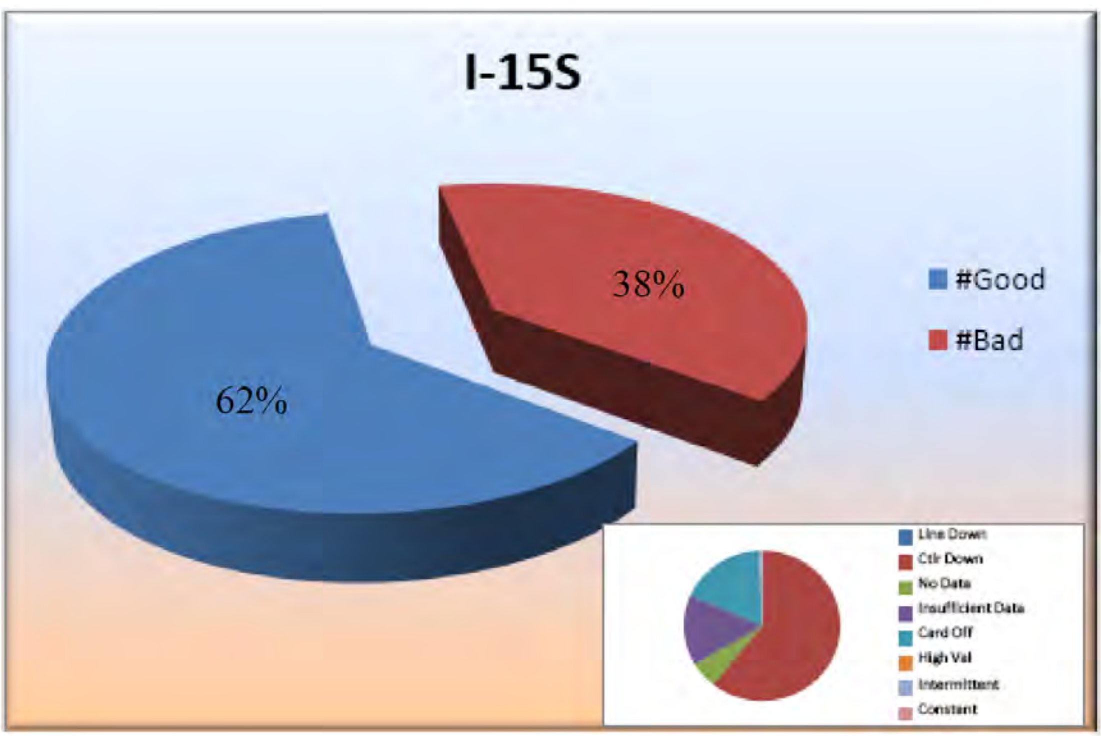


Exhibit 1-4: Percentage of Good & Bad Detection on Southbound I-15



Exhibits 1-5 and 1-6 provide the detectors health for the I-15 filtered by all collector-distributor, freeway to freeway, mainline, off-ramp, and on-ramp in Riverside and San Bernardino Counties. The y-axis shows the percent of total detectors and the x-axis shows the period from November 2010 to May 2011. The exhibits suggest reasons for the detectors bad health is insufficient data, controller down, no data, or the card was off. In late 2010, approximately 82 percent of the detectors were good. Today, this percentage has dropped to approximately 63 percent. The greatest change has been in the increase in the number of down controllers.

Exhibit 1-5: Percentage of Total Detectors on I-15 Northbound

Detector Health, filtered by All
Freeway I-15 N in D8
Wed 11/10/2010 00:00:00 to Mon 05/09/2011 23:59:59

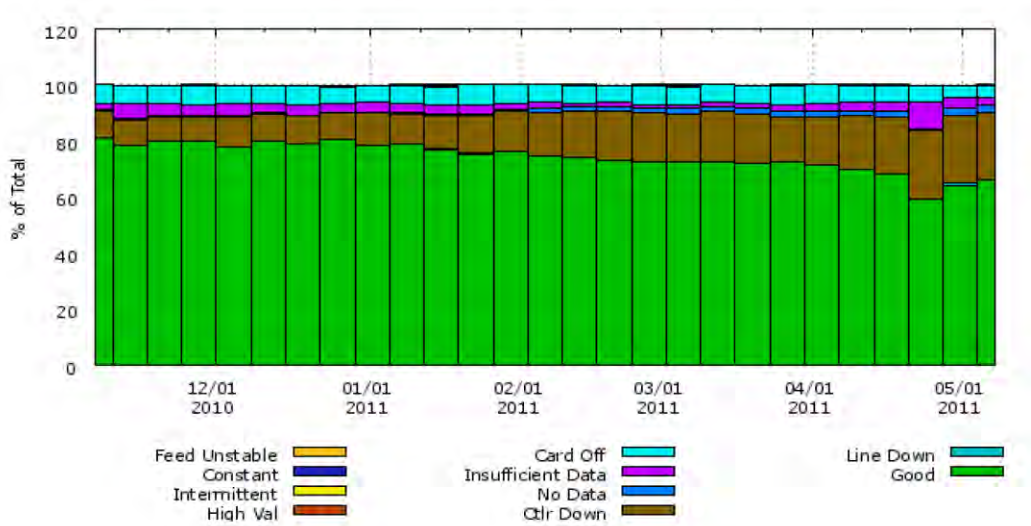


Exhibit 1-6: Percentage of Total Detectors on I-15 Southbound

Detector Health, filtered by All
Freeway I-15 S in D8
Wed 11/10/2010 00:00:00 to Mon 05/09/2011 23:59:59

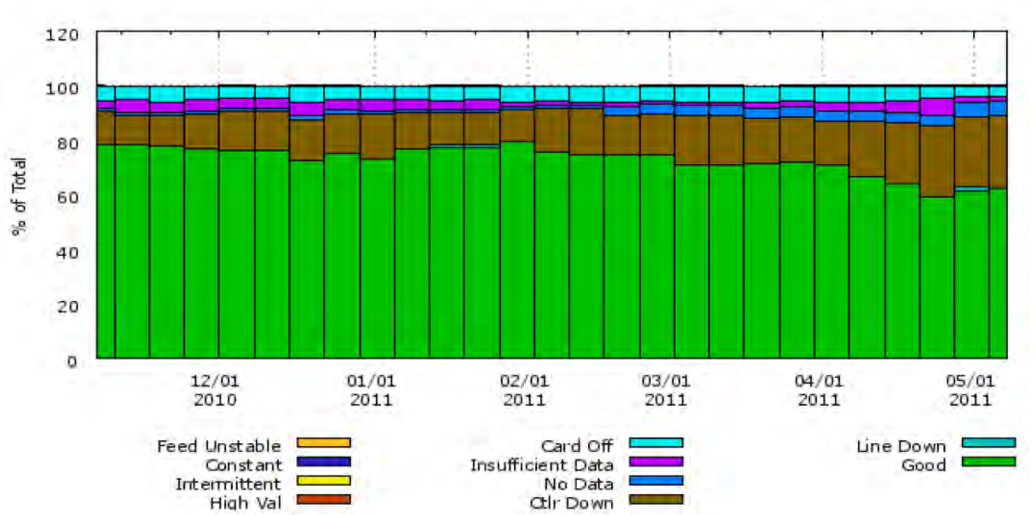


Exhibit 1-7 illustrates gaps in detection on the northbound and southbound I-15. It is standard practice to have detection placed approximately every half mile in urban areas. At times, detectors are placed closer depending on geometrics such as on-ramps, off-ramps and interchanges. Additional detectors are being considered north of SR-138 as shown in Appendix B.

Exhibit 1-7: Gaps in Detection on I-15

LOCATION		COUNTY	ABS PM		LENGTH
FROM	TO		FROM	TO	(Miles)
NORTHBOUND					
RAINBOW VALLEY BLVD	RAINBOW TR INSP STA	RIV	55.015	56.715	1.7
RAINBOW TR INSP STA	ROUTE 15/79 SEP.	RIV	56.715	57.715	1.0
ROUTE 79 NB ONR	RANCHO CALIFORNIA	RIV	58.015	59.215	1.2
RANCHO CALIFORNIA RD	RANCHO CALIF. N/O	RIV	59.615	60.215	0.6
RANCHO CALIF. N/O	WINCHESTER ROAD	RIV	60.215	61.115	0.9
WINCHESTER RD	WINCHESTER RD N/O	RIV	61.315	62.015	0.7
WINCHESTER RD N/O	ROUTE 15/215 SEP	RIV	62.015	62.915	0.9
ROUTE 15/215 SEP	MURRIETA HOT SPRINGS	RIV	62.915	63.915	1.0
MURRIETA HOT SPRINGS	CALIFORNIA OAKS RD	RIV	64.115	64.815	0.7
CALIFORNIA OAKS ROAD	NUTMEG ROAD S/O	RIV	65.315	66.115	0.8
NUTMEG ROAD S/O	NUTMEG ROAD N/O	RIV	66.115	67.015	0.9
NUTMEG ROAD N/O	CLINTON KEITH ROAD	RIV	67.015	67.815	0.8
BAXTER ROAD N/O	BUNDY CANYON ROAD	RIV	69.715	70.515	0.8
BUNDY CANYON ROAD	OLIVE STREET UC S/O	RIV	70.915	72.015	1.1
OLIVE STREET UC S/O	OLIVE ST. UC SB N/O	RIV	72.015	72.715	0.7
OLIVE ST. UC NB N/O	RAILROAD CANYON RD	RIV	72.716	73.515	0.8
RAILROAD CANYON RD	FRANKLIN STREET OC	RIV	73.815	74.715	0.9
MAIN STREET	CENTRAL AVE.	RIV	75.615	76.593	1.0
CENTRAL AVE.	NICHOLS ROAD	RIV	76.893	78.193	1.3
NICHOLS ROAD	GAVILAN WASH N/O	RIV	78.193	80.293	2.1
GAVILAN WASH N/O	LAKE STREET	RIV	80.293	81.093	0.8
LAKE STREET	TEMESCAL WASH	RIV	81.593	82.493	0.9
TEMESCAL WASH	HORSETHIEF WASH	RIV	82.493	83.493	1.0
HORSETHIEF WASH	INDIAN TRUCK TRAIL	RIV	83.493	84.793	1.3
INDIAN TRUCK TRAIL	TEMESCAL CANYON UC	RIV	85.093	85.893	0.8
TEMESCAL CANYON UC	MAYHEW WASH	RIV	85.893	86.793	0.9
MAYHEW WASH	TEMESCAL CANYON RD	RIV	86.793	87.493	0.7
TEMESCAL CANYON RD	BROWN CANYON WASH	RIV	87.893	88.993	1.1
BROWN CANYON WASH	WEIRICK ROAD	RIV	88.993	90.093	1.1
EL CERRITO ROAD	ONTARIO	RIV	92.293	93.419	1.1

MAGNOLIA N/B ON	.5 N/O MAGNOLIA	RIV	94.873	95.493	0.6
500 S/O PARKRIDGE	HIDDEN VALLEY	RIV	96.306	97.513	1.2
HIDDEN VALLEY	2nd St ONR	RIV	97.516	98.185	0.7
.02 N/O 4TH ST	M .18 N/O FIFTH ST	RIV	99.187	99.793	0.6
M 1.63 S/O LIMONITE	.75 S/O LIMEONITE	RIV	100.783	101.923	1.1
.75 S/O LIMEONITE	M .28 S/O LIMONITE	RIV	101.923	102.693	0.8
LIMEONITE NB ON	.25 N/O LIMEONITE	RIV	102.893	103.713	0.8
CANTU GALLEANO NB LP	.4 S/O 15/60 IC	RIV	104.593	105.334	0.7
.4 S/O 15/60 IC	M 1.2 S/O JURUPA ST	RIV	105.334	106.593	1.3
PHILADELPHIA UC	JURUPA	RIV	106.763	107.733	1.0
JURUPA	M .65 S/O I-10	SBD	108.003	108.574	0.6
AT AIRPORT DR	M 1.1 S/O FOOTHILL	SBD	108.774	110.774	2.0
15 N/O FOURTH ST	FOOTHILL NB	SBD	110.875	111.974	1.1
FOOTHILL NB	ETIWANDA/MILLER	SBD	111.974	112.774	0.8
ETIWANDA/MILLER	15 N/O BASELINE IDS	SBD	112.774	113.830	1.1
M 2.25 N/O FOOTHILL	S/O 15/210 IC	SBD	114.324	115.234	0.9
N/O 15/210 IC	SUMMIT S/O 15	SBD	115.424	116.194	0.8
DUNCAN CANYON	M 1.8 N/O SUMMIT AVE	SBD	117.274	118.174	0.9
M 1.8 N/O SUMMIT AVE	SIERRA NB ON	SBD	118.174	118.944	0.8
1.0 S/O GLEN HELEN	GLEN HELEN PKWY	SBD	119.774	120.444	0.7
N/O GLEN HELEN PKWY	M 1.5 S/O I-215	SBD	120.974	121.574	0.6
M 1.5 S/O I-215	M .16 S/O I-215	SBD	121.574	122.854	1.3
M .16 S/O I-215	M 2.25 N/O OAKIE FLT	SBD	122.854	124.329	1.5
M 2.25 N/O OAKIE FLT	M 1.65 S/O OAKIE FLT	SBD	124.329	125.292	1.0
M 1.65 S/O OAKIE FLT	M .3 S/O HWY 138	SBD	125.292	130.619	5.3
M .3 S/O HWY 138	NEVADA STATE LINE	SBD	130.619	283.590	153.0

SOUTHBOUND

RAINBOW VALLEY	RAINBOW TR INSP STA	RIV	55.005	56.705	1.7
RAINBOW TR INSP STA	ROUTE 15/79 SEP.	RIV	56.705	57.705	1.0
ROUTE 79 NB ONR	RANCHO CALIFORNIA	RIV	58.005	59.205	1.2
RANCHO CALIFORNIA RD	RANCHO CALIF. N/O	RIV	59.605	60.205	0.6
RANCHO CALIF. N/O	WINCHESTER ROAD	RIV	60.205	61.105	0.9
WINCHESTER RD	WINCHESTER RD N/O	RIV	61.305	62.005	0.7
WINCHESTER RD N/O	ROUTE 15/215 SEP	RIV	62.005	62.905	0.9
ROUTE 15/215 SEP	MURRIETA HOT SPRINGS	RIV	62.905	63.905	1.0
MURRIETA HOT SPRINGS	CALIFORNIA OAKS RD	RIV	64.105	64.805	0.7
CALIFORNIA OAKS ROAD	NUTMEG ROAD S/O	RIV	65.305	66.105	0.8
NUTMEG ROAD S/O	NUTMEG ROAD N/O	RIV	66.105	67.005	0.9
NUTMEG ROAD N/O	CLINTON KEITH ROAD	RIV	67.005	67.805	0.8
BAXTER ROAD N/O	BUNDY CANYON ROAD	RIV	69.705	70.505	0.8
BUNDY CANYON ROAD	OLIVE STREET UC S/O	RIV	70.905	72.005	1.1

OLIVE STREET UC S/O	OLIVE ST UC SB N/O	RIV	72.005	72.705	0.7
OLIVE ST. UC NB N/O	RAILROAD CANYON RD	RIV	72.706	73.505	0.8
RAILROAD CANYON RD	FRANKLIN STREET OC	RIV	73.805	74.705	0.9
MAIN STREET	CENTRAL AVE.	RIV	75.605	76.583	1.0
CENTRAL AVE.	NICHOLS ROAD	RIV	76.883	78.183	1.3
NICHOLS ROAD	GAVILAN WASH S/O	RIV	78.183	79.183	1.0
GAVILAN WASH S/O	GAVILAN WASH N/O	RIV	79.183	80.283	1.1
GAVILAN WASH N/O	LAKE STREET	RIV	80.283	81.083	0.8
LAKE STREET	TEMESCAL WASH	RIV	81.583	82.483	0.9
TEMESCAL WASH	HORSETHIEF WASH	RIV	82.483	83.483	1.0
HORSETHIEF WASH	INDIAN TRUCK TRAIL	RIV	83.483	84.783	1.3
INDIAN TRUCK TRAIL	TEMESCAL CANYON UC	RIV	85.083	85.883	0.8
TEMESCAL CANYON UC	MAYHEW WASH	RIV	85.883	86.783	0.9
TEMESCAL CANYON RD	BROWN CANYON WASH	RIV	87.483	88.983	1.5
BROWN CANYON WASH	WEIRICK ROAD	RIV	88.983	90.083	1.1
CAJALCO ROAD	EL CERRITO ROAD	RIV	91.583	92.283	0.7
EL CERRITO ROAD	0.4 N/O ONTARIO AVE.	RIV	92.283	93.722	1.4
MAGNOLIA N/B ON	.5 N/O MAGNOLIA	RIV	94.863	95.483	0.6
PARKRIDGE OC	HIDDEN VALLEY	RIV	95.941	97.217	1.3
YUMA	2ND	RIV	97.217	97.941	0.7
2ND	M .18 N/O FIFTH ST	RIV	97.960	99.783	1.8
6 TH ST SB	M 1.63 S/O LIMONITE	RIV	100.158	100.773	0.6
M 1.63 S/O LIMONITE	SB LIMENONITE ONR	RIV	100.773	102.563	1.8
M .28 S/O LIMONITE	M 2.04 S/O RIVERSIDE	RIV	102.683	104.003	1.3
CANTU GALLEANO SB LP	M 1.2 S/O JURUPA ST	RIV	104.683	106.583	1.9
M 1.2 S/O JURUPA ST	JURUPA	RIV	106.583	107.733	1.2
JURUPA	M .65 S/O I-10	SBD	107.733	108.564	0.8
M .65 S/O I-10	4TH ST SB LOOP ONR	SBD	108.564	109.764	1.2
4TH ST SB LOOP ONR	M 1.1 S/O FOOTHILL	SBD	109.764	110.764	1.0
M 1.1 S/O FOOTHILL	FOOTHILL SB	SBD	110.764	111.764	1.0
FOOTHILL LOOP SB	BASELINE SB	SBD	111.864	113.164	1.3
BASELINE SB	M 2.25 N/O FOOTHILL	SBD	113.164	114.354	1.2
M 2.25 N/O FOOTHILL	15@SUMMIT SB	SBD	114.354	116.415	2.1
M .46 N/O SUMMIT AVE	M 1.8 N/O SUMMIT AVE	SBD	116.864	118.164	1.3
M 1.8 N/O SUMMIT AVE	SIERRA	SBD	118.164	118.834	0.7
M .37 S/O SIERRA AVE	M 1.0 S/O GLEN HELEN	SBD	119.264	120.464	1.2
M 1.0 S/O GLEN HELEN	M .86 N/O I-215	SBD	120.464	121.274	0.8
M 1.5 S/O BARSTOW FW	M .16 S/O BARSTOW FW	SBD	121.564	122.844	1.3
M .16 S/O BARSTOW FW	M 1.65 S/O OAKIE FLT	SBD	122.844	125.282	2.4
M 1.65 S/O OAKIE FLT	M 2.25 N/O OAKIE FLT	SBD	125.282	129.528	4.2
M 2.25 N/O OAKIE FLT	M .3 S/O HWY 138	SBD	129.528	130.609	1.1
M .3 S/O HWY 138	SB OFF TO YATES WELL RD	SBD	130.609	289.360	158.8

2. CORRIDOR DESCRIPTION

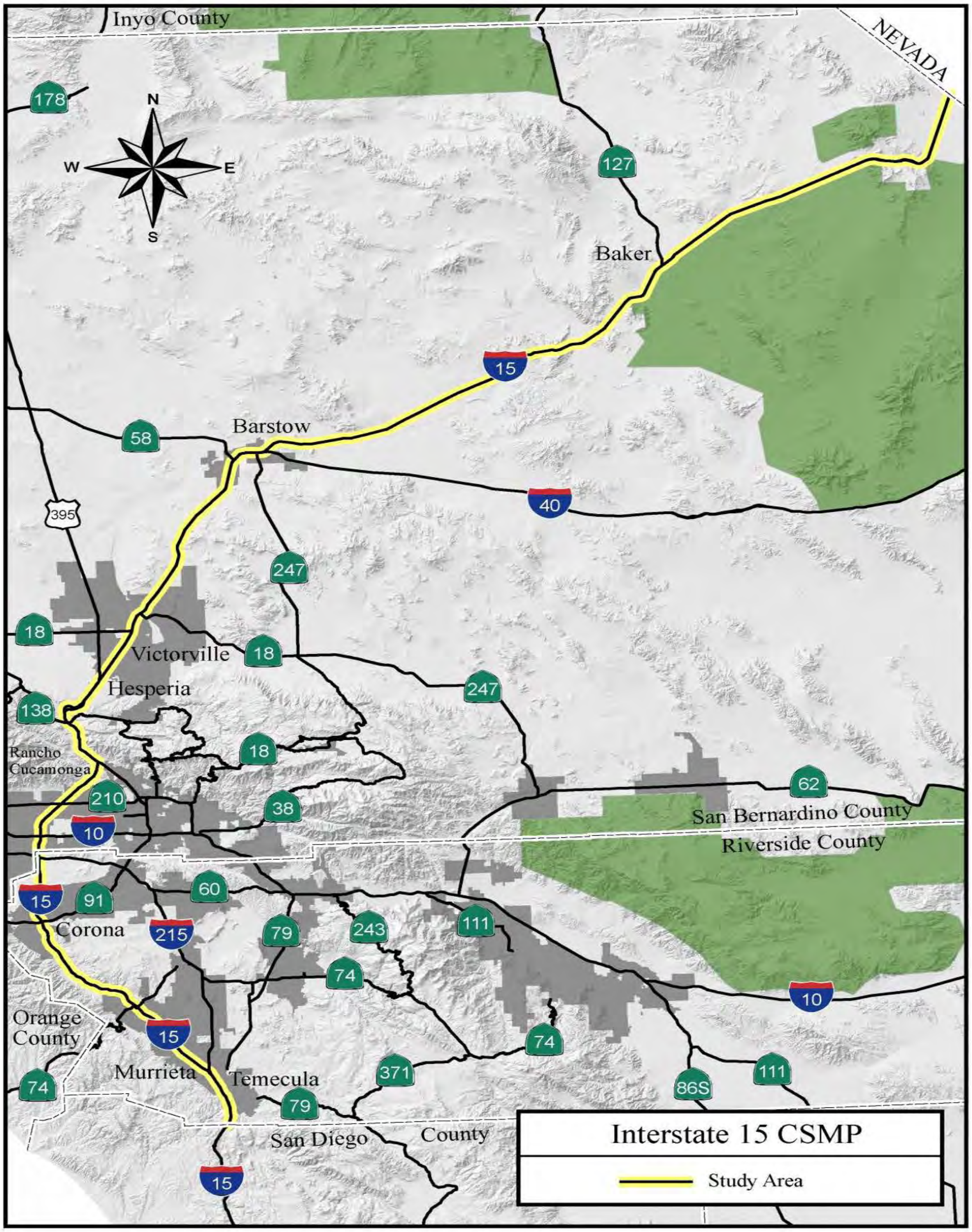
The I-15 study corridor (Exhibit 2-1) has a total length of 239 miles beginning at the San Diego/Riverside County Line and terminating at the California/Nevada State Line. The corridor passes through cities of Temecula, Murrieta, Wildomar, Lake Elsinore, Corona, Norco, Jurupa Valley, and Eastvale in the County of Riverside. Within the County of San Bernardino, the corridor traverses the cities of Ontario, Fontana, Rancho Cucamonga and passes through the high desert cities of Hesperia, Victorville, Apple Valley, and Barstow.

The corridor is a primary link for the Inland Empire and the High Desert to major economics centers and geographic regions of Orange and San Diego Counties and the Greater Los Angeles area. It is a significant goods movement corridor between the Ports of Los Angeles and Long Beach, border crossings with Mexico to destinations nationwide. It also serves as a conduit for recreation travel to Las Vegas, San Diego and other destinations.

In 2009, Average Daily Traffic ranged from nearly 214,000 vehicles near the Riverside/San Bernardino County Line to 37,000 near the California/Nevada State Line. Traffic is forecasted to increase about 40 percent to approximately 299,000 and about 86 percent to approximately 69,000 vehicles per day by 2035, respectively. The growing population and relatively affordable housing market in Riverside and San Bernardino Counties, along with increasing employment opportunities in the Greater Los Angeles, Orange, and San Diego County areas, and increasing goods movement and recreation traffic have increased demand on the corridor in the last decade and are expected to continue into the future. I-15 is part of the National Highway System (NHS), the Strategic Highway Corridor Network of National Defense (STRAHNET), and the Freeway and Expressway System (F&E).

The I-15 freeway varies from a six to eight-lane freeway facility in the urbanized areas and four to six-lanes in rural areas.

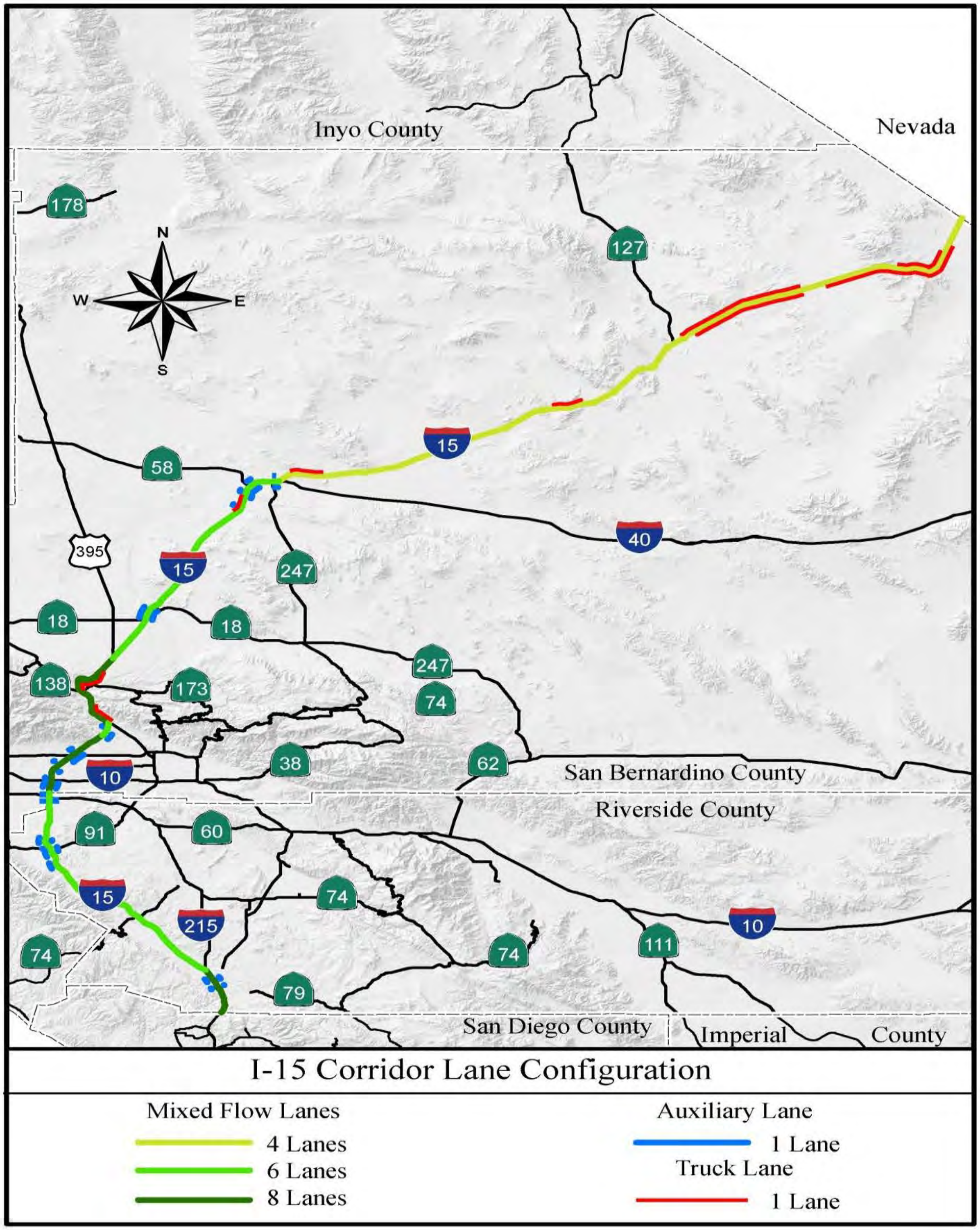
Exhibit 2-1: I-15 Study Corridor



Corridor Roadway Facility

As depicted in Exhibit 2-2, I-15 varies from a six to eight-lane freeway facility in the urbanized areas and four to six-lanes in rural areas with concrete median barrier that separates northbound and southbound traffic for most of the corridor. Note that the exhibit depicts lanes in each direction. There are auxiliary (aux) lanes along many sections of the corridor, but they are not continuous nor are they always available for both sides of the freeway. There are no continuous High Occupancy Vehicle (HOV) lanes on the corridor. Metered ramps for Single Occupancy Vehicle (SOV) and HOV lanes are present along the study corridor. In addition to the eight freeway-to-freeway interchanges, the corridor has seven interchanges with other state routes and 62 local road interchanges.

Exhibit 2-2: Corridor Lane Configuration



According to the 2008 Caltrans Annual Traffic Volumes Report, the I-15 corridor carries between 30,000 and 214,000 Annual Average Daily Traffic (AADT) as shown in Exhibit 2-3 and Exhibit 2-4 for the High Desert Region. The highest AADT was reported near the Riverside/San Bernardino County line area.

Exhibit 2-3: I-15 2008 AADT Riverside-San Bernardino Valley

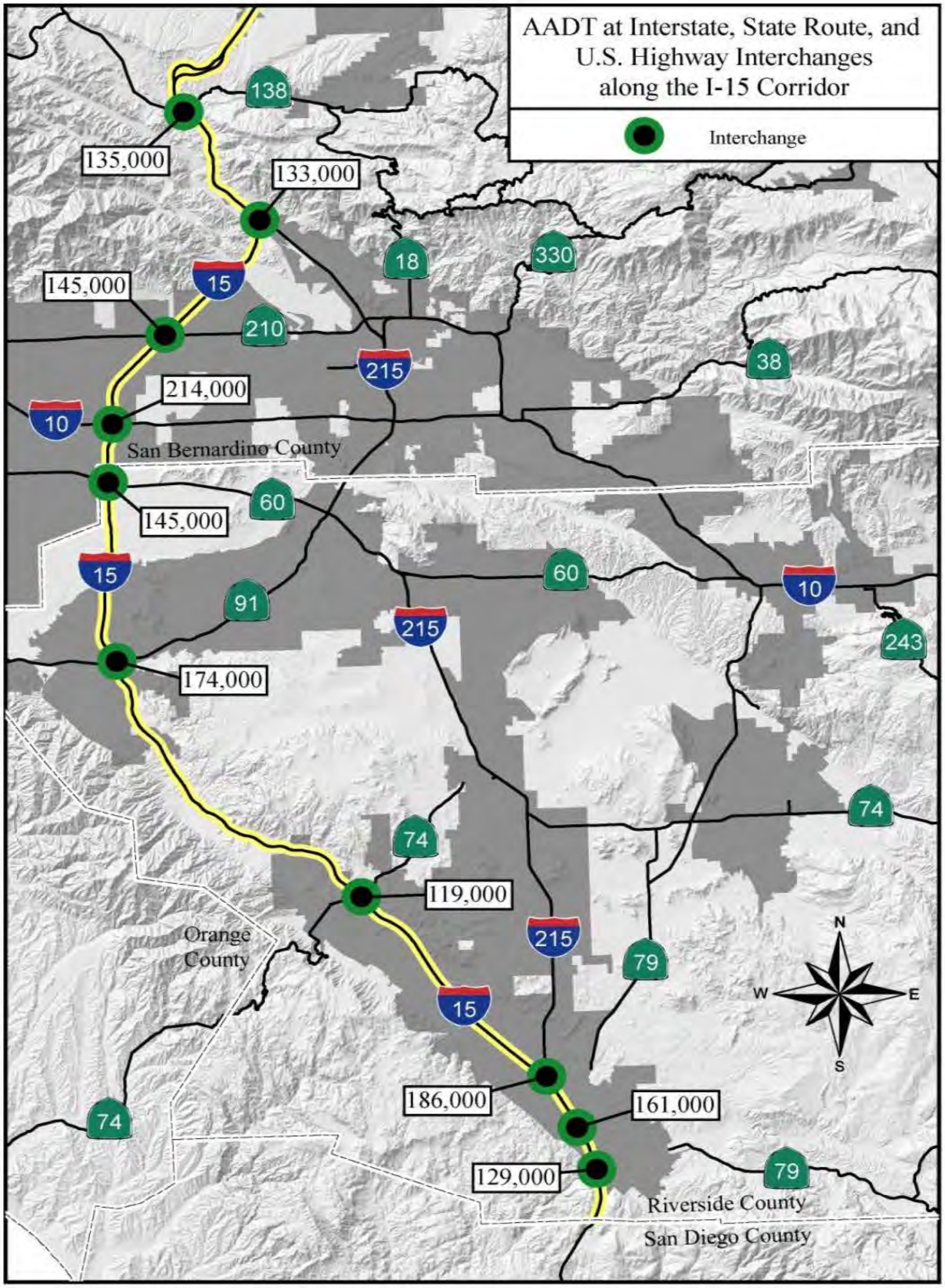
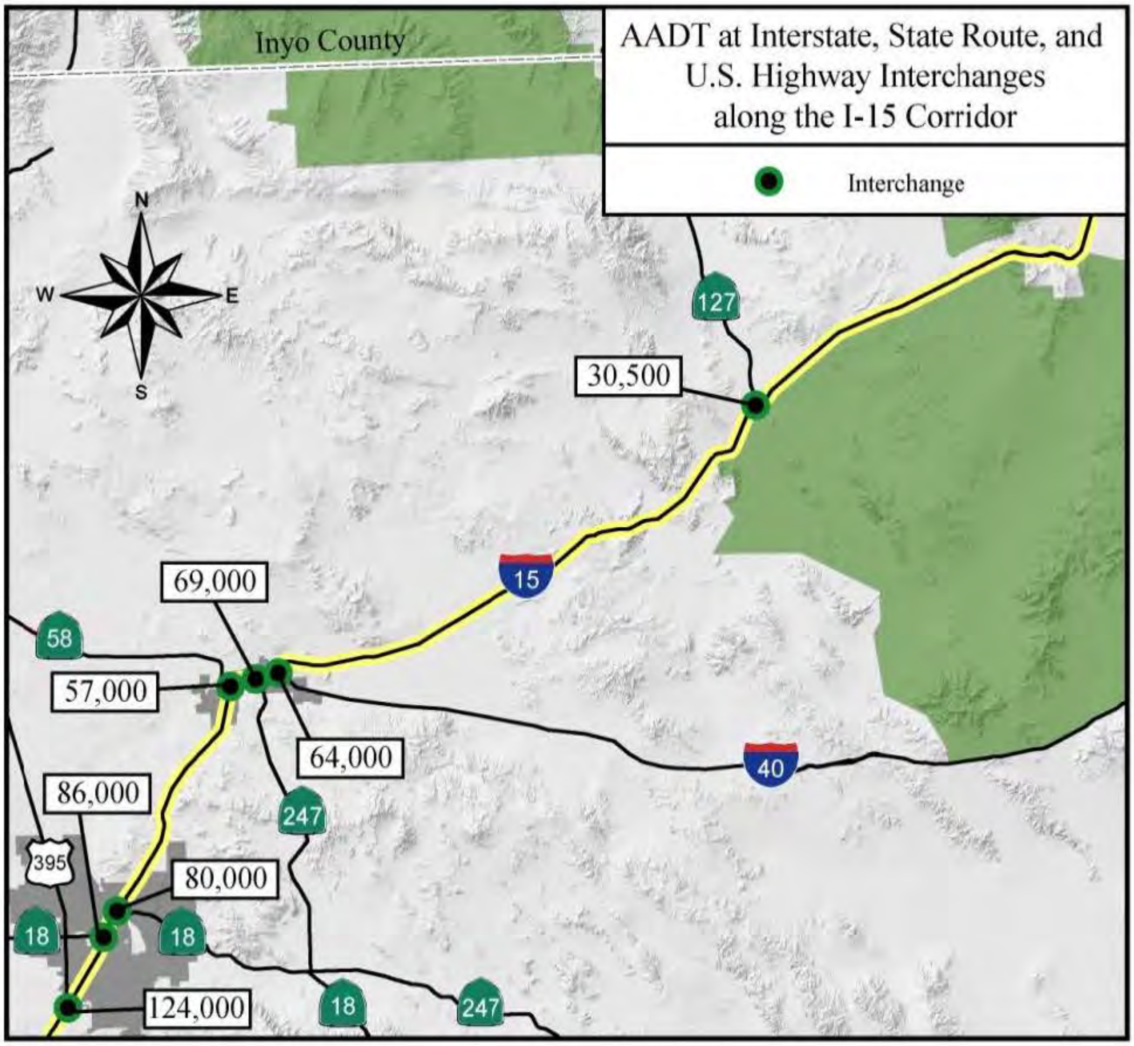


Exhibit 2-4: I-15 2008 AADT High Desert



As part of the Surface Transportation Assistance Act (STAA) route, trucks may operate along the corridor as shown in Exhibit 2-5. Exhibits 2-6 and 2-7, indentify trucks as a percentage of AADT (listed as total percentage). According to the 2008 Annual Average Daily Truck Traffic on the California State Highway System published by Caltrans in September 2009, this corridor's daily truck traffic ranges from 5.55 percent to 23.24 percent of the total daily traffic.

Exhibit 2-5: District 8 STAA Truck Routes

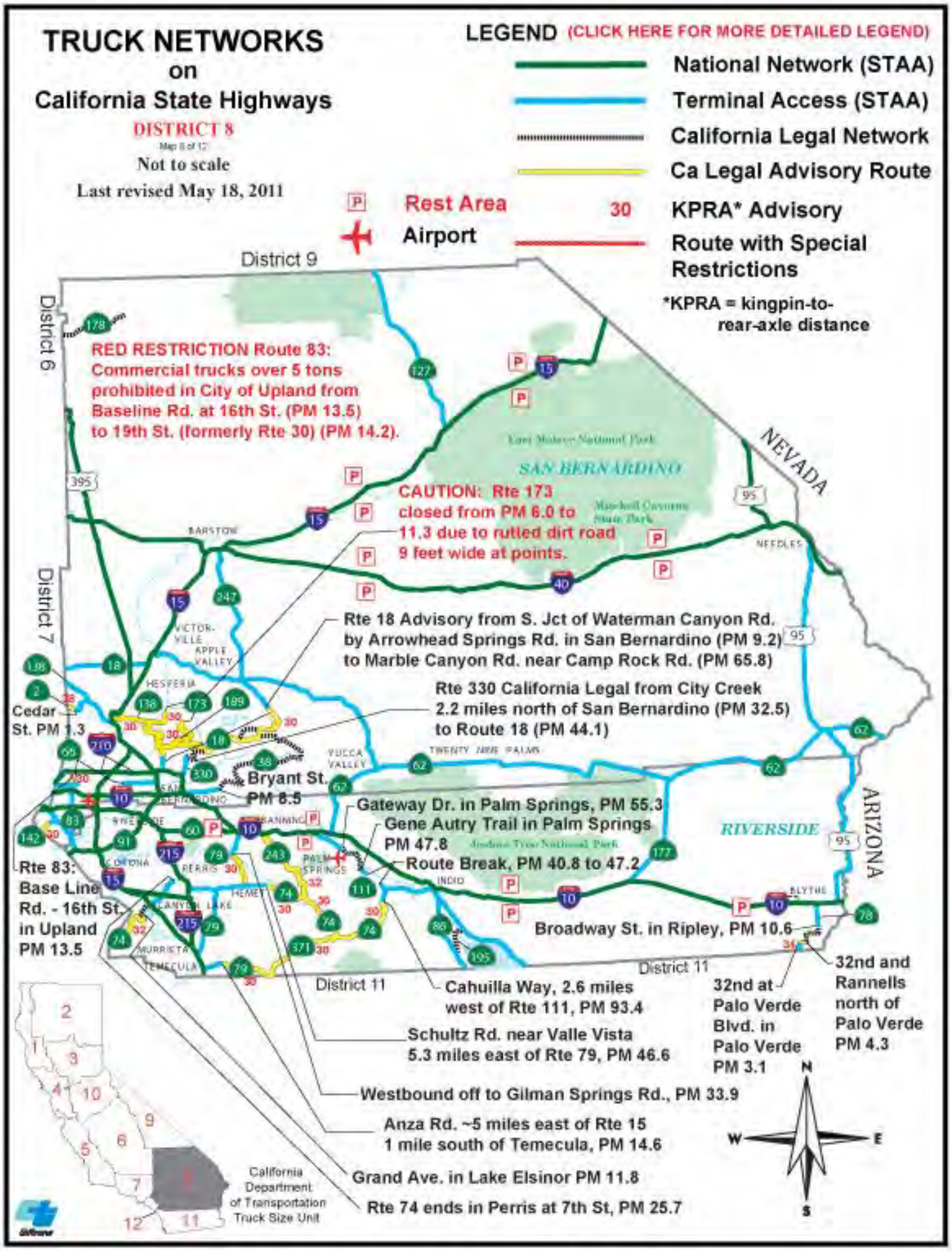


Exhibit 2-6: I-15 2008 Truck AADT – Riverside/San Bernardino Valley

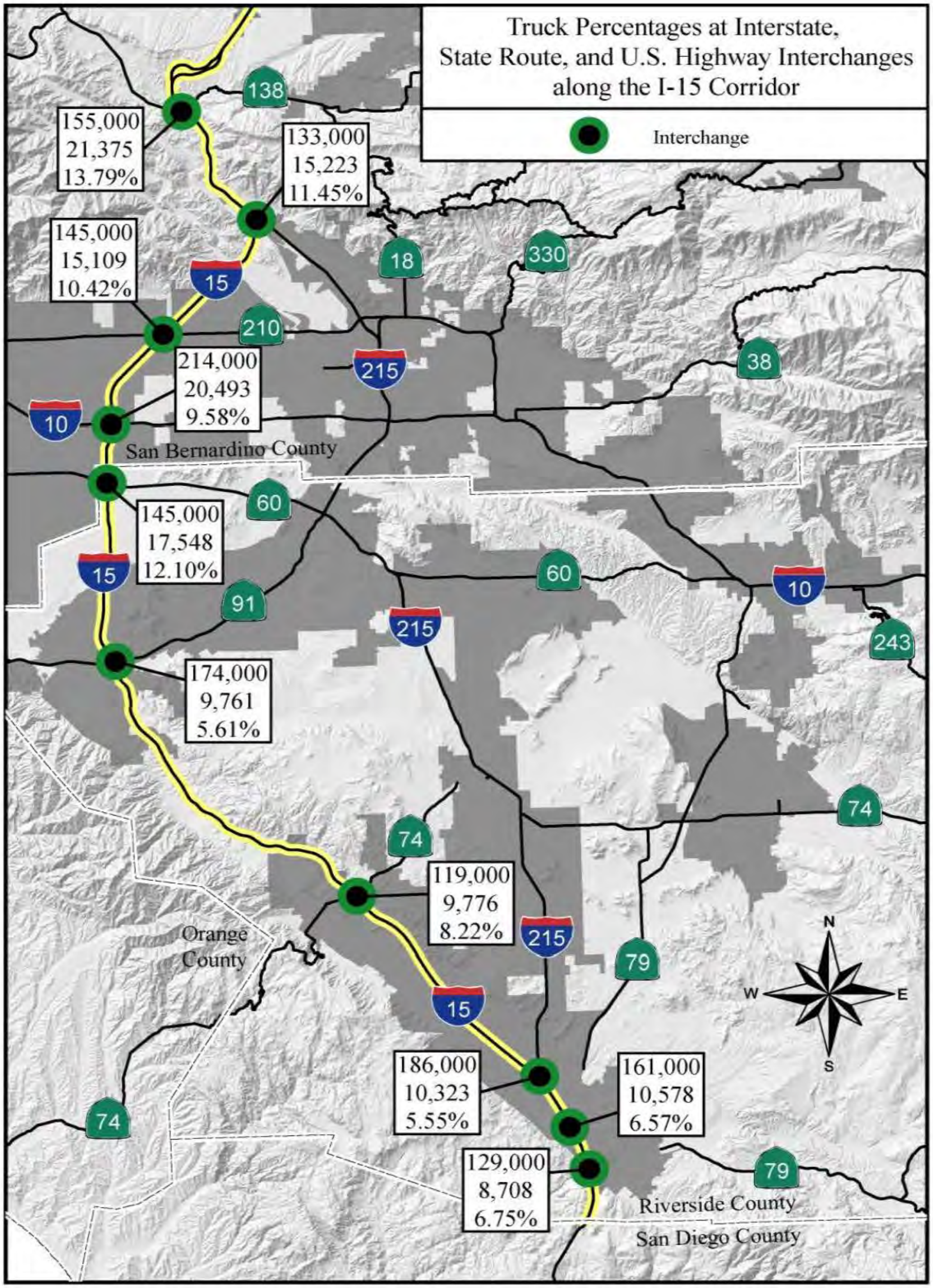
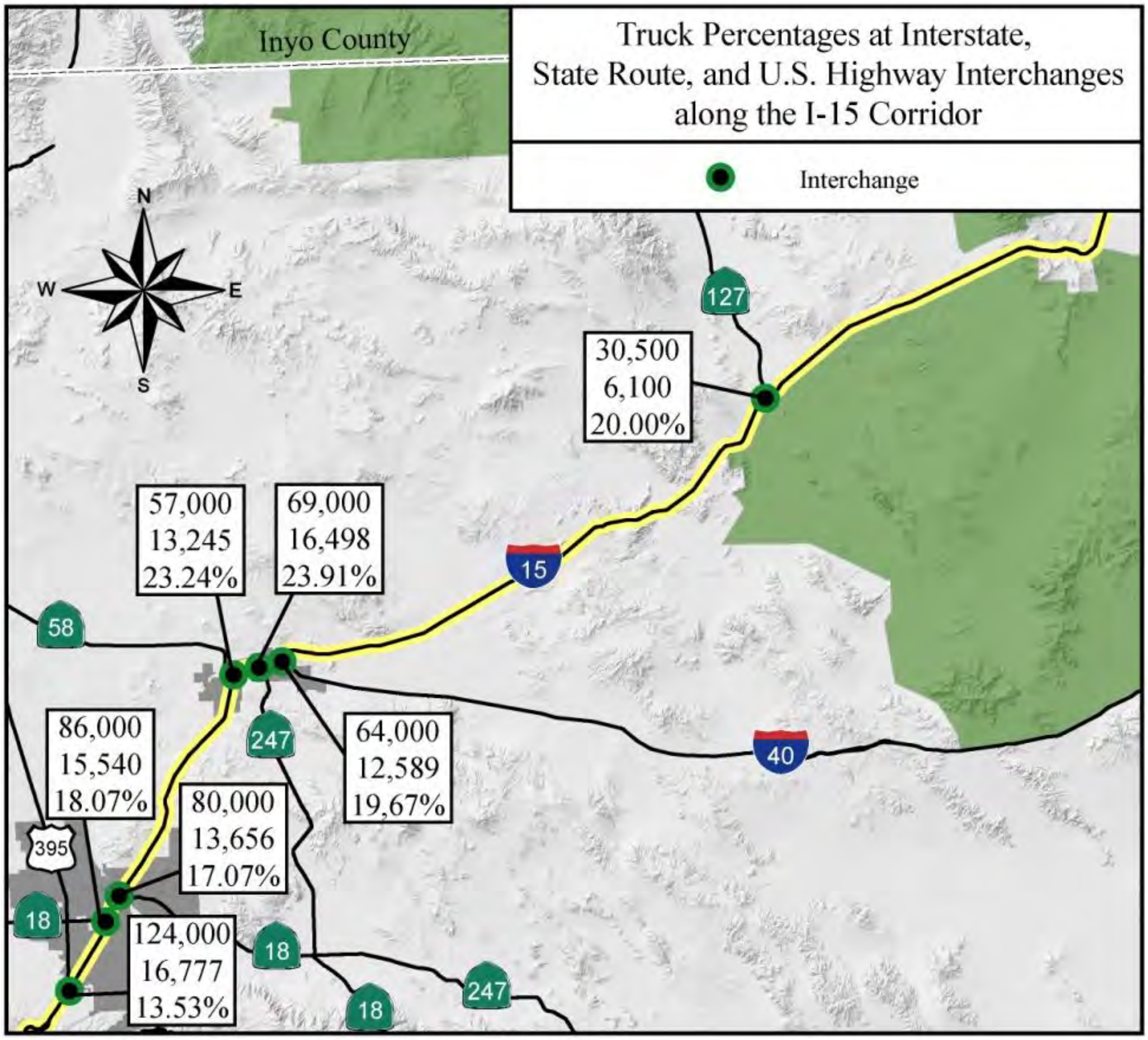


Exhibit 2-7: I-15 2008 Truck AADT - High Desert



Parallel Freeways and Expressways

Between the city of Temecula in Riverside County and the community of Devore in San Bernardino County, I-215 is the only major parallel freeway. In the city of Corona, SR-91 serves as a bypass for a short distance in the northwest section of the Riverside County.

Listed in Exhibit 2-8, below are other existing alternative parallel freeways/highways to I-15. During peak hours, the parallel routes are also congested/and or discontinuous and do not provide viable alternatives to the freeway.

Exhibit 2-8: Alternative Parallel Freeways-Highways to the I-15 Corridor

Parallel Routes		
Route	**County**	**Location**
I-215	Riv/SBd	East of and parallel to I-15 from the city of Temecula and the community of Devore in Riverside and San Bernardino Counties, respectively
SR-71	SBd	West of and parallel to I-15 in the Prado Dam Basin area
SR-83	SBd	West of and parallel to I-15 in southwest San Bernardino County, in the Ontario/Chino Valley area
I-40	SBd	East Barstow
US-395	SBd	West of and parallel to I-15 in High Desert
SR-247	SBd	East of and parallel to I-15 in High Desert

Major Parallel Local Arterials

In the event of a lane closure or high demand, parallel and intersecting local arterials that can accommodate trips or relieve congestion on I-15 are very limited. In the event of an I-15 closure, the southwest Riverside County arterial system does not provide adequate capacity to accommodate the additional traffic demand. There are no continuous local roads through Cajon Pass that can be used as an alternate. The urban area of Victor Valley does provide a series of parallel local streets but Barstow has limited alternate streets for the highly travelled I-15. Through the rural, undeveloped areas north of Barstow, alternate roads are very limited.

Major Intersecting Routes

Listed in Exhibit 2-9, below are intersecting freeways and conventional highways that connect to I-15.

Exhibit 2-9: Freeways/Conventional Highways Connecting to I-15

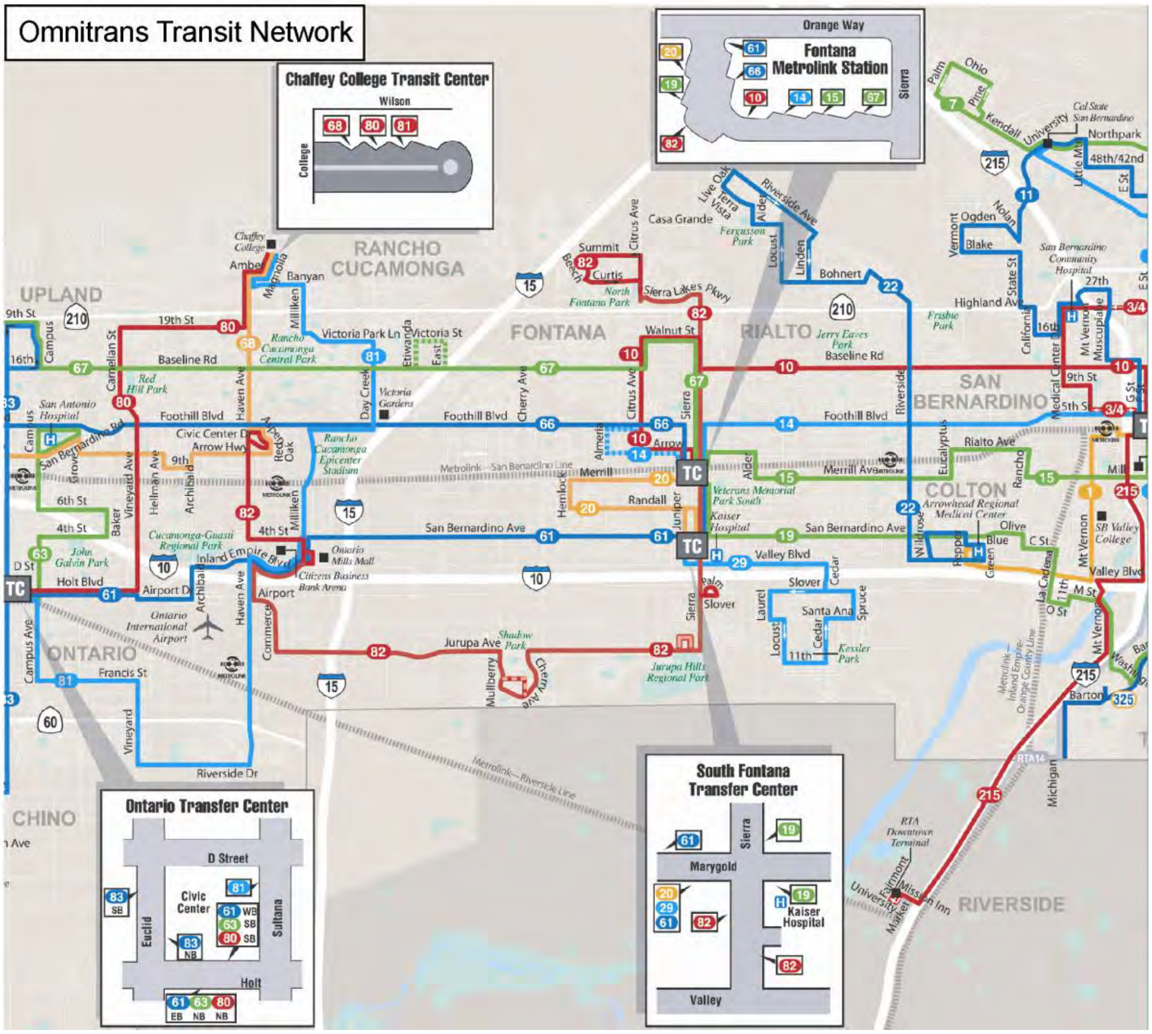
Route	Location
SR-79	City of Temecula
I-215	City of Murrieta
SR-74	City of Lake Elsinore
SR-91	City of Corona
SR-60	City of Ontario
I-10	City of Ontario
SR-210	City of Rancho Cucamonga
I-215	Devore
SR-138	Cajon Pass
US-395	City of Hesperia
SR-18	City of Victorville
SR-58	City of Barstow
SR-247	City of Barstow
I-40	City of Barstow
SR-127	Baker

Public Transit

Passenger Bus: Various local transit routes parallel different segments of I-15. Commuter bus service in Western Riverside County is provided by the Riverside Transit Agency (RTA), Exhibit 2-10. Omnitrans, a joint powers authority, provides public transportation (Exhibit 2-11) in the urbanized portion of the San Bernardino Valley including transit service that parallels Interstate 15. The Victor Valley Transit Authority provides local bus service in the urban areas of the High Desert. Central Barstow which is traversed by Interstate 15 is serviced by city busses. For longer commutes, Greyhound Line, Inc. provides scheduled bus service to and from Las Vegas, Nevada with stops in Barstow and Victorville with connections through the cities of San Bernardino, Riverside and Temecula. Amtrak also provides connecting bus service with stops in the community of Baker, and the cities of Barstow, Victorville and Ontario.

Exhibit 2-10: RTA Bus Service Map

Exhibit 2-11: Omnitrans Bus Service Map



Passenger Rail: The Amtrak Southwest Chief traveling between Los Angeles and Chicago uses the BNSF tracks which parallel I-15 from I-215 North junction at the foot of the Cajon Pass to the city of Barstow. Amtrak provides daily train and motor coach service (Exhibit 2-12) to and from the cities of San Bernardino and Riverside to destinations in Orange County and the city of Los Angeles.

Exhibit 2-12: Amtrak Map

Metrolink does not provide service along I-15. The 2008 SCAG RTP includes expanded service east of I-15, adjacent to the I-215 freeway with stops in the cities of Perris, Moreno Valley, Norco and Corona. The new service will provide access to the neighboring counties which include Los Angeles, Orange, and San Diego. Metrolink will be launching the new service by end of 2013.

Future High-Speed Passenger Rail Service: There are several planned or proposed high speed passenger rail services. They include:

- DesertXpress: This service is an interstate high-speed rail project that will provide non-stop service for the approximate 190 miles between Victorville, California and Las Vegas, Nevada. Running parallel to I-15 reaching speeds up to 150 mph; travel time will be approximately 80 minutes between the two cities. A future link between Victorville and Palmdale will connect Las Vegas and the voter–approved California High-Speed Rail (CHSR) network with planned Southern California stations in San Diego, Orange, Los Angeles, and San Bernardino Counties.[5]

- California-Nevada Interstate Maglev Train: The trains will use magnetic levitation technology providing passenger rail service for the 268 miles between Anaheim, California and Las Vegas, Nevada. Traveling at speeds up to 310 mph and with proposed stops to include the cities of Ontario, Victorville, and Barstow. Travel time is expected to be 87 minutes between Anaheim and Las Vegas.

- California High-Speed Rail (CHSR): This service is voter-approved, connecting Southern California with Northern California via high-speed passenger rail. The service would run from San Diego County traversing Orange County and the Los Angeles metropolitan area into the Central Valley with destinations in the San Francisco Bay area and Sacramento. A proposed south-eastern CHSR station would connect to the City of Ontario and its International Airport, and with a stop in the city of Palmdale, the CHSR service will be positioned for a proposed future connection with the DesertXpress service in Victorville.

Intermodal Facilities

Airports: Ontario International (ONT) is a medium-hub full service airport and a member of the Los Angeles World Airports system. It is the only commercial-passenger airport served by I-15 in San Bernardino and Riverside Counties. It is located near the southwest quadrant of the I-10/I-15 junction, approximately three miles from I-15. In 2010, the airport had a total of 94,030 operations serving a total of 4.8 million commercial airline passengers with a projected 30 million annual passengers (MAP) to be served by 2030.

[5] www.desertxpress.com

The Southern California Logistics Airport (SCLA), formerly George Air Force Base, is being developed with the main purpose of facilitating goods movement. The airport is located in north Victorville and does not offer commercial passenger airline service at this time. The SCAG RTP shows that SCLA is expected to serve about 2 million MAP by 2035.

Listed in Exhibit 2-13 below and shown in Exhibits 2-14 to 2-25 are several private and municipal airports in the vicinity of I-15.

Exhibit 2-13: Private and Municipal Airports near the I-15 Corridor

Airport Name	Location	Description	Annual Flights Ops	Year
French Valley Airport	Temecula	4 miles northeast of I-15 via SR-79	98,185	2006
Skylark Field Airport	Lake Elsinore	2 miles west of I-15 via Bundy Cyn Rd.	-	-
Corona Municipal Airport	Corona	3 miles west of I-15 via SR-91	68,000	2004
Hesperia Airport	Hesperia	5 miles east of I-15 via Main St.	-	-
Apple Valley County Airport	Apple Valley	5 miles east of I-15 via SR-18	-	-
Osborne Airport	SBd Co.	Adjacent to I-15 via Stoddard Wells Rd.	-	-
Barstow-Daggett Airport	Daggett	4 miles south of I-15 via Minneola Rd.	36,500	2006
Baker Airport	Baker	2 miles northwest of I-15 via SR-127	500	2006

Exhibit 2-14: District 8 Airport Map, I-15 Corridor

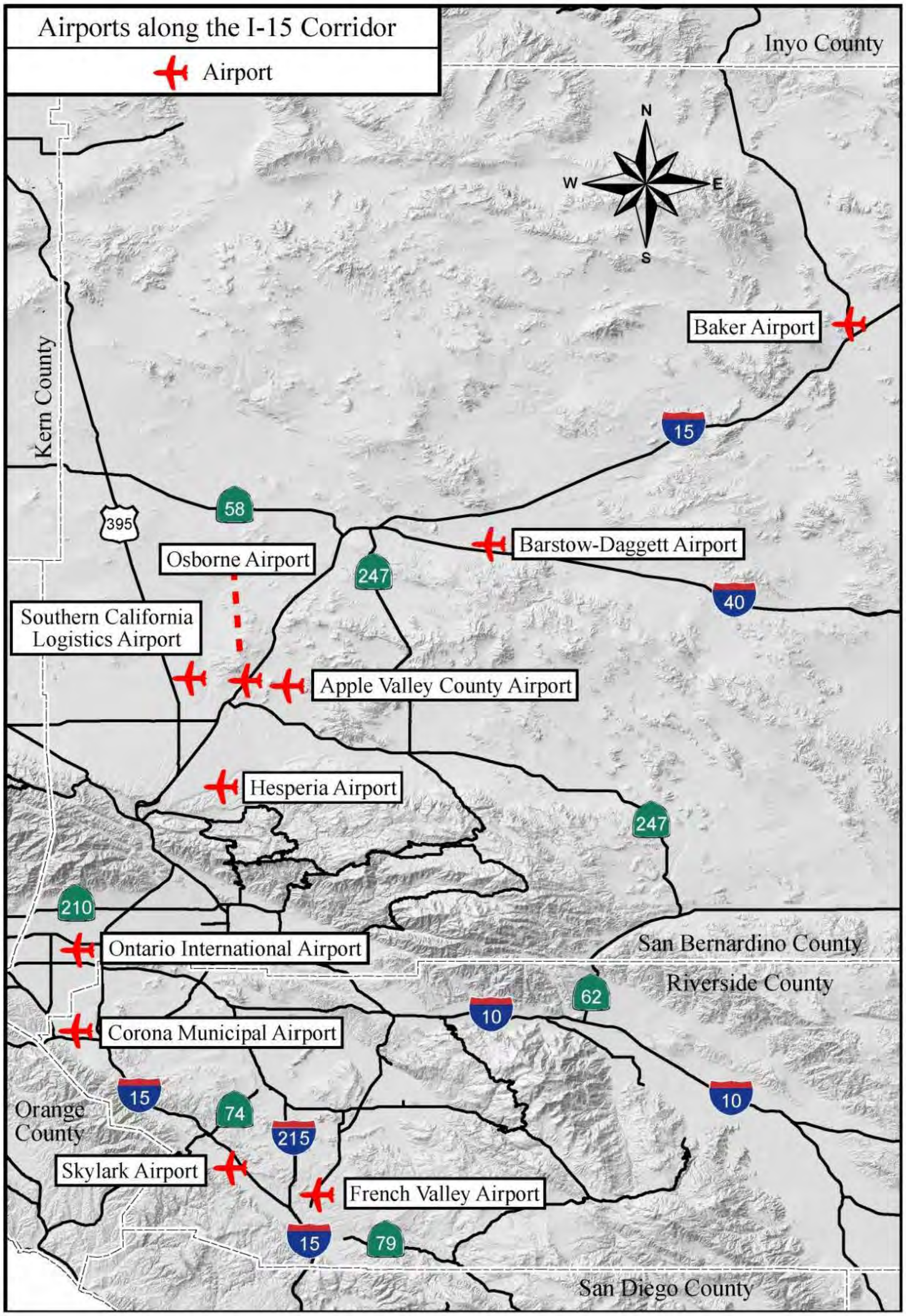


Exhibit 2-15: French Valley Airport

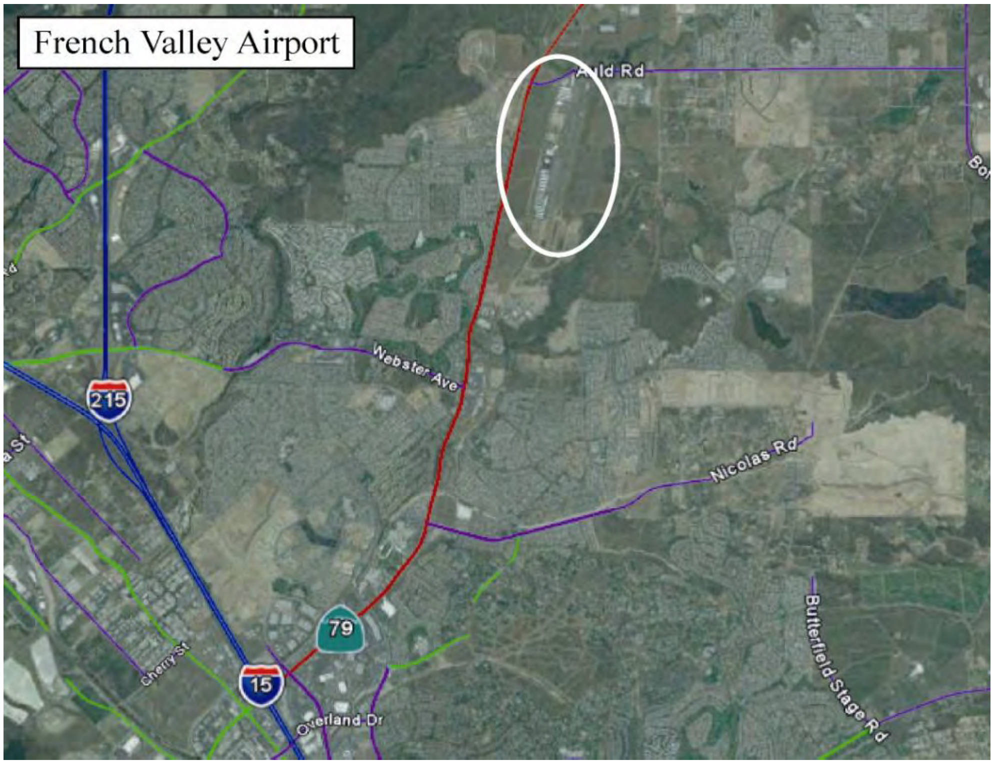


Exhibit 2-16: Skylark Field Airport

Exhibit 2-17: Corona Municipal Airport

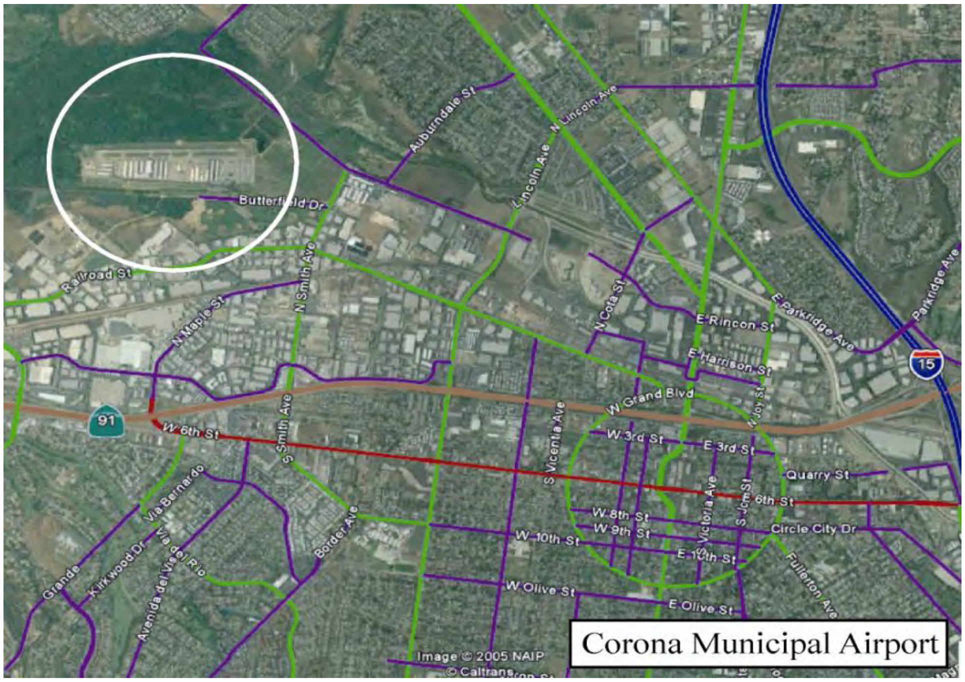


Exhibit 2-18: Ontario International Airport

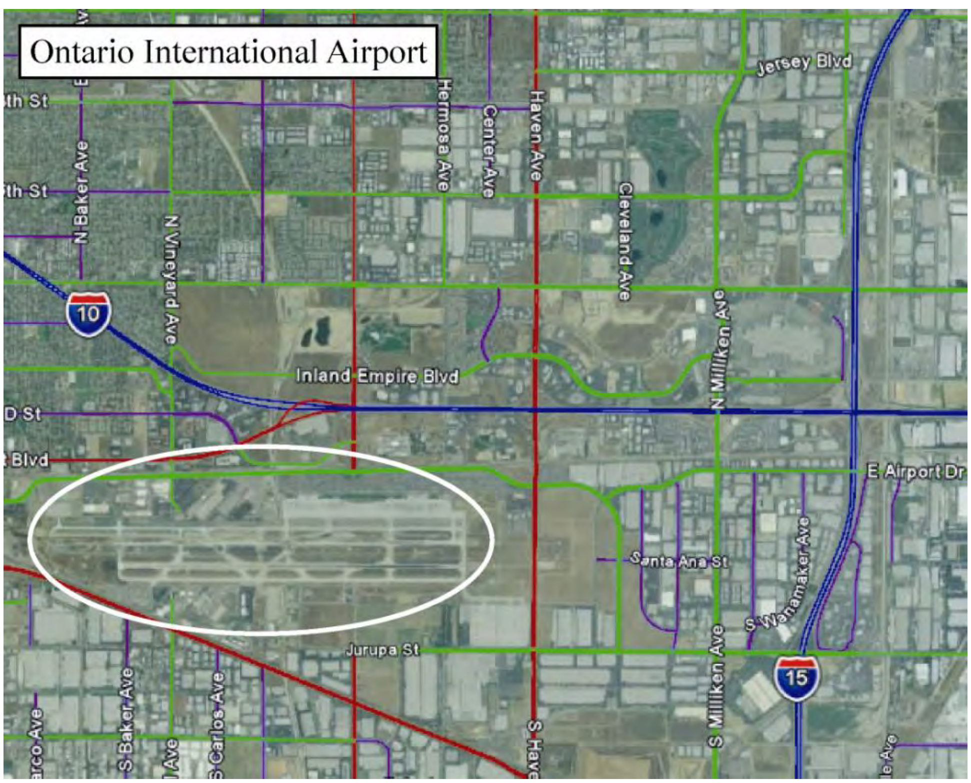


Exhibit 2-19: Hesperia Airport

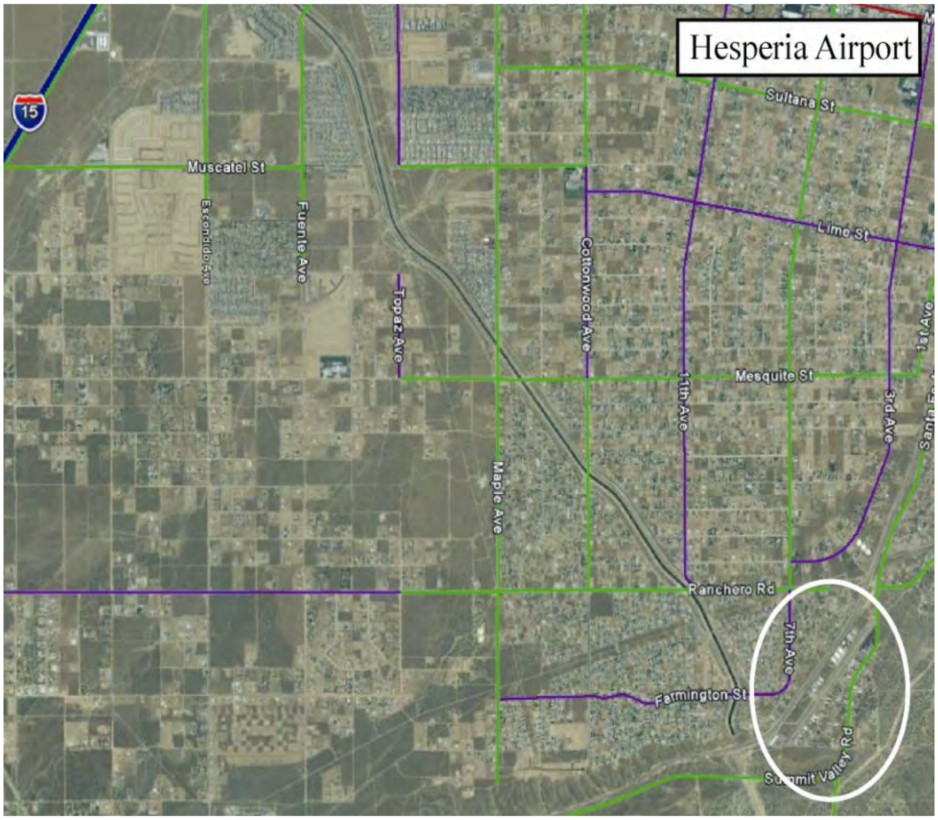


Exhibit 2-20: Southern California Logistics Airport

Exhibit 2-21: Apple Valley County Airport

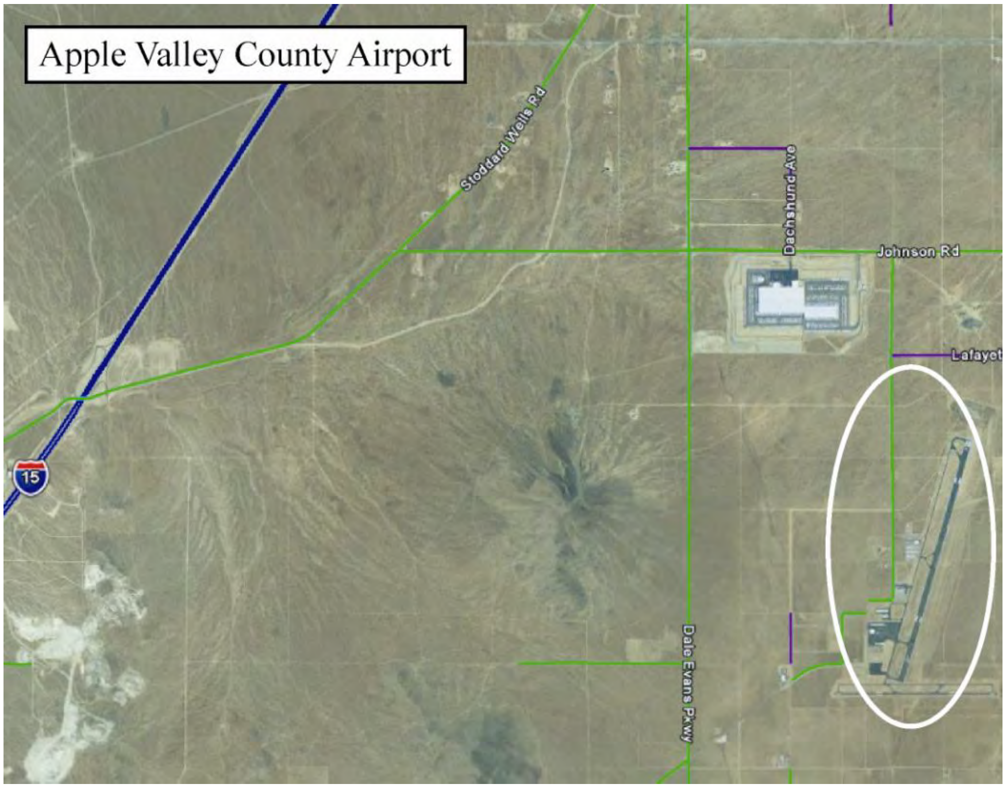


Exhibit 2-22: Osborne Airport

Exhibit 2-23: Barstow-Daggett Airport

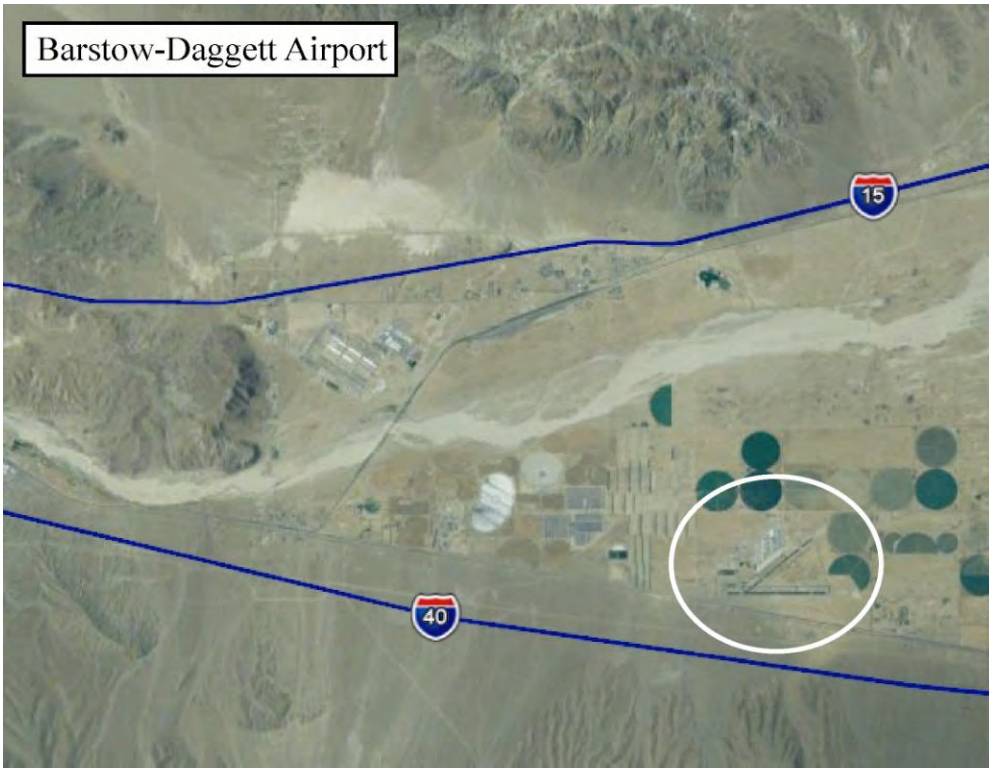


Exhibit 2-24: Baker Airport

Non-motorized Facilities

Of the 239 miles of the I-15 corridor, about 47 percent or 113 miles are accessible (Exhibit 2-25) for bicycles.

Exhibit 2-25: I-15 Bicycles Permitted

County	Post Miles	Description
SBd	R20.0-R28.6	Cleghorn Road to Oakhill Road
SBd	76.9-79.6	SR-58 to Fort Irwim Road
SBd	R81.8-R135.8	Ghost Town Road to South Baker Blvd.
SBd	R138.5-186.2	North Baker Blvd. to CA/NV State Line

In areas where bicycles are prohibited, bicylists can travel parallel to the I-15 corridor via local arterials.

Trip Generators

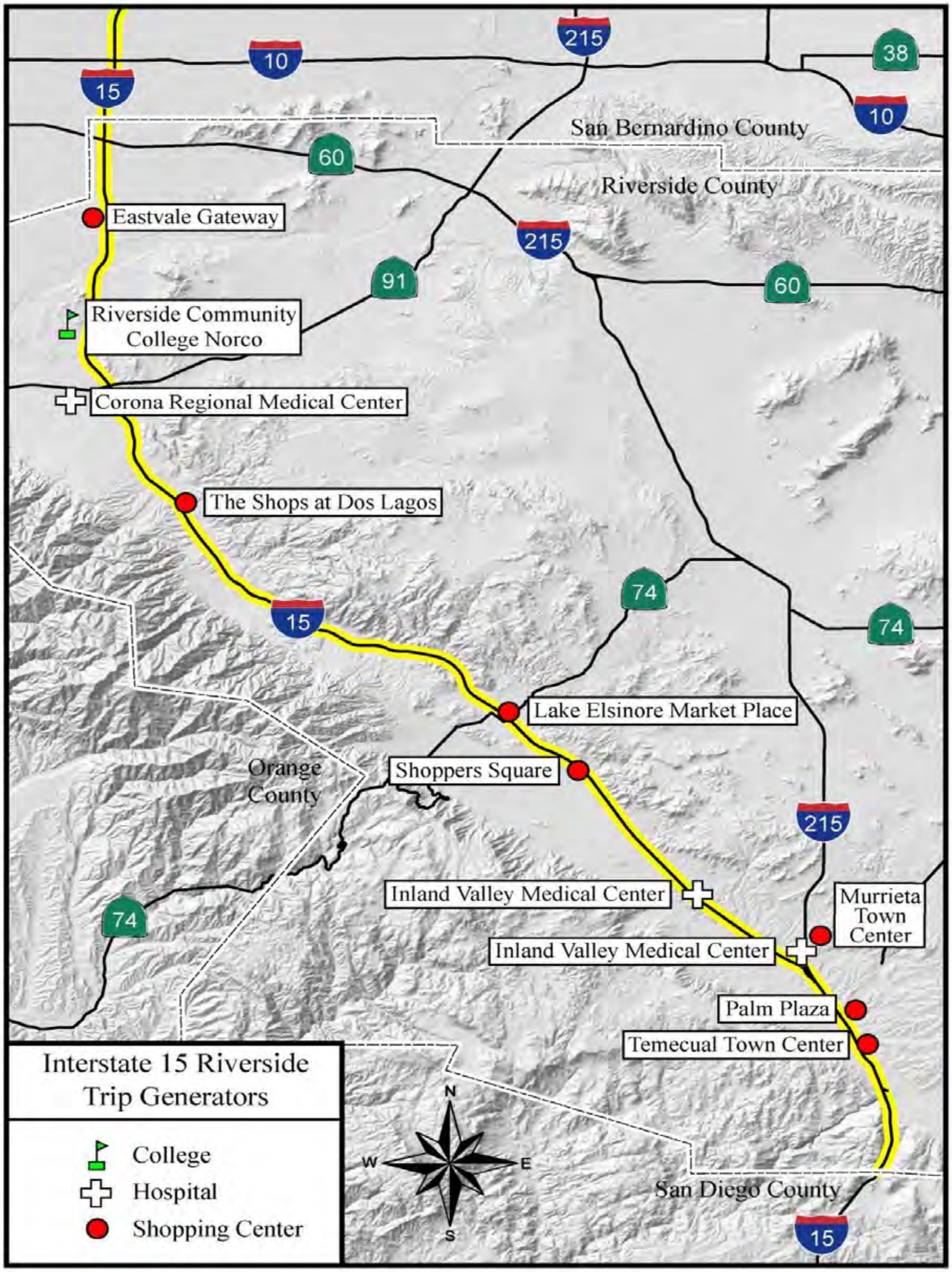
Major land use facilities such as educational institutions, medical centers, commercial/retail and entertainment centers can generate significant trips on the I-15 corridor. All educational institutions along the corridor are part of the California Community College System. Medical centers are comprised of regional and general Hospitals. Commercial/retail and entertainment centers can be a combination, in part or in all, major retail store (anchor store), retail store, general services store, movie theatre, sit-down dining, drive-through restaurant, etc. These facilities are listed in Exhibit 2-26 and displayed in map form, Exhibit 2-27.

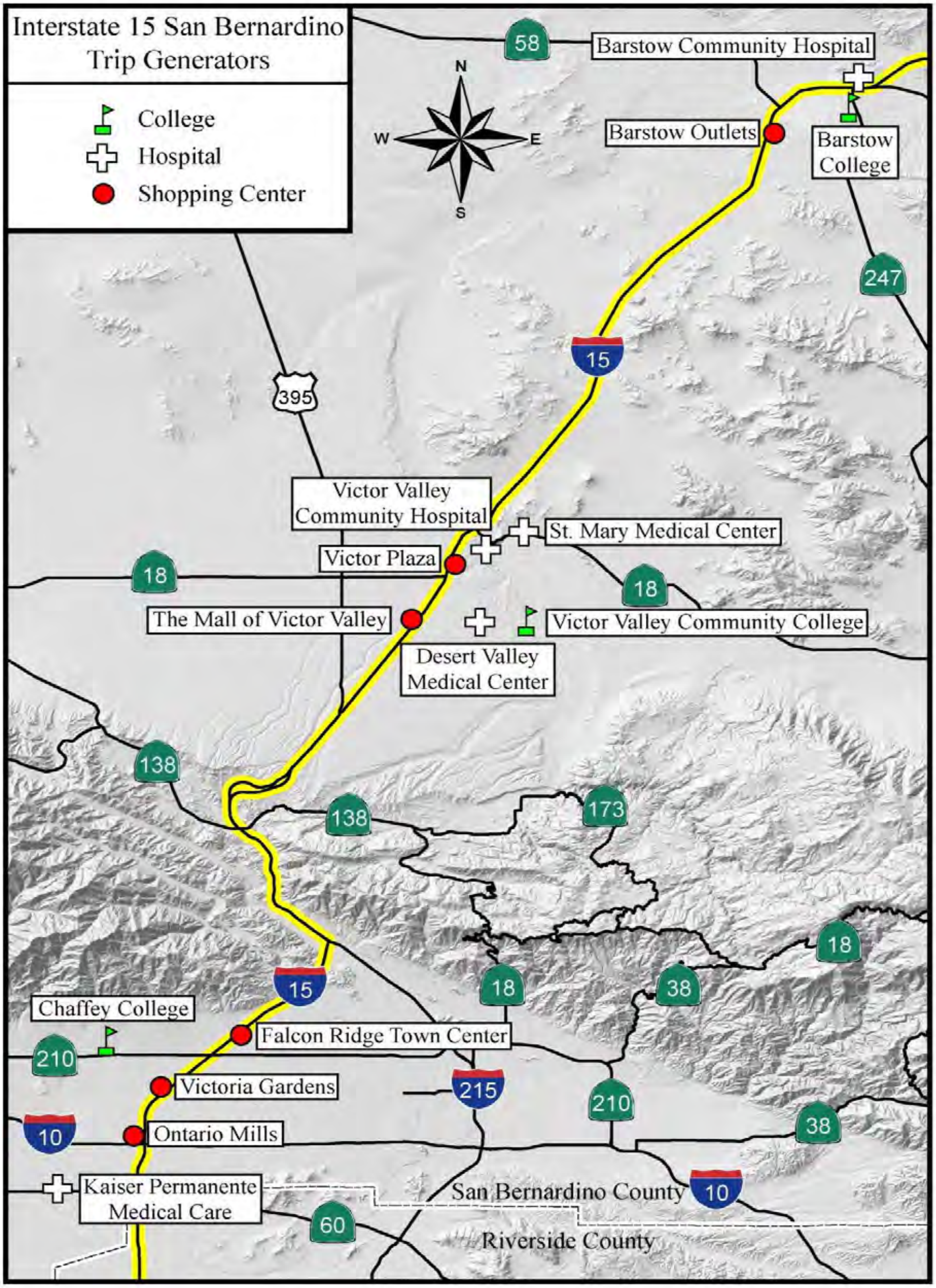
Exhibit 2-26: Trip Generators, I-15 Corridor

Land Use	Location	Description
Educational Institutions		
Riverside Community College	Norco	1 mile west of I-15 via Second St.
Chaffey College	Rancho Cucamonga	5 miles west of I-15 via SR-210
Victor Valley Community College	Victorville	5 miles east of I-15 via Bear Valley Rd.
Barstow College	Barstow	1 mile south of I-15 via SR-247
Medical Centers		
Rancho Springs Medical Center	Murrieta	1 east of I-15 via I-215
Inland Valley Medical Center	Murrieta	1 miles east of I-15 via Clinton Keith Rd.
Corona Regional Medical Center	Corona	1 mile west of I-15 via SR-91
Kaiser Permanente Medical Center	Ontario	3 miles west of I-15 via SR-60
Desert Valley Medical Center	Victorville	3 miles east of I-15 via Bear Valley Rd.

Land Use	Location	Description
Victor Valley Community Hospital	Victorville	1 mile east of I-15 via Mojave Dr.
St. Mary Medical Center	Apple Valley	3 miles east of I-15 via SR-18
Barstow Community Hospital	Barstow	1 mile north of I-15 via Barstow Rd.
Commercial/Retail and Entertainment Centers		
Temecula Town Center	Temecula	Adjacent to I-15 via Rancho California Rd.
Palm Plaza Shopping Center	Temecula	Adjacent to I-15 via SR-79 North
Murrieta Hot Springs Shopping Center	Murrieta	Adjacent to I-15 via Murrieta Hot Springs Rd.
Shoppers Square Shopping Center	Lake Elsinore	Adjacent to I-15 via Diamond Dr.
Lake Elsinore Market Place	Lake Elsinore	Adjacent to I-15 via Central Ave.
The Shops at Dos Lagos	Corona	Adjacent to I-15 via Cajalco Rd.
Eastvale Gateway	Eastvale	Adjacent to I-15 via Limonite Ave.
Ontario Mills	Ontario	Northwest quadrant of I-10/I-15
Victoria Gardens	Rancho Cucamonga	Adjacent to I-15 via Foothill Blvd.
Falcon Ridge Town Center	Fontana	Adjacent to I-15 via Summit Ave.
The Mall Victor Valley	Victorville	Adjacent to I-15 via Bear Valley Rd.
Valley Center Shopping Center	Victorville	Adjacent to I-15 via Roy Rogers Dr.
Barstow Outlet	Barstow	Adjacent to I-15 via Lenwood Rd.

Exhibit 2-27: Trip Generators Map, I-15 Corridor




Interstate 15 San Bernardino
Trip Generators
College
Hospital
Shopping Center
N
W
E
S
58
Barstow Community Hospital
Barstow Outlets
Barstow
College
247
15
395
Victor Valley
Community Hospital
St. Mary Medical Center
Victor Plaza
18
18
The Mall of Victor Valley
Victor Valley Community College
Desert Valley
Medical Center
138
138
173
18
18
38
15
Chaffey College
Falcon Ridge Town Center
210
Victoria Gardens
215
210
38
10
Ontario Mills
Kaiser Permanente
Medical Care
San Bernardino County
10
60
Riverside County

Demand Profile

Demand for I-15 within the study area is described in terms of commute, recreational, and truck traffic. Exhibit 2-28 summarizes the current ADT and anticipated future traffic growth.

Commuter Traffic: Commuter traffic within the I-15 corridor is concentrated in three areas: 1) the urbanized portion of western Riverside County to San Diego County, 2) between San Bernardino and Riverside Counties, and 3) Victor Valley to western San Bernardino County and further westward toward Los Angeles. The traffic to San Diego County is projected to grow 101 percent from 2008 to 2040. The projected traffic volumes between San Bernardino and Riverside Counties increased 47 percent. The traffic between the Victor Valley and San Bernardino grew 77 percent south of US-395 and 100 percent north of I-215 in Devore.

Recreational Traffic: Much of the traffic headed northward on I-15 from southern California toward Nevada is recreational traffic bound for Las Vegas, the high desert, the Colorado River and beyond. The traffic volume north of the city of Barstow expected to increase 81 percent from 2008 to 2040.

Southbound I-15 traffic headed to San Diego/Mexico includes a recreational component bound for resorts, casinos, shopping centers, and theme parks. Traffic crossing from Riverside County into San Diego County is expected to increase 101 percent.

Truck Traffic: The projected volume of trucks headed north from San Diego into Riverside County grew 168 percent from 2008 to 2040. Continuing from Riverside into San Bernardino County, the truck traffic is projected to grow 66 percent. From San Bernardino on toward the Victor Valley, the volume of trucks is expected to grow 127 percent north of I-215 and 106 percent south of US-395. North of the city of Barstow toward Nevada, truck volumes increase 125 percent.

Exhibit 2-28: Traffic Demand Growth on I-15 within District 8

Description	2010 AADT	2010 Trucks	2010 Truck Volume	2040 AADT	2040 Trucks	2040 Truck Volume	Growth in AADT from 2010 to 2040	Growth in Trucks from 2010 to 2040
North of SD/Riv Co. Line	129,000	7%	8,708	259,500	9%	23,355	101%	168%
North of SB/Riv Co. Line	219,578	8%	17,548	323,044	9%	29,074	47%	66%
North of I-215 Devore	161,263	13%	21,237	321,895	15%	48,284	100%	127%
South of US-395	129,726	13%	16,777	230,052	15%	34,508	77%	106%
North of I-40	46,807	16%	7,515	84,704	20%	16,941	81%	125%

3. CORRIDOR-WIDE PERFORMANCE AND TRENDS

This section summarizes the analysis results of the performance measures used to evaluate the existing conditions of the I-15 Corridor. The primary objectives of the measures are to provide a sound technical basis for describing traffic performance on the corridor.

The performance measures focus on five key areas:

- **Mobility** describes how well the corridor moves people and freight
- **Reliability** captures the relative predictability of the public's travel time
- **Safety** captures the safety characteristics in the corridor such as collisions
- **Productivity** describes the productivity loss due to inefficiencies in the corridor
- **Pavement Condition** describes the structural adequacy and ride quality of the pavement

Mobility

Mobility describes how well the corridor moves people and freight. The mobility performance measures are both readily measurable and straightforward for documenting current conditions and are easily forecast making them useful for future comparisons. Two primary measures are typically used to quantify mobility: delay and travel time.

Delay

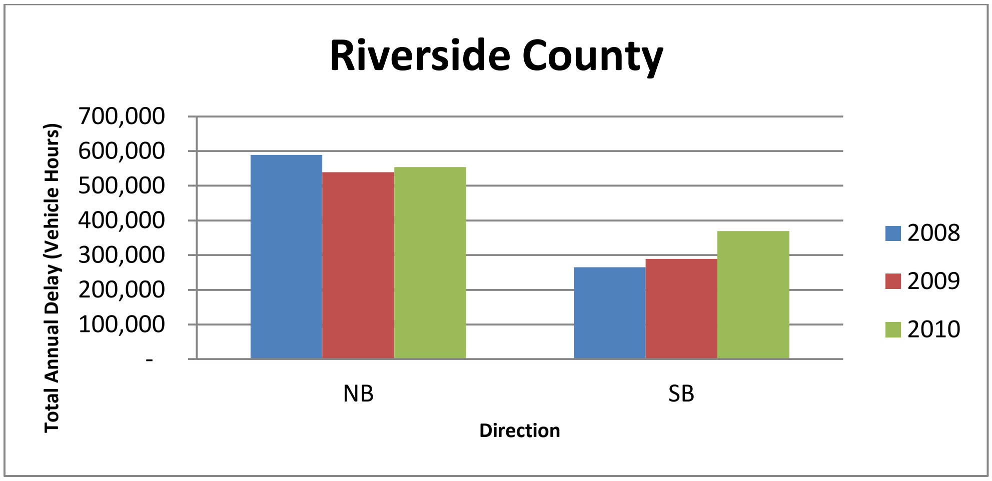
Delay is defined as the total observed travel time less the travel time under non-congested conditions, and is reported as vehicle-hours of delay. Delay can be computed for severe congested conditions using the following formula:

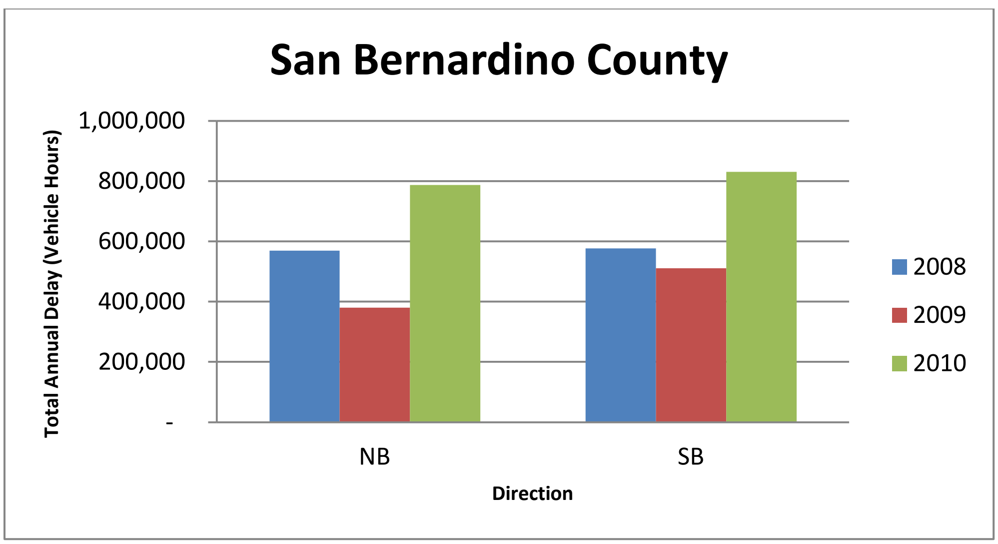
$$(\text{Vehicles Affected per Hour}) \times (Distance) \times (Duration) \times \left[\frac{1}{(\text{Congested Speed})} - \frac{1}{35\text{mph}} \right]$$

In the formula above, the *Vehicles Affected per Hour* value depends on the methodology used. Some methods assume a fixed flow rate (e.g., 2,000 vehicles per hour per lane), while others use a measured or estimated flow rate. The distance is the length under which the congested speed prevails and the duration is the hours of congestion experienced below the threshold speed. However, all delays can be computed by replacing the —35 mph” with —60mph” in the previous formula.

Exhibit 3-1 shows the yearly delay trends from 2008 to 2010 for both directions along the I-15 corridor. As indicated, the northbound direction had the most significant congestion in Riverside County while the southbound direction experienced the most congestion in San Bernardino County.

Exhibit 3-1: Total Annual Vehicle-Hours of Delay (2008-2010)





Source: PeMS

Exhibit 3-2 shows the complete list of bottleneck locations reported by the Mobility Performance Report (MPR) for the I-15 corridor. A bottleneck is defined as a persistent and significant drop in speed between two locations on the freeway.[6] It is identified through the annual vehicle hours of delay (AVHD) below 60 miles per hour. Further analysis demonstrated these locations not to be areas of concern.

Exhibit 3-2: MPR Bottleneck Locations (2009)

County	Direction	Post Mile	Location	2009 AVHD (60 mph)
San Bernardino	NB	13.70	South of Glen Helen Pkwy.	151,000
Riverside	SB	39.24	North of Ontario	147,000
Riverside	NB	39.43	North of Temescal	77,000
Riverside	NB	52.27	Philadelphia	76,000
Riverside	SB	39.77	North of Orlando	63,000
San Bernardino	NB	109.97	4th St. NB On-Ramp	62,000

[6] Mobility Performance Report 2009

Freeway Performance Measurement System (PeMS)

Freeway detector data obtained from PeMS can be used to calculate daily delay, which is not possible through probe vehicle runs. The ability to capture it daily enables delay to be presented in different ways, such as by time period, month, day of the week, or time of day. For the I-15 study corridor, detector data was only available from the San Diego/Riverside County Line to State Route 138.

Delays identified using PeMS represent the difference in travel time between actual conditions and free-flow conditions at 60 miles per hour, applied to the actual output flow volume collected from a vehicle detector station.

Exhibits 3-3 and 3-4 show the typical weekly delay for the I-15 Corridor in each county by month and direction. As indicated in this exhibit, the typical weekday delay varies month to month, ranging from approximately 200 vehicle-hours to 5,000 vehicle-hours. December 2010 experienced the highest levels of congestion during the three-year period with over 5,000 vehicle-hours of delay in the northbound direction.

Exhibit 3-3: Riverside County I-15 Northbound Typical Weekday Delay by Month (2008)

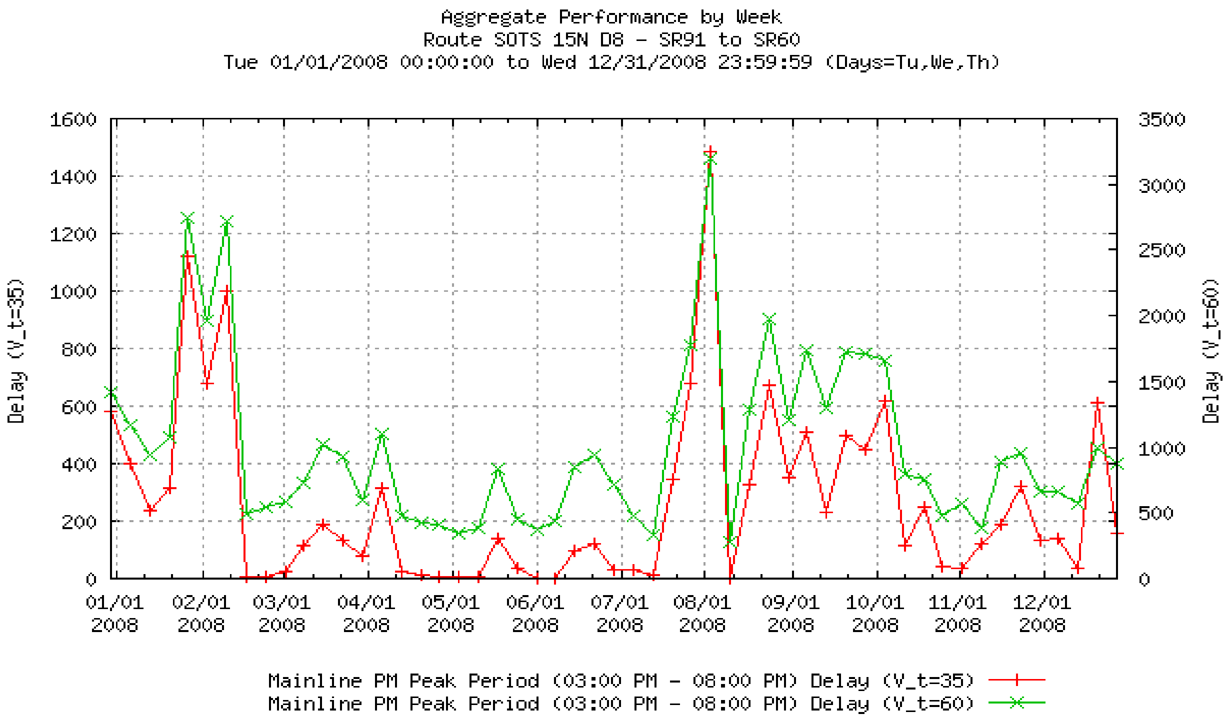


Exhibit 3-3: Riverside County I-15 Northbound Typical Weekday Delay by Month (2009)

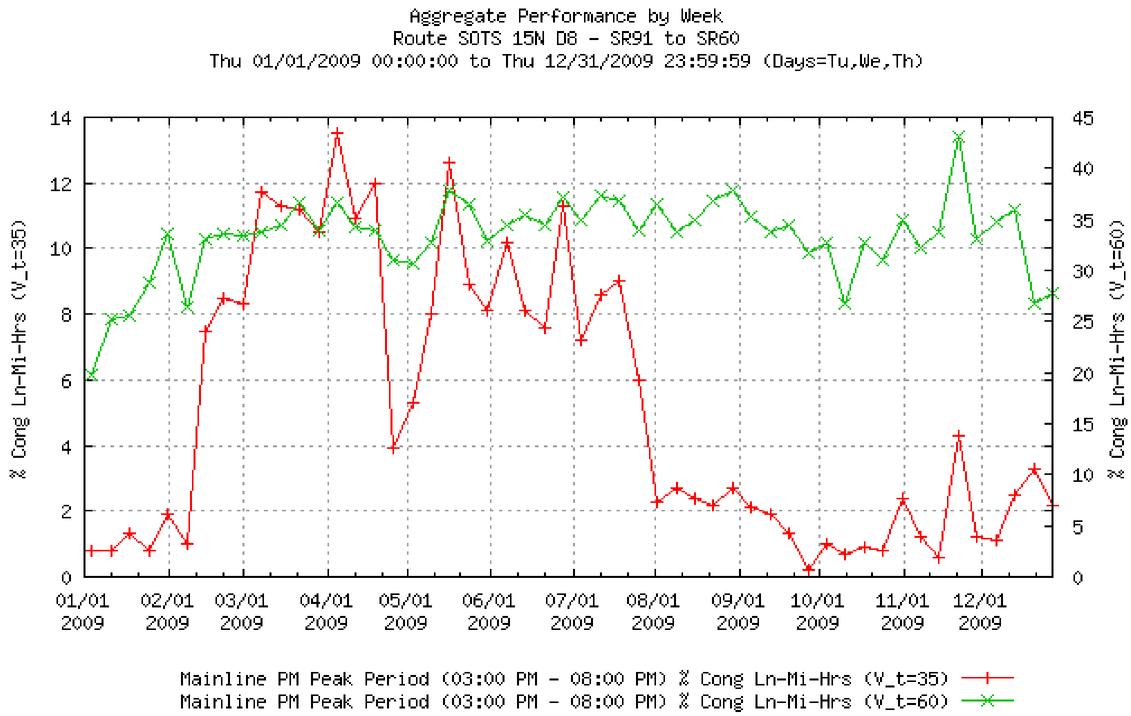
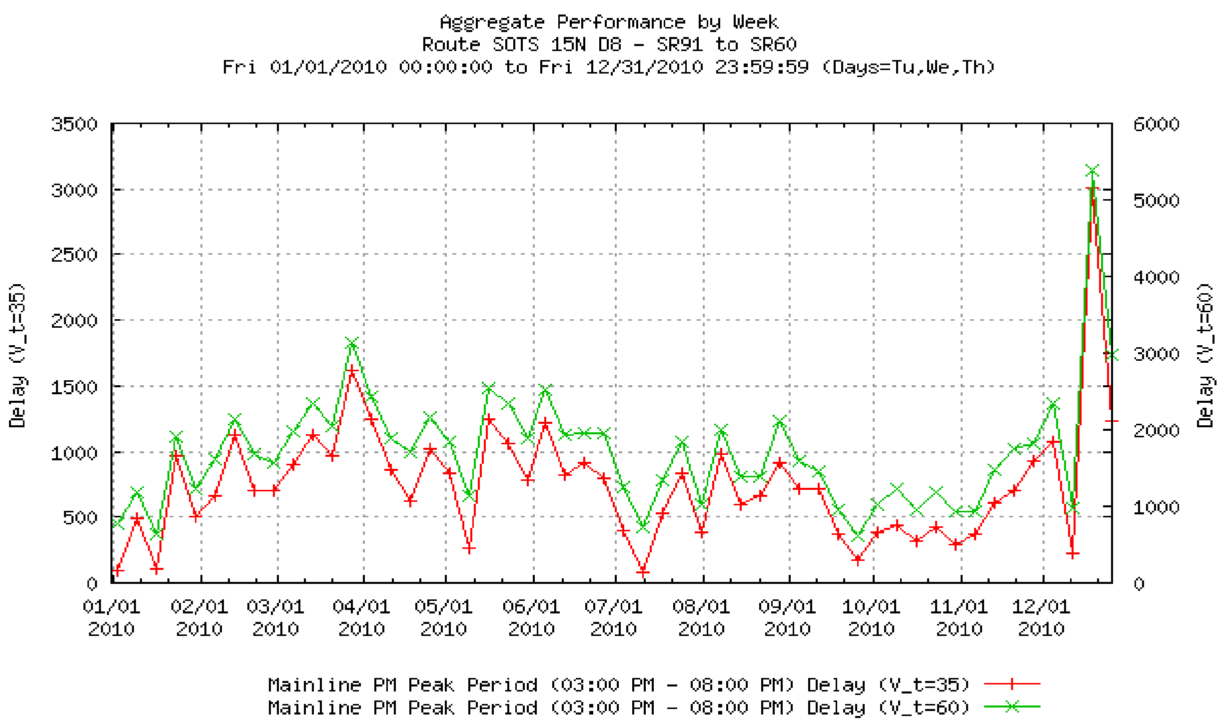


Exhibit 3-4: Riverside County I-15 Northbound Typical Weekday Delay by Month (2010)



Source: PeMS

Delay presented above represents the difference in travel time between —actual” conditions and free-flow conditions at 60 miles per hour. This delay can be segmented into two components as shown in Exhibits 3-3 and 3-4:

- Severe delay – delay occurring when speeds are below 35 miles per hour
- Other delay – delay occurring when speeds are between 35 and 60 miles per hour.

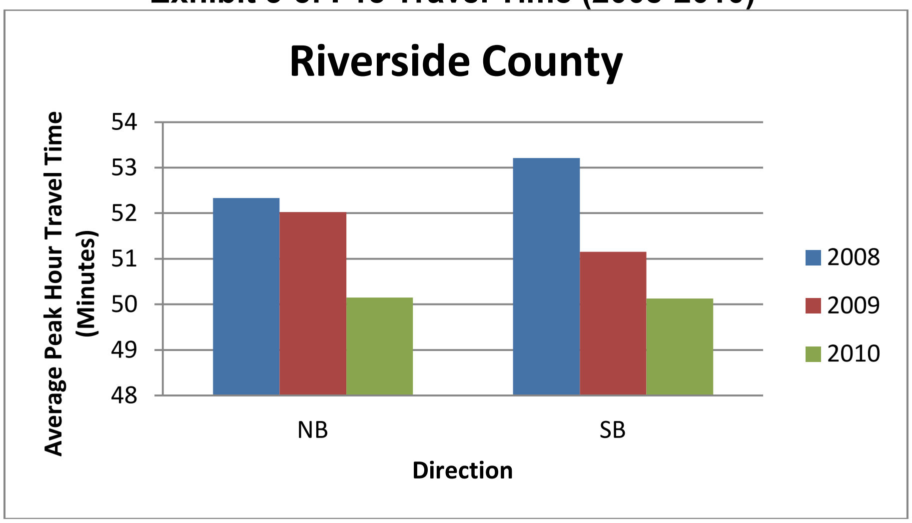
Severe delay represents *breakdown conditions* and is the focus of most congestion mitigation strategies. —Other” delay represents conditions approaching the breakdown congestion that are temporary slowdowns rather than widespread breakdowns.

Travel Time

Travel time is reported as the amount of time for a vehicle to traverse two points on a corridor. For the travel time analysis, PeMS data was analyzed for the corridor from the San Diego/Riverside County Line to State Route 138. The performance measure is reported in terms of time to travel from one end of the corridor to the other along the freeway. Travel time on parallel arterials is not included in the analysis.

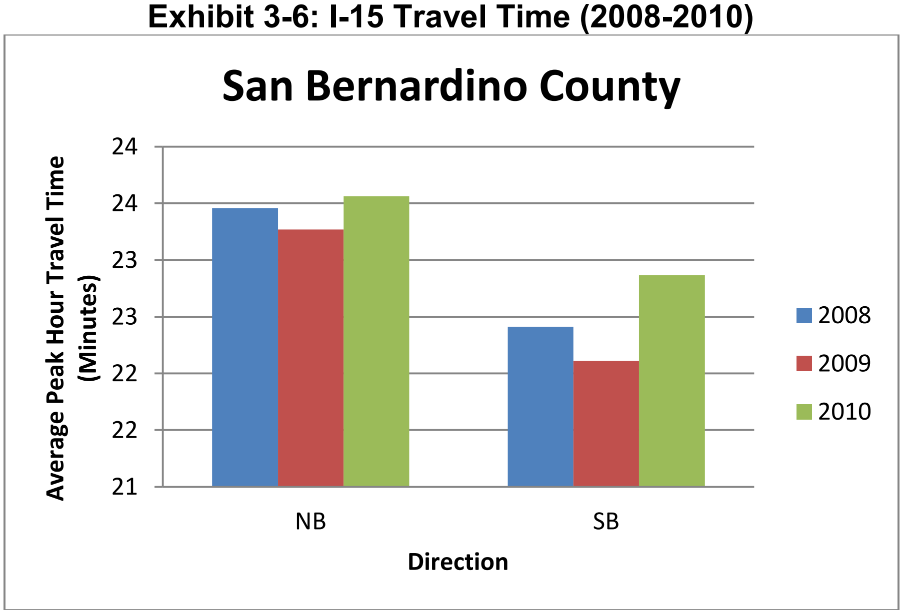
Exhibits 3-5 and 3-6 depict the travel times calculated for the I-15 Corridor in each county for 2008, 2009, and 2010. Both Exhibits 3-5 and 3-6 show that travel times remained consistent during 2008 to 2010.

Exhibit 3-5: I-15 Travel Time (2008-2010)



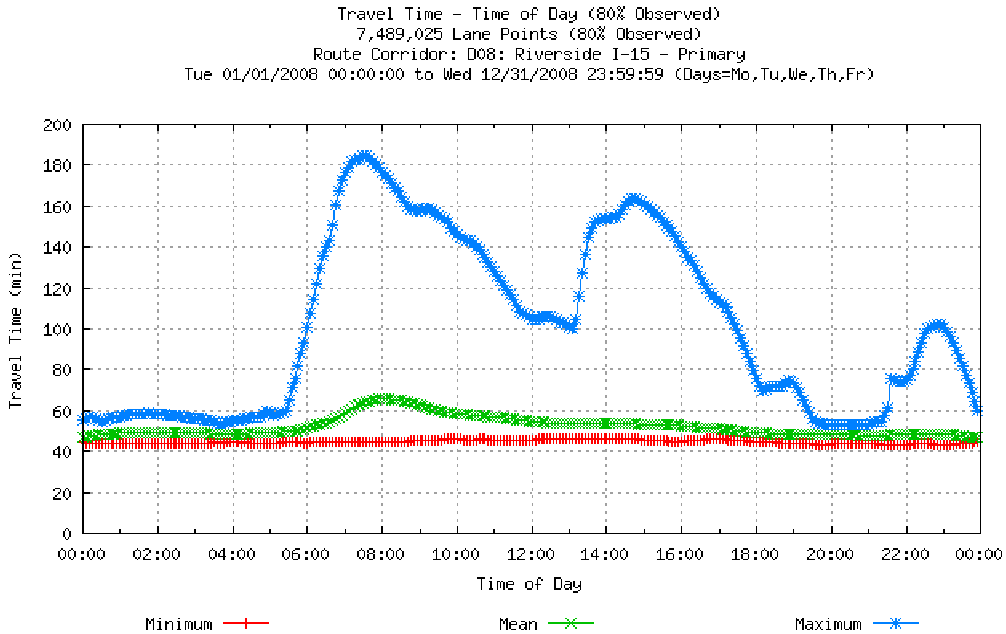
Source: PeMS

Exhibit 3-6: I-15 Travel Time (2008-2010)

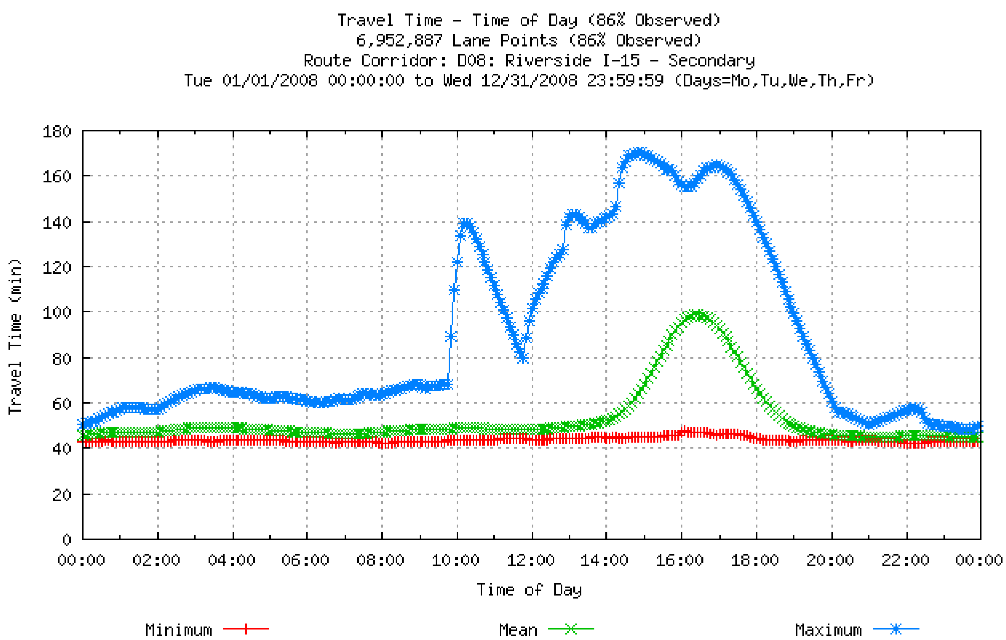


Source: PeMS

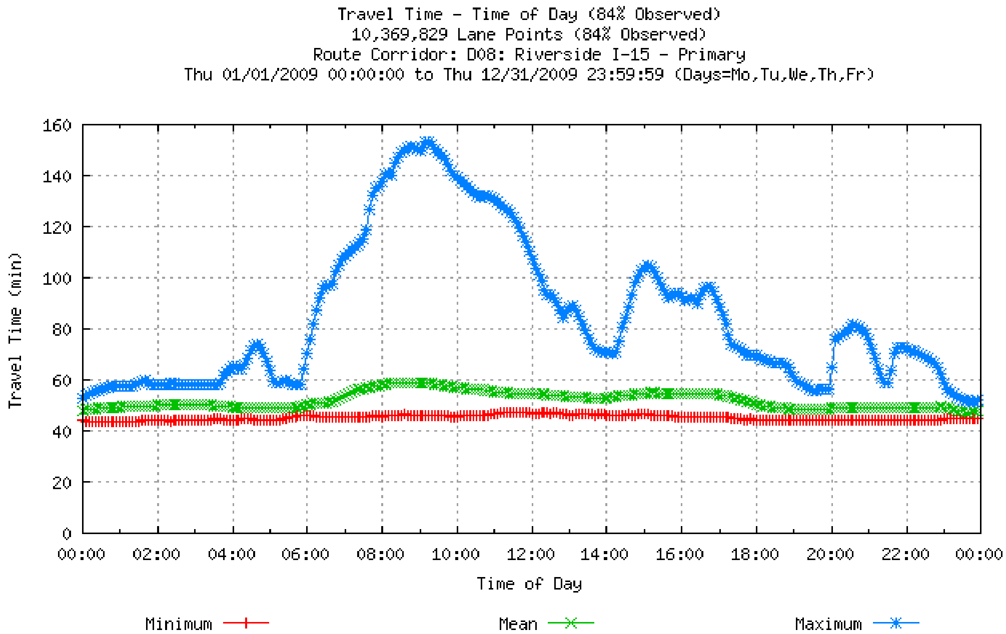
2008 Northbound – Riverside County



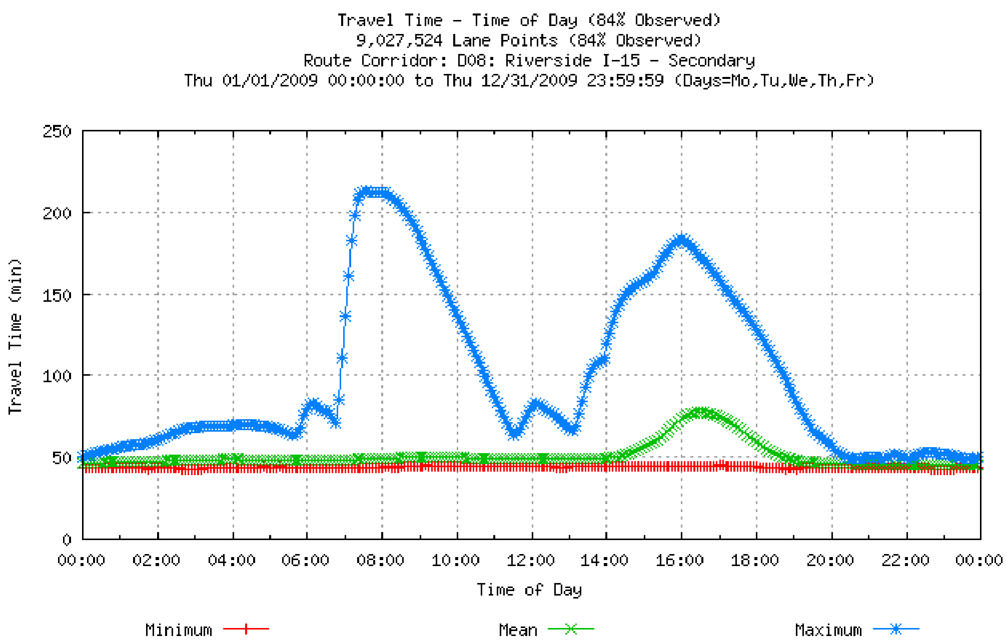
2008 Southbound – Riverside County



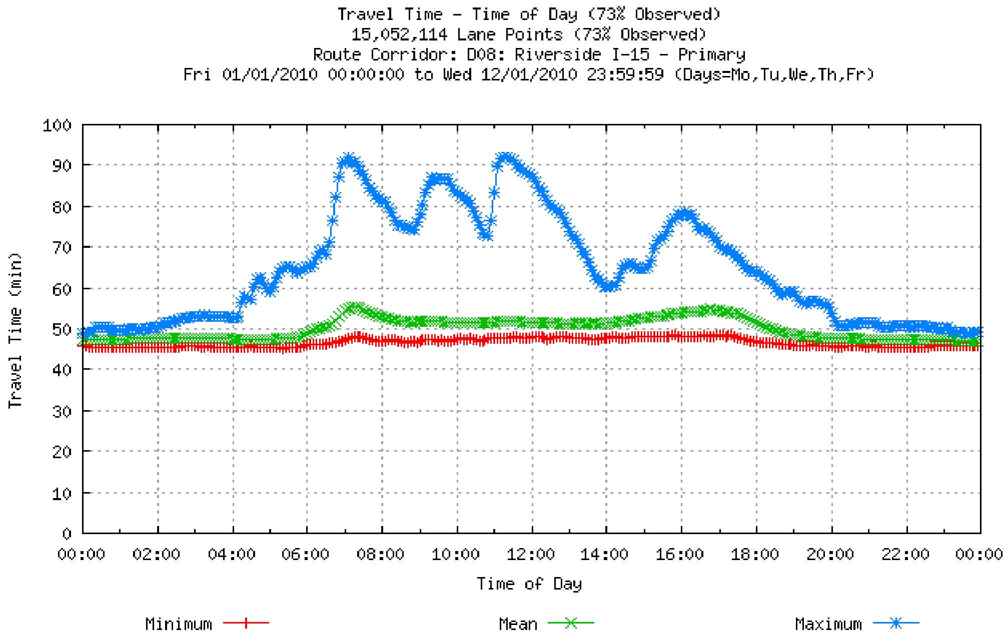
2009 Northbound – Riverside County



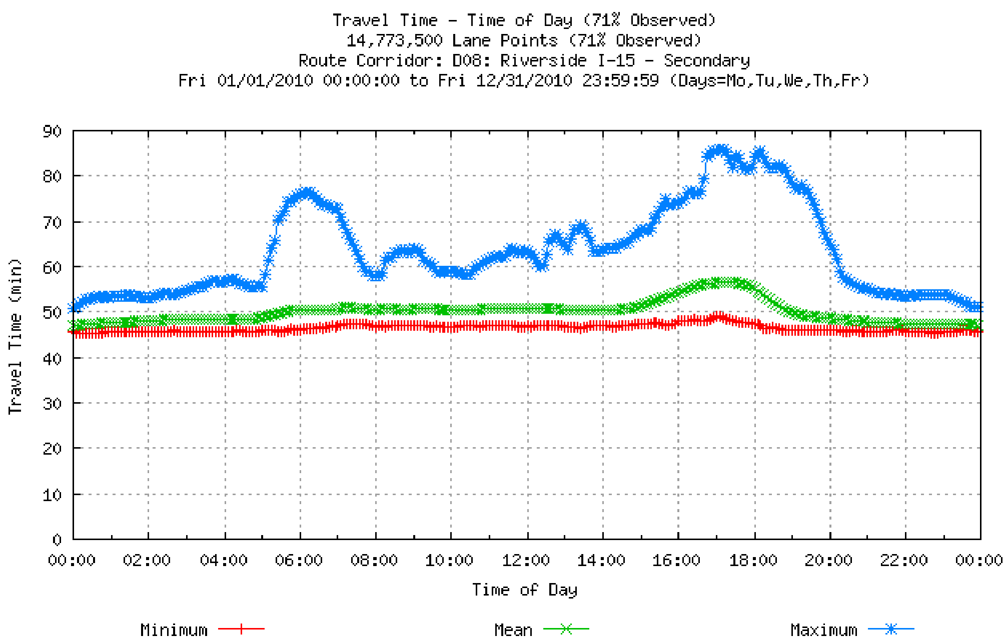
2009 Southbound – Riverside County



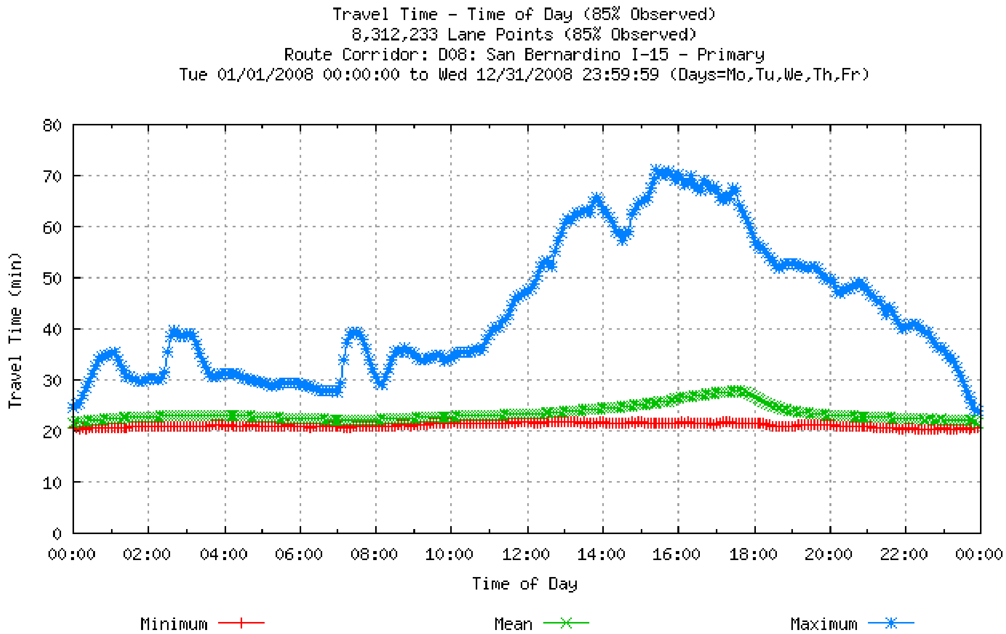
2010 Northbound – Riverside County



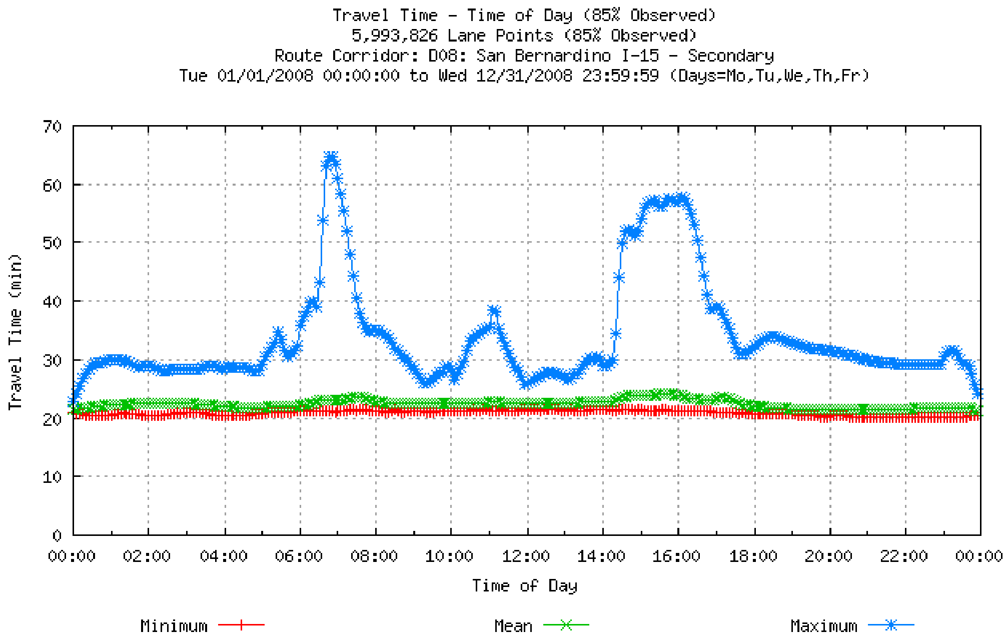
2010 Southbound – Riverside County



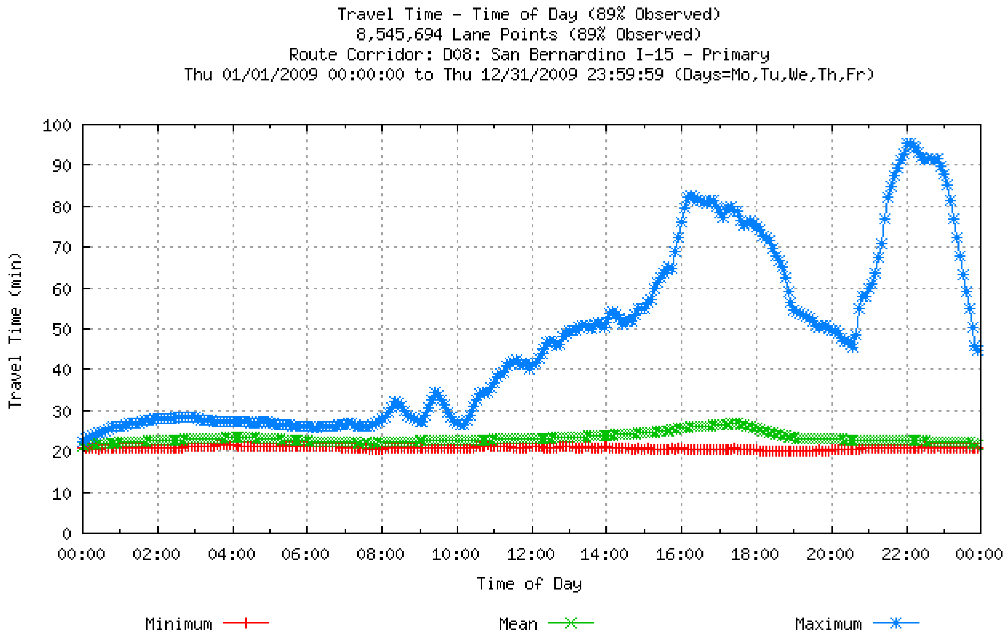
2008 Northbound – San Bernardino County



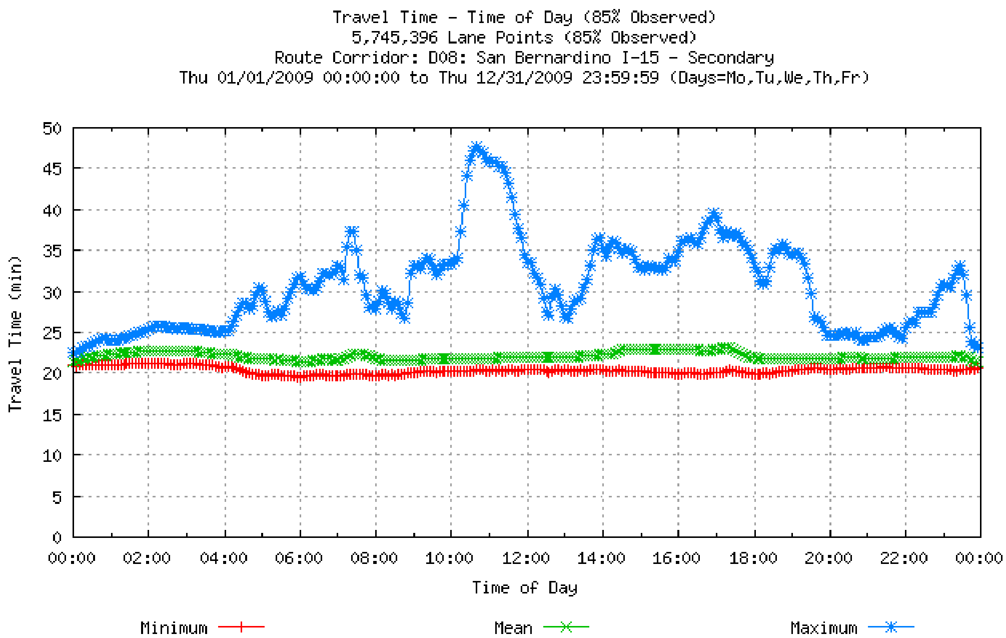
2008 Southbound – San Bernardino County



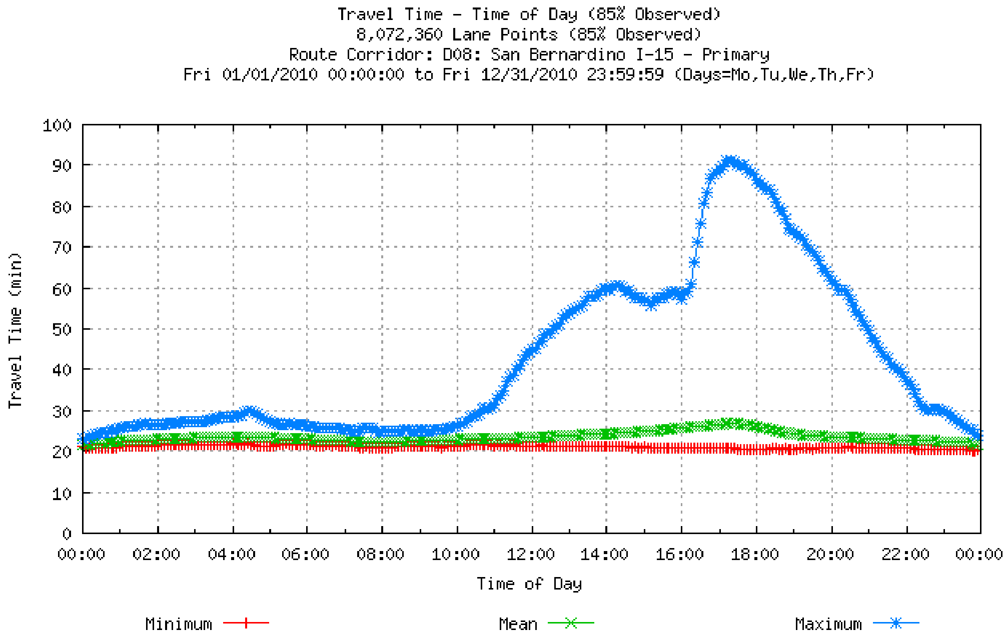
2009 Northbound – San Bernardino County



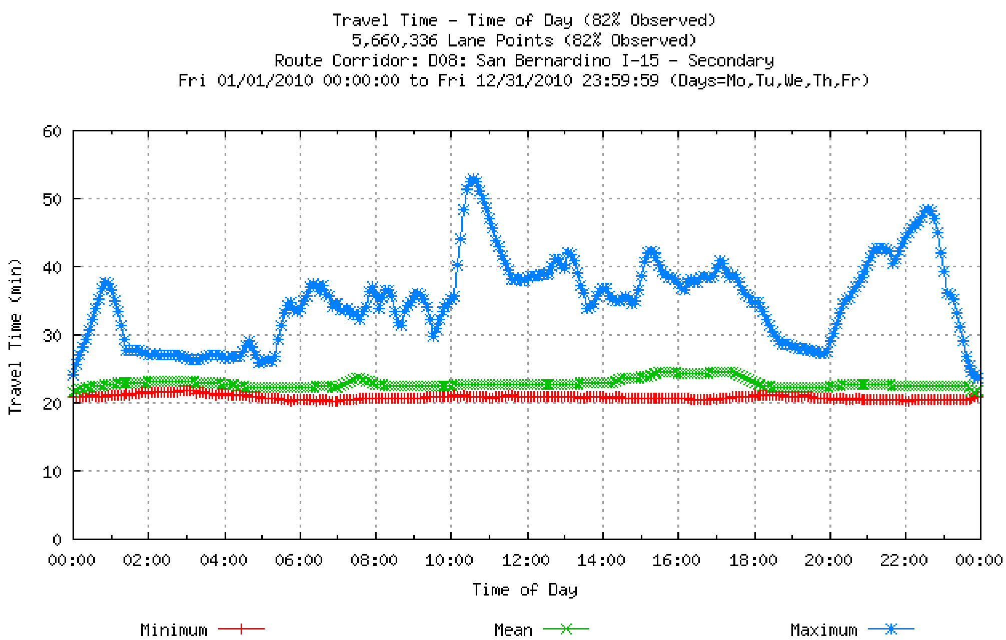
2009 Southbound – San Bernardino County



2010 Northbound – San Bernardino County



2010 Southbound – San Bernardino County



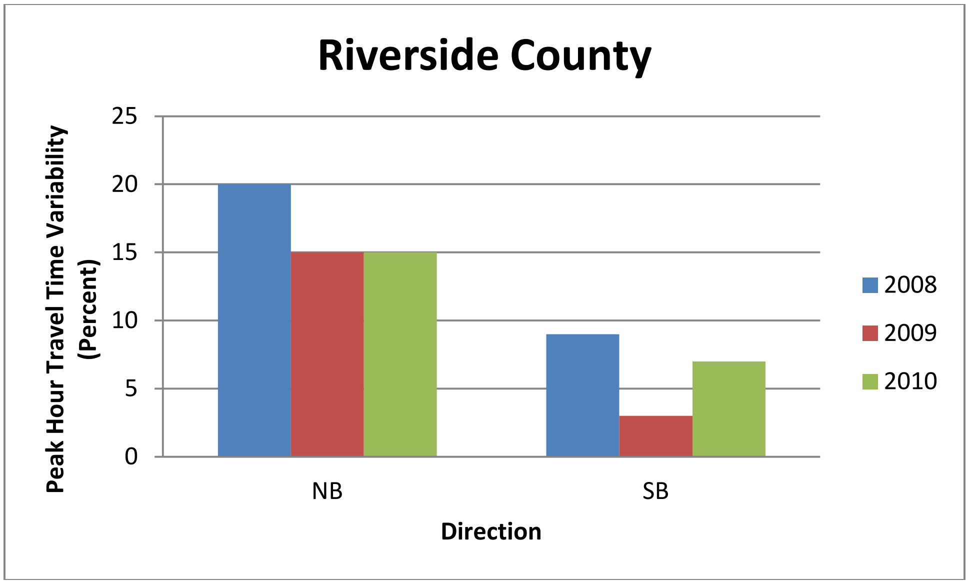
Reliability

Reliability captures the degree of predictability in travel time. Unlike mobility, which measures the rate of travel, the reliability measure focuses on how travel time varies from day to day. To measure reliability, the study team used statistical measures of variability on the travel times estimated from the PeMS data. The 95th percentile was chosen to represent the maximum travel time that most people would experience on the corridor. Severe events, such as certain collisions, could cause longer travel times, but the 95th percentile was chosen as a balance between extreme events and a —typical” travel day.

Exhibits 3-7 to 3-8 on the following page illustrate the variability of travel time along the I-15 corridor on weekday peak periods for 2008, 2009, and 2010 in both Riverside and San Bernardino Counties.

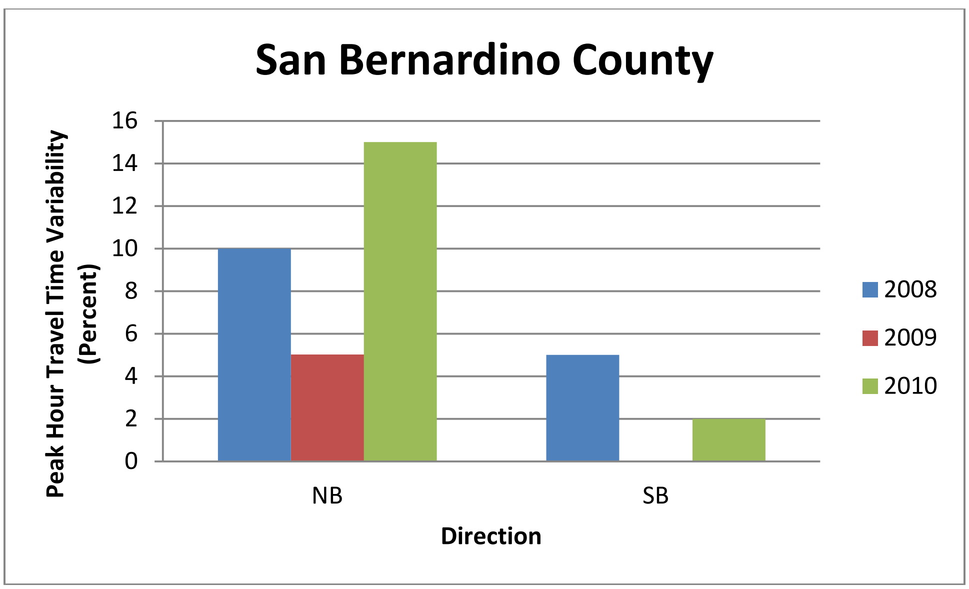
In Riverside County, the variability of travel time has declined slightly in recent years. In San Bernardino County, however, while the variability of travel time has declined slightly in the southbound direction, it has increased in the northbound direction. This may be due to marginal bottlenecks becoming more significant.

Exhibit 3-7: I-15 Travel Time Variation (2008-2010)



Source: PeMS

Exhibit 3-8: I-15 Travel Time Variation (2008-2010)



Source: PeMS

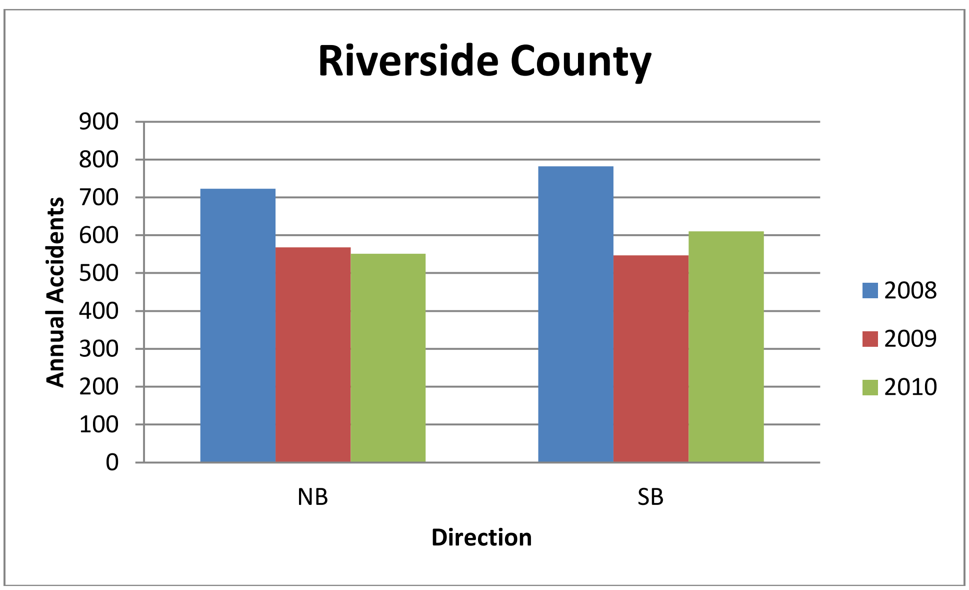
Safety

Collision data in terms of the number of accidents and accident rates from the Traffic Accident Surveillance and Analysis System (TASAS) were used for the safety measure. TASAS is a traffic records system containing an accident database linked to a highway database. The highway database contains description elements of highway segments, intersections and ramps, access control, traffic volumes and other data. TASAS contains specific data for accidents on state highways. Accidents on non-state highways are not included (e.g., local streets and roads).

The safety assessment in this report is intended to characterize the overall accident history and trends in the corridor, and to highlight notable accident concentration locations or patterns that are readily apparent. This report is not intended to supplant more detailed safety investigations routinely performed.

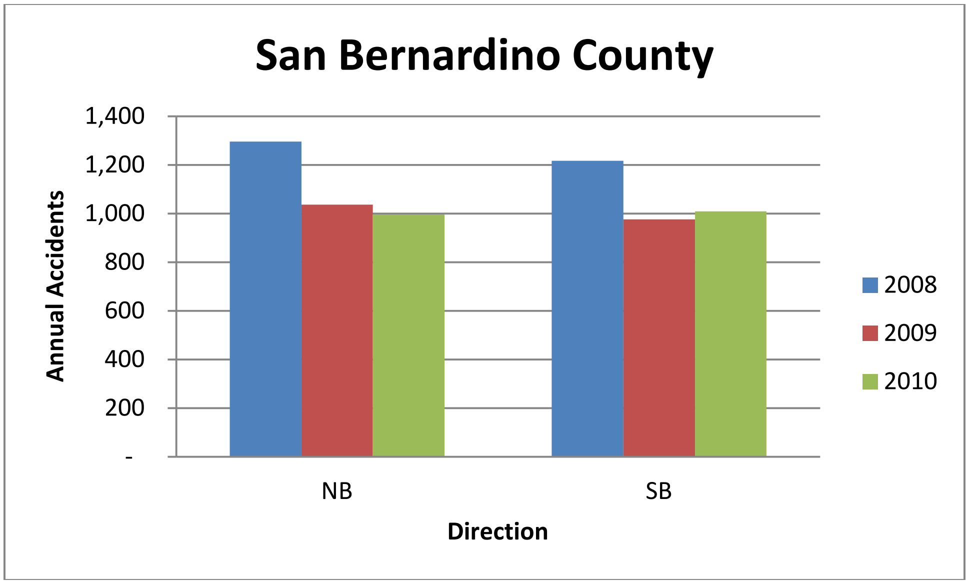
Exhibits 3-9 and 3-10 show the I-15 Corridor annual accidents by year in each direction. The annual accidents are broken down by weekdays and weekends. Typically the latest three-year safety data are analyzed, currently available only through March 31, 2010. Therefore, annual data for the three-year period from April 1, 2007 through March 31, 2010 were analyzed. As indicated, both the northbound and southbound corridor experienced similar total collisions for the combined three years. In addition, the northbound direction experienced slightly fewer collisions each year between 2008 and 2010, while the southbound direction had a slight increase in 2010 after declining in 2009.

Exhibit 3-9: I-15 Annual Accidents (2008-2010)



Source: PeMS

Exhibit 3-10: I-15 Annual Accidents (2008-2010)



Source: PeMS

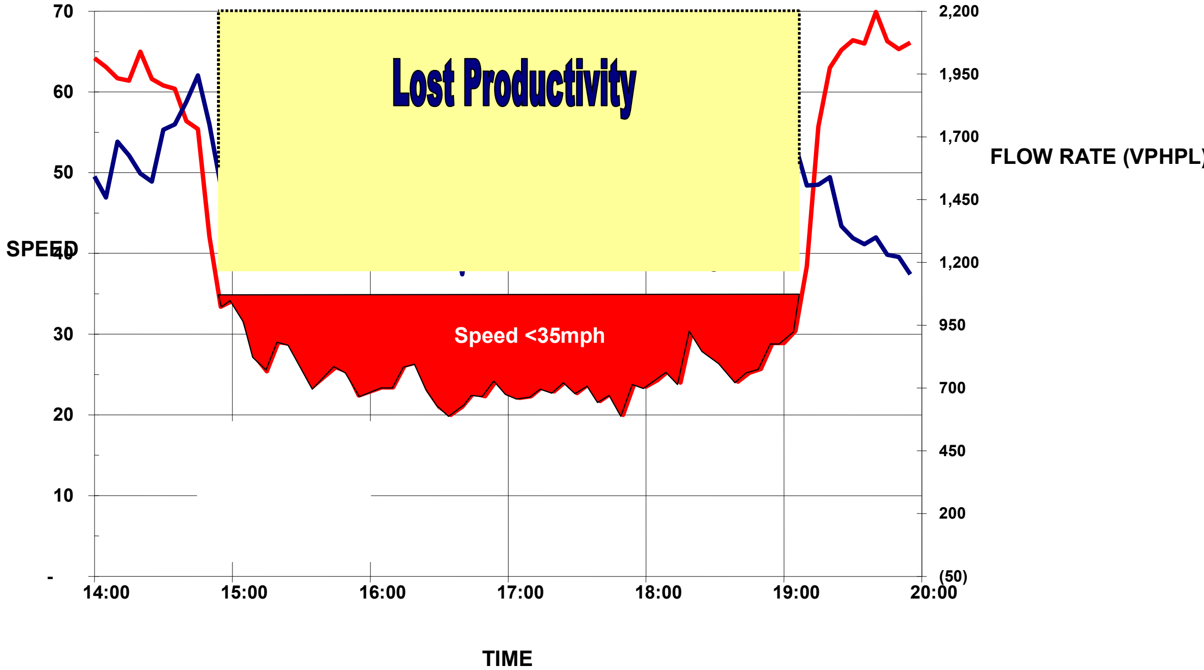
Productivity

Productivity is a system efficiency measure used to analyze the capacity of the corridor, and is defined as the ratio of output (or service) per unit of input. In the case of transportation, it is the amount of people served divided by the level of service provided. Specific to highways, the input to the system is the capacity of the roadways. In transit, it is the number seats provided.

For corridor analysis, productivity is defined as the percent utilization of a facility or mode under peak conditions. The highway productivity performance measure is calculated as actual volume divided by the capacity of the highway. Travel demand models do not generally predict capacity loss for highways, but detailed micro-simulation tools can forecast productivity. For highways, productivity is particularly important because where capacity is needed the most, the lowest “production” from the transportation system often occurs.

This loss in productivity example is illustrated in Exhibit 3-11. As traffic flow increases close to the capacity limits of a roadway, speeds decline rapidly and throughput drops dramatically. This loss in throughput is the lost productivity of the system. There are a few ways to estimate productivity losses. Regardless of the approach, productivity calculations require good detection or significant field data collection at congested locations. One approach is to convert this lost productivity into “equivalent lost lane-miles.” These lost lane-miles represent a theoretical level of capacity that would need to be added in order to achieve maximum productivity. For example, losing six lane-miles implies that adding a new lane along a six-mile section of freeway would be needed to improve productivity.

Exhibit 3-11: Lost Productivity Illustrated



Equivalent lost lane-miles is computed as follows (for congested locations only):

$$LostLaneMiles = \left(1 - \frac{ObservedLaneThroughput}{2000vphpl}\right) \times Lanes \times CongestedDistance$$

Exhibits 3-12 and 3-13 summarize the productivity losses on the I-15 Corridor for the respective directions of travel. The trends in the productivity losses are comparable to the delay trends. Productivity during the AM and PM peak periods in both directions improved from 2008 to 2009, but then worsened in 2010.

Strategies to combat such productivity losses are primarily related to operational improvement. These strategies include: building new or extending auxiliary lanes, developing more aggressive ramp metering strategies without negatively influencing the arterial network, and improving incident management.

Exhibit 3-12: I-15 Average Lost Lane-Miles by Direction and Year

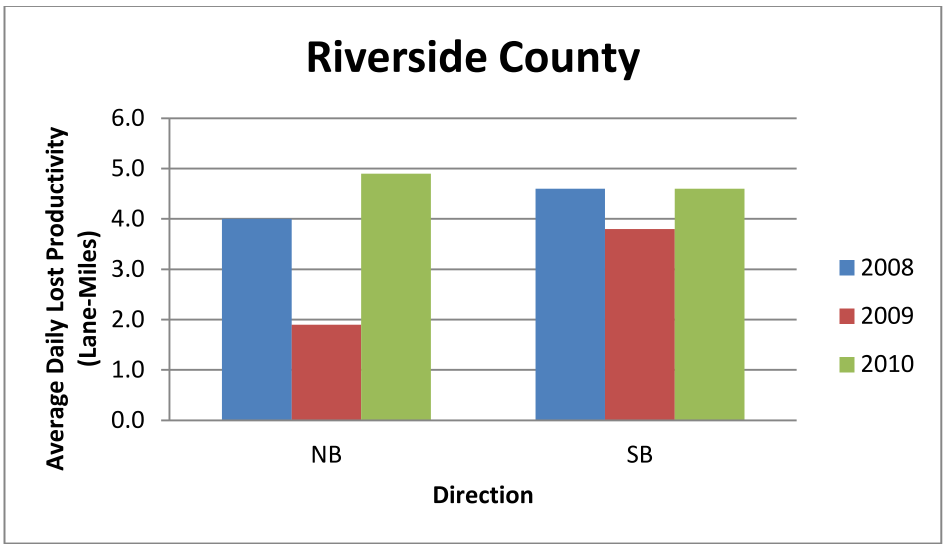
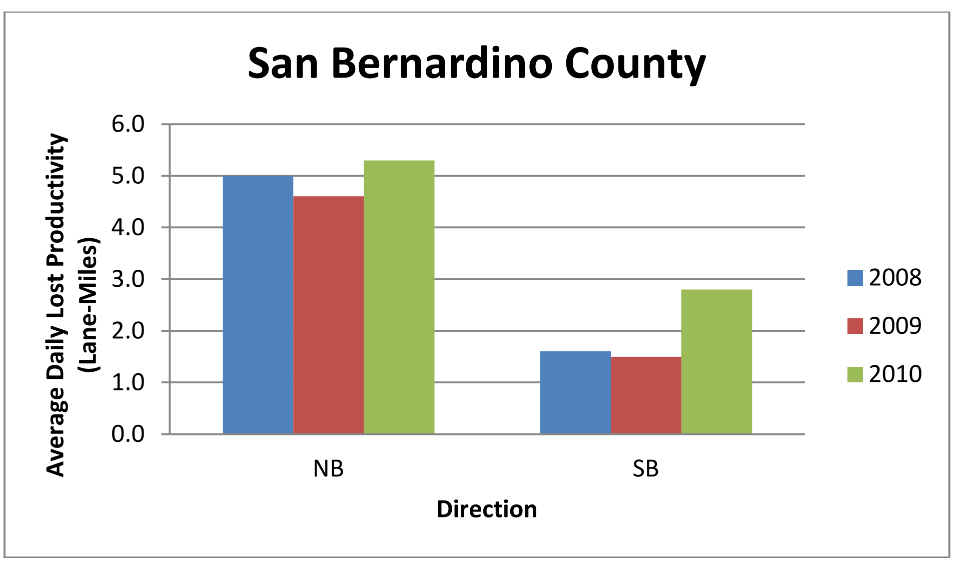


Exhibit 3-13: I-15 Average Lost Lane-Miles by Direction and Year



Source: PeMS

Pavement Condition

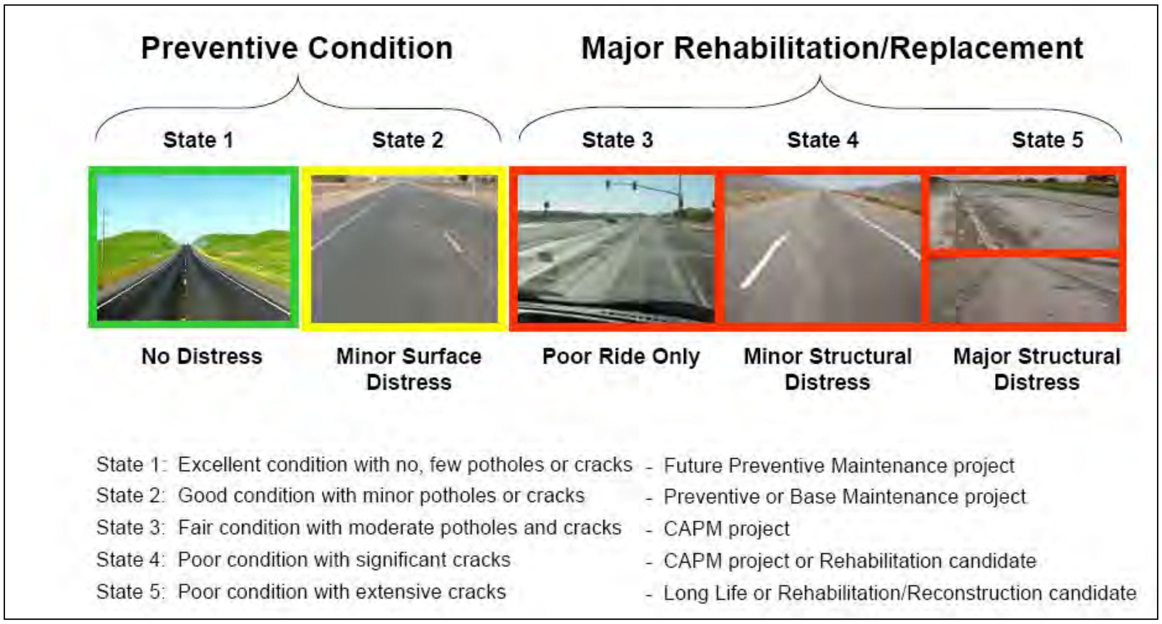
The condition of the roadway pavement (or ride quality) on the corridor can influence its traffic performance. Rough or poor pavement conditions can decrease the mobility, reliability, safety, and productivity of the corridor, whereas smooth pavement can have the opposite effect. Pavement preservation refers to maintaining the structural adequacy and ride quality of the pavement. It is possible for a roadway section to have structural distress without affecting ride quality. Likewise, a roadway section may exhibit poor ride quality, while the pavement remains structurally adequate.

Performance Measures

The —smoothness” of pavement is measured using a standardized scale, called the International Ride Index (IRI). This is generally accepted as a worldwide pavement roughness measurement. The IRI measures a vehicle's up and down movement over the pavement in inches per one mile of driving. On a smooth road, such as a recently completed pavement rehabilitation project, the up and down movements are low. The Federal Highway Administration (FHWA) *2002 Conditions and Performance Report* simplified the measurement of ride quality into two descriptive terms: —Good” or —Acceptable.” To be rated acceptable, pavement performance must have an IRI value of less than or equal to 170 inches per mile. According to the FHWA IRI rating scale, the IRI value must be less than or equal to 95 inches per mile to be rated good.

—Distressed lane-miles” distinguishes among pavement segments that require only preventive maintenance at relatively low cost and those segments that require major rehabilitation or replacement. Exhibit 3-14 provides an illustration of this distinction. The first two pavement conditions include roadway that provides adequate ride quality and is structurally adequate. The remaining three conditions are included in the calculation of distressed lane-miles.

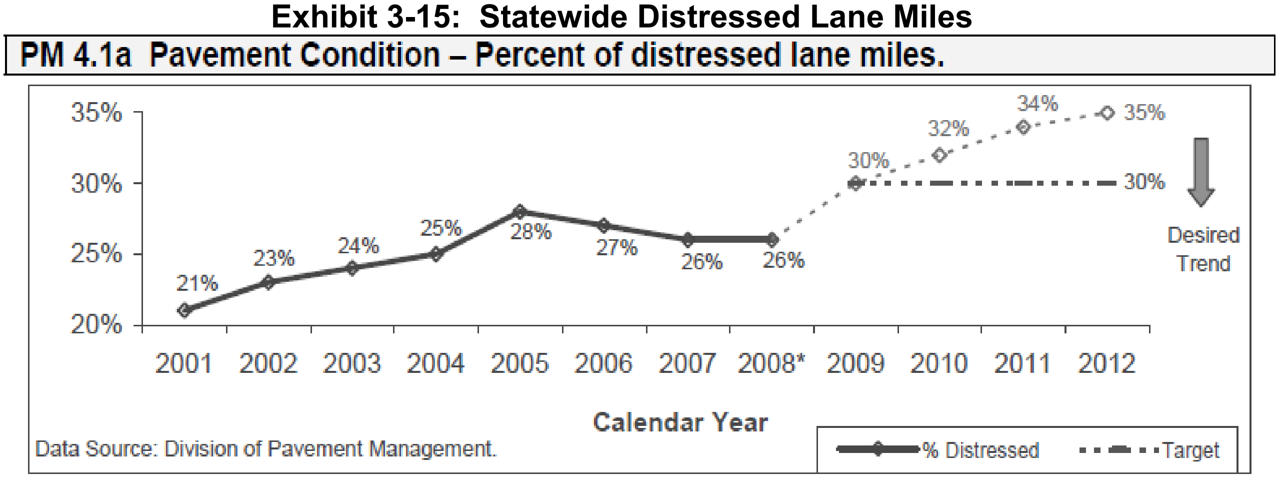
Exhibit 3-14: Pavement Condition States Illustrated



Source: Caltrans Division of Maintenance, 2007 State of the Pavement Report

Exhibit 3-15 shows that in 2008 distressed lane-miles were 26 percent, statewide while the 2009 reporting cycle projects lane-miles to be 30+ percent distressed by 2012. However, the desired target is to maintain 30 percent distressed lane-miles.

Exhibit 3-15: Statewide Distressed Lane Miles



Notes

1. *The 2008 survey did not collect data for the entire system (only the NHS) and one of the distress types (faulting) was not collected. An estimate of the 2008 data can be made using the previous survey (2007), adding the distressed miles due to wear and aging of the pavement and subtracting the distressed miles eliminated due to construction.
2. Strategic Plan baseline for distressed lane miles is 28%, based on 2005 data.
3. 2006 pavement survey was delayed to 2007. The percentage shown for 2006 is interpolated.
4. Figures shown in red are forecast for pavement distress levels in 2008-2012, based on current State Highway Operation and Protection Program (SHOPP) funding for pavement projects. Meeting the stated target of 30% by 2012 will require a significant increase in SHOPP funding for pavement projects.

Existing Pavement Condition

The 2007 Pavement Condition Survey (PCS) included pavement field studies for a period longer than a year, due to an update in the data collection methodology. The field work consists of two parts. In the first part, pavement raters visually inspect the pavement surface to assess structural adequacy. In the second part, field staff uses vans with automated profilers to measure ride quality. The Statewide 2007 PCS revealed that the majority of distressed pavement was on freeways and expressways (Class 1 roads). As a percentage of total lane-miles for each class, collectors and local roads (Class 3 roads) had the highest amount of distress.

During the 2009 PCS the following was found on I-15:

- From the San Diego County Line (PM R0.000) to north of Glen Eden Road (PM 30.0) in Riverside County, the route exhibited a fair pavement condition with ride quality remaining fairly constant with minor surface distress.
- From Lake Elsinore south of Temescal Canyon Road (PM 31.0) in Riverside County to the north of Sierra Avenue (PM 13.0) in San Bernardino County, the corridor exhibited a major rehabilitation pavement distress with rehabilitation projects in the preliminary stage.
- From north of the I-15/I-215 split (PM R17.4) to south of Victorville near the Bear Valley Overcrossing (PM 39.2) in San Bernardino County, the corridor exhibited a poor distressed condition that requires major rehabilitation and or replacement.
- From Victorville north bound near Bear Valley Overcrossing (PM 39.2) to the Nevada State Line (PM 179.4), after rehabilitation projects pavement condition were shown to exhibit good ride, which is an improvement from the 2007 Condition report that showed Poor-Ride only and Major Pavement Distress.

Exhibits 3-16 through 3-19 show the poorest pavement conditions in each freeway segment. The worst pavement quality is shown since pavement investment decisions are made on this basis. As seen in the exhibit, segments of this corridor has at least one lane with ride quality issues (IRI greater than 170), but it is important to keep in mind that some lanes have better quality than others within the same roadway section.

The corridor exhibits relatively good ride quality when the conditions on all lanes are considered. The study corridor is comprised of roughly 1,407 lane-miles, with a Total Distressed Pavement of 62 lane miles at 4.4 percent.

Exhibit 3-16: I-15 Pavement Condition
Riverside and San Bernardino Counties

I-15 Pavement Conditions	Lane-Miles	Percent
Major	27.30	1.9
Minor	3.74	0.3
Poor Ride	31.39	2.2
Total Distressed Pavement	62.43	4.4
Total Lane Miles	1,406.82	

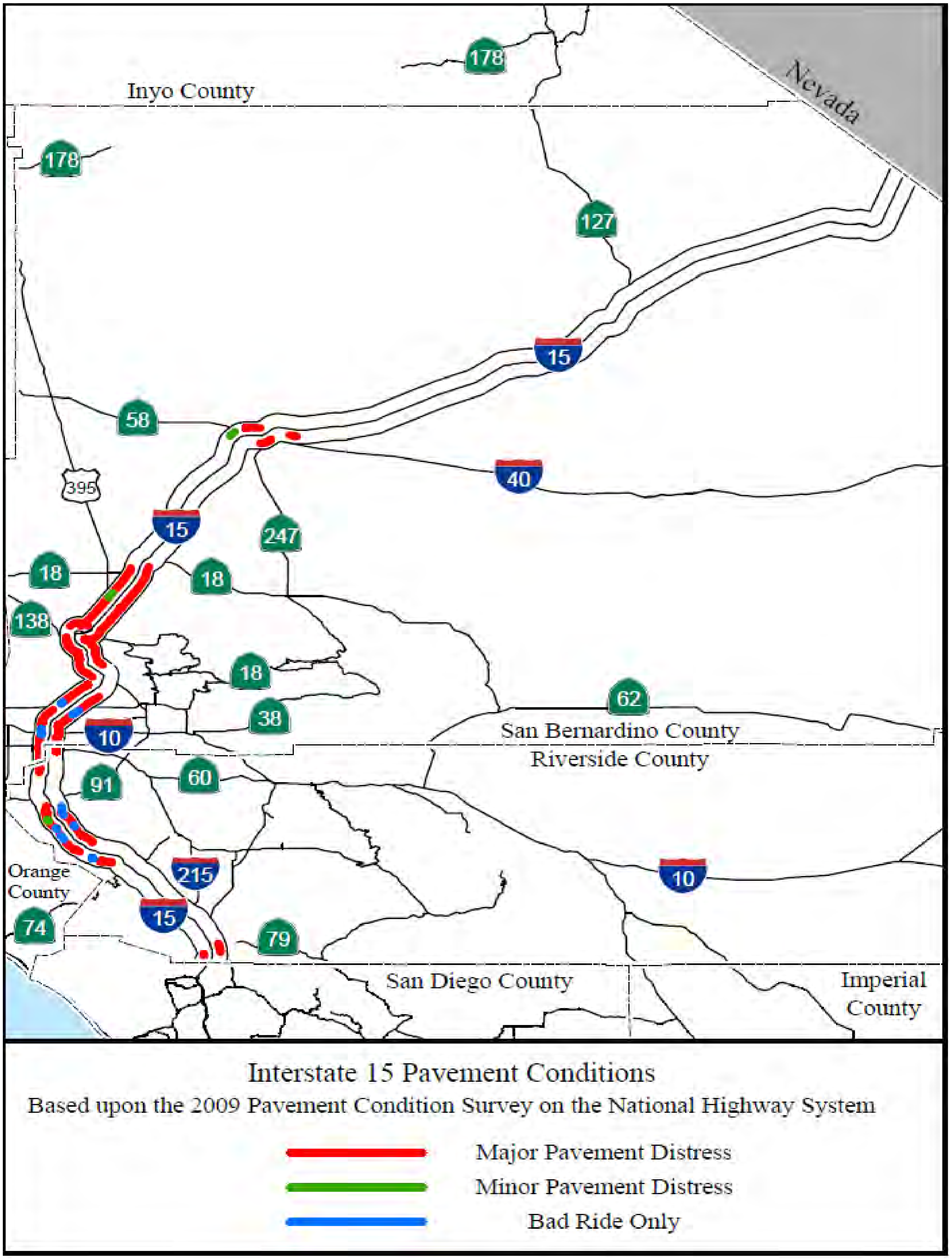
Exhibit 3-17: I-15 Riverside County Pavement Condition

Left Alignment Post Miles			Right Alignment Post Miles		
Poor Ride	Minor Distress	Major Distress	Poor Ride	Minor Distress	Major Distress
28.9-29.0	38.0-38.3	1.0-2.0	34.7-35.0		2.0-3.0
34.0-34.7		26.1-28.0	37.85-38.0		30.0-32.9
36.0-36.6		31.0-33.2	39.4-39.7		34.0-34.7
		34.7-35.0			35.0-37.8
		36.6-38.0			38.0-38.3
		38.3-40.0			51.0-52.28
		47.0-48.0			
		49.0-50.0			
		51.0-52.28			

Exhibit 3-18: I-15 San Bernardino County Pavement Condition

Left Alignment Post Miles			Right Alignment Post Miles		
Poor Ride	Minor Distress	Major Distress	Poor Ride	Minor Distress	Major Distress
2.0-3.0	34.0-35.0	0.0-2.0	8.0-9.0		0.0-8.0
7.6-8.0	70.0-71.0	3.0-6.0			9.0-12.8
		8.0-13.0			R15.0-R21.0
		R15.0-R22.8			R21.9-R26.2
		R23.9-R26.5			R28.9-R29.65
		R28.9-34			30.0-42.0
		35.0-41.0			74.0-75.0
		72.1-74.0			

**Exhibit 3-19: I-15 Pavement Conditions
Riverside and San Bernardino Counties**



4. BOTTLENECK IDENTIFICATION AND ANALYSIS

Potential bottlenecks were identified through PeMS. Field reviews were also conducted to verify PeMS data

Northbound Bottlenecks

Beginning at San Diego/Riverside County Line and moving northbound, the following bottlenecks were identified during the **AM** peak period:

- **Weirick Road On-ramp**: The northbound on-ramp joins the mainline with a short merge distance on an uphill grade. The high volume of traffic merging onto the mainline at this location is found to be the cause of this bottleneck.

- **2nd Street Lane Drop**: At the 2nd Street off-ramp, there are four mixed-flow lanes with an auxiliary lane ending at the 2nd Street off-ramp. The fourth lane is dropped within the interchange. A bottleneck occurs at the location of the lane drop.

- **6th Street On-ramp**: The on-ramp joins the mainline on an uphill grade. In addition there is a geometric curvature. The volumes on this ramp plus the vertical and horizontal geometry lends to the bottleneck.

The following bottlenecks were identified during the **PM** peak period only:

- **Rancho California Road On-ramps**: Successive on-ramps (loop and slip ramp) add high volumes of traffic from the ramps.

- **Winchester Road On-ramps**: Successive on-ramps (loop and slip ramp) add high volumes of traffic from the ramps.

- **Bellegrave Overcrossing to Cantu-Galleano Off-Ramp**: High volumes and the change in the horizontal alignment to the freeway create the bottleneck.

- **I-15/I-215 Connector**: Horizontal alignment and grade, high traffic volume, and decision point/ merge with I-215

The following bottlenecks were identified during the **AM** and **PM** peak periods:

- **Riverside/San Bernardino County Line (Philadelphia Undercrossing)**: North of the State Route 60 connectors, there is a lane drop. There is also significant merging and weaving traffic from the connectors to the mainline. A bottleneck occurs at the lane drop due to the loss of capacity.

Southbound Bottlenecks

The following bottlenecks were identified during the **AM** peak period:

- **Cajalco On-ramp**: The horizontal curvature of the mainline as well as a moderate upgrade creates a bottleneck south of the onramp.

- **Magnolia Avenue Off-ramp**: The significant merging and weaving between the State Route 91 connectors and the Magnolia off-ramp causes a bottleneck.

- **Baseline Road Off-ramp**: There are six mixed-flow lanes at the SR-210/15 Junction which reduce to four lanes past the off-ramp. There is also significant merging and weaving between connectors and the off-ramp. The lane drop compounded by the weaving condition causes a bottleneck.

The following bottlenecks were identified during the **PM** peak period only:

- **Ontario Avenue Off-ramp**: there are changes to the horizontal and vertical alignment of the roadway. Volumes and the alignment cause a bottleneck at this location 85 percent of the time in the southbound PM peak during weekdays.

- **Magnolia Avenue On-ramp**: there are changes to the horizontal and vertical alignment of the roadway. Volumes and the alignment cause a bottleneck at this location 82 percent of the time in the southbound PM peak during weekdays.

- **Jurupa Street Off-ramp**: Between the Interstate 10 connectors and the Jurupa Street off-ramp, there is significant merging and weaving that causes a bottleneck.

Exhibits 4-1 through 4-4 graphically illustrate the location of each of the bottleneck locations for the I-15 Corridor. The bottleneck locations are also listed in Exhibits 4-6.

Exhibit 4-1: I-15 Riverside County AM Bottleneck Locations

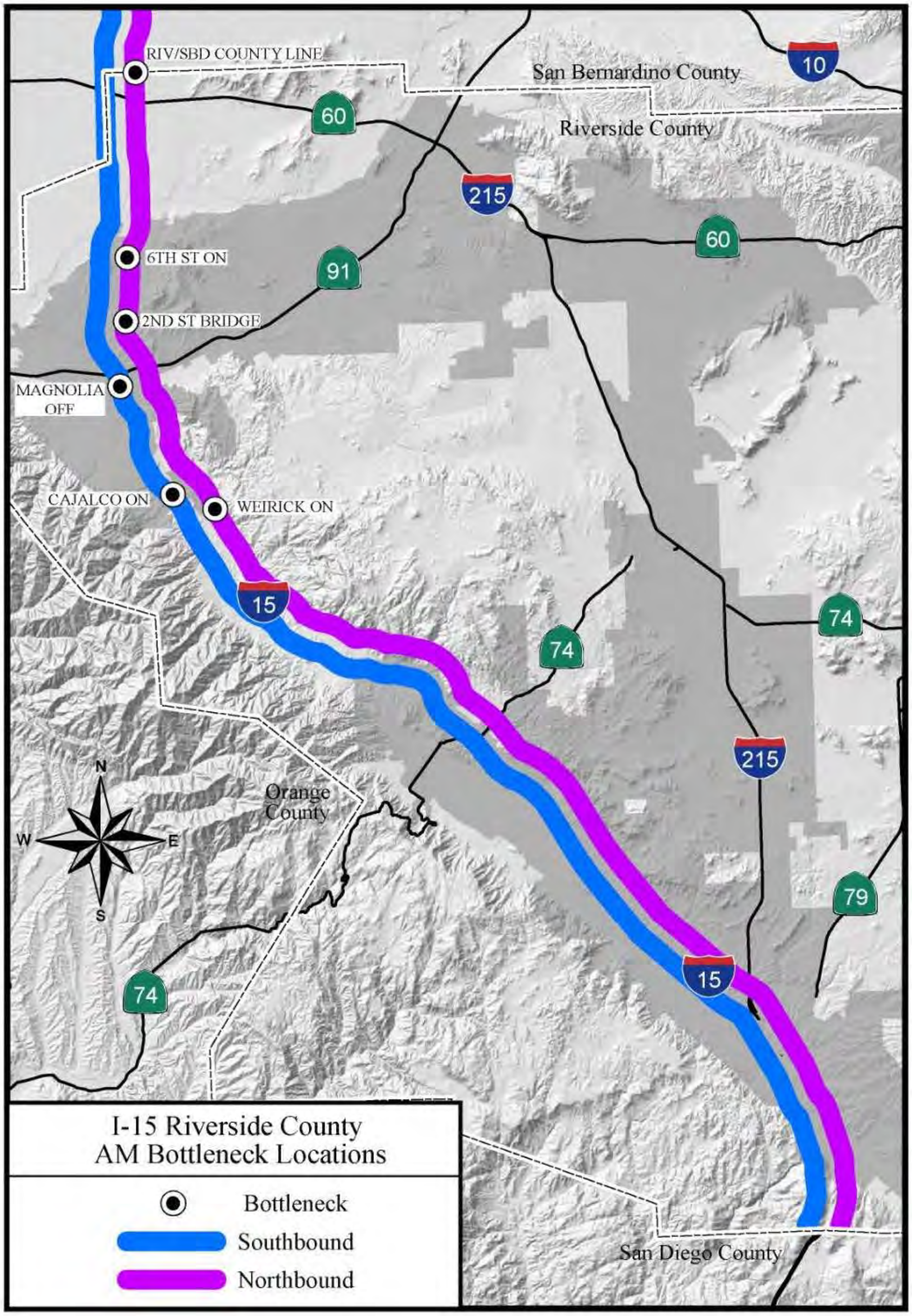


Exhibit 4-2: I-15 Riverside County PM Bottleneck Locations

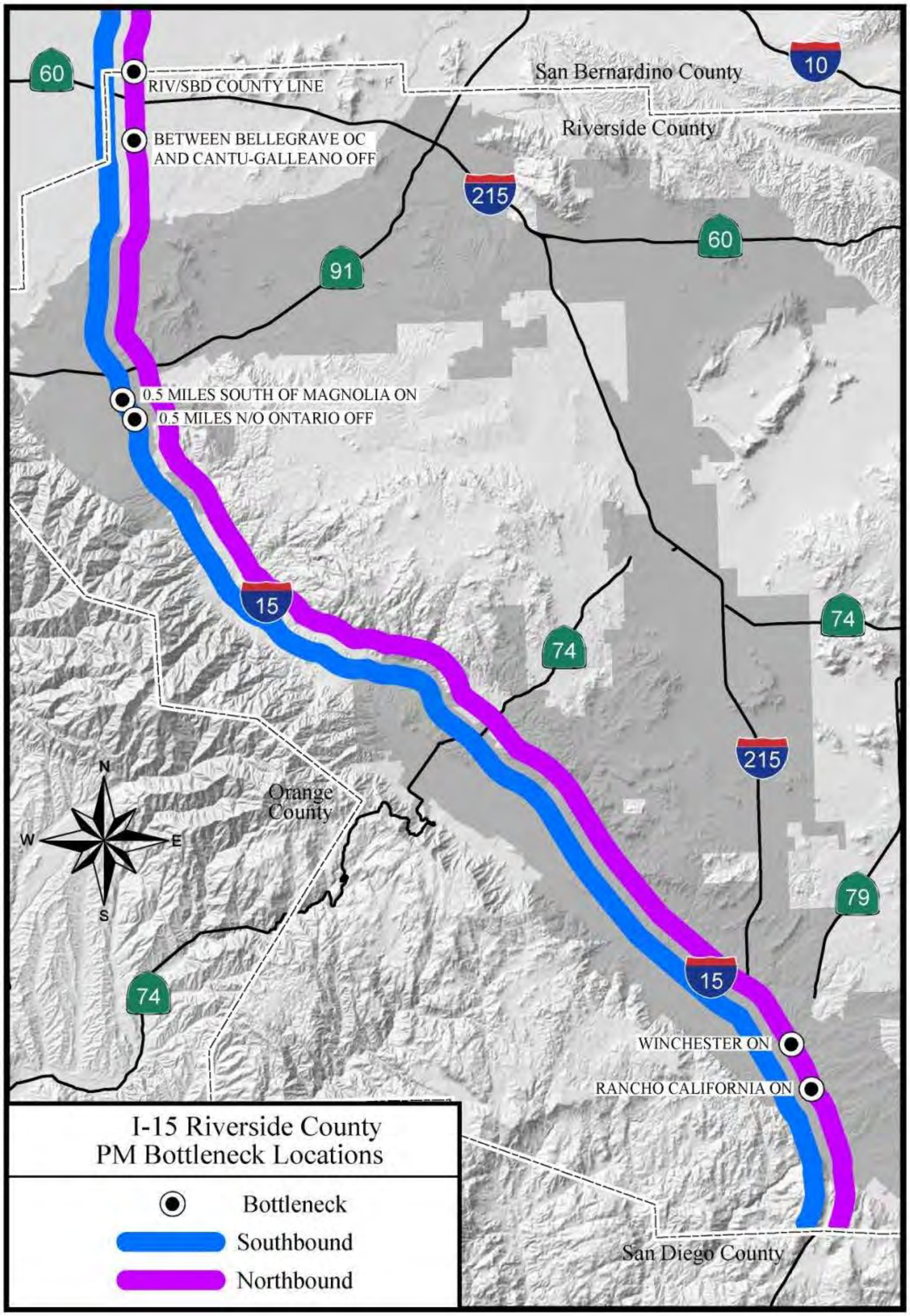


Exhibit 4-3: I-15 San Bernardino County AM Bottleneck Locations

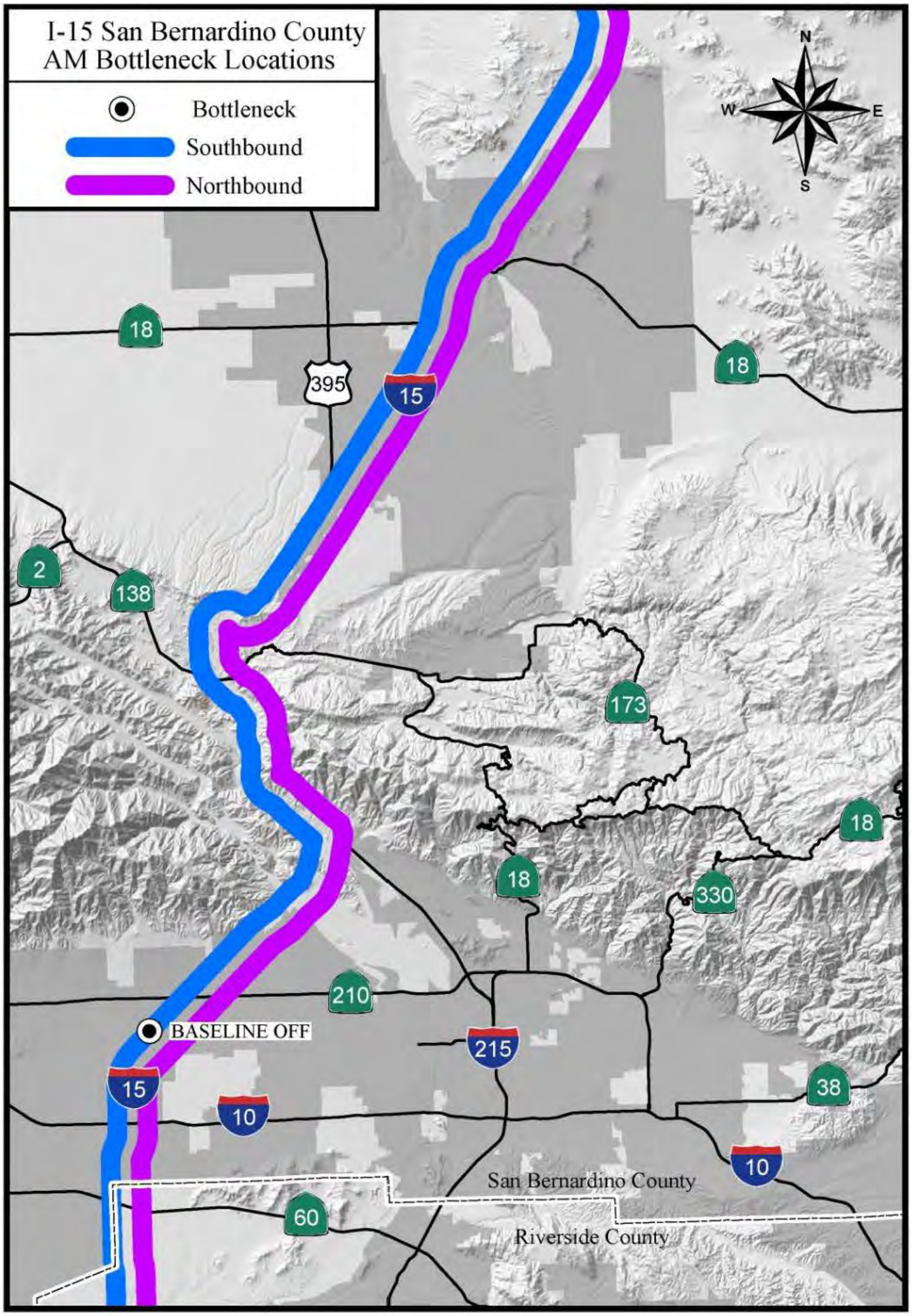
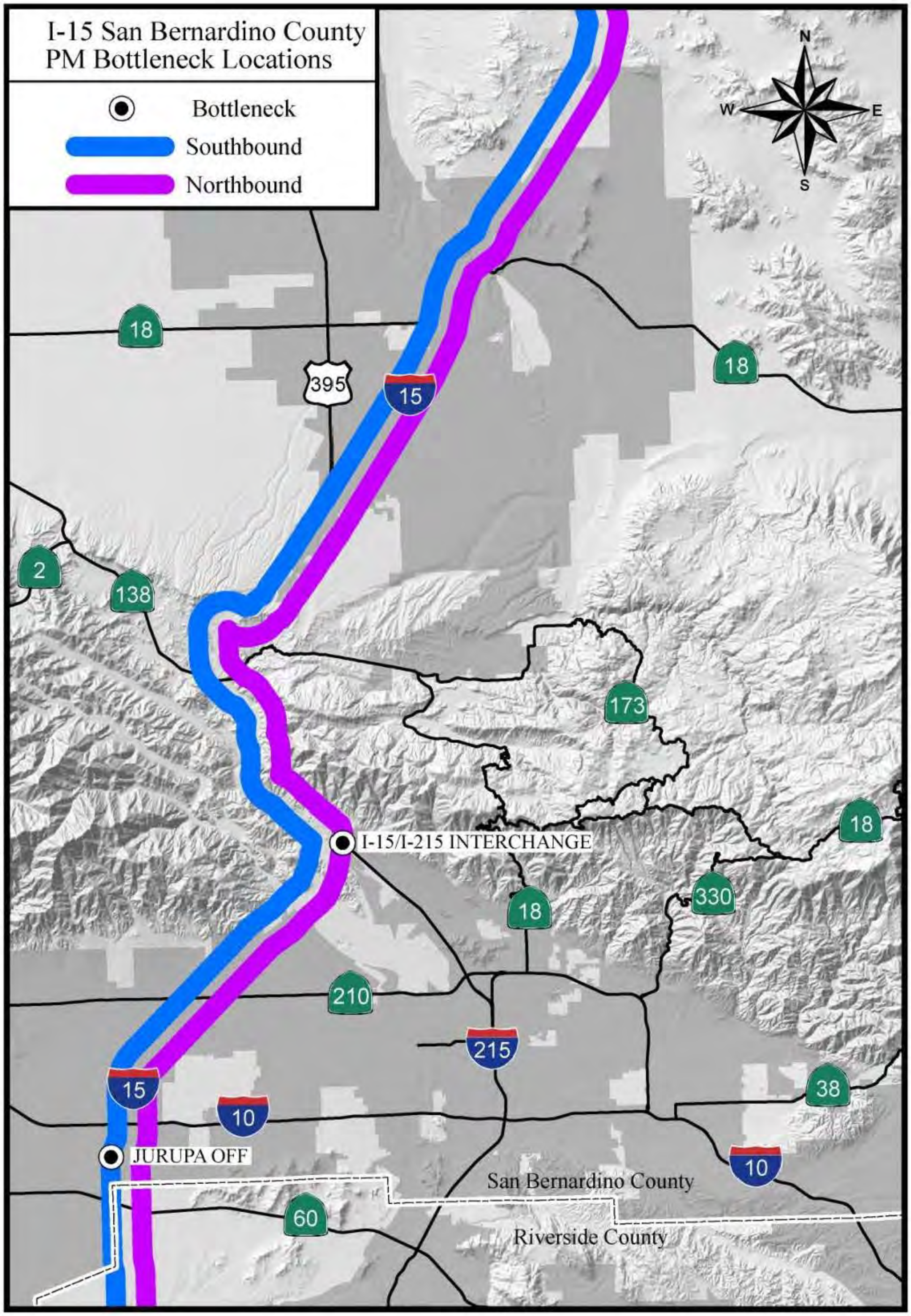


Exhibit 4-4: I-15 San Bernardino County PM Bottleneck Locations



Analysis of Bottleneck Areas

Bottleneck areas represent segments that are defined by one major bottleneck (or a number of smaller ones). By segmenting the corridors into these bottleneck areas, the performance statistics that were presented for the entire corridor can then be broken down by bottleneck area. This way, the relative contribution of each bottleneck area to the degradation of the corridor performance can be gauged. The performance statistics that lend themselves to such segmentation include:

- Mobility
- Safety

Based on this approach, the study corridor comprises several bottleneck areas, which are different by direction. Exhibit 4-5 illustrates the *concept of bottleneck areas*. The red vertical lines represent the bottleneck locations, while the arrows identify the bottleneck areas.

Exhibit 4-5: Dividing a Corridor into Bottleneck Areas

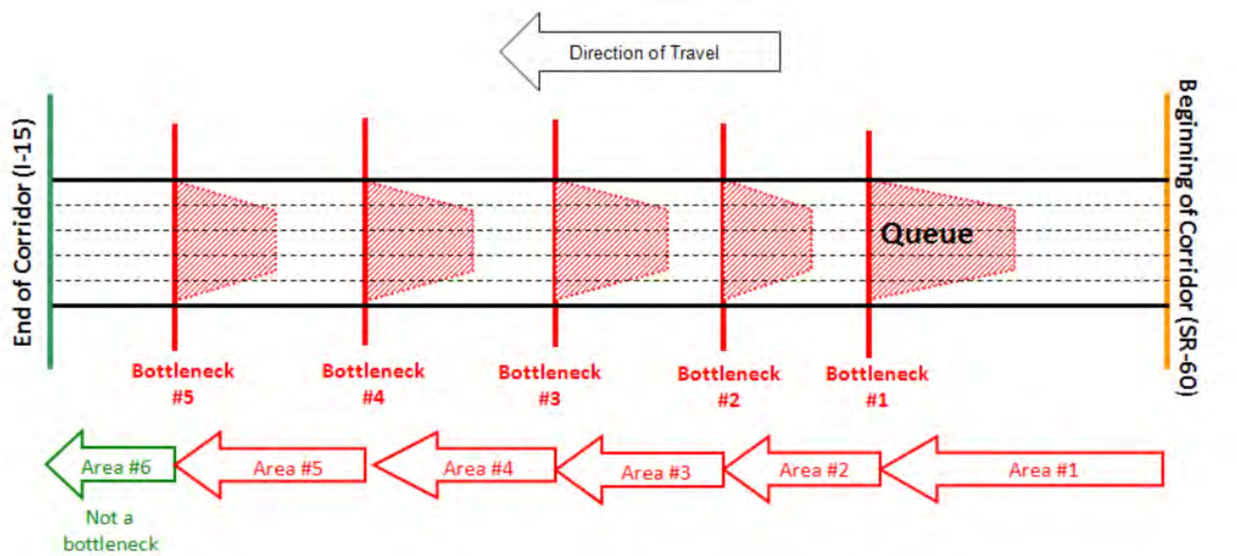


Exhibit 4-6: I-15 Identified Bottleneck Areas

Riverside County

Bottleneck Location	Active Period		Direction
	AM	PM	
Rancho California On		X	Northbound
Winchester On		X	Northbound
Weirick On	X		Northbound
2nd St. Lane Drop	X		Northbound
6th St. On	X		Northbound
Between Bellegrave OC and Cantu-Galleano Off		X	Northbound
Riverside/San Bernardino County Line	X	X	Northbound
Cajalco On	X		Southbound
0.5 mile north of Ontario Off		X	Southbound
0.5 mile south of Magnolia On		X	Southbound
Magnolia Off	X		Southbound

San Bernardino County

Bottleneck Location	Active Period		Direction
	AM	PM	
Jurupa Off		X	Southbound
Baseline Off	X		Southbound
I-15/I-215 Connector		X	Northbound

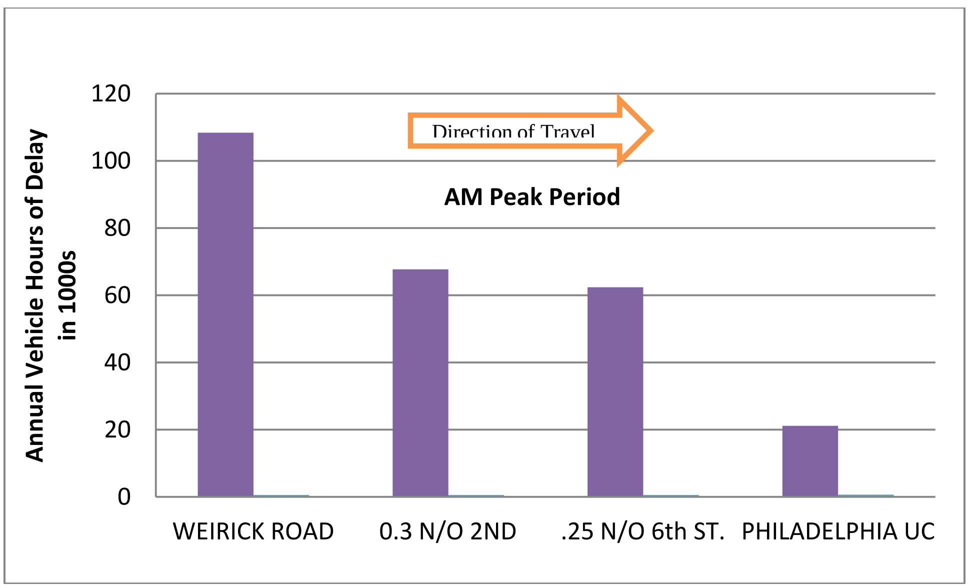
The following section uses the previously discussed performance measures of mobility, safety, productivity, and pavement condition to evaluate each bottleneck area. The results from this analysis reveals which segments of the corridor should be considered for improvement.

Mobility by Bottleneck Area

Mobility describes how efficiently the corridor moves vehicles. To evaluate how well (or poorly) each bottleneck area moves vehicles, vehicle-hours of delay were calculated for each segment. The results reveal the areas of the corridor that experience the worst mobility. The source of data used to calculate delay for the corridor is PeMS. For each direction of travel, these charts express delay by illustrating the bottleneck areas where PeMS detection exists and is used to calculate delay.

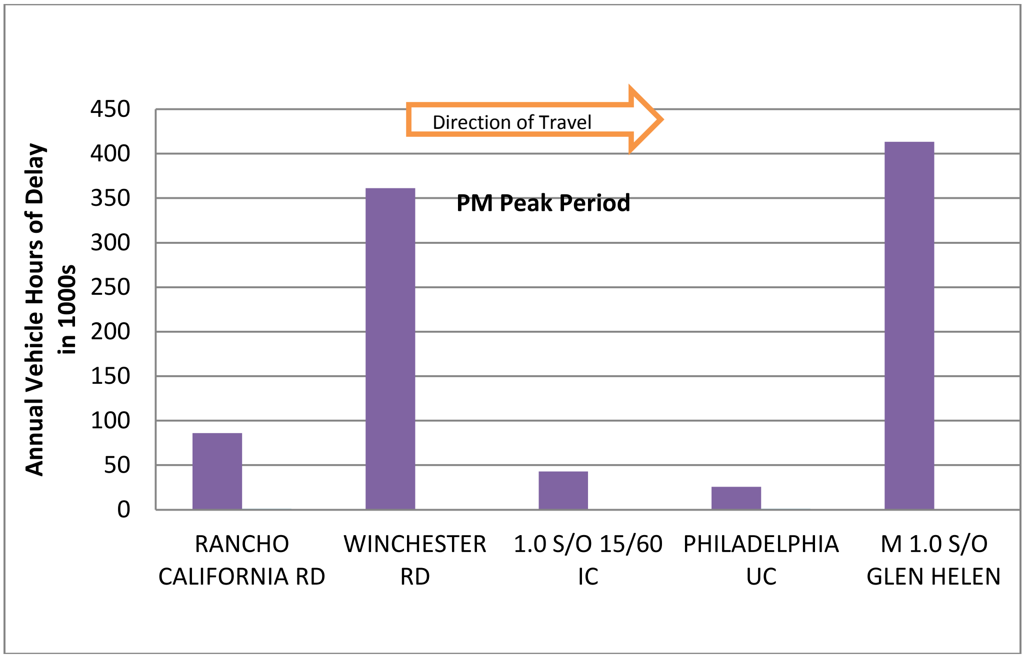
Exhibits 4-7 through 4-10 illustrate the vehicle-hours of delay experienced by each bottleneck area during the peak periods in each direction on I-15. The percentages assigned to each bottleneck area are the number of weekdays the bottleneck occurs. As depicted in Exhibit 4-7, the bottleneck at Weirick experienced the most delay with slightly over 100,000 vehicle-hours of delay.

Exhibit 4-7: Northbound I-15 Annual Vehicle-Hours of Delay (2010)



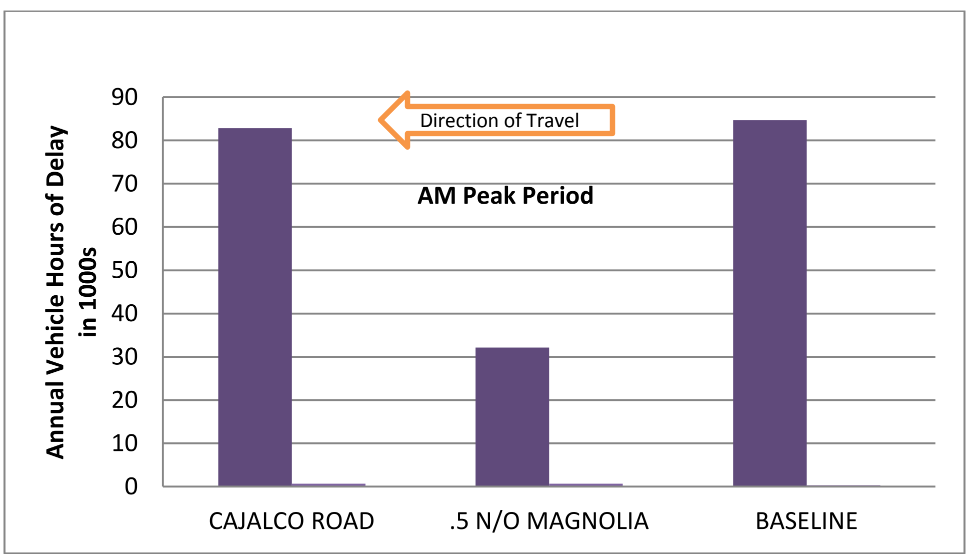
Source: PeMS

Exhibit 4-8: Northbound I-15 Annual Vehicle-Hours of Delay (2010)



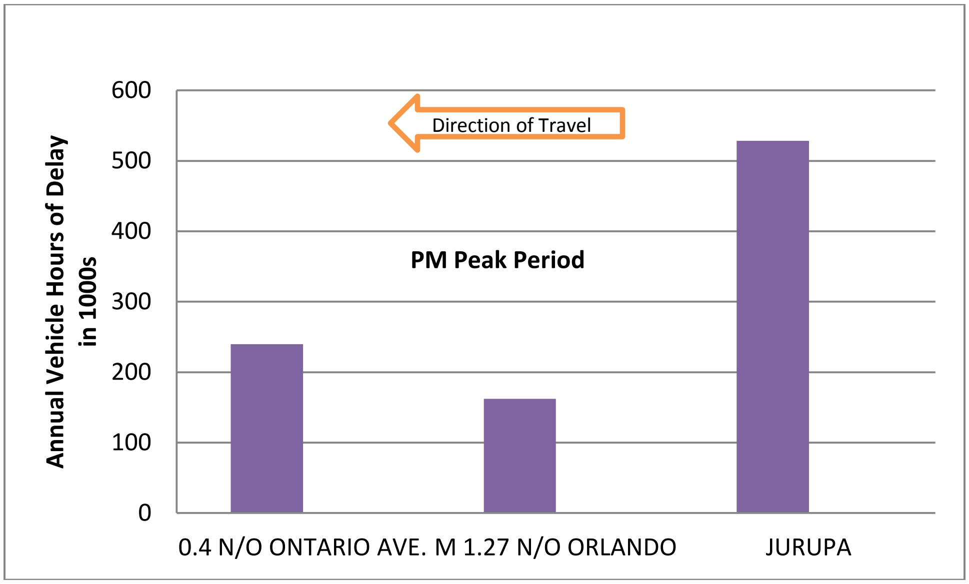
Source: PeMS

Exhibit 4-9: Southbound I-15 Annual Vehicle-Hours of Delay (2010)



Source: PeMS

Exhibit 4-10: Southbound I-15 Annual Vehicle-Hours of Delay (2010)



Source: PeMS

5. CAUSALITY

Major bottlenecks are the location of corridor performance degradation and resulting congestion and lost productivity. It is important to verify the specific location and cause of each major bottleneck to determine appropriate solutions to traffic operational problems.

By definition, a bottleneck is a condition where traffic demand exceeds the capacity of the roadway facility. In most cases, the cause of the bottleneck is related to a sudden reduction in capacity, such as roadway geometry, heavy merging and weaving; or a surge in demand that the facility cannot accommodate. In many cases, it is a combination of increased demand and capacity reductions. Below is a summary of the causes of the bottleneck locations.

Northbound Bottlenecks and Causes

Congestion occurs in both the AM and PM peak hours.

The following is a summary of the northbound bottlenecks for the **AM** peak period and their identified causes.

Weirick On

Exhibit 5-1 is an aerial photograph of the of the Weirick Road interchange. The northbound on ramp joins the mainline with a short merge distance on an uphill grade. The high volume of traffic merging onto the mainline at this location is found to be the cause of this bottleneck.

Exhibit 5-1: Northbound I-15 at Weirick Road Interchange

<u>2nd Street Overcrossing Lane Drop</u>

Exhibit 5-2 is an aerial photograph of the 2nd Street interchange. At the 2nd Street off-ramp, there are four mixed-flow lanes with an auxiliary lane ending at the 2nd Street off-ramp. The fourth lane is dropped within the interchange. A bottleneck occurs at the location of the lane drop.

Exhibit 5-2: Northbound I-15 at 2nd Street Interchange

6th Street On

Exhibit 5-3 is an aerial photograph of the 6th Street on-ramp. The on-ramp joins the mainline on an uphill grade. In addition there is a horizontal curve. The volumes on this ramp plus the vertical and horizontal geometry lends to the bottleneck.

Exhibit 5-3: Northbound I-15 at 6th Street Interchange

Riverside/San Bernardino County Line (Philadelphia Undercrossing)

Exhibit 5-4 is an aerial photograph of the Philadelphia undercrossing at the Riverside/San Bernardino County Line. North of the State Route 60 connectors, there is a lane drop with significant weaving traffic from the connectors to the mainline. There is also significant merging and weaving traffic from the connectors to the mainline. A bottleneck occurs at the lane drop due to the loss of capacity.

Exhibit 5-4: Northbound I-15 at Philadelphia Undercrossing

The following is a summary of the northbound bottlenecks for the **PM** peak period and their identified causes.

Rancho California On

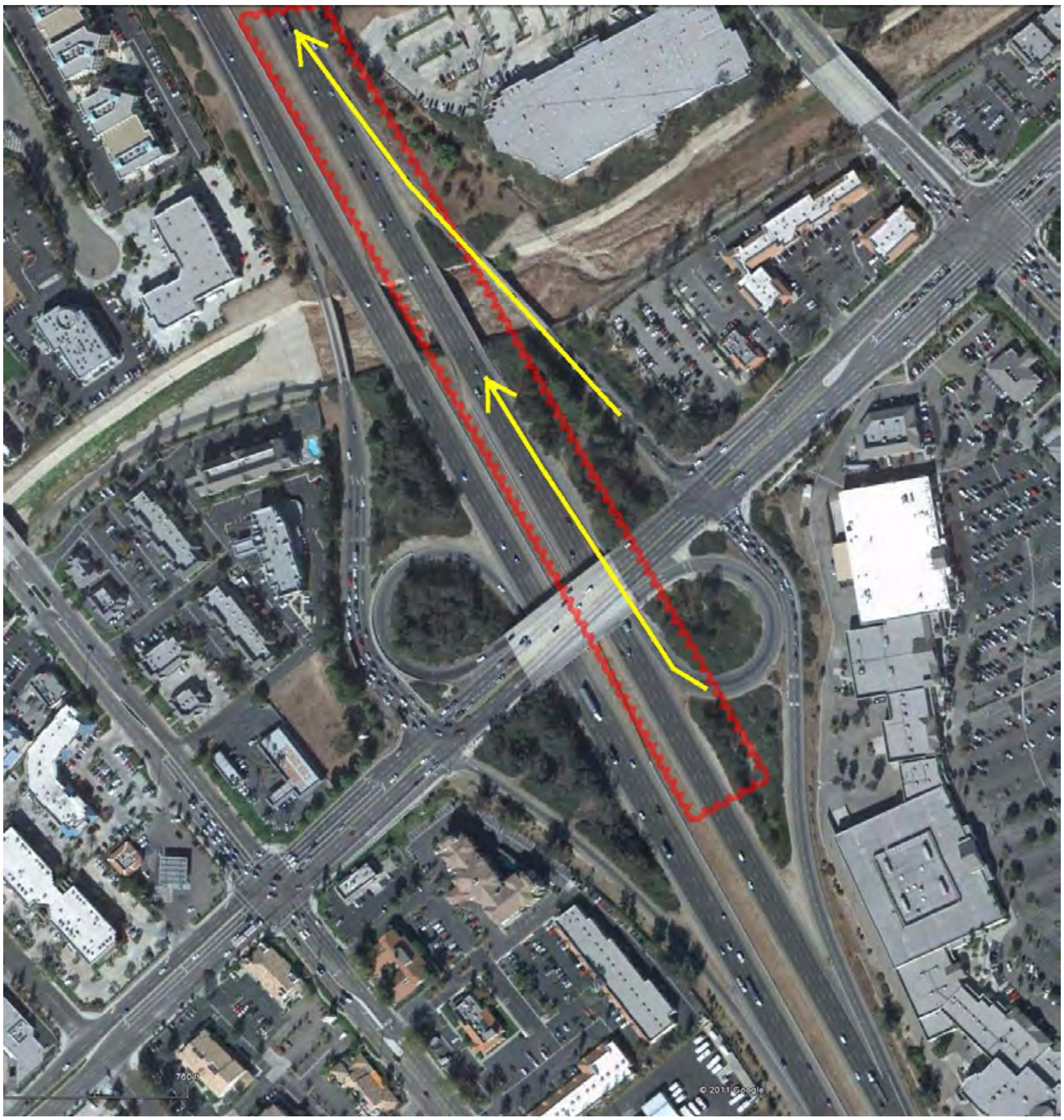
Exhibit 5-5 is an aerial photograph of the northbound I-15 at the Rancho California interchange. The bottleneck is due to successive on-ramps (loop and slip ramps) and high volumes of traffic from the ramps.

Exhibit 5-5: Northbound I-15 at Rancho California On

Winchester On

Exhibit 5-6 is an aerial photograph of the northbound I-15 at the Winchester Road interchange. The bottleneck is due to successive on-ramps (loop and slip ramps) and high volumes of traffic from the ramps.

Exhibit 5-6: Northbound I-15 at Winchester On



Bellegrave Overcrossing to Cantu-Galleano Off

Exhibit 5-7 is an aerial photograph of the northbound I-15 near the Bellegrave overcrossing. High traffic volumes and the change in the horizontal alignment create the bottleneck.

Exhibit 5-7: Northbound I-15 near the Bellegrave Overcrossing

I-15/I-215 Connector in Devore

Exhibit 5-8 is an aerial photograph of the northbound I-15 near the I-215 southbound connector. Horizontal alignment and grade, high traffic volume, and decision point/ merge with I-215 create the bottleneck.

Exhibit 5-8: Northbound I-15 near I-215 Southbound Connector

Southbound Bottlenecks and Causes

Congestion occurs in both the **AM** and **PM** peak hours.

The following is a summary of the southbound bottlenecks for the **AM** peak period and their identified causes.

Cajalco On

Exhibit 5-9 is an aerial photograph of the Cajalco on-ramp. The horizontal curvature of the mainline combined with a moderate grade creates a bottleneck south of the on-ramp.

Exhibit 5-9: Southbound I-15 at Cajalco Road On

Magnolia Off

Exhibit 5-10 is an aerial photograph of the southbound I-15 at the Magnolia Avenue off-ramp. Significant merging and weaving between the State Route 91 connectors and the Magnolia Avenue off-ramp causes a bottleneck.

Exhibit 5-10: Southbound I-15 at Magnolia Avenue Off

<u>Baseline Off</u>

Exhibit 5-11 is an aerial photograph of the I-15 at the Baseline interchange. There are six mixed-flow lanes approaching the Baseline interchange which reduce to four lanes past the off-ramp. There is also significant merging and weaving between connectors and the off-ramp. The lane drop compounded by the weaving condition causes a bottleneck.

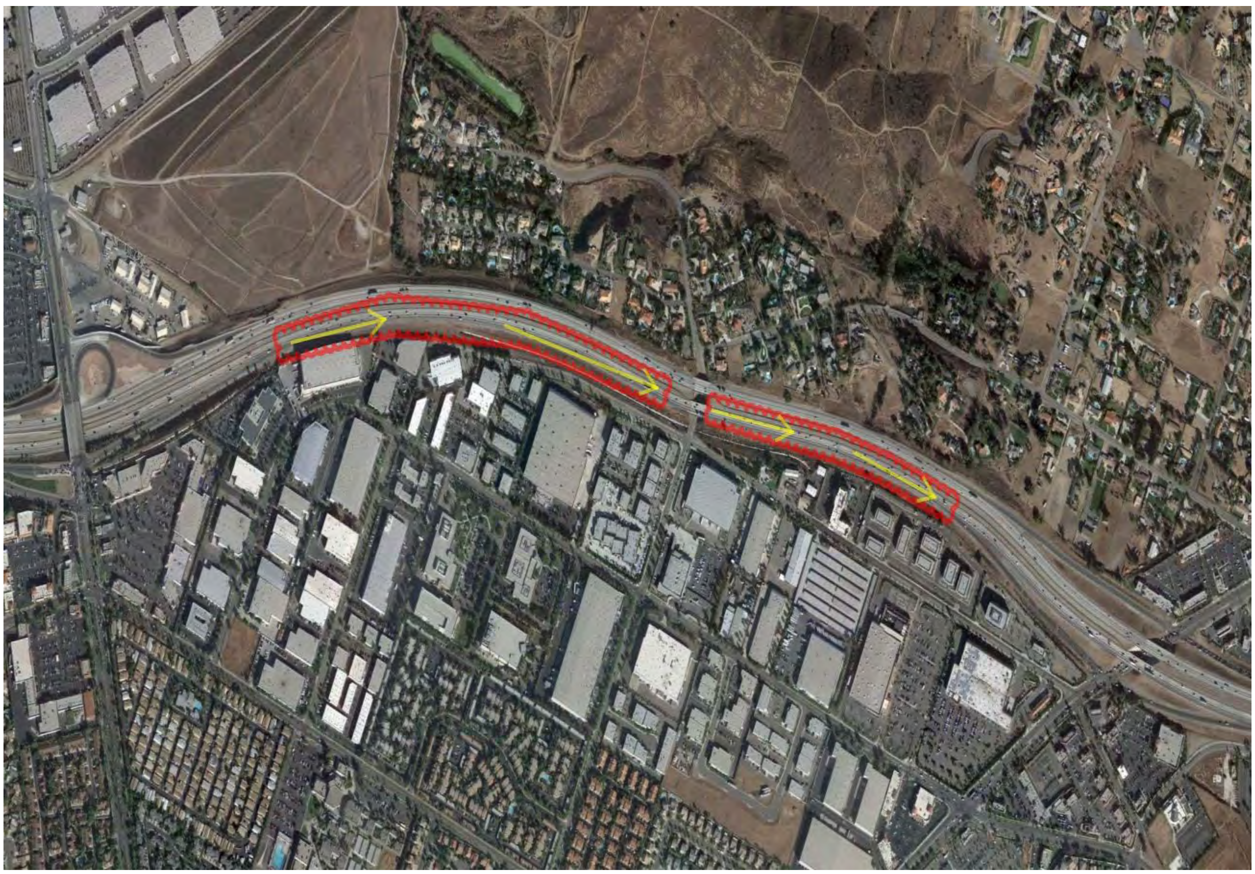
Exhibit 5-11: Southbound I-15 at Baseline Off

The following is a summary of the southbound bottlenecks for the **PM** peak period and their identified causes.

<u>0.5 mile north of Ontario Off and 0.5 mile south of Magnolia On</u>

Exhibit 5-12 is an aerial photograph of the southbound I-15 mainline between the Magnolia Avenue on-ramp and the Ontario Avenue off-ramp. There are changes to the horizontal and vertical alignment of the roadway. Volumes and the alignment cause a bottleneck.

Exhibit 5-12: Southbound I-15 between Magnolia On and Ontario Off



Jurupa Off

Exhibit 5-13 is an aerial photograph of southbound I-15 at the Jurupa Avenue off-ramp. Between the Interstate 10 connectors and the Jurupa off-ramp, there is significant merging and weaving that causes a bottleneck.

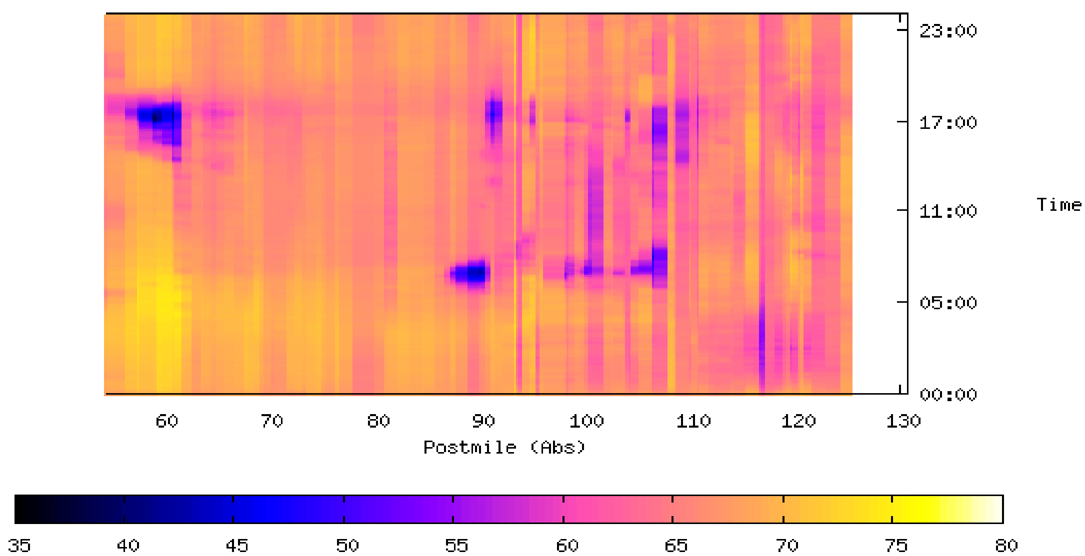
Exhibit 5-13: Southbound I-15 at Jurupa Avenue Off

Speed Contours

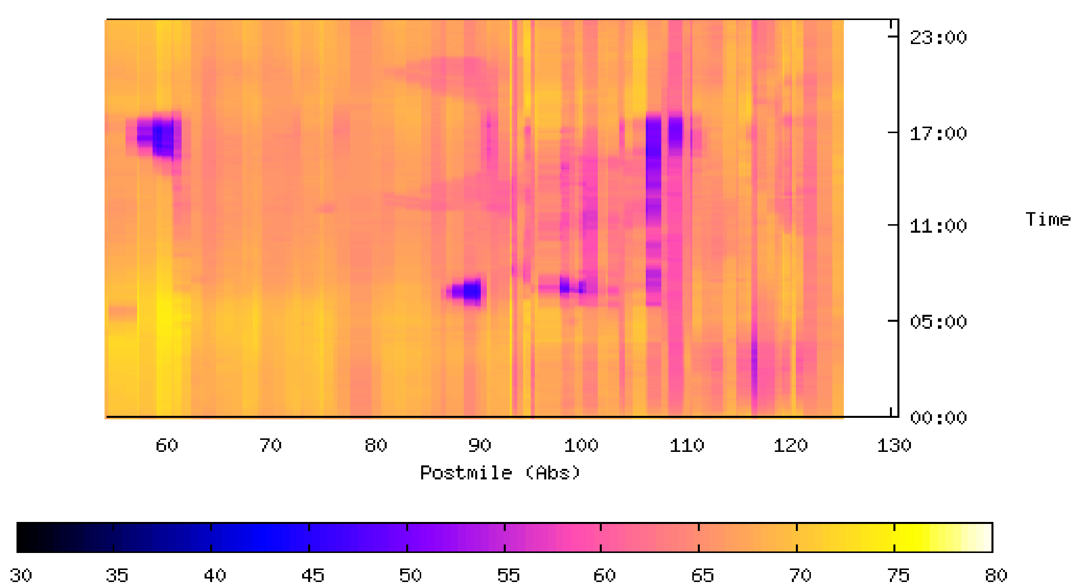
Exhibits 5-14 and 5-15 show the speed contours along I-15 in the PM peak period for each quarter during 2010. The dark coloring represents areas of congestion.

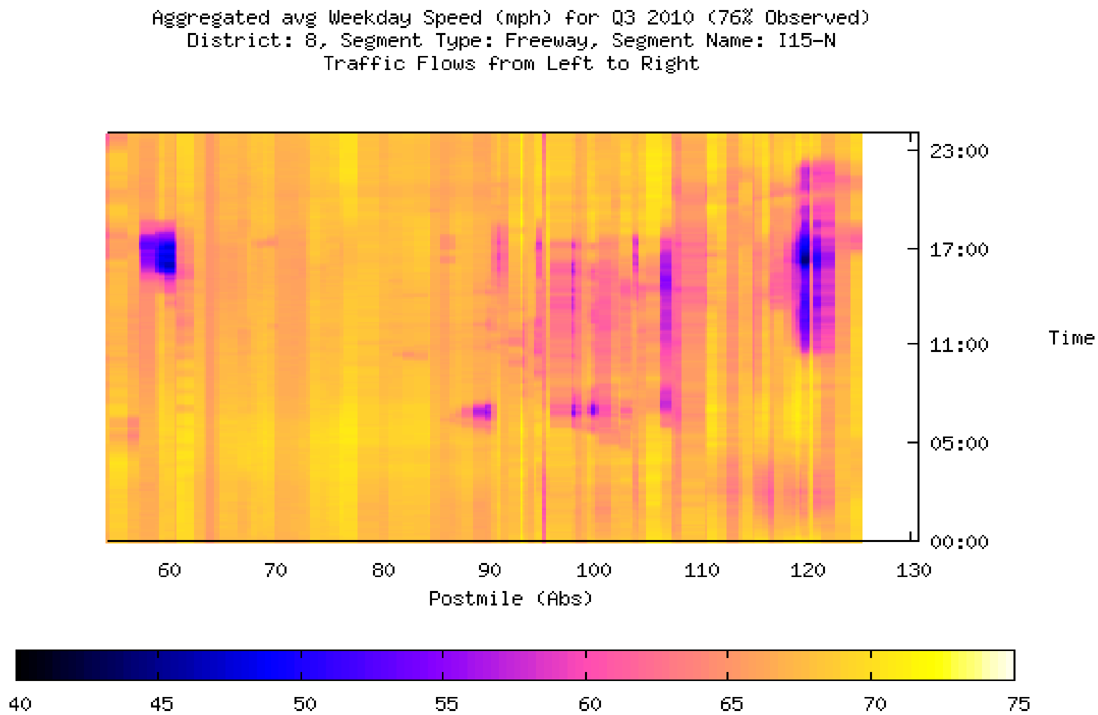
Exhibit 5-14: Northbound I-15 Speed Contours (2010 Average by Quarter)

Aggregated avg Weekday Speed (mph) for Q1 2010 (80% Observed)
District: 8, Segment Type: Freeway, Segment Name: I15-N
Traffic Flows from Left to Right



Aggregated avg Weekday Speed (mph) for Q2 2010 (74% Observed)
District: 8, Segment Type: Freeway, Segment Name: I15-N
Traffic Flows from Left to Right




Aggregated avg Weekday Speed (mph) for Q3 2010 (76% Observed)
District: 8, Segment Type: Freeway, Segment Name: I15-N
Traffic Flows from Left to Right
23:00
17:00
11:00
05:00
00:00
Time
60
70
80
90
100
110
120
130
Postmile (Abs)
40
45
50
55
60
65
70
75

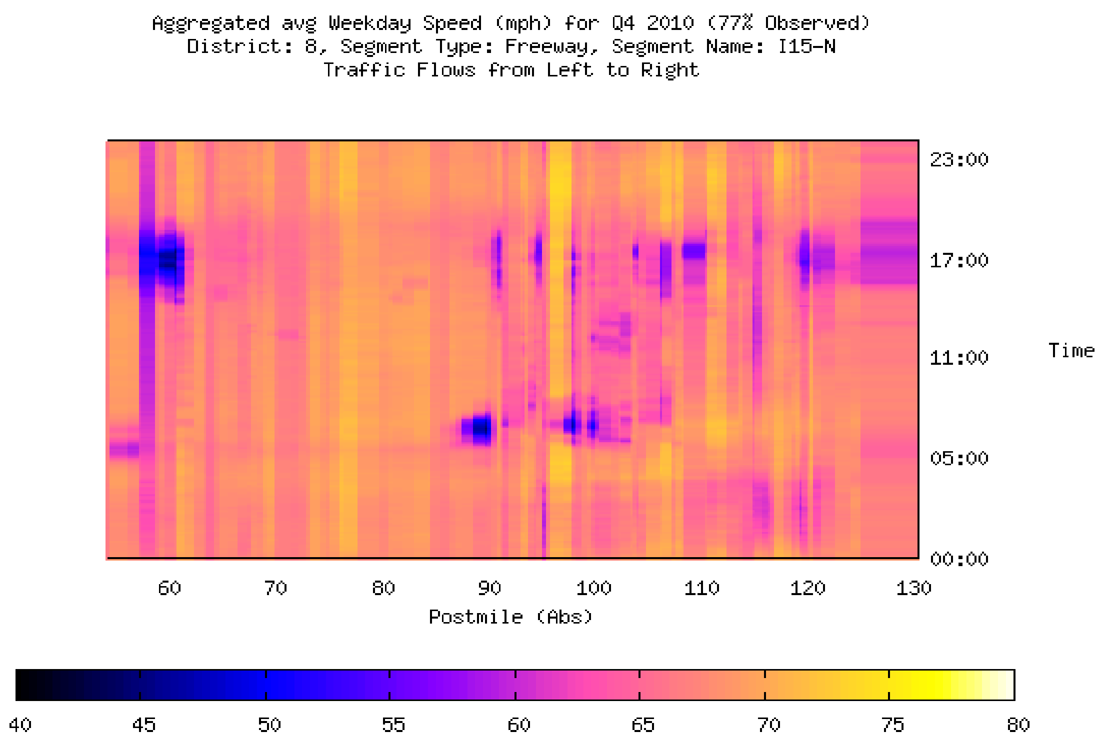
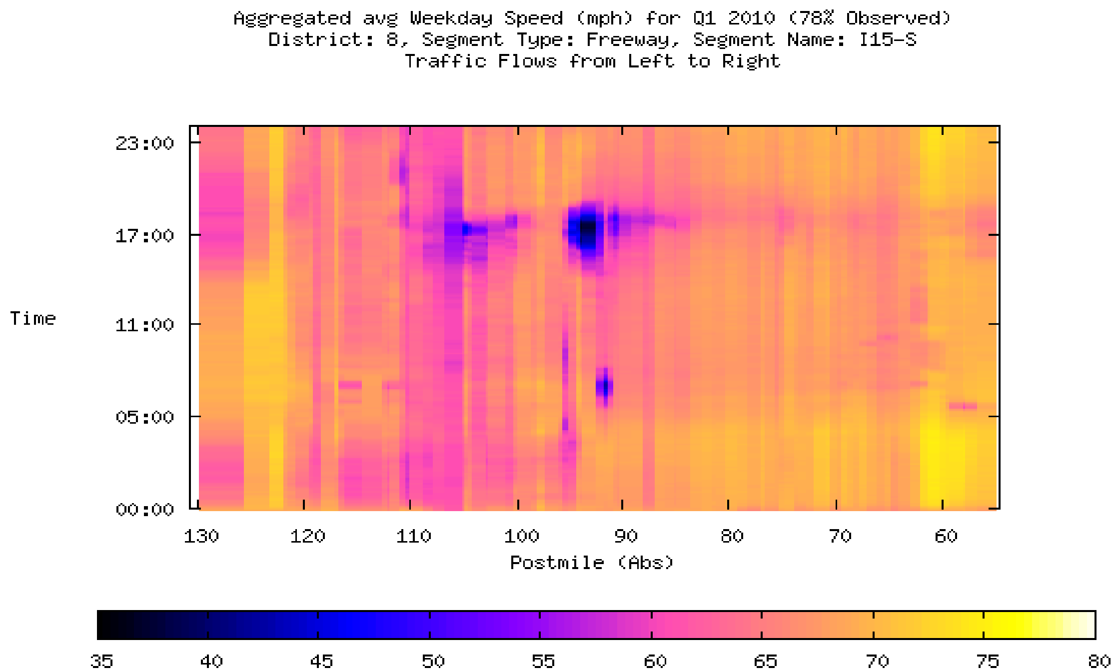
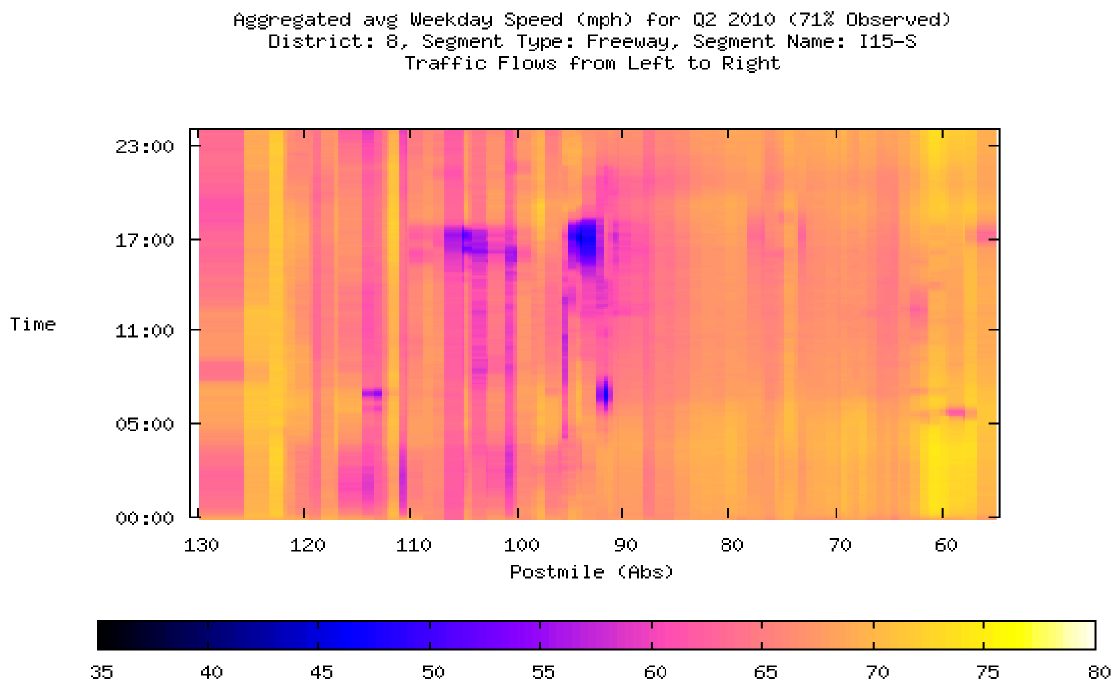
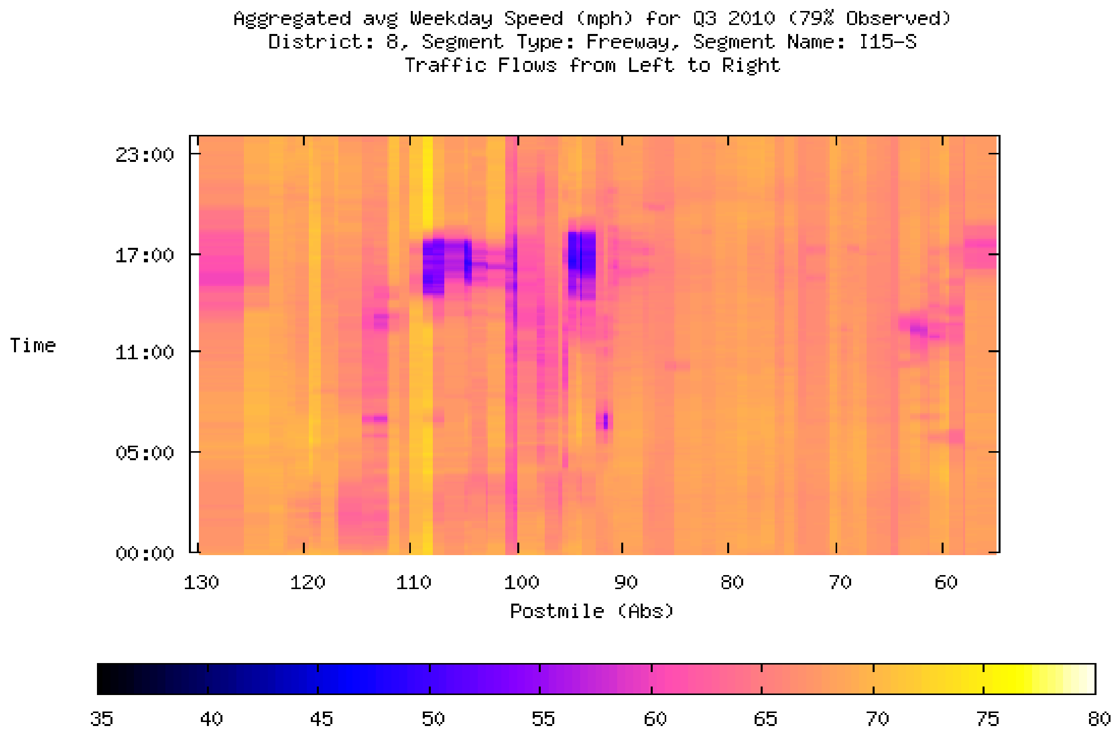
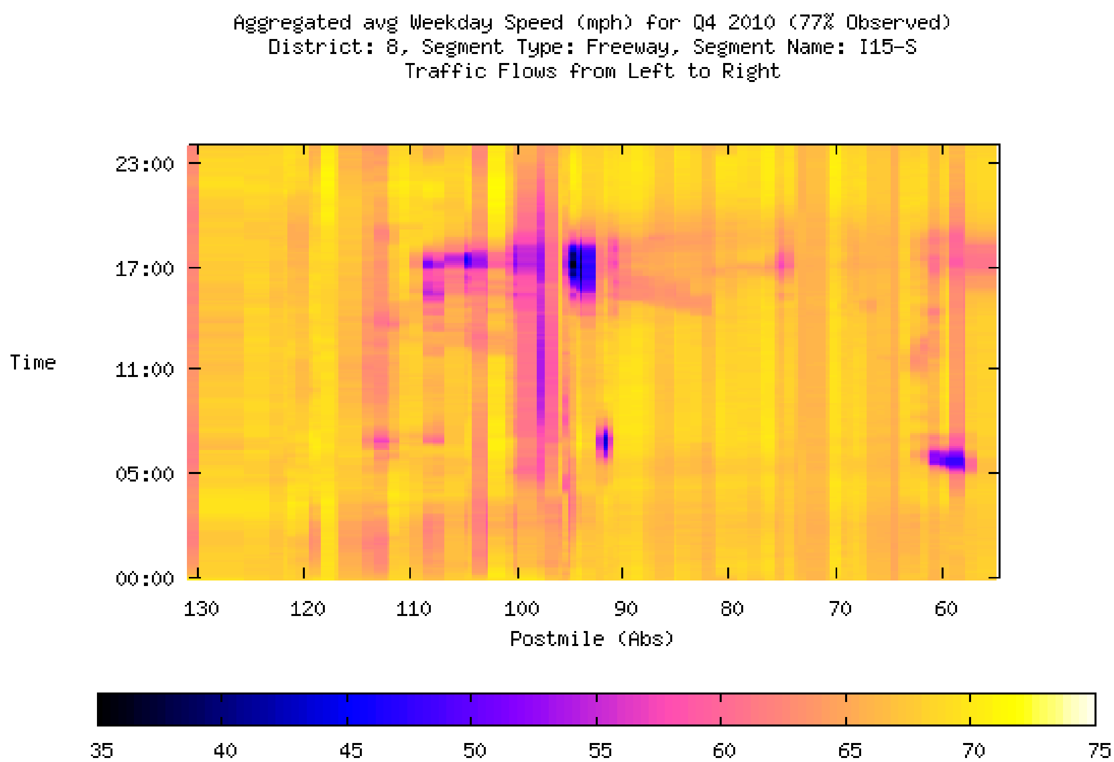

Aggregated avg Weekday Speed (mph) for Q4 2010 (77% Observed)
District: 8, Segment Type: Freeway, Segment Name: I15-N
Traffic Flows from Left to Right
23:00
17:00
11:00
05:00
00:00
Time
60
70
80
90
100
110
120
130
Postmile (Abs)
40
45
50
55
60
65
70
75
80

Exhibit 5-15: Southbound I-15 Speed Contours (2010 Average by Quarter)






Aggregated avg Weekday Speed (mph) for Q3 2010 (79% Observed)
District: 8, Segment Type: Freeway, Segment Name: I15-S
Traffic Flows from Left to Right
Time
23:00
17:00
11:00
05:00
00:00
130
120
110
100
90
80
70
60
Postmile (Abs)
35
40
45
50
55
60
65
70
75
80


Aggregated avg Weekday Speed (mph) for Q4 2010 (77% Observed)
District: 8, Segment Type: Freeway, Segment Name: I15-S
Traffic Flows from Left to Right
Time
23:00
17:00
11:00
05:00
00:00
130
120
110
100
90
80
70
60
Postmile (Abs)
35
40
45
50
55
60
65
70
75

6. PLANNED CORRIDOR SYSTEM MANAGEMENT STRATEGIES

Interstate 15 is a primary link for the Inland Empire and the High Desert to major economic centers and geographic regions of the Greater Los Angeles area and San Diego. It is a significant goods movement corridor and it also serves as a conduit for recreation travel to San Diego, Las Vegas and other destinations.

This section summarizes currently funded projects and ones proposed for future implementation. It also presents a framework for combining these projects into scenarios that can be tested through micro-simulation modeling.

Current Corridor Programmed and Planned Projects

Projects on the state highway system that have secured funding and are ready for implementation are identified in SCAG's Federal Transportation Improvement Program (FTIP) or Caltrans' State Highway Operation and Protection Program (SHOPP). The FTIP is a listing of all capital transportation projects proposed over a six-year period for the SCAG region. Similarly, the SHOPP is a listing of all safety and operational projects that can be implemented in the short term. Six projects identified in the 2011 FTIP are relevant to the I-15 corridor.

Exhibits 6-1 and 6-3 list the projects on I-15 programmed in the current 2011 FTIP. It also identifies bottleneck locations within the limits of each project.

Exhibit 6-1: Riverside I-15 Projects Programmed in the 2011 FTIP

RTIP ID	EA	Improvements	Location	Expected Completion Date	Estimated Total Project Cost (in 1,000s)	Bottleneck Locations Targeted by Project										
						Northbound							Southbound			
						Rancho California On Ramp	SR-79 North (Winchester Rd.) On Ramp	Weirick Rd. /Dos Lagos Dr. On Ramp	Second St. UC	Sixth St. On Ramp	Between Bellegrave OC and Cantu-Galleano Ranch Rd.	Riv/SBd County Line	Cajalco Rd. On Ramp	0.5 Miles N/O Ontario Ave. Off Ramp	0.5 Miles S/O Magnolia Ave. On Ramp	Magnolia Ave. Off Ramp
RIV071267	-	2 HOT lanes each dir. from SBd Co. Line to SR-74/1 MF lane each dir. from SBd Co. Line to SR-74/1 HOV lane each dir. from SR-74 to I-15/215	PM 8.7/52.3: From I-15/I-215 South Junction in the City of Murrieta to Riv/SBd County Line in the city of Ontario.	2020	-			x	x	x	x	x	x	x	x	x
RIV050531*	-	On I-15 S/O Temecula – Construct new 4-lane eastern bypass/I-15 IC and ramps	-	2030	-	x	x									

While the FTIP includes projects that are fully funded and ready for implementation, there are projects without committed funding, but planned for the future. Many of these projects are in the 2008 Regional Transportation Plan (RTP), which is a fiscally constrained long-range plan. As shown in Exhibit 6-2, the RTP projects involve capacity improvements to the Riverside I-15 corridor by adding a mixed-flow lane, managed lane or auxiliary lane in each direction. The exhibit indicates the bottleneck locations that lie within the limits of each project.

Exhibit 6-2: Riverside County I-15 Projects Programmed in the 2008 RTP

RTIP ID	EA	Improvements	Location	Expected Completion Date	Estimated Total Project Cost (in 1,000s)	Bottleneck Locations Targeted by Project										
						Northbound							Southbound			
						Rancho California On Ramp	SR-79 North (Winchester Rd.) On Ramp	Weirick Rd. /Dos Lagos Dr. On Ramp	Second St. UC	Sixth St. On Ramp	Between Bellegrave OC and Cantu-Galleano Ranch Rd.	Riv/SBd County Line	Cajalco Rd. On Ramp	0.5 Miles N/O Ontario Ave. Off Ramp	0.5 Miles S/O Magnolia Ave. On Ramp	Magnolia Ave. Off Ramp
3M0701	-	Add 1 Auxiliary Lane in Each Direction	PM 3.4/6.6: From SR-79 South (Temecula Pkwy) to SR-79 North (Winchester Rd.) in the city of Temecula.	2012	-	x	x									
3M07A	-	Add 1 MF Lane in Each Direction	PM 8.7/16.3: From I-15/I-215 South Junction in the City of Murrieta to Bundy Cyn. Rd. in the community of Sedco Hills.	2014	-											
3M0702	0C350	Add/Extend Auxiliary Lane	PM 51.5/52.3 (Riv); PM 0.0/2.4 (SBd): From SR-60 to I-10 in the city of Ontario.	2030	-						x	x				

Exhibit 6-3: San Bernardino County I-15 Projects Programmed in the 2011 FTIP

RTIP ID	EA	Improvements	Location	Expected Completion Date	Estimated Total Project Cost (in 1,000s)	Bottleneck Locations Targeted by Project[7]				
						Northbound		Southbound		
						I-15/I-215 Connector		Jurupa Off Ramp	Baseline Off Ramp	
44850	44850	Add 1 NB MF/Convert Outside Lane to Truck Climbing Lane	PM R21.3/R28.6: In Cajon Pass northbound I-15 from SR-138 to Oak Hill Road.	2008	$8,709					
35072	35072	Widen from 2 to3 Lanes in northbound direction	PM 69.2/74.1: In city Barstow 0.5 miles N/O Lenwood Rd to 0.1 miles S/O East Main St.	2008	$12,636					
20430	20430	New Freeway-to-Freeway IC	PM 7.1/10.0: In cities of Fontana and Rancho Cucamonga at I-15 and SR-210.	2008	$138,121				x	
20061201	0K710	Add 1 MF Lane from Glen Helen Pkwy. to the 15/215 IC; Add Truck Bypass Lane/Aux Lanes/Improve Kenwood IC	PM 14.0/16.4: In the community of Devore.	2020	$272,825	x				

While the FTIP includes projects that are fully funded and ready for implementation, there are projects without committed funding, but planned for future implementation. Many of these projects are in the 2008 Regional Transportation Plan (RTP), which is fiscally constrained long-range plan. As shown in Exhibit 6-4, the RTP projects involve capacity improvements to the San Bernardino I-15 corridor by adding a mixed-flow lane, managed lane, and auxiliary lane in each direction, or truck climbing lane through the Cajon Pass. The exhibit indicates the bottleneck locations that lie within the limits of each project.

[7] Bottlenecks were not identified north of SR-138 due to the lack of detection

Exhibit 6-4: San Bernardino County I-15 Projects Programmed in the 2008 RTP

						Bottleneck Locations Targeted by Project[8]					
						Northbound		Southbound			
RTIP ID	EA	Improvements	Location	Expected Completion Date	Estimated Total Project Cost (in 1,000s)	I-15/I-215 Connector		Jurupa Off Ramp	Baseline Off Ramp	
4T01003	-	Add Truck Climbing Lane	PM 15.9/27.0: In Cajon Pass from the community of Devore to the city of Hesperia.	2010	-	x				
4H01005	-	Add 1 HOV in Each Direction	PM 16.0/33.2: In Cajon Pass from the community of Devore to the city of Hesperia.	2020	-	x				
4H01006	-	Add 1 HOV in Each Direction	PM 31.0/40.6: In the cities of Hesperia and Victorville from US-395 to SR-18 (Palmdale Rd.)	2020	-					
4H01004	-	Add 1 HOV in Each Direction	PM 0.0/16.0: From Riv/SBd Co. Line to the community of Devore.	2030	-	x		x	x	
3M0702	0C350	Add/Extend Auxiliary Lane	PM 51.5/52.3 (Riv); PM 0.0/2.4 (SBd): From SR-60 to I-10 in the City of Ontario	2030				x		

[8] Bottlenecks were not identified north of SR-138 due to the lack of detection

Current Corridor Strategies and Implementation Plan

This section describes five efforts to develop corridor management strategies and plans to implement these strategies:

- 2005 I-15 Comprehensive Corridor Study
- 2008 Victor Valley Area Transportation Study
- 2010 Victor Valley Long Distance Commuter Needs Study
- 2007 I-15 Interregional Partnership Phase II
- *Draft* 2010 I-15 Corridor Improvement Project

All of these strategies will be used to develop scenarios for future micro-simulation analyses.

2005 I-15 Comprehensive Corridor Study (SANBAG)

This study analyzed I-15 between the Riverside/San Bernardino County Line and the Mojave River. Two action plans were prepared: one for the critical near-term improvements to the I-15/I-215 interchange, and one for the long-term corridor improvement process. Each action plan includes near-term steps and the responsible agency, followed by an overview of subsequent steps leading to ultimate implementation of the Locally Preferred Strategy (LPS).

Near-Term Improvements: I-15/I-215 Interchange

Next Steps:

1. Conduct studies for the major interchange improvement of Devore Interchange
2. Perform preliminary design and environmental clearance for improvements to Cajon Boulevard

Long-Term Improvements Action Plan: I-15 Corridor Projects

Next Steps:

1. Based upon results of Multi-County Goods Movement Action Plan, adopt the final LPS for the I-15 Corridor.
2. Request SCAG to include the final LPS in the 2008 RTP update.

Overview of Long-term Corridor Improvement Process by FY 2035:

1. Conduct PSRs for the corridor mainline improvements by segment: southern (SR-60 to SR-210), central (SR-210 to US-395), and northern (US-395 to Mojave River)
2. Identify funding for the corridor mainline improvements
3. Conduct PR/EDs for the corridor mainline improvements by segment
4. Perform final design of the corridor mainline improvements by segment
5. Acquire right-of-way for corridor mainline improvements by segment
6. Construct corridor mainline improvements by segment

Overview of Ongoing TSM/TDM Strategy Implementation

1. Work with corridor cities to plan, design, and implement Intelligent Transportation Systems strategies for the corridor.
2. Work with the California Highway Patrol to identify opportunities and means to enhance enforcement through the corridor.
3. Identify opportunities and means to enhance freeway service patrol in the corridor.
4. Work with Victor Valley Transit and Omnitrans to identify opportunities and means to increase express transit service between the high desert and the Valley area.

2008 Victor Valley Area Transportation Study (SANBAG)

This analysis was used to develop two roadway plans for the Victor Valley: a Year 2035 plan and a General Plan Buildout. The 2035 plan was designed to satisfy the level of service objectives with projected 2035 levels of development using funding from current sources to the greatest extent possible. The Buildout plan was designed to satisfy the level of service objectives with full buildout of the Victor Valley as envisioned in the General Plans of the four incorporated areas and the County of San Bernardino.

Year 2035 Recommendations

The recommended roadway system plan for Year 2035 includes the following elements:

- Increase capacity on I-15 consistent with the adopted Locally Preferred Strategy (LPS) for the I-15 corridor (one additional general purpose lane plus one high occupancy vehicle lane in each direction from US-395 to the High Desert Corridor, and two reversible managed lanes from US-395 to SR-210).
- Construct the High Desert Corridor as a limited access highway from US-395 to Dale Evans Parkway, and as an expressway from Dale Evans Parkway to SR-18.
- Develop US-395 as a high capacity six-lane arterial, with limited driveway access and enhanced intersection capacity at major intersections.
- Realign SR-138 between I-15 and Summit Valley Road and widen to four lanes from Oasis Road to State Route 173.
- Construct new freeway interchanges on I-15 at Ranchero Road, Muscatel/Poplar, Mojave Street, Eucalyptus Street, and La Mesa/Nisqualli.
- Widen SR-18 at multiple locations: from Interstate 15 to Sheep Creek Road widen to six lanes, from Sheep Creek Road to the Los Angeles/San Bernardino County Line widen to four lanes, from Stoddard Wells Road to Apple Valley Road widen to six lanes, and from Apple Valley Road to Bear Valley Road widen to four lanes.
- Develop local arterial streets, including new bridges across the Mojave River (at Yucca Loma Road, Lemon Street/Tussing Ranch Road, and Rock Springs Road) and new grade-separated crossings of the BNSF rail line.

With the recommended improvements, the only roadways projected to experience Levels of Service E or F are the highways through the Cajon Pass area (I-15 and SR-138), as well as a few localized congestion hot spot locations, mostly through interchanges along I-15 and intersections on US-395. The estimated construction cost of the recommended Year 2035 roadway system is approximately $3.06 billion.
The recommended system has been derived by substantially cutting back on what was originally conceived as a more robust transportation network. The recommended system meets the anticipated 2035 demands, with the exception of a few ―hot spot" locations mainly at interchanges along I-15, but does not leave substantial room for additional growth beyond 2035.

General Plan Buildout Recommendations
The recommended roadway system for General Plan Buildout includes all the improvements recommended for Year 2035, plus new highway corridors (the realigned US-395 and the Southeast Beltway), and full development of the roadway systems planned in the local agencies' general plans.

A number of alternative alignments have been identified for the realigned US-395 but a preferred alignment will be determined through additional studies to be conducted at a later date.

The Buildout peak period demand in the SR-138 corridor would require additional capacity from I-15 to Summit Valley Road. West of Summit Valley Road the two arterials would provide sufficient capacity. Therefore it is recommended that the Southeast Beltway limited access highway be constructed from I-15 to Summit Valley Road.

2010 Victor Valley Long Distance Commuter Needs Study (SANBAG)

About half of all employed people who reside in Victor Valley make long commutes to worksites outside the ―Valley." Commutes are dispersed across the entire Los Angeles Basin, with some motorists commuting to worksites as far away as San Diego County. Employers in the Victor Valley are relatively small businesses and it is likely many Victor Valley residents do not work in proximity to their residence. A further contribution to the dispersion is that 25% to 30% of all Victor Valley households contain a person who works outside the Valley. As a result, the study found that many daily commuters view public transportation as an impractical commuting option.

The recommendations summarized below form an introductory program to encourage ridesharing in the Victor Valley. The program consists of six steps that could be phased over a period as long as ten years. Steps can overlap and be taken out of order, however the order is intended to build and reinforce the market for non-single occupant commute choices.

Phase 1 – Enhance Park and Ride Facilities in Victor Valley

Develop as many as 1,000 new park and ride spaces over the next 10 years. This would also include full paving and improved lighting, signing, security and enforcement of current lots. Efforts to arrange, fund, and construct this strategy objective are already in progress.

Phase 2 – Enhance Vanpool, Carpool, and Flex-commute Options

Place greater emphasis on non-SOV travel by providing expanded emphasis on vanpooling and enhanced rideshare. Specific recommended measures include:

- Continuance of the current rideshare matching program being administered by SANBAG.
- Pilot program for ―social marketing" of Transportation Demand Management (TDM) alternatives based on residence location.
- Increased marketing of ridesharing matching services at the residential end of the trip.
- Emphasis on emergency ride home benefits, ensuring a ride home in the event of an emergency.
- A more aggressive program to subsidize vanpool usage.
- Pilot program to create a telecommute program.

Phase 3 – Casual Vanpooling

Fill empty seats on existing vanpools with commuter passengers with similar location and temporal objectives, but on a daily, or temporary, basis.

Phase 4 – Worker-Driver Express Buses

Worker-driver buses employ part-time operators who work full time for an employer in the target service area. Possible applications of the concept include destination areas such as San Bernardino, Loma Linda, Ontario, and Rancho Cucamonga.

Phase 5 – Express Bus

Express bus service linking Victor Valley with San Bernardino. A logical first step for this may be a new route which begins when the Omnitrans "E" Street sbX begins operation.

Phase 6 – Express Bus Service

Express service from Victor Valley to the Metrolink system at Rancho Cucamonga or Montclair (A previously canceled service).

2007 I-15 Interregional Partnership Phase II (SANDAG/WRCOG)

Capacity-enhancing improvements on I-15 at the San Diego/Riverside County Line will be needed to meet the interregional transportation demand between the two counties. Within this portion of the I-15 corridor necessary to continue to address both the causal factors of increasing commute trips along I-15 and the symptoms of the job-housing imbalance which is evidenced by the steadily increasing traffic volumes on I-15 into San Diego County. As such, Caltrans will seek to continue to support and sponsor grant-funded work that addresses both the transportation and socio-economic needs in the corridor.

The level of service analyses clearly show that without improvements, congested conditions will begin to occur sometime between now and 2015. As large, capacity-improving projects typically require longer lead time and a larger amount of time, money and staff resources to deliver compared to operational, ITS, and certain types of transit projects, two separate approaches should be carried forward in considering the delivery of those projects that taken in sum, would provide congestion relief within this portion of I-15:

- Those projects that could be delivered within five to ten years would be described as short-term and would be considered as a group to be short listed for further project development and potentially funding/programming.

- Those projects that would take longer than ten years to deliver would be described as long-term and would also be considered as a group to be short listed for further project development and potentially funding/programming. Long-term projects would also need to consider multi-modal interregional travel needs, including goods movement, commuter or high-speed rail along I-15, and opportunities for right-of way preservation with recognition of the likely scenario that there is a lack of funding to fully meet the future corridor needs, within current funding structures.

As part of the work of a Phase III IRP, the strategic implementation plan would identify and further develop selected short-term and long-term transportation. More in-depth analysis of when these projects would be needed, followed by the development of project-specific delivery schedules and project-specific programming plans based on reasonable revenue scenarios.

Transit Service Coordination

SANDAG's 2030 RTP, MOBILITY 2030, identifies a future transit route between San Diego and Riverside Counties from Temecula to Sorrento Mesa via I-15 and Mira Mesa Boulevard, by 2020. SANDAG, with assistance from the Metropolitan Transit System (MTS) and North County Transit District (NCTD), is currently completing an operations plan for Bus Rapid Transit (BRT) service in the I-15 corridor for the year 2012 and beyond. Travel forecasting for the project has indicated that a significant portion of the patronage (approximately 1,000 patrons per day in 2015 and 1,500 per day by 2030) bound for downtown San Diego and Sorrento Mesa/University Town Center (UTC)/University of California San Diego (UCSD) will be originating in Riverside County. Additionally, up to 75 percent of these potential patrons could be accessing transit by car, resulting in the need for a significant amount of parking at existing and future park and ride locations.

There are two approaches to accommodating Riverside County demand:

Originating Service in Escondido – Accommodating this demand in Escondido would mean more bus services than needed for local resident demand with resulting increased operating costs and also would require an increase in the parking supply in Escondido, by up to 600-800 spaces. However, Riverside County residents may not drive to Escondido to access public transit, which could result in a continued high number of Riverside County residents driving private vehicles in peak-commute periods. The second approach shown below may better address this issue.

Originating Service North of Escondido – Extending service north from Escondido would increase operating costs and require an investment in park and ride facilities to efficiently allow these patrons access to the services. For example, preliminary analysis suggests that in 2015, bus service from Temecula running every 15 minutes to San Diego and every 20 minutes to the Sorrento Mesa/UTC/UCSD area in the 3-hour peak period could accommodate Riverside County demand at an operating cost of approximately $2 million per year. Alternatively, service from the I-15/SR 76 area to San Diego and Sorrento Mesa/ UTC/UCSD at the same frequencies could cost between $1 million and $1.5 million per year. As with the Escondido service scenario, parking would be needed for approximately 600-800 potential patrons.

Rail

High Speed Passenger Train Service
The California High-Speed Rail Authority (CHSRA) is the state agency responsible for planning, constructing, and operating a high-speed train system serving California's major metropolitan areas, including Riverside and San Diego. The proposed system stretches over 800 miles and would connect San Diego, Los Angeles, the Central Valley, San Francisco, and Sacramento.

High-speed train (HST) service along the inland corridor would parallel I-215 and I-15 and extend east from Los Angeles to Riverside and south to downtown San Diego. Stations are planned in Riverside, Murrieta, Escondido, University City, and downtown San Diego.

In 2000, CHSRA adopted a final business plan for an economically viable train system capable of speeds in excess of 200 miles per hour on a fully grade-separated track with state-of-the-art safety, signaling, and automated control systems. The Program-Level Environmental Impact Report/Environmental Impact Statement (PEIR/EIS) for the proposed statewide high-speed passenger train system was certified in November 2005. These documents are available at: www.cahighspeedrail.ca.gov

Passenger Rail Planning – I-15 Commuter Rail Feasibility Study

In May 2005, RCTC evaluated a new commuter rail service from Temecula to San Diego to accommodate the large number of Riverside County residents who commute along I-15. The purpose of this study is to perform an objective evaluation of the potential for commuter rail extensions along the I-15 corridor from Temecula to Corona and Temecula to San Diego.

The proposed I-15 Commuter Rail Feasibility study will examine this segment and build upon the work completed by CHSRA on the stations and alignments.

In addition, given the growth forecast in the I-15 corridor, the project will include a study of a conventional commuter rail corridor between Temecula and Corona on the I-15 corridor, maximizing use wherever possible of the former Santa Fe Railroad right-of-way between Lake Elsinore and Corona.

The study will evaluate the following three alternatives:

- Conventional Commuter Rail: Temecula to San Diego
- High-Speed Rail – Commuter Rail: Temecula to San Diego
- Conventional Commuter Rail: Corona to Temecula

A number of evaluation criteria will be used to determine the feasibility of commuter and high speed rail. These include: 2030 ridership, institutional issues, mobility improvements, operating cost per passenger mile, farebox recovery, capital cost, and capital cost per passenger.

Conventional Commuter Rail: Temecula to San Diego
Alignment: This route will follow the CHSRA-adopted preferred alignment between Temecula and Downtown San Diego for its statewide high-speed rail system.
Stations: Temecula, Escondido, Rancho Bernardo/Poway, University City, Old Town San Diego, and Downtown San Diego.
Tracks: For purposes of estimating capital costs, the conventional commuter rail corridor shall be assumed to be primarily single-track with a single, two-mile long passing siding spaced midway—based upon travel time—between Temecula and San Diego.
Equipment: Seven trains of six cars each operated in a push-pull manner, requiring that 9 cars of the 42-car fleet consist of cab cars to direct the operation of the train.

High Speed Rail- Commuter Rail: Temecula to San Diego
Alignment: This route will follow the CHSRA-adopted preferred alignment between Temecula and Downtown San Diego for its statewide high-speed rail system.
Stations: Temecula, Escondido, Rancho Bernardo/Poway, University City, and Downtown San Diego.

Tracks: This alternative assumes the high-speed rail double-track network shall be in operation.
Equipment: Three high-speed rail trainsets shall be assumed to protect the commuter service with the balance of the train requirements met by existing intercity equipment staged at San Diego.

Conventional Commuter Rail: Temecula – Corona
Alignment: This route will operate between Temecula-Murrieta along the I-15 corridor to Corona and will utilize, to the extent feasible, both the abandoned and active railroad right-of way between Lake Elsinore and Corona.
Stations: North Main Corona, Dos Lagos (Corona), Lake Elsinore, and Temecula.
Tracks: This alternative shall be assumed to be primarily single-track, with a single, two-mile long passing siding spaced midway—based upon travel time—between Temecula and Corona.
Equipment: Six trains of six cars each are assumed to provide eight daily roundtrips, six during the peak period and two during the midday.

Vanpool Coordination (2004 I-15 IRP)

In 2004, a study was completed that identifies short- and long-term strategies to address both the causes and effects caused by the increasing number of interregional commute trips in the corridor.

Short-term strategies, most of which currently are underway, include promoting transportation demand management (TDM) strategies, such as interregional coordination of rideshare programs between RCTC and SANDAG; implementing park and ride lots along the I-15 corridor; and joint marketing and promotion of alternative transportation services (e.g., carpools, vanpools, and public transit) targeting solo commuters in the corridor. Other demand management programs, such as alternative work schedules and teleworking, are considered.

The San Diego Regional Vanpool Program (SANDAG's program) offers a $400 continual monthly subsidy for those vanpools that:

- Apply through a contracted vendor.
- Have 80 percent occupancy.
- Have an origin or destination within San Diego County.
- Travel at least 20 miles in San Diego County, and
- Travel on the most congested freeways in San Diego County.

RCTC's program is an incentive-based program that provides up to $1,800 over a nine-month period. The incentive shall be paid monthly to the vanpool leasing company (first three months at $300/month, second three months at $200/month, and the last three months at $100/month) based on RCTC's verification of participating commuters' monthly ridership. If the ridership of the startup vanpool is comprised of less than 100 percent western Riverside and/or San Bernardino County residents, the incentive shall be prorated to match the vanpool composition percentage.

Additionally, existing vanpools formed through the Mobile Source Air Pollution Reduction Review Committee (MSRC) vanpool program (which is sun setting) shall be eligible to receive a balance of a new vanpool incentive through RCTC up to a maximum incentive amount of $1,800. The van provider must submit in writing to RCTC, all documentation of participation in the MSRC program. The remaining incentive balance will be prorated so that the final delivered incentive is not to exceed $1,800 and is to be delivered over nine months. The balance of incentive payments shall be paid directly to the van provider, subject to RCTC approving the vans' eligibility to participate in its program and subject to monthly approval of the vans' current eligibility.

SANDAG is currently in a position of having more demand than funding to start new vanpools. Therefore, it has been discussed that RCTC's program could be a potential bridge for those vanpoolers who are waiting to be enrolled in SANDAG's program. This approach would allow two additional vanpools with origins in Riverside County and destinations in San Diego County to start vanpooling.

Draft *2010 I-15 Corridor Improvement Project (CIP) (RCTC)*

The Riverside County Transportation Commission (RCTC), in cooperation with the California Department of Transportation (Department) District 8, proposes capacity and operational improvements on Interstate (I-) 15 from just north of the I-15/I-215 separation in the City of Murrieta (in Riverside County), northward to the I-15/State Route (SR-) 60 Interchange. The I-15 Corridor Improvement Project stretches 43.5 miles in length traversing the Cities of Murrieta, Wildomar, Lake Elsinore, Corona, Norco, Eastvale and Jurupa Valley and portions of unincorporated Riverside County. These improvements identified below will address existing and projected deficiencies in capacity and operation within the project limits. The project proposes to implement improvements consistent with the RCTC 2009 Measure A 10-year Delivery Plan. The project is proposed to be funded with local funds including, but not limited to, Measure A (sales tax) and Transportation Uniform Mitigation Fee (TUMF) funds. Construction completion is anticipated in 2019.

There are currently two build proposals under consideration.

The first build alternative would:
• Add (in each direction) between I-215 and SR-74 one high-occupancy-vehicle (HOV) lane;
• Add (in each direction) between SR-74 and SR-60:
One mixed-flow (MF) lane and One HOV lane;
• Add auxiliary lanes at needed locations; and
• Not add any new connectors or ramps.
The second build alternative would:
• Add (in each direction) between I-215 and SR-74 one HOV lane;

• Add (in each direction) between SR-74 and SR-60:
One MF lane and Two tolled express lanes;
• Add auxiliary lanes at needed locations; and
• Not add any other new connectors or ramps.

Additionally, each build alternative includes components such as retaining walls, sound walls, storm water runoff treatment devices, and bridge widenings, replacements, and reconstructions to accommodate the new MF/auxiliary lanes and HOV or tolled express lanes. Permanent right-of-way acquisitions will be needed to accommodate the improvements, and temporary construction easements will be required to stage construction equipment, build components of the facility, and/or access some areas. Both build alternatives will be evaluated to ensure compatibility with 2040 traffic projections, updated City General Plans, and proposed improvements on I-15, and at the I-15/SR-60 and I-15/SR-91 Interchanges.

Scenario Development Framework

The study team is currently considering developing a traffic model for I-15 using Vissim software. Micro-simulation models are complex to develop and calibrate for large urban corridors. However, they are one of few tools capable of providing a reasonable approximation of bottleneck formation and queue development, especially in future years. This tool will help quantify the impacts of operational strategies, which traditional travel demand models cannot.

The base year model will be calibrated against the 2010 conditions. The SCAG 2008 travel demand model will be used for the Horizon Year. The model's output will then be used to evaluate the 2035 scenarios (no build and build) and quantify the congestion-relief benefits. The

Exhibit 6-5 provides information on what projects will be modeled with estimated costs for each project, as available. The project costs listed include support and construction costs in current dollars.

Exhibit 6-5: Scenario List for Micro-Simulation Modeling

Project #	County	City	Project Description	Cost ($1,000's)
0H790	SBD	Rancho Cucamonga	This 0.8 mile project proposes improvements to the Interstate (I)-15 /Foothill Boulevard Interchange (I/C) in the City of Rancho Cucamonga. Work includes the widening of the existing southbound (SB) off-ramp and the construction of a deceleration lane.	$650
0A490	Riv	Murrieta	This project in the City of Murrieta will reconstruct and lengthen the undercrossings on Interstate (I)-15 to accommodate widening of California Oaks Road to 6 lanes with a median. Reconfigure lanes and loop on-ramps, and widen California Oaks Road from the northbound (NB) ramp to California Oaks Plaza Road, with ramp metering on all on-ramps.	$36,208
0F580	Riv	Murrieta	This project on Interstate (I)-15 in the City of Wildomar involves interchange (IC) improvements in the County of Riverside from 0.5 miles south of the Clinton Keith IC to 0.5 miles north of the Clinton Keith IC. Widen overcrossing and ramps and construct auxiliary lanes and ramps with 40-year Joint Portland Cement Concrete Pavement (JPCCP).	$25,180
0Q530	Riv	Murrieta	It is proposed to realign the existing northbound off-ramp of the Interchange on Interstate 15 (I-15) at Murrieta Hot Springs Road and construct a new northbound on-ramp loop for eastbound traffic from Murrieta Hot Springs Road in the City of Murrieta.	$2,783

Exhibit 6-5: Scenario List for Micro-Simulation Modeling (continued)

Project #	County	City	Project Description	Cost ($1,000's)
43271	Riv	Temecula	This project (Phase 1 of EA 43270) involves constructing a portion of the new French Valley Parkway (FVP) Interchange (IC) in the City of Temecula (City) on Interstate (I)-15 between the Winchester Road IC and the I-15/215 Junction. Specifically, this project consists of constructing the FVP between Jefferson Avenue and FVP southbound (SB) exit ramp, a one-lane FVP SB exit ramp, a SB auxiliary (AUX) lane between FVP and Winchester Road, and the widening of the Winchester SB exit ramp from one to two lanes. Also, construct on-site drainage improvements.	$29,273
0H130	SBD	Fontana	This project will construct a new interchange (IC) at the Duncan Canyon Road Over-crossing (OC) on Interstate (I)-15, in the City of Fontana. The existing OC will be widened, and the on- and off-ramps will be signalized.	$35,834
0J610	Riv	Corona	This project will reconstruct the existing interchange at Cajalco Road on Interstate (I)-15 in the City of Corona by replacing the over crossing with a new over crossing and modification of the ramps.	$58,199
0k710	SBD		This 2.4 mile project on Interstate (I)-15 extends from Glen Helen Parkway to Kenwood Avenue and on I-215 from south of the Devore Interchange(IC) through the I-15/I-215 IC. The project proposes to add one additional through lane in each direction on I-15 from Glen Helen Parkway to the I-15/I-215 IC. The project will also include reconfiguration of the connectors to I-215, truck bypass lanes and auxiliary lanes, as needed.	$499,262

Exhibit 6-5: Scenario List for Micro-Simulation Modeling (continued)

Project #	County	City	Project Description	Cost ($1,000's)
0A440	Riv	Lake Elsinore	This project involves improvements to Interstate (I)-15 in the City of Lake Elsinore from north of Bundy Canyon Road to south of the Main Street Undercrossing (UC). The Railroad Canyon Interchange (IC) is to be reconstructed. Construct new IC at Franklin Street, including auxiliary lanes between the Interchanges.	$71,838
0J080	Riv	Norco/Corona	Pave the existing 70-foot median, widen the existing pavement on the outside to accommodate two Toll Express Lanes (TEL) and one mixed-flow lane in each direction and install concrete median barrier on Interstate(I)-15 between the Riverside/San Bernardino County Line and State Route (SR)-74. Construct one High Occupancy Vehicle (HOV) lane in each direction from SR-74 to the I-215/I-15 separation.	$1,706,347

7. NEXT STEPS AND EXPECTED OUTCOMES

The previous chapters identify the current bottlenecks and their cause and list planned and programmed improvements within the corridor. The next step is to evaluate the planned and programmed projects using traffic simulation software. The model output will be compared against the findings in this report. If necessary, additional improvements will be recommended to address planned and programmed project shortcomings. Also, the model output will be used to verify the project's benefits using Cal B/C.