California Department of Transportation

Transportation System Performance Measures: Status and Prototype Report

Transportation System Information Program

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Prepared by

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EXECUTIVE SUMMARY

This report documents the progress of the Transportation System Performance Measures initiative as the California Department of Transportation (Caltrans) embarks on implementation of the concepts and methodologies developed to date. The report documents data detection and access issues on State Highways and data issues of various transportation modes. The report also includes a prototype of a performance measures monitoring document. This prototype demonstrates how the tested performance measures work, and how the performance measures information can be communicated. The prototype is not intended as a statewide decision-making tool, since it does not cover the entire State or contain performance trends. Rather, it serves as a vehicle to solicit feedback and advice to ensure the usefulness and acceptance by decision makers and transportation stakeholders.

The conclusions of the efforts conducted over the last year include:

- The tested performance measures provide meaningful and decisive monitoring information where data are available.
- Significant data detection and access gaps exist that hinder comprehensive reporting and analyses for the State Highway System. Data for other modes serving the inter-regional transportation market have other gaps related to bus ridership.
- Many initiatives are underway to address these gaps not only for performance measurement, but for transportation operations and traveler information purposes.

HOW DID WE GET TO THIS POINT?

The Performance Measurement initiative was initiated by the Business, Transportation, and Housing Agency (BT&H) and led by the California Department of Transportation (Caltrans) to achieve two broad goals:

- To develop indicators/measures to assess the performance of California's multi-modal transportation system and support informed transportation decisions by transportation officials, operators, service providers, and system users; and
- To establish a coordinated and cooperative process for consistent performance measurement in California.

Over the last two years, Caltrans' efforts to develop and implement performance measurement, in coordination with public partners and private stakeholders, have demonstrated significant progress:

- Defining the outcome-based performance objectives influenced by transportation-related decisions and felt by the public and society;
- Identifying candidate indicators to reflect these outcomes;
- Testing these candidate indicators to ensure that they can be supported by standard transportation data detection methods, add value to decision makers, and can be communicated easily to the public;
- Developing strategies to integrate the fully tested measures and indicators into existing planning and programming processes/products; and
- Collecting sample transportation system data to develop a prototype report that illustrates how the monitoring component of this initiative can be developed once data issues are addressed.

Consistent with the original guiding principles set forth by the Policy Advisory Committee (PAC), all indicators tested to date are multi-modal in nature and reflect the customer experience, while improving the quality of transportation information available to transportation professionals and decision makers. The three outcomes fully tested to date (i.e., safety/security, mobility/accessibility, and reliability) meet these requirements and can be implemented to the degree supported by existing data practices and availability.

PROTOTYPE REPORT

The prototype report illustrates how the fully tested outcomes can be measured and communicated for the existing system. As data challenges are addressed via several initiatives already underway, this prototype can be augmented to represent a truly comprehensive System Performance monitoring report. Such a report would then represent the "monitoring" component of the performance measurement initiative. A comprehensive monitoring report would provide state and local decision makers an easy-to-understand assessment of how well the state's transportation systems are performing. Over time, it would also address trends of performance.

This prototype document is the first of its kind and addresses system performance for a subset of California's transportation system, which includes the statutorily-identified inter-regional state highway system, as well as other elements of the inter-regional transportation system, such as intercity buses, commuter rail, intercity rail and freight railroads.

The performance measurement areas covered in this prototype include measures corresponding to four transportation outcomes:

Exhibit ES-1: Transportation Outcomes

Outcome	Definition
Safety/Security	Minimizing the risk of accidents, death, injury, or property loss
Mobility/Accessibility	Reaching desired destinations with relative ease within a reasonable time, at a reasonable cost with reasonable choices
Reliability	The level of variability in transportation service between anticipated (based on scheduled or normal travel) and actual travel
Environmental Quality	Helping to maintain and enhance the quality of the natural and human environment

The following describes the status of the measures and how they fit into the prototype performance monitoring document. Sample detail and analysis is provided in the body of the prototype.

Safety/Security

The primary safety indicator computed and presented is accident rates. Summaries of findings by mode are:

Highway Safety – Comprehensive data exist for highway safety rates. Accident rates are computed and presented by route within each county. Accident rates can be broken down by vehicle type (e.g., auto, bus, truck) and by severity (e.g., fatality, property damage). Over time, trends of such data can be analyzed to evaluate priorities and successes.

Bus Safety – Inter-regional bus statistics are also examined in this report. Accident rate data, including accidents on highways, was obtained from the same central database used for highway safety analysis (i.e., TASAS). No urban transit accidents are addressed in the prototype.

Rail Safety – The report considers Amtrak, commuter railroads, and freight railroads separately. Inter-regional rail accident data is reported by severity (e.g., fatality, property damage) and by grade-crossing incidents.

Security – Inter-regional bus and rail crime rates are computed for the security analysis. Security relates primarily to criminal activity at transit stations, bus/train depots and on transit vehicles rather than how busses and trains operate.

Mobility/Accessibility

Mobility is measured in terms of delay experienced by travelers. Summaries of findings by mode include:

Highway Mobility - Highway mobility was computed for District 3 (Sacramento), District 11 (San Diego) and District 12 (Orange County) using loop detector data. Results can be shown in a variety of formats, including morning and afternoon aggregation levels, worst hour, duration, and intensity. Several of these are presented in the prototype report included in this document. As data issues are addressed, the mobility results can add significant value to planning and decision making and can be used to inform management of trends, seasonality impacts, and effectiveness of operational and expansion strategies.

Transit Mobility – Transit mobility was computed for all inter-regional bus and rail services. Data does not exist consistently for ridership. Therefore delay is presented in terms of delay per trip and as a percentage of the total trip time.

Highway Accessibility - Highway accessibility is defined as the percent of the population living within a reasonable distance to the State Highway System. The 249 routes that comprise the state highway system provide nearly universal accessibility for Californians. Over 29.6 million (99.5 percent of all) Californians live in census tracts within 3 miles of a state highway. This report includes no information on the accessibility to desired travel locations.

Transit Accessibility - Accessibility is defined as the percent of the population living within a reasonable distance to an inter-regional transit station, both rural and urban. Nearly half of the state population (13.5 million) lives in a census tract more than 3 miles from an inter-regional transit facility. Accessibility is generally lower in mountainous or rural areas as well as small geographic areas within major metropolitan areas.

Reliability

Reliability is presented in terms of variability in travel time and presented as a percentage of variation from average travel time. As such, it reflects the predictability of a given trip. When variability is high, travel time is less predictable.

Reliability is critical for traffic operations because to some extent, it reflects how well incidents are managed. The combination of mobility and reliability offer a powerful new analysis framework for planners as well. Summary of reliability findings by mode include:

Highway Reliability - Highway reliability was computed for District 3 (Sacramento), District 11 (San Diego) and District 12 (Orange County) using loop detector data available from traffic management centers. Similar to mobility, results can be shown in different formats. Maps and tables related to reliability in the prototype section of this report can be very useful because they can help identify reliability problems. However, the best value can be derived through an analysis of reliability and mobility combined.

Transit Reliability – Transit reliability was not computed because detailed on-time performance statistics are not available for most operators.

Environmental Quality

The report summarizes data on the number of days exceeding California and Federal air quality standards for criteria pollutants and explains the State's current attainment status for both. The California Air Resources Board (ARB) tracks attainment against nine pollutants. Portions of the state are in nonattainment for five pollutants: carbon monoxide, ozone, particulate matter$_{10}$, sulfates, and hydrogen sulfide. The State also monitors nitrogen dioxide, lead, sulfur dioxide, and visibility reducing particles. The Federal Government, through the Environmental Protection Agency (EPA), tracks six pollutants: carbon monoxide, ozone, particulate matter$_{10}$, nitrogen dioxide, lead, and sulfur. The ARB and U.S. EPA have determined that California is not in attainment for three pollutants: carbon monoxide, ozone, particulate matter$_{10.}$ However, the State and national thresholds, time periods, and designation areas for evaluating levels of the three pollutants differ somewhat.

CHALLENGES AND OPPORTUNITIES AHEAD

The two major challenges for full implementation of performance measurement over the next couple of years are:

- Data availability and accessibility, and
- Integration with existing processes.

The data challenge relates to technology, resources, and time. The last section of this report discusses the current status of the detection and accessibility of traffic data by district. As mentioned before, several initiatives have recently started to address most of the data needs for performance measurement. The resources for these initiatives must be secured to the extent possible. In the interim, all available data sources will be utilized.

The integration challenge relates more to culture and training. For performance measurement to become truly effective, it has to permeate the entire organization, from management to staff, from planning to project development to operations. It must be incorporated into existing products (e.g., Project Study Reports or PSRs) and future strategies (e.g., Interregional Transportation Strategic Plan or ITSP).

Despite all these challenges, everyone recognizes the opportunities ahead. All involved in this initiative from managers to staff and consultants, from within Caltrans to external stakeholders understand and appreciate the value of this initiative. Making better decisions, communicating to the public, and establishing accountability are the long-term legacy of this study.

A. INTRODUCTION

This report documents the progress of the Transportation System Performance Measures Initiative as the California Department of Transportation (Caltrans) begins to implement the concepts and methodologies developed to date. The report documents data detection and access issues on State Highways as well as data issues for various transportation modes.

The report also includes a prototype of a performance monitoring document. This prototype demonstrates how performance measures work and how performance information can be communicated. The prototype is not intended as a statewide decision-making tool, since it does not cover the entire State nor establishes performance baselines. Instead, it serves as a vehicle to solicit feedback and advice to ensure its usefulness and acceptance by decision makers and transportation stakeholders.

The remainder of this introduction provides a background on the performance measurement initiative, describes the performance monitoring prototype more fully, and outlines the organization of this report.

A.1. PERFORMANCE MEASUREMENT INITIATIVE

The statewide Performance Measurement Initiative was established by the Business, Transportation, and Housing Agency (BT&H) and led by Caltrans to achieve two broad goals:

- To develop indicators/measures to assess the performance of California's multi-modal transportation system and support informed transportation decisions by transportation officials, operators, service providers, and system users; and

- To establish a coordinated and cooperative process for consistent performance measurement in California.

Performance measurement allows us to understand how the transportation system is performing today and how it is likely to perform in the future given anticipated changes in population, the impacts of today's investments, and other critical factors, such as land-use patterns and economic conditions.

The State began the Transportation System Performance Measures Initiative in response to several national and state-level policy developments. The passage of the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 shifted transportation decision-making responsibility from the federal government to the State and local level and directed the adoption of a multi-modal approach to transportation planning and decision making. The 1993 California Transportation Plan (CTP) affirmed this system approach and the CTP update initiated the development of a systematic performance measurement framework. Senate Bill 45, enacted into law in 1997, divided authority for State Transportation Improvement Plan funding between the State and regions. System performance measures provide some of the tools necessary for consistently comparing projects.

Over the last two years, Caltrans' efforts to develop and implement performance measurement, in coordination with public partners and private stakeholders, have demonstrated significant progress by:

- Defining the outcome-based performance objectives influenced by transportation-related decisions and felt by the public and society;
- Identifying candidate indicators to reflect these outcomes;
- Testing these candidate indicators to ensure that they can be supported by standard transportation data detection methods, add value for decision makers, and can be communicated easily to the public;
- Developing strategies to integrate the fully tested measures and indicators into existing planning and programming processes/products; and

Collecting sample transportation system data to develop a prototype report that illustrates the monitoring component of this initiative. Recent efforts have led to three primary conclusions:

- The tested performance measures provide meaningful and decisive monitoring information where data are available.
- Significant data detection and access gaps exist that hinder comprehensive reporting and analyses for the State Highway System. Data for other modes serving the inter-regional transportation market have other gaps related to bus ridership.
- Many initiatives are underway to address these gaps not only for performance measurement, but also for transportation operations and traveler information purposes.

Consistent with the original guiding principles set forth by the Policy Advisory Committee (PAC), all indicators tested to date are multi-modal in nature and reflect the customer experience, while improving the quality of transportation information available to transportation professionals and decision makers. The three outcomes fully tested to date (i.e., safety/security, mobility/accessibility, and reliability) can be implemented to the degree supported by existing practices and data availability.

A.2. PROTOTYPE REPORT

The prototype report illustrates how the fully tested outcomes can be measured and communicated for the existing system. As data challenges are addressed via several initiatives already underway, this prototype can be augmented to represent a truly comprehensive System Performance monitoring report.

A comprehensive monitoring report would provide state and local decision makers with an easy-to-understand assessment of how well the state's transportation systems are performing. Over time, it would also address trends of performance. A comprehensive monitoring report is not intended to replace or replicate detailed planning analyses, since other tools exist for these purposes.

This prototype document is the first of its kind and addresses system performance for a subset of California’s transportation system, which includes the statutorily-identified inter-regional state highway system, as well as other elements of the inter-regional transportation system, such as intercity buses, commuter rail, intercity rail and freight railroads.

The prototype relies on available data even when those data are not complete. It is recognized that this report has data gaps, but consolidating this report is the best way to discover and address shortcomings in data collection. The sources used to compile this prototype are listed in the Appendix. In addition, the underlying data source for each chart and graph is identified under the exhibit and again in the text in the main body of the report.

The statewide Performance Measurement Initiative identified nine performance outcomes to consider in multi-modal transportation performance evaluation:

- Cost Effectiveness
- Customer Satisfaction
- Economic Well-Being
- Environmental Quality
- Equity
- Mobility/Accessibility
- Reliability
- Safety/Security
- Sustainability.

Four of these outcomes are covered in this prototype document, as illustrated in Exhibit A-1.

Exhibit A-1: Transportation Outcomes

Outcome	Definition
Safety/Security	Minimizing the risk of death, injury, or property loss
Mobility/Accessibility	Reaching desired destinations with relative ease within a reasonable time, at a reasonable cost with reasonable choices
Reliability	Providing reasonable and dependable levels of service by mode
Environmental Quality	Helping to maintain and enhance the quality of the natural and human environment

A comprehensive monitoring report would include all performance outcomes for which monitoring is appropriate. The exhibit below addresses some of the main questions regarding the contents and uses of this report.

Exhibit A-2: Summary Questions on this Report

Why A Prototype Transportation System Performance Measures Report?
Transportation System Performance Measures are not yet implemented; however, significant progress has been made. This prototype report rolls up the progress made in developing system performance measures and presents the results of transportation outcomes. The intent is to solicit feedback and advice from transportation agencies, decision makers, stakeholders and others regarding the usefulness and continued acceptance of performance measures. A prototype report is appropriate now as four of the nine performance outcomes are ready for implementation and analysis.. As data challenges are addressed and the remaining performance outcomes are fully tested, this prototype will serve as the structure for a complete State of the System Report.
What This Prototype Report Is and What It Is Not.
This prototype report demonstrates how the tested performance measures can be organized and communicated in a report format for use by transportation agencies, decision makers and stakeholders. Report organization is in a format consistent with how transportation system performance for California's multi-modal transportation system would be reported and documented after full implementation of performance measures. This report, due to incomplete nature of the data, can be viewed as a limited sample of performance measures documentation and its communication. Despite these limitations, the analysis processes employed in this report are valid. The format, information and analysis are all representative of what would be presented after full implementation.
What is Contained in this Prototype Report and What Is Not?
The prototype report contains some performance outcomes analysis based on research conducted to date by Caltrans. The report considers the following outcomes: safety, mobility/accessibility, reliability and environmental quality. It also contains sections on the transportation system and transportation market, intended to provide depth and background in evaluating overall system performance. This report does not contain information on transportation outcomes still in the research stage, such as system transportation preservation and customer satisfaction.

How Should the Prototype Report Be Used?
This prototype report is intended for a wide audience of transportation system decision makers and stakeholders. The report serves as a vehicle to solicit feedback on the overall structure for achieving the most useful statewide decision-making tool possible. As Caltrans expands its research efforts and increases the analysis coverage to include the remaining outcomes and achieve true statewide coverage, the prototype report will evolve into the State of the System Report. The goal is a statewide performance monitoring tool that provides decision makers, stakeholders and the public a true "state of the system" report.

A.3. REPORT ORGANIZATION

This report is organized into two sections in addition to the introduction:

- *Challenges and Opportunities Ahead* (Section B) describes the efforts needed to address data availability and accessibility as well as to integrate performance measurement with existing internal and external processes.

- *The Prototype Report* (Section C) is the main body of the comprehensive monitoring report prototype. It consists of four elements:

  - *Selected Results (Section C1)* contains the results of performance measurement calculations for each mode and all four categories of performance.

  - *The Multi-Modal Transportation System* (Section C2) addresses key elements of the transportation system supply: infrastructure and service provision.

  - *The Transportation Market* (Section C3) summarizes the demand placed upon the system in terms of person movement and freight movement.

  - *Next Steps* (Section C4) provides a brief description of efforts anticipated in the near future

The appendix sections contain information on the Caltrans High Emphasis Routes (HERs) as well as general reference materials (i.e., list of acronyms, glossary and list of sources).

B. CHALLENGES AND OPPORTUNITIES

Caltrans faces several challenges to implement performance measurement for California's transportation system and to integrate it within the organization. As these challenges are met, the resulting opportunities are more than promising. This section addresses the main challenges that impede full implementation of system performance measures, describes how these challenges can be overcome, and outlines some of the resulting benefits expected in the near future.

B.1. CHALLENGES

Two primary sets of challenges exist for full implementation of performance measurement.

B.1.1 Data

The first set of challenges relates to data availability and access. To date, highway data has been collected and analyzed using Transportation Management Center (TMC) operations data. In order to streamline this process, several issues or implementation strategies remain:

- Connecting TMCs to PeMS – It is critical that urban TMCs be connected to the Performance Measurement System (PeMS) which has been developed by Partners for Advanced Transit and Highways (PATH) on behalf of Caltrans. This system has been fully tested with District 7 and District 12. Once connected, data are transferred real-time to PATH on the wide area network (WAN) and stored for historical and real-time analysis. A major next step is to develop a "module or interface" that allows users to access the PeMS data in order to calculate performance measures such as mobility and reliability. In addition a world wide web interface would provide access to Caltrans districts, programs, and others as required.

- Ensuring Detector Fitness – Caltrans is currently evaluating the status of automatic detectors to ensure that they communicate with their respective TMCs and that the data transferred are "clean". This initiative may require significant resources and field equipment upgrades. For example, detectors developed to collect traffic census data require upgrading to process speed information and transmit data. The end result is that detectors will collect data for various data uses including operational analysis, incident identification and response, and ultimately, performance measurement.

- Extending Coverage and Providing Connections – This point addresses two major challenges. The first is the lack of detector coverage in many rural, and some urban areas. The second is the lack of, or operational inadequacy of, the connection between detectors and TMCs. Where no local TMC is present, there may be other technologies that can be considered. To ensure greater coverage, it will be necessary to install more loops or deploy different technologies to collect the traffic data in those areas. Working with the districts, a “best mix” of existing and new technologies needs to be developed. The resulting data must also be transferred to PeMS, either on the Caltrans WAN or via different communication methods. Once completed, this effort will ensure adequate coverage throughout the State and enable a truly statewide analysis.

Exhibit B-1 on the next page illustrates the status of the aforementioned issues by district. It has been developed in cooperation with the Traffic Operations Program. This chart is intended to further discussions with individual districts and headquarters programs to implement the data strategies.

Inter-regional rail and bus data availability also poses a continuing challenge. This prototype performance measures report has highlighted several weaknesses in the data availability and/or reporting processes for non-highway modes:

- Inter-regional transit schedule and on-time performance information is not consistently available, which complicates the transit mobility and reliability analysis. The Mass Transportation Program is currently examining options for sharing transit mobility-related data electronically and is considering the development of a mobility analysis tool.

- Due to established reporting processes and the broad range of regulatory agencies and operators involved, "current" performance data span a range of several years. For example, the timeframe for the latest available transit safety data may be different than that for highways.

- Availability of detailed performance data from the private sector (e.g., freight railroads) also poses a continuing challenge.

Ultimately, aviation should be addressed in system performance measures given the importance of its role in the movement of people and goods in California.

B.1.2 Integration

Full implementation of system performance measures faces a second set of challenges, namely to integrate performance measurement into the planning, programming, operations, and project development processes. Ultimately, decisive information generated through performance measurement will influence decision making within Caltrans. For performance measurement to truly become effective, it has to permeate the entire organization and be incorporated into short and long range planning products, operational analysis techniques and documents, priority setting for programming, and project development activities. A key challenge is the continued management support for performance measurement.

Exhibit B-1: STATUS OF DATA STRATEGIES IMPLEMENTATION

	Connect TMCs To PeMS	Complete Detector Fitness Initiative	Extend Detector Coverage And Connect To PeMS
District 1	○	○	◔
District 2	○	○	◔
District 3	◑	◕	◑
District 4	◔	◔	◕
District 5	○	○	◔
District 6	○	○	◔
District 7	●	◕	◕
District 8	◑	◑	◕
District 9	○	○	◔
District 10	◔	◑	◑
District 11	◑	◑	◕
District 12	◕	◑	◕

CONNECT TO PeMS

○ = District does not have a TMC and does not receive real-time loop data continuously.

◔ = District has a TMC, but does has not have transportation management software (TMS)

◑ = District has a TMC and TMS, but no linkage to PeMS yet

◕ = District has a TMC and TMS, did have linkage to PeMS that is currently being restored

● = District has a TMC and TMS and live linkage to PeMS

COMPLETE DETECTOR FITNESS INITIATIVE

○ = Not applicable (little or no loops in district --able to collect speed data)

◔ = Less than 50 percent of the loop data is accessible by the TMS (Estimate)

◑ = Less than 75 percent (but more than 50 percent of the loop data is accessible by the TMS

◕ = More than 75 percent of the loop data is accessible by the TMS

EXTEND DETECTOR COVERAGE AND CONNECT TO PEMS (gaps may be addressed by additional loops or alternative technologies, connection to PEMS to be determined)

◔ = Gaps cover the majority of the system.

◑ = Considerable gaps exist, but the majority of the system is covered

◕ = Few gaps exist

B.2. OPPORTUNITIES

While the challenges appear daunting, performance measurement offers opportunities and benefits at all levels. In the future, decision makers, staff and eventually the public will be able to obtain performance information for all modes on a regular basis and ultimately make better transportation decisions. Project Study Reports can include detailed operational strategies over and beyond the traditional expansion descriptions. The combination of mobility and reliability offers great promise to enable Caltrans to maximize the use of its current infrastructure. Performance trends can be communicated periodically and in real-time to the public, which will allow the public to be a full partner in managing the system. In geographic areas where performance measures indicate success, strategies can be shared with other geographic areas with similar characteristics to facilitate "learning exchange." Performance measures can help to forge consensus among transportation stakeholders and decision makers in areas such as system goals and objectives. These are but a few of the opportunities the performance measurement initiative can help provide.

That is why everyone involved to date with the initiative, from staff to consultants, from the Policy Committee and staff within Caltrans to external stakeholders, understand and appreciate the value of this initiative. Making better decisions, communicating more effectively to the public, and establishing accountability should be the long-term impacts of this study.

C. PROTOTYPE REPORT

This section contains a prototype report that illustrates how the performance outcomes that are fully tested can be measured and communicated for select portions of the existing system. As data challenges are addressed via several initiatives already underway and the performance measures are fully tested, this prototype can be augmented to represent a truly comprehensive System Performance monitoring report. Such a report would then represent the "monitoring" component of the performance measurement initiative.

This prototype presents a limited snapshot of how the transportation system is performing today. It addresses system performance for a subset of California's transportation system, which includes the statutorily-identified inter-regional state highway system, as well as other elements of the inter-regional transportation system, such as intercity buses, commuter rail, and freight railroads.

The Policy Advisory Committee identified nine multi-modal performance measure outcomes for the inter-regional transportation system, and these are undergoing proof-of-concept testing. Three outcomes have already been tested, and this section addresses system performance results for these. In addition to the three outcomes, this section discusses air quality attainment as monitored by federal and State agencies. Performance measures addressed include:

- Safety/security
- Mobility/accessibility
- Reliability
- Environmental quality

The focus of the report is on current system performance (i.e., for the most recent year available). Selected trends in performance that go back three to five years are also presented, where appropriate. Over time, a comprehensive performance-monitoring document would address performance trends in a more encompassing manner as a performance monitoring history is built.

C1. SELECTED RESULTS

1.1. SAFETY/SECURITY

The safety/security outcome addresses minimizing the risk of death, injury, or property loss on California transportation infrastructure. Separate, multimodal indicators (i.e., the same indicator can be used across modes) were chosen to represent the safety/security outcome. The monitoring of these indicators provides an indication of the improvement or decline of safety and security over time.

For all modes, safety accident information is reported as "totals" and "rates". Totals relate to the total number of accidents, fatalities, and injuries experienced by that mode. Rates represent the indicator for safety. Indicators for safety include accident, fatality, and injury rates. Rates are simply the "totals" divided by a common measure of use of the system for each mode (e.g., vehicle miles traveled)

Security information is reported also as "totals" and "rates". Totals relate to the total number of violent and property crimes experienced for each mode. Rates represent the indicator for security. Indicators for security include crime rates (i.e., violent and property crimes per trip).

1.1.1. Safety Information

All safety information is presented by mode and by source of data. Mode accident totals and rates are presented in the following order:

- Roadway (all roads and highways in California, State Highways Only, and Non State Highways (Local Streets and Roads)) accident totals
- Roadway accident rates
- Inter-regional bus accident totals
- Inter-regional bus accident rates
- Rail (i.e., Amtrak, commuter railroads, and freight railroads) accident totals
- Rail accident rates.

Accident rates are calculated by dividing the total number of accidents by the "use" of the respective mode. For example, the number of vehicle miles traveled (VMT) is a good proxy for the use of the highway by automobiles, buses and trucks. In this section, three main accident rates are reported:

- Total Accidents per VMT (property damage, fatality, injury accidents)
- Fatality Accidents per VMT
- Injury Accidents per VMT.

For the rail mode, million train-miles was used as the denominator.

Roadway Accident Totals

The California Highway Patrol (CHP) reports collisions on the entire roadway system (State Highways and local streets and roads). Information at this level of aggregation is useful for analyzing broad safety trends on roadways. More detailed or micro level analysis and additional information is required to develop conclusions related to the trends.

The data itself contains collisions (fatality, injury and property damage accidents), as well as fatalities and injuries reported. The data is limited to what is actually reported. For example, property damage and injury accidents are likely to be under-reported.

Summary statistics are shown below.

Exhibit 1-1: All Roadway Accident Totals in California

Type of Accident And Ratio to VMT	YEAR			
	1995	1996	1997	1998
Total Collisions	471,758	475,685	463,894	482,608
Fatal Collisions	3,636	3,555	3,252	3,075
Injury Collisions	196,569	193,805	185,952	189,007
Fatalities	4,165	3,972	3,671	3,459
Injuries	304,941	300,106	284,871	290,698
Fatalities per Million VMT	1 per 66	1 per 70	1 per 78	1 per 84
Injuries per Million VMT	1 per 0.91	1 per 0.93	1 per 1.0	1 per 1.0

Source: TABLE 8A - Annual Report of Fatal and Injury Motor Vehicle Traffic Collisions, Statewide Integrated Traffic Records System Department of California Highway Patrol

While total collisions increased slightly along with the population growth in California, the fatal and injury collisions on all roadways decreased between 1995 and 1998. Total fatalities and injuries decreased as well.

Exhibit 1-2: State Highway Accident Totals in California

Type of Accident And Ratio to VMT	YEAR			
	1995	1996	1997	1998
Total Collisions	156,245	164,114	165,065	173,549
Fatal Collisions	1,506	1,606	1,483	1,394
Injury Collisions	57,031	58,343	57,377	58,625
Fatalities	1,810	1,855	1,763	1,601
Injuries	91,917	94,266	91,837	94,192
Fatalities per Million VMT	1 per 81	1 per 81	1 per 87	1 per 97
Injuries per Million VMT	1 per 1.59	1 per 1.59	1 per 1.67	1 per 1.65

Source: Statewide Integrated Traffic Records System Department of California Highway Patrol

Overall, collisions on State highways increased by about 17,300 between 1995 and 1998. During this same time period, fatalities decreased by 11.5 percent despite the increase both in population, amount of travel, and the increase in collisions. Injuries increased slightly.

Exhibit 1-3: Non-State Highway Accident Totals in California

Type of Accident and Ratio to VMT	YEAR			
	1995	1996	1997	1998
Total Collisions	315,513	311,571	298,829	309,059
Fatal Collisions	2,130	1,949	1,769	1,681
Injury Collisions	139,538	135,462	128,575	130,392
Fatalities	2,385	2,117	1,908	1,858
Injuries	213,024	205,840	193,034	196,506
Fatalities per Million VMT	1 per 55	1 per 61	1 per 69	1 per 73
Injuries per Million VMT	1 per 0.61	1 per 0.62	1 per 0.68	1 per 0.69

Source: TABLE 8A - Annual Report of Fatal and Injury Motor Vehicle Traffic Collisions, Statewide Integrated Traffic Records System Department of California Highway Patrol

Annual Vehicle Mile Travel (VMT) Summary, in Billions

	1995	1996	1997	1998
VMT on State Highways	146.2	149.6	153.1	155.4
VMT on Other Public Roads	130.2	128.5	131.7	135.1
VMT on All Public Roads	276.4	278.0	284.8	290.5

Source: Caltrans, Transportation System Information Program, Office of Travel Forecasting and Analysis, Statewide Travel & Analysis Branch "California Motor Vehicle Stock, Travel, and Fuel Forecast" November 1999, Appendix B.

Trends on California non-State highways mirror trends on the roadway system as a whole, with fatality and injury collisions declining. Overall collisions are down slightly between 1995 and 1998.

In 1995, 33 percent of all fatal collisions in California occurred on State Highways and 67 percent occurred on Local Streets and Roads. This distribution is changing. By 1998, 36 percent of all fatal collisions in California occurred on State Highways and 64 percent occurred on Local Streets and Roads. At the same time, the absolute number of fatal collisions and resulting fatalities is decreasing in all three categories.

The 1999 Caltrans Route Segment Report (RSR) provides safety data pertaining to the interstate and State highway system, at a segment level. The RSR contains roughly 4,000 segments, most of which are short – about 0.4 miles. The RSR smoothes out widely varying annual safety statistics by reporting total accidents and average annual accident rates over the three-year period from 1996 through 1998.

Roadway Accident Rates

Roadway accident rates are reported in the prototype only on State Highways. Information is provided by county, and a subset of the State Highways by county and by High Emphasis Routes (HERs). The HERs system represents 34 major inter-regional corridors in California and the backbone of Caltrans inter-regional strategic plan. Examples of HERs corridors include Interstate Route 5 in its entirely; State Route 99 in its entirety, and the portion of State Route 1 and State Route 17 that connects Carmel to San Jose. The entire HERs network is depicted in Exhibit 2-2 in Chapter C2 of this document.

The source of the data is the 1999 Caltrans RSR. Accident rates represent a three-year average. Only a limited sampling of Accident Rate information for Local Streets and Roads is available. The source of this information is the Highway Performance Monitoring System. This information is not included in this prototype. It will be included in the future Performance Monitoring Report.

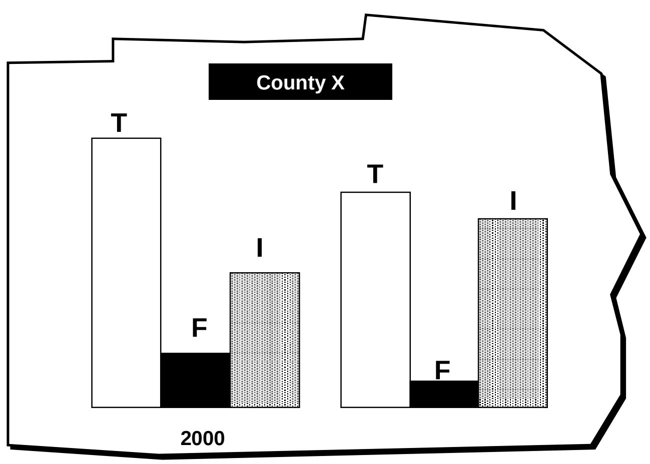
The results of the highway accident rate analysis are shown at two main levels of aggregation – <u>county-level</u> and <u>route-level</u> – for the HERs Routes.

The county safety analysis shows highway accident rates for the following:

- County Accident Rates by Vehicle Type (Total, Auto and Truck)
- Count Accident Rates by Accident Type (Total, Fatality and Injury)
- High Emphasis Route Accident Rates (Route Average)
- High Emphasis Route Accident Rates (Average Within Each County)

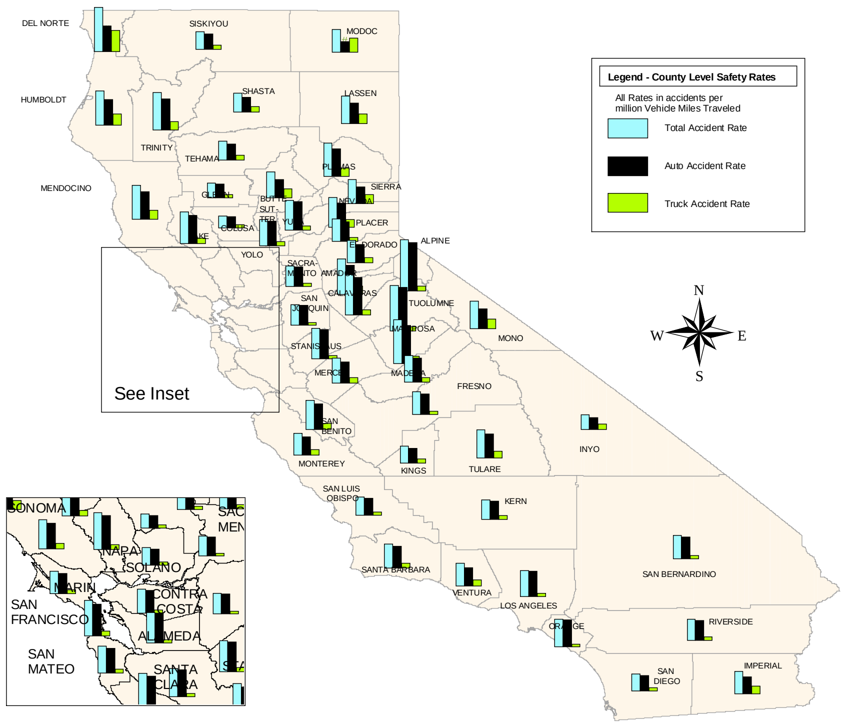
This information is depicted in Exhibits 1-4 through 1-7 on the following pages.

In this report prototype, the year 1999 serves as the base year. In the future, the intent is to show trends spanning several time periods (e.g., 2000-2004). The information be displayed as illustrated below. This type of display will allow each county to monitor its accident information over time to determine where more detailed safety analysis may be necessary.



T = Total Accident Rate
F = Fatality Accident Rate
I = Injury Accident Rate

Exhibit 1-4: County Accident Rates by Vehicle Type (Total, Auto, and Truck)



Source: Caltrans 1999 Route Segment Report, Booz·Allen analysis

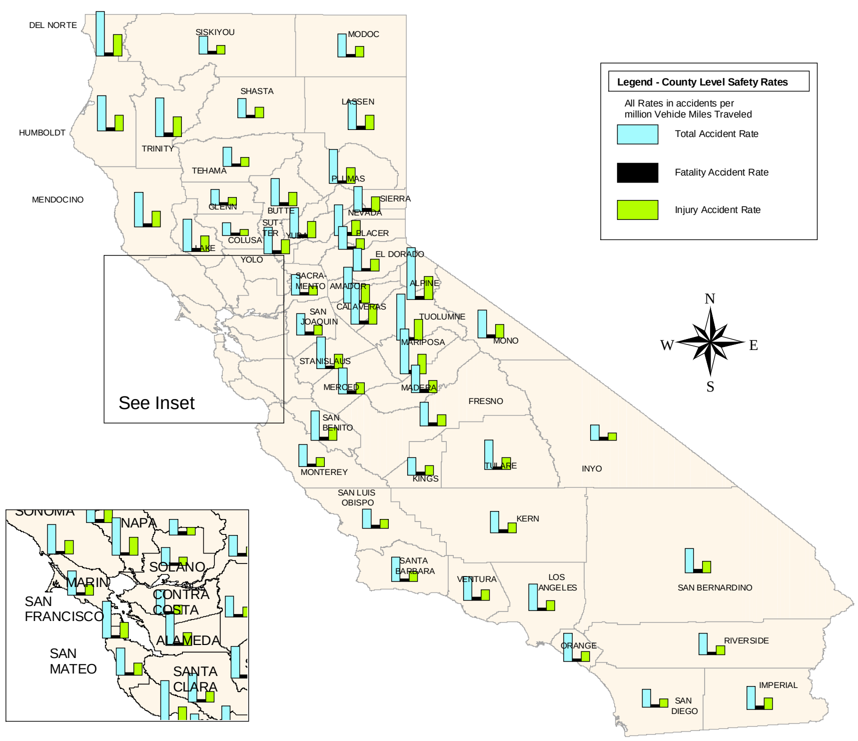
Exhibit 1-4 shows the total accident rate for each County (in light blue bars) and the truck/auto shares (in green and black, respectively). All accident rates are expressed in accidents per total million VMT, which includes both trucks and automobiles. The accident rates reflect total number of accidents divided by VMT. The accident rates shown represent a three-year average between 1996 and 1998.

The exhibit shows that the accident rate for Alpine County is higher than the accident rate for Los Angeles County. The higher accident rate in a rural area such as Alpine County is due to factors such as roadway curvature in mountainous terrain, predominant undivided roads rather than freeways, weather conditions and relatively low vehicle miles of travel.

After several time periods are monitored, this type of information could be useful for trend analysis for individual counties. However, more detailed analysis is required to draw conclusions for planning, programming and project development decision-making.

The accident rates shown in the exhibit reflect accidents divided by VMT, not total accidents. For each county, the accident rate shown is a function of several variables, such as the number of vehicle miles traveled in the county, the terrain, weather, and other factors. If Alpine County has a higher accident rate than Los Angeles County, this does not mean that there are more accidents in Alpine County. The higher accident rate may be due to curvature in the roads, icy conditions, or other factors. On the other hand, Los Angeles County has a lower accident rate due primarily to its high total of vehicle miles traveled.

Exhibit 1-5: County Accident Rates by Accident Type (Total, Fatality, and Injury)

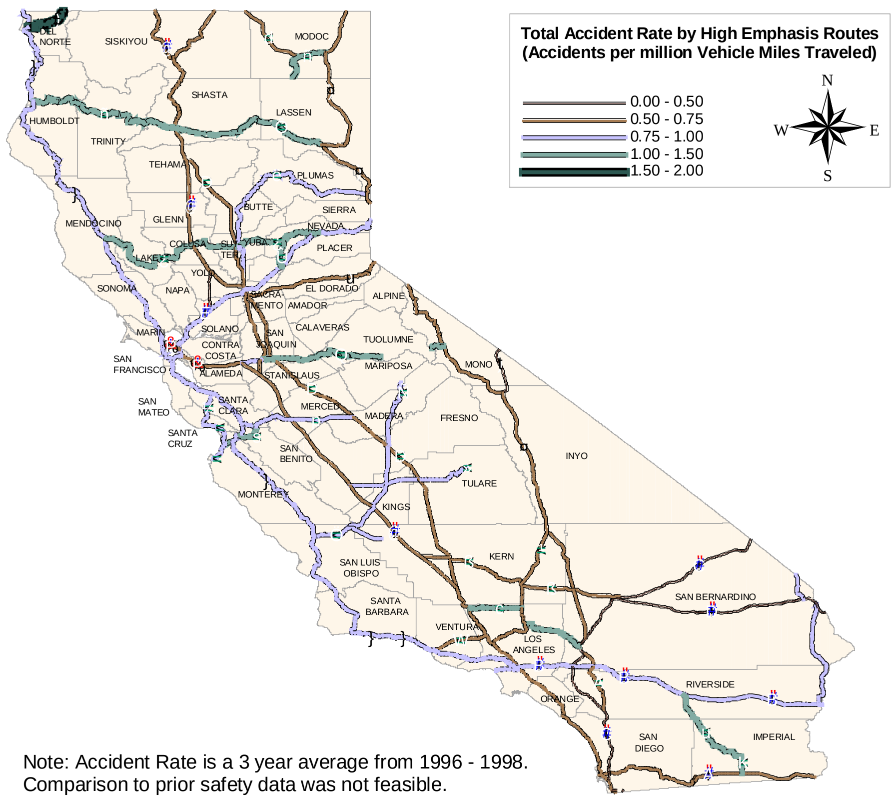


Source: Caltrans 1999 Route Segment Report, Booz·Allen analysis

Exhibit 1-5 shows the total accident rate for California compared to fatality and injury accident rates. The intent is also to show trends of these county accident rates so that each county can better assess how their safety outcome is evolving over time.

The same comments for the magnitude of accident rates made for Exhibit 1-4 apply here also.

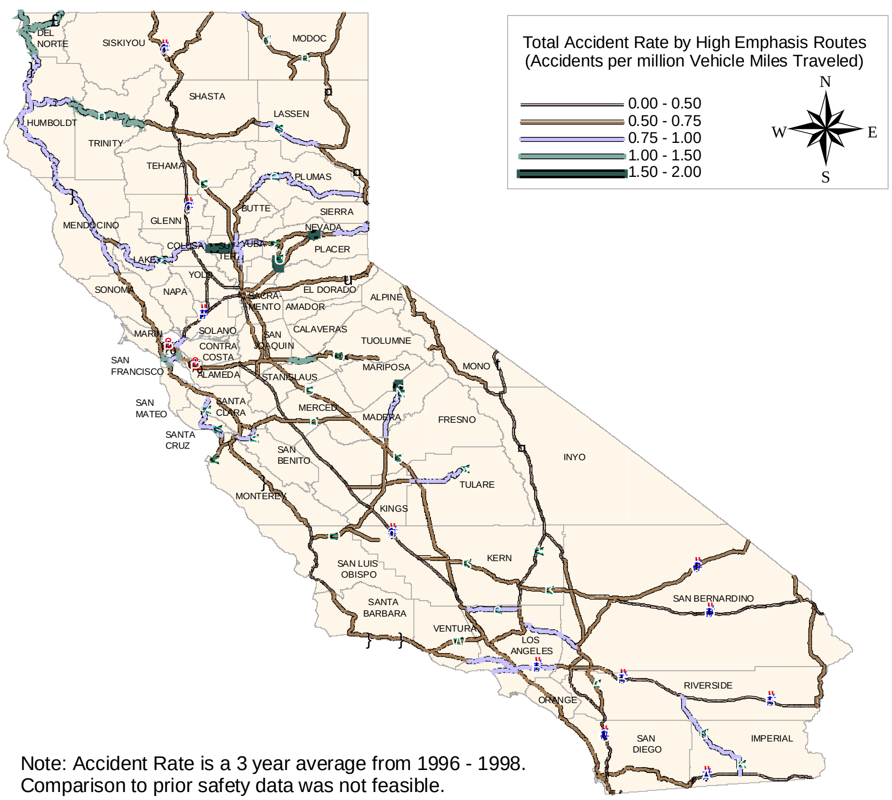
Exhibit 1-6: High Emphasis Route Accident Rates (Route-Level Averages)



Source: Caltrans 1999 Route Segment Report, Booz·Allen analysis

The HERs route-level aggregation for total accidents is analyzed in two different ways: first for the route (corridor) as a whole, then for each route with county line breaks. Exhibit 1-6 shows the entire HERs route level accident rates. The routes shown in green and blue have the highest overall accident rates (i.e., total accidents per vehicle mile traveled).

Exhibit 1-7: High Emphasis Route Accident Rates (County Line to County Line Detail)



Source: Caltrans 1999 Route Segment Report, Booz·Allen analysis

Exhibit 1-7 shows the same HERs route-level accident rates as on the preceding map, this time broken down by county. The highway segments in green and in blue exhibit the highest overall accident rates. This map provides additional detail on each route with a county focus.

Inter-Regional Bus Accident Totals

The Caltrans Traffic Accident and Surveillance Analysis System (TASAS) database provides total bus accidents reported on the State Highway System. The Federal Transit Administration (FTA) also reports on inter-regional bus service safety throughout the state. Information at this level of aggregation is useful for analyzing broad inter-regional bus safety trends on roadways in California.

The data itself contains bus collisions as well as fatalities and injuries reported. The data is limited to what is actually reported. One limitation in the data is the absence of specific reporting for Greyhound Lines, the largest inter-regional bus carrier in California. The company does not track accident statistics for specific states (districts span multiple states), hence this prototype cannot show Greyhound safety measures using California data reported directly by Greyhound.

For the year 1998, TASAS reported 960 accidents involving buses. As defined in the TASAS database, buses include all buses except for school buses.

A number of smaller agencies provide inter-regional bus services throughout the state. Safety data is available for the agencies listed in Exhibit 1-8 from the Federal Transit Administration (FTA) through its National Transit Database (NTD).

Exhibit 1-8: Inter-Regional Bus Providers

Agency	Extent of Inter-Regional Service
Antelope Valley (AVTA)	Lancaster – Los Angeles
Fairfield-Suisan Transit	Davis – Fairfield
Golden Gate Transit	San Francisco – Santa Rosa
Modesto Area Express (MAX)	Lathrop – Modesto – Pleasanton
Monterey-Salinas Transit (MST)	Monterey – Salinas – Santa Cruz
Riverside Transit (RTA)	Hemet – Riverside
Roseville Transit	Sacramento – Roseville
San Joaquin RT	Centered in San Joaquin County
Santa Barbara MTD	Hollister – Santa Barbara
Santa Clara (SCVTA)	San Jose – Santa Cruz
Santa Clarita (SCT)	Lancaster – Santa Clarita
Santa Cruz Metro	San Jose – Santa Cruz
Sunline Transit	Palm Springs – Riverside
Vallejo Transit	Sacramento – Vallejo
Victor Valley Transit	Helendate – Hesperia
Yolobus	Davis – Vallejo

These inter-regional bus service providers reported 367 collisions to the FTA for 1998. Individual provider totals ranged from zero for the service provider with the lowest number of accidents to 159 for the carrier with the highest.

These collisions resulted in a total of 4 fatalities and 179 injuries. None of the fatalities involved a passenger, but 148 of the injuries were passengers. Note that collisions accounted for 80 percent of the total fatalities and 26 percent of the total injuries reported by these operators. Other casualties occurred primarily while patrons were boarding/alighting, waiting at the bus stop, or inside the vehicle.

Most of the inter-regional bus operators provide both local (regional) and inter-regional bus service. In the case of SCVTA, the majority of the routes are within or near to San Jose. It is not possible at this time to determine how many of the collisions and casualties took place on inter-regional, rather than regional, services.

Inter-Regional Bus Accident Rates

Inter-regional bus accident rates are reported for the service providers who report to the FTA only (i.e., bus providers listed in Exhibit 1-8).

Currently, significant limitations to reporting bus accident rates exist. The first is the absence of vehicle mile traveled (VMT) information for the TASAS bus data. The second is the lack of Greyhound-specific accident and VMT data to be able to cross-reference the FTA and TASAS accident information.

The inter-regional bus providers listed in Exhibit 1-8 reported 58.47 million VMT to the FTA for 1998. The collision rate of the inter-regional buses was 6.28 per million VMT. There were 0.07 fatalities per million VMT related directly to collisions, and 3.06 injuries per million VMT.

In the future, these bus safety trends can be monitored over time.

Inter-Regional Rail Accident Totals

Rail accident totals are reported at the statewide level for Amtrak, the commuter railroads and the freight railroads. Information at this level of aggregation is useful for analyzing broad safety trends on the railroads. Rail is a unique transportation mode in that for safety, trends can be analyzed for grade-crossings and along the traditional right of way. In most cases, the rail safety data is reported at the county level (e.g., Federal Railroad Administration on grade crossing incidents, Amtrak accident data). In all cases, the data is reported for the rail system as a whole (e.g., Metrolink).

Overall Rail Statistics – Unique to the rail mode, most rail-related casualties are among employees or non-passengers, rather than passengers on board vehicles. Rail accidents involving casualties are categorized into hjghway-rail grade crossing incidents, train incidents, and other incidents. The latter includes incidents involving employees that are not a result of the first two incident categories.

The Federal Railroad Administration Office of Safety Analysis (FRAOSA) defines a highway-rail grade-crossing incident as any impact between a rail and highway user (both motor vehicles and other users of the crossing) at a designated crossing site. Grade-crossing incidents are particularly important in rail safety because they occur at a higher frequency than other types of accidents, and because of the high probability for casualties when incidents take place. FRAOSA defines a train accident as a safety-related event involving on-track rail equipment (both standing and moving), excluding grade-crossing incidents, causing monetary damage to rail equipment and track above a prescribed amount (threshold was $6,600 in 1998).

In 1998, there were 190 grade-crossing incidents, 135 train accidents, 114 rail-related fatalities, and 795 rail-related injuries in California. In 1998, there was an average of one grade-crossing incident every 1.9 days and one train accident every 2.7 days. There was one rail-related fatality every 3.2 days and 2.2 rail-related injuries every day. These safety totals have remained generally unchanged over the past four years[1].

Most rail-related casualties occur in situations not considered as accidents or grade-crossing incidents, and most are not among rail passengers:

- In 1998, only one of the fatalities (1 percent) and 38 of the injuries (5 percent) within California actually took place among passengers of the rail system.
- The largest category of rail-related fatalities were those hit while being on a rail right-of-way (79 in 1998, or 69 percent). Some fatalities were suicides.
- The largest category of rail-related injuries was rail employees in situations not considered to be accidents or grade-crossing incidents (624 in 1998, or 78 percent). Common injuries were bruises, sprains, and cuts.
- In 1998, grade-crossing incidents accounted for 32 of the rail-related fatalities (28 percent) and only 64 of the injuries (8 percent). Train accidents accounted for zero of the fatalities and 14 of the injuries (2 percent). All other casualties came about from other situations.

1 *These numbers do not include data from local rail systems such as BART, LACMTA, and MUNI. The FRA data also do not include Caltrain and Metrolink statistics.*

In 1998, ten counties (out of 58) reported 54 percent of rail-related fatalities and 69 percent of rail-related injuries in California.

Amtrak – Amtrak serves as the primary inter-regional passenger rail carrier in California. In 1998, about 21 percent of rail-related fatalities and 24 percent of rail-related injuries involved Amtrak trains. Safety statistics for Amtrak, shown in Exhibit 1-9, include all of primary California services (i.e., Capital Corridor, San Diegan, and San Joaquin). They also include the portion of national services (i.e., Coast Starlight, California Zephyr, Southwest Chief, and Sunset Limited) that operate on California right-of-way. Note that Amtrak feeder bus services are not included in these statistics.

Exhibit 1-9: Amtrak Accident Totals, 1998

Safety Category	Events	Fatalities	Injuries
Grade-crossing incidents	30	11	22
Train accidents	8	0	0
Other situations	N/A	15	141
Totals	**N/A**	**26**	**163**

Source: Public Utilities Commission

Commuter Railroads – Two commuter railroads are included in this accident analysis:

- Caltrain: operates between San Francisco and Gilroy
- Metrolink: also known as the Southern California Regional Rail Authority (SCRRA), operates primarily in the Los Angeles area but also connects to San Diego.

Exhibit 1-10 summarizes safety totals for the commuter railroads.

Exhibit 1-10: Commuter Railroad Accident Totals, 1998

Commuter Railroad	Accident Category	Events	Fatalities	Injuries
Caltrain	Grade-crossing incidents	4	2	2
	Train accidents	25	8	6
	Other situations	N/A	8	20
Metrolink	Grade-crossing incidents	2	2	3
	Train accidents	6	6	16
	Other situations	N/A	0	20
	Totals	**N/A**	**26**	**69**

Source: Public Utilities Commission

Accident data for the newly instituted Altamont Commuter Express (ACE) was not available for this prototype report. ACE service formally began in October 1998. Statistics for the ACE would be included in future comprehensive performance monitoring reports.

Freight Railroads – Of the thirty freight railroads that operate within California, two provide the majority of the inter-regional service. Both are Class 1 railroads:

- Burlington Northern and Santa Fe Railway (BNSF): operates on about 1,800 railroad miles in California

- Union Pacific Railroad (UP): operates on about 3,800 railroad miles in California.

Exhibit 1-11 presents summary safety statistics for the freight railroads.

Exhibit 1-11: Freight Railroad Accident Totals

Freight Railroad	Safety Category	Events	Fatalities	Injuries
BNSF	Grade-crossing incidents	46	9	7
	Train accidents	49	0	7
	Other situations	N/A	19	127
UP	Grade-crossing incidents	96	8	31
	Train accidents	82	0	7
	Other situations	N/A	43	323
	Totals	**N/A**	**79**	**502**

Source: Public Utilities Commission, 1998 Data

The two railroads account for most of the statewide rail-related casualties. These casualties tend to occur in Southern California:

- 31.4 percent of BNSF 1997-98 casualties were in San Bernardino County, 12.4 percent were in Los Angeles, 11.1 percent were in Contra Costa, and 7.8 percent were in Kern.

- 23.5 percent of Union Pacific casualties were in Los Angeles County, 12.1 percent were in San Bernardino, 7.6 percent were in Placer, and 7.5 percent were in Alameda.

By comparison, 31.4 percent of Amtrak casualties were in Los Angeles County, 7.4 percent were in Orange, 6.9 percent were in Riverside, and 6.9 percent were in San Diego.

The other 29 "short line" freight railroads combined accounted for less than 10 percent of the total rail fatalities and less than 20 percent of the total rail injuries in 1998. None operate on more than 400 railroad miles within California.

Inter-Regional Rail Accident Rates

Rail accident rates are reported in the prototype for Amtrak, Commuter Railroads, and Freight Railroads. The sources are the Federal Railroad Administration and the California Public Utilities Commission.

Overall, inter-regional rail accident rates have remained steady over the past four years. There is a slight downward trend for fatality and injury rates. Summary statistics for the inter-regional rail providers are provided in Exhibit 1-12.

Exhibit 1-12: Inter-Regional Rail[2] Accident Totals and Rates in California Four-Year Trend

	Year			
Totals	**1995**	**1996**	**1997**	**1998**
Grade-crossing incidents	200	201	159	190
Train accidents	112	127	105	135
Fatalities, rail total	106	96	109	114
Fatalities from grade-crossing incidents	28	24	22	32
Fatalities from train accidents	1	2	1	0
Fatalities, other situation: struck on the right-of-way	73	69	83	79
Fatalities, other situation: passengers on train	0	0	0	1
Fatalities, other situation: employees	4	1	3	2
Injuries, rail total	793	731	724	795
Injuries from grade-crossing incidents	70	56	65	64
Injuries from train accidents	11	9	13	14
Injuries, other situation: struck on the right-of-way	52	55	59	62
Injuries, other situation: passengers on train	1	11	39	31
Injuries, other situation: employees	659	600	548	624

Rates	**1995**	**1996**	**1997**	**1998**
Grade-Xing incidents per million train-miles	7.63	9.27	6.20	6.48
Train accidents per million train-miles	4.27	5.86	4.09	4.60
Fatalities per million train-miles	4.04	4.43	4.25	3.89
Injuries per million train-miles	30.25	33.73	28.24	27.13

Source: Federal Railroad Administration

2 *Does not include local rail, such as BART, MTA, and MUNI. Also does not include Caltrain and Metrolink, which are considered to be inter-regional services. Numbers for Caltrain and Metrolink are provided separately.*

Exhibit 1-13 contains information on the distribution of population, grade crossings and rail casualties by county. Only counties with 50 or more casualties over the 1997-1998 time period are shown.

Exhibit 1-13: 1998 County Rail Casualties

County	% of State Population	% of Grade Crossings	% of Rail Fatalities, 1998	% of Rail Injuries, 1998
Alameda	4.3%	6.3%	2.6%	5.3%
Contra Costa	2.7%	3.9%	4.4%	4.0%
Fresno	2.3%	5.0%	4.4%	3.0%
Kern	1.9%	3.7%	3.5%	3.6%
Los Angeles	28.8%	14.2%	13.2%	24.2%
Orange	8.3%	3.0%	5.3%	2.3%
Placer	0.7%	0.8%	0.9%	4.8%
Riverside	4.4%	2.6%	6.1%	4.3%
San Bernardino	4.9%	4.3%	7.0%	13.1%
San Joaquin	1.6%	5.9%	6.1%	4.8%
Others (48)	28.1%	50.3%	46.5%	30.7%
California	100.0%	100.0%	100.0%	100.0%

Source: Federal Railroad Administration

The rest of this section on rail accident rates addresses:

- Amtrak
- Commuter Railroads
- Freight Railroads.

Amtrak - Amtrak accident statistics are summarized in Exhibit 1-14 (the rates are highlighted in bold). Amtrak safety rates for grade-crossing incidents per train-mile traveled in California are high compared to the rest of the inter-regional rail providers. Their safety rate in accidents per million train-miles is the lowest of the providers.

Exhibit 1-14: 1998 Amtrak Accident Statistics in California

Annual Train-Miles Traveled (in millions):	2.30*
Grade-Crossing Incidents:	30
Train Accidents:	8
Total Fatalities	26
- Fatalities from Grade-Crossing Incidents	11
- Fatalities from Train Accidents	0
Total Injuries:	163
- Injuries from Grade-Crossing Incidents	22
- Injuries from Train Accidents	0

Grade-Crossing Incidents per million train-miles:	**13**
Train Accidents per million train-miles:	**3.5**
Fatalities per million train-miles:	**11.3**
Injuries per million train-miles:	**70.9**

Source: Public Utilities Commission

**Train-Miles Traveled Source: Estimate based on Amtrak Schedules, Caltrans Rail Program Forecasting Model, and Booz·Allen analysis*

Commuter Railroads – Safety statistics for the two commuter railroads are summarized in Exhibit 1-15 (accident rates are shown in bold). For 1998, Caltrain's train accident rate was the highest in the industry. Metrolink's safety rates were low for both grade crossings and overall accidents.

Exhibit 1-15: Commuter Rail Accident Statistics in California, 1998

	Caltrain	Metrolink
Annual Train-Miles Traveled (in millions):	1.02*	1.61*
Grade-Crossing Incidents:	4	2
Train Accidents:	25	6
Fatalities, Total:	18	8
- Fatalities from Grade-Crossing Incidents:	2	2
- Fatalities from Train Accidents:	8	6
Injuries, Total:	28	39
- Injuries from Grade-Crossing Incidents:	2	3
- Injuries from Train Accidents:	6	16
Grade-Crossing Incidents per million train-miles:	**3.9**	**1.2**
Train Accidents per million train-miles:	**24.5**	**3.7**
Fatalities per million train-miles:	**17.6**	**5.0**
Injuries per million train-miles:	**27.5**	**24.2**

Source: Public Utilities Commission

**Train-Miles Traveled Source: Estimate based on 1998 National Transit Database*

Freight Railroads – Overall freight safety statistics are reported to both the FRA and the PUC. Train-miles traveled by individual railroads could not be estimated. However, by subtracting passenger rail numbers from the rail total, freight railroad train miles could be calculated as a whole. Summary safety statistics for the freight carriers are shown in Exhibit 1-16, with the accident rates highlighted.

Exhibit 1-16: 1998 Freight Rail Accident Statistics in California

Annual Train-Miles Traveled (millions):	25.4*
Grade-Crossing Incidents:	152
Train Accidents:	123
Fatalities, Total:	82
- Fatalities from Grade-Crossing Incidents:	17
- Fatalities from Train Accidents:	0
Injuries, Total:	616
- Injuries from Grade-Crossing Incidents:	42
- Injuries from Train Accidents:	14

Grade-Crossing Incidents per million train-miles:	**6.0**
Train Accidents per million train-miles:	**4.8**
Fatalities per million train-miles:	**3.2**
Injuries per million train-miles:	**24.3**

Source: Public Utilities Commission

**Train-Miles Traveled Source: Estimate based on 1998 National Transit Database*

1.1.2. Security Information

Crimes committed on the transportation infrastructure are considered part of the safety/security outcome that should be monitored over time. While crime rates are the performance measure for the outcome, *crime events* provide additional insight into the magnitude of the problem.

Security information is therefore reported as "crime events", then as "crime rates". Crime events relate to the total number of crimes (e.g., violent or property crimes) committed for the particular mode, while the crime rates relate to the ratio of crimes committed to usage of the system. In this analysis, crime rates are calculated as violent crimes per passenger trip and property crimes per million passenger trips. For this prototype report, crime events are reported for the bus and rail modes only. While crime events do take place on the highways (e.g., "carjackings" and shootings), no source was identified that could fully address this issue.

Inter-Regional Bus Crime Events

The Federal Transit Administration (FTA) collects annual inter-regional bus crime events for the following categories:

- Violent crimes (assault, homicide, rape, robbery)
- Property crimes (arson, burglary, larceny, theft).

Other crime events, such as vandalism, disorderly conduct, trespassing, and loitering are not included in this report.

For the six inter-regional transit agencies that reported crime data to the FTA, the table below shows the total violent and property crimes for 1997 and 1998.

Inter-regional Bus Crime Events	1997	1998
Violent Crime	35	13
Property Crime	60	53

Inter-Regional Bus Crime Rates

In 1998, the state inter-regional bus violent crime rate was 0.13 crime per million passenger trips. The property crime rate was 0.53 crime per million passenger trips. Note that these rates represent crimes *reported* to the FTA, and may be less than what actually occurred.

Inter-Regional Rail Crime Events

Statistics on security for Amtrak trains is available from Amtrak's headquarters in Philadelphia. The latest year data were available is 1998.

Amtrak Crime Events (in California)	1998
Violent Crime	6
Property Crime	285

The FTA collects rail security data for the commuter railroads, Caltrain and Metrolink. Over the past two years, there were an average of 29 violent crimes and 240 property crimes annually on both railroads.

Crime events for freight railroads were not available for this analysis.

Inter-Regional Rail Crime Rates

In 1998, the state commuter rail violent crime rate was 1.55 crimes per million passenger trips. The property crime rate was 14.88 crimes per million passenger trips. As with bus crime rates, these rates represent crimes *reported* to the FTA, and may be a subset of what actually occurred.

1.2. MOBILITY/ACCESSIBILITY

The mobility/accessibility outcome addresses the ability of travelers and goods to reach desired destinations with relative ease and within a reasonable time. Travel time delay is the indicator for mobility and it can be measured as the difference between optimal and actual average travel time. Accessibility to the transportation system is measured by how easy it is to reach the transportation system. Accessibility to desired travel destinations is a key indicator that will be reported in a future report. This indicator will require close coordination regional and private sector interests.

Highway mobility provides users with an indicator for the level of congestion on a particular highway segment. Mobility is defined as the portion of the average point-to-point travel time that is considered to be due to delay. Delay is the additional travel time that results from less than optimal circumstances. A longer period of delay indicates a lower level of mobility. Highway mobility is measured in hours of delay experienced on the facility. The measure is applicable to any portion of a highway, regardless of how people access the highway (e.g., by on-ramps, at intersections), number of lanes, speed limit or other characteristics. This report only includes selected district highways with the best possible loop detector data to provide highway mobility analysis.

Inter-regional transit delays are calculated by taking the difference between the optimal travel time and the average travel time for a trip from a specific origin to a specific destination. Optimal travel time reflects free-flow conditions along the transit right-of-way (i.e., highway or railway). Since most transit agencies do not collect data on actual travel times, they must be inferred from published schedules.

Freight rail delay data were not available for the freight railroads. Freight rail mobility is therefore not included in this prototype.

Accessibility represents the ability of travelers to access the system and is measured in terms of distance to the system.

1.2.1. Delay

Delay information is presented by mode:

- Highway
- Inter-regional transit (includes inter-regional bus, Amtrak, and commuter railroads)

Highway Delay

Delay along a highway segment is calculated by subtracting the free-flow travel time from the actual average travel time during a particular period (i.e., hour of day, day of week). The free-flow travel time is determined by the posted speed (i.e., Free-Flow Travel Time = Distance ÷ Posted Speed). For example, if the distance is 10 miles and the posted speed is 65 mph, then the free flow travel time is 9.2 minutes. Actual average travel time is determined by the actual travel speed over the same distance.

Delay is reported as average daily vehicle-hours of delay. That is, the average travel delay along a segment is multiplied by the number of vehicles experiencing that delay. A segment with little delay over which many vehicles travel may measure the same level of delay as a segment with a much larger delay per vehicle, if the latter segment has fewer vehicles experiencing that delay.

For this report information on highway delays is based on available detection data provided by Caltrans District Transportation Management Centers (TMCs). The availability of detection data is limited by the physical presence of detector systems and their operating status. Some Caltrans districts lack automatic and integrated detector coverage for the entire State Highway system. This means that delay data are not available for some districts. Even in districts with extensive detector coverage, some routes may not have working loop detectors. Some highway segments with known traffic congestion may not show delays in the analyses that follow. Although delay data in rural areas is not included in this prototype report, the addition of this information is being investigated for future reports.

This prototype includes delay information for three Caltrans districts:

- District 3 – The Sacramento Area (State Route 51, or Business Route 80),
- District 11 – San Diego County (Interstate 5), and
- District 12 – Orange County (Interstate 5).

The mobility information is presented on maps that contain the following types of information:

- Average Daily Vehicle-Hours of Delay - This map shows the total average daily delay for the two time periods described above.

- Average Daily AM/PM Peak Period Vehicle-Hours of Delay - The AM map shows delay occurring between 5:30 AM and 10:30 AM. These are the morning hours most likely to experience delays. The PM map shows delays from 1:30 PM to 8:00 PM, which represent the hours of typical afternoon and early evening delay.

District 3

Exhibit 1-17 shows the sum of the average daily vehicle-hours of delay occurring on Route 51 (Business 80) in the Sacramento area between 5:30 AM and 10:00 AM during the morning and from 1:30 PM to 8:00 PM in the afternoon.

Exhibit 1-18 shows the average daily AM peak period vehicle-hours of delay for Route 51 in the Sacramento area. The hour in which the most delay occurred is shown for those areas experiencing very high levels of delay. The map identifies, by route segment, the level of delay that occurs during the morning commute hours. Note: the entire district was not monitored.

Exhibit 1-19 shows the average daily delay for the PM peak period.

The tables below shows the most congested segments on Route 51 based on the analysis of the loop detector data. The tables identify the components for calculating delay: the free-flow time per vehicle, actual average travel time per vehicle. Total delay figures for each segment are shown to the right.

AM Peak Period Mobility: Route 51 (Business 80) Southbound

Segment	Location Description	Facility/ # Lanes	Segment Length (miles)	Average Speed	Est Avg Hourly Volumes	Free Flow Travel Time (minutes)	Average Travel Time (minutes)	Delay per Veh (minutes)	Total AM Delay (hours)	Hours of Maximum Delay
1	El Camino to Fulton Ave	3	1.42	47.9	6753	1.31	1.78	0.47	237	5:00 - 6:00
2	Auburn Blvd to Watt Ave	3	1.30	53.0	1374	1.20	1.47	0.27	28	8:00 - 9:00

AM Peak Period Mobility: Route 51 (Business 80) Northbound

Segment	Location Description	Facility/ # Lanes	Segment Length (miles)	Average Speed	Est Avg Hourly Volumes	Free Flow Travel Time (minutes)	Average Travel Time (minutes)	Delay per Veh (minutes)	Total AM Delay (hours)	Hours of Maximum Delay
1	Tirbute Rd to Frienaz Ave	3	1.69	36.2	1375	1.56	2.80	1.24	128	9:00 - 10:00
2	E Street to Tribute Rd	3	1.69	31.8	254	1.56	3.19	1.63	31	7:00 - 8:00

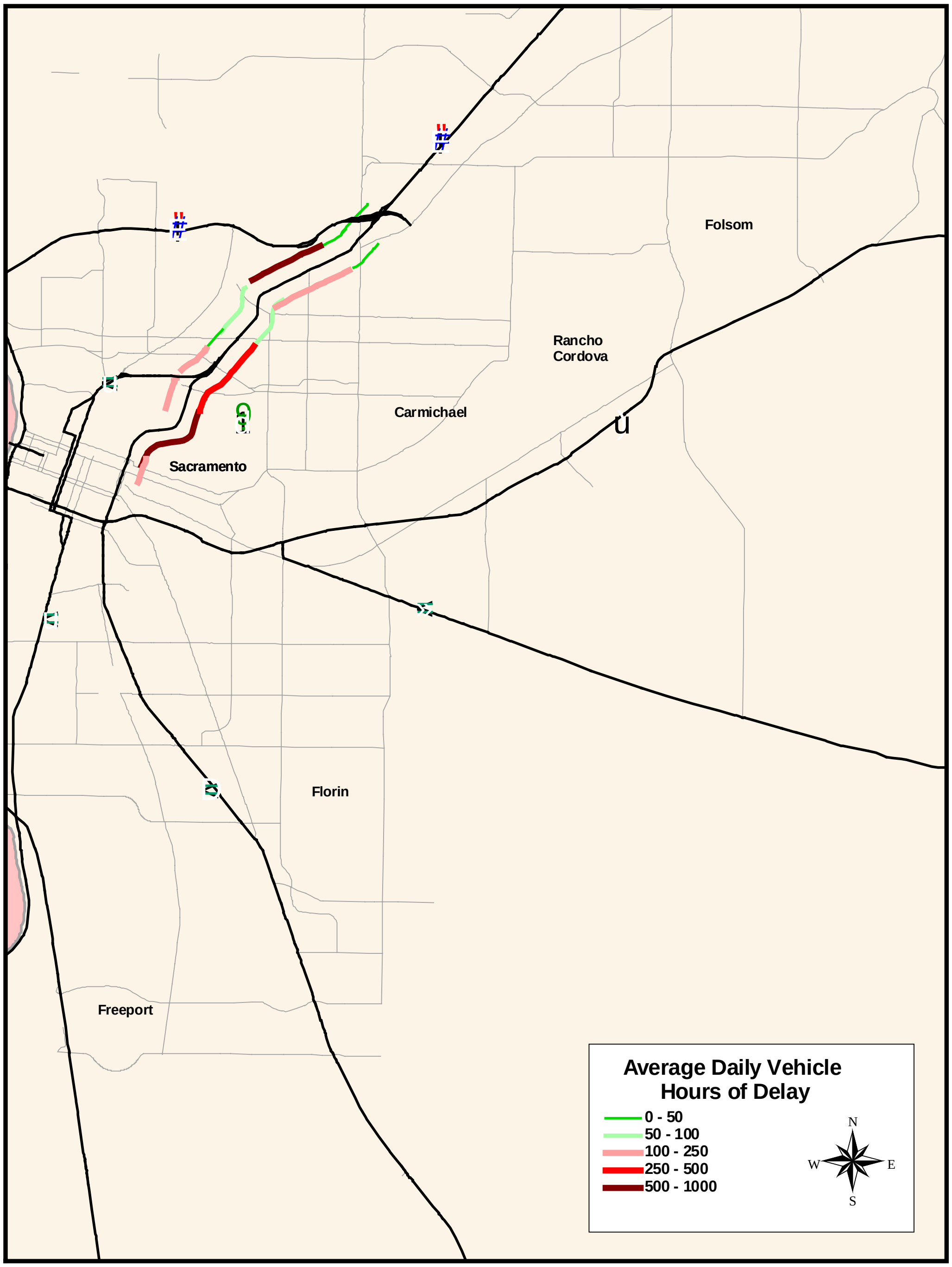
PM Peak Period Mobility: State Route 51 (Business 80) Southbound

Segment	Location Description	Facility/ # Lanes	Segment Length (miles)	Average Speed	Est Avg Hourly Volumes	Free Flow Travel Time (minutes)	Average Travel Time (minutes)	Delay per Veh (minutes)	Total PM Delay (hours)	Hour of Maximum Delay
1	Exposition to Fulton Ave	3	4.37	42.3	3846	4.03	6.20	2.16	902	17:00 - 18:00
2	Auburn Blvd to Watt Ave	3	1.3	53.0	136	1.20	1.47	0.27	4	13:00 - 14:00

PM Peak Period Mobility: State Route 51 (Business 80) Northbound

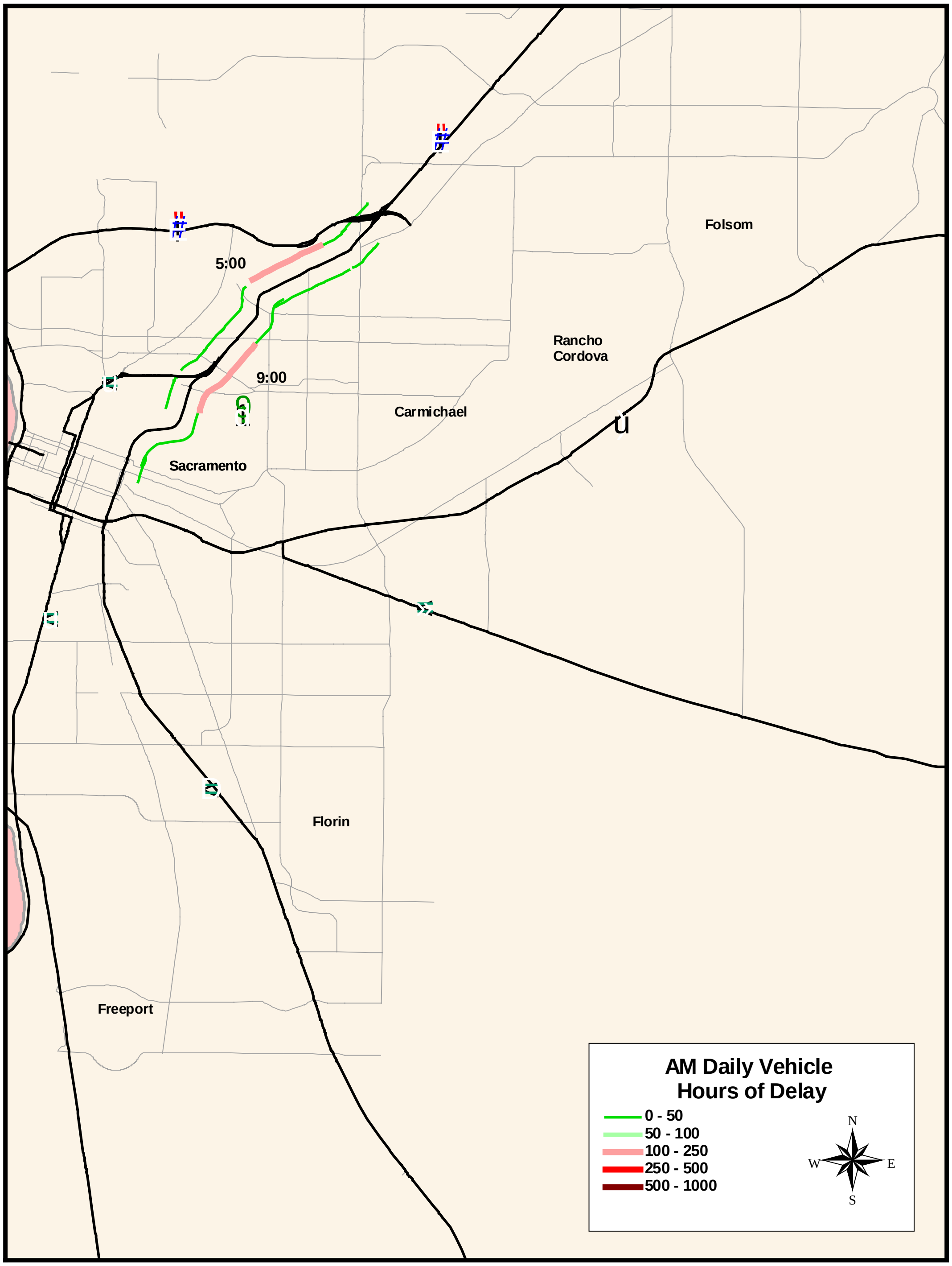
Segment	Location Description	Facility/ # Lanes	Segment Length (miles)	Average Speed	Est Avg Hourly Volumes	Free Flow Travel Time (minutes)	Average Travel Time (minutes)	Delay per Veh (minutes)	Total PM Delay (hours)	Hour of Maximum Delay
1	J St to Watt Ave	3	7.71	39.1	2624	7.12	11.83	4.71	1340	15:00 - 16:00
2	E Street to Tribute Rd	3	1.69	31.8	3276	1.56	3.19	1.63	578	17:00 -18:00

Exhibit 1-17: Average Daily Vehicle-Hours of Delay* on Route 51 (Business 80) in District 3



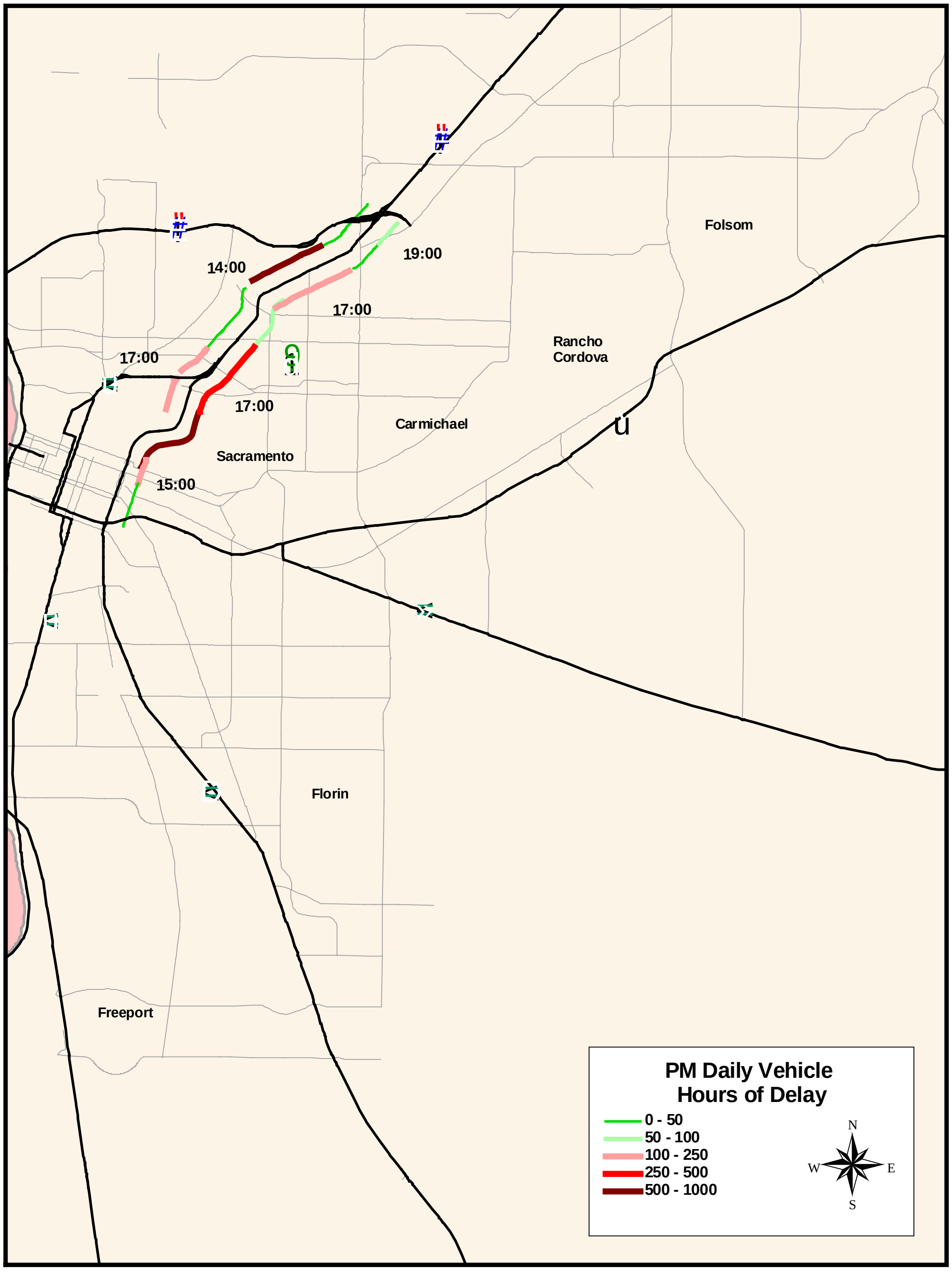
** - Delay is estimated for only those segments on Route 51 from SR-50 to Interstate 80 that have consistent and reliable data collected at the District Traffic Management Center.*

Exhibit 1-18: Average AM Peak Period Vehicle-Hours of Delay* on Route 51 (Business 80) in District 3



** - Delay is estimated for only those segments on Route 51 from SR-50 to Interstate 80 that have consistent and reliable data collected at the District Traffic Management Center.*

Exhibit 1-19: Average PM Peak Period Vehicle-Hours of Delay* on Route 51 (Business 80) in District 3



** - Delay is estimated for only those segments on Route 51 from SR-50 to Interstate 80 that have consistent and reliable data collected at the District Traffic Management Center*

District 11

Exhibit 1-20 shows the sum of the average daily vehicle-hours of delay occurring on Interstate 5 in District 11 between 5:30 AM and 10:00 AM during the morning commute period, and from 1:30 PM and 8:00 PM in the afternoon.

Exhibit 1-21 shows delay for the PM peak period. The tables below show the worst I-5 segments for delay during the PM peak period. The tables identify the components for calculating delay: the free-flow time per vehicle, actual average travel time per vehicle.

Exhibit 1-22 presents the AM peak period vehicle-hours of delay experienced during a typical weekday commute. The map identifies, by route segment, the level of delay that occurs during the morning commute hours. The segments listed below identify the I-5 segments with the most delay during the AM peak period. Note: the entire district was not monitored.

AM Peak Period Mobility: Interstate 5 Northbound

Segment	Location Description	Facility/ # Lanes	Segment Length (miles)	Average Speed	Est Avg Hourly Volumes	Free Flow Travel Time (minutes)	Average Travel Time (minutes)	Delay per Veh (minutes)	Total AM Delay (hours)	Hour of Maximum Delay
1	Jct 274 to Damon St	6	3.11	53.6	6682	2.87	3.481	0.61	306	8:00 - 9:00

AM Peak Period Mobility: Interstate 5 Southbound

Segment	Location Description	Facility/ # Lanes	Segment Length (miles)	Average Speed	Est Avg Hourly Volumes	Free Flow Travel Time (minutes)	Average Travel Time (minutes)	Delay per Veh (minutes)	Total AM Delay (hours)	Hour of Maximum Delay
1	Carmel Valley Rd to Leucadia Blvd	4	12.74	38.7	2688	11.76	19.737	7.98	1608	7:00 - 8:00

PM Peak Period Mobility: Interstate 5 Northbound

Segment	Location Description	Facility/ # Lanes	Segment Length (miles)	Average Speed	Est Avg Hourly Volumes	Free Flow Travel Time (minutes)	Average Travel Time (minutes)	Delay per Veh (minutes)	Total Delay (hours)	Hour of Maximum Delay
1	Carmel Valley Rd to Lomas Santa Fe Dr	4	7.36	41.5	2776	6.794	10.636	3.842	1333	17:00 - 18:00

PM Peak Period Mobility: Interstate 5 Southbound

Segment	Location Description	Facility/ # Lanes	Segment Length (miles)	Average Speed	Est Avg Hourly Volumes	Free Flow Travel Time (minutes)	Average Travel Time (minutes)	Delay per Veh (minutes)	Total PM Delay (hours)	Hour of Maximum Delay
1	Balboa Ave to Del Mar Heights Rd	4 - 6	12.32	43.6	2979	11.372	16.950	5.578	1800	17:00 - 18:00
2	7th Ave to Hancock St	5	3.22	36.1	4487	2.972	5.349	2.377	1333	17:00 - 18:00

Exhibit 1-20: Average Daily Vehicle-Hours of Delay* on Interstate 5 in District 11

* - *Delay is estimated for only those segments on Interstate 5 from downtown San Diego to Carlsbad that have consistent and reliable data collected at the District Traffic Management Center.*

Exhibit 1-21: Average AM Vehicle-Hours of Delay* on Interstate 5 in District 11

** -Delay is estimated for only those segments on Interstate 5 from downtown San Diego to Carlsbad that have consistent and reliable data collected at the District Traffic Management Center.*

Exhibit 1-22: Average PM Vehicle-Hours of Delay* on Interstate 5 in District 11

**- Delay is estimated for only those segments Interstate 5 from downtown San Diego to Carlsbad that have consistent and reliable data collected at the District Traffic Management Center.*

District 12

State Highways in Orange County are some of the most congested in the state. Exhibit 1-23 shows the sum of the average daily vehicle-hours of delay occurring on Interstate 5 in District 12 between 5:30 AM and 10:00 AM during the morning commute period, and from 1:30 PM and 8:00 PM in the afternoon

Exhibit 1-24 presents delay for the AM peak period in Orange County. The map identifies, by route segment, the level of delay that occurs during the morning commute hours. The tables below shows the I-5 segments that contribute the most to the delay on the route. The tables identifies the components for calculating delay: the Free-flow time per vehicle, actual average travel time per vehicle. Note: the entire district was not monitored.

Exhibit 1-25 shows PM congestion for a typical weekday in District 12. The tables below shows I-5 segments with PM period congestion.

AM Peak Period Mobility: Interstate 5 Northbound

Segment	Location Description	Facility/ # Lanes	Segment Length (miles)	Average Speed	Est Avg Hourly Volumes	Free Flow Travel Time (minutes)	Average Travel Time (minutes)	Delay per Veh (minutes)	Total Delay (hours)	Hour of Maximum Delay
1	Oso Pkwy to El Toro Rd	4	4.22	22.00	4338	3.90	11.5	7.61	2477	7:00 - 8:00
2	Jeffery Rd Newport Ave	5	4.47	36.30	5767	4.13	7.4	3.26	1411	8:00 - 9:00
3	Barranca Pkwy to Jct 133/5	5	0.88	15.60	3012	0.81	3.4	2.57	581	10:00 - 11:00

AM Peak Period Mobility: Interstate 5 Southbound

Segment	Location Description	Facility/ # Lanes	Segment Length (miles)	Average Speed	Est Avg Hourly Volumes	Free Flow Travel Time (minutes)	Average Travel Time (minutes)	Delay per Veh (minutes)	Total Delay (hours)	Hour of Maximum Delay
1	Avenida Pico to Avenida Vaquero	4	0.47	29.00	8913	0.43	1.0	0.54	360	10:00 - 11:00

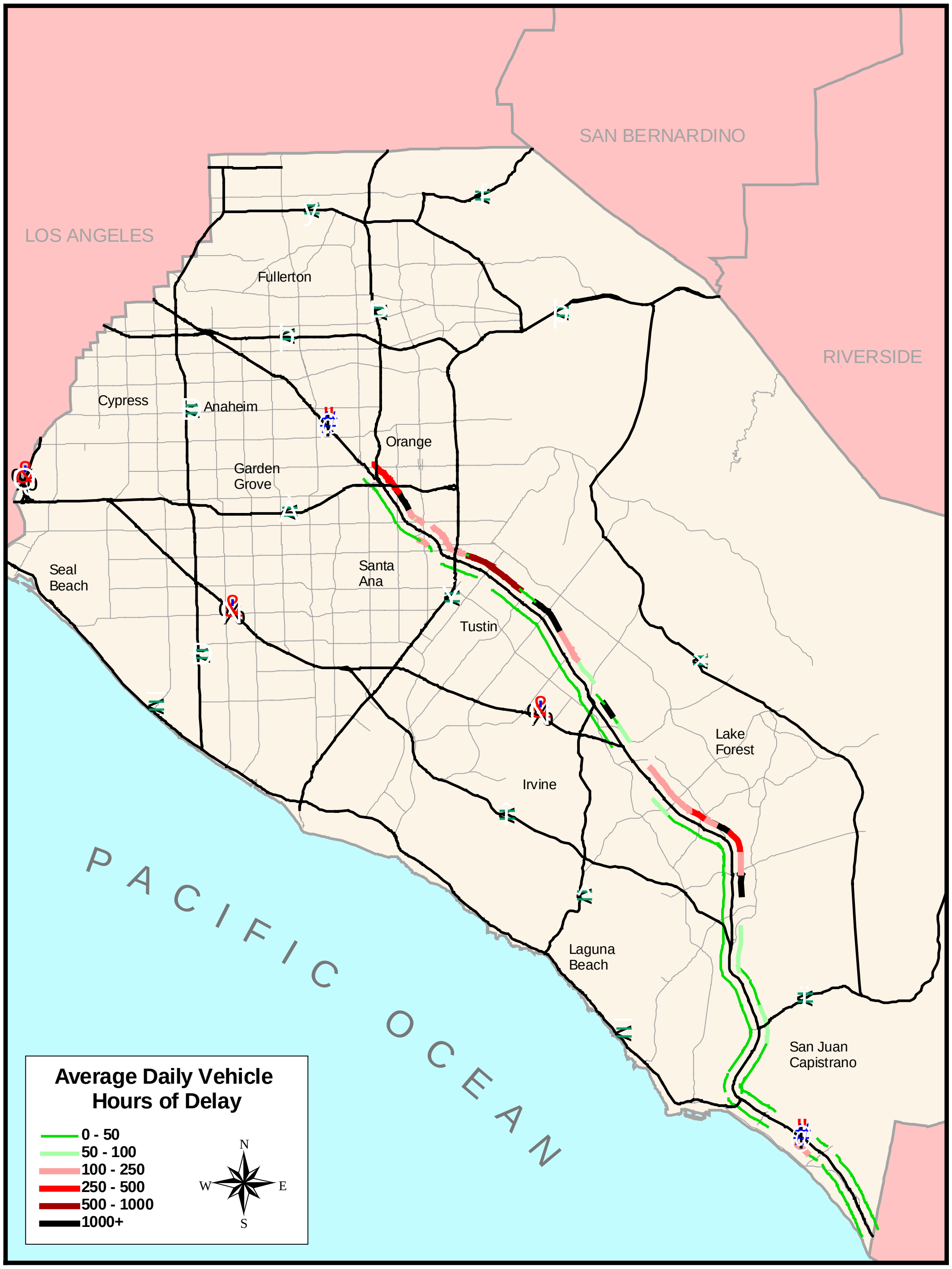
PM Peak Period Mobility: Interstate 5 Northbound

Segment	Location Description	Facility/ # Lanes	Segment Length (miles)	Average Speed	Est Avg Hourly Volumes	Free Flow Travel Time (minutes)	Average Travel Time (minutes)	Delay per Veh (minutes)	Total Delay (hours)	Hour of Maximum Delay
1	Jeffery Rd to Chapman Ave	3 - 5	7.41	25.7	2979	6.84	17.30	10.46	3376	17:00 - 18:00
2	Oso Pkwy to Alicia Pkwy	4	2.56	13.4	981	2.36	11.46	9.10	967	16:00 - 17:00
3	Barranca Pkwy to Jct 133/5	5	0.5	35.6	16807	0.46	0.84	0.38	694	16:00 - 17:00

PM Peak Period Mobility: Interstate 5 Southbound

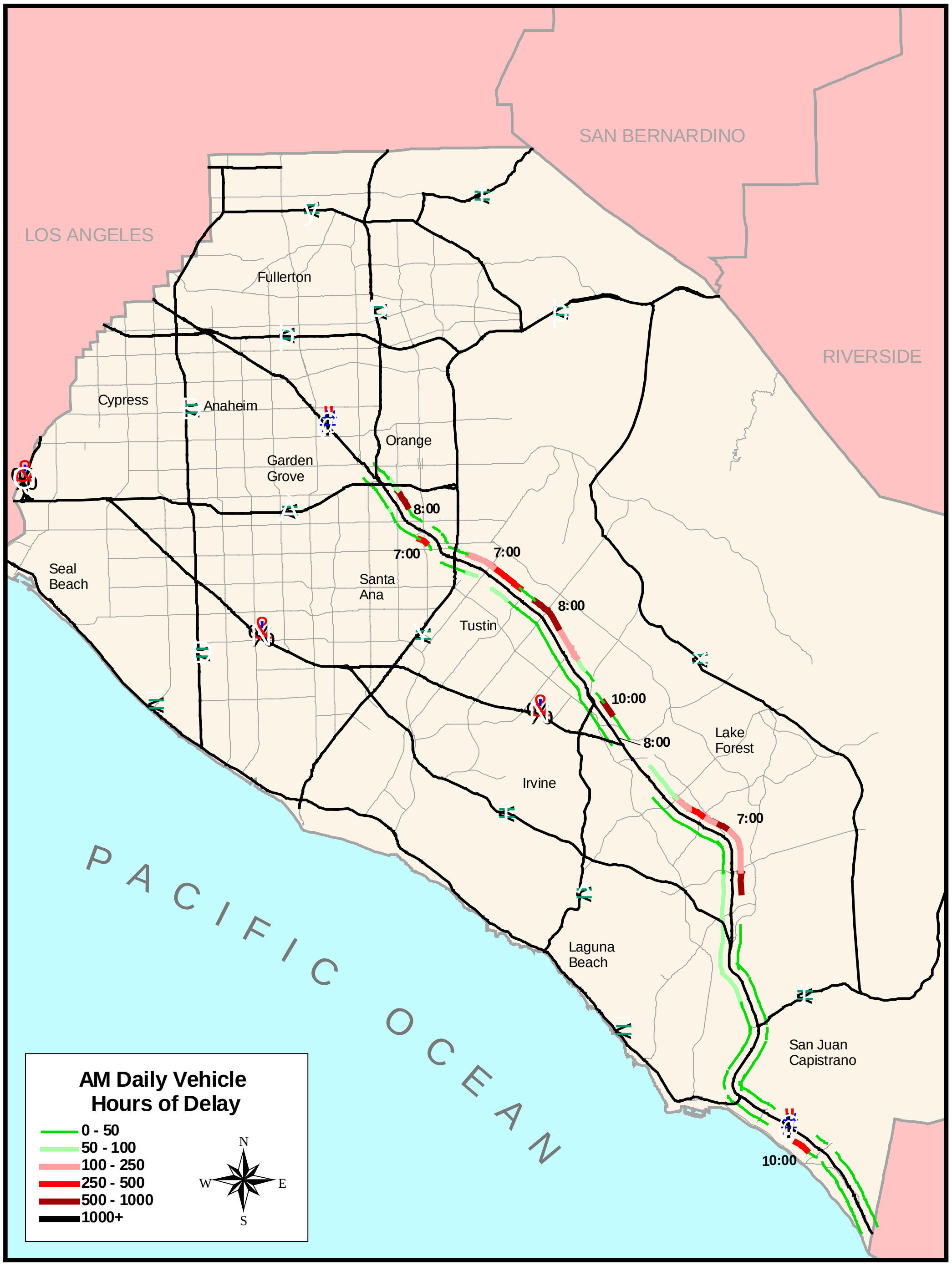
Segment	Location Description	Facility/ # Lanes	Segment Length (miles)	Average Speed	Est Avg Hourly Volumes	Free Flow Travel Time (minutes)	Average Travel Time (minutes)	Delay per Veh (minutes)	Total Delay (hours)	Hour of Maximum Delay
1	Avenida Pico to Avenida Vaquero	4	0.5	29.0	7314	0.46	1.03	0.57	454	17:00 - 18:00
2	El Toro Rd to Lake Forest Dr	4	0.65	27.4	3061	0.60	1.42	0.82	273	17:00 - 18:00

Exhibit 1-23: Average Daily Vehicle-Hours of Delay* on Interstate 5 in District 12



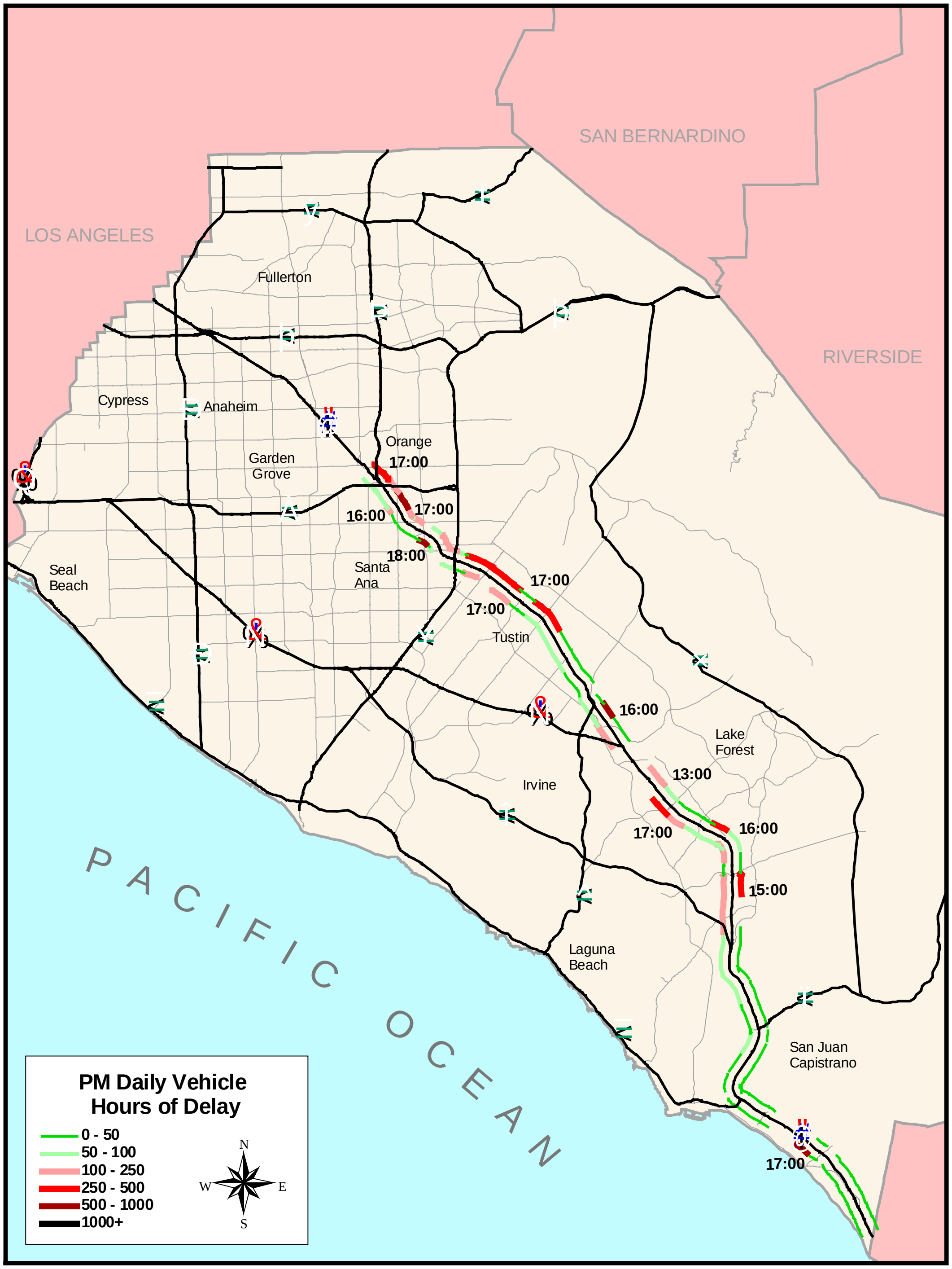
** - Delay is estimated for only those segments on Interstate 5 from San Clemente to Santa Ana that have consistent and reliable data collected at the District Traffic Management Center.*

Exhibit 1-24: Average AM Vehicle-Hours of Delay* on Interstate 5 in District 12



** - Delay is estimated for only those segments on Interstate 5 from San Clemente to Santa Ana that have consistent and reliable data collected at the District Traffic Management Center.*

Exhibit 1-25: Average PM Vehicle-Hours of Delay* on Interstate 5 in District 12



** - Delay is estimated for only those segments Interstate 5 from San Clemente to Santa Ana that have consistent and reliable data collected at the District Traffic Management Center.*

Inter-Regional Transit Delay

Inter-regional transit includes buses and rail modes (e.g., Amtrak and commuter railroads), which may be used interchangeably or in combination for making transit trips. Inter-regional transit delays are calculated by taking the difference between the optimal travel time and the average travel for travel from an origin to a destination. Optimal travel time reflects free-flow conditions along the transit right-of-way (i.e., highway or railway). Most transit agencies do not collect data on actual travel time so travel time is inferred from published schedules.

Unlike highway travel, trips taken on inter-regional transit may require travelers to use a combination of vehicles (due to transfers) and modes. As a result, delays on inter-regional transit occur for a number of factors:

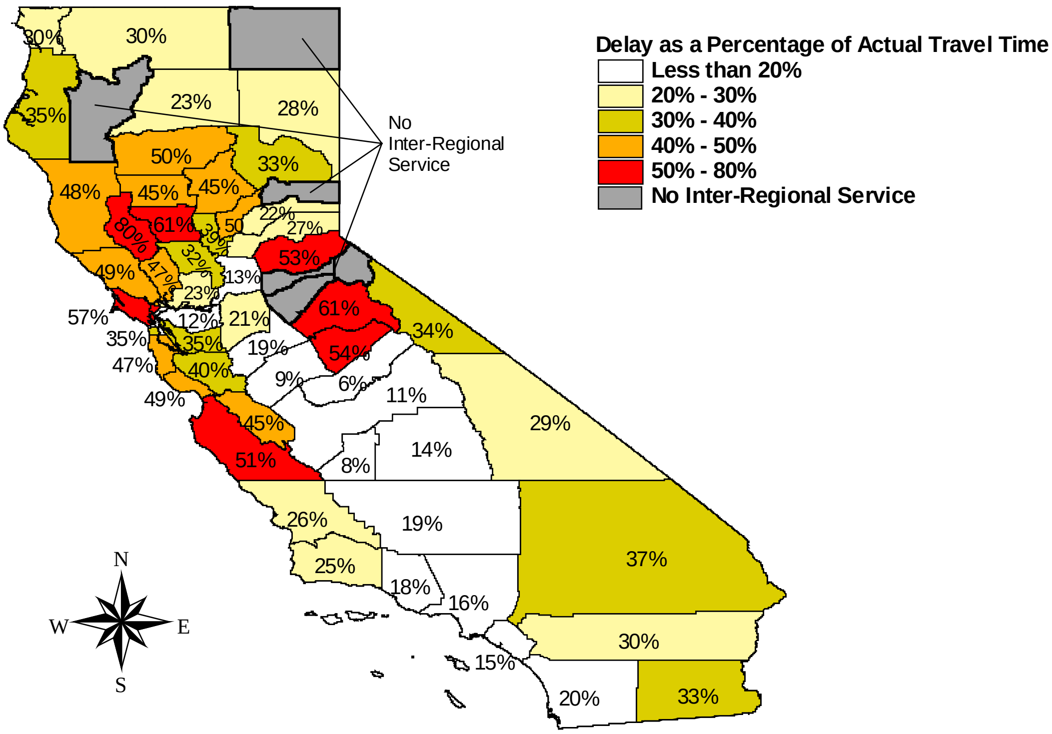
- Congestion along the travel corridor
- Number of transit stops
- Number of transfers required.

Exhibit 1-26 shows the average delay (calculated as the difference between actual travel time and optimal travel time as a percentage of actual trip time) experienced for inter-regional transit travel for each county in California. This map is a composite of the delay experienced for high-demand, inter-regional travel with origins in the county. The highest delays occur in Northern California, in the Sierras and along the Central Coast with delays reaching above 50 percent and up to 80 percent. This means that a two-hour trip would take between four and ten hours to complete (at optimum speeds). As the map indicates, six counties do not have any inter-regional transit service within their borders:

- Alpine
- Amador
- Calaveras
- Modoc
- Sierra
- Trinity.

Although direct service is unavailable, inter-regional services may stop in an adjacent county. For instance, inter-regional transit serves Placerville in El Dorado County, which is next to Amador County.

Exhibit 1-26: Average Delay for Inter-Regional Transit Travel



Source: Caltrans Mass Transportation Program, 1999

Inter-regional transit delays can also be calculated separately by origin and destination. Delay represents how scheduled travel times compare to an optimal travel time, and includes the wait time between connecting services. Exhibit 1-27 lists the ten county pairs that experience the highest delay as a percentage of the actual trip time on transit. The travel pairs are generally in Northern California and the Sierras.

Exhibit 1-27: County Pairs Experiencing the Ten Highest Delays

Route (Origin-Destination)	Delay (in Hours)	Delay as Percent of Actual Travel Time
Tuolumne to Mono	32:29	98%
Mono to Tuolumne	29:49	98%
Colusa to Lake	13:32	96%
Lake to Colusa	9:47	95%
Butte to Glenn	6:47	94%
Butte to Plumas	9:41	92%
Nevada to Plumas	16:54	91%
Lake to Mendocino	7:59	90%
Sutter to Glenn	6:55	90%
Sutter to Colusa	4:49	80%

Source: Caltrans Mass Transportation Program, 1999

1.2.2. Accessibility

Accessibility is defined as people being a reasonable distance to the transportation network. Accessibility measures the distance to the system rather than to desired locations due to the difficulty in establishing a widespread accepted list of desired locations. A critical indicator of accessibility is system user's access to desired travel destinations. This accessibility indicator is planned for inclusion in future monitoring reports.

This report presents information on access to Highways and Inter-regional transit (i.e., includes inter-regional bus, Amtrak, and commuter railroads).

Highway Accessibility

Highway accessibility is generally excellent throughout California. As shown in Exhibit 1-28, the state highway system constitutes the backbone for inter-regional travel in the state. These routes carry both highway travelers and transit passengers, who take inter-regional transit operating on the same routes. The 249 routes that comprise the state highway system provide nearly universal accessibility for Californians. Over 29.6 million (99.5 percent of all) Californians live in census tracts within 3 miles of a state highway.

Exhibit 1-28: State Highway System

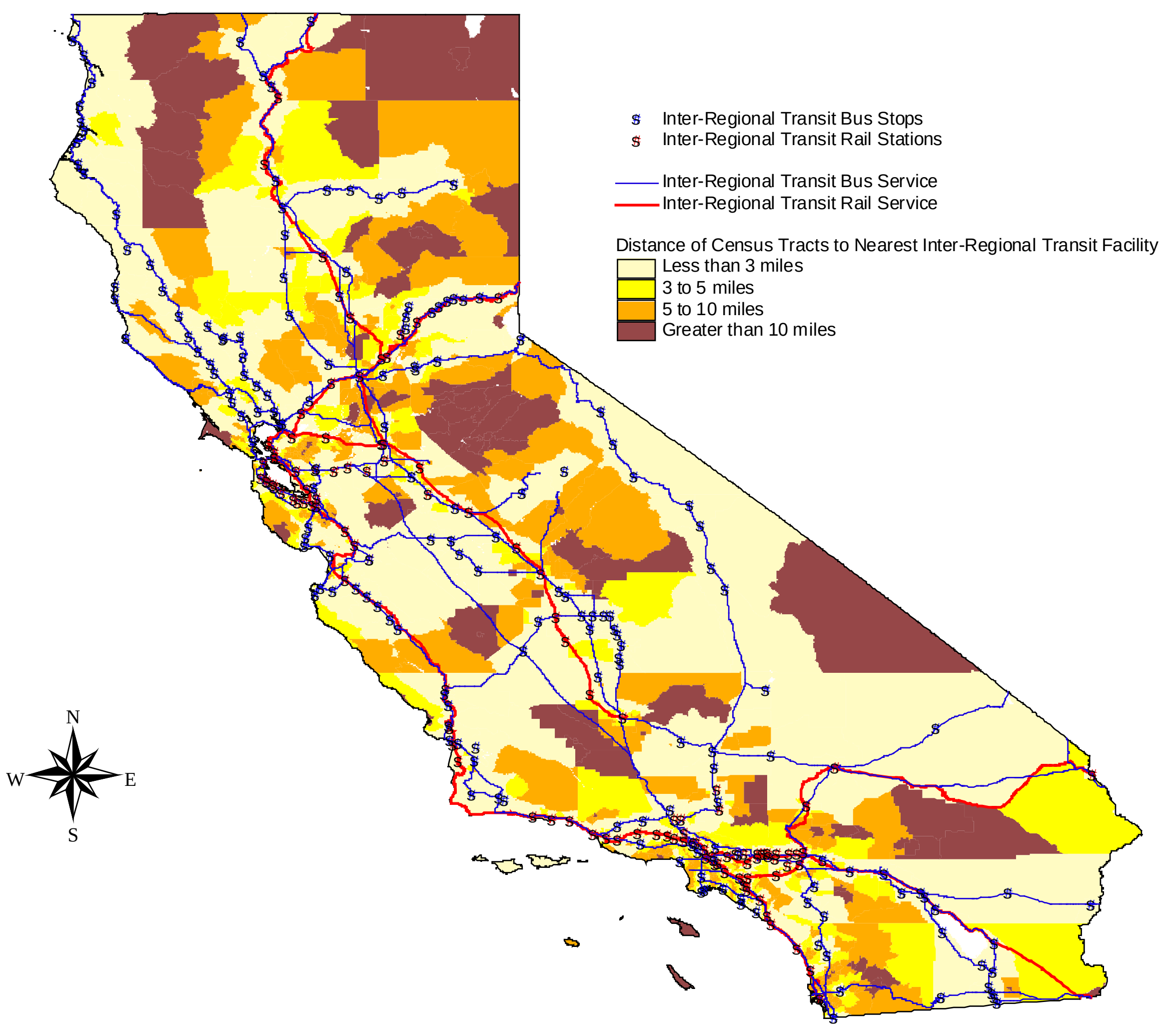
Source: Caltrans Inter-Regional Transportation Strategic Plan, 1998

Inter-Regional Transit Accessibility

Accessibility gaps are generally larger for inter-regional transit than they are for highways. Although inter-regional bus service is supplemented by inter-regional rail service, inter-regional transit service is limited by demand and the two modes do not cover all of the corridors served by the state highway system.

Exhibit 1-29 shows accessibility as measured by distance to the nearest inter-regional transit facility by census tract for three representative distances. If any person in a census tract lives within a given distance, the entire census tract is considered to be within that distance. One in five Californians (over six million) live in census tracts more than 5 miles from an inter-regional transit facility. Nearly half of the state population (13.5 million) lives 3 miles beyond a facility.

Exhibit 1-29: Inter-Regional Transit Accessibility by Census Tract at Three Representative Distances

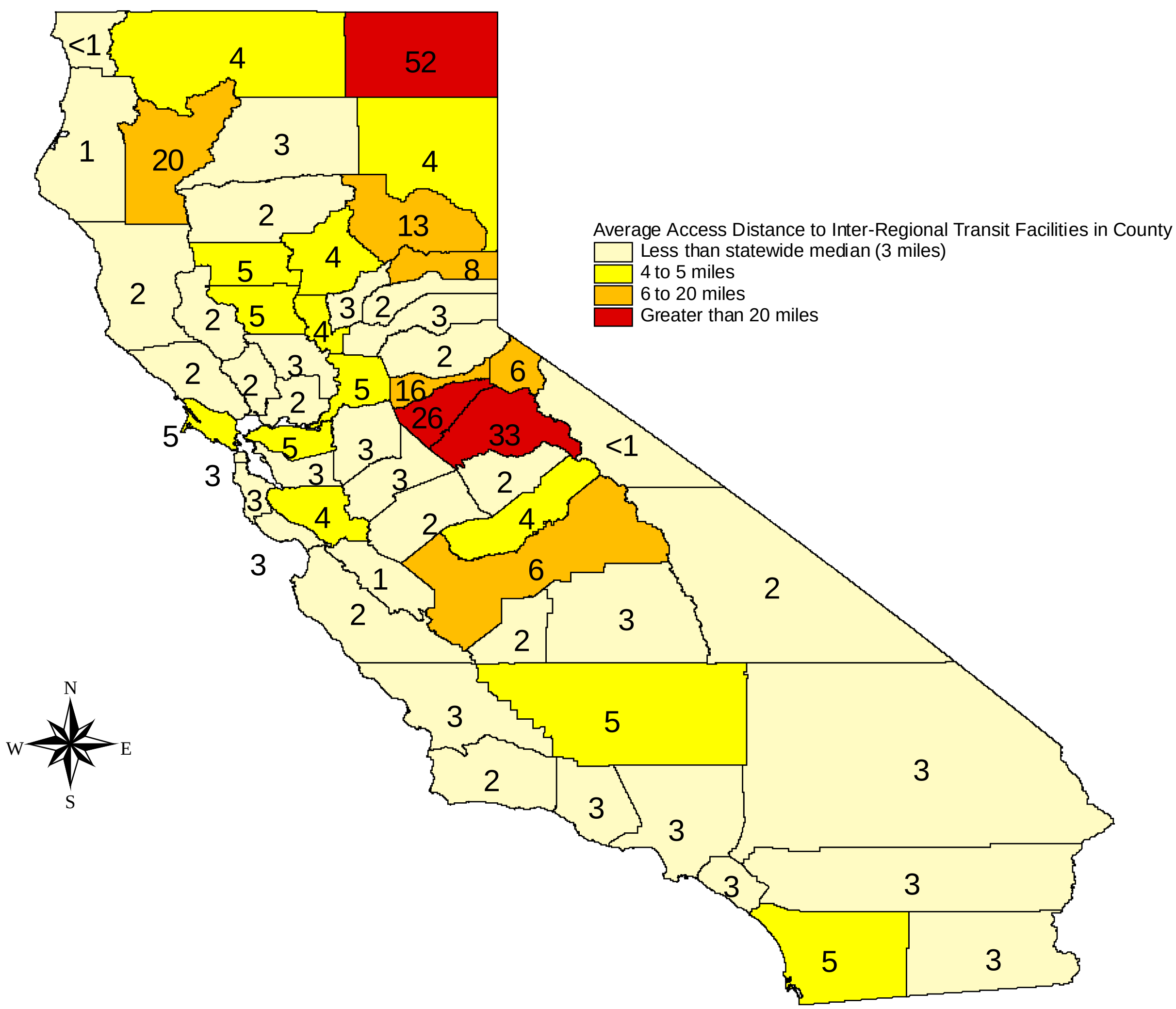


Source: Caltrans Mass Transportation Program, 1999

Areas of lower accessibility are scattered across the state. However, accessibility is generally lower in mountainous or rural areas as well as small geographic areas within the major metropolitan areas. The accessibility results for urban areas do not consider the intra-regional urban transit networks that provide local connections to inter-regional facilities. In some cases, these local networks can be quite extensive.

The statewide median distance to an inter-regional transit facility is 3 miles. Exhibit 1-30 shows how transit accessibility compares in each county to the statewide median. Most counties above the statewide median have accessibility measured at four or five miles. However, Calaveras, Modoc, and Tuolumne counties have accessibility more than 20 miles.

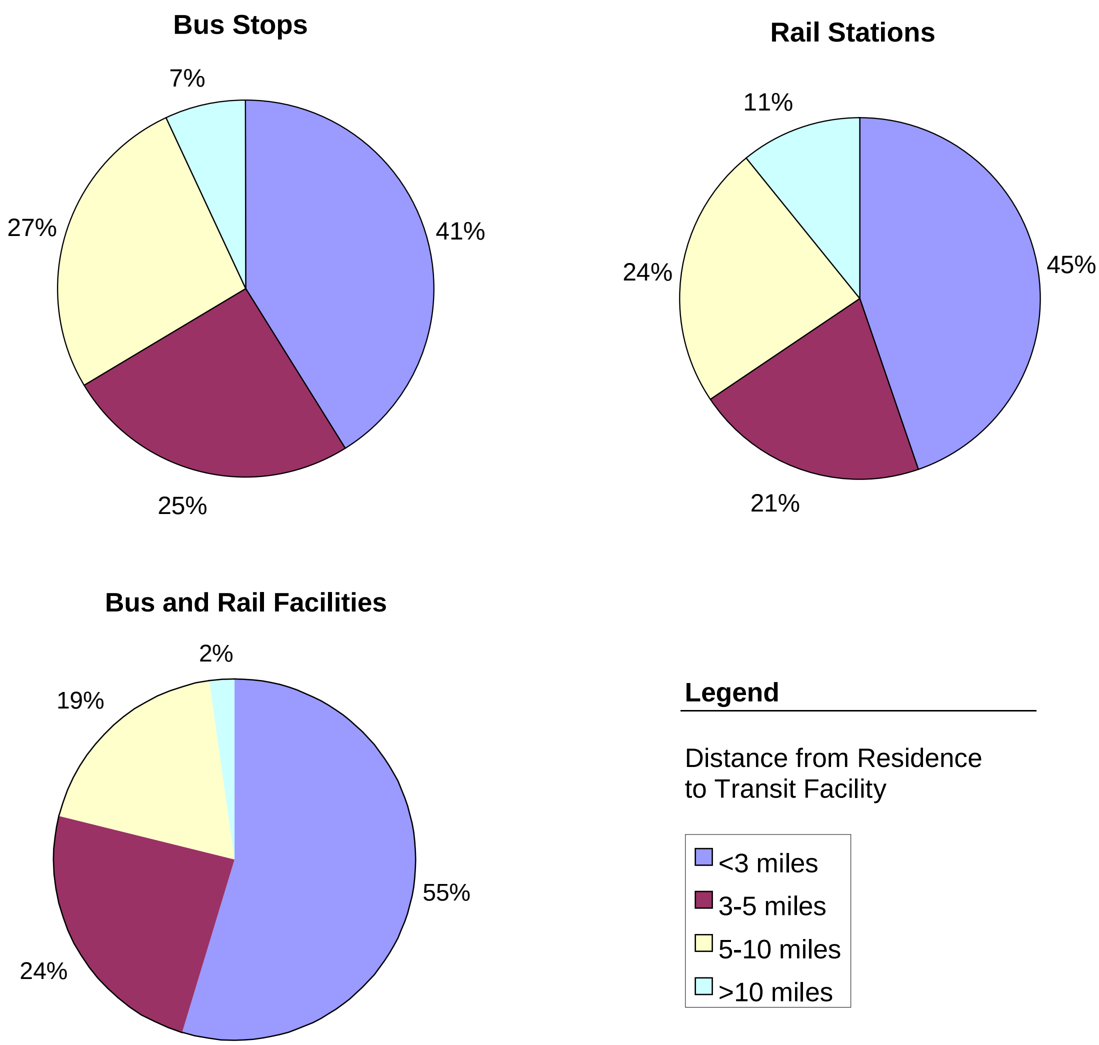
Exhibit 1-30: County-Wide Inter-Regional Transit Accessibility Compared to the State Median



Source: Caltrans Mass Transportation Program, 1999

As Exhibit 1-31 illustrates, accessibility to inter-regional transit facilities does not vary substantially by mode. Inter-regional rail accessibility is improved by the presence of rail services in major urban areas, such as Metrolink in Southern California, that make frequent stops and also provide inter-regional service. Overall transit accessibility is higher than that for the modes individually, since bus and rail stations are often located in different areas.

Exhibit 1-31: Percent of Californians Living Within a Given Distance of an Inter-Regional Transit Facility



Source: Caltrans Mass Transportation Program, 1999

1.3. RELIABILITY

Reliability describes the ability of the transportation system to provide reasonable and dependable service to system users. Reliability measures the variability in actual travel time. The primary indicator for reliability is percent standard deviation, which indicates the degree to which travel time on a given day deviates from the average travel time. Reliability helps system users to better predict their travel times. Reliability also is useful system operators to identify and deploy strategies to improve system operations.

This prototype report presents reliability statistics only for State Highways. Data for other modes was not available.

1.3.1. Highway Reliability

Reliability is defined as day-to-day variability between the expected travel time and the actual travel time. To estimate how much the travel time on any given day will "deviate" from the average travel time, the statistical tool standard deviation, is used. It provides the probable range of time that a motorist will arrive within his or her scheduled time.

Standard Deviation of Travel Time

$$= \sqrt{\frac{(\text{Travel Time on Day } n \ - \ \text{Average Travel Time})^2}{\text{Number of Days} - 1}}$$

Reliability (variability of travel time) on a highway segment is calculated by dividing the standard deviation by the average time spent traveling produces:

$$\text{Travel Time Variability (Reliability)} = \frac{\text{Standard Deviation of Travel Time}}{\text{AverageTravelTime}}$$

Information on highway travel time is based on available detection data provided by Caltrans district Transportation Management Centers (TMCs). The availability of detection data is limited by the physical presence of detector systems and their operating status. Some Caltrans districts do not have adequate automatic detector coverage of the state highway system. This means that delay data will not be available for some districts. Where a district does have extensive detector coverage, some routes in the system may not have working loop detectors in place. Highway segments with known traffic congestion may not show poor reliability in this prototype report. Although reliability data in rural areas is not included in this prototype report, the addition of this information is being investigated for future reports.

This prototype includes delay information for three Caltrans districts:

- District 3 – The Sacramento Area (Route 51 (Business 80)),
- District 11 – San Diego County (Interstate 5), and
- District 12 – Orange County (Interstate 5).

The highway reliability information is presented on two maps showing average AM and PM peak period travel time variability. The AM map shows areas with high travel time variability (i.e., low reliability) occurring between 5:30 AM and 10:30 AM. These are the hours of the morning most likely to experience congestion and substantial reliability problems. The PM map shows high travel time variability (i.e., low reliability) for the period from 1:30 PM to 8:00 PM, which represents the hours of afternoon and early evening congestion.

The following sections summarize the results for each of the three districts.

District 3

Exhibit 1-32 shows the travel time variability on State Route 51 in Sacramento during the AM peak period. The map shows reliability during a typical weekday. Variability indices above 60 percent are considered to show poor reliability.

Exhibit 1-33 shows PM period variability. The tables below show, for each of the two peak periods, those segments in District 3 that have variability exceeding 60 percent (i.e., poor reliability). A variability rate exceeding 60% was the threshold found at which travel times degrade significantly.

Routes 51 from Exposition to Watt Ave show low reliability during both the AM and PM peak period.

AM Period Reliability: State Route 51 Southbound

Location Description	Segment Length (miles)	Hours of Worst Reliability (Maximum Variability)
Exposition to Watt Ave	5.61	6:00 - 7:00

AM Period Reliability: State Route 51 Northbound

Location Description	Segment Length (miles)	Hours of Worst Reliability (Maximum Variability)
J St to El Camino	3.85	8:00 - 9:00

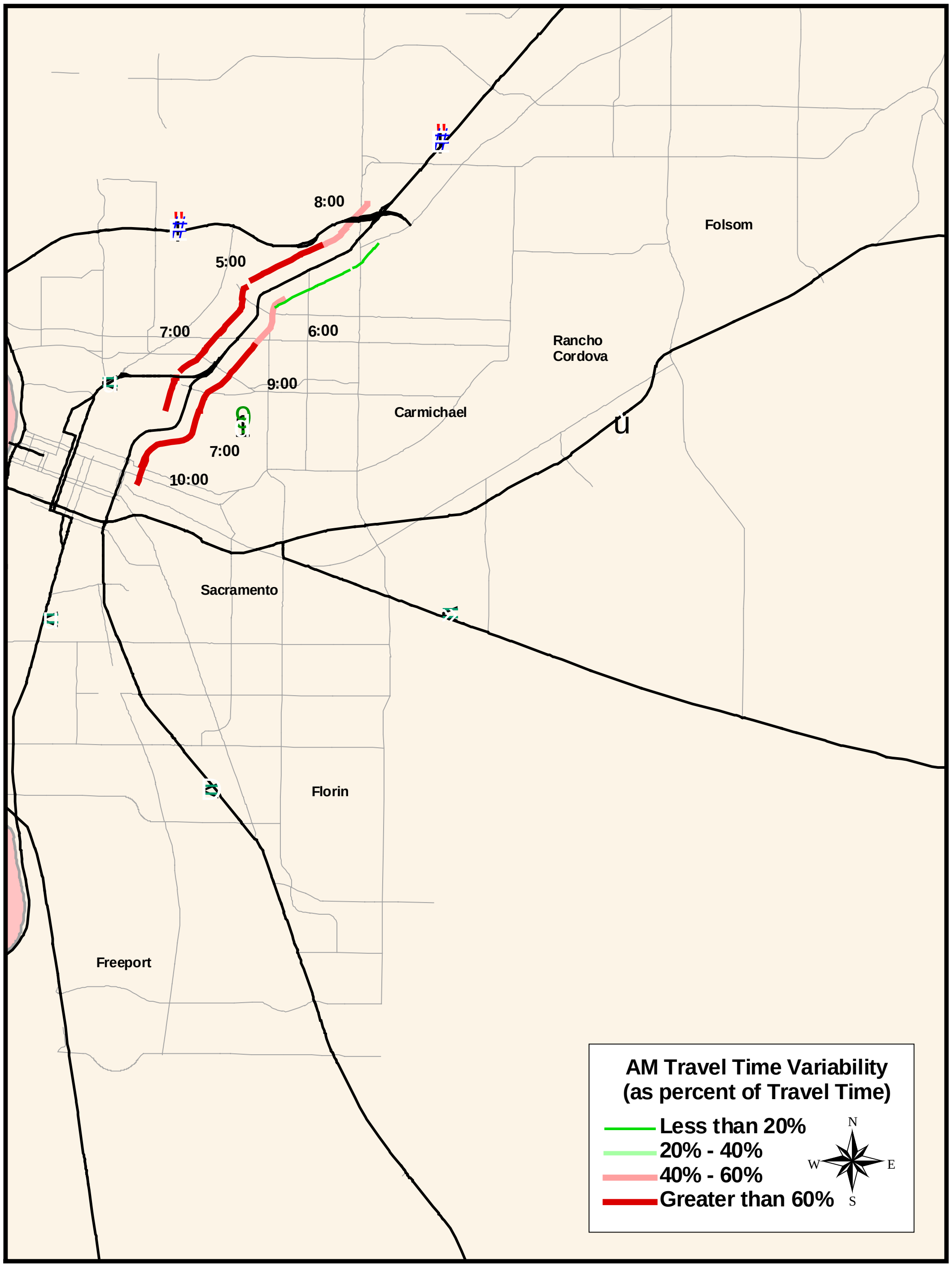
PM Period Reliability: State Route 51 Southbound

Location Description	Segment Length (miles)	Hours of Worst Reliability (Maximum Variability)
Exposition to Watt Ave	5.61	13:00 - 14:00

PM Period Reliability: State Route 51 Northbound

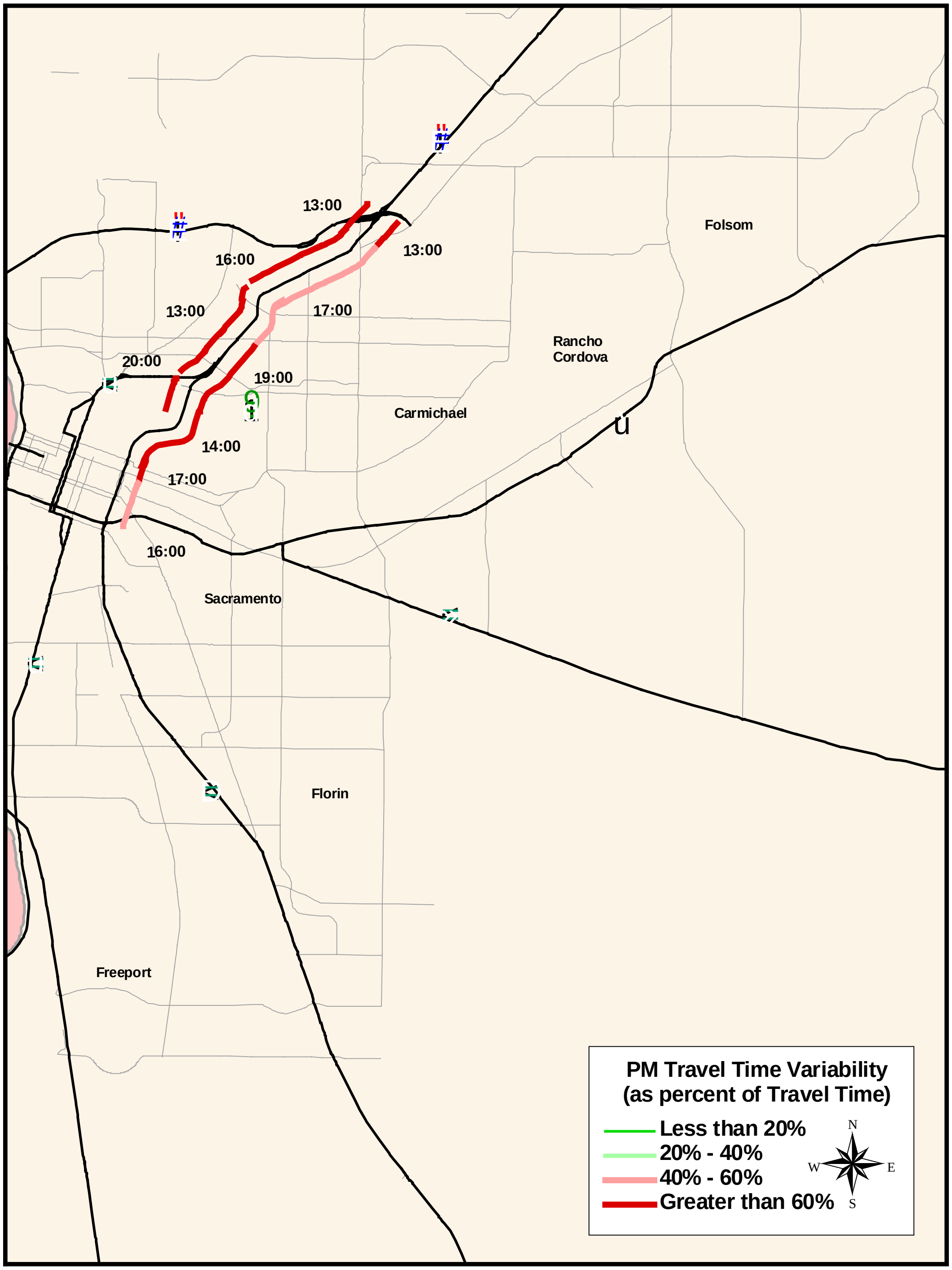
Location Description	Segment Length (miles)	Hours of Worst Reliability (Maximum Variability)
J St to El Camino	3.84	13:00 - 14:00
Silver Spur Way to Watt Ave	0.53	13:00 - 14:00

Exhibit 1-32: AM Peak Period Travel Time Variability* on Route 51 (Business 80) in District 3



* - *Variability is estimated for only those segments on Route 51* from SR-50 to Interstate 80 *that have consistent and reliable data collected at the District Traffic Management Center.*

Exhibit 1-33: PM Peak Period Travel Time Variability* on Route 51 (Business 80) in District 3



** - Variability is estimated for only those segments on Route 51 from SR-50 to Interstate 80 that have consistent and reliable data collected at the District Traffic Management Center.*

District 11

Exhibits 1-34 and 1-35 show travel time reliability for San Diego County. The data for San Diego were collected between 5:30 AM and 10:00 AM during the morning commute period, and from 1:30 PM and 8:00 PM in the afternoon during the fall of 1999. The segments along I-5 with the most variable travel times from one day to the next (i.e., greater than 60 percent) are labeled with the worst hour for which that variability occurs. These segments are listed in the tables that follow. A variability rate exceeding 60% was the threshold found at which travel times degrade significantly.

AM Period Reliability: Interstate 5 Southbound

Location Description	Segment Length (miles)	Hours of Worst Reliability (Maximum Variability)
Race Track Ct to Boca Ave	1.68	9:00 - 10:00
Hegdewod RW to Mission Bay	1.66	5:00 - 6:00
Seagaze Dr to Birchley	0.58	8:00 - 9:00
Santa Fe Dr to Encinitas Blvd	1.99	8:00 - 9:00
Del Mar Heights Rd to Vista View Pt	1.18	9:00 - 10:00

AM Period Reliability: Interstate 5 Northbound

Location Description	Segment Length (miles)	Hours of Worst Reliability (Maximum Variability)
Hawthorne St to Wash/San Diego Ave	2.25	8:00 - 9:00

PM Period Reliability: Interstate 5 Southbound

Location Description	Segment Length (miles)	Hours of Worst Reliability (Maximum Variability)
Balboa Ave to Mission Bay/Grand	2.49	14:00 - 15:00
Lomas Santa Fe Dr to Encinitas Blvd	5.33	13:00 - 14:00
Kettner Blvd to Old Town Ave	3.28	16:00 -17:00
Nobel Dr to La Jolla Village Rd	3.24	17:00 - 18:00
Race Track Ct to Boca Ave	1.68	14:00 - 15:00
Seagaze Dr to Birchley	0.58	16:00 - 17:00

PM Period Reliability: Interstate 5 Northbound

Location Description	Segment Length (miles)	Hours of Worst Reliability (Maximum Variability)
Jct I-805 to Del Mar Height Rd	3.84	13:00 - 14:00
State Street to India St	0.69	17:00 - 18:00

Exhibit 1-34: AM Peak Period Travel Time Variability* on Interstate 5 in District 11

** - Variability is estimated for only those segments on Interstate 5 from downtown San Diego to Carlsbad that have consistent and reliable data collected at the District Traffic Management Center.*

Exhibit 1-35: PM Peak Period Travel Time Variability* on Interstate 5 in District 11

** - Variability is estimated for only those segments on Interstate 5 from downtown San Diego to Carlsbad that have consistent and reliable data collected at the District Traffic Management Center.*

District 12

Exhibit 1-36 shows reliability on Orange County freeways during the AM peak period. Exhibit 1-37 presents a reliability map for the PM peak period. The tables below show segments on I-5 with particularly poor reliability (i.e., variability exceeding 60 percent). A variability rate exceeding 60% was the threshold found at which travel times degrade significantly.

AM Period Reliability: Interstate 5 Southbound

Location Description	Segment Length (miles)	Hours of Worst Reliability (Maximum Variability)
Avenida Pico to Arroyo Central	0.47	6:00 - 7:00
El Toro Rd to Alton Pkwy	1.51	6:00 - 7:00
Main St (City of Tustin) to 4th St/Maybury St	1.11	5:00 - 6:00
Broadway to Chapman Ave	1.5	5:00 - 6:00

AM Period Reliability: Interstate 5 Northbound

Location Description	Segment Length (miles)	Hours of Worst Reliability (Maximum Variability)
Calle Juanita to 5/1 Separation	0.51	9:00 - 10:00
Near Avery Pkwy to Alicia Pkwy	3.44	8:00 - 9:00
Alton Pkwy to Jamboree Rd	3.71	8:00 -9:00
Junction Route 55 to Chapman Ave	3.00	5:00 - 6:00

PM Period Reliability: Interstate 5 Southbound

Location Description	Segment Length (miles)	Hours of Worst Reliability (Maximum Variability)
Avenida Pico to Arroyo Central	0.47	14:00 -15:00
San Juan Creek Rd to San Juan Creek Bridge	0.85	18:00 - 19:00
La Paz to Alton Pkwy	3.13	15:00 -16:00
4th St/Maybury St to Grand Ave	0.25	14:00 -15:00
Broadway to Chapman Ave	1.5	15:00 -16:00

PM Period Reliability: Interstate 5 Northbound

Location Description	Segment Length (miles)	Hours of Worst Reliability (Maximum Variability)
Calle Juanita to 5/1 Separation	0.51	19:00 -20:00
Avery Pkwy to Crown Valley Pkwy	1.56	13:00 - 14:00
La Paz to Alicia Pkwy	0.46	19:00 - 20:00
Lake Forest Dr to Bake Pkwy	0.71	14:00 -15:00
Barranca Pkwy to Junction Routes 133/5	0.5	14:00 -15:00
Jeffery Rd to Chapman Ave	9.6	15:00 - 16:00

Exhibit 1-36: AM Peak Period Travel Time Variability* on Interstate 5 in District 12

** - Variability is estimated for only those segments on Interstate 5 from San Clemente to Santa Ana that have consistent and reliable data collected at the District Traffic Management Center.*

Exhibit 1-37: PM Peak Period Travel Time Variability* on Interstate 5 in District 12

** - Variability is estimated for only those segments Interstate 5 from San Clemente to Santa Ana that have consistent and reliable data collected at the District Traffic Management Center.*

1.3.2. Reliability for Other Modes

The actual travel time data necessary to calculate reliability for other modes (e.g., inter-regional bus and rail) were not available for inclusion in this report.

1.4. ENVIRONMENTAL QUALITY

This section reports on the State's trends and status in areas related to the environment. For the prototype report, the section includes trends and status information pertaining to air quality only. Future reports may discuss noise and other transportation-related environmental quality impacts that transportation decision-makers and customers identify.

Air quality is assessed in terms of whether individual planning areas meet, or attain, State and federal regulatory standards for specific pollutants (e.g., carbon monoxide, ozone, and particulate matter). Attainment means simply that a particular region meets pre-defined federal or State thresholds for a criteria pollutant over a specified time period. A planning area, such as an air basin, can be designated as nonattainment if it violates the standard more than once in that time period (in the case of ozone or PM_{10}). The process of determining whether a State violation has occurred includes review of possible statistical irregularities that may be due to highly irregular infrequent events, such as a natural forest fire or other extreme occurrences. The federal process differs from the State's. For ozone, it is the fourth highest value of a planning area's pollutant levels for each year over a three-year period to determine whether a violation has occurred. For carbon monoxide the determining value is the second highest in two years, while PM_{10} statistics are calculated values.

Section 1.4.1 provides trend information for the number of days each regional air basin exceeds State and federal standards for three criteria pollutants. The report describes the attainment status of California's regional air basins in section 1.4.2. The pollutants discussed in this report are those monitored in California by the State's Air Resources Board and the United States Environmental Protection Agency (EPA). Though now under Supreme Court review, new legislation requires EPA to collect data on $PM_{2.5}$ in the future. Exhibit 1-38 shows the criteria pollutants monitored for attainment by the Air Resources Board and the U.S. EPA.

Exhibit 1-38: Criteria Air Pollutants Monitored for State and Federal Attainment

Pollutant	State	Federal
Carbon Monoxide	✔	✔
Ozone	✔	✔
Particulate Matter$_{10}$	✔	✔
Sulfates*	✔	
Hydrogen Sulfide*	✔	
Nitrogen Dioxide	✔	✔
Lead	✔	✔
Sulfur Dioxide*	✔	✔
Visibility Reducing Particles**	✔	

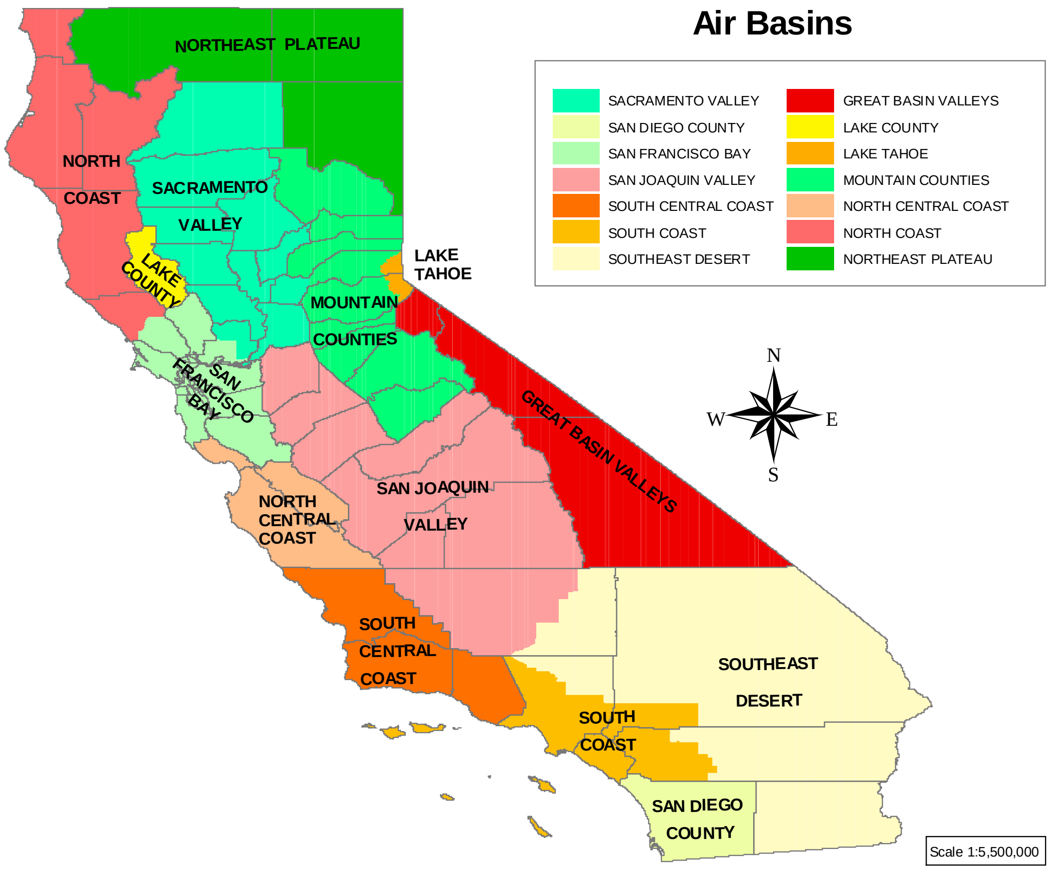
** Note: Some pollutant compounds, though related, are the result of different sources and chemical reactions, such as hydrogen sulfide, sulfates, and sulfur dioxide.*
*** Not actively monitored.*

1.4.1. Air Quality Trends

This section reports on the number of days each California air basin recorded pollutant levels above the State or national standard between 1996 and 1998. This statistic can be used to compare air quality trends and is provided for three pollutants: ozone, PM_{10} (particulate matter), and carbon monoxide. The exhibits discussed in this section are drawn from the supplement to the 1999 California Air Quality and Emissions Almanac on Pollutant Specific Air Quality Trend Data. The supplement provides trend data on State and national air quality statistics from 1980 to 1998.

Several factors should be considered when evaluating any trend data on air quality. According to the California Air Resources Board, air quality trend data is generally used to examine at air quality in a particular county or air basin. However, the air quality data used to calculate trend statistics may not be consistent from year-to-year. Factors that can impact consistency include the number of monitoring sites in the network, the opening and closing of critical sites, and the completeness of the data. State and national standards can also be revised over time, though standards were not revised during 1996-98. A map of the air basins in California is provided in Exhibit 1-39.

Exhibit 1-39: California Air Basins



Source: California Air Resources Board, 2000

Days Above National Standards

Exhibit 1-40 shows the number of days California air basins exceeded national standards for three criteria pollutants (ozone, PM_{10}, and carbon monoxide) between for each year 1996-98. Standards for the three pollutants are more stringent at the state level than those set at the national level. Statewide, total days by air basin exceeding the national standard for ozone and carbon monoxide declined during the three-year period, while days with PM_{10} concentrations exceeding the standard increased. The days above the national standard for ozone decreased from 246 to 182 and for carbon monoxide from 28 to 18. Days exceeding the national standard for PM_{10} increased from 66 to 82.

For ozone, the air basins with the highest number of days above the national standard are South Coast, San Joaquin Valley, and Mojave Desert. Days exceeding the national standard for ozone declined in the South Coast from 85 to 60, and fluctuated from 39 to 22 to 26 days in 1998 for the Mojave Desert, and 56 to 16 to 39 in the San Joaquin Valley. For the most part, air basins with days above the national ozone standard tended to fluctuate in the number of days in each of the three years studied. The remaining air basins had fewer total days above the standard, with the exception of the Great Basin Valleys, Lake County, Lake Tahoe, North Central Coast, and the Northeast Plateau where no days exceeded the standard. The Salton Sea air basin has the highest number of days above the standard for PM_{10} each year and shows an increase from 48 days to 60 days. The Great Basin Valley has the next highest number of days exceeding the PM_{10} standard, with the number of days rising from six to 16 in 1998. The Mojave Desert was the only other air basin with PM_{10} levels exceeding the national standard in 1998 at 6 days. The only air basins exceeding national carbon monoxide standards were San Diego, where the number of days above standard ranged from eight to ten, and the South Coast, which showed a decline from 19 days to ten days.

Exhibit 1-40: Number of Days Exceeding National Standards by Air Basin

	Ozone*			PM 10**			Carbon Monoxide***		
California Air Basins	1996	1997	1998	1996	1997	1998	1996	1997	1998
GREAT BASIN VALLEYS	0	0	0	6	14	16	0	0	0
LAKE COUNTY	0	0	0	0	0	0			
LAKE TAHOE	0	0	0	0	0	0	0	0	0
MOJAVE DESERT	39	22	26	0	0	6	0	0	0
MOUNTAIN COUNTIES	7	2	7	0	0	0	0	0	0
NORTH CENTRAL COAST	0	0	0	0	0	0	0	0	0
NORTH COAST	0	0	1	0	0	0	0	0	0
NORTHEAST PLATEAU	0	0	0	6	0	0			
SACRAMENTO VALLEY	9	3	14	0	0	0	0	0	0
SALTON SEA	21	13	12	48	36	60	0	0	0
SAN DIEGO	2	1	9	0	0	0	9	10	8
SAN FRANCISCO BAY AREA	8	0	8	0	0	0	0	0	0
SAN JOAQUIN VALLEY	56	16	39	0	6	0	0	0	0
SOUTH CENTRAL COAST	19	3	6	0	6	0	0	0	0
SOUTH COAST	85	64	60	6	6	0	19	13	10
Total Days Exceeding Standard	246	124	182	66	68	82	28	23	18

* For Ozone, both Federal and State data refer to days where the standards are exceeded in any one-hour period

**For PM 10, both Federal and State data refer to calculated days above the 24-hour standard

***For Carbon Monoxide, both Federal and State data refer to days where standards are exceeded in an eight-hour period

No comparable data is used to evaluate Sulfur Dioxide or Nitrogen Dioxide.

Days Above State Standards

Exhibit 1-41 provides the same information as the table in Exhibit 1-3 but is based on State standards. Across California, days exceeding the State standard for ozone, PM_{10}, and carbon monoxide declined during the three-year period. Between 1996 and 1998, total days for each air basin that exceed the standard for ozone levels declined from 774 to 613. Total days exceeding the standard for PM_{10} dropped from 1107 to 996, and for carbon monoxide, they declined from 37 to 25 days. As shown in Exhibit 1 on the next page, the air basin with the highest number of days exceeding the State standards is the South Coast. However, over the three-year period the number of days exceeding State standards for the three pollutants monitored declined significantly. This trend is also evident in the South Central Coast, San Joaquin Valley, and the Mojave Desert. In the remaining air basins, pollutant levels fluctuated over time or remained at a low level. In 1998, the North Central Coast had a significant decline in days exceeding the State standard for PM_{10} while at the same time, the Great Basin Valleys experienced a comparable increase.

Exhibit 1-41: Number of Days Exceeding State Standards by Air Basin

	Ozone*			PM 10**			Carbon Monoxide***		
California Air Basins	1996	1997	1998	1996	1997	1998	1996	1997	1998
GREAT BASIN VALLEYS	1	0	0	21	36	78	0	0	0
LAKE COUNTY	0	0	0	0	0	0			
LAKE TAHOE	0	1	0	24	12	12	0	0	0
MOJAVE DESERT	108	101	77	24	18	18	0	0	0
MOUNTAIN COUNTIES	65	29	51	18	66	24	0	0	0
NORTH CENTRAL COAST	16	1	10	72	72	24	0	0	0
NORTH COAST	0	2	7	9	6	0	0	0	0
NORTHEAST PLATEAU	0	0	0	12	18	12			
SACRAMENTO VALLEY	58	25	62	42	24	60	0	0	0
SALTON SEA	98	91	72	246	294	264	11	15	12
SAN DIEGO	51	43	54	90	126	108	0	0	0
SAN FRANCISCO BAY AREA	34	8	29	12	18	18	0	0	0
SAN JOAQUIN VALLEY	120	110	90	204	108	114	0	0	0
SOUTH CENTRAL COAST	82	59	54	78	48	48	0	0	0
SOUTH COAST	141	144	107	255	246	186	26	18	13
Total Days Exceeding Standard	774	614	613	1107	1092	966	37	33	25

* For Ozone, both State and Federal data refer to days where the standards are exceeded in any one-hour period
**For PM 10, both State and Federal data refer to calculated days above the 24-hour standard
***For Carbon Monoxide, both State and Federal data refer to days where standards are exceeded in an eight-hour period
No comparable data is used to evaluate Sulfur Dioxide or Nitrogen Dioxide.

1.4.2. Federal Air Quality Attainment Status

According to Federal standards for air quality, the State is designated as in attainment for three out of the six criteria air pollutants regularly measured. The Clean Air Act and Amendments of 1990 define a "nonattainment area" as a locality where air pollution levels persistently exceed National Ambient Air Quality Standards. Designating an area nonattainment is a formal rulemaking process, and EPA normally takes this action only after air quality standards have been exceeded for several consecutive years. The definition of attainment area is a geographical area identified as having air quality as good as, or better than, the national and/or California ambient air quality standards.

California meets the United States Environmental Protection Agency (EPA) standards for nitrogen dioxide, lead, and sulfur dioxide and thus is designated in attainment for these pollutants. Portions of the state do not meet EPA standards for three other pollutants: carbon monoxide, ozone, and particulate matter. A map for each pollutant illustrates the areas that are designated as attainment, nonattainment, transitional (from nonattainment to attainment), or unclassified. An air basin's pollutant level is designated unclassified if the data are incomplete and do not support a designation of attainment or nonattainment. Each of the three criteria pollutants is discussed next and illustrated by a color map.

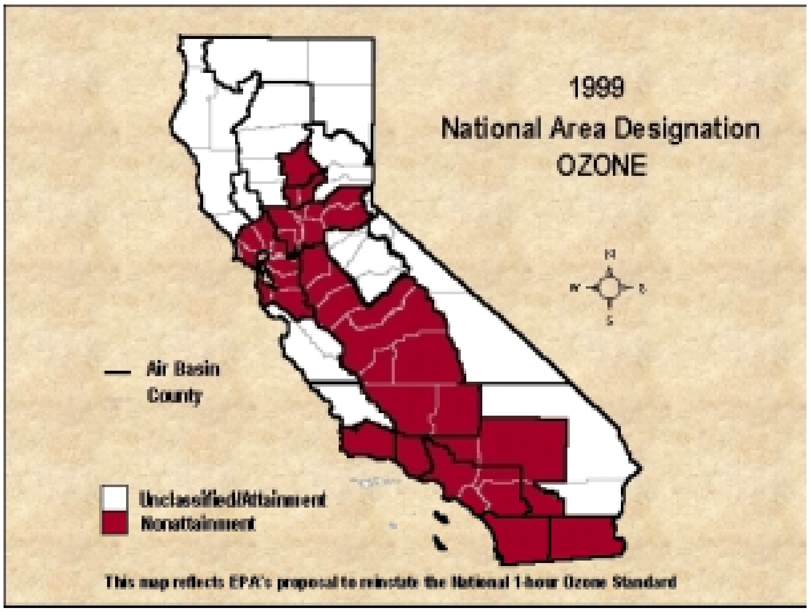
Carbon Monoxide - Los Angeles, Orange, and parts of Riverside and San Bernardino counties are the only areas in the state that are designated as nonattainment for carbon monoxide as shown in Exhibit 1-42.

Exhibit 1-42: Federal Carbon Monoxide Area Attainment Status

Source: California Air Resources Board

Ozone - EPA has designated over half of the state as nonattainment for ozone as shown in Exhibit 1-43. The nonattainment areas include South Coast, San Diego County San Francisco Bay, San Joaquin Valley, South Central Coast, the western and southern portions of the Southeast Desert, the southeast and southern portions of the Sacramento Valley, and the central portion of Mountain Counties.

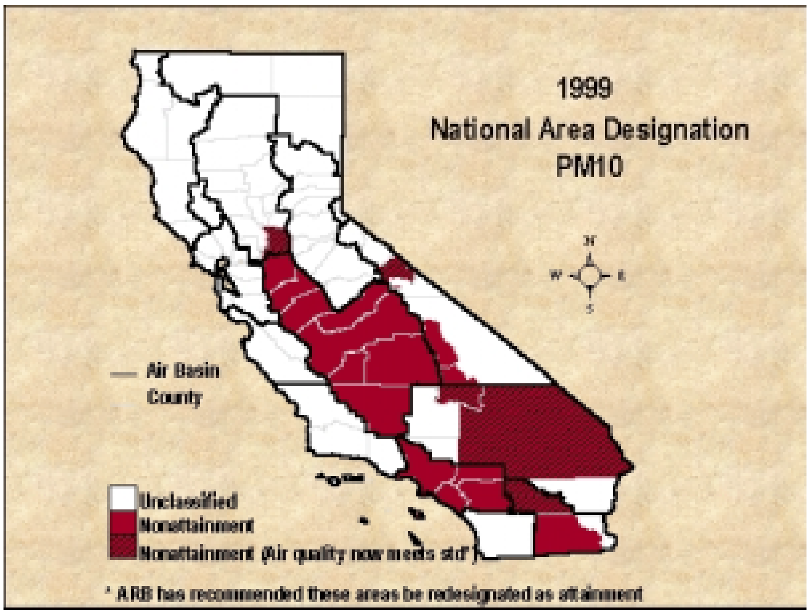
Exhibit 1-43: Federal Ozone Area Attainment Status



Source: California Air Resources Board

Particulate Matter – The EPA currently designates most of San Bernardino County as well as sections of Riverside County (in Southeast Desert), Sacramento County, and Mono County as nonattainment areas for particulate matter (PM-10) (Exhibit 1-44). The California Air Resources Board is petitioning to have them re-designated as in attainment since they now meet federal standards. The South Coast and remaining parts of San Bernardino and Riverside, along with western Imperial County do not meet federal standards. All of San Joaquin Valley is a nonattainment area, with the exception of eastern Kern County, as are small portions of western Great Basin Valley.

Exhibit 1-44: Federal Particulate Matter$_{10}$ Attainment Status



Source: California Air Resources Board

1.4.3. State Air Quality Attainment Status

California's air quality standards are more stringent than those set at the national level. This section discusses the attainment status for five air pollutants according to State standards. The information is drawn from maps provided by the California Air Resources Board and produced in 1999. A map for each pollutant illustrates the areas that are designated as attainment, nonattainment, transitional (from nonattainment to attainment), or unclassified, as defined in the section 1.4.2. Under State standards, the entire state is in attainment for lead, nitrogen oxide, and sulfur dioxide.

Carbon Monoxide (CO)- Most of the state meets the California standard for carbon monoxide levels with the exception of Los Angeles and a small portion of central Imperial County along the border with Mexico, as shown in Exhibit 1-45.

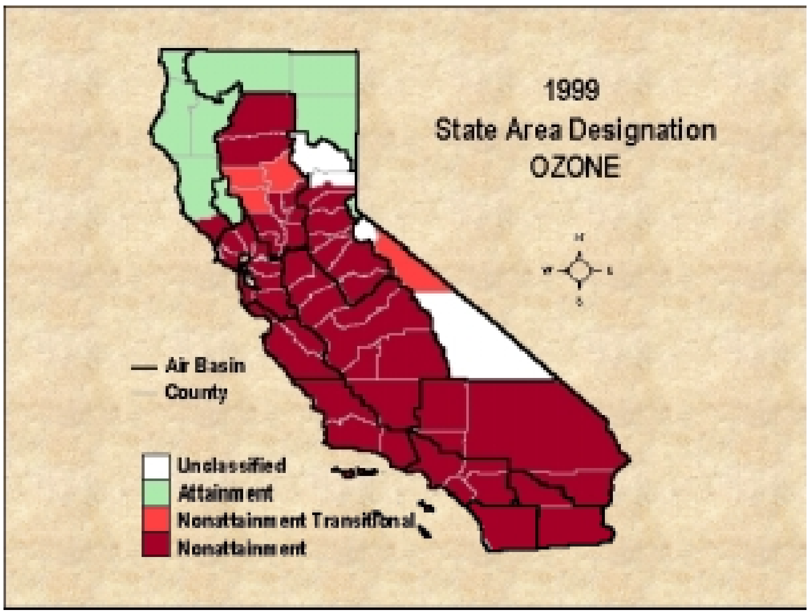
Exhibit 1-45: State Carbon Monoxide Area Attainment Status

Source: California Air Resources Board

Ozone (O_2)- As of 1999, most of the state was designated nonattainment for ozone as illustrated in Exhibit 1-46. All of southern and central California is in nonattainment. The boundary of nonattainment areas extends into Shasta and Tehama Counties, which represent the farthest north incursions of ozone standard violations. Butte, Colusa, and Glenn counties, as well as parts of Mono and Inyo counties, are in transition between attainment and nonattainment.

The far northern counties extending north from Lake, Mendocino, and Lassen counties are designated in attainment for ozone standards.

Exhibit 1-46: State Ozone Area Attainment Status



Source: California Air Resources Board

Particulate Matter (PM_{10})- With the exception of Lake County, every reporting county violates State standards for particulate matter and is designated as nonattainment. This is shown in Exhibit 1-47. Also note that Tuolumne, Mariposa, and Amador counties do not have reported data.

Exhibit 1-47: State Particulate Matter Area Attainment Status

Source: California Air Resources Board

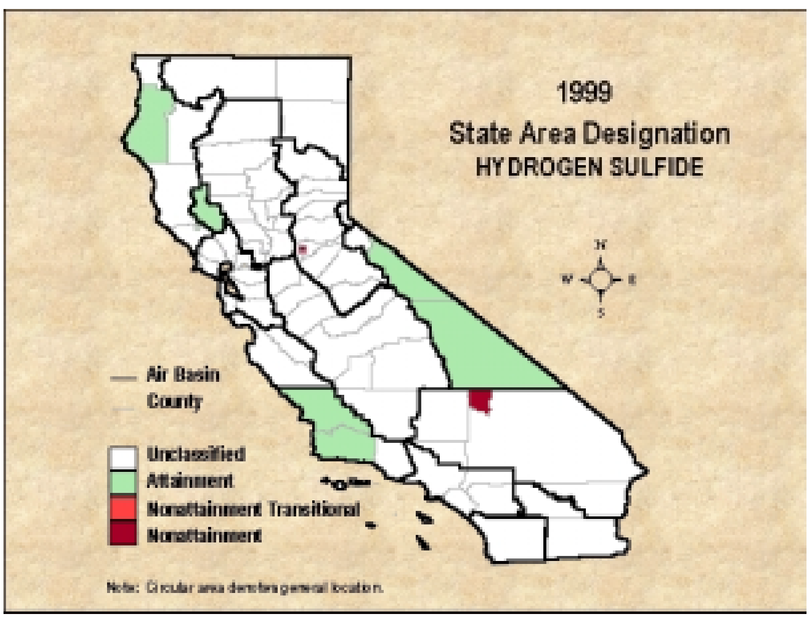
Sulfates - Nearly all of the state meets the air quality standard for sulfates as seen in Exhibit 1-48. The only part of the state that is not designated in attainment is located in the northwest corner of San Bernardino County.

Exhibit 1-48: State Sulfates Area Attainment Status

Source: California Air Resources Board

Hydrogen Sulfide - Two small areas of the state are in nonattainment for hydrogen sulfide, as illustrated in Exhibit 1-49. They are located in western Amador County and in the northwest corner of San Bernardino County.

Exhibit 1-49: State Hydrogen Sulfide Area Attainment Status



Source: California Air Resources Board

1.4.4. Summary of Federal and State Attainment Status

California shows mixed status for air quality in 1999. There has been an improvement over the past several years with a number of air districts transitioning from nonattainment to attainment for State carbon monoxide status and for federal particulate matter (PM_{10}). Carbon monoxide attainment is good, with the exception of Los Angeles County and a small part of Imperial County. However, the state's PM_{10} attainment and ozone attainment record remains poor.

A summary chart illustrated with performance status is shown in Exhibit 1-50. Each pollutant is evaluated for attainment using a "harvey ball." A clear ball indicates that all air districts are in attainment according to either federal or State standards. A black ball indicates that nearly all of the state does not meet attainment standards for that pollutant.

Exhibit 1-50: Summary Attainment Chart

Pollutant	State Attainment	Federal Attainment
Carbon Monoxide	1	1
Ozone	3	2
Particulate $Matter_{10}$	3	2
Sulfates	1	*
Hydrogen Sulfide	1	*
Nitrogen Dioxide	0	0
Lead	0	0
Sulfur Dioxide	0	0

* *Not monitored for attainment by either the California Air Resources Board or the U.S. Environmental Protection Agency*

Key:

0	All air districts in attainment	1	Most air districts in attainment	2	Partial compliance	3	A small area of the state is in compliance	4	No air district in attainment

Most Desirable ⟷ *Least Desirable*

C2. THE MULTI-MODAL TRANSPORTATION SYSTEM

This section describes the inter-regional and multi-modal transportation system within California. The system described represents the *supply* of transportation infrastructure. When examined in concert with the *demand* for transportation, described in the next section, this information sets the context for intrepreting the performance measure results presented in Section 4.

2.1. HIGHWAYS

The state highway system constitutes the backbone for inter-regional travel in the state, and contains 249 routes. Of these, 87 have been statutorily designated as the inter-regional road system (IRRS). A listing of the 87 IRRS Routes can be found in Interregional Transportation Strategic Plan (ITSP), June 1998, Appendix A.

Due to the large number of routes and capacity improvements needed on the IRRS, Caltrans identified a subset of the most critical IRRS routes and as "High Emphasis Routes" (HERs). There are 34 HERs routes in the 1998 Interregional Transportation Strategic Plan. A listing of HERs routes can be found in the 2000 ITSP Working Paper #1, February 1999. In addition, a list of all IRRS and HERs routes is provided in the appendix of this report.

The length of road miles covered by each of these three categories of roadway is summarized in Exhibit 2-1 below, and shown graphically in Exhibit 2-2 on the next page. Exhibit 2-2 shows the route numbers for the HERs routes.

Exhibit 2-1: State Road Miles in California

Measure	Highway System	IRRS	HERs
Number of Routes	249	87	34
Centerline Miles	15,194	8,574	5,991
Lane Miles	50,042	24,425	23,691

Sources: 1997 Assembly of Statistical Reports, 1997 Route Segment Report

Exhibit 2-2: State Highway System

Source: Caltrans Inter-Regional Transportation Strategic Plan, 1998

2.2. INTER-REGIONAL BUS

For the purposes of performance monitoring, inter-regional is generally defined in this report as crossing regional boundaries. A more specific definition is provided in the Appendix. Buses travel on highways and local streets for both regional and inter-regional services. Inter-regional bus services in California can be divided into three categories:

- Rail feeder bus: services operated as direct feeders to the State-subsidized Amtrak network; Amtrak bus and rail schedules are frequently coordinated to ensure shorter transfer times

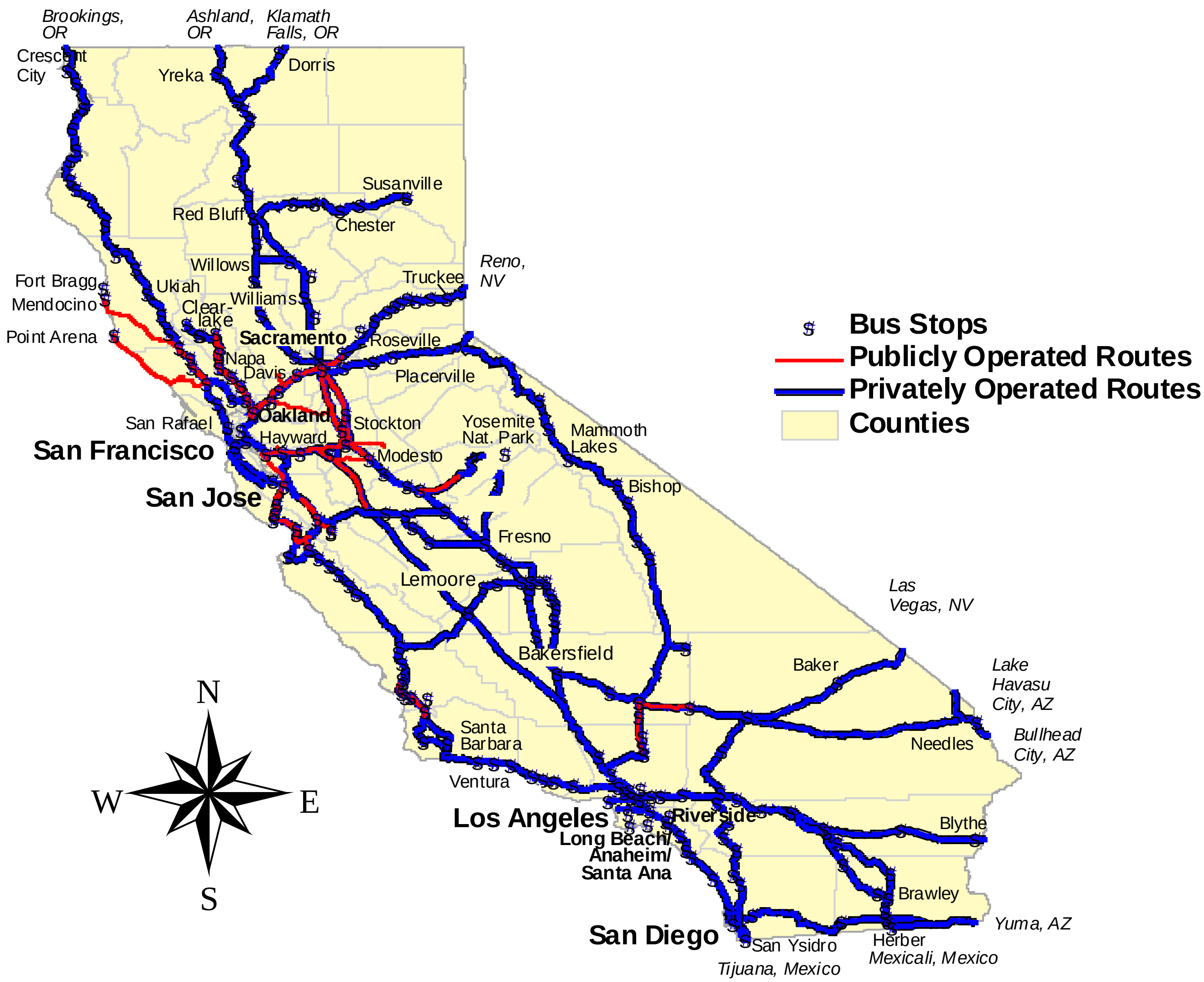
- Other public bus: bus services that cross regional boundaries and are operated by local public transit agencies

- Private bus: private carriers, such as Greyhound, that do not receive state subsidies.

Exhibit 2-3, on the next page, shows the statewide inter-regional bus network.

The frequency of service provided by the inter-regional bus network varies considerably across the state. As shown in Exhibit 2-4 (on page after Exhibit 2-3), some parts of the state, such as rural Inyo and Mono counties, are served by one to two round-trips daily. Other corridors, such as the Capitol Corridor between the San Francisco Bay Area and Sacramento, receive up to 60 daily round-trips.

Exhibit 2-3: California's Inter-Regional Bus System



Source: Caltrans Mass Transportation Program, 1999

Exhibit 2-4: Frequency of Inter-Regional Bus Service

Source: Caltrans Mass Transportation Program, 1999

2.2.1. Rail Feeder Bus

Exhibit 2-5 shows the 19 bus routes that provide services to Amtrak rail stations. These routes compliment and act as bus extensions to the Amtrak Capital Corridor, San Diegan, and San Joaquin lines. High-frequency routes that provide 13 to 17 round trips daily include San Francisco to Emeryville, Los Angeles to Bakersfield, and San Jose to Santa Cruz. Lower-frequency routes that serve destinations such as Placerville, Redding, and Yosemite provide only one to four trips per day. Route lengths range from 14 miles to nearly 300 miles (San Jose to Santa Barbara).

Exhibit 2-5: Rail Feeder Bus System

Source: Caltrans Mass Transportation Program, 1999

2.2.2. Other Public Bus Services

A number of local transit agencies provide inter-regional bus services on routes ranging from roughly 15 to 100 miles in length. These agencies and the extent of their inter-regional services are listed in Exhibit 2-6. Frequencies vary from one trip per day to about once every half-hour (San Jose to Santa Cruz).

Many of these operators also maintain an important portion of service for regional trips. For example, the Santa Clara Valley Transportation Authority maintains local routes throughout Santa Clara County, in addition to running some trips to Santa Cruz.

Exhibit 2-6: Inter-Regional Bus Providers

Agency	Extent of Inter-Regional Service
Antelope Valley (AVTA)	Lancaster – Los Angeles
Central Coast Area Transit	San Luis Obispo – Santa Maria
Fairfield-Suisan Transit	Davis – Fairfield
Golden Gate Transit	San Francisco – Santa Rosa
Kern Regional Transit	California City – Palmdale
Lake Transit	Clear Lake – Santa Rosa
Mariposa Transit	Mariposa – Merced
Mendocino Transit	Ukiah – Santa Rosa
Modesto Area Express (MAX)	Lathrop – Modesto – Pleasanton
Monterey-Salinas Transit (MST)	Monterey – Salinas – Santa Cruz
Napa Valley Transit	Calistoga – Vallejo
Riverside Transit (RTA)	Hemet – Riverside
Roseville Transit	Roseville – Sacramento
San Benito Co. Transit	Gilroy – Hollister
San Joaquin RT	Centered in San Joaquin County
Santa Clara (SCVTA)	San Jose – Santa Cruz
Santa Clarita (SCT)	Lancaster – Santa Clarita
Santa Cruz Metro	San Jose – Santa Cruz
START	Gustine – Modesto
Sunline Transit	Palm Springs – Riverside
Vallejo Transit	Sacramento – Vallejo
Victor Valley Transit	Helendate – Hesperia
Yolobus	Davis – Vallejo

2.2.3. Private Intercity Bus

Greyhound Lines is the largest private inter-regional bus carrier in California. Greyhound has an extensive service network in California. It operates 22 routes, covering over 2,000 route-miles and reaching many small and medium-sized cities.

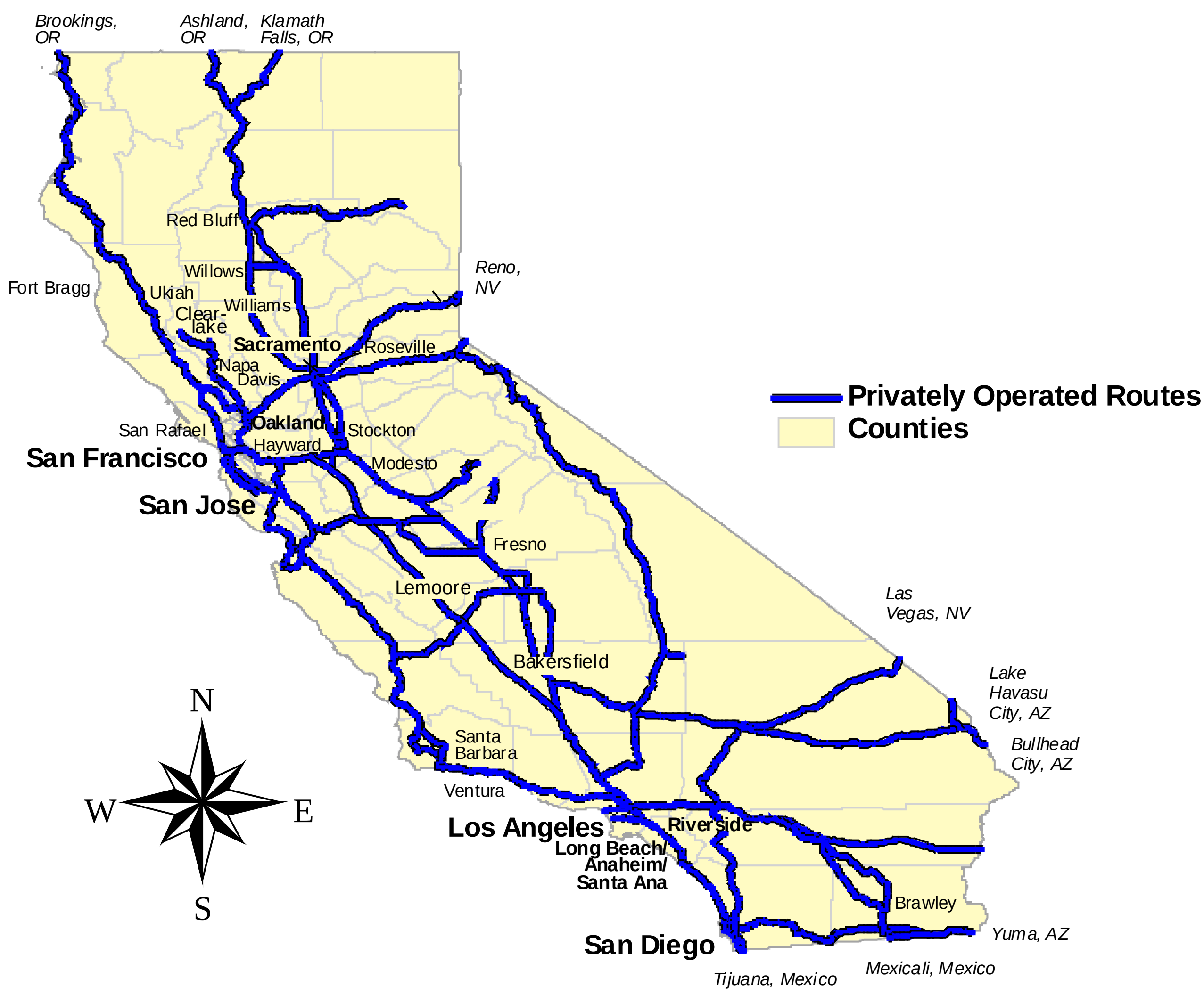
High-frequency Greyhound corridors include: Los Angeles to San Francisco (one trip every 45 minutes to an hour), Los Angeles to San Diego (one trip every 30 to 45 minutes) and San Francisco to Sacramento (one trip every 90 minutes to two hours). Service frequencies for smaller communities vary, typically from one to ten trips daily.

Other private operators in California focus primarily on serving recreational travelers and airport users. Routes served by these operators vary in length from about 30 to 250 miles, and service frequencies range from one to eight trips daily. These operators include:

- VIA Adventures: one route between Merced and Yosemite
- K-T Services: one route between Lake Havasu and Laughlin
- Mt. Lassen: one route between Red Bluff and Susanville
- Orange Belt Stages: four routes centered in the San Joaquin Valley
- Various airport services: seven routes.

Exhibit 2-7 shows private intercity bus routes operated by all carriers in the state.

Exhibit 2-7: Private Intercity Bus Routes



Source: Caltrans Mass Transportation Program, 1999

2.3.

INTER-REGIONAL RAIL

Unlike bus, inter-regional rail transports both people and goods:

- *People:* On the passenger rail side, inter-regional rail is comprised of intercity rail operated by Amtrak and commuter rail services. Urban rail operates within urban regions to serve local transportation rather than inter-regional needs.

- Goods: On the freight-rail side, commercial railroads, such as the Burlington Northern Santa Fe and Union Pacific, own most of the right-of-way. Nearly thirty local freight railroads also operate within the state.

Exhibit 2-8 depicts all rail services within California, with insets for the major metropolitan areas. Thereafter, the report examines major inter-regional rail groups individually.

Exhibit 2-8: Detailed California Rail Map

Source: Caltrans Mass Transportation Program, 1999

2.3.1.

Inter-Regional Passenger Rail

Inter-regional passenger rail includes Amtrak services as well as commuter rail near metropolitan areas. Inter-regional passenger rail frequently operates on the same right-of-way as freight railroads. These services are shown in Exhibit 2-9.

Exhibit 2-9: Inter-Regional Passenger Rail

Source: Caltrans Mass Transportation Program, 1999

Amtrak Intercity Rail

Amtrak serves as the primary inter-regional rail passenger carrier in California. The majority of Amtrak service in California takes place on three state-subsidized lines over about 850 railroad miles:

- Capitol Corridor: eight daily round-trips between San Jose and Sacramento

- San Diegan: eleven daily round-trips between San Diego and Los Angeles (four trips extend north to Santa Barbara, one of which continues to San Luis Obispo)

- San Joaquin: four daily round-trips between San Francisco and Bakersfield.

Amtrak also operates the dedicated feeder bus services, which support the three rail lines. In addition, five routes traverse California as part of the Amtrak national system:

- California Zephyr: one daily-round trip serving the San Francisco-Sacramento-Reno corridor with continuing service to Salt Lake City and beyond

- Coast Starlight: one daily round-trip serving many major metropolitan areas in California and the Pacific Northwest

- Southwest Chief: one daily round trip with direct service from Los Angeles to Kansas City and Chicago

- Sunset Limited: operates three days a week with one train in each direction and connects Los Angeles to many major cities as Amtrak's only transcontinental passenger train (traveling between Los Angeles and Jacksonville, Florida)

- Texas Eagle: operates four days per week in each direction and connects to such major cities as For Worth, Dallas, Little Rock, St. Louis, and Chicago.

Commuter Railroads

Three commuter railroads currently provide inter-regional service in California:

- Caltrain: Operates between San Francisco and Gilroy through San Jose. There are 26 round-trips daily or trains about once every half-hour during the day.

- Metrolink: Also known as the Southern California Regional Rail Authority (SCRRA), primarily operates in the Los Angeles area, but also connects to San Diego County. Route frequencies range from one to thirteen trips daily.

- Altamont Commuter Express (ACE): This line runs 85 miles from Stockton to San Jose. There are two daily AM inbound trips to San Jose and two daily PM outbound trips to Stockton. ACE service formally began service in October 1998.

2.3.2. Freight Rail

Exhibit 2-10 shows the freight rail network in California, which includes more than 6,300 miles of track. Over 48 million tons of freight origins in California traveled via rail in

1997. Tons terminating in the state were even higher, at almost 84 million tons. Frequencies for freight rail services were not available for inclusion in this report. There are generally two types of railroads in the state: major main-line railroads with transcontinental systems (Class 1 railroads) and local railroads commonly known as short lines (Class 3 railroads). There is also one regional (Class 2) railroad near the Oregon border.

Of the 30 freight railroads that operate within California, two provide the majority of the inter-regional service. Both are Class 1 railroads:

- Burlington Northern and Santa Fe Railway (BNSF): operates on about 1,800 railroad miles in California.

- Union Pacific Railroad (UP): operates on about 3,800 railroad miles in California.

Exhibit 2-10: California Freight Rail System – Base Map

Source: Caltrans Intermodal Transportation Management System, 1996

2.4. INTERMODAL FACILITIES

The state's intermodal facilities serving the inter-regional travel market include a wide range of terminals that act as connectors to the major modes and as transfer points from one mode to another mode.

- The primary intermodal facilities for person movement include airports, intercity bus terminals (or depots), intercity rail stations, and cruise terminals.

- The primary intermodal facilities for freight movement include airports, ports, intermodal freight facilities, and tanker farm facilities.

Each major facility type is described in the subsections that follow. Only the largest intermodal facilities in the state are shown. The main sources for data are the Caltrans Intermodal Transportation Management System (ITMS) from the Transportation Planning Program and the inter-regional transit database from the Mass Transportation Program.

2.4.1. Airports

Airports are located in virtually every community of the state. Airports serving significant inter-regional travel are fewer in number. According to the ITMS, there are 14 airports of statewide significance (i.e., 2 million passenger enplanements per year) as listed in the table below and shown in the map in Exhibit 2-11 on page 2-17. Regional hubs include the Los Angeles basin with five airports and the San Francisco Bay Area with three airports.

Airport	City
Burbank-Glendale-Pasadena Airport	Burbank
Fresno-Yosemite International Airport	Fresno
John Wayne Airport – Orange County	Santa Ana
Long Beach Airport	Long Beach
Los Angeles International Airport	Los Angeles
Metropolitan Oakland International Airport	Oakland
Monterey Peninsula Airport	Monterey
Ontario International Airport	Ontario
Palm Springs Regional Airport	Palm Springs
San Diego International Airport	San Diego
San Jose International Airport	San Jose
San Francisco International Airport	San Francisco
Sacramento Metropolitan Airport	Sacramento
Santa Barbara Metropolitan Airport	Santa Barbara

2.4.2. Intermodal Transit Stations

Every metropolitan area in the state has at least one dedicated transit station, and many major transit lines also have permanent transit stations along the route. Many of these facilities serve intermodal services: bus-rail transfer stations, park-n-ride facilities adjacent to light rail or commuter rail stations, and so forth. However, few intermodal transit stations provide purely inter-regional services.

Some of the few stations that do are in Fresno, Los Angeles, San Diego, San Francisco, and San Jose. Other stations may provide some level of inter-regional transit, but the number of inter-regional trips is small compared to the number of local trips.

Intermodal Transit Stations	City
Downtown Fresno Transit Center	Fresno
Union Station	Los Angeles
Union Station	San Diego
Transbay Terminal	San Francisco
San Jose Diridon Station	San Jose

2.4.3. Ports

The largest coastal urban areas in California have deep-water harbors. The twin ports of San Pedro and Los Angeles handle most of southern California's cargo. Oakland and San Diego handle much of the rest of port traffic in the state. Relatively new ports such as Hueneme are growing in importance.

River ports are located along the Sacramento River, where significant oil industry and other industrial goods travel. The eight largest ports are listed in the table below and illustrated in the map on Exhibit 2-11.

Ports
Port of Benicia
Port of Humboldt
Port of Long Beach
Port of Los Angeles
Port of San Diego
Port of San Francisco
Port of Sacramento
Port of Stockton

2.4.4. Major Intermodal Freight Facilities

Intermodal freight facilities are private facilities generally built and owned by the Class 1 railroads (Union Pacific or Burlington Northern Santa Fe). They are placed at the crossroads between major state highways and convenient railroad switching locations, so as to take advantage of rail-to-truck distribution opportunities. The table below lists eleven major intermodal freight facilities. The facilities are shown in Exhibit 2-11.

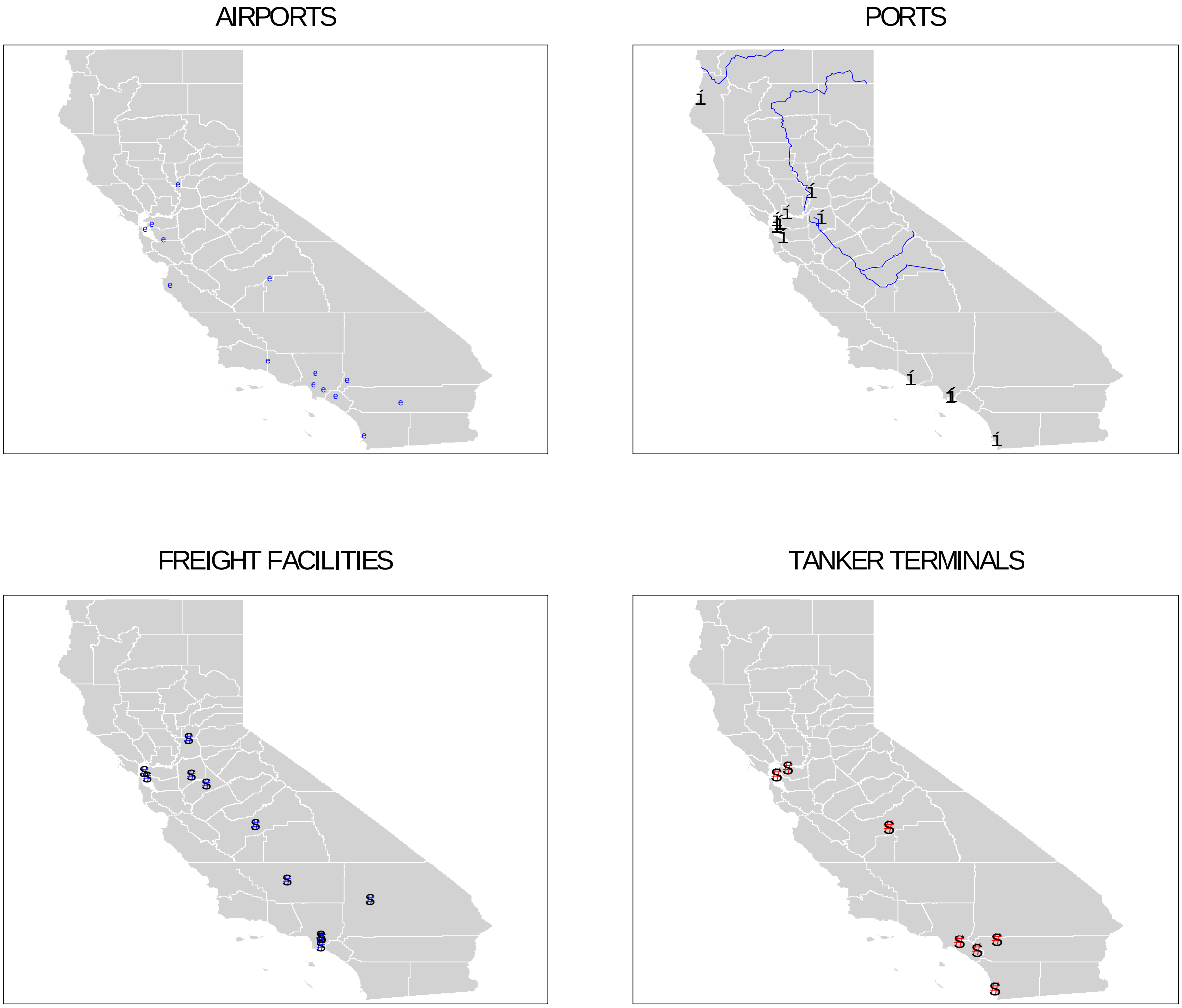
Major Intermodal Freight Facilities
City of Industry (UP)
East Los Angeles (UP)
Fresno (UP)
Lathrop (UP)
Long Beach (UP)
Los Angeles Transportation Center (UP)
Los Angeles Hobart Yard (BNSF)
Oakland (UP)
Modesto (BNSF)
Richmond (BNSF)
San Bernardino (BNSF)

2.4.5. Tanker Terminals

Tanker terminals or tank farms are facilities used to store and distribute gas and liquid petroleum products. They are usually owned by major oil and gas companies and tend to be located near truck routes, shipping lanes (such as the Sacramento river), or rail lines. Tanker terminals are located along the coastal regions and in parts of the Central Valley. The major tanker terminals are shown below and in Exhibit 2-11.

Tanker Terminals	City
Carquinez	Rodeo
Colton Terminal	Blooming
Fresno	Fresno
Mission Valley	San Diego
Orange Terminal	Orange
Richmond	Richmond
Watson Station	Long Beach

Exhibit 2-11: Major Airports, Ports, Freight Facilities, and Tanker Terminals



Source: Caltrans Intermodal Transportation Management System, 2000

C3. THE TRANSPORTATION MARKET

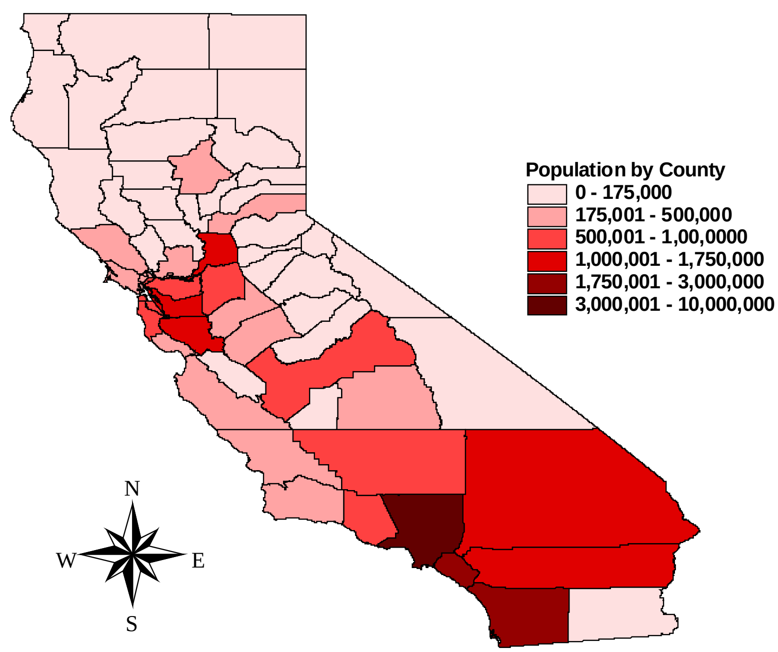
Monitoring the characteristics of the state's transportation market provides a basis for evaluating system requirements over time. This section describes the inter-regional transportation market, using maps wherever possible, to provide a snapshot of the *demand side* of the transportation system. When combined with a description of the state's transportation infrastructure, this information provides the context for examining transportation performance measure results.

3.1. DEMOGRAPHICS

3.1.1. Population

The California Department of Finance maintains the state's population database. The Department of Finance developed its most recent data, including projections to 2040, in December 1998. The year 1998 is the base for analysis and corresponds with the latest available data available on jobs, employment rates, and vehicle registration.

Exhibit 3-1: Population by County



Source: California Department of Finance, 1998

According to the Department of Finance, the total state population was 33,506,406 as of 1998. The most highly populated county in the state is Los Angeles County, which has 9,623,420 people or 23.5 percent of the state total. San Diego and Orange Counties are the second and third most populous counties as shown in Exhibits 3-1 and 3-2.

Exhibit 3-2: Counties with the Highest Population

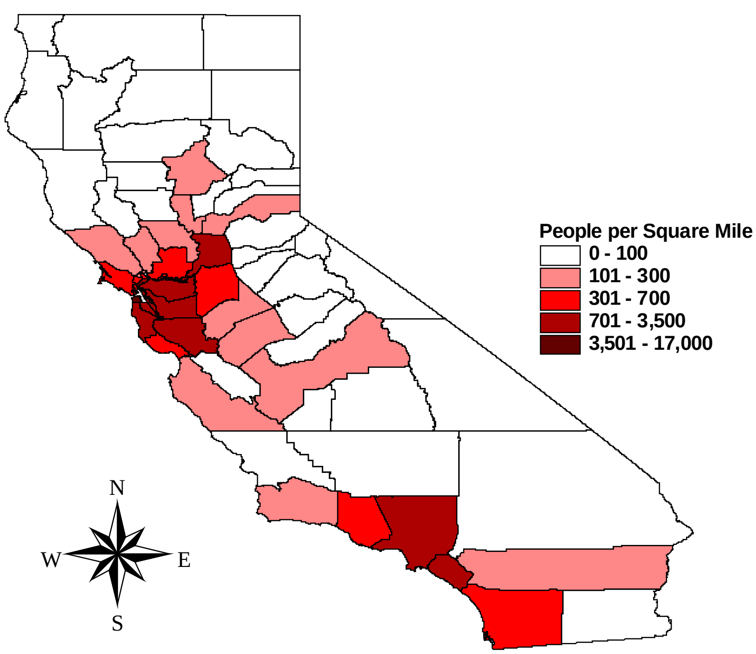
County	1998 Population
Los Angeles	9,623,420
San Diego	2,823,630
Orange	2,744,995
Santa Clara	1,700,976
San Bernardino	1,652,363
Riverside	1,470,398
Alameda	1,424,779

Source: California Department of Finance, 1998

Combined, these seven most populous counties contain over 21 million residents, almost two-thirds of the state's population. Nearly half (twenty-eight) of California counties have less than 175,000 residents each. Twenty-six of these counties have populations below 125,000 people.

The density of the state's population by county shows a different pattern. San Bernardino and Riverside County, for example, have far fewer people per square mile than their absolute numbers might indicate. Exhibit 3-3 shows the distribution of residents per square mile by county.

Exhibit 3-3: Population per Square Mile by County



Source: California Department of Finance, 1998

The state's population is concentrated in the San Francisco Bay Area, and in Southern California, specifically Orange and Los Angeles counties. San Francisco is by far the most densely populated county in the state with 16,801 people per square mile. It is surrounded by additional population centers in the Bay Area counties to the south and east and in Sacramento County. After San Francisco County, Orange County is the second most densely populated county with 3,476 people per square mile.

3.2. EMPLOYMENT

The California Department of Employment and Economic Development is responsible for tracking data on the number of jobs by industry sector. Exhibit 3-4 summarizes the state totals.

Exhibit 3-4: California Job Summary

Jobs in California (Summary Data)	1998 Average
Total, All Industries	14,002,275
Total Farm	406,158
Total Nonfarm	13,596,117
Service Producing	11,008,767
Goods Producing	2,587,350

Source: California Department of Employment and Economic Development, 1999

Exhibit 3-5 provides a breakdown of all jobs in the state by industry sector. The distribution of jobs by county differs from the distribution of population. California has over 14 million jobs, with the highest concentration in the Services (4.2 million) and Trade (3.1 million) sectors. Government is the third highest job sector with 2.2 million. The prominence of trade- and manufacturing-related employment indicates the significant role that goods movement plays in the state's economy.

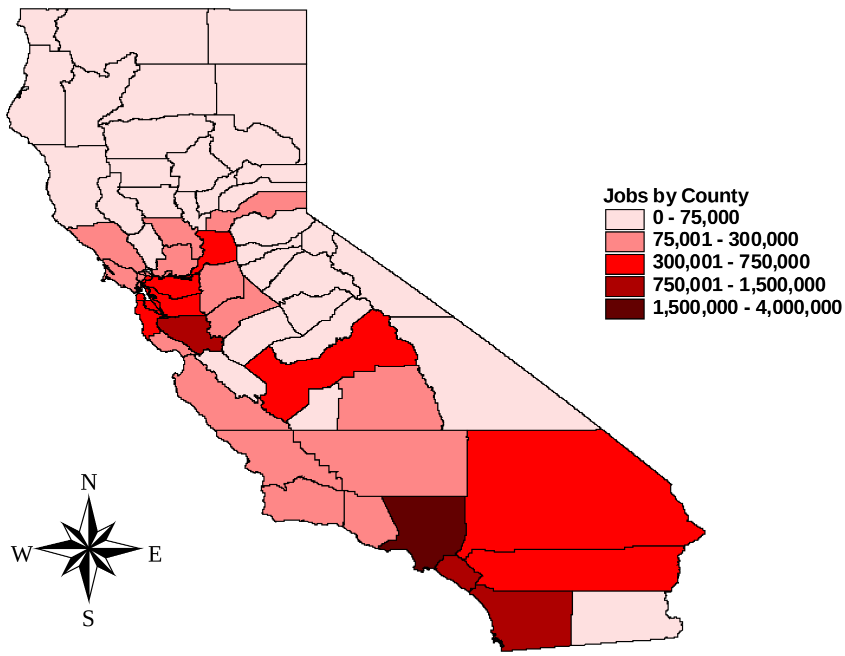
Exhibit 3-5: California Jobs by Industry

California Jobs by Industry Sector	1998 Average
Services	4,224,317
Trade	3,123,583
Total Government	2,166,075
Special Districts	97,017
Indian Tribal Government	6,525
Manufacturing	1,950,967
Durable Goods	1,228,642
Nondurable Goods	722,325
Finance, Insurance & Real Estate	799,400
Transportation & Public Utilities	695,392
Construction	611,233
Total Farm	406,158
Mining	25,150

Source: California Department of Employment and Economic Development, 1999

Exhibit 3-6 shows the number of jobs in the state distributed by county. Los Angeles County has the most jobs overall with 3,951,300 or 28 percent of the state total. Orange County is second with 1,305,800 jobs, followed by San Diego with 1,116,100. In the Bay Area, Santa Clara County has the highest number of jobs, 961,500. Alameda and San Francisco Counties have 657,900 and 566,000 jobs respectively.

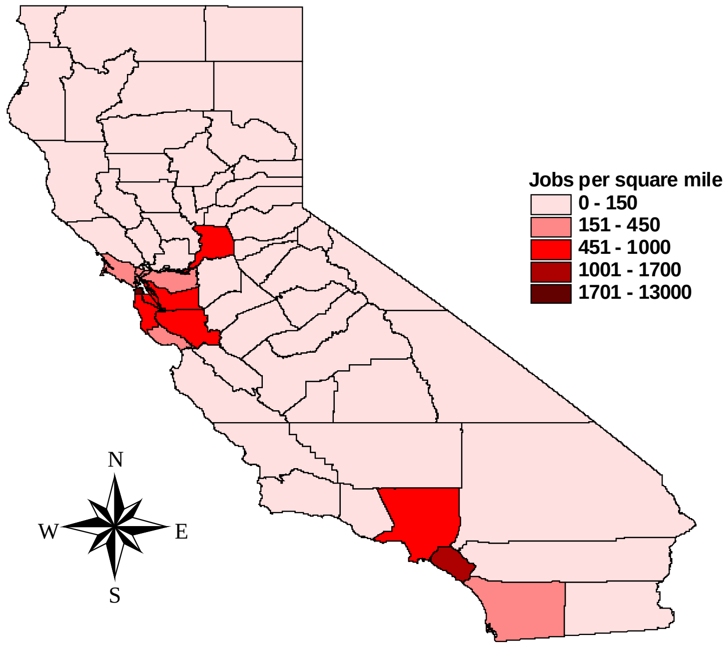
Exhibit 3-6: Number of Jobs by County



Source: California Department of Employment and Economic Development, 1998

These six job centers account for 8.5 million jobs or 61 percent of all jobs in the state. Comparing the distribution of jobs and population in the state (Exhibits 3-6 and 3-1, respectively) gives a picture of the extent to which counties export workers to major job centers (e.g., Alameda to San Francisco).

Exhibit 3-7: Jobs per Square Mile by County



Source: California Department of Employment and Economic Development, 1998

Exhibit 3-7 shows the distribution of jobs per square mile in each county. San Francisco has the highest proportion of jobs to land area (nearly 13,000 jobs per square mile), followed by Orange County. Exhibits 3-3 and 3-7 show that jobs are more concentrated than population in the state. The most job-rich counties after San Francisco and Orange County are Los Angeles and Alameda County, followed by Santa Clara. Orange County has nearly twice the job density of Los Angeles.

The top four industry sectors in the state are services, trade, manufacturing, and government, as shown in Exhibit 3-8.

Exhibit 3-8: Top Industries by County

County	Services	Trade	Manufacturing	Government	Total
Los Angeles	3,158,600	871,900	661,700	541,000	5,233,200
Orange	1,001,100	322,500	231,700	136,400	1,691,700
San Diego	127,600	915,800	194,500	249,400	1,487,300
Santa Clara	653,300	186,400	261,300	88,900	1,189,900
Alameda	528,300	148,200	96,300	123,200	896,000
San Francisco	515,000	105,000	35,100	76,900	732,000
Total	**5,983,900**	**2,549,800**	**1,480,600**	**1,215,800**	**11,230,100**

Source: California Department of Employment and Economic Development, 1998

Exhibit 3-9 ranks the top three counties for each of the major industry sectors.

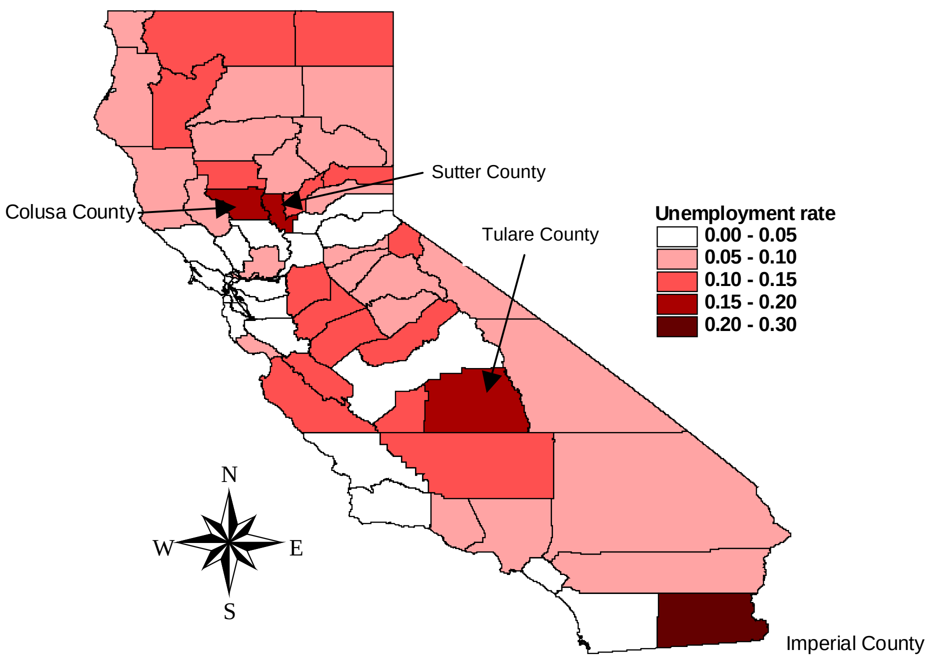
Exhibit 3-9: Top Employment Counties by Industrial Sector

County	Services	Trade	Government	Manufacturing
Los Angeles	1	2	1	1
Orange	2	3	3	3
San Diego		1	2	
Santa Clara	3			2

Source: California Department of Employment and Economic Development, 1998

Exhibit 3-10 compares the unemployment rate in each county. The counties with the highest unemployment rates are Imperial County in the southeast corner with 26 percent, and Colusa County in the north central part of the state with 20 percent. Merced, Sutter, and Tulare Counties follow with approximately 15 percent unemployment each. Marin, San Mateo, Orange, Santa Clara, Sonoma, San Diego, Contra Costa, and San Francisco have the lowest unemployment (under 4 percent) in ascending order. Marin has only 2.3 percent unemployment, and San Mateo has 2.5 percent.

Exhibit 3-10: Unemployment by County



Source: California Department of Employment and Economic Development, 1998

3.3. VEHICLE REGISTRATIONS

The California Department of Motor Vehicles (DMV) is the official state source for vehicle registrations and drivers license information. The DMV reported 20,735,500 current California driver's licenses in 1998. This total represents 62 percent of the state's population. Exhibit 3-11 provides a breakdown of vehicle registrations in the state by mode.

Exhibit 3-11: Vehicle Registrations

	Autos	Trucks	Trailers	Motorcycles	All Vehicles
In-State	17,841,378	4,814,956	1,909,190	395,070	**24,960,776**
Out-of-State	90,822	55,870	181,910	1,962	**330,564**
1998 Total	18,092,781	5,978,355	3,053,025	410,263	**27,534,424**

Source: California Department of Motor Vehicles, 1998

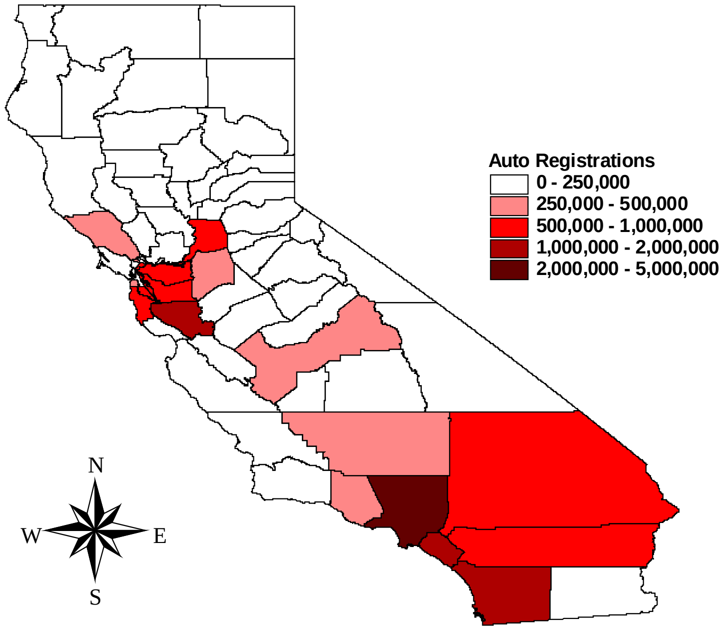
The DMV defines autos as including motor homes and vans. The "trucks" category includes vehicles with commercial plates, small pickups, and utility vans. Trailers are vehicles designed to carry persons or property on their own structure or drawn by a motor vehicle. The DMV definition of trailer includes a semitrailer when used with an auxiliary dolly, if the dolly is constructed to replace the drawbar and the front axle of a trailer.

Los Angeles County has the largest number of total vehicle registrations with 6 million or 22 percent of all vehicles registered in the state. This figure is three times as high as the two next highest counties, Orange and San Diego, with 2.1 million registrations each.

3.3.1. Auto Registrations

Exhibit 3-12 is a map illustrating the auto registrations by county. Los Angeles has the highest number of auto registrations with over 4.8 million, one for every two people in the county. Next in auto registrations are Orange County with over 1.6 million vehicles (one per 1.7 residents), San Diego with 1.6 million (one per 1.8 residents), and Santa Clara County with 1.1 million (one per 1.5 residents).

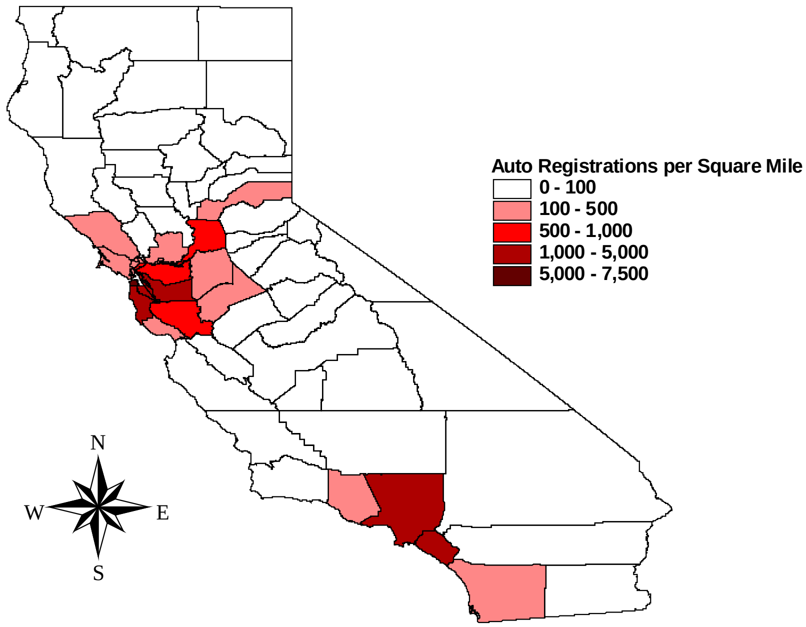
Exhibit 3-12: Auto Registrations by County



Source: California Department of Motor Vehicles, 1999

Exhibit 3-13 shows the density of auto registrations, with density defined as auto registrations per square mile.

Exhibit 3-13: Auto Registration Density by County



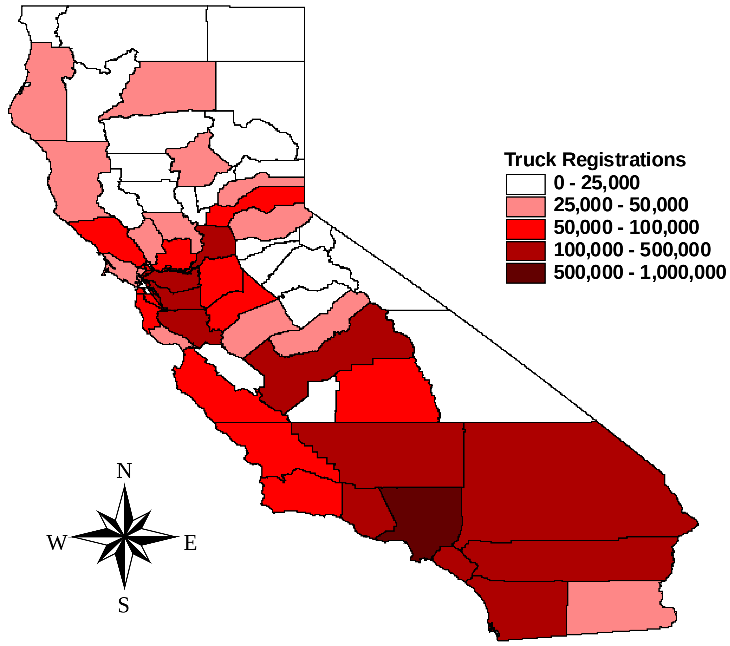
Source: California Department of Motor Vehicles, 1999

Note that the densest registration counties correspond to the major urban areas and Sacramento County.

3.3.2. Truck Registrations

Los Angeles has the largest number of truck registrations overall (nearly one million), followed by San Diego (392,000), Orange, and San Bernardino counties. In Northern California, Santa Clara, Alameda, and Sacramento counties have the most truck registrations, although each has less than 225,000. Exhibit 3-14 shows the number of truck registrations by county.

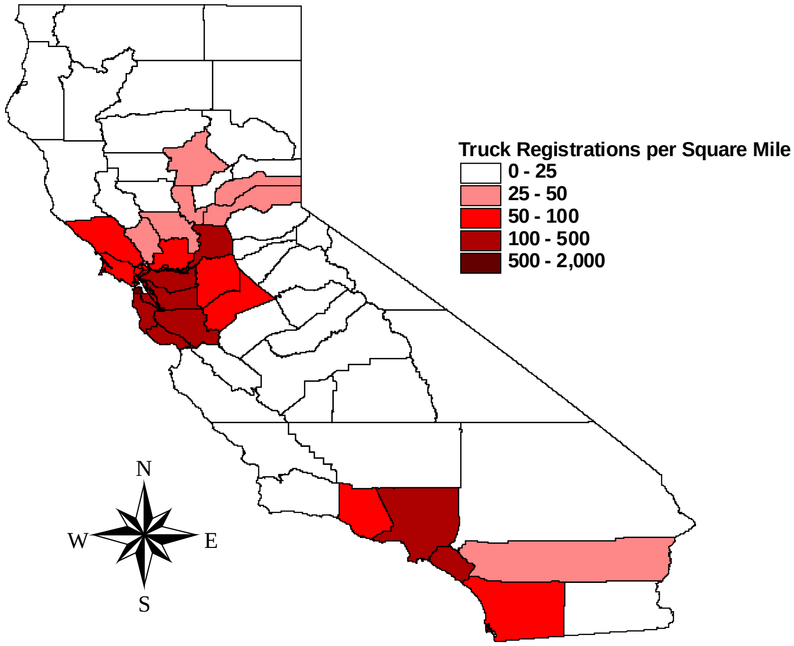
Exhibit 3-14: Truck Registrations by County



Source: California Department of Motor Vehicles, 1999

Exhibit 3-15 provides an analysis of density of truck registrations per square mile. It gives a very different picture of where truck registrations are concentrated in the state from the map showing total numbers by county. San Bernardino, given its size, does not have as high a concentration of registrations as its county total would suggest. By far the largest proportion of truck registrations per square mile is in San Francisco (close to 2,000 registration per square mile).

Exhibit 3-15: Truck Registration Density



Source: California Department of Motor Vehicles, 1999

3.4. MODE SHARE AND MAJOR ORIGIN-DESTINATION FLOWS

3.4.1. Person Market

The American Travel Survey (ATS) provides the most up-to-date statistics on inter-regional travel, both between states and within California, including mode choice. The U.S. Bureau of Transportation Statistics (BTS) conducted the latest American Travel Survey in 1995. BTS is combining this survey with the National Personal Transportation Survey to be conducted in 2002. Mode share data for regions is available only at the household level. In all cases, the trips included in the survey have a minimum length of 100 miles.

Exhibit 3-16 below separates total person-trips in the state into three groups:

- Those that have both origin and destination in the state
- Those that begin in the state and end in another
- Those that originate outside the state.

The exhibit also provides information on the principal modes of travel. There were 65,000 annual inter-regional trips in the state reported in the survey. Of the total, personal use vehicles comprised 86 percent of all modes taken. Those trips taken by airplane account for 12 percent of the total. The remaining modes (bus, train, ship or ferry) add up to only 2 percent of the total trips taken.

For interstate travel, significantly more inter-regional travel originates in California than is California-bound, but originated in other states. California residents are more likely to use cars for these trips (47 percent of total trips) than those traveling to California from other states (37 percent).

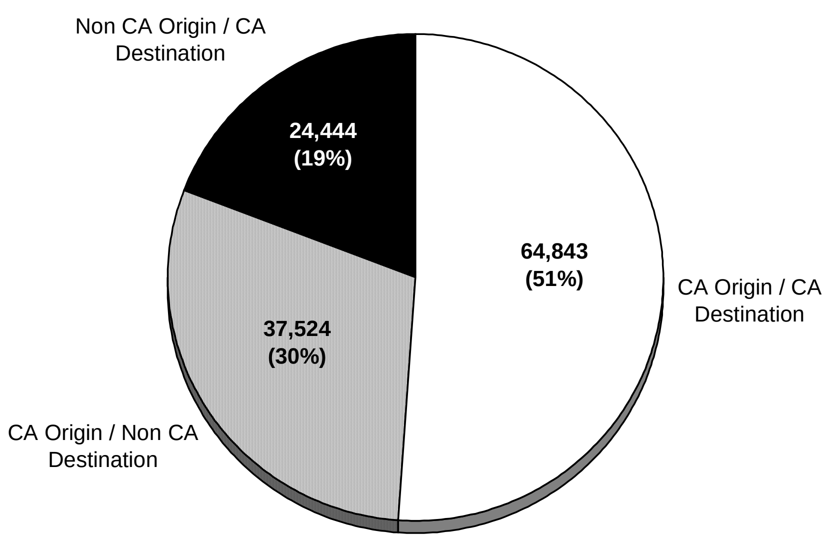
Exhibit 3-16: Total Surveyed Person-Trips for Inter-Regional Travel by Mode

Principal Mode	CA Origin / CA Destination	CA Origin / Non-CA Destination	Non-CA Origin / CA Destination
Personal Use Vehicle	**55,466**	**17,709**	**9,061**
Airplane	**7,988**	**18,270**	**15,050**
Commercial Airplane	7,283	18,048	14,880
Bus	**903**	**1,381**	**204**
Intercity Bus	539	138	37
Charter or Tour Bus	290	1,243	145
Train	**427**	**144**	**76**
Ship, Boat, or Ferry	**58**	**-**	**30**
Other	**-**	**19**	**23**

Source: American Travel Survey, 1995

To illustrate the balance of travel into and out of the state, the pie chart in Exhibit 3-17 compares the proportion of inter-regional travel within, into, and out of the state.

Exhibit 3-17: Share of Total Person-Trips for All Modes



The ATS also provides information on the main purpose given for taking inter-regional trips and the activity status of the trip taker. Of all trips originating in the state, 21 percent were for business. The primary trip purpose was for either leisure or pleasure (66 percent of the survey respondents). Personal business trips represented the remaining 13 percent of trips originating in California. Of those inter-regional trips surveyed traveling into the state, 32 percent were for business, 57 percent were for pleasure, and 12 percent were for personal business.

Approximately 65 percent of those represented in the survey work full-time, 10 percent are retired, and 25 percent chose another category.

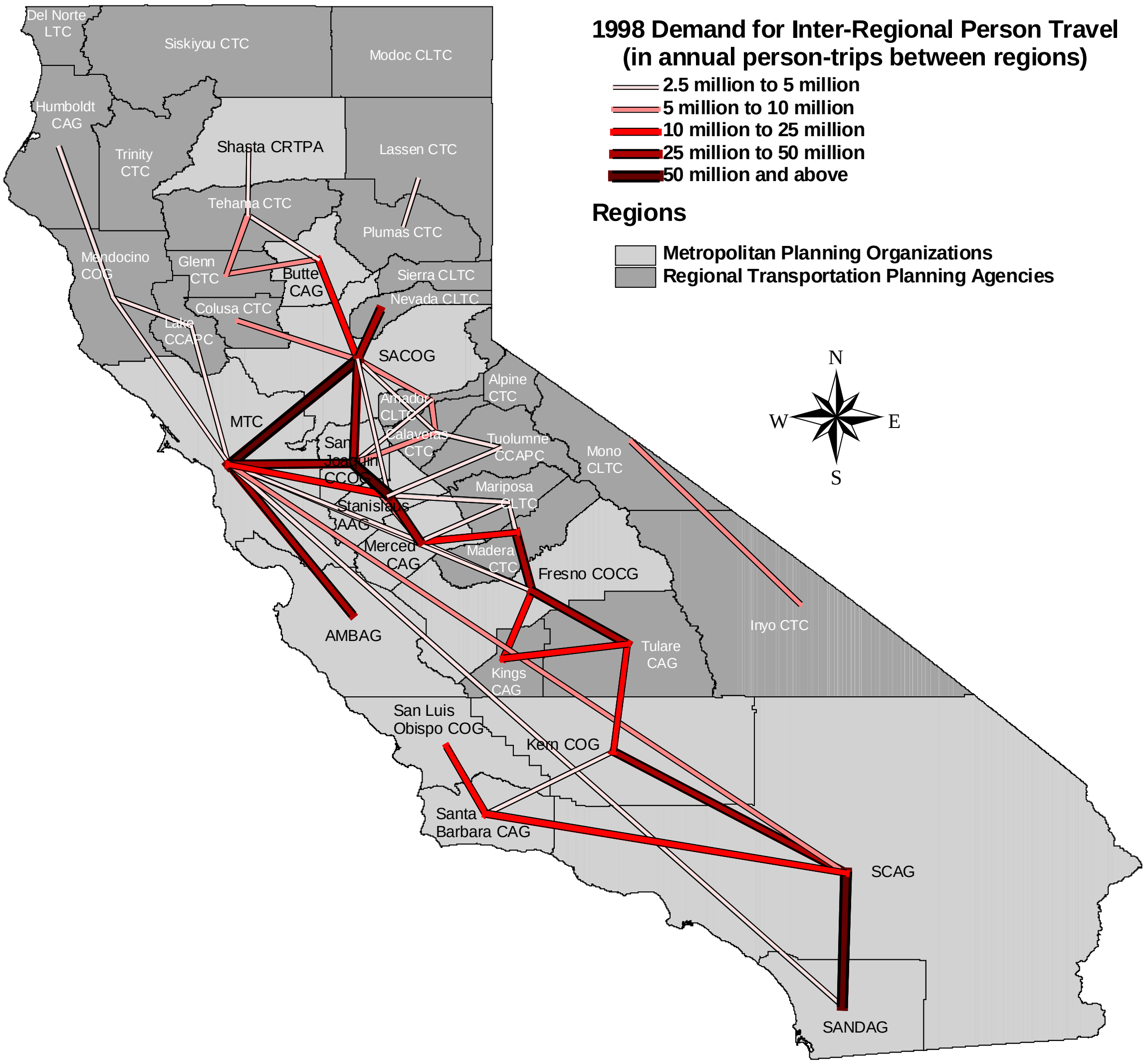
Travel within California

Californians primarily use personal vehicles rather than other surface modes, such as transit, for inter-regional travel. Data from the Caltrans Rail Program Forecasting Model suggests that the average mode share for non-automobile modes is less than one percent. This data reflects travel primarily along the Capitol (Sacramento to the San Francisco Bay Area) and San Joaquin (Sacramento to Bakersfield) corridors.

Exhibit 3-18 shows the demand for inter-regional travel using all surface modes within California in 1998. Demand is shown for travel between regions (as defined by MPOs and RTPAs) that exceeds 2.5 million person-trips annually. The exhibit reflects the best data available (provided by Caltrans Mass Transportation) and draws on data from the Caltrans Rail Program Forecasting Model, the Caltrans Statewide Travel Demand Model, and the 1995 American Travel Survey.

The thickest lines indicate the heaviest volumes between MPO/RTPA regions in California. The most highly traveled corridor according to the demand data is the corridor between the San Francisco Bay Area and Sacramento. High demand also occurs along the following corridors: Sacramento to Nevada County, Sacramento to Butte, Sacramento to San Joaquin, San Joaquin to Stanislaus, Stanislaus to Merced, Madera to Fresno, Fresno to Tulare, Tulare to Kern, and Kern to the five-county Southern California Association of Governments region. Along the coastal areas, the corridors with the highest demand are San Francisco to the Monterey region and the SCAG region to San Diego.

Exhibit 3-18: Demand for Inter-Regional Travel within California



Source: Caltrans Mass Transportation Program

Travel between California and Cities in Nearby States

Exhibit 3-19 shows patterns for interstate travel to and from cities outside California. The largest proportion of interstate round trips originating in California goes to Las Vegas. These trips are primarily from the Los Angeles, Orange County, and Riverside/San Bernardino County region, though a significant number originate in San Diego. Phoenix generates the largest proportion of travel, although this number does not compare with the significant travel leaving California for Las Vegas. Of all interstate trips represented in this summary, 73 percent originate in the state.

Exhibit 3-19: Interstate Travel Patterns at the Regional Level

Region	Destination	From Origin	From Destination	Total Round Trips
LA Metro Area	Las Vegas	8,112	806	**8,918**
LA Metro Area	Phoenix	755	1,416	**2,171**
LA Metro Area	Salt Lake City		107	**107**
LA Metro Area	Seattle		300	**300**
Sacramento	Reno		137	**137**
San Diego	Las Vegas	1,980	234	**2,214**
San Diego	Phoenix	215	507	**722**
San Diego	Reno	328		**328**
San Diego	Tucson		205	**205**
SF Bay Area	Phoenix	250	484	**734**
SF Bay Area	Portland		258	**258**
SF Bay Area	Reno	872	139	**1,011**
SF Bay Area	Seattle		142	**142**
Total trips		**12,512**	**4,735**	**17,247**

Source: American Travel Survey, 1995

The amount of inter-regional travel between California regions and cities in other states can be computed by totaling the round-trips reported in the ATS. Exhibit 3-20 maps the total person round-trips between regions in California and cities outside the state. The width of each line indicates the total demand for travel between these locations as reported in the survey. Based on the sample in the survey, the locations with the highest travel are between the Los Angeles metropolitan area and Las Vegas, San Diego and Las Vegas, and the Los Angeles metropolitan area and Phoenix.

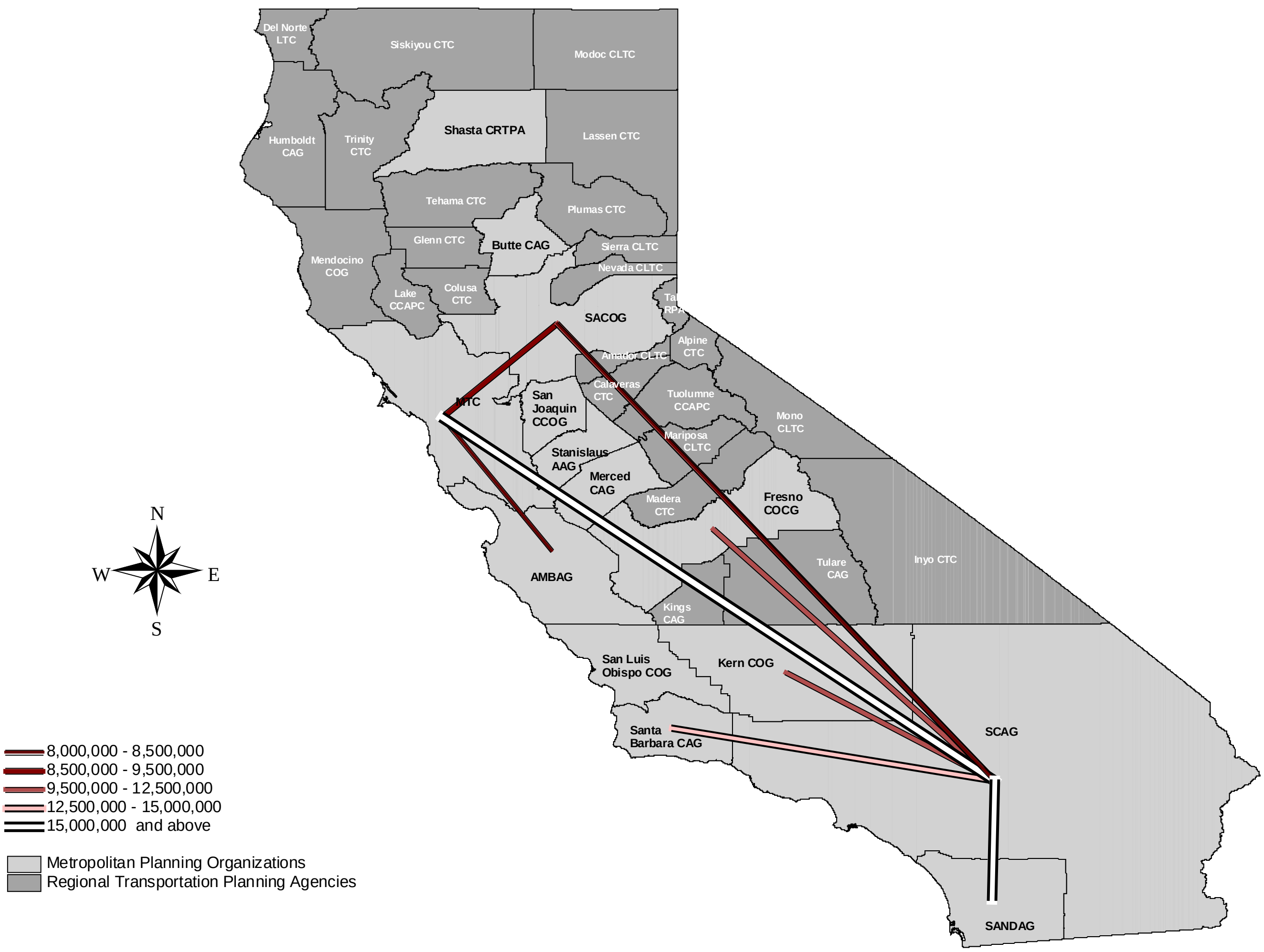
Exhibit 3-20: Inter-Regional Travel Between California Regions and Cities in Other States

3.4.2. Freight Market

Data on freight movement in the state is drawn from the Caltrans Intermodal Transportation Management System (ITMS). ITMS freight data includes truck, rail, and intermodal commodity flows. It is based on reported shipment data and accounts for port statistics as well as empty truck movements.

Exhibit 3-21 shows freight origin-destination flows in California. The base year for the data is 1996. The two corridors with the highest number of freight ton movements in the state are: San Francisco Bay Area to the SCAG region, and the SCAG region to the San Diego Association of Governments (SANDAG) region. Each corridor has over 15 million tons of freight travel. The next most traveled corridor is between the Santa Barbara region and SCAG with approximately 14 million tons. The corridors from Fresno to SCAG and Kern to SCAG each have between 9.5 and 12.5 annual freight tons.

Exhibit 3-21: Freight Origin-Destination Flows in California



Source: Caltrans Intermodal Transportation Management System (ITMS), 1996

Mode Share and Origin/Destination Counties of Annual Freight Tons

This section discusses the total annual freight tons originating in or delivered to each county and the mode share. The exhibits include all freight modes, except goods shipped by water. None of the counties ship or receive a significant percentage of goods via air carriers (Los Angeles, the highest, is in the single digits). Statewide, trucks are by far the primary mode of transportation for freight. Rail is the second mode for freight transportation, carrying 6.8 percent of all goods. Some commodities are always shipped via rail (e.g., coal), while others can be shipped via rail or trucks.

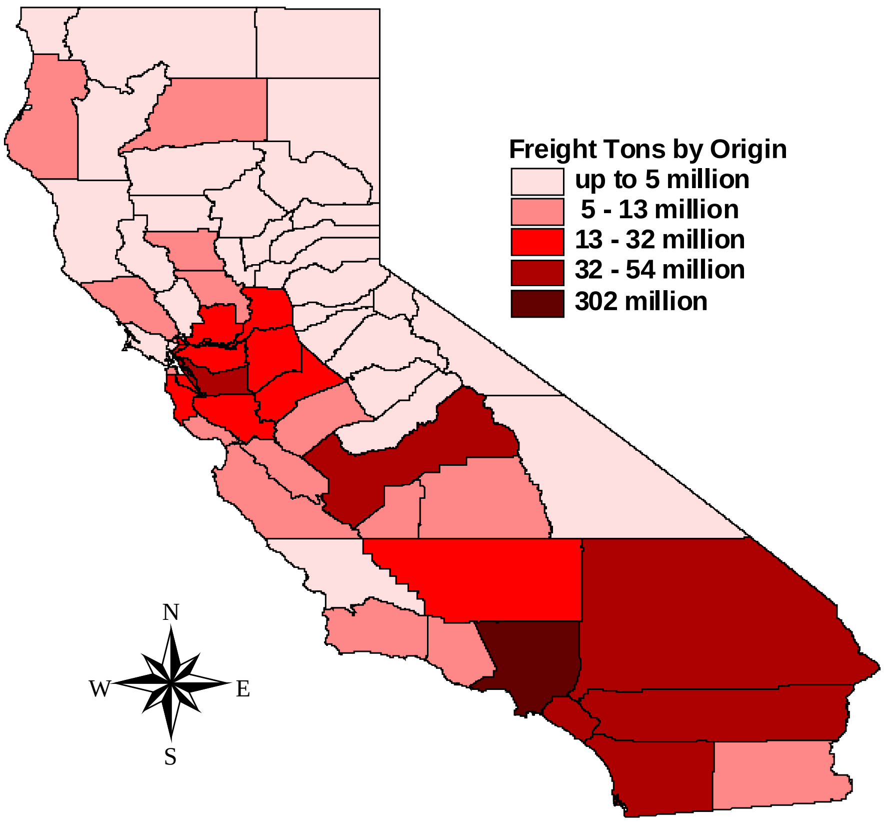
Exhibit 3-22 depicts the total annual tons of freight shipped from each county in the state. Exhibit 3-23 shows the counties with ten percent or higher mode share for rail freight carriers for those goods. For total annual tons shipped, Los Angeles County ships annually four times more freight tons (302 million tons) to destinations outside its borders than any other county in California. Though the majority of goods from Los Angeles are shipped by truck, intermodal carriers are more significant than in most other counties and comprise approximately ten percent of the total volume shipped.

Six counties ship between 36 and 54 million tons annually (from lowest to highest): San Diego, Alameda, Riverside, Fresno, San Bernardino, and Orange. Freight tons in Riverside, Orange, and San Diego counties are carried almost exclusively by truck. Of these six, San Bernardino ships the most goods by rail, about ten percent. Fresno uses a small amount of rail to ship goods, and Alameda uses a small portion of intermodal carriers and rail, approximately five percent of the total.

Counties that ship between 17 and 36 million tons annually include Sacramento, San Mateo, Solano, Contra Costa, Kern, Stanislaus, and San Joaquin. Of these, Kern and Contra Costa counties use modes other than trucks for at least ten percent of goods shipped. Rail carries almost 20 percent of Kern's goods. Contra Costa ships 14 percent using a combination of rail and intermodal carriers.

The North American Free Trade Agreement (NAFTA) and trade with Pacific Rim counties play a significant role in shaping freight movement into and out of the state.

Exhibit 3-22: Total Annual Freight Tons by Origin



Source: Caltrans Intermodal Transportation Management System (ITMS), 1996

Exhibit 3-23: Counties with the Highest Rail Mode Share for Freight Exports

Counties	Percent Shipped Out by Rail
Modoc	20%
Kern	19%
San Benito	16%
Lassen	15%
Contra Costa	14%
San Luis Obispo	11%
Imperial	11%
San Bernardino	10%

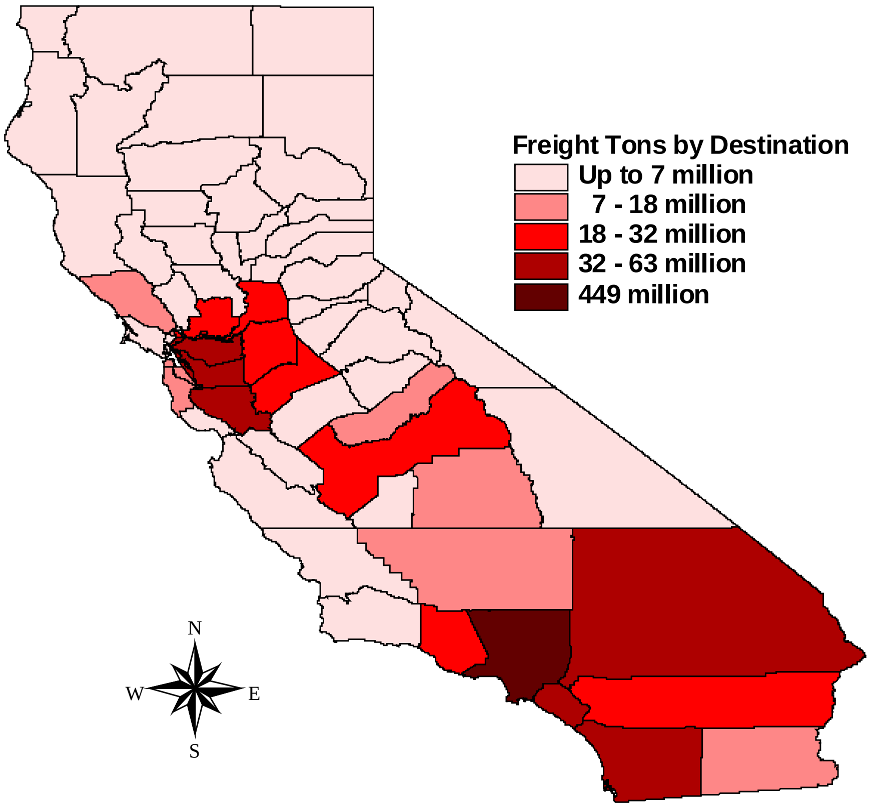
Exhibit 3-24 shows total freight tons shipped *into* each county, and Exhibit 3-25 shows the counties with the highest percentage of rail freight mode share. Los Angeles County receives the most freight tons, 449 million tons annually. This import volume is about 50 percent more than the volume of freight that departs the county. It receives approximately the same proportion of goods via modes other than truck, although a higher proportion arrives by rail than intermodal carrier. Seven percent of goods are shipped out via rail and nine percent of goods shipped into the county travel by rail.

Counties receiving between 37 and 63 million tons include (from lowest to highest) Santa Clara, San Bernardino, Contra Costa, San Diego, Alameda, and Orange. San Bernardino receives 25 percent of its goods via rail. Contra Costa and Alameda receive approximately the same amount of goods by rail as they do by intermodal carriers, making up a total of 10 to 12 percent of total tons received.

Counties with incoming shipments between 20 and 36 million include Sacramento, Fresno, Riverside, Stanislaus, and San Joaquin. None of the Southern California counties use non-truck modes to a significant degree. San Joaquin uses rail and intermodal for about 16 percent and Stanislaus uses rail for about 10 percent of good received.

Kern and Merced counties receive a relatively high proportion of goods via rail, with mode shares of 14 and 15 percent. However, Kern County ships out twice as many goods as it receives (22.6 million freight tons versus 14.5 million freight tons). The same pattern occurs in Merced (7.5 million freight tons versus 3.4 million freight tons). Central Valley counties tend to be net exporters due to the magnitude of the agricultural industry.

Exhibit 3-24: Total Annual Freight Tons by Destination



Source: Caltrans Intermodal Transportation Management System (ITMS), 1996

Exhibit 3-25: Counties with the Highest Rail Mode Share for Freight Imports

Counties	Percent Shipped In by Rail
Glenn	31%
San Bernardino	25%
San Joaquin	16%
Merced	15%
Kings	15%
Tulare	15%
Kern	14%
Alameda	12%
Contra Costa	10%
Imperial	10%
Stanislaus	10%

According to the Caltrans ITMS, California is a net importer of freight. Total freight tons originating in California counties was 844 million in 1996, while total freight tons delivered into California counties was 943 million. Exhibit 3-26 shows the top five net importing counties and exporting counties.

Exhibit 3-26: Annual Freight Tons (in millions)
Top Importing and Exporting Counties

Counties	Origin Tons	Destination Tons	Net Exports
Los Angeles	302	449	-147
Contra Costa	27	42	-15
San Diego	36	46	-10
Ventura	9	19	-10
Orange	53	63	-10
Fresno	43	22	21
Riverside	43	29	13
Kern	22	14	8
San Benito	6	1	5
Colusa	6	1	5

*Net exports = Origin Tons – Destination Tons

Source: Caltrans ITMS – Reebie Associates California Transearch Database, 1996

3.5. ANNUAL STATISTICS

3.5.1 Highways

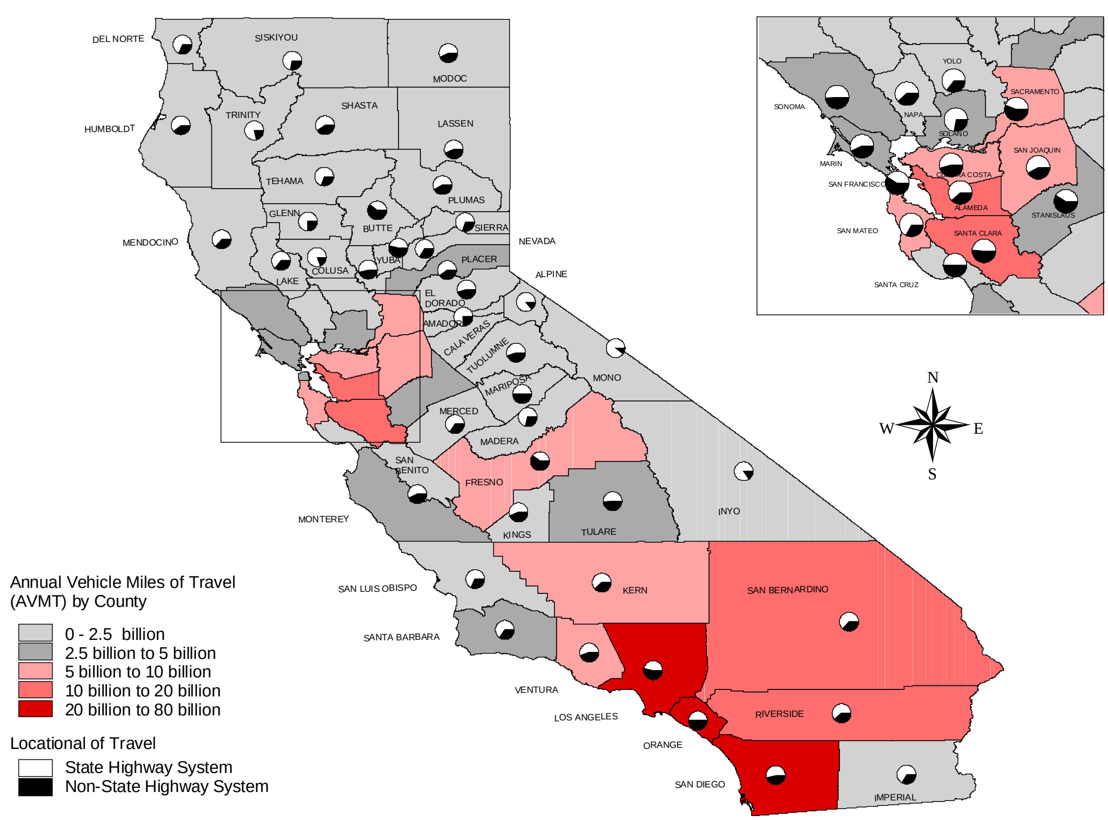
The Assembly of Statistical Reports is the official Caltrans source for vehicle-miles traveled. According to the 1997 Assembly of Statistical Reports, California drivers traveled 285 billion vehicle-miles that year. For travel on state highways only, vehicle-miles traveled (VMT) was 153 billion. Total travel on non-state highways amounted to the difference (i.e.,132 billion vehicle-miles).

Exhibit 3-27 shows VMT by county and the proportion of VMT occurring on state or non-state highways in each county. Los Angeles, Orange, and San Diego County have the highest VMT in the state. Approximately half of this demand occurred on state highways. Los Angeles had close to 80 billion annual VMT, while Orange and San Diego Counties each had an annual VMT of close to 24 billion.

San Bernardino, Riverside, Santa Clara, and Alameda had between 10 and 20 billion vehicle miles traveled each. Two-thirds of the VMT in San Bernardino, Riverside, and Alameda as well as about half of the VMT in Santa Clara County occurred on state highways.

Exhibit 3-28 shows VMT by route. The most heavily traveled routes are in Los Angeles (portions of Highways 5 and 101) and San Diego counties (Highways 5 and 15). Highway 101 in Santa Clara County, Highway 580 in Alameda County, and Highway 15 between the western edge of San Bernardino County and Los Vegas are the next most heavily traveled routes.

Exhibit 3-27: Annual Vehicle Miles of Travel on State and Non-State Highways within California



Source: 1997 Assembly of Statistical Reports

Exhibit 3-28: Vehicle Miles Traveled by State Route

Source: Caltrans System Transportation Information Program

3.5.2 Inter-Regional Rail

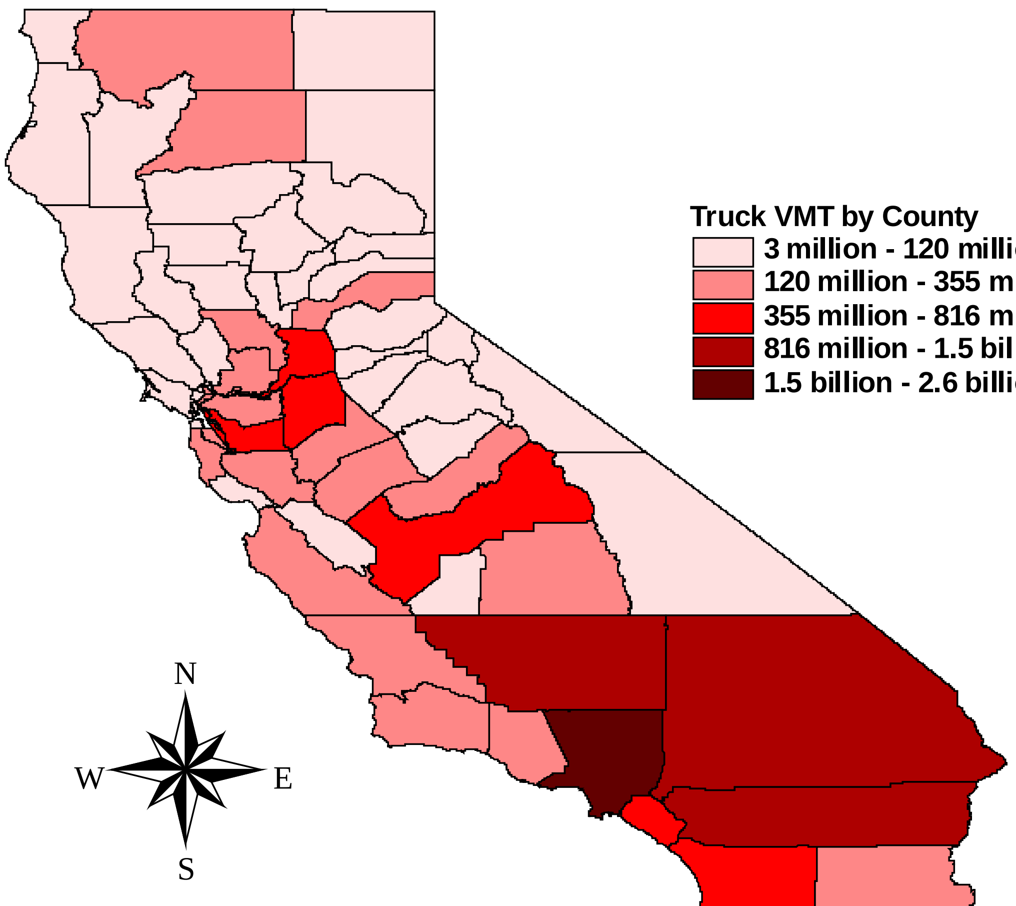
Information on train-miles traveled is drawn from the "1998 Annual Report of Railroad Accidents Occurring in California," produced by the California Public Utilities Commission, Rail Safety and Carriers Division, and the National Transit Database (for Caltrain). According to these sources, 26.6 million inter-regional train miles were traveled in 1997. These numbers include Amtrak, the commuter railroads, and the freight railroads. It does not include local rail services such as those operated by the Los Angeles County Metropolitan Transportation Authority and Bay Area Rapid Transit District.

3.5.3 Trucks

Data on truck-miles traveled comes from the Caltrans Transportation System Information Program (TSIP) report entitled "Truck Kilometers of Travel 1982-1997." In 1997, trucks traveled a total of 14.5 billion miles in California, or roughly five percent of all VMT. TSIP also provides truck-miles traveled by county and total vehicle miles traveled within each county.

Exhibit 3-29 shows the distribution of truck-miles traveled across the counties. Trucks in Los Angeles traveled 2.6 billion miles in 1997. Counties with the next highest level of truck travel are Kern, San Bernardino, and Riverside. Other counties with high truck traffic include Alameda, San Joaquin, Sacramento, Orange, and San Diego.

Exhibit 3-29: Truck Miles Traveled by County



Source: Caltrans Transportation System Information Program, 1997

Source: Caltrans Transportation System Information Program, 1997

C4. NEXT STEPS

This section briefly outlines next steps in the Performance Measurement Initiative relative to full implementation of performance measures. These next steps address the completion of tasks needed to issue the first State of the System Report – an annual or biennial report that would fulfill the monitoring portion of system performance measures implementation. The other part of these efforts is to continue research and outreach efforts for the integration of performance measures within Caltrans' and California's planning and programming processes.

Caltrans has initiated an action plan to address two challenges,: data and integration. The plan calls for three parallel work approaches, discussed below:

- Solicit feedback on prototype
- Increase data coverage
- Integrate with planning and programming processes.

4.1. SOLICIT FEEDBACK ON PROTOTYPE

The first order of business in planning for the first State of the System Report will undoubtedly be the soliciting of feedback of this report. Already, meaningful feedback has been received and incorporated by a large number of reviewers, including the Caltrans Director, Deputy Directors and staff, and District Directors and staff.

The intent is for this report prototype to gain yet additional exposure and, in doing so, generate additional value-added comments that enable the project team to fine-tune the report.

4.2. INCREASE DATA COVERAGE

In developing this report prototype for four transportation outcomes, the project team discovered that data gaps currently exist related to the data. The gaps mainly relate to lack of data detection coverage for mobility and reliability data in most urban and rural areas. In addition, data gaps exist for other modes such as freight rail and inter-regional bus services.

The table below summarizes the strengths and weaknesses of available data and proposed next steps to fully document these four transportation outcomes in a future State of the System Report.

Exhibit 4-1: Status of Current Four Outcomes

Outcome	Data Strengths	Data Weaknesses	Next Steps
Safety	• CHP (State level) • TASAS (State Highways) • Transit data from FTA • Freight data from PUC	• Greyhound Data not reported at California level • Train consist size data difficult to obtain; making it hard to convert train miles to car miles	• Research alternatives for Greyhound safety data • Research additional sources to obtain or estimate rail freight consist sizes
Mobility/Accessibility	• Reliable loop data currently available from many urban areas statewide • Integration with in-house Caltrans data collection for transit	• Loop data not currently available from significant urban areas and virtually no rural areas statewide • Mobility/accessibility data for freight railroads not available	• Work with Operations to expand urban area coverage • Research alternatives for measuring rural mobility • Research Mobility/Accessibility for freight
Reliability	• Same as for above	• Same as above	• Same as above
Environmental Quality	• Consistently reported by CARB	• Need to identify other environmental areas to report	• Work with customers including California Transportation Commission and regional agencies to identify measurement areas

The research efforts listed in the right-most column of the exhibit are already under way.

In addition to the four outcomes listed above, the Performance Measurement Initiative has earmarked additional outcomes to report on as part of a comprehensive monitoring tool. Many of these outcomes are currently being tested for applicability to both monitoring and forecasting.

Exhibit 4-2: Monitoring and Forecasting for Outcomes

Outcome	Monitoring	Forecasting
Safety / Security*	✔	✔
Mobility / Accessibility*	✔	✔
Reliability*	✔	
Environmental Quality*	✔	✔
Transportation System Preservation	✔	✔
Sustainability	✔	✔
Customer Satisfaction	✔	
Economic Well-Being		✔
Cost Effectiveness		✔
Equity		✔

* Outcomes incorporated into System Performance Measures Prototype Report.

As can be seen from the exhibit, the outcomes of transportation system preservation, sustainability, and customer satisfaction are the three remaining outcomes that are candidates for inclusion in the first State of the System Report. Some of the other outcomes, such as economic well-being, apply more to forecasting and therefore would be excluded from California's main system transportation performance monitoring tool.

The goal is to issue the first State of the System Report within two years. Complete state coverage is considered important and will require Caltrans Programs and Districts to work closely together to close the data gaps.

Finally, Caltrans is pressing on with additional testing of modes, such as the applicability of aviation to performance measures. One of the challenges in this task will be reconciling when aviation serves the same market as other modes and when it does not. Caltrans is also performing additional research on how the freight movement modes can be further integrated into a system performance measurement tool.

4.3. INTEGRATE WITH PLANNING AND PROGRAMMING PROCESSES

Caltrans is continuing the efforts from the past few years to integrate performance measures into existing and proposed planning and programming processes. While the most visible part of this work involves outreach to partners internal and external to Caltrans, an important part also involves additional research of the applicability of concepts to current planning and programming processes. This year, Caltrans is also embarking on ambitious pilot efforts with various customers of performance measures to test integration within functional areas. The first phase of customer training is also underway as part of the Planner Academy Program and training related to the Regional Transportation Plan Guidelines.

The initial focus areas for research include applicability of performance measures to the Interregional Transportation Strategic Plan, State Highway and Operations Protection Plan and Regional Transportation Plans' "objectives" for rural RTPAs. A significant part of the analysis will be collecting data to calculate performance indicators related to the SHOPP program.

The training program will be primarily aimed at District and regional partner agency staff. The program will contain an introduction to system performance measurement, as well as a pragmatic, "how to" program on techniques to integrate system performance measures into traditional planning processes.

APPENDIX - INTER-REGIONAL ROAD SYSTEM AND HIGH EMPHASIS ROUTES

Inter-Regional Road System (IRRS)
(Streets and Highways Code, Sections 16410-16420)

For purposes of subdivision (e) of Section 1643, the eligible interregional and intercounty routes include all of the following:

Route 1, all
Route 2, between the north urban limits of Los Angeles-Long Beach and Route 138
Route 4, between the east urban limits of Antioch-Pittsburg and Route 89
Route 5, all
Route 6, all
Route 7, all
Route 8, all
Route 9, between the north urban limits of Santa Cruz and the south urban limits of San Jose
Route 10, between the east urban limits of San Bernardino-Riverside and the Arizona state line
Route 12, all
Route 14, all
Route 15, all
Route 16, between the east urban limits of Sacramento and Route 49
Route 17, between the north urban limits of Santa Cruz and the south urban limits of San Jose
Route 18, between the north urban limits of San Bernardino-Riverside and Route 138
Route 20, all
Route 25, between Route 146 and Route 101 in San Benito County, Route 28, all
Route 29, all
Route 36, between Route 5 and Route 395
Route 37, between the east urban limits of San Francisco-Oakland near Novato and the west urban limits of San Francisco-Oakland near Vallejo
Route 38, between the east urban limits of San Bernardino-Riverside and Route 18 west of Big Bear Lake
Route 40, all
Route 41, between Route 1 and Yosemite National Park
Route 44, between the east urban limits of Redding and Route 36
Route 46, between Route 1 and Route 99
Route 49, between Route 41 and Route 89
Route 50, all
Route 53, all
Route 58, between Route 5 and Route 15
Route 62, all
Route 63, between the north urban limits of Visalia and Route 180
Route 65, between the north urban limits of Bakersfield and Route 198 near

Exeter, and between Route 80 and Route 99 near Yuba City
Route 68, all
Route 70, between Route 99 north of Sacramento and Route 395
Route 74, all
Route 78, all
Route 79, between Route 8 and Route 10
Route 80, all
Route 86, between Route 111 in Brawley and Route 10
Route 88, all
Route 89, all
Route 94, except within the urban limits of the County of San Diego
Route 95, between Route 10 and the Nevada state line
Route 97, all
Route 98, between Route 111 and Route 7Route 99, with routing to be determined via Route 70 or via Route 99 between
Route 70 north of Sacramento and Route 149 north of Oroville
Route 101, all
Route 108, between Route 120 at Yosemite Junction and Route 395
Route 111, between the Mexico border near Calexico and Route 10 near Whitewater
Route 113, between Route 80 and Route 5
Route 116, between Route 1 and Route 12
Route 120, between Route 5 and Route 395
Route 126, between the east urban limits of Oxnard-Ventura-Thousand Oaks / Route 5
Route 127, all
Route 128, all
Route 129, between Route 1 and Route 101
Route 132, west of Route 99
Route 138, between Route 5 and Route 18
Route 139, between Route 299 and the Oregon state line
Route 140, between the east urban limits of Merced and Yosemite National Park
Route 146, between Route 101 and Pinnacles National Monument
Route 149, all
Route 152, between Route 101 and Route 99
Route 154, all
Route 156, between Route 1 and Route 152
Route 160, between the north urban limits of Antioch-Pittsburg and the south urban limits of Sacramento
Route 168, between the east urban limits of Fresno and Route 168 at Florence Lake Road, and between Route 168 near Lake Sabrina and Route 395
Route 178, between the east urban limits of Bakersfield and Route 14
Route 180, between the east urban limits of Fresno and Kings Canyon National Park
Route 188, allRoute 190, between Route 65 and Route 127
Route 198, between Route 5 and the Sequoia National Park
Route 199, all
Route 203, all
Route 205, all
Route 207, all

Route 215, all
Route 243, all
Route 267, all
Route 299, between Route 101 and Route 89, and between Route 139 and Route 395
Route 330, between the north urban limits of San Bernardino-Riverside and Route 18
Route 371, all
Route 395, all
Route 505, all
Route 580, all
Route 680, all
Route 905, except within the urban limits of San Diego

High Emphasis Routes (HERs)

Route 1 and 17
- Route 1, between south urbanized boundary in Carmel and Route 17
- Route 17, between Route 1 and Route 280

Route 5, all
Route 6, all
Route 7, between Mexico border and Route 8
Route 8, all
Route 10, all
Route 15, all
Route 20, between Route 101 and Route 29; between Route 53 and Route 80
- Route 29, between Route 20 and Route 53
- Route 53, between Route 29 and Route 20
- Route 49, between Route 20 and Route 80 at Auburn

Route 40, all
Route 41 and 46
- Route 41, between Route 46 and Yosemite National Park
- Route 46, between Route 101 and Route 5

Route 50, all
Route 58, between Route 5 and Route 15
Route 70, all
Route 80, all
Route 86, 78, and 111
- Route 111, between Mexico border and Route 78
- Route 78, between Route 111 and Route 86
- Route 86, between Route 111 and Route 10

Route 95, between Route 10 and the Nevada state line
Route 97, all
Route 99, all
Route 101, all
Route 120, between Route 5 and Route 395
Route 126, between Route 101 and Route 5

Route 138, between Route 5 and Route 15
Route 139, between Route 299 and the Oregon state
Route 152, between Route 101 and Route 99
Route 198, between Rout 5 and Sequoia National Park
Route 199, all
Route 205, all
Route 215, all
Route 299, between Route 101 and Route 5; between Route 139 and Route 395
    Route 44, between Route 5 and Route 36
    Route 36, between Route 44 and Route 395
Route 395 and Route 14, all
Route 505, all
Route 580, all
Route 905, all

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LIST OF ACRONYMS

Acronym	Description
AADT	Average Annual Daily Vehicle Traffic
ATS	American Travel Survey
BART	Bay Area Rapid Transit District
BNSF	Burlington Northern and Santa Fe Railway
BTH	Business, Transportation, and Housing Agency
BTS	Bureau of Transportation Statistics
CHP	California Highway Patrol
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CTP	California Transportation Plan
DMV	Department of Motor Vehicles
EPA	U.S. Environmental Protection Agency
FRA OSA	Federal Railroad Administration, Office of Safety Analysis
FTA	Federal Transit Administration
HERs	High Emphasis Routes
IRRS	Inter-Regional Road System
ISTEA	Intermodal Surface Transportation Efficiency Act
ITMS	Intermodal Transportation Management System
ITSP	Interregional Transportation Strategic Plan
O_2	Oxygen
LACMTA	Los Angeles County Metropolitan Transportation Authority
MPO	Metropolitan Planning Organization
NTD	National Transit Database
PM_{10}	Particulate Matter
PAC	Policy Advisory Committee
PSR	Project Study Report
PUC	Public Utilities Commission
RSR	Route Segment Report
RTPA	Regional Transportation Planning Agency

REFERENCE

LIST OF ACRONYMS

Acronym	Description
SANDAG	San Diego Association of Governments
SCAG	Southern California Association of Governments
TASAS	Traffic Accident and Surveillance Analysis System
UP	Union Pacific Railroad
VMT	Vehicle Miles Traveled

REFERENCE

GLOSSARY

Term	Description
Accident Rate	Number of accidents per distance traveled
Attainment	Meeting state and/or federal standards for air quality
Casualty	Person injured or killed in a highway or rail incident
Class 1 Railroad	Major mainline railroad with transcontinental system
Class 2 Railroad	Regional railroad
Class 3 Railroad	Short line railroad
Crime Event	A violent or property crime
Crime Rate	Number of crimes per passenger trip
Delay	Difference between actual travel time and free-flow travel time
Environmental Quality Indicators	Federal and State standards for attainment of air quality based on measured pollutant levels
Environmental Quality Outcome	Helping to maintain and enhance the quality of the natural and human environment
Fatality Accident	Accident resulting in one or more fatalities
High Emphasis Route	Route, or series of joined portions of routes that constitute a major logistical transportation corridor
Highway/Rail Grade Crossing Incident	Any impact between a rail and highway user (both motor vehicles and other users of the crossing) at a designated crossing site
Injury Accident	Accident resulting in one or more injuries
Intermodal Facilities	Facilities that provide mode-to-mode transfers
Inter-Regional Trip	Trip originating in one regional agency's jurisdiction and ending within the jurisdiction of another regional agency
Mobility/Accessibility Outcome	Reaching desired destinations with relative ease within a reasonable time, at a reasonable cost with reasonable choices. Measured by the *Mobility/Accessibility Indicators*
Mobility/Accessibility Indicators	Travel time, Delay, Access to Desired Locations, Access to the System
Mode Share	Demand breakdown by mode, usually by trips, percent trips, or volume shipped (for goods movement)
Nonattainment	Not meeting state and/or federal standards for air quality
Property Crime	Incident that causes loss of value or use of property
Rail Feeder Bus	Bus extensions to Amtrak service

REFERENCE

GLOSSARY

Term	Description
Reliability Outcome	Providing reasonable and dependable levels of service by mode. Measured by the *Reliability Indicator*
Reliability Indicator	Variability of Travel Time
Safety Outcome	Minimizing the risk of death, injury, or property loss. Measured by the *Safety Indicators*.
Safety Indicators	Accident rates per vehicle-mile of travel or train-miles traveled
Shortline Railroad	Regional or local freight railroads
Tank Farms	Facilities used to store and distribute gas and liquid petroleum products
Train Accident	Safety-related event involving on-track rail equipment (both standing and moving), excluding grade-crossing incidents, causing monetary damage to the rail equipment and track above a prescribed amount (threshold was $6,600 in 1998)
Violent Crime	Incident perpetrated to cause harm or death

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