Corridor System Management Plan
San Joaquin County
I-205 / I-5 Corridor

Comprehensive Corridor Performance Assessment and Causality Report

Prepared for

State of California
Department of Transportation

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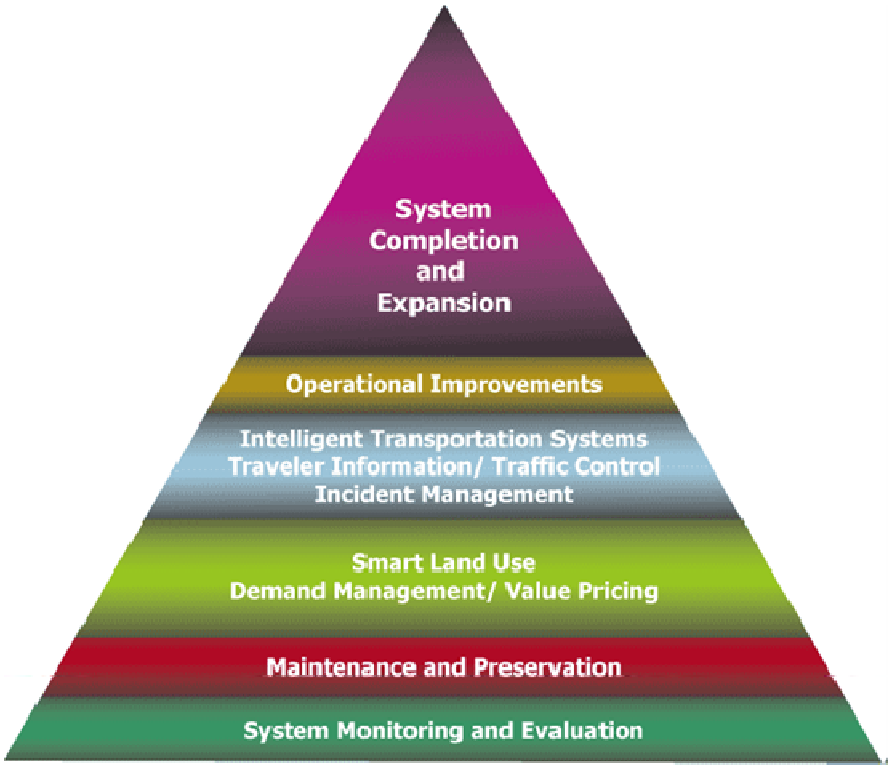
1 INTRODUCTION

Corridor System Management Plans (CSMPs) provide for the integrated management of travel modes and roadways so as to facilitate the efficient and effective mobility of people and goods within California's most congested transportation corridors. Each CSMP will present an analysis of existing and future traffic conditions and propose traffic management strategies and transportation improvements to maintain and enhance mobility. CSMP's will address State Highways, local roadways, transit, and other transportation modes.

The corridor management planning strategy is based on the integration of system planning and system management.

System Planning is the long-range transportation planning process of Caltrans that evaluates the current and future operating conditions and deficiencies on the State transportation system. Improvements are recommended to maintain mobility by minimizing or alleviating the identified deficiencies. The process considers the entire transportation system on and off the State Highway System (SHS), including the highways and local arterials, inter- and intra-city transit services, railroads, airports, seaports, non-motorized modes of transportation such as bicycling and walking, goods movement, intelligent transportation systems (ITS), and local land use and environmental issues.

System Management is the process of maximizing the efficiency and effectiveness of the existing transportation infrastructure through use of proven methods and technologies, which generally involve low capital or no cost activities. A few examples include ramp metering, traffic information collection and dissemination, incident management, high occupancy vehicle lanes, use of local arterial roadways that provide parallel service within the corridor, and demand management strategies, such as transit and rideshare marketing, flexible work hour schedules, and telecommuting. Figure 1.1 diagrams the concept of systems management as a pyramid.



Source: Caltrans web site

Figure 1.1 System Management Pyramid

1.1 Purpose of the Report

The purpose of this report is to provide a comprehensive assessment of the I-205 and I-5 corridor performance in San Joaquin County, based on the existing data available to the study team. This document is identified as Item 6.0 Comprehensive Corridor Performance Assessment and Item 7.0 Causality of Corridor Performance Degradation of the Corridor System Management Plan (CSMP) Guidelines. The performance assessment guidelines state that this report is to contain corridor-wide performance measures and bottleneck identification. It also requires reporting performance measures on mobility (travel time and delay), reliability, safety, productivity, and other related performance measures such as vehicle miles of travel and vehicle hours of travel. The guidelines for the bottleneck analysis ask for more detail on the causes of both recurring congestion (due to geometric or operational causes in association with significant traffic demands) and non-recurring congestion (often due to accidents).

1.2 Contents of the Report

This report is comprised of the following sections:

Section 1: Introduction. This section provides the report overview.

Section 2: Corridor Description. This section explains the geometries and related design of the corridor.

Section 3: Existing Conditions. This section describes the overall utilization of the corridor.

Section 4: Existing Performance. This section details the corridor's performance, using those measures described above.

Section 5: Bottleneck Analysis and Causality. This section evaluates the existing condition in more details, focusing on the causes of the performance degradation.

Section 6: Summary of Findings. This section is a concise review of the findings in this report.

1.3 Study Context

This document is prepared for the I-205 and I-5 CSMP in San Joaquin County. The CSMP includes I-205 between the Alameda/San Joaquin County Line and the junction of I-205/I-5 east of the city of Tracy. It also includes I-5 through the Lathrop and Stockton area, between the Junction of State Route 12 (SR-12) west of the city of Lodi and I-205. The corridor boundaries are shown in Figure 1.2. The corridor includes major local parallel arterials, local road intersections, ramps, signal controls, bus and rail transit, park and ride lots, pedestrian and bike lanes. The corridor is 40.34 miles long, with 13.39 miles on I-205 and 26.95 miles on the I-5 segment.

A significant reason why this corridor is chosen is because a project has been funded through the Proposition 1B Corridor Mobility Improvement Account (CMIA). This project is to construct auxiliary lanes between Tracy Boulevard and West Grant Line Road and west of West 11th Street. The locations of the proposed lanes are also illustrated in Figure 1.2.

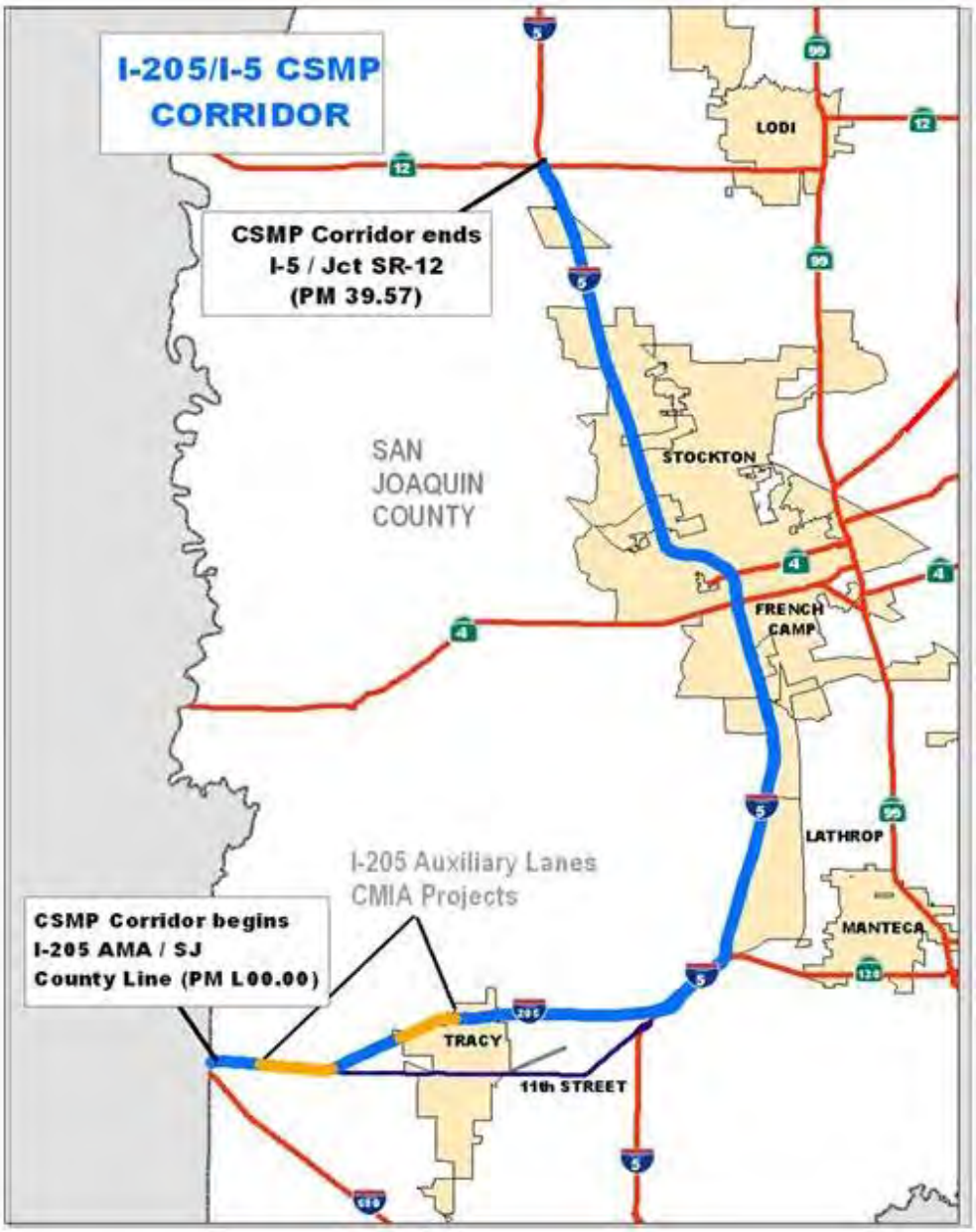


Figure 1.2 Corridor Study Location and I-205 Auxiliary Lane CMIA Projects

1.4 Measures Examined in the Report

The primary objectives of the performance measures examined in this report are to provide a sound technical basis for describing traffic within the corridor. The performance measures focus on four key areas:

Mobility is considered a general description of how well the corridor moves people and freight. The mobility performance measures are both readily measurable and straightforward for documenting current conditions and are readily forecast making them useful for future comparisons. Two primary measures are typically used to quantify mobility: delay and travel time. 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. Travel time is reported as the amount of time for a vehicle to traverse between two points on a corridor,

describing the experience on the corridor as viewed by a person driving through the corridor from end to end.

Reliability is considered the relative predictability of the travel time for persons or goods. Unlike mobility, which measures how many people or vehicles are moving at what rate, the reliability measure focuses on how much mobility varies from day to day or how reliable or unreliable the travel time is.

Safety captures the safety characteristics and issues in the corridor such as collisions. Historical accident rates from the Caltrans Traffic Accident Surveillance and Analysis System (TASAS) provide a reliable source of these events.

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 analyses, productivity is defined as the percent utilization of a facility or mode under peak conditions.

Other delay-related measures include vehicle miles of travel (VMT) and vehicle hours of travel (VHT); these are important representative indicators of the aggregate level of use and congestion in the corridor.

1.5 Bottleneck Analysis

The bottleneck analysis further details the causes of the bottlenecks, examining the duration and severity of locations where congestion is both recurring (due to geometric or operational causes in association with significant traffic demands) and non-recurring (often due to accidents).

1.6 Relationship Between CSMP Performance Measures and Level of Service

The term Level of Service (LOS) is a measure of effectiveness by which traffic engineers have typically used to define the quality of service on traffic utilization. Although the term has been defined in different ways over time, it generally is the most common term used to define the level of utilization on freeways. In the latest edition of the *Highway Capacity Manual* (2000), the term is defined as the density of vehicles on the roadway. This definition provides information on the overall roadway utilization, and this determination is based mostly on the number of vehicles on the freeway.

Recurring congestion measures in this report are based on travel times. Thus, they are not intended to define the overall level of service for roadway segments. Instead, they define the performance in terms of delay or travel times, as well as the general variability of the travel times (or reliability). While there is a general relationship between volume and speed, the measures in this report cannot be directly translated into LOS.

2 CORRIDOR DESCRIPTION

2.1 Network Description

The corridor is defined as two freeway segments, along with key adjacent roadways:

Interstate 5 (I-5) from I-205 interchange to SR-12 interchange in San Joaquin County. I-5 is a continuous freeway which crosses the United States from the Canadian border to the Mexican border. The freeway is the westernmost continuous freeway in the United States. This segment is 26.95 miles.

Interstate 205 (I-205) between the Alameda/San Joaquin County line and the I-5 interchange (the entirety of I-205). I-205 is a supplemental connecting freeway in the national highway system connecting I-5 to the Bay Area, which contains approximately 7,000,000 residents and is a metropolitan area of national importance. This roadway is 13.39 miles.

Both of these roadways are classified as freeways on the national interstate system. As freeways, they are multi-lane facilities with limited access points at interchanges and medians separating the directions of traffic.

In order to accurately study the freeway operations, a wider network of surrounding arterials that have interchanges on the facility or are parallel to the facility also are included. The agreed study network is illustrated in Figure 2.1 and described by facility type on the following pages.

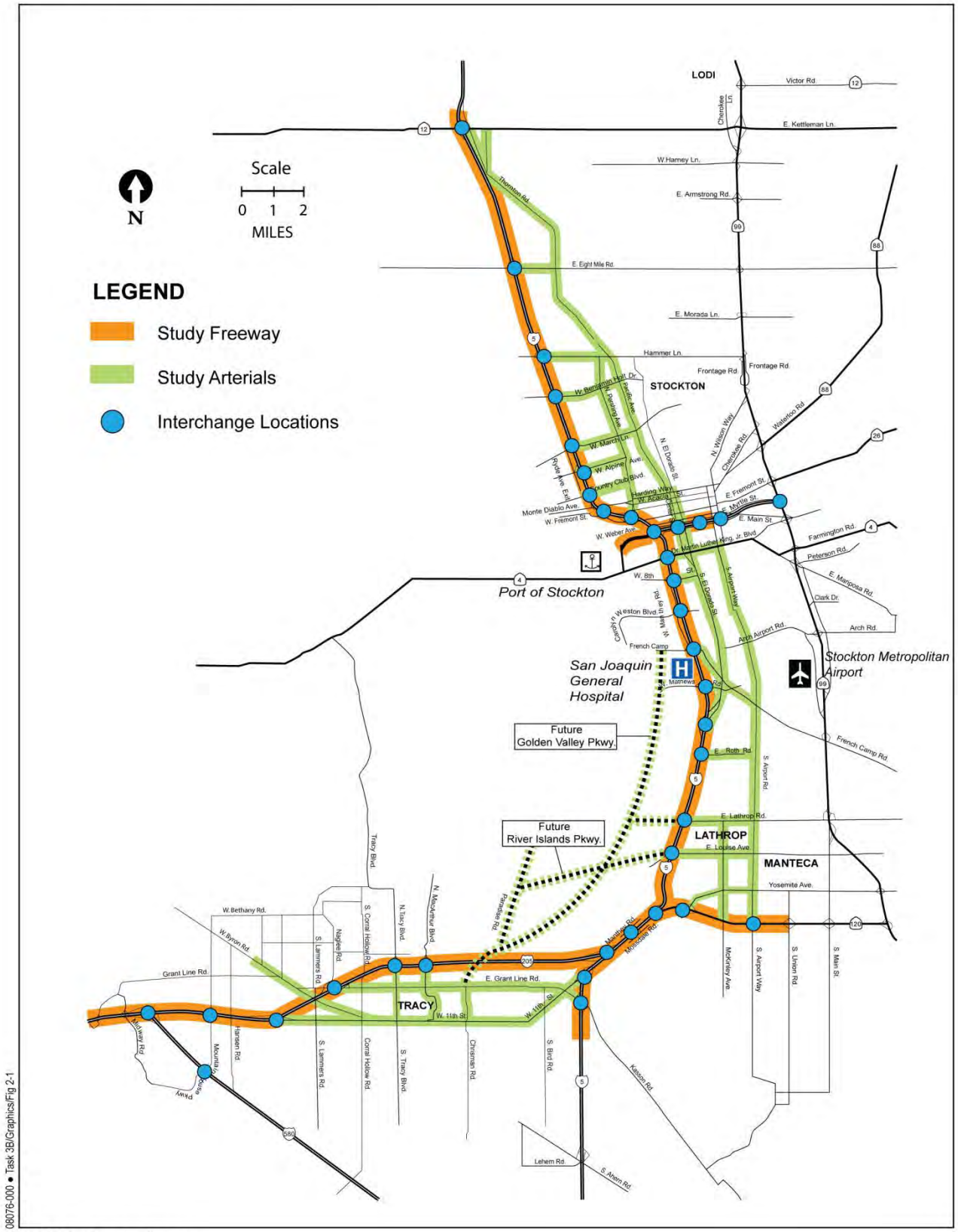


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Figure 2.1 Designated Study Network

2.1.1 Freeway Facilities

The design of each of the study area freeway segments regulates the operation of traffic on them. Details of the geometries vary by segment, as discussed below.

I-205

I-205 runs approximately thirteen miles in an east-west direction connecting I-580 and I-5. It is a major corridor that serves traffic between the Central Valley and the Bay Area during both weekdays and weekends. I-205 currently carries approximately 123,000 vehicles per day during the peak month. The annual average along this part of I-205 ranges from 99,000 to 119,000 daily vehicles.

Between I-580 and West 11th Street, the freeway has three lanes in each direction. East of 11th Street I-205 now has three lanes in each direction, with the recent completion of a project to add one freeway lane in each direction in spring 2009. The description and analysis in this document and the simulation model calibration is based on the geometry and number of lanes along I-205 when field work was conducted, which is before the third lane in each direction was completed along I-205 east of 11th Street to the I-5 junction.

A lane diagram has been prepared as Figure 2.2 for this segment of the study area. As the diagram shows, there are 2 or 3 mainline lanes, and interchanges that are spaced every 1 to 3 miles.

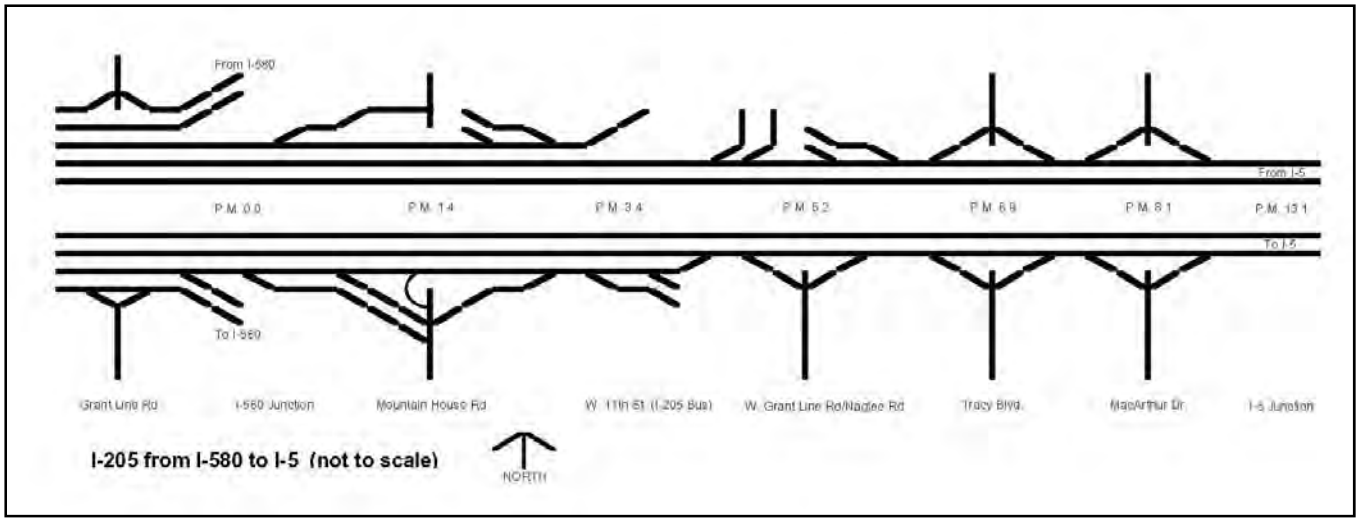

Figure 2.2 Lane Diagram for I-205

I-5

The I-5 segment within the San Joaquin County extends approximately 30 miles from I-205 to SR-12. It serves as a major freeway corridor for commuters within the County as well as those traveling to Sacramento and the Bay Area. Three major freeway junctions along the study segment are at I-205, SR-120 and SR-4 (Crosstown Connector). The highest traffic volume segment in the study carries approximately 152,000 vehicles per weekday (south of the SR-120 junction) and the lowest traffic volume segment is approximately 77,000 vehicles per day (at the SR-12 interchange).

South of the I-205 interchange, the freeway has two lanes in each direction. The freeway has four to five lanes in each direction between I-205 and SR-120. The freeway has three in each direction between I-205 and the Dr. Martin Luther King Jr. Blvd interchange (south of SR-4 Crosstown Connector). There are four lanes between the Dr. Martin Luther King Jr. Blvd interchange and Country Club Drive in each direction, with some auxiliary lanes and several sections resulting in five lanes. There are three in each direction between Country Club Drive and SR-12. Recently the northbound lane drop at Country Club Drive has been switched from the left to the right lane.

Lane Diagrams for Interstate 5 are located in Figure 2.3 through Figure 2.5. The diagrams show the corridor and its interchanges from south to north, with the ends of the diagrams extending slightly past the study area. The diagrams show that the entire study corridor features closely spaced interchanges (1 to 3 mile spacing) with several lane drops and shifts that occur in the corridor. In contrast to long sections of I-5 south of the study area

which function with wide spacing between interchanges, this area operates in a more urban environment with many interchanges.

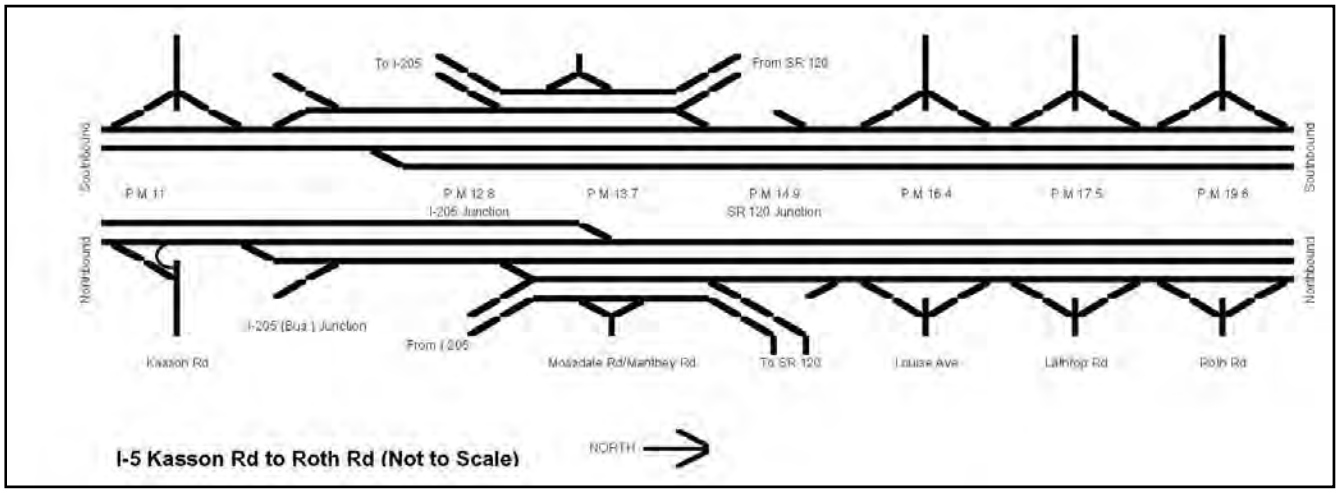

Figure 2.3 Lane Diagram for I-5 (Lathrop Area)

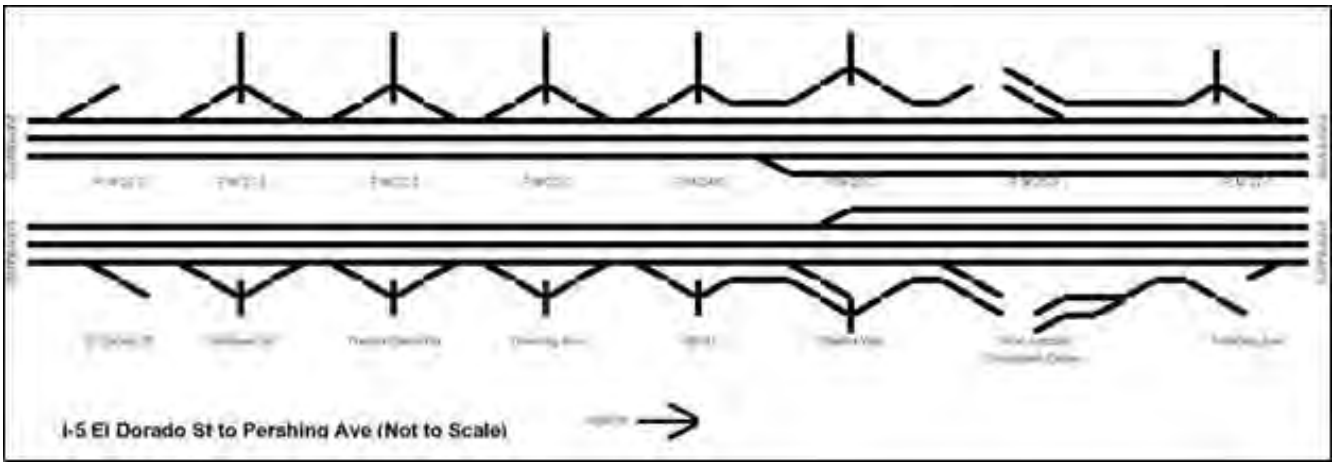

Figure 2.4 Lane Diagram for I-5 (Central Stockton Area)

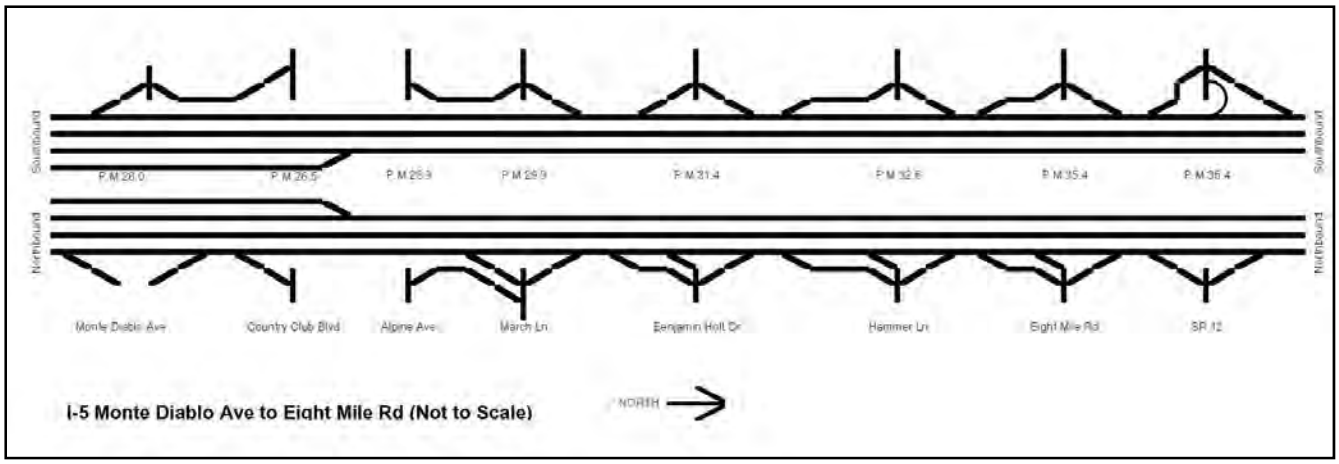

Figure 2.5 Lane Diagram for I-5 (Northern Stockton Area)

Other Freeway Segments Related to the Study Area

Additional sections of freeways are included in the study area. These are included to ensure that operational analysis is responsive. Specific freeways added include:

I-580 between I-205 and the West Grant Line Road interchange in Alameda County (west of study area). This freeway operates with four freeway mixed-flow lanes in each direction at its most restricted point. It includes additional lanes at the merge (westbound) and diverge (eastbound) points where I-205 intersects with the facility, as shown in Figure 2.2 above.

I-5 between the I-205 interchange and south of the Kasson Road interchange (south of study area). This continuation of I-5 contains three freeway mixed-flow lanes in each direction north of Business I-205 and two freeway mixed-flow lanes in each direction south of Business I-205, as shown in Figure 2.3 above.

SR-120 between from I-5 and east of South Airport Way interchange (east of study area). The entirety of the freeway portion of SR-120 within the San Joaquin County is a seven-mile corridor connecting I-5 and SR 99. It serves as a major connector for commuters from cities in San Joaquin, Stanislaus and Merced Counties to the Bay Area. Currently, this section of SR-120 carries traffic of approximately 77,000 vehicles per day. Between I-5 junction and Airport Way, SR-120 has two lanes in each direction. This facility contains two freeway mixed-flow lanes in each direction. There are existing interchanges at Guthmiller Road and Airport Way. A diagram of SR-120 in the study area is shown in Figure 2.6.

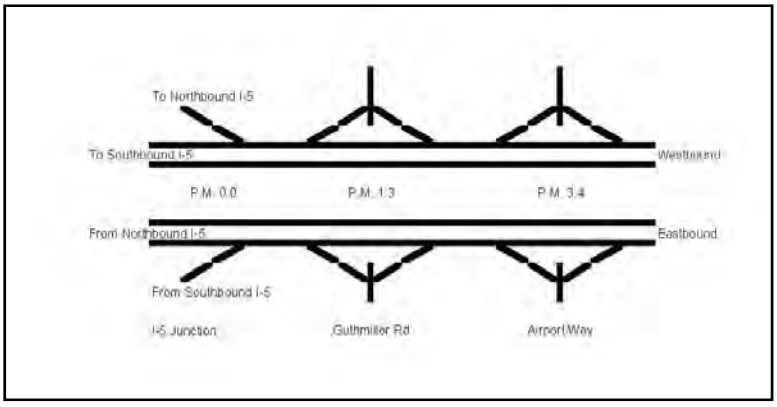

Figure 2.6 Lane Diagram for SR-120 in Lathrop Area

SR-4 (Crosstown Connector) between I-5 and the Wilson Way interchange (east of the study area). The portion of SR-4 that operates as a freeway segment within the City of Stockton functions is also known as the Crosstown Connector, and it connects I-5 and SR 99. It currently carries traffic of approximately 96,000 vehicles per day. Because of the proximity of the I-5 junction with interchanges at the Center and El Dorado one-way couplet, and at South Stanislaus Street and South Wilson Way, there is a variation in the number of through lanes and auxiliary lanes along the length of this study section. This variation is shown in Figure 2.7.

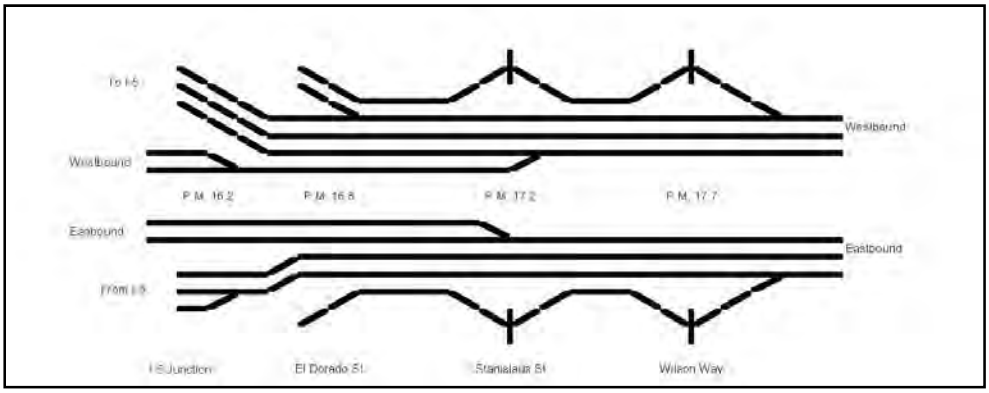

Figure 2.7 Lane Diagrams for SR-4 (Crosstown Connector)

2.1.2 Parallel Arterials

The effective operation of the freeway network depends on nearby arterials that are parallel to the freeway alignment, and/or intersect with the freeway operations at interchanges. These arterials are generally designed to carry more local traffic, but can function as freeway reliever routes (particularly for short-distance trips) if the freeway becomes congested and general speeds deteriorate, or if incidents significantly reduce freeway operations.

The arterials discussed here are listed by city in the study area. The cities include Tracy, Lathrop and Stockton.

Arterials in Tracy (I-205 Segment)

Parallel arterials included in the study area in and around the City of Tracy include 11th Street, and Grant Line Road. Arterials that intersect with I-205 include Mountain House Parkway, Tracy Boulevard and MacArthur Drive. These are shown in Figure 2.1, earlier in this section.

As a major east-west arterial, 11th Street functions as the east-west street with the highest traffic volumes in Tracy. It serves many residential areas located on either side of the roadway. It extends westward to align with I-205, and crosses to I-5 to the east. Because it connects to the corridor at two locations, it provides a parallel reliever route for I-205 through Tracy, frequently used by peak hour traffic avoiding congestion on I-205. It has been developed as a high speed arterial with four to six through lanes, central median and left turn bays.

West of West Byron Road, West Grant Line Road is a two lane rural arterial that connects to I-580 west of the I-205/I-580 junction. It is used by some traffic to bypass congestion on I-205 between I-580 and West Byron Road.

East of I-205, Grant Line Road runs parallel to I-205 and is an important arterial within Tracy, connecting some of the older developed parts of Tracy. It also provides a parallel reliever route to I-205, running between I-205 in the west and I-5 in the east.

There are several north-south arterials that connect I-205 to West Grant Line Road and 11th Street. These include Mountain House Parkway, Tracy Boulevard and MacArthur Drive. West Byron Road and Paradise Road - South Chrisman Road cross I-205 without interchanges and connect West Grant Line Road to 11th Street. These have similar functions in the Tracy street system, connecting the various activities within the City to each other, as well as to I-205, at one-mile intervals.

Arterials in Lathrop and Southern Stockton (South of SR-4 – Crosstown Connector) (I-5 Segment)

Between SR-120 and SR-4 (Crosstown Connector) there are two key parallel routes that are currently operating to the east of I-5 (South Airport Way and South El Dorado Street). No parallel arterials are currently serving long-distance trips to the west of I-5. Several parallel arterials to the east of the corridor provide routes for local traffic between Manteca, Lathrop and Stockton. These are also shown in Figure 2.1, earlier in this section.

South Airport Way provides a continuous route from SR-120 to SR-4, and extends north into the edge of downtown Stockton. It connects to I-5 via Louise Avenue, Lathrop Road, Roth Road, French Camp Road and Dr. Martin Luther King Jr. Blvd.

South El Dorado Street connects Downtown Stockton at SR-4 (Crosstown Connector) to I-5 south of Mathews Road. It is also connected to I-5 via Dr. Martin Luther King Jr. Blvd, W 8th Street, French Camp Road and Mathews Road.

There is no useful parallel route between the SR-120 and I-205 junctions. This is because there is a major river crossing at the San Joaquin River, so that cost of constructing a parallel arterial has been considered prohibitive until recently.

Arterials that intersect with I-5 at interchanges include Louise Avenue, Lathrop Road, Roth Road, El Dorado Street, Mathews Road, French Camp Road, Downing Avenue, 8th Street and Dr. Martin Luther King Jr. Blvd in addition to SR-4 -- Crosstown Connector.

Arterials in Northern Stockton (North of SR-4 – Crosstown Connector) (I-5 Segment)

As with I-5 south of Stockton, there is no long-distance parallel route north of Stockton. The main route parallel to I-5 north of SR-4 (Crosstown Connector) and south of SR-12 is Pacific Avenue and Thornton Road. Between Hammer Lane and Harding Way, Pershing Avenue also provides a parallel route. South of Harding Way, a parallel route is provided by the Center/El Dorado one-way couplet, passing through Downtown Stockton to SR-4 (Crosstown Connector). These are shown in Figure 2.1, earlier in this section.

Arterials that intersect with I-5 at interchanges north of SR-4 (Crosstown Connector) include Pershing Avenue / Fremont Street, Mount Diablo Avenue, Country Club Boulevard / Alpine Avenue, March Lane, Benjamin Holt Drive, Hammer Lane, Eight Mile Road and State Route 12.

2.2 Grades and Curvature

Most of the study corridor is constructed at an almost flat elevation below 50 feet above sea level. Portions of the route are slightly elevated above the surrounding farm land and wetlands, with the only grades related to bridges and interchanges. There are two bridges over bodies of water – one is over the Stockton Deep Water Channel adjacent to SR-4 (Crosstown Connector) (and high enough so that watercraft can pass under the bridge) and the other is located in between the SR-120 and I-205 interchanges over a local slough. There is a grade at the very western end of I-205 as it approaches I-580, which passes through the Altamont Grade to the west of the study area.

Most of the roadway alignment is straight or almost straight, without any curve restrictions. There are about six identifiable curves, all of the curvatures are very gentle with the design speeds are equal to or greater than the speed limit; no speed reductions at curves are advised in the corridor.

2.3 Existing Management Strategies

The primary management strategy that operates for traffic in this corridor is weather-related. This corridor is somewhat prone to high winds and low visibility because of fog banks. As a result, Caltrans has installed weather monitoring stations. These weather monitoring stations detect high winds and low visibility. When these conditions occur, a system noting the condition is activated and several changeable message signs are used to display appropriate warnings to motorists.

Within the Stockton area there are several CCTV cameras that provide video to a TMC at the Caltrans District 10 office. Several of these cameras are shared with City of Stockton and there is a video link between the City's TMC and Caltrans' TMC. Caltrans and CHP have incident management plans in place that involve coordination of emergency services, Freeway Service Patrol (FSP) and use of CMS to advise motorists.

There are no capacity-related or throughput-related management strategies in place on this route. There are two active ramp meters at the Mountain House Parkway interchange. The meters are activated in the westbound direction in the AM peak period, and the eastbound direction (loop ramp) in the PM peak period (illustrated in Figure 2.8). There are no other ramp meters operating in the corridor at the time of this report; a county-wide study of ramp metering and HOV lanes has recently been completed by SJCOG and an operating agreement is currently under discussion between SJCOG and Caltrans.

Figure 2.8 New EB Ramp Meter at Mountain House Parkway

2.4 Area Land Uses and Major Generators

The attractiveness of lower land costs and availability has resulted in San Joaquin County becoming a residential choice location for persons who work in either the Bay Area to the west, or the Sacramento area to the north. As a result of increased demand for housing, a significant amount of housing stock has been constructed in the County in the past few decades. Over time, this has created a growing imbalance between the number of workers who live in San Joaquin County and the number of jobs actually located there, even though both have grown steadily over the past two decades. One key consequence of this imbalance has been extensive commuting out of the study area in the morning peak hours to the Bay Area and Sacramento, with heavy return traffic in the afternoon peak hours.

The adjacent land uses in the Stockton Area along I-5 vary between residential, commercial, retail and industrial. A notable major trip generator is the county-owned San Joaquin General Hospital, located just west of I-5 at the Mathews Road interchange. The hospital is currently being renovated and expanded through an extensive master planning effort.

The Port of Stockton is actually located less than one mile west of I-5 in the vicinity of the SR-4 (Crosstown Connector) interchange on the Stockton Deepwater Ship Channel; in the 1930's the Port of Stockton facilities were built and the deep water channel was dredged to accommodate ocean going vessels. The Port of Stockton current expansion project involves redeveloping the 1459-acre Rough and Ready Island (west of the existing port on property once utilized by the U.S. Navy) by upgrading seven wharves; constructing and operating maritime, industrial and commercial facilities; developing an intermodal rail yard; dredging to provide access to 75 percent of the world's large ocean-going vessels; and bridge and road improvements to accommodate increased port operations.

Immediately to the east of I-5 at the same interchange is Downtown Stockton, which serves as an important higher-density activity center and county administrative seat. Just west of Downtown Stockton is a recently-opened arena/events center, an accompany parking garage, and a ballpark; plans also include a new hotel and marina.

The portion of the study corridor north the Downtown Stockton area is primarily residential. Just north of Downtown are two college campuses accessible primarily from March Lane – The University of the Pacific (a private institution with an enrollment of 4,600 – 3,500 as undergraduates – over half of whom live on the Stockton campus); and San Joaquin Delta College (a public institution of 8,000 full-time equivalent students that attend classes at this main campus as well as other campuses throughout the county). March Lane is also a key access route to a regional shopping district located adjacent to San Joaquin Delta College.

The urban edge of Stockton has been shifting northward in the past few decades. For example, the Sanctuary development located west of I-5, south of Spanos Park West, is proposed to have 7,070 dwelling units and 700,000 square feet of combined commercial and industrial development.

The portion of the I-5 corridor South of SR-4 (Crosstown Connector) has adjacent land uses that take advantage of the freeway location. There is light industry south of SR-4, particularly in the vicinity of the Stockton Metropolitan Airport. There is also a large medical facility, San Joaquin Medical Center, to the west of I-5 in this area.

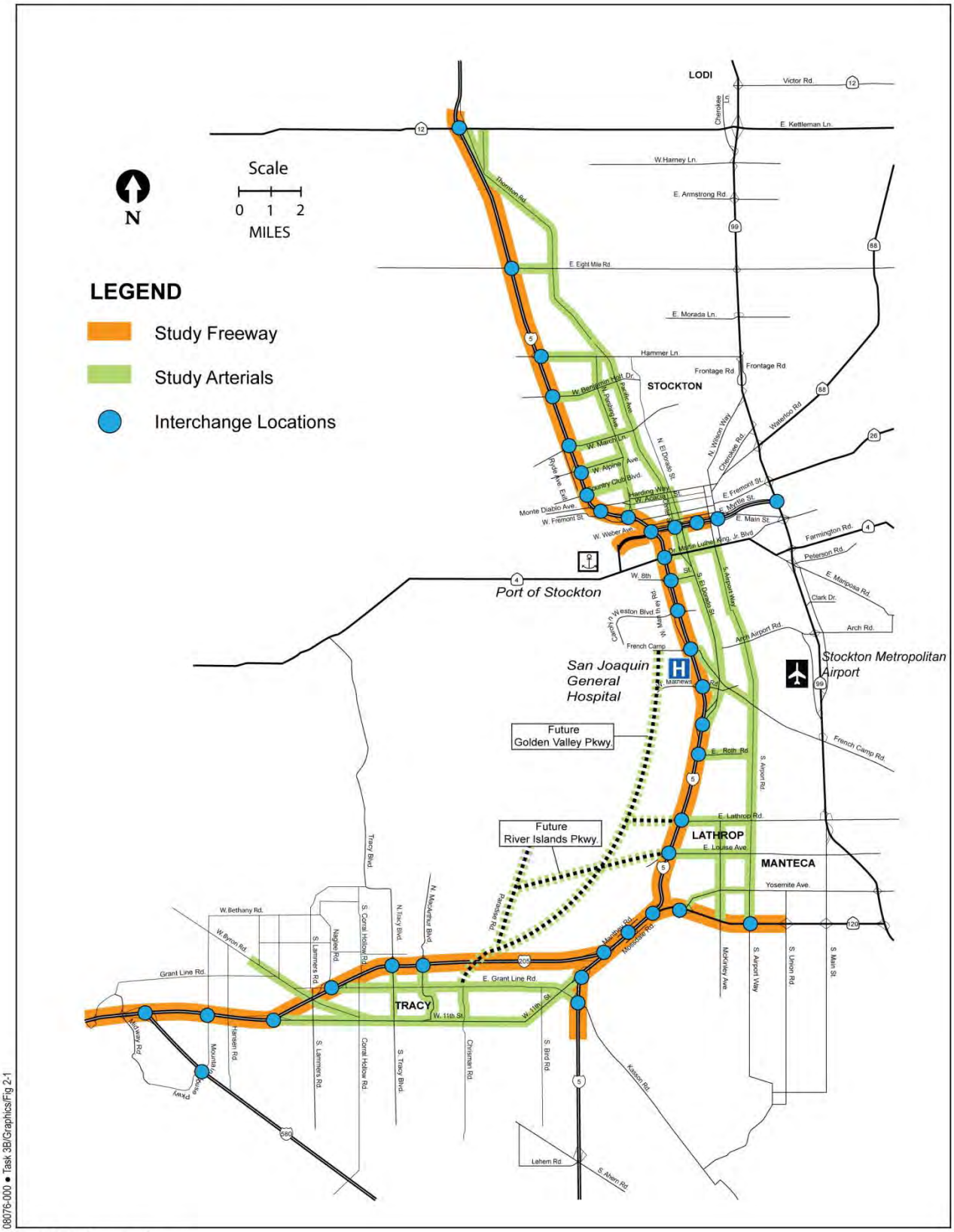

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Figure 2.9 Key Generators and Land Use Characteristics

The Lathrop area, further south of Stockton along I-5, is also a fast-growing community. Where once there was mainly agricultural land, now there is a large amount of new housing stock constructed in this area, as well as supporting commercial development. The area is also home to many regional warehouse distribution facilities, which take advantage of the strategic positioning of this location, which has easy access to the north and south (using I-5), the west (using I-205) and to the east (using SR-120).

Similarly, the Tracy area along I-205 has also experienced significant population and employment growth. Where once there was agricultural land, the City has experienced a rapid population increase as the community nearest to the land-limited Bay Area. The result is that there are many more working residents than there are employment opportunities, and many of these residents take advantage of higher wages available in the Bay Area. As a growing community, Tracy has also seen growth in supporting retail and medical facilities. There is also some distribution facilities located in Tracy, taking advantage of the City's location and access (similar to Lathrop's). Tracy is also the location for the major regional shopping mall located along the I-205 corridor, the West Valley Mall, which contains 875,000 square feet and is located at the Grant Line Road interchange with I-205.

At the western end of the corridor, the planned community of Mountain House is in the initial stages of development. This community is projected to house 45,000 residents when completed, and be incorporated as a new city within the County (when the population is sizeable enough). While primarily residential, the community will have supporting retail, institutional, industrial, office and related activities that will occur within it.

Along the I-205 and I-5 corridor there are numerous land uses that generate high levels of truck activity. There are many large shipping and distribution centers for major retailers and suppliers. There are food processing plants, which package products grown in the area to locations worldwide.

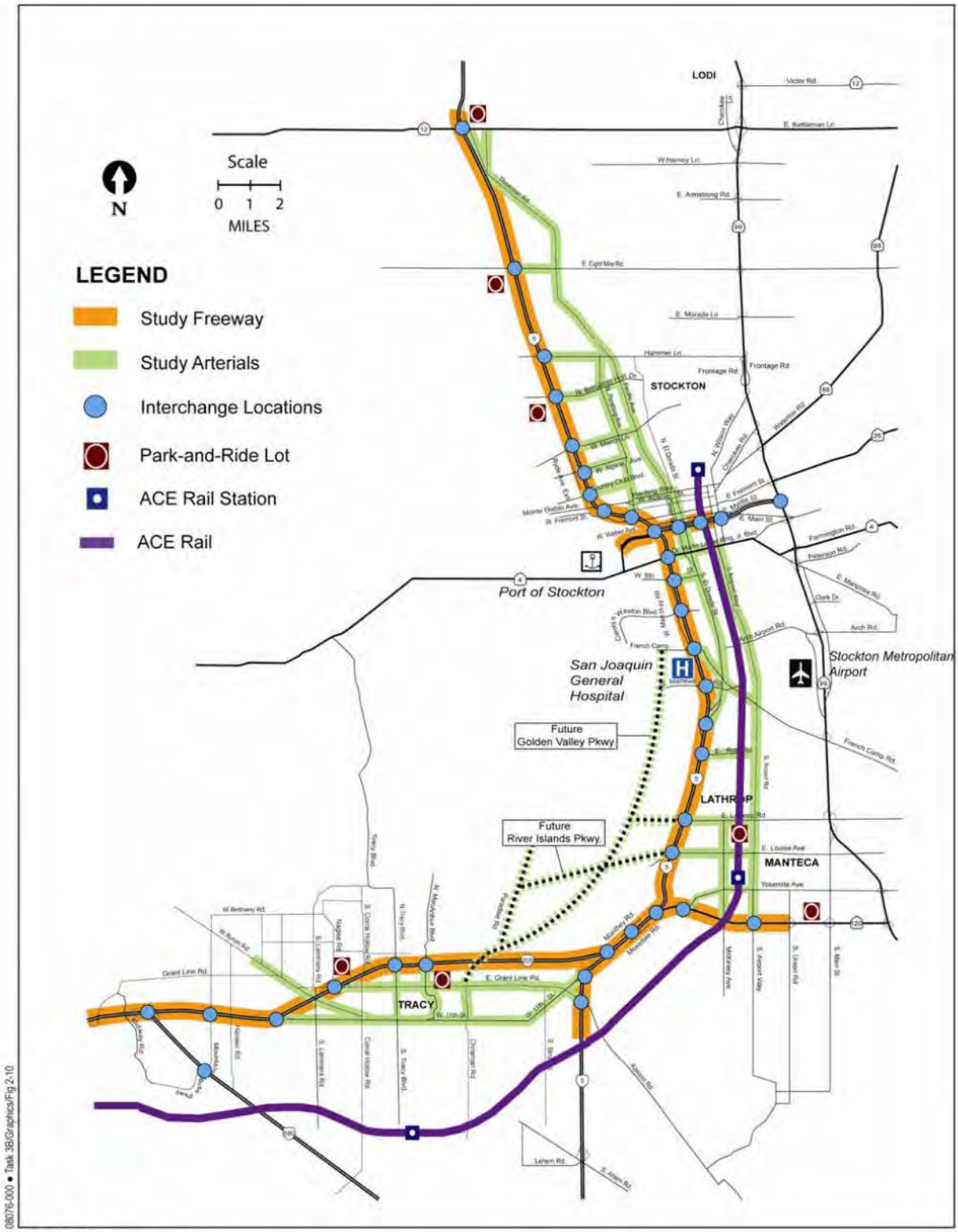
2.5 General Purpose Park-and-Ride Lots

There are several activities and facilities in place that provide for persons to gather and park cars, providing a place to form carpools (allowing higher per car occupancies) or to use non-auto modes of transportation for a portion of the trip (such as express buses and commuter rail). There are several existing park and ride lots within a mile of the corridor. Their sizes and occupancy are described in Table 2.1. It can be seen that the current storage capacity is rather modest and the demand exceeds the capacity at many locations; creating overflow conditions where drivers park vehicles in locations that are not designated parking spaces. These lots provide the opportunity for auto drivers to transfer to express buses or to carpools. The location of these lots is also identified in Figure 2.10. Park-and-ride lots are also available at ACE Rail stations, but these lots are primarily designed for rail riders; details on their capacity are discussed in Section 2.6.2.

Table 2.1 Existing General Purpose Park-and-Ride Lots

No.	Park-and-Ride Lots	Jurisdiction	Sponsor	No. of spaces	% of Demand Compared to Spaces in 2007
1	Flag City - I-5/SR-12	Lodi	Caltrans	43	109%
2	Calvary Church - Kelley Drive	Stockton	SJCOG/SJRTD	40	158%
3	Marina Center - I-5/Ben Holt Drive	Stockton	SJCOG/SJRTD	35	142%
4	Bethany Church - I-5/Michigan Avenue	Stockton	SJCOG/SJRTD	45	60%
5	Community Center- 5th Street	Lathrop	City/ SJCOG	48	96%
6	Wal-Mart – SR-120/Main Street	Manteca	Developer	50	200%
7	City Park-n-Ride - Naglee Road/I-205	Tracy	City/ SJCOG	180	63%
8	Factory Outlet Center - I-205/MacArthur Drive	Tracy	Developer	45	1%

Source: San Joaquin Council of Governments, 2009



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TRANSPORTATION SOLUTIONS

Figure 2.10 Existing Park-and-Ride Lots
Source: San Joaquin Council of Governments, 2009

2.6 Transit Operations

2.6.1 San Joaquin Regional Transit District

The San Joaquin Regional Transit District (SJRTD) operates various services on different sections of the I-5 and I-205 study corridor. SJRTD operates several coach services along the corridor servicing commuters traveling to the Bay Area and Sacramento. These services not only include some traditional fixed-route services but also subscription services, so that commuters are guaranteed a bus seat if they subscribe. Each route is tailored to the work destinations in the Bay Area (and related work hours), and has several pick-up points located in the study corridor (including several at the park-and-ride lots listed in Table 2.1.

The number of bus trips and estimated daily passenger trips are summarized in Table 2.2. The San Joaquin Regional Transit District (SJRTD) In addition to this segment, other local routes provide transportation alternatives between the various activities on the corridor. In conjunction with the City of Stockton (which has provided transit signal priority capabilities along the segment), the SJRTD operates a "bus rapid transit" (BRT) segment on Pacific Avenue from Hammer Lane to the Downtown Transit Center (DTC). The BRT operation will be extended during 2009 south to the airport.

Table 2.2 SJRTD Routes Using I-5 and I-205

Route	Origin - Destination	Corridors/Areas Served in San Joaquin County	Daily Bus Trips	Estimated Weekday Average Daily Passenger Trips
22	North Stockton - Tracy Defense Depot	I-5/Defense Depot	4	105
26	Stockton-Lathrop-Tracy	I-5/Harlan/I-205/Grant Line	25	220
51	Stockton - South Stockton - County Hospital	Parallel roads to I-5	36	300
52	Kaiser-Stockton-County Hospital	Hwy 4/Manthey/I-5	25	315
55	Stockton-Weston Ranch	Dr. Martin Luther King Jr. Blvd /I-5	30	305
90	Stockton -Lathrop - Tracy	I-5/Manthey/I-5/Grant Line	15	160
151	Stockton -Livermore (Lawrence Lab)	I-5/I-205	2	40
152	Stockton -Livermore (Lawrence Lab)	I-5/I-205	2	64
153	Manteca -Livermore (Lawrence Lab)	SR-120/I-5/I-205	2	52
154	Manteca -Livermore (Lawrence Lab)	SR-120/I-5/I-205	2	64
157	Stockton – Manteca – Tracy - Dublin (BART-Hacienda Business Park)	SR-120/I-5/I-205	2	48
160	Stockton - Dublin (BART)	I-5/I-205	2	91
162	Tracy - Sunnyvale (Lockheed)	I-5/I-205	2	66
164	Manteca - Sunnyvale (Lockheed)	I-5/I-205	2	110
166	Stockton - Sunnyvale (Lockheed)	I-5/I-205	2	108
167	Ripon - Livermore (Lawrence Lab)	SR-120/I-5/I-205	2	98
170	Stockton - Manteca - San Jose (Silicon Valley)	SR-120/I-5/I-205	2	96
171	Stockton - Dublin (BART)	I-5/I-205	2	82
172	Stockton - Sunnyvale (Lockheed)	I-5/I-205	2	70
173	Stockton – Manteca - Sunnyvale (Northrop/Grumman)	SR-120/I-5/I-205	2	102
174	Stockton - Palo Alto (Loral)	I-5/I-205	2	82
175	Stockton – Manteca - Santa Clara (Silicon Valley)	SR-120/I-5/I-205	2	62
	TOTAL		**167**	**2,640**

Source: San Joaquin Regional Transit District web site, 2009

2.6.2 Altamont Commuter Express

In addition to the SJRTD bus services, there is a parallel commuter rail service operated by the San Joaquin Regional Rail Authority called the Altamont Commuter Express, or ACE. The ACE alignment is shown in Figure 2.11. The service operates in one direction only, with four trains heading westbound in the AM peak period (leaving Stockton between 4:20 am and 9:30 am) heading toward San Jose, and four trains returning eastbound in the PM peak period (arriving in Stockton between 2:15 pm and 7:45 pm). The service headways are an hour or greater during these operating periods.

As a train service, the capacity is controlled by the number of passenger coaches on the train. The service is ultimately designed to carry eight coaches per train, with up to 137 seats per coach (assuming no seats removed for bicycles). The service carries approximately 3,700 riders a day on the eight trains.

There are large parking lots available for riders. The lot at the Stockton Station is estimated at 90 spaces, with 510 spaces at the Lathrop/Manteca station and 525 spaces at the Tracy station.

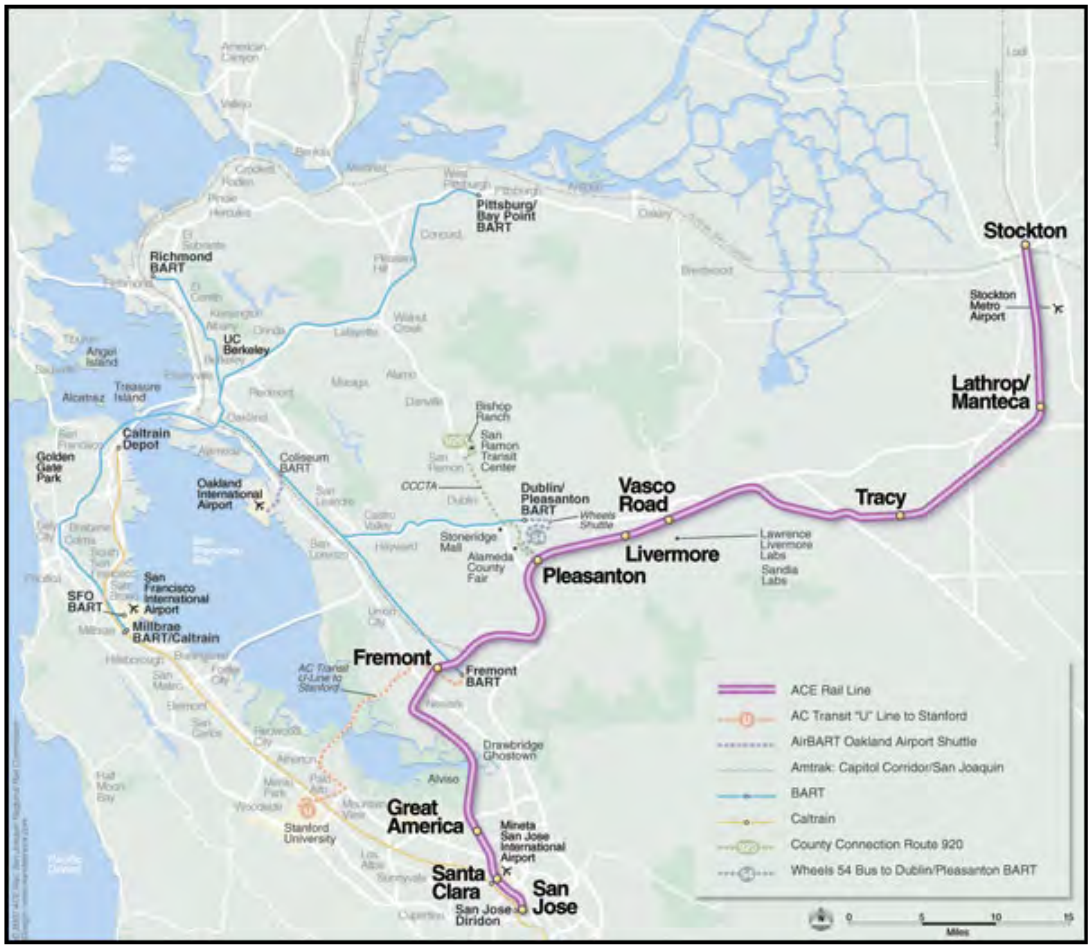

Figure 2.11 Altamont Commuter Express Map
Source: www.acerail.com

2.6.3 Other Bus Transit Providers

In addition to the SJRTD services summarized above, there are other bus lines that use I-5, I-205 or parallel arterials in the study area. These are described in Table 2.3. In addition to these routes, other local transit services also operate in Stockton, Tracy, Lodi, Manteca and Escalon.

Table 2.3 Other Bus Routes Operating In the Corridor

Provider	Route Number	From	To	Weekday Service Description	Weekend Service Description
Tracer (Tracy)	Route A	Prime Outlets	West Valley Mall	06:00 AM to 07:00 PM	07:45 AM to 03:00 PM
	Route B	City Hall	West Valley Mall	06:00 AM to 07:00 PM	07:45 AM to 03:00 PM
	Route C	City Hall	City Hall (Loop Route)	06:00 AM to 07:00 PM	07:45 AM to 03:00 PM
GrapeLine (Lodi)	Route 1	Lodi Station	Church/ Lower Sacramento	06:00 AM to 07:00 PM	07:45 AM to 03:00 PM
	Route 2	Lodi Station	Central	06:00 AM to 07:00 PM	07:45 AM to 03:00 PM
	Route 3	Lodi Station	Ham	06:00 AM to 07:00 PM	07:45 AM to 03:00 PM
	Route 4	Lodi Station	Century	06:00 AM to 07:00 PM	07:45 AM to 03:00 PM
	Route 5	Lodi Station	Cherokee	06:00 AM to 07:00 PM	07:45 AM to 03:00 PM

Source: Tracy Tracer and Grapeline web sites, 2009

2.7 Goods Movement

The San Joaquin County intermodal system consists of the State and Interstate highway system, the inland Port of Stockton, the Stockton Metropolitan Airport, major railroads and intermodal yards. San Joaquin County is a major Northern California distribution point where the two primary north-south highways, I-5 and SR-99, are joined by the SR-4 (Crosstown Freeway) through downtown Stockton and SR-120 through the City of Manteca. I-205 is a major interregional connector between the northern San Joaquin Valley and the San Francisco Bay Area.

Stockton's deep-water port and airport provide international transport links. The international link can also be made through San Francisco Bay Area air and shipping distribution ports. The location advantage, coupled with shipping/receiving facilities such as the Union Pacific Intermodal Facility, the Stockton Deep Water Port, the Stockton Airport, and the transportation infrastructure has made San Joaquin County an attractive location for warehouses and distribution centers.

The Caltrans 2001 *Global Gateways Development Program (GGDP) Report* identified I-5, I-205, and SR-120 (from I-5 to SR-99) among the top priority global gateways within California. *The San Joaquin Valley Goods Movement Study*, prepared for Caltrans and the eight San Joaquin Valley counties of (Kern, Fresno, Tulare, Kings, Madera, Merced, Stanislaus and San Joaquin) determined that trucking is the dominant mode for moving freight. The increase in freight movement by trucks on State highways is growing faster than can be accommodated by the existing capacity.

I-205 and I-5 are both designated STAA truck routes. The 2006 Average Annual Daily Traffic (AADT) on I-205 ranged from 94,300 to 113,000 vehicles with trucks constituting 12 percent of the AADT in some sections. Truck volumes ranged from 11,500 to 13,500 with five axle truck volumes representing approximately 60 percent of total truck volumes. The 2006 AADT on I-5 ranged from 77,000 to 160,000 vehicles with trucks constituting 26.4% of the AADT in some sections. Truck volumes ranged from 15,500 to 42,200 with five axle truck volumes representing approximately 80% of total truck volumes.

The California Transportation Commission (CTC) has awarded Proposition 1B CMIA Trade Corridor Improvement Funds (TCIF) to extend the SR-4 Crosstown Freeway in Stockton to improve goods movement and access to and from the Stockton Port. The Port of Stockton was also awarded TCIF funds to deepen the Stockton Ship Channel for improved access to the San Francisco Bay. Both projects are expected to significantly reduce truck-related congestion on I-205/I-5.

The region is currently experiencing goods movement constraints due to the lack of local STAA routes and available truck parking. These issues are currently being evaluated by the SJV Goods Movement Task Force,

and the subcommittee formed to address truck parking issues in the region. Local, regional, and State STAA maps can be located at:
http://www.dot.ca.gov/hq/traffops/trucks/truckmap/index.htm.

2.7.1 Union Pacific and Burlington Northern Santa Fe Railroads

A substantial amount of goods are moved in the corridor using rail. Several major railways stretch link to the north, south and west, including the UP and BNSF Railroad. There are also UP and BNSF intermodal terminals that serve both San Joaquin and Sacramento regions. Stockton serves as a hub for many of these railways and acts as a major distribution center for freight shipped to locations throughout California and the United States.

2.8 Air Service

In San Joaquin County, the Stockton Metropolitan Airport is the only public access airport in San Joaquin County. The airport currently provides passenger service through Allegiant Air including two flights weekly to Phoenix, Arizona and five flights weekly to Las Vegas, Nevada and Orlando, Florida.

The airport is located between two major north-south thoroughfares; I-5, 1.5 miles to the West, and SR-99, which borders the airport to the east. The airport is situated on 1,449 acres of land and has an 8,650-foot long, 150-foot wide primary instrument landing system (ILS) runway, with a takeoff distance available of 11,037 feet. The Stockton Metropolitan Airport also has a 4,458 foot long, 75 foot wide general aviation runway. Six air carrier gates adjoin the 44,355 square-foot terminal building.

2.9 Construction Activities

I-205

A major construction project was completed in this corridor in the spring of 2009, as discussed previously. The widening project on I-205 provides a third lane in each direction between West 11th Street west of Tracy and I-5. This project widened Interstate 205 (I-205) from a four-lane freeway to a six-lane freeway by constructing additional lanes in the median. The project also included widening existing structures, construction of a median barrier, and re-striping Interstate 5 prior to the northbound I-5/I-205 Connector. The ground-breaking for the project occurred in April of 2006, and the ceremonial ribbon-cutting to open the project was held in April of 2009. The project cost an estimated $93 million.

At the western end of I-205, an interchange was completed at the newly-constructed Mountain House Parkway in 2008, serving the growing residential population in the new community of Mountain House. This new roadway and interchange was provided as a condition of approval to the development of this community.

I-5

Improvements to the section of I-5 from Paradise Cut overflow to just north of SR-120 have been underway, improving the bridge and related pavement. Other projects recently completed or in the closeout stage are listed in Table 2.4.

Table 2.4 Recent Projects on I-5

Description	Post Mile
Median barrier in and near Lathrop, French Camp Road and Stockton	R13.1 to 41.6
Microwave vehicle detection	16.4 to 38.1
Traffic signals at French Camp Road undercrossing	R22.7
Resurface between Dunning Avenue and SR-4W	23.9 to 25.1
Rehabilitate ramps at Eighth Avenue and SR-4W undercrossings	24.5 to 25.5

Source: State Transportation Improvement Program, 2008

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3 EXISTING CONDITIONS

3.1 Historical Growth and Commuting Patterns

The corridor has been often widened to accommodate growth in traffic. The demands on the corridor have grown significantly since 1990, even greater than the population within San Josquin County. Table 3.1 summarizes San Joaquin County's growth, and general average annual daily traffic volumes in the corridor. Although San Joaquin County population has grown by 34 percent between 1990 and 2005, the daily volumes have grown much faster, from 65 to 111 percent in the same time period.

Table 3.1 San Joaquin County and Corridor Historical Growth

Attribute	2005	1990	% Increase Since 1990	2000	% Increase Since 2000	Source
Population	646,259	480,628	34%	563,598	15%	*US Census*
Households	206,346	158,156	30%	181,629	14%	*US Census*
Average Annual Daily Traffic Volumes						
I-205 at San Joaquin County Line	111,000	55,000	102%	83,000	34%	*Caltrans Traffic Count*
I-5 between I-205 and SR-120	160,000	76,000	111%	125,000	28%	*Caltrans Traffic Count*
I-5 between SR-4 and Pershing Avenue	140,000	85,000	65%	107,000	31%	*Caltrans Traffic Count*

Source: US Bureau of the Census, Decennial Census (1990 and 2000) and American Community Survey (2005); Caltrans, Traffic Counts (http:traffic-counts.dot.cao.gov (2000 and 2005) and 1990 Traffic Volumes on California State Highways.

The corridor is used as a primary route of travel for San Joaquin County residents to get to jobs during peak hours. This is important because the imbalance in population and employment in San Joaquin County results in approximately one quarter of all commute trips leaving the county each morning.

To better explain the result of this trend, commute patterns reported by San Joaquin County residents in the 2000 Census are illustrated. As shown in Figure 3.1, while most of San Joaquin County residents both live and work in the same county (163,500). A large number (30,000) travel both to and from the east (to Bay Area counties) each day. Another 6,300 travel between San Joaquin County and counties to the north (mainly Sacramento County), while 6,600 travel to and from the south (to Stanislaus and Merced Counties). Because each of these workers travel in both directions at different times of days, the traffic on the freeways in the study reflect these patterns.

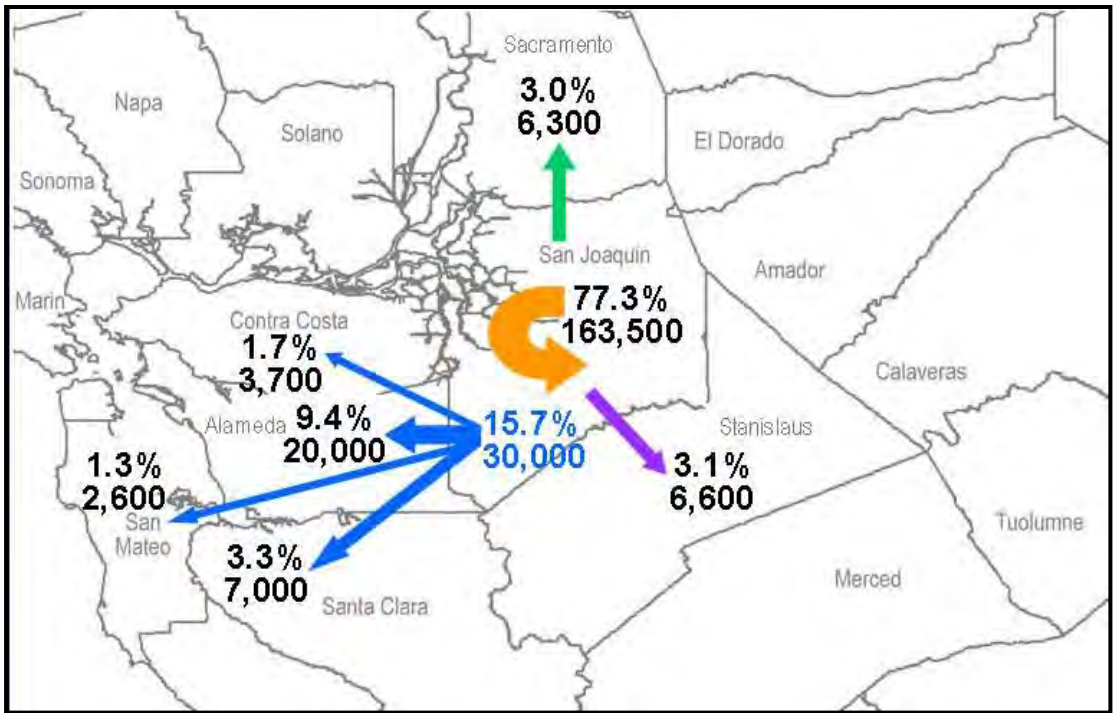


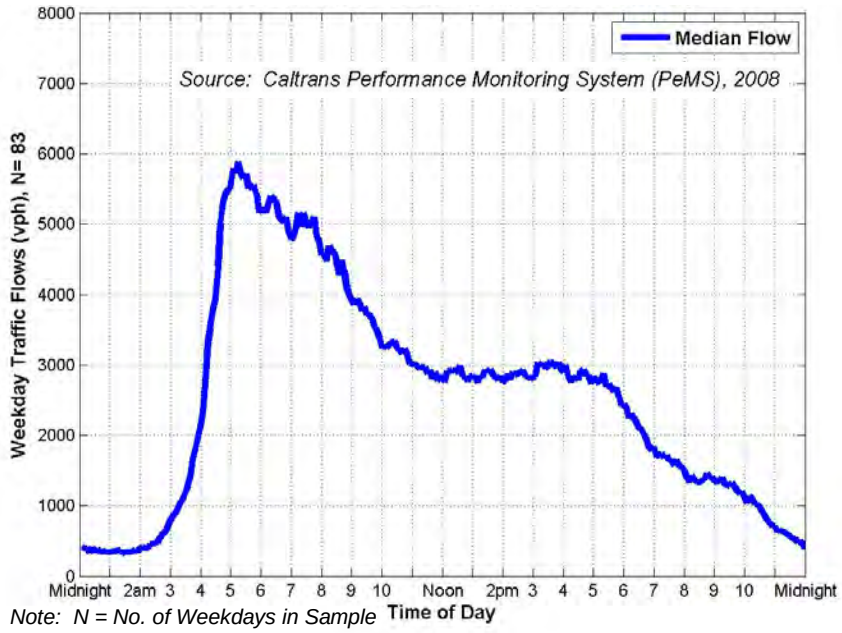
Figure 3.1 Commute Patterns for San Joaquin County Residents, 2000
Source: US Bureau of the Census

The 2000 decennial census represented the last time that comprehensive county-to-county worker flows were estimates. However, the Census Bureau has provided additional statistics through the American Community Survey program. The data from this program has been compiled in a three-year running average, with the most recent data provided for 2006 to 2008. This data showed that 74.5 percent of working residents of San Joaquin County continue to work in the county, with the remaining 25.5 percent commuting to other metropolitan areas and rural areas. Thus, while the total working residents in the county has grown from 207,000 in 2000 to 269,000 today, the basic out-commuting patterns is roughly consistent with the patterns in the Year 2000, and there continues to be a slight increase in out-commuting from 23.0 percent in 2000 to 25.5 percent today.

3.2 Hourly Freeway Volumes

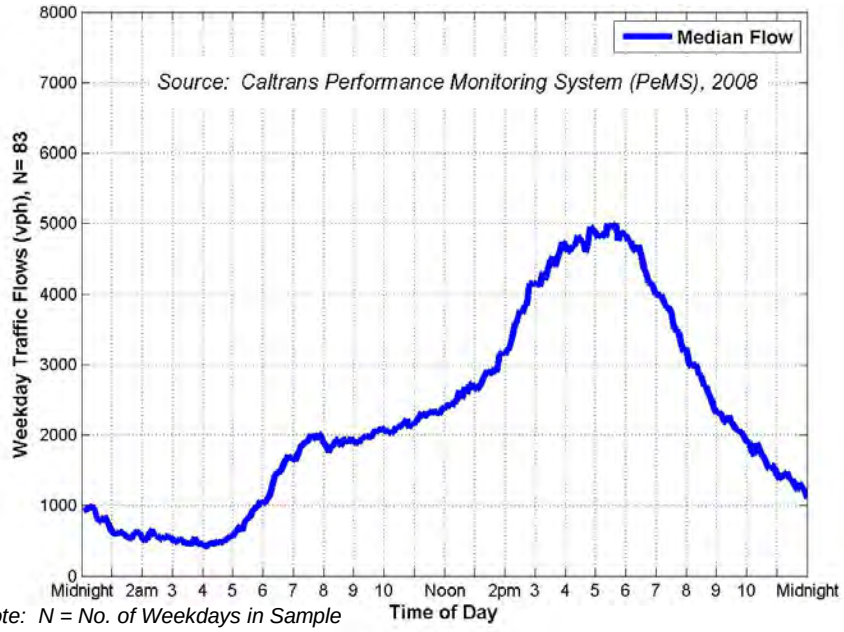
3.2.1 I-205 Hourly Volumes

Because the commute pattern between the Bay Area and San Joaquin County is clearly in one direction, traffic flows are significantly different by direction depending on the time of day. The westbound weekday peak traffic volumes occur between 4:00 am and 9:00 am (reaching almost 6,000 vehicles an hour) while the eastbound peak traffic volumes occur between 2:00 pm and 6:00 pm (reaching 5,000 vehicles an hour). An example of hourly traffic volumes that occur on I-205 are shown at the heaviest volume location at the western edge of the corridor, west of Mountain House Parkway in Figure 3.2 and Figure 3.3. Except for days when incidents occur, the traffic volume is reasonably consistent from day to day and the peaks are clearly identifiable on the figures. (The data is derived from a four month daily sample of Tuesdays, Wednesdays and Thursdays between August and November, 2008. This presented data is before the completion of the third lane through Tracy and points east to I-5.)



Note: N = No. of Weekdays in Sample

Figure 3.2 I-205 Westbound West of Mountain House Parkway



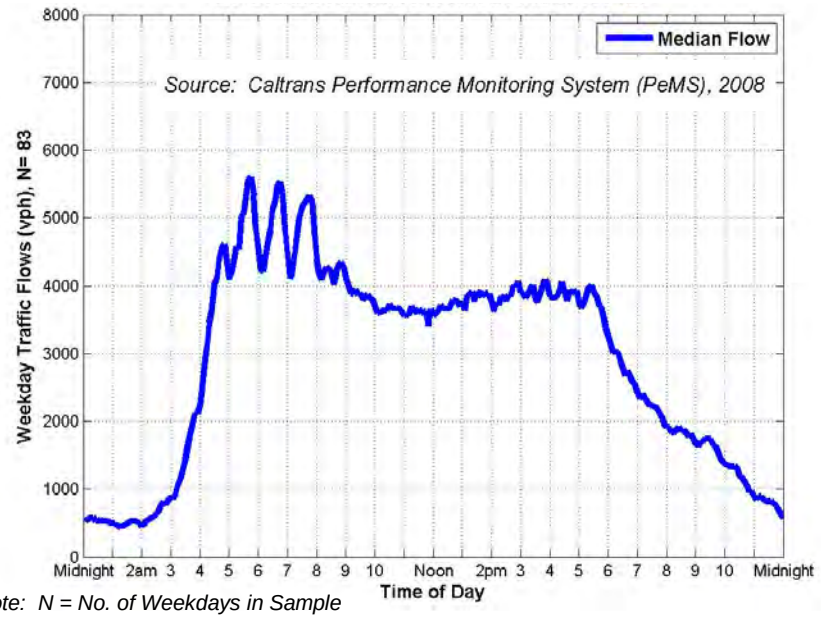
Note: N = No. of Weekdays in Sample

Figure 3.3 I-205 Eastbound West of Mountain House Parkway

3.2.2 I-5 Hourly Volumes

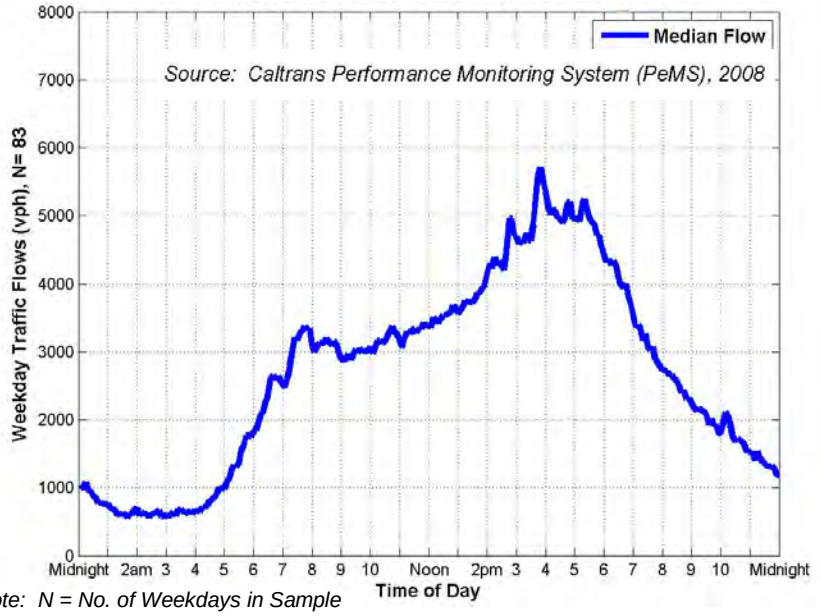
Unlike I-205, I-5 carries heavy traffic throughout the day. There are higher volumes at some peak hours, but the peak traffic increases are not as pronounced as it is on I-205. To illustrate this, traffic volumes for five representative locations are shown (on Tuesdays, Wednesdays and Thursdays between August and November, 2008).

Figure 3.4 and Figure 3.5 show the volumes on I-5 between I-205 and SR-120, the highest traffic volume segment in the corridor. At this location, the peak direction is southbound (towards the Bay Area) in the morning, while it is northbound (away from the Bay Area) in the evening. The peak volumes are slightly less than 6,000 in each of the peak hours.



Note: N = No. of Weekdays in Sample

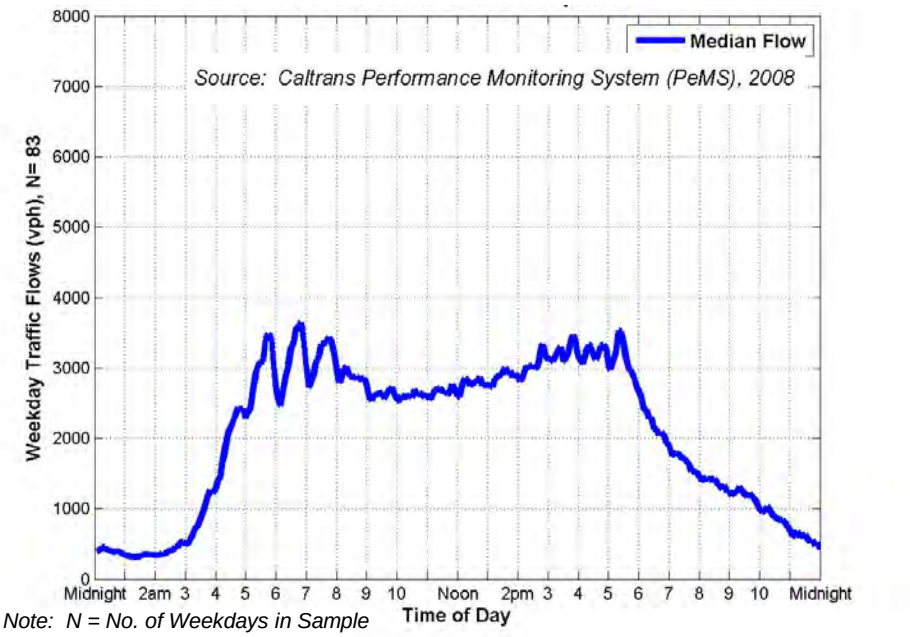
Figure 3.4 Southbound Between I-205 and SR-120



Note: N = No. of Weekdays in Sample

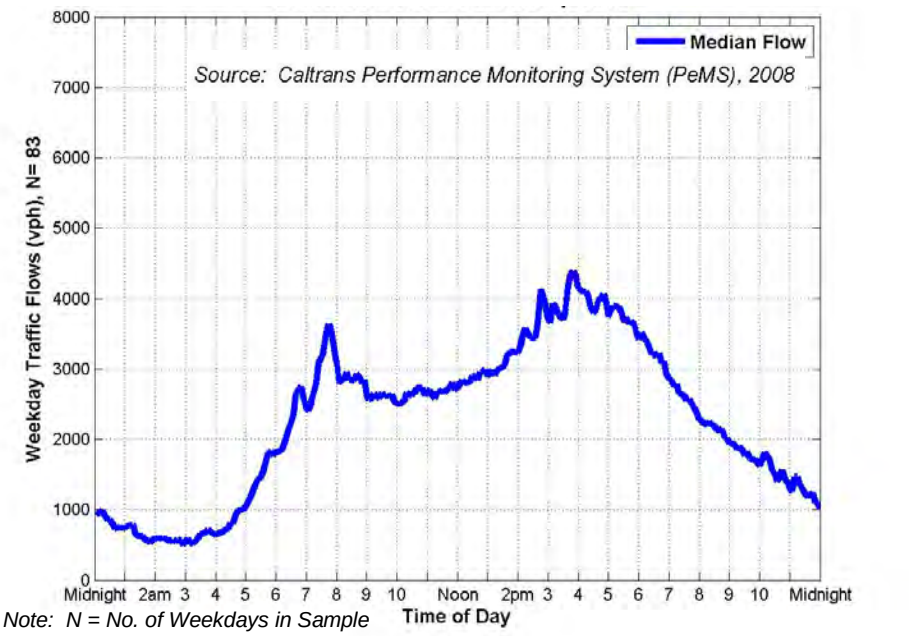
Figure 3.5 I-5 Northbound Between I-205 and SR-120

North of SR-120, the strong peak hour flow dissipates, as the strong Bay Area commute influence is less apparent north of Lathrop. In the southbound direction, there are similar volumes in both the AM and PM peaks, occurring at approximately 4:30 am to 8:00 am and 2:00 pm to 5:30 pm. In the northbound direction, there are short peaks between 7:00 am to 8:00 am 2:00 pm to 5:00 pm. The variations are shown in Figure 3.6 and Figure 3.7.



Note: N = No. of Weekdays in Sample

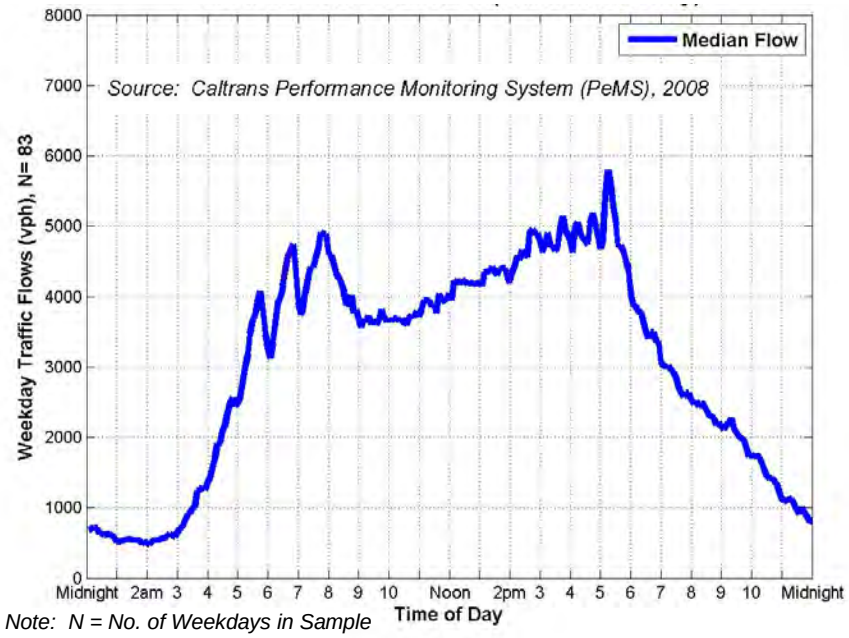
Figure 3.6 I-5 Southbound Between Lathrop Road and Louise Avenue



Note: N = No. of Weekdays in Sample

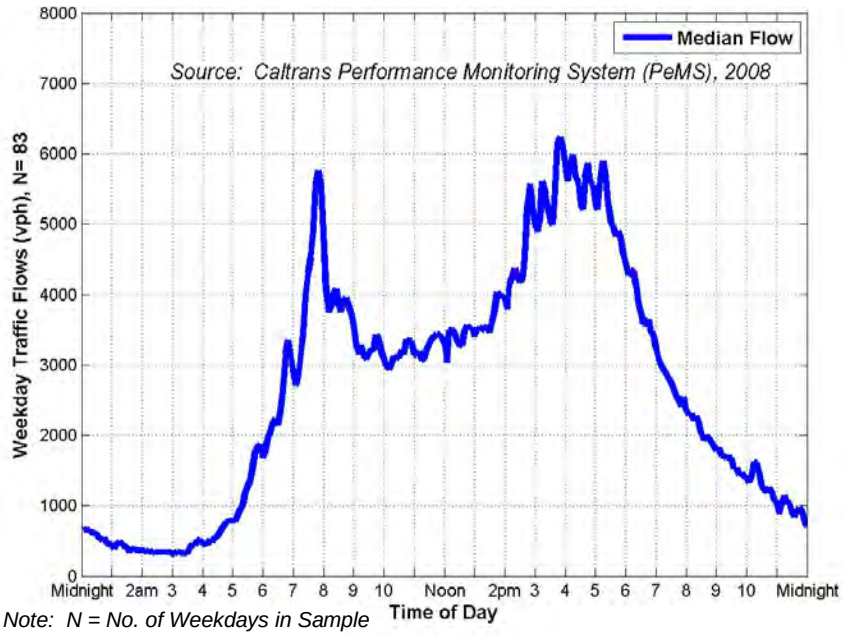
Figure 3.7 I-5 Northbound Between Louise Avenue and Lathrop Road

In the southern portion of Stockton, the influence of employment near Downtown and the Port create slightly greater peaks on I-5 than is found sections to the north and south. For example, as shown in Figure 3.8 and Figure 3.9, the peak hour traffic volumes can be as high as 6,000 vehicles at peak hour in one direction.



Note: N = No. of Weekdays in Sample

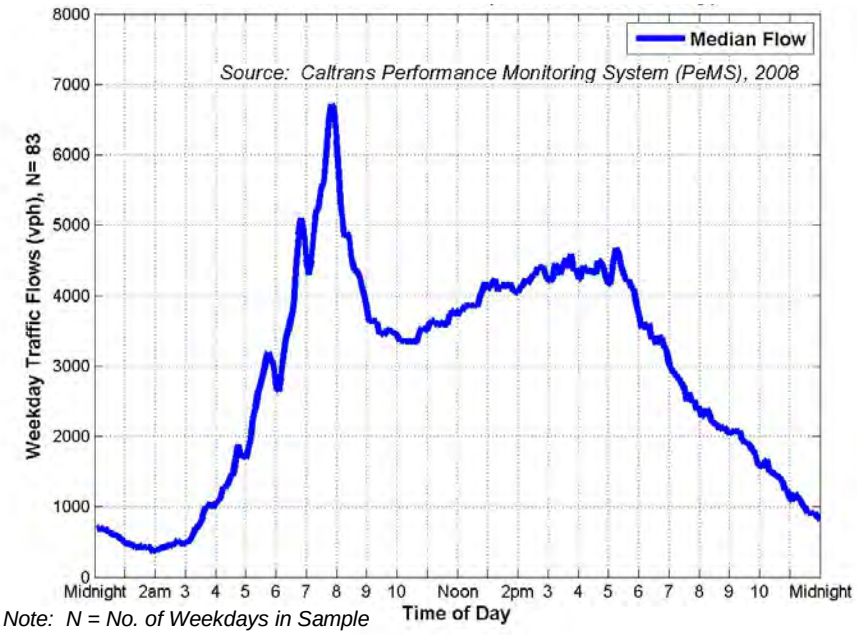
Figure 3.8 I-5 Southbound South of SR-4W (West Dr. Martin Luther King, Jr. Boulevard)



Note: N = No. of Weekdays in Sample

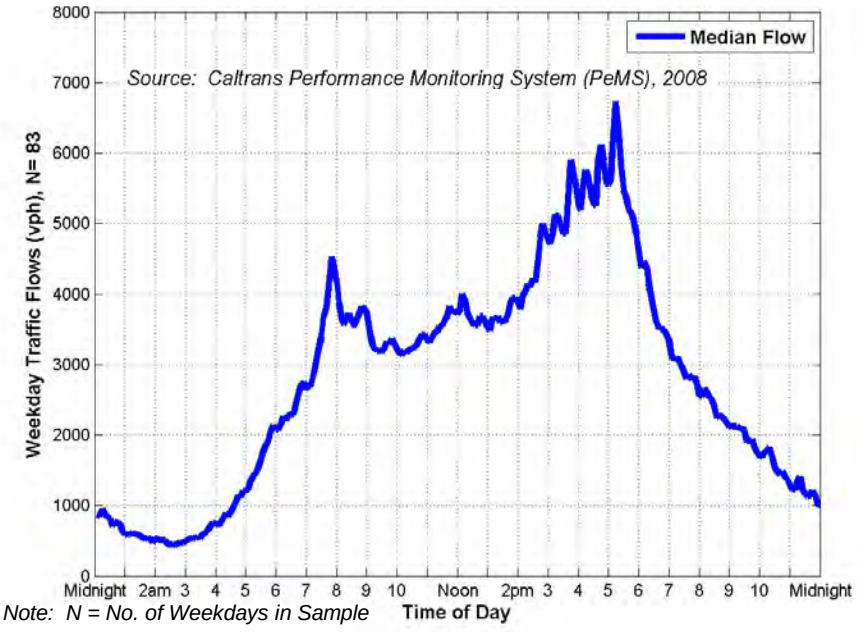
Figure 3.9 Northbound South of SR-4W (West Dr. Martin Luther King, Jr. Boulevard)

There is southbound AM peak (approximately 6:30 am to 8:30 am) and northbound PM peak (approximately 2:30 pm to 5:30 pm) to the just north of SR-4 (Crosstown Connector). This occurs because there are many drivers headed to jobs near Downtown Stockton or to activities at the Port. The volumes here can reach as high as 7,000 vehicles in the AM peak hour southbound and the PM peak hour northbound. Figure 3.10 and Figure 3.11 show these patterns.



Note: N = No. of Weekdays in Sample

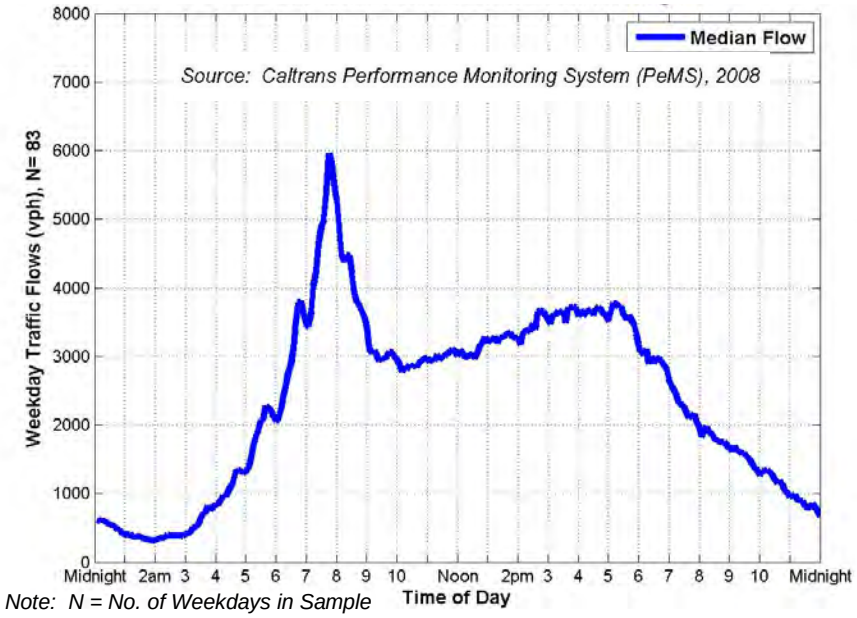
Figure 3.10 I-5 Southbound North of SR-4 (Crosstown Connector)



Note: N = No. of Weekdays in Sample

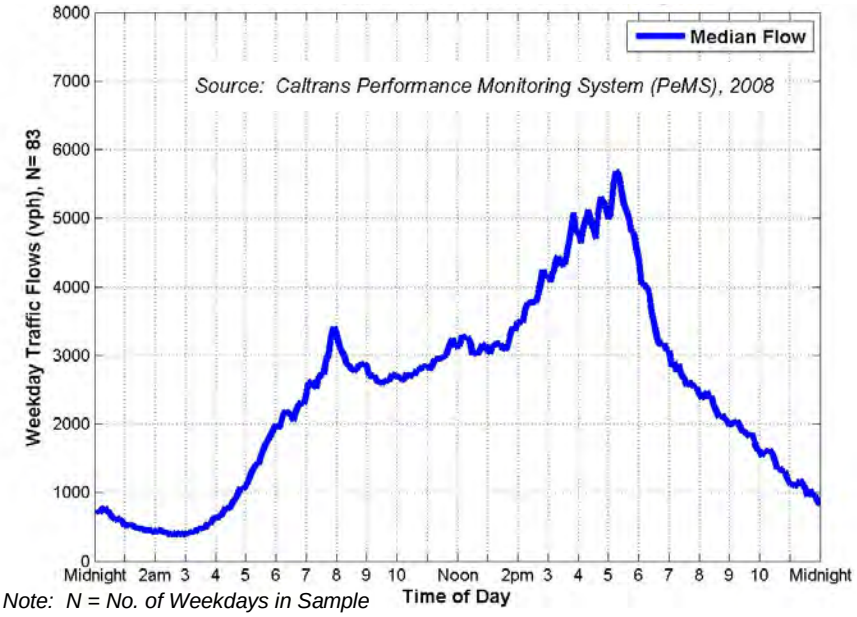
Figure 3.11 I-5 Northbound North of SR-4 (Crosstown Connector)

At the northern end of the corridor, the volumes return to a more steady flow throughout the day. South of the Eight Mile Road interchange at Fourteen Mile Slough, there is a slight southbound peak in both the morning and the afternoon commute periods. The northbound direction shows an afternoon peak. In both cases, the peak volumes are about 3,500 as a median but they can reach as high as 4,000 vehicles per hour in each direction. The midday median volumes are sampled at 2,000 to 2,500 vehicles in either direction. Figure 3.12 and Figure 3.13 illustrate this as a graph.



Note: N = No. of Weekdays in Sample

Figure 3.12 I-5 Southbound South of Eight Mile Road



Note: N = No. of Weekdays in Sample

Figure 3.13 I-5 Northbound South of Eight Mile Road

3.3 Vehicle Occupancy

The number of eligible persons who use these lanes is important information to gather because HOV lanes or HOV bypass ramps are potential future operational improvements. The average vehicle occupancy varies between 1.2 and 1.5 occupants per vehicle in the study corridor, with the percentage of vehicles with two or more occupants in the range of 13% to 29%. There are no HOV lanes within the study corridor at present. The average vehicle occupancies at various locations are shown in Table 3.2. It should be noted that ramps often have a higher percent of HOV volumes, especially during the PM peak, because they carry shorter-distance (such as school and shopping) traffic.

Table 3.2 Representative Vehicle Occupancy During AM and PM peaks

Segment	Location	Direction	AM Peak Period		PM Peak Period		Source
		Direction	Average Vehicle Occupancy	% HOV (2 or more persons)	Average Vehicle Occupancy	% HOV (2 or more persons)	
I-205	Paradise Rd	Eastbound	-	-	1.4	22%	*San Joaquin HOV Lane and Ramp Metering Study*
		Westbound	1.2	16%	-	-	
	Grant Line Road Ramps	Eastbound	1.1	12%	1.3	23%	*DKS Associates Wiltec, 2008*
		Westbound	1.2	13%	1.4	31%	
	Tracy Boulevard Ramps	Eastbound	1.2	18%	1.3	23%	*DKS Associates Wiltec, 2008*
		Westbound	1.3	26%	1.4	37%	
I-5	French Camp	Northbound	1.2	13%	1.2	19%	*San Joaquin HOV Lane and Ramp Metering Study*
		Southbound	1.3	18%	1.3	19%	
	Monte Diablo/ Country Club	Northbound	1.2	17%	1.3	22%	*Caltrans 2007 HICOMP Report*
		Southbound	1.2	21%	-	-	
	Eight Mile	Northbound	1.4	25%	1.3	24%	*Caltrans 2007 HICOMP Report*
		Southbound	1.3	19%	1.3	21%	
	SR12	Northbound	1.5	29%	1.3	22%	*Caltrans 2007 HICOMP Report*
		Southbound	1.4	24%	1.4	22%	
SR-120	Yosemite Ave	Eastbound	1.3	22%	1.2	21%	*Caltrans 2007 HICOMP Report*
		Westbound	1.3	21%	1.3	24%	
SR-4	Filbert St	Eastbound	1.3	21%	1.3	25%	Caltrans 2007 HICOMP Report

3.4 Truck Volumes

The number of heavy trucks that use the facilities varies significantly by season. As an important goods movement corridor, the presence of trucks is high. The trucks are primarily carrying goods to and from the many distribution centers in the study area, as well as other nearby areas. During harvest times, there is also considerable agricultural-related truck traffic as farm goods are transportation to processing plants and to markets.

Representative daily I-5 truck traffic is from the Caltrans *2007 Annual Daily Truck Traffic* report. The numbers of trucks on I-205 have been shown to be between 11,000 and 14,000 a day. The available truck volumes are summarized in Table 3.3. On I-5 trucks comprise approximately about 42,000 vehicles per day (both directions) at the highest volume location on I-5 south of SR-120. The number of daily trucks drops to 27,000 to 34,000 in the Stockton area. The truck volumes on I-5 are likely to increase with the planned expansion of the Port of Stockton.

Table 3.3 Daily Average Truck Volumes and Percentages

Segment	Location	AADT	Truck AADT	Truck %	Year
I-205	East of I-580	112000	13,440	12.0%	2007
	West of West 11th Street	113000	13,560	12.0%	2007
	West of MacArthur Drive	99,000	11,290	11.3%	2007
	West of I-5	101,000	11,540	11.5%	2007
I-5	North of I-205	160,000	44,240	26.4%	2007
	North of SR-120 East	106,000	27,450	25.9%	2007
	North of French Camp Rd	112,000	28,000	25.0%	2007
	North of Dr. Martin Luther King, Jr. Boulevard	131,000	32,100	24.5%	2007
	North of March Lane	118,000	27,140	23.0%	2007
	North of Hammer Lane	95,000	21,470	22.6%	2007
	South of SR-12	77,000	12,620	16.4%	2007
SR-120	East of I-5	61,800	14,170	18.4%	2007
SR-4	East of I-5	95,200	8,450	9.6%	2007

Note:
[1] The truck volumes were not counted continuously or quarterly in that year, therefore volumes for this period were estimated.

Source: Caltrans 2007 Average Annual Daily Truck Traffic On The State Highway System

Additional representative peak hour truck data was available for I-205. This is shown in Table 3.4. The peak hour truck volume is in the range of 600 to 1,100 in each direction at Mountain House Parkway and Paradise Road. The range of the percentage of trucks when compared to these volumes show how the truck demands are more constant in each direction, and how commuter traffic has larger variations in volume on this roadway.

Table 3.4 I-205 Peak Hour Truck Data

Location	Direction	AM Peak Hour		PM Peak Hour	
		Truck Volumes (per hour)	% Trucks	Truck Volumes (per hour)	% Trucks
Mountain House Parkway	Eastbound	820	19.9%	716	4.9%
	Westbound	927	7.8%	568	7.7%
Paradise Road	Eastbound	919	21.4%	902	9.2%
	Westbound	1046	11.4%	673	8.8%

Source: I-205 Auxiliary Lane Study, 2007

These sources were augmented with addition peak period truck percentage data, collected in 2008. Summarized in Table 3.5, the surveys show the importance of I-5 as a major national freight movement facility, with a high percentage of trucks even in the peak hours. The percentage of trucks on I-205 are lower, reflecting the presence of a high number of auto commuters as well as a congested corridor which truck operators often avoid because of the additional labor costs associated with driving in congested traffic.

Table 3.5 Freeway Peak Period Truck Data

Roadway	Location	Direction	AM Peak Period	PM Peak Period
I-5	North of SR-12	Northbound	27%	24%
		Southbound	23%	18%
I-5	South of I-205	Northbound	49%	26%
		Southbound	35%	38%
I-205	East of I-580	Eastbound	20%	6%
		Westbound	9%	8%
I-205	West of I-5	Eastbound	17%	9%
		Westbound	9%	7%
I-580	South of I-205	Northbound	15%	16%
		Southbound	36%	11%

Source: DKS Associates - Wiltec, 2008

3.5 Recent Volume Decreases

Observed traffic congestion during the survey period in the fall of 2008 was less than in recent years. The causes are related to a general increase in household occupancy and a related downturn in the economy. To better illustrate that the conditions were not during the time when congestion was the highest, a comparison of the hourly volumes to those obtained from other studies was made.

The change is summarized in Table 3.6. As the table shows, peak hour volumes were significantly lower in most of the corridor when compared to years prior to the study period. The decreases ranged from 5 to 18 percent in when comparing the various data sources. It is important to recognize that the decrease in traffic appears as a recent occurrence (noting significant increases in traffic volumes since 1990 shown in Table 3.1), and that traffic volume increases are expected to return.

Because small decreases in traffic can result in significant changes in speeds, the reduction in traffic demand has produced improved travel speeds in the 2008 surveys, as compared to earlier studies in the corridor.

Table 3.6 Freeway Traffic Volume Comparisons between 2008 and Earlier Years

Roadway	Location	Direction	Year	Peak Hour Volume	% Change	Source
I-205	East of West 11th St	Eastbound	2007	2913		*I-205 Auxiliary Lane PSR*
			2008	2703	-8%	*PeMS, 2008*
		Westbound	2007	3430		*I-205 Auxiliary Lane PSR*
			2008	3062	-12%	*PeMS, 2008*
	West of Tracy Blvd	Eastbound	2007	2929		*I-205 Auxiliary Lane PSR*
			2008	2609	-12%	*PeMS, 2008*
		Westbound	2007	3472		*I-205 Auxiliary Lane PSR*
			2008	2865	-21%	*PeMS, 2008*
	East of MacArthur Dr	Eastbound	2007	3330		*I-205 Auxiliary Lane PSR*
			2008	3165	-5%	*PeMS, 2008*
		Westbound	2007	3441		*I-205 Auxiliary Lane PSR*
			2008	2914	-18%	*PeMS, 2008*
I-5	I-205 to SR-120	Northbound	2004	5960		*SR-120/McKinley Ave Interchange PSR*
			2008	5492	-9%	*PeMS, 2008*
		Southbound	2004	5543		*SR-120/McKinley Ave Interchange PSR*
			2008	5003	-11%	*PeMS, 2008*
	South of Louise Ave	Northbound	2005	3850		*Louise Avenue Interchange PSR*
			2008	3811	-1%	*PeMS, 2008*
		Southbound	2005	3630		*Louise Avenue Interchange PSR*
			2008	3183	-14%	*PeMS, 2008*
	North of Louise Ave	Northbound	2005	3760		*Louise Avenue Interchange PSR*
			2008	3197	-18%	*PeMS, 2008*
		Southbound	2005	3550		*Louise Avenue Interchange PSR*
			2008	3209	-11%	*PeMS, 2008*
	North of March Lane	Northbound	2004	5634		*North Stockton Interchanges PSR*
			2008	5087	-11%	*PeMS, 2008*
		Southbound	2004	5763		*North Stockton Interchanges PSR*
			2008	4912	-17%	*PeMS, 2008*

Note: Peak Hour Volume is Eastbound or Northbound in PM and Westbound or Southbound in AM

4 PERFORMANCE MEASURES

4.1 Mobility

The measure of mobility is developed by examining delay as well as travel time. Both of these measures can also be defined in terms of speed.

4.1.1 Delay

The delays in the system are defined as those that are experienced when the speed drops below a free flow speed of 60 miles per hour. This is shown in Table 4.1. Delay is reported in vehicle hours of delay. The data used in this analysis is based on a non-holiday Tuesday, Wednesday or Thursday from October 2 to November 20 2008, provided from PeMS. The highest delayed freeway segment is Eastbound I-205 in the PM peak period. The other significantly delayed freeway segments are Northbound and Southbound I-5 between SR-12 and SR-120 due to significant delay in the midday time period. In this analysis the AM peak period is 5 am to 10 am, the midday period is 10 am to 2 pm and the PM peak period is 2 pm to 7 pm.

During the AM peak period, there are several locations that have demonstrated vehicle hours of delay such as on I-205 westbound and I-5 southbound. Delay is encountered during midday hours as well, especially on I-5. Finally, the PM peak period has delays that occur on I-205 eastbound, and both directions of I-5 between I-205 and SR 10.

Table 4.1 Average Weekday Vehicle Hours of Delay

Freeway	Segment	AM Peak Period (5 – 10 am)	Midday (10 am – 2 pm)	PM Peak Period (2 – 7 pm)	Daily
I-205 Eastbound	I-580 to I-5	43	148	902	1,093
I-205 Westbound	I-580 to I-5	192	69	20	281
I-5 Northbound	SR-12 to SR-4 E	166	187	248	601
I-5 Northbound	SR-4 E to SR-120	97	187	133	417
I-5 Northbound	SR-120 to I-205	13	16	10	39
I-5 Southbound	SR-12 to SR-4 E	168	290	242	700
I-5 Southbound	SR-4 E to SR-120	124	247	150	521
I-5 Southbound	SR-120 to I-205	275	114	38	427

Source: PeMS – October 2 to November20, 2008; Tuesdays through Thursdays

A separate analysis was performed based on speed measured by floating cars. This is shown in Table 4.2. These cars drove the corridor during the peak period on a Tuesday, Wednesday or Thursday 16 times in January 2009, and an additional 4 times in April 2009. The peak periods measured were 5 am to 9 am and 3 pm to 6 pm. The delay was experienced when speeds dropped below a free flow speed of 60 miles per hour and delay is reported in vehicle hours of delay. This table shows that majority of the delay is experienced on Westbound I-205 during the AM peak period and on Eastbound I-205 during the PM peak period, with very little sampled delay on I-5 during this time.

Table 4.2 Peak Period Vehicle Hours of Delay

Freeway	AM Peak Period (5 am – 9 am)	PM Peak Period (3 pm – 6 pm)
I-205 Eastbound	1	668
I-205 Westbound	226	13
I-5 Northbound	0	0
I-5 Southbound	20	0

Source: DKS Associate & Wiltec, January and April 2009

4.1.2 Travel Times

Another key performance measure available from existing data is the travel time. Travel times provide an indication of the direct user experience on the corridor when traveling between the two end points. The average travel time variations provide an indication of when things are taking more time during the day.

Because the travel patterns and volumes vary through the corridor, it is clear that people often do not drive the entire corridor. Thus, the travel time report is best divided up into segments of the corridor. This section discusses the travel times for I-205 as one segment, then reports three segments of I-5 – from I-205 to SR-120, SR-120 to SR-4 (Crosstown Connector), and SR-4 (Crosstown Connector) to SR-12 – as portions of the same trip.

The data used in this analysis are travel time profiles on a Tuesday, Wednesday or Thursday in September 2008. The experiences reported here are representative of the travel times that have occurred in the corridor. The source is derived from PeMS data.

I-205 Travel Times

The increased peak direction travel time on I-205 is notable in the surveys of the corridor. A PeMS-based analysis in Figure 4.1 shows that the corridor experiences increased westbound travel times during the morning commute of 25 percent (8 minutes to 10 minutes) between 5:00 am travel and 6:00 am travel; the travel times during most other times of the day are similar. As shown in Figure 4.2, the travel times are greatest in the PM peak commute hours, and can be as high as 15 minutes; most other times of day have travel times within a minute of one other. These are based the 19 detectors active on the corridor.

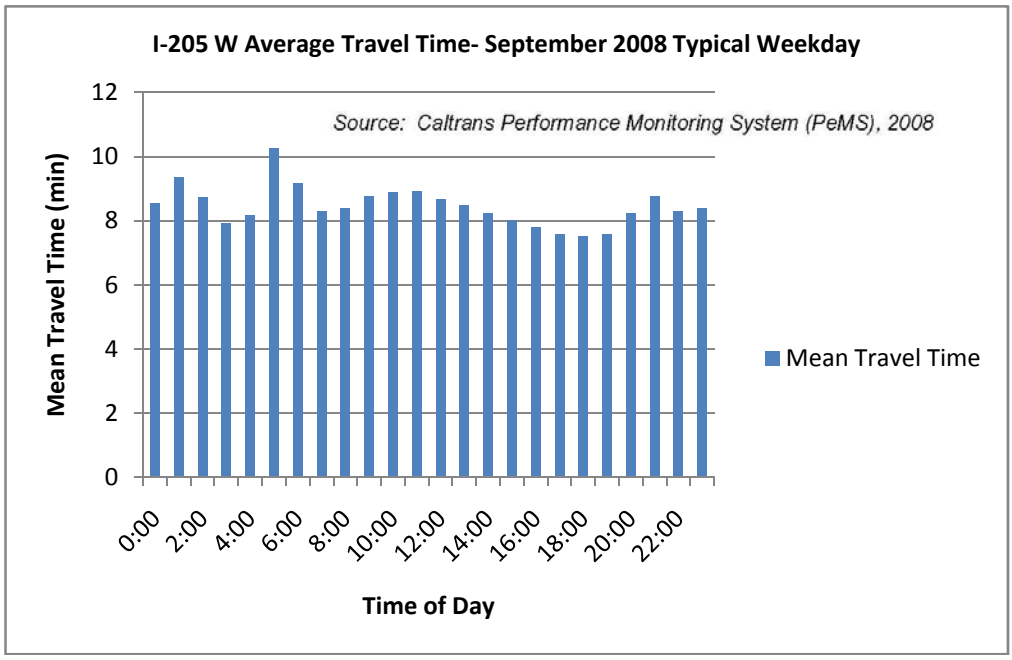


Figure 4.1 Travel Times on I-205 Westbound

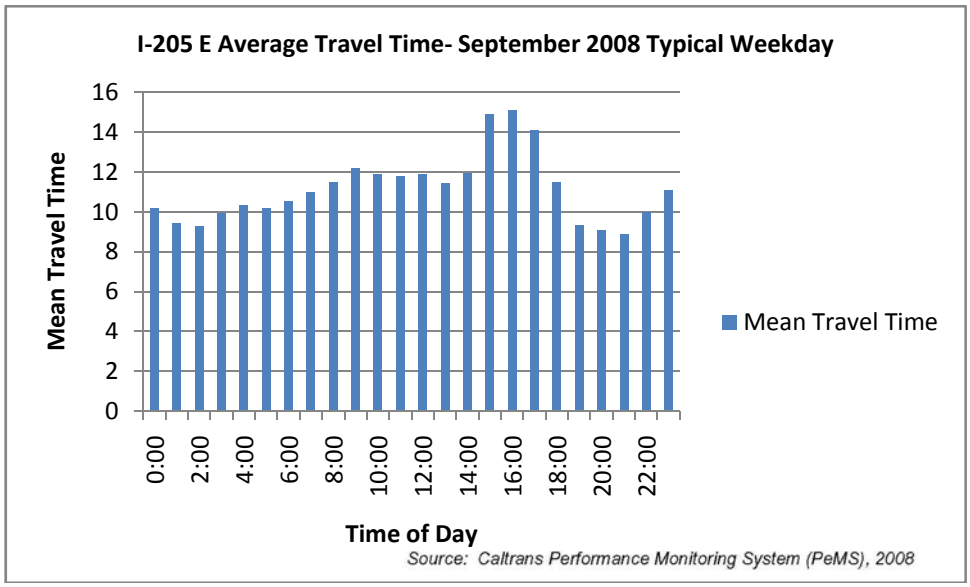


Figure 4.2 Travel Times on I-205 Eastbound

The same trend was verified in floating car survey results taken in the spring of 2009 (before new travel lanes were open). These results, shown in Figure 4.3, demonstrate that the corridor has increased westbound travel times during the morning commute of 25 percent (8 minutes to 10 minutes) between 5:00 am travel and 6:00 am travel; the travel times during most other times of the day are remarkably similar. As shown in Figure 4.4, the travel times are greatest in the PM peak commute hours between 3:00 pm and 5:00 pm, and can be as high as 20 minutes (an increase of 65 percent); most other times of day have travel times within a minute of one other.

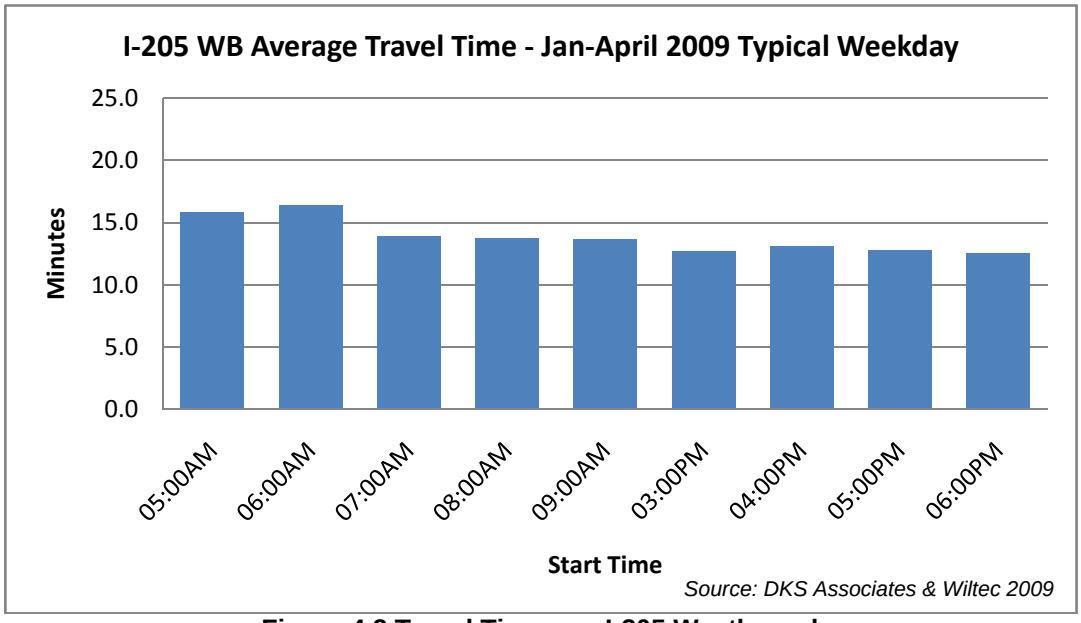


Figure 4.3 Travel Times on I-205 Westbound

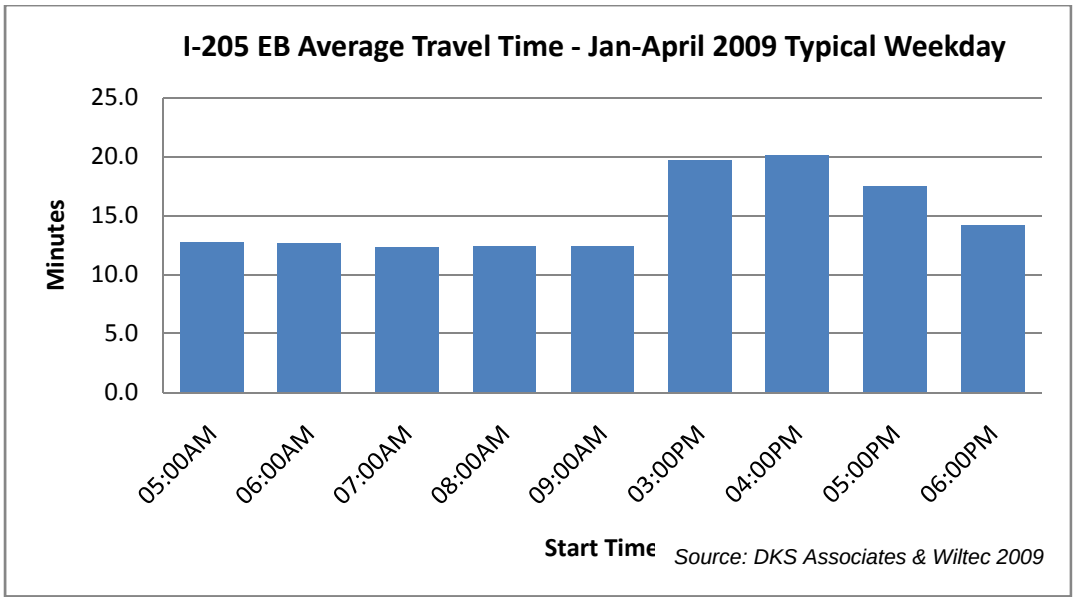


Figure 4.4 Travel Times on I-205 Eastbound

I-5 Travel Times

I-5 travel times, demonstrated in the PeMS-based analysis and shown in Figure 4.5 and Figure 4.6, are fairly similar, with the greatest travel times being in the midday hours. Observations suggest that this is due to increased truck traffic. These results suggest that there is little congestion that occurs at specific points on this corridor, but that the increased travel times during midday hours is due to generally heavy traffic volumes on this roadway through the study area. These are based on a total of 67 detectors located throughout in the corridor.

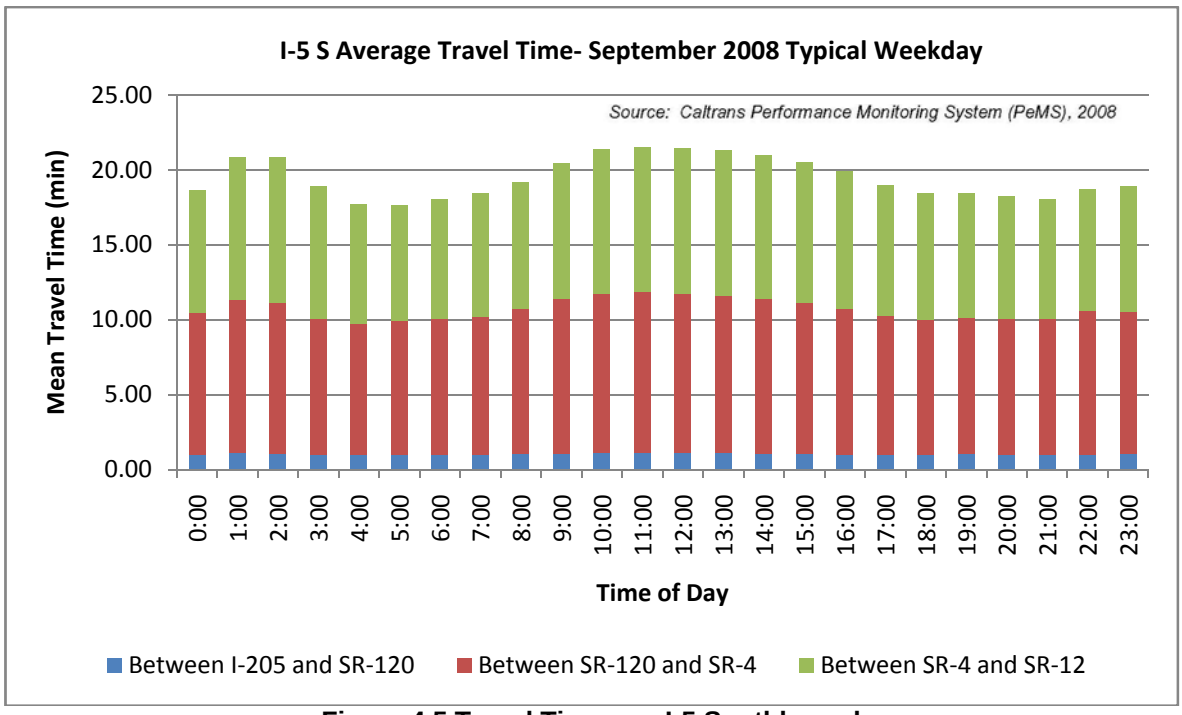


Figure 4.5 Travel Times on I-5 Southbound

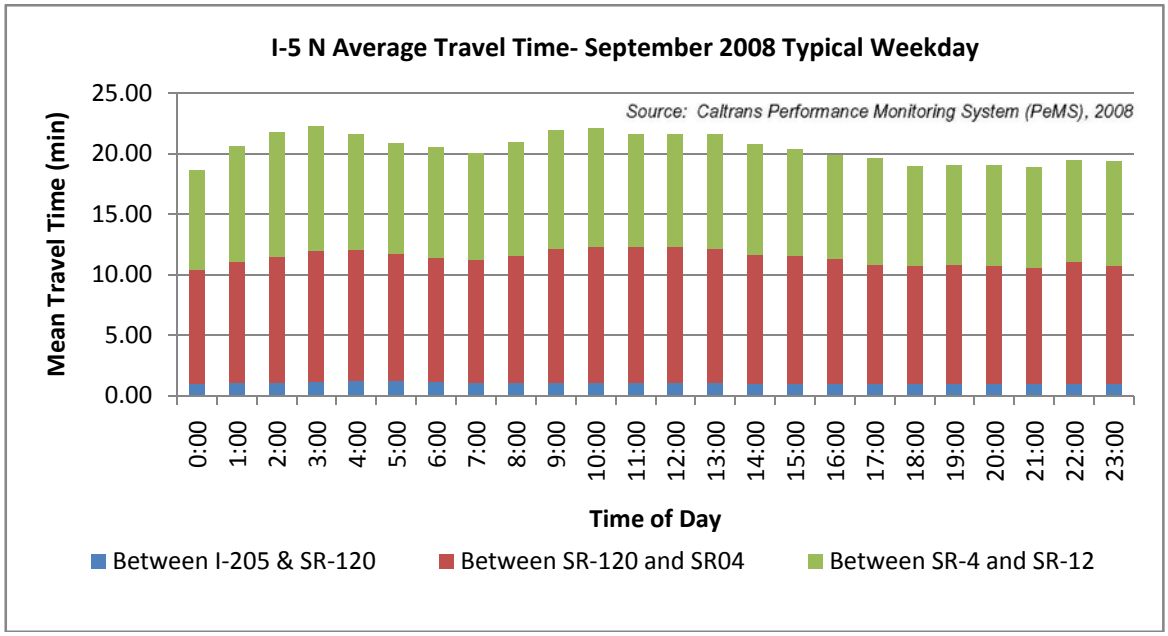


Figure 4.6 Travel Times on I-5 Northbound

The lack of a significant travel time delay was further verified in floating car surveys taken in the spring of 2009. The survey results in Figure 4.7 and Figure 4.8 also show that the travel times on I-5 are actually fairly similar.

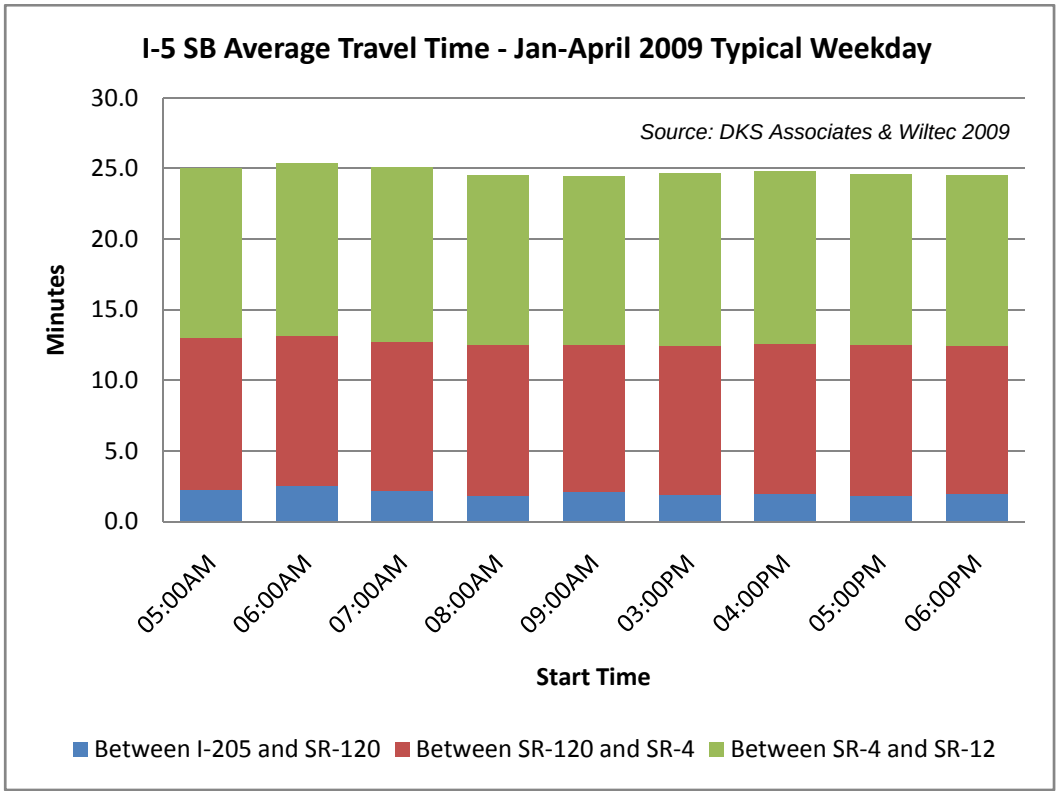


Figure 4.7 Travel Times on I-5 Southbound

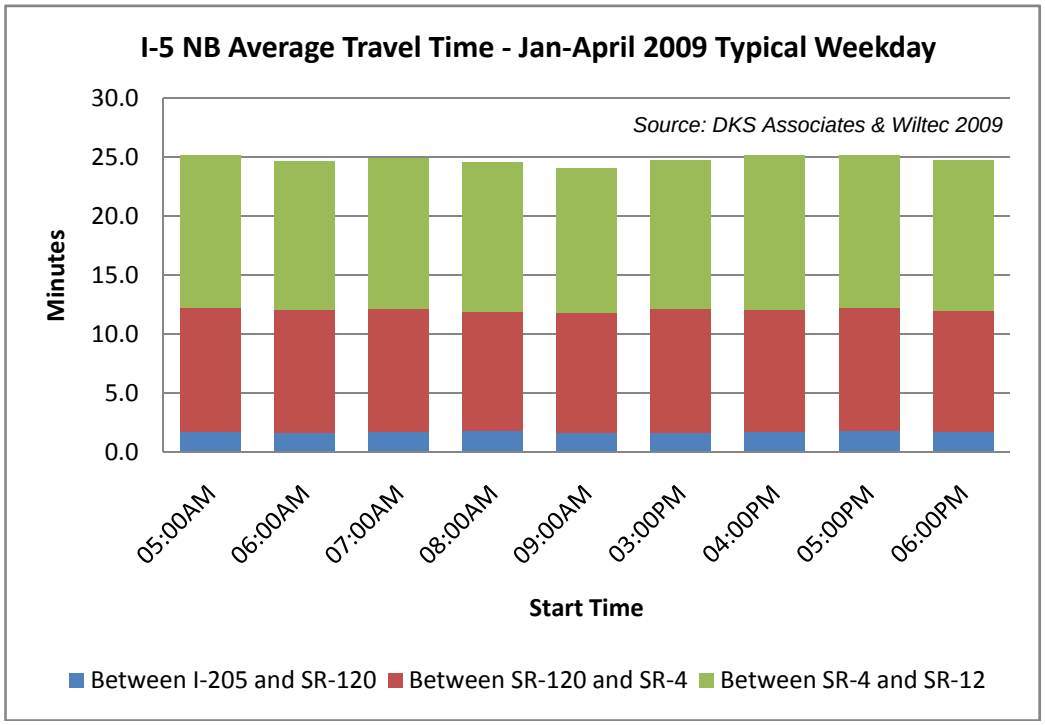


Figure 4.8 Travel Times on I-5 Northbound

4.2 Reliability

The reliability of the system is an indication of how predictable the travel times will be for the persons on the facility. A roadway may operate at a reasonable median speed, but individual daily experiences could vary significantly.

4.2.1 Travel Time Variation

A key measure of reliability is the variation in travel times between days. This data can be reliably described using data from PeMS detector stations in the corridor. The stations provide information about the mean and the 95th percentile corridor travel times. These two points provide an indication of what the average and peak travel time conditions are. (This formulation of the buffer index uses a 95th percentile travel time to represent a near-worst case travel time. Whether expressed as a percentage or in minutes, it represents the extra time a traveler should allow to arrive on-time for 95 percent of all trips. A simple analogy is that a commuter or driver who uses a 95 percent reliability indicator would be late only one weekday per month. Source:

http://ops.fhwa.dot.gov/publications/tt_reliability/TTR_Report.htm#overview) When all weekdays are plotted on a graph, the variability in travel time is clearly illustrated. These illustrations follow in the next several figures; in each figure, the blue line represents the mean travel time, while the red line represents the 95th percentile travel time. Areas that show reliable travel times are represented where the two lines are close to one another, while the times with the greatest unreliability are those when the lines are far apart. (The data is derived from a four month daily sample of Tuesdays, Wednesdays and Thursdays between August and November, 2008, derived from PeMS.)

I-205 Travel Time Reliability

The travel times on I-205 can vary significantly from one day to the next. Figure 4.9 shows this variability in each direction. Figure 4.9 clearly shows the greatest difference in travel time during the AM peak period commute, and this reliability difference is pronounced between 5:30 am and 7:30 am. Figure 4.10 shows a significant occurrences of unreliable travel times with variations of over 5 minutes beginning as early as 12:45 pm and continuing until 7:00 pm.

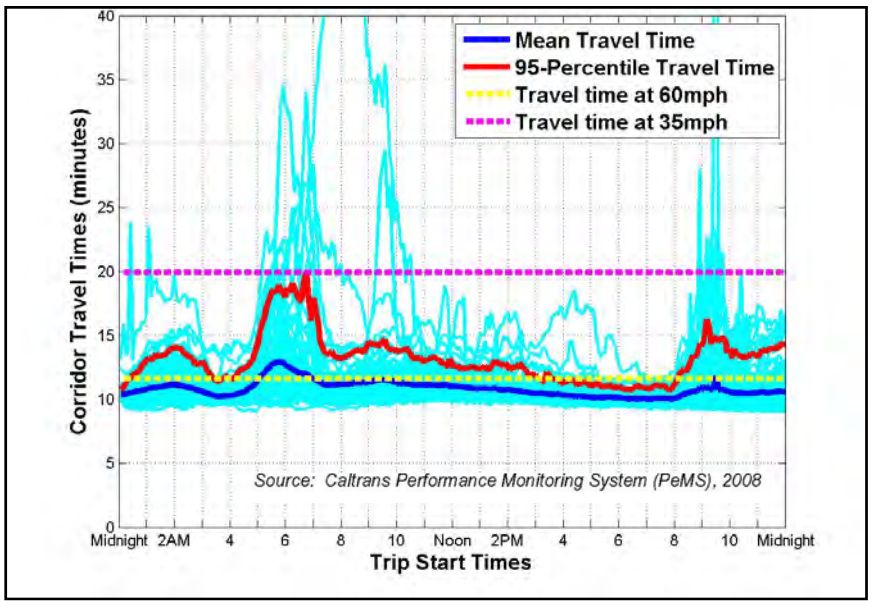


Figure 4.9 I-205 Westbound Travel Time Reliability

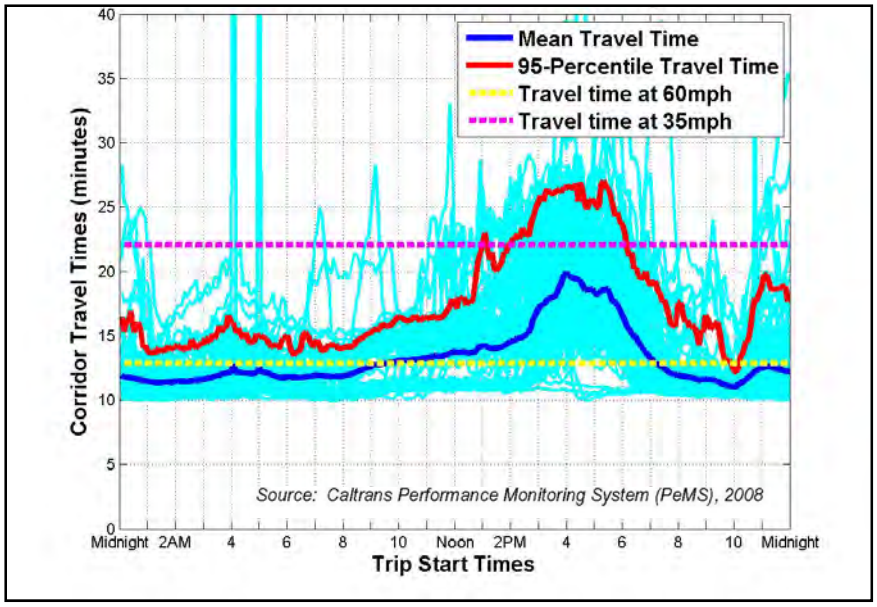


Figure 4.10 I-205 Eastbound Travel Time Reliability

After I-205 Widening Travel Time

Floating cars measured travel times and speeds on I-205 an I-5 to SR-120 in June 2009 after the new third lane was opened in each direction of I-205, 11th Street to I-5, and a new fifth northbound lane was opened on I-5, between I-205 and just north of SR-120. There was also some restriping of the I-5 at the I-205 interchange. The average AM and PM peak period speeds on I-205 and I-5, from I-205 to SR-120, increased up to between 60 mph and 70 mph. The comparison is shown in Figure 4.11.

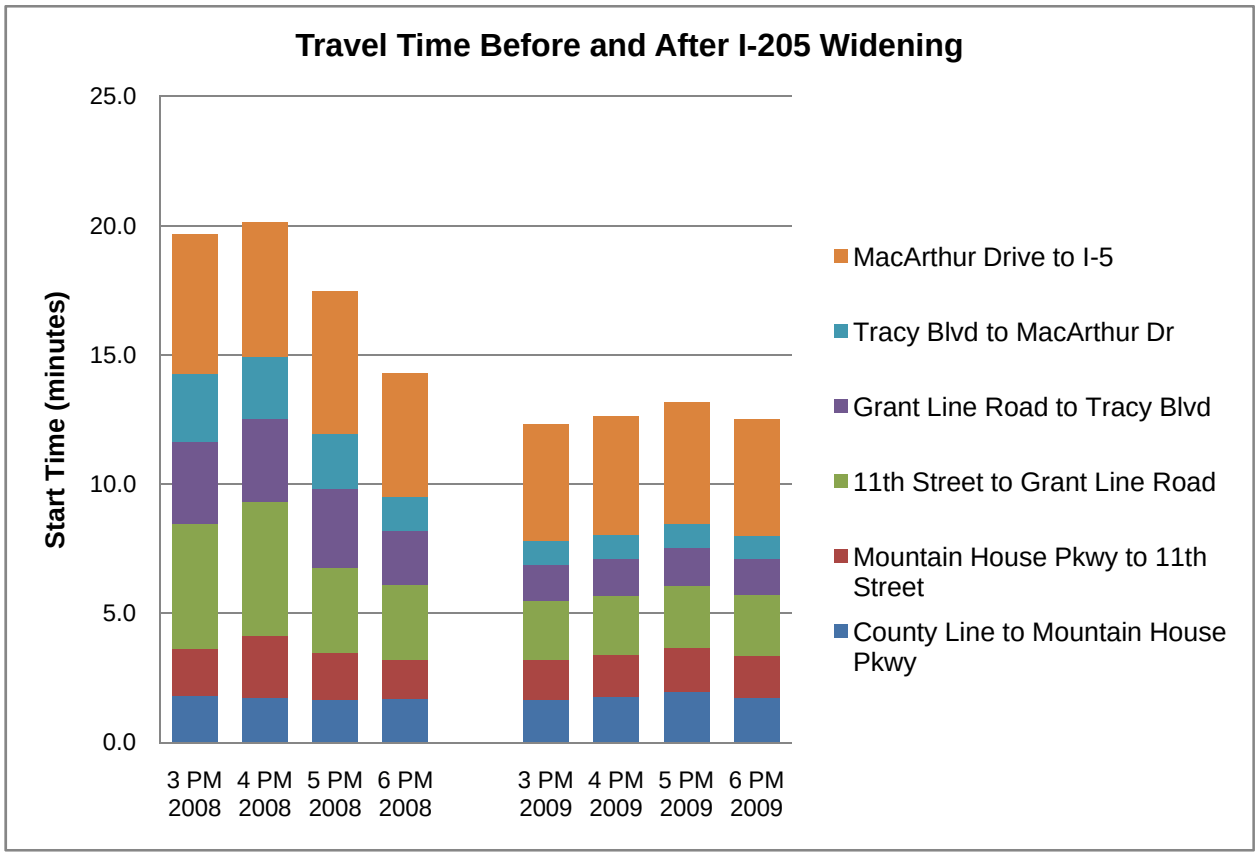


Figure 4.11 Comparison of 2008 and 2009 Surveyed Weekday Travel Times for I-205 Eastbound during Weekday PM Peak Period

Source: DKS Associates and Wiltec, 2008/2009

I-5 Travel Time Reliability

The travel time reliability on I-5 varies depending on the roadway segments being evaluated. The three segments shown in the median travel time graph above are discussed separately here. Figure 4.12 summarizes these travel time indicators between SR-120 and I-205 southbound; some variability in the AM peak period commute period occurs southbound, with the 95th percentile as high as 8 minutes (or 60 percent higher than the mean travel time of about 5 minutes to traverse this segment). Figure 4.13 summaries how the northbound variability is not as different between the various sampled days.

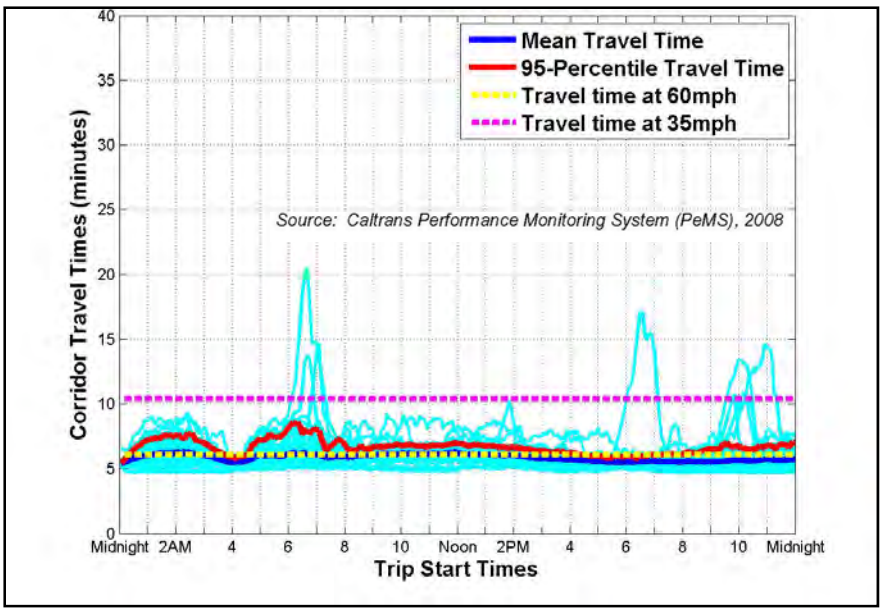


Figure 4.12 I-5 Southbound Average Weekday Travel Times from SR-120 to I-205 (minutes)

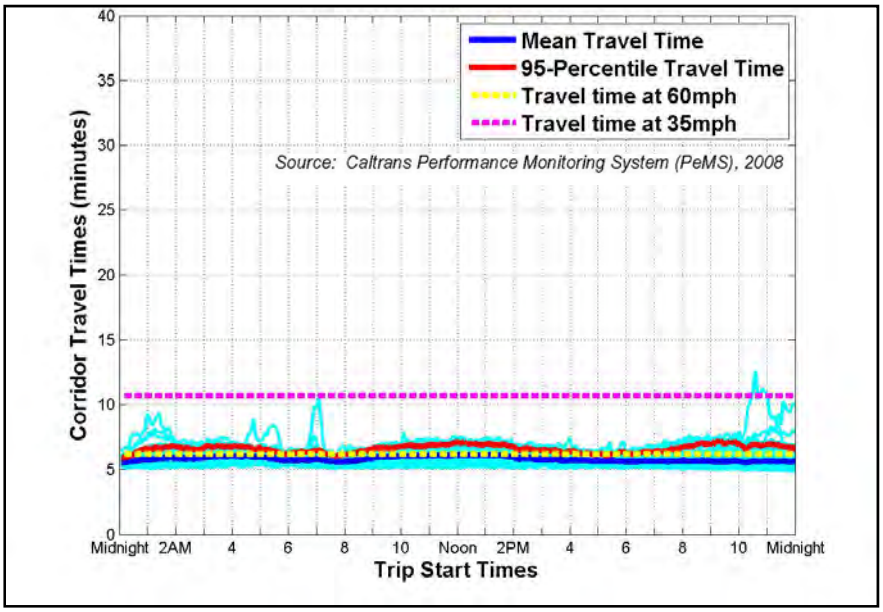


Figure 4.13 I-5 Northbound Average Weekday Travel Times from I-205 to SR-120 (minutes)

The two travel time indicators between SR-120 and SR-4 (Crosstown Connector) in the southbound direction, shown in Figure 4.14, shows little variability (about a minute) between the two indicators, suggesting that the travel times are reliable throughout the day in this segment direction. In the northbound direction, the data suggest that there is a bit more variability (about two minutes) as shown in Figure 4.15, although the greatest variability appeared during times in the middle of the night, suggesting that road work was occurring.

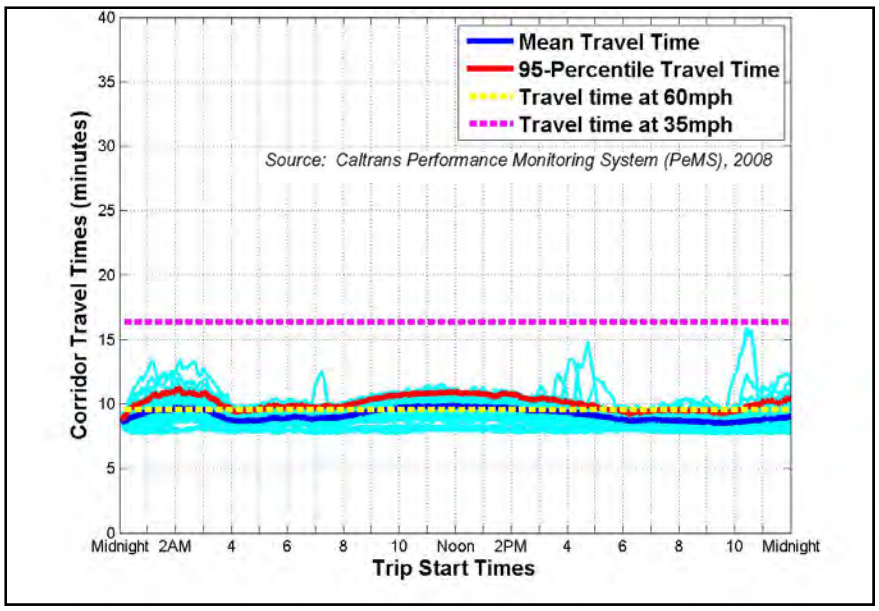


Figure 4.14 I-5 Southbound Average Weekday Travel Times from SR-4 (Crosstown Connector) to SR-120 (minutes)

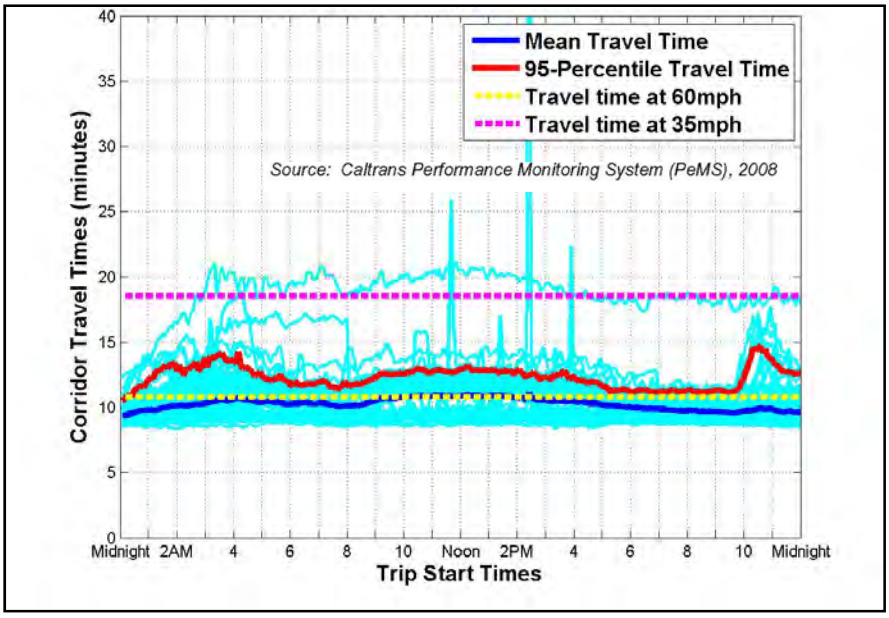


Figure 4.15 I-5 Northbound Average Weekday Travel Times Between SR-120 to SR-4 (Crosstown Connector) (minutes)

The two travel time indicators between SR-4 (Crosstown Connector) and SR-120 in the southbound direction shown in Figure 4.16 shows some variability (about three minutes) between the two indicators, suggesting that the travel times are somewhat reliable throughout the day in this segment direction (noting the variability in the overnight hours, attributable to road maintenance). In the northbound direction, shown in Figure 4.17, the data suggest that there is similar variability (about two minutes or about 20 percent longer), again with the greatest variability appeared during times in the middle of the night, attributable to road construction.

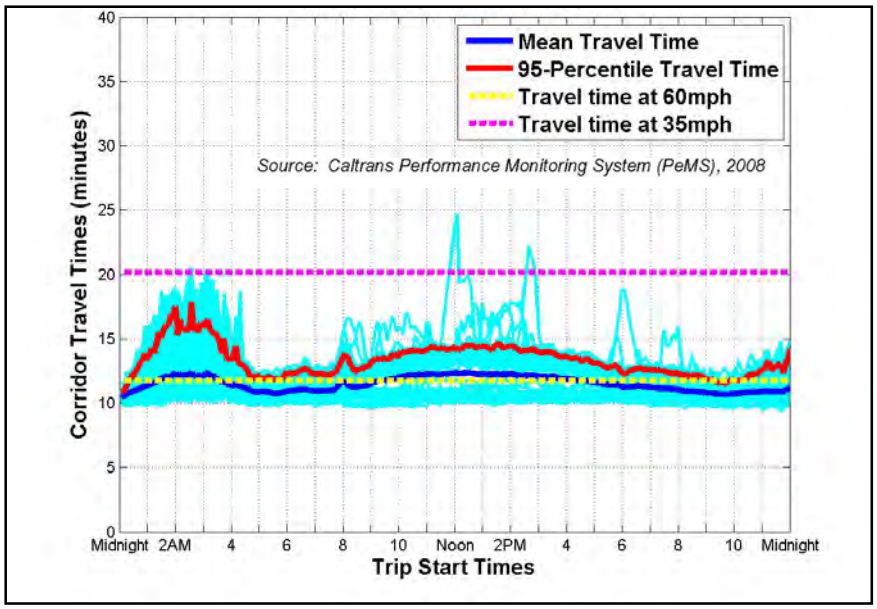


Figure 4.16 I-5 Southbound Average Weekday Travel Times from SR-12 to SR-4 (minutes)

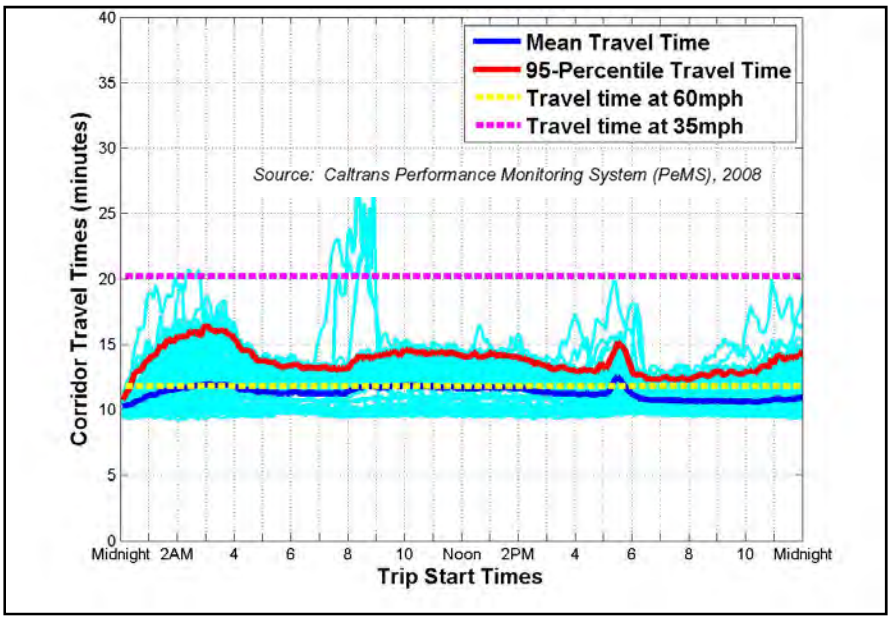


Figure 4.17 I-5 Northbound Average Weekday Travel Times from SR-4 to SR-12 (minutes)

4.2.2 Buffer Index

Another way to summarize travel time data is through the "buffer index". The *buffer index* is a percentage that shows the additional time that would have added to the average travel time to reach the 95th percentile peak travel time. A larger buffer index indicates a large amount of variation in observed travel times, due to recurrent congestion, accidents, other incidents and construction. The average travel times and buffer index are illustrated

in Figure 4.18 through Figure 4.25. The presence of roadway maintenance or construction activities on both I-5 and I-205 appear to have contributed significantly to the high buffer index outside the peak hours.

I-205 Buffer Index

The buffer index shown in Figure 4.18 demonstrates clearly that there is considerable uncertainty to travel time westbound in the AM peak period. The uncertainty is less pronounced in the PM peak period, shown in Figure 4.19. The roadway construction in I-205 during the sampling period contributed to uncertainty in travel times in the overnight hours.

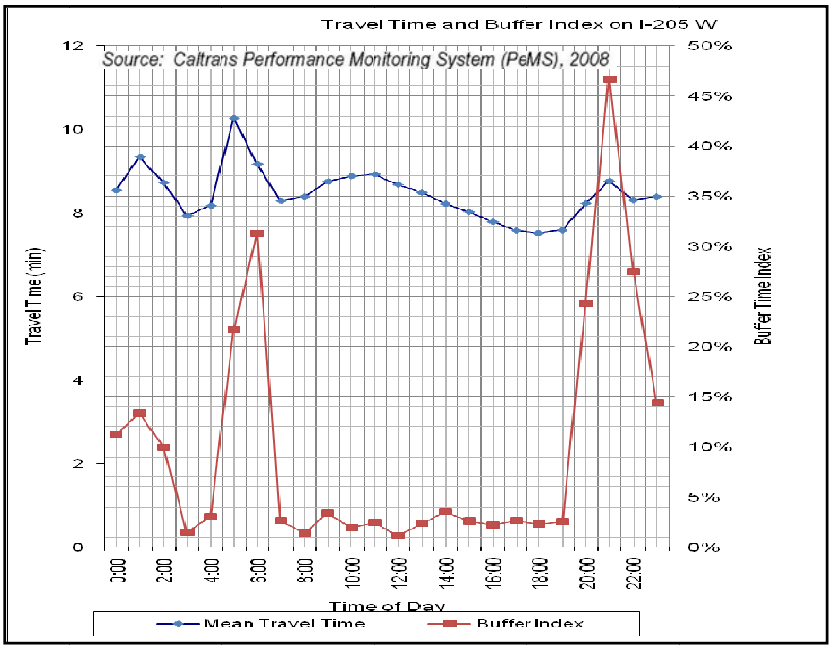


Figure 4.18 Buffer Index of I-205 Westbound

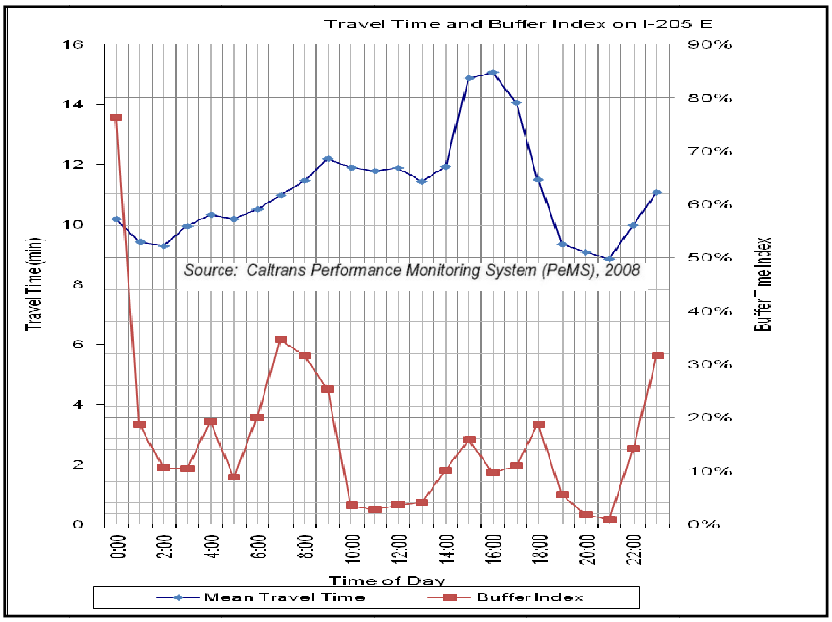


Figure 4.19 Buffer index I-205 Eastbound

I-5 Buffer Index

The I-5 buffer index is demonstrated in three separate segments. The segment shown in Figure 4.20 demonstrates clearly that there is not much greater than a 10 percent variation at any times of the day. The same is true for the northbound direction, shown in Figure 4.21, except for the AM peak commute hours.

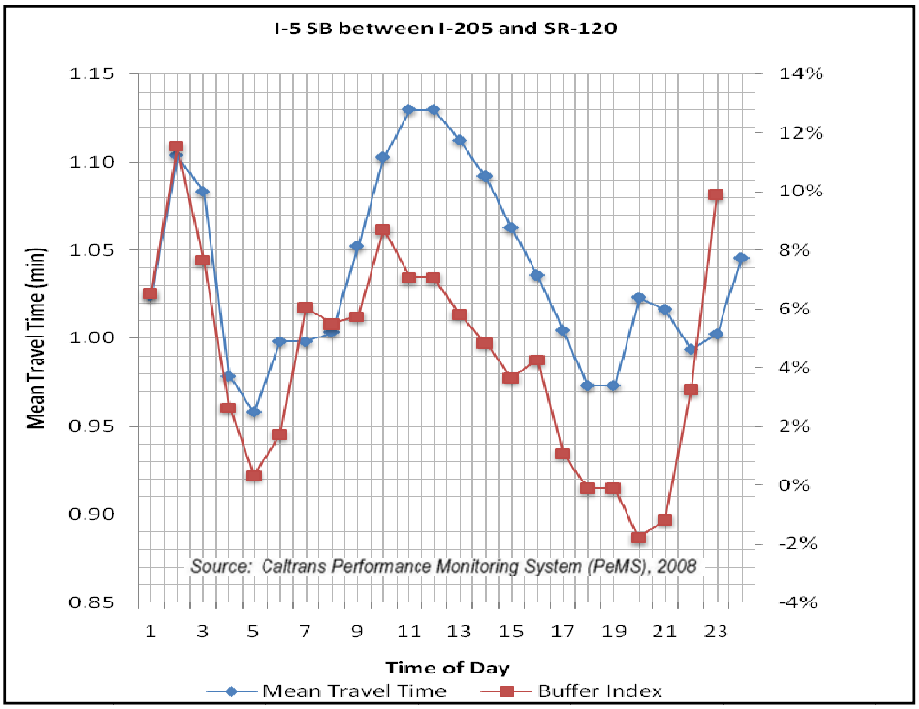


Figure 4.20 Buffer index I-5 Southbound from SR-120 to I-205

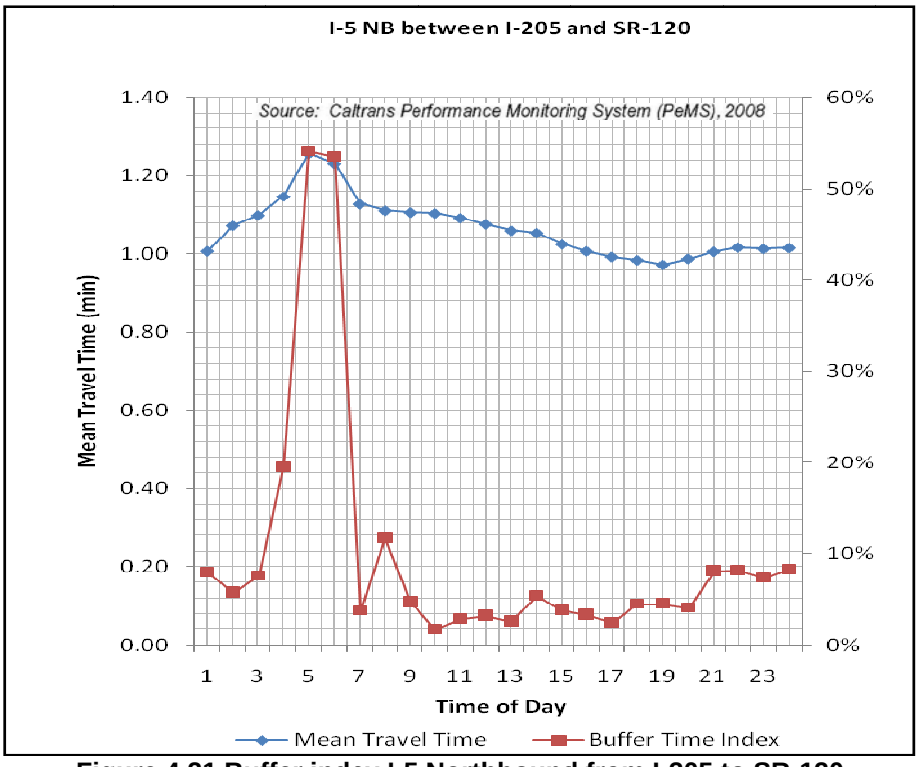


Figure 4.21 Buffer index I-5 Northbound from I-205 to SR-120

The segment between SR-120 and SR-4 (Crosstown Connector), as shown in Figure 4.22, again shows little uncertainty in travel time, except for a period at around 11 pm, demonstrating road maintenance disruptions that occurred in the study period southbound. The same pattern is found northbound as shown in Figure 4.23, with the same late evening occurrence because of road maintenance disruptions.

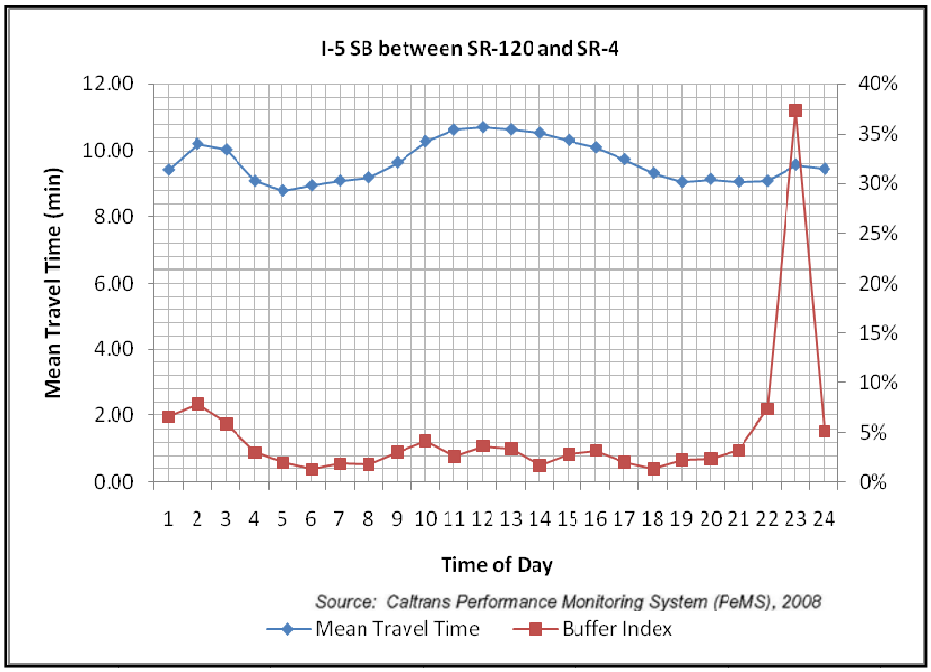


Figure 4.22 Buffer Index I-5 Southbound from SR-4 (Crosstown Connector) to SR-120

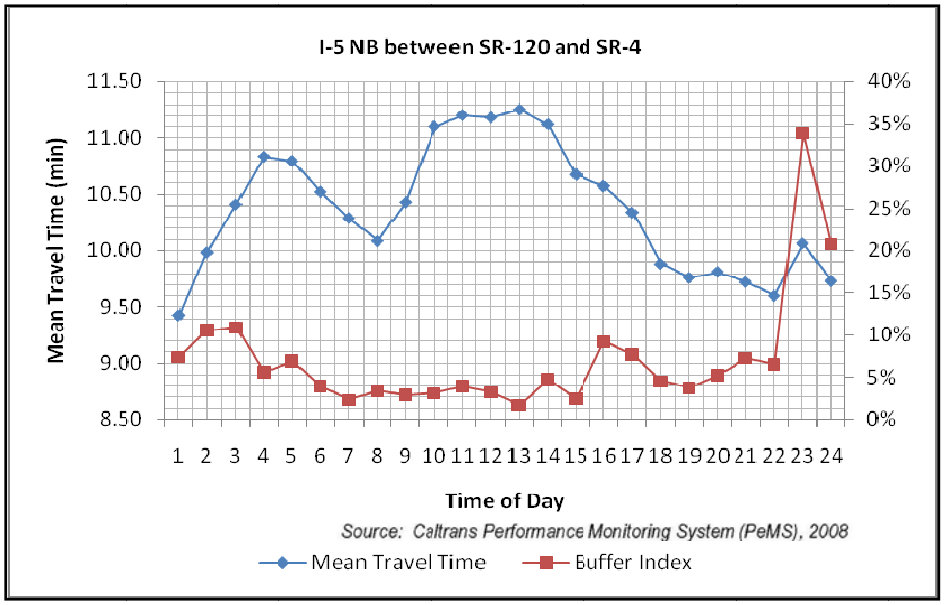


Figure 4.23 Buffer Index I-5 Northbound from SR-120 to SR-4 (Crosstown Connector)

The southbound segment between SR-4 (Crosstown Connector) and SR-12 shows virtually no variation greater than 7 percent in daytime hours, as shown in Figure 4.24. Figure 4.25, which is the same segment in the northbound direction, shows little uncertainty in travel time, except for a period at around 11 pm, demonstrating road maintenance disruptions that occurred in the study period increases the uncertainty to 23 percent, and a less occurrence in the PM peak commute hours of 15 percent.

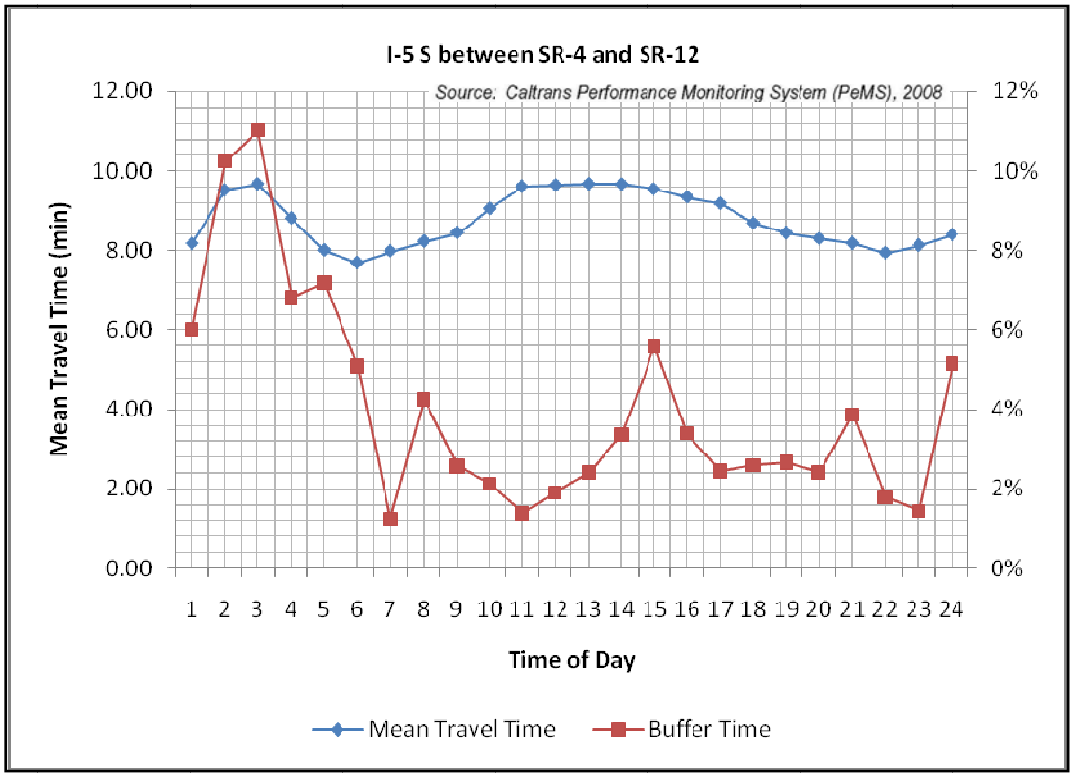


Figure 4.24 Buffer Index I-5 Southbound from SR-12 to SR-4 (Crosstown Connector)

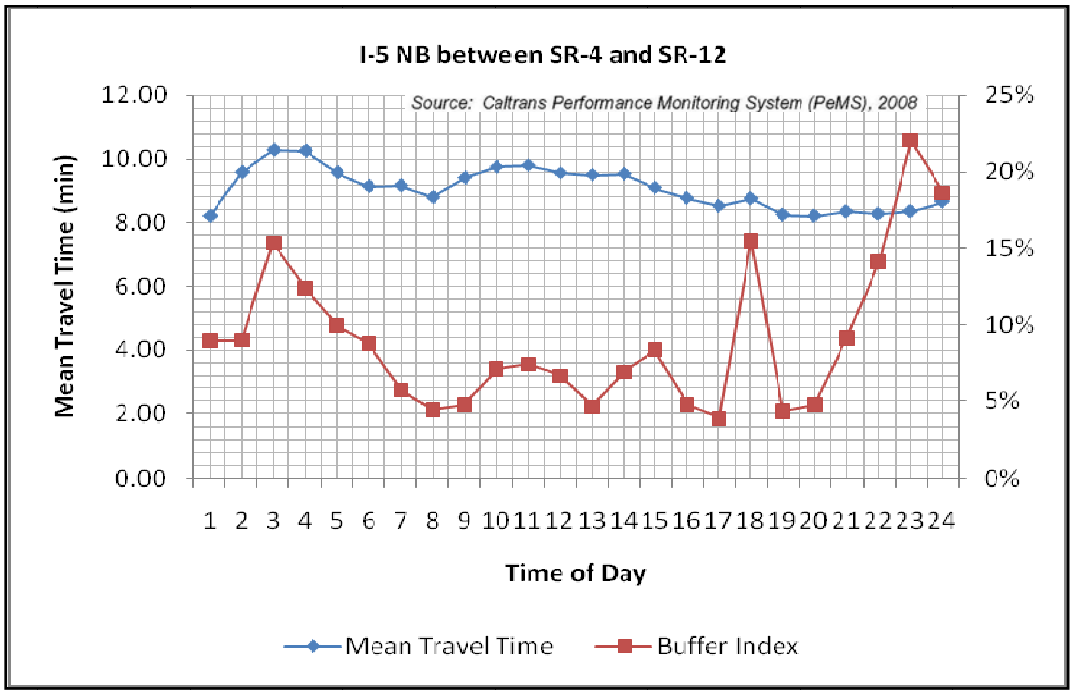


Figure 4.25 Buffer Index I-5 Northbound from SR-4 (Crosstown Connector) to SR-12

4.2.3 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, while smooth pavement can have the opposite effect. It is possible for a roadway section to have structural distress without affecting ride quality. Likewise, a roadway section may exhibit poor ride quality, while the pavement remains structurally adequate.

Pavement roughness is generally defined as an expression of irregularities in the pavement surface that adversely affect the ride quality of a vehicle (and thus the user). Roughness is an important pavement characteristic because it affects not only ride quality but also vehicle delay costs, fuel consumption and maintenance costs. The World Bank found road roughness to be a primary factor in the analyses and trade-offs involving road quality vs. user cost (UMTRL 1998).

The International Roughness Index (IRI) is one of the most prevalent measures used to quantify pavement roughness or present pavement serviceability.

Pavement Condition on I-205

The Caltrans Division of Maintenance conducts a Pavement Condition Survey (PCS) to identify pavement distress. The PCS is used to identify needs in the roadway preservation programs (Roadway, Rehabilitation, and Pavement Preservation). Based on 2005 PCS data provided by Caltrans, I-205 has 50.1 lane miles identified for rehabilitation strategies.

Additional data was available from the 2007 PCS data on The International Roughness Index (IRI). This index, calculated in inches per mile, was shown to range between 85 and 316 for segments of the corridor. A breakdown of these data shows the following:

- Eight (8) percent, was considered to have good pavement conditions (IRI < 95)
- Seventy-eight (78) percent, was considered to have acceptable pavement conditions (95 < IRI >170)
- Fourteen (14) percent was considered to have unacceptable pavement conditions (IRI > 170)

These reports were prepared before completion of the major widening in much of the corridor, adding an additional lane in each direction. This project introduced approximately 40 percent more lane miles to the corridor in good condition, and improved approximately 45 lane miles of the 50.1 lane miles identified in 2005.

Pavement Condition on I-5

Pavement conditions on I-5 have recently be improved as well. The 2005 PCS data reported that I-5 portion of the study corridor had 117 lane miles identified for rehabilitation strategies.

A breakdown of the International Roughness Index on the corridor from the 2007 PCS data shows the following:

- 7 percent, was considered to have good pavement conditions (IRI < 95)
- 45 percent, was considered to have acceptable pavement conditions (95 < IRI >170)
- 48 percent was considered to have unacceptable pavement conditions (IRI > 170)

These reports were prepared before completion of major rehabilitation in much of the corridor.

4.3 Safety

4.3.1 Overall Incident and Accident Information.

The adopted performance measures to assess safety are the total number of incidents and the incident rates. These characteristics are computed using the Caltrans Traffic Accident Surveillance and Analysis System (TASAS).

Overall accident rates and numbers of accidents are available from TASAS. These are summarized in Table 4.3. For I-5 in both directions and I-205 westbound, the accident rate per million vehicle miles is at or below the statewide average, listed on the Caltrans web site. The one area with an aggregate higher rate is I-205 eastbound, where the accident rate is 1.7 times the statewide average.

Table 4.3 Accident Summary by Freeway Segment

Freeway	Direction	Segment	Post Mile	Number of Accidents	Accident Rate (per mile)	Accident Rate (per MVM)[2]	State Average Accident Rate (per MVM)[2]
I-205	Eastbound	Between I-580 and I-5	0.00-12.70	1,030	81.1	1.46	0.87
	Westbound	Between I-5 and I-580	0.00-12.70	614	48.35	0.87	0.87
I-5	Northbound	Between Kasson Rd and SR-12[1]	11.00-42.00	1,106	35.68	0.63	0.83
	Southbound	Between SR-12 and Kasson Rd[1]	11.00-42.00	1,197	38.61	0.68	0.83

[1] In this table, the segment boundaries on I-5 are set by the TASAS reporting system, and do not exactly match the I-5 segment studied here.

[2] MVM – million vehicle-miles

Source: TASAS, August 2004 through July 2007

The locations of incidents on I-5 are illustrated in Figure 4.26 and Figure 4.27 on the following page. These figures (derived from PeMS) show that the numbers of other incidents exceeds the number of accidents.

In the northbound direction, there is a high concentration of incidents around PM 35 (Eight Mile Road), PM 30 (March Lane) and in the section PM 24.5 to 27.5 (SR-4W to Monte Diablo). In the southbound direction, there are clusters of incidents at PM 13 (I-205 split), PM 26 (SR-4 Crosstown Connector) and PM 30 (March Lane). Since some data show no incidents and the adjacent post mile shows high numbers of incidents, some records may be reported at adjacent postmiles, creating higher than expected readings at these locations. Appendix A provides a reference for postmile locations.

The recent opening of the additional lane on I-205 may change the safety performance of the corridor. The opening has not been long enough for an appropriate evaluation on its impacts to accidents to be determined. Historical accident rates on I-205 before the widening project, shown in Table 4.4, identified two areas had rates higher than the statewide average – between 11th Street and MacArthur Drive. The segment between Tracy Boulevard and MacArthur Drive had the highest rate.

Table 4.4 Accident Rates on I-205 Before Widening

Post Mile	Segment Description	Total Number of Accidents	Accident Rate (per MVM)[1]	Statewide Average Accident Rate (Per MVM)[1]
00.00-01.37	Alameda County Line to Mountain House	113	.65	.81
01.37-03.37	Mountain House to 11th Street	204	.83	.81
03.37-05.20	11th Street to Grant Line Rd.	158	.84	.78
05.20-07.00	Grant Line Rd. to Tracy Blvd.	303	1.64	1.03
07.00-08.13	Tracy Blvd. to MacArthur Dr.	247	2.14	1.33
08.13-13.39	MacArthur Dr. to Jct. I-5	582	1.01	.76

[1] MVM – million vehicle-miles
Source: Caltrans, Traffic Accident Surveillance and Analysis System (TASAS) database, January 1, 2004 through December 31, 2006

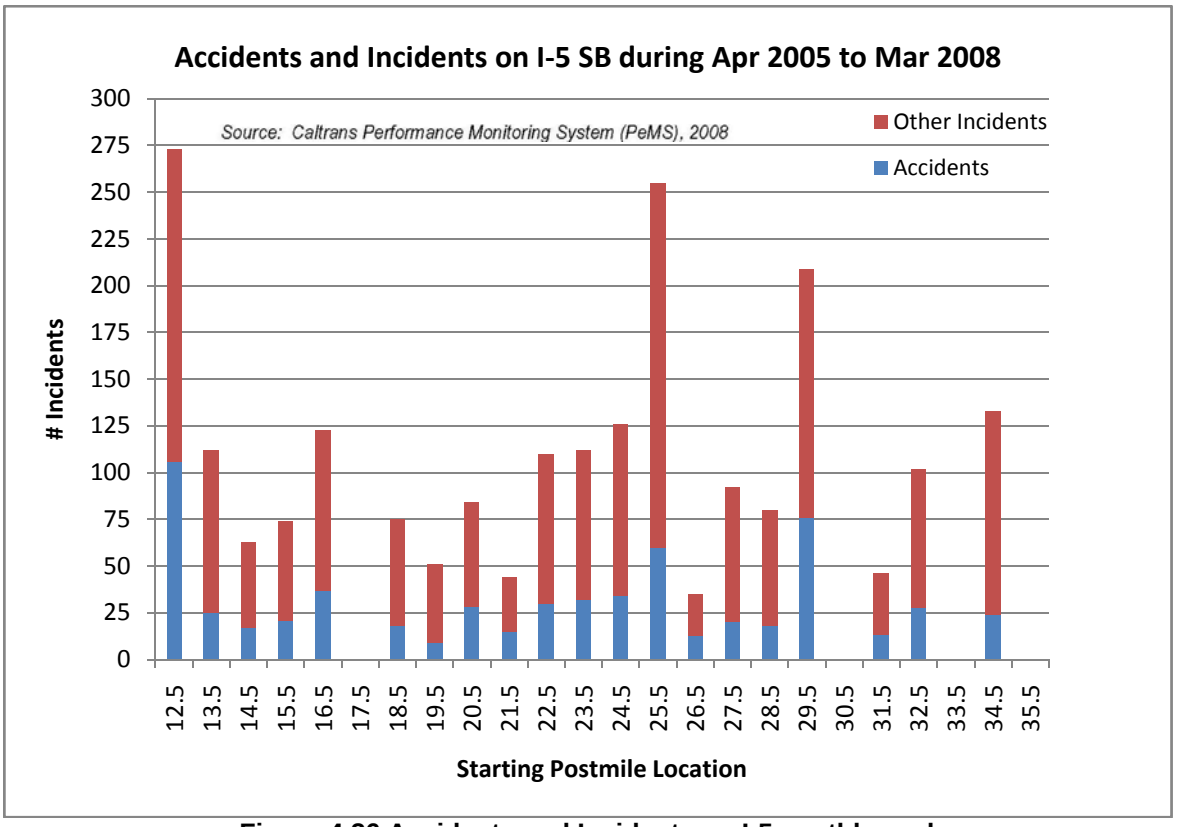


Figure 4.26 Accidents and Incidents on I-5 southbound

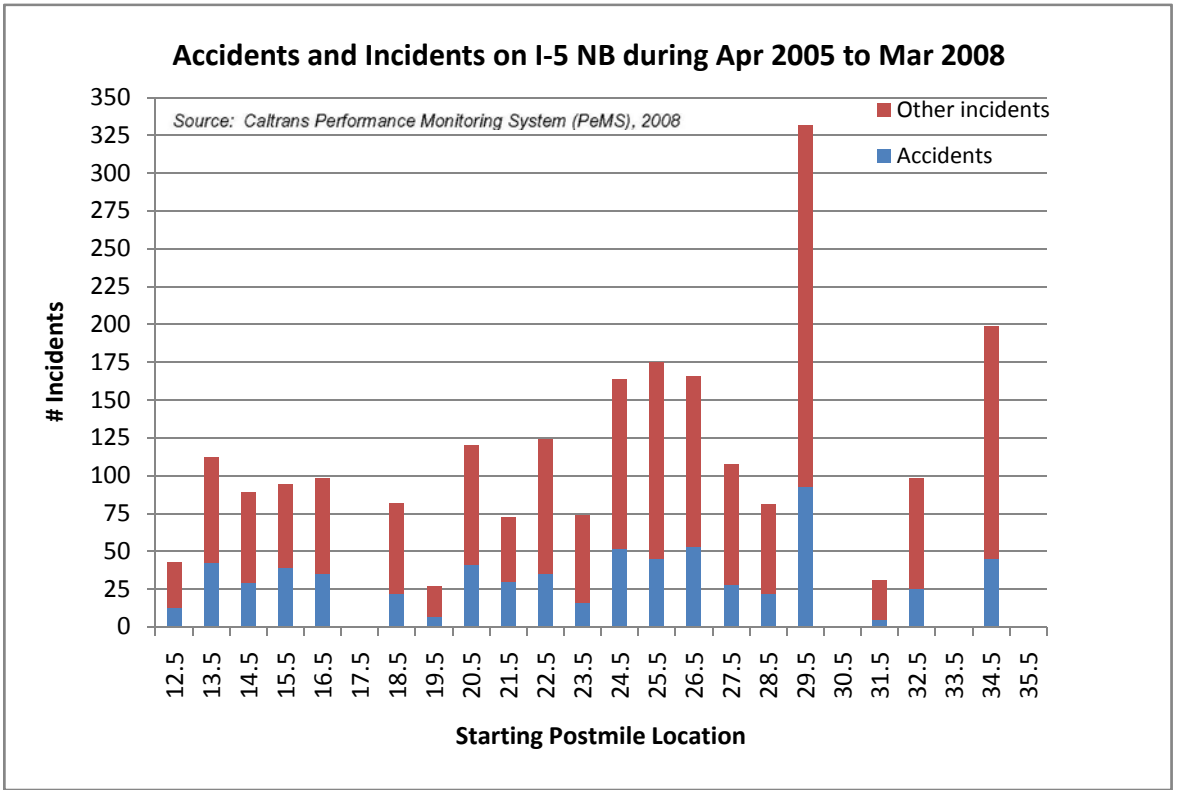


Figure 4.27 Accidents and Incidents on I-5 Northbound

4.4 Productivity

Productivity is a system efficiency measured used to analyze the effective capacity of the corridor. The concept is best described as a relationship between volume and capacity.

Clearly, a roadway's productivity is enhanced when more vehicles are on a facility – to a point. As more vehicles are added, travel speeds fall. As the speeds deteriorate, a point is reached where the actual number of cars cannot be carried by the system, and the flow rates begin to drop. This *optimum capacity* reflects the most effective utilization of the roadway at its preferred level.

For freeways, this point is reached at about half of the free-flow speed. This is typically assigned to be 35 miles an hour. Once speeds fall below 35 miles an hour, the flow of traffic volumes that can be carried by the roadway falls. This concept of "lost productivity" is illustrated in Figure 4.28 by an example from SR-99 in Sacramento County. As traffic flow increases to the capacity limits of a roadway, speeds often decline rapidly at merge/weave locations (e.g., at on-ramps) and throughput drops dramatically. This loss in throughput is the lost productivity of the system.

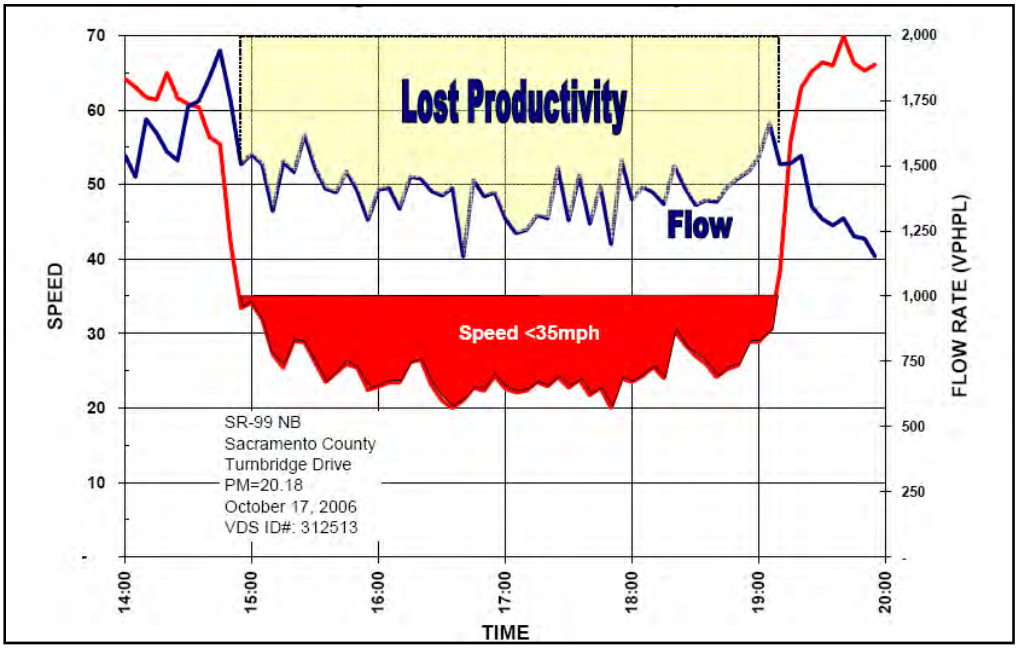


Figure 4.28 Illustration of Lost Productivity

For reporting purposes, this lost productivity was converted into "equivalent lost lane-miles." These lost lane-miles represent a theoretical level of capacity that would have to be added in order to achieve maximum productivity. Equivalent lost lane-miles is computed as follows (for congested locations only):

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

Lost lane miles represent a theoretical level of capacity that would have to be added in order to achieve maximum productivity. For examples, losing six lane-miles implies that adding a new lane along a six-mile section of freeway would improve productivity.

The results for the study corridors are summarized in Table 4.4 The data used in this analysis is based on PeMS data from a Tuesday, Wednesday or Thursday between September 9 and October 30, 2008. (Fridays were not included in this analysis.) The analysis shows that there is lost productivity to a significant degree on I-205 eastbound and I-5 northbound between SR-4 (Crosstown Connector) and SR-12. The lost lane productivity

occurs as a result of afternoon peak hour congestion. It is important to also note that many segments have delay during the midday as well as during the peak commute times, indicating some lost productivity throughout the day.

Table 4.5 Lost Productivity (less than 35 mph)

Freeway	Segment	AM Peak Period (5 – 10 am)	Midday (10 am – 2 pm)	PM Peak Period (2 – 7 pm)	Total (5 am – 7 pm)
I-205 Eastbound	I-580 to I-5*	0.1	0.4	8.6	9.1
I-205 Westbound	I-5 to I-580*	0.8	0.0	0.0	0.8
I-5 Northbound	SR-4 (Crosstown Connector) to SR-12	2.1	1.4	2.3	5.8
I-5 Northbound	SR-120 to SR-4 (Crosstown Connector)	0.5	0.2	0.9	1.6
I-5 Northbound	I-205 to SR-120	0.0	0.0	0.0	0
I-5 Southbound	SR-12 to SR-4 (Crosstown Connector)	0.3	0.6	0.3	1.2
I-5 Southbound	SR-4 (Crosstown Connector) to SR-120	0.0	0.4	0.3	0.7
I-5 Southbound	SR-120 to I-205	0.8	0.2	0.2	1.2

** Lost productivity based on surveys before the additional lanes were provided on this segment.*
Source: Caltrans Performance Monitoring System (PeMS) – September 9 to October 30, 2008; Tuesdays through Thursdays

The addition of travel lanes on I-205 and declining economic activity were factors to remove observed delays of less than 35 mph from I-205.

4.5 Arterial Roadway Intersection LOS Analysis

Because traffic management strategies can include use of the adjacent arterial roadways, the performance of these intersections is important to have available. A study of traffic intersection operations at a number of locations in the study area have been made, and reported as Intersection Level of Service.

The Intersection Level of Service was calculated based on existing geometry, signal timing and counts. It is shown for all study intersections in Appendix B. The calculations cover four peak hours that during a weekday on a Tuesday, Wednesday or Thursday. The peak hours were 7 am to 9 am and 4 pm to 6 pm.

The results indicate that LOS F is estimated to be occurring at five locations, shown on Figure 4.29:

- Pershing Avenue / Hammer Lane 4 pm to 6 pm
- Pershing Avenue / March Lane 4 pm to 6 pm
- Pacific Avenue / March Lane 4 pm to 5 pm
- Grigsby Place / Benjamin Holt Drive 7 am to 8 am
- Feather River Drive / March Lane 5 pm to 6 pm

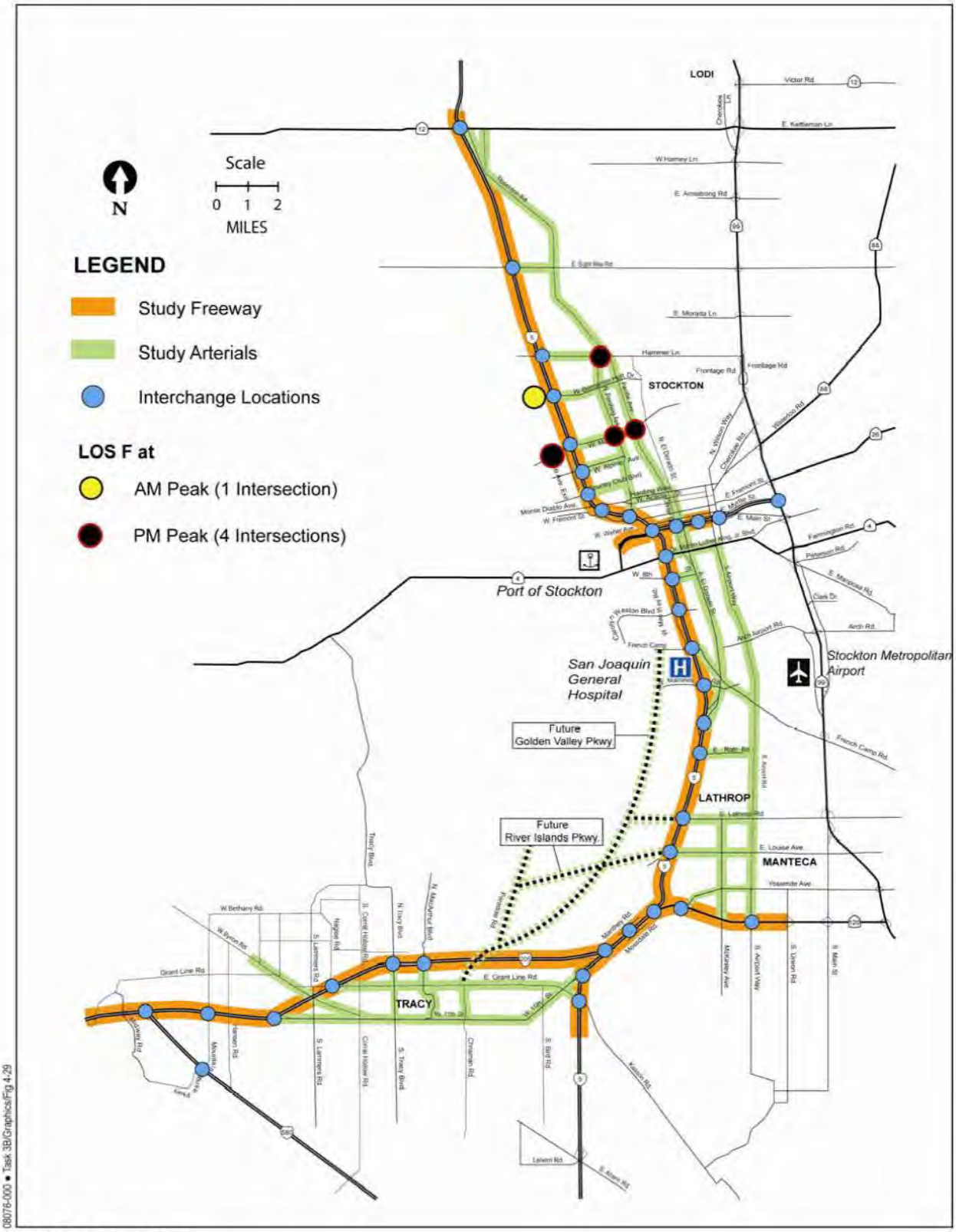


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Figure 4.29 Arterial Intersections Operating at Level of Service F

4.6 Daily and Seasonal Variations in Freeway Traffic Operations

A review of traffic volume and average speed data was undertaken to see if there are differences in performance measures along the corridor during certain days of the week, or in certain months of the year. Fridays are the days with the highest amount of congestion on both I-205 and I-5. Table 4.5 shows the total VMT by corridor segment and direction.

Table 4.6 Day of Week Comparisons

Day of Week	I-5 North	I-5 South	I-205 West	I-205 East	Total
Sunday	607,225	734,025	159,734	147,122	1,341,250
Monday	767,423	894,760	169,829	166,586	1,662,184
Tuesday	783,198	887,037	163,994	170,255	1,670,236
Wednesday	802,623	907,925	167,987	176,073	1,710,548
Thursday	822,021	930,665	170,318	180,856	1,752,687
Friday	908,821	989,607	180,037	199,005	1,898,427
Saturday	719,937	776,675	166,793	185,345	1,496,611
Weekday	816,817	921,999	170,433	178,555	1,738,816
Sunday	74.3%	79.6%	93.7%	82.4%	77.1%
Monday	94.0%	97.0%	99.6%	93.3%	95.6%
Tuesday	95.9%	96.2%	96.2%	95.4%	96.1%
Wednesday	98.3%	98.5%	98.6%	98.6%	98.4%
Thursday	100.6%	100.9%	99.9%	101.3%	100.8%
Friday	111.3%	107.3%	105.6%	111.5%	109.2%
Saturday	88.1%	84.2%	97.9%	103.8%	86.1%
Weekday	100.0%	100.0%	100.0%	100.0%	100.0%

Figure 4.30 provides a graphical comparison of average vehicles miles traveled (VMT) in 2008 on I-205 and I-5 in each direction, for each day of the week. The graph shows percentages as compared to an average weekday (average weekday = 100 percent). By using percentages, the overall activity variations on the corridor can be more easily interpreted. The graph also demonstrates that weekends are generally lower, that average Saturdays are higher days than average Sundays, and that I-205 westbound is the segment with the most steady daily VMT (in comparison to the other corridor directions).

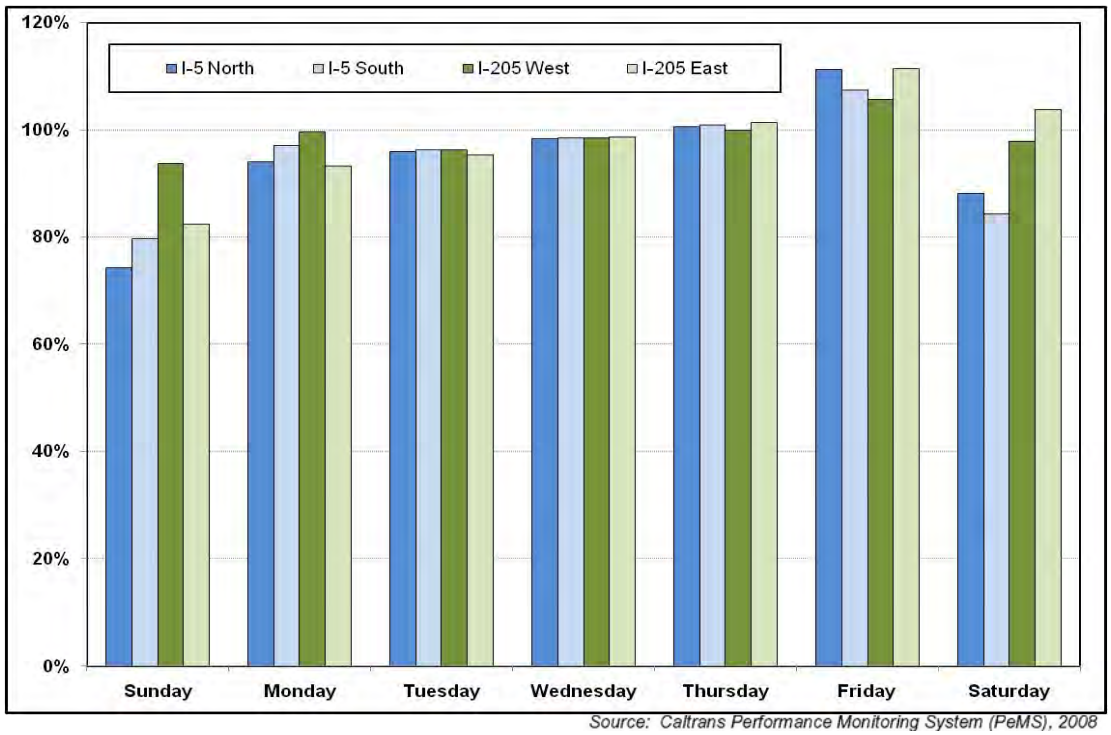

Figure 4.30 Daily VMT Relative to Friday VMT as a Percentage

5 BOTTLENECK ANALYSIS

Understanding the locations of major bottlenecks and their relative degradation to the transportation system's performance in the corridor is crucial to developing an effective CSMP because bottlenecks are often one of the most identifiable causes of recurrent congestion and lost productivity. Using the survey information presented in prior chapters, this chapter identifies the major bottlenecks and quantifies the relative degradation to the degree possible. This provides a more in-depth understanding of the causes of corridor performance degradation that occur at recurrent and non-recurrent bottlenecks.

A "bottleneck" occurs when traffic must slow down to traverse a roadway segment. Typically, bottlenecks occur with a lane merge, a lane drop, weaving or an accident. These points are when the roadway traffic demands approach full saturation of the facility. From the bottleneck point, the traffic delays extend upstream to a point where a slowdown begins. When bottlenecks occur, the begin close to the point of origin, growing in length upstream to the furthest congestion distance, and then reduce in length again until the bottleneck disappears because of a reduced traffic demand. For these freeway corridors, each bottleneck location has been defined as the end of the link at which speed is below 40 miles per hour and rises above 40 miles per hour for the downstream link (as defined in the Caltrans PeMS form: http://pemsforum.dot.ca.gov/?page_id=79).

Generally, there are multiple causes attributable to creating bottlenecks, such as:

- Merging freeways at interchanges
- Growth (development)
- Lane drops
- Increased traffic volumes
- Missing auxiliary lanes
- Geometric constraints
- Interchange design restrictions
- Construction activity

This section of the report identifies all potential bottlenecks, describes them, and defines their causality.

5.1 Recurrent Congestion

5.1.1 Identification of Potential Bottlenecks

The primary cause of recurrent performance degradation is a combination of changes in geometrics with high levels of demand. The performance of system data presented in Chapter 4 help to identify the bottleneck locations where these occur. The information on recurrent congestion is available from the PeMS, 2007 HICOMP report and field observations. A summary of the potential bottleneck locations identified from a variety of sources are shown in Table 5.1.

There are several bottleneck areas that have been observed in the morning travel time periods. Bottlenecks appear in the I-205 westbound direction in the vicinity of Mountain House Parkway, East Grant Line Road and MacArthur Drive. On I-5, there is a slight southbound delay that also appears in the AM study period as far north as Hammer Lane to a bottleneck at the curves in the vicinity of Monte Diablo Avenue.

There are identified delays during the PM peak as well. These are located on I-5 and I-205 in the same areas but are generally in the opposite direction. On I-205 there is congestion throughout the Tracy area from Mountain House Parkway to I-5. On I-5 northbound, a second congestion point occurs north of Downtown Stockton during the PM peak between SR-4 and March Lane.

Several of these bottleneck locations were clearly observed in the travel time surveys performed for the project. During the PM peak hour, two recurring significant bottlenecks were identified. The first bottleneck was found on I-205 eastbound beginning at the MacArthur Drive on-ramp, extending back to the Tracy Boulevard off-ramp. On I-5 northbound there is a recurring queue between the Alpine Avenue off-ramp and the Country Club Boulevard off-ramp during the PM peak hour. Additional recognition of generalized congestion in the PM peak period on I-5 northbound between the I-205 merge and the SR-120 diverge was also reported in Caltrans field studies.

Table 5.1 Potential Bottlenecks Identified on Study Corridors

Freeway	Segment	AM Peak Period	PM Peak Period	Source
I-205 Westbound	I-5 to Paradise Road over-crossing	4:!5 to 5:00 am		*2007 HICOMP Report*
I-205 Westbound	Tracy Boulevard to Grant Line Road	4:30 to 5:45 am		*2007 HICOMP Report*
I-205 Westbound	W 11th Street to I-580	5:10 to 6:55 am		*2007 HICOMP Report*
I-5 Southbound	Hammer Lane to Country Club Blvd	7:30 to 8:45 am		*2007 HICOMP Report; Staff comments 11-09*
I-205 Eastbound	Mountain House Parkway to Grant Line Road		2:15 to 7:30 pm	*2007 HICOMP Report*
I-205 Eastbound	Grant Line Road to Tracy Boulevard		2:00 to 8:15 pm	*2007 HICOMP Report*
I-205 Eastbound	Tracy Boulevard to I-5		2:30 to 8:00 pm	*2007 HICOMP Report; Travel time field observations*
I-5 Northbound	SR-4 to March Lane		4:00 to 6:00 pm	*2007 HICOMP Report; Staff comments 11-09; Travel time field observations*
I-5 Northbound	I-205 to SR-120		4:00 to 6:00 pm	*Staff comments 11-09*

5.1.2 Description of Observed Bottlenecks Observed in HICOMP Report

The *2007 HICOMP Report*, prepared by Caltrans, identified several bottleneck areas in the morning travel time periods. ***Figure*** 5.1 illustrates the typical 2007 morning peak congestion map for the freeway study corridors from the report. Specific locations are on I-205 westbound and on I-5 southbound at this time of day.

On I-205, the congestion occurs very early, which is consistent with the PeMS volume and speed data previously presented. Bottlenecks appear in the westbound direction in the vicinity of Mountain House Parkway, East Grant Line Road and MacArthur Drive. This congestion occurs quite early in the morning (as early as 4:15 am for the segment closest to I-5), and dissipates by 6:55 am.

On I-5, there is a slight southbound delay that also appears in the AM study period – between 7:30 and 8:45 am as far north as Hammer Lane to a bottleneck at the curves in the vicinity of Monte Diablo Avenue.

Figure *5.2* identified delays during the PM peak as well. These are located on I-5 and I-205 are in the same areas but are generally in the opposite direction, as illustrated in the report diagram, shown as Figure 5.2. On I-205 there is congestion appearing as early as 2:15 pm and extending as last as 8:15 pm along the study section.

On I-5 northbound, a second congestion point occurs north of Downtown Stockton, between 4:00 pm and 6:00 pm. This section contains multiple points of reduced speeds between SR-4 and March Lane. The bottleneck includes maneuvering near the interchange of I-5 with SR-4, such as the weaving between the westbound SR-4 on-ramp and the Pershing Avenue off-ramp.

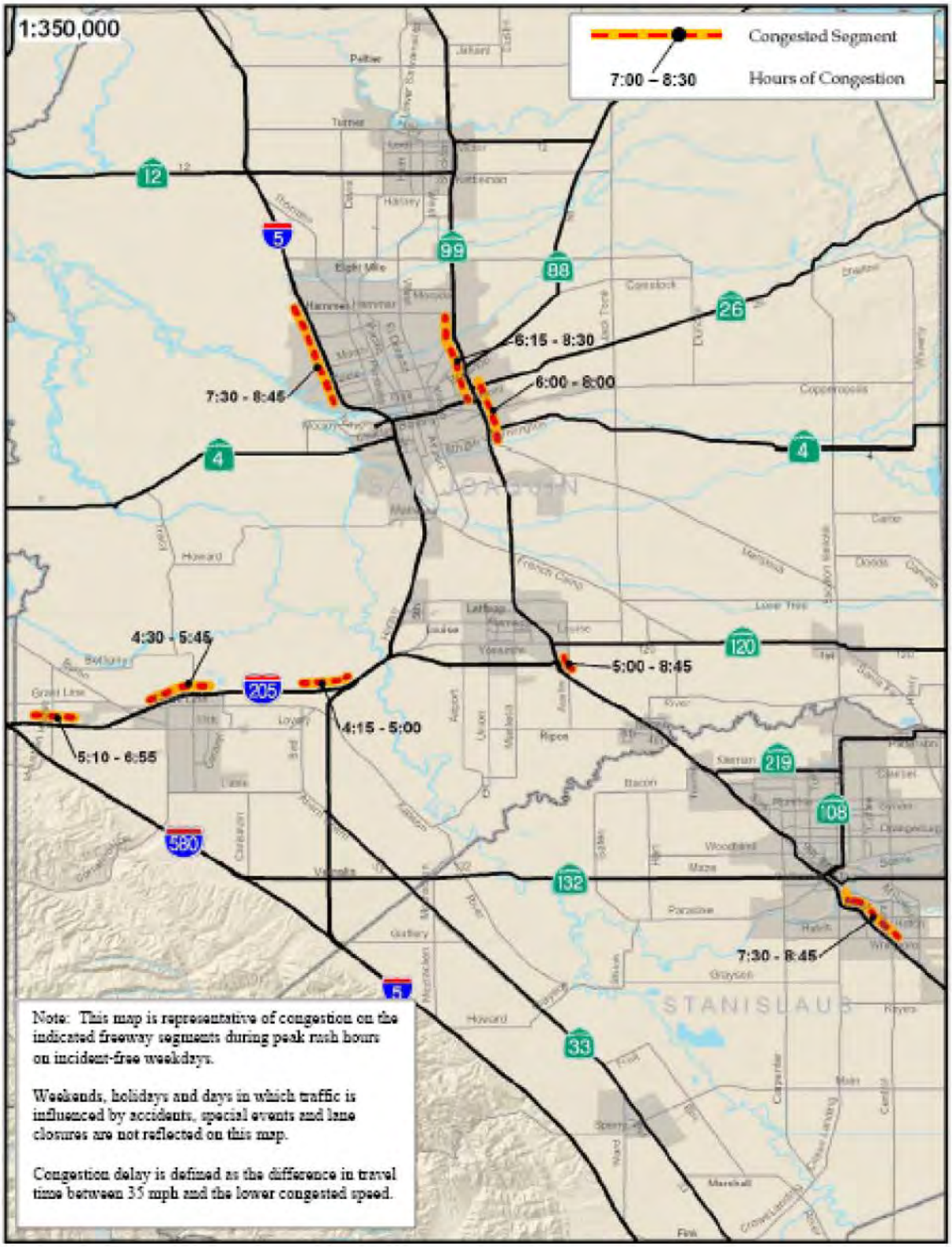

Figure 5.1 Congestion during AM Peak Period in San Joaquin County
Source: 2007 HICOMP Report, Caltrans

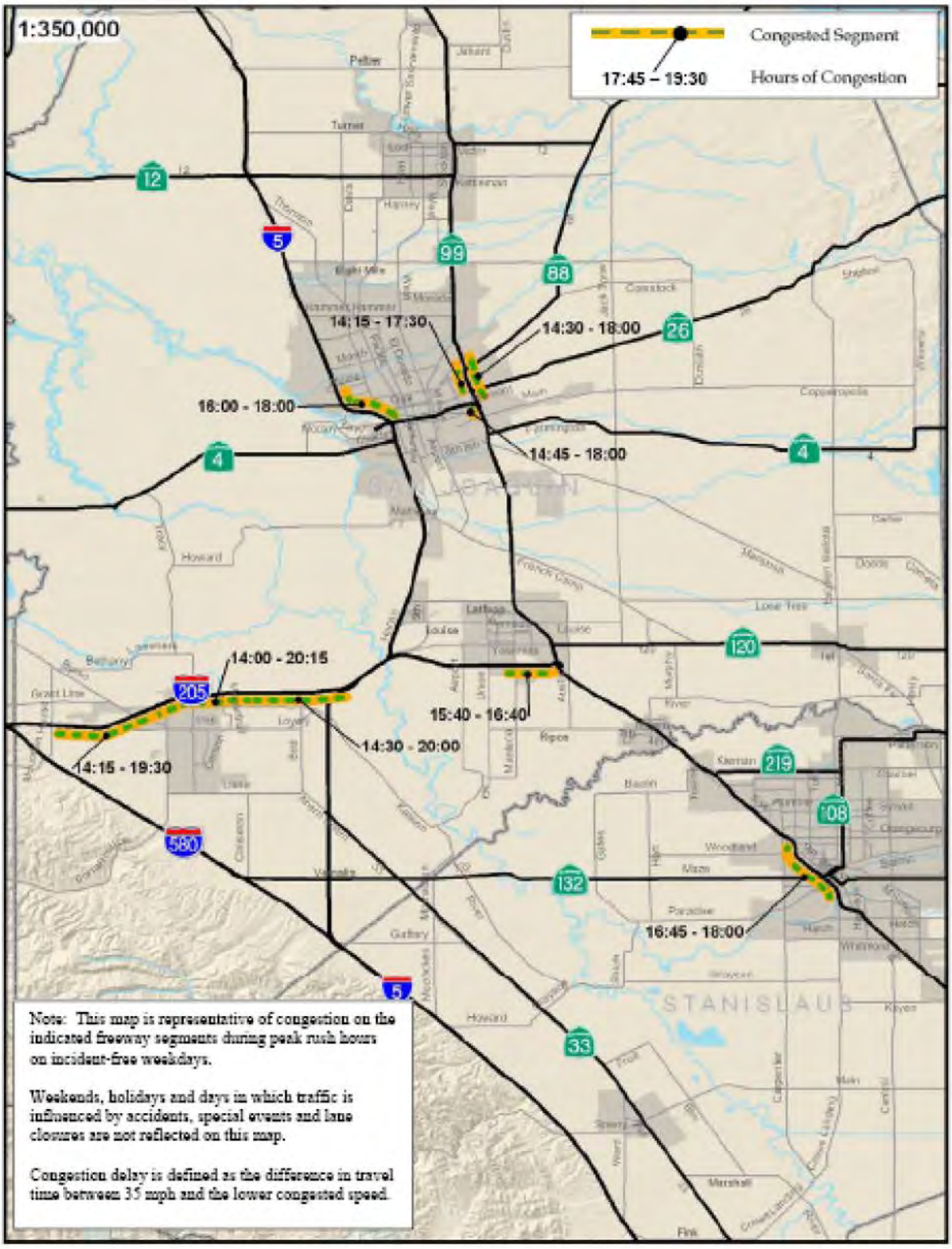

Figure 5.2 Congestion during PM Peak Period in San Joaquin County
Source: 2007 HICOMP Report, Caltrans

5.1.3 Description of Observed Bottlenecks Observed in Field Studies

Through the process of floating car runs, potential bottlenecks and their causes were studied though travel time runs. These runs were performed in the last part of 2008, and there was general agreement that a slower economy may have contributed to a reduction in the severity of the bottleneck impacts.

No recurring significant bottlenecks were identified during the AM peak hour in the DKS-led field studies in the studied project segments. Slow traffic was observed on I-205 westbound, but because speeds did not resume to 40 mph, the bottleneck is located west of the study corridor, on I-580 in the Altamont Pass area.

During the PM peak hour, two recurring significant bottlenecks were identified. The first bottleneck was found on I-205 eastbound beginning at the MacArthur Drive on-ramp, extending back to the Tracy Boulevard off-ramp. Queues along this segment typically exist between 2:30 pm and 6:30 pm.

On I-5 northbound there is a recurring queue between the Alpine Avenue off-ramp and the Country Club Boulevard off-ramp during the PM peak hour. This is caused by the merging traffic at the mainline lane drop just north of the Country Club Drive off-ramp. Large numbers of trucks in the right lane must merge into the next lane. Queues along this segment typically exist between 3:00 pm and 6:00 pm.

While general congestion is sometimes observed in other locations and during other periods, it is not evident based on the average travel times, floating car surveys, or other data that the speeds deteriorate to bottleneck situations. The average speeds confirm the bottleneck locations that were identified from other sources.

Figure 5.3 through Figure 5.8 summarize the average speed based on the floating car surveys. These surveys have result from both corridors combined as a continuous segment. There is one for each direction for the AM and PM time periods.

The analysis from the eastbound I-205 and northbound I-5 traffic, shown in Figure 5.3, demonstrates a slight decrease in speeds on I-205 eastbound during the AM peak period. However, the speeds do not deteriorate significantly enough to be a bottleneck condition.

Figure 5.4 shows the opposite direction of traffic -- southbound I-5 and westbound I-205. The delays on I-205 in this direction are apparent from the field surveys. (These observations were made before the additional lane was opened on I-205.) The deterioration clearly begins at the SR-120 interchange and extends through the corridor to just before where the third lane begins west of 11th Street in Tracy. The congestion is caused by the climb over the railroad tracks and the short on-ramp merges. It occurs occasionally between 5 am and 10 am.

The PM recurring congestion is visible in the surveys as well, as shown in Figure 5.5. This figure, which summarizes the results of the eastbound I-205 and northbound I-5 direction, the greatest bottleneck occurs on I-205 at the MacArthur Drive on-ramp merge, with speeds resuming once the I-5 merge has occurred. The queue extends past Tracy Boulevard and can extend as far back as the 11th Street off-ramp. It lasts from 2 pm to 6 pm with the maximum queue between 3 pm and 5 pm.

The southbound I-5 and westbound I-205 PM peak period congestion, shown in Figure 5.6, shows no significant speed reductions.

Figure 5.7 shows the location and extent of congestion based on the travel time surveys. This figure summarizes the field observations findings for the entire corridor. This unique map diagrams the bottleneck locations in two dimensions. The maximum length of the diagram extends back from the bottleneck. The duration of the bottleneck is indicated by the width of the “triangle” at the bottleneck point.

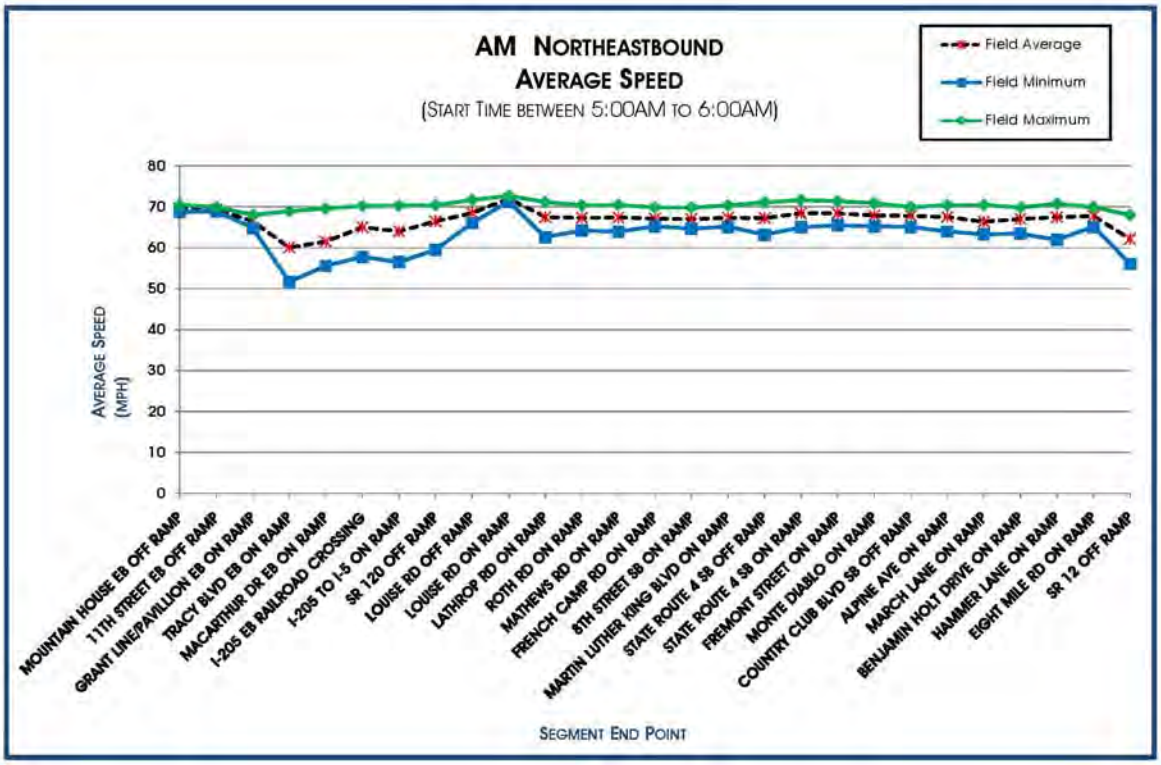

Figure 5.3 AM Peak Period I-205 East/I-5 North Average
Source: DKS Associates, 2008

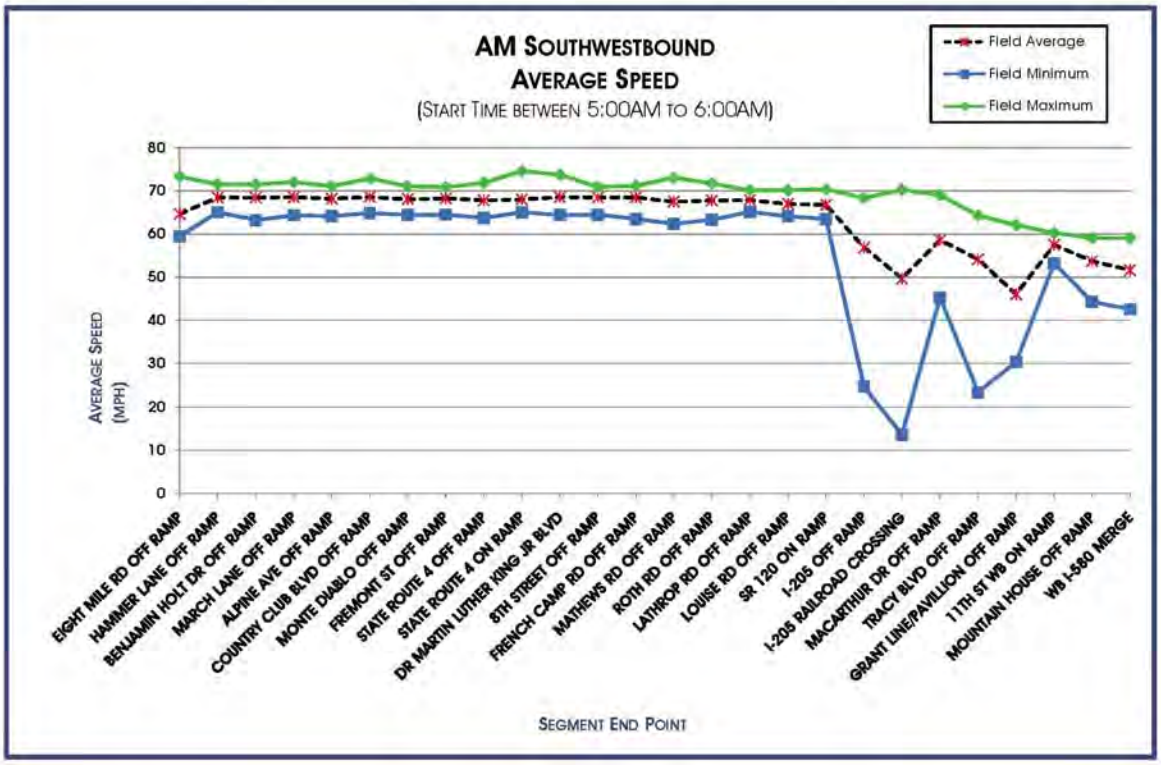

Figure 5.4 Field Studies AM Peak Period I-5 South/I-205 West Average
Source: DKS Associates, 2008

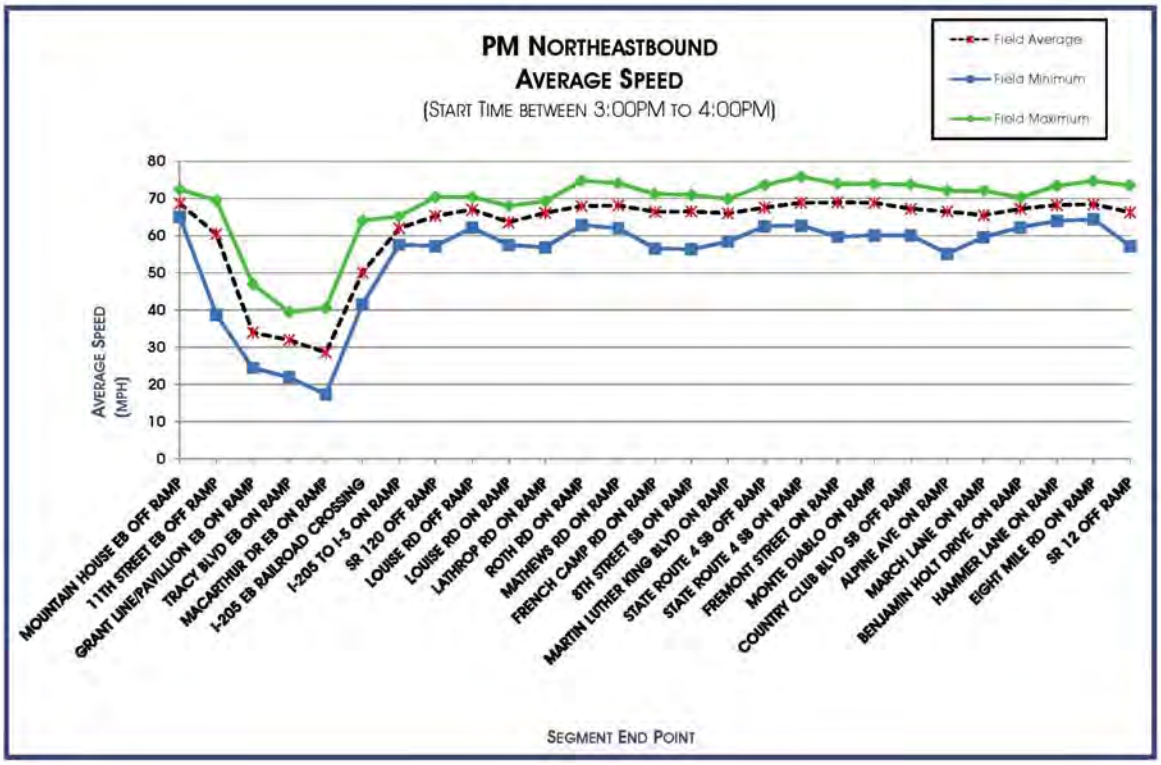

Figure 5.5 Field Studies PM Peak Period I-205 East/1-5 North Average
Source: DKS Associates, 2008

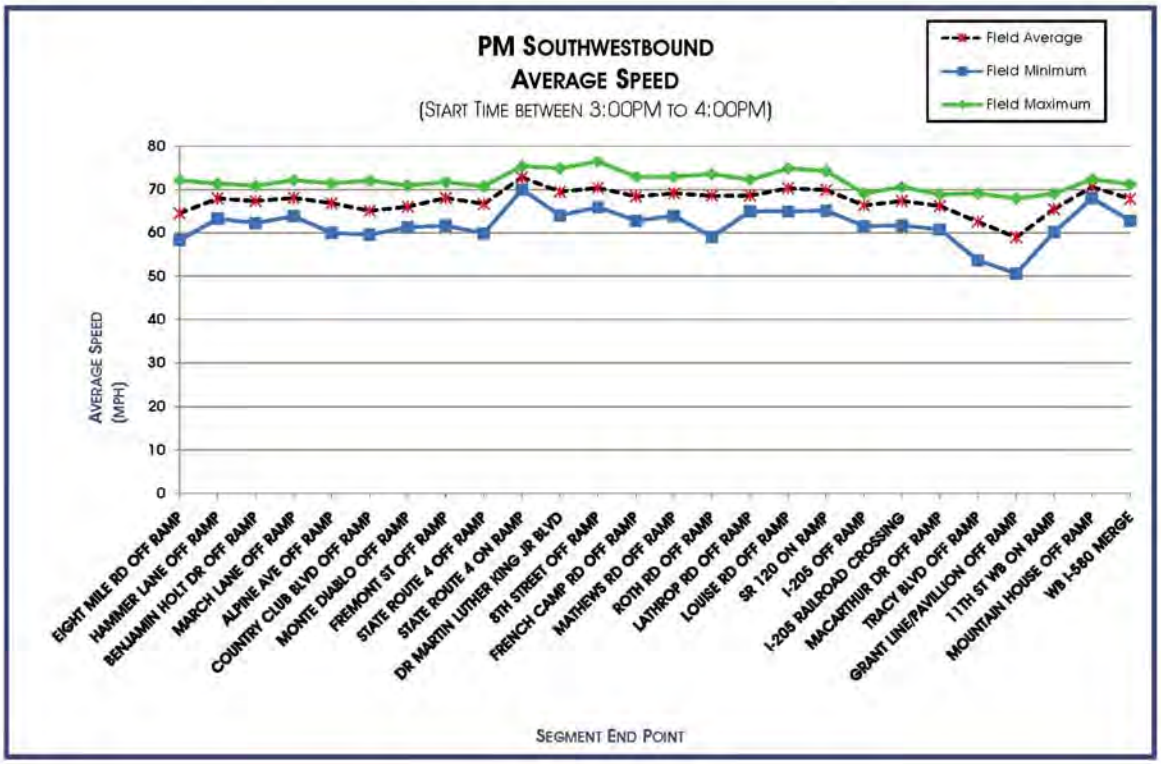

Figure 5.6 Field Studies PM Peak Period I-5 South/I-205 West Average
Source: DKS Associates, 2008

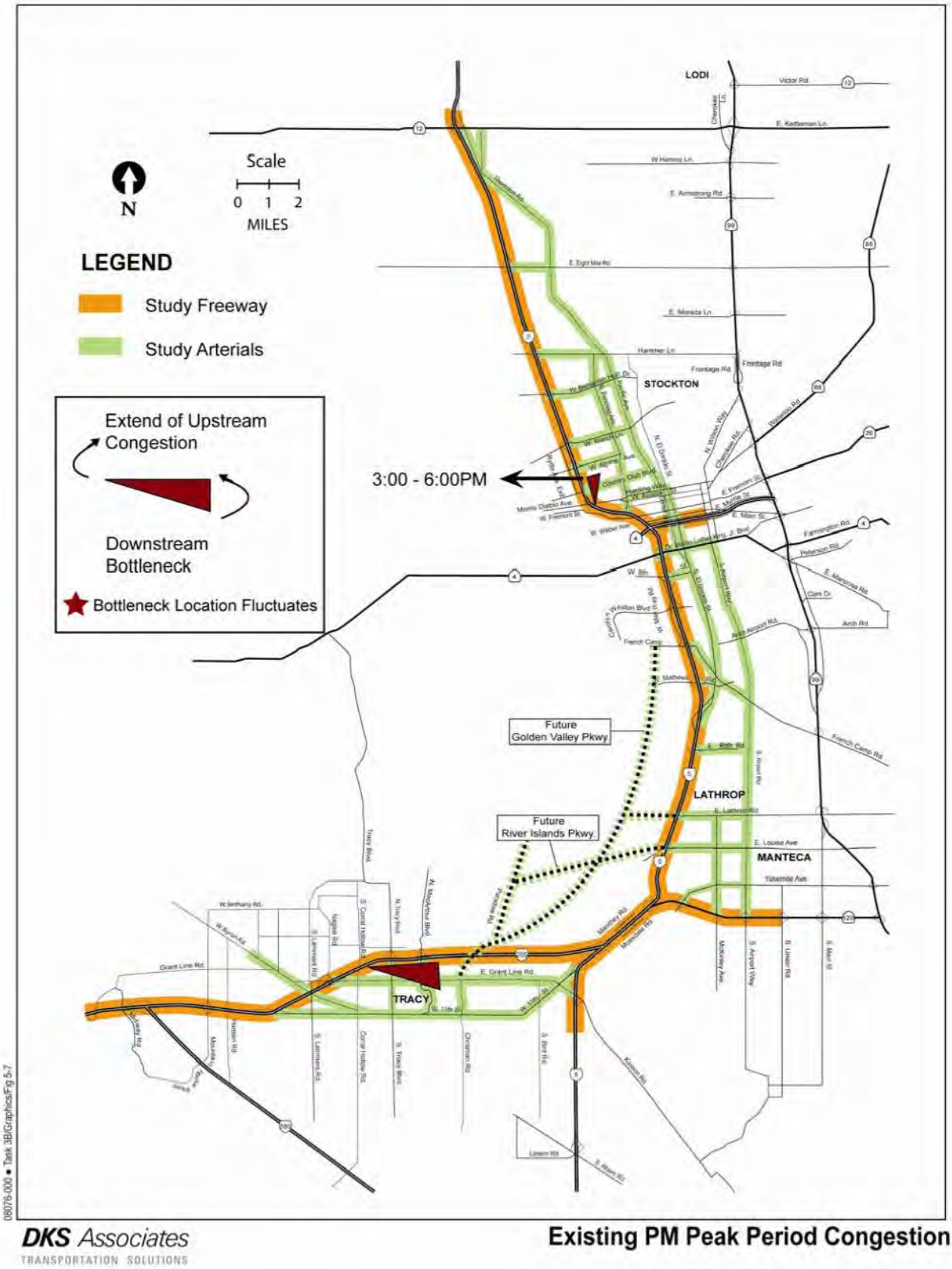

Figure 5.7 Field Studies PM Peak Period I-5 South/I-205 West Average
Source: DKS Associates, 2008

5.1.4 Causes of Observed Bottlenecks

There are several bottleneck areas that are apparent in the morning travel time periods. A summary of each major bottleneck and the cause is summarized by location:

I-205 Westbound in Tracy Area

- On I-205, the congestion occurs very early, which is consistent with the PeMS volume and speed data previously presented. Bottlenecks appear in the westbound direction in the vicinity of Mountain House Parkway, West Grant Line Road and MacArthur Drive. This reflects the high demand levels that exceed the capacity of the freeway; with additional delays created as heavy volumes of on-ramp traffic are added into the corridor. At two on-ramps at Grant Line Road and MacArthur Drive, slow moving trucks are slowing accelerating uphill on these ramps -- and then merging with only a short distance -- causing slow-moving mainline traffic to further slow to accommodate the merging vehicles. This congestion occurs quite early in the morning (as early as 4:15 am for the segment closest to I-5), and dissipates by 6:55 am.

I-5 Southbound in Northern Stockton

- On I-5, there is a slight southbound delay that also appears in the AM study period – between 7:30 and 8:45 am as far north as Hammer Lane to a bottleneck at the curves in the vicinity of Monte Diablo Avenue. There is also some lane changing activity that occurs in this vicinity that also serves to further reduce the flow of traffic at that point. Observations indicate that this bottleneck is mainly due to the large numbers of vehicles using the right lanes to exit at the various Downtown Stockton interchanges. Traffic in those lanes travels at reduced speed, while traffic volume in the left lanes is less that the capacity of those lanes, and flows at a higher speed.

I-205 Eastbound in Tracy Area

- On I-205, there had been congestion appearing as early as 2:15 pm and extending as last as 8:15 pm along the study section. The opening of the third eastbound lane on I-205 eliminated the mainline bottleneck.

- A specific additional bottlenecks remains where on-ramps were merging with the mainline traffic. Slow moving trucks were slowly accelerating uphill at the on-ramps on MacArthur Drive and Grant Line road, and then merging with only a short distance, which results in mainline operation congestion and speed reduction. Queues along this segment typically occur between 2:30 pm and 6:30 pm. The primary bottleneck cause is the slow merge of uphill on-ramp traffic from MacArthur Drive without an acceleration lane, at the high-volume section of the freeway. Merging vehicles are thus not able to enter mainline traffic streams effectively, so that mainline vehicles in the rightmost lane must also slow. The merging-related queue extends past Tracy Boulevard and can extend as far back as the 11th Street off-ramp. This bottleneck generally lasts from 2 pm to 6 pm with the maximum queues between 3 pm and 5 pm. This is illustrated in Figure 5.7.

I-5 Northbound in Northern Stockton

- On I-5 northbound, a congestion point occurs north of Downtown Stockton, between 4:00 pm and 6:00 pm. This congestion results from the high volumes of local traffic leaving the area merging at the mainline lane drop just north of the Country Club Drive off-ramp. It is also resulting from weaving on the Ship Channel bridge structure over the railroad near Downtown Stockton caused by the merging onto I-5 northbound from Westbound SR-4 and the large diverge to the Pershing Street off-ramp, in combination with the heavy traffic volumes and high truck presence on I-5 in that area. In addition, large numbers of trucks in the right lane must merge into the next lane at the point of the lane drop, and this requires slower truck movements during congested times. Queues along this segment typically exist between 3:00 pm and 6:00 pm. This is also illustrated in Figure 5.7.

5.2 Non-Recurring Congestion

A second cause of congestion is a high presence of incidents which reduce the flow of the freeways. This congestion is "non-recurring" as it only appears when accidents occur.

Data presented in the prior chapter from PeMS is available for the I-5 corridor. Data on I-205 was not available from PeMS. The highest numbers of incidents are located in the March Lane (mile post 30 area) and Eight Mile Road (mile post 35) interchange areas northbound. Additional areas are located in and near Downtown Stockton. These that the incidents that occur here are attributable to lane changes associated with the on-ramps and off-ramps. The occurrences for a three-year period are shown in Figure 5.8. The description the postmile locations are shown in Appendix A.

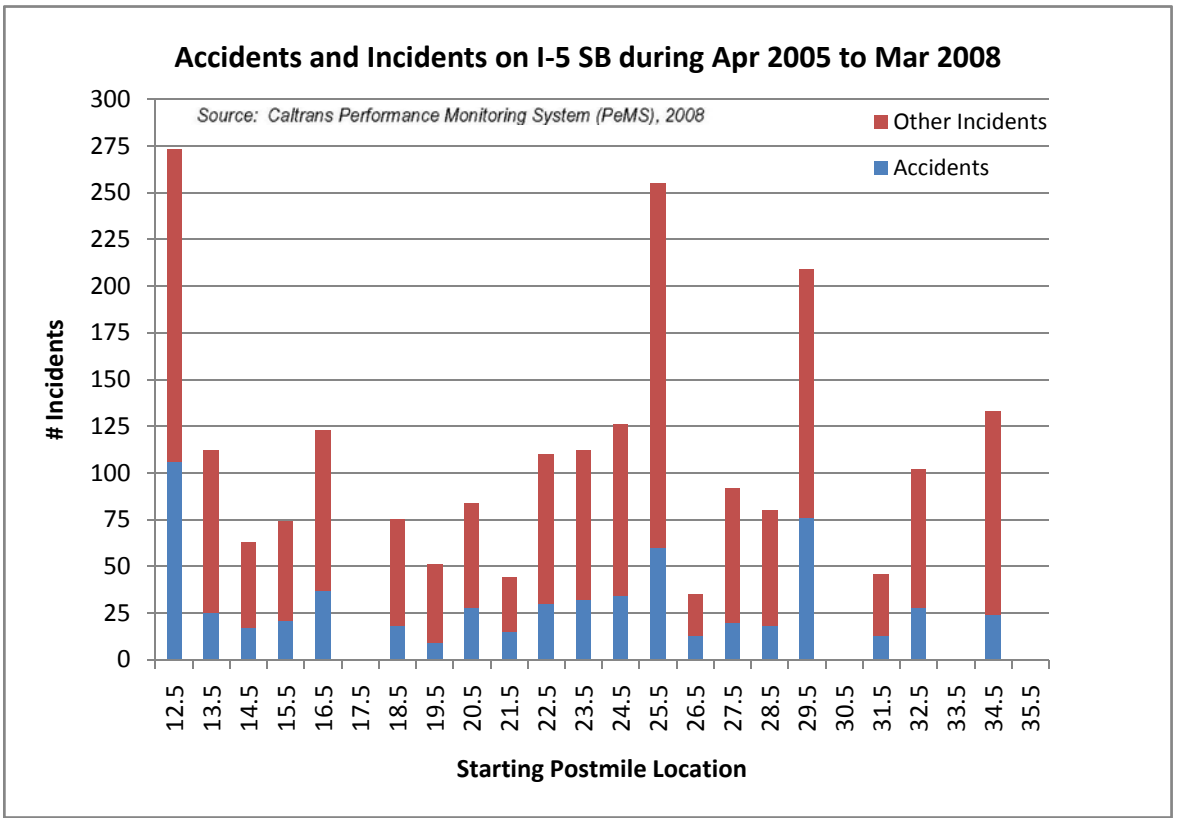

Figure 5.8 Accidents and Incidents on I-5 Northbound

In the Southbound direction shown in Figure 5.9, the highest number of incidents on I-5 are located in the areas near the I-205 and SR-120 interchanges (mile post 13) and near I-4 (Crosstown Connector) (mile post 24); these are due to the high volumes of traffic that are lane changing near these major interchanges. High accidents are also shown in that occur near Monte Diablo Avenue (mile post 29), which has merging activity that results from Downtown Stockton and Port of Stockton traffic.

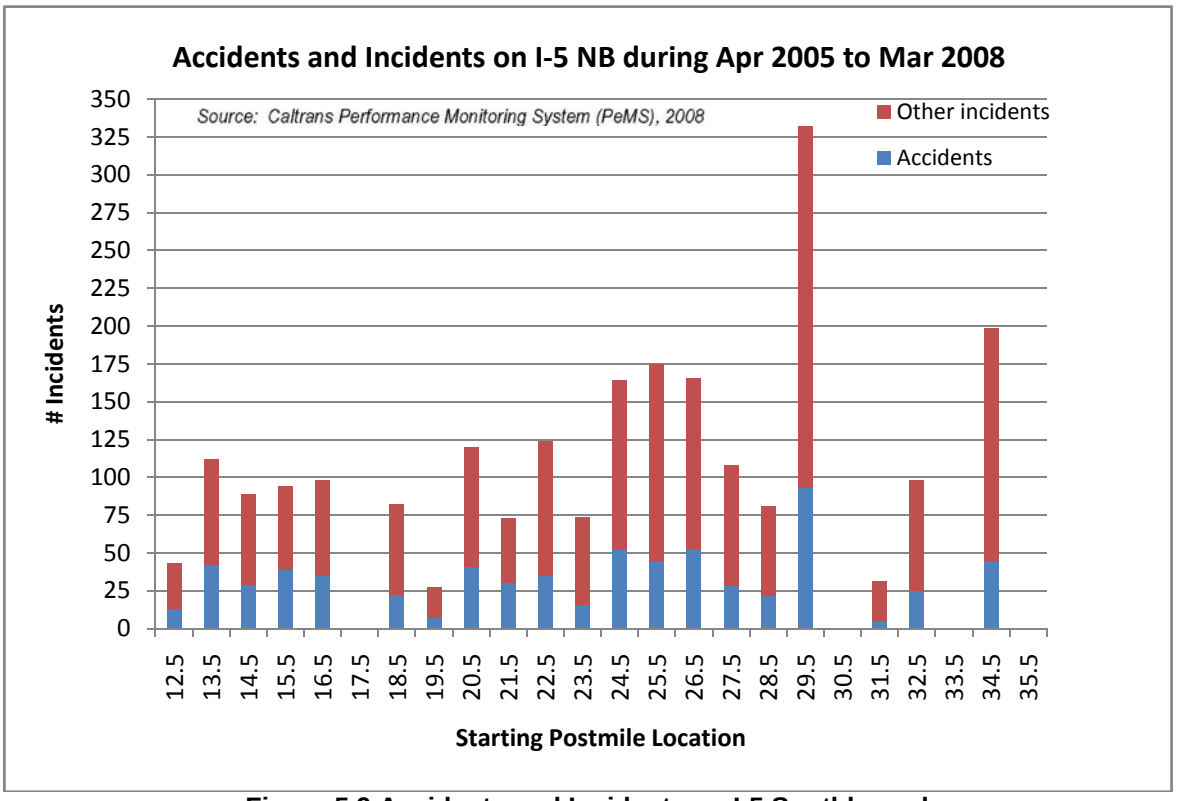

Figure 5.9 Accidents and Incidents on I-5 Southbound

The locations which were apparent as areas of note from this and supplementary sources are:

- I-5 northbound from SR-4 (Crosstown Connector) to Alpine
- I-5 northbound between I-205 and SR-120
- I-5 southbound between SR-120 and I-205
- I-205 eastbound from Grant Line Road to MacArthur Drive
- I-205 westbound at the I-5 merge and between MacArthur Drive and Tracy Boulevard.

No recurring significant bottlenecks were identified during the AM peak hour. (The slow speeds on I-205 westbound were related to a bottleneck outside of the corridor area, in Alameda County.)

6 SUMMARY OF FINDINGS

The I-5 and I-205 corridors carry significant amounts of traffic, and serve many functions. Both are important to not only transport people but also transport goods between the Bay Area and the Central Valley, as well as to connect the commodities from California with the rest of the world. In particular, I-5 has a significant presence of trucks which travel at all hours (as high as 26 percent).

Mobility and Recurring Bottlenecks. The southernmost portion and the entirety of I-205 carry the most significant peak direction traffic. Speeds also vary the most here. With the addition of new freeway lanes in 2009, this section of freeway no longer has speed deterioration on the corridor segment. The AM traffic speed reduction that continues to occur on this portion of the corridor in the morning is due to an upstream congestion on I-580 in Alameda County.

While general congestion is sometimes observed in other locations and during other periods, it is not evident based on the average travel times, floating car surveys, or other data that the speeds deteriorate to bottleneck situations as a recurring condition.

Reliability. The areas with the most unreliable speeds tend to be focused on the bottleneck locations. In addition, some speed unreliability occurs on I-5 at some hours as a result of generalized heavy traffic volumes that can move more slowly if incidents or other events occur that reduces freeway traffic speeds.

Safety. The traffic incidents and accidents are possible throughout the corridor, as interchanges are closely spaced. The areas with the greatest concern are those where there are freeway-to-freeway movements, such as I-5 in the vicinity of I-205 and SR-120, or near Downtown Stockton and the SR-4 (Crosstown Connector).

Productivity. The corridor does not suffer from extensive loss of productivity at peak hours. The primary segment that shows significant loss of productivity was I-205, and this was eased with the completion of the third travel lane in 2009. I-5 northbound north of Downtown Stockton has generalized loss of productivity at all hours during the day.

Recurring Bottlenecks. The most pronounced traffic congestion during the AM peak period in the study corridor is the westbound direction of I-205. The congestion occurs from a downstream bottleneck where I-205 and I-580 meet, located west of the corridor. The congestion that occurs in this corridor has been reported to occur as early as 4:15 am, and reported to dissipate by 7:00 am.

Another morning bottleneck was observed on I-5 southbound in northern Stockton, from Hammer Lane to Country Club Boulevard. This congestion was focused on the more typical commute period of 7:30 to 8:45 am,

Afternoon congestion had been pronounced on I-205 eastbound. This congested lasted over several hours, from as early as 2:00 pm to as late as 8:00 pm. The addition of the third lane on I-205 in the Tracy area in 2009 substantially reduced this major bottleneck to one that was not significant. A secondary bottleneck was found on I-205 eastbound beginning at the MacArthur Drive on-ramp, extending back to the Tracy Boulevard off-ramp; queues along this segment typically exist between 2:30 pm and 6:30 pm.

On I-5 northbound, there is a recurring queue between the Alpine Avenue off-ramp and the Country Club Boulevard off-ramp during the PM peak hour. Queues along this segment typically exist between 3:00 pm and 6:00 pm.

Non-Recurring Bottlenecks. Some non-recurring bottlenecks occur as a result of road maintenance and other incidents in the corridor, as the overall volumes of traffic are high enough throughout the day to result in some speed deterioration when events occur.

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Appendix A
Postmile Reference Table

Relationship of Absolute and San Joaquin Postmiles on I-205

Interchange	Absolute Postmile	County Postmile
I-5	13.6	12.6
MacArthur	9.2	8.2
Tracy	8.1	7.1
Grant Line	6.4	5.4
West 11th	4.0	2.0
Mountain House	2.4	1.4
Ala Co Line	1.0	0.0

Relationship of Absolute and San Joaquin Postmiles on I-5

Interchange	Absolute Postmile	County Postmile
SR-12	484.9	39.5
8 Mile	480.6	35.2
Hammer	478.0	32.6
Ben Holt	476.8	31.4
March	475.3	29.9
Alpine	474.3	28.9
Country Club	473.9	28.5
Monte Diablo	473.2	27.8
Fremont	472.4	27.0
SR-4E	471.5	26.1
SR-4W	470.7	25.3
8th St	470.0	24.6
C. Weston / Downing	469.0	23.6
French Camp	467.8	22.4
Mathews	466.2	20.8
S. El Dorado	465.9	20.5
Roth	464.9	19.5
Lathrop	462.8	17.4
Louise	461.8	16.4
SR-120	460.2	14.8
Mossdale	459.4	14.0
W. Manthey	459.0	13.6
I-205	458.0	12.6

Appendix B
Intersection Level of Service

City of Tracy Signalized Intersection LOS

East-West	North South	7-8 AM	8-9 AM	4-5 PM	5-6 PM
Grant Line Rd	Mountan House Prky	A	A	B	B
Grant Line Rd	Naglee Rd	A	B	B	B
Grant Line Rd	EB I-205 Ramp	B	B	B	C
Grant Line Rd	Joe Pombo Pkwy	D	D	D	D
Grant Line Rd	Orchard Pkwy	C	C	D	C
Grant Line Rd	N Corral Hollow Rd	C	C	D	D
Grant Line Rd	Lincoln Blvd	C	C	C	C
Grant Line Rd	Tracy Blvd	C	C	D	D
Grant Line Rd	Parker Ave	A	A	B	B
Grant Line Rd	Holly Dr	B	B	B	B
Grant Line Rd	East St	A	A	B	B
Grant Line Rd	N MacArthur Dr	C	D	C	C
Grant Line Rd	Chrisman Rd	A	A	A	A
Grant Line Rd	W 11th St	B	B	D	D
W 11th St	S Lammers Rd	B	B	B	B
W 11th St	Crossroads Dr	C	C	C	D
W 11th St	N Corral Hollow Rd	C	D	D	D
W 11th St	Alden Glen Dr	B	B	B	B
W 11th St	Lincoln Blvd	B	B	C	B
W 11th St	Tracy Blvd	C	D	D	D
W 11th St	Parker Ave	B	B	B	C
W 11th St	Holly Dr	B	B	B	C
W 11th St	East St	B	C	B	B
W 11th St	S MacArthur Dr	B	A	B	B
W 11th St	N MacArthur Dr	A	A	A	A
W 11th St	Chrisman Rd	C	C	C	C
W 11th St	S Banta Rd	A	A	A	B
W 11th St	S Bird Rd	A	A	B	B
Von Sosten Rd	Mountan House Prky	A	A	A	A
WB I-205 Ramp	Mountan House Prky	B	B	A	A
EB I-205 Ramp	Mountan House Prky	A	A	B	B
Pavilion Prky	Naglee Rd	A	A	B	B
Mall Entrance	Naglee Rd	B	A	B	B
Lowell Ave	N Corral Hollow Rd	C	C	C	C
W Byron Rd	N Corral Hollow Rd	B	B	C	C
WB I-205 Ramp	Tracy Blvd	C	C	B	C
EB I-205 Ramp	Tracy Blvd	A	A	A	A
Clover Rd	Tracy Blvd	B	B	B	B
W Kavanagh Ave	Tracy Blvd	B	B	B	B
Vallerand Rd	Tracy Blvd	A	A	A	A
Lowell Ave	Tracy Blvd	B	C	B	B
W Eaton Ave	Tracy Blvd	B	B	B	B
WB I-205 Ramp	N MacArthur Dr	B	B	B	B
EB I-205 Ramp	N MacArthur Dr	A	A	A	A
Clover Rd	N MacArthur Dr	B	B	B	B

Source: DKS Synchro May 2009 (based on Wiltec counts in Nov and Dec 2008)

City of Lathrop Signalized Intersection LOS

North South	East-West	7-8 AM	8-9 AM	4-5 PM	5-6 PM
Airport Way	Industrial Dr	B	B	B	B
Airport Way	Arch Airport Rd	B	B	B	B
Airport Way	C E Dixon St	B	C	D	C
Airport Way	French Camp Rd	C	C	C	C
Airport Way	E Roth Rd	A	A	A	A
Airport Way	Lathrop Rd	C	B	C	C
Airport Way	Louise Ave	C	C	C	C
Airport Way	Yosemite Rd	C	B	D	D
Airport Way	Daniels St	C	C	C	C
Airport Way	WB 120 Ramp	B	B	B	B
Airport Way	EB 120 Ramp	B	B	C	C
El Dorado St	French Camp Rd	B	B	B	B
El Dorado St	County Hospital	B	B	B	B
Harland Rd	Lathrop Rd	C	C	C	C
5th St	Lathrop Rd	C	C	C	C
Golden Valley	Louise Ave	B	B	B	B
SB I-5 ramps	Louise Ave	D	C	C	C
NB I-5 ramps	Louise Ave	B	B	B	C
Harland Rd	Louise Ave	C	C	C	D
Cambridge Dr	Louise Ave	B	B	B	B
5th St	Louise Ave	B	B	A	A
S McKinley Ave	Louise Ave	A	A	C	A
D'Arcy Pkwy	Yosemite Rd	A	A	A	A
Source: DKS Synchro May 2009 (based on Wiltec counts in Nov and Dec 2008)					

City of Stockton Signalized Intersection LOS

North South	East-West	7-8 AM	8-9 AM	4-5 PM	5-6 PM
SB I-5 ramps	State Route 12	A	A	A	A
NB I-5 ramps	State Route 12	B	B	B	A
N Thornton Rd	State Route 12	B	B	B	A
SB I-5 ramps	Eight Mile Rd	B	B	A	B
NB I-5 ramps	Eight Mile Rd	B	B	B	C
Thornton Rd	Eight Mile Rd	E	D	D	D
Thornton Rd	A G Spanos Blvd North	B	B	B	B
Thornton Rd	Whistler Way	C	C	B	B
Thornton Rd	A G Spanos Blvd South	C	C	B	B
Thornton Rd	Estate Dr	C	C	B	B
Thornton Rd	Wagner Heights Rd	C	C	D	D
Thornton Rd	Davis Rd	B	B	A	A
Thornton Rd	N Pershing Ave	C	C	C	B
Thornton Rd	W Hammer Ln	C	C	D	E
Mariners Dr	W Hammer Ln	E	C	C	C
SB I-5 ramps	W Hammer Ln	C	B	C	C
NB I-5 ramps	W Hammer Ln	B	B	C	C
Kelley Dr	W Hammer Ln	C	C	C	C
Richland Ave	W Hammer Ln	B	B	C	C
Meadow Ave	W Hammer Ln	C	B	C	C
W Alexandria Pl	W Hammer Ln	C	C	D	D
Lower Sacramento Rd	W Hammer Ln	C	C	C	C
N Pershing Ave	W Hammer Ln	D	D	**F**	**F**
N Pershing Ave	W Lincoln Rd	C	C	C	C
N Pershing Ave	W Benjamin Holt Dr	C	D	D	E
N Pershing Ave	Douglas Rd	C	C	C	C
N Pershing Ave	W Swain Rd	C	C	C	C
N Pershing Ave	W Robinhood Dr	C	C	C	B
N Pershing Ave	North Rd	B	B	B	B
N Pershing Ave	W March Ln	D	E	**F**	**F**
N Pershing Ave	Rosemarie Ln	C	C	B	B
N Pershing Ave	Brookside Rd	D	D	C	C
N Pershing Ave	Alpine Ave	C	C	C	C
N Pershing Ave	Country Club Blvd	B	B	C	C
N Pershing Ave	Harding Way	C	C	C	C
N Pershing Ave	Acacia St	C	B	C	C
N Pershing Ave	NB I-5 on	B	B	B	B
N Pershing Ave	Fremont St	C	C	B	B

City of Stockton Signalized Intersection LOS

North South	East-West	7-8 AM	8-9 AM	4-5 PM	5-6 PM
Pacific Ave	Rivara Rd	C	C	C	C
Pacific Ave	Edan Ave	D	C	C	C
Pacific Ave	W Lincoln Rd	C	C	B	B
Pacific Ave	W Benjamin Holt Dr	D	D	E	E
Pacific Ave	Douglas Rd	B	B	C	C
Pacific Ave	W Swain Rd	B	C	C	C
Pacific Ave	W Robinhood Dr	C	C	C	C
Pacific Ave	W Yokuts Ave	B	C	C	C
Pacific Ave	W March Ln	D	D	**F**	E
Pacific Ave	Bianchi Rd	C	C	C	C
Pacific Ave	Alpine Ave	C	C	B	B
Pacific Ave	Castle St	C	C	B	B
Pacific Ave	Cleveland St	C	C	C	C
Pacific Ave	Maple St	B	B	B	B
Pacific Ave	Harding Way	C	C	D	D
Grigsby Pl	W Benjamin Holt Dr	**F**	C	D	D
SB I-5 ramps	W Benjamin Holt Dr	C	B	B	C
NB I-5 ramps	W Benjamin Holt Dr	B	B	B	C
Plymouth Rd	W Benjamin Holt Dr	C	C	C	C
Alexandria Pl	W Benjamin Holt Dr	C	C	C	D
Gettysburg Pl	W Benjamin Holt Dr	B	B	C	C
Feather River Dr	W March Ln	E	E	E	**F**
SB I-5 ramps	W March Ln	E	D	D	E
NB I-5 ramps	W March Ln	D	D	E	E
Quail Lakes Dr	W March Ln	C	C	E	E
Quail Lakes Pl	W March Ln	C	B	C	C
Grouse Run Dr	W March Ln	B	B	C	C
Venetian Dr	W March Ln	C	C	C	C
Precissi Ln	W March Ln	B	C	B	B
SB I-5 ramps	Alpine Ave	E	D	C	D
NB I-5 ramps	Alpine Ave	C	D	C	C
SB I-5 ramps	Country Club Blvd	B	B	B	B
NB I-5 ramps	Country Club Blvd	B	B	C	C
Lincoln St	Harding Way	B	B	C	C
Center St	Harding Way	B	B	B	B
Center St	Acacia St	A	A	A	A
Center St	Park St	A	A	A	A
Center St	Oak St	A	A	A	A
Center St	Fremont St	B	B	B	B
Center St	Miner Ave	A	A	A	A
Center St	Weber Ave	B	B	C	B
Center St	Market St	A	A	B	A
Center St	Washington St	A	A	B	B
Center St	Lafayette St	D	D	C	C
Center St	Charter Way	B	B	B	B

City of Stockton Signalized Intersection LOS

North South	East-West	7-8 AM	8-9 AM	4-5 PM	5-6 PM
El Dorado St	Harding Way	B	B	B	C
El Dorado St	Acacia St	A	A	A	A
El Dorado St	Park St	A	A	A	A
El Dorado St	Oak St	A	A	A	A
El Dorado St	Fremont St	A	A	A	A
El Dorado St	Miner Ave	B	A	A	A
El Dorado St	Weber Ave	C	B	B	B
El Dorado St	Market St	A	A	A	A
El Dorado St	Washington St	D	D	C	C
El Dorado St	Lafayette St	A	A	B	B
El Dorado St	Charter Way	B	B	B	B
El Dorado St	W 8th St	B	B	B	B
El Dorado St	Clayton Ave	B	C	D	D
Navy Dr	Charter Way	C	C	B	B
SB I-5 ramps	Charter Way	B	B	B	B
NB I-5 ramps	Charter Way	B	B	C	B
Lincoln St	Charter Way	C	C	C	C
French Camp Turnpike	Charter Way	B	B	B	B
S San Joaquin St	Charter Way	A	A	B	B
S California St	Charter Way	C	C	C	B
S Grant St	Charter Way	A	A	A	A
S Wilson Wy	Charter Way	A	A	A	A
SB I-5 ramps	W 8th St	B	B	B	B
NB I-5 ramps	W 8th St	C	B	C	B
French Camp Turnpike	W 8th St	C	B	B	C
Airport Way	E 8th St	B	B	B	B
Airport Way	E 10th St	B	B	B	B
Airport Way	Ralph Ave	B	B	B	B

Source: DKS Synchro May 2009 (based on Wiltec counts in Nov and Dec 2008)