1 PURPOSE AND NEED AND OBJECTIVES

The California High-Speed Rail Authority (Authority) and the Federal Railroad Administration (FRA) of the U.S. Department of Transportation (DOT) completed a statewide program environmental impact report/ environmental impact statement (EIR/EIS) as the first phase of a tiered environmental review process for the proposed California High-Speed Train (HST) system (California High-Speed Rail Authority and Federal Railroad Administration 2005). As part of the selected HST Alternative, the Authority and FRA defined a broad corridor between the Bay Area and Central Valley for additional review at the program level. This Bay Area to Central Valley HST Program EIR/EIS (Program EIR/EIS) further examines this broad corridor as the next phase of the tiered environmental review process.

Additionally, future tiered site-specific project environmental documents will assess the impacts of constructing and implementing individual HST projects (i.e., portions of the HST system).

This chapter provides brief background information about the Authority's choice to proceed with a statewide HST system and its decision to undertake additional programmatic environmental review for the Bay Area to Central Valley corridor (Section 1.1), the purpose of the HST system for the Bay Area to Central Valley corridor (Section 1.2.1), and the statewide and regional need for the HST system to relieve the growing capacity and congestion constraints on intercity travel using existing highway, airport, bus, and conventional passenger rail infrastructure (Section 1.2.2). This chapter also describes how the proposed HST system would deliver predictable, consistent, and shorter travel times; augment the existing transportation infrastructure; and help relieve congestion and capacity constraints with a reliable, safe, low-emission, time-efficient travel alternative.

1.1 Introduction

The Authority was created pursuant to state legislation in 1996 to develop a plan for the construction, operation, and financing of a statewide, intercity high-speed passenger train system offering intercity service (California Public Utilities Code § 185000 *et seq*.). The Authority completed several initial studies to assess the feasibility of an HST system in California and to evaluate the potential ridership for a variety of alternative corridors and station areas. Based on the results of these studies, the Authority recommended evaluation of a proposed HST system as the logical next step in the development of California's transportation infrastructure. The Authority does not have responsibility for transit systems or other intercity transportation systems and facilities, such as highways, airports, or conventional passenger rail.

In June 2000, the Authority adopted the final *High-Speed Train System Business Plan* (Business Plan) (California High Speed Rail Authority 2000) for an economically viable 700-mile-long (1,127-kilometer [km]-long) HST system. This system would be capable of speeds in excess of 200 miles per hour (mph) (322 km per hour [kph]) and would travel on a mostly dedicated system with fully grade-separated tracks and with state-of-the-art safety, signaling, and automated train control systems. It would connect and serve the major metropolitan areas of California, extending from Sacramento and the San Francisco Bay Area through the Central Valley to Los Angeles and San Diego. Such a system would be expected to carry a minimum of 88 million passengers annually, representing 66 million intercity trips and 22 million intra-regional trips, by the year 2030, and would have revenues in excess of operations and maintenance costs. Of this projected HST ridership, 37% of the intercity trips (24.4 million) and 21% of the intra-regional trips (4.6 million) are expected to begin or end in the Bay Area to Central Valley study region.

The Authority envisions seeking possible future federal financial support for the statewide system that might be provided through the FRA. The FRA and the DOT have several loan and grant programs that might be potential sources of future financial assistance. Several proposals for intercity rail programs

have been introduced in the 109th and previous congressional sessions. In addition to possible funding, a Rule of Particular Applicability may be required from the FRA to establish safety standards for the proposed HST system for operating speeds over 200 mph (322 kph) and for operations in shared-use rail corridors.

Following adoption of the Business Plan, the Authority commenced an environmental review process to comply with federal and state laws, in particular the National Environmental Policy Act of 1969 (NEPA) (42 USC § 4321 *et seq*.) and the California Environmental Quality Act (CEQA) (Cal. PRC § 21000 *et seq*.). The completed statewide program EIR/EIS, as the first-phase of a tiered environmental review process for the proposed HST system, evaluated three alternatives: (1) No-Project, (2) Modal (highway and airport expansion), and (3) HST. The HST alternative was selected when the program EIR was certified by the Authority via Resolution No. 05-01, signed November 2, 2005, and when FRA issued a Record of Decision on November 28, 2005.

The Authority resolution (No. 05-01) approved the HST system as the program alternative. The HST system would use electrically propelled steel-wheel-on-steel-rail trains capable of maximum operating speeds of 220 mph (322 kph) on dedicated, fully grade-separated lines. In addition, the HST system would use design practices to avoid, minimize, and mitigate potential impacts.

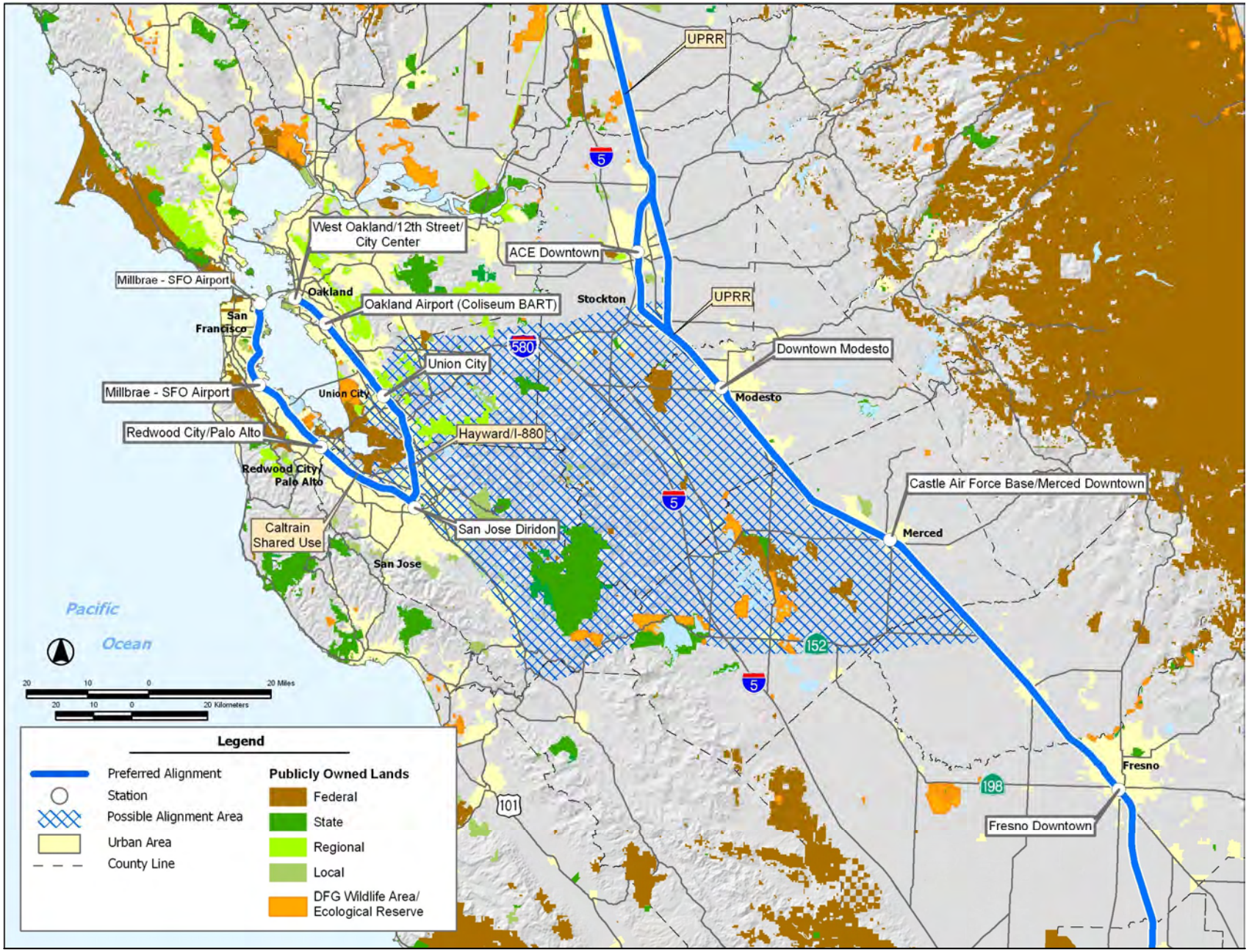
The resolution also authorized Authority staff to "prepare a separate program-level EIR to identify a preferred alignment within the broad corridor between and including the Altamont Pass and Pacheco Pass for the HST segment connecting the San Francisco Bay Area to the Central Valley." This Bay Area to Central Valley corridor is generally bounded by (and includes) the Pacheco Pass (State Route 152 [SR-152]) to the south, the Altamont Pass (Interstate 580 [I-580]) to the north, the BNSF Corridor to the east, and the Caltrain Corridor to the west[1] (Figure 1.1-1).

The Program EIR/EIS enables the Authority and FRA to evaluate the potential impacts of proposed HST system alignment and station locations in the Bay Area to Central Valley corridor, select preferred alignments and station locations, and define general mitigation strategies to address any potentially significant adverse impacts.

NEPA requires federal agencies to prepare an EIS for proposed actions that have the potential to cause significant environmental impacts. Because of possible funding and regulatory action, the FRA is the lead federal agency, working with the Authority as the lead state agency, for the environmental review required by NEPA and related statutes. The FRA has further determined that the preparation of a tier 1, program-level EIS for the proposed HST system in the Bay Area to Central Valley corridor is the appropriate NEPA document because of the conceptual stage of planning and decision-making. Decisions related to advancing and ultimately constructing the proposed HST system could constitute major federal actions requiring environmental review under NEPA for several federal agencies in addition to the FRA, including the Federal Highway Administration (FHWA), U.S. Environmental Protection Agency (EPA), U.S. Army Corps of Engineers (USACE), Federal Aviation Administration (FAA), U.S. Fish and Wildlife Service (USFWS), and Federal Transit Administration (FTA). The EPA and USACE are cooperating agencies for this Program EIR/EIS.

The proposed HST system in the Bay Area to Central Valley corridor is subject to environmental review under CEQA, and the Authority is both the project sponsor and the lead agency for CEQA compliance. The Authority has determined that an EIR is the appropriate CEQA document for the project at this conceptual stage of planning and decision-making, which includes selecting a preferred alignment and station locations.

1 Highway route numbers are provided only as a convenient reference for the reader, not as a limitation on the corridor to be considered.



U.S. Department
of Transportation
Federal Railroad
Administration

Figure 1.1-1
Bay Area to Central Valley Corridor

No permits were sought in this phase of environmental review. After the selection of preferred alignments and station locations in the Bay Area to Central Valley corridor and completion of this Program EIR/EIS, project-specific environmental documentation will be prepared to assess in more detail the impacts of reasonable and feasible alignment and station options in this segment of the system.

Preparation of a program-level document followed by more detailed project-specific documents that *tier*[2] off the program document offers a number of advantages. As described in Council on Environmental Quality (CEQ) regulations (40 CFR § 1508.28), FHWA Guidelines (23 CFR Part 771; 52 FR § 32646 [August 1987]), and the State CEQA Guidelines (14 CCR § 15168[b]), this approach offers the following advantages:

- More exhaustive consideration of impacts and alternatives than would be practical in an individual or project-specific EIR/EIS.
- Consideration of cumulative impacts that might be slighted in a case-by-case analysis.
- An opportunity for decision-makers to consider broad policy alternatives and program-level mitigation strategies at an early stage, when the flexibility to incorporate them is greater.
- Ability to avoid reconsideration of policy issues in subsequent documents.
- Early coordination with USACE and EPA to identify avoidance and minimization opportunities that are likely to yield or will lead to the selection of a least environmentally damaging practicable alternative (LEDPA) under Section 404 of the Clean Water Act (CWA).
- Less paperwork by encouraging the reuse of data through incorporation by reference in subsequent tiered documents.

The required contents of a program EIR/EIS are the same as those of a project-level document. However, the level of detail provided in the two types of documents differs substantially because a program-level document analyzes a general conceptual design of the proposed program and alternatives rather than providing detailed analysis of a specific project proposal.

A program EIR/EIS is an informational document intended to analyze and to disclose to the public and to public decision-makers the environmental effects and benefits of a proposed program and its alternatives. The preparation, circulation, and review of a draft program EIR/EIS provides for the evaluation of alternatives, including a no-project/no-action alternative; the assessment of all significant environmental impacts; and the opportunity for public input and comments to help inform the decision-making process. Evaluating alternatives as required by the FRA 's Procedures for Considering Environmental Impacts (64 FR § 28545 [May 26, 1999]) and other federal agency NEPA regulations and State CEQA Guidelines helps ensure that avoidance and minimization of potential environmental impacts are addressed, and potential benefits, costs, and trade-offs of the alternatives are considered.

This Program EIR/EIS was prepared under the supervision and direction of the FRA and the Authority in conjunction with other federal agencies and with input from state and local agencies. It is intended that other federal, state, regional, and local agencies use this Program EIR/EIS to review the proposed program and develop expectations for the project-level (tier 2) environmental reviews that would follow selection of preferred HST alignments and station locations in the Bay Area to Central Valley corridor.

The preparation of this Program EIR/EIS was coordinated with the concurrent preparation of a Bay Area Regional Rail Plan by a coalition of the San Francisco Bay Area Rapid Transit District (BART), the Metropolitan Transportation Commission (MTC), the Peninsula Corridor Joint Powers Board (Caltrain), and

[2] *Tiering* refers to a multilevel approach where a first tier environmental document analyzes general matters and subsequent tiers analyze narrower projects/actions, referencing the more general document.

the Authority. Bay Area voters in 2004 passed Regional Measure 2, which required MTC to adopt a Regional Rail Plan. As stipulated in the Streets and Highways Code Section 30914.5 (f), the Regional Rail Plan defined the future passenger rail transportation network for the nine-county San Francisco Bay Area, including an evaluation of the HST options. Information on the Regional Rail Plan is available at www.bayarearailplan.info.

1.2 Purpose of and Need for High-Speed Train System

Purpose and need are closely linked but subtly different. *Need* may be thought of as the problem and *purpose* as an intention to address the problem. *Purpose* describes why the sponsoring agency is proposing an action that may have environmental impacts and provides the basis for selecting reasonable and practicable alternatives for consideration, comparing the alternatives, and selecting the preferred alternative (40 CFR § 1502.13 ["The statement shall briefly specify the underlying purpose and need to which the agency is responding in proposing the alternatives including the proposed action"]; see also NEPA § 102.). CEQA requires that an EIR identify the project sponsor's objectives, which are similar to the purpose required by NEPA (CEQA Guidelines, CCR, Title 14, § 15124 [b]). The *objectives* provide benchmarks for selecting a reasonable range of alternatives for analysis, as required by CEQA. The Authority has responded to this mandate by adopting the objectives and policies described in Section 1.2.1 below for the proposed HST system to guide compliance with CEQA and NEPA.

1.2.1 Purpose of High-Speed Train System

This Program EIS/EIR identifies and fully evaluates alternative HST alignments and stations within and related to the Bay Area to Central Valley corridor as part of a statewide HST system. **The purpose of the Bay Area HST is to provide a reliable high-speed electrified train system that links the major Bay Area cities to the Central Valley, Sacramento, and Southern California, and that delivers predictable and consistent travel times. Further objectives are to provide interfaces between the HST system and major commercial airports, mass transit, and the highway network and to relieve capacity constraints of the existing transportation system in a manner sensitive to and protective of the Bay Area to Central Valley region's and California's unique natural resources.**

This purpose is consistent with recent expressions of federal transportation policy, most notably the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) (Public L. 109-59; 119 Stat. 1144 [2005]), Transportation Equity Act for the 21st Century (TEA-21) (Pub. L. 105-178; 112 Stat. 107 [1998]), and its predecessor the Intermodal Surface Transportation Efficiency Act (ISTEA) (Pub. L. 102-240; 105 Stat. 1914 [1991]), which encourage public transportation investment that increases national productivity and domestic and international competition while improving safety and social and environmental conditions. Specifically, these policies encourage investments that offer benefits such as those listed below.

- Link all major forms of transportation.
- Improve public transportation systems and services.
- Provide better access to seaports and airports.
- Enhance efficient operation of transportation facilities and service.

The Authority's statutory mandate is to plan, build, and operate a HST system that is coordinated with the state's existing transportation network, particularly intercity rail and bus lines, commuter rail lines, urban rail transit lines, highways, and airports. The Authority has responded to this mandate by adopting the following objectives and policies for the proposed HST system.

- Provide intercity travel capacity to supplement critically over-used interstate highways and commercial airports.
- Meet future intercity travel demand that will be unmet by present transportation systems and increase capacity for intercity mobility.
- Maximize intermodal transportation opportunities by locating stations to connect with local transit, airports, and highways.
- Improve the intercity travel experience for Californians by providing comfortable, safe, frequent, and reliable high-speed travel.
- Provide a sustainable reduction in travel time between major urban centers.
- Increase the efficiency of the intercity transportation system.
- Preserve environmental quality and protect California's sensitive environmental resources by reducing emissions and vehicle kilometers/vehicle miles traveled for intercity trips.
- Consult with resource and regulatory agencies during the tier 1 environmental review and use all available information for identifying the alternative that is most likely to yield the least damaging practicable alternative by avoiding sensitive natural resources (e.g., wetlands, habitat areas, conservation areas) where feasible.
- Maximize the use of existing transportation corridors and rights-of-way, to the extent feasible.
- Develop a practical and economically viable transportation system that can be implemented in phases by 2020 and generate revenues in excess of operations and maintenance costs.

1.2.2 Statewide and Regional Need for High-Speed Train System

The need for an HST system exists at both the statewide and regional levels.

A. STATEWIDE NEED[3]

The capacity of California's intercity transportation system is insufficient to meet existing and future demand, and the current and projected future congestion of the system will continue to result in deteriorating air quality, reduced reliability, and increased travel times. The system has not kept pace with the tremendous increase in population, economic activity and tourism in the state. The interstate highway system, commercial airports, and conventional passenger rail system serving the intercity travel market are operating at or near capacity and will require large public investments for maintenance and expansion to meet existing demand and future growth over the next 20 years and beyond. Moreover, the ability to expand many major highways and key airports is uncertain; some needed expansions may be impractical or may be constrained by physical, political, and other factors. Simply stated, the *need* for improvements serving intercity travel in California relates to the following issues.

- Future growth in demand for intercity travel.
- Capacity constraints that will result in increasing congestion and travel delays.
- Unreliability of travel stemming from congestion and delays, weather conditions, accidents, and other factors that affect the quality of life and economic well-being of residents, businesses, and tourism in California.
- Reduced mobility as a result of increasing demand on limited modal connections between major airports, transit systems, and passenger rail in the state.

[3] Also presented in statewide program EIR/EIS (California High-Speed Rail Authority and Federal Railroad Administration 2005).

- Poor and deteriorating air quality and pressure on natural resources as a result of expanded highways and airports.

The following sections provide additional information on these factors, emphasizing the transportation constraints and capacity limitations relevant to intercity travel in California.

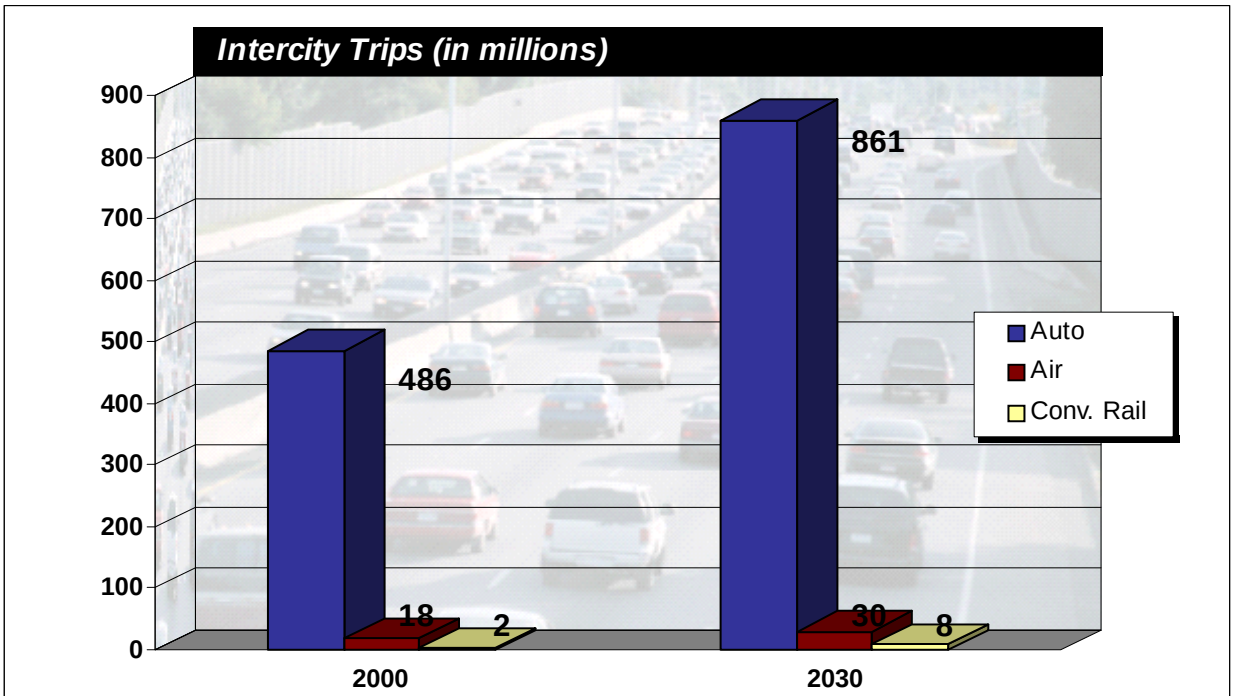
Travel Demand and Capacity of California's Intercity Transportation System

Intercity travel in California is forecasted to increase up to 63% between 2000 and 2030, from 550 million trips to more than 896 million trips (Figure 1.2-1). According to the Department of Finance, the state population is projected to increase by more than 13 million people in the same time period, from about 34 million to over 48 million people statewide (more than 40% growth). The population growth is shown by region in Figure 1.2-2. The highest regional growth rate is projected for the Central Valley (79% between 2000 and 2030). However the Inland Empire (Riverside and San Bernardino Counties) area of the Los Angeles region is forecast to grow by more than 82% over the same period.

The greatest increase in population is projected to occur in the Southern California region (including Los Angeles) (5.6 million between 2000 and 2030). In 2000, Californians made more than 550 million trips per year between the state's metropolitan regions, including those in northern and southern California and in between. Approximately 188 million of these trips were journeys of at least 100 miles (161 km); by 2030, this number is expected to increase to 271 million trips per year. Without high-speed trains, more than 3% of all intercity travel and 11% of longer intercity trips (those in excess of 100 miles [161 km]) are forecasted to be air travel. At present, the automobile dominates intercity travel. Auto trips are expected to account for more than 95% of all intercity travel and close to 86% of longer intercity trips in 2030. Also by 2030, almost 50% of the intercity travel market between the state's major metropolitan regions is expected to have a destination within the Bay Area to Central Valley study region.

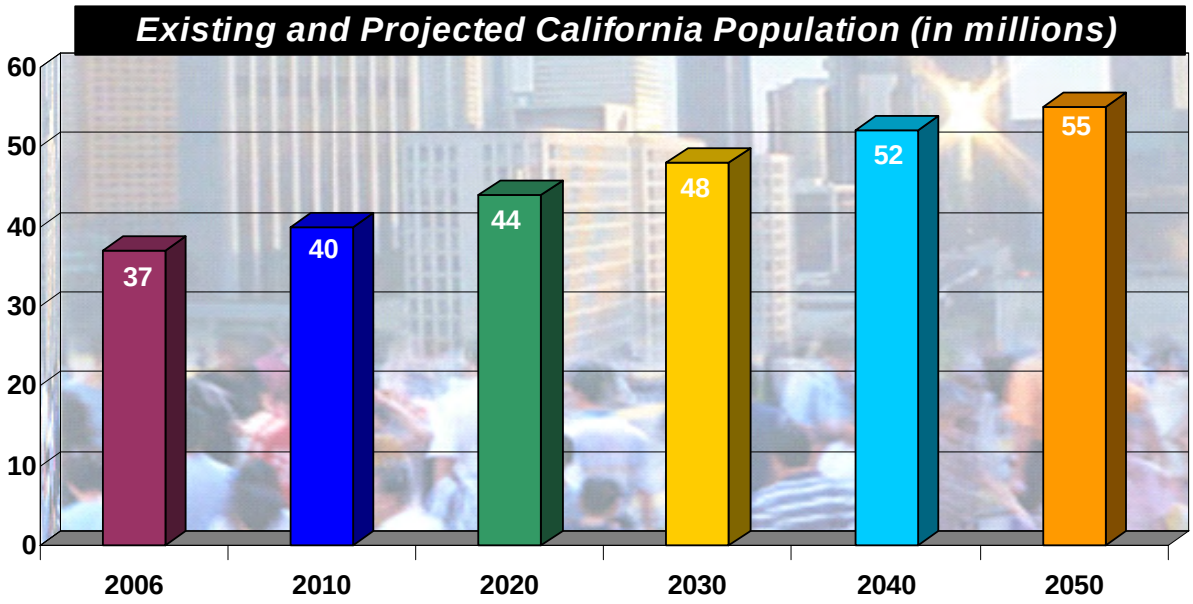
Much of the intercity travel in California consists of trips of intermediate distance. A statewide forecasting model was developed in 2006 (Cambridge Systematics), and Table 1.2-1 shows the model results for expected growth in traffic volumes on major highways from 2000 to 2030. These trips include more than 339 million annual intercity trips between the Central Valley and other metropolitan areas, or 38% of all intercity travel. Travel between the Los Angeles and San Diego regions is the second-largest geographic market, with more than 134 million trips per year in 2030. Travel between Sacramento and San Francisco represents the third-largest intercity travel market in the state, at over 67 million trips per year. In addition, Los Angeles to San Francisco is the busiest air travel route in the United States, with 8.6 million in-state air trips and 19 million total air trips in 2005. The in-state air trips between these two cities represented about 43% of the intercity trips in this market via all modes of transportation.

The demand for air travel has grown dramatically in California and nationwide with a period of suppressed demand from the effects of the World Trade Center terrorist attack on September 11, 2001. Federal, state, and regional transportation plans forecast recovery from this reduction and continued growth in air travel over the next 15 years. Table 1.2-2 shows air travel growth between the San Francisco Bay Area and southern California from 1992 to 2005, with projections to 2020. Overall, annual passenger demand at San Francisco International Airport (SFO) has increased from 31 million passengers in 1990 to 41 million in 2000; during the same period, the demand at Los Angeles International Airport (LAX) increased from 45.8 million to 67 million.



Source: Cambridge Systematics, 2007

Figure 1.2-1
Intercity Trips



Source: State of California, Department of Finance, *Population Projections by Race/Ethnicity for California and its Counties 2002-2050* , Sacramento, California, May 2004

Figure 1.2-2
Existing and Project California Population

Table 1.2-1
Travel Growth in 20 Years for Intercity Highways

Major Highways	Average Daily Volume 2000	Average Daily Volume 2030	Percent Change 2000–2030
I-5 between San Diego and Los Angeles (Orange County-LA County line)	150,000	306,000	103
I-5 between Los Angeles and Bakersfield (at Santa Clarita)	192,000	308,000	60
SR-99 in Central Valley (north of Bakersfield)	49,000	77,000	56
US 101 just south of San Jose	137,000	234,000	71
I-580 between Bay Area and Stockton (at Livermore)	138,000	181,000	31
Source: Cambridge Systematics 2007.			

Table 1.2-2
Intercity Air Travel between Southern California and San Francisco Bay Area (Annual Enplanements)

Airport	Historical		Projected Continued Trend		Percent Change
	1992	2000	2005	2020	2005–2020
Bay Area to Southern California Airports					
San Francisco	1,667,290	1,531,306	2,949,590	5,563,183	89
Oakland	1,317,960	2,072,328	2,664,380	4,474,188	68
San Jose	687,680	2,127,815	3,927,300	6,897,516	76
Bay Area	3,674,922	5,733,449	9,541,270	16,934,887	77
Southern California To Bay Area Airports					
Los Angeles	1,688,870	2,286,330	4,212,440	6,819,689	62
John Wayne	588,670	1,766,314	2,281,030	3,422,818	50
Ontario	559,980	607,930	1,213,240	1,881,429	55
Burbank	705,110	1,066,844	1,834,560	2,582,595	41
Long Beach	130,300	0	-		
So. California	3,672,930	5,727,418	9,541,270	14,706,531	54
All Travel	**7,345,860**	**10,856,550**	**19,082,540**	**31,641,418**	**62**

Source: FAA Terminal Area Forecasts and U.S. Department of Transportation O&D Market Database.
Note: These data represent all air trips, including both in-state and out-of-state (i.e., connecting) travelers and differ from the HST ridership forecasting model, which includes only in-state travelers.

The MTC projects that air travel at SFO will increase to 61 million passengers in 2030—an increase of 65% over 30 years, with an associated increase in airport congestion.[4] Estimates for LAX indicate that regional demand for flights will increase by about 54% between 1996 and 2015 (LAX Master Plan Supplement to the Draft EIS/EIR 2003). The Southern California Association of Governments (SCAG) regional transportation plan indicates that the practical physical capacity of LAX with its existing configuration is 78 million annual passengers (Southern California Association of Governments 2001).

[4] Regional Airport Plan, MTC, 2000

Population growth and increasing tourism in California place severe demands on the already congested transportation system serving the state's major metropolitan areas. As described in the regional transportation plans for areas that would be served by the proposed HST system, the highways and airports serving key cities are operating at capacity, and plans for expansion will not keep pace with projected growth over the next 20–40 years. The volume of traffic on major highways and the number of enplanements at key airports are presented in Tables 1.2-1 and 1.2-2. Figure 1.2-3 illustrates the major routes and airports used for intercity travel between the markets potentially served by the HST system.

According to the FAA,

> Delays at San Francisco International and other major airports are expected to worsen within the next decade unless capacity is increased by building new runways or with other improvements, according to a landmark federal study released yesterday. For the first time, the Federal Aviation Administration tallied the number of flights that 31 major U.S. airports can accommodate in good and bad weather, when air-traffic controllers must use radar to ensure that planes are properly separated. The FAA found that seven major airports, including San Francisco International, will experience "significant delays" within the next 10 years as air travel surges to 1 billion passengers annually. (San Francisco Chronicle, April 26, 2001).

Airports at or nearing capacity, like SFO, will likely be forced to reduce air service on intercity travel markets with high levels of service (such as between LAX and SFO). As stated by John L. Martin, director of San Francisco International Airport:

> The airport is now focused on increasing long-haul and international service, because this type of service translates to larger aircraft with more passengers per plane, but fewer flights. That, along with the implementation of a new radar landing procedure, allows SFO to make more efficient use of its limited runway capacity. The 'smart growth' program at SFO has resulted in a 12% growth in passenger traffic in the first 11 months of 2004, while the number of flight operations has grown by only 5.1%. Larger planes with higher passenger loads. (*San Francisco Chronicle*, February 8, 2005).

Travel Time

Travel time is the time spent in a highway vehicle, in an aircraft, or on a train for a specific point-to-point trip. *Total travel time* includes the time spent getting to a station or an airport, waiting for the next scheduled train or flight, getting to the boarding area, checking and retrieving luggage, getting a rental car or taxi, and getting to the final destination. Total travel time is an important economic factor for business travel because it is a business cost that affects worker productivity and scheduling of business activities. Table 1.2-3 shows the approximate total travel time in 2000 and the projected total travel time in 2030 for auto, air, and rail between various city pairs, based on the ridership analysis completed for the HST forecasting model (Cambridge Systematics 2007), including information collected from regional transportation planning agencies, Caltrans, and current air and conventional rail schedules.

Projected increases in automobile travel time are largely caused by increased travel demand and resulting congestion on highways used for intercity travel, and programmed and funded improvements would not measurably change future conditions. Although Amtrak has proposed improvements that could reduce conventional rail travel time over the next 20 years, they are not programmed or funded. There are some capacity improvements funded for the Central Valley and southern California, but these are only basic enhancements that will do more to improve reliability than travel time. The 20-year 10-billion-dollar Amtrak plan includes adding 21 intercity roundtrips,

Figure 1.2-3
Major Intercity Travel Routes and Airports

adding capacity, increasing speeds, and enhancing grade crossing safety. These improvements will benefit all rail users, including both freight and commuter traffic.

Table 1.2-3
Estimated Total Travel Times (Door to Door) between City Pairs by Auto, Air, and Rail Peak Conditions

City Pair	Auto 2000	Auto 2030	Air 2000	Air 2030[a]	Conventional Rail 2000[b]
Los Angeles downtown to San Francisco downtown	6:28	6:50	3:30	3:38	10:05[c]
Fresno downtown to Los Angeles downtown	3:32	3:41	3:17	3:24	5:46[d]
Los Angeles downtown to San Diego downtown	2:37	2:41	2:51	3:01	3:26
Burbank (Airport) to San Jose downtown	5:31	5:54	2:46	2:43	9:46[e]
Sacramento downtown to San Jose downtown	2:29	2:32	3:33	3:33	4:06

[a] Represents the same level of service observed in 2005, compiled from the Federal Aviation Administration data from the 10 percent ticket sample combined with wait, terminal, access and egress times developed from the California High-Speed Rail ridership forecasting model (Cambridge Systematics 2007).

[b] Conventional rail assumptions for travel times and wait and terminal times are the same for 2000 and 2030. Access and egress times may vary but in practice do not vary significantly between 2000 and 2030.

[c] Based on October 27, 2003, San Joaquin schedule, which would require bus connections from Los Angeles to Bakersfield and from Emeryville to San Francisco. The travel time with the Coast Starlight from Los Angeles to San Francisco would be 13:05.

[d] Based on October 27, 2003, San Joaquin schedule, which would require bus connections from Los Angeles to Bakersfield.

[e] Based on October 27, 2003, San Joaquin schedule, which would require bus connections from Burbank to Bakersfield and from Stockton to San Jose.

Source: Parsons Brinckerhoff 2003 and Cambridge Systematics 2007.

Reliability

Reliability is the delivery of predictable, consistent, travel times that remain the same over a period of years. As discussed above, roadway congestion, limited airport capacity, track conflicts between passenger rail and freight rail, and a growing intercity travel market are adversely affecting the travel time reliability of air, conventional passenger rail, and automobile travel. Weather-related events are an additional source of disruption and delay that affect transportation reliability. Based on current performance and projected congestion levels, the reliability of highway and air travel will continue to worsen in future years.

From 1990 to 2020, the Bay Area regional transportation plan (RTP) forecasts a 249% increase in average daily vehicle hours of delay. The Bay Area may be an extreme case, but there are many causes of increased highway congestion rates all over California. For example, accidents, road work, cars stranded along the roadside, or a routine traffic violation stop can create a bottleneck effect, potentially delaying commuters for miles. Poor weather conditions (rain, wind, and dense Central Valley fog) also have a negative effect on the reliability of highway travel times. Rain and wind can make the roads dangerously slick, increasing accident rates. Snow and icy weather make roads

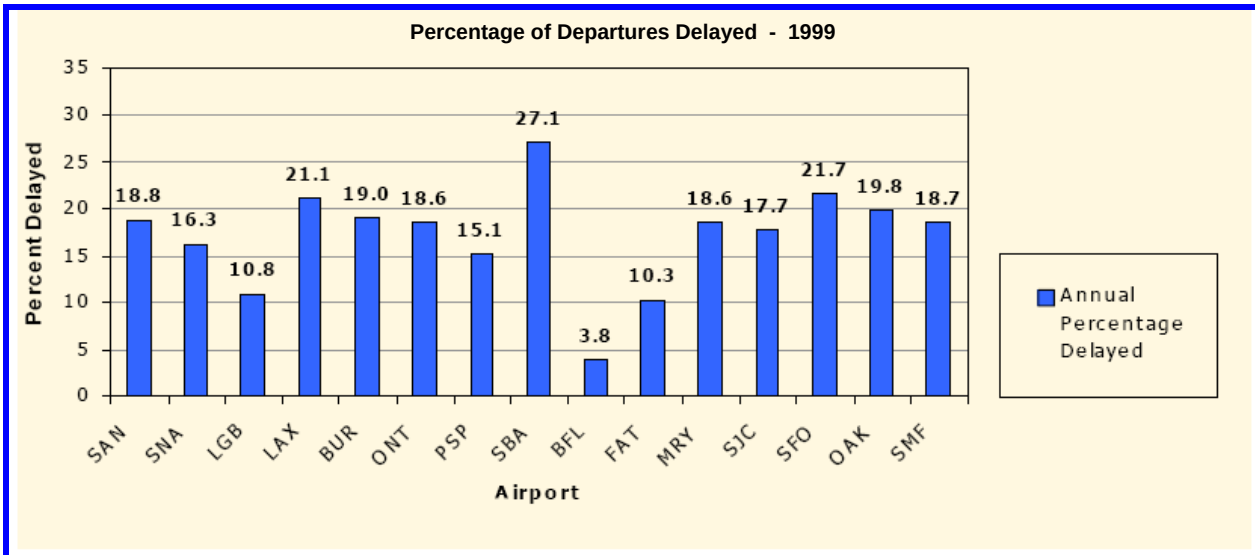
conditions even worse, especially in heavily traveled areas. Fog, haze, and glare at times can distract drivers or cause them to slow down.

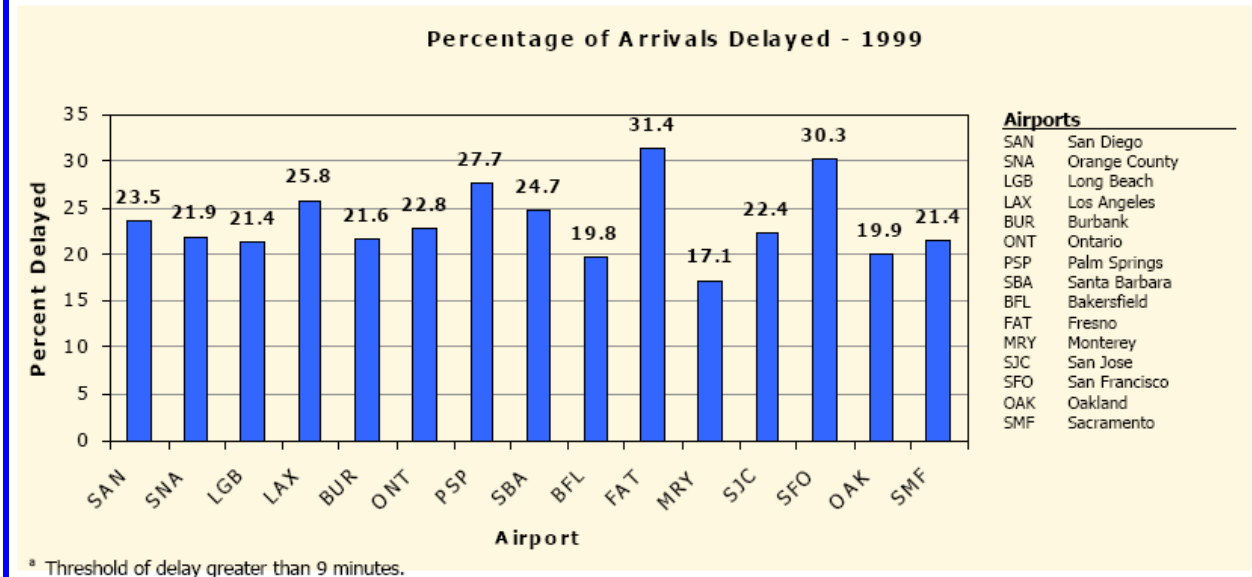
Weather conditions are also a key factor in flight delay. For instance, during poor weather conditions at SFO as of 1999, more than 25% of flight departures were delayed by more than 1 hour and 10% were delayed by more than 2 hours. By contrast, when weather conditions were good, 83% of flights arrived on time. The percentages of delayed arrivals and departures are illustrated in Figure 1.2-4 for each of the major California airports serving the intercity travel market. Some airlines adjust their schedules to achieve on-time arrivals even if departures are delayed; some airlines have increased their scheduled flight times between high-demand city pairs such as LAX and SFO to maintain their on-time arrival statistics in the face of potentially increasing delays (Office of Inspector General 2000). Weather also results in flight cancellations. As noted by the *San Francisco Business Times*, "During good weather, SFO can accept between 60 and 65 aircraft per hour. But fog or rain causes delays at SFO on average every third day, reducing the number of landings to about 30 per hour." (*San Francisco Business Times*, December 12, 2003, Eric Young).

Aircraft delays cost both the airlines and the traveling public time and money, and the FAA has identified the reduction of airport delay nationwide as one of its highest priorities. Data from the DOT's *Air Travel Consumer Report* show SFO and LAX ranking among the worst of major airports in the country in terms of delay (U.S. Department of Transportation 2003). Airport delays are a function of capacity, weather conditions, and safety conditions. When demand at an airport exceeds the capacity on the airfield at that time, flights are delayed until they can be safely accommodated. Delayed flights sometimes compound problems for other flights and can result in cancelled flights. Because the FAA Ground Delay Program holds flights at their point of departure until the destination airport can accept the demand, and because short flights (e.g., SFO to LAX) are more easily adjusted than longer flights (e.g., East Coast or Midwest to West Coast), short flights are more likely to experience delays or capacity reductions. Consequently, intercity air travel within California can be hard hit by delays related to total airport demand.

Safety

Projected growth in the movement of people and goods in California by auto, air, and rail over the next two decades underscores the need for improved travel safety. With more and more vehicles on the intercity highways, the potential for accidents increases. The California Department of Highway Safety and Motor Vehicles publishes an annual summary of accident data for state highways. As shown in Table 1.2-4, there were a total of 4,094 fatalities and 203,386 nonfatal injuries on California highways in 2004, which corresponds to a fatality rate of 1.25 per 100 million vehicle miles of travel (VMT).





[a] Threshold of delay greater than 9 minutes.

Source: Air Travel Consumer Report 2004

Figure 1.2-4
Airport Delay—1999*

Table 1.2-4
State of California Vehicular Accident Statistics

California Statistics	1995	2000	2004
Fatal Collisions	3,636	3,331	3,701
Persons Killed in Collisions	4,165	3,730	4,094
Injury Collisions	196,569	198,348	203,386
Persons Injured in Collisions	304,941	303,023	302,357
Population (millions)	32.063	34.480	36.591
Motor Vehicle Miles of Travel (millions)	274,840	306,371	328,255
Mileage Death Rate *	1.52	1.22	1.25
* Number of persons killed per 100 million miles of travel.			
Source: *2004 Annual Report of Fatal and Injury Motor Vehicle Traffic Collisions,* Statewide Integrated Traffic Records System (SWITRS), California Highway Patrol, 2004.			

Correspondingly, while the national vehicular fatal crash rates per vehicle mile and per total population improved between 1995 and 2005, the number of national vehicular fatalities increased over the same time period from 37,241 to 39,189, as shown on Table 1.2-5.

Commercial airline travel accident/injury rates nationally have remained fairly constant over the last 10 years. In 1999, the number of accidents for commercial airlines was 0.0077 per one million miles (1.6 million km) flown; this represents 0.0003 fatalities per 1 million miles flown (National Transportation Safety Board 2000).

Table 1.2-5
National Vehicular Crash Statistics

National Statistics	2005	2000	1995
Motor Vehicle Fatal Crashes	39,189	37,526	37,241
Traffic Crash Fatalities vehicle occupants and motorcycle riders	37,594	36,348	35,291
Vehicle Miles Traveled (Billions)	2,965	2,747	2,423
Resident Population (Thousands)	296,410	282,193	262,803
Rates: Fatalities			
Fatalities per 100 Million Vehicle Miles Traveled	1.47	1.53	1.73
Fatalities per 100,000 Population	14.66	14.86	15.91
Source: Fatality Analysis Reporting System (FARS), National Center for Statistics and Analysis, 2006.			

Table 1.2-6 shows a comparison of the number of fatal accidents by mode for the United States. HSTs in Europe and Japan have not reported any fatalities at high speeds and are not shown in the table. As shown in the table, there were 12 fatalities (railroad employee and passenger fatalities only) associated with passenger railroad operations (intercity and commuter railroad services) across the

United States in 2005. For the years 2000–2005, rail passenger fatalities ranged from 0 to 12. The corresponding fatality rate per 100 million miles ranged from 0.00 to 0.08. (Federal Railroad Administration 2007.)

As shown in Table 1.2-6, the average passenger fatality rates from 2000 to 2005 for U.S. air carrier, highway, and railroad were 0.02, 0.55, and 0.02 passenger fatalities per 100 million passenger miles, respectively. It should be noted that the U.S. railroad fatalities occurred on a system that is not fully grade-separated, but the zero fatalities on the European and Japanese rail systems are on fully grade-separated systems.

Table 1.2-6
National Transportation Fatalities by Mode

	2000	2001	2002	2003	2004	2005	Average
U.S. Air Carrier[a]							
Passenger Fatalities	92	531	0	22	14	22	114
Passenger Miles (100 Millions)	7,008	6,585	6,505	6,742	7,523	7,951	7,052
Passenger Fatalities/100 Million Passenger Miles	0.01	0.08	0.00	0.00	0.00	0.00	0.02
Highway (total)							
Passenger Fatalities	36,348	36,440	37,375	37,341	37,304	37,594	37,067
Passenger Miles (100 Millions)	64,555	65,730	67,116	67,915	69,631	69,678	67,437
Passenger Fatalities/100 Million Passenger Miles	0.56	0.55	0.56	0.55	0.54	0.54	0.55
Railroad (total[b])							
Passenger Fatalities	0	1	7	1	1	12	4
Passenger Miles (100 Millions)	141.8	152.9	148.9	153.8	152.3	155.7	151
Passenger Fatalities/100 Million Passenger Miles	0.00	0.01	0.05	0.01	0.01	0.08	0.02

Notes

[a] Carriers operating under 14 CFR 121, all scheduled and nonscheduled service. Since Mar. 20, 1997, 14 CFR 121 include aircraft with 10 or more seats that formerly operated under 14 CFR 135.

[b] Passenger fatalities caused by collisions and other train accidents.

Sources

Air:

Internet site www.ntsb.gov/aviation (April 2007).

Bureau of Transportation Statistics, Internet site http://www.bts.gov/xml/air_traffic/src/datadisp.xml (April 2007).

Highway:

Fatality Analysis Reporting System (FARS), National Center for Statistics Analysis (April 2007).

1975-2004: Ibid., *Traffic Safety Facts 2004*, DOT HS 809 775 (Washington, DC: 2005), table 4, Internet site http://www-nrd.nhtsa.dot.gov/pdf/nrd-30/NCSA/TSFAnn/TSF2003F.pdf (February 16, 2006).

Railroad:

Federal Railroad Administration, Office of Safety Analysis, Internet site http://safetydata.fra.dot.gov (March 2007).

Modal Connections

Limited connections exist between intercity travel facilities (primarily airports) and the extensive regional urban and commuter transit systems in the state. While some major connections with existing rail have been completed, such as the extension of the BART system to SFO, other airports remain entirely unconnected to the local and regional transit systems. Where connections exist (except for BART), the connections are cumbersome, often involving multiple transfers and long waits.

Air Quality and Protection of Natural Resources

The Clean Air Act (CAA) makes transportation conformity the affirmative responsibility of the DOT and the Metropolitan Planning Organizations (MPOs). *Transportation conformity* addresses strategies for the attainment and maintenance of air quality standards contained in the California State Implementation Plan (SIP) used to evaluate transportation alternatives, including the no-project/no-action alternative. Figure 1.2-5 shows the counties in California designated as nonattainment areas.

Maintaining air quality is one goal of the State Transportation Improvement Program (STIP) and the various RTPs. Metropolitan areas will continue to be challenged to reduce emissions to acceptable levels from a growing number of vehicles and to maintain air quality standards by encouraging more efficient use of land resources, improving mobility, and providing alternative transportation facilities and services. Policies aimed at reducing the demand for trips in single-occupant vehicles are integral to all transportation plans and programs to help areas presently in nonattainment conform to federal air quality standards.

One statewide strategy adopted in the SIP is development of multiuse corridors with designated lanes for high-occupancy vehicles (HOVs), transit, and rail alternatives. Meeting federal and state air quality standards over the next 20–40 years will also require reductions in the total distance traveled by vehicles, integration of land use and transportation planning and development, development of transportation demand strategies, implementation of operational improvements, and use of new technologies that improve transportation efficiencies and provide a transportation alternative to the single-occupant automobile. For example, in 2000, 89% of intercity trips in California of a distance of at least 100 miles (161 km) were made by automobile.

In addition to improving and maintaining the state's air quality, another critical need is to protect and preserve natural resources by limiting potential impacts related to expanding transportation systems. Key resources include wetlands and waterways, habitat areas for sensitive species of plants and animals, wildlife migration corridors, and agricultural lands. These natural resources have been subject to both direct and indirect impacts as the population has increased and growth has occurred in the less developed areas of the state. Avoidance of sensitive natural resources is a guiding criterion in the environmental review process. Various agencies, including USACE, USFWS, and the California Department of Fish and Game (CDFG) may have jurisdiction to impose specific restrictions on the use of wetlands and encroachment into wildlife habitat areas, wildlife migration corridors, and conservation areas important to the protection of threatened or endangered species. The environmental analysis process includes consideration of alternatives that offer opportunities to protect and enhance sensitive natural resources and improve existing conditions.

Another priority is the conservation of energy, and particularly the reduction in demand for petroleum. The need to reduce per-passenger energy consumption is important now and is becoming ever more important as energy use depletes reserves, drives up the cost of fuels or energy, and affects air quality.

B. REGIONAL NEED

The Bay Area to Central Valley link is an essential component of the proposed statewide HST system. More than 42% of the intercity travel market forecast for 2030 between the state's major metropolitan areas and more than 62% of the projected intercity ridership of the proposed statewide HST system would have a trip-end (either origin or destination) in the Bay Area to Central Valley study region. In addition to the needs of this region as part of a statewide system (as described earlier) there are similar needs within the Bay Area to Central Valley that are described below.

Regional Growth

Today, the nine-county Bay Area is home to nearly 7 million people and supplies more than 3 million jobs. By 2050, the region's population is anticipated to grow by more than 40% for a total of 10 million people. Recent projections for how the region will grow, adopted by the Association of Bay Area Governments, presume a shift to more compact growth patterns, with about 60% of the population growth taking place in the major cities and the inner suburbs that ring the Bay. This shift still leaves 40% of the growth to continue to occur in the Bay Area's outer ring of more distant suburbs and agricultural lands.

This population growth will put tremendous pressure on the existing transportation network, as can be seen by the substantial growth that is projected in specific Bay Area transportation corridors (Figure 1.2-6). The peak travel periods are expected to encompass many more hours of the day. For example, MTC's 2000 San Francisco Bay Crossing Study projected the Bay Bridge peak period to more than double from 1.5 hours in 2000 to 3.5 hours by 2020. A growing number of trips made throughout the day for shopping, education, recreation, and other activities are also anticipated.

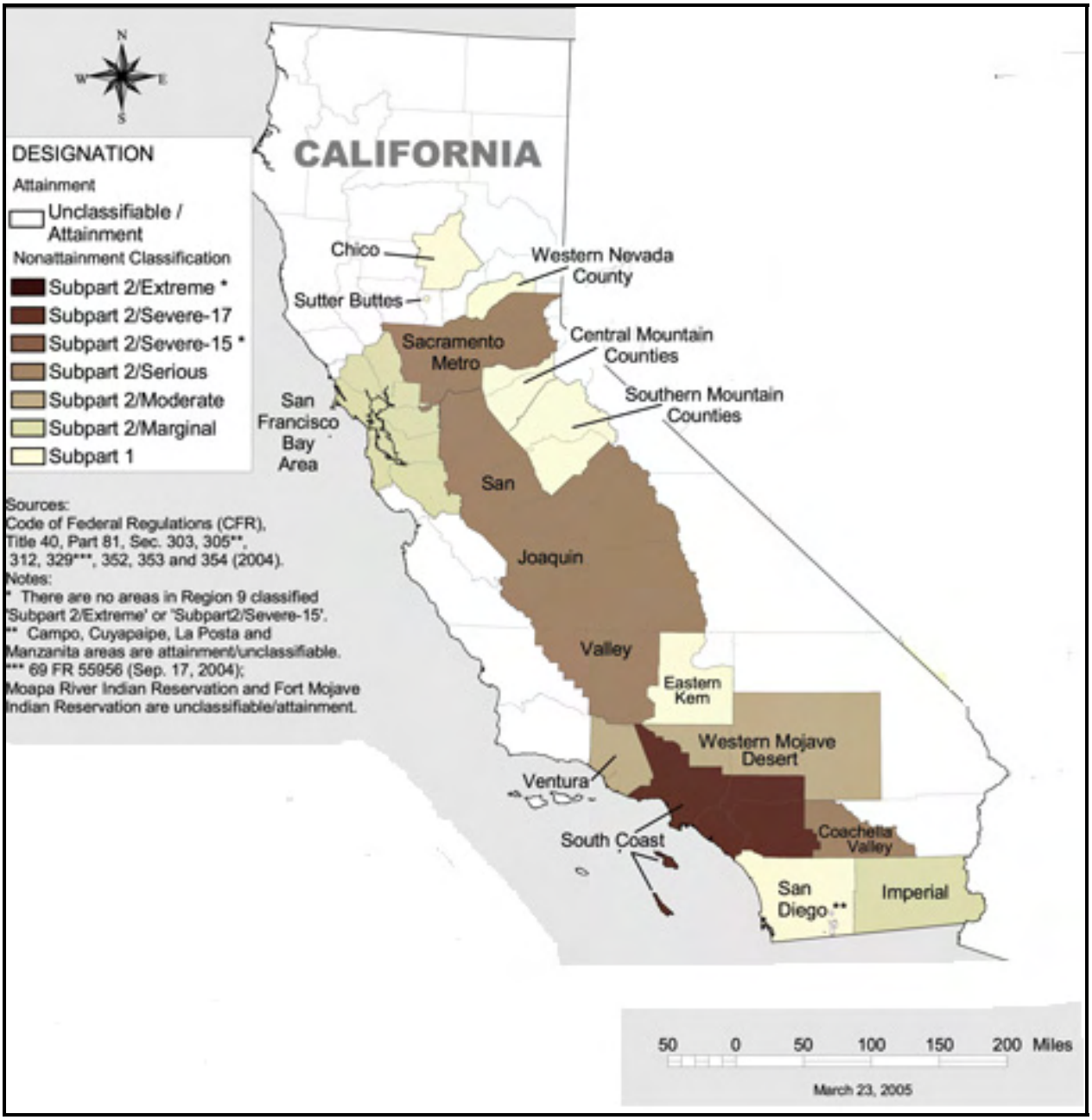
While the Bay Area continues to grow at a steady rate, the Sacramento and Central Valley areas are experiencing a true population boom. San Joaquin County, just east of the Altamont Pass, will lead the way with a more than 200% increase in population by 2050 (Figure 1.2-7). This population growth and the growing interconnectedness of the region's economies are creating a surge in travel through the "gateways" that connect the Bay Area with the rest of northern California.

As shown in Figure 1.2-8, the greatest increase in travel growth into the Bay Area over the next 25 years is anticipated to come from areas to the east. By 2030, commutes from Sacramento Valley will grow by more than 200% and from the San Joaquin Valley by 112%.

Not only is the population increasing rapidly in these regions, but the growth is taking place in the form of segregated and dispersed land uses, which rely on individual vehicles for most trips. Without stronger transit systems leading to the main Central Valley cities and connecting them to each other, there will be little chance for the cities to move toward compact transit-oriented development or to satisfy the Bay Area planning framework.

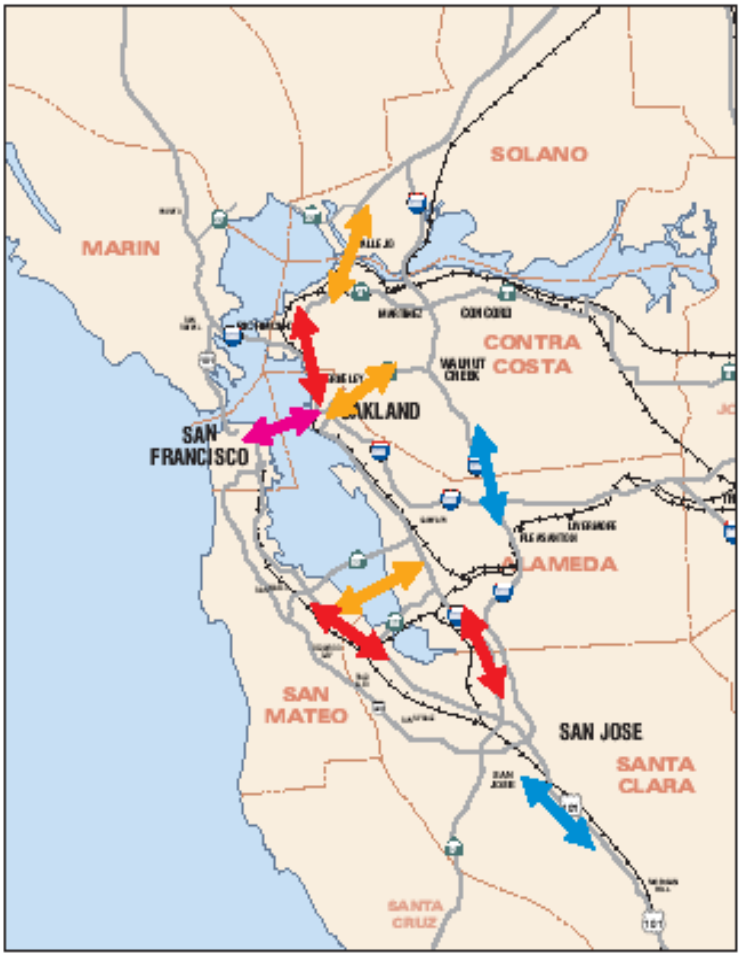
Regional Congestion

The Bay Area already experiences the second-worst traffic congestion in the country, after Los Angeles. Congestion is expected to worsen over the next 25 years, especially in existing hotspots (Figure 1.2-9). Congestion often seems to come "out of nowhere" but there is actually a clear cause—as the volume of traffic exceeds a road's capacity, the speed of traffic decreases exponentially rather than gradually. As Figure 1.2-10 illustrates, once the traffic slows to 5 or 10 mph, the number of cars a road can accommodate in an hour (its "vehicle throughput") also decreases. With more people trying to get through a road that now carries fewer cars, the traffic delays increase exponentially. Speeds degrade to stop-and-go conditions, pollution emissions worsen, and vehicles become less fuel efficient, making the environmental impacts of traffic more severe.



U.S. Department of Transportation
Federal Railroad Administration

Figure 1.2-5
2006 Area Designations for National Ambient Air Quality Standards—Ozone



LEGEND

Daily Trip Growth
>200,000
150,000
100,000
50,000

Figure 1.2-6
Regional Trips—High Growth Corridors
(2000—2030)

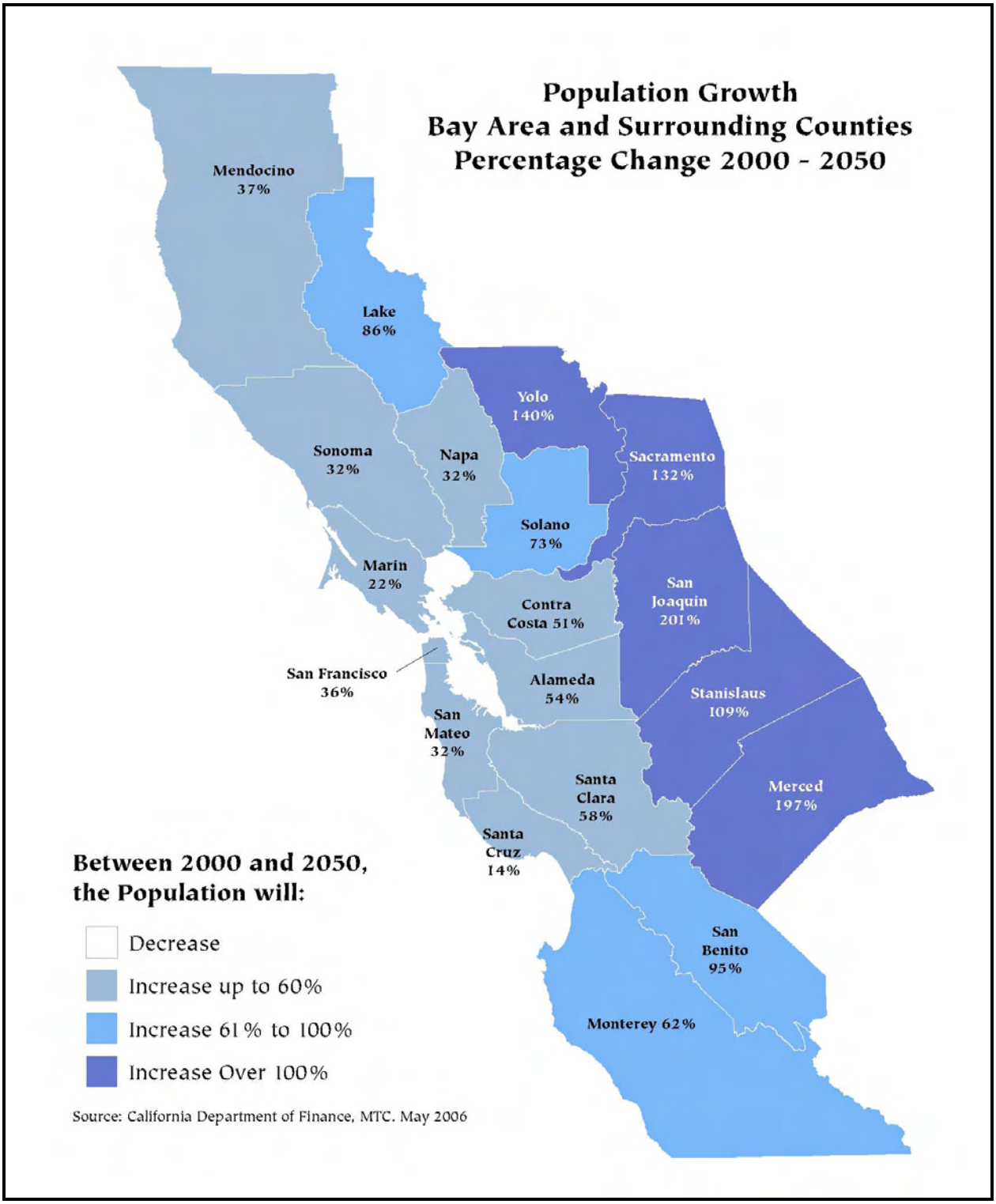
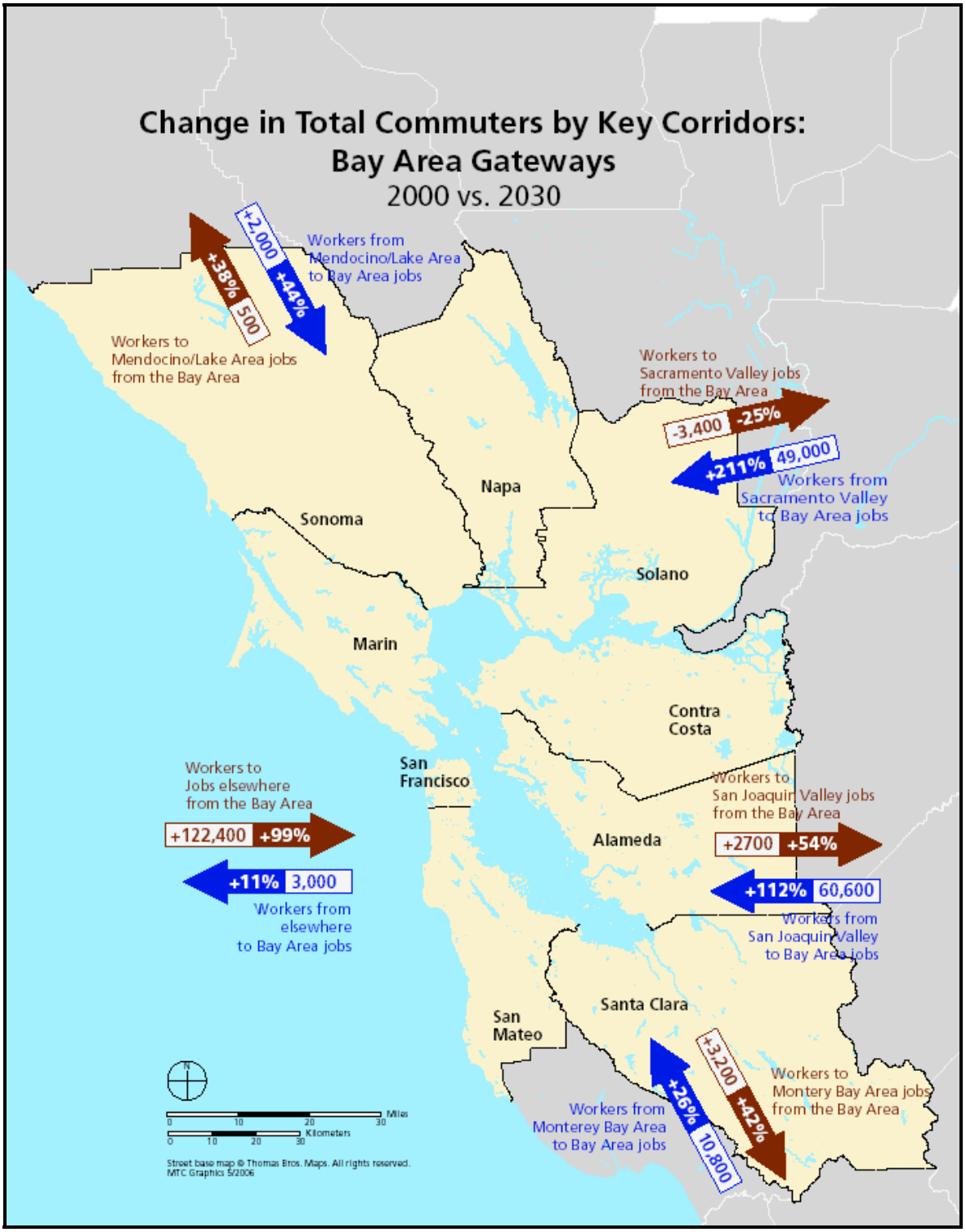


Figure 1.2-7
Population Growth



U.S. Department of Transportation
Federal Railroad Administration

Figure 1.2-8
Bay Area Gateways

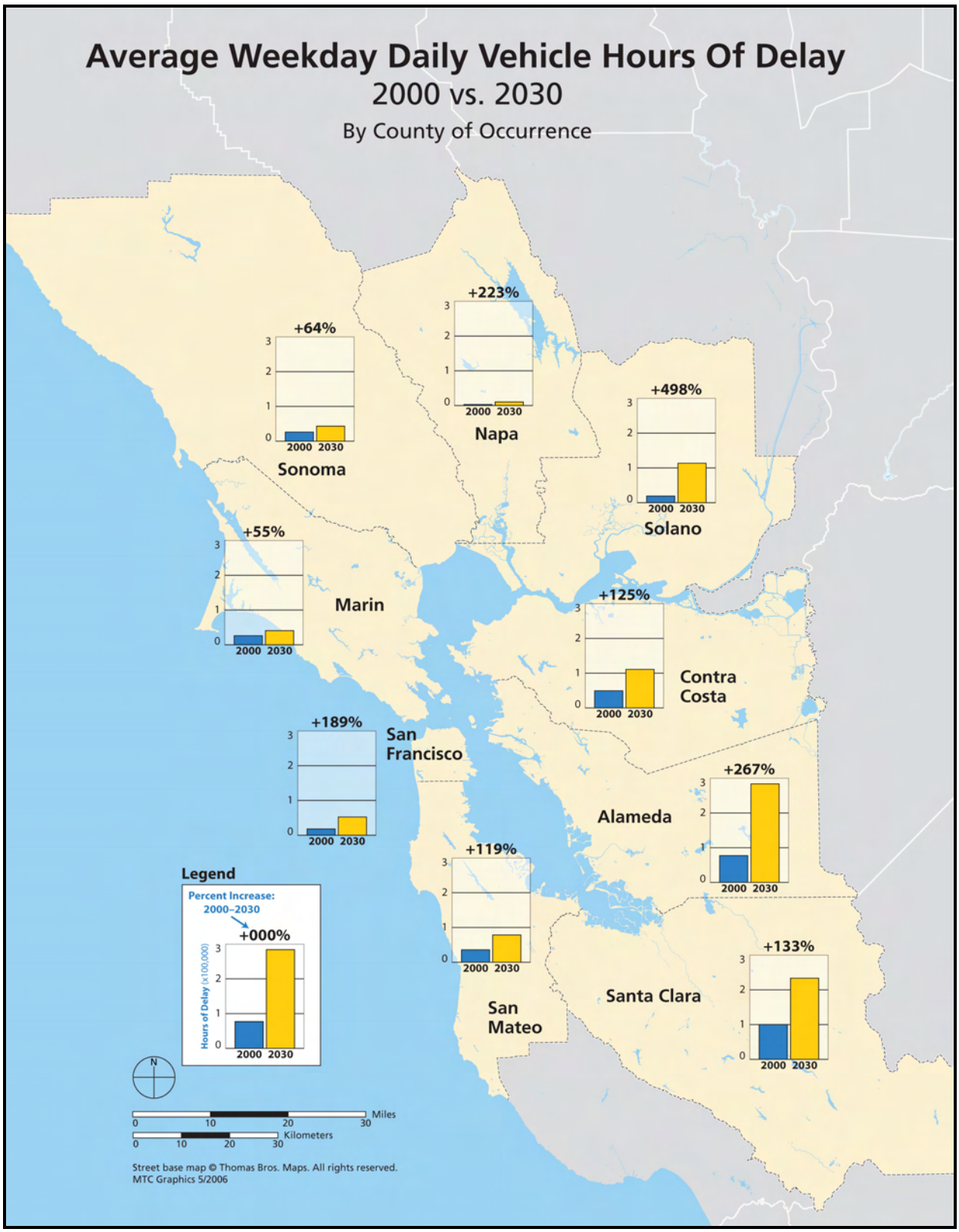


Figure 1.2-9
Vehicle Hours

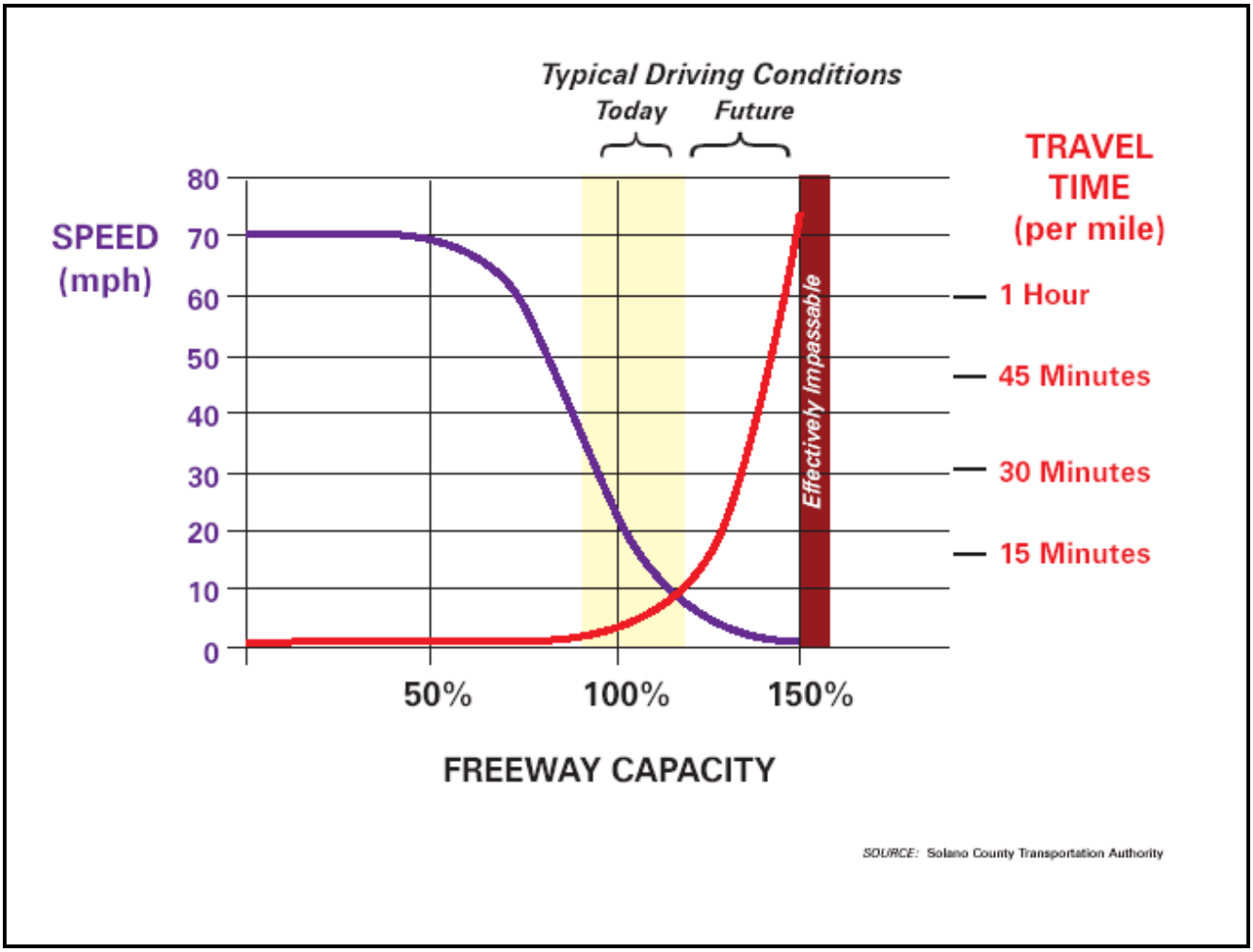


Figure 1.2-10
Freeway Capacity

The combination of significant population growth, dispersed development patterns (requiring a car for most trips), highway facilities that cannot keep pace with traffic demands, and large increases in interregional commuting, has and will continue to worsen congestion levels and the associated environmental and economic impacts.

Economic Implications

The adverse economic impacts of congestion and inadequate transportation/transit access are already apparent. The 150,000 daily hours of Bay Area commute congestion had an estimated cost of $2.6 billion in 2003 alone. This congestion would have been about 50% worse if not for the region's public transit system.

When transportation access to urban and suburban centers becomes too difficult, employers are likely to move jobs to areas where land prices are lower and workers' commutes might be shorter. Without better passenger rail access, major job growth will continue to decentralize and move to the Central Valley, and beyond.

Environmental Implications

Without an expanded rail network, the natural environment may also continue to suffer. More than 400,000 acres (ac) of land in the Bay Area are at risk from development. Promoting development in walkable communities near HST and other transit stations offers the best opportunity for taking development pressure off open space and farms. Demand for an additional 550,000 homes near transit in the Bay Area by 2030 is anticipated, but transit-oriented development only functions well when transit service is frequent and reliable enough that residents can reduce the number of vehicles they own and the number of car trips they take.

An additional growing environmental concern is global climate change, and the transportation sector is responsible for about 40% of California's greenhouse gas emissions, and up to 50% in the Bay Area. These emissions are directly proportional to the amount of fuel burned, so offering effective transportation choices that can reduce driving will be critical for cutting these emissions.