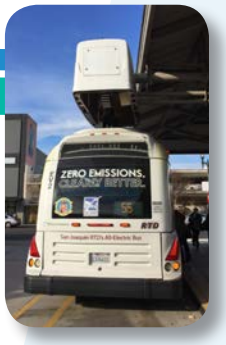
2018 California State Rail Plan

Connecting California

Draft

Caltrans

2018 california state rail plan



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Statewide Rail Stakeholders

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CalSTA
California Air Resources Board
California Freight Advisory Committee
California High Speed Rail Authority
California Public Utilities Commission
California Transportation Commission
Federal Railroad Administration
Governor's Office of Business and Economic Development (GoBiz)
National Railroad Passenger Corporation / Amtrak
State of Arizona Department of Transportation
State of Nevada Department of Transportation / XpressWest

Intercity Passenger Rail and Rail Transit

Bay Area Rapid Transit / BART
Capital Corridor Joint Powers Authority / Northern California Rail Partners
Los Angeles – San Diego – San Luis Obispo Rail Corridor Agency Joint Powers Authority
Los Angeles County Metropolitan Transportation Authority
North County Transit District
Peninsula Corridor Joint Powers Board / Caltrain
Sacramento Regional Transit / SacRT
San Diego Metropolitan Transit System
San Francisco Municipal Transportation Agency / MUNI
San Joaquin Joint Powers Authority / Altamont Corridor Express
Sonoma Marin Area Regional Transit
Southern California Regional Rail Authority / Metrolink
Valley Transportation Authority

Regional Planning Agencies

California Association of Councils of Governments
Metropolitan Transportation Commission
Placer County Transportation Planning Agency
San Benito Council of Governments
San Bernardino Association of Governments
San Diego Association of Governments
San Francisco County Transportation Authority
San Joaquin Valley Regional Policy Council
San Luis Obispo Council of Governments
Santa Barbara County Association of Governments
Santa Cruz County Regional Transportation Commission
Sacramento Area Council of Governments
Southern California Association of Governments
Riverside County Transportation Commission
Transportation Agency for Monterey County

Freight Rail

California Shortline Railroad Association
California Association of Port Authorities / California Airports Council
BNSF Railway
Genesee & Wyoming Inc.
Pacific Merchants Shipping Association
Union Pacific Railroad

Advocates

California Transit Association
California Farm Bureau Federation
Local Government Commission
The Nature Conservancy

Tribal Representation

Native American Advisory Committee
Northern California Chairman's Association
Central California Chairman's Association
Southern California Chairman's Association

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Acronyms and Abbreviations

°F	degrees Fahrenheit
Rail Plan	2018 California State Rail Plan
AADT	Annual Average Daily Traffic
AAR	Association of American Railroads
Amtrak	The National Rail Passenger Corporation
AB	Assembly Bill
ACE	Altamont Corridor Express
BART	San Francisco Bay Area Rapid Transit District
BCA	Benefit-Cost Analysis
BNSF	BNSF Railway
CalSTA	California State Transportation Agency
Caltrans	California Department of Transportation
CARB	California Air Resources Board
CCJPA	Capitol Corridor Joint Powers Authority
CEQA	California Environmental Quality Act
CFAC	California Freight Advisory Committee
CFMP	California Freight Mobility Plan
CHP	California Highway Patrol
CHSRA	California High-Speed Rail Authority
CO2	Carbon dioxide
CPUC	California Public Utilities Commission
CSMP	Corridor System Management Plan
CTC	California Transportation Commission
CTP	California Transportation Plan
DMU	Diesel multiple unit
DOT	Department of Transportation
DRMT	Caltrans Division of Rail and Mass Transportation
FAF	Freight Analysis Framework
FAST	Fixing America's Surface Transportation
FFY	Federal Fiscal Year
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration

FTA	Federal Transit Administration
FY	Fiscal Year
GDP	Gross Domestic Product
GGRF	Greenhouse Gas Reduction Fund
GHG	Greenhouse Gas
HSR	High-Speed Rail
HSPTBP	High-Speed Passenger Train Bond Program
I-10	Interstate 10
I-680	Interstate 680
IOS	Initial Operating Segment
ITCF	Intermodal Container Transfer Facility, Long Beach
ITSP	Interregional Transportation Strategic Plan
JPA	Joint Powers Authority
JPB	Joint Powers Board
LAX	Los Angeles International Airport
LOS	Level of Service
LOSSAN	Los Angeles–San Diego–San Luis Obispo Rail Corridor Agency
LA Metro	Los Angeles County Metropolitan Transportation Authority
mph	Mile(s) per hour
MPO	Metropolitan Planning Organization
MTC	Metropolitan Transportation Commission
Muni	San Francisco Municipal Transportation Agency
NAAC	Native American Advisory Committee
NATCOP	Native American Tribal Coordination and Outreach Plan
NCTD	North County Transit District
NISSP	Network Integration Strategic Service Planning
NOx	nitrogen oxide
O&M	Operation and Maintenance
OTP	On-time performance
OTS	Office of Traffic Safety
PCJPB	Peninsula Corridor Joint Powers Board
PISOP	Public Involvement and Stakeholder Outreach Plan
PM10	Particulate Matter 10 Microns in Diameter or Less
POLA	Port of Los Angeles

POLB	Port of Long Beach
PPP	Public-Private Partnerships
PRCIP	Passenger Rail Corridor Investment Plan
PRIIA	Passenger Rail Investment and Improvement Act of 2008
PTA	Public Transportation Account
PTC	Positive Train Control
RRIF	Railroad Infrastructure Financing and Improvement Act
RSIA	Federal Rail Safety Improvement Act of 2008
RTP	Regional Transportation Plan
SAC	Stakeholder Advisory Committee
SANDAG	San Diego Association of Governments
SB	Senate Bill
SCAG	Southern California Association of Governments
SCRRA	Southern California Regional Rail Authority
SCS	Sustainable Communities Strategies
SHA	State Highway Account
SJJPA	San Joaquin Joint Powers Authority
SJRRC	San Joaquin Regional Rail Commission
SMART	Sonoma-Marin Area Regional Transit District
SRPAA	State Rail Plan Approval Authority
SRTA	State Rail Transportation Authority
STA	State Transit Assistance
STB	Surface Transportation Board
STIP	State Transportation Improvement Program
TAMC	Monterey County Transportation Agency
TAP	Transit Access Pass
TCRF	Traffic Congestion Relief Fund
TIGER	Transportation Investment Generating Economic Recovery
TIRCP	Transit and Intercity Rail Capital Program
TOD	Transit-Oriented Development
UPRR	Union Pacific Railroad
VCRR	Ventura County Railroad
VMT	Vehicle miles traveled

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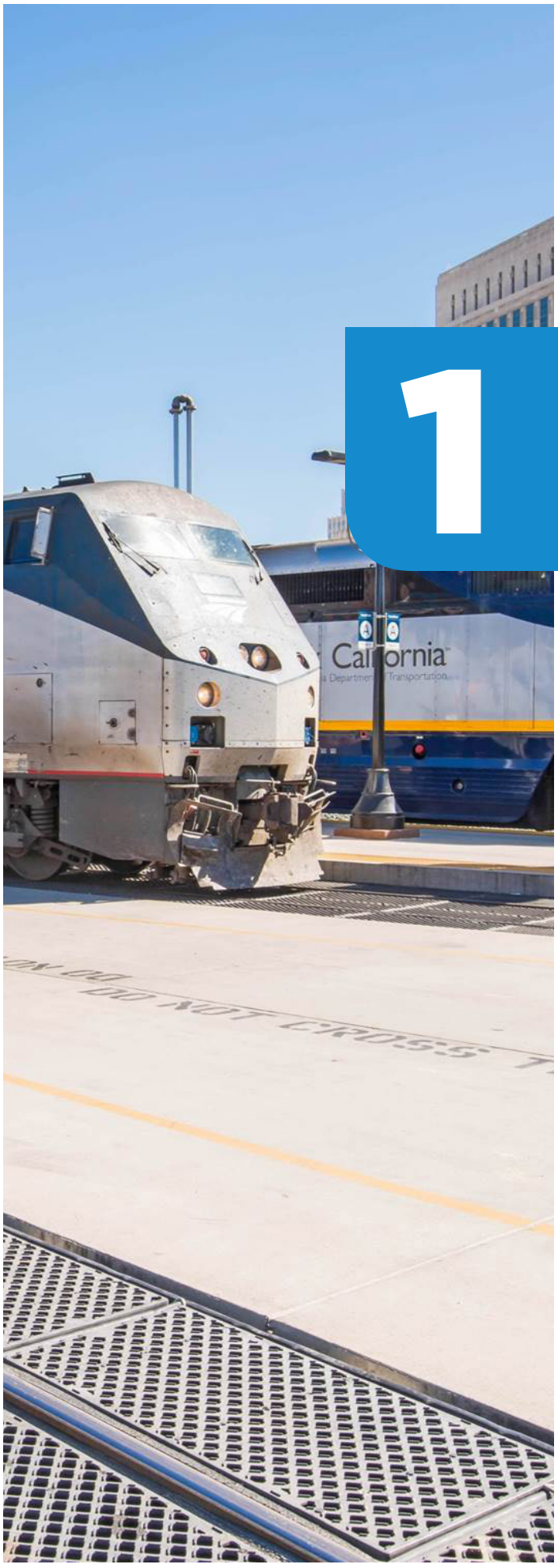


1 Role of Rail in Statewide Transport

Caltrans' mission in developing the California State Rail Plan is to provide a framework for a safe, sustainable, integrated, and efficient California rail network that successfully moves people and goods while enhancing the State's economy and livability.

1.1 2018 California State Rail Plan Overview

California is building the future every day. California is the world's sixth-largest economy, home to nearly 40 million people, and contains world-class cities, universities, and research centers, and the world's most valuable, innovative, and technologically advanced companies. The State's agricultural industry feeds the nation, and is a center of international trade with ports through which goods and products flow to the rest of the nation. California's iconic parks and landscapes draw visitors from all over the world.

California's success can be enhanced multifold by efficiently connecting and updating the transportation system built on rail networks and highways from the 19th and 20th centuries. The status quo is not enough to support this growing economy and meet its robust economic and environmental future needs. Residents and workers in California's growing mega-regions face increasing vehicle congestion and crippling commute times due to pressures on the housing market and aging transportation infrastructure. This also creates bottlenecks for the movement of goods and access to popular destinations and across California's borders. The quality of life in the state's communities is further impacted by transportation-related air pollution. The state's farms and forests are threatened by erratic patterns of drought and downpour, along with extreme weather generated by greenhouse gas (GHG) emissions and a changing climate.

California is uniquely poised to meet its challenges. The State is a national leader in developing a passenger and freight rail network connecting its growing regions. Modern rail is the most cost- and energy-efficient transportation technology to quickly, safely, and affordably connect people to their destinations or goods to their markets. Californians must continue to invest in and build an advanced, integrated statewide rail system befitting both their needs and their ambitions to continue to compete and thrive on the cutting edge of global technology; to lead in efforts to curb climate change; and to grow sustainably and resiliently in a fast-changing world.

The 2018 California State Rail Plan (Rail Plan) establishes a statewide vision describing a future integrated rail system that provides comprehensive and coordinated service to passengers through more frequent service, and convenient transfers between rail services and transit. This integrated system uses the existing rail system more efficiently; expands the coverage and mix of rail services in several key corridors; scales proposed services to meet anticipated market demand; and facilitates network-wide coordination through scheduled, or "pulsed," transfers. For passengers, this integrated system means a faster, more convenient and reliable door-to-door travel experience. For freight movements, this integrated system means better system reliability and a clear pathway to growing capacity, which leads to economic benefits that reverberate locally, regionally, and nationally.

The Rail Plan anticipates exciting new developments in California's rail system, and presents a future vision for statewide rail travel that builds on the State's existing conventional rail, along with opportunities provided by high-speed rail (HSR) and transit; leveraging emerging technologies such as electrification and advanced train control systems that help make rail travel more efficient, faster, safer, and more reliable; making the existing system more cost-effective to operate; and channeling savings to new capital projects and system enhancements. The Rail Plan assesses a changing funding landscape, including the influence of newly funded Senate Bill (SB) 1 (SB1) transportation package and California's Cap-and-Trade Program for reducing GHG emissions. The planned rail system envisioned in the Rail Plan will improve Californians' quality of life by mitigating roadway congestion; reducing vehicle emissions; supporting compact land use; and offering convenient, reliable, and auto-competitive alternative travel and goods movement. The Rail Plan also addresses issues of access—the availability of opportunities within a certain distance—as well as mobility—the ability to move between activity sites.[1] A statewide rail system offers a viable alternative to driving for both local and long-distance trips for all populations, including those who lack access to or cannot afford automobiles, and for people who choose not to drive.

The California transportation network today:

- Total highway / roadway centerline miles: 175,818
- Over 13,133 State-owned bridges
- Twelve California seaports, including the nation's largest port complex
- Over 300 airports (Commercial and General Aviation)
- One of the nation's most extensive passenger and freight rail systems with over 10,000 passenger and freight route miles

The Rail Plan vision provides a technical framework for realizing the full potential of our existing rail network, and using the current slot times on freight heavy routes in a fully integrated statewide passenger service that draws on detailed input and guidance from key stakeholder initiatives and leadership. In partnership with those same stakeholders, this vision can be achieved in phases, with different levels of integration activated as improvements are delivered over time. The Rail Plan provides for incremental service planning and capital investment decision-making with an ultimate network vision in mind: it offers leadership toward a more integrated, convenient, and efficient statewide rail system.

Chapter 1 provides the statewide context of California's multimodal transportation system, outlining the key trends and opportunities guiding transportation planning; characterizing rail's role in the State transportation system; and highlighting key multimodal policies, programs, and plans on which statewide planning for the rail network is based. This chapter also reviews the rail governance structure and identifies funding opportunities from Federal, State, local, and other sources.

1 Hanson, Susan, The Geography of Urban Transportation, 2004, accessed 2016.

1.2 State Multimodal Transportation

California's multimodal transportation system, which consists of highway, rail, transit, and seaport and airport systems, provides the foundation from which the State economy can flourish. It provides residents access to jobs, and businesses access to markets. New trends and opportunities are emerging in all modes and scales of transportation planning, and were considered and incorporated in developing the Rail Plan.

1.2.1 California's Rail System Summary

In California, freight rail services are provided by two Class I railroads, or large railroads; and 26 Class III railroads, or small railroads. The National Rail Passenger Corporation (Amtrak) operates four long-distance services. The State of California sponsors three corridor services. There are five commuter railroads in the State of California, of which the newest commenced operations in 2017. Most of these passenger services operate over trackage owned by the Class I railroads.

Table 1.1: California Transportation Facilities[2]

Freight Rail Route Mileage	
Freight: Class I Railroads	5,418
Freight: Class II Railroads	1,317
Freight: Switching Terminals	275
Passenger Rail Route Mileage	
Long Distance	887
Intercity Passenger Rail	1,663
Commuter and Regional Rail	830
Urban Mass Transit Rail	382
Highway/Roadway	
Highway/Roadway Mileage	175,818
Airports	
Commercial Service Airports	28
General Aviation Airports	215
Special Use Airports	68
Ports	
Seaports (Inland and Coastal)	12
International Ports of Entry	6

1.2.2 Trends and Opportunities

The Rail Plan addresses the following key trends and opportunities for the California transportation system:

Population growth. The State population is now 39 million, four times its 1950 population of 10 million, when the core of California's highway (interstate) transportation system was built. This quadrupling of the population results in severe congestion on roads, rail, airports, and bridges. By 2040, the State's population is projected to grow from 39 million[3] to 50 million.[4] Accommodating population growth, while transporting people and goods, will pressure the already-strained capacity of the State's transportation system. The integrated rail system envisioned for 2040 in the Rail Plan will provide significant new, reliable capacity to the existing transportation system, moderating the pressure of population growth.

Mega-Regional Planning. Mega-regions are extended geographical areas around a metropolitan center that connect regions through transportation and communication networks. Comprehensive evidence shows that mega-regions are emerging as an efficient scale for planning and managing transportation, labor, housing, land use, and economic systems. California is home to both a northern and southern mega-region (see Exhibit 1.1;[5] and increasingly, the regional planning organizations in these areas are not in a position to optimize services without considering the cross-border and cross-regional impacts.[6]

2 Route miles are estimated by adding each agency or railroad company's operating route miles.

3 California Department of Finance, *Population Estimates for California* (2015).

4 California Department of Finance, *"New Population Projections: California to Surpass 50 Million in 2049"* (2013).

5 The research names 10 or 11 nationwide mega-regions; 2 are in California. The California mega-regions account for nearly 95 percent of the State's population.

6 Bay Area Council: Economic Institute, The Northern California Megaregion: Innovative, Connected, Growing." (2016).

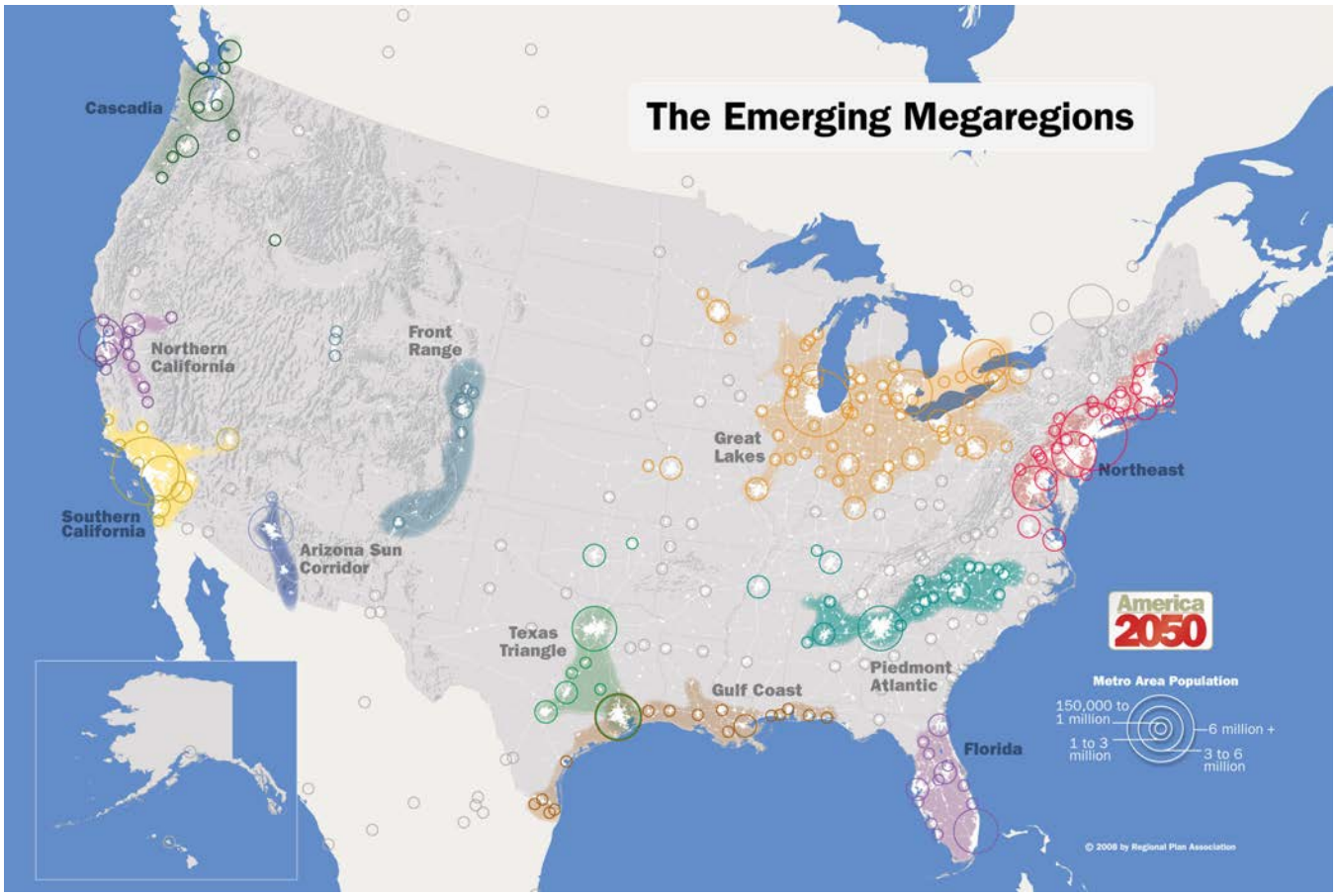


Exhibit 1.1: Emerging Mega-Regions in the U.S. and Their Areas of Influence (2013)[7]

System preservation. Much of California's multimodal transportation system was built in the mid-20th century, and is approaching the end of (or exceeding) its useful life. Simply maintaining the existing transportation system generates significant internal and external costs. Internal costs include sustaining quality operations and performing frequent maintenance and upkeep to ensure that the existing capacity can accommodate demand, and that public health and safety are preserved.

External costs include harmful pollutants emitted by motor vehicles, airports, railroads, and seaports. These pollutants adversely affect public health and contribute to global climate change, which jeopardizes the State's ecological and economic future. A stronger freight and passenger rail system will help alleviate the demands on existing highway infrastructure and with anticipated mode shift to reduce the rate of degradation of the existing transportation system.

7 Regional Plan Association, *"Emerging Mega-Regions in the U.S. and Their Areas of Influence"*, Accessed 2017.

California Air Quality and Climate Change Mandates. The passage of Assembly Bill (AB) 32, the California Global Warming Solutions Act of 2006, was landmark legislation requiring California to reduce GHG emissions to 1990 levels by 2030. Senate Bill 32 (Statutes of 2016) requires GHG levels to be 40 percent below 1990 levels by 2030. Governor's Executive Order further requires GHG levels to be 80 percent below 1990 levels by 2050. The transportation sector must play a large role in these reductions, which are the most aggressive in the country. Climate change is already affecting California through its exacerbation of extreme heat, more frequent and intense wildfires, poor air quality, drought, and related public health concerns—as well as sea level rise and flooding—which threaten transportation infrastructure and economic vitality. These impacts escalate maintenance and preservation costs, and may seriously affect transportation infrastructure, causing economic disruptions, safety issues, and reduced quality of life. A more extensive and efficient rail system can reduce the transportation sector's substantial GHG emissions; add resiliency to the transportation system; mitigate climate change's adverse impacts; and contribute to California's ambitious GHG reduction requirements.

As elaborated in the air quality study presented in Chapter 6 of this Rail Plan, with the implementation of the Rail Plan 2040 vision, the anticipated mode shift from highways to rail will reduce carbon dioxide emissions per passenger mile of travel by nearly 20 times.

A changing rail funding landscape. California recently passed SB1, a law that estimated $52 billion over the next decade to help cover the State transportation need. A substantial portion will be dedicated to rail and transit needs. SB1 adds a ½% diesel sales tax specifically in support of intercity and commuter rail operational and capital needs. It also adds significant new revenue to public transit, which includes commuter rail and other high capacity transit corridors that are essential to the integrated rail network. This is funded by a new 3.5% diesel sales tax and $350 million per year from new vehicle license fees that support both transit and intercity rail capital needs. Combining this funding with existing funding for rail and transit, like the Transit and Intercity Rail Capital Program (TIRCP) and subsequent modification SB9, the State has committed to fund transformative capital improvements that focus on connectivity between systems. Together, California is dedicated to modernizing the entire transit system and many significant investments can be made to improve the rail network within this expanded budget authority.

First- and Last-Mile Connections.

A rail journey doesn't begin when a passenger boards a train; but when the passenger leaves home or place of work on the way to the rail station. Similarly, the journey does not end when the train pulls into the arriving station, but when the passenger arrives at their final destination. Covering this gap between the rail stations and the origin and destination is known as the "first/last mile connection." Solutions to this challenge (discussed in Chapter 3), include, among other things, emerging technologies that enhance bike-share, car-share, and transit park-and-ride schemes.

Emerging technologies. Advancements in technology are rapidly changing and improving the structure, capacity, and performance of the transportation system. There is a revolution of technologies that will change the landscape of transportation. Rail technologies such as advanced train control systems, including Positive Train Control (a system for monitoring and controlling train movements on certain corridors, including those that have regularly scheduled passenger services), are bringing about improvements in operational safety. When these technologies are fully deployed, they provide gains in operational performance, capacity, and labor productivity. Modern HSR is based on technological advancements in many areas, including track, electric traction, vehicles, and maintenance practices. Advances in diesel locomotive technology have resulted in a dramatic reduction in pollutants. In the coming years, alternative fuels, better propulsion technologies, and new, lighter equipment (including the equipment used to electrify Caltrain commuter rail service) are expected to further reduce the GHGs emitted by rail systems. Autonomous vehicles, significant advances in fuel technology, and electric vehicles, trip planning, and real-time trip and congestion monitoring technology are increasing the utility and efficiency of vehicles, and improving system operations. Similar changes are taking place with rail and mass transportation, improving operational and environmental efficiencies. Transit and rail connectivity can be greatly enhanced by significant innovations in integrated ticketing systems that allow reliable linked transit trips. New ridesharing systems couple well with mass transportation to provide first- and last-mile connections especially where high-density transit service is not available for the connection.

High-Speed Rail. The deployment of HSR in California will revolutionize the efficient movement of large volumes of people at fast speeds over long distances at an anticipated lower operations cost than other rail and transit services in the state. Additionally, HSR is perfectly suited to accommodate mega-regional travel, and to address planning challenges that may arise from the scale, pace, and form of urbanization.[8] For the first time in California, there will be a significant alternative to auto travel for medium-distance travel , and an air-competitive option in many markets.

Integrated passenger rail service. The HSR System will revolutionize intercity travel in California; and coupled with existing rail, provide an extensive and practical rail system. The Rail Plan's integrated service concept lays the foundation for a coordinated rail network. By integrating HSR, intercity rail and bus, and regional rail and local transit, this 2040 Vision benefits residents in rural, suburban, and urban areas across the state. Implementation of the integrated service concept will reduce transfer times, increase service frequencies, integrate ticketing, and help local services coordinate with each other; changes that are expected to dramatically boost ridership and lead to operating efficiencies. In addition, connections to neighboring states and Mexico will be streamlined as California's rail system grows and matures.

Freight Benefits. As described in detail in Chapters 5 and 6, planned investments in freight rail would generate a range of benefits. They increase the efficiency of the freight system, reducing travel times, costs, and emissions of existing trips. Efficiency and capacity improvements attract trips away from other modes, primarily trucks, potentially saving costs, emissions, and time, as well as improving safety of those trips relative to their original mode. These diversions can also lower congestion, positively impacting emissions and safety on the roadway networks, generally. The investments can make a region more economically competitive, attracting development from other regions. These benefit transfers from one geographic area to another are not always counted as net benefits, and benefit tabulation varies by methodology.

8 Catherine Ross, Policy & Practice: Transport and megaregions: high-speed rail in the United States (2011).

Rail Congestion Trends. A central concern for California's rail system is to ensure that there is sufficient capacity to handle current and anticipated rail traffic in a timely and efficient manner. Insufficient capacity leads to poor service performance, thereby reducing the competitiveness of rail service vis-a-vis other modes, and increases costs for service providers. Such "bottlenecks" were analyzed for the Rail Plan, where capacity needs for current and projected passenger and freight traffic were identified. Bottlenecks are defined as locations where a rail line's practical capacity is less than what is required for projected traffic volumes. Practical capacity is driven by infrastructure configuration (number of tracks, signal system type, etc.) and the number and mix of train types (passenger, HSR, manifest, intermodal, etc.) that are using the segment. For a given physical configuration, capacity is highest when all of the trains have the same dynamic performance in terms of operating speeds, acceleration, and deceleration. Conversely, large variations in the dynamic performance of various trains operating over a route will adversely affect capacity.

Highway Trends. A review of 5 years of mainline Annual Average Daily Traffic (AADT) volumes (2011 to 2015) obtained from the California Department of Transportation (Caltrans) Freeway Performance Measurement System database for specific locations along Interstate (I)-5, I-10, and I-80 showed increasing traffic volumes. These freeways parallel north-south and east-west existing Class I rail lines. The increases are not limited to metropolitan areas like Los Angeles and Alameda Counties. Increasing traffic volumes are also seen in inland counties like Merced and Stanislaus (along I-5), and Solano and Placer (along I-80). For example, east-west interstate AADT in Los Angeles County increased 4.9 percent over the period. Likewise, north-south interstate AADT in Stanislaus County increased 16.2 percent over the same 5 years.

This trend of increasing traffic volume is also seen in the increasing amount of time that segments of these freeways experience Level of Service (LOS) D (LOS D signifies traffic conditions are approaching unstable flow) or worse during peak commute periods. AADT and LOS figures for metropolitan and inland counties over the 5 years are seen in Appendix A. The major implication here is that, absent major investments all along these major interstate freeways to increase speeds and fluidity, shippers may look increasingly to rail transportation as an alternative for north-south and east-west long-distance movements, presenting a unique opportunity for rail to play a larger role in major corridor movements, and not just remain a last alternative.

Exhibit 1.2 shows the density of daily commuter travel activity within 50 miles of the largescale megaregions. Megaregions were defined empirically using a data set of more than 4 million commuter flows. It highlights the congested travel and land use patterns which would help define the demand that the Rail and Transit can help fulfill.

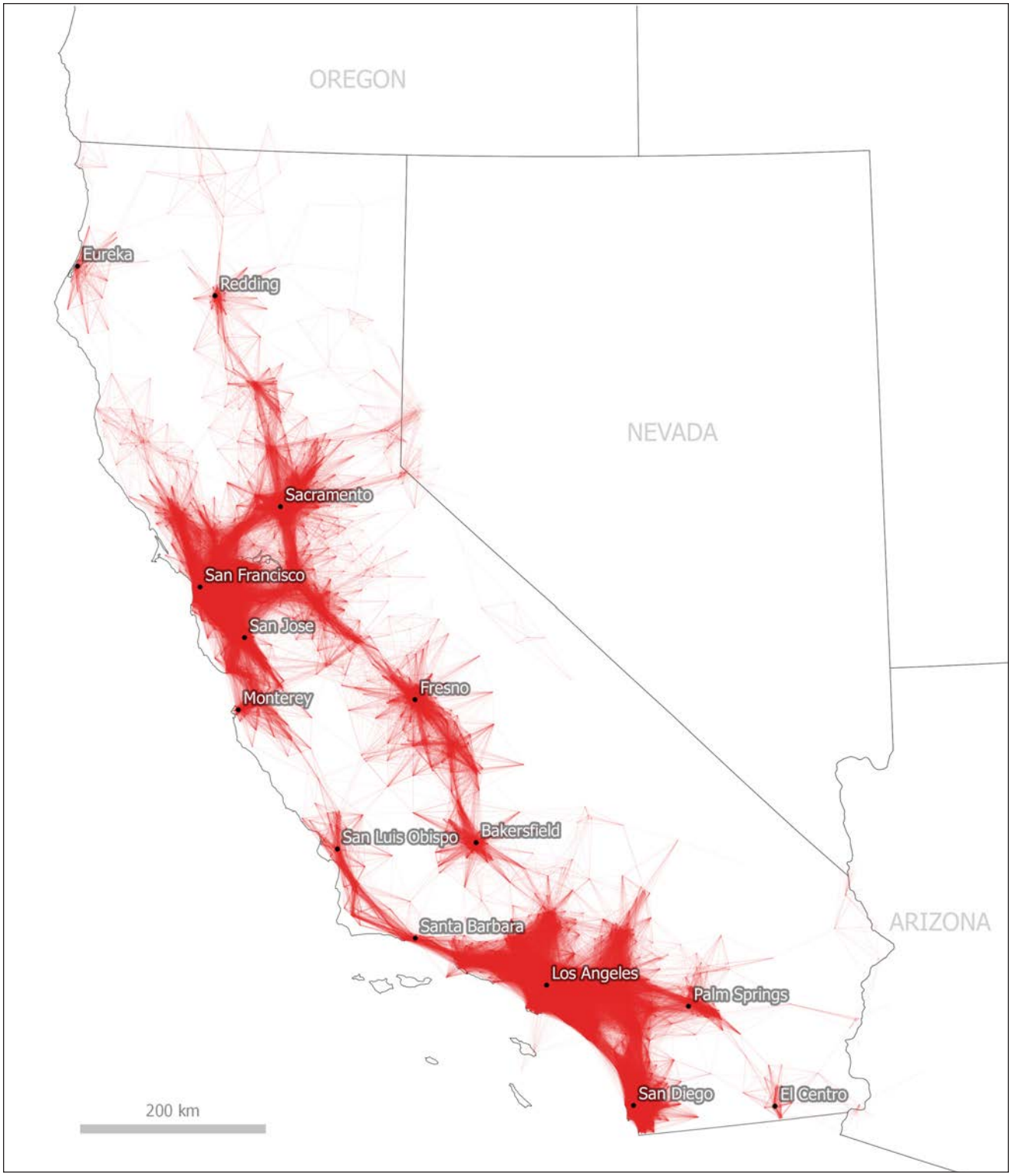


Exhibit 1.2: Tract-to-Tract Commutes of 80km/50 miles or less in California[9]

9 Garrett Dash Nelson, Alasdair Rae, *An Economic Geography of the United States From Commutes to Megaregions*, "Tract-to-Tract Commutes of 80km/50 miles or less in California", 2017.

Airport Trends. There are 26 commercial airports in California. Of these, 11 accounted for more than 98 percent of total passenger enplanements in 2015. As seen in Table 1.2, the two airports with the highest volume of enplanements are Los Angeles and San Francisco. Over the last 5 years, these two airports experienced increases in enplanements of 19.1 percent and 20.6 percent, respectively. Rapid growth has been seen at six other airports: San Diego, Oakland, Santa Ana, Sacramento, San Jose, and Palm Springs. Enplanements dropped over this period at Ontario, Burbank, and Long Beach. The total growth in enplanements was 16.5 percent.

Table 1.2: Enplanements for California's Top 11 State Airports 2011-2015

Airport	Code	2011	2012	2013	2014	2015	Change Over Period
Los Angeles	LAX	30,528,737	31,326,268	32,425,892	34,314,197	36,351,272	19.1%
San Francisco	SFO	20,056,568	21,284,236	21,704,626	22,770,783	24,190,560	20.6%
San Diego	SAN	8,465,683	8,686,621	8,878,772	9,333,152	9,985,763	18.0%
Oakland	OAK	4,550,526	4,926,683	4,770,716	5,069,257	5,506,687	21.0%
Santa Ana	SNA	4,247,802	4,381,172	4,540,628	4,584,147	4,945,209	16.4%
San Jose	SJC	4,108,006	4,077,654	4,315,839	4,621,003	4,822,480	17.4%
Sacramento	SMF	4,370,895	4,357,899	4,255,145	4,384,616	4,714,729	7.9%
Ontario	ONT	2,271,458	2,142,393	1,970,538	2,037,346	2,089,801	-8.0%
Burbank	BUR	2,144,915	2,027,203	1,918,011	1,928,491	1,973,897	-8.0%
Long Beach	LGB	1,512,212	1,554,846	1,438,756	1,368,923	1,220,937	-19.3%
Palm Springs	PSP	759,510	867,720	875,699	953,607	947,728	24.8%
Total		**83,016,312**	**85,632,695**	**87,094,622**	**91,365,522**	**96,749,063**	**16.5%**

Source: https://www.faa.gov/data_research/aviation/

The Federal Aviation Administration forecasts growth of around 2 percent per year at the State's three largest airports. Such a rate could push Year 2040 enplanements at Los Angeles to 56.3 million, at San Francisco to 38.7 million, and at San Diego to 16 million.[10] Rail, therefore, plays a very important role as airport capacity throughout the state reaches its maximum. Efficient rail services among mega-regions provide excellent alternatives that bring passengers right to the city centers, instead of to the airports, which are usually located away from the city centers. Along with rail and transit, linkages to the airports from the city centers will become ever more important over the next two decades for moving people efficiently to and from airports. As expanding airport capacity becomes more challenging (i.e., the cost of land in urban areas, the environmental impacts of building on green fields or potential relocation expenses[11]), HSR offers viable alternatives to alleviate capacity constraints on short interstate air trips.

10 Federal Aviation Administration, *Terminal Area Forecast Summary*, Fiscal Years 2015-2040.

11 International Transport Forum, *Expanding Airport Capacity Under Constraints in Large Urban Areas* (2013).

1.3 Role of Rail in the State Transportation System

Supporting a changing population, an expanding economy, and an intersecting social, political, and physical environment will require new and strategic transportation planning. Coordination between different modes of transportation and land use planning must drive priorities to ensure no one system is bearing undue burden to provide access and mobility to all of California's communities.

California's multimodal transportation system, which consists of highway, rail, transit, seaport, and airport systems, provides the foundation from which the State's economy can flourish. It provides residents access to jobs and services, and businesses access to markets.

Rail is an essential element of California's multimodal transportation network. More than any other transportation technology or mode, rail is able to move people and goods more quickly and safely for less money, and with far fewer environmental impacts. This section aims to address the key ways rail supports and enhances California's multimodal transportation system. The importance of rail to the state cannot be underestimated. California must meet the challenges of accommodating a growing and changing population, expanding the economy, reducing GHG emissions, and protecting the environment, while increasing the livability and quality of life for all Californians, especially the most disadvantaged.

The rail system can provide more service within potential existing latent capacity and more efficient performance. With longer trains, more frequent services, better connectivity, and ease of access, the number of riders will grow, reducing average costs per passenger. More trains, more often, with faster travel times will also be auto- and air-competitive. This will not only motivate travelers to use rail and transit for more daily trips, but will compliment needed capacity on roads and at airports—expansions that will require significant investment.

The State rail system provides essential mobility for both residents and goods. The Rail Plan provides the framework for helping the State rail system meet these goals. Specifically, the integrated passenger rail service concept in the Rail Plan will facilitate a coordinated rail system, increasing its utility for existing rail users, incentivizing more rail travel, and further leveraging rail's economic, environmental, safety, and quality-of-life benefits. Along with investing in passenger rail, existing rail corridors will become more fluid and reliable, allowing domestic and international goods movement by rail to grow as a share of total goods movement.

1.3.1 Mobility

The State's rail system provides both residents and industries a competitive travel alternative to highway and air travel, lowering household and business transportation costs, and mitigating the roadway congestion caused by continued growth. California must improve and increase the efficiency of all modes and intermodal connections to address its transportation challenges; it needs competitive options to spur progress toward scalable solutions, both in and across regions.

1.3.2 Economic Development and Demographic Changes

Since the Great Recession (December 2007 to June 2009), unemployment and housing foreclosure rates have decreased nationwide, and State and municipal credit ratings have steadily improved, contributing to a positive economic outlook for the State.[12]

A robust passenger rail system supports the economy by providing Californians with access to jobs, education, health care, goods and services, and social and recreational activities. The freight rail system is an important vehicle through which California goods and services reach international, national, and local markets, thereby sustaining California jobs.

Over the coming decades, the State's population is projected to grow at a compound annual rate of 0.8 percent, constituting a 29 percent increase in California residents from 2010 to 2040, and 18 percent increase from 2020 to 2040. Households are expected to grow similarly. The projected population increase of 7.1 million would bring the State total to 48 million. Los Angeles, Riverside, San Bernardino, and San Diego Counties are expected to add the most people by 2040.

Employment is projected to increase by a similar annual rate during this period. With a 31 percent increase from 2010 to 2040, and 15 percent increase from 2020 to 2040, the expected 2040 employment is 21.3 million. Los Angeles, Riverside, San Bernardino, and San Diego Counties are also expected to add the most jobs by 2040. Table 1.3 displays these population, household, and employment data.

Table 1.3: Statewide Demographic Forecasts

	2010	2020	2029	2040
Population	37,251,241	40,789,998	44,614,079	47,950,711
Households	12,583,816	13,910,434	15,088,299	16,465,705
Employment[a]	16,204,377	18,488,891	19,548,788	21,295,761

[a] Total nonfarm employment.

12 U.S. Bureau of Economic Analysis, *Regional Economic Accounts*, Q2, 2015.

This anticipated population growth will increase demand for consumer products and associated goods movement, warehousing, distribution centers, and intermodal facilities. Additional freight growth will be driven by national and international consumer demand. Much of this freight is generated by the busiest port complex in the nation: the Ports of Los Angeles and Long Beach. Freight rail offers the most efficient way to transport certain types of goods across the state and the nation. A sustainable, reliable, and cost-effective freight rail system helps California ports and businesses compete with those in neighboring states and Mexico, fostering industrial growth and economic opportunity for Californians.

Demands for passenger and freight rail have increased over the past several years (see Exhibits 1.3 and 1.4). As of 2015, California is the sixth largest economy in the world, with a gross domestic product of over $2.4 trillion.[13] California businesses export roughly $162 billion worth of goods to more than 225 foreign countries annually.[14]

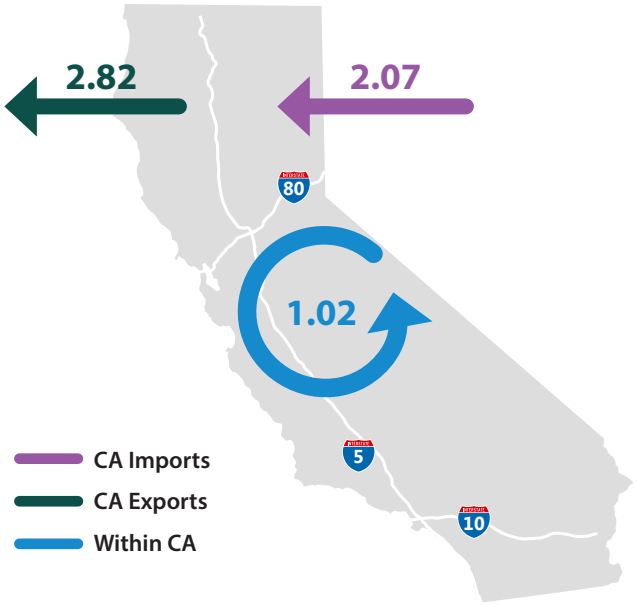


Exhibit 1.4:
Total Increase in California Rail Freight Tonnage Flows 2012-2015 (in million tons) [16]

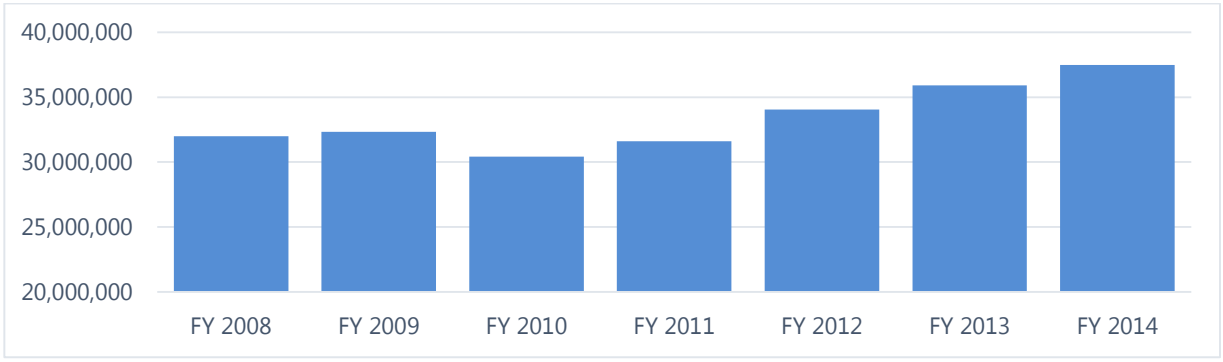


Exhibit 1.3: California Passenger Rail Ridership for ACE, Caltrain, COASTER, Metrolink, Pacific Surfliner, San Joaquin, Capitol Corridor Lines by State Fiscal Year[15]

13 International Monetary Fund, World Economic Outlook Database, April 2015; Bureau of Economic Analysis, California Gross Domestic Product: advance estimate as of June 10, 2015.

14 International Trade Administration, "Trade Stats Express. U.S. Dept. of Commerce" (2012).

15 Amtrak (2016).

16 Note: Total flows selected for rail domestic mode. Figures calculated using three extractions: California origin to combined national total destination (CA Exports); combined national total origin to California destination (CA Imports); and California origin to California destination (Within CA). Within CA totals were subtracted from CA Exports and CA Imports to avoid double counting. Source: Oak Ridge.

Rail forms an increasingly integral part of California's transportation system, and will play a key role in accommodating the growth of this system. Amtrak operates over 70 intercity trains per day in California; attracting 5.6 million boardings annually, up from 3.6 million a decade earlier.[17] California commuter rail ridership grew to nearly 33 million trips in fiscal year 2016, from 21.6 million trips a decade earlier.[18] These commuter rail services connect to California's urban transit systems, which served 1.5 billion trips in 2014.[19]

Changes in the age distribution of the growing population could also increase dependency on the passenger rail system; the State's population aged 60 and older is projected to increase from just over 6 million in 2010 to over 12 million in 2040.[20] As the population ages, people increasingly need mobility assistance; providing access to quality rail and transit helps people with mobility needs or those who can no longer drive to maintain their independence. Also, younger generations may increasingly choose rail transport. For example, Millennials,[21] those born around 1980 and reached adulthood around 2000, have shown a preference to reside in urban centers with good public transportation systems, thereby saving money by avoiding buying cars.

The State rail system also plays a central role in California and national goods movement. Today, the State generates approximately 51 million tons of freight, receives 94 million tons from out-of-state, and generates 27 percent of the nation's intermodal volume in terms of units (over 30 million tons of cargo annually).[22] Much of this freight is generated by the busiest port complex in the nation, the Ports of Los Angeles and Long Beach.

Lastly, the railroad industry is a significant employer in the State. Amtrak and the freight railroads combined have 11,500 California employees, earning $1 billion in wages and benefits.[23]

17 Amtrak, Amtrak Fact Sheet, *Fiscal Year 2015 State of California*, 2016.

18 American Public Transit Association, *Public Transportation Ridership Report: Fourth Quarter 2015*.

19 Federal Transit Administration, National Transit Database 2014, Table 19: Transit Operating Statistics: Service Supplied and Consumed, Accessed 2016.

20 California Department of Aging, *California State Plan on Aging*, 2013–2017.

21 APTA, *Millenials & Mobility: Understanding the Millennial Mindset*, October 2013.

22 Surface Transportation Board, Waybill Sample (2013).

23 Association of American Railroads, *Railroads and States, California*, Accessed 2017.

1.3.3 Passenger Rail Demand and Growth Trends

According to an analysis comparing patterns and projections between 2010 and 2040; in year 2010, Californians took an estimated 361 million annual interregional trips on all modes of travel. California's busiest interregional travel market exists between the Los Angeles Basin[24] and San Diego County (98.2 million annual person trips),[25] followed by Sacramento[26] to/from the San Francisco Bay Area[27] (42.3 million); the Bay Area to/from the northern San Joaquin Valley[28] (31.2 million); the Los Angeles Basin to the southern San Joaquin Valley[29] (25.1 million); and the Los Angeles Basin to the Central Coast[30] (22.1 million).

By 2040, interregional travel is forecasted to increase by 50.9 percent to 544.7 million (Exhibit 1.5) trips annually, out of which about 70 percent of the increased demand can be addressed through an efficient rail network, mainly in the mid- to long-distance range. The mode shift model shows that almost 90 percent of the long distance travel (200- to 350-mile range) can potentially be handled by HSR that is well connected to the statewide network. The regional economic concentration will be reflected in California's five busiest interregional travel corridors by 2040, which are projected to account for over 60 percent of the total 544.7 million interregional person trips by year 2040:

- Los Angeles Basin to/from San Diego (139.1 million)
- Sacramento to/from San Francisco Bay Area (73.5 million)
- San Francisco Bay Area to/from the northern San Joaquin Valley (48.9 million)
- Los Angeles Basin to the southern San Joaquin Valley (38.9 million)
- San Francisco Bay Area to/from Central Coast (29.7 million)

The rail system will be an important element for meeting this growing interregional travel demand, and a better integrated rail/transit system with high-speed service can serve a higher proportion of this demand. As portrayed in Exhibit 1.5, the growth in interregional passenger travel and 2040 annual two-way person trip figures shows that several regional pairs are expected to experience over 70 percent increases in interregional travel (see reddish-brown arrows). These include the San Francisco Bay Area-Sacramento, San Francisco Bay Area-San Joaquin Valley South, Sacramento-San Diego, Sacramento-Northern California, Sacramento-San Joaquin North, and Sacramento-San Joaquin Valley-South pairs. The interregional market growth are shown as percentages in boxed numbers which will likely continue to involve travel between the State's major metropolitan areas and adjacent regions, such as the Los Angeles Basin-San Diego and San Francisco Bay Area-Sacramento pairs.

24 Includes Ventura, Los Angeles, San Bernardino, Orange, Riverside, and Imperial Counties.

25 California Statewide Travel Demand Model, 2016.

26 Includes Placer, El Dorado, Yuba, Sutter, Sacramento, and Yolo Counties.

27 Includes Sonoma, Napa, Solano, Marin, Contra Costa, San Francisco, Alameda, San Mateo, and Santa Clara Counties.

28 Includes San Joaquin, Amador, Calaveras, Stanislaus, Tuolumne, Merced, Mariposa, and Madera Counties.

29 Includes Fresno, Kern, Kings, and Tulare Counties.

30 Includes Monterey, San Benito, San Luis Obispo, Santa Barbara, and Santa Cruz Counties.

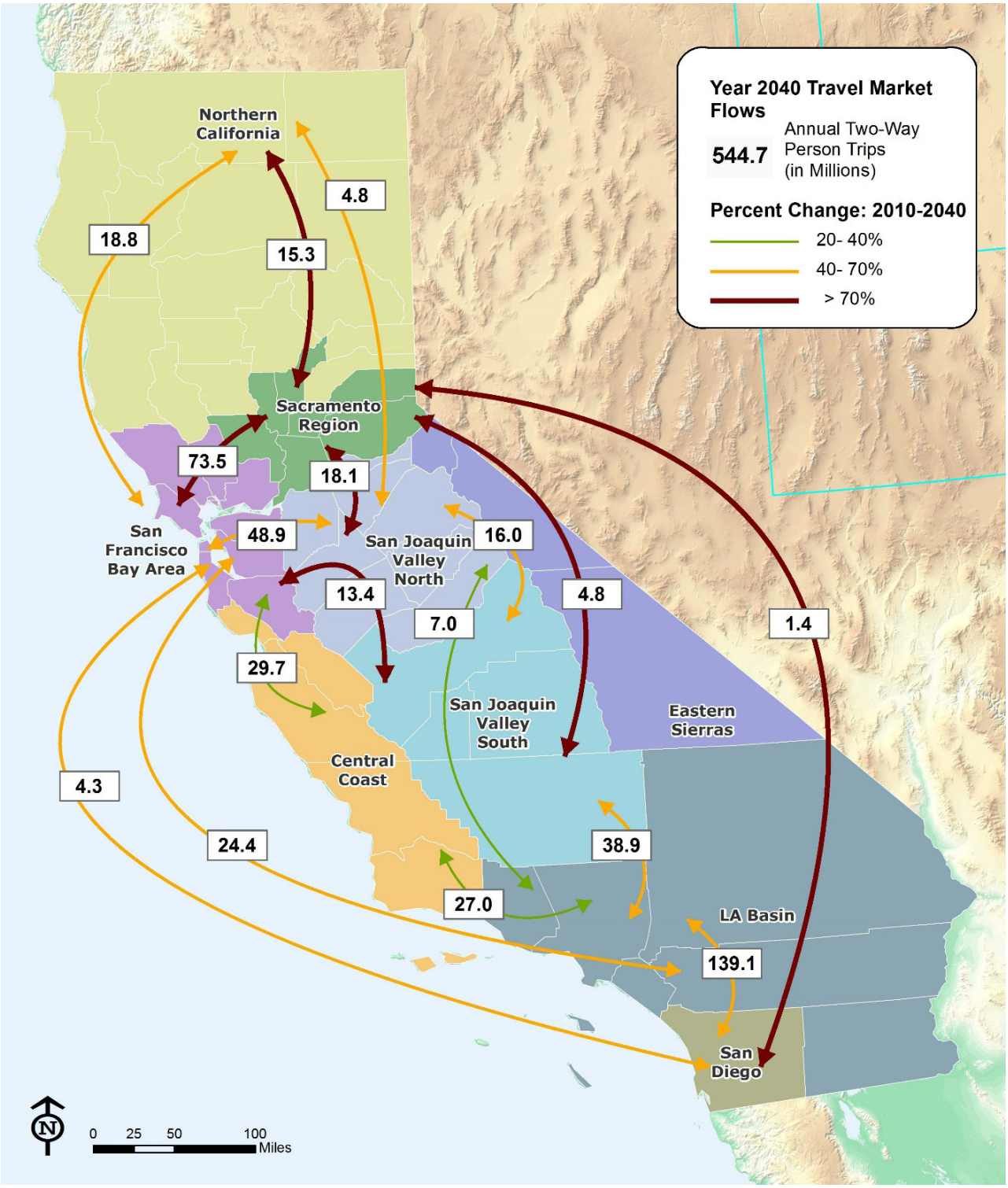


Exhibit 1.5: Growth in Intraregional Personal Travel, 2010 to 2040[31]

Note: This exhibit shows data for the largest and/or highest growth interregional travel markets. Some travel markets are not shown on the map to retain legibility.

31 California High Speed Rail Authority, *California High-Speed Rail Ridership and Revenue Model,* 2016.

1.3.4 Freight Demand and Growth Trends

As of 2015, California is the sixth largest economy in the world, with a gross domestic product of over $2.4 trillion.[32] California businesses export roughly $162 billion worth of goods to more than 225 foreign countries annually,[33] and all of this has implications for freight rail in the state.

To understand how traffic trends may impact California's rail system, traffic was projected for the year 2040 and compared against a base year of 2013.[34] Overall base year and 2040 tonnages for the top carload commodities are shown in Exhibit 1.6 and Exhibit 1.7.

In 2013, 62.1 million and 98.6 million tons of goods were moved in carload and intermodal services, respectively. The large share of intermodal traffic reflects the substantial container volumes associated with the San Pedro Bay and Oakland ports. By 2040, these totals are expected to grow to 96.8 million tons of carload and 213.3 million tons of intermodal, respectively; with compound annual growth rates of approximately 1.7 and 2.9 percent for carload and intermodal service, respectively. The top five carload commodities are anticipated to grow at similar rates, with cereal grains showing the strongest growth. For intermodal traffic, mixed freight shows the greatest increase, with its share of the market increasing from 57 percent in 2013 to 65 percent in 2040.

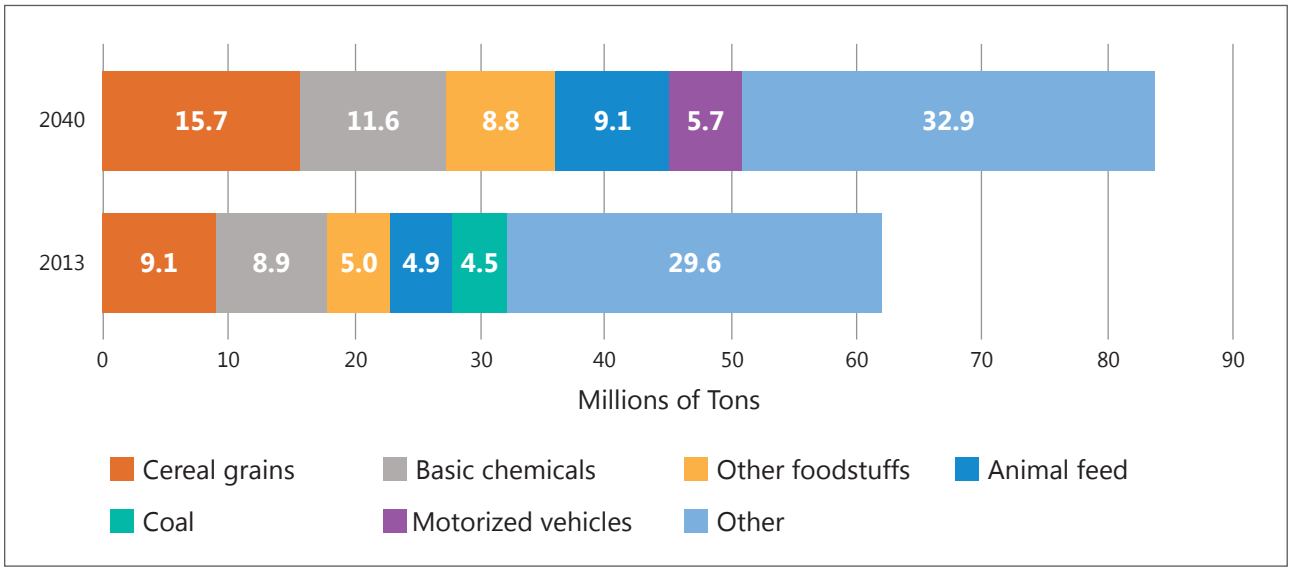


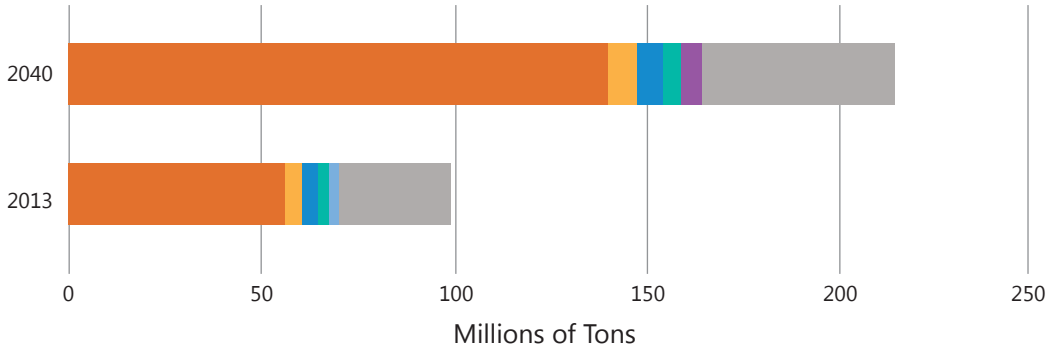
Exhibit 1.6: Top 5 Rail Carload Commodities (millions of tons), 2013 and 2040[35]

32 International Monetary Fund, World Economic Outlook Database, April 2015;
Bureau of Economic Analysis, California Gross Domestic Product: advance estimate as of June 10, 2015.

33 International Trade Administration, *"Trade Stats Express. U.S. Dept. of Commerce"* (2012).

34 The process was used to develop the rail traffic forecast is described in Appendix A.

35 Source: STB Confidential Carload Waybill Sample and forecast from FHWA Freight Analysis Framework 3.5.



Commodity	2013	2040
Mixed freight	56.2	139
Cereal grains	4.7	8
Basic chemicals	3.5	7.2
Gravel	3.1	4.6
Textiles/leather		4.6
Other foodstuffs	2.6	
Other	28.4	49.9

Exhibit 1.7: Top 5 Rail Intermodal Commodities (millions of tons), 2013 and 2040[36]

36 Source: STB Confidential Carload Waybill Sample and forecast from FHWA Freight Analysis Framework 3.5.

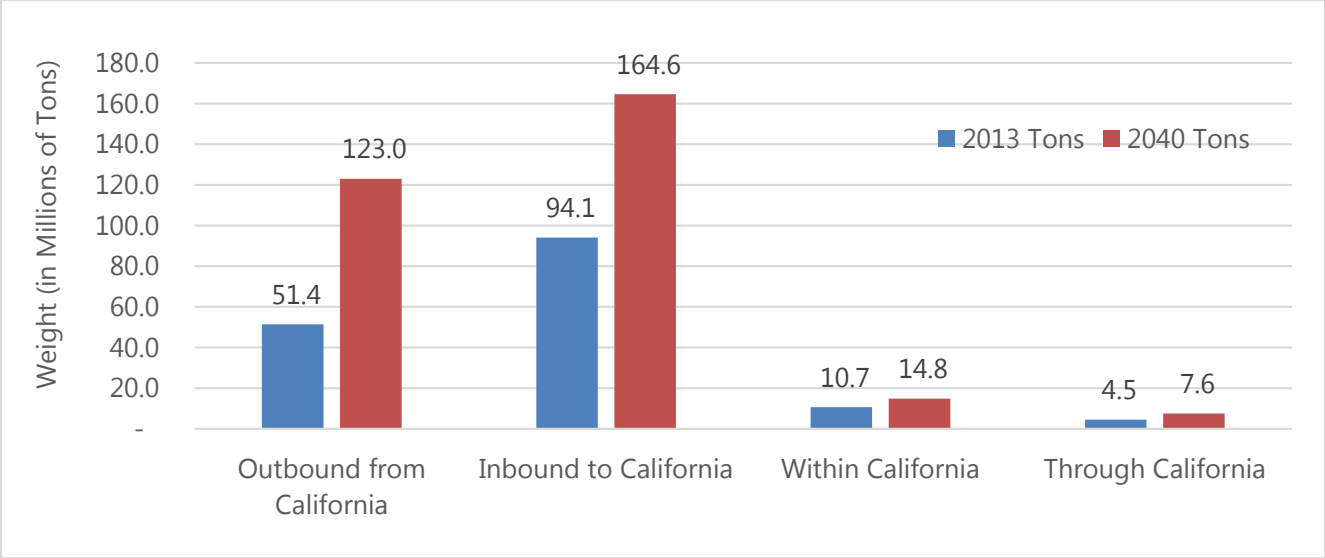


Exhibit 1.8: Directional Distribution of California Rail Tonnage, 2013 and 2040[37]

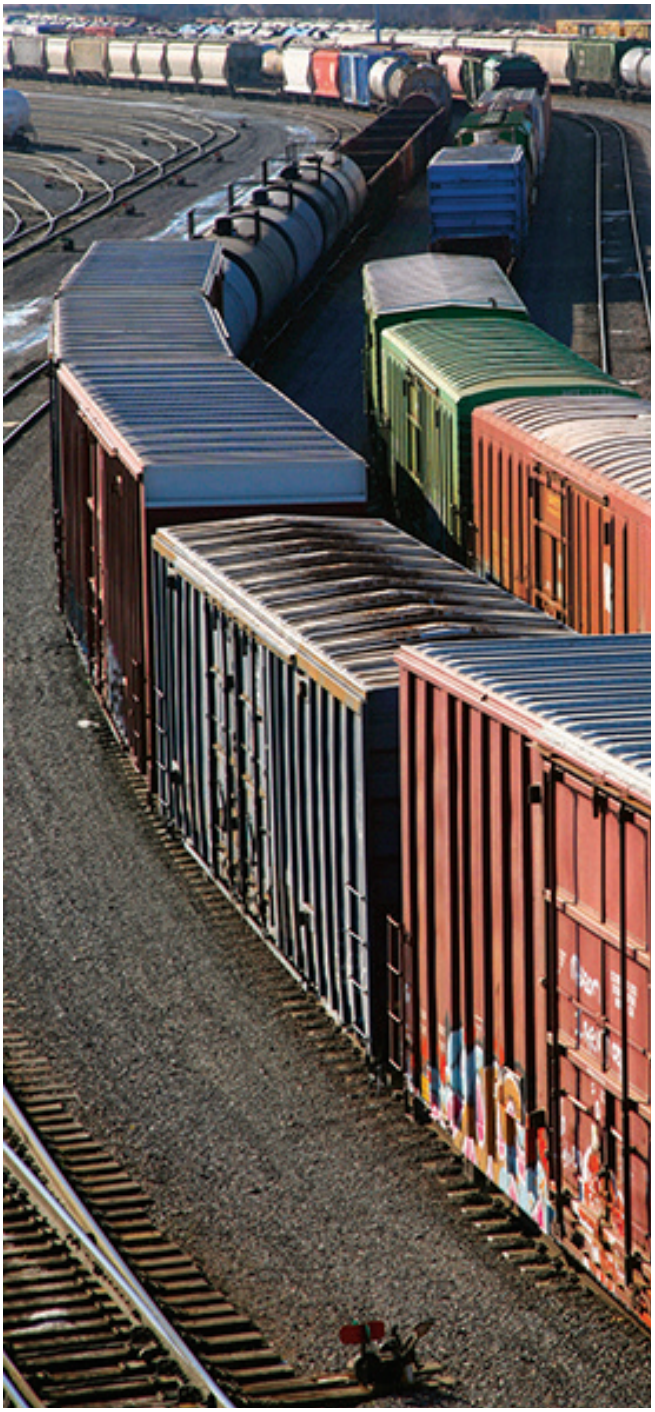
Exhibit 1.8 shows the general inbound, outbound, intrastate, and through flow of tonnage in California. The majority of the traffic is either inbound or outbound. Intrastate traffic is negligible, a reflection of California's economic geography and the superior competitiveness of rail for long-haul moves. Similarly, California's location and the topography of its rail network result in very modest volumes of through-traffic.

Both inbound and outbound traffic are expected to increase by roughly the same amount: approximately 70 million tons. Because the outbound tonnage is almost half the amount of the inbound tonnage in 2013, the increase in outbound tonnage seen in 2040 is more substantial than that of inbound traffic.

37 Surface Transportation Board, 2013 STB Confidential Carload Waybill Sample, Freight Analysis Framework (FAF) 3, Ports of Long Beach and Los Angeles, 2013.

Exhibit 1.9 and Exhibit 1.10 show the general direction of movement of tonnage by region for intermodal and carload traffic.[38] Notably, in 2013, 63 percent of all traffic (intermodal and carload tons) originated and terminated in the Midwest/Northeast (including Canada) and Pacific Northwest (North). At the same time, 31 percent of all traffic originated and terminated in the Southeast (southern states and Mexico). Intermodal traffic is a mostly east-west flow, while the westbound flow from the Midwest/Northeast dominates carload movements. This total traffic will double by 2040; the directional flows remaining largely the same: 63 percent to/from the Midwest/Northeast and Pacific Northwest, and 32 percent to/from the Southeast. Rail traffic within California (the circular flows) will grow by 38 percent from 2013 to 2040.

Current and projected 2040 freight train volume trends along California's principal network are shown in Exhibit 1.11 and Exhibit 1.12, which describe that freight growth along the transcontinental route is increasing at a much faster pace than the population growth in California, demonstrating the role that California plays in the nations good's movement and overall economy. These figures reflect line-haul freight trains only, and do not include locals and other movements such as light engines, equipment transfers, and maintenance of way. The strongest growth in freight traffic is expected along the Union Pacific Railroad's (UPRR's) Sunset Route east of Los Angeles, and the BNSF Railway's (BNSF's) Central Valley Route south from Sacramento to Barstow and east of Los Angeles on BNSF and UPRR routes. The highest growth in intermodal rail traffic is expected east of Sacramento on the UPRR Overland Route, south of Sacramento through the Central Valley towards Barstow, and between Los Angeles and points east. Consistent with recent trends, intermodal train volumes are expected to grow faster than carload volumes.



38 For the definition of the regions found in the respective exhibits, please refer to Chapter 4.

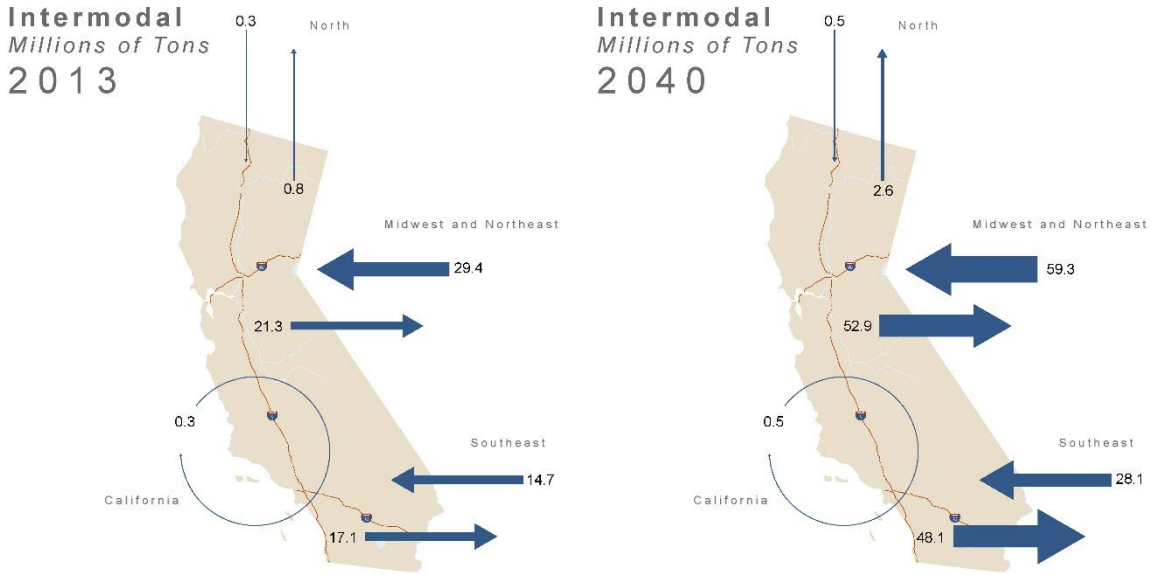


Exhibit 1.9: Intermodal Freight Flows 2013 and 2040, Tonnage and Direction[39]

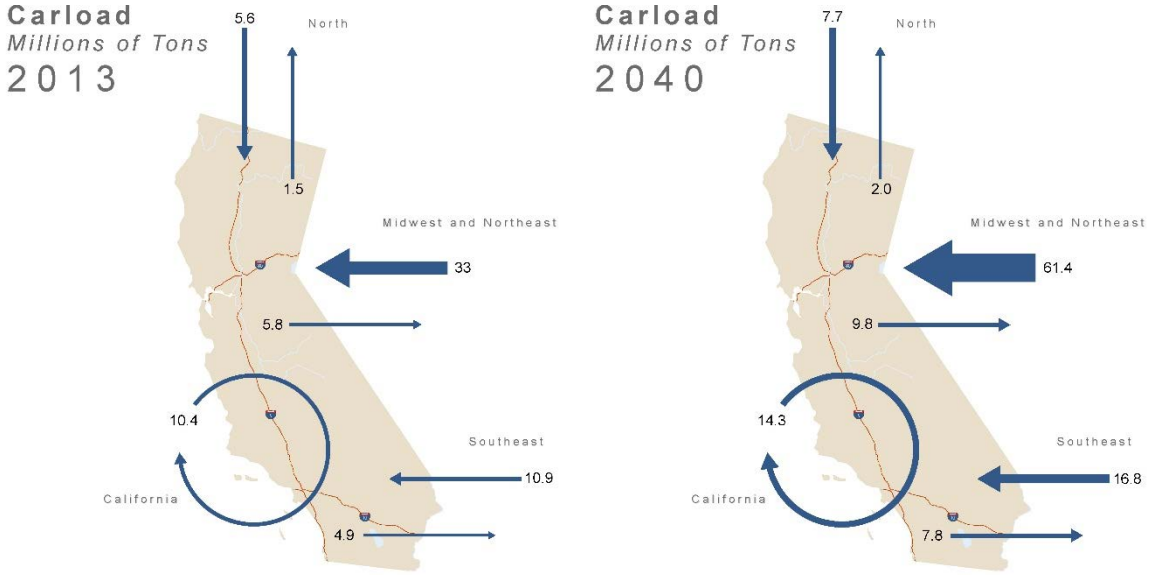


Exhibit 1.10: Carload Freight Flows 2013 and 2040, Tonnage and Direction[40]

39 Surface Transportation Board, *2013 STB Confidential Carload Waybill Sample, Freight Analysis Framework (FAF) 3, Ports of Long Beach and Los Angeles.*

40 Surface Transportation Board, *2013 STB Confidential Carload Waybill Sample, Freight Analysis Framework (FAF) 3, Ports of Long Beach and Los Angeles.*

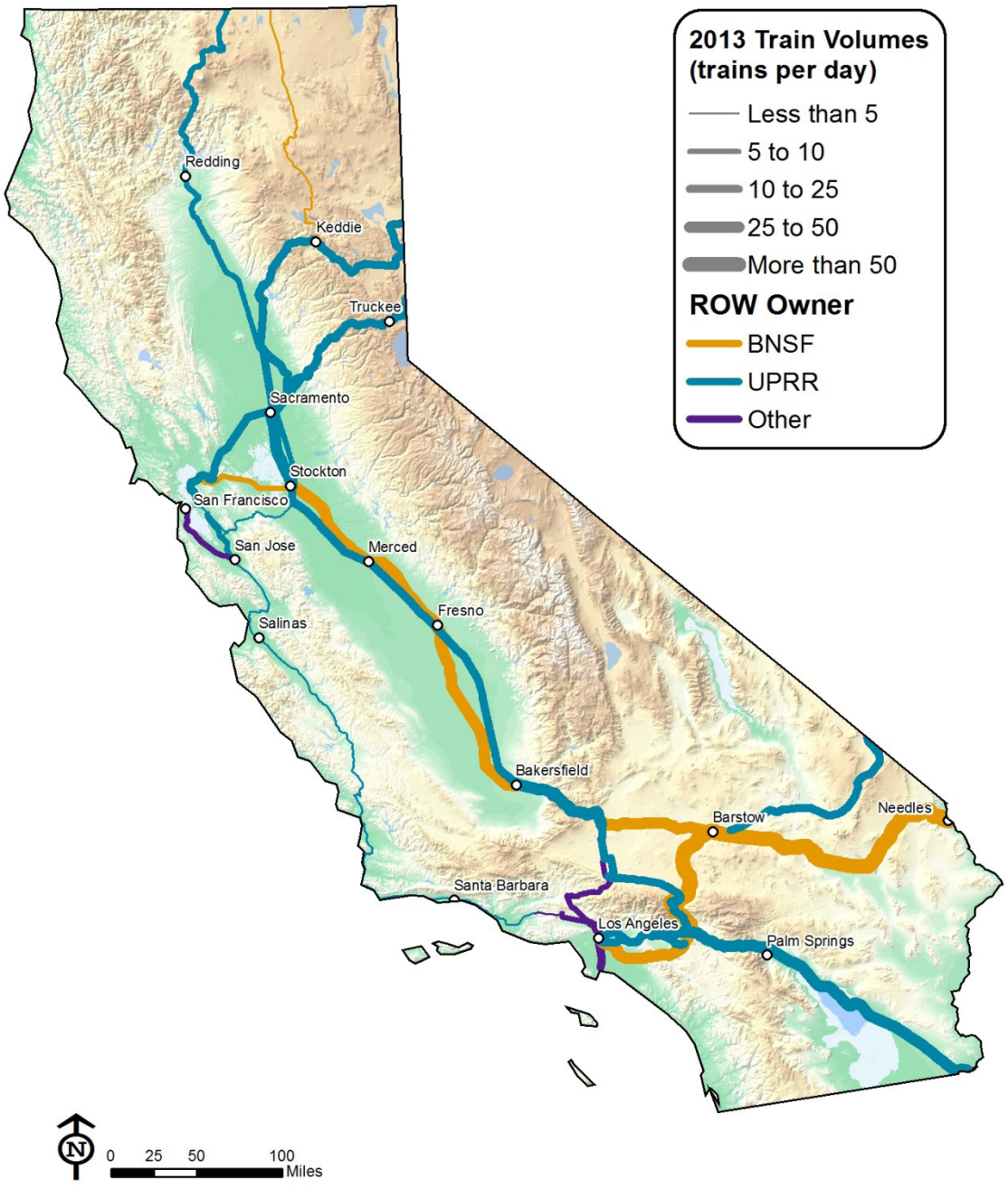


Exhibit 1.11: Line-Haul Freight Train Volumes, 2013

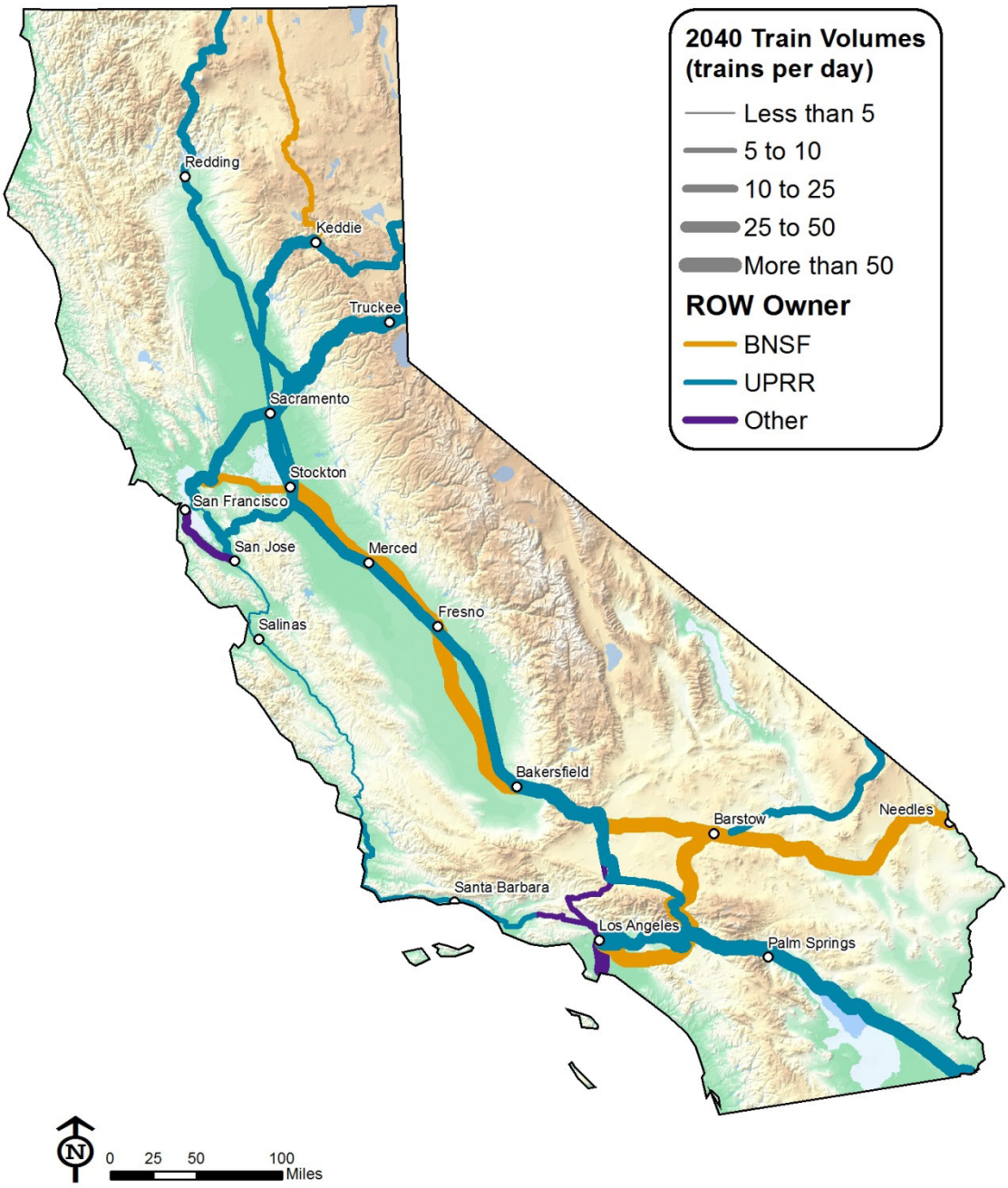


Exhibit 1.12: Change in Line-Haul Freight Train, 2013-2040

As visible in Exhibit 1.11 and Exhibit 1.12, the greatest growth is seen on the BNSF's Needles Subdivision between Barstow to Needles, and the UPRR's Yuma Subdivision around Palm Springs, with an increase of 60 and almost 50 trains per day, respectively. The UPRR Fresno, the BNSF Stockton, and the BNSF Bakersfield Subdivisions through Central Valley each will have a modest increase of around 20 freight trains per day. Combined across corridors, freight movement between Stockton and Sacramento will have an increase of more than 60 freight trains per day. The UPRR Roseville Subdivision from Sacramento to Reno (east of Truckee) will have increase of almost 50 freight trains per day. A significant mode shift from highways to rail is assumed by rail forecasts along these long-distance freight corridors, implicitly implying the capacity improvements that will need to be constructed along major trade corridors. It is pertinent that the State's policy supports the infrastructure to accommodate the projected growth, and maintain California's competitive edge in the global market and throughout the nation.

1.3.5 Land Use and Quality of Life

For decades, California has both benefitted from and been challenged by high rates of growth and urbanization. Often, this growth has taken the form of low-density suburban sprawl, placing burdens on the transportation network and the environment as California's infrastructure expansion struggled to meet demands to move people and goods over greater distances. However, recent policies and trends suggest that perhaps that pattern may be slowing down, which could shorten trips, and therefore help alleviate congestion and reduce emissions.

Land use and transportation policy are connected and co-dependent. The ultimate goal of both is to sustainably manage growth while continuing to facilitate economic development and improved quality of life. State policy actions, specifically the passage of SB 375 (2008),[41] reflect the State's recognition of the importance of coordination as a way to create healthy communities. Many local jurisdictions have begun implementing land use policies targeted toward transit-oriented development (TOD),[42] infill development[43] and other strategies likely to increase passenger rail demand.

41 SB 375 is the Sustainable Communities and Climate Protection Act of 2008—explained in Section 1.5.2.

42 TOD: moderate to higher-density development in easy walking distance of a major transit stop.

43 New development and redevelopment projects on vacant or underused land in existing developed areas.

Rail has a unique effect among transport modes, in that its structure of networked nodes (organized around rail stations and connection points), and spatial efficiency (moving more people and goods using less physical space) lends itself to efficient land use. A connected network, "specifically, the synergy between a modern, statewide rail network, with HSR as its backbone, will catalyze more compact land use patterns, the combined effect of which will be even greater reductions in GHG emissions."[44] This effect has key benefits, both for the transportation system and the environment, because concentrated development around stations spares rural land and open space from the pressures of urban development. Less energy and travel time are needed to transport people and goods. With efficient use of rail, positive environmental and social benefits are created for communities, while further enhancing economic strength and resilient transport networks.

Some regions, like MTC, have developed their Sustainable Communities Strategies (SCS) to identify that all new development must happen in the existing urban footprint.[45] These types of strategic and coordinated land use and transportation planning processes are also supported by State environmental goals,[46] as described by the Air Resources Board and the Strategic Growth Council.

Integrating rail systems with multimodal transportation and land use planning that minimizes sprawl offers residents, workers, and tourists more travel choices and better access to jobs, retail, entertainment, recreational facilities, and open spaces. A connected statewide network will improve the quality of life for all, and help mitigate concerns regarding access, particularly for those people living in transit-dependent households, which are often vulnerable communities. By working to connect passenger and commuter rail systems with complementary transit, bicycle, and pedestrian infrastructure, greater access and mobility will be realized. These improvements support livable communities for all, improved public health, and reductions in vehicle miles traveled (VMT) and automobile dependency.

Station Area Planning

Robust station area planning is an important land use and development trend that can help solve the first mile/last mile challenge, maximize ridership, integrate statewide services, and optimize returns on public investment. Dense, walkable development proximate to rail stations not only provides seamless connections between rail services and origins and final destinations—thereby decreasing overall travel times—but also leverages public investment in the rail network through sustainable development and value capture. Focusing urban development at or near rail stations is important in preventing sprawl, maintaining neighborhood affordability and equity, sustainably growing California's cities and communities, and maximizing the environmental benefits of integrated statewide rail transportation.

Rail stations are complex places that must balance the competing needs of physical rail infrastructure, often multiple rail service providers or public agencies, and the needs of the local community and local governments. Because of the value created through effective rail transportation, the land on, above (air rights), or walkable to rail stations is typically highly valuable relative to where the station is located and how well it is served. Planning is needed to effectively understand the trade-offs involved in prioritizing dense, walkable development, transit access, and/or parking availability. Strategic implementation of those plans is needed for effective development around stations, and to capture the value created by the station. For these reasons, effective, long-range planning and governing structures are crucial to both optimizing the station operations and leveraging the value created in the community.

44 California High Speed Rail Authority, California High-Speed Rail Sustainability Report, (December 2016).

45 Plan Bay Area (MTC's SCS) identifies Priority Development Areas and Priority Conservation Areas, and calls for all new development to happen in the current urban footprint. Other MPOs are prioritizing urban infill development.

46 California Air Resources Board, Vibrant Communities and Landscapes A Vision for California in 2050. (2016).

1.3.6 Environment

The California Air Resources Board's 2014 update to its Climate Change Scoping Plan emphasized increased certainty in humans' role in climate change and accelerating the impacts of climate change, which is already affecting California through its contributions to extreme heat, more frequent and intense wildfires, low air quality, and sea level rise. An increase in the global average temperature of 3.6 degrees Fahrenheit (°F) above pre-industrial levels (2.0°F above present levels) "poses severe risks to natural systems and human health and well-being."[47]

Rail investments contribute to reduced impacts on the environment by offering shippers and travelers a cleaner alternative to motor vehicle and air travel. In the Bay Area, the Caltrain corridor alone is responsible for saving over 200 metric tons of GHG emissions per day. Over the course of the year, that equates to 50,000 metric tons of carbon dioxide saved, and over 1 million dollars on the cap-and-trade market, just from mode shift.[48] Electrification of the Caltrain line will lead to further net air quality benefits in the form of reduced on-board emissions from the switch away from diesel trains.

47 California Air Resources Board, *First Update to the Climate Change Scoping Plan* (2014).

48 UC Berkeley, UC Connect Study, *Rail and the California Economy* (2017).

Passenger rail services often provide cost- and time-competitive alternatives to auto travel, particularly when accompanied by increased development density, mixed land uses, connected transit services, and safe bicycle and pedestrian ingress and egress to stations. The freight rail system reduces environmental impacts further by removing heavy truck traffic from roadways. The Ventura County Port's reinvestment in their short line railroad (Ventura County Railroad [VCRR]) has taken the equivalent of 5,000 trucks off the road each year at a reduced emissions profile.[49] Reduced motor vehicle use eases roadway congestion and improves air quality by lowering on-road emissions. Investments in grade separations and crossings also reduce surface vehicle traffic delays and associated emissions per mile. Additional emissions reductions result from requirements for diesel locomotives, and State and regional investment in cleaner locomotives, as well as other operational improvements, such as electric wayside power at layover facilities and stations.

California's set of vehicle, fuel, and land use policies are projected to decrease passenger transportation emissions by 50 percent over the next 2 decades.[50] Because rail travel generates significantly lower GHG emissions per passenger mile and freight ton-mile than autos and trucks, investment in rail facilities promotes progress toward meeting State GHG emissions reduction goals.

In 2015, Amtrak riders in California generated approximately 835 million passenger miles.[51] Four of California's commuter railroads—Caltrain and Altamont Corridor Express (ACE) in the Bay Area, Metrolink in the Los Angeles area, and COASTER in San Diego County—carried 107,000 riders on average per weekday in 2015, generating a savings in VMT of 3.2 million.[52]

49 UC Berkeley, UC Connect Study, *Rail and the California Economy* (2017).

50 California Air Resources Board First Update to the Climate Change Scoping Plan, (2014).

51 Amtrak, *Amtrak Fact Sheet, Fiscal Year 2015 State of California,* 2016.

52 Assuming an average trip length of about 30 miles per Public Transportation Fact Book, American Public Transportation Association (2011).

1.3.7 Safety

The Federal Railroad Administration (FRA) tracks "all accidents and incidents resulting in injury or death to an individual or damage to equipment or a roadbed arising from the carrier's operations during the month."[53] Exhibit 1.13 indicates California and national passenger rail–related accidents and incidents from 2006 to 2015. Overall accidents/non-fatal incidents in California accounted for 8 percent, and mirrored the national average.

Despite these trends, the FRA reports that fatalities per mile are 17 times more likely in an auto than in an intercity passenger train.[54] Moving freight by rail reduces the number of trucks on roads—reducing congestion and the potential for truck-related accidents. This supports the State's goal of adopting a 'Toward Zero Deaths' practice in coordination with local Vision Zero programs to achieve zero fatalities or serious injuries on highways and arterial roads.[55]

Investments in new technologies, such as Positive Train Control, can further contribute to improved rail system safety. At-grade crossing improvements, such as crossing gates, warning systems, physical barriers, and grade separations, help reduce potential conflicts between rail vehicles, motor vehicles, bicyclists, and pedestrians.

Investment in HSR further improves the safety of the rail system. Mode shift leads to reductions in VMT, which lead to lower incidences of traffic accidents; and an integrated, statewide rail network provides a competitive alternative to driving.

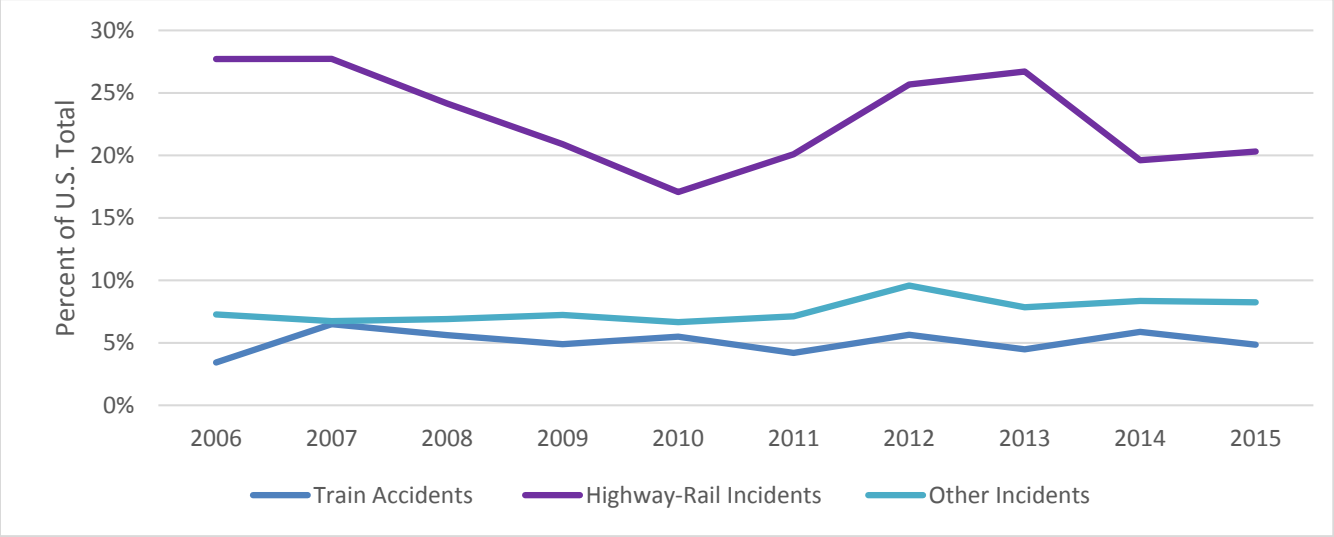


Exhibit 1.13: California Passenger Rail Accidents as a Percent of the National Total [56]

53 FRA, *FRA Guide for Preparing Accident/Incident Reports* (2011).

54 Federal Railroad Administration, Office of Safety Analysis, accessed 2016, The rate for intercity passenger rail = 0.43 per billion; for car passengers/drivers = 7.3 per billion.

55 Caltrans, California Transportation Plan 2040, (2016).

56 FRA, Office of Safety Analysis Website. Accessed 2016.

The CHP Office of Traffic Safety (OTS) reports annual fatality and injury statistics. Using 2010 as the base year,[57] OTS reported 2,739 persons killed, or $25.3 billion dollars in damages—just associated with loss of life. In 2010, there were nearly 200,000 additional injury collisions, and over 250,000 property-damage only collisions,[58] resulting in billions more in damages. The HSR analysis also assumes accident rates stay constant over time; therefore, the only possibility for a reduction in incidences of accidents comes from mode shift. Further safety improvements and economic benefits will result from the integration of the entire network, as outlined in the Rail Plan.

1.3.8 Tribal Context

In addition to all of the mobility, economic, and environmental benefits enjoyed by all Californians, the Rail Plan will continue to focus planning efforts on protecting and promoting California's diverse cultural heritage and resources. The planning process for the Rail Plan has included specific outreach to Native American Tribal partners and stakeholders, in an attempt to understand their concerns, and for these communities to share in the benefits of a modernized, fully integrated rail system. Through various outreach programs, including listening sessions and formal consultation, Tribes have had opportunities throughout the development of the Rail Plan to identify sensitive lands and specific cultural and environmental concerns that may be impacted by the build-out of the 2040 Vision. By working closely with Tribal representatives, the planning team was able to provide geographic- and context-specific information for Tribes that requested such, and to respond to concerns. The accessibility and mobility benefits of an integrated rail system need to be realized by all Californians, and this process helped to ensure the Rail Plan reflects the specific needs and desires of Native American Tribes.

Both passenger and freight rail systems, if properly maintained, serve as engines of economic growth, contribute to State environmental goals, improve safety, and enhance Californians' quality of life. The Rail Plan provides the framework for helping the State rail system meet these goals. Specifically, the integrated service concept in the Rail Plan will facilitate a coordinated rail system, increasing its utility for existing rail users, incentivizing more rail travel, and further leveraging rail's economic, environmental, safety, and quality-of-life benefits.

57 2010 numbers were used for consistency with the HSR BCA data years, but it is worth noting that fatal accidents have increased every year since, and accidents per VMT have also increased.

58 California Highway Patrol. *2010 Annual Report of Fatal and Injury Motor Vehicle Traffic Collisions* (2010).

1.4 Policies and Programs

The Federal and California State governments have developed a series of policies and planning documents to guide the transportation system toward a more efficient use of public dollars by investing in the entire intermodal network—including highway, rail, and transit—and also addressing other trends in sustainability[59] and smart growth.[60]

1.4.1 Federal Policy Trends

Recent Federal transportation policies have shifted toward the application of performance-based planning principles, which rely on data and analytics to support policy decisions that help achieve desired outcomes. The Moving Ahead for Progress in the 21st Century Act of 2012 mandated a renewed emphasis on performance management in Federal-aid programs, and called for integrating performance-based approaches in statewide and regional transportation planning practices.

The most recent Federal surface transportation reauthorization legislation, the Fixing America's Surface Transportation Act of 2015 (FAST Act), allocates funding to states for highway, transit, and railway programs over a 5-year period. The FAST Act continues and reinforces the goals set forth in the Moving Ahead for Progress in the 21st Century Act of 2012, calling for performance-based BCAs to support prioritization and funding of State plans and programs. Other Federal programs offer additional funding through competitive, performance-based grant programs. This shift toward performance-based planning has in turn forced State and regional planning and funding systems to require clear performance s, measurable metrics, and achievable benchmarks.

The Transportation Investment Generating Economic Recovery (TIGER) grant program supports multi-modal and multi-jurisdictional projects, which are difficult to fund through traditional Federal programs. Awards focus on capital projects that generate economic development and improve access to reliable, safe, and affordable transportation for communities: both urban and rural.[61]

The FAST Act established a new National Highway Freight Program, with dedicated funding. Although the program is focused on highways, up to 10 percent is set aside for rail, ports, and intermodal projects. The program includes funds apportioned to states on a formula basis, and FASTLANE competitive grants. This new Federal program provides new opportunities for the State's freight rail program.

Eligible projects for INFRA/FASTLANE grants include railway-highway grade crossing or grade separation projects, or a freight project that is 1) an intermodal or rail project; or 2) within the boundaries of a public or private freight rail, water (including ports), or intermodal facility. For a freight project within the boundaries of a freight rail, water (including ports), or intermodal facility, these funds can only support project elements that provide public benefits.[62]

59 In ecology, sustainability is the capacity to endure; it is how biological systems remain diverse and productive indefinitely. However, in more general terms, sustainability is the endurance of systems and processes.

60 Smart growth is an urban planning and transportation concept that concentrates growth in compact, walkable urban centers to avoid sprawl.

61 USDOT, *TIGER Discretionary Grants,* 2016.

62 USDOT, FASTLANE Notice of Funding Opportunity, 2016.

1.4.2 State Policy Trends

California has been at the forefront in proactively identifying and addressing critical trends that impact the condition and performance of a statewide transportation system, including:

- **Climate change.** Since 2002, State legal and administrative directives have set policies aimed at reducing GHG emissions to limit the harmful effects of climate change. Investment in efficient freight and passenger rail systems constitute key steps towards meeting the targets of the following policies":
  - California's landmark "Global Warming Solution's Act of 2006," AB 32, created the Cap-and-Trade program, and requires that California's GHG emissions be reduced to 1990 levels by the year 2020. Executive Order B-30-15 (2015) establishes a California GHG reduction target of 40 percent below 1990 levels by 2030, and reaffirms the long-term target of reducing GHGs to 80 percent below 1990 levels by 2050 (Executive Order S-3-05).
  - SB 375, the "Sustainable Communities and Climate Protection Act of 2008," promotes integrated transportation and land use planning at the regional level to reduce GHG emissions from passenger vehicle travel, and helps California meet AB 32 goals. SB 375 requires the California Air Resources Board to develop regional GHG emissions reduction targets for passenger vehicle travel, setting benchmarks in 2020 and 2035 for each of the State's 18 Metropolitan Planning Organizations[63] (MPOs).[64]
  - AB 1482 (2015) directs ongoing updates to the State's climate adaptation strategy, Safeguarding California (beginning in 2017), and requires future updates (every 3 years) to describe the vulnerabilities from climate change in a minimum of nine specific sectors, including transportation. It also identifies the priority actions needed to reduce climate risks in each of the sectors.[65] Investment in efficient freight and passenger rail systems constitutes key steps toward meeting these targets.
- **Dedicated State support for passenger rail systems.** Governor Brown signed into law SB1, the road repair and accountablty act of 2017—the first legislation in over twenty years to significant increase state transportation funding.[66] In addition to dedicated funding programs for rail, SB1 authorized the Solutions for Congested Corridors Program, which will provide $2.5 billion over 10 years for multimodal investments to improve the State's most congested travel corridors. Corridor-based planning to be undertaken by Caltrans will place increased emphasis on rail and transit as a competitive solution for relieving congestion on state highways and reducing greenhouse gas emissions.
- **Complete streets.** AB 1358 (2008) requires cities and counties to include complete streets policies in their general plans. These policies aim to ensure that roadways safely accommodate bicyclists, pedestrians, transit riders, children, the elderly, the disabled, and motorists. Complete streets policies can help improve Californians' first-mile and last-mile connections to the state passenger rail system via urban transit, commuter rail, and intercity rail hubs.

63 A metropolitan planning organization is a federally mandated and federally funded transportation policy-making organization in the United States that is made up of representatives from local government and governmental transportation authorities.

64 Caltrans, 2013 *California State Rail Plan* (2013).

65 Ibid.

66 California Transportation Commission, *General Overview: SB1.*

- **Sustainable goods movement.** In 2015, Governor Brown issued Executive Order B-32-15, which directs State agencies to improve freight efficiency, transition to zero-emission technologies, and identify State policies, programs, and investments to achieve these goals while increasing the competitiveness of California's freight system. Ensuring efficient access to markets through the freight rail system is a central component of this strategy.
- **Mitigating transportation impacts.** SB 743 (2013) created a process to change the way transportation impacts are analyzed and mitigated, including promoting the reduction of GHG emissions, emphasizing infill development (use of existing undeveloped land), enhancing multimodal transportation options, and encouraging a diversity of land uses. SB 743 provides exemptions to the California Environmental Quality Act (CEQA) requirements to help streamline the environmental review process for certain transit and rail accessibility projects that do not add motor vehicle capacity.
- **Environmental Justice.** SB 535, signed into law in September 2012, established environmental justice goals and requirements for the Cap-and-Trade program. The law addresses concerns that actions taken to achieve the goals laid out by AB 32 must not disproportionately affect low-income and disadvantaged communities. It states that 25 percent of the cap-and-trade funds are required to be used for projects that will benefit disadvantaged areas, and that at least 10 percent must be allocated to projects actually located in disadvantaged communities. This legislation is part of increasing emphasis at the State level to link environmental justice, public health, and social and racial equity issues with other State goals, including GHG reductions and transportation goals.
- **Cap-and-Trade.** AB 32 created the Cap-and-Trade Program, which requires California to reduce its GHG emissions to 1990 levels by 2020—a reduction of approximately 15 percent below emissions expected under a "business as usual" scenario. In addition, SB 862 established a long-term funding plan for portions of Cap-and-Trade Program money, including a continuous appropriation of 25 percent of the funds to HSR and 10 percent to the Transit and Intercity Capital Program. The Transit and Intercity Capital Program was created to provide grants from the Greenhouse Gas Reduction Fund (GGRF) to fund capital improvements that will modernize California's intercity, commuter, and urban rail systems—and bus and ferry transit systems—to reduce emissions of GHGs by reducing congestion and VMT throughout California. With the passage of SB 1, an additional $3 billion will be added to the Transit and Intercity Rail Capital Program (TIRCP) over the next 10 years. All of these mechanisms represent a significant and ongoing funding stream for the rail system.

1.4.3 Program Coordination

The Rail Plan is one of six periodically updated long-range modal plans that apply the vision, goals, and policies of the CTP to specific modes of travel. The Rail Plan clarifies rail's role in the multimodal transportation system.

California Transportation Plan 2040

California's long-range transportation plan, the CTP, is required, under SB 391 (2009), to identify "the statewide integrated multimodal transportation system" needed to reduce GHG emissions to 1990 levels by 2020, and 80 percent below the 1990 levels by 2050. SB 391 added this new requirement under AB 32 to help meet California's climate change goals by requiring the CTP to be updated every 5 years.

The CTP 2040 (2016) is an umbrella plan that integrates Caltrans' modal plans into a statewide multimodal transportation vision. CTP 2040 offers a detailed overview of the existing transportation network, and assesses future transportation trends and challenges. It offers strategies that improve mobility and accessibility across all modes, contribute to system preservation, support a vibrant economy, improve public safety and security, promote livable communities and social equity, and support environmental stewardship.

The CTP 2040 includes the State's transportation policies and performance objectives. It describes broad systemic umbrella concepts and strategies synthesized from Regional Transportation Plans (RTPs) and SCSs) and presents recommendations for transportation system planning. The CTP 2040 identifies a series of broad policies that aim to address recent trends and challenges, meet Federal and State regulatory obligations, and move toward a more efficient, competitive, multimodal transportation system (see Exhibit 1.14).

CTP 2040 Statewide Transportation Vision

California's transportation system is safe, sustainable, universally accessible, and globally competitive. It provides reliable and efficient mobility for people, goods, and services, while meeting the State's greenhouse gas emission reduction goals and preserving the unique character of California's communities.

INTERREGIONAL TRANSPORTATION STRATEGIC PLAN (ITSP)
Next Update: 2020

The ITSP is California's long-range planning document for the interregional transportation system that reflects input from the public, regional RTPs, and statewide modal planning. The ITSP prioritizes interregional state highway projects and summarizes information about other interregional transportation modes, including freight and passenger rail, to improve movement of people and freight safely and sustainably. The ITSP identifies 11 Strategic Interregional Corridors that are typically characterized by high volumes of freight movement and significant recreational tourism, and they constitute the most significant interregional travel corridors in California.

CALIFORNIA AVIATION SYSTEM PLAN (CASP)
Next Update: 2020

This plan includes updated programs and directives to better support aviation sustainability. The plan also provides guidance for Caltrans district planners and local planners for coordination with surface transportation systems, including rail and public transit systems.

CALIFORNIA FREIGHT MOBILITY PLAN (CFMP)
Next Update: 2019

The California Freight Mobility Plan is a statewide, long-range plan for California's freight transportation system. It was developed by CalSTA and Caltrans in consultation with the California Freight Advisory Committee. The plan includes designation of priority freight corridors and identification of improvement projects supporting interregional goods movement, and serves as a foundation for ongoing work to achieve a sustainable freight transport system.

STATEWIDE TRANSIT STRATEGIC PLAN (STSP)
Next Update: 2018

The STSP helps the State and partners gain a better understanding of present and future roles and responsibilities to support public transportation. The plan provides a framework for a cost-effective transit system to improve mobility, meet greenhouse gas emissions targets associated, provide improved access to jobs, and make environmental improvements.

CALIFORNIA STATE BICYCLE AND PEDESTRIAN PLAN (CSBPP)
Updated 2017

The Bicycle and Pedestrian Plan will guide the planning and development of non-motorized transportation facilities and maximize the use of future investments on the State Highway System and other State facilities. The CSBPP will plan for safe and integrated bicycle and pedestrian projects for enhanced connectivity with all modes, including plan intercity and commuter rail.

SUSTAINABLE FREIGHT ACTION PLAN (SFAP)
Updated 2016

Executive Order B-32-15 directed CalSTA and the California Environmental Protection Agency to develop a Sustainable Freight Action Plan in coordination with the California Air Resources Board, Caltrans, the California Energy Commission, and Governor's Office of Business and Economic Development. The SFAP is intended to promote the State's environmental, public health, and safety goals in the freight sector. This plan establishes targets to improve multimodal goods movement efficiency, a transition to zero-emission technologies, and the increased competitiveness of California's

Exhibit 1.14: Current Long-Range Transportation Plans

In response to State legislation and executive orders, CTP 2040 includes an innovative approach to address climate change and GHG emissions. Three scenarios were evaluated to illustrate the potential effectiveness of State policies, programs, and major investments on reaching GHG emissions goals. In addition to GHG reductions, each scenario was evaluated based on multimodal system performance and economic impacts.

Scenario analyses informed policy recommendations, which were refined through extensive outreach and coordination with stakeholders to reflect the full breadth of California's geographic and cultural diversity. The aim of CTP 2040 is to ensure that transportation and land use policy decisions and investments made at all levels of government, and in the private sector, will complement one another to enhance California's economy, improve social equity, support local communities, protect the environment, and achieve GHG reduction goals.

1.4.4 Regional Plans

A seamless interregional travel experience requires coordinated transportation planning and interagency cooperation with neighboring states, and at the State and regional levels. The FRA requires coordinated passenger rail planning under its new state rail planning guidelines. The FRA has indicated that the coordinated system-level and project-level planning presented in state rail plans and service development plans will be linked to future Federal funding for HSR or conventional intercity passenger rail projects.

Regional Transportation Plans

RTPs are the long-term blueprints of regions' transportation systems. MPOs and regional transportation planning agencies develop the RTPs as guided by Federal and State statutes. RTPs are the basis for statewide transportation plans, including the Rail Plan and CTP 2040, and all regional transportation investments, including regional and local rail.

Sustainable Communities Strategy

SB 375 not only updated AB 32 to strengthen the GHG reduction targets for the State, but also required each MPO to prepare an SCS as a key component of its RTP. SCSs tie transportation investments to sustainable growth patterns as a strategy for reducing GHG emissions. All SCSs must contain transportation, land use, and housing strategies as a means to develop plans at a regional scale to reduce emissions and promote long-term sustainable development patterns and investments.[67]

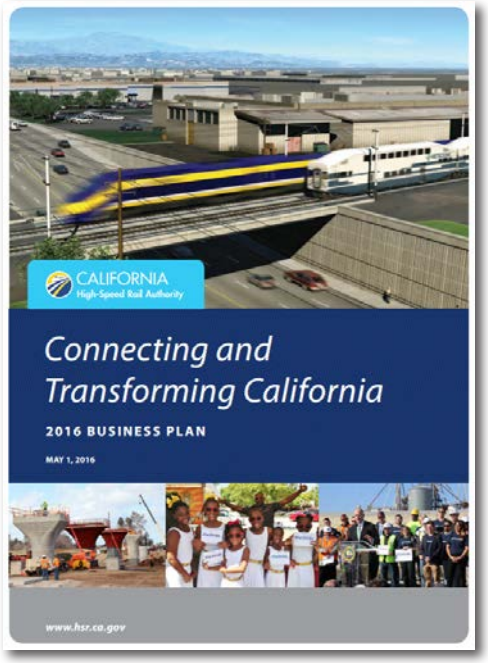
1.4.5 Corridor-Level Plans

In addition to the Federal, State, and regional planning activities, all initiatives, plans, and studies developed directly by service providers and stakeholder agencies themselves at a corridor level were reviewed to inform the development of this Rail Plan, and ensure that it aligns with local planning activities.

California High-Speed Rail Business Plan

The California High-Speed Rail Authority (CHSRA) is responsible for planning, designing, building, and operating the planned HSR corridor connecting Northern and Southern California via the Central Valley. Pursuant to AB 528, the High-Speed Rail Business Plan summarizes the most recent HSR System plans, services, ridership forecasts, and financial scenarios. Updated every 2 years, this document forms a key input into planning and modeling efforts for the Rail Plan. The latest business plan was published in 2016, and the next plan is scheduled to be published in 2018.

Key decision points in the 2016 Business Plan are the basis for service planning and capital cost estimations in the Rail Plan. Improvements and service goals determined in the 2016 Business Plan are detailed in Chapters 4 and 6.



67 Air Resources Board, *Sustainable Communities,* (2016).

Southwest Multi-State Rail Planning Study

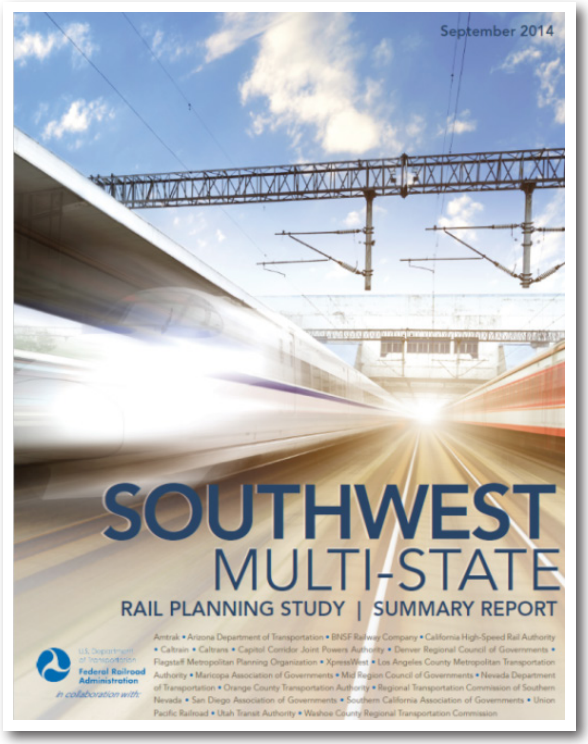
The Southwest Multi-State Rail Planning Study was a 2014 rail planning effort led by FRA. The study is part of a national effort to develop high-performance interstate passenger rail networks through a common preliminary technical vision and strategic planning at the multi-state and mega-regional level.

The study focused on Arizona, California, and Nevada, and parts of Utah, Colorado, and New Mexico, and identified key corridors for future planning. Those recommendations are carried in the Rail Plan with phased implementation steps the State of California can take to invest in those services, as well as future planning needs to continue to coordinate with stakeholders outside of California.

The Rail Plan shares guiding principles from the FRA study in its efforts to:

- **Support** development of safe, reliable, efficient, and interconnected multimodal travel options.
- **Balance** providing a premier transportation system with the duty to be a responsible steward of public dollars.
- **Consider** factors such as return on investment, cost-effectiveness, and modal alternatives when developing the network.
- **Envision** a preliminary multi-state rail network that supports environmental, social, and economic sustainability.
- **Encourage** cross-state coordination to achieve the most optimal outcomes in network planning.

Specifically, the Rail Plan's 2040 Vision builds on the study's vision for major corridors in California, and interstate connections between Sacramento and Reno and Los Angeles, Las Vegas, and Phoenix. The 2040 Vision also leverages lessons learned from the study; specifically, incorporating a multimodal perspective and recognizing the importance of Federal involvement in multi-state planning. Therefore, the Rail Plan seeks to integrate the Southwest Multi-State Rail Planning Study into existing and ongoing transportation planning efforts. The Rail Plan also includes specific funding and policy support for a Blue Ribbon Panel to organize relevant stakeholders and advance service planning.



Passenger Rail Corridor Investment Plans

A Passenger Rail Corridor Investment Plan (PRCIP), as defined by the FRA, consists of two primary elements: a Service Development Plan, which is focused on passenger rail service planning and alternatives analysis; and a programmatic, corridor-level environmental analysis of rail services being proposed. The PRCIP includes an alternatives analysis, and presents the preferred alternative that best addresses the underlying transportation issues. Completing a PRCIP is a precondition of high-speed and intercity passenger rail Federal investment.

Corridor System Management Plans

Caltrans also provides for the development of Corridor System Management Plans (CSMPs). CSMPs are developed to facilitate the efficient and effective movement of people and goods along California's most congested transportation corridors. CSMPs help Caltrans and its regional planning partners prioritize, implement, and manage multimodal investments. CSMPs are developed by Caltrans in consultation with local stakeholders, and they provide critical insights into rail capacity and intermodal accessibility issues and solutions at key chokepoints throughout California.

Each CSMP presents an analysis of existing and future travel conditions, and proposes traffic management strategies and transportation improvements to maintain and enhance mobility. Analyses encompass state highways, local roadways, transit, and other transportation modes. CSMPs result in a phasing plan of recommended operational improvements, intelligent transportation system strategies, and capacity expansion projects to maintain or improve corridor performance. CSMPs are required for all projects receiving funding from the Corridor Mobility Improvement Account under Proposition 1B[68] (2006).

1.4.6 Private-Sector Railroad Services, Initiatives, and Plans

Coordination with private-sector railroads was conducted to identify any plans and initiatives relevant to the State rail network. The two Class I (the largest class) railroads operating in California publicly announce their near-term investment plans annually. Most recently, BNSF's 2016 capital plan called for $4.3 billion in improvements system-wide, of which $180 million would be allocated to California.[69] Similarly, UPRR's projected capital plan of $3.75 billion system-wide included $121.6 million of track improvements, signal system enhancements, and bridge infrastructure in California.[70]

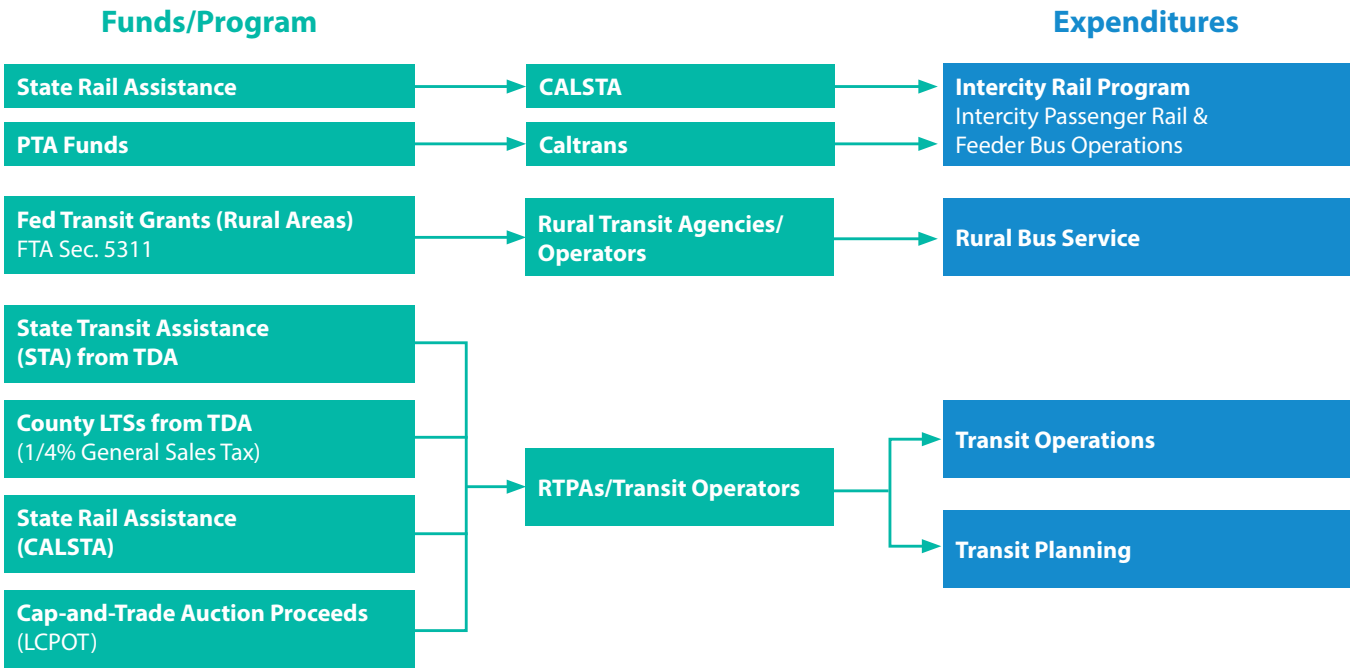
68 Proposition 1B, the Highway Safety, Traffic Reduction, Air Quality, and Port Security Bond Act of 2006, "authorized the issuance of $19.93 billion in State general obligation bonds for specific transportation programs intended to relieve congestion, facilitate goods movement, improve air quality, and enhance the safety of the State's transportation system." (California Transportation Commission, Proposition 1B (2016), accessed 2016.

69 BNSF Railway, BNSF plans $180 million capital program in California for 2016 (2016), accessed 2016.

70 Union Pacific Railroad, Union Pacific Plans to Invest $121.6 Million in its California Rail Infrastructure (2016).

1.5 Governance and Funding

This section provides a high-level summary of the governance and funding of the California State rail system, including powers and regulations related to the rail system and rail revenue sources at the Federal, State, and local levels. The later portions of this section provide an overview of freight rail governance. Chapter 6 lists the funding sources for rail improvements in more detail.



1.5.1 Federal Laws and Powers for Planning, Operating, and Funding Rail Services

The FRA, the Federal Transit Administration (FTA), and the Surface Transportation Board (STB) each play a role in passenger rail governance.

Federal Railroad Administration

From its beginnings in 1966, the FRA has held the primary Federal responsibility for enforcing the safe operation of the national rail network. In subsequent years, the agency's portfolio was expanded to encompass other functions, including overseeing a rail research program and administering Federal grants to Amtrak. More fundamental changes to the FRA's responsibilities came on approval of the Passenger Rail Investment and Improvement Act of 2008 (PRIIA), which changed the agency's role from a primary focus on safety to active management of rail policy development and investment, more akin to FTA's role with public transit. Central to this change has been PRIIA's requirement for FRA to oversee comprehensive state rail plans, regional passenger rail planning projects (such as Northeast Corridor Futures), and administration of Federal grant and loan programs for intercity passenger rail with the states, Amtrak, and other rail operators. The recent FAST Act continues and expands on these FRA responsibilities through various funding and policy provisions.

Federal law, 49 United States Code § 22702, and the minimum requirements established by the FRA under that code section govern state rail plans, which are required to be updated every 4 years. This Rail Plan is compliant with Title 49 United States Code Section 22102, which pertains to a state's eligibility to receive Federal financial assistance. Compliance requires, among other things, an adequate plan for rail transportation in the state, and a suitable process for updating, revising, and modifying that plan. The Rail Plan and periodic updates fulfill this requirement.

Federal Transit Administration

The FTA provides financial and technical assistance to state and local public transit service providers, including commuter railroads. The FTA oversees capital and operating grants to the transit providers, and ensures that grant recipients are managing their programs in accordance with Federal, statutory, and administrative requirements. Under traditional grant agreements, carried forward in the FAST Act as part of the New Starts, Core Capacity, and other similar programs, local stakeholders are typically required to provide a 50 percent local match to receive Federal funds. In this way, the FTA and local project sponsors play a joint role in project development and investment.

Surface Transportation Board

The STB is the Federal economic regulatory body for the railroad industry, and the successor to the Interstate Commerce Commission. The STB settles railroad rate and service disputes, and reviews proposed railroad mergers, acquisitions, abandonments, and new line construction. More recently, it has been assigned responsibility for mediating conflicts between passenger operators (including Amtrak and other intercity and commuter rail operators) and track-host freight railroads. This responsibility includes investigating causes of poor on-time performance, or other intercity passenger rail service quality deficiencies caused by the operator, the track-host railroad, or the managing entity.

1.5.2 State Laws and Powers for Planning, Operating, and Funding Rail Services

Many California agencies are involved in overseeing rail planning, operating, and funding. Chief among these is CalSTA, which was formed in 2013 to bring together the State's multiple transportation-related departments under one exclusive agency. CalSTA oversees Caltrans, the California Transportation Commission (CTC), and CHSRA, and other departments related to transportation. Under CalSTA, the focus of rail's role in transportation has increased substantially with HSR and Caltrans now being under one state agency. CalSTA has been designated the State Rail Plan Approval Authority (SRPAA), and Caltrans is responsible for rail planning in the State, including development of the Rail Plan.

The CTC is composed of 11 members appointed by the governor and the California State Legislature.[71] The CTC is responsible for programing and allocating funds, and advises the Secretary of Transportation and the California State Legislature on issues related to transportation planning and funding.

As the State Department of Transportation, Caltrans is charged with planning and maintaining the State's transportation system. The Caltrans Division of Rail and Mass Transportation (DRMT) is responsible for developing the Rail Plan, administering Federal and State capital grant programs primarily for intercity rail projects, providing oversight and support to State-supported intercity rail services, and managing and procuring State-owned intercity rail equipment and related facilities.

The CHSRA is a unique State entity, responsible for planning and implementing the State's long-term HSR vision. CHSRA also is under the jurisdiction of CalSTA, and is separate from Caltrans and the CTC.

Although the State retains many rail funding and planning responsibilities, the passage of SB 45 in 1998 allowed for regional agencies to play a more active role in passenger rail planning and delivery. Today, State-supported intercity rail services are administered by Joint Powers Authorities (JPAs), and statewide rail planning has evolved toward a more collaborative process between State and local agencies.

Laws and Powers for Rail Planning

Per PRIIA,[72] the State of California must develop a state rail plan to be eligible to receive Federal funding for rail projects. California Government Code Section 14036 requires Caltrans to prepare a California State Rail Plan that generally aligns federal and state requirements. A State Rail Plan was developed in 2013, with this Rail Plan presenting an integrated statewide vision for HSR, intercity rail, and State requirements for the Rail Plan, with some State-specific additions.

Caltrans is designated the State rail transportation authority to prepare, maintain, coordinate, and administer the Rail Plan. CalSTA is designated to approve the plan, compliant with Section 220705.

Today, all State-supported intercity rail routes are managed and administered by regional JPAs consisting of membership from stakeholder jurisdictions and agencies. Intercity Rail Agreements AB 1779 and SB 1225 (2012) authorized Caltrans to enter into interagency transfer agreements for additional intercity rail corridors with respect to the Los Angeles-San Diego-San Luis Obispo Rail Corridor Agency (LOSSAN) and San Joaquin corridors. Among other powers, each JPA is authorized to:

- Make and enter into contracts;
- Own and lease property;
- Manage and build facilities; and
- Incur debts.

71 Of the 11 members, 9 are appointed by the governor, 1 is appointed by the Senate Rules Committee, and 1 is appointed by the Speaker of the Assembly. There also are 2 ex officio nonvoting members appointed by the State Senate and State Assembly. These ex officio members are often the chairs of the transportation policy committee in each house.

72 PRIIA, Section 303 (2008).

JPAs are also responsible for fiscal planning through the annual business plans they submit to the State.

The Secretary of Transportation retains the responsibility for overall planning, coordination, and budgeting of the intercity rail services, for the development of a statewide passenger rail network that meets statewide and regional goals and objectives, and for preparing the Interregional Transportation Improvement Program of projects for intercity passenger rail services and state-wide transit systems.

On the local level, MPOs, RTPAs, and regional transportation planning agencies must develop RTPs,[73] which are guiding documents for regional transportation investments, including regional rail investments. The RTPs serve as key inputs to the statewide transportation plans, contributing to both the Rail Plan and the CTP. Emerging corridor agency planning is being conducted by RTPAs in the Coachella Valley and in the central valley along the Central Coast Corridor. Future RTPs will evolve to incorporate statewide, interregional, mega-regional and emerging corridor agency plans as well.

Laws and Powers for Rail Funding under PRIIA

States are responsible for sharing the costs of all Amtrak routes of less than 750 miles. The law requires states and Amtrak "to jointly develop a cost-sharing methodology to equitably charge states for state-supported intercity passenger rail service."[74] In California, Caltrans now funds all operating expenses for these state-supported routes. Capital expenses are funded by a combination of Federal, State, regional, and private funds. Table 1.4 summarizes California's State-supported routes – *Pacific Surfliner*, *San Joaquin,* and *Capitol Corridor*. Regional agencies must also meet the performance standards outlined in PRIIA Section 209. Regional commuter trains receive funding from both the Federal and State governments, in addition to local jurisdictions.

73 State legislation, Government Code Section 65080 et seq., of Chapter 2.5 and Federal legislation, United States Code, Title 23, Sections 134 and 135 et seq.

74 Amtrak, *Amtrak National Facts,* accessed 2016.

Table 1.4: State-Supported Intercity Passenger Rail Agency Roles and Responsibilities[75]

	Pacific Surfliner	San Joaquin	Capitol Corridor
Governance			
Management	Los Angeles–San Diego–San Luis Obispo Rail Corridor Agency (LOSSAN) JPA	San Joaquin Joint Powers Authority (SJJPA)	Capitol Corridor Joint Powers Authority (CCJPA)
Operations	Amtrak	Amtrak	Amtrak
Oversight	Caltrans	Caltrans	Caltrans
Funding			
Operating funding	Caltrans	Caltrans	Caltrans
Capital funding	Caltrans and local agencies	Caltrans and local agencies	Caltrans and local agencies
Equipment			
Equipment Ownership	Amtrak and Caltrans	Primarily Caltrans	Primarily Caltrans
Maintenance	Amtrak	Amtrak with oversight from CCJPA and SJJPA	Amtrak with oversight from CCJPA
Track Ownership	UPRR, Ventura County Transportation Commission, Los Angeles County Metropolitan Transportation Authority, BNSF, Orange County Transportation Authority, North County Transit District (NCTD), San Diego Metropolitan Transit System	UPRR, BNSF	UPRR, Peninsula Corridor Joint Powers Board (PCJPB)

75 Sources:
Amtrak, *About Amtrak California*, accessed 2016;
Caltrans, 2013 California State Rail Plan (2013);
LOSSAN Rail Corridor Agency, Business Plan FY 2016-17 – FY 2017-18, 2016. Accessed 2016.

1.5.3 Local Authority for Funding Rail Improvements

Article XIIIB of the State Constitution allows local agencies to enact sales tax measures, subject to voter approval. Over 22 counties have passed local "self-help" tax measures dedicated to transportation funding, including rail enhancements. Local sales taxes typically support local projects, have sunset dates, and are under local control.[76] Regional rail projects have been included in the expenditure plans. Several regional agencies have successfully passed and/or are considering future ballot measures. In the Bay Area, for example, voters approved a $3.5 billion bond measure, Measure RR, to upgrade the 44-year-old Bay Area Rapid Transit (BART) system. BART has connections to the Capitol Corridor trains at its Richmond and Oakland Coliseum stations, and to the Caltrain commuter service at its Millbrae station.

During the 2016 elections, a number of local and reginal entities took up ballot measures for self-funding transportation improvements, investments in passenger rail and transit expansion, and investments in state of good repair for existing infrastructure assets. For greater detail on 2016 local and regional tax measures, please refer to Chapter 2.

1.5.4 Freight Rail Governance

California's freight railroads are owned and / or operated by private companies ranging in size from North America's two largest Class I railroads, BNSF and UPRR, to short line railroads such as the Fillmore & Western, Pacific Harbor Line, San Diego & Imperial Valley Railroad, and Yreka Western Railroad, which are often owned by a parent company such as Genesee & Wyoming. Unlike other freight carriers, such as trucking companies and air delivery services that rely on public infrastructure to conduct their operations, most North American railroads operate as integrated systems; they have full responsibility for building and maintaining their infrastructure, in addition to transporting goods.

Federal regulations exempt freight rail operators from many kinds of state and local regulations that might affect other businesses.[77] For example, states and local governments can set speed limits for trucks on public roads, but cannot set limits on railroad operating speeds. Likewise, only the STB has jurisdiction over the economic regulation of railroads. The Federal government also enforces regulations pertaining to rail employee labor and retirement practices.

76 Martin Wachs, *Devolution as Revolution*,, ACCESS, no. 22, spring 2003.

77 Initially established by the Interstate Commerce Act of 1887.

Although freight railroads are largely interstate and regulated by the Federal government, State and local governments have tools at their disposal to influence rail carrier operations, including:

- **Taxation.** States set property and income tax rates for operations that occur in their jurisdictions, which Federal law requires to be done in a non-discriminatory manner. Rail owned property that serves a transportation purpose, such as tracks, typically is taxed at a single statewide rate, with proceeds channeled to the communities in which the activity occurs. Active rail-owned property that does not serve a transportation purpose, such as buildings and open space, is subject to local tax levy.
- **Safety programs.** Railroad safety regulation is reserved for the Federal government through the FRA. However, states can opt-in to a program in which inspectors are trained and certified by the FRA to assist in special enforcement activities and other rail safety work. Some states generate funds to offset the costs of these safety activities through a rail-related fee. In addition, states can impose regulations that supplement those specified by the FRA. However, carriers often view these state-level regulations as a burden, given their need to operate consistently across state boundaries.
- **Freight rail assistance and related economic development initiatives.** States offer a variety of incentives to support railroad line preservation, capacity expansion, and economic development. Incentives include loan guarantees, tax credits, direct investments, and matching grants to leverage private investments by railroads and shippers. Recent financing innovations have included leveraging private funds with public funds, which can reduce the costs assumed by a railroad or other entity, thereby increasing a project's financial rate of return. California's Carl Moyer Memorial Air Quality Standards Attainment Program, which provides for cleaner-than-required engines and equipment, has helped finance purchases of low-emissions locomotives at many freight railroads.
- **Highway-rail at-grade crossings.** The Federal Highway Administration (FHWA) Section 130 program, which provides dedicated funding for rail/highway grade-crossing safety improvements, assigns state DOTs the task of disbursing these funds in their jurisdictions. States typically manage the process of determining the locations where active crossing devices will be installed, and assembling the funding necessary for improvements. The costs associated with the installation, upgrade, or replacement of an active device is usually the responsibility of public agencies, but the railroad assumes responsibility for the operation and maintenance of the device. Many states, including California, augment Federal grade-crossing funds with matching State resources.

Beyond these specific areas, state regulations that apply to all businesses may also apply to railroads on issues not specifically under Federal jurisdiction. As a result, freight railroads are subject to a range of state-level environmental, safety, engineering standards, and land use regulations.

1.6 Passenger Rail Service Delivery Agencies: Coordination and Background Information

This section describes the agencies that deliver rail services in California. It also describes the coordination process followed in developing the Rail Plan, and summarizes other rail initiatives and plans that are relevant to the Rail Plan.

1.6.1 Service Provider Engagement

Coordination with stakeholder entities is a critical component of the Rail Plan. To ensure that service provider information is accurately reported in this document, JPAs and other service operators throughout the State were engaged to obtain operating and financial data; information on upcoming projects, plans, and service changes; and information on any recent or planned changes to route administration and service delivery.

Caltrans convened a Stakeholder Advisory Committee (SAC) to provide input to the development of the Rail Plan. The SAC "includes representatives from diverse groups of passenger rail operators, planning agencies, freight rail interests, Tribal Nations, private railroads, ports, transit operators, and neighboring states." Several advocacy groups were also invited to participate on the SAC.[78]

1.6.2 Relevant Rail Initiatives and Plans

In addition to the Federal, State, and regional planning activities, various initiatives, plans, and studies developed directly by service providers and stakeholder agencies themselves were reviewed to inform the development of this Rail Plan, and ensure that it aligns with local planning activities. These specific plans are detailed in Chapter 4.

78 Caltrans, 2018 *California State Rail Plan: Stakeholder Advisory Committee,* accessed 2016.

1.6.3 Passenger Service Providers

This section summarizes institutional and strategic arrangements available to increase coordination between rail services in the implementation of the 2040 Vision. Examples of arrangements between separate rail agencies, between rail agencies and other bodies of government, and between rail agencies and the private sector in place or available to provide service to passengers are discussed.

High-Speed Rail: California High-Speed Rail Authority

The CHSRA was formed in 1996[79] to initiate HSR planning and implementation in the State. The CHSRA maintains its own board,[80] and must submit a business plan to the California State Legislature every 2 years.[81] The 2016 Business Plan calls for an initial segment between San Jose (Silicon Valley) and a station north of Bakersfield (Central Valley), with construction ending in 2024 and service opening in 2025. The larger Phase 1 of the HSR corridor is planned to run from San Francisco to the Los Angeles basin in under 3 hours, with top speeds exceeding 200 miles per hour (mph). Phase 2 would then extend the system to Sacramento, the Inland Empire and San Diego.[82]

Intercity Rail: Long-Distance Routes

Amtrak operates four long-distance routes serving portions of California:

- The *Coast Starlight*, from Los Angeles to Seattle
- The *California Zephyr*, from Emeryville to Chicago
- The *Southwest Chief,* from Los Angeles to Chicago
- The *Sunset Limited*, from Los Angeles to New Orleans

These routes are funded through Amtrak's Federal appropriations.

79 Pursuant to SB 1420 (1996).

80 The CHSRA Board of Directors consists of nine members, five of which are appointed by the governor, two who are appointed by the Senate Committee on rules, and two appointed by the Speaker of the Assembly.

81 As outlined in AB 528 (Chapter 237, Statutes of 2013) and SB 1029 (Budget Act of 2012-2013).

82 CHSRA, *Business Plan* (2016).

Intercity Rail: State-Supported Intercity Passenger Rail Routes

The State is responsible for funding the three in-State Amtrak-operated rail services. These "State-supported" routes and their major stations are:

- The *Pacific Surfliner*, serving San Luis Obispo, Santa Barbara, Los Angeles, Anaheim, Santa Ana, Oceanside, and San Diego.
- The *San Joaquin*, serving Oakland, Richmond, Martinez, Stockton, Modesto, Madera, Fresno, and Bakersfield.
- The *Capitol Corridor*, serving San Jose, Oakland, Richmond, Martinez, Davis, Sacramento, and Auburn.

These intercity routes are distinct from local commuter rail services in that they serve longer-distance travelers in addition to daily commuters.

As of 2015, all three lines are managed by regional JPAs, which have responsibility for planning and administration. Table 1.4 lists the State-supported intercity passenger rail agencies' roles and responsibilities.

Commuter Rail Service Providers

In addition to the Amtrak-operated, JPA-administered, and State-supported routes, several regional commuter systems serve the metropolitan areas of the San Francisco Bay Area, Los Angeles, and San Diego. These commuter rail services are often overseen by their own JPAs, composed of representatives from within their rail service area. Commuter rail services support multimodal transportation options, and their connections to longer-distance rail facilitate travel to statewide destinations. Chapter 2 summarizes California's commuter rail services, routes, and administrators.

Intergovernmental Coordination between Service Providers

County transportation agencies, regional commissions, JPAs, regional passenger rail agencies, and privately owned freight railroads play important roles in the delivery of passenger and freight rail services in California. Together, these agencies support statewide planning goals through planning, funding, and provision of rail services. The Rail Plan's integrated passenger rail service will improve the integration through coordinated transfers and better collaboration between service delivery agencies.

This section highlights the agencies primarily responsible for service delivery by route distance. Chapter 2.1 discusses the services in greater detail.

A JPA is a special entity wherein two or more government agencies jointly exercise power over a shared service across relevant regions. JPAs have been established throughout California to organize and manage passenger rail service across jurisdictional and geographic boundaries. JPAs have proven to be useful in scaling the provision of rail service across governmental geographies while maintaining the benefits of local knowledge of the market being served. As the State moves forward to integrate more service across more regions, such organizations will become even more important.

Intercity and commuter rail services are currently provided by the following eight JPAs, described in detail in Chapter 2:

- Capitol Corridor Joint Powers Authority (CCJPA)
- Los Angeles-San Diego-San Luis Obispo Rail Corridor Agency (LOSSAN)
- San Joaquin Joint Powers Authority (SJJPA)
- Peninsula Corridor Joint Powers Board (PCJPB)
- Southern California Regional Rail Authority (SCRRA)
- San Joaquin Regional Rail Commission (SJRRC)
- North County Transit District (NCTD) (COASTER)
- Sonoma-Marin Area Rail Transit (SMART) District

Intergovernmental Coordination between Service Providers and Local Government

As relates to station area planning, successful intergovernmental partnerships are crucial to effective transit-oriented development. Urban design, consistent zoning, and local service integration are all generally outside the purview of rail service providers, but are still important to the overall success of the integrated network. Partnerships between service providers and local governments, especially in regard to land use and station development, will be mutually beneficial in terms of maximizing the value of the rail service, maximizing the value of local real estate, and maximizing return on investment of local dollars.

The Transbay Transit Center project provides an example of such a partnership. The Transbay Joint Powers Authority was created to plan and construct the multimodal HSR terminal in downtown San Francisco. The mega-project is an ongoing collaboration between the CHSRA, the PCJPA, the City of San Francisco, San Francisco Municipal Transportation Agency (Muni), BART, and multiple public bus services. When complete, integrated services and timed connections will be available for rail services traveling throughout the State.

1.6.4 Freight Providers

Freight Rail Services and Intermodal Connections

California's freight railroad system supports industries and consumers, and it links the State with other geographic markets. Freight railroads are classified by size. BNSF and UPRR are the only Class I railroads in the State, and handle a majority of the State's tonnage. California has no Class II (i.e., regional) railroads, and has 27 active Class III (i.e., short line) railroads. Chapter 2 discusses the freight rail system and ports in greater detail.

Intermodal rail terminals—locations where containers and bulk cargo are transferred from rail to truck or rail to ship, and vice-versa—help link the freight rail network with the State's overall multimodal system. Most international cargo is handled at intermodal terminals at California's three container ports (referred to as on-dock intermodal terminals) or at locations within a few miles of the ports (referred to as near-dock terminals). Domestic cargo and some international cargo are handled at off-dock intermodal terminals. California is home to three major container ports: the Port of Los Angeles and the Port of Long Beach, collectively known as the San Pedro Bay Ports, and the Port of Oakland.

As the intermodal market has grown for both international and domestic cargo, both Class I railroads and the ports have identified the need for new or expanded terminals near the San Pedro Bay ports and the Port of Oakland. However, the recent slowdown in rail traffic and difficulties in obtaining the necessary approvals have greatly slowed the progress of these initiatives. Nevertheless, the projected long-term growth in traffic through these ports will require increased capacity in rail intermodal terminals in the future.

Private-Sector Involvement

Currently, intercity services in California are provided by agreements with Class I freight railroad operators (i.e., BNSF and UPRR). These agreements may be orchestrated through Amtrak, which has a nationwide access agreement, or by public railroad operators (e.g., Altamont Corridor Express contracts directly with UPRR). Private contract service providers also operate trains through agreement with various operators throughout the state. Most of these arrangements essentially involve provision of a specified service for a fee.

In addition to coordination among government entities, innovative partnerships will be needed to integrate rail services with private entities. Such partnerships would include both private operations of public rail services, and coordination with private-sector providers of non-rail connecting services, such as airlines, rideshare operators, and private bus operators.

Although such models are common in Europe and Asia, private rail operators are less familiar in the United States. These agreements can take the form of private-sector firms competing to operate government-owned services; or private concessions and public infrastructure for set periods of time and agreed costs. When managed properly, they can be successful tools for managing long-term costs and risk, while ensuring responsive service to passengers.

Several public rail operators, such as the Altamont Corridor Express, Caltrain, Coaster, and Metrolink, are operated by a private entity that provides on-board conductor and engineer staff, dispatch, and maintenance. Although the infrastructure and rolling stock are publicly owned, their stewardship is managed privately for a set contract period. At the end of the period, these functions can either revert to the public entity, or be put back on the marketplace in whole or in part in a new contract offering, at the public entity's discretion. Such an arrangement provides flexible opportunities to try to provide the best service to customers at the lowest cost, while minimizing risk.

Beyond the provision of rail services, private-sector partnerships can also work to integrate wider sectors of the transportation industry to extend the reach of rail service to more customers. This can take a variety of forms, many of which are already in place, and are described in detail in Chapter 3. It is anticipated that use of PPPs and agreements will increase as California implements its network integration.

1.6.5 Section 22102 Compliance Statement

Compliance requires, among other things, an adequate plan for rail transportation in the state, and a suitable process for updating, revising, and modifying that plan. The Rail Plan and periodic updates fulfill this requirement.

1.7 Conclusion

To adequately support California's projected population growth, economic goals, and climate change responsibilities, California must develop its class of railroads, highways, ports, airports, local assets, and land use practices to find ever-greater efficiency in investment, economic output, energy use, and user capacity. This development will require a redirection of legacy planning and investment solutions, new ways of strategizing investments, and adapting and leveraging the latest technological solutions.

Modern, integrated rail service must play an increasingly prominent role in the statewide multimodal transportation system, and the Rail Plan provides a framework for fulfilling this challenge. The advent of new technologies, implementation of HSR and advanced train control systems, groundbreaking policies for reining-in GHG emissions, continued population and economic growth, and other factors will influence and drive development of the rail network in California over the next several decades. The Rail Plan seeks to integrate and optimize the State rail network as a core component of the multimodal transportation system.

Chapter 2 examines the existing rail infrastructure and funding landscape in greater detail, projecting future trends and changes, and identifying needs and opportunities.

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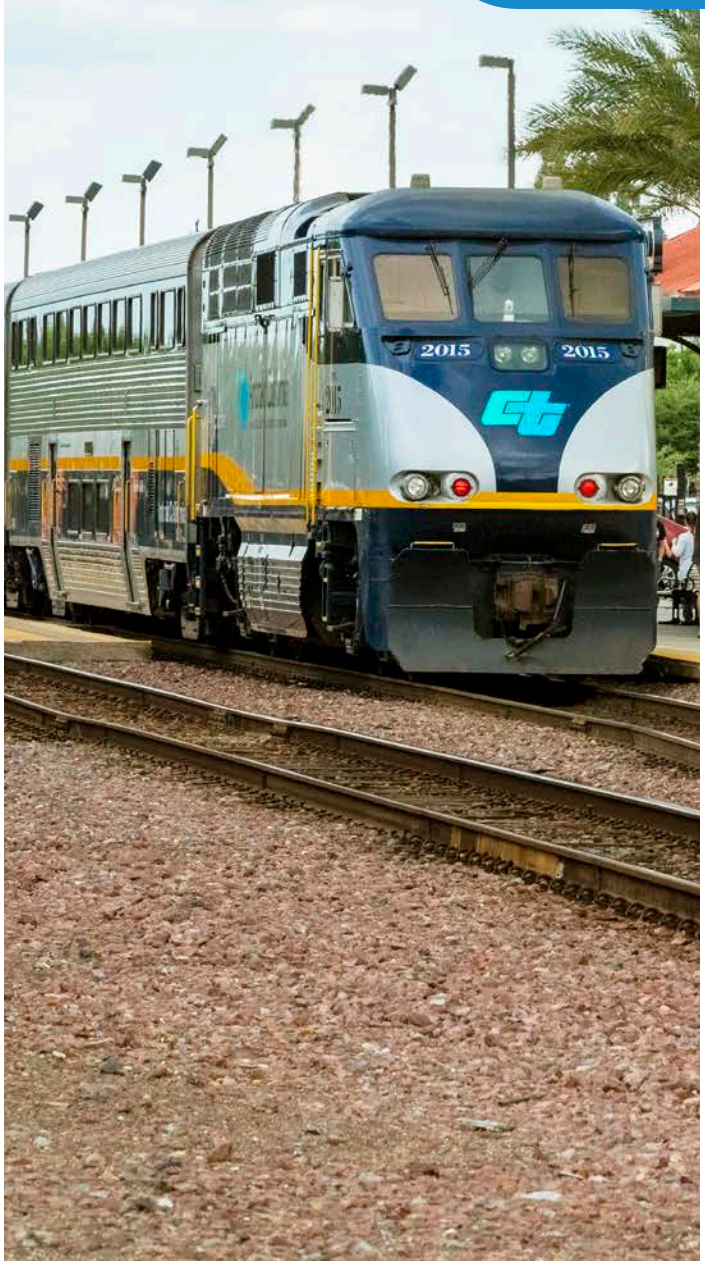
2 Existing Rail System



California's rail system is and will continue to be critically important to a statewide, multimodal transportation system that is efficient, flexible, and sustainable for all persons and markets. The State's existing rail system moves people and goods throughout the state through a range of infrastructure and services. Planning for rail is often more complicated than planning for roads or highways because the State, in large part, does not own the infrastructure. However, understanding the delicate dynamics of rail operations, service providers, funding mechanisms, and future trends and challenges is imperative for assessing the future possibilities of rail in California.

For example, county transportation agencies, regional commissions, JPAs, regional passenger rail agencies, and privately owned freight railroads play important roles in the delivery of passenger and freight rail services in California. Together, these agencies support statewide planning goals through planning, funding, and provision of rail services. The Rail Plan's integrated passenger rail service will improve the integration through better collaboration between service delivery agencies.

Chapter 2 inventories the statewide rail system, including the existing passenger rail system, which is composed of Amtrak long-distance and State-supported intercity passenger trains and locally supported commuter and urban rail services, with connections to other modes of transportation. The proposed passenger rail system includes HSR and many other improvements to better connect the rail system and create a seamless, door-to-door travel experience for passengers. Additionally, freight railroads and facilities are vital to California's goods movement, and must substantially grow in their carrying capacity to meet broader economic and societal trends and challenges.

The Rail Plan builds on the existing statewide rail system, connected by HSR, to extend the impact of the rail system in achieving integrated service offerings between diverse markets. The coordination among various existing rail and transit service providers is critical to implementing a fully integrated system. The Rail Plan also protects and enhances the freight-carrying capacity of the State's existing freight rail providers, often recommending investments that reduce conflicts between freight and passenger trains. This chapter details how strategic investment and planning decisions help the State to maintain the existing rail capacity, and build on past efforts to move California's rail system forward.

Exhibit 2.1: California Intercity and Commuter Rail Network (including connecting bus service)

2.1 Description and Inventory

2.1.1 Existing Passenger Rail Lines, Corridors, and Services

Expanding and improving an integrated statewide rail system requires coordination between service providers, as well as between service providers and local governments. This section summarizes existing passenger rail service providers in California, with a detailed explanation of the three categories of passenger rail services operating in California today:

1. Intercity passenger rail services;
2. Commuter rail services in metropolitan regions or between adjacent regions; and
3. Urban passenger rail transit systems serving metropolitan areas.

Intercity Passenger Rail Services

Intercity passenger rail provides transportation between metropolitan areas, to rural areas, and to points beyond California's borders. Amtrak operates all intercity rail services in the state. California's intercity rail services can be divided into two groups: Amtrak long-distance routes, which are funded by Amtrak and serve both California and interstate markets; and State-supported routes that serve California travel markets. Exhibit 2.1 maps California's State-supported and long-distance intercity rail routes.

Exhibit 2.2: California Intercity Routes

Amtrak Long-Distance Routes[84]

These are the multi-state Amtrak long-distance passenger routes serving California.

- ***California Zephyr*** **(Emeryville – Sacramento – Reno – Denver – Chicago).** The *California Zephyr* provides daily round trip regional service in the Emeryville-Sacramento-Reno corridor. Extra coaches are often operated on this portion of the route to handle heavy loads to and from Reno. Connecting buses link Emeryville with San Francisco. A stop in Truckee serves Lake Tahoe and nearby Sierra Nevada ski areas. In route to Chicago, the California Zephyr also serves Salt Lake City, Denver, and Omaha. The route served 417,322 passengers in Federal Fiscal Year (FFY) 2016 across its entire interstate route.
- ***Coast Starlight*** **(Los Angeles – Oakland – Sacramento – Portland – Seattle).** The Coast Starlight's daily round trip is the second most popular long-distance train in the Amtrak system. A substantial portion of the route's ridership is generated by intrastate California travel. The route provides the only rail service north from Sacramento to Redding and the Pacific Northwest, and the only one-seat rail service from the Bay Area to Los Angeles. Connections with the Pacific Surfliner at Los Angeles provide access to San Diego, and connections with the San Joaquin at Sacramento and Martinez provide access to the Central Valley. Portland and Seattle are major stops to the north. The route served 453,131 passengers in FFY 2016.
- ***Sunset Limited*** **(Los Angeles – San Antonio – New Orleans).** The Sunset Limited, originating and terminating in Los Angeles, operates 3 days per week in each direction and is the only rail service serving Palm Springs. It continues east, connecting California to Tucson, El Paso, San Antonio, Houston, and New Orleans. The Texas Eagle, which links Chicago with San Antonio, carries through-cars to and from the Sunset Limited. The route served 98,079 passengers in FFY 2016; in addition, a portion of the 306,321 passengers in FFY 2016 on the Texas Eagle had an endpoint of their journey in California.
- ***Southwest Chief*** **(Los Angeles – Albuquerque – Kansas City – Chicago).** The daily round-trip Southwest Chief provides the only rail service in California between Los Angeles and Victorville, Barstow, and Needles to the east. Beyond California, major stops include Flagstaff (Grand Canyon), Albuquerque, Kansas City, and Chicago. The route served 364,748 passengers in FFY 2016.

84 Ridership information from: Amtrak, Amtrak FY15 Ridership and Revenue, 2015. Accessed 2016

State-Supported Services

State-supported routes are services funded by the State, administered by JPAs, and operated by Amtrak under contract with each JPA. Amtrak also provides maintenance on the equipment, some of which is owned by the State and some by Amtrak. The State funds the services and provides oversight, including overall planning, coordinating, and budgeting, to ensure that the State-supported system, including the Thruway bus network, is integrated internally with the rest of the commuter and planned HSR Systems, as well as the transit system in California, with the goal of an integrated and seamless system.

In FFY 2016, the three State-supported corridor services were ranked 2nd, 3rd, and 6th in ridership across all Amtrak routes nationally, behind only the Northeast Corridor (NEC: Boston to Washington D.C.). California State-supported ridership was over 38 percent of total national State-supported ridership,[85] and three of the top ten busiest Amtrak stations were in California (Los Angeles, Sacramento, and San Diego[86]).

Section 2.1.2 provides data on State-supported intercity rail performance from FFY 2008-2015.

Appendix A includes information on State-supported route ownership and track characteristics, the Amtrak Thruway bus system, historical State-supported route performance, and connecting rail services; and includes maps of the State-supported intercity rail routes along with their supporting Amtrak Thruway bus routes. Table 2.1 shows Intercity Passenger Rail Historical Ridership.

Table 2.1: Intercity Passenger Rail Historical Ridership

Fiscal Year	Surfliner	San Joaquin	Capitol Corridor	Total Intercity Rail Ridership	Thruway Bus Ridership
2005	2,454,396	743,245	1,260,249	4,457,890	879,418
2006	2,655,490	801,242	1,273,088	4,729,820	956,661
2007	2,685,194	789,641	1,450,069	4,924,904	880,678
2008	2,835,132	894,346	1,693,580	5,423,058	1,068,190
2009	2,696,951	958,946	1,599,625	5,255,522	950,911
2010	2,614,777	967,437	1,580,619	5,162,833	991,548
2011	2,746,320	1,032,579	1,708,618	5,487,517	1,121,210
2012	2,664,935	1,133,654	1,746,397	5,544,986	1,189,359
2013	2,689,465	1,195,898	1,701,185	5,586,548	1,184,752
2014	2,673,170	1,202,624	1,419,084	5,294,878	1,126,985
2015	2,827,134	1,181,639	1,474,873	5,483,646	1,135,535
2016	2,924,117	1,135,424	1,560,814	5,620,355	1,118,625

85 Amtrak, Updated FY '15 Ridership Revenue Fact Sheet, 2016.

86 CATC, 2016 Annual Report Final, 2016.

Pacific Surfliner (San Luis Obispo – Los Angeles – San Diego)

The *Pacific Surfliner* operates along the Southern California coast; it is the third-busiest Amtrak route in the nation, serving 2,924,117 passengers in FFY 2016.

Route Description. The *Pacific Surfliner* extends 351 route-miles, serving 29 stations between San Luis Obispo and San Diego, including Los Angeles. There are 17 stations between San Luis Obispo and Los Angeles, and 12 south of Los Angeles. UPRR owns 175 miles of line between San Luis Obispo and Moorpark. Most of the route from Moorpark to San Diego is publically owned by regional and local agencies, except the 22-mile segment between Redondo Junction in Los Angeles and Fullerton, which is owned by BNSF.

Effective November 6, 2016, the *Pacific Surfliner* route features 12 daily round trips between San Diego and Los Angeles. Five trips extend north to Santa Barbara and Goleta, with two of these trips extending further north to San Luis Obispo.[87] Dedicated Amtrak Thruway bus connections provide service to and from San Luis Obispo for rail passengers making connections in Goleta on the train frequencies that terminate in Goleta. Bus routes connect with many of the *Pacific Surfliner* stops, providing service to a large network of destinations, including Bakersfield, San Jose, and other Bay Area stops; various communities on the Central Coast; Indio; San Pedro; Hemet; Las Vegas; and many points in between.

Travel Times. Current San Diego to Los Angeles travel times average 2 hours and 51 minutes. Los Angeles to Santa Barbara averages 2 hours and 37 minutes in the northbound direction, and 2 hours and 53 minutes in the southbound direction. Los Angeles to San Luis Obispo travel times average 5 hours and 28 minutes in both directions. Between Los Angeles and San Diego, the 70-plus mile segment between Santa Ana and Sorrento has a maximum track speed of 90 mph, the only location on the State-supported system where trains operate above 79 mph.

Proposed Improvement Strategies. A major improvement strategy in the LOSSAN Corridor is to address capacity needs, including future studies, as well as grant funding for lease of Talgo equipment. Additionally, grade separation efforts, such as Rosecrans-Marquardt, will allow for increased train frequencies. Frequency expansion, including peak hour services between Los Angeles and Santa Barbara will improve corridor performance and provide travel time savings. Beyond capacity improvements, further business class enhancements will provide improved travel opportunities for riders.

87 One northbound train begins in Los Angeles rather than San Diego.

San Joaquin (Bay Area/Sacramento – Stockton – Bakersfield)

The *San Joaquin* provides service from the San Francisco Bay Area and Sacramento through the San Joaquin Valley to Bakersfield. It is the seventh-busiest Amtrak route in the nation in FFY 2016, with 1,122,301 passengers traveling on the *San Joaquin* route.

Route Description. The *San Joaquin* route extends 316 route-miles between Oakland and Bakersfield, with 13 intermediate stops. In addition, the Stockton-Sacramento segment of the route extends 49 miles, with one intermediate stop. BNSF primarily owns the right-of-way (Port Chicago-Bakersfield); however, UPRR owns 39 miles between Oakland and Port Chicago and 49 miles between Stockton and Sacramento.

Seven daily round-trip trains currently serve the *San Joaquin* route, of which five run between Oakland and Bakersfield and two run between Sacramento and Bakersfield. All trains between Stockton and Bakersfield operate on the same tracks. Connecting Thruway buses run between Stockton and Sacramento for trains serving Oakland. For trains serving Sacramento, connecting buses operate between Stockton, Oakland, and San Francisco. All trains connect to a bus from Bakersfield to Los Angeles. In addition, there is an extensive network of connecting buses north to Redding and McKinleyville; west to San Jose and to the Central Coast; and east to many points, including Las Vegas, Coachella Valley, Reno, and Yosemite. A total of 69.34 percent of riders use one or more buses for a portion of their trip.

Travel Times. The average travel time in the northbound direction between Bakersfield and Oakland is 6 hours and 12 minutes, and 5 hours and 18 minutes between Bakersfield and Sacramento. The average southbound travel time is 6 hours and 10 minutes between Oakland and Bakersfield, and 5 hours and 20 minutes between Sacramento and Bakersfield.

Proposed Improvement Strategies. The delivery of new locomotives to the corridor will provide major environmental improvements to many areas particularly challenged by air quality. Additionally, certain stations along this corridor have disjointed land uses that create access constraints. Rail access issues are often overlooked, but are crucial to system connectivity and seamlessness of the travel experience for the rider, resulting in higher ridership. Continued study and infrastructure investment are necessary to improve some access issues, particularly to link intercity rail services to regional rail and transit.

Capitol Corridor (Roseville/Auburn – Sacramento – Oakland – San Jose)

The *Capitol Corridor* provides service between San Jose, the East Bay, and the Sacramento region. It is the fourth-busiest Amtrak route in the nation. Over 1.5 million passengers traveled on this route in FFY 2016.

Route Description. The *Capitol Corridor* extends 169 route-miles and has 7 daily round trips between Oakland and San Jose, 15 weekday round trips between Sacramento and Oakland (11 on weekends), and 1 daily round trip extending from Sacramento to Auburn. The route has a number of Thruway bus connections. Trains at Emeryville have a bus connection to and from San Francisco. Bus routes connect the *Capitol Corridor* to a large network of destinations, including north to Redding and McKinleyville; south to Stockton, Santa Cruz and the Central Coast; and east to Stateline and Reno.

Travel Times. Current Sacramento-Oakland travel times average 2 hours and 1 minute in the eastbound direction, and 1 hour and 54 minutes in the westbound direction. Oakland-San Jose travel times average 1 hour and 4 minutes in the eastbound direction, and 1 hour and 18 minutes in the westbound direction. The Auburn-Sacramento trip averages 1 hour and 3 minutes in both directions.

Proposed Improvement Strategies. *Capitol Corridor* was awarded $4.62 million for its Travel Time Reduction project to improve track and signal systems to increase safety and speeds along the corridor. Further improvements include imminent service to Vacaville, and additional service to increasing access to more markets. Improvements to bike access and capacity are also being pursued along this corridor.

Amtrak California Thruway Bus Network

An extensive network of dedicated *Amtrak Thruway* buses supports intercity passenger rail by providing dedicated connecting service with guaranteed seating to markets without direct passenger rail service. To ride the bus, a passenger must purchase an integrated train and bus ticket. Caltrans is conducting a "California Intercity Bus Study" and will recommend strategies and improvements to further integrate the statewide rail and transit network. The Appendix A describes the bus network in greater detail.

Table 2.2: Amtrak Thruway Bus Historical Ridership[88]

Fiscal Year	Thruway Bus Ridership
2005	879,418
2006	956,661
2007	880,678
2008	1,068,190
2009	950,911
2010	991,548
2011	1,121,210
2012	1,189,359
2013	1,184,752
2014	1,126,985
2015	1,135,535
2016	1,118,625

88 Source: Amtrak Performance Reports, based on Federal Fiscal Year

Intercity Rail: Service Providers and Roles and Responsibilities

A JPA is a special entity created where two or more government agencies jointly exercise power over a shared service. Three JPAs have been established in California to organize and manage intercity passenger rail service across jurisdictional and geographic boundaries. JPAs have proven to be useful in scaling the provision of rail service across governmental geographies while maintaining the benefits of local knowledge of the market being served. The three JPAs are described below.

The State funds the services and provides oversight, including overall planning, coordinating, and budgeting, to ensure that the State-supported rail and Thruway bus system are integrated internally and with the rest of the commuter and planned HSR Systems, as well as the transit systems—with the goal of a statewide integrated and seamless system.

Appendix A describes State-supported intercity passenger rail agency roles and responsibilities.

Capitol Corridor Joint Powers Authority

The CCJPA was the first agency that took over administration of intercity operations from Caltrans under the provisions of SB 457. The CCJPA board consists of two representatives from each of the eight counties along the 150-plus-mile route between Auburn and San Jose (Placer, Sacramento, Yolo, Solano, Contra Costa, San Francisco, Alameda, and Santa Clara Counties), which are represented by Placer County Transportation Planning Agency, Sacramento Regional Transit District, San Francisco BART District, Santa Clara Valley Transportation Authority, Solano Transportation Authority, and Yolo County Transportation District. BART provides day-to-day management support to the CCJPA, under contract. The CCJPA is also supported by the MTC and the Sacramento Area Council of Governments. The majority of the equipment on the route is owned by the State. Amtrak maintains the equipment, with oversight by the CCJPA.

Los Angeles–San Diego–San Luis Obispo Rail Corridor Agency

Effective July 1, 2015, administrative and oversight responsibility passed from Caltrans to the LOSSAN JPA under the provisions of an Interagency Transfer agreement between the State and LOSSSAN that was completed pursuant to the provision of SB 1225 (2012). The LOSSAN Board of Directors is composed of current and former elected officials representing rail owners, operators, and planning agencies along Amtrak's *Pacific Surfliner* corridor between San Diego, Los Angeles, and San Luis Obispo. The Orange County Transportation Authority serves as the managing agency on behalf of the LOSSAN JPA. The *Pacific Surfliner* uses a combination of State- and Amtrak-owned equipment on the route. Amtrak owns the locomotives and 40 bi level cars, as well as additional equipment leased from Amtrak; and the State owns 10 cars. Amtrak maintains the equipment.

San Joaquin Joint Powers Authority

The SJJPA took over management and administration of the *San Joaquin* service from the State in July 1, 2015, under the provisions of an ITA between the State and the SJJPA, pursuant to AB 1779 (2012). The ten Member Agencies that make up the SJJPA are Alameda County, Contra Costa Transportation Authority, Fresno Council of Governments, Kings County Association of Governments, Madera County Transportation Commission, Merced County Association of Governments, Sacramento Regional Transit, San Joaquin Regional Rail Commission, Stanislaus Council of Governments and Tulare County Association of Governments. The San Joaquin Regional Rail Commission is the Managing Agency for the SJJPA. The majority of the equipment on the route is owned by the State. Amtrak maintains the equipment, with oversight of equipment maintenance by the SJJPA and the CCJPA, working in partnership with Caltrans.

Intercity Rail: Emerging Corridors

Regional agencies and jurisdictions across California are currently engaged in coordinated planning with the state and rail operators to develop new passenger rail corridors and services, which provide opportunities to develop intercity and regional rail connections to a statewide passenger system

Coachella Valley – San Gorgonio Pass Rail Corridor

The Riverside County Transportation Commission (RCTC) has been studying passenger service in a 141 mile rail corridor between Los Angeles Union Station and Indio, CA since 1991. Passenger service in this corridor is being proposed to provide a safe, reliable, and convenient intercity passenger rail travel option to address mobility challenges that are likely to expand as growth in population, employment, and tourism increase.

RCTC, in coordination with the FRA, completed an Alternatives Analysis in 2016 that evaluated several alternatives for new intercity passenger rail service between Los Angeles and Indio. RCTC is preparing a Passenger Rail Corridor Investment Plan, including a Program Environmental Impact Statement (EIS)/ Program Environmental Impact Report for a twice daily roundtrip service, which will evaluate and conceptualize how service will operate in the corridor and what infrastructure improvements would be needed to accommodate the new service.

Central Coast Rail

The Coast Route between Los Angeles, Santa Barbara, San Luis Obispo, Salinas and San Jose is defined as a state intercity passenger rail corridor in California Government Code. Regional agencies and jurisdictions along this route have been coordinating with Caltrans and rail operators, both independently and through a Coast Rail Coordinating Council, to develop proposals for expanding passenger rail service in the Central Coast counties.

Rail Extension to Salinas.

The Transportation Agency for Monterey County (TAMC) is planning an extension of passenger rail service to Salinas, which has been conceived as either an extension of Caltrain commuter rail service or Capitol Corridor intercity service, including two daily round trips to start with stops in San Jose, Gilroy, Pajaro/Watsonville, Castroville and Salinas. TAMC is proceeding with a reduced "Kick Start" project utilizing available state funds that would accommodate an initial service with station and track improvements at Gilroy and Salinas. TAMC is in the process of undertaking NEPA environmental review of the San Jose to Salinas segment, undertaking design work for capital improvements, purchasing right of way and coordinating with the state and rail operators on a strategy for implementing service.

Monterey Branch Line.

TAMC purchased the Monterey Branch Line between Castroville and Monterey from Union Pacific Railroad in 2003 with the intention of reestablishing intercity passenger rail service between the San Francisco Bay Area and the Monterey Peninsula. TAMC subsequently adopted a preferred alternative for Federal Transit Administration Small Starts funding identifying a light rail commuter service on a segment between Marina and Monterey with a future connection to intercity passenger rail service at Castroville, but this project has not progressed beyond the environmental stage due to a lack a funding. The Branch Line is currently being planned to include a commuter transit service guideway and remains an opportunity for providing a future passenger rail service connection for popular tourist destinations on the Monterey Peninsula.

Santa Cruz Branch Line.

The Santa Cruz County Regional Transportation Commission (SCCRTC) purchased the Santa Cruz Branch Line between Watsonville and Davenport, which is currently an active freight short line serving local industries. SCCRTC completed a feasibility study of passenger service alternatives in 2015, including various options for providing commuter service between Santa Cruz and Watsonville and connections to intercity passenger service at Pajaro/Watsonville, providing a reliable travel option in the congested Highway 1 corridor.

Coast Route Service North of San Luis Obispo.

The San Luis Obispo Council of Governments (SLOCOG), in coordination with its Central Coast Coordinating Council Partner agencies has planned a once daily intercity passenger rail service, referred to as the Coast Daylight, which has been conceived as an extension of Pacific Surfliner service north of San Luis Obispo to San Jose or San Francisco providing an additional passenger rail frequency on the Coast Route with proposed stops in Paso Robles, King City, Soledad, Salinas, Castroville, Pajaro/Watsonville and San Jose. Additional service in the Coast Route will provide passenger rail access to the state supported rail network, including access to the Fort Hunter Liggett military installation outside of King City.

SLOCOG completed an EIS/EIR for the Coast Route in San Luis Obispo and Monterey Counties in 2015 that encompassed a broad range of improvements identified in the Coast Corridor Service Development Plan completed by Caltrans in 2013 and previous plans and studies.

Central Valley: Tulare Cross Valley Corridor

The Tulare County Association of Governments (TCAG) is preparing a Cross Valley Corridor Plan to improve transportation system connections and mobility by developing a short line rail corridor between Huron and Porterville, a corridor that includes the proposed Kings/Tulare High Speed Rail Station and planned connections to the California High Speed Rail system. This corridor is planned to utilize existing rail right of way to provide passenger rail access to population centers in Kings-Tulare Counties, including the Lemoore Naval Air Station facility.

CROSS VALLEY
CORRIDOR PLAN

Commuter Rail

Commuter rail systems typically provide passenger service within a single region, and occasionally between regions. Service is more frequent during peak commuting periods. These commuter rail services are essential to supporting and connecting regional economies.

Commuter rail capital funding comes from Federal, State, and local sources, while operating funding is the responsibility of local and regional entities. Exhibit 2.2 and Exhibit 2.3 map these commuter rail services. Appendix A discusses other transit services that connect to the commuter rail lines.

Commuter rail in California currently operates in five markets:

Caltrain

Caltrain offers service from San Francisco through the San Francisco Peninsula to San Jose and Gilroy. Ridership for Fiscal Year (FY) 2016 was 19,233,427.[89]

Route Description. Caltrain operates 7 days a week on 77 miles of track owned by the PCJPB—from San Francisco to Tamien in San Jose—and by the UPRR from Tamien to Gilroy. Caltrain serves 32 stations in 19 cities between the cities of San Francisco, San Jose, and Gilroy in the counties of San Francisco, San Mateo, and Santa Clara. The system has a mixture of local, limited, and express trains; and serves work centers in San Francisco, the Peninsula, and Silicon Valley, including developing residential areas in southern Santa Clara County. Caltrain operates 92 weekday trains between San Francisco and San Jose. Of the 92 trains, 22 are express Baby Bullet (limited-stop express) trains that have only 4 to 6 stops between San Francisco and San Jose.[90] Weekdays, there is service at least every hour from 4 am until midnight, with significantly higher frequencies during peak commute periods.

The system provides extensive weekend service, including 36 Saturday trains and 32 Sunday trains. The weekend service consists primarily of local trains operating between San Francisco and San Jose Diridon stations on 1-hour headways from 7 am until 11 am on Saturdays, and 8 am to 10 pm on Sundays,[91] supplemented by four Baby Bullet trains. On weekends, buses provide a connection between San Jose Diridon and Tamien stations between approximately 7:30 am and 10:30 pm.

The ridership increased by 9 percent between FY 2014 and FY 2015 and 3.7 percent between FY 2015 and FY 2016, with a total of 19.2 million total passengers for FY 2016. The frequency is dependent on time of day and location of stations, with the peak hours and busiest stations receiving the most frequent service. Caltrain owns and operates 118 passenger cars and 29 locomotives.[92]

Travel Times. The current San Francisco to San Jose trip time is just over 1 hour and 30 minutes. Caltrain also offers two express trains at various times during a daily schedule. The Limited Stop train has a travel time of approximately 1 hour and 15 minutes to 1 hour and 30 minutes from San Francisco to San Jose. The Baby Bullet train has a San Francisco to San Jose trip time of approximately 1 hour and 5 minutes.[93]

Proposed Improvement Strategies. Focused improvements in the Caltrain corridor include the electrification program, and installation of the PTC system. These improvements increase corridor frequency, efficiency and safety.

89 Caltrain, Ridership, 2016. Accessed 2016.

90 Caltrain, Weekend Timetable, 2016. Accessed 2016.

91 Caltrain, Weekend Timetable, April 2016. Accessed 2016.

92 Caltrain, Commute Fleet, April 2016. Accessed 2016

93 Caltrain, Weekday Timetable, April 2016. Accessed 2017.

Altamont Corridor Express

ACE offers service from Stockton to San Jose via Livermore and Fremont. ACE ridership was approximately 1.3 million in FY 2015-2016.[94]

Route Description. ACE operates on weekdays on over 85 miles of track owned by UPRR and PCJPB. ACE has just over 5,000 daily riders.[95] American Public Transportation Association, *Transit Ridership Report: Fourth Quarter 2016*, March 2017. Accessed 2016. ACE serves a total of 10 stations (Stockton, Lathrop/Manteca, Tracy, Vasco Road, Livermore, Pleasanton, Fremont, Great America, Santa Clara, and San Jose). Free parking is available at all stations, except at the Santa Clara and San Jose stations, where there is a daily fee of $4 and $3, respectively.

Travel Times. All westbound trips occur in the morning, with four total westbound trips departing Stockton between 4:20 am and 7:05 am. All four eastbound trips occur in the evening, departing San Jose between 3:35 pm and 6:38 pm. This schedule serves commuters working in San Jose, but also those commuting from the Central Valley to the Tri-Valley, and to BART for other Bay Area destinations. The running time between Stockton and San Jose is approximately 2 hours and 12 minutes.[96]

Proposed Improvement Strategies. ACE received TIRCP funding for platform lengthening, and has begun to expand capacity and access. This includes new locomotives capable of handling longer trains on the same schedule. Additionally, ACE was awarded $400 million from SB1 for additional ACE*forward* improvements.

94 American Public Transportation Association, *Transit Ridership Report: Fourth Quarter* 2016, March 2017. Accessed 2016

95 American Public Transportation Association, *Transit Ridership Report: Fourth Quarter 2016*, March 2017. Accessed 2016.

96 ACE Rail Schedule, October 2016, Accessed 2016.

Metrolink

Metrolink offers a large network of commuter rail services between Los Angeles, Orange, Riverside, San Bernardino, San Diego, and Ventura Counties. Metrolink served approximately 10.9 million passengers in FY 2015-2016.[97]

Route Description. Metrolink currently operates 165 daily trains on weekdays, serving 55 stations on seven lines with over 39,000 daily weekday passengers.[98] The seven lines and their approximate running times are shown in **Table A.5** in Appendix A.

Most weekday trains operate during peak commuting hours before 8:30 a.m. and after 3:30 p.m. Metrolink also provides Saturday and Sunday service on the Antelope Valley, San Bernardino, Orange County, Inland Empire-Orange County, and 91 lines.

Metrolink has a total of 534 route-miles in the regional system; of those, 146 are shared route miles, where Metrolink trains share the track with freight and other passenger trains.[99] All Metrolink stations have ticket-vending machines. Stations on the Metrolink routes are owned by the cities or regional transportation agencies, and over 30,000 parking spaces are provided the majority of which are free.

Travel Times. Current travel time from Los Angeles to San Bernardino is 1 hour and 43 minutes; from Los Angeles to Riverside is 1 hour and 28 minutes; and from Los Angeles to Perris takes 2 hours and 13 minutes.

Proposed Improvement Strategies. Significant improvements are being realized through a majority replacement of the locomotive fleet with new Electro-Motive Diesel (EMD) F-125 locomotives. Metrolink is also at the forefront of PTC completion, which will significantly increase safety.

97 American Public Transportation Association, Transit Ridership Report: Fourth Quarter 2016, March 2017. Accessed 2016

98 *ibid*

99 *ibid*

COASTER

COASTER commuter trains offer service along the San Diego County coastline, from Oceanside to San Diego, via Carlsbad, Encinitas, and Solana Beach. COASTER served 1,556,056 passengers in FY 2015-2016.[100]

Route Description. The COASTER serves an average of 5,700 weekday passengers at eight stations between San Diego and Oceanside on 41 route-miles. It runs 126 trains per week that primarily are concentrated during peak periods[101]. Four round trips are operated on Saturdays, Sundays, and holidays. Additional service is provided in the spring and summer, and for special events such as home games at Petco Park for the San Diego Padres Major League Baseball franchise. All stations have free parking available, except downtown San Diego's Santa Fe Depot, where metered parking is available. Trains run between Oceanside and San Diego Santa Fe Depot from approximately 5:00 am to 8:30 pm.

Travel Times. Current travel time from Oceanside to San Diego is approximately 1 hour.

100 North County Transit District, Personal Communications, May 2017.

101 COASTER, *Fact Sheet,* 2016. Accessed 2016

Sonoma-Marin Area Rail Transit

SMART is a voter-approved commuter rail service that will initially run from Santa Rosa to San Rafael. Rail service on the initial segment will commence in 2017.

Route Description. SMART's initial segment runs 43 miles from Sonoma County Airport in Santa Rosa, south to San Rafael Transit Center, with eight intermediate stops. Trains began commercial operations on August 25, 2017. The service will eventually serve 14 stations along 70 miles of rail, from Cloverdale to Larkspur Landing, where it will connect with commuter Golden Gate ferries to/from San Francisco, although the first phase in operation is from Santa Rosa Airport to San Rafael, a 43 miles section. The project aims to bring the publicly owned Northwestern Pacific Railroad alignment into passenger use to encourage modal shift and relieve traffic on Highway 101. Passenger service beyond the initial operating will be extended as funding becomes available.[102]

Seven self-propelled Diesel Multiple Unit trainsets, each with two cars, will operate along the initial segment. Trains will run every 30 minutes in both directions during peak weekday hours, with one mid-day trip scheduled. SMART also will provide weekend service.

Travel Times. SMART is scheduled to launch passenger service in late-spring 2017. The estimated travel time from the northernmost station, Sonoma County Airport, to the southernmost station, San Rafael, is 1 hour and 7 minutes.

Proposed Improvement Strategies. The key improvements to this corridor include extensions to Cloverdale and Larkspur, adding service for additional markets and connections to the Bay Area.

102 Sonoma-Marin Area Rail Transit, Website, 2016. Accessed 2016

Exhibit 2.3: California Commuter Rail Services (Northern California)

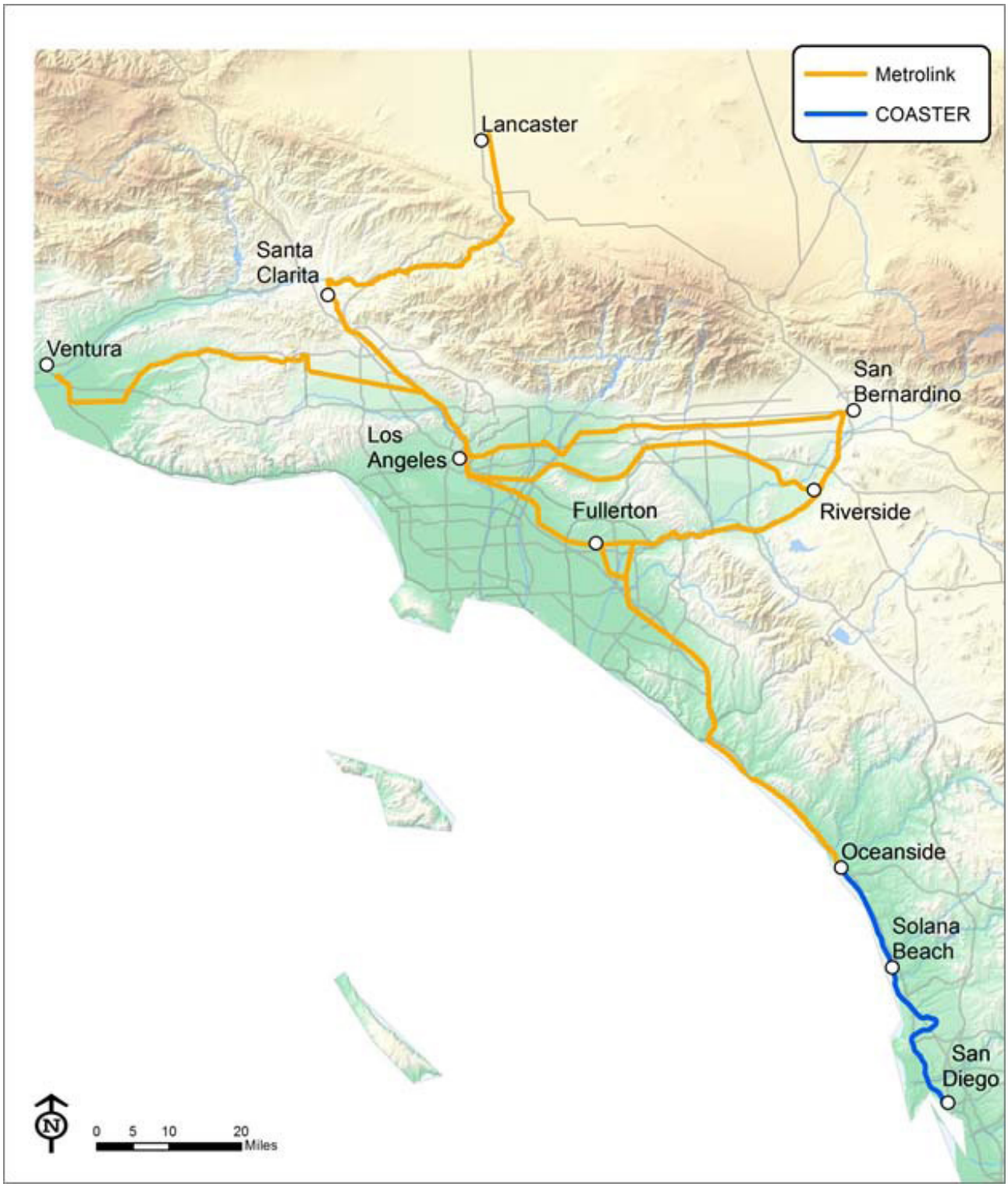


Exhibit 2.4: California Commuter Rail Services (Southern California)

Commuter Rail: Service Providers

The five regional commuter systems serve the metropolitan areas of the San Francisco Bay Area, Marin, Los Angeles, and San Diego. Exhibit 2.2 and Exhibit 2.3 provide maps of these services. These commuter rail services are overseen by various administrative structures, including JPAs and districts, composed of representatives from within their rail service area. Appendix A, **Table A.6** summarizes California's commuter rail services, routes, and administrators; and Table 2.3 provides ridership history for the services. Commuter rail services support multimodal transportation options, and their connections to longer-distance rail facilitate travel to statewide destinations.

All of the commuter rail operators contract with a private entity or entities, or Amtrak, to provide operations and equipment maintenance. Such an arrangement provides flexible opportunities to try to provide the best service to customers at the lowest cost, while minimizing risk.

Commuter rail services are currently provided by a variety of management structures, including JPAs and Transit Districts.

Peninsula Corridor Joint Powers Board (Caltrain)

The PCJPB owns and operates the Caltrain commuter rail service between San Francisco and Gilroy, which serves San Francisco, San Mateo, and Santa Clara Counties. Its Board of Directors includes nine members who represent San Francisco County (and City), San Mateo County, and Santa Clara County.[103] Public involvement with the service began in 1980, when Caltrans contracted with the Southern Pacific Railroad to fund operations. In 1987, the JPB was formed to manage the line. The JPB bought the railroad right-of-way in 1991, and subsequently extended service to Gilroy. Service is provided by a private operator under contract to the JPB.

Southern California Regional Rail Authority (Metrolink)

SCRRA operates and governs Metrolink. SCRRA's eleven-member Board of Directors represents five county agencies (Los Angeles County Metropolitan Transportation Authority [LA Metro], Orange County Transportation Authority, Riverside County Transportation Commission, San Bernardino Associated Governments, and Ventura County Transportation Commission).[104] Metrolink serves six counties, and currently operates a network of over 500 route-miles. A substantial portion of the service is operated on publicly owned lines, but services are also provided on lines owned and operated by BNSF and UPRR.

San Joaquin Regional Rail Commission (SJRRC)

SJRRC owns, operates, and makes policy for ACE. The San Joaquin Council of Governments appoints the Board of Directors, which governs SJRRC. Board selections are made based on nominations by local governments.[105] UPRR is the primary track owner, and PCJPB owns the track between Santa Clara and San Jose.

North County Transit District (COASTER)

NCTD operates the COASTER along with the BREEZE bus service and SPRINTER light rail service. The NCTD Board of Directors comprises a member from each incorporated city in its jurisdiction; and the Fifth District County Supervisor, who represents unincorporated areas of the jurisdictions and the cities of Carlsbad, Oceanside, Vista, and San Marcos.[106] NCTD is the primary track owner, and the San Diego Metropolitan Transit System is a track owner in San Diego.

103 Caltrain, Board of Directors, 2017. Accessed 2017

104 Metrolink, About Metrolink, 2017. Accessed 2017

105 ACE, Board of Directors, 2017. Accessed 2017

106 NCTD, Board of Directors, 2017. Accessed 2017

Sonoma-Marin Area Rail Transit District

The SMART District currently oversees the development and planning of—and will operate—the SMART rail service. The District's twelve-member Board is composed of two county supervisors from both Marin County and Sonoma County, three City Council members from each county, and two Golden Gate Bridge District members.[107]

Overall, commuter rail ridership has continued to grow over the past decade. Table 2.3 shows that annual ridership for the State's four commuter rail operators increased by more than 11 million trips since 2005. FY 2015 ridership was 33.3 million across the four lines. Caltrain ridership grew the fastest. With an express service (i.e., the Baby Bullet) and a resurgent job market, it nearly doubled ridership from 2005 to 2015.

Table 2.3: Historical Annual Ridership Information for California's Commuter Rail Operators

State Fiscal Year	ACE [a]	Caltrain [b]	COASTER [c]	Metrolink [d]	Total Commuter Rail Ridership
2005	941,693	9,454,467	1,432,468	9,946,566	21,775,194
2006	708,274	10,148,616	1,554,450	10,584,078	22,995,418
2007	805,257	10,980,802	1,560,729	11,026,264	24,373,052
2008	797,253	11,961,717	1,686,015	12,013,206	26,458,191
2009	683,190	12,691,717	1,501,619	12,332,037	27,208,563
2010	676,958	11,967,716	1,271,620	11,325,800	25,242,094
2011	838,750	12,673,420	1,390,142	11,142,645	26,044,957
2012	786,947	14,134,117	1,624,211	11,977,540	28,522,815
2013	940,774	15,595,559	1,629,196	12,112,826	30,278,355
2014	1,713,664	17,029,447	1,673,816	11,769,645	32,186,572
2015	1,244,309	18,567,173	1,641,525	11,826,382	33,279,389
2016	1,295,500	19,233,427	1,556,056	10,903,000	32,987,983

Note: Map excludes SMART, whose revenue operations will begin in 2017.

[a] Ridership data for 2004 to 2008: California State Controller's Office, Transit Operators and Non-Transit Claimants Annual Report. Other years: State Controller's Office, Open Data website, 2016. Accessed 2016.

[b] Caltrain, Personal Communications (2016).

[c] North County Transit District, Personal Communications (2016).

[d] Metrolink, Monthly Line Ridership Reports. Accessed 2016.

107 SMART, Who We Are, 2017. Accessed 2017

Urban Rail Systems

Urban rail systems provide passenger service within a metropolitan area. Urban rail service exists in a number of different forms for varying purposes, and includes high-capacity, high-speed heavy-rail transit service (i.e., subways and elevated trains); lower-speed, lower-capacity streetcars and cable cars offering localized service (and often sharing roadways with motor vehicles); and light-rail systems, which offer capacities and speeds between those of heavy rail and streetcar systems. Seven different agencies offer nine urban rail transit systems, including two heavy-rail transit systems, five light-rail transit systems, and one cable car system. Table 2.4 details urban rail services by operator. Connections to commuter and intercity rail systems provide convenient access for passengers travelling long distances with rail.

Table 2.4: Existing Urban Rail Systems in California[108]

Type	Operator	Service Name	Service Area
Heavy-Rail Transit	**BART**	*BART* Green Line	Warm Springs/South Fremont (Berryessa)[a] – Oakland – San Francisco – Daly City
		Orange Line	Richmond – Oakland – Warm Springs/South Fremont (Berryessa)
		Red Line	Richmond – San Francisco – Daly City – Millbrae
		Blue Line	Dublin/Pleasanton – Oakland – San Francisco – Daly City
		Yellow Line	Pittsburg/Bay Point – San Francisco – San Francisco Airport – Millbrae
	LA Metro	*Metro Rail:* Red Line	Los Angeles – Hollywood – North Hollywood
		Purple Line	Los Angeles – Westlake – Wilshire/Western

[a] Berryessa BART willbe operational in 2017.

108 Sources: BART, LA Metro, RT, SFMTA, Santa Clara VTA, and SDMTS, 2016.

Tabel 2.4: Existing Urban Rail Systems in California (continued)

Type	Operator	Service Name	Service Area
Light-Rail Transit	**RT**	RT Light Rail: Gold Line	Downtown – Sunrise – Folsom
		Blue Line	Watt/I-80 – Downtown – Consumnes River College
		Green Line	Downtown Sacramento – Richards Blvd.
	SFMTA	*Muni:* F – Market-Wharves (Streetcar Line)	Fisherman's Wharf – Castro
		J – Church	Ferry Building – Noe Valley – Balboa Park
		K – Ingleside	Ferry Building – Ingleside District – Balboa Park
		L – Taraval	Ferry Building – San Francisco Zoo
		M – Oceanview	Ferry Building – Oceanview District – Balboa Park
		N – Judah	Caltrain Station – Ocean Beach
		T – Third Street	Castro Station – Bayshore
	SCVTA	*SCVTA Light Rail:* 900: Almaden to Ohlone/ Chynoweth	Almaden – Ohlone/Chynoweth
		901: Santa Teresa to Alum Rock	Santa Teresa – Ohlone/Chynoweth – San Jose – Tasman – Alum Rock
		902: Mountain View to Winchester	Mountain View – Tasman – San Jose – Winchester
	LA Metro	*Metro Rail:* Blue Line	Los Angeles – Compton – Long Beach
		Gold Line	East Los Angeles – Union Station – Pasadena – Azusa
		Green Line	Redondo Beach – Aviation/LAX – Lynwood-Norwalk
		Expo Line	Los Angeles – Crenshaw – Culver City – Santa Monica
	NCTD	SPRINTER	Oceanside – Vista – San Marcos – Escondido
	SDMTS	*San Diego Trolley:* Blue Line	San Diego – San Ysidro
		Orange Line	San Diego – El Cajon
		Green Line	San Diego – Qualcomm Stadium – SDSU – Santee
Cable Car	**SFMTA**	*Muni Cable Car:* California Street	Embarcadero Station – California Street – Van Ness
		Powell-Mason/Hyde	Powell Street – Mason Street – Taylor/Bay Street, Powell Street – Hyde Street – Victorian Park

Excursion Passenger Rail Services

Excursion railroads typically serve recreational trips and provide an alternative to automobile travel for tourists visiting scenic destinations throughout the state. They also provide an educational function, informing visitors of what rail travel was like in previous generations. Often, visitors ride in historic railroad passenger cars pulled by diesel locomotives; and in some cases, by steam locomotives. Many excursion railroads operate in California, including the Sierra Railroad, the Fillmore and Western Railway, the Santa Cruz and Monterey Bay Railway, Santa Cruz, Big Trees, and Pacific Railway, the Sacramento Southern Railroad, and the Napa Valley Wine Train. These railroads are sometimes referred to as Heritage railroads. In addition, regular seasonal charter trains operate to serve markets such the Reno and Lake Tahoe area, often using a combination of Amtrak and private rail equipment.

Passenger Intermodal Facilities

Many passenger intermodal facilities throughout California facilitate transfers between intercity rail, commuter rail, and bus/rail transit. Most Amtrak stations in California offer transit connections, while several key intermodal hubs offer transfers to other travel modes. Table 2.5 details key passenger intermodal facilities and their location, and available connections to Amtrak other travel modes.

California's rail system also facilitates connections to State airports. Appendix A, **Table A.6**, indicates rail corridors serving California's major commercial airports.

Table 2.5: Key Passenger Rail Intermodal Facilities[109]

Facility Name	Location	Connecting Amtrak Services	Connecting Commuter Rail/Transit Services	Other Connections
Anaheim – ARTIC Station	Anaheim	*Pacific Surfliner*	Metrolink, OCTA buses	Anaheim Resort Transit to Disneyland
Bob Hope Airport Regional Intermodal Transportation Center	Burbank	*Pacific Surfliner,* Amtrak Thruway bus	Metrolink, LA Metro buses, Burbank Bus shuttle connection to Metro Red/Orange Line	Bob Hope Airport
Emeryville Amtrak	Emeryville	*Capitol Corridor, Coast Starlight, San Joaquin, California Zephyr,* Amtrak Thruway bus	AC Transit buses, Emery-Go-Round	San Francisco
Los Angeles Union Station	Los Angeles	*Pacific Surfliner, Southwest Chief, Sunset Limited,* Amtrak Thruway bus	LADOT DASH, LA Metro buses and Gold, Red, and Purple Line rail, Metrolink, OCTA buses, municipal buses	LAX Airport (via FlyAway shuttle)
Millbrae Intermodal Terminal	Millbrae	N/A	BART, Burlingame Trolley, Caltrain, SamTrans buses	SFO Airport (via BART)
Oakland Coliseum	Oakland	*Capitol Corridor*	BART, AC Transit buses	OAK Airport shuttle
Oceanside Transportation Center	Oceanside	*Pacific Surfliner,* Amtrak Thruway bus	COASTER, Metrolink, NCTD buses, Riverside Transit, SPRINTER	N/A
Richmond Amtrak/BART Station	Richmond	*Capitol Corridor, San Joaquin*	BART, AC Transit buses	N/A
Sacramento Amtrak	Sacramento	*Capitol Corridor, Coast Starlight, San Joaquin, California Zephyr,* Amtrak Thruway bus	RT light rail and buses	Sacramento Airport (via Yolobus)
Santa Clara Station	Santa Clara	*Capitol Corridor,* Amtrak Thruway bus	ACE, Caltrain, VTA light rail and buses	SJC Airport (via VTA)
Santa Fe Depot	San Diego	*Pacific Surfliner,* Amtrak Thruway bus	SDMTS trolley/light rail and buses	San Diego Airport (via SDMTS)
San Jose Diridon Station	San Jose	*Capitol Corridor, Coast Starlight,* Amtrak Thruway bus	ACE, Caltrain, Santa Cruz METRO and Monterey-Salinas Transit buses, VTA light rail and buses	N/A
Stockton ACE	Stockton	*San Joaquin,* Amtrak Thruway Bus	ACE, SJRTD buses	N/A

109 Source: Cambridge Systematics, Inc., 2016.

2.1.2 Existing State-supported Intercity Rail Performance

This section presents performance information for the three State-supported intercity passenger rail routes. Appendix A provides more detailed passenger rail system performance data.

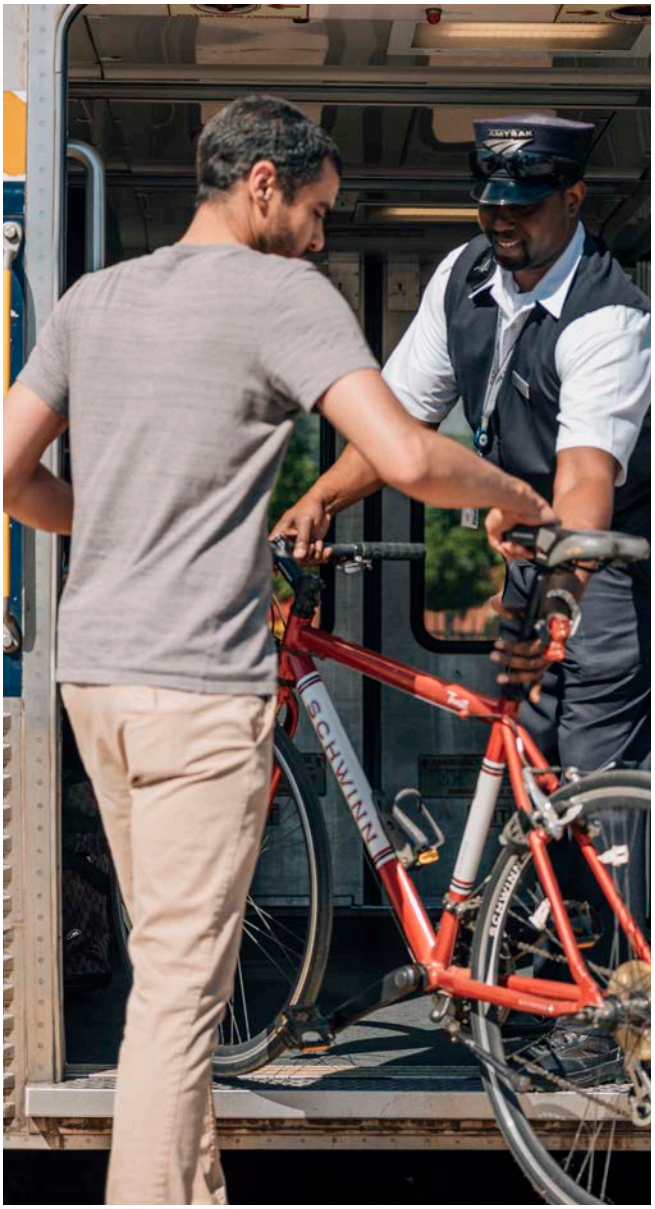
Service Performance of State-Supported Routes

Table 2.6 presents historic intercity passenger rail ridership and service levels on State supported routes. *Pacific Surfliner* ridership increased by 10 percent from FFY 2006-2016, to over 2.9 million. *San Joaquin* ridership increased 40 percent over the same period, with 1.1 million annual ridership in FFY 2016. Capitol Corridor ridership increased 23 percent, and was over 1.5 million in FFY 2016.[110] During the recession, ridership for the commuter-heavy *Pacific Surfliner* and *Capitol Corridor* dipped more than ridership for the *San Joaquin*.

Ridership across the three routes increased 19 percent from FFY 2006-2016, and was over 5.5 million in FFY 2016. The largest single-year ridership decrease occurred in FFY 2009 (8 percent), and the largest single-year increase occurred in FFY 2008 (12 percent).

Table 2.6 also presents passenger mile and on-time performance ('OTP'). A passenger mile is equivalent to 1 mile traveled by one passenger. OTP is the percentage of instances in which a train arrives on time at a station, where on time is defined as a 15 minute or less deviation from schedule. Frequency refers to the number of round trips per day.

Table 2.7 displays financial and operational performance of the State-supported routes. Both revenues and expenses grew substantially over the FFY 2006-2016 period. However, expenses grew at a slower rate, resulting in increasing farebox ratio. Across the three lines, revenues increased by 100 percent over the period to approximately $150.3 million in FFY 2016, and expenses increased by 50 percent to approximately $236 million. In FFY 2014, under the requirements of Section 209 of PRIIA, the State assumed responsibility for 100 percent of the operating costs on the *Pacific Surfliner*; therefore, both revenues and expenses increased significantly starting in that year. The farebox ratio is the total fare revenue divided by total operating expenses. The metric shows the fraction of operating expenses that are met by passenger fares. Farebox ratios during the last 10 years grew from 56.4 percent to 78.8 percent for *Pacific Surfliner*, 46 percent to 49.6 percent for *San Joaquin*, and 38.6 percent to 56.3 percent for *Capitol Corridor*.



110 Amtrak began adjusting Capitol Corridor ridership numbers in FY 2014 onwards to account for actual ticket scans. Previous estimations made usage assumptions about multi-ride tickets, and these estimates were inflated. The current method results in reported ridership being 15 to 20 percent lower than prior years. CCJPA, Capitol Corridor Intercity Passenger Rail Service Business Plan Update FY 2016-17 – FY 2017-2018 Final Draft, February 2016. Accessed 2017.

Table 2.6: State-Supported Routes – Ridership and Service Levels[111]

	Actual											
	FFY 05	FFY 06	FFY 07	FFY 08	FFY 09	FFY 10	FFY 11	FFY 12	FFY 13	FFY 14	FFY15	FFY 16
Pacific Surfliner Route												
Annual Ridership (thousands)[a]	2,520	2,658	2,707	2,899	2,593	2,614	2,787	2,640	2,706	2,681	2,827	2,924
Annual Passenger Miles (thousands)	201,915	218,372	222,446	240,761	213,656	215,640	230,759	223,501	232,276	205,497	241,451	251,650
On Time Performance	72.90%	76.10%	74.80%	76.1%	83.1%	76.3%	77.5%	75.5%	84.8%	77.0%	77.9%	78.1%
Frequency (Round Trips)[b]												
San Diego – Los Angeles[c]	11	11	11	11	11	11	11	11	11	11	11	11
Los Angeles – Goleta	5	5	5	5	5	5	5	5	5	5	5	5
Goleta – San Luis Obispo	2	2	2	2	2	2	2	2	2	2	2	2
San Joaquin Route												
Annual Ridership (thousands)	756	800	805	950	929	978	1,067	1,145	1,220	1,188	1,177	1,122
Annual Passenger Miles (thousands)	115,621	120,615	120,914	139,005	133,712	139,405	156,428	166,337	170,076	165,538	164,250	155,936
On Time Performance	63.50%	62.60%	67.90%	82.6%	89.6%	90.7%	89.5%	88.1%	77.7%	75.4%	73.4%	83.2%
Frequency (Round Trips)												
Oakland – Bakersfield[f]	4	4	4	4	4	4	4	4	4	4	4	5
Sacramento – Bakersfield	2	2	2	2	2	2	2	2	2	2	2	2
Capitol Corridor Route												
Annual Ridership (thousands)[d]	1,260	1,274	1,450	1,694	1,600	1,581	1,709	1,746	1,701	1,419	1,475	1,561
Annual Passenger Miles (thousands)	85,906	86,519	96,343	109,882	102,283	101,251	109,074	111,191	112,158	96,161	98,943	104,135
On Time Performance[e]	84.70%	72.70%	74.60%	86.0%	92.3%	93.1%	94.9%	93.9%	95.0%	95.3%	93.0%	94.1%
Frequency (Round Trips)												
San Jose – Oakland	4	7	7	7	7	7	7	7	7	7	7	7
Oakland – Sacramento[d]	12	16	16	16	16	16	16	15	15	15	15	15
Sacramento – Auburn	1	1	1	1	1	1	1	1	1	1	1	1
State-Supported Route Summary												
Annual Ridership (thousands)	4,537	4,731	4,962	5,542	5,122	5,172	5,563	5,531	5,627	5,288	5,479	5,607
Annual Passenger Miles (thousands)	403,442	425,506	439,704	489,648	449,651	456,296	496,260	501,029	514,510	467,196	504,644	511,721

a Total ridership, including State and Amtrak shares.
b Service frequencies shown are for weekday service.
c One additional weekend round trip. Approximately 12 weekend round trips.
d See earlier footnote about Capitol Corridor ridership reporting methodology changing in FY 2014 to reflect actual ticket scans. Change resulted in 15-20% lower reported ridership.
e End point on time performance.
f Starting in June 2016, the San Joaquin began offering 5 Oakland-Bakersfield round trips per day.

111 Sources: Caltrans rail operational database.

Table 2.7: State-Supported Routes – Financial Operational Performance [112]

	Actual											
	FFY 05	**FFY 06**	**FFY 07**	**FFY 08**	**FFY 09**	**FFY 10**	**FFY 11**	**FFY 12**	**FFY 13**	**FFY 14**	**FFY15**	**FFY 16**
Revenue (Million Dollars)												
Pacific Surfliner (State Portion)	$28.10	$32.60	$35.50	$38.30	$34.90	$35.80	$40.30	$43.09	$46.38	$70.40	$75.80	$79.47
San Joaquin	$23.30	$26.50	$26.40	$31.30	$29.60	$33.20	$37.80	$41.09	$41.83	$41.22	$40.46	$38.67
Capitol Corridor	$15.20	$16.00	$19.30	$23.80	$23.50	$24.20	$27.10	$29.49	$29.19	$29.23	$30.09	$32.19
Total Revenue	**$66.60**	**$75.10**	**$81.20**	**$93.3**	**$88.00**	**$93.20**	**$105.30**	**$113.67**	**$117.40**	**$140.85**	**$146.35**	**$150.33**
Expenses (Million Dollars)												
Pacific Surfliner (State Portion)	$49.20	$57.80	$56.90	$63.00	$61.60	$67.00	$69.80	$72.88	$73.76	$102.73	$110.00	$100.90
San Joaquin	$50.80	$58.20	$60.60	$68.30	$65.10	$67.80	$69.80	$73.09	$73.26	$81.86	$80.02	$78.04
Capitol Corridor	$39.30	$41.50	$46.00	$53.30	$51.00	$53.90	$57.90	$59.41	$58.64	$57.71	$58.06	$57.14
Total Expenses	**$139.30**	**$157.50**	**$163.50**	**$184.7**	**$177.7**	**$188.7**	**$197.5**	**$205.38**	**$205.66**	**$242.30**	**$248.08**	**$236.08**
Farebox Ratio												
Pacific Surfliner	57.10%	56.40%	62.40%	60.8%	56.6%	53.5%	57.7%	59.1%	62.9%	68.5%	68.9%	78.8%
San Joaquin	44.50%	46.00%	45.50%	45.8%	45.5%	48.9%	54.2%	56.2%	57.1%	50.4%	50.6%	49.6%
Capitol Corridor	36.60%	38.60%	41.90%	44.6%	46.1%	44.9%	46.9%	49.6%	49.8%	50.6%	51.8%	56.3%
State Costs (Million Dollars)												
Existing Routes												
Pacific Surfliner	$21.20	$25.20	$21.40	$24.7	$26.8	$31.2	$29.6	$29.7	$27.4	$32.3	$34.2	$32.55
San Joaquin	$27.40	$31.70	$34.20	$37.1	$35.5	$33.6	$32.0	$32	$31.4	$40.6	$40.1	$43.44
Capitol Corridor	$24.10	$25.50	$26.70	$29.6	$27.5	$29.7	$30.2	$29.9	$29.5	$28.5	$27.96	$33.01
Subtotal	**$72.70**	**$82.40**	**$82.30**	**$91.3**	**$89.7**	**$94.5**	**$91.7**	**$91.6**	**$88.3**	**$101.4**	**$102.26**	**$109.00**
Equipment Heavy Overhaul	$13.50	$13.80	$14.00	$13.8	$13.2	$12.7	$16.1	$2.6	$4.2	$1.6	$1.7	$0
Total	**$86.20**	**$96.20**	**$96.30**	**$105.1**	**$102.9**	**$107.2**	**$107.8**	**$94.2**	**$92.5**	**$103**	**$103.96**	**$109.00**

112 Source: Caltrans rail operational database

2.1.3 California's Freight Railroad System

California's freight railroad system links industries and consumers throughout the state with North American and overseas markets. The 5,295-mile freight rail system is central to the handling of the State's international trade, and plays a central role in maintaining the competitiveness of some of its principal freight-oriented industries. In 2013, the base year for the Rail Plan, California's rail network handled 159.6 million tons of commodities, of which 60.9 million tons originated, and 103.7 million tons terminated, in California.[113] According to the Association of American Railroads (AAR), California ranked eighth among states in terms of rail tons originated in 2012.[114]

Railroads are commonly characterized in the context of revenues, with Class I being the largest, and Class III being the smallest. BNSF and UPRR, two Class I railroads, each with annual revenues of over $475 million (2013), provide service throughout the state. Class II carriers have revenues between $38.05 million and $475.75 million (2013); there are no Class II railroads in California. Finally, with revenues of less than $38.05 million (2013), Class III carriers, commonly referred to as "short lines," provide service to various communities across the state. In 2016, a total of 27 short lines, including seven terminal and switching railroads, operated in the state. All freight railroads serving the state, along with their parent company (if they have one) and route mileage operated (miles owned plus trackage rights), are listed in Table 2.8.

California's Class I and publicly owned rail network is displayed in Exhibit 2.4, and short lines operating in the State are shown in Exhibit 2.5. The vast majority of route-miles (3,871 miles) is owned by the two Class I railroads, BNSF and UPRR, followed by short lines (1,296 route-miles). Public ownership accounts for almost 700 miles, most of which are concentrated around the state's major metropolitan areas in Southern California and the Bay Area. Because the publicly owned lines are Class I spin-offs of the former Atchison Topeka and Santa Fe Railway and the former Southern Pacific Railroad, successors BNSF and UPRR continue to hold trackage rights over most of the existing mileage. In some instances, these rights have been ceded or transferred to short-line operators.

Union Pacific Railroad

UPRR operates 32,000 route-miles of track across 23 states, and is California's largest railroad in terms of volume, employees, and mileage. In 2015, with a workforce of about 5,000 employees, UPRR's California operations handled over 3 million carloads on a network of almost 3,300 miles.[115]

113 AAR, AAR Fact Sheet, California (2013).

114 AAR, AAR State Rankings 2012.

115 UPRR, California Fact Sheets, 2015; 10-K Filings (2011).

Table 2.8: California's Freight Railroads[116]

Name	Standard Carrier Alpha Code (SCAC)	Parent Company	Total Miles Operated[b]
BNSF Railway	BNSF	Berkshire Hathaway	2,114
Union Pacific Railroad	UPRR	Independent	3,292
Class III Railroads (Short Lines)			
– Local Railroads			
Arizona & California Railroad Company	ARZC	Genesee & Wyoming Inc.	190 (84 in CA)
California Northern Railroad	CFNR	Genesee & Wyoming Inc.	210
Central Oregon & Pacific Railroad	CORP	Genesee & Wyoming Inc.	305 (56 in CA)
Fillmore and Western[a]	FWRY	Independent	28
Lake County Railway	LCR/LCY	Frontier Rail	
Napa Valley Wine Train[a]	NVRR	Independent	18
Northwestern Pacific	NWP	Independent	63
Pacific Sun Railroad, LLC	PSRR	Watco	62
Sacramento Southern Railroad	SSR	State of California	3
Sacramento Valley Railroad	SAV	Patriot Rail	7
San Diego & Imperial Valley Railroad	SDIY	Genesee & Wyoming Inc.	1
San Joaquin Valley Railroad Company	SJVR	Genesee & Wyoming Inc.	297
Santa Cruz, Big Trees & Pacific Railway	SCBG	Roaring Camp, Inc.	9
Santa Cruz and Monterey Bay Railway Company	SCMB	Iowa Pacific Holdings	31
Santa Maria Valley Railroad	SMV	Independent	14
Sierra Northern Railway	SERA	Independent	68
Stockton Terminal & Eastern Railroad	STE	OmniTrax	25
Trona Railway Company	TRC	Searles Valley Minerals/Nirma	31
Ventura County Railroad Company	VCRR	Genesee & Wyoming Inc.	9
West Isle Line, Inc.	WFS	Western Farm Service	5
– Switching & Terminal Railroads			
Central California Traction	CCT	BNSF/UPRR	96
Los Angeles Junction Railway Company	LAJ	BNSF	64
Modesto & Empire Traction Company	MET	Independent	49
Oakland Terminal Railway	OTR	BNSF/UPRR	10
Pacific Harbor Line, Inc.	PHL	Anacostia & Pacific	59
Quincy Railroad	QRR	Independent	3
Richmond Pacific Railroad Corporation	RPRC	Independent	6

[a] Primarily passenger operator, but does handle some freight.
[b] Includes trackage rights.
Note: The table does not include freight railroads that operate solely for the purpose of its owner. These include CEMEX's South Western Portland Cement Railroad, U.S. Gypsum's operation near Plaster City, and several railroads operating on military facilities.

116 Sources: American Short Line and Regional Railroad Association, Association of American Railroads, carrier Interviews 2016.

Exhibit 2.5: Class I and Public Agency Owned Rail System

Exhibit 2.6: Short Line and Switching and Terminal Freight Railroads[117]

Note: Exhibit shows short lines mentioned in Table 2.8.

117 Rail lines with less than 10 miles of track are not shown on the map.

Today, UPRR operates an expansive rail line network that serves California's diverse regions, including the agriculturally rich San Joaquin Valley, the Port of Oakland, the San Francisco Bay Area, and the Los Angeles metropolitan area. For its carload services, UPRR operates two system classification yards at West Colton in southern California, and Roseville in northern California; and three regional yards in Lathrop (San Joaquin County), Commerce (Los Angeles County), and Yermo (San Bernardino County). Intermodal services are available at six dedicated terminals, in Oakland, Stockton, and the Los Angeles and Long Beach region. UPRR also has shared use of the on-dock rail terminals at the Ports of Los Angeles and Long Beach, which are discussed in more detail in Section 2.1.5. In California, UPRR holds trackage rights over BNSF in various locations; most notably, between San Bernardino and Yermo over Cajon Pass.

BNSF Railway Company

BNSF is North America's largest intermodal carrier, handling over 4.9 million trailers and containers in 2015 in the United States, compared to UPRR's 3.9 million.[118][119] BNSF operates more than 32,000 route-miles of track throughout the U.S. across 28 states. In addition to its own routes, BNSF holds trackage rights over the UPRR between Salt Lake City and the San Francisco Bay Area, Tehachapi Pass between Bakersfield and Mojave, as well as in the Central Valley.

In California, BNSF operates more than 2,114 route-miles in California, with a workforce of almost 3,500 employees. These operations occur on 1,149 miles owned by BNSF and 965 miles of line on which BNSF holds trackage rights. BNSF moves about 3.9 million carloads per year in California.[120] Major BNSF freight hubs include 11 carload yards, including its major system yard at Barstow; five dedicated intermodal terminals; and the shared on-dock rail facilities at the Ports of Los Angeles and Long Beach. The carload yards are in Bakersfield, Barstow, City of Commerce, Fresno, Needles, Richmond, Riverbank, San Bernardino, San Diego, Stockton, and Wilmington. The five intermodal facilities are in Fresno, Richmond, San Bernardino, Stockton, and Los Angeles.[121]

California serves as the western anchor to BNSF's Transcontinental Corridor route, which links Southern and Northern California with Chicago. On this corridor, consumer products, which include everything from food and automobile products to agricultural and industrial products, represent the majority of BNSF's transported commodities.[122]

Class III Short Lines (Local, Terminal, and Switching Railroads)

California's 20 local railroads and seven switching and terminal railroads are a diverse group, varying widely in terms of mileage, ownership, traffic volumes, and markets served. Although some, such as the Santa Maria Railroad, the Trona Railway, and the Modesto & Empire Traction Company, have been longstanding fixtures in California's rail map, many more came into existence during the industry restructuring of the 1980s and 1990s, when the Class I railroads streamlined their networks by selling off or abandoning light-density lines. Since then, the short-line sector has consolidated, with the majority of carriers coming under the control of a handful of holding companies. In California, as in the rest of the U.S., the largest short-line operator is Genesee & Wyoming, operating six of the 20 short lines; and 657 miles, or 51 percent of total short-line mileage. Other holding companies, such as Watco, Omnitrax, and Patriot Rail, are also present in California, with each operating only one railroad. Also, BNSF and UPRR continue to own three switching railroads (two of them jointly).

With the exception of Pacific Harbor Line, which handles container traffic at the San Pedro Bay ports, the State's short lines focus on carload traffic. By providing "last mile" service to many smaller shippers in the state's rural communities, they ensure continued access to rail service and facilitate economic development. Tourist passenger service is also part of the business mix for several short lines; for a few, such as the Napa Valley Railroad and the Fillmore and Western, it is their primary business.

118 UPRR, Union Pacific Railroad: Weekly Carloads and Intermodal Traffic Report, Week 52 (Week of December 27, 2015 through January 2, 2016; Week of December 28, 2014 through January 3, 2015).

119 BNSF Railway, BNSF Railway: Weekly Intermodal and Carload Units Report Week 52 (Week ending January 2, 2016; Week ending January 3, 2015).

120 BNSF, California 2015 Fact Sheet (2015).

121 *ibid*

122 BNSF, State Fact Sheet for the State of California (2010).

Short Line Trends

The vast majority (89 percent) of rail traffic tonnage in California is handled entirely by the Class I railroads. In part, the high volume of intermodal freight drives the high Class I share, traffic that short lines commonly do not handle. The situation is different for carload traffic, where almost one in five (19 percent) originated carloads begin their trip on a short line. Eight percent of carloads end their trip on a California short line. For the more rural regions of the state, short lines take on even greater importance as a means to accessing rail service. As shown in Table 2.9, upwards of 41 percent of all carload traffic originating in the Central Valley is on short lines. In Northern California, over one out of four carloads begin or end their trip on a short line.

Short lines are responsible for transporting most of the alcoholic beverages (93 percent) and fuel oils (78 percent) originating in California. They are also responsible for transporting more than half of the transportation equipment (52 percent), and almost a third of fertilizers (28 percent) terminating in California.

Because carload traffic is projected to increase by over 50 percent between 2013 and 2040, (Table 2.9) short lines will need to grow to handle the increasing carload traffic.

Short Line Performance

It is apparent that some short lines operating in California are not meeting critical volume thresholds, and services and investment in track and equipment are declining. Concurrently, short line railroads are facing pressure for investment to remain competitive with the Class I railroads, as well as other modes of freight transportation. Remaining competitive includes short lines being able to accommodate heavier-weight railcars (i.e., loaded car weights of 286,000 pounds, or "286K"), and providing competitive pricing and service offerings in conjunction with their Class I connections. Although the Class I rail network is generally in excellent physical condition, short line conditions tend to have less well-maintained track and other infrastructure elements. Although most of California's short lines can handle 286K railcars, light track and outdated bridges on a number of routes greatly impede efficiency and produce risks.

Many of the short lines contacted in development of the Rail Plan expressed concerns about new environmental, safety, and insurance-related regulations (including the recently imposed hazmat fees, and two-person crew requirements) that they are required to follow. Although the desired intent behind these requirements is positive, the cash-strapped nature of many short lines makes the additional costs imposed by these regulations difficult to bear.

Table 2.9: Short Line Carload Service Traffic Originating (left) and Terminating (right) in California[123]

	Originating		Terminating	
California Regions	**Short line Traffic % (units)**	**Short line Traffic % (tons)**	**Short line Traffic % (units)**	**Short line Traffic % (tons)**
Northern California	28%	23%	33%	23%
Southern California	6%	8%	2%	3%
Bay Area & Central Coast	9%	9%	2%	3%
Central Valley	41%	39%	16%	15%
California Statewide	18%	19%	7%	8%

123 Surface Transportation Board, 2013 STB Confidential Carload Waybill Sample, Freight Analysis Framework (FAF) 3, Ports of Long Beach and Los Angeles.

Positive Train Control

The Class I railroads are implementing PTC largely at their own expense, and installation is well under way in California and elsewhere. However, PTC poses costly challenges to some short lines that are handling hazardous materials, or more commonly must operate over PTC-equipped Class I main lines. The $100,000-plus cost of retrofitting older locomotives that are typical of short line fleets is beyond the financial ability of many carriers.

Freight Corridor Bottlenecks

The principal current and potential bottlenecks can be found on shared passenger and freight corridors. The analysis shown in **Table A.21** in Appendix A lists those shared-use segments that were identified to be potential problem areas affecting goods movement. Where capacity constraints are anticipated, for the most part, they are expected to be the result of passenger train growth, with impacts from freight-volume growth being secondary. The Appendix contains the full corridor analysis for freight.

Exhibit 2.6 below maps eight of the bottlenecks with the highest estimated daily freight train flows (listed as the last 8 in **Table A.21** in Appendix A).

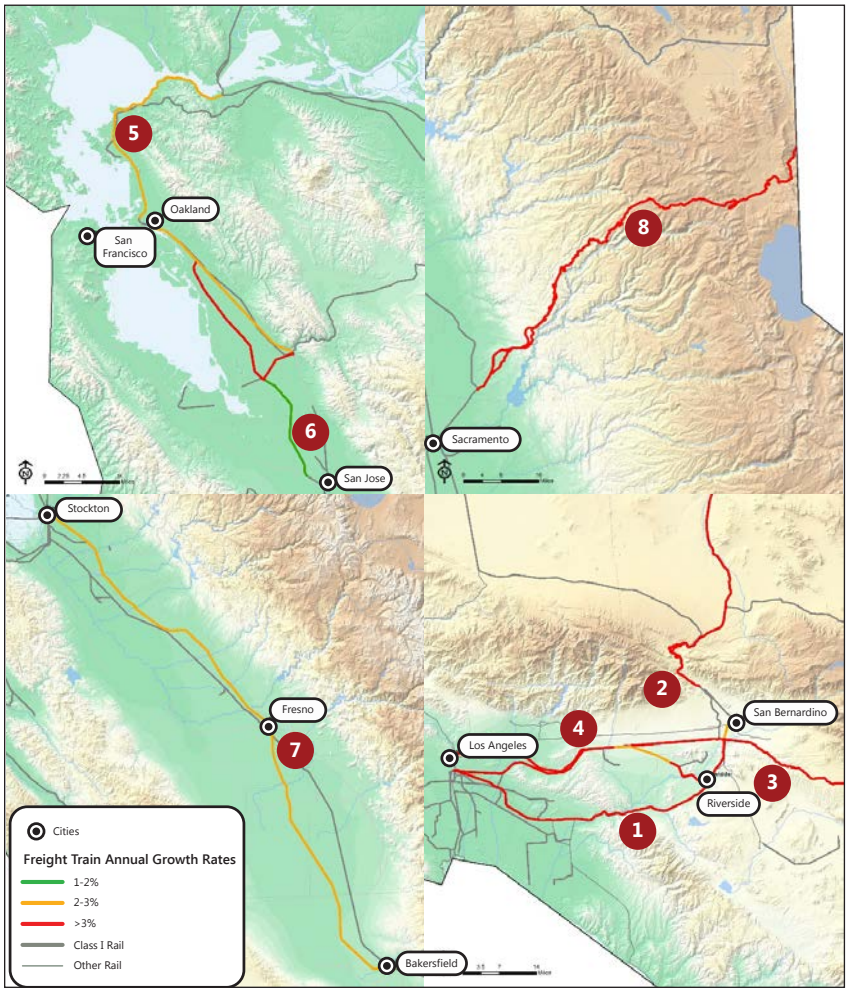


Exhibit 2.7: Heavy Freight Traffic Corridor Bottlenecks

1 = Los Angeles to San Bernardino, 2 = BNSF Cajon (Barstow to Keenbrook); 3 = UPRR Sunset Route (Yuma Subdivision); 4 = UPRR Alhambra and Los Angeles; 5 = East Bay to Richmond; 6 = UPRR Coast Subdivision south of Newark; 7 = BNSF Mainline Stockton to Bakersfield (San Joaquin Corridor); 8 = UPRR Roseville to Reno over Donner Pass

2.1.4 Rail Line Abandonments

Rail lines are classified as abandoned when the STB has granted permission to remove a line from service, with no potential for operation in the foreseeable future. Subsequently, track materials are then scrapped and the right-of-way is sold off, reverted to abutters, or "rail banked" for use as a transportation corridor in the future. Table 2.10 lists all of the STB abandonment filings in California since the 2013 Rail Plan was developed[124]. Miles of route proposed for abandonment changed sporadically from year to year, and short lines consistently submitted more abandonment requests than Class I railroads. Between 2005 and 2015, short line railroad abandonment requests affected almost 201 miles, compared to only 105 miles attributed to Class I railroads. Among the abandonments commenced by Class I railroads, many were for industrial leads or other connectors to specific facilities and industries.

Table 2.10: Rail Line Abandonment Filings with FRA[125]

Name	Year	Counties	Length
UPRR; Santa Clara Valley Transportation Authority	2013	Alameda	1.97
UPRR	2013	Riverside; San Bernardino	1.27
Alameda Belt Line Railroad	2012	Alameda	2.61
UPRR; Santa Clara Valley Transportation Authority	2012	Plumas; Lassen	8.95
BNSF	2012	Los Angeles	5.3
UPRR	2011	Riverside; San Bernardino	3.73
BNSF Railway	2011	Los Angeles	4.85

124 A complete listing of abandonment filings in California since 2005 can be found in the Appendix

125 A complete listing of abandonment filings in California since 2005 can be found in the Appendix

2.1.5 Intermodal Facilities

Trains carrying containers and trailers represent one link in the multimodal supply chain that connects shippers with receivers, together with container ships and trucks. Intermodal rail terminals are established to facilitate transfer of containers and trailers between modes (ship to rail, truck to rail, and vice-versa). In California, the majority of intermodal traffic is associated with the Port of Oakland, the Port of Los Angeles (POLA) and the Port of Long Beach (POLB); a sizeable but smaller volume is related to traffic associated with the rest of the U.S., Canada, and Mexico.

California's intermodal terminals are concentrated in the State's two largest metropolitan regions, which also host the State's largest port areas: the San Pedro Bay Ports in Southern California, and the Port of Oakland in the San Francisco Bay Area. Two intermodal facilities are in the Central Valley; these primarily serve the Central Coast and Central Valley regions, and are focused on domestic rail traffic, although they also handle international traffic transloaded into domestic equipment. Key characteristics of California's rail intermodal terminals are shown in Table 2.11 These facilities are defined as inland, on-dock, off-dock, or near-dock terminals. Containers can be loaded directly onto railcars from a ship at on-dock facilities. At off-dock and near-dock facilities, containers are first transported from the port terminals to the facilities. Off-dock facilities are more than 5 miles from the marine terminals, and near-dock are within 5 miles of the marine terminal. Rail intermodal service at the inland terminals consists of domestic trailers, domestic containers, and international containers moving between rail intermodal facilities on specialized rail cars.[126]

Intermodal Terminal Needs

Expected growth in both domestic and international intermodal demand is expected to exceed available capacity at some locations, such as the San Pedro Bay Ports. Solutions will require reconfiguration of existing intermodal facilities; and potentially, construction of new ones. Recent experience has shown that such projects can be controversial, such as BNSF's proposed Southern California Intermodal Gateway near the San Pedro Bay Ports, and therefore difficult to execute. In addition to addressing capacity constraints at existing locations, there is also the opportunity to develop new intermodal services, including short-haul shuttles that transport international traffic from port areas to inland freight hubs. The State has an interest in these projects because of their relationship to the economic growth opportunities associated with intermodal rail, and because they contribute to increased use of rail in a manner that benefits the State's economy and environment through improved competitiveness, employment opportunities, and lower collateral impacts than would result from use of trucks.

Because of the environmental impact intermodal freight activity has on surrounding communities, technological development of cleaner rail equipment will be a key consideration in proposals to expand such activity. The state will look to incorporate clean technological practices in future project proposals.

126 Caltrans, 2013 California State Rail Plan (2013).

Table 2.11: Intermodal Terminal Facility Characteristics
[127][128]

Location/Name	Serving Carrier(s)	Facility Type	Current Cap.(Lifts)
Central Valley			
Lathrop	UPRR	Inland	270,000
Stockton/Mariposa	BNSF	Inland	300,000
Bay Area			
Oakland International Gateway (OIG)	BNSF	Near-dock	300,000
Railport-Oakland	UPRR	Near-dock	450,000
Southern California			
East Los Angeles	UPRR	Inland	650,000
San Bernardino	BNSF	Inland	660,000
Intermodal Container Transfer Facility (ICTF), Long Beach	UPRR	Near-dock	760,000
City of Industry	UPRR	Off-dock	232,000
Hobart	BNSF	Off-dock	1,700,000
Los Angeles Transportation Center	UPRR	Off-dock	340,000
POLA/POLB On-Dock Intermodal Facilities	UPRR, BNSF	On-dock	2,257,775
TOTAL			**7,919,775**

Projections for continued growth in intermodal traffic indicate the need for substantial additional terminal capacity. Table 2.12 lists the proposed expansions by region that will result in a doubling of the current lift capacities of California's intermodal facilities. These include pending expansion plans for Lathrop, the Long Beach Intermodal Container Transfer Facility (ICTF), and POLA/POLB on-dock intermodal facilities. Two new facilities are also being considered: the Oakland Outer Harbor Rail Intermodal Yard and the Southern California International Gateway at the Port of Los Angeles.

127 Does not include intermodal facilities that are captive to a single shipper.

128 Sources: California State Rail Plan (2013); Oakland Army Base Rail Master Plan Report (2012); Manteca Bulletin: UPRR expansion may take up to 40 years (2015); Journal of Commerce: Railroads Expand ICTF Capacity; Southern California International Gateway Recirculated Draft Environmental Impact Report (EIR) (2012).

Table 2.12: Current versus Proposed Future Capacities[129]

	Yard Capacity (Lifts)	Future (Lifts)	Increase (Lifts)
Central Valley	570,000	1,030,000	460,000
Bay Area	750,000	1,150,000	400,000
Southern California	6,600,000	12,260,000	5,660,000
TOTAL	**7,200,000**	**14,440,000**	**6,520,000**

Carload Yards

For carload service, carriers operate a variety of yards to collect, distribute, and sort traffic, similar to how a hub and spoke system works for large airlines. Most common are industry yards, which handle incoming and outgoing traffic from nearby rail customers. These yards are located throughout the state, on Class I railroads, as well as some of the short lines. Regional yards process traffic associated with larger geographic areas, consolidating and dispatching traffic to and from industry yards, as well as local industries. Largest in terms of size and volume are system yards, which sort or "classify" traffic by a carrier's major traffic lanes. In California, there are three system yards. UPRR operates two—one in Roseville and the other in West Colton—which process carload traffic for the northern and southern parts of the state, respectively. BNSF's Barstow Yard processes most of BNSF's manifest traffic for the entire state.[130]

129 Sources: California State Rail Plan (2013); Oakland Army Base Rail Master Plan Report, 2012: UPRR expansion may take up to 40 years; Manteca Bulletin (2015); Journal of Commerce: Railroads expand ICTF Capacity; Southern California International Gateway Recirculated Draft EIR (2012).

130 Caltrans, 2013 California State Rail Plan (2013).

2.1.6 Safety and Security

Like all transportation systems, freight and passenger rail operations face safety and security challenges. Rail-related safety incidents range from minor injuries to fatalities, which can occur due to at-grade crossing conflicts, trespassing on railroad property, pedestrian conditions, human error and other deficiencies. Where deficiencies exist, safety risks can be mitigated through a combination of public education campaigns; and sometimes through track and signal upgrades, gate and warning system activation, and grade separations when practicable.

The safety and security of railroads is regulated by Federal and State law, and enforced by a variety of Federal and State agencies. Funding of critical safety improvements is administered through a variety of Federal and State programs.

Regulatory Agencies

Federal rail safety regulators include:

- **The FRA Office of Railroad Safety,** which conducts safety inspections, collects and analyzes accident data, and enforces existing safety laws and regulations. A Passenger Rail Division in the Office of Safety develops passenger rail–specific safety programs, and initiatives and enforces safety policies, regulations, and guidance for commuter, intercity, and HSR.
- **Transportation Security Administration,** which oversees Amtrak and commuter rail system security by monitoring stations and infrastructure, and identifying and mitigating potential security risks to both passengers and cargo.
- **National Transportation Safety Board,** which investigates and reports on all passenger railroad fatalities or property damage. State safety regulators include:
- **California Public Utilities Commission (CPUC),** which helps enforce Federal safety and security regulations; conducts design safety reviews of crossing projects; investigates railroad accidents; and responds to safety-related public and agency inquiries. The CPUC also hires railroad safety inspectors to supplement FRA's regional inspectors.

State rail safety regulators include:

- **Caltrans Division of Rail and Mass Transportation (DRMT),** inspects State-owned rail equipment and facilities; funds safety improvements; and is partner in safety education and awareness programs.
- **Pipeline and Hazardous Materials Safety Administration (PHMSA),** which regulates the rail transportation of poisonous by inhalation (PIH) materials carried in tank cars.
- **California Emergency Management Agency (Cal EMA),** which coordinates preparedness for and response to natural and manmade disasters; and administers transit security grants to intercity passenger rail and commuter rail systems.

Safety Regulations

Regulations aimed at improving rail system safety include the following:

Positive Train Control

PTC refers to technology that is capable of preventing train-to-train collisions, over-speed derailments, and casualties or injuries to roadway workers (e.g., maintenance-of-way workers, bridge workers, and signal maintainers). The Federal Rail Safety Improvement Act of 2008 (RSIA) (Public Law 110-432) mandated the widespread installation of PTC systems by December 2015 on all lines handling regularly scheduled passenger trains and/or toxic inhalation hazard materials.[131]

In response to complaints from freight and passenger operators that RSIA's PTC implementation timetable was too aggressive, HR 3819, the Surface Transportation Extension Act of 2015, included a provision that extended the deadline for implementing PTC to December 31, 2018. It also gave the FRA discretion to further extend it to 2020 on a case-by-case basis.[132] In 2016, the two western Class I railroads, BNSF and UPRR, indicated that they expect to comply with the December 2018 deadline.[133] A critical concern for short lines operating over Class I trackage equipped with PTC is that continued access will be contingent on using PTC-equipped locomotives, which short lines may not have. Although the FRA allows exemptions from this requirement under some circumstances, individual track owners (usually Class I railroads) may impose more stringent requirements. PTC for short lines is very costly, with a single installation on an older locomotive costing in excess of $100,000. Once locomotive PTC systems are operational, short lines will incur recurring costs for back-office services necessary to support PTC.

Highway Rail-Grade Crossing Safety Action Plans

RSIA act of 2008 requires 10 states including California, to prepare and submit plans to prioritize specific highway rail grade crossing improvements in order to invest resources where the greatest improvement in safety are anticipated. California's plan includes development of a comprehensive rail-crossing inventory database, and implementing data-driven, risk-based project selection methodologies for Section 130 and other grade-crossing safety funding programs.

Crude Oil Safety

Much of the concern regarding increased shipments of crude oil by rail is focused on safety and environmental impacts. Incidents involving oil by rail in California increased from three in 2011 to 25 in 2013.[134] Railroad safety regulation is primarily a Federal responsibility, and U.S. DOT has moved to adopt new safety and operational practices. Notably, this includes a new specification for a safer tank car (DOT 117), hazmat reporting requirements, and more stringent regulations on certain operating practices. In California, the State has responded with some new requirements and regulations, including the CPUC's Crude Oil Reconnaissance Team, whose duty is to monitor, assess, and solve any risks involved in future crude oil projects.

SB 730 – Two-Person Train Crew Requirements

SB 730 was signed into law in early September of 2015. The bill requires that at least two persons operate all freight trains and light engine movements. The safety impacts from differing crew sizes are a matter of considerable debate. At this time, most freight operations are conducted with two-person crews, but Amtrak and other passenger operators, as well as some short lines, frequently have only one operator in the cab.

131 FRA, Positive Train Control. Accessed 2016.

132 GovTracker, H.R. 3819: Surface Transportation Extension Act of 2015, 2015. Accessed 2016.

133 FRA, Positive Train Control. Accessed 2016.

134 FRA, CA Crude Oil by Rail Shipments and Railway Accidents, 2015. Accessed 2015.

2.2 Infrastructure Constraints

Section 2.1 (and the corresponding sections of Appendix A) inventoried existing passenger and freight rail services, identified rail capacity issues, and outlined infrastructure needs. Some of the State's immediate deficiencies include:

- At-grade crossings[135], track curves,[136] surrounding land uses,[137] or speed limits that require trains to travel at slower speeds;[138]
- Facilities and existing rail-related infrastructure, such as stations that are too small[139] or require reversing maneuvers[140] or bridges that are at capacity;[141]
- Insufficient number and insufficient capacity of rail cars;[142] and,
- Insufficient number of tracks or passing sidings.

In addition, existing peak-period congestion issues affect several components of the rail system. Caltrain, in particular, already operates at or near capacity during peak period.[143] The Peninsula Corridor in the Bay Area will continue to experience high-rail demand as job growth concentrates in San Francisco and Silicon Valley. These near-term needs will necessitate new infrastructure investments.

In addition to short-term challenges to addressing existing deficiencies, increased future demand will further stress the overburdened system. Statewide Rail Market Analysis Tool provides estimates of 2040 travel demand by rail corridor, with some corridors expecting an increase in person trips by over 30 percent. The Rail Plan's capacity analysis examined each segment under projected conditions in 2040. The analysis made assumptions about future operating characteristics, and identified the necessary infrastructure improvements to address the projected capacity needs. The combination of projected freight and passenger traffic growth in the primary corridors of California's rail network will result in bottlenecks that will impede the efficient flow of traffic. The potential improvements range from simple, minor infrastructure upgrades to more complex and costly investments, including but not limited to:

- Improved signaling and turnout switch controls;
- Improved/new sidings;
- Electrification;
- Double tracking, triple tracking, and overtake sections;
- Grade separations; and
- Line speed improvements.

135 In Stockton, an at-grade crossing between two major freight routes poses a challenge to *Capitol Corridor* operations (I 20).

136 Sharp curves at Rose Canyon limit the Pacific Surfliner to 65 mph (I 51).

137 *Capitol Corridor* must operate at slower speeds north of the Berkeley/Oakland station due to proximity of the freeway. There also is limited capacity for trains terminating in Berkeley/Oakland (I 32).

138 Speed limit of 50 mph for *Capitol Corridor* trains between Auburn and Sacramento (I 32).

139 Van Nuys is an example of a *Pacific Surfliner* station that has only one platform, but expansion is difficult due to ownership rights (I 48).

140 East Ventura station requires a reversing maneuver to access the platform (I 48).

141 The lifting bridge over Suisun Bay in Martinez is not large enough and requires the *Capitol Corridor* to reduce speeds (I 32).

142 Capacity on the *Coast Starlight* is constrained during holidays and other peak service periods (I 83).

143 Some of these capacity issues may be addressed in the Caltrain Modernization Program.

2.2.1 Freight Rail Constraints

Most critical to maintaining the viability of California's freight rail system is ensuring that there is adequate capacity on the core network to maintain or improve rail's competitiveness versus truck. As noted previously, insufficient capacity that leads to congestion and higher costs will impact the railroad's ability to compete, and may shift traffic away from rail. Most of the potential congestion impacts are on joint passenger and freight facilities, with the attendant potential conflicts from the varying demands of passenger and freight services. As passenger rail service is expanded, adequate capacity must be provided for current and future freight rail needs. These needs may include not only through-services, but also industrial access and the attendant local switching.

Hazardous Material Transport

For many years, the railroad and chemical industries and U.S. DOT have been actively engaged in improving the safe transport of hazardous materials by rail. Substantial progress was made in the design of and materials used in tank cars, reporting, custody, education, communications, and safe handling. In May 2015, the FRA and the Pipeline and Hazardous Materials Safety Administration issued updated safety regulations related to transporting flammable liquids by rail. These regulations include a tank car standard, DOT 117, that incorporates enhanced tank head and shell puncture-resistance systems, and enhanced top fittings protection. California is actively pursuing preventative and emergency response measures to improve the safety of crude oil and hazardous materials shipments, especially in track and hazardous materials inspection and grade-crossing improvements.

Grade Crossings

The Federal Section 130 program has been an ongoing source for investments in grade-crossing improvements under way or pending on the State's primary network. However, there is need for partnership between State and Railroad operators, particularly among short lines that must bear a portion of the cost of maintaining crossing protection systems. Additional funds from Federal and State sources could help address some of these concerns.

2.2.2 Other Constraints

Even with a clearly defined and well-supported rail vision, there are constraints to service implementation. Existing infrastructure and land uses, such as rail operating in dense urban places, along sensitive environmental areas, or in similarly challenging locations, sometimes can only be resolved by major and expensive overhauls. Corridors that are jointly used by multiple public and private owners or jurisdictions also may pose a coordination challenge to future projects and integration efforts. A plurality of demands for the rail system is a challenge; even the most well-integrated State rail system will be unable to serve all locations or with the same service levels. Instead, greater integration is meant to maximize rail service and benefits. Funding is another important constraint to future system preservation and enhancement.

Furthermore, even when technically feasible and well-funded, efforts to improve passenger service rail may be hindered without appropriate policies, contracts, and coordination efforts. This Rail Plan, which brought together service providers throughout the state, outlines policy goals to meet the Plan's vision for the more integrated system. It also follows the policies and recommendations established by the CTP 2040 for rail's role in the broader multimodal system.

2.3 Conclusion

California's existing rail system is extensive and complicated and boasts some of the most popular and well-ridden rail lines in the United States. Rail offers an alternative to driving for residents, employees, visitors and businesses alike. The coordination between intercity rail, commuter rail, urban rail and other connecting services like Amtrak Thruway buses, give the state access to a statewide network. This existing system is critical to the success of future rail travel and rail planning in California. Chapter 3 details the Rail Plan vision for an integrated passenger and freight rail network, including opportunities to improve the multimodal transportation system by creating a viable, efficient, sustainable and enjoyable alternative to auto travel.

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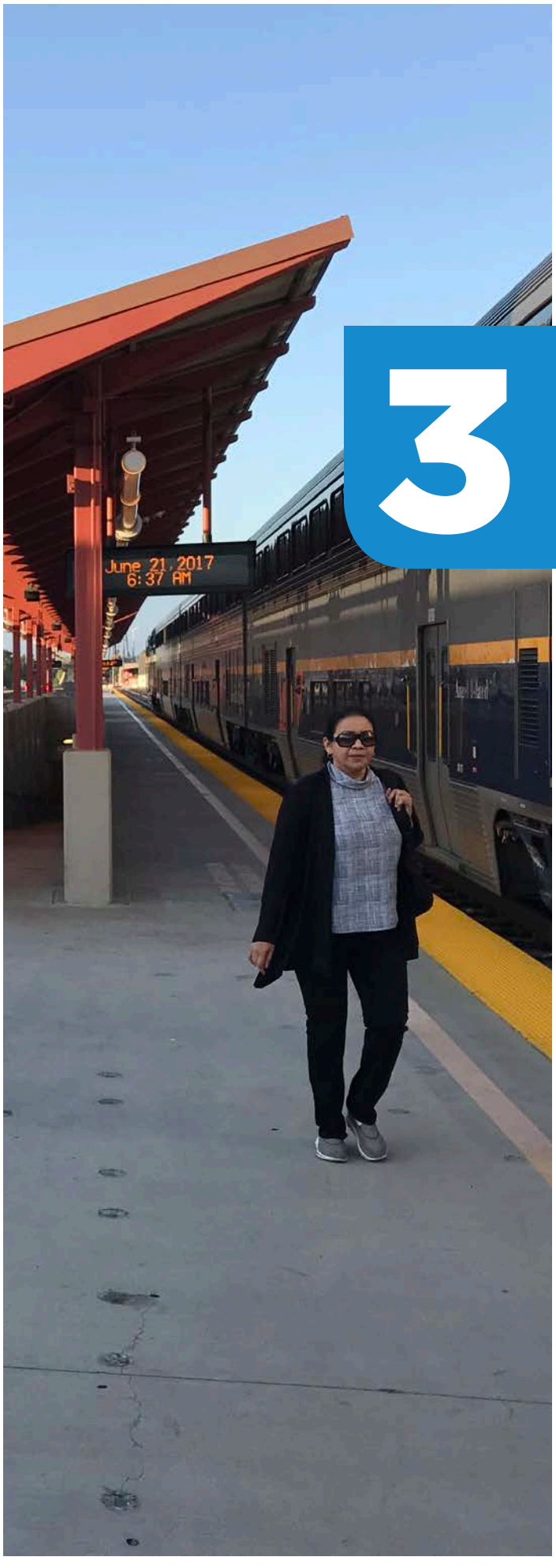


3 California Rail Network Vision

California's climate, natural and built environments, diverse population and economy, universities, and employment centers attract people from all over the world. Connecting these people, places and goods in a cost-effective and efficient manner requires a sustainable, multimodal transportation system. A sustainable system must be accessible to all, provide for travel options to increasingly congested roads and highways, support development of vibrant and healthy communities, enhance the environment by reducing emissions and pollution, and support the State's economy by ensuring the fluid movement of goods and services to and from international, national, regional, and local markets.

An advantage to private auto travel is the convenience of traveling from origin to destination in one vehicle without being reminded of the high cost of driving, other than the occasional visit to the gas pump. Rail transportation, however, can offer many advantages over the private car, including a lower cost-per-mile to operate; the ability to bypass congestion; potentially shorter end-to-end travel times between many origins and destinations; the

ability to be productive while moving (reading, working, or resting); and extraordinary safety benefits.[144] Public transit trips are also associated with increased physical activity, and further bike and pedestrian improvements at rail stations makes that correlation stronger. Active travel helps to reduce chronic disease and is significantly beneficial for health and health-care costs, when coupled with safety improvements and VMT substitution.[145]

However, connecting between different rail systems is often a much more challenging experience. Schedules may result in substantial transfer delays, physical connections may be poor, and multiple payments may be needed. These and other issues (including limited frequencies of service and travel times) negatively affect the ability of the rail mode to compete with other modes. The Rail Plan presents a path toward eliminating as many of these barriers as possible so that transferring across modes or across systems will feel to the rail passenger as simple as merging off of one road and onto another.

The Rail Plan defines a system that will help to fundamentally shift the way passengers view their travel choices. Imagine if you could reliably board a train at least every 30 minutes at a station in denser urban regions, or at least every 60 minutes at any station in the rest of the state, and travel seamlessly to any city in California? That is the vision for passenger rail in California.

The remainder of this chapter defines the 2040 Passenger Rail Vision (2040 Vision) for passenger and freight rail, and how the 2040 Vision directly supports the State policy goals established in the CTP 2040. This chapter also describes the planning principles and policies underlying the 2040 Vision.

144 According to 2015 data from the US Department of Transportation Bureau of Transportation Statistics, nearly 95 percent of transportation fatalities occur on highways (35,092 versus 13 fatalities on trains).

145 Maizlish, Neil, Ph.D., MPH, California Department of Public Health Office of Health Equity. Increasing Walking, Cycling, and Transit: Improving Californians' Health, Saving Costs, and Reducing Greenhouse Gases (2016), accessed 2017.

3.1 California Transportation Plan 2040 Coordination

The Rail Plan is one of seven mode-specific plans that support the vision, goals, and policies of the CTP 2040. The CTP 2040 uses a "whole system" planning approach to evaluate the impact of plans system-wide—across modes and regions—on transportation and land use scenarios and policies.[146] The vision for CTP 2040 is to achieve a fully integrated, multimodal and sustainable transportation system that supports the environment, the economy, and social equity. CTP 2040 offers a detailed overview of the existing transportation network, and assesses future transportation trends and challenges. It offers strategies to improve mobility and accessibility across all modes, contribute to system preservation, support a vibrant economy, improve public safety and security, promote livable communities and social equity, and support environmental stewardship.

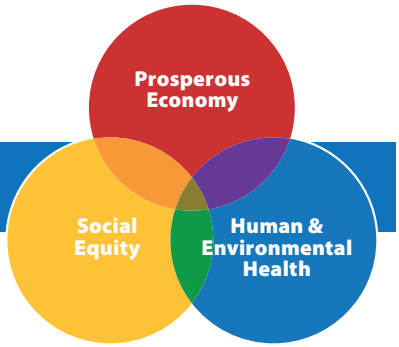
CTP 2040 identifies six broad goals, each with a series of policies and implementation recommendations (Exhibit 3.1). The policies aim to address recent transportation trends and challenges; meet Federal and State regulatory obligations; and move toward a more efficient, competitive, multimodal transportation system.

CTP 2040 Vision: Sustainability

California's transportation system is safe, sustainable, universally accessible, and globally competitive. It provides reliable and efficient mobility for people, goods, and services, while meeting the State's greenhouse gas emission reduction goals and preserving the unique character of California's communities

146 CTP 2040 Fact Sheet (2016). Accessed 2016

CTP2040 Policy Framework



THE VISION
SUSTAINABILITY

California's transportation system is safe, sustainable, universally accessible, and globally competitive. It provides reliable and efficient mobility for people, goods, and services, while meeting the State's greenhouse gas emission reduction goals and preserving the unique character of California's communities.

THE GOALS

1	2	3	4	5	6
Improve Multimodal Mobility and Accessibility for All People	Preserve the Multimodal Transportation System	Support a Vibrant Economy	Improve Public Safety and Security	Foster Livable and Healthy Communities and Promote Social Equity	Practice Environmental Stewardship

THE POLICIES

1	2	3	4	5	6
POLICY 1 Manage and Operate an Efficient Integrated System	POLICY 1 Apply Sustainable Preventative Maintenance and Rehabilitation Strategies	POLICY 1 Support Transportation Choices to Enhance Economic Activity	POLICY 1 Reduce Fatalities, Serious Injuries, and Collisions	POLICY 1 Expand Engagement in Multimodal Transportation Planning and Decision Making	POLICY 1 Integrate Environmental Considerations in All Stages of Planning and Implementation
POLICY 2 Invest Strategically to Optimize System Performance	POLICY 2 Evaluate Multimodal Life Cycle Costs in Project Decision Making	POLICY 2 Enhance Freight Mobility, Reliability, and Global Competitiveness	POLICY 2 Provide for System Security, Emergency Preparedness, Response, and Recovery	POLICY 2 Integrate Multimodal Transportation and Land Use Development	POLICY 2 Conserve and Enhance Natural, Agricultural, and Cultural Resources
POLICY 3 Provide Viable and Equitable Multimodal Choices Including Active Transportation	POLICY 3 Adapt the Transportation System to Reduce Impacts from Climate Change	POLICY 3 Seek Sustainable and Flexible Funding to Maintain and Improve the System		POLICY 3 Integrate Health and Social Equity in Transportation Planning and Decision Making	POLICY 3 Reduce Greenhouse Gas Emissions and Other Air Pollutants
					POLICY 4 Transform to a Clean and Energy Efficient Transportation System

Exhibit 3.1: CTP 2040 Policy Framework

The CTP 2040 Policy Framework sets out specific goals and supporting policies to guide strategic planning across all modes of transportation in California.

3.1.1 California State Rail Plan Vision Statement

The Vision Statement identifies rail's strategic role in advancing California's needs, using the transportation capacity that our rail corridors can provide through more intensive use, and largely within existing rail rights-of-way, to handle the equivalent volume of many additional lanes of freeway for cars and trucks. The 2040 Vision anticipates booming ridership on a truly integrated, statewide system that is a natural result of connecting so many more markets to each other, and allowing the network to provide value not just for getting to work, but to travel for many purposes on clean, comfortable trains. The 2040 Vision also anticipates shared benefits and freight-specific investments that will allow significantly more freight capacity in the most important freight traffic corridors.

The 2040 Vision defines the State interest in planning for the rail network and policies for investing in passenger and freight rail to achieve the 2040 Vision. The Vision Statement describes how the State desires the rail system to function in 2040 (the horizon year for the Rail Plan), and how it will support the goals and policies of the CTP 2040.

California State Rail Plan Vision Statement

California will have a premier, customer-focused, integrated rail system that successfully moves people and products while enhancing economic growth and quality of life.

3.1.2 GOAL 1: Improve Multimodal Mobility and Accessibility for all People

Policy 1: Manage and Operate an Efficient Integrated System

The 2040 Vision foresees an efficient network of rail services that provide a statewide mobility solution benefitting both regional and interregional travel needs. The vision will also build on and fully realize the benefits of California's investment in the HSR System by integrating intercity and local rail services with the HSR spine to expand the reach of the combined rail network to more Californians.

The 2040 Vision includes the following attributes:

Connectivity to Top Population and Employment Centers: The 2040 Vision establishes a State interest in connecting the most populous California cities and the communities in between to the passenger rail network to provide transportation options for the entire state, using existing or planned rail rights-of-way and corridors.

Competitive Travel Times and Service Frequencies: Existing intercity and regional rail service would be expanded in phases over time to provide more frequencies that both complement the HSR System, and significantly improve public transport for both long-distance and regional trips. The passenger rail network will be developed to provide travel times that are competitive with air travel times in the longest-distance trips between major urban areas, and auto-competitive in regional markets. The 2040 Vision establishes service frequency goals for individual corridors on the state network that are tailored to market demand.

Rail Service Integration: The 2040 Vision foresees a statewide passenger rail network that physically integrates services at hub stations, allowing for seamless transfers between services, and convenient trips by rail across the state. These hubs provide connection points to local and regional transit systems providing fast frequent access to regional destinations and expanding the coverage of the State rail network. In addition to service goals, the Vision establishes State connectivity goals and key transfer hubs that tie corridors together.

Pulsed Schedules: A key component of the Vision is a Pulsed System—a transportation network with trains[147] operating on coordinated schedules that repeat regularly—every hour or half hour, for example. The immediate advantage of a Pulsed System to the end user is that its repetitive pattern is intuitive and user-friendly, because services are usually offered at the same time every hour (or even half-hour) throughout the day. More importantly, the cyclical nature enables connecting services at hubs to be linked together easily and efficiently; connections between services can be designed to allow optimal onward travel consistently throughout the day with minimal transfer times.

Efficient Infrastructure Design and Use: Another benefit of a repeating schedule is that it allows for optimal design of infrastructure requirements. Knowing the schedule and where trains meet allows engineers to design routes featuring more targeted and often less expensive infrastructure solutions. Additionally, track segments can be designed to meet pre-determined travel times. For example, if the pulsed schedule only requires trains to travel a segment in 60 minutes, expensive projects that would reduce that travel time but would create significant community impacts can be revisited; a wider range of solutions may be available to planners, that would be more acceptable to communities and the environment.

Multiple Service Types

Each mode and service in the transportation network, from streetcars to HSR, represents a tool designed for a certain kind of trip. When integrated effectively, these tools will form a seamless network that is both robust and flexible enough to meet diverse passenger transportation needs. For example, HSR trains can cover long distances, and passengers can transfer quickly to regional trains or local transit buses to get to their final destination in the most efficient manner.

The 2040 Vision identifies service types for different corridors based on travel time requirements for providing auto- and air-competitive trips, as well as the State interest in providing access to the rail network.

- **High-Speed Rail** provides air-competitive travel times between major urban centers of the state (when used for long-distance travel); and high capacity for longer distance regional and interregional trips between hubs (often used to link passengers to other services at one or both ends). HSR has numerous non-stop or limited stop services tied to meeting long-distance market demand, but also offers trains that stop at all stations on a regular basis (every 30 or 60 minutes, based on market demand), allowing connectivity throughout the statewide rail network. Unlike the other categories, most sections of infrastructure used by HSR are designed for speeds over 125 mph (with long sections allowing up to 220 mph speeds).
- **Intercity** passenger rail services provide fast service between regions, with stops at major cities or at connectivity hubs in corridors that do not require HSR-level travel times to meet market demand.
- **Regional** services provide for both express and local trips within a region that provides for access to the State rail network, with connections to Intercity and High Speed services at hubs for longer-distance trips. Regional services operate with auto-competitive travel times, which may be faster than auto travel in rush-hour periods, but generally operate at slower speeds than intercity service.

147 Although trains account for the majority of this Pulsed System, Integrated Express Buses are included in the coordination and pulsed schedule planning.

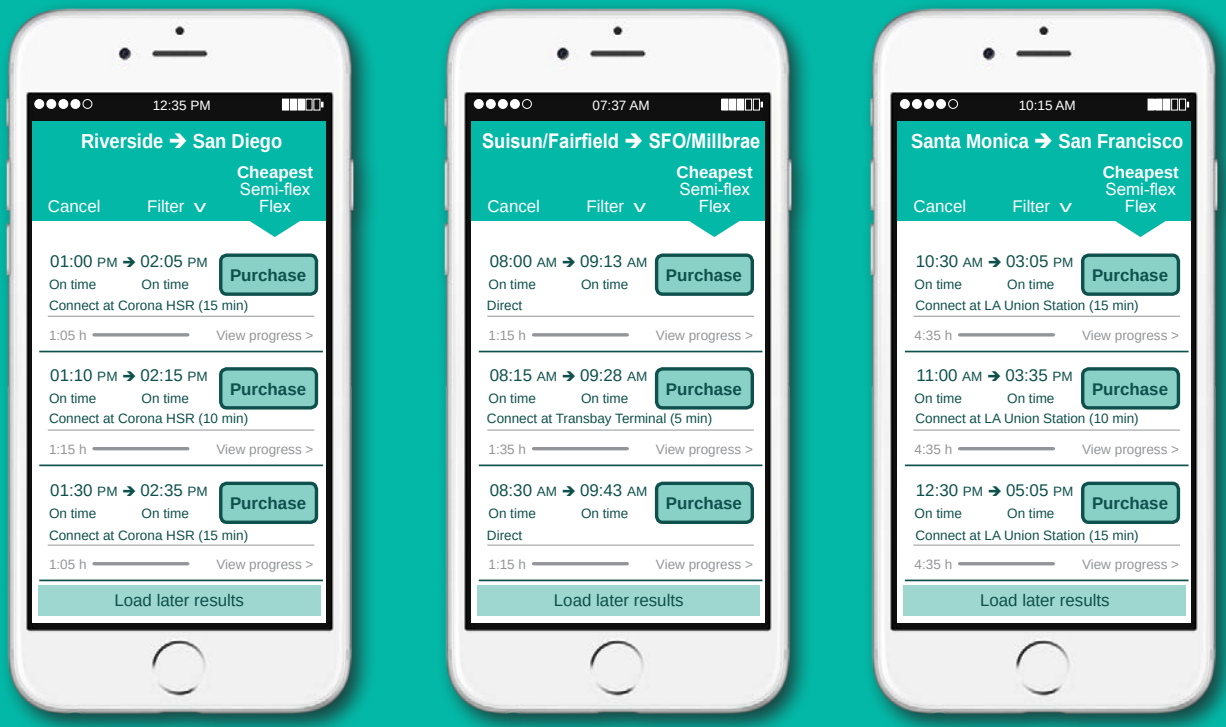
- **Amtrak Long-Distance Trains** provide connectivity to cross-border markets in Oregon, Nevada, and Arizona, in addition to providing service to rural communities. These trains service fewer stations and with lower frequencies, but serve increase network-wide connectivity and flexibility.
- **Integrated Express Bus** service is used as an important part of the State rail network to provide connections to rural markets in the state that are too small or remote to support rail service, where rail rights-of-way do not exist, or may be too expensive to upgrade to meet State service and connectivity goals, or to fill low-ridership time slots in a regular schedule. Integrated Express Bus is also used in markets where bus service is more time competitive with automobile trips than rail, using managed or high-occupancy vehicle lanes to bypass vehicle congestion where the State or region has made those investments.

The 2040 Vision identifies corridors that could support more than one type of service, where there may be a market for providing local service in addition to express service, thereby providing access to the state network for local communities. Other, primarily rural corridors can include one type of service that serves all stops.

Integrated Ticketing and Fare Coordination: Successful implementation of the 2040 Vision requires the coordinated fares and integrated ticketing options across service providers. Coordinated fare collection streamlines the methods of payment across different services over the course of a journey. With integrated ticketing, a passenger can use one ticket that works across all modes, rather than multiple cards and tickets. Additional features of an integrated fare collection system could include passes that work with combined ticket types, benefits to frequent travelers and specialized fare packages for events and tourist attractions.

Integrated Passenger Service

The Rail Plan envisions integrated, door-to-door rail service. Rather than piecing together itineraries across different services and service providers, users will be able to plan a trip and buy a ticket for the entire integrated network in a seamless fashion. The graphic below represents both the possibility of schedule integration on different technological platforms and possible outcomes for rail travel within the State of California with an integrated system.



One challenge going forward will be to scale these efforts to include more systems and to achieve inter-operability of fare media across regions and the entire state, rather than just within metropolitan regions. Another challenge will be to leverage smartphone technology to streamline the purchase and use of integrated fare media. Amtrak and various commuter rail and transit operators in California currently support a smartphone application that can sell and save e-tickets to the phone, which can be scanned by train conductors. This app also provides on-time status and alerts. It will also be important to provide safety nets, like maintaining a cash payment or cash card option, for populations that may not have access to a bank account or smartphone.

Policy 2: Invest Strategically to Optimize System Performance

The CTP 2040 recommends investing to ensure the transportation system is truly multimodal and integrated to serve all of the State's population and businesses, as well as to seek a broad suite of strategies to manage congestion in the state's most congested corridors. Investments in an integrated rail system strengthens one of the modes in the State's multimodal transportation system, while benefiting the entire system by providing viable alternatives to traveling on congested road and highway corridors.

The 2040 Vision incorporates a strategic framework to guide State and regional service planning and capital investment to support development of the ultimate 2040 Rail Plan Vision in phases over time. The integrated, scheduled network in the 2040 Vision is designed to optimize performance of the rail network to maximize use of existing infrastructure in shared passenger and freight corridors as a first priority, with targeted investments being made where necessary to connect the state network, and then provide the capacity needed to grow freight and passenger services toward the 2040 network goals of the Rail Plan.

The State's investment strategy will include service development plans that identify individual elements (e.g., rail line and station infrastructure, vehicles, and other needs such as communications and systems) based on anticipated funding to develop the network. Key provisions of the investment strategy include:

- **Services scaled to market demand:** Integrated services will be scaled to market demand to maintain a reasonable balance between operations and maintenance costs in relation to fare revenues.
- **Providing for rail freight capacity:** Where passenger services are operating in corridors with freight or track is shared with freight, sufficient capacity and other infrastructure will be provided to accommodate both freight and passenger traffic needs. The scheduling of trains will consider maintenance windows, as required. Taking freight owner/operator needs into account, slotted timetable planning methods will be used to identify specific capacity improvement projects that enhance timetable reliability and reduce overall infrastructure spending needs, creating a better operating environment for freight trains. Finally, the State's investment strategy recognizes the value to goods movement and the potential impact on the need for highway investments of supporting trade corridor investments that deliver benefits for freight rail.

Electrification and Zero Emission Technology (ZET)

The 2040 Vision recognizes opportunities to electrify or deploy other zero emission vehicle (ZEV) technology on as much of the intercity passenger rail network as possible, which allows the system to be operated in a more efficient, cost-effective, and cleaner manner than is possible with existing diesel-powered locomotive technology.

Electrification for some parts of the statewide rail network will mean traditional catenary-based systems. For other services, this will mean other zero or near-zero emissions technologies.

This definition of electrification provides considerable opportunities to increase system efficiencies and performance, and improve air quality. This means longer trains can be deployed and accelerated faster and the rail network supports the State's efforts to reach its GHG emissions

- **Avoiding duplicate investments:** The integrated network will not include duplicate or overlapping investments. Where multiple services operate in the same corridor, the mix of services (such as high-speed, express, and local) should address regional and statewide needs, and serve all markets, often using the same corridor.
- **Avoiding stranded investments:** To the greatest extent possible, interim investments will be incorporated into the long-range plan.
- **Phased delivery of integrated services:** As market conditions and ridership indicate, services can be integrated and expanded in phases over time. The 2040 Vision is divided into three time phases representing building-blocks for achieving the Vision: . While specific dates are used for the building blocks, some projects may get completed well in advance of the dates, and others may take a few years longer. The years for each phase have been chosen at points in time as markers that meet statutory planning requirements. They are as follows:
    - **Short-Term (by 2022):** The short-term capital plan in the Vision represents improvements already being planned for which funding for construction and implementation is largely committed. These improvements serve as the near-term foundation for integrating the rail network. The short-term plan identifies the region-specific service planning studies required to implement the mid-term and long-term Vision. The short-term investment program is also intended to address the significant existing rail freight bottlenecks on trade corridors.
    - **Mid-Term (by 2027):** The mid-term capital plan is intended to represent a realistic phasing of the Vision where the State coordinates with rail partners to grow passenger services to a level that maximizes use of the capacity available on existing rail infrastructure, with targeted infrastructure investments that tie services together and provide new access to different regions, including regions that now have only limited rail access. The mid-term capital plan begins growing rail freight capacity in significant rail freight corridors. This mid-term phase includes projects that the State expects will have a reasonable funding commitment, employing a range of funding strategies. Finally, during this phase, many of the detailed planning studies necessary to prioritize and advance long term improvements will be funded and completed.
    - **Long-Term (by 2040):** The long-term capital plan includes the infrastructure elements required to support the service and connectivity goals of the 2040 Vision, and to maximize the performance and market-capture potential of passenger rail within the 2040 time horizon of the plan, which provides for additional rail freight capacity as investments to expand the passenger rail system are made. The long-term plan represents the integration of services that is possible.

The 2040 Vision represents a strategy for meeting the State's transportation needs that takes advantage of rail's ability to develop in existing rights-of-way to add capacity. The 2040 Vision is focused on making existing lines more efficient as a first priority, making better uses of existing frequencies to improve productivity of passenger services. The State intends to achieve the Vision through service planning, in partnership with local communities.

Policy 3: Provide Viable and Equitable Multimodal Choices, Including Active Transportation

The 2040 Vision establishes the State's interest in developing a statewide passenger rail network that is time- and cost-competitive with other modes. Passenger rail and intercity bus services will be physically integrated with each other and with transit operations at mobility hubs, providing communities with statewide, door-to-door access via a seamless passenger rail network. The 2040 Vision allows for additional passenger rail frequencies to be physically connected, serving specific regional or corridor-level travel markets that are not necessary for statewide connectivity.

However, when poorly integrated, the first-mile / last-mile portions of a trip can present an insurmountable hurdle to rail passengers because they cannot access stations or their destinations from a rail station. The expanded passenger rail access and connectivity that are part of the Vision provides opportunities for expanding the use of bicycling, walking, and transit trips to provide first- and last-mile connections to a system that can be used for regional commute and interregional travel. When well integrated across agencies, urban mass transit and local land use policies can provide nearly seamless connections to rail stations in ways that reduce trip time, reduce trip cost, and ultimately reduce barriers to ridership. Some opportunities for reducing the first-mile / last-mile challenge include:

- State support for network and station planning will ensure that stations are pedestrian and bicycle friendly, and accessible to public transit systems providing connections to major centers of population and employment. This includes making transfers between rail and bus, transit, and active transportation as efficient and intuitive as possible. Reducing the time and difficulty of transfers is crucial to stimulating additional ridership, as is dramatically reducing the risk of delay due to missed connections.
- Expanding bike- and car-sharing systems, and design stations for simple pick-up and drop-off.
- Secure and convenient bicycle parking at stations
- Safe and complete pedestrian and bicycle networks that bring passengers as close to the platform as possible with minimal interaction with road networks.
- Where transit connections are made that are less frequent (primarily those services that operate less frequently than every 15 minutes), the State has an interest in coordinating with local and regional transit partners to coordinate the schedules of bus trips that expand coverage.

Rail rights-of-way also present opportunities to develop walking and bicycling networks connecting communities at the regional level. The 2040 Vision supports preserving rail corridor rights-of-way and assets for multimodal uses wherever feasible. Multi-use corridors support State and local mobility goals and can safely enhance access for all modes coexisting in a corridor.[148]

SMART Rail corridor, pre-project build out, with future rail right-of-way and bicycle corridor

148 Rails-to-Trails Conservancy, *America's Rails with Trails* (2013)., Accessed 2016.

3.1.3 GOAL 2: Preserve the Multimodal Transportation System

Policy 1: Apply Sustainable Preventive Maintenance and Rehabilitation Strategies

California's rail system will be a premier, national leader by 2040 in its functionality, innovation, and effectiveness. The State will regularly benchmark the passenger and freight rail services in California against those of other states and international leaders as it supports development of the rail network to deliver a best-in-class system. To be premier, the system needs to be in a good state of repair, with investments made over time to maintain the system. The Rail Plan Vision supports State investment in capitalized maintenance costs to preserve the performance of the passenger and freight rail network.

Investment in an expanded and more efficient passenger and freight rail network in California is intended to enhance the State's ability to maintain and rehabilitate the entire transportation system by shifting car and truck trips, particularly long-distance interregional trips, from the State highway system to rail. This shift is expected to reduce vehicular wear and tear on the state's interregional roadways, and the substantial costs associated with bringing roadway infrastructure into a state of good repair. In addition, by improving the economics of the rail system, additional resources will become available in support of railroad capitalized maintenance to ensure that railroads remain in a state of good repair throughout their life cycle, and that services achieve a high degree of reliability.

Policy 2: Evaluate Multimodal Life-Cycle Costs in Project Decision Making

The 2040 Vision is intended to provide a significant option for statewide travel and goods movement in interregional travel corridors. It can help evaluate ways to improve mobility on a corridor through various combinations of improvements to rail and transit, along with highway improvements. Life-cycle costs analysis could lead to efficient road use, parking, and fuel pricing, and road space allocation, leading to an overall reduction in the growth of VMT.

The network efficiencies and performance improvements associated with the 2040 Vision are expected to result in significant infrastructure savings that can be factored into corridor-level investment decisions, based on transportation demand management programs. This multimodal consideration of long-term corridor needs can maximize the effectiveness of asset management and advance efficient use of limited resources for highway and bridge maintenance programs.

Investment decisions within the rail mode will focus on optimizing decisions across the life cycle, especially in the area of rolling stock replacement and maintenance. By considering the total cost of rolling stock across its life-cycle costs, new approaches will be considered that allow for more regular refreshing and replacement of fleet, based on both commercial decisions and total expenditure across both capital and operating resources.

Policy 3: Adapt the Multimodal Transportation System to Reduce Impacts from Climate Change

All State infrastructure planning and investments need to be made in a manner that facilitates meeting the State's climate goals, and prioritizes actions that both build climate preparedness and reduce GHG emissions. The Rail Plan is an important component of the State strategy to reduce GHG emissions, and is one of many plans that leverage State support to reduce fuel dependency and serve disadvantaged communities in a changing climate.

The State will pursue and support technology and fuel-based solutions to reduce fuel consumption, and also work to increase the number of seats filled on each train operated (often referred to as the load factor), to reduce GHG emissions per passenger mile. In addition, because the Rail Plan includes significant core infrastructure, especially high speed, that is electrified, additional opportunities to expand electrification on adjoining corridors and on services that share HSR blended infrastructure will be pursued to operate a cleaner rail system. By 2040, Caltrans expects a majority of passenger miles on the rail system to be provided by electric trains.

Caltrans and HSR will take climate change into account in all State planning and investment decisions that support implementation of the Rail Plan. Wherever possible, the Rail Plan supports flexible and adaptive approaches to prepare for uncertain climate impacts. The State supports and will use information from vulnerability assessments and other data to inform long-term life-cycle analysis in project selection, including anticipated climate impacts.[149]

Further, current and future planning and requirements should reflect climate change adaptation in a more coordinated manner.[150] The 2040 Vision provides a common framework for coordinated planning between the State, rail operators, and stakeholder agencies to develop network infrastructure that takes known and projected climate change impacts into account.

149 Natural Resources Agency, *Safeguarding California: Implementation Action Plans* (2016). Accessed 2016.

150 Ibid

3.1.4 GOAL 3: Support a Vibrant Economy

Policy 1: Support Transportation Choices that Enhance Economic Activity

California's rail system will successfully move people and products by balancing the needs of freight rail and passenger rail customers. On the one hand, the freight rail system provides California's businesses, producers, and manufacturers with cost-effective transportation connections to national and international markets, making the State an effective place to conduct business. On the other, the passenger rail system provides access to essential and non-essential trips alike. Passenger rail also provides major safety and productivity benefits, further enhancing California's economy. Safety benefits translate into significant hospital and health care savings.[151]

Currently, many passenger rail operations share tracks owned by UPRR and BNSF. The infrastructure requirements for additional passenger rail service will be negotiated between public rail operators and private railroad companies. Requirements and negotiated terms for further shared use of freight railroad track may include major investments to enhance the capacity of these lines. These improvements and investments help to decrease bottlenecks and improve freight mobility and reliability, and support the shift of freight from trucks to rail where it is economically feasible to do so.

151 According to the Center for Disease Control's "State-Based Motor Vehicle Data & Information," in 2013, California lost $4.48 billion in medical expenses and work-loss due to collision fatalities. Short- and long-term hospital follow-up visits related to crash-related injuries translate into additional health care costs than can be mitigated or eliminated through safety improvements and decreased VMTs.

The passenger and freight rail systems support growth of California's existing businesses and communities, and the development of new businesses in the state. An integrated and coordinated passenger rail system connects workers to their jobs and travelers to recreation, and fosters sustainable development around rail stations. The rail system of the future will also be significantly less expensive on a unit basis than today's rail services, lowering the overall household and business expenditures on transportation, and further enhancing California's economy.[152] A robust passenger rail system is necessary to support the continued development and competitiveness of California's economy.

Policy 2: Enhance Freight Mobility, Reliability, and Global Competitiveness

California is committed to developing a world-class, sustainable freight rail system, and the Rail Plan addresses State policies and practices to enhance freight rail services. Those companies, subject to certain Federal and State laws and regulations, are responsible for daily operational decisions and capital investments on the freight rail network. There is a need to strengthen partnerships that better align with the policies and action of the state and private freight rail companies. The 2040 Vision establishes a framework for partnerships between the freight railroads and the State that supports rail freight investment that is consistent with State sustainable freight goals.

The Rail Plan process identified five major areas of need and opportunity of statewide importance for freight rail services:

- **Trade corridor improvements:** California has several critical multimodal freight corridors that support both domestic and international trade. Given the importance of these corridors to the regional, State, and national economies, the Rail Plan has a significant interest in transforming these corridors into primary, high-capacity freight routes, shifting a share of freight loads from trucks to freight rail.
- **Economic development and short lines:** Traditional and emerging industries in the state can take advantage of freight rail services. The Rail Plan has an opportunity to support programs that provide grants and loans to short lines to improve and upgrade their track to current standards, or to shippers to provide or improve rail network access.
- **Statewide grade crossing improvements:** Grade crossing projects, including grade separations, are extremely expensive, and Federal and State program funds are limited. The Rail Plan will endeavor to expand funding for grade crossing improvements, and continue advocacy for an expansion of the Federal Section 130 program and the State Section 190 Grade Separation Program.
- **Terminal and yard capacity:** There is a need to expand intermodal terminal capacity in California. Many of these projects are in urban centers with access challenges on congested roadways. Roadway access improvements and congestion alleviation are critical components to achieving the concepts of the California State Rail Plan Vision Statement.
- **Short-haul trains:** Short-haul trains can serve as efficient transportation between ports and distribution centers.

152 Fang, Kevin, and Jamey Volker, The National Center for Sustainable Transportation. Cutting Greenhouse Gas Emissions Is Only the Beginning: *A Literature Review of the Co-Benefits of Reducing Vehicle Miles Traveled* (2017), accessed 2017.

Freight railroads are understandably concerned about the preservation of their existing operating flexibility and future capacity to accommodate growing freight train traffic. Therefore, they are interested in minimizing impacts on existing and future freight rail operations. Caltrans will consider the potential impacts of the planned passenger rail service improvements on railroad capacity and access to industry spurs and yards. The infrastructure investments necessary for increased passenger train volumes will be planned so as to add capacity and flexibility to freight operations. The 2040 Vision enables market-responsive growth in goods movement by freight rail while also providing for increased passenger capacity.

Policy 3: Seek Sustainable and Flexible Funding to Maintain and Improve the System

The integrated statewide mobility solution represented by the 2040 Vision encompasses a range of services that will require strategic investment and active partnerships to realize. The Vision therefore provides an operator-neutral framework for partnerships between the State, other public agencies, and private industry that can be used to leverage different sources of funding and different types of operating models to deliver cost-effective infrastructure and service improvements that implement the Rail Plan.

The 2040 Vision is designed with the intent of improving the efficiency and effectiveness of the intercity passenger rail network to drive down costs and increase ridership and revenue. The integrated statewide network will realize infrastructure savings from more intensive use of existing infrastructure, with scheduled operations allowing infrastructure capacity to be targeted where needed to grow the passenger and freight network over time. The 2040 Vision establishes a State interest in providing for higher frequencies on the integrated network to improve the convenience of passenger rail travel, which will dramatically increase ridership on the State's rail services. The State expects that increased passenger rail revenues generated from increased use of the system will, in the ultimate 2040 Vision, allow the state network services to operate without a subsidy, and generate profits in some corridors that can be reinvested in maintaining and improving the system.

The State supports public-public partnerships as well as public-private partnerships to deliver a variety of project types. Partnerships between service providers and local governments, especially in regard to land use and station development, will be mutually beneficial in terms of maximizing the value of the rail service, maximizing the value of local real estate, and maximizing return on investment of local dollars.

In addition to coordination among government entities, innovative partnerships will be needed to integrate rail services with private entities. Such partnerships would include both private operations of public rail services and coordination with private-sector providers of non-rail connecting services, such as airlines, rideshare operators, and private bus operators.

Beyond the provision of rail services, private-sector partnerships can also work to integrate wider sectors of the transportation industry to extend the reach of rail service to more customers. This can take a variety of forms, and many are already in place, including:

- **Intercity Bus:** Currently, Amtrak uses connecting bus services to extend and bridge rail services in the state. Beyond Amtrak, other long-distance and connecting bus services operate in California, and could be coordinated in a future integrated network to provide integrated fares and coordinated schedules to increase utility to customers.
- **Ride Share and Ride-Hailing Apps:**[153] Ride share service providers, especially ride hailing apps, are already playing an increasing role in solving first-mile/last-mile challenges. By extending the local reach of urban transit networks and rail stations, on-demand ride-hailing and ride-sharing can provide key connections to origins and final destinations for passengers. Establishing partnerships between rail providers and these companies can elevate those services and provide better value for passengers.

153 Ride-sharing and ride-hailing apps are also referred to as Transportation Network Companies.

- **Bike Share providers** are further playing an increasing role in first-mile/last-mile challenges. In the Bay Area, Motivate—in partnership with MTC—is deploying 7,000 bikes at stations across the region. Similarly in Los Angeles, Metro is providing bike sharing with partners *'BCycle'* and *'Bicycle Transit Systems',* for which riders can use their same TAP transit card.
- **Air-Rail Alliance Code-Sharing:** Common in Europe and occasionally in the northeastern United States, an air-rail alliance takes the concept of code sharing between partnered airlines and extends it to the rail network. By allowing airlines to sell airline and rail services on a single ticket, the rail network can be used to extend the reach of airports, and better connect communities without an international or even regional airport.
- **Rail-Air substitution:** Population growth is predicted to strain the multimodal transportation system, including airports. Coordination between rail and air can expand an airport's catchment zone (especially when connected with intercity or HSR services) and attract new markets. A rail system that is connected to both a local or regional market, as well as a statewide market, can help divert some of the airport demand and help reduce capacity burdens. Although the result can be a reduction, or complete elimination, of inefficient air services, it actually benefits both air and rail partners by freeing up capacity for more profitable and long-haul air travel, while increasing rail ridership, thereby providing customers flexibility on the same routes.[154][155]

It is anticipated that use of public-private partnerships and agreements will increase as California implements its network integration.

In the northeastern U.S., United Airlines and Amtrak have an alliance connecting services to and from Newark Liberty International Airport and several regional cities served by Amtrak. Customers can buy a single ticket from the airline that includes their rail connection to and from the airport.

Similar arrangements are quite common in Europe, even involving American carriers. American Airlines has an air-rail alliance with Deutsche Bahn (the German national railroad) to provide rail connections at Frankfurt Airport. Germany has perhaps the most robust examples of connecting rail and air services, which occur in approximately 16 cities and involve dozens of domestic and international airlines. Through such agreements, rail services are integrated into the entire global transportation network, providing great value for passengers and rail service providers across the rail service spectrum.

154 Resource Systems Group, Inc., Airport Cooperative Research Program; Transportation Research Board; National Academies of Sciences, Engineering, and Medicine. *Integrating Aviation and Passenger Rail Planning* (2015).

155 Although there is a market (travel distances between 200 and 500 miles) for HSR or other intercity rail services to replace air travel (beyond the aforementioned inefficient routes), the research shows that this is unlikely to occur, especially in the U.S. context.

3.1.5 GOAL 4: Improve Public Safety and Security

Policy 1: Reduce Fatalities, Serious Injuries, and Collisions

The State rail system will offer high performance to customers consistent with the performance management metrics emphasis in the 2016 FAST Act Federal surface transportation legislation. Another measure of success for the State rail system will be the movement of people and products safely and without incident. The Rail Plan supports significant passenger and rail freight investments that include grade crossing improvement projects to eliminate at-grade conflicts, and supports full implementation of PTC to reduce fatalities, serious injuries, and collisions on the rail system.

Even without these necessary safety improvements to the system, the FRA reports that fatalities per mile are 17 times more likely in an auto than in an intercity passenger train.[156] California had 7.28 fatalities per billion miles traveled in a car, versus 0.43 fatality per billion miles traveled on Amtrak, commuter and urban rail systems, buses, and commercial aviation between 2000 and 2009, thereby supporting the need to reduce VMTs because they are strongly correlated to fatalities per capita.[157] Safety improvements to the rail network will only continue to reduce injury and death on the transportation system.

Policy 2: Provide for System Security, Emergency Preparedness, Response, and Recovery

Inherent in a multimodal transportation system are network redundancies that can offer system security and emergency preparedness. An integrated, statewide rail network is crucial to the State's emergency preparedness because it provides a viable evacuation option, particularly for the 10 million Californians who do not drive. Developing the rail network to be reliable, safe, and efficient for daily uses will ensure the system can respond and recover during an emergency.

In 1994, 10 seconds of shaking during the Northridge Earthquake created havoc in Los Angeles County. Many commuters lost access to freeways—especially from Santa Clarita to either Los Angeles or the San Fernando Valley. Nine days after the earthquake, Metrolink reached 22,000 daily boardings along the Santa Clarita line at a time when normal ridership was 1,000 daily riders. The catastrophe of the 1994 earthquake illustrates the importance of a resilient, multimodal system and how rail can offer evacuation and alternative travel options if roads and highways are compromised.

Metrolink riders utilizing commuter rail in Santa Clarita, after the Northridge Earthquake[158]

156 Federal Railroad Administration, Office of Safety Analysis, accessed 2016, The rate for intercity passenger rail = 0.43 per billion; for car passengers/drivers = 7.3 per billion.

157 Fang, Kevin, and Jamey Volker, The National Center for Sustainable Transportation. *Cutting Greenhouse Gas Emissions Is Only the Beginning: A Literature Review of the Co-Benefits of Reducing Vehicle Miles Traveled* (2017), accessed 2017.

158 Photo Credit: Dana Peters (http://trn.trains.com/bonus/TL1990#twelve)

3.1.6 GOAL 5: Foster Livable and Healthy Communities and Promote Social Equity

Policy 1: Expand Collaboration and Community Engagement in Multimodal Transportation Planning and Decision-Making

The Rail Plan has implemented many of the recommendations for this policy, including early collaboration with stakeholders and partner agencies to implement transparent decision making for all investment options, as well to include economic, health, equity, and sustainability considerations in the planning process. The long-range planning process undertaken by the State as part of the Rail Plan includes local, regional, and Tribal outreach to improve collaboration and engagement. The 2040 Vision also provides a framework for ongoing collaboration and engagement with partners and stakeholders tied to implementation actions supporting development of the Vision, including specific planning studies needed to facilitate conversations with communities about how the rail network can be improved to meet local needs. The State will develop the Vision through this engagement process.

Transbay Joint Powers Authority (TJPA), 2017.

The under-construction Transbay Terminal in San Francisco will serve as a key hub station for California High Speed Rail connections to other local and intercity rail and bus services.

Policy 2: Integrate Multimodal Transportation and Land Use Development

Passenger rail is a safe, clean, and efficient mode of transportation with stations that support efficient and transit-oriented land use development. RTPs now include SCSs, which link land use planning and transportation investments to meet regional targets for GHG emissions reductions. The 2040 Vision of an integrated state network tying the State's population centers together will enhance regional SCSs, and provide for expanded access to a statewide network that supports sustainable, efficient land use development. This 2040 Vision for passenger rail is an important State tool for working with regional agencies and stakeholders to address the mega-regional nature of transportation needs in California. California's two mega-regions account for nearly 95 percent of the population, and therefore must be taken into consideration when planning transportation[159] —especially transportation well-suited for inter- and intra-regional passenger travel and goods movement, like rail. In the Northern California mega-region, for example, building a second Transbay tube to accommodate conventional rail will expand the mega-regional travel options, while further decreasing congestion on parallel corridors.

The 2040 Vision provides for attractive opportunities in more communities for station area planning that supports walkable, TOD near station sites with access to a statewide rail network—a network providing for local, regional, interregional, and out-of-state travel. The 2040 Vision is focused on providing transportation improvements using existing rights-of-way that generally serve existing city centers, and where it doesn't, provides for future growth around sites that can be designed around rail, transit, and active transportation. The 2040 Vision supports California's Vibrant Communities and Landscapes component of the State's climate strategy.[160]

159 Bay Area Council: Economic Institute, *The Northern California Megaregion: Innovative, Connected, Growing*. (2016).

160 California Air Resources Board, *Vibrant Communities and Landscapes: A Vision for California in 2050*. (2016).

Policy 3: Integrate Health and Social Equity in Transportation Planning and Decision Making

This policy recognizes the need for a comprehensive multimodal system that increases access to education, employment opportunities, amenities, and health care; and preserves California's competitive edge as a highly desirable place to live and work. The Rail Plan will build on this vision of quality of life for all Californians, especially by providing viable access to destinations across the state without a car. Rail network investments and station stops can be well integrated with local transit, bicycle, and pedestrian improvements to provide for a healthy transportation system with a statewide reach.

The State supports integrating social equity in the rail planning process. The 2040 Vision plans for many more access points to a transportation network than exist today, or that were envisioned previously, providing economic benefits and opportunities to disadvantaged communities in the state. Implementation actions and investment supported by the 2040 Vision are also associated with discussion and evaluation of improvements to possible community impacts of rail service, including establishment of quiet zones and implementation of grade crossing improvements to make rail corridors good neighbors.

3.1.7 GOAL 6: Practice Environmental Stewardship

Policy 1: Integrate Environmental Considerations in All Stages of Planning and Implementation

The 2040 Vision represents a significant state strategy for meeting California's future mobility needs and environmental goals by developing and investing-in a clean, efficient State rail network for the movement of people and goods. The Rail Plan provides a program-level platform from which more detailed service and environmental analysis must be conducted by the State and rail operators as the 2040 Vision is implemented.

Policy 2: Conserve and Enhance Natural, Agricultural, and Cultural Resources

The 2040 Vision supports development of existing rail corridors and rights-of-way as a priority for adding transportation capacity serving the needs of future population growth and avoiding sprawl-inducing impacts of new roadway construction or expansion of state highways. The 2040 Vision outlines a State strategy for planning and investment in transportation infrastructure that supports local and regional planning and efficient growth around rail stations, thereby reducing development pressures on natural and agricultural resources. Planning for services that are part of the 2040 Vision will be sensitive to the preservation of natural resources, and mitigation strategies will be deployed at the landscape level, with superior ecological outcomes wherever possible. The State rail planning process includes early outreach and consultation with Native American Tribes to identify and disclose concerns about cultural resource disturbance, which will be addressed throughout the planning and project development process.

Policy 3: Reduce GHG Emissions and Other Air Pollutants

As the State's passenger rail system grows, the resulting reduction in VMTs and reduced rate of highway expansion will result in air quality benefits. As described in Chapter 2, emissions from transportation account for 38 percent of California's total GHG emissions, the vast majority of which come from on-road sources. Limiting the growth of VMTs through mode-shift will reduce on-road sources of pollution. Rail is also a relatively energy-efficient way to move freight. According to Federal statistics, an average freight rail car moves 10.6 miles per gallon of fuel consumed, while an average combination truck moves 5.9 miles per gallon.[161] A 2009 FRA study reported that a double-stack container-trailer-freight rail car moves freight three to five times more fuel-efficiently than a truck.[162] Each freight train carries much more total weight than a single combination truck, so each train movement reduces truck traffic on highways and reduces GHG emissions.

Policy 4: Transform to a Clean and Energy Efficient Transportation System

An accessible, connected, integrated, state-of-the-art passenger rail system offers travelers a wealth of mobility choices, reducing reliance on the automobile. Reducing the number of auto trips will reduce pressure on—and improve the performance of—the State's highway network, while decreasing VMTs and GHG emissions.

Rail's ability to transport more people with fewer emissions supports a clean and energy efficient transportation system. The 2040 Vision intends to accommodate additional demand for trips, and grow the rail network in a manner that incorporates substantial electrification of the state network, with improvements possible on additional corridors where there is support to do so. The statewide HSR network included in the 2040 Vision will be powered entirely from renewable energy sources, providing a growing market for clean energy providers.

161 Bureau of Transportation Statistics, *National Transportation Statistics* (2011), Tables 4 14 (2012) and 4 17.

162 Federal Railroad Administration, *Comparative Evaluation of Rail and Truck Fuel Efficiency on Competitive Corridors* (2009), page 5.

3.2 Program Effects

The State's passenger and freight rail vision and investment program have been carefully developed to provide benefits to California residents and businesses, while minimizing adverse impacts. To evaluate the performance of the vision and investment program toward meeting the stated goals and objectives, Chapter 6 considers program effects across many measures, including the following:

- **Access and mobility:** Effects are measured through forecasted changes in travel times; passenger rail ridership and revenue; number of travelers using air versus passenger rail and automobiles; roadway travel by trucks and automobiles; and elimination of rail congestion locations and choke points. As passenger rail service frequencies are increased, the system can carry more passengers to more destinations in less time. This is achieved through reduced wait times at destinations and transfer points, improved connections, and expanded travel time flexibility—all providing travelers more seamless mobility.
- **Environmental stewardship:** Effects are measured through projected changes in GHG and criteria air pollutant emissions; consideration of actions taken to address rail-related noise; the extent to which projects and programs can support State climate change policies; and the extent to which sea level rise and extreme weather may affect rail corridors and investment needs.
- **Livable and healthy communities:** Effects are considered by evaluating impacts on grade crossings, quiet zones, and other neighborhoods near rail lines, yards, and passenger stations; the extent to which projects and programs support local land use visions in regional transportation plans and sustainable communities strategies; and the extent to which expanded passenger rail service integrates with local transportation options.
- **Safety and security:** Effects are considered through summarizing research results regarding the demonstrated safety benefits of passenger and freight rail travel versus highway travel; and through including and prioritizing programs that directly fund rail safety improvements.
- **Economic benefits:** The potential job creation and economic growth effects are addressed quantitatively through synthesis of recently completed economic and benefit-cost analyses, which are used to characterize enhanced real estate values near passenger rail stations. This plan also considers potential highway and bridge maintenance cost reductions from reduced truck and automobile travel. It decreases direct and indirect health care costs for the State and individuals as a result of improved safety associated with reduced VMTs (from mode shift). Additionally, households spend nearly 20 percent of their income on transportation, largely from the associated costs of car ownership.[163] Increasing access to alternatives, as is the goal of the 2040 Vision, will help to lower VMTs, thereby reducing total household transportation costs and increasing disposable income.

163 Fang, Kevin, and Jamey Volker, The National Center for Sustainable Transportation. *Cutting Greenhouse Gas Emissions Is Only the Beginning: A Literature Review of the Co-Benefits of Reducing Vehicle Miles Traveled* (2017), accessed 2017.

3.3 Conclusion

California's diversity is one of the State's strongest assets; however, the diversity of people and places poses great challenges to safeguarding against climate impacts and preparing for future vulnerabilities. To sustainably and equitably prepare for the future and expand mobility choices for California's residents, visitors, and businesses, the State needs a robust, multimodal transportation system—and an integrated passenger and freight rail network. An integrated rail system that is developed in coordination with land use planning strengthens the benefits of both by increasing access, and dispersing mobility and equity benefits. Further, almost every city or region in the state is vulnerable to at least one effect of climate change; and planning and being equipped to handle all of them is a daunting task. The Rail Plan can help by guiding rail planning and corresponding investments to incorporate State policies that aim to reduce GHG emissions, reflect climate change adaptation strategies, and provide a seamless travel experience for all populations.

The 2040 Vision and planning framework details how a pulsed system incorporates integrated and complementary services, and can be sustainably executed through a phased investment strategy. Chapter 4 will elaborate on these planning principles, and explain geographically specific connectivity and service delivery goals and options.

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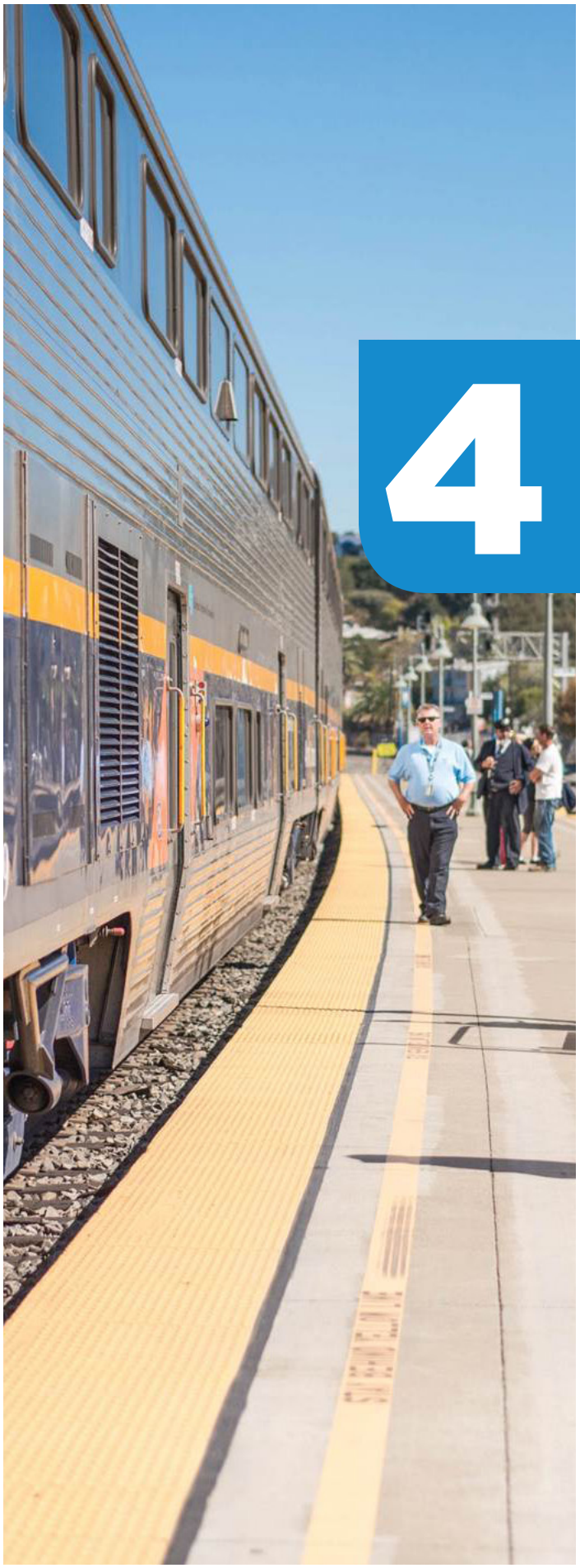


4 Proposed Passenger Improvements and Investments

Chapter 4 presents the service improvements and investments needed to achieve the Rail Plan Vision. The Rail Plan supports near-term plans and proposals being developed in individual corridors and regions, with a 2022 targeted completion date; but presents a flexible, corridor-level framework for developing the passenger rail system over the long-term, 2040 time horizon of the plan. This framework is intended to serve as the basis for State-led service implementation planning to be undertaken in coordination with regional agencies, rail operators, and stakeholders to achieve the 2040 Rail Plan Vision. The Rail Plan does not seek to prescribe specific projects or solutions and their associated costs, but rather to provide a path for implementation and a common understanding of how the State's rail network should develop to meet State goals.

4.1 Network Integration Strategic Service Planning

The 2018 State Rail Plan Vision was developed as part of the State's Network Integration Strategic Service Planning (NISSP) process. The overarching goal of the NISSP is to plan for a statewide passenger rail system that maximizes the performance potential of intercity passenger rail as a time and cost competitive travel option for meeting the State's transportation needs and goals. The network planning process undertaken as part of the Rail Plan included an assessment of statewide travel demand, existing rail service and infrastructure, service types responding to market demand in different regions or corridors, and infrastructure elements required to support service levels and address infrastructure constraints. The draft network vision was developed through an iterative process of network planning, ridership and revenue modeling, capital improvement analysis, and operations and revenue analysis.

In addition to the demand and infrastructure analysis from the NISSP, the most recent planning or programming documents in each service area were reviewed to identify projects related to passenger rail. Documents reviewed include RTPs, corridor strategic plans, corridor business plans, and programming documents such as the State Transportation Improvement Program (STIP) and the Safe, Reliable, High-Speed Passenger Train Bond Act for the 21st Century (Proposition 1A).

4.2 Pulse Scheduling

State network planning in the Rail Plan is based on *pulse scheduling*, which represents uniform train service patterns that repeat throughout the day on regular, recurring time intervals. This timetable-based planning approach allows for timed transfers between services at hub stations where a transfer is required to complete a trip across the state, or to a location served by local transit. The benefit to users of pulse scheduling is that a repeating timetable allows for easy trip planning and seamless travel by ensuring that connections between trains can be made throughout the day, with minimal transfer times. By not requiring a train for every travel market, pulse scheduling allows fewer trains to serve more destinations through connections, not unlike how the airlines use hubs to allow smaller communities more frequent access to more destinations than would otherwise be possible, and do so at a lower cost. Pulse schedule planning allows cost savings to be realized by reducing the set of infrastructure improvements needed to operate services to only those that are necessary to reliably operate the timetable (e.g., the capacity of a single-track railroad can be maximized to operate services before additional track infrastructure is needed to accommodate higher service frequency).

The Rail Plan has preliminarily identified a 30-minute or 60-minute service frequency (or headway) across most portions of the state by 2040. Because the HSR system will serve as the major artery for the long-distance travel option of the statewide system, the service plans from the *2016 CHSRA Business Plan* were used to determine primary time point hubs for the integrated, statewide network.

4.3 State Service and Connectivity Goals

The Rail Plan presents the State's goals for providing and connecting services in different regions. Service goals describe the service-desired train frequencies on the State passenger rail network; reflect the travel times needed to provide services that are competitive with automobile and air travel; and provide for timed connections. Service goals balance travel times with the need to schedule connections between services where transfers are needed for travel between different travel markets. Service goals are also operator-neutral and strategic, rather than prescriptive—the Rail Plan does not determine specific operating and institutional responsibilities, which must be negotiated over time to deliver improvements with the 2040 Vision in mind.

In some cases, service goals are associated with delivery options, where the State goal can be met with different types or services and capital investments to address funding needs or specific geographical and operational constraints. Service delivery options represent the physical improvements and capital investments necessary to achieve the service goals; and ultimately, the 2040 Vision.

4.3.1 Phasing

The service goals and service delivery options identified in the Rail Plan provide a strategic framework for service implementation planning, coordination between the State and rail partners, and prioritization of capital improvements in phases tied to the short-term (2022), mid-term (2027), and long-term (2040) Vision in the Rail Plan. The goals of the phased implementation strategy in the Rail Plan are to follow through on the committed, funded service improvements planned across the state (mostly expected to be complete by 2022), which leverages existing assets and prioritizes maximizing use of existing infrastructure. The long-term 2040 Vision defers significant infrastructure investments that are necessary to integrate passenger rail services, and fully realize the possible service and connectivity goals in the 2040 Vision, if funding and regional support are available to deliver those infrastructure elements. The time phases described in the Rail Plan also identify the specific service planning and analysis that are needed for developing and integrating the rail network over time in a manner that is responsive to the needs of local and regional stakeholders. Critically, the time horizons used in the Rail Plan do not tie to the specific completion year of the recommended projects. Some projects may be completed ahead of the specified year; others may be near completed by the Rail Plan date. The project years and corresponding plans serve as important planning markers and meet statutory planning requirements.

4.3.2 Interstate Rail Connections

Beyond California's statewide goals, the State has an interest in maintaining long-distance national Amtrak service, with interstate connections to Oregon, Nevada, and Arizona; thereby providing service and access to communities that are not on the high-frequency State passenger rail network. The State also has an interest in developing specific passenger rail corridors in coordination with Nevada and Arizona to provide for future interstate HSR service to Las Vegas, Nevada, and Phoenix, Arizona. These future HSR connections represent significant opportunities for accommodating interstate travel to these important destinations via passenger rail, which will address congestion on interstate highways and at California's airports.

The Rail Plan also seeks to address cross-border congestion between California and Mexico through passenger rail connections at the border, providing service that is integrated with the state network.

4.3.3 Host Railroad Coordination

Freight railroad owners desire to improve existing operating efficiency and preserve future capacity to accommodate growing freight rail traffic. Therefore, they are interested in minimizing or improving passenger rail impacts on existing and future freight rail operations. Caltrans will consider the potential impacts of the planned passenger rail service improvements on railroad capacity, and access to yards and customers. Infrastructure investments necessary for increased passenger train volumes will also add capacity and flexibility to freight operations. The goal will be to enable continued, market-responsive growth in goods movement by freight rail, while also providing for increased passenger capacity. This goal will be achieved by early and continuous dialogue with the freight railroad partners, and progressive identification of shared opportunities.

In some cases, ensuring capacity for passenger and freight rail operations will be realized through development of a shared track infrastructure that both freight and passenger trains will use. In other cases, ensuring capacity for freight will involve the development of largely dedicated track for passenger and freight trains in a shared right-of-way, while retaining the ability to share track under certain conditions, or the development of completely separate freight and passenger infrastructure.

The nature of corridor development may change over time as more passenger service is phased in. Limits on passenger train growth in a corridor during early phases of network development will place a premium on using available passenger train slots for the highest-ridership services (often running with more cars on each train than today), while supplementing the service with integrated express bus service during off-peak or lower-demand times of day. Additional growth would be achieved through significant investments in physical infrastructure in partnership with the freight railroads. In return for access for more passenger trains on freight railroads' lines, many funding options will be considered, including various combinations of upfront capital project investments and infrastructure access fees, as well as agreements on future capital investments tied to ensuring reliable service for both freight and passenger services. The partners may conclude that future growth needs will require investing in dedicated passenger rail infrastructure for all or a portion of a corridor.

Additionally, where freight and passenger services share a corridor, opportunities may exist to expand or reorganize tenancy agreements with host railroads for passenger services to gain additional capacity on the freight rail network. The ability of passenger service providers to purchase additional slots for more passenger service is key to scaling services to meet market demand over time, while minimizing large capital outlays for new infrastructure and limiting redundant infrastructure as the network evolves toward the 2040 Vision.

Although the Rail Plan reflects a general understanding of the type of investments appropriate to each corridor, specific decisions will be made through detailed implementation planning and host railroad negotiations. A detailed description of the proposed freight rail improvements and investments is included in Chapter 5.

4.4 Service Areas and Organizational Framework

In addition to organizing proposed passenger improvements, the three time horizons in the Rail Plan mark important milestones in building towards the 2040 Vision. The geographic service regions described in this chapter were refined from service regions developed in the network planning effort as a framework for understanding, discussing, and organizing future services. Those service areas were developed to facilitate planning and analysis for services that could be grouped into logical statewide rail travel sheds justified by early market and ridership analysis. HSR and intercity services, as well as several regional services, are likely to operate across more than one service area, and may be described in both where it is necessary to do so.

The Rail Plan defines nine geographic service areas. Exhibit 4.1 represents these geographies visually using current maps of the rail network as it is in 2018. The areas are:

- **Central Valley and Sierra Nevada:** This region includes the State rail network in the San Joaquin and Sacramento Valleys, including service and improvements between Palmdale and Bakersfield in the South, and Sacramento and Redding in the North, as well as connections to Reno, Carson City, the Sierra Nevada, and counties north of Sacramento.
- **North San Francisco Bay Area and the North Coast:** This region includes the State rail network between Sacramento and Oakland/San Francisco, as well as the North San Francisco Bay Area rail network in Marin, Sonoma, Napa, and Solano Counties. The rail network connecting the Stockton area to the San Francisco Bay Area at Martinez is included in this geographic region.
- **South San Francisco Bay Area:** This region includes the State rail network providing services to and from the South San Francisco Bay Area, including the San Francisco-San Jose Peninsula Corridor, the rail network between Oakland and San Jose, and the network carrying services between the Stockton Area and San Jose over the Altamont Pass.
- **Central Coast:** This region encompasses the Central Coast rail network between San Jose in the North and Santa Barbara/Goleta in the South, including the UPRR Coast Route and Monterey and Santa Cruz Branch Lines.
- **Las Vegas to High Speed Rail:** This region encompasses the HSR route being privately developed for service between Las Vegas and Victorville or Palmdale. The developer of the Victorville to Palmdale segment (known as the High Desert Corridor) has not been finalized and could be either public or private sector.
- **LOSSAN North & Antelope Valley:** This region includes the State rail network included in the existing LOSSAN North corridor between San Luis Obispo, Santa Barbara, and Los Angeles. The regional rail corridor between Santa Clarita and Los Angeles is included in this region.
- **Los Angeles Urban Mobility Corridor:** This region includes the high-capacity rail network being developed for different services between Burbank and Anaheim through the Los Angeles Area and Los Angeles Union Station. Services providing connectivity to the state network in the Los Angeles area are included in this region.
- **Inland Empire:** The Inland Empire region includes the rail network connecting San Bernardino and Riverside Counties to Los Angeles, Orange County, and San Diego.
- **LOSSAN South:** The LOSSAN South region includes the existing LOSSAN South Corridor between Los Angeles/Anaheim and San Diego.

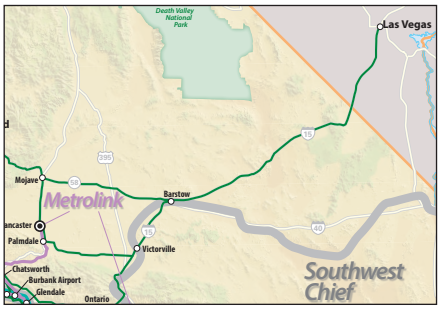
State service goals and improvements, organized by timeframe and geographic region, are described in the sections that follow.

Central Valley and Sierra Nevada

North San Francisco Bay Area and the North Coast

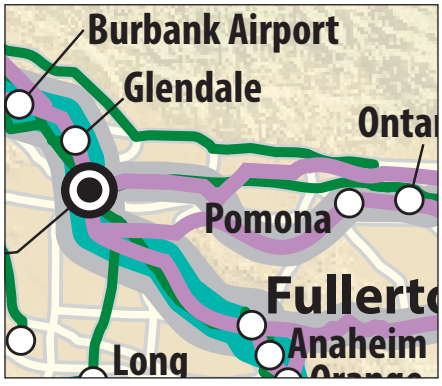
South San Francisco Bay Area

Central Coast



Las Vegas to High Speed Rail

LOSSAN North & Antelope Valley



Los Angeles Urban Mobility Corridor

Inland Empire

LOSSAN South

Exhibit 4.1: Rail Plan Geographic Service Areas

Exhibit 4.2: Caltrans Statewide 2040 Vision Rail Map

4.5 2022 Short-Term Plan – Statewide Goals

The Statewide plan for 2022 identifies service improvements that will lay the foundation for improving and integrating the passenger rail network. These improvements have already been or are being planned; and are funded, or likely to be funded, for construction and implementation, and will be under way or completed by 2022. Additionally, specific planning, environmental, and engineering studies needed to implement service goals in the long-term vision are described here.

Statewide focus areas for the 2022 horizon include:

- Planned and committed projects, including service extensions to Larkspur, Redlands, and Salinas, electrification of the Caltrain service between San Jose and San Francisco, and significant frequency increases throughout the state.
- Completion of significant construction for HSR Valley-to-Valley service and for the ACE extension to Modesto and Ceres.
- Service implementation planning for the 2027 and 2040 time horizons.
- Assisting communities statewide in better connecting transit systems to rail and enhancing station area functions.
- Working with available or identified capacity from existing host railroad agreements; or from opportunities with clear paths for negotiation.
- Strategic planning for fleet management, replacement, and expansion, as well as the expansion or construction of new maintenance facilities that support the fleet.
- Conducting significant research and development and targeted investments in integrated ticketing and travel planning.
- Identifying opportunities to begin developing integrated schedules and repeated patterns, especially in areas of shared regional and intercity operations.
- Make significant progress in implementing alternative fuels or zero-emission technology on both rail and integrated express bus services
- Continuation of California advocacy for continuation of the Federally funded Amtrak long-distance trains: the *Coast Starlight* (Seattle-Los Angeles), the *California Zephyr* (Emeryville-Chicago), the *Southwest Chief* (Los Angeles-Chicago) and the *Sunset Limited* (Los Angeles-New Orleans). These trains provide the only rail service to a number of California communities throughout the state, and connect the state to the national rail network.

4.6 2022 Short-Term Plan – Regional Goals

4.6.1 Central Valley and Sierra Nevada

The 2022 Short-Term Plan regional goals include building out planned investments in the regional intercity rail network, and integration with full HSR Phase I.

Service Goals and Improvements:

- Introduction of early-morning service into Sacramento and the Bay Area from the San Joaquin Valley, using mid-corridor starts from Fresno and Stockton.
- Peak period service between Roseville and Sacramento (at least three trains per day in each direction).
- Implement bi-hourly repeating service (with some exceptions) between Bakersfield and Stockton.
- Expanded direct service between Stockton and Sacramento with a target of at least 4 trains per day in each direction, with potential new stations in Elk Grove and Sacramento, and consideration of some service continuing north to Marysville. Related projects include Stockton Wye and ACE Maintenance Facility Lead Track.
- Expanded integrated express bus service to Redding, Reno, and South Lake Tahoe (on demand-based frequencies).
- Invest in Bakersfield to Sacramento and Martinez corridor improvements focused on increasing ridership on existing frequencies through faster, integrated train schedules, improved reliability, and better transit connectivity.

Planning, Analysis, and Project Development:

- Study expansion of Sacramento-Roseville service to hourly and half-hourly service, based on market and network development.
- Plan for additional, post-2025 regional service frequency to Merced via Modesto and Ceres.
- Plan for phased growth in east-west service across the Altamont Pass to hourly off-peak and half-hourly peak service, enabling connectivity to regional transit and statewide rail networks, including connectivity in the Tri-Valley.
- Complete HSR Connected Corridor Study, planning for phased improvements to northern San Joaquin Valley services, and a clear investment plan that provides enhanced regional and intercity rail services prior to future HSR service.
- Study potential regional rail and Integrated Express Bus needs to communities between Fresno and Bakersfield, developing recommendations that consider capacity currently used for San Joaquin service, along with regional rail opportunities and the need to feed HSR stations at Fresno, Kings-Tulare, and Bakersfield.
- Develop recommendations for 2027 that primarily leverage existing investments and for 2040 that consider additional investment opportunities.
- Study expansion of integrated rail service north from Sacramento to Marysville, including potential stations in northern Sacramento to serve residents and provide connections to Sacramento International Airport.
- Study potential for regularly scheduled, seasonal rail service to the Lake Tahoe region during congested travel periods such as peak travel weekends, with potential termini in Truckee, California or Sparks, Nevada.

4.6.2 North San Francisco Bay Area and the North Coast

The 2022 Short-Term Plan regional goals focus on optimizing existing rail services and building on the recently established SMART service from San Rafael to Sonoma County Airport, launched on August 25, 2017 with 17 weekday round trips (and 5 weekend round trips), including half-hourly peak period service. Primary goals include improving intercity rail service and connectivity between Oakland and Roseville, and enhancing connectivity between the North Bay and North Coast and the rest of the statewide network through well-timed Integrated Express Bus and transit connections, while planning for longer-term rail investments.

Service Goals and Improvements:

Improve service speeds and frequencies between Roseville and Oakland with track and right of-way improvements, and by introducing an optimized rail schedule that better uses capacity available under existing and enhanced railroad agreements across all intercity rail service providers.

- Improve ridership and revenue on intercity and regional rail services through enhancing Integrated Express Bus services, and through improving connectivity to high-frequency urban transit networks at rail stations throughout the corridor between Roseville and Oakland
- Connect SMART at the San Rafael Transit Center to Richmond with Integrated Express Bus services.
- Expand SMART rail service to Larkspur in the south and add new transfer to expand capacity and connect communities in the North Bay Area to an integrated ferry connection to San Francisco.
- Improvements to bus services to better connect communities north of Sonoma County Airport (on the North Coast) and in the Napa Valley, with SMART, as well as with intercity services in Solano County and at Martinez.

Planning, Analysis, and Project Development:

- Evaluate options for higher-capacity hourly off-peak and half-hourly peak intercity rail service between Sacramento and Oakland on the existing alignment (with the potential for some trips being served by Integrated Express bus in low-congestion periods).
- Evaluate options for improved connections at Martinez for trains between Stockton and Martinez with those traveling between Sacramento and Oakland.
- Evaluate intercity and regional rail options for the Sacramento to Oakland corridor, allowing both local and express services over all or part of the route. Include an assessment of service needs with and without a new Transbay crossing to San Francisco and the Peninsula, as well as the business case and phasing recommendations for adding service beyond what is possible on the existing alignment.
- Evaluate options for fully integrated express bus services connecting northern California communities with SMART and the State's intercity rail corridors.
- Plan for completion of SMART to Cloverdale by 2027.
- Evaluate expansion of rail service from San Rafael, Sonoma, and Napa Counties to Solano County, considering rail service primarily on existing rail alignments with potential connections to the statewide network at Fairfield-Suisun or near Vallejo.

4.6.3 South San Francisco Bay Area

The 2022 Short-Term Plan regional goals focus on optimizing regional service timetables, building out planned expansion, and electrification investments in the regional transit and commuter rail networks, and early investments to integrate services with the HSR Initial Operating Segment. The Rail Plan supports electrification of the Peninsula Corridor as a high priority. It is the artery through which long-distance services from the Central Valley and Southern California will serve the Bay Area. Caltrain electrification is critical to mitigating congestion on the U.S.-101 corridor, and supporting a key State and national engine for economic growth.

Service Goals and Improvements:

- Six total trains per hour in each direction in peak periods (fewer in the off-peak), providing express and local service, between San Francisco and San Jose, supported by the Caltrain Modernization Program and Peninsula Corridor Electrification Project.
- 25th Avenue grade separation and South San Francisco station improvements in the San Francisco-San Jose corridor.
- Improve service speeds and frequencies between San Jose and Oakland with track and right of-way improvements, and by introducing an optimized rail schedule that better uses capacity available under existing and enhanced railroad agreements across all intercity and regional rail service providers.
- Improve ridership and revenue on intercity and regional rail services through enhancing Integrated Express Bus services and through improving connectivity to high-frequency urban transit networks at rail stations throughout the corridor between San Jose and Oakland.
- Expanded capacity on peak service between the Stockton area and San Jose through the Altamont Corridor with timed connections in the East Bay.
- Initial Integrated Express Bus services connecting the Peninsula with East Bay across the Dumbarton Bridge regional and intercity rail stations, allowing connectivity to the Statewide rail network.
- Initial Integrated Express Bus services in the I-680 corridor, using freeway managed lanes to better connect the San Ramon Valley to Sacramento and the Bay Area.
- Enhanced integrated express bus services in the Highway 101 corridor using managed-lane improvements in San Mateo Country between Santa Clara and San Francisco.

Planning, Analysis, and Project Development:

- Plan for integrated all-day, express, and local service between San Francisco and San Jose, allowing all stations to be served at least half-hourly, and to connect with the Statewide rail network in San Jose
- Plan for capacity investments in the San Jose to San Francisco corridor that address 2027 and 2040 growth.
- Evaluate intercity and regional rail options for the San Jose to Oakland corridor, allowing both local and express services over all or part of the route. Include an assessment of service needs with and without a new Transbay crossing to San Francisco and the Peninsula, as well as the business case and phasing recommendations for adding service beyond what is possible with existing capacity.
- Determine final alignment of Downtown Extension to Transbay Terminal and begin construction, allowing future high-speed and regional services to serve Transbay Terminal.
- Conduct long-term Northern California mega-regional demand analysis to refine specific needs and opportunities for an integrated rail and bus network.
    - Complete operational analyses of the Transbay Terminal with the goal of optimizing capacity to accommodate high-speed, intercity, and regional rail service types and potential through-train service opportunities, if a second Transbay tube were to be constructed.
    - Continue work with Alameda County to study freight and passenger rail investments in the East Bay and to determine investments by alignment, and select a preferred alignment for Oakland to San Jose passenger rail services.

- Analyze opportunities to provide necessary rail capacity between Oakland and San Jose, considering existing and planned BART and UPRR investments.
- Complete study of the Dumbarton alignment to connect the Peninsula and East Bay within a regional network, including alternatives for both Integrated Express Bus and Rail service.
- Plan for future half-hourly Integrated Express Bus service in the I-680 corridor, providing connections at the future Solano County Hub, Martinez, the Walnut Creek or Pleasant Hill BART station, the Dublin/Pleasanton BART station, and the Pleasanton ACE station, connecting communities along the corridor to the Statewide rail network.
- Study to address alternatives for meeting capacity needs through Niles Canyon and across Altamont Pass to support growing freight and passenger train volumes as part of a regional network.

4.6.4 Central Coast

The 2022 Short-Term Plan regional goals provide for additional service frequencies connecting the Central Coast and San Francisco Bay Area, and early planning for the Santa Cruz – Monterey County regional network.

Service Goals and Improvements:

- Two intercity trains per day connecting the San Francisco Bay Area to Salinas via San Jose, including new stations in Pajaro/Watsonville and Castroville.
- Early investment in additional local stops on the Coast Route in Soledad and King City, for immediate use by the long-distance Coast Starlight and longer-term use by intercity trains between Goleta and Gilroy.
- Bi-hourly Integrated Express Bus service connecting communities between San Jose, Salinas, San Luis Obispo, and Santa Barbara, including directly serving significant population centers not on the existing rail line, and providing important connections between trains that terminate in Goleta or San Luis Obispo in the south and San Jose or Salinas in the north.
- Enhanced Integrated Express Bus service connecting the Central Valley at Paso Robles.
- Enhanced and Initial Integrated Express Bus service connecting Hollister, Monterey, and Santa Cruz to the Statewide rail network.

Planning, Analysis, and Project Development

- Analyze opportunities for an enhanced rail network to improve connections between the Monterey Peninsula, Santa Cruz, Salinas, and Hollister to HSR at Gilroy.
- Plan for improvements to the Coast and Santa Barbara Subdivisions to increase frequencies between San Jose and Goleta by 2027 and 2040.

4.6.5 Las Vegas HSR

The State will coordinate with the private project sponsor and local planning authorities to develop detailed operations plans to ensure integration and inter-operability between California HSR and Las Vegas services.

Planning, Analysis, and Project Development:

- High Desert Corridor environmental clearance and right-of-way acquisition between Victorville-Palmdale.
- Complete High Desert Corridor service integration study.

4.6.6 LOSSAN North

- The 2022 Short-Term Plan regional goals support service improvements between Los Angeles, Ventura, and Santa Barbara Counties, and connections to regional destinations and the statewide network. Investments by 2022 will improve schedule reliability throughout the corridor.

Service Goals and Improvements:

- Invest in LOSSAN North corridor improvements focused on increasing ridership on existing frequencies through faster, integrated train schedules, improved reliability, and better transit connectivity, which includes investment in layover facilities.
- Increase frequency between Santa Barbara and Los Angeles by at least one train per day in each direction, achieving largely bi-hourly service in the corridor, with some gaps filled by Integrated Express Bus.
- Integrate intercity and regional rail services to provide improved rail service, with at least hourly service at most stations, and at least half-hourly service during the peak

Planning, Analysis, and Project Development:

- Detailed planning and implementation studies for improvements in LOSSAN North should begin as early as possible, addressing:
- Corridor requirements for achieving 2027 and 2040 phased expansion of service, including goals of hourly intercity service to Goleta, half-hourly regional service to Ventura County, and integrated express and local service on at least half-hourly headways between Chatsworth and Los Angeles.
- The North LOSSAN Corridor interface with the HSR System at Burbank/Bob Hope Airport.
- Ongoing planning to address regional rail service needs between Ventura and Santa Barbara Counties during peak periods, building on peak-period service planned for implementation in 2018.

4.6.7 Los Angeles Urban Mobility Corridor

The 2022 Short-Term Plan regional goals support the significant regional commitment to rail capacity and service improvements in the Los Angeles area. The Rail Plan seeks to harmonize statewide goals with those investments by integrating service in the Los Angeles Area with the statewide network. The LA Urban Mobility Corridor, extending from Burbank to Anaheim, is a critical piece of the statewide network that will provide needed freight and passenger capacity in this significantly congested transportation corridor. During this period, construction of run-through tracks at Los Angeles Union Station will advance, but not be complete. The Rosecrans-Marquardt grade separation will be completed during this time-period, allowing increase in service from San Diego, Riverside, and Orange Counties.

Service Goals and Improvements:

- Develop well-integrated rail service provided by both intercity and regional rail operators:
  - Hourly express and half-hourly peak (hourly off-peak) local service between Anaheim and Los Angeles Union Station, using capacity benefits of Rosecrans-Marquardt grade separation.
  - Additional local service between Fullerton and Los Angeles from increase in service from Perris Valley and Riverside, using capacity benefits of Rosecrans-Marquardt grade separation.
  - At least half-hourly peak and hourly off-peak service from Burbank to Los Angeles Union Station.
- Crenshaw corridor and Regional Connector completion, allowing improved access to statewide rail network.
- Initial Integrated Express Bus service between Los Angeles International Airport (LAX) and Van Nuys, LAX and Los Angeles Union Station, Long Beach and Los Angeles, and Long Beach and Santa Ana.

Planning, Analysis, and Project Development:

- Determine final design for run-through tracks at Los Angeles Union Station, accommodating HSR, intercity rail, regional rail, and local transit operators; and begin construction.
- Plan for integration of Los Angeles County Metropolitan Transportation Authority (LA Metro) projects with statewide rail network at key connection points such as Van Nuys, Chatsworth, Burbank, Glendale, Los Angeles Union Station, and Norwalk/Santa Fe Springs.
- Plan to incorporate Integrated Express Bus services as part of the LA Urban Mobility Corridor regional network.
- Implementation planning study for HSR Phase 2 service east of Los Angeles Union Station.

4.6.8 Inland Empire

The 2022 Short-Term Plan regional goals support service and frequency improvements connecting the Inland Empire to Southern California regional networks and future HSR and interstate service expansions. Advance planning is critical for development of future electrified regional services and phased implementation HSR services in the Inland Empire.

Service Goals and Improvements:

- Half-hourly peak and hourly off-peak regional service between Los Angeles and San Bernardino, and Los Angeles and Riverside/ Perris Valley, with Integrated Express Bus filling any gaps in the schedule due to insufficient available railroad capacity.
- Integrated regional service between San Bernardino and Redlands that matches the service frequency between San Bernardino and Los Angeles.

Planning, Analysis, and Project Development:

- Plan for achieving 2027 and 2040 phased expansion of service, inclusive of Phase 2 HSR, intercity rail, and regional rail investments connecting Los Angeles and the Inland Empire, service to the Coachella Valley, and service from the Inland Empire to San Diego.
- Interstate Blue Ribbon Commission in cooperation with Arizona to coordinate future service expansion to Arizona via the Inland Empire.

4.6.9 LOSSAN South

The 2022 Short-Term Plan regional goals support analysis of operating complementary services and stopping patterns in a shared corridor along the South LOSSAN and Orange County corridors between Los Angeles and San Diego. Analysis of timetable and regional scheduling will lead to reliability and service speed improvements.

Service Goals and Improvements:

- Introduce initial integrated service featuring hourly express and half-hourly local service between Los Angeles and San Diego (with exceptions to half-hourly local headways based on availability of slots between Los Angeles and Fullerton), taking advantage of expanded capacity of completion of Rosecrans-Marquardt grade separation and completion of multiple double track projects in San Diego region and other infrastructure improvements.

Planning, Analysis, and Project Development:

- Plan for achieving 2027 and 2040 phased expansion of service, inclusive of Phase 2 HSR, intercity rail, and regional rail investments connecting Los Angeles and San Diego, improved connectivity to Mexico border crossings, and enhanced local transit connections at key stations along the corridor.
- Identify maintenance facility requirements for integrated services in LOSSAN South corridor.

4.7 2027 Mid-Term Plan – Statewide Goals

The 2027 service goals focus on targeted improvements for integrating Phase I of HSR service, and maximizing service in existing rail corridors. By 2027, there will be a minimum service of every 2 hours on the core system, including Integrated Express Bus services to places like Redding and Reno. The 2027 plan is based on funding levels reasonably expected from sources currently available at the Federal, State, and local levels. Some services may be improved well in advance of 2027, while others may be near completion but not yet complete.

Key components of the 2027 plan include:

- Operation of HSR Valley-to-Valley service.
- Initiation of statewide pulse-hub operations on at least a bi-hourly basis, with hourly service on certain high-demand corridors.
- Full use of programmed corridor capacity—e.g., places where agencies intend to have a completed core capacity transit, HSR, or intercity rail project , including:
  - Proposed capacity expansion of the San Bernardino Line.
  - Service expansion and restructuring made possible by the Los Angeles Union Station run-through tracks.
  - Early investment in blended-service corridors (San Jose-San Francisco and Burbank-Anaheim).
  - Growth of service to Modesto, Ceres, and Merced.
  - Planned capacity in the corridor between Sacramento and Roseville.
  - Targeted expansion of service from Oakland and the Central Valley to San Jose.
  - Extension of SMART corridor north of Sonoma County Airport.
- Full use of negotiated slots on existing capacity.
- Targeted connectivity investments at hubs to connect to HSR.
- Fully developed and operational integrated ticketing.
- Assisting communities statewide in better connecting transit systems to rail and enhancing station area functions.
- Implementation of new fleet and maintenance facility strategy.
- Service implementation planning for the 2040 time horizon.

4.8 2027 Mid-Term Plan – Regional Goals

4.8.1 Central Valley and Sierra Nevada

The 2027 Mid-Term Plan regional goals focus on targeted investments to increase service to Sacramento, connecting to the HSR network in Merced, providing for connections to Southern California.

Service Goals and Improvements

- Weekday peak-period regional service from Ceres and Madera to the Bay Area, and Merced to the Bay Area. Additional operating frequencies, based on market demand and available railroad capacity. Integrated Express Bus connections at Merced to regional rail stations during time slots not served by rail on at least a bi-hourly basis, 7 days per week.
- Valley-to-Valley HSR services including hourly service from Central Valley to the Bay Area, integrated connections at the HSR Madera transfer station and at San Jose Diridon Station to the statewide rail network.
    - Provide demand-based service with most frequent service during peak travel periods.
    - Provide demand-based connectivity (at least bi-hourly) to statewide rail and Integrated Express Bus services at HSR Kings-Tulare, Merced, and Gilroy stations.
    - Continue construction of remainder of the Phase 1 HSR System.
- Half-hourly peak and bi-hourly off-peak service from Roseville to Sacramento, integrated at Roseville with bi-hourly Integrated Express Bus services from Reno and North Lake Tahoe, as well as with local transit services.
- Hourly service from Fresno, Madera, and Merced to Sacramento, with connections to and from HSR at the HSR Madera transfer station.
    - HSR connection to regional rail corridor stations north of Merced at the Merced HSR station (meeting regional trains extended to Merced).
    - HSR connection to stations north of Merced on the express rail corridor to Stockton and Sacramento at Madera HSR transfer station.
    - Integrated Express Bus service filling in any gaps not achievable due to railroad capacity limitations.
- Implement 2027 recommendations of study addressing rail and Integrated Express Bus service in communities between Fresno and Bakersfield.
- Enhanced Integrated Express Bus connections at Sacramento to Carson City and South Lake Tahoe (on a demand-based frequency).
- Integrated Express Bus connections to Yosemite National Park at Merced and Fresno.
- Integrated Express Bus connections at Kings-Tulare to Visalia, Porterville, Lemoore, and the Central Coast, with at least a bi-hourly frequency. Initial Integrated Express Bus service to Sequoia and Kings Canyon National Parks on a demand-based frequency.

Planning, Analysis, and Project Development:

- Complete HSR planning efforts to identify the service needs between Madera, Merced, and the rest of the northern San Joaquin Valley and Sacramento, including identification of alignment and infrastructure that meets express and local station stop needs, and consideration of electrification of the corridor. Begin acquisition of right-of-way.
- Assist communities throughout the Central Valley and the Sierras in better connecting transit systems to rail, and enhancing station area functions, as well as in identifying any additional Integrated Express Bus corridors.
- Determine future regional rail requirements in the southern Central Valley (Lemoore to Visalia/ Porterville, plus additional region-identified opportunities).

4.8.2 North San Francisco Bay Area and the North Coast

The Rail Plan supports investments that leverage full use of existing regional corridor capacity between Sacramento and Oakland; expansion of planned rail service in Marin and Sonoma Counties; and implementation of Integrated Express Bus service to the statewide network in Solano County.

Service Goals and Improvements

- Integrated regional service from Larkspur to Cloverdale as part of SMART Phase 2, increasing the utility of the service, and providing a rail link between northern Sonoma County and North Coast communities with ferry connections to San Francisco.
    - Integrated Express Bus services connecting SMART services to North Coast communities, to Richmond, to regional and HSR services in San Francisco, and to the statewide rail network at Suisun-Fairfield.
    - Integrated Express Bus services connecting Napa County and Suisun-Fairfield. .
- Half-hourly peak and hourly off-peak intercity service from Oakland to Sacramento (with the potential for some trips to be served by Integrated Express bus in low-congestion periods, should sufficient railroad capacity not be available).
- Stockton-Richmond/Martinez bi-hourly regional service for connections to statewide rail network.
    - Richmond/Martinez station connectivity investment to turn Stockton-Richmond/ Martinez trains.
- Implement improvements to Integrated Express Bus network recommended by 2022 study.

Planning, Analysis, and Project Development:

- Implementation planning for a connection from Marin and Napa Counties to the state network at a Solano County hub, based on the results of the 2022 evaluation.
- Planning for a new electrified alignment between Richmond and the Solano County hub, including selection of an alignment and determination of service needs for express and local service on the corridor.
- Begin implementation of results of study on intercity and regional rail options for the Sacramento to Oakland corridor, including detailed planning based on Transbay tunnel decision.
- Assist communities throughout the North Bay and North State area in better connecting transit systems to rail and enhancing station area functions.

4.8.3 South San Francisco Bay Area

The Rail Plan supports investments to leverage HSR connections from San Jose to regional rail and bus services. Future rail service improvements assume BART urban rail expansion to downtown San Jose via Milpitas and in the Tri-Valley area.

Service Goals and Improvements:

- Implement integrated, all-day express and local service between San Francisco and San Jose, with all stations connected at least hourly to the statewide rail network in San Jose.
- Improve San Francisco to San Jose corridor capacity through first phase of investments in grade separations, grade crossing improvements, and level boarding at priority locations.
- Implement HSR Valley-to-Valley service.
- Continue construction of remainder of Phase 1 HSR System improvements between San Jose and San Francisco, and Downtown Extension to Transbay Terminal, allowing up to four HSR trains per hour to San Francisco.
- Half-hourly peak and at least bi-hourly off-peak services between Oakland and San Jose, leveraging initial implementation of Alameda County East Bay rail planning recommendations reached prior to 2022.
- Up to half-hourly peak service in the Altamont corridor connecting San Jose and the Stockton Area, with timed connections in the Tri-Valley and East Bay to integrated transit and Express Bus services.
- Hourly Integrated Express Bus services between the East Bay and the Central Valley, filling gaps not served by rail, making connections to other rail and high-frequency transit corridors.
- Half-hourly peak and hourly off-peak bus or rail service in the Dumbarton Corridor (based on the results of the 2022 study), with connections in the East Bay to Altamont Corridor, Oakland to San Jose rail, and BART services.
- Establishment of a Tri-Valley hub to connect BART, Altamont Corridor services, and Integrated Express Bus service to Solano County on the I-680 Corridor.
- Open an East Bay hub station near Newark, Hayward, or Fremont to allow connections between north-south service between Oakland and San Jose, and east-west services between the Stockton Area and San Jose and a regional Dumbarton Bay Crossing. Location will be chosen consistent with results of the 2022 study.

Planning, Analysis, and Project Development:

- Implementation planning for an Oakland hub and East Bay rail network that could connect future service between Sacramento and the East Bay to San Francisco, based on the decisions reached in the mega-regional and Transbay tube studies completed by 2022. The importance and function of the Oakland hub will depend on the design of the services between Sacramento and the Bay Area, and regional planning for a new Transbay tube. In all cases, it is highly desirable to provide convenient connections between the passenger rail services and the BART network.
- Plan for full grade separation and level boarding on corridor between San Francisco and San Jose to improve corridor capacity and safety by 2040.
- Assist communities throughout the East Bay, South Bay, Peninsula, and Tri-Valley in better connecting transit systems to rail, and enhancing station area functions.

4.8.4 Central Coast

The Rail Plan supports investments that expand passenger rail access to the Central Coast, connecting services to Phase 1 HSR in the North, and service to the South on the LOSSAN North Corridor between San Luis Obispo and Los Angeles.

Service Goals and Improvements:

- At least hourly peak period regional rail service between Gilroy and San Jose, integrated with statewide rail system at both Gilroy and San Jose. Hourly Integrated Express Bus service complementing connections to key local stations between Gilroy and San Jose in the off-peak.
- Bi-hourly rail service connecting Salinas to statewide rail network at Gilroy.
- At least bi-hourly Integrated Express Bus service connecting Hollister to the statewide rail network at Gilroy.
- Bi-hourly integrated intercity rail and Integrated Express Bus service from Salinas to San Luis Obispo, including at least one intercity rail service in addition to the long-distance Coast Starlight.
- Bi-hourly integrated intercity rail and Integrated Express Bus service from San Luis Obispo to Santa Barbara, including at least three intercity rail frequencies in addition to the long-distance Coast Starlight.
- Bi-hourly Integrated Express Bus service from Paso Robles to the Central Valley.

Planning, Analysis, and Project Development:

- Implementation planning for development of an integrated Central Coast intercity rail, regional rail, and Express Bus network providing coastal mobility and key connections to the statewide network, including equipment procurement requirements that address unique operating and market characteristics of Coastal service.
  - Includes implementation planning for connecting Monterey and Santa Cruz to the statewide rail network with regional rail services, if recommended by the 2022 study.
  - Determine appropriate mix of rail and bus services based on infrastructure capabilities, market study, and business case for investments. Initial goal of planning for every-4-hour rail service between San Luis Obispo and Salinas, and bi hourly rail service between San Luis Obispo and Gilroy.
  - Implementation planning for rail services, including determining maintenance facility and equipment needs, and opportunities for through-running trains north of Gilroy and south of Goleta.
- Assist communities throughout the Central Coast in better connecting transit systems to rail and enhancing station area functions.

4.8.5 Las Vegas HSR

The Rail Plan supports investments connecting privately operated HSR service to Las Vegas with the State passenger rail network that expands the reach and performance of this service.

Service Goals and Improvements:

- HSR infrastructure and build-out to Las Vegas is expected to be in operation as early as 2022, pending completion of project financing. If feasible for private project sponsors, Las Vegas HSR could be constructed and operating to Victorville in this time frame with Integrated Express Bus services connecting to the Statewide rail system in Bakersfield, Palmdale, San Bernardino, and Riverside.
- Include Las Vegas HSR service in statewide integrated ticketing system.
- Enhance Integrated Express Bus service, in partnership with private project sponsor, connecting Las Vegas HSR service between Victorville and Las Vegas to the statewide rail network, based on frequency improvements on the corridors serving Bakersfield, Palmdale, San Bernardino, and Riverside.
- Begin construction of High Desert Corridor (HDC) connection based on results of HDC environmental clearance, subject to available financing, between Victorville and Palmdale to connect with Phase 1 HSR service.

Planning, Analysis, and Project Development:

- Conduct long-term, 2040-focused service integration study addressing Las Vegas HSR and HDC in the context of the statewide network, including potential for through-train operations.

4.8.6 North LOSSAN and Antelope Valley

The 2018 State Rail Plan supports investments by 2027 providing expanded services on the North LOSSAN corridor between San Luis Obispo and Los Angeles, providing access to the Central Coast; with services providing access for commute trips in the San Fernando Valley that address significant highway congestion between Ventura, Santa Clarita, and Los Angeles, and services continuing along the Coast Route to popular Central Coast destinations north of San Luis Obispo.

Service Goals and Improvements:

- Service improvements between Los Angeles and San Luis Obispo supporting the following frequencies:
  - At least hourly rail service between Los Angeles and Chatsworth.
  - Every-2-hour rail service between Chatsworth and Goleta.
  - Every–4-hour rail service between Goleta and San Luis Obispo.
- Half-hourly service will provide connectivity between Santa Clarita and San Fernando Valley communities, and Los Angeles, and the statewide network, including HSR services.

Planning, Analysis, and Project Development:

- Study electrification of corridor segments north of Burbank on the SCRRA Valley Subdivision and west of Burbank on the LOSSAN North Corridor, to leverage the benefits of HSR electrification. Determine appropriate investments both in conjunction with HSR Phase 1 service in the region, and for the 2040 time horizon.
- Determine the appropriate mix of regional bus and rail services between Santa Clarita and the Antelope Valley for the time when HSR services will be integrated into the regional rail system.
- Study to determine the long-term mix of express and local services that can be supported in the corridor, including the extent of electrification that is possible, and the end point for half-hourly services (i.e., Chatsworth, Moorpark, or Ventura). Decisions about electrifying the corridor will influence service patterns and which corridor sections may need peak-only additional service.
  - In the event that capacity cannot be upgraded to allow blended service operations at half-hourly intervals, Integrated Express Bus services could supplement rail services to fill service gaps.

4.8.7 Los Angeles Urban Mobility Corridor

By 2027, the Los Angeles Urban Mobility Corridor will provide significant capacity and trip-time reductions across the Los Angeles area, and improve the entire rail travel experience from Ventura County to San Diego. Coupled with run-through HSR, Intercity, and Regional services at Los Angeles Union Station, initiation of new services in the Urban Mobility Corridor will unlock end-to-end travel markets that have been stymied by stub-end operations. With Los Angeles being selected to host its third Olympic Games in 2028, initial improvements to increase capacity and permit run-through Metrolink and LOSSAN services at Los Angeles Union Station will provide the ability to move enormous volumes of travelers to Olympic venues spread throughout the region.

Service Goals and Improvements:

- Run-through service at Los Angeles Union Station as part of the LINK-US program, allowing for the restructuring of intercity and regional services passing through Los Angeles Union Station, covering local and express stations throughout the region on at least a half-hourly basis (local stops) and hourly basis (express stops).
- Half-hourly Integrated Express Bus services connecting Santa Monica, LAX, and Long Beach to Los Angeles Union Station.
- Continue construction of HSR supporting infrastructure between Burbank and Anaheim.
- Implement recommendations from 2022 studies related to Integrated Express Bus network and integration of LA Metro high-capacity transit projects into the statewide network.

4.8.8 Inland Empire

The 2018 State Rail Plan supports development of regional rail corridors providing for statewide connectivity and access between Los Angeles and the Inland Empire. This phased strategy for developing future HSR service between Los Angeles and San Diego makes full use of available capacity, and supports implementation of regional plans for expanding service between Los Angeles, San Bernardino, and Riverside.

Service Goals and Improvements:

- Half-hourly all-day service on the San Bernardino line between Los Angeles and San Bernardino, with core capacity improvements.
- Half-hourly peak rail service on the 91 Line, with all-day rail and Integrated Express Bus services leveraging remaining available rail slots on the Riverside and 91 Line corridors to connect to the statewide rail network serving Orange County, San Diego, and Los Angeles on a half-hourly basis.
- Two trains per day between Los Angeles Union Station and Indio in the Coachella Valley.
- Half-hourly regional rail service between Perris Valley and Riverside, with extension of rail and/or Integrated Express Bus service to Hemet and Murrieta, based on regional development timelines.

Planning, Analysis, and Project Development:

- Determine extent of 2040 electrification on Los Angeles Union Station to Inland Empire lines, and plan for implementation on at least corridors served by express rail service, and potentially also on corridors served by local rail services.
- Plan for half-hourly all-day local service between Los Angeles and Riverside via Fullerton, and between Riverside and Laguna Niguel, by 2040.
- Plan for half-hourly express rail services (to be implemented by 2040) connecting Riverside, San Bernardino, and Ontario with Los Angeles and the rest of the statewide rail system.
- Plan for integrated half-hourly rail service to Hemet by 2040.

- Plan for HSR services connecting Los Angeles, Ontario, Riverside, and San Bernardino to each other and to San Diego, using electrified east-west express rail corridors. Include identification of opportunities to further upgrade corridor speeds through phased investment when Coachella Valley and Arizona rail service plans reach their recommendations.
- Select corridor for 2040 Coachella Valley regular-interval service.

4.8.9 LOSSAN South

The Rail Plan supports improvements by 2027, providing for a regular, frequent service on the LOSSAN South Corridor between Los Angeles and San Diego, supported by Urban Mobility Corridor investments between Los Angeles and Orange Counties. The Rail Plan anticipates that service levels will be fully implemented by 2027 in this corridor, and that future long -distance travel between San Diego and the rest of the state will be served by the State's significant investment in HSR service through the Inland Empire.

Service Goals and Improvements:

- Complete maintenance facility investments for integrated services.
- Continue service improvements to solidify half-hourly service to all local stations, with increased reach of half-hourly network due to capacity improvements between Fullerton and Los Angeles, as well as between Fullerton and Riverside.

Planning, Analysis, and Project Development:

- Plan for 2040 LOSSAN South network, including increase in express train service to half-hourly, and integration of 2029 HSR services to Anaheim.

4.9 2040 Long-Term Vision – Statewide Goals

The 2040 Vision represents the full build-out of the long-term planning goals for the integrated, statewide rail network. The 2040 Vision supports an energy efficient rail network, which will be realized either through traditional catenary-based systems or other zero, or near-zero emission technology. The highlights of the 2040 Vision include:

- HSR expansion and integration beyond the initial operational segments.
- Expansion of network capacity in full realization of the integrated service goals.
- Establishment of regional rail networks providing integration with the statewide network and expanded regional access.
- Intensification of services implemented during the short- and mid-term horizon years.

4.10 2040 Long-Term Vision – Regional Goals

4.10.1 Central Valley and Sierra Nevada

The 2040 Vision expands the reach of the HSR System to the Northern Central Valley, providing for regular, frequent connections to HSR trains from Sacramento to the San Joaquin Valley and Southern California, while also providing service to communities between Merced and Sacramento, and access to the State passenger rail network.

Service Goals and Improvements:

- Phase 1 HSR service, with initial hourly service to local stations, and half-hourly service to local stations by 2040.
- Electrified HSR run-through service from the Central Valley to Sacramento, including new infrastructure to speed trip time.
- Off-peak local service expected to rely on transfers between Bay Area and Sacramento HSR trains at Merced and/or Madera transfer stations to achieve full connectivity.
- HSR express stopping patterns and service at market-driven levels.
- Hourly service between Richmond/Martinez and Stockton, based on transfer location recommended in Northern Bay Area study.
- Half-hourly rail service from Roseville to Sacramento.
- Extend hourly rail service north from Sacramento to Yuba City/Marysville.
- Hourly integrated express bus service north from Sacramento to Woodland and communities in-between.
- Every-2-hour integrated express bus service north from Sacramento to Redding and communities in-between.
- Every–2-hour integrated express bus service east from Sacramento to Carson City.
- Every-2-hour integrated express bus service east from Roseville to Reno.
- Enhance integrated express bus service to national parks from Kings-Tulare, Fresno, and Merced.
- Hourly regional rail service connecting Lemoore, Hanford, King-Tulare HSR station, Visalia, and Porterville, based on 2027 study.
- Implement 2040 recommendations of 2022 study on rail and Integrated Express Bus services between Fresno and Bakersfield.

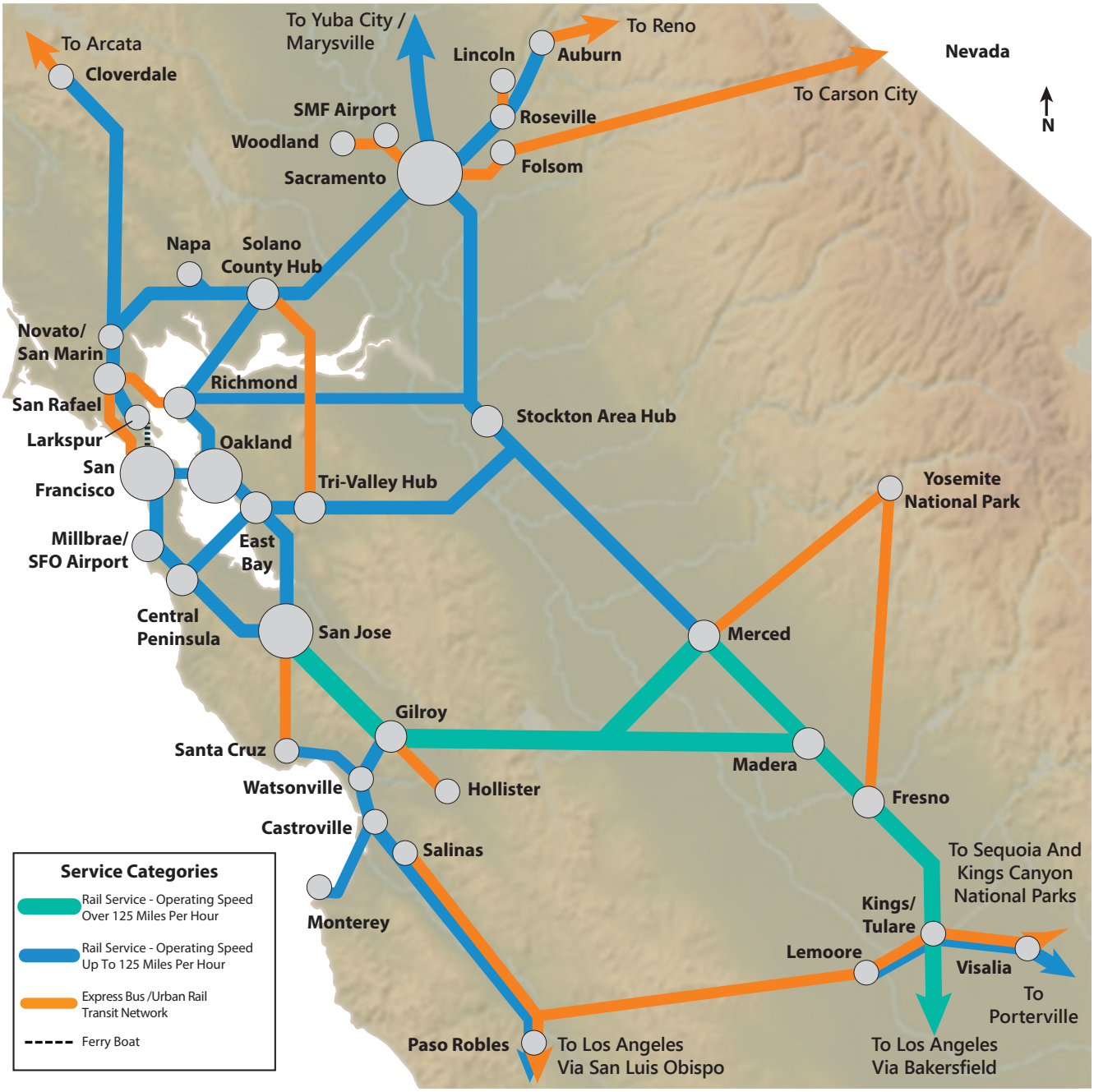


Exhibit 4.3: Northern California Service (2040 Vision)

4.10.2 North San Francisco Bay Area

The 2040 Vision in the North San Francisco Bay Area will provide for fast, frequent service connecting the Sacramento region and outer Solano and Contra Costa County suburbs to Oakland and San Francisco, with connections to Napa, Marin, and Sonoma Counties, and to the North Coast. Development of the 2040 Vision in the North San Francisco Bay Area is dependent on decisions to pursue construction of a second Transbay tube between the San Francisco Transbay Terminal and Oakland. This possible long-term improvement provides an opportunity to extend conventional electrified rail services, including HSR from Southern California and regional electric service between San Jose and San Francisco, across the Bay to Oakland; and connect electrified passenger rail service from Sacramento directly to San Francisco and San Jose along the Peninsula Corridor. An electrified conventional rail tube also offers the opportunity for additional regional electric service for regional trips between Solano County and the East Bay to San Francisco and San Jose as an option for relieving severe congestion in the I-80 and I-880 highway corridors, especially during peak commute periods. The cost of a new Transbay tube could be justified by the access to additional travel markets made possible by this improvement, supporting ridership on the intercity passenger rail network and congestion reduction.

Service Goals and Improvements:

- Half-hourly electrified intercity service between Sacramento and San Francisco through an Oakland hub (and continuing to San Jose).
- Half-hourly electrified regional service between a Solano County hub and San Francisco via a Richmond and Oakland hub.
- Half-hourly electrified local service between a Solano County hub and an East Bay Hub through Richmond and Oakland on a dedicated electrified passenger line south of Oakland.
- Hourly service connecting the Stockton Area Hub and Martinez/Richmond.
- Half-hourly peak and hourly off-peak service between Cloverdale and Larkspur corridor with Integrated Express Bus connections from San Rafael to San Francisco and Richmond, and Ferry connections from Larkspur to San Francisco.
- Hourly service between a Solano County Hub and Novato, providing timed connections to service between Cloverdale and Larkspur, or through service to Marin or Sonoma Counties.
- Hourly service between Napa and the Solano County Hub, providing connection between Napa County and the State rail network.

4.10.3 South San Francisco Bay Area

The 2040 Vision in the South San Francisco Bay Area supports continued operation of HSR service between San Francisco and Los Angeles in the Peninsula Corridor, with development of regional electric services connecting the East Bay to San Francisco and San Jose, and possible extension of intercity services from Sacramento to San Jose via the electrified Peninsula Corridor, if a second Transbay tube were constructed that carries conventional electric trains. The 2040 Vision assumes that a dedicated passenger line south of Oakland could be electrified at least as far south as an East Bay hub—services between that hub and San Jose are focused on providing for east-west connectivity to the Tri-Valley and Stockton Area, given the establishment of fast, frequent BART service in the East Bay to San Jose serving regional trips. Development of the South San Francisco Bay Area network in the 2040 Vision provides significant regional and intercity passenger rail options that complement planned urban rail and transit expansion, addressing highway congestion in the San Francisco Bay Area, and providing for connections to the rest of the state.

Service Goals and Improvements:

- Full HSR Phase I service, with direct trains between San Francisco and Los Angeles/ Anaheim, serving HSR local stations half-hourly by 2040.
- Implement integrated all-day express and local services between San Francisco and San Jose, with all stations connected at least half-hourly to the Statewide rail network at San Jose.
- Complete San Francisco to San Jose corridor capacity improvements, including grade separations, level boarding, and platform lengthening.
- Implement recommended Transbay tube alternative, including at least half-hourly electric regional rail making all local stops between Transbay Terminal and the Richmond and Solano County hubs, as well as the East Bay Hub south of Oakland. Also includes intercity trains providing half-hourly service to Sacramento as extensions of half-hourly express service from San Jose to Transbay Terminal.
- Half-hourly regional electric services between a Solano County hub and an East Bay hub through Oakland, with half-hourly connectivity or through service to San Jose.
- Half-hourly peak and hourly off-peak service, 7 days per week, between the Stockton Area and San Jose through a Tri-Valley Hub and an East Bay Hub.
- Half-hourly bus or rail service in the Dumbarton corridor (based on the results of the 2022 study), integrated with East Bay, BART, and Altamont services.

4.10.4 Central Coast

The 2040 Vision in the Central Coast region supports expansion of services along the Coast Route, providing access to and from Northern and Southern California, and providing for additional through frequencies on a limited but regular schedule supplemented by Integrated Express Bus connections. The 2040 Vision supports establishment of a regional rail network on the Central Coast, providing connections from Santa Cruz, Monterey, and Salinas to the state network at Gilroy, with the possibility of different train routings allowing Santa Cruz to Monterey service, providing for transportation capacity in the constrained Coastal Highway 1 corridor.

Service Goals and Improvements:

- The Rail Plan envisions a regional rail network connecting Central Coast communities to each other, feeding into HSR at Gilroy:
  - Hourly service connecting Gilroy and Salinas with establishment of a hub station at Pajaro/ Watsonville, providing hourly connections to Santa Cruz; and a hub station at Castroville providing hourly connections to Monterey.
  - Hourly Integrated Express Bus connection between Gilroy and Hollister.
  - Hourly integrated intercity rail and Express Bus service from Salinas to San Luis Obispo, including intercity rail services at least every 4 hours.
  - Hourly integrated intercity rail and Express Bus service from San Luis Obispo to Goleta/Santa Barbara, including at least bi-hourly intercity rail services.
  - Hourly Integrated Express Bus service from Paso Robles to the Central Valley.

Exhibit 4.4: Southern California Service (2040 Vision)

4.10.5 Las Vegas HSR

The State supports the implementation of HSR service between Las Vegas and Los Angeles via an expanded HSR network beyond Victorville and Las Vegas to the California Statewide rail network.

Service Goals and Improvements:

- Full build-out of HSR Phase I and subsequent expansion and integration will provide regular high speed connections and through-run connections to Las Vegas via Palmdale to Victorville.

4.10.6 LOSSAN North and Antelope Valley

The Rail Plan identifies integrated rail services that connect communities in the North LOSSAN region to the rest of Southern California, the Central Valley, and southern Nevada via HSR in Burbank and Los Angeles Union Station. Expanded Coastal services integrated with regional and intercity services in the Los Angeles area, and HSR connections in Burbank and Los Angeles Union Station provide the LOSSAN North area fast and frequent access to destinations across Southern California.

Service Goals and Improvements:

- Service between Goleta and Los Angeles Union Station with the following service characteristics:
- Half-hourly local service between Chatsworth and Los Angeles Union Station.
- Half-hourly express service between Oxnard and Los Angeles Union Station, with timed connections at all hubs (Chatsworth, Van Nuys, and Burbank).
- Hourly service connecting Los Angeles Union Station and Goleta.
- Development of Burbank/Bob Hope Airport as a major hub connecting services extending west to Santa Barbara/Goleta, as well as north to Palmdale.

4.10.7 Los Angeles Urban Mobility Corridor

The Los Angeles Urban Mobility Corridor between Burbank and Anaheim will be an electrified railroad providing enormous benefits to regional and statewide travel. With electrification and run-through operations at Los Angeles Union Station, the LA Urban Mobility Corridor will provide valuable traffic relief on U.S. 101, I-5, and other regional roadways. The Urban Mobility Corridor will expand commuter options beyond the suburb-to-downtown-Los Angeles market by providing fast, frequent, and reliable services from Ventura County to San Diego, and from to Riverside and San Bernardino.

Statewide connections from the Greater Los Angeles Area to the rest of the state will be achieved by running a half-hourly integrated service that connects Greater Los Angeles with San Diego, the Central Valley, and Northern California.

The Rail Plan supports locally directed transit expansion projects funded partly by local ballot measures to continue to build out the passenger rail network in the Los Angeles area and extend the reach of integrated rail and transit services.

Frequent Integrated Express Bus connections will connect communities throughout the Greater Los Angeles Area to the Statewide rail system at major hubs, such as Los Angeles Union Station, Burbank, and Santa Ana.

Service Goals and Improvements:

- Very frequent service between Los Angeles Union Station and Burbank.
  - Frequent HSR services to northern California.
  - Frequent HSR services to Las Vegas.
  - Half-hourly express rail service continuing on to Oxnard.
  - Half-hourly local service continuing on to Santa Clarita.
  - Half-hourly local service continuing on to Chatsworth.
- Very frequent service between Los Angeles Union Station and Fullerton via Norwalk/Santa Fe Springs hub, with connections between services and connections to urban transit.
  - Frequent HSR service.
  - Hourly express service to the Inland Empire.
  - Half-hourly express service to San Diego.
  - Half-hourly service continuing on to the Inland Empire, making local stops.
  - Half-hourly service continuing on to San Diego making local stops.
- Very frequent service between Fullerton and Anaheim.
  - Frequent HSR service terminating at the Anaheim hub.
  - Half-hourly express rail service.
  - Half-hourly local rail service.
- Half-hourly Integrated Express Bus Services connecting all hubs (Santa Monica, Van Nuys, LAX, Long Beach, and Los Angeles Union Station) to the statewide rail network.
- Urban rail network and high-capacity bus rapid transit connections between Los Angeles area hubs extend the Statewide rail network throughout the Los Angeles region.
  - Los Angeles Union Station
  - Pasadena
  - Burbank
  - South El Monte/Whittier
  - Santa Monica
  - LAX, Torrance
  - San Pedro
  - Long Beach
  - Santa Ana

4.10.8 Inland Empire

The design decisions for the HSR System expansion will have major impacts on how passenger service is delivered to Inland Empire communities, and the planning for HSR is a priority for the State. A routing via Ontario Airport could be combined with one or more spurs that would provide direct, one-seat ride access to Riverside and San Bernardino with high-speed trainsets. This option has the most potential for blended service investments that would increase capacity for trains operating at varying speeds and stopping patterns between Los Angeles and the Inland Empire, and lower the overall capital cost.

Statewide connections from the Inland Empire to the rest of the state are achieved by running a half-hourly integrated service that connects Los Angeles to San Diego via Ontario Airport, and a half-hourly integrated service that connects the Inland Empire with Orange County. Further, a half-hourly Integrated Express Bus service between Victorville and San Bernardino connects the Inland Empire with Las Vegas from San Bernardino and Riverside. An hourly service connects San Bernardino and Riverside to the Coachella Valley, the city of Indio, and onward to Arizona (including Phoenix). Finally, a half-hourly direct service connects to the Inland Empire from San Diego via Corona, and/or Ontario to Riverside and to San Bernardino.

Further planning efforts for the HSR System expansion can assist in determining the ability to pursue phased implementation that may initially invest in improvements (such as those featured in the routing via Ontario Airport), while creating a pathway to future additional investments in significant dedicated HSR infrastructure all the way to San Bernardino and/or Riverside, perhaps as part of a system connecting to Phoenix.

Service Goals and Improvements:

- HSR service between Los Angeles Union Station and San Diego via the Inland Empire, with the following characteristics:
  - HSR trains running from Los Angeles, Riverside, and San Bernardino via Ontario Airport, with trains providing service at local stops at least half-hourly to maximize statewide connectivity.
  - Express intercity and HSR trains providing at least half-hourly all-day service between Los Angeles and San Bernardino via Ontario Airport.
  - Express intercity and HSR trains providing at least half-hourly all-day service between Los Angeles and Riverside via Ontario Airport.
  - HSR trains on express service schedules driven by market demand between Riverside and San Diego, as well as San Bernardino and San Diego.
  - HSR between Ontario Airport and San Diego via Corona.
  - Potential to upgrade east-west express rail corridors beyond 2040 to accommodate HSR extension to Coachella Valley and Arizona.
- At least half-hourly local service between Los Angeles Union Station and San Bernardino via Fullerton, Corona, and Riverside.
- Half-hourly local service connecting Laguna Niguel to Riverside via Corona.
- Half-hourly local service between Riverside and Hemet via Perris. Trains could continue on to Orange County (Laguna Niguel).
- Half-hourly service between Los Angeles Union Station and San Bernardino, making local stops via a San Gabriel Valley Hub that provides connectivity to other rail services and urban mass transit.
- At least half-hourly service between Redlands and San Bernardino, with train connections to the state network.
- Hourly service to the Coachella Valley from San Bernardino and Riverside. The State foresees the provision of this service as an opportunity to provide the groundwork for anticipated HSR service to Arizona.
  - The State envisions that a high-speed line will eventually run between Phoenix and Los Angeles, serving the Coachella Valley.
- Half-hourly Integrated Express Bus service from San Bernardino between the Inland Empire and HSR service at Victorville (with service to Las Vegas).

Planning, Analysis, and Project Development:

- Complete HSR planning for post-2040 investments, including additional upgrades to east-west infrastructure, planning for HSR to the Coachella Valley and Arizona, and potential connectivity via San Bernardino to Victorville and Las Vegas.

4.10.9 LOSSAN South

The Rail Plan calls for multiple connections from Imperial County and the Mexico border area to the statewide network at San Diego using a combination of potential rail services to San Ysidro, and Integrated Express Bus Service from Imperial County/Mexicali and Otay Mesa/Tijuana Airport, allowing cross-border connections. Regular half-hourly regional services between Los Angeles and San Diego will use both local and express service patterns to fully integrate local stations in Orange and San Diego Counties into the statewide network.

The design of this corridor will have major operational impacts on the rest of the State's rail network. This corridor, together with the Peninsula blended-service corridor in the Bay Area, is the most critical corridor to design early and strategically.

Service Goals and Improvements:

- At least half-hourly HSR service to stations between San Diego Airport and the Inland Empire and Los Angeles Union Station, with one-seat rides or connections to destinations throughout the state.
- Half-hourly express service between Los Angeles and San Diego, with timed connections at hubs in Santa Ana, Laguna Niguel, Oceanside, and the San Diego Airport.
- Half-hourly service making all local stops between Los Angeles Union Station and Laguna Niguel. Laguna Niguel could serve as the southern terminus of electrified local services connecting to the LA Urban Mobility Corridor.
- Half-hourly service between Oceanside and Escondido, with connections to HSR services.
- San Diego integrated transit connections to services to San Ysidro, and Integrated Express Bus connections to Otay Mesa and the Tijuana Airport.
    - Creation of a San Diego Hub for HSR, intercity rail, regional rail, and high-capacity transit at the San Diego HSR station.
- Half-hourly service from the Mexico border, possibly from Tijuana—with customs and border pre-clearance—to San Diego, if the service can be delivered with significant improvement in travel time compared to the existing local transit service.
- Integrated Express Bus service from the San Diego Hub to El Centro/Calexico via El Cajon.

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5 Freight Rail Investment Strategy

Since its initial development in the 19th century, California's rail network has evolved in response to the changing needs of what is now the United States' largest state economy. The freight rail network, responsible for the movement of goods that generate that economic competitiveness, operates on privately owned infrastructure that has integrated freight and passenger service on the same tracks. To date, private capital has been the principal source of funding for upkeep and improvement of the freight network.

By improving rail infrastructure to attract additional long-distance freight movement (otherwise concentrated on highways), extra capacity is created on highways for passengers and short distance freight travel. Improvements to the rail network allow for the shift of goods movement from auto and air to rail, thereby creating capacity on those existing infrastructures by reducing demand. Rail, therefore, is an effective mechanism for congestion relief on highways, and for the movement of people and goods, while simultaneously improving and complementing parallel trade corridors.

Because freight rail is owned and operated by private industry and is therefore market-driven, patterns of goods movement are determined by the reliability and availability of the transportation network. It is imperative that California's infrastructure—especially the long distance, transcontinental routes—remain robust and competitive as a means for further generating economic activity at ports, throughout the state, and throughout the country. There are still areas where public and private interests intersect; and in such situations, public participation is beneficial, or even necessary, to support and enhance the entire statewide, multimodal transportation system.

This chapter presents a corridor-based planning and investment strategy that addresses the needs of California's freight rail system and helps ensure its long-term utility and viability. Rather than identifying a comprehensive list of projects, the chapter describes categories of investments that will advance the State's vision for a rail network; describes how they can impact California's economy, environment, and communities; and identifies opportunities where investments will be mutually beneficial for both passenger travel and goods movement. This chapter also articulates the State's strategy for improving the rail network through the context of transportation objectives defined in the CTP 2040 and the Governor's Sustainable Freight Action Plan, while laying the foundation for the next update of the California Freight Mobility Plan.

5.1 Corridor-Based Approach

Freight growth along the transcontinental corridors almost doubles in the next 20 years, representing a more significant increase than population growth (and its corresponding demands of the transportation network). This highlights the fact that the State's interest in freight rail planning is not just about accommodating passenger rail on existing rail infrastructure, but also about efficient management of the entire rail network to promote goods movement to maintain and expand the economic gains that California has achieved in the past few decades. Future growth projections show that rail in California has potential to continue to serve as a national hub and distribution center for economic activity in the United States if the infrastructure can keep up with the growth demands.

One way to efficiently manage the transportation system is through corridor planning. As has been explained throughout this Rail Plan, long-term planning for freight improvements can be difficult because the State does not own the infrastructure, and the freight rail industry is sensitive to releasing information on their long-term projects—for profit and proprietary reasons. However, there are opportunities to work with the freight railroads and there are opportunities to maximize State money by investing in projects that benefit an entire corridor rather than individual projects. A corridor-based approached to freight rail planning helps to identify the best projects that will intensify the use of existing infrastructure, and invest in projects that can improve parallel and complementary routes or projects in a corridor. As elaborated in Exhibit 5.1, there are multiple Trans America freight routes and many sea ports along east coast, west coast and the gulf of Mexico which are constantly competing for business and if one region fails to meet the growing demand of the market the other might step up to fill the gap, shifting business away from the region that cannot meet its demand. So, it is paramount for California to invest in its transportation network in order to maintain its economic edge.

The Rail Plan's freight strategy pulls from a number of existing plans and policies that attempt to identify and define corridors and subsequent investment priorities. In the 2013 Rail Plan, funding priorities were guided by the amount of gross tonnage being carried on the existing freight rail system. The priorities based on that metric were defined in Caltrans' 2014 Freight Mobility Plan, in consultation with the California Freight Advisory Committee.

An integral part of corridor-based planning is to develop criteria for defining, selecting, and prioritizing corridors. Volumes of tonnage, as identified in previous freight and State rail plans, can serve as one of the selection criteria. Other selection categories might include:

- Critical connections to transcontinental routes;
- Railroad classification;
- Location, with respect to land and sea ports; and
- Available alternatives for port traffic.

Defining corridors allows transportation agencies at the local, regional, and State levels to better collaborate to identify multimodal approaches to solving problems and prioritizing funding. It can make it easier to examine trade-offs, trade corridor impacts, and joint passenger and freight rail effects. Often, the State, regional, and local agencies have similar overarching objectives, but different plans for reaching them, and corridor-based planning allows for a more open and cross-jurisdictional process that weighs corridor-wide, and therefore network wide impacts. This can include transportation decisions and non-transportation decisions such as land use planning, zoning, and environmental regulations to help decision makers invest more strategically for the greatest benefit and efficiency.

For example, a proposed grade separation on a lightly used line that is projected to serve an intermodal terminal may not be justifiable, absent construction of the terminal. In that case, corridor-level planning allows a broader look at the overall gains for the entire corridor, and bundles the projects together, from the standpoint of funding, sequencing of construction, and impact. This type of corridor-level project delivery will result in more timely overarching and coordinated improvements for the specific corridor that will improve system-wide mobility and efficiency.

Exhibit 5.1: Transcontinental Freight Routes[165]

165 Kim, Jaehoon. International Journal of Traffic and Transportation Engineering. Multimodal Freight Distribution & Economic Development due to International Capacity Expansion, (2015).

5.1.1 Identifying Freight Corridors

Planning for freight rail and goods movement through the corridor-based approach is important for maximizing investments, but it is key to first understand the options for securing capacity and identifying corridors. Ensuring the appropriate capacity for passenger and freight rail operations can happen in a few different ways. First, there can be shared track infrastructure used by both freight and passenger trains. Second, there can be largely dedicated track for passenger and freight in a shared right-of-way that retains the ability to share track under certain conditions. Finally, capacity can be ensured by the development of completely separate freight and passenger infrastructure. Rail freight corridors are characterized as follows:

- **Primary Trade Corridors** requiring investment in dedicated freight capacity;
- **Shared Corridors** where State investment in expanding the passenger rail network will provide capacity benefits for freight rail; and
- **Interregional Investment Corridors**[166] defined in the Interregional Transportation Strategic Plan where the State has an interest in investing in rail as a strategy for ensuring capacity for goods movement, and addressing projected trucking volumes on parallel interregional highway segments.

The nature of corridor development may change over time, as more passenger service is phased in. Limits on passenger train growth in a corridor during early phases of network development will place a premium on using available passenger train slots for the highest-ridership services, and lengthening train consists where necessary, while supplementing the service with integrated express bus during off-peak or lower-demand times of day. Additional growth would be achieved through significant investments in physical infrastructure, in partnership with the freight railroads. For more passenger trains to gain access to freight railroads' lines, the freight railroads may require upfront capital project investments and ongoing access fee agreements enabling capital investments to be made by the railroad corridor owner over time. The partners may conclude that future growth needs may require investing in dedicated or mostly dedicated passenger rail infrastructure for all or a portion of the corridor.

Although the Rail Plan reflects a general understanding of the type of investment appropriate to each corridor, specific decisions will be made through detailed implementation planning and host railroad negotiations. The established goals and objectives of the freight rail planning process that should guide future implementation planning and negotiations are:

- Improving trade corridors;
- Developing economic opportunities;
- Improving safety and efficiency of the rail network;
- Advancing climate and environmental goals;
- Eliminating adverse impacts from rail (i.e., noise, congestion, safety) on communities; and
- Improving the overall quality of life.

The most effective projects and efficient investments will be those that satisfy one or more of the overall goals and objectives, and address national trade route demands while serving economic needs at the local and regional levels. These corridor-level planning and investment decisions play a major role in shaping the economy and trade growth along every corridor within regions and across the entire state. A corridor-based approach for planning has system wide effects—each investment decision aimed at improving a portion of the network has cascading impacts on the performance and reliability of rail and goods movement statewide, thereby impacting the future growth and overall demand for rail services.

166 Caltrans. *Interregional Transportation Strategic Plan,* (2015).

5.1.2 Freight Rail Corridor Investment Strategy

Freight rail plays an integral mobility role in trade corridors, and with innovative techniques, alternatives analysis, corridor evaluation, and cost benefit analyses, the available funding can be targeted to identify investment programs and system management strategies.

Establishing a network of identified corridors and conducting targeted studies to identify the needs of the entire system can help make clear which projects support corridor-wide improvements, thereby increasing system-wide efficiencies—creating a multi-tiered strategy for prioritizing funding. Corridor plans can provide an effective link between statewide modal plans and local and regional needs that can simultaneously enhance statewide and urban mobility and statewide and transcontinental goods movement. The identification of the needs, priorities, and funding availability help identify the investment level required to achieve the performance expectations from the network.

For example, California's Trade Corridor Investment Fund, which was specifically established to ensure the continued competitiveness of California's trade-related infrastructure, can fund freight rail projects that benefit the economy of the State, and create capacity on freeways. The newly established Trade Corridor Enhancement Account (TCEA) can provide additional opportunities to address strategic investments in highway and rail trade corridors. Funds designated for grade crossing improvements can be invested efficiently to minimize interaction of rail and roadways.

Freight rail can also benefit from freight-specific Federal and State funding. For example, the FAST Act of 2015 contains freight-related provisions that offer the prospect of modest funding for freight rail. Other funding sources include local ballot initiatives, some of which direct money to freight rail or goods movement more broadly. Flexibility in the use of public funds (Federal, State, and local) can provide the means to accelerate some of the freight railroads' investments, either for the direct benefit of goods movement, or for shared benefits achieved while addressing passenger rail needs.

Phased Investment Strategy

Similar to the passenger rail investment strategy, phasing freight rail investments allows for the most efficient use of money that seeks to intensify uses and avoid duplicate or stranded investments, while building towards the long-term goals.

- The Rail Plan freight investment strategy envisions an evolving partnership between the State and freight railroads to:
- Eliminate bottlenecks and use existing corridors more intensively, enhancing the capabilities of both freight and passenger trains in the short term;
- Use significant new Federal and State funding programs, such as FASTLANE and TCEA, to implement corridor investment programs for freight improvements;
- Make shared investments that improve the performance and utility of freight and passenger operations through strategic identification of infrastructure projects that provide benefits to all operators; and
- Implement quiet zones and grade separations, as well as foster the use of cleaner and quieter locomotives that will make railroads better neighbors.

In the short-term (2022) horizon, addressing existing trade corridor bottlenecks is the top priority. These improvements will greatly increase the reliability and efficiency of the entire statewide rail network, and can be implemented in this time frame. Building on the short-term improvements, the mid-term (2027) horizon year prioritizes investing in shared corridors and dedicated trade corridor capacity. Again, these investments will need to be identified through strategic implementation planning with freight and passenger rail providers, but improving shared corridors will improve the functionality of the entire system for passenger mobility and economic growth. Finally, the long-term vision (2040) will expand on all the short- and mid term improvements, and will represent the integration of all services possible.

Recognizing the potential impact of proposed improvements is important in prioritizing the needs of the system. Through this process, the most important issues can be identified and addressed first through appropriate policy and funding strategies.

5.2 Categories of Investment

Chapter 3 of the Rail Plan presents a vision for the State's rail system, and sets forth the context for rail-related investments by developing a premier, customer-focused, integrated system that successfully moves people and products while enhancing economic growth and quality of life for all Californians. As described in the previous section, with a corridor-based planning approach, the investments can be more effective, and create system-wide improvements. In this context, six major areas of need and opportunity (also referred to as categories of investment) were identified for freight rail in California:

- Trade corridor improvements
- Economic development and short lines
- Grade-crossing improvement needs throughout the state
- Additional terminal and yard capacity
- Short-haul rail improvements
- Advancement of zero and near-zero emissions technologies

These categories of improvement are expected to improve the freight rail system in accordance with the State's vision for freight rail. Through the framework of these investment categories, the remainder of this chapter defines and articulates the freight rail investment strategy with example projects, and identifies their potential impacts. The project examples will also identify where freight improvements will also have passenger rail co-benefits.

5.2.1 Freight Rail Vision

A premier system requires improved trade corridors, yards, and terminals; upgraded track conditions for short lines; and innovative service concepts that have efficiency and safety benefits for all users. A customer-focused system will lead to improved access to the rail network (Class I and Short Lines), with competitive cost and service (improved speeds and service options), enhancing options for the State's shippers. An integrated system requires improved intermodal terminal and transload connections to smooth transfers between modes. The Rail Plan is focused on supporting development of a rail network that moves both people and products, and will address strategies and improvements for coordinating passenger and freight service, and preserving freight capacity as passenger services grow. Economic growth will be achieved through trade corridor improvements and the availability of competitive modal options for California's industries. Finally, the freight component of the State rail vision will support improvements in California's quality of life through modal energy/emissions benefits associated with the adoption of zero- and low-emissions technologies, and the movement of freight by rail and mode-shift to rail where feasible. The Rail Plan will also address grade-crossing impacts.

5.2.2 Trade Corridor Improvements

Trade corridor improvements focus on core system capacity, efficiency, reliability, and economic development. System capacity improvements (e.g., adding additional track or sidings) can help address current and future bottlenecks, allowing for additional traffic, decreased travel times, and improved reliability. Improved reliability and faster travel times impact the entire network, just as slowdowns at bottlenecks have a cascading effect on the rest of the system. A reduction in bottlenecks will make the system more efficient and reliable, fostering economic development and competitiveness. Current and future bottlenecks can also be tackled through various operational strategies, such as directional running or segregating by train type where parallel lines are available. This type of network rationalization could reduce conflicts between freight and passenger service, while also increasing overall capacity.

A reduction in bottlenecks and the decreased travel times that would result could also reduce overall emissions through more efficient rail operations. Additionally, the potential diversion of freight from highways will create more capacity on the roadways, and thereby further reduce emissions. Signalization improvements offer increased capacity and speeds, greater reliability, and safety benefits. Bridge and tunnel improvements are primarily associated with state of good repair and ensuring that these structures can handle modern freight equipment.

Examples of trade corridor improvements and how they would contribute to California's overall rail vision, including potential co-benefits for both freight and passenger rail, are summarized in Table 5.1.

Table 5.1: Project Examples of Trade Corridor Improvements with Co-Benefits

Investment	Freight	Passenger
Trade Corridor		
Capacity improvements UPRR Martinez Subdivision	✓	✓
Siding and access improvements at Benicia	✓	
Track additions – Bakersfield to Mojave	✓	
Capacity improvements – Southern route to/from Oakland (UPRR Niles, Coast, Oakland Subs)	✓	✓
New connections to facilitate Northern California route alternatives (Stockton Wye)	✓	✓
Merced to Stockton improvements (BNSF Stockton Sub)	✓	✓
Joint-use facilities on the Altamont Pass rail corridor and an intermodal rail shuttle between Port of Oakland and the northern part of the Central Valley	✓	
Full build out of BNSF corridor capacity between Fullerton and Los Angeles	✓	✓
Double tracking San Diego County	✓	✓
Track additions on BNSF San Bernardino Subdivision	✓	✓
Complete UPRR Alhambra Subdivision double track	✓	
Triple track BNSF between Fullerton and Imperial Highway, and two main tracks to San Diego	✓	

5.2.3 Economic Development and Short Lines

California's short lines handle approximately one-tenth of the State's carload freight tonnage, and are a critical link between many of the State's freight-intensive industries, ports, and principal trade corridors. Therefore, it is important to maintain a modern and efficient short-line rail system in California that operates seamlessly with its Class I connections.

The principal challenge that must be addressed is that some of the State's short-line trackage cannot handle freight cars weighing 286K pounds, a standard that the Class I railroads adopted in 1994. Where a line is not 286K-capable, the common practice is to either load a railcar to less than its maximum capacity, or transfer the load to trucks for transport to a location where the railroad can handle the heavier load. Both practices unnecessarily increase costs through the inefficient use of assets, the additional steps required, and the increased travel time.

Addressing the 286K issue on a line typically requires undertaking one or more improvements, including replacing rail, ensuring that there are an adequate number of performing ties, and strengthening or replacing bridges. Concurrently, except for short lengths of line, it is greatly beneficial to bring track conditions up to FRA Track Class II, which allows speeds of up to 25 miles per hour for freight trains. Higher speeds greatly improve railroads' operational efficiency, reduce their costs, and have the potential to improve the marketability of rail service, particularly for potential new rail shippers. Industrial spurs provide direct access to the rail network and reduce truck movement, and often are a necessity for some industries that wish to use rail.

Some examples of short-line-focused improvements and how they would contribute to California's overall rail vision, including potential co-benefits for both freight and passenger rail, are summarized in Table 5.2.

Table 5.2: Project Examples of Economic Development and Short Lines with Co-Benefits

Investment	Freight	Passenger
Economic Development and Short Lines		
Freight spurs/sidings SMART/NWP (increase rail opportunities for North Bay shippers)	✓	✓
Evaluate rail-served industrial development infrastructure for Northern Contra Costa Waterfront	✓	
State of good repair and infrastructure upgrades to maintain and expand service (SMVRR)	✓	
Track and yard expansion (SMVRR)	✓	
Reload yard and multiple rail upgrades for CCTC	✓	
Sidings, track upgrades, industrial spurs, and loaders for rail-served customers (SJVR, CCT)	✓	✓
State of good repair and infrastructure upgrades to maintain and expand service (SMVRR)	✓	✓
Track and yard expansion (SMVRR)	✓	
Grade separation at SCRRA tracks on San Canyon Road	✓	

5.2.4 Grade Crossing Improvement Needs throughout the State

The most common freight-related projects at the regional level have been rail grade-crossing improvements; primarily, grade separation projects. Grade separations are expensive, but there are other cost-efficient ways of making a grade-crossing safe using funding allocations from Federal and State programs for other types of crossing improvements. Although the comparative safety risks and delays at rural crossings are much lower than in the state's high-volume corridors, particularly in urban areas, the equipment at many rural crossings does not meet current standards for safety and operational efficiency, and is expensive to maintain. Through conglomeration of upgrade projects, and prioritizing them based on corridor-level planning, the reliability and safety improvements become more enhanced throughout the region.

By incorporating current best practices, technology, and equipment, improving these crossings enhances safety, and reduces vehicular and pedestrian delays. Ongoing maintenance costs are also reduced, creating savings that accrue to the railroads and the State and local agencies—which together share the financial burden.

Some examples of grade-crossing improvements and how they would contribute to California's overall rail vision, including potential co-benefits for both freight and passenger rail, are summarized in Table 5.3.

Table 5.3: Project Examples of Grade-Crossing Improvements with Co-Benefits

Investment	Freight	Passenger
Grade Crossings Improvements		
Address community impacts as rail traffic grows/shifts – Martinez/Niles, Corridor-based improvement plan	✓	✓
Bridge and crossing improvements on SMART	✓	✓
Address community impacts as rail traffic grows/shifts – Martinez/Niles, Corridor-based improvement plan	✓	✓
Address rural grade crossing needs, including along short lines	✓	
Develop corridor improvement program along major highways	✓	✓
City of Colfax grade separation	✓	
Improvements along BNSF and UPRR main lines in Fresno	✓	
Address rural grade crossing needs, including along short lines	✓	
Develop corridor improvement program along major highways	✓	✓

5.2.5 Additional Terminal and Yard Capacity

Terminals and yards are instrumental in the handling of goods at the beginning of their trip by rail, at the end of their trip by rail, or at intermediate locations along the way. These facilities help maintain the efficient flow of intermodal and carload traffic across the network. Intermodal rail terminals are established to facilitate transfer of containers and trailers between modes (ship to rail, truck to rail, and vice-versa).[167] Future growth studies show that the demand at the ports and at terminals will increase at a much faster pace than the population growth of California—indicating that freight and goods movement for the economy of the State and rest of the country will rely on the transcontinental routes originating in California. Improvements to terminals help ensure that capacity is sufficient to meet demand for goods movement, and help maintain—and perhaps improve—rail's competitive position. Additional terminal capacity might also improve travel times and reliability, and potentially serve markets that are currently not being served due to capacity constraints.

Some examples of terminal and yard capacity improvements and how they would contribute to California's overall rail vision are summarized in Table 5.4.

Table 5.4: Examples of Adding Terminal and Yard Capacity and Co-Benefits

Investment	Freight	Passenger
Terminal and Yards		
Ensure capacity and connectivity at Port of Oakland – 7th Street Grade Separation and North Lead	✓	
Potential battery assist switcher demonstration in Bay Area yards	✓	
Planned intermodal expansion	✓	
Improvements and expansion at Port of Stockton	✓	
Intermodal terminal expansion to address growth – terminal access improvements for on-dock rail	✓	
Reduce yard and terminal emissions through implementation of zero emissions technologies (cargo handling and switching)	✓	
Realize truck/rail emission tradeoffs – on-dock and near-dock terminals	✓	
Port of San Diego yard capacity improvements	✓	

167 The majority of intermodal traffic in California is associated with the Port of Oakland, POLA, and POLB; a sizeable but smaller volume is related to traffic associated with the U.S., Canada and Mexico. For a more detailed description and list of intermodal facilities in California, please refer to Chapter 2.

5.2.6 Short-Haul Rail Improvements

Short-haul rail shuttles connecting ports with inland regions hosting substantial international trade-related distribution activity offer the opportunity to improve the velocity of the flow of goods into and out of the densely populated regions of Southern California and San Francisco Bay Area. With sufficiently high volumes, short-haul rail shuttles transfer the volume of freight truck traffic away from the already congested highways, particularly in and around the major ports. The capital investment in short-haul rail shuttle improvement can be made using the Traffic Congestion Relief Program funds, given a clear analysis of how the rail shuttle can help relieve congestion on roadways. The feasibility of short-haul rail shuttles is highly sensitive to the differential in costs between rail and highway transportation, and would require efficient operation to maximize their viability, and to capture a better rate of return on the investment of public funds.

The ways that short-haul rail improvements would contribute to California's overall rail vision are summarized in Table 5.5.

5.2.7 Advancement of Zero and Near-Zero Emissions Technologies

Priority should be given to rail projects that support the deployment of technologies that produce zero or near-zero air emissions. An element of the California Sustainable Freight Action Plan is that zero-emissions equipment should be deployed, where feasible, to reliably and efficiently transport freight; near-zero emission equipment powered by clean, low-carbon renewable fuels should be used everywhere else. The use of less polluting equipment reduces GHGs and other toxic emissions, and ultimately improves air quality. The freight railroads are private companies that operate in national and transcontinental markets, and therefore may be more reluctant to invest in zero and near-zero emissions technologies to meet California-specific standards. However, the State's role in advancing the adoption of this technology is central, from both a regulatory and financial perspective, because it can help advance development of the prerequisite technology; and by providing financial incentives, support its commercialization.

Table 5.5: Project Examples of Short-Haul Rail Improvements

Investment	Freight	Passenger
Short Haul		
Re-assess short-haul link between Oakland and Central Valley	✓	
Connectivity to Bay Area ports	✓	
Connectivity to Southern California ports	✓	
Potential Shafter terminal expansion	✓	
Re-examine inland port concepts	✓	

5.3 Rail Projects with Freight Elements

Paralleling the proposed passenger rail improvements presented in Chapter 4, a set of projects that contain a freight rail element can be found in Appendix A. These projects present the existing need on the freight rail network. Consideration of these projects also helps identify potential gaps where specific initiatives may be needed to advance the State's vision and goals for freight rail.

The projects on the current list, extracted from the 2014 CFMP, subsequent RTPs, and stakeholder input, represent the potential costs of freight improvements by 2040. Based on projects from these existing lists, the total improvements will cost between $20 and $40 billion. Only projects that include a freight rail element are included; nevertheless, in some regions, most or all projects address joint-use passenger and freight facility needs, along with grade separations and other crossing improvements. Grade separations benefit freight reliability and speed, as well as highway users and abutters and overall safety of the transportation system.

5.3.1 Freight Rail Projects and the Freight Investment Strategy

The freight investment strategy identifies projects under each of the investment categories guiding the freight rail strategy. Unlike passenger rail projects, specific regional service goals and investments tied to specific horizon years cannot be identified due to the differing nature of the private-public relationships required for delivery.

As previously discussed, for the most part, private freight railroad investment plans are not included. Therefore, unlike passenger rail projects, the freight rail strategy does not identify specific service goals tied to time horizons. Rather, the freight investment strategy helps prioritize projects in the short-term as a means to intensify services and reduce redundancies in the long-term, with the understanding that private freight companies respond to market demands and change plans accordingly. Most investments are associated with maintaining the infrastructure in a state of good repair, and therefore are usually exempt from any kind of reporting requirement. However, information about projects that require extended planning cycles and environmental review—such as those involving new or reconfigured terminals and major civil engineering efforts—may be publicly available. Chapter 6 includes a list of funded projects as identified in the CFMP 2014.

The appendices provide prospective lists of current and planned investments drawn from the CFMP, RTPs, and stakeholder feedback, and are neither exhaustive, nor meant to necessarily reflect the State's priorities for funding freight rail. They do not recommend specific projects for adoption in the Rail Plan; rather, they highlight improvements that various stakeholders have identified as important. Freight projects will be proposed based on the investment strategy listed in this chapter.

The freight rail needs, as identified throughout this chapter, suggest trade corridor improvements and at-grade crossings are the two biggest categories of need as we prepare to invest in a more reliable rail network. Congestion relief, efficient transportation, better air quality, and safety are all goals that are met by investing in these projects. Yard capacity improvements are location-based, and despite the fact that they impact the whole network, come as a secondary priority for the investment of public funds. Because the railroad industry is predominantly privately owned and operates nationwide, the short line industry needs more organization to enter into better public-private partnerships for maintenance and providing connectivity to the larger network. Together, these identified improvements, based on strategic and phased investment from public and private coordination, will increase the efficiency, reliability, and safety of goods movement in California and the United States.

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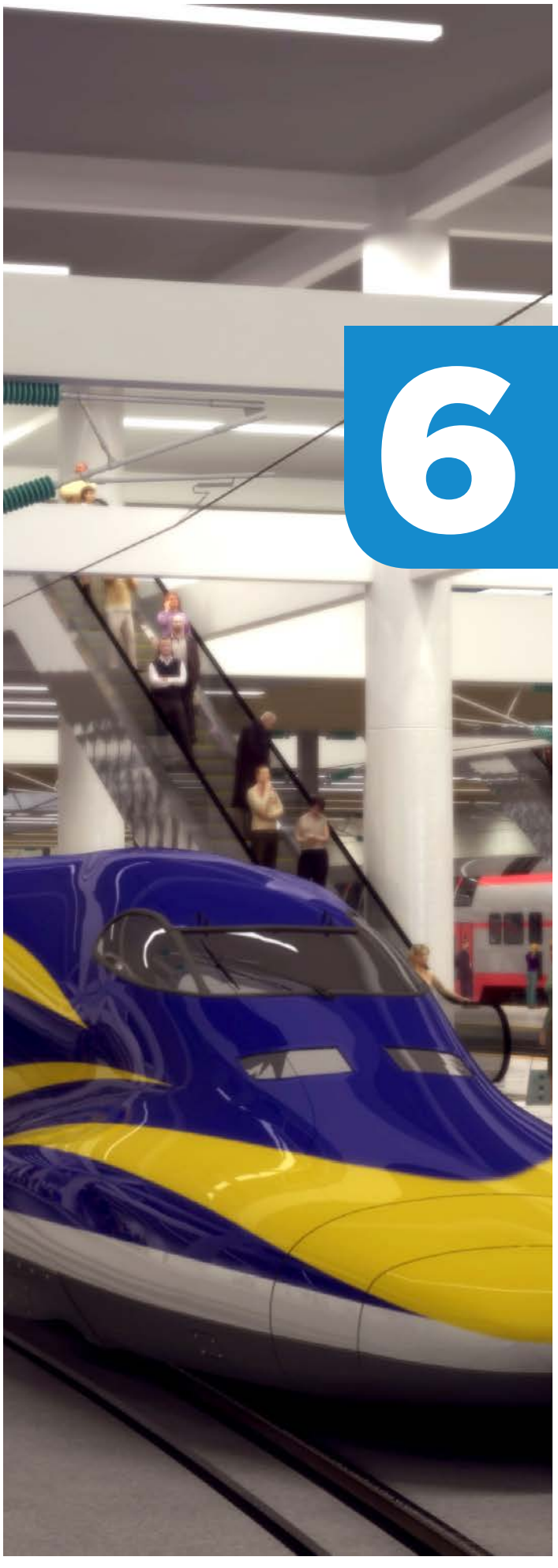


6 The State's Rail Service and Investment Program

California's multimodal transportation network is a complex system that moves people, goods and services, furthering the State's robust economy. As California moves forward in the direction of implementing sustainable practices and building climate resiliency and adaptability while maintaining a technological and economic edge, there is a need to find effective solutions to maintain efficiency in strategic interregional transportation corridors.

Chapter 6 presents the proposed capital plan, Federal, State and local funding sources, program effects, and current and future rail studies and reports necessary for the implementation of the 2040 Vision. Details of the passenger rail Capital Program include implementation goals for the short-term (2022), mid-term (2027) and long-term Vision (2040) time horizons, with appropriate funding sources, as well as the freight rail funding strategy, along with relevant shared-use corridor and safety programs. This chapter also explains the 2040 Vision program effects and benefits to both the passenger and freight networks, economic benefits, shared environmental impacts and benefits, and the regional balance in the distribution of benefits. Finally, ongoing coordination between existing rail plans is important for future implementation planning, and this chapter identifies those as well as other identified future planning needs and proposed studies.

6.1 Passenger and Freight Rail Capital Program

California needs to decide how best to invest public dollars strategically to maximize benefits without compromising levels of service, while building and phasing investments in a manner that does not duplicate efforts over time.

As the Interregional Transportation Strategic Plan identifies and the Rail Plan expands on, a modernized and integrated statewide rail network is an investment that allows the State to strengthen regional transportation corridors and provide viable alternatives to the movement of goods, people, and services.

The Rail Plan offers an investment strategy that allows the State to focus on corridor-level rail investments to achieve service goals that will help in closing capacity gaps, improving corridor safety, and increasing frequency and reliability of intercity passenger rail.

Metropolitan Los Angeles and San Francisco both rank in the top five for most congested urban areas in the world[167]. Los Angeles was ranked as having the worst auto congestion in the world, with drivers spending an average of 104 hours stuck in congestion in 2016, costing the city an estimated $9.7 billion—or $2,408 per driver. Meanwhile, the San Francisco Bay Area has the highest U.S. congestion on arterial and city streets during commute hours.

Auto congestion, coupled with the economic losses attached to congestion, along with aggressive air quality and GHG emissions targets, make the case for shifting travel mode shares away from driving.

Passenger Rail Program

Passenger rail services across California, where strategic and timely investments have been made, are serving record numbers of passengers and achieving record growth rates. Where passenger service is provided and well-planned to meet customer needs, it is successful, and often overwhelmed by passenger demand. The passenger rail program presented in the 2040 Vision represents a series of strategic investments to continue maximizing the return from existing and ongoing investments, and then connect them with fully integrated regional and statewide service networks.

As detailed in Chapter 4, the 2040 Vision sets forth specific service goals to deliver a fully integrated statewide network of passenger rail services. The following sections describe the capital costs associated with the service delivery goals presented in Chapter 4 necessary for achieving full connectivity in the 2040 Vision. The 2040 Vision assumes the completion of California HSR serving as the backbone of a statewide system of interconnected regional networks.

Capital Planning

This section details the methodology used to identify capital improvements, compile cost estimates, and phased improvements over short-term (2022), mid-term (2027), and long-term Vision (2040) time horizons, ensuring that infrastructure scales to meet market needs and is not redundant or stranded by future investments. Based on the service goals established for the 2040 Vision, the planned and required capital investments are defined to detail the needed infrastructure improvements and understand their related costs.

167 INRIX, *Los Angeles Tops INRIX Global Congestion Ranking, Global Traffic Scorecard,* 2017.

Methodology

Assembling the Capital Program for the Rail Plan followed two tracks: citing costs for established projects; and estimating costs for additional projects. The majority of the Capital Program in the 2040 Vision represents previously identified projects that improve the safety and capacity of existing infrastructure and realizing its potential; and aligns investments for improved accessibility, reliability, safety, and sustainability of the multimodal connectivity of the state. It leverages existing assets and connects and evolves regional rail and local transit networks.

First, established costs for existing and defined projects were identified and citied from publicly available documents. Where relevant, these costs were escalated to 2018 dollars for consistency. Such cited costs make up the bulk of projects listed in the 2022 time horizon, when projects included in the capital plan are further along in the development process.

Second, additional capital costs in the Rail Plan include planning-level estimates that consider complexity, environment, geographic location (urban, suburban, and rural), proximity to active tracks, and other factors that may influence costs. Planning-level estimates of capital cost are within a rough order of magnitude, intended to inform investment decisions, and not be interpreted as engineering-level estimates.

The cost catalog developed for this process follows the Federal Railroad Administration Standardized Cost Categories, with unit costs for typical elements identified based on an average project cost. For high-cost improvements, such as intermodal hubs, a lump-sum cost is assumed based on comparable costs from recent projects of similar scope.

The 2040 Vision provides the service type, frequency (system pulse), required average service speed, departure and arrival times, and route nodes used to develop corridor-specific improvements and build related capital cost estimates. These service plans were used to identify capacity requirements at the corridor level throughout the state, which are the primary basis for all project descriptions and assumptions in this estimate. The corridors were investigated through a survey of the existing infrastructure and conditions. The capacity and capabilities of that infrastructure was compared with future capacity requirements.

State Capital Investments

The service and connectivity goals, along with corridor-level improvements required to achieve the 2040 Vision, are described in a phased plan with Capital projects identified for the next 4 years (2022); and mid-range needs identified for the next decade (2027), along with long range improvements and investments for long-range (2040) planning towards the envisioned future.

- **2022** catalogs the Capital Plan of ongoing and committed projects as part of an enhanced existing conditions assessment of present and near-term rail services across the state.
- **2027** captures new and established projects and planning studies intended to maximize capacity and utility of the existing passenger rail network, and begin using HSR while connecting it to the statewide integrated network.
- **2040** identifies additional corridor-level investments and service goals needed to fully realize the 2040 Vision, connecting regional networks into a statewide-integrated system.

To achieve the 2040 Vision Network as described in Chapter 4, the Rail Plan identifies a robust, strategic capital investment program that catalogs near-term projects, maximizes returns from existing investments, and builds out and connects regional networks into an integrated statewide system. The full spectrum of passenger rail modes is included in the capital investment program, from Urban Rail projects to potential future HSR extensions.

2022 (Near-Term) Infrastructure Investment

The 2022 services goals and Capital Program are focused on identifying the planned, committed, or otherwise under-construction projects that will ultimately serve the network identified in the 2040 Vision. Goals for the 2022 Capital Programs and projects list, which will potentially be achieved earlier than 2022, include relevant State-level projects that are already scoped, scheduled, and budgeted; and establish existing conditions for future capital cost analysis. Although capital projects identified for 2022 have specific operators and modes associated with the service, the subsequent time horizons are intended to be mode- and operator–neutral, and assign costs to service types rather than any specific entity or jurisdiction.

Intercity Rail improvements for 2022 include capacity expansion and speed improvements to existing intercity rail services, grade separations and other safety improvements, and shared freight corridor improvements like new sidings and double-tracking sections. In addition, a number of planning studies have been identified and included in the Capital Program to explore project implementation for future service goals. These projects positively impact the statewide network, improving interregional corridors and overall connectivity goals, inciting State interest in project sponsorship and funding.

There are a number of commuter rail improvements identified in the 2022 Capital Program, including the initial stages of ACE*forward,* SMART, and Caltrain's Peninsula Corridor Electrification Project.

Table 6.1 catalogs capital costs for projects supporting the integrated statewide network in 2022. Costs attributed to locally led, privately sponsored, or CHSRA-programmed projects are included in the overall 2040 Vision.

Table 6.1: 2022 Short-Term Project List (thousands $)[168]

Planning Area	Corridor	2022 Capital Projects	2022 Capital Cost (thousands $)	2022 Pricing Source
South Bay Area	San Francisco-San Jose	Peninsula Corridor Electrification Program	$1,980,000	Caltrain
		Completion of Full Electrified Service + Targeted Corridor Infrastructure Improvements/Grade Sep Planning	$280,000	Caltrain + Regional Programming
		CBOSS Positive Train Control	$248,000	Caltrain
		25th Ave Grade Separation	$165,000	Caltrain
		South San Francisco Station Improvements	$61,000	Caltrain
South Bay Area	San Jose-Gilroy	PTC Expansion + Added Frequency	$47,000	FRA Award + Regional Programming
South Bay Area	San Jose-Stockton	ACE*forward* Capacity Expansion	$26,000	TIRCP/AQMD Award
South Bay Area	Oakland-San Jose	Coast Subdivision Rail Corridor Improvements	$20,000	CCJPA
South Bay Area	Multiple	Regional Network & Service Integration Project Development (Peninsula, Dumbarton, East Bay, Altamont)	$6,000	CSRP Pricing Catalog
North Bay Area	San Francisco-Oakland	New Transbay Crossing Planning	$10,000	BART
North Bay Area	Multiple	North Bay to Sacramento Network & Service Integration Project Development (Marin, Sonoma, Napa, Solano, Yolo, Sacramento, Contra Costa, Alameda)	$3,000	CSRP Pricing Catalog
North Bay Area	Larkspur-Cloverdale	SMART San Rafael - Larkspur Connection Ferry Connection to San Francisco	$84,000	SMART
		2 New Trainsets for expanded capacity	$11,000	TIRCP Award
		San Rafael Transit Center	$30,000	SMART
Central Valley/ Sierra Nevada	Sacramento-Roseville	Placer County Service Expansion (Increased Capitol Corridor service)	$79,000	TIRCP Award
Central Valley/ Sierra Nevada	Fresno-Stockton	Merced Station Double Tracking	$10,000	CTC Allocation
		Stockton to Escalon Double Track	$23,000	CTC Allocation
		Stockton Maintenance Facility Lead Track & Stockton Wye	$32,000	Caltrans
		Bi-Hourly + Morning Express Service Expansion	$36,000	Caltrans

168 Estimated costs in 2018 dollars. These costs are planning-level estimates and require further study in implementation.

Table 6.1: 2022 Short-Term Project List (thousands $)(continued)

Planning Area	Corridor	2022 Capital Projects	2022 Capital Cost (thousands $)	2022 Pricing Source
Central Valley/ Sierra Nevada	Multiple	HSR-Connected Corridors Network & Service Integration Project Development	$4,000	CSRP Pricing Catalog
		Regional Network & Service Integration Project Development (Kern, Kings, Tulare, Fresno, Madera,Shasta,Yuba, Butte, Tehama, Shasta)	$2,000	CSRP Pricing Catalog
Central Coast	San Jose-Goleta	Central Coast Network & Service Integration Project Development	$2,000	CSRP Pricing Catalog
Central Coast	San Jose-Goleta	Central Coast Layover Facility & Station Expansion	$23,000	Caltrans
Central Coast	Salinas-San Jose	Kick Start Service	$85,000	TAMC + CSRP Pricing Catalog
LOSSAN North	San Luis Obispo-Los Angeles	LOSSAN North Frequency Expansion (including peak hour Los Angeles – Goleta service), Corridor Performance & Travel Time Improvement, including Van Nuys Station Double Tracking	$110,000	Caltrans
LOSSAN North	Goleta to Chatsworth	Seacliff siding and extension	$23,000	Caltrans
Vegas to Palmdale	Victorville to Las Vegas *Palmdale to Victorville*	Nevada-High Desert Corridor Network & Service Integration Project Development	$1,000	CSRP Pricing Catalog
LA Urban Mobility Corridor	Multiple	LACMTA-Statewide Network Service Integration Project Development	$2,000	CSRP Pricing Catalog
LA Urban Mobility Corridor	LA-Fullerton	Rosecrans / Marquardt Avenue Grade Sep	$155,000	Project Funding Plan
LA Urban Mobility Corridor	LAUS	Metro Frequency Improvement @ LAUS	$162,000	TIRCP Award
Inland Empire	San Bernardino-Redlands	Redlands Passenger Rail Project	$265,000	SBCTA
Inland Empire	Multiple	HSR-Connected Corridors Network & Service Integration Project Development; Blue Ribbon Commission for CA-AZ Rail Service	$4,000	CSRP Pricing Catalog
LOSSAN South	Irvine-Oceanside	Laguna Niguel-SJC Passing Siding	$25,000	TIRCP Award
		San Onofre-Pulgas Phase 2	$29,000	NCTD

Table 6.1: 2022 Short-Term Project List (thousands $)(continued)

Planning Area	Corridor	2022 Capital Projects	2022 Capital Cost (thousands $)	2022 Pricing Source
LOSSAN South	Oceanside-Sorrento Valley	San Elijo Lagoon Double Track	$76,000	SANDAG
		Batiquitos Lagoon Double Track	$69,000	SANDAG
		Poinsettia Station Improvements	$29,000	SANDAG
LOSSAN South	Sorrento Valley-Santa Fe Depot	San Diego River Bridge, Elvira-Morena Double Track	$286,000	TIRCP Award
LOSSAN South	San Diego-Mexican Border	US-Mexico Network & Service Integration Project Development	$1,000	CSRP Pricing Catalog
Statewide	Multiple	Amtrak Equipment Replacement, Fleet Capacity Expansion & Maintenance Facility Planning, ADA Access Improvements	$300,000	Caltrans
Statewide	Multiple	Corridor Service Improvement - Capitalized Maintenance	$16,000	Caltrans
Statewide	Multiple	Mobility Hub Project Development	$5,000	CSRP Pricing Catalog
Statewide	Multiple	Fare Integration & Demonstration	$10,000	Caltrans
Total				**$4,835,000**

2027 (Mid-Term) Infrastructure Investment

The 2027 Capital Program and service goals are focused on maximizing the potential of existing infrastructure, making full use of available passenger rail capacity, and making key investments in regional networks to prepare for integration with HSR. In identifying service goals for 2027, every rail network in the state was carefully examined to identify latent capacity for additional service, while assessing it against the ridership potential of the corridor. Goals for the 2027 Capital Program include identifying achievable mid-term improvements that affordably increase opportunities for additional long-distance passenger rail trips per day, while strengthening an integrated rail network that leverages HSR investments and enables rapid statewide travel by rail, creating more options for auto-dependent communities.

Key projects in the 2027 Capital Program include preparing regional networks to connect to and leverage HSR service. Additional service frequencies and improved speeds connecting greater Los Angeles, Orange County, and the Inland Empire to HSR hubs at Burbank, Los Angeles Union Station, and Anaheim are key investments in this time period. Similarly, investments include improving blended-speed regional service expansions in the Central Valley, for interim connections from HSR in Merced to Stockton and Sacramento.

HSR capital costs include projects necessary to complete valley to valley service delivery.

Intercity rail improvements include further capacity improvements, service expansions, and infrastructure around the state. The 2027 Capital Program includes supporting extended service in Sonoma County to Cloverdale; enhanced capacity between San Jose and Sacramento with improving travel times, frequency, and other right-of-way improvements building toward electrification of the corridor; and increasing service frequencies north of Sacramento to Placer County.

The plan supports increased service on the coastal corridors, using strategic track investments, sidings, layover facilities, and other capacity and speed improvements to bring service to the coast throughout the day. Additional service on the Central Coast, providing connections north to the San Francisco Bay Area, and connections south to the Los Angeles area, will provide residents and businesses with frequent, fast, and reliable connections within the Central Coast, and beyond to high-speed hubs in Gilroy and Burbank.

Urban Rail investments include expansions of Los Angeles, San Diego, Sacramento, and San Francisco Bay Area rail transit networks largely funded through local ballot initiatives. These projects are extensions and connections in the existing transit networks identified and led by relevant local stakeholders. Major investments include the completion of BART service to San Jose, numerous expansions of the LA Metro system, and extending rail service to the Sacramento International Airport.

The Las Vegas High Speed Rail (Las Vegas HSR) project is included in the 2027 capital project time horizon.

Table 6.2 catalogs capital costs for projects supporting the integrated statewide network in 2027. Costs attributed to locally led, privately sponsored, or CHSRA-programmed projects are included in the overall 2040 Vision.

Table 6.2: 2027 Capital Costs[169]

Planning Area	Capital Cost [thousands $]
South Bay Area	$7,320,000
North Bay Area	$520,000
Central Valley/Sierra Nevada	$1,150,000
Central Coast	$250,000
LOSSAN North	$550,000
Las Vegas HSR	$10,500,000
LA Urban Mobility Corridor	$2,500,000
Inland Empire	$950,000
LOSSAN South	$950,000
Statewide	$22,310,000
Total	**$47,000,000**

169 Estimated costs in 2018 dollars. These costs are planning-level estimates and require further study in implementation.

2040 (Long-Term) Infrastructure Investment

The 2040 Capital Program is focused on completion of the full build-out of regional networks to integrate the statewide system and High Speed Rail with unified service throughout the state. The program represents the long-term investments needed to achieve the passenger rail service goals described in the 2040 Vision (see Chapter 4). These include incremental projects built to expand and connect previously described services in the 2022 and 2027 programs, wider-scale investments to modernize services through electrification and connectivity improvements at station hubs, and large infrastructure projects like HSR expansion, intermodal hubs, new Transbay tube, and urban rail transit investments.

HSR expansion plays of key importance to the 2040 Capital Program, and includes electrified blended service from Sacramento to Merced and through the Inland Empire, as well as HSR service to San Diego.

Intercity rail improvements for 2040 include electrification of express services in both Northern and Southern California, complementing HSR in network hubs with pulsed service schedules to achieve the 2040 Vision.

This includes wide-scale electrification of intercity services in the San Jose-Oakland-Sacramento corridor, Central Valley from Merced to Sacramento, and Inland Empire, from Los Angeles separately to San Bernardino and Riverside, and on to the Coachella Valley. Large investments are identified for a shared second Transbay tube (hosting regional and intercity rail) to improve San Francisco-to-Oakland capacity, and improve overall Northern California network functionality. Complementary services to the HSR expansion are included in both the Sacramento-to-Merced corridor, east-west in the Central Valley, and throughout the Inland Empire. These projects require numerous grade separations and track improvements to support service speeds and safety in identified corridors.

The end result is a modern, energy efficient, and fully integrated statewide network providing the frequent, fast, and pulse scheduled services described in the 2040 Vision. This network will provide seamless service to passengers, and serve as the high-level State investment needed for California to be increasingly economically competitive while true to its environmental and equity goals, improving quality of life across the state.

Table 6.3 catalogs capital costs for projects supporting the integrated statewide network in 2040.

Table 6.3: 2040 Capital Costs[170]

Planning Area	Capital Cost [thousands $]
South Bay Area	$5,000,000
North Bay Area	$18,400,000
Central Valley/Sierra Nevada	$4,900,000
Central Coast	$1,500,000
LOSSAN North	$700,000
Inland Empire	$17,300,000
LOSSAN South	$1,200,000
Statewide	$36,000,000
Total	**$85,000,000**

170 Estimated costs in 2018 dollars. These costs are planning-level estimates and require further study in implementation.

6.1.1 Passenger and Freight Rail Integration

Intercity and commuter railroad operations in shared-use corridors are quite common across the country. A shared-use corridor generally involves passenger and freight operations using the same track plant. As defined by the FRA, shared-use corridors can take on three different forms:

Shared tracks. In this form, the trains of two or more service providers operate over the same tracks. The most common arrangement is that of a freight carrier and an intercity or regional passenger service provider all sharing the same track, with dispatching performed by the track owner.[171]

Shared Right-of-Way. In this form, two rail services are operated independently on separate parallel tracks having a track centerline separation of less than 30 feet. Separation of 30 feet or less triggers the application of certain FRA safety regulations. Separation also may be referenced in shared-corridor agreements between railroads; for example, as limiting the kinds of permitted operation or requiring specific safety precautions. An example of this type of operation is on the SCRRA Metrolink system between Palmdale and Lancaster, where SCRRA's line is operated separately from the parallel UPRR freight line.

Shared corridors. In this form, two rail services are operated independently on separate parallel tracks having a track centerline separation between 30 and 200 feet. Two hundred feet is considered the outer limit of separation, where an accident on one line could interfere with operations on the other. Shared right-of-way operations exist on a broad scale in several metropolitan regions where FRA-compliant railroads share right-of-way with rapid transit systems (e.g., Washington, D.C., New Jersey, and Chicago).

Most of California's intercity and commuter rail operations occur on shared track (Item 1 above), with the exception of the SCRRA line segment between Palmdale and Lancaster. This situation is expected to change with HSR implementation. Some HSR sections will be classified as shared right-of-way or shared corridors.

6.2 Funding for California Passenger and Freight Rail

California's rail system is funded by a number of sources and programs, including State fuel taxes and fees, Federal fuel taxes, Federal grant programs, State bonds, the Cap and Trade program, and local sales tax measures. Currently, the largest sources of funding include the State's Public Transportation Account (funded by the diesel fuel tax and other State accounts), the Greenhouse Gas Reduction Fund (GGRF) from the Cap-and-Trade program, and Federal Fixed Guideway Capital Investment grants. Detailed descriptions of these funding sources are listed later in the chapter.

Passenger rail capital projects draw funding from a number of sources at the Federal, State, and local levels. Although near-term projects are more likely to have funding sources committed, long-term projects are more open-ended and are less likely to have funding sources committed. Due to the private-sector nature of freight rail, less detail is known regarding freight capital spending. However, public funding sources for shared corridor improvements are identified in the next section, and delineated in the 2022 projects list. This section describes the full breadth of funding options available at the Federal, State, and local levels.

171 Time of day separation" is a distinct category of shared tracks that is not covered in this overall definition. Such an arrangement is required when the passenger rail vehicles are not compliant with FRA standards. California hosts two such operations: the San Diego Trolley on two branches, and the SPRINTER between Oceanside and Escondido

6.2.1 Funding Opportunities

California's transportation system is at a precipice for making pivotal decisions and setting course for the mobility of the State and the rest of the country for several years to come. State and local spending has outpaced Federal spending over the past few decades. Exhibit 6.2 shows the amount of spending by year on mass transit and rail by Federal, State, and local sources across the United States. In 2014, State and local governments accounted for 77 percent of the nation's mass transit and rail spending. Combined nationwide spending was an estimated $68.4 billion.

With the passage of SB1, the Road Repair and Accountability Act of 2017, there is an increase in the transportation investment to rebuild California by fixing neighborhood streets, freeways and bridges in communities across California and targeting funds toward transit and congested trade and commute corridor improvements. SB1 invests an average of $5.4 billion annually over the next decade to fix California's transportation system and at a higher level beyond the first decade. It will address a backlog of repairs and upgrades, while ensuring a cleaner and more sustainable travel network for the future.

California's state-maintained transportation infrastructure will receive roughly half of SB 1 revenue: $26 billion. The other half will go to local roads, transit agencies and an expansion of the state's growing network of pedestrian and cycle routes. Each year, this new funding will be used to tackle deferred maintenance needs both on the state highway system and the local road system.

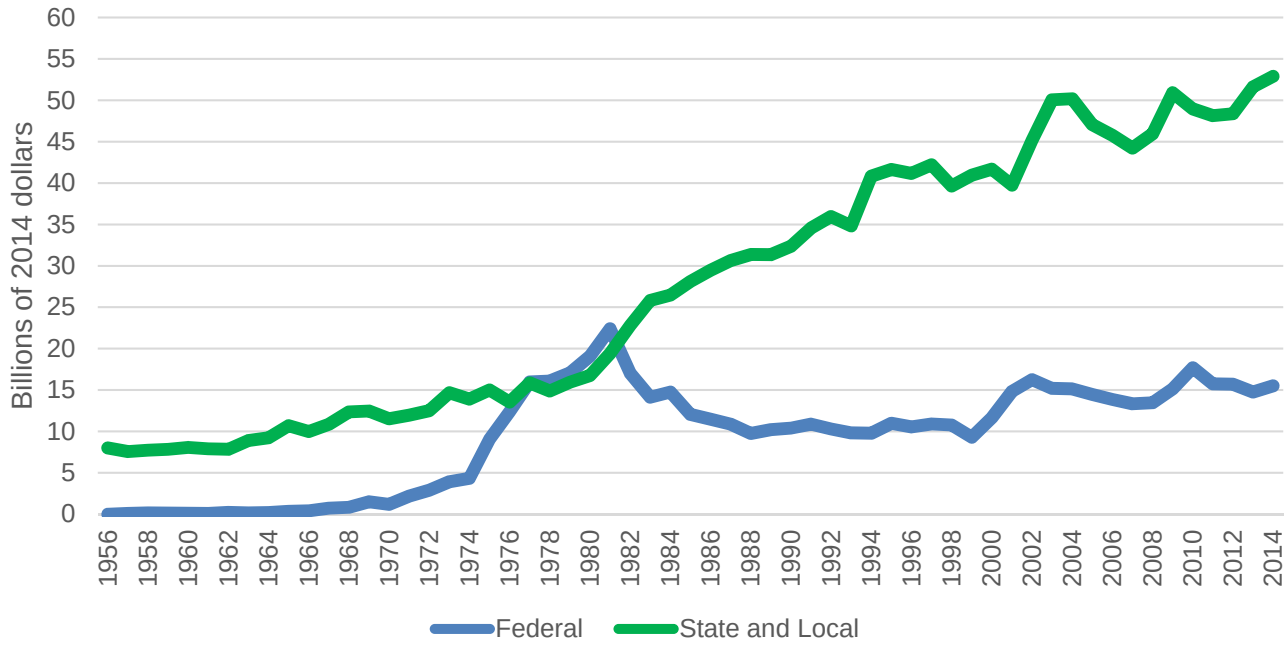


Exhibit 6.1: Federal Government and State and Local Government Spending on Mass Transit and Rail across the U.S., 1956 to 2014 (billions of 2014 dollars)[172]

172 Congressional Budget Office, *Public Spending on Transportation and Water Infrastructure, 1956 to 2014 (Data Underlying Figures)* (2015). Accessed 2016.

6.2.2 Federal Rail Funding

Fixing America's Surface Transportation Act[173]

The FAST Act of 2015 authorized $10.4 billion nationally for passenger rail (equivalent to about $2.1 billion annually over 5 years). Of this overall amount, the FAST Act authorizes $2.2 billion over 5 years for three new competitive rail development grant programs that build off of the Administration's previous $10 billion investment through the High-Speed Intercity Passenger Rail Program:[174]

Consolidated Rail Infrastructure and Safety Improvements (Sec. 11301). The purpose of this grant program is to improve the safety, efficiency, and reliability of passenger and freight rail systems. Eligible activities include a wide range of capital, regional and corridor planning, environmental analyses, research, workforce development, and training projects.

Federal-State Partnership for State of Good Repair (Sec. 11302). The purpose of this grant program is to reduce the state of good repair backlog on publically owned or Amtrak-owned infrastructure, equipment, and facilities. Eligible activities include capital projects to (1) replace existing assets in-kind or with assets that increase capacity or service levels; (2) ensure that service can be maintained while existing assets are brought into a state of good repair; and (3) bring existing assets into a state of good repair.

Restoration and Enhancement Grants (Sec. 11303). The purpose of this grant program is to provide operating assistance to initiate, restore, or enhance intercity passenger rail transportation. Grants are limited to 3 years of operating assistance per route and may not be renewed.

The FAST Act investments are expected to increase spending by $1.7 billion over 5 years, controlling for inflation. [175]

National Highway Freight Program

Section 1116 of the FAST Act created the formula-funded National Highway Freight Program, which funds projects that support the movement of goods on the National Highway Freight Network, including rail crossings, with $1.2 billion annually in funding. California is expected to receive $600 million over the next 5 years, or an average of $117 million per year, from the National Highway Freight Program. Up to 10 percent of these funds may be put toward improvements to freight rail or ports.

National Surface Transportation and Innovative Finance Bureau

The FAST Act reorganized Federal loan and discretionary programs under the new Surface Transportation and Innovative Finance Bureau.[176] The Bureau houses the following programs:

Transportation Infrastructure Finance and Innovation Act (1998). The act provides Federal credit and financing assistance with flexible repayment terms to projects of national and regional significance, including rail transit programs. To date, California has received roughly $2.8 billion in TIFIA assistance, $1.7 billion of which has gone to rail transit programs, primarily intercity rail in Los Angeles. The FAST Act reauthorized TIFIA, but with funding levels significantly lower than Moving Ahead for Progress in the 21st Century Act (MAP 21). [177]

Railroad Infrastructure Financing and Improvement Act (RRIF, 2015). The FAST Act expanded eligible projects for Railroad Rehabilitation and Improvement Financing to include transit-oriented and station development. The FAST Act also shortens review time and allows joint public-private ventures to encourage more applications to apply. As of May 31, 2015, the program has executed 35 loans for approximately $2.7 billion nationally. Some California projects have received loans through RRIF.[178]

Nationally Significant Freight and Highway Program (2015). Section 1105 of the FAST Act created the Nationally Significant Freight and

173 FRA, *FAST ACT Overview*, 2017.

174 FRA, *FAST ACT Overview*, 2017.

175 America Road and Transportation Builders, 2015 *"Fixing America's Surface Transportation Act" – A Comprehensive Analysis* (2015). Accessed 2016.

176 FRA, *FAST ACT Overview*, 2017.

177 Squire Patton Boggs, FAST Act: Opportunities for Private Sector Investment and P3s (2015). Accessed 2016. TIFIA funding will be $275 million in FFY 2016 and 2017, $285 million in 2018, and $300 million in 2019 and 2020.

178 FRA, *Railroad Rehabilitation and Improvement Financing (RRIF) Program Fact Sheet* (2015). Accessed 2016.

Highway Program, a competitive grant program. The program is planning to allocate $4.5 billion of grants from fiscal years 2016 through 2021. The minimum grant awarded is $25 million.

FASTLANE/INFRA Grants Program

The FAST Act established the FASTLANE/INFRA grant program, which provides competitive grants to nationally and regionally significant freight and highway projects that demonstrate cost-effectiveness and the ability to generate national or regional economic, mobility, or safety benefits. Eligible projects include freight rail and freight intermodal facility improvements and improvements within the border of freight rail and intermodal facilities.[179] The FFY 2016 FASTLANE/INFRA grants awarded $759 million to 18 projects nationally.[180] California received one of the grants, although it was for a highway rather than rail project. FASTLANE/INFRA grants were authorized $4.5 billion from FFY 2016 to FFY 2020.[181]

Fixed Guideway Capital Investment Grants (Section 3005) The Fixed Guideway Capital Investment Grants Program is a discretionary program that provides funding for new or expanded commuter rail, ferry, or bus rapid transit projects. It includes four categories: New Starts, Small Starts, Core Capacity, and Programs of Interrelated Projects. It is programmed to fund $2.3 billion of projects nationally each year from FFY 2016 through FFY 2020.[182] The FFY 2017 funding recommendations for the program included nine California projects across the four categories. These California projects were allocated over $2.3 billion in Federal funding through FFY 2016, and had $4.4 billion in remaining Federal funding needs after FFY 2016. The FFY 2017 budget recommendations cover over $1.1 billion of these remaining needs in that year.[183]

TIGER – Transportation Investment Generating Economic Recovery

The U.S. DOT awards competitive Federal TIGER discretionary grants to fund capital investments in surface transportation infrastructure. TIGER grants focus on capital projects that generate economic development and improve access to reliable, safe, and affordable transportation. Both rail and port projects are eligible. In FFY 2016, the eighth round of TIGER discretionary grants awarded $500 million in transportation improvement projects, including rail. California projects received $40 million from this round, including $30 million for three passenger rail projects.[184] TIGER has funded $5.1 billion of grants nationally from 2009 to 2016.[185]

Railroad Safety Risk Reduction Program (Section 130)

Section 130 of the Rail Safety and Improvement Act of 2008 established the Railroad Safety Risk Reduction program. This program has been continued under the FAST Act as a set-aside from the Highway Safety and Improvement Program, and is apportioned to eligible states by formula. About 50 percent of the state's allocation must go to installing protective devices at at-grade crossings. 268FUnder the FAST Act, California is expected to receive $82 million via this program for crossing safety enhancement projects between the years 2016-2020.[186]

179 FRA, *FAST ACT Overview*, 2017

180 U.S. DOT, *Fiscal Year 2016 FASTLANE Awards Annual Report* (2016). Accessed 2016.

181 U.S. DOT, *FASTLANE Grants FAQs* (2016). Accessed 2016.

182 FTA, *Fixed Guideway Capital Investment Grants.* Accessed 2016.

183 FTA, *Annual Report on Funding Recommendations, Fiscal Year 2017, Capital Investment Grant Program,* (2016). Accessed 2016.

184 Newton, Damien, *California Brings Home Four TIGER Grants; Three for Passenger Rail,* Streetsblog California (2016). Accessed 2016.

185 U.S. DOT, *Tiger Discretionary Grants*, 2016. Accessed 2016.

186 Caltrans, *FAST Act Memorandum* (2015). Accessed 2016.

6.2.3 State Funding

The California State Legislature passed SB1 and the Road Repair and Accountability Act of 2017 to reform the transportation program and increase transportation revenue. In the 2016-2017 budget documentation, the Governor presented a transportation funding and reform package that included a new road improvement charge; stabilization of the gasoline excise tax to 18 cents, with an adjustment annually of the broader gasoline tax to inflation; an increase in the diesel excise tax; additional money provided by the Cap-and-Trade Program; and costs savings from increasing Caltrans' efficiency.[187] This funding package will generate $5.4 billion annually, and establishes new funding sources like a new annual vehicle fee, amongst other things. The Transportation Improvement Fee and Road Improvement Fee each of which generate $16.35 billion and $191 million respectively over the next ten years. This section describes all the opportunities to pursue State funding.

WHERE DOES THE MONEY GO?

California's state-maintained transportation infrastructure will receive roughly half of SB 1 revenue: $26 billion. The other half will go to local roads, transit agencies and an expansion of the state's growing network of pedestrian and cycle routes. Each year, this new funding will be used to tackle deferred maintenance needs both on the state highway system and the local road system, including:

- Maintenance and Rehabilitation of the State Highway System: **$1.5 billion**
- Maintaining and Repairing the State's Bridges and Culverts: **$400 million**
- Repairs to Local Streets and Roads: **$1.5 billion**
- Matching Funds for Local Agencies: **$200 million**
  This money will go to local entities who are already making their own extra investment in transportation. These matching funds will support the efforts of cities and counties with voter-approved transportation tax measures.
- Bike and Pedestrian Projects: **$100 million**
  This will go to cities, counties and regional transportation agencies to build or convert more bike paths, crosswalks and sidewalks. It is a significant increase in funding for these projects through the Active Transportation Program (ATP).
- Freeway Service Patrol: **$25 million**
  Assists stranded motorists on the most congested freeways to keep drivers moving during peak hours.
- New Funding to Transit Agencies to help them increase access and service and build capital projects: **over $750 million**
- Trade Corridor Enhancement Program: **$300 million**
  Money from this new program will fund freight projects along important trade corridor routes.
- Solutions for Congested Corridors Program: **$250 million**
  Money from this new program will go to projects from regional agencies and the state that will improve traffic flow and mobility along the state's most congested routes while also seeking to improve air quality and health.
- Local Planning Grants: **$25 million**
  Addresses community needs by providing support for planning that may have previously lacked funding, good planning will increase the value of transportation investments.
- Transportation-Related Research at state universities: **$7 million**
  Research will help identify cost-effective materials and methods to improve the benefits of transportation investments.
- Workforce Training Programs: **$5 million**
  Every $1 billion spent on infrastructure projects creates more than 13,000 jobs, according to federal government estimates. California needs to ensure there is a ready workforce to carry out these transportation projects coming down the way.

Source: http://www.rebuildingca.ca.gov/overview.html

187 Legislative Analyst's Office, Governor's Budget Summary 2016-17 – Transportation Summary (2016). Accessed 2016.

State Transportation Accounts

State Highway Account

The bulk of State Highway Account funding goes to the State highway system. The State Highway Account (SHA) receives its funds from State gasoline fuel taxes, State vehicle weight fees, and reimbursements from the Federal Trust Fund for Federal Aid projects and other smaller sources of funds.

The SHA had an estimated $11.4 billion available for distribution in FY 2016-2017.[188] The SHA is funded 60 percent from State sources and 40 percent from Federal sources. It does not fund passenger rail directly; but rather, flows into the PTA and STIP.

Public Transportation Account

The PTA is a trust fund to be used "only for transportation planning and mass transportation purposes." The PTA is now almost exclusively funded through the sales tax on diesel fuel, and there is a transfer of $25 million from the SHA. The 2016-2017 State Budget includes $1.24 billion in PTA resources.

PTA funds are apportioned between State and local programs in accordance with Proposition 22, passed by the voters in 2010.[189] Approximately 60 percent of the funds go to the local State Transit Assistance (STA) program, where funds are apportioned on a formula basis to local transit agencies. The State portion goes to intercity rail operations ($130.8 million in the 2016-2017 State Budget), State-owned equipment rehabilitation, staff support to Caltrans and other State agencies that support mass transportation, and rail projects in the STIP. The PTA is the only State funding source for State-supported intercity rail service operations.

SB1 significantly increased the amount of funding in the PTA, but low fuel prices along with greater fuel efficient vehicles may erode the future revenue in this account.

State Transportation Improvement Program

The STIP is a program and not a funding source. The STIP is funded through the SHA, the Federal Trust Fund, and a small amount from the PTA. The STIP devotes 25 percent of its expenditures to the Caltrans Interregional Transportation Improvement Program, which includes intercity rail improvements; and 75 percent of its expenditures to the Regional Agencies' Regional Transportation Improvement Program, which funds local projects, including regional rail transit.[190]

The amended 2016 STIP Capacity for 2015-2016 through 2020-2021 is $1.95 billion, with $250 million for transit (including passenger rail) from the PTA,[191] and the remaining amount from the SHA. Available funding for the 2016 STIP was not sufficient to fund existing programed projects from the 2014 STIP; therefore, the 2016 STIP was reduced by $167 million for PTA projects, and reduced by a similar percentage for road projects. This caused the California Transportation Commission (CTC) to rescind funding for previously committed STIP projects.

SB1 stabilized and increased funding in the STIP program which will be reflected in forthcoming years.

The Section 190 Grade Separation Program

This is a State-funded safety program that supports projects that replace and upgrade existing at-grade railroad crossings, primarily with grade separations. The CPUC establishes a project list, and the Caltrans Division of Rail and Mass Transportation administers the program.

Section 190 of the California Streets and Highways Code requires the State's annual budget to include $15 million for funding these projects.[192] The maximum funding per project is $5 million annually.

188 CalSTA, *2016-17 California State Transportation Financing Package* (2016). Accessed 2016.

189 Per Proposition 22, passed by voters in 2010.

190 California Streets and Highways Code Section 164.

191 CTC, *Adoption of 2016 State Transportation Improvement Program (STIP) Resolution G-16-19* (2016). Accessed 2016.

192 Caltrans Division of Rail and Mass Transportation, *Grade Separation Program Section 190 Guidelines* (2016). Accessed 2016.

Trade Corridor Enhancement Account (TCEA)

The Highway Safety, Traffic Reduction, Air Quality, and Port Security Bond Act of 2006 (Proposition 1B) created the Trade Corridors Improvement Fund and provided for allocation by the California Transportation Commission of $2 billion in bond funds for infrastructure improvements on highway and rail corridors that have a high volume of freight movement and for specified categories of projects eligible to receive these funds.

SB 1 would deposit the revenues attributable to 50% of the $0.20 per gallon increase in the diesel fuel excise tax imposed by the bill into the Trade Corridor Enhancement Account, to be expended on corridor-based freight projects nominated by local agencies and the state.

Automatic Grade-Crossing Warning Device Maintenance Fund

Caltrans sets aside a minimum allocation of $1 million for this fund, which is administered by CPUC. As Table A.28 in Appendix A indicates, claims have continued to exceed fund allocations in recent years. In response, the CTC has approved allocations of $2 million. In the FY 2015-2016 State Budget, funding was increased to $3.8 million to help close this funding gap.[193]

193 CPUC, Rail Crossing Engineering Section, "Grade Crossing Maintenance Fund Program," February 2016.

State Bonds

State bonds used to fund California's rail system include the following.

Proposition 108 – Passenger Rail and Clean Air Bond Act (1990)

Officially known as the Passenger Rail and Clean Air Bond Act of 1990, Proposition 108 provided a bond issue of $1 billion exclusively for intercity rail ($225 million), commuter rail, and rail transit. The bond provided funds for purchase of right-of-way and rolling stock and other capital investments. The bond's funding capacity is almost entirely exhausted.

Proposition 116 – Clean Air and Transportation Improvement Bond (1990)

The Clean Air and Transportation Improvement Bond of 1990 authorized a bond of $1.99 billion to fund passenger rail and transit projects, including about $382 for intercity rail projects, $1.37 billion for urban and commuter rail projects, and $235 for other transit and transit-related projects. The bond's funding capacity is virtually exhausted.

Proposition 1A – High-Speed Passenger Train Bond Program (2008)

Known as the Safe, Reliable High-Speed Passenger Train Bond Act for the 21st Century of 2008, Proposition 1A authorized a total of $9.95 billion in bond funding for rail investments, including $9 billion for HSR directly, and the remaining $950 million to intercity and commuter rail that provide connectivity to the HSR system under the High-Speed Passenger Train Bond Program (HSPTB).

The HSPTB program funds, allocated by the CTC, funds the $190 million Intercity Rail Program and the $760 million Urban and Commuter Rail formula funded Program. As of the third quarter of FY 2015-2016, $124 million of the Intercity Rail Program funding had been allocated ($68 million to the competitive portion of the program, and $56 million to the formula-based portion of the program); and $687 million of the Urban and Commuter Rail Program had been allocated.[194]

194 Caltrans, *Fiscal Year 2015-16 3rd Quarter Report High-Speed Passenger Train Bond Program* (2016). Accessed 2016.

Proposition 1B – Highway Safety, Traffic Reduction, Air Quality, and Port Security Bond Act (2006)

Proposition 1B authorizes $19.9 billion of general obligation bonds for a wide variety of programs The CTC was authorized to manage $12 billion[195] of this money, including the following programs that impact rail funding:

Public Transportation Modernization, Improvement, and Service Enhancement Account

Proposition 1B authorized the Public Transportation Modernization, Improvement, and Service Enhancement Account with $3.6 billion, $3.49 billion of which has been committed.[196] The account had an estimated $87 million available for distribution in FY 2016-2017.[197]

Intercity Rail Improvement Program

Proposition 1B authorized the Intercity Rail Improvement Program with $400 million, of which $125 million were reserved for intercity passenger rail equipment. The IRI Program consists of seventeen projects: two projects that remain unallocated, two projects that are partially allocated, five projects are fully allocated; eight projects are completed. The total programmed amount is $392 million.

195 California Transportation Commission, *Proposition 1B: Promises Made, Promises Kept* (2015). Accessed 2016.

196 State of California, *Strategic Growth Plan Bond Accountability – Proposition 1B* (2016). Accessed 2016.

197 CalSTA, 2016-17 *California State Transportation Financing Package* (2016). Accessed 2016.

Highway Railroad Crossing Safety Account (Freight)

Proposition 1B authorized the Highway Railroad Crossing Safety Account with $250 million for high-priority grade separation and railroad crossing safety improvements. The Highway Railroad Crossing Safety Account program has a total of 37 projects programmed with $250 million, of which $242,354,000 has been allocated to 37 projects, and $19 million expended. Twenty-two of the 37 projects have completed construction. The amount of un-programmed available funds is $.6 million[198] as of March 2016, all of which has been committed.[199] The account had an estimated $9.4 million budgeted for distribution in FY 2016-2017.[200]

Cap-and-Trade Program California Greenhouse Gas Reduction Fund

In 2006, the California State Legislature passed AB 32 with the ambitious goal of reducing GHG in the state. AB 32 created the Cap-and-Trade Program, and authorized the California Air Resources Board (CARB) to establish a carbon permit auction. A series of subsequent bills allocated the revenue from the Cap-and-Trade Program to the newly created California GGRF, which is also known as the California Climate Investments Program[201]. One program under GGRF allocated 25 percent of revenues to HSR, and 10 percent to the TIRCP. The TIRCP is a competitive grant program that receives annual appropriations equivalent to 10 percent of the State's Cap-and-Trade auction revenues. This program is dedicated to transformative transit and rail projects that will have a significant impact on increasing ridership and reducing GHGs. This program has also received funds from sources other than Cap-and-Trade auction revenues, including early debt repayment appropriated to the TIRCP.

Another transportation program now available through the GGRF includes:

- The Low Carbon Transit Operations Program, where funds are allocated to local agencies to support new or enhanced bus and rail services and intermodal transit facilities, and to prioritize projects that support disadvantaged communities. The Low Carbon Transit Operations Program receives a continuous allocation of 5 percent of the Cap-and-Trade revenues via GGRF.

Revenue from the Cap-and-Trade Program is allocated to GGRF. To date (FY 2013-2014 through FY 2015-2016), GGRF has funded the HSR program $707 million, the Transit and Intercity Rail Capital Program $224 million, and the Low Carbon Transit Operation Program $116 million, in addition to other non-transit programs. For FY 2016-2017, GGRF allocates 25 percent of funds to the HSR program, $135 million plus 10 percent of funds to the Transit and Intercity Rail Capital Program, and 5 percent of funds to the Low Carbon Transit Operation Program.

SB1 significantly increased funds for the TIRCP by providing a portion of the new vehicle license fee revenues to the TIRCP on an ongoing basis.

198 CATC, *Quarterly Reports '15-'16*. 2016.

199 State of California, *Strategic Growth Plan Bond Accountability – Proposition 1B* (2016). Accessed 2016.

200 CalSTA, 2016-17 *California State Transportation Financing Package* (2016). Accessed 2016.

201 CARB, *California Climate Investments from the Greenhouse Gas Reduction Fund* (2016). Accessed 2016.

6.2.4 Local Funding

As noted Chapter 1, Article XIIIB of the State Constitution allows for local sales tax measures subject to voter approval. The majority of county sales tax measures are used to fund urban transit, but also support commuter rail services, and intercity rail stations.

In November 2016, voters approved many local sales tax measures, including Los Angeles Measure M, LA Metro's transportation ballot measure, which includes funding to expand the rail and rapid transit system, to accelerate rail construction and build new rail lines, enhance local regional and express bus service, and improve system connectivity. Measure M included $1.9 billion for regional rail improvements (i.e., for the Metrolink commuter rail system), over the next 40 years. Other local tax measures that passed on the November ballot and support the statewide rail network and connectivity goals are outlined in Table 6.4.

Table 6.4: Local Tax Measures

Location	Explanation of Funding Source	Amount	Description of Proposed Improvements
BART Region (San Francisco, Contra Cost and Alameda Counties) (Measure RR)	Property tax, for 40 years	$3.5 billion	Repairs and maintenance on BART transit: electrical systems, rail replacement, fixing leaking tunnels and upgrading central computer control system.
Alameda and Contra Costa Counties (Measure C1)	20-year parcel tax extension	$30 million/ year	AC Transit bus operations and maintenance.
San Francisco (Prop J)			Create transit improvement fund: beginning in 2018 (for 24 years), City will allocate $101.6 million to fund annually.
Santa Clara County (Measure B)	0.5% sales tax for 30 years	$6.5 billion	$1.5 billion for BART Phase II; $250 million for bike/pedestrian projects; $2.85 billion for highways; $1.2 billion for local streets; $500 million for transit operations.
Santa Cruz County (Measure D)		$500 million	Portion of the money for analysis of rail as transit option.
Merced County (Measure V)	0.5% sales tax for 30 years	$450 million	Half of the funding to local jurisdictions (nondiscretionary); of the remaining half, 20% on bike/pedestrian, and 5% on transit.
Stanislaus County (Measure L)	0.5% sales tax for 25 years	$975 million	Local street and road improvements, traffic management, bike/pedestrian improvements and transit connection improvements.
Los Angeles County (Measure M)	0.5% sales tax increase, plus continue the existing (Measure R) 0.5% sales tax, set to expire in 2039, in perpetuity	$860 million/year, estimated $100 billion over 40 years	Big expansion of rail, bus transit, bike/ pedestrian projects and 10 highway projects. 17% of funds would go to cities for local streets projects.

6.3 Combined Program Effects and Benefits

The service and connectivity goals analyzed for plan assumptions outlined in this section were developed for planning purposes to enable ridership and revenue forecasting. Service planning continues in many corridors, and specific operating plans and timetables have not been finalized at this time. Service plan implementation will require funding and agreements that are yet to be established. Therefore, the service plan assumptions described below are illustrative and do not reflect a commitment to provide the indicated services.

The illustrative service plan assumptions reflect phased implementation of the California HSR System and blended operations with intercity rail routes to deliver integrated statewide passenger rail service. The assumptions are consistent with the California High-Speed Rail Program Revised 2016 Business Plan (2016 Business Plan), and planned near-term expansion of the California intercity and regional rail network. Finally, the assumptions include increased passenger service on those corridors shared with freight traffic that freight rail operators have agreed to evaluate or are currently evaluating.

The expenditures will result in nearly 463,000 full-time jobs, and labor income surpassing $28 billion across industries[202]. By 2040, State and local tax revenues anticipated from the expenditures will be close to $2 billion, and Federal tax revenues will be $5.4 billion. New Federal and State trade corridor funding will accelerate many of these investments, bringing the economic benefits sooner.

The Rail Plan identifies $40.8 billion of direct expenditures planned by private railroads and regional agencies, resulting in total economic output of nearly $77.5 billion by 2040—a payout of nearly two dollars for every dollar invested.

202 Steere Davies Gleave, 2018 State Rail Plan Analysis, Appendix A.6

6.3.1 Regional Balance and Distribution of Benefits

The equitable distribution of public investments and their returns is a key metric to successful economic development and good stewardship of the State's fiscal resources. When properly planned, integrated rail networks directly serve as effective tools for connecting people to jobs and goods to markets. By focusing investment on connecting and expanding existing regional networks into a statewide system, benefits are distributed in a balanced way throughout the state.

Distribution of Passenger Rail Benefits

By increasing service frequencies, expanding coverage areas, and improving speeds, direct and indirect benefits will accrue throughout the state. In an integrated statewide system, a grade separation in San Bernardino can improve service connections from Sacramento or Oakland. An electrification project in Sacramento can improve service speeds in San Jose when that investment is part of a coordinated program to improve an entire corridor and build an integrated system. Double-tracking in Los Angeles can improve service frequency in Fresno. Further, by connecting and coordinating these services, regional hubs can be established throughout the state in places like Suisun-Fairfield, Burbank, Ontario, Stockton, Palmdale, or Escondido.

Taken together, the 2040 Vision has the potential to change the shape of the State of California. Bakersfield will be an hour and a half from Los Angeles. Fresno would no longer be a 3.5-hour drive from San Francisco, but rather a 2-hour train ride. Sacramento and Los Angeles would go from a nearly 7-hour drive to a 3-hour train ride. Even within regional networks, San Bernardino will be 45 minutes closer to Los Angeles, cutting travel time in half, compared to driving. The power of the integrated statewide network is to move markets closer to one another, and expand economic opportunity for all.

Even places without direct passenger rail service will benefit in ways ranging from improved connections to vastly improved services. Integrated bus service from Redding, Calexico, Arcata, or Yosemite National Park can offer timed and direct passenger services to the rail network to connect these communities to the rest of the state by passenger rail.

The 2040 Vision is strategic in its approach to scaling phased, market-oriented investments toward an integrated statewide network. The result of the specific investments supporting the vision will be to distribute the benefits of an integrated network to system users and their communities throughout the state.

Mode Shift and Safety Benefits

In addition to travel time and connectivity benefits across the state, California at large will benefit from the safety improvements and congestion mitigation associated with mode shifts from driving to rail. Based on the 2040 Vision and the associated system enhancements, intercity and regional rail ridership will increase to over 1.3 million riders per day. For all travel on all modes, rail passenger miles will account for 30 percent of the total growth in trips, resulting in 7 percent of the total statewide mode share.

In total of the expected total growth on the transportation system, mode shift to rail will draw 74 million of those daily VMT from roads, significantly mitigating congestion on roads and working to achieve statewide GHG emissions reductions targets. Because rail is many times safer than driving, the mode shift of 74 million VMTs away from highways can potentially reduce over 250 fatalities per year and 19,000 transportation-related injuries in California by 2040. At a value of a statistical life of $9.6 million, this represents a net gain of $2.4 billion to the economy of California per year.

Distribution of Freight Rail Benefits

The success of freight rail networks depends on how well they connect freight generators to markets. Freight network constituents include the main line and short line railroads, ports, and shippers. The Rail Plan identifies a host of improvements and programs from grade separation on main-line freight railroads to assistance for short haul and short line services to increase capacity and access throughout the freight network. In this way, a safety or capacity investment to a main line in one part of the state and a short line investment to another all build toward a more robust transportation network that spurs economic development throughout the entire state.

6.3.2 Passenger Rail Effects and Benefits

The passenger rail improvements detailed in Chapter 4 catalog and identify significant investments in passenger services and capital projects. Beyond better connectivity and an improved statewide transportation network, these investments will have benefits to several important areas, including, but not limited to, significant returns to local, regional, and statewide economies, increased ridership, reduced per-capita operating costs; and of course, the newer technology and efficiencies in transportation will benefit the environment.

Economic Benefits

Benefits include employment (measured as person years of full-time employment), income (wages and salaries) associated with this employment, and firm output (essentially the same as expenditures).

Improvements in California's rail system are investments that will pay off in terms of greater economic activity: new construction, more jobs, and growing tax revenues.

- The $40.8 billion of direct expenditures identified in the Rail Plan will result in total output for the economy of nearly $77.5 billion by 2040—a payout of nearly 2 dollars for every dollar invested.
- The expenditures will result in a total employment impact across affected industries of nearly 463,000 full time jobs and labor income of over $28 billion.
- By 2040, State and local tax revenues anticipated from the expenditures will be close to $2 billion, and Federal tax revenues will be $5.4 billion.

The tax impacts are for taxes for which revenues can be directly inferred from economic expenditures, such as sales or income taxes. The total tax revenues anticipated from the expenditures are close to **$2 billion** for State and local, and **$5.4 billion** for Federal taxes by 2040.

Direct Economic Benefits

463,000 full time jobs
$28 Billion in labor income

$77.5 Billion in new State
economic output by 2040

Increased Ridership

The 2040 Vision anticipates an increase in intercity passenger rail ridership, including HSR, to approximately 1.3 million riders per day. Current daily intercity passenger rail ridership is approximately 115,000 trips per day. This is an increase in ridership of nearly 12 folds from current levels, shown in Exhibit 6.4. This increase assumes faster rail service and smooth transfers at hubs; and better accessibility and timed connections to transit and rail services at stations; along with integrated ticketing throughout the transportation network.

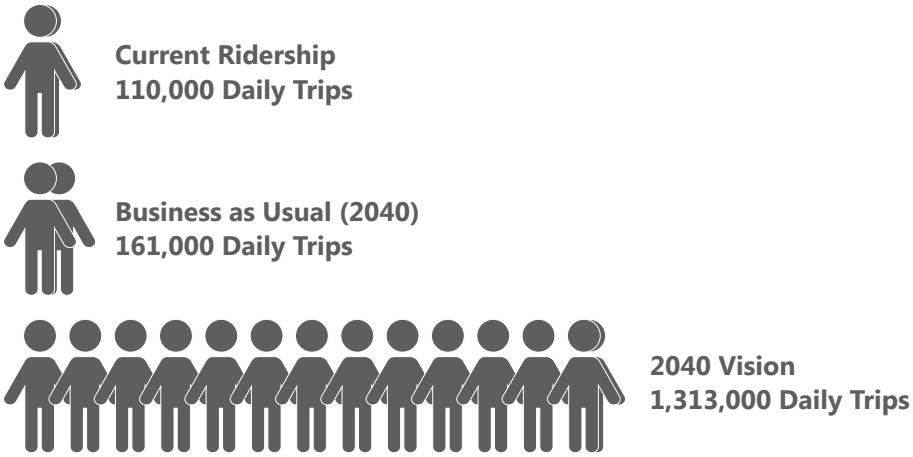


Exhibit 6.2: 2040 Vision Ridership Growth

In addition to increased rail ridership, improved system-wide connectivity will expand the efficiency and reach of the rail and transit networks, as well as the entire transportation system at large. Currently, California accommodates 3.9 million daily transit boardings. Rail has more capacity on existing ROW than any other transport mode and therefore, coupled with better connectivity, presents an opportunity to capture more riders that can complement the highway system by relieving some of the growing transportation pressures. Rail also provides connections to the vast transit network that is expected to accommodate 9 million daily riders by 2040 further expanding the impact the rail network and increased rail ridership has on statewide mobility.

As shown in Exhibit 6.3, translating the ridership growth numbers in Exhibit 6.2, the number of passengers using rail instead of highways in key corridors could increase dramatically. The rail travel patterns between counties as seen after the implementation of the 2040 Vision plan is much denser and more diverse. Reduced travel times and better network connectivity can provide more options for travelers. It is anticipated that of total transportation trips made on all modes, 30 percent of the growth will be made on rail instead of an automobile. Of the expected growth by 2040 74 million fewer daily VMT will occur and need to be managed on highways due to mode shift from roads to rail. This has the additional benefit of removing travelers from highways, thereby eliminating some of the anticipated congestion and improving the level and quality of service on the transportation network as a whole. Under the 'No Build Scenario,' whereby the status quo is maintained, a modest increase in intercounty travel on rail and possibly all the additional growth that could have been accommodated by rail would end up on highways.

Exhibit 6.3 shows intercounty travel for current conditions, "No Build" scenario, and 2040 Vision.

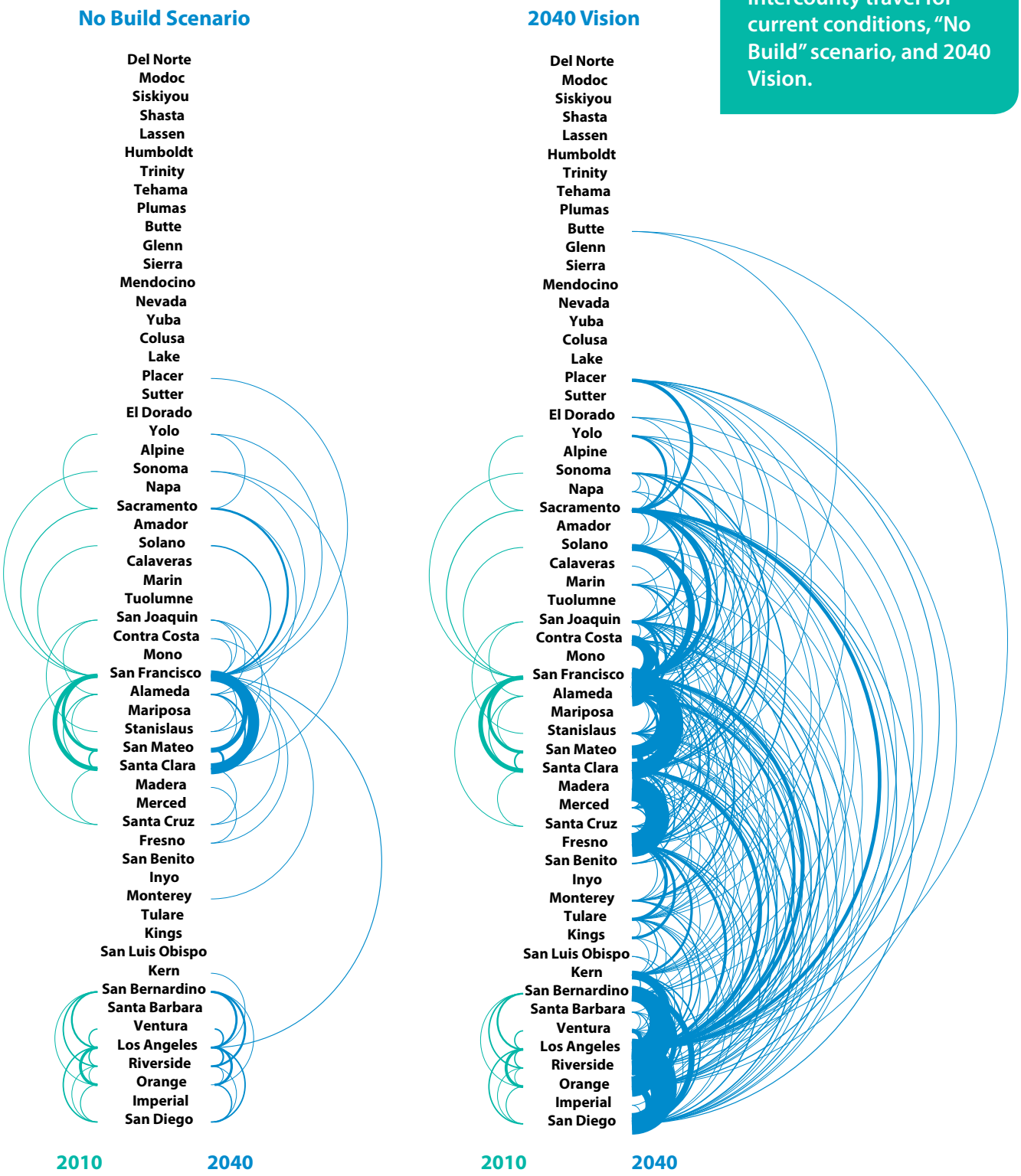


Exhibit 6.3: County to County Ridership Demand "No Build" vs. 2040 Vision

The "No Build" Scenario

California has already made significant investments in passenger rail, and has one of the most robust statewide rail networks in the nation. Many rail services across the State have seen tremendous amounts of ridership growth, and there have been increasing concerns regarding overcrowding, infrastructure constraints, and efficient schedule operations to meet peak demand. Based solely on population growth, 2040 ridership in the "No Build" scenario is expected to increase by approximately 50,000 per day.

2040 Vision

As detailed in Chapter 2, statewide travel is forecasted to continue to increase across all travel modes, including passenger rail, highway, and air travel. Highway travel VMTs are increasing, while California's highways are already the most congested in the nation. The status quo will only result in increased congestion, longer travel times, and an overall loss in economic productivity. As part of the environmental analysis detailed in subsection 6.3.4, Californians are expected to drive an additional 150 million miles per day. It is imperative that the passenger rail network investments meet the needs of additional travel demand to avoid further degradation of the traffic network and environment. Full integration of the State rail network is expected to meet additional passenger demand of approximately 90 million passenger miles of daily travel.

Operating Costs and Funding

Capital costs are only half the equation to establishing a financially sustainable passenger rail service. The other half consists of operation and maintenance (O&M) costs for providing the service. Although operating passenger rail service is costly, there are massive efficiencies and economies of scale to be captured through well-planned, fast, and frequent service. In this way, the more the more frequently and faster trains run, the more people ride, and the more cost-effective it is to provide the service per passenger mile travelled.

Key factors to lowering costs include:

- More efficient train rolling stock, largely through electrification and modern DMU trains that are cleaner and lighter than traditional diesel locomotive-hauled trains.
- Faster train speeds, allowing for shorter trips and more hours of revenue service with more efficient train crew service.
- Faster turn-arounds, reducing the amount of time trains are idling at station or in rail yards.
- Changes in travel distances, largely through integrating regional and statewide services to ensure market sensitivity in route and service planning.

Taken together, these changes reduce per-capita costs for train operations, crews, and other overhead, resulting in more service available for far lower unit prices.

Although the O&M costs for the 2040 integrated network seem higher than the O&M costs for existing (i.e., today's) rail services, increased train speeds and frequencies, newer equipment, longer consists (i.e., higher capacity), longer travel distances, and increased operating efficiencies all contribute to driving down the average cost per train mile and cost per seat mile. The 2040 integrated network has a 45 percent lower cost per train mile, and a 65 percent lower cost per seat mile over today's service.

Fares

Higher ridership and lower cost of providing service ultimately means that the "fare box recovery ratio," or the portion of the cost of providing a ride that is paid for by rider fares, improves to the point that certain operations and services can be self-funding. Although it may not be the goal for public passenger rail service or transit to be profitable; Local, Express, and High-Speed rail services all benefit from the financial sustainability of self-funding their operations through low costs and high ridership.

Public-Private Partnerships

Rail services that approach or exceed self-funding for operating specific services can be attractive for private operators looking to enter public-private partnership with government to take on some of the operating risk of providing passenger rail service, for the opportunity to earn a return on investment through fare revenues. Through a diverse range of options, governments can engage private partners via concessions, operating agreements, and other arrangements that offload some of the risk involved in operating investments, and capture further service efficiencies, while protecting taxpayers and ensuring high-quality levels of service for riders.

Land Use

A good land use plan is a good transportation plan because it will efficiently organize development to minimize travel distances and need for expensive public infrastructure to connect development. However, a good transportation plan is a good land use plan because it organizes the movement of people and goods around high-value nodes that signal where development should be concentrated to maximize efficient use of the public investment. A long-term, strategic transportation plan that coordinates and maximizes use of highly efficient infrastructure, such as this Rail Plan, will provide key incentives and guidance to regional and local levels, the market, and private citizens to organize land use and development around the State's key transportation hubs identified in the 2040 Vision in a way that can reduce sprawl, contribute to equitable economic development, and minimize environmental impacts.

Rail Capacity and Congestion

Carrying so many passengers throughout the state on the intercity and local rail system, as is projected in the 2040 Vision, will result in large numbers of passenger miles being served by the rail system instead of the highway system. The 2040 Vision results in an additional 90 million passenger miles per day on the rail system, exclusive of urban transit. This is equivalent to the rail network accommodating 1.5 times the current daily traffic volumes of the entirety of I-5, from the Oregon state line to the border with Mexico. Likewise, it would accommodate the equivalent of 1.8 times the current daily traffic volume on U.S.-101 from the Oregon state line to Los Angeles.

Sea Level Rise

Human activity has impacted the climate for some time. GHG emissions, including those coming from coal and oil (or fossil fuels) burnt to generate electricity and power motor vehicles, planes, ships, and trains, trap solar energy from reflecting back into space, therefore warming the earth's atmosphere (therefore, the term "greenhouse"). Warmer temperatures in turn melt glaciers and ice sheets, and the run-off flows into the oceans, causing sea levels to rise.

As GHG emissions have increased since the Industrial Revolution in the early 19th Century, the rate of sea level rise has accelerated. Sea levels rose 2.4 inches during 19th Century, and 7.5 inches in the 20th Century;[203] and the pace is not expected to slow anytime soon. For example, in the San Francisco Bay Area, projections of sea level rise to Year 2100 appear in Table 6.5.

Table 6.5: Sea Level Rise Estimates for San Francisco Bay

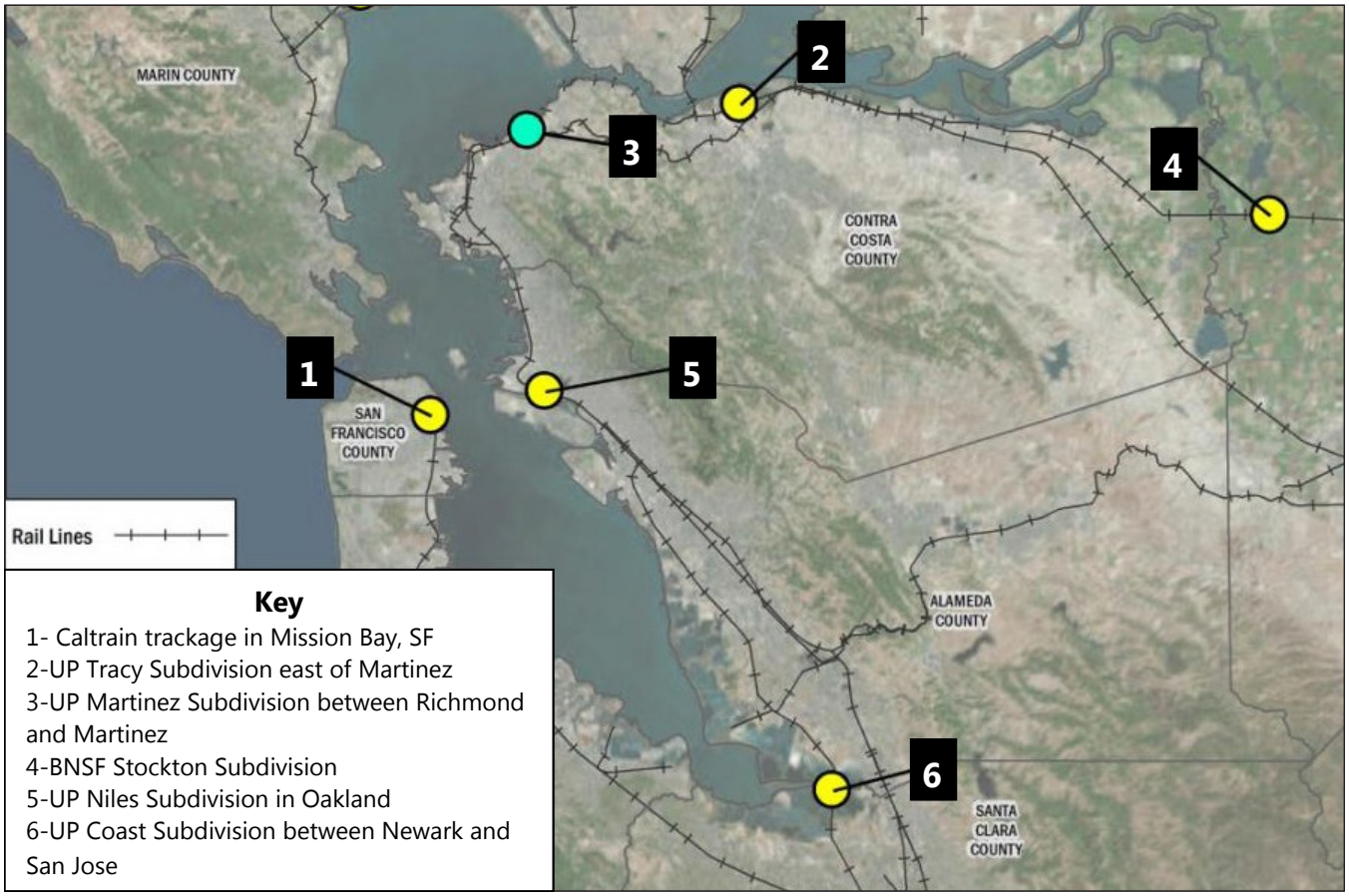
Year	Most Likely Projections	Upper Range
2030	6 inches	12 inches
2050	11 inches	24 inches
2100	36 inches	66 inches

Source: Sea-Level Rise for the Coasts of California, Oregon and Washington, Past, Present and Future, National Research Council, 2012

203 Geophysical Research Letters, Svetlana Jevrejeva, J. C. Moore, A. Grinsted, and P. L. Woodworth, *Recent global sea level acceleration started over 200 years ago?*, 2008.

Railroad Lines at Risk

Sea level rise is putting California's infrastructure, including railroads, at risk. The risk to railroads comes largely in two forms: flooding of trackage in low-lying areas in San Francisco Bay and San Pedro Bay; and higher and fiercer storm surges eroding coastal bluffs that support rail lines atop them, such as those found along the Central Coast and in San Diego County. Several busy main lines and terminal trackage that appear to be at risk later in this century are shown in Exhibit 6.6 and Exhibit 6.7.

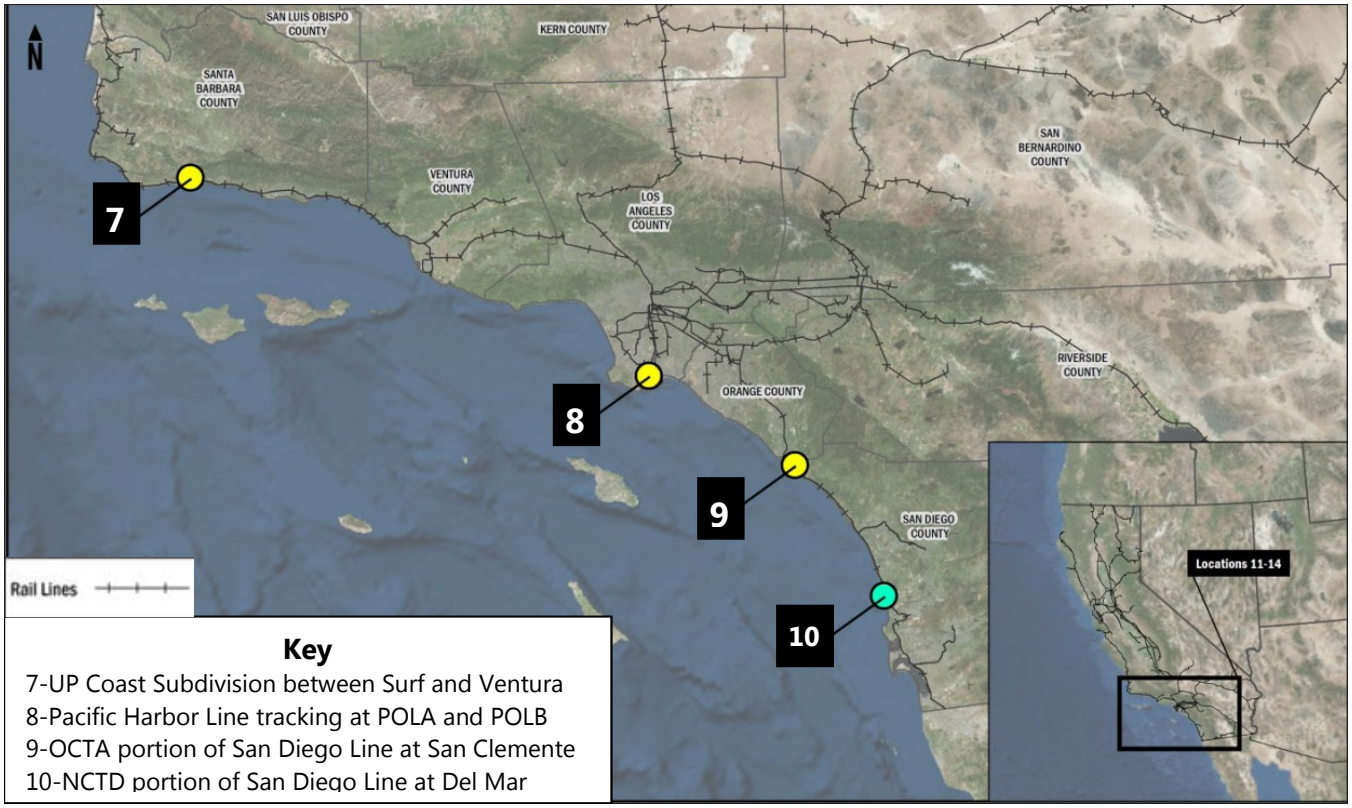


Sources: Inundation: NOAA 2012; Basemaps: ESRI 2017; Rail Lines: State of California

Exhibit 6.4: Major Rail Line the Bay Area at Risk from Sea Level Rise

Major Rail Lines in the Bay Area at Risk from Sea Level Rise and not pictured in map include:

- SMART owned line San Rafael to Petaluma
- SMART owned line parallel to SR37
- UP Martinez Subdivision between Benicia and Fairfield
- UP Coast Line along Elkhorn Slough



Sources: Inundation: NOAA 2012; Basemaps: ESRI 2017; Rail Lines: State of California

Exhibit 6.5: Major Rail Lines in Central and Southern California at Risk from Sea Level Rise

Both freight and passenger rail traffic (intercity and commuter) will be affected. Ensuring protection and resiliency from sea level rise could include raising track, relocation of rail lines to higher ground, and implementing water barriers such as dykes and berms. All solutions have pluses and minuses.

In the sections that follow, two locations with illustrative impacts of sea level rise are discussed: the UPRR Martinez Subdivision at Rodeo in Contra Costa County; and the Del Mar Bluffs in San Diego County. The locations of these spots are identified by the greenish-blue dots in Exhibits 6.6 and 6.7.

Martinez Subdivision at Rodeo

The UPRR's Martinez Subdivision is the busiest rail link between Central California and the Bay Area. In all, 70 to 80 trains traverse the line on weekdays. Most of the traffic is intercity passenger traffic, via the *Capitol Corridor* and *San Joaquin Corridor* trains, and Amtrak's long-distance *California Zephyr* and *Coast Daylight* trains. The line is also UPRR's primary freight route in and out of the Bay Area.

Exhibit 6.8 shows the impact of sea level rise in 2100, with the inundation of the UPRR route at Rodeo along the North Bay. The segments of the line in red indicate segments that are at risk of inundation.

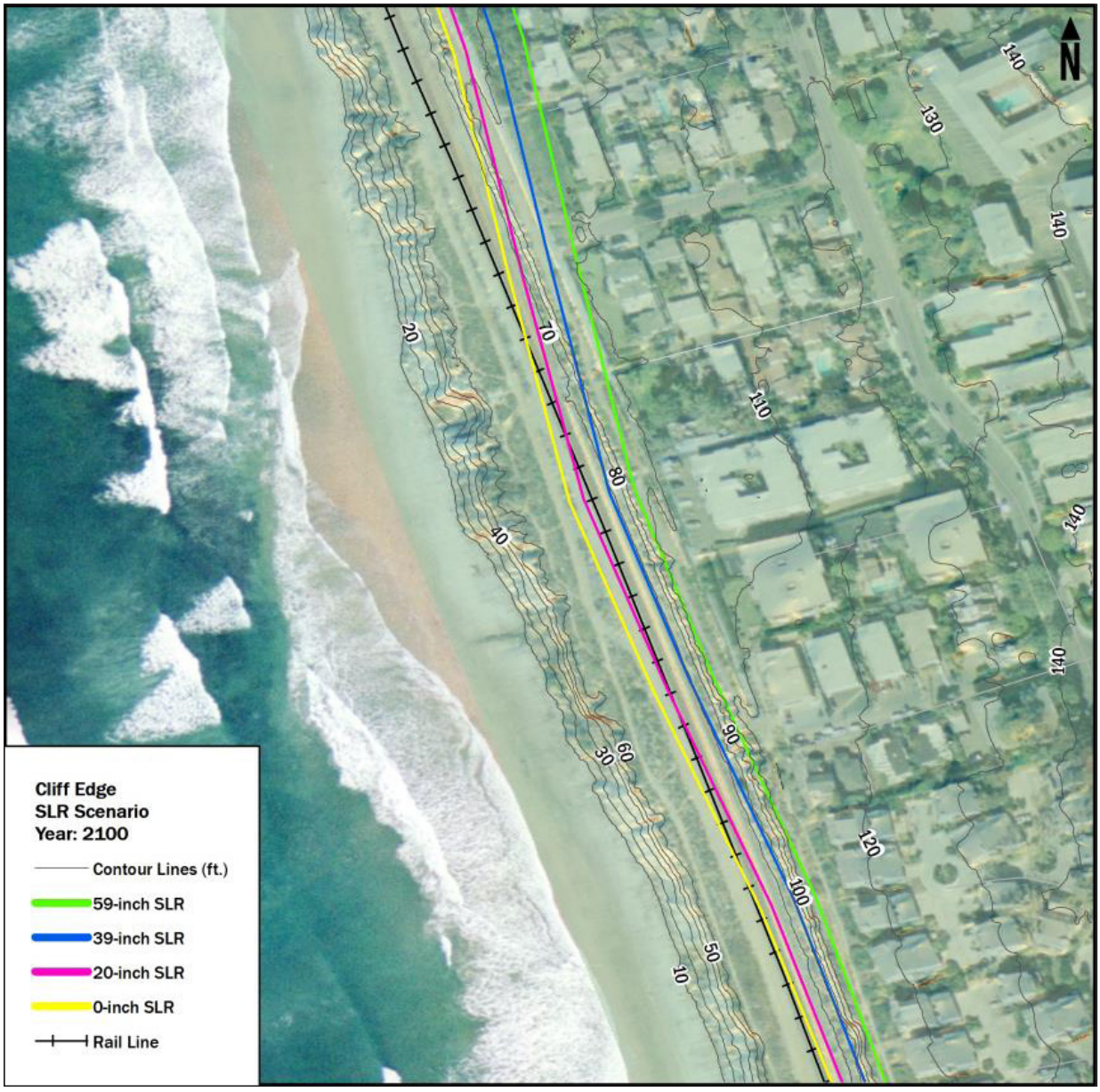
Sources: Streets, Contra Costa County 2017; Rail Lines: State of California

Exhibit 6.6: Inundation of the UPRR Martinez Subdivision at Rodeo

Del Mar Bluffs

The portion of the San Diego Line in San Diego County is owned by the NCTD, which purchased it from the former Atchison Topeka and Santa Fe Railway (now part of the BNSF) in the late 1980s. The line hosts *Pacific Surfliner* Corridor trains, COASTER commuter trains, and BNSF freight service. A section of the line runs across the Del Mar Bluffs above the Pacific Ocean. On weekdays, about 50 trains, mostly passenger, traverse the Del Mar Bluffs.

As seen in Exhibit 6.9, sea level rise will accelerate erosion of the bluffs, threatening stability and the viability of the route. Indeed, erosion by 2100 could eliminate the rail line completely, as well as adjacent homes, absent preventative measures.



Sources: LiDAR Surface for Contours: NOAA Coastal LiDAR; SLR Retreat Lines: Coastal Storm Modeling System: USGS; Rail Lines: State of California

Exhibit 6.7: Erosion of the Del Mar Bluffs in San Diego County

6.3.3 Freight Rail Effects and Benefits

The planned investments in freight rail would generate a range of public and private benefits. In this case, "public benefits" refer to net increases in public goods.[204][205] Public benefits from freight rail investments can accrue in several ways: they increase the efficiency of the freight system, reducing travel times, costs, and emissions of existing trips. The freight rail efficiency and capacity improvements can attract trips away from other modes, primarily trucks, potentially saving costs, emissions, and time, as well as improving safety of those trips relative to their original mode. These diversions can also lower congestion, positively impacting emissions and safety on the roadway networks generally. The investments can also make a region more competitive economically, attracting development from other regions. These benefit transfers from one geographic area to another are not always counted as net benefits, and benefit tabulation varies by methodology.

"Private benefits" accrue to either shippers or railroads—or in many cases—both. Shippers can potentially benefit from freight rail investments in the form of business cost reductions, access to service, service reliability, and transit time, while maintaining the competitive edge of the region. Railroads can potentially benefit from system velocity improvements, reduced delay, reduced yard dwell time, increased revenue traffic, and improved rolling stock use and resulting labor productivity.

The remainder of this section discusses how freight rail investments create public and private benefits. It is organized around the five categories of freight rail investments identified in Chapter 5: trade corridor investments, economic development and short line investments, grade crossing improvements, terminal and yard capacity investments, and short-haul rail investments. For each investment category, the general type of benefit (i.e., public or private) is identified, along with the specific gains accrued from that investment. In many cases, freight rail investments yield both public and private benefits.

Trade Corridor Investments

The shorter, more reliable travel times associated with many of the proposed investments decrease the cost of goods movement by rail. Although these cost savings are private benefits, the growth in tax revenue resulting from subsequent increased profits is public. Likewise, if private firms use these cost savings to hire more workers, then the tax revenue from these workers would be a public benefit.

Lower freight costs could also attract existing economic activity away from other regions. This is a benefit transfer, although if activity is diverted to California or the U.S. from other states or countries, the transfer is a net benefit for the California or the U.S., respectively. Calculations of these net benefits should account for any subsequent increase in emissions or safety costs resulting from the shift in activity.

204 Public goods are by definition non-excludible and non-rivalrous. Cowen, Tyler, P*ublic Goods*, The Concise Encyclopedia of Economics (2008). Accessed 2017.

205 There can be overlap between both components of this definition. For example, lower maintenance costs could be characterized as an increase in a public good (well-maintained roads), or as public-sector cost savings.

Public Benefits

Perhaps the most significant public benefit that could result from trade corridor investments is the potential to divert freight traffic from highways to rail. By decreasing the average and variation of freight rail travel time, trade corridor investments improve overall reliability. As a result, these investments can potentially spur a diversion of freight trips to rail from highway; which in turn, can alleviate congestion for the general public on highways. Public benefits are equivalent to the monetary value of time multiplied by the reduction in hours travelled. An analogous mobility benefit can occur for passenger rail travelers traveling on shared freight and passenger rail lines that undergo improvements.

Reduced truck miles travelled due to a shift in freight traffic from truck to rail also has a public safety benefit in the form of lower crash risks on the State's highways. Public costs associated with crashes can include medical costs, public property damage, foregone tax revenue given lost productivity, and intangible costs such as a diminished quality of life. Shifting freight traffic to rail reduces the opportunities for conflict between passenger vehicles and freight vehicles.

There are also public benefits to trade corridor investments in the form of mobility improvements and roadway maintenance costs. Public mobility benefits are generated through lower fuel costs for both the passenger vehicles and the public passenger rail operators that experience less congestion and therefore higher fuel efficiency. The State's highways can experience lower maintenance costs due to freight truck traffic diverted to rail.

As part of its *Comprehensive Regional Goods Movement Plan and Implementation Strategy*, SCAG estimated the economic impacts of freight rail investments in the region. SCAG estimated that grade separations, rail, and intermodal improvements would contribute $2.9 billion to gross domestic product (GDP) in public-sector activities over the 2021-to-2045 time period. Public sector activities include government-related work (e.g., permitting, project management, planning, and design) that would be required to facilitate these investments.

Private Benefits

Trade corridor investments would potentially yield a number of benefits to both California railroads and shippers in the areas of competitiveness and system maintenance. Trade corridor investments would allow railroads to operate at higher velocities and increase operating efficiency. This improved service performance would make freight rail service in California more competitive, potentially increasing its market share as goods shift from trucks to rail. Furthermore, these types of investments would bring the rail system to an overall better state of repair as capacity and operational upgrades necessitate the replacement of aging components of the rail infrastructure with state-of-the-art components.

For Southern California, SCAG estimated that the private-sector economic impact of freight rail investments would yield a $64.2 billion contribution to GDP over the 2021-to-2045 time period. Furthermore, SCAG estimated that freight-dependent industries would be the biggest beneficiaries in terms of economic output and job creation. These include the transportation and warehousing, construction, administrative and waste services, manufacturing, and wholesale trade industry sectors.

At the statewide level, the California trade corridors that are likely to most benefit from these investments are identified by the State's top trading partners by total tonnage, as shown in Table 6.6. Illinois is the State's top trading partner, accounting for over 29 percent of total tonnage in 2013. Both the UPRR and BNSF networks connect California to Illinois. There are currently over $8 billion worth of trade corridor investments planned for the Southern California, Central Valley, and Northern California regions, which largely define the BNSF and UPRR routes through California toward Illinois. These investments will improve the overall level of service between California and its most important rail trading partner, and yield direct benefits to the private sector.

Over $7.3 billion (nearly 92 percent) of the $8 billion in planned trade corridor investments occur in Southern California. These investments will help improve the overall level of service on the portions of the BNSF and UPRR networks that connect California to Texas, the State's second most important trading partner by total tonnage. Texas accounts for 16.5 percent of California's total rail tonnage. Also along this route is Louisiana, which accounts for 3.1 percent of California's total tonnage. Not only do California's Class I rail carriers benefit from these investments in the form of direct infrastructure upgrades, shippers who transport goods along these routes benefit in terms of lower transportation costs (as captured by decreased travel times and improved reliability).

Table 6.6: California's Top 10 Trading Partners by Rail, North America, 2013

Trade Partner	Region	Total Tons		Inbound		Outbound	
		Tons (millions)	% of Total	Tons (millions)	% of Total	Tons (millions)	% of Total
Illinois	East North Central	43	29.60%	25.1	26.70%	17.9	34.70%
Texas	West South Central	24	16.50%	12.5	13.30%	11.5	22.30%
Nebraska	West North Central	7.1	4.90%	7.1	7.50%	0.1	0.10%
Kansas	West North Central	6.1	4.20%	4.1	4.30%	2	4.00%
Tennessee	East South Central	5.8	4.00%	3	3.20%	2.8	5.50%
Utah	Mountain	5.2	3.60%	4.3	4.60%	0.9	1.80%
Louisiana	West South Central	4.6	3.10%	2.9	3.10%	1.7	3.30%
Oregon	Pacific	4.1	2.80%	2.9	3.10%	1.2	2.20%
Canada	Canada	4	2.80%	3.6	3.80%	0.4	0.80%
Iowa	West North Central	3.7	2.60%	3.5	3.70%	0.2	0.50%
SUBTOTAL		**107.6**	**74.1%**	**69**	**73.3%**	**38.7**	**75.2%**
ALL OTHERS		**37.8**	**25.9%**	**25.1**	**26.7%**	**12.7**	**24.8%**
TOTAL		**145.4**	**100%**	**94.1**	**100%**	**51.4**	**100%**

Source: Surface Transportation Board Confidential Carload Waybill Sample, 2013

Grade Crossings

The benefit most commonly associated with grade-crossing investments (either their separation or the closure of a roadway) is the reduction in highway traffic delays, followed by safety improvements. Although often presented as a public-sector benefit, improved safety is actually both a public- and private-sector benefit, albeit with modest impact. By eliminating interaction between trains and roadway users, the possibility of train-roadway user incidents decreases. Crossing safety enhancements improve the workplace safety of rail employees, and reduce the railroad's exposure to the legal and financial liabilities associated with crashes—such as worker's compensation, injuries to motorists or pedestrians, and damages to property.

Safety benefits are also derived from investments in technological upgrades to grade crossings. These include four-quadrant gates, extended cantilever arms, median barriers, in-pavement LED lights, barrier gates, stationary or wayside horns, and devices that instantly report active warning system failures via cellular technology. In 2014, the North Carolina Department of Transportation installed sensors atop crossing gate masts at certain grade-level crossings. The sensors can detect if a vehicle is trapped within a four-quadrant gate, and lift the gates so that the vehicle can move to safety. The private sector benefits from investments like these, just as it benefits from the closure or separation of a crossing.

Public Benefits

Grade-crossing improvements accrue benefits differently than the other categories. They are specifically aimed at both rail and roadway users, including motor vehicles, bicycles, and pedestrians. They improve safety, a public good, across modes. Grade separations can also directly reduce roadway traffic congestion and emissions, in addition to making rail somewhat more efficient. SCAG's Comprehensive Regional Goods Movement Plan and Implementation Strategy examined certain grade separations and found that travel time and reliability (i.e., mobility) benefits to highway users constituted 65 percent of their overall benefits.[206] Safety benefits accounted for 34 percent of the benefits, and vehicle operating cost and emissions benefits each accounted for less than 1 percent of the benefits. The estimated monetary value of grade separation projects in the SCAG region is given in Table 6.7.

Table 6.7: Value of Economic Benefits of Grade Separation in the SCAG Region

Region	Travel Time and Reliability	Vehicle Operating Costs	Safety Costs	Emission Costs
SCAG	$414.1	$3.3	$219.6	$1.9

In Million Dollars, 2012
Source: Southern California Association of Governments, Comprehensive Regional Goods Movement Plan and Implementation Strategy, Appendix U (2012).

206 SCAG, *Comprehensive Regional Goods Movement Plan and Implementation Strategy*, Accessed 2017.

Private Benefits

Private benefits associated with grade-crossing investments are the operational cost savings resulting from the closing of a crossing. Grade crossings require the installation and maintenance of safety equipment, including warning signs, flashing lights, crossing gates, and the signal control box and associated equipment to operate the crossing. Installing a crossing signal system can cost $250,000 or more.[207] Maintenance costs are also considerable, because BNSF is reported to spend approximately $45 million annually on crossing signal maintenance and repair.[208] With the closing or separation of a crossing, the railroad minimizes the cost of maintaining and operating this equipment.

It is important to note, however, that there are also private-sector costs associated with grade crossing improvements. In the case of a separation, the railroad still has some financial responsibility for the construction and/or maintenance of the resulting civil works. Only in the case of a closure does the railroad realize the full financial benefit of the safety improvements.

Short Line Program

For industries that rely on bulk commodities (such as coal, gravel, and base metals) as inputs to the production process, rail access via short lines can be critical to their operations. Industries that produce heavy machinery or otherwise large, cumbersome equipment also require direct rail access, because these types of products are difficult to efficiently transport by truck over long distances. For example, the Pacific Harbor Line, serving the San Pedro Bay Ports of Los Angeles and Long Beach, lists among its customers companies representing the building materials, plastics, and petroleum manufacturing industries.[209] These industries ship and receive commodities such as steel products, liquid gas and petroleum products, and plastic pellets. Therefore, short line rail investments directly benefit shippers and receivers in those types of industries.

Public Benefits

Short line investments can contribute to economic competitiveness and attract investment from businesses that rely on short line access. This would represent new economic activity to the State if these firms relocate from outside of California or are new businesses.

A related potential public benefit of short line investments is the retention of businesses that may be forced to relocate if access is lost. Although it is difficult to measure the benefit of an event that did not occur, it stands to reason that preventing businesses that rely on short line rail access from leaving the State would save a number of jobs, and the associated local economic activity that results from workers spending their wages.

207 Indiana Department of Transportation. Accessed 2017.

208 Cotey, A., "Grade crossing equipment, technology help railroads continue quest to improve crossing safety," Progressive Railroading, January 2014, Accessed 2017.

209 Pacific Harbor Line, Inc., Accessed 2017.

Private Benefits

The analysis of rail flows discussed in Chapter 2 found that one in five shipments (19 percent of total tonnage and 18 percent of rail carload traffic) originate on a short line; and one in 12 shipments (8 percent of total tonnage and 7 percent of carloads) end their journeys on a short line. The agricultural, chemical, and building material industrial sectors all represent significant users of the short line rail system. Therefore, the amount of private-sector economic activity facilitated by California short lines is significant.

Short lines that cannot handle loaded car weights of up to 286K require shippers to either load a railcar to less than its maximum capacity, or to transload to truck at a location that can handle the heavier load. Investments that upgrade California's short lines to the 286K standard would benefit shippers by removing the additional transportation costs associated with transloading and sub-maximum railcar loading. Short line railroads also benefit from these improvements, because they are direct investments on the short line system, and help their ability to attract and retain business.

Similarly, upgrading California's short lines to the FRA Track Class 2 standard, which permits freight train speeds up to 25 mph, will also directly benefit shippers and railroads. Class 2 track allows carriers to operate at higher speeds (maximum speed allowable on Class 1 track is 10 mph), providing a productivity increase for the railroad and a decrease in transportation costs, except in the case of very short routes. Although investments in line rehabilitations and bridge and tunnel improvements do not effectively expand capacity in the same manner as improvements that yield speed and weight-capacity gains, they do bring the system to an overall better state of repair. In addition, points at which bridges, tunnels, or tracks are in poor condition represent chokepoints in the system. Repairing these components of the short line system will improve the overall level of service of short line operators.

Short Haul Program

Public Benefits

The primary public benefit to short-haul rail investments is the diversion of freight traffic from highways to rail, which results in reduced highway maintenance costs and related improvements in air quality and congestion. A 2011 report estimated that rail was three times more fuel efficient than trucking per ton-mile.[210] The same report projected 2,020 grams per ton-mile of carbon dioxide (CO2) emissions of 209 for trucks, and 44 for rail (21 percent of the truck emissions rate); particulate matter 10 microns in diameter or less (PM10) emissions of 0.012 for trucks and 0.010 for rail (83 percent); and nitrogen oxide (NOx) emissions of 0.79 for trucks and 0.53 for rail (67 percent). Therefore, any diversion of truck traffic to rail could yield significant air quality benefits, especially in the Southern California region, which historically suffers from poor air quality.

The aforementioned University of California Berkeley study found that short-haul rail intermodal service from the San Pedro Bay ports to the Inland Empire could yield a 180 percent reduction in emissions, if marine containers alone shift to rail. The air quality improvements could be even greater if a portion of domestic containers also shifted. In addition to air quality improvements, the study estimated that with a successful short-haul intermodal service, up to 2.6 million drays per year between the ports and the Inland Empire would be removed from busy Southern California's freeways.

Private Benefits

The University of California Berkeley study found that the large nationwide original equipment manufacturers operating national distribution centers in the Inland Empire would be the primary customers of short-haul rail service, and therefore, the primary beneficiaries. Another group of potential beneficiaries is comprised of the retailers operating import warehouses and regional distribution centers in the Inland Empire. The same groups of shipping customers would likely benefit from short-haul rail service in the Bay Area.

210 Connecticut Department of Energy and Environmental Protection, *Development of a Strategic Plan for Reducing Emissions Associated with Freight Movement in Connecticut*, 2011. Accessed 2017.

Another private-sector benefit is the potential that a successful short-haul rail service would create for the private development of an inland port. The co-location of warehousing, distribution, and other logistics-related industries with intermodal rail service has been a key feature of several prominent large-scale logistics developments over the past decade. Importantly, these are located some distance away from traditional seaport areas. These include the Virginia Inland Port, Alliance Texas Logistics Park, and CenterPoint Intermodal Centers in Illinois and Missouri. It is conceivable that many of these same development opportunities would be possible with the successful implementation of short-haul rail service. The San Joaquin Council of Governments' *California Inter-Regional Intermodal System* report identified the potential for industrial development as an important benefit of the successful implementation of short-haul service.

Terminal and Yard Capacity

Terminal expansions help to increase capacity at terminals that may be nearing constrained conditions. The University of California at Berkeley study, *Rail Transport and Containerized Imports Using California Ports: Past, Present, and Future*, found that rail intermodal volumes at Los Angeles Basin terminals were near or exceeding peak 2006 volumes[211]. Over this period, rail intermodal terminals throughout the Los Angeles Basin exhibited lift volumes that were—on average—90 percent of peak 2006 levels. The only exception was the period from 2009 to 2010, during which the United States was experiencing a severe recession. Importantly, Inland Empire terminals exceeded the 2006 peak by 15 percent. The acquisition of terminal capacity in the Inland Empire is a significant impediment to short-haul rail service in Southern California.

Terminal expansions and access improvements could also help to improve regional access to freight rail. These expansions benefit California railroads by allowing them to achieve a higher level of service. In turn, decreased travel times and improved reliability would then make rail service more competitive with trucks for statewide and multi-state freight movements for some commodities. This enhanced competitive position would yield a public benefit of decreased trucking activity on already busy highways. The private benefit is increased revenue from new customers. However, capacity improvements at a single terminal, or terminals within a single state, are not likely to significantly decrease travel times or improve reliability for long-haul movements unless those improvements remove a severe bottleneck.

New terminals have the potential to open up additional markets that are currently not served by rail due to capacity constraints or distance from existing terminals. Such an expansion benefits both the public sector (in the form of increased economic activity and shipping options) and the private sector (in the form of increased market competitiveness). For example, the previously cited UC Berkeley freight rail case study examined the potential to shift perishable produce from truck to rail; the perishable market was one in which rail was once very competitive in California.[212] Although the Berkeley study primarily focuses on the public sector benefits to shifting perishable produce to rail, it also discusses the private sector benefits to rail service. According to studies from the Monterey County Transportation Agency (TAMC)[213] and the Association of Monterey Bay Area Governments,[214] farmers in the Salinas Valley sometimes struggle to acquire reliable truck service. The lack of adequate truck service motivated the region to explore the feasibility of intermodal rail service. The studies concluded that there was reasonable demand to locate an intermodal ramp in the region, because it could generate 180 to 200 domestic refrigerated containers per day. The studies also found that Salinas Valley perishables would not be harmed by the switch from truck to rail. In fact, some perishables (such as broccoli and iceberg lettuce) would experience transportation cost savings. As illustrated by the case study of perishable produce, new terminals that are strategically located have the potential to capture new customers, and allow rail carriers operating in California to tap into new markets.

211 Leachman, R., *Rail Transport of Containerized Imports Using California Ports: Past, Present and Future*., (2016).

212 Seeherman, J., and M. Hansen, *Freight Rail Case Study: Case Study #1 (Opportunity), Perishable Produce*., (2016).

213 Monterey County Transportation Agency, Grower-Shipper Association of Central California. Rail Feasibility Study (2008).

214 Association of Monterey Bay Area Governments. Salinas Valley Truck to Rail Intermodal Feasibility Study (2011).

Public Benefits

Terminal expansions and new terminals could improve regional access to rail, and open up additional markets to rail service. In the event that freight traffic shifts from truck to rail, this shift could result in public benefits in the form of decreased pavement damage and GHG emissions, among others. The freight rail case study conducted by researchers at the University of California examined the potential to shift perishable produce from truck to rail. The scenario entailed rail moving a full 75 percent of the State's top three crops currently moved by rail (carrots, oranges, and potatoes)—a large increase for rail compared to trucks.[215] The study estimated benefits of at least $45.5 million per year due to reduced pavement damage ($4.8 million), GHG reduction ($11.6 million), health care savings related to local pollution reduction ($2.8 million), and crash reduction ($26.4 million). This estimate was the study's conservative benefit estimate; the potential healthcare savings ranged from $2.8 million to $77.0 million.

Private Benefits

The private benefit to terminal improvements represents a direct financial investment into infrastructure that is largely privately owned and maintained. Terminal investments (i.e., expansions, access improvements, and new construction) better position railroads to compete with other modes and capture larger shares of the market. However, these types of investments are costly and sometimes publicly unpopular, because they require the acquisition of land, and would generate new traffic through the selected community. The investment of public dollars would represent not only a cost benefit to railroads planning terminal expansions or new terminals, but also a show of public support for expanded freight capacity.

6.3.4 Environmental

Freight and passenger rail implementation can bring tremendous positive environmental and economic benefits to the State. They can also impact communities and the natural environment. The most common effects include contribution to air pollution and GHG emissions, and physical impacts such as noise and light pollution.

U.S. Environmental Protection Agency Criteria Pollutants

According to the United States Environmental Protection Agency (U.S. EPA), there are six criteria pollutants that can affect human health, the environment, and property: reactive organic gases (ROG), PM, carbon monoxide (CO), NOx, sulfur dioxide (SO2), and lead (PB).[216] Freight and passenger rail operations emit CO, NOx, ROG, and PM. Increased presence of these criteria pollutants have been linked to a variety of poor health conditions. These conditions may include:

- Reduced lung function
- Asthma and other respiratory illnesses
- Increased cancer risk
- Premature death (especially in vulnerable groups such as children and the elderly)

Emissions from rail activities also lead to ozone formation. Ozone is formed when emissions of NOx chemically react with ROG under conditions of heat and sunlight. Ozone is linked to public health impacts, including chest pain, coughing, throat irritation, and congestion. Long-term exposure can worsen existing afflictions like asthma or bronchitis, or even lead to permanently scarred lung tissue.[217]

PM is divided into two subcategories: PM10 and PM2.5 (particles less than 2.5 microns in diameter). Numerous studies have linked PM exposure to public health issues, including irregular heartbeat, asthma, decreased lung function, and increased respiratory ailments that can lead to premature death.[218]

215 Seeherman, Joshua and Mark Hansen, *Freight Rail Case Study – Case Study #1 (Opportunity), Perishable Produce*, University of California Berkeley Institute of Transportation Studies. (2016).

216 U.S. EPA, *Urban Air*, 2016.

217 U.S. EPA, *Ozone Pollution,* 2016.

218 U.S. EPA, *Health*, 2016.

Greenhouse Gas Emissions

Freight emissions comprise close to one-third of U.S. transportation GHG emissions. These emissions have grown by more than 50 percent since 1990.[219]According to the U.S. EPA, there are six key transportation-related GHG emissions that affect public health and welfare:

1. CO_2
2. Methane (CH_4)
3. Nitrous oxide (N_2O)
4. Hydrofluorocarbons (HFC)
5. Perfluorocarbons (PFC)
6. Sulfur hexafluoride (SF_6)

GHG emissions contribute to climate change. They are linked to regional and atmospheric changes that can exacerbate acid rain, ozone depletion, and damage to crops, plants, and property.

Emissions Analysis

The prior sections illustrate that improved rail services and HSR would reduce automobile and truck VMT throughout California. VMT reductions lead directly to reduced emissions of CO_2 and key mobile source pollutants.[220] Air quality emissions were forecasted for years 2020, 2025, and 2040 using the CARB Emissions Factor (EMFAC) model[221] coupled with the VMT forecasts.

Freight locomotive emissions forecasts are based on projected ton-miles traveled coupled with Emission rates published by EPA[222], and Locomotive Technology distributions available from the ARB.[223]Passenger locomotive emissions were forecast by scaling CARB's emission inventory[224] by the estimated change in passenger miles of travel.

Table 6.8 compares the carbon dioxide emissions from passenger rail service to on-road passenger vehicles, and shows the substantial emission reduction benefits of the Rail Plan. The 2020 baseline passenger train service emits about 2.4 times less CO_2 per passenger mile of travel than on-road motor vehicles. With the Rail Plan, that advantage grows to nearly 20 times less CO_2 per passenger mile of travel from passenger trains relative to on-road passenger vehicles.

Table 6.8:
Grams CO_2 per Passenger Mile of Travel by Mode

Region	2020	2040 with CSRP
On Road Passenger Vehicles (g/PMT)*	302	179
Passenger Locomotives (g/PMT)	127	9

* Based on assumed vehicle occupancy of 1.2 passengers per vehicle

219 Federal Highway Administration. Freight and Air Quality Handbook, May 2010.

220 The Rail Plan analysis included reactive organic gases (ROG), oxides of nitrogen (NOx), carbon monoxide (CO), large particles (PM_{10}), and small particles ($PM_{2.5}$).

221 The 2018 Rail Plan analysis used the EMFAC 2011 model.

222 U.S. EPA Emission Factors for Locomotives, Office of Transportation and Air Quality, EPA-420-F-09-025, April 2009.

223 Nicole Dolney and M. Malchow, Locomotive Inventory Update: Line Haul Activity, CARB tech distribution ref. (Presentation), November 7, 2014, California Air Resources Board, Accessed 2016.

224 CARB, ARB's Emission Inventory Activities, California Air Resources Board (2016)

Table 6.9 summarizes statewide air quality emissions by analysis year and passenger rail corridor. The column titled "No Action Emissions" shows total statewide on-road mobile source emissions by pollutant and analysis year. "No Action" assumes that the Rail Plan is not adopted. The remaining columns indicate emissions reduction attributable to both on-road mobile sources and locomotives in each passenger rail corridor, arising from the modeled planning scenarios. Each row shows emission reductions for the indicated year; the values are not cumulative between years.

Table 6.9: Annual Statewide Emission Reduction

No-Action Emissions (Tons/Day)				Change in Locomotive and On-road Emissions with the Rail Plan (Tons/Day)					
Year	On-Road	Loco-motives	Total (On-Road and Loco-motives)	Bay Area and N. Calif.	Greater LA and LOSSAN South	LOSSAN North and Central Coast	Las Vegas HSR and Inland Empire	Central Valley	Statewide Total
Carbon Dioxide (CO_2)									
2020	470,828	8,101	478,929	(718)	(1,742)	(233)	(216)	(1,351)	(4,259)
2025	454,565	8,682	463,247	(1,077)	(2,612)	(349)	(324)	(2,026)	(6,389)
2040	405,777	10,424	416,201	(2,154)	(5,225)	(699)	(648)	(4,052)	(12,778)
2040 High	405,777	10,992	416,769	(2,154)	(5,225)	(699)	(648)	(4,052)	(12,778)
Reactive Organic Gases (ROG)									
2020	356.56	5.91	362.47	(0.29)	(0.65)	(0.08)	(0.09)	(0.50)	(1.60)
2025	294.35	6.30	300.65	(0.43)	(0.97)	(0.12)	(0.13)	(0.75)	(2.40)
2040	107.73	7.47	115.20	(0.87)	(1.94)	(0.24)	(0.26)	(1.50)	(4.81)
2040 High	107.73	7.85	115.57	(0.87)	(1.94)	(0.24)	(0.26)	(1.50)	(4.81)
Oxides of Nitrogen (NO_x)									
2020	892.06	110.69	1,002.75	(0.70)	(0.34)	0.36	0.23	(0.67)	(1.11)
2025	723.03	118.02	841.05	(1.05)	(0.51)	0.54	0.35	(1.01)	(1.67)
2040	215.93	140.02	355.95	(2.09)	(1.03)	1.09	0.70	(2.01)	(3.34)
2040 High	215.93	147.16	363.09	(2.09)	(1.03)	1.09	0.70	(2.01)	(3.34)
Carbon Monoxide (CO)									
2020	2,892.97	20.24	2,913.21	(1.74)	(4.37)	(0.67)	(0.69)	(3.17)	(10.65)
2025	2,354.50	21.59	2,376.09	(2.62)	(6.56)	(1.00)	(1.03)	(4.76)	(15.97)
2040	739.10	25.63	764.73	(5.23)	(13.12)	(2.00)	(2.06)	(9.52)	(31.94)
2040 High	739.10	27.11	766.21	(5.23)	(13.12)	(2.00)	(2.06)	(9.52)	(31.94)
Large Respirable Particles (PM_{10})									
2020	76.17	3.79	79.96	(0.16)	(0.36)	(0.05)	(0.05)	(0.29)	(0.91)
2025	74.26	4.05	78.30	(0.24)	(0.54)	(0.07)	(0.07)	(0.44)	(1.36)
2040	68.52	4.80	73.32	(0.48)	(1.08)	(0.14)	(0.14)	(0.88)	(2.72)
2040 High	68.52	5.06	73.58	(0.48)	(1.08)	(0.14)	(0.14)	(0.88)	(2.72)
Fine Particles ($PM_{2.5}$)									
2020	41.29	3.67	44.96	(0.07)	(0.15)	(0.01)	(0.02)	(0.12)	(0.37)
2025	37.98	3.92	41.90	(0.11)	(0.22)	(0.02)	(0.02)	(0.19)	(0.56)
2040	28.06	4.65	32.71	(0.22)	(0.44)	(0.04)	(0.05)	(0.37)	(1.12)
2040 High	28.06	4.90	32.95	(0.22)	(0.44)	(0.04)	(0.05)	(0.37)	(1.12)

Sources: AECOM, T. Kear Transportation Planning and Management, Inc., and Cambridge Systematics Inc., 2017.

The service plan assumptions, detailed in Chapter 4, are projected to reduce statewide emissions, but at a magnitude of only about 3 to 4 percent for all of the pollutants except NOx, which is reduced by about 1 percent, despite 88 million daily passenger miles diverted to rail from highways and an increase of 92 million daily passengers miles on rail as a result of Rail Plan investments. Reductions are largest in the regions directly served by the improvements to the rail system, and for corridors served by HSR. Calculation details are provided in Appendix A.

This emissions analysis reflects vehicle travel reduction due to mode shifts from personal vehicles to passenger rail, and residual congestion reduction from this mode shift. Additional emission reduction might arise from: 1) improved rail system efficiency through reduced locomotive idling and improved locomotive fuel economy; 2) reduced aircraft operations from air to rail modal shifts; 3) reduced vehicle acceleration and deceleration from highway bottleneck elimination; and 4) shifting of freight from trucks to trains.

Rail Mode Share

Current: 0.34%

2040 No Build: 0.52%

2040 Vision: 6.8%

- 88 million passenger miles diverted to rail from highway
- Overall annual increase of 92 million passenger miles by rail

Exhibit 6.8: Rail Mode Share shift in 2040 Vision

6.4 Rail Studies and Reports

6.4.1 Coordinating Rail Policies and Plans

The 2022 project list and service goals were developed by reviewing recent and ongoing strategic, vision, and service plans published by stakeholder passenger rail agencies and service providers around the state. Those plans were used to identify near-term goals, and to begin the implementation planning toward the 2040 Vision.

Existing Rail Plans

Those plans include, but are not limited to:

- ACE*forward*, 2015
- Amtrak FY2015 Budget and Business Plan, 2015
- Amtrak Strategic Plan 2014-2018
- BART Sustainable Communities Operations Analysis, 2013
- Bay Area Council Economic Institute – The Northern California Megaregion, 2016
- Caltrain Strategic Plan, 2014
- Capitol Corridor Business Plan, 2015
- CCJPA Business Plan FY 2015-2017
- CCJPA Vision Plan, 2014
- CHSRA 2016 Business Plan
- CTC Annual Report to the California Legislature, 2014
- FRA Southwest Multi-State Rail Planning Study, 2014
- LA Metro Long Range Transportation Plan, 2009
- LOSSAN Rail Corridor Agency Business Plan FY 2015-2017
- Monterey Bay – 2035 Metropolitan Transportation Plan / Sustainable Communities Strategy, 2014
- NCTD Comprehensive Strategic Operating and Capital Plan FY 2016
- Sacramento Regional Transit District – Strategic Plan 2015-2020
- SCAG – Regional Transportation Plan / Sustainable Communities Strategy, 2012
- SFMTA Strategic Plan FY 2013-2018
- SJJPA 2015 Business Plan
- TAMC 2014 Monterey County Regional Transportation Plan
- VTA – VTP2040

6.4.2 Environmental Policy

Freight and passenger rail implementation can bring tremendous positive environmental and economic benefits to the State. They can also impact communities and the natural environment. The most common effects include contribution to air pollution and GHG emissions, and physical impacts such as noise and light pollution.

As mentioned in Chapters 1 and 3; in recent years, California has enacted several laws and executive orders to reduce climate change–inducing GHG emissions through efficient land use and transportation planning, increased energy efficiency, and other actions.

Executive Order S–3–05, signed in 2005, established State GHG emission reduction targets to reduce California's contribution to global climate change. The Global Warming Solutions Act, AB 32, signed into law in 2006, expanded on these goals. It requires that California's GHG emissions be reduced to 1990 levels by the year 2020 (Chapter 488). AB 32 is a multi-sector, interdisciplinary approach to reducing GHG emissions in the State. In accordance with its responsibilities under AB 32, the CARB adopted a *Scoping Plan* in December 2008 (readopted in August 2011) that quantified the statewide GHG emission reduction target, and identified reductions that would result from specific programs. This included the HSR project, which is expected to reduce GHG emissions by 1 million metric tons annually in CO2 equivalent. Other related legislative bills outline individual regulations for specific sectors.

SB 375 – the Sustainable Communities and Climate Protection Act of 2008 – promotes integrated transportation and land use planning to reduce GHG emissions from passenger vehicle travel, and help California meet AB 32 goals. SB 375 requires CARB to develop regional GHG emissions reduction targets

for passenger vehicle travel, setting benchmarks in 2020 and 2035 for each of the State's 18 MPOs. SB 375 requires that California's MPOs each draft an SCS as part of their RTP, which describes the transportation and land use strategies the MPO regions will use to meet the regional GHG emissions reduction targets established by the CARB.

Although SB 375 has a regional focus, SB 391 highlights the critical roles that Caltrans and other State agencies play in addressing interregional travel issues, including the reduction of GHG emissions associated with interregional travel. The California Interregional Blueprint (CIB) defines strategies to address interregional travel needs, while ensuring that CTP 2040 identifies statewide policies and investment priorities needed to support the State's GHG emission reduction goals. These goals include reducing GHG emissions to 80 percent below 1990 levels by 2050, as called for in Executive Order S-3-05.

6.4.3 Future Planning Studies

The Rail Plan is ultimately an iterative strategic document. It will be updated every 4 years, scaled and adjusted as the State rail network is built out, and as market factors and other key indicators, like climate change, dictate. Undoubtedly, the scope and detail of specific services and projects will continue to be refined in future revisions to this document. Ongoing planning studies are particularly important to integrating networks to ensure the right investments are being made, in the right markets, at the right time. When done properly, thorough and consistent planning will guide State policymakers and regional stakeholders through the ongoing process of optimizing current investments, and scaling appropriately toward an effective and integrated regional and statewide network.

While capital rail improvements and studies across the state are ongoing, the Rail Plan intends to conduct planning studies with the help of local and regional partners in the Rail planning regions; to be completed in the near-term (2022) time horizon for possible project implementation, either in the mid- or long-term time horizons.

Statewide

- **Statewide Grade Separation Corridor Prioritization Study.**
  Although Caltrans and the CPUC put out an annual lists of prioritized grade separation projects, an additional study or criteria is needed to consider grade separations not as stand-alone safety or traffic relief projects, but rather as rail corridor based projects. When organized and pursued strategically as part of an identified corridor, grade-separation projects can dramatically improve rail capacity and passenger service.
- **Statewide Inter-Agency Service Integration Plan**
  The 2040 Vision describes in great detail the types and intensities of service to be provided in various corridors around the state. However, more study is needed to make recommendations on rail governance and service integration to ensure that the various rail providers can proactively align and scale their services as the statewide network comes online.
- **Study of Potential Future Freight Rail Impacts Related to 'Self-Driving' Trucking Technology**
  The Rail Plan is written in a dynamic time for new technology in the trucking industry. A number of private-sector efforts are under way to bring various self-driving or driverless vehicle technologies to trucking. These technologies are in relatively early stages of development, and exist on a spectrum from advances in driver assistance like automatic braking capabilities, to "platooning," where one or more driverless trucks automatically follow a traditional human-driven truck, to full automation of truck operations. The ultimate adoption and scalability of these technologies is unknown, but could have major impacts on the freight rail industry, including potential traffic diversions. A comprehensive study is needed to understand the opportunities and challenges these technologies may present for the rail industry; where and how the technology would be applicable in ways that compete or complement freight rail; potential impacts on highway maintenance resulting from new trucking volumes (some arising from diversions from rail); and the ways in which the State can plan for infrastructure investments accordingly.

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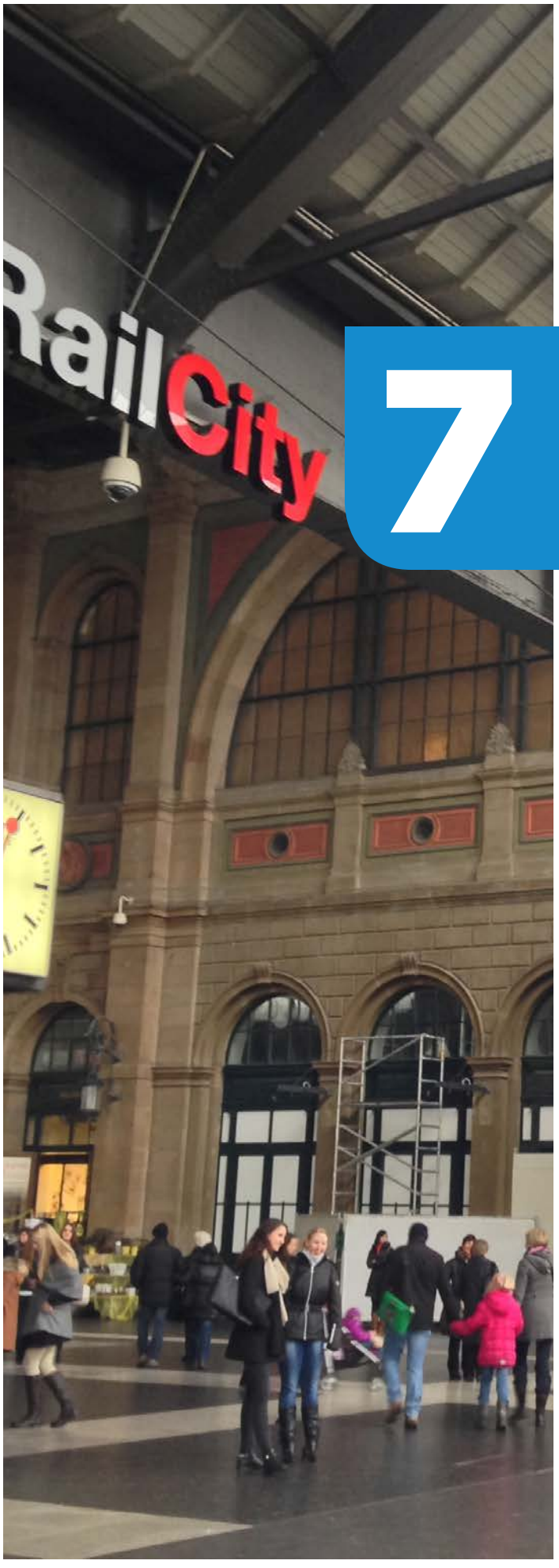


7 Public Outreach

Planning for rail is much different than planning for street and highway systems. As the previous chapters have detailed, the State largely does not own the infrastructure; there are many public and private players involved in planning services and improvements on the infrastructure; and there are additional hurdles, including first-mile/last-mile connections, that create barriers to rail access. Because of this, early, continuous, and meaningful engagement with rail stakeholders and the public was imperative to the creation and future success of the Rail Plan. This chapter summarizes public outreach for the Rail Plan. It provides an overview of the methods and specific steps used to engage the general public and interested stakeholders. This chapter also describes outreach and consultation with Native American Tribes.

7.1 Public and Agency Participation Approach

The development of a visionary, integrated statewide rail network, as has been developed in this Rail Plan, required equally robust and comprehensive outreach to ensure that the State's vision was developed in a manner consistent with regional plans and priorities. In developing a new statewide vision for both passenger and freight rail, Caltrans engaged stakeholders and the public through early and thoughtful outreach to achieve some measure of consensus for a statewide rail network that not only integrated passenger rail for a seamless customer experience, but defined the State's goals for investing in freight rail infrastructure. The effort involved a complex passenger and freight rail planning process that provided an opportunity for the State to establish a vision (detailed in Chapter 3) for a statewide passenger rail network that addresses multi-modal connections between rail, intercity bus, and transit service. To achieve this goal, the Rail Plan was closely coordinated with other statewide planning efforts, and incorporates several iterations of public and agency input and feedback.

To ensure a comprehensive outreach strategy, the study team developed a Public Involvement and Stakeholder Outreach Plan (PISOP) and a Native American Tribal Coordination and Outreach Plan (NATCOP). These documents outline the methods, goals, and objectives for outreach to stakeholders for the Rail Plan.

7.1.1 Public Involvement and Stakeholder Outreach Plan

The PISOP for the Rail Plan sets forth the public involvement strategies and tasks to support and further develop the plan. The outreach tasks outlined in the PISOP were designed to promote an ongoing discussion with the Rail Plan stakeholders to proactively engage them, listen to them, inform them, and address their questions and concerns throughout the process.

The primary purpose of the PISOP was to obtain meaningful opinions, comments, and suggestions on the Rail Plan from interested and affected parties throughout the state. The PISOP also aimed to build ownership and support for rail transportation consistent with the Caltrans commitment to public involvement and engagement, as stated in the 2013 Public Participation Plan. Public outreach focused on engaging key stakeholders and the California public to help shape the Rail Plan by providing input on issues, including the various types of rail service (intercity passenger rail, commuter rail, HSR, and freight rail), State policies, system operations, community impacts, environmental considerations, and funding. Information was also disseminated and input was gathered on service in the existing and proposed intercity passenger rail corridors and for HSR.

The goal was to conduct a transparent and inclusive planning process that was fully integrated and consistent with existing and ongoing Caltrans and statewide planning efforts, and that engaged stakeholders early in the process.

The following are the goals for the public outreach program in support of the development of the Rail Plan:

- Ensure that the statewide rail community and interest groups understand Caltrans' role in state rail planning and its vision for the state and feel engaged in its development.
- Conduct a transparent, inclusive, and inviting outreach campaign that leads to the development of a comprehensive Rail Plan.
- Ensure that the messaging regarding the Rail Plan is consistent with the plans and programs of the CHSRA.

- Implement an outreach program whose messaging is consistent with other statewide planning documents.

The outreach program objectives are as follows:

- Increase awareness of the Rail Plan in Caltrans districts and improve public awareness through collaborative efforts that capitalize on existing communication programs.
- Provide easily understood, concise, and multi-lingual project information that fosters project education and garners public interest and input.
- Apply recognizable project branding and foster relations with media venues that will serve as long-term public portals for obtaining state-wide rail information.
- Ensure environmental justice, Native American, and other disenfranchised groups are part of the public process.
- Create an opportunity for key stakeholders to provide valuable input that improves decision making and leads to better project delivery.
- Improve statewide stakeholder communication and collaboration between the various rail corridors.
- Communicate Caltrans' key messages of safety, mobility, delivery, stewardship, service, and sustainability.
- Communicate how the State is responding to Senate Bill 391 legislation[229] and GHG targets and associated legislation.
- Develop and implement a communication framework that moves the Rail Plan project toward approval by necessary agencies with support from the general public.

7.1.2 Native American Tribal Consultation and Outreach Plan

The NATCOP sets forth strategies and tasks to ensure timely inclusion of Native Americans in the overall development process for the Rail Plan. The guiding approach was to ensure effective, transparent, and mutually informative Native American consultation, and maintain consistency with existing, successful methods and outreach efforts implemented by Caltrans.

The following outreach goals were pursued for the NATCOP in support of the development of the Rail Plan:

- Conduct early, timely, and comprehensive outreach and government-to-government consultation.
- Appoint three Native American representatives from different parts of the state to be members of the California State Rail Plan SAC.
- Ensure that Native Americans are aware of and understand Caltrans' role in state rail planning, and its vision for the state.
- Implement a complementary and coordinated outreach program with ongoing Tribal, regional, statewide, and interstate planning efforts, to the extent feasible.
- In addition to the outreach goals, NATCOP objectives included, but were not limited to, the following:
- Provide easily understood and concise project information that fosters project education and garners Native American input.
- Establish recognizable project branding and media venues that will serve as long-term portals for Native American groups to obtain statewide rail information.
- Ensure that Native Americans are part of the public process, while fostering ongoing government-to-government consultation.
- •Create opportunities for interested Native Americans to provide valuable input that improves the decision making and leads to better project delivery.

229 Senate Bill 391 requires Caltrans to update the California Transportation Plan every 5 years to show how to achieve statewide GHG reduction consistent with Executive Order S 3 05.

7.1.3 Public Noticing and Commenting Process

To ensure a robust noticing program, the study team used both traditional and Internet based noticing for the public meetings in support of the release of the Draft Rail Plan. Email notifications were sent to the stakeholder list, and press releases were issued at key milestones for the Rail Plan, including the launch of the planning process, the project website, and the start of the public review period of the Draft California State Rail Plan.

The commenting process included a project email address (RailPlan@dot.ca.gov) and California State Rail Plan website comment form (www.californiastaterailplan.com). Opportunities for public comment were also provided through the California State Rail Plan survey (results in Appendix A.7), the online Interactive Map, and during the public workshops on the Draft Rail Plan, which were held in spring 2017.

7.1.4 California State Rail Plan Website

The California State Rail Plan website was launched in January 2016, to provide a central location for the public to find informational materials, notices regarding upcoming California State Rail Plan milestones, media links, the early engagement survey, and an opportunity to submit comments. The website provides general information regarding the California State Rail Plan purpose and process, contact information, and informational materials such as Native American listening session summaries, factsheets, and survey summary reports. The California State Rail Plan website can be accessed at www.californiastaterailplan.com.

7.1.5 California State Rail Plan Factsheet

Caltrans developed and distributed a factsheet (Exhibit 7.1) and presentation materials during development of the California State Rail Plan to communicate key concepts and elements being considered in the Plan. Documents were published and made available on the California State Rail Plan website, at outreach events such as SAC meetings and public review draft meetings, and for presentations made by staff.

CALIFORNIA STATE RAIL PLAN

2018 california state rail plan

CONNECTING CALIFORNIA...BETTER

Caltrans is beginning work on its new 2018 Rail Plan which will provide an exciting new framework for California's rail network and set the stage for new and better rail and community connections in the State for the next 20 years and beyond.

The creation of a railroad network in California in the 19th century connected us to the rest of the nation with what was then the highest-speed form of transportation. Continued rail investments in the 20th century helped California's rapid economic development. For the 21st century, California is again poised to put "high speed" back in rail, and achieve a modernized and integrated rail system to improve both freight and passenger transportation.

Rail Can Provide
SIGNIFICANT SOLUTIONS TO TODAY'S TRANSPORTATION CHALLENGES:

- Rail provides a safe, quality and efficient transportation choice for Californians who collectively take billions of trips to millions of destinations each year
- Rail provides a cost-effective, and often best-value, investment in transportation infrastructure that minimizes impacts on our communities and supports economic growth.
- Rail can alleviate significant levels of highway and air transportation congestion in our highly urbanized state. Especially considering that our population is expected to grow to nearly 50-million by 2040.
- Rail, including electrified rail, is an effective way to help achieve the state's greenhouse gas emission targets and achieve other air quality benefits.

What is the
2018 CALIFORNIA STATE RAIL PLAN?

The 2018 Rail Plan will present a vision and strategies for California's future passenger and freight rail network that will guide state investments supporting implementation of an integrated rail network. It also fulfills state and federal rail plan requirements. The Rail Plan is not being developed in a vacuum - it is an important element in the comprehensive examination of statewide transportation investment strategies tied to the 2040 California Transportation Plan which seeks to build on regional initiatives for curbing greenhouse gas emissions and climate change by coordinating statewide planning for all transportation modes, including air, roads and highways, local and regional public transit, and passenger and freight rail.

See the website **www.californiastaterailpllan.com** for more information.

THE RAIL PLAN'S MISSION

The mission of the 2018 Rail Plan is to provide a safe, sustainable, integrated, and efficient California rail network that successfully moves people and goods while enhancing the State's economy and livability.

WHAT WILL BE DIFFERENT
from the 2013 Rail Plan?

The 2018 Rail Plan is more ambitious than previous Caltrans rail plans, as it will provide a vision for a more comprehensive integration of freight and passenger rail – with a focus on better timed connections and more transportation options. The 2018 Rail Plan will also address how rail can help achieve statewide greenhouse gas emissions mandates.

STAKEHOLDER ENGAGEMENT

Caltrans convened a Stakeholder Advisory Committee in November 2015 as a technical working group to provide input and expertise in the development of the California State Rail Plan. The committee meets quarterly through August 2017, and includes passenger rail operators, planning agencies, freight rail interests, Tribal Nations, private railroads, ports, transit operators, and neighboring states. Advocacy groups representing environmental, disadvantaged community, livable community/active transportation and agricultural interests have also been invited to participate. A full roster of participating agencies is available on www.californiastaterailplan.com/about

In addition, Caltrans developed a focused Native American outreach program for the 2018 Rail Plan which includes appointing three Native American tribal representatives to the Stakeholder Committee, tribal listening sessions early in the formal process, formal consultation options for the draft 2018 Rail Plan, and providing and obtaining regular updates from the Native American Advisory Council.

CONTACT US

E-mail:
Railplan@dot.ca.gov

Website:
www.californiastaterailplan.com

2018 california state rail plan

PROJECT SCHEDULE

July 2015	Preparation of the 2018 Rail Plan began
Early 2016	A public survey will be available online at the Rail Plan website for individuals to provide early input on rail issues and opportunities
Spring 2017	A draft of the Rail Plan will be available to the public for review and provide feedback during a public comment period
Mid-2018	The final Rail Plan will be released, including responses to public comments

How you can **GET INVOLVED**

This Rail Plan planning process is being designed to allow for early and meaningful public participation throughout, with several options for input and feedback.

- Sign up to receive e-mail updates and notifications on the Rail Plan planning process
- Provide comments through the website's online comment form
- Participate in the online survey, which will be available in early 2016
- Attend public meetings, and provide feedback on the Draft Plan during the Public Comment Period in March and April of 2017
- Bookmark the website and check it often for updates

For more information on how to participate in the planning process, visit the project website at **www.californiastaterailplan.com**.

Exhibit 7.1: Factsheet

7.1.6 Early Engagement Survey

As part of the effort to develop the Rail Plan, Caltrans released a survey in January 2016 seeking public input early in the planning process. The survey was available through the Caltrans website and was distributed to an extensive mailing list for the Rail Plan, through organizations and rail providers represented on the California State Rail Plan SAC, press releases, and Amtrak and Caltrans social media sites. The survey received a total of 2,189 responses between January 27, 2016, and March 4, 2016.

The goal of this survey was to obtain input from a large range of current and potential rail riders in California to help guide the development of the Rail Plan, which will present a vision for California's future passenger and freight rail network, and address strategies to achieve a modernized and integrated rail system.

Survey questions inquired about respondents' current use of California rail, their opinions on the current state of California rail, and their highest priorities for improving California rail in the future. Additional optional demographic questions helped garner general information on respondents' affiliations, age, gender, income, race, and contact information. Providing that information allowed them to enter them into a raffle for a $50 Amtrak gift card; five winners from across the state were randomly selected.

According to the survey responses, the top priorities and themes were:

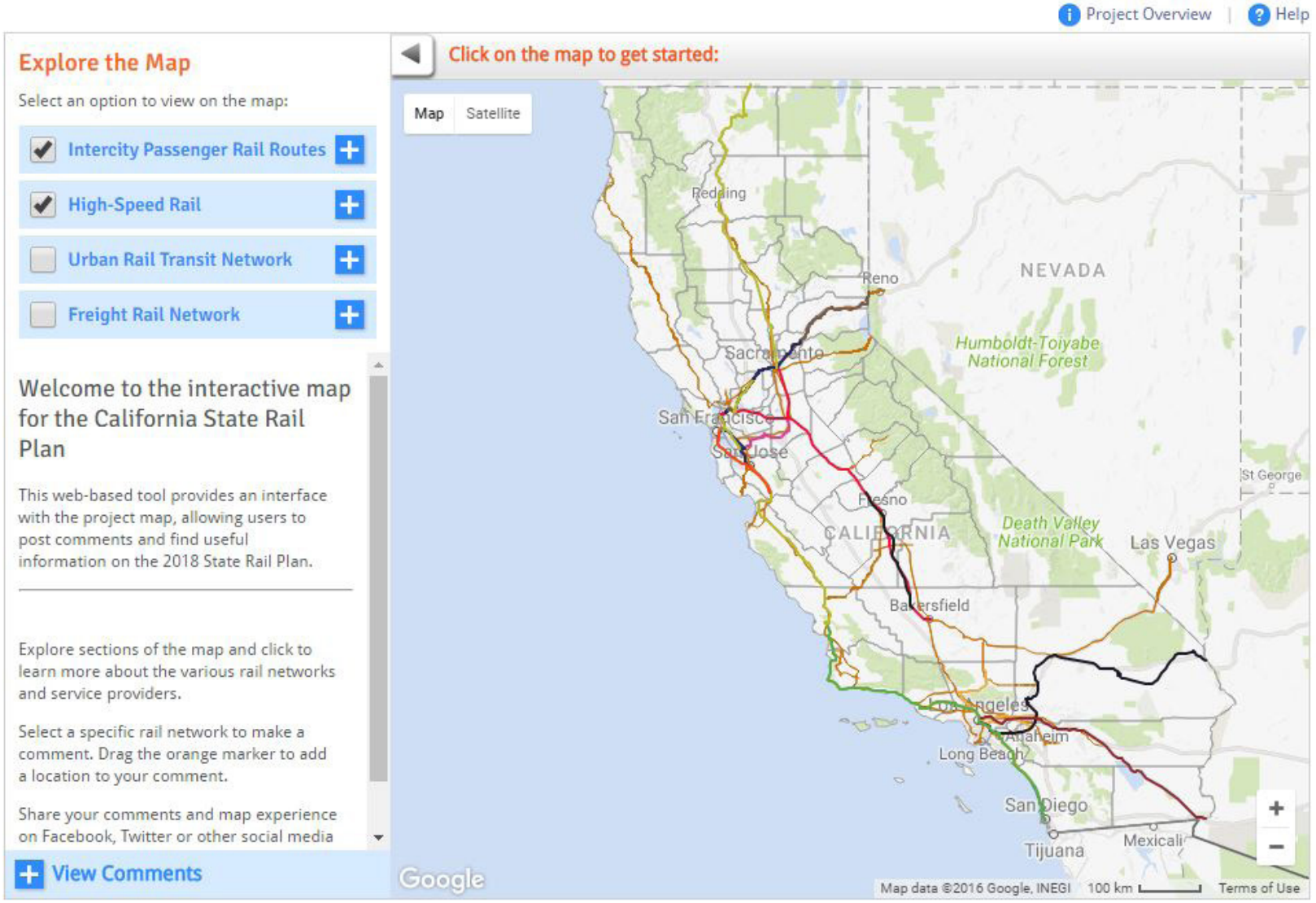
- To expand coverage and increase service for passenger rail. (These were the top two priorities for improving passenger rail and the top two factors preventing people from using rail regularly. Additional priorities were to improve transfers, connections with local transit, reliability, and on-time-performance.
- The majority of respondents choose rail because they enjoy riding the train, and the train is often cheaper than driving or flying.
- The respondents use or would like to use rail for a variety of different reasons, from leisure travel to commuting.
- The highest priority for safety improvements was to improve crossings with grade separations.

A detailed summary of the survey results (Exhibit 7.2) was posted to the California State Rail Plan website (www.californiastaterailplan.com), and is included in Appendix A.

7.1.7 Interactive Map

An online Interactive Map (Exhibit 7.3) was developed to illustrate the existing statewide rail network, the 2040 rail vision, and the network integration of the Rail Plan. The Interactive Map is available online at www.californiastaterailplan.com, and can also be accessed directly at http://csrp.civicresource.com/projects/2040/. The Interactive Map is a tool to educate project stakeholders and garner public input. Users can zoom into specific areas of interest such as statewide rail corridors, rail routes, transit stations, and cities, and provide geo-coded comments and share them via social media. Due to the strategic, programmatic nature of the Rail Plan, the interactive map does not depict detailed information about planned alignments for new rail facilities identified in the Rail Plan.

Exhibit 7.2: 2018 California Rail Plan Survey Summary Report



This tool allows users to explore various rail networks and service providers throughout California and submit comments for consideration in the development of the California State Rail Plan.

Exhibit 7.3: Online Interactive Map

7.1.8 Network Integration Strategic Service Planning Engagement

Customized 'term sheets' of regional and statewide service goals and delivery options were created to organize strategic planning in a network and corridor-based approach. Term sheets are discrete descriptions of service goals and options for capital improvements in a given corridor that build toward the integrated statewide network defined in the 2040 Vision. Importantly, term sheets articulated geographically specific goals and delivery options as scalable, operator neutral, and necessarily integrated with local planning initiatives. In practice, term sheets were a useful tool for engaging stakeholders and refining implementation strategies in an iterative process. Chapter 4 provides a detailed description of the established service goals. Chapter 6 outlines delivery options and capital costs.

To engage passenger rail agencies and other stakeholders with the term sheets, Caltrans organized meetings across the state, based on relevant geography and expertise. Feedback from these discussions was integrated through an iterative process, and ultimately aggregated into refined service goals and related capital costing in the 2040 vision.

Caltrans conducted 29 NISSP agency meetings. A list of these meetings is presented in Appendix A.

Michael Fischer presents at the August 23, 2016, Stakeholder Advisory Committee Meeting in Sacramento

7.2 Stakeholder Involvement in State Rail Plan Preparation

A primary goal for the outreach process for the Rail Plan was to develop a plan integrated with other public-sector transportation plans, as well as to recognize and address the issues and concerns of key stakeholders. Accordingly, as part of the Rail Plan's development, other statewide and regional planning documents were consulted. As noted in Chapter 1, these plans included Federal and State plans, as well as regional plans generated by MPOs and regional transportation planning agencies. Furthermore, as noted in this chapter, the outreach conducted for the Rail Plan included regional public transportation planners, freight and passenger rail operators, environmental and community advocates, and Native American representatives. Lastly, input on the Rail Plan has been sought from neighboring states—Arizona, Oregon, and Nevada.

7.2.1 Stakeholder Advisory Committee

The SAC was convened by Caltrans in November 2015 as a technical working group to provide input and expertise in the development of the Rail Plan. The purpose of the SAC was to provide Caltrans with policy guidance and technical information on all aspects of the plan.

The California State Rail Plan SAC included representatives from diverse groups, including passenger rail operators, planning agencies, freight rail interests, Tribal Nations, private railroads, ports, transit operators, and neighboring states. Advocacy groups representing environmental, disadvantaged communities, livable community/ active transportation, and agricultural interests also participated on the committee.

Caltrans met with the SAC periodically to provide updates on the progress of developing the Rail Plan, and to gather input from various agencies, organizations, and other stakeholders on the content of the Rail Plan. Notes summarizing topics discussed at the SAC meetings can be found in Appendix A.

This SAC roster consists of representatives from the following:

State and Federal Partner Agencies

- California Department of Transportation
- California State Transportation Agency
- California High-Speed Rail Authority
- Federal Railroad Administration
- California Transportation Commission
- California Air Resources Board
- California Public Utilities Commission
- California Governor's Office of Business & Economic Development

Passenger Rail and Transit

- Amtrak
- Capitol Corridor Joint Powers Authority/ Northern California Rail Partners
- San Joaquin Joint Powers Authority/Altamont Corridor Express
- Los Angeles-San Diego-San Luis Obispo Rail Corridor Agency Joint Powers Authority
- Los Angeles County Metropolitan Transportation Authority
- Caltrain
- Sonoma-Marin Area Rail Transit
- North County Transit District
- Southern California Regional Rail Authority
- California Transit Association

Freight Rail

- Union Pacific Railroad
- BNSF Railway
- California Short Line Railroad Association
- Genesee & Wyoming Inc.
- California Association of Port Authorities/ California Airports Council
- California Freight Advisory Committee Representative
- Pacific Merchant Shipping Association (California Freight Advisory Committee Representative)

Regional Planning

- California Association of Councils of Governments
- Metropolitan Transportation Commission
- Southern California Association of Governments
- San Joaquin Valley Regional Policy Council
- Sacramento Area Council of Governments
- San Diego Association of Governments

Advocates

- The Nature Conservancy
- California Farm Bureau Federation
- Local Government Commission

California State Agencies and Neighboring States

- Arizona Department of Transportation
- Nevada Department of Transportation

Tribal Representatives

- Northern California Tribal Chairmen's Association
- Central California Tribal Chairmen's Association
- Southern California Tribal Chairmen's Association

Additional Network Integration Strategic Service Planning Agency Engagement

- Placer County Transportation Commission
- Alameda County Transportation Commission
- Santa Cruz County Regional Transportation Commission
- San Benito Council of Governments
- Transportation Agency for Monterey County
- San Luis Obispo Council of Governments
- Santa Barbara County Association of Governments
- San Bernardino Associated Governments
- Metrolink
- San Diego Metropolitan Transit System

In addition to serving as a body for providing input and expertise for the California State Rail Plan, the SAC also served as a channel for disseminating information to the public. The California State Rail Plan outreach team coordinated with the SAC to provide updates, surveys, and opportunities to comment on the Rail Plan using each stakeholder's contact lists and constituencies. For example, the study team disseminated the early engagement online survey to all members of the SAC, who were then able to publicize the survey to their respective groups. This resulted in an overwhelmingly successful response, with the public survey garnering nearly 2,200 responses in just over a month.

7.2.2 Interstate Coordination

The railroad network and the flow of goods and passengers on trains routinely cross state boundaries, as well as international borders. Many freight and passenger rail corridors serve multiple western states and Mexico. For example, proposed HSR services would link Los Angeles with Las Vegas and Phoenix. Therefore, the Rail Plan should coordinate with neighboring states and Mexico, where applicable.

Arizona

CalSTA met with the Arizona Department of Transportation in Phoenix on June 21, 2016, for the purpose of discussing coordination between the states. Arizona is currently beginning the process of updating its 2011 State Rail Plan, in conformity with FRA guidance. Both California and Arizona discussed the potential study of HSR services between Los Angeles and Phoenix, and interim strategies to improve services while HSR was being studied. Arizona agreed to be a member of the California State Rail Plan SAC, and has been an active participant in the meetings through teleconferencing.

Mexico

Caltrans and CalSTA have coordinated with SANDAG in efforts to examine better ways to improve public transportation and intercity passenger rail services to San Diego, with connections to the international border at Tijuana as part of the network integration planning process. Caltrans and CalSTA met with SANDAG in San Diego on July 13, 2016, to discuss these network integration strategies. SANDAG is an active member of the SAC.

Nevada

Caltrans and CalSTA have coordinated with the Nevada Department of Transportation and Nevada High Speed Rail Commission on future HSR connections between California and Nevada. The Rail Plan supports the implementation of HSR between Los Angeles and Las Vegas. Caltrans is also coordinating with Nevada to provide intercity connections to Reno. Nevada agreed to be a member of the California State Rail Plan SAC, and has been an active participant in the meetings through teleconferencing.

Oregon

Caltrans submitted the Draft 2018 California State Rail Plan to the Oregon Department of Transportation to provide the State of Oregon with an opportunity to review and comment on the Plan.

7.2.3 Rail Partners Working Group

The ad hoc Rail Partners Working Group was formed to review technical approaches and methods for developing the Network Integration Strategic Service Plan. The ad hoc Rail Partners Working Group consisted of representatives from Caltrain, CCJPA, COASTER, LOSSAN JPA, Metrolink, SJJPA, SMART, North County Transportation District (operator of COASTER and SPRINTER), and the CHSRA.

The ad hoc Rail Partners Working Group convened three times during the development of the Rail Plan. The first meeting was conducted on September 1, 2015. The purpose of this first meeting was to acquaint the ad hoc Rail Partners Working Group with the concepts and benefits of an integrated passenger rail network that focuses on the customer experience, and is oriented towards service enhancement and delivery; and to subsequently seek their comments and suggestions as the network integration planning proceeded. Presentation materials included system connectivity maps and vision scenarios. The group was invited to provide feedback to inform the further refinement of integrated network planning scenarios.

The second meeting of the Rail Partners Working Group was a series of breakout sessions by geographic region conducted in Northern and Southern California, designed to concentrate on further refinement of the service delivery maps developed in response to comments from the initial introductory meeting. These meetings occurred in Sacramento and San Diego in January 2016.

The third meeting was in Los Angeles in April 2016; the meeting was timed to coincide with the California Rail Summit.[230] The purpose of this meeting was to present preliminary vision statements, supported by planning principles used to articulate the vision. Initial freight forecasts and a discussion of the market assessment tool were provided, in addition to rough estimates of potential changes in ridership. A case study from Toronto was presented by an invited speaker working on the GO Transit network integration with VIA Rail and the Toronto Transit Commission. The benefits of electrification and more frequent service were discussed. The ad hoc Rail Partners Working Group were concerned that the baseline ridership forecast was not in alignment with existing passenger counts.

The outcome of these meetings informed methods and analytical processes, and resulted in the development of a final passenger rail vision that included the integrated rail service scenarios that would be presented to the SAC.

230 A meeting with leaders in the rail industry for discussions regarding the modernization and integration of passenger rail service in California.

7.2.4 Freight Railroad Coordination

Planning an integrated statewide rail network that allows for seamless travel of people and goods necessarily required a coordinated strategy between passenger and freight rail. At the beginning of the Rail Plan development, the team began formulating a strategic framework for new freight rail policies and programs, and worked with the Caltrans Office of Freight Planning to coordinate input for other Caltrans modal plans. The California Sustainable Freight Action Plan, which is a multi-agency effort being undertaken in response to the Governor's Executive Order B-32-15, July 2015, provided an early opportunity for the State to better define its policies for investing in rail freight infrastructure. Therefore, Caltrans coordinated development of a rail freight policy framework for the Sustainable Freight Plan that is carried forward into the Rail Plan.

The development of the Freight Vision (Chapter 5) was an integral part of the freight element for the final Rail Plan, and required additional external coordination. Throughout the development of the Rail Plan, Caltrans held meetings with Class I and Short Line freight railroads to review the freight methodology, and request input on the development of the freight element. Fourteen meetings with various freight railroads were conducted in 2016, a complete list of which is provided in Appendix A.

California Freight Advisory Committee

An important aspect of the freight railroad outreach was coordination with CFAC. CFAC was established as a forum to discuss freight-related topics and advise the development of the California Freight Mobility Plan. Therefore, Caltrans took advantage of the organized group of freight interests to coordinate the Rail Plan freight outreach. Throughout the development of the Rail Plan, Caltrans met with CFAC several times to present and receive feedback on the policy framework, freight and train forecast analysis, and the Freight Vision and Rail Plan development.

7.2.5 Native American Stakeholder Involvement

The purpose of the Native American outreach and government-to-government consultation process was to ensure opportunities to meet with, brief, obtain comments from, and consult with Native Americans. This process required:

- Integrating Native Americans in the public process.
- Holding Native American–specific outreach meetings.
- Developing a clear process for government-to-government consultation.

The focus of the outreach to Native Americans and government-to-government consultation with Native Americans and tribal communities was on listening sessions and formal consultations.

The study team coordinated with Caltrans' Native American Liaison Branch to identify existing Native American meetings, and coordinate Native American outreach. The following identifies the groups, meeting types, and logistics for both Native American outreach and government-to-government consultations:

- Native American Advisory Committee (NAAC) (Caltrans has committed to providing regular Rail Plan updates to the NAAC.)
- Northern California Tribal Chairmen's Association
- Central California Tribal Chairmen's Association
- Southern California Tribal Chairmen's Association
- San Diego Association of Governments, Interagency Technical Working Group on Tribal Transportation Issues (SANDAG Tribal Working Group)
- Reservation Transportation Authority

Native American Advisory Committee

On August 12, 2015, Caltrans met with the NAAC to present a proposed timeline for Native American engagement for the Rail Plan. The sequence presented was as follows:

- Initiate Native American engagement: August 2015 (with periodic updates).
- Convene the California State Rail Plan SAC: October 2015.
- Prepare Native American listening sessions and webinars: Spring 2016.
- Invite Native American Tribes to consult on the Rail Plan before draft development: 2016.
- Invite Native American Tribes to consult on the Draft California State Rail Plan: January 2017.
- Prepare the Draft 2018 California State Rail Plan: October 2017.
- Convene public workshops on the Draft 2018 California State Rail Plan: Fall 2017.
- Issue the Final 2018 California State Rail Plan: May 2018.

The study team also presented the following maps, which display where California Tribal lands, the intercity and HSR networks, and the BNSF and UPRR operations routes intersect (Exhibit 7.4).

The NAAC offered the following input on Native American engagement for the Rail Plan:

- Early engagement with the NAAC is positive, but the State should provide regular updates on the development of the Rail Plan.
- Effectively engage with tribes and offer government-to-government consultation before the release of the Draft 2018 California State Rail Plan.
- Coordinate with the Northern, Central, and Southern California Tribal Chairman's Associations to fill the Native American positions on the SAC.
- Coordinate engagement efforts with scheduled tribal meetings.

Native American Listening Sessions

The Rail Plan outreach team held three listening sessions in different regions of the state to establish meaningful dialogue with California Native American tribes about the Rail Plan, and to identify the concerns and priorities of tribal communities. These listening sessions were held in Redding, San Diego, and Sacramento, California. The Sacramento listening session also provided the opportunity for Native American participants to join remotely by webinar during the listening session. The Caltrans Native American Liaison Branch liaisons also shared the materials from these listening sessions at meetings with tribes, including the SANDAG Tribal Working Group. These listening sessions were held in partnership with the CHSRA and the Sustainable Freight Action Plan, in response to Native American requests for joint informational meetings for related Caltrans activities.

These listening sessions were an important component of early engagement. They were held in preparation for a first round of invitations for government-to-government consultation on the Rail Plan. The listening sessions fostered project understanding and informed Native American tribes and individuals of opportunities for early engagement in the Rail Plan. They offered Native American tribes an opportunity to showcase regional issues of concern involving the Rail Plan and rail systems. Tribal participants' feedback from these listening sessions is summarized below. Transcripts and detailed summaries of these sessions were made available on the California State Rail Plan website (www.californiastaterailplan.com). A detailed summary of input provided at the Listening Sessions is provided in Appendix A.

Native American Formal Consultation

Engaging Native American Tribes was an important part of achieving the Rail Plan's mission to provide a safe, sustainable, integrated, and efficient California rail network that successfully moves people and goods, while enhancing the State's economy and livability. Pursuant to a number of Federal and State laws, Caltrans formal consultation provides prior notice to Tribes of at least 45 days. Caltrans invited Tribes to consult on the Rail Plan 60 days in advance of the release of the Draft Rail Plan for public review. Consultation was offered to approximately 113 Tribes through a formal letter on January 1, 2017. For a list of the Tribes that received consultation, see Appendix A.

7.2.6 Rail Plan Public Workshops

The Draft 2018 California State Rail Plan will be released for public, review Fall 2017, and seven public workshops will be held throughout the state. The approved Rail Plan is scheduled to be submitted to the Legislature by May 31, 2018.

On release of the draft Rail Plan, the public will have the opportunity to submit comments online during the subsequent 60-day public review period. During this public review, Caltrans will host seven public open-house meetings across the state to gather public input. The seven public workshops will be held in the following locations: Sacramento, Oakland/San Francisco, Fresno, San Luis Obispo, Riverside, Los Angeles, and San Diego. In addition, a statewide webinar will be held to allow for further participation online.

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www.californiastaterailplan.com

2018 CALIFORNIA STATE RAIL PLAN

Technical Appendix

Appendix A

October 2017

Appendix Table of Contents

Appendix A.2
Existing Rail System

Existing and Proposed Passenger Rail Lines, Corridors, and Services

Intercity Passenger Rail Services

State-Supported Routes – Detail

Amtrak Thruway Bus Network

An extensive network of dedicated Amtrak Thruway buses supports intercity passenger rail by providing dedicated connecting service to markets without direct passenger rail service. Amtrak Thruway buses offer connections between the *Pacific Surfliner* in the south and the *San Joaquin* and *Capitol Corridor* routes in the north, providing access to dozens of communities between.

Additional bus routes serve destinations from McKinleyville and Redding in the north, to Coachella Valley and San Diego in the south, and Reno and Las Vegas in the east. Amtrak Thruway buses provide connections to many popular destinations in California, including Yosemite National Park, Napa Valley, Palm Springs, Lake Tahoe, and the Monterey Bay. Amtrak Thruway bus service is extended only to passengers who transfer directly to/from either State-supported or Amtrak long-distance rail routes.

Ownership and Track Characteristics[1]

The ownership and track characteristics are shown in Table A.1 for the *San Joaquin* route; Table A.2 for the *Capitol Corridor* route; and Table A.3 for the *Pacific Surfliner* route.

[1] Caltrans, *2013 California State Rail Plan*, 2013.
Notes: SJJPA provided updated information for the *San Joaquin* since the 2013 Rail Plan. LOSSAN confirmed that the information on the *Pacific Surfliner* from the 2013 Rail Plan is still current.

Table A.1: San Joaquin Route Ownership and Track Characteristics

SAN JOAQUINS ROUTE OWNERSHIP AND TRACK CHARACTERISTICS								
Between	**Mile Post**	**And**	**Mile Post**	**Miles**	**Owner of Track**	**No. of Tracks***	**Max. Speed***	**Signal System**
Oakland Jack London Square	7.0	Oakland 10th St	4.2	2.8	UPRR	2	50	CTC
Oakland 10th St	2.2	Martinez	31.6	29.4	UPRR	2	79	CTC
Martinez	31.6	Port Chicago	40.8	6.1	UPRR	1	79	CTC
Port Chicago	1163.5	Sacramento	1121.1	42.4	BNSF	1-2	79	CTC
Sacramento	89.1	Elvas	91.7	2.6	UPRR	2	35	CTC
Elvas	38.9	Stockton	84.1	45.2	UPRR	1	60	CTC
Stockton	1121.1	Bakersfield	886.9	234.2	BNSF	1	79	CTC
Total				362.7				
*Number of Tracks = General number of mainline tracks; does not include sidings or very short sections of 2nd main track.								
*Maximum Speed = Primary maximum passenger speed (not necessarily continuous) within indicated section of main line.								
Owners:								
BNSF - The BNSF Railway Company								
UPRR - Union Pacific Railroad Company								
Signal Systems:								
CTC - Centralized Traffic Control - Wayside signals protect possession of blocks and grant authority for train movements. Signals and powered switches are remotely controlled from the dispatching center.								

Table A.2: Capitol Corridor Route Ownership and Track Characteristics

CAPITOL CORRIDOR ROUTE OWNERSHIP AND TRACK CHARACTERISTICS								
Between	**Mile Post**	**And**	**Mile Post**	**Miles**	**Owner of Track**	**No. of Tracks***	**Max. Speed***	**Signal System**
Auburn	124.3	Rocklin	110.5	13.8	UPRR	1	50	ABS/CTC
Rocklin	110.5	Roseville	106.4	4.1	UPRR	2	40	CTC
Roseville	106.4	Elvas	91.8	14.6	UPRR	2	79	CTC
Elvas	91.8	Sacramento	88.9	2.9	UPRR	2	35	CTC
Sacramento	88.9	Sacramento River	88.5	0.4	UPRR	2	20	CTC
Sacramento River	88.5	Davis	75.4	13.1	UPRR	2	79	CTC
Davis	75.4	Martinez	31.7	43.7	UPRR	2	79	CTC
Martinez	31.7	Oakland 10th St	4.2	29.5	UPRR	2	79	CTC
Oakland 10th St	4.2	Oakland Jack London Square	7.0	2.8	UPRR	2	50	CTC
Oakland Jack London Square	7.0	North Elmhurst	13.5	6.5	UPRR	2	79	CTC
North Elmhurst	13.5	Niles Junction	29.7	16.2	UPRR	1	79	CTC
Niles Junction	29.7	Newark	31.0	5.2	UPRR	2	79	CTC
Newark	31.0	Santa Clara	44.7	13.7	UPRR	1	70	CTC
Santa Clara	44.7	San Jose	47.5	2.8	PCJPB	3	40	CTC
Total (**includes rand trip between Union Station and Mission Tower)				169.3				
*Number of Tracks = General number of mainline tracks; does not include sidings or very short sections of 2nd main track.								
*Maximum Speed = Primary maximum passenger speed (not necessarily continuous) within indicated section of main line.								
Owners:								
BNSF - The BNSF Railway Company								
PCJPB - Peninsula Corridor Joint Powers Board								
Signal Systems:								
ABS - Automatic Block Signals - Wayside signals protect possession of block by indicating whether the track ahead is clear. The signals do not grant authority for train movements.								
CTC - Centralized Traffic Control - Wayside signals protect possession of blocks and grant authority for train movements. Signals and powered switches are remotely controlled from the dispatching center.								

Table A.3: Pacific Surfliner Route Ownership and Track Characteristics

PACIFIC SURFLINER ROUTE OWNERSHIP AND TRACK CHARACTERISTICS								
Between	Mile Post	And	Mile Post	Miles	Owner of Track	No. of Tracks*	Max. Speed*	Signal System
San Luis Obispo	248.7	South San Luis Obispo	251.4	2.8	UPRR	2	60	CTC
South San Luis Obispo	251.4	Ellwood	355.8	104.3	UPRR	1	70	TWC/ABS
Ellwood	355.8	North Santa Barbara	365.0	9.2	UPRR	1	79	CTC
North Santa Barbara	365.0	South Santa Barbara	368.6	3.6	UPRR	2	45	CTC
South Santa Barbara	368.6	Los Posas (west of Moorpark)	423.1	54.5	UPRR	1	70	CTC
Los Posas (west of Moorpark)	426.4	Ventura/Los Angeles county line	442.0	15.6	(a)UPRR/VCTC	1	70	CTC
Ventura/Los Angeles county line	442.0	Rayner (west of Van Nuys)	453.1	11.1	(a)UPRR/LACMTA	1	70	CTC
Raymer (west of Van Nuys)	453.1	Burbank Jct (milepost equation)	462.6	9.5	(a)UPRR/LACMTA	2	70	CTC
Burbank Jct. (milepost equation)	11.3	Glendale (CP Fletcher Drive)	4.8	6.5	(a)UPRR/LACMTA	2	79	CTC
Glendale (CP Fletcher Drive)	4.8	CP Dayton	2.2	2.6	LACMTA	2	79	CTC
CP Dayton (b)	2.2	Mission Tower	0.7	1.5	LACMTA	2	50	CTC
Mission Tower	0.7	L.A. Union Station	0.0	1.4	LACMTA	5	25	CTC
Mission Tower	0.7	CP San Diego Jct. (mp equation)	0.9	0.2	LACMTA	2	25	CTC
CP San Diego Jct. (mp equation)	140.2	Soto (east of Redondo Jet)	144.4	4.2	LACMTA	2	79	CTC
Soto (east of Redondo Jct)	144.4	Bancini (west of Pico Rivera)	149.8	5.4	BNSF	3	79	CTC
Bandini (west of Pico Rivera)	149.8	Buena Park	160.3	10.5	BNSF	2	79	CTC
Buena Park	160.3	Fullerton Jct.	165.5	5.2	BNSF	3	79	CTC
Fullerton Jct.	165.0	Santa Ana	175.2	9.7	OCTA	2	79	CTC
Santa Ana	175.2	Laguna Niguel	193.7	18.5	OCTA	2	90	CTC/ATS
Laguna Niguel	193.7	San Juan Capistrano	197.2	3.5	OCTA	1	90	CTC/ATS
San Juan Capistrano	197.2	Orange/San Diego County Line	207.4	10.2	OCTA	1	40	CTC/ATS
Orange/San Diego County Line	207.4	Del Mar/San Diego City Limits	245.6	38.2	NCTD	2	90	CTC/ATS
Del Mar/San Diego City Limits	245.6	CP Cumbres (Miramar Road)	252.9	7.3	SDMTS	2	90	CTC/ATS
CP Cumbres (Miramar Road)	252.9	CP Elvira	257.9	5.0	SDMTS	2	50	CTC
CP Elvira	257.9	Old Town	264.2	6.3	SDMTS	2	75	CTC
Old Town	264.2	San Diego	267.6	3.4	SDMTS	1	60	CTC
Total (**includes round trip between Union Station and Mission Tower)				351.6				
*Number of Tracks = General number of mainline tracks; does not include sidings or very short sections of 2nd main track.								
*Maximum Speed = Primary maximum passenger speed (not necessarily continuous) within indicated section of main line.								
(a)On these segments VCTC and LACMTA purchased a 40 foot wide portion of UPRR's right-of-way. Between Raymer and Burbank Junction, LACMTA constructed and owns the second man line track.								
(b)Via West Side of Los Angeles River (Downey Avenue Bridge)								
Owners:								
BNSF - The BNSF Railway Company								
LACMTA - Los Angeles County Metropolitan Transportation Authority								
NCTD - North County Transit District								
OCTA - OCTA								
SDMTS - San Diego Metropolitan Transit System								
UPRR - Union Pacific Railroad Company								
VCTC - Ventura County Transportation Commission								
Signal Systems:								
ABS - Automatic Block Signals - Wayside signals protect possession of block by indicating whether the track ahead is clear. The signals do not grant authority for train movements.								
ATS - Automatic Train Stop - An overlay system that allows speeds of 90 mph. System automatically applies train brakes if a restrictive signal indication is not observed a warning alarm is not acknowledged.								
CTC - Centralized Traffic Control - Wayside signals protect possession of blocks and grant authority for train movements. Signals and powered switches are remotely controlled from the dispatching center.								
TWC - Track Warrant Control - Dispatching center gives authority for train movement by radio to train crew directly. (On some railroads this is identified as Direct Traffic Control, or DTC.)								

Amtrak Thruway Bus Maps

Maps of the Amtrak Thruway Bus routes are shown on Exhibit A.1 for Southern California; Exhibit A.2 for Central California; and Exhibit A.3 for Northern California.

Exhibit A.1: Amtrak Thruway Bus Service (Southern California)

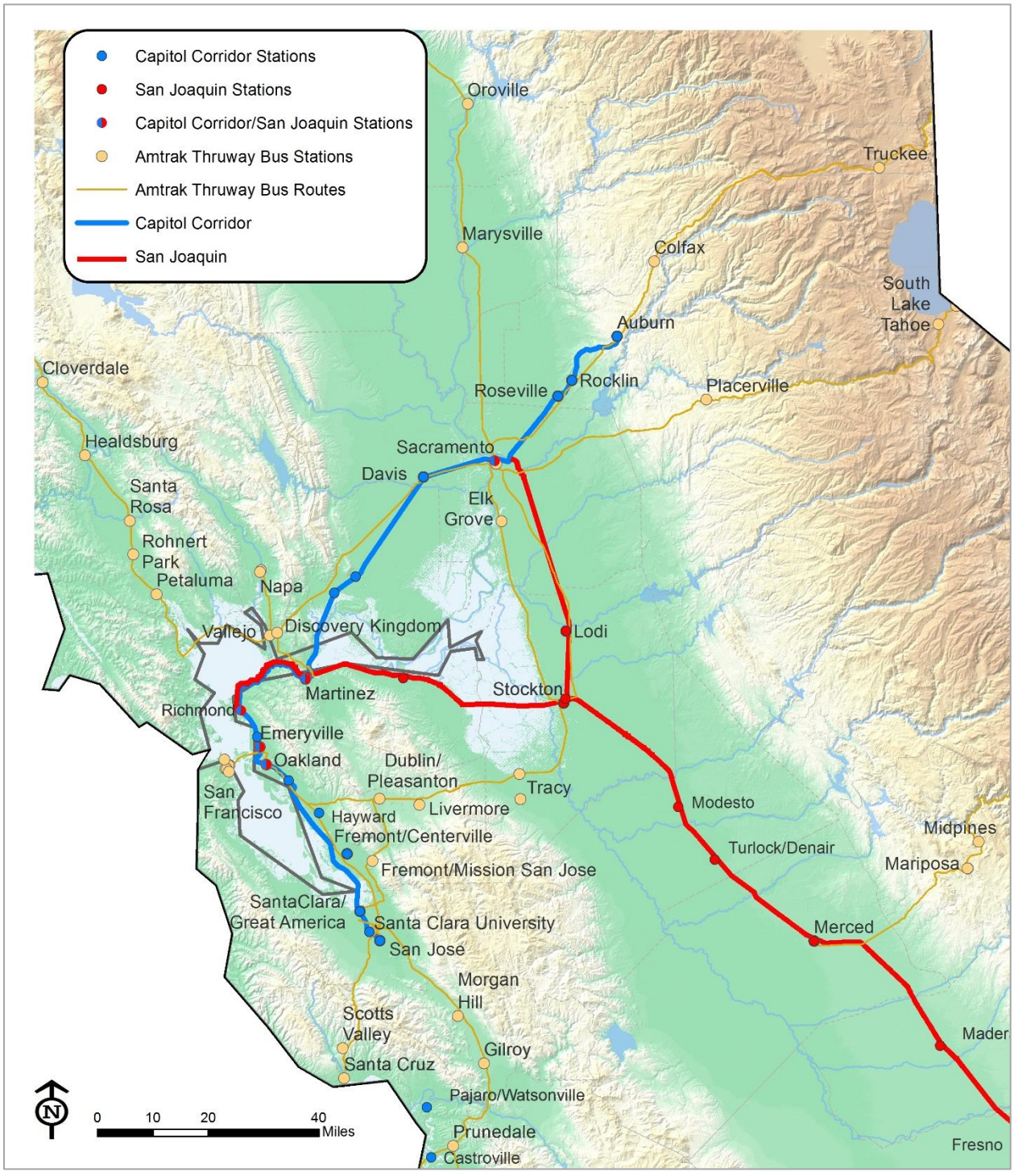


Exhibit A.2: Amtrak Thruway Bus Service (Central California)

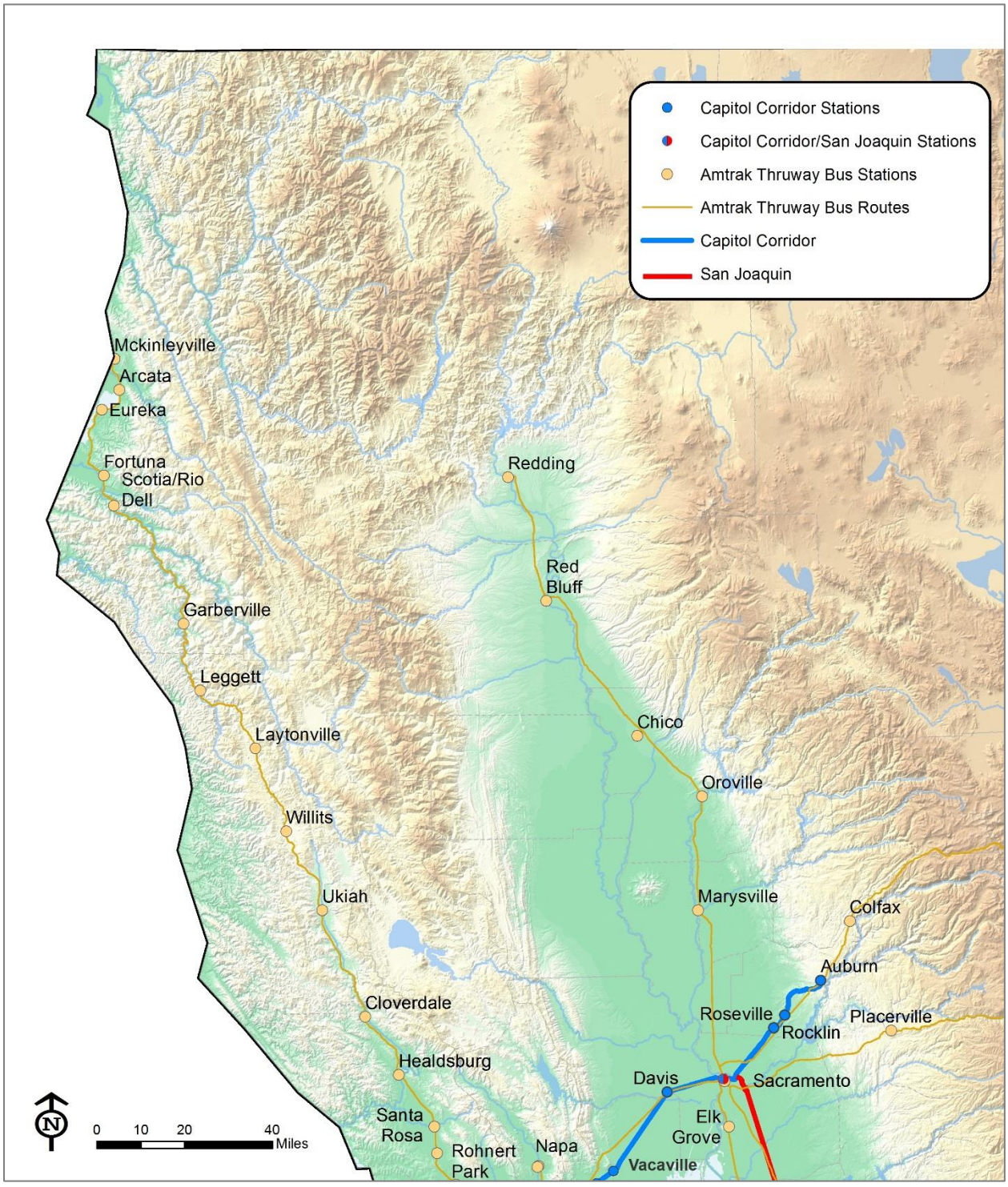


Exhibit A.3: Amtrak Thruway Bus Service (Northern California)

Table A.4: State-Supported Intercity Passenger Rail Agency Roles and Responsibilities

	Pacific Surfliner	San Joaquin	Capitol Corridor
Governance			
Management, Planning	Los Angeles–San Diego–San Luis Obispo Rail Corridor Agency (LOSSAN)	San Joaquin Joint Powers Authority (SJJPA)	Capitol Corridor Joint Powers Authority (CCJPA)
Comprehensive Rail System Planning	Caltrans	Caltrans	Caltrans
Operations	Amtrak	Amtrak	Amtrak
Oversight	Caltrans	Caltrans	Caltrans
Funding			
Operating funding	Caltrans	Caltrans	Caltrans
Capital funding	Caltrans, Federal and local agencies	Caltrans, Federal and local agencies	Caltrans, Federal and local agencies
Equipment			
Equipment Ownership	Amtrak and Caltrans	Primarily Caltrans	Primarily Caltrans
Maintenance	Amtrak	Amtrak with oversight from CCJPA and SJJPA	Amtrak with oversight from CCJPA
Track Ownership	UPRR, Ventura County Transportation Commission, Los Angeles County Metropolitan Transportation Authority, BNSF, Orange County Transportation Authority, North County Transit District (NCTD), San Diego Metropolitan Transit System	UPRR, BNSF	UPRR, Peninsula Corridor Joint Powers Board (PCJPB)

Sources: Amtrak, *About Amtrak California*, accessed 2016; Caltrans, *2013 California State Rail Plan* (2013); LOSSAN Rail Corridor Agency, *Business Plan FY 2016-17 – FY 2017-18*, 2016. Accessed 2016.

Commuter Rail

Connecting Services

Caltrain

Caltrain has a direct connection with other major public transportation operators on its route at various multimodal facilities. These operators include San Francisco Municipal Transportation Agency (Muni) light rail and buses, BART, SamTrans, Santa Clara VTA light rail and buses, Alameda-Contra Costa Transit District (AC Transit), the Dumbarton Express bus, and ACE (commuter service from Stockton to San Jose). ACE shares a terminal with Caltrain at San Jose Diridon Station.

Caltrain connects directly with the intercity *Capitol Corridor* and Amtrak's long-distance *Coast Starlight* at the San Jose Diridon Station. Amtrak *San Joaquin* and *Capitol Corridor* route feeder bus stops are located at the Caltrain station in San Francisco. Local transit services link many Caltrain stations to key city destinations and employment centers. For example, the San Jose Diridon station is served by multiple Santa Clara VTA bus lines, along with Monterey–Salinas Transit buses and Highway 17 Express bus service to Santa Cruz. In addition, a variety of shuttles connect Caltrain stations to major employment sites on the San Francisco Peninsula. Some shuttles are partially sponsored by Caltrain, and are free and open to the public; while others are privately operated.

ACE

Bus and rail transit connections and dedicated shuttles are an integral part of the ACE system, providing a seamless commuting link between stations and workplaces. All stations have some form of connecting transit. In addition, four stations have direct connections to rail services. The Stockton station has connections to *San Joaquin* trains. At the Great America station, connections can be made with Santa Clara VTA light rail and buses (approximately 750 feet east of the station) and the *Capitol Corridor*. At Santa Clara, connections can be made with Caltrain and the *Capitol Corridor*; and at San Jose, connections can be made with Caltrain, the *Capitol Corridor*, the Amtrak *Coast Starlight*, and Santa Clara VTA light rail and buses.

Metrolink

Each county has a transit plan to ensure integration of Metrolink service with other transit systems and transportation modes. The Metrolink fare is designed to provide a free transfer, either from feeder bus or to local transit at the destination station. Metrolink passengers can connect with Amtrak trains at Anaheim, Burbank Bob Hope Airport, Camarillo, Chatsworth, Fullerton, Glendale, Irvine, Moorpark, Oceanside, Oxnard, San Clemente Pier, San Juan Capistrano, Santa Ana, Simi Valley, and Van Nuys. Metrolink passengers can connect to the

Metro Red Line/Purple Line subway and the Metro Gold Line light rail at Los Angeles Union Station (LAUS), to the Metro Green Line at Norwalk (via Norwalk Transit Route 4), to the Metro Blue Line and the Metro Expo Line at the 7th Street/Metro station, and to the Metro Orange Line at Chatsworth station, all at no additional charge.

Shuttle service connects the Downtown Burbank and Burbank-Bob Hope Airport stations to the Burbank Bob Hope Airport terminal. LAUS connects to the State-supported *San Joaquin* route in Bakersfield via Amtrak Thruway bus service. In addition, it also connects to Amtrak long-distance trains, such as the *Sunset Limited*, *Southwest Chief*, *and Coast Starlight*. LAUS also provides connections with various local and city bus and shuttle services, including direct FlyAway shuttle service to the Los Angeles International Airport.

Recent light-rail additions, including the Metro Exposition Line to Santa Monica (reachable from LAUS via the Red or Purple Lines) and the Metro Gold Line Foothill Extension to Azusa, allow Metrolink passengers to travel to additional areas.

Metrolink

Table A.5: Metrolink Lines and Service Areas[2]

Line	Service Area	Approximate Running Time
Ventura County Line	East Ventura, Oxnard, Camarillo, Moorpark, Simi Valley, Chatsworth, Northridge, Van Nuys, Burbank Bob Hope Airport, Downtown Burbank, Glendale, Los Angeles.	Trains operate between East Ventura and Los Angeles from 5:00 AM to 9:00 PM.
Antelope Valley Line	Lancaster, Palmdale, Vincent Grade/Acton, Via Princessa, Santa Clarita, Newhall, Sylmar/San Fernando, Sun Valley, Downtown Burbank, Glendale, Los Angeles.	Trains operate between Lancaster and Los Angeles from 3:30 AM and 12 AM.
San Bernardino Line	San Bernardino, Rialto, Fontana, Rancho Cucamonga, Upland, Montclair, Claremont, Pomona (North), Covina, Baldwin Park, El Monte, Cal State L.A., Los Angeles.	Trains operate between San Bernardino and Los Angeles from 3:30 AM to 11:30 PM.
Riverside Line	Riverside Downtown, Pedley, East Ontario, Downtown Pomona, Industry, Montebello/Commerce, Los Angeles.	Trains operate between San Bernardino and Los Angeles from 4:30 AM to 8:00 PM. Weekdays only.

[2] Metrolink, *Timetable*, 2016. Accessed 2017.

Line	Service Area	Approximate Running Time
Orange County Line	Oceanside, San Clemente Pier, San Clemente, San Juan Capistrano, Laguna Niguel/Mission Viejo, Irvine, Tustin, Santa Ana, Orange, Anaheim, Fullerton, Buena Park, Norwalk/Santa Fe Springs, Commerce, Los Angeles.	Trains operate between Oceanside and Los Angeles from 4:30 AM to 12:00 AM.
Inland Empire-Orange County Line	San Bernardino, Riverside Downtown, Riverside La Sierra, North Main Corona, West Corona, Anaheim Canyon, Orange, Santa Ana, Tustin, Irvine, Laguna Niguel/Mission Viejo, San Juan Capistrano, San Clemente, San Clemente Pier, Oceanside.	Trains operate between San Bernardino and Oceanside from 4:30 AM to 8:30 PM.
91 Line	South Perris, Downtown Perris, Moreno Valley / March Field, Riverside Downtown, Riverside La Sierra, North Main Corona, West Corona, Fullerton, Buena Park, Norwalk/Santa Fe Springs, Los Angeles.	Trains operate between South Perris and Los Angeles from 4:30 AM to 8:30 PM.

COASTER

All COASTER stations have connecting transit services available. COASTER passengers can connect with Amtrak trains at Oceanside, Solana Beach, Old Town Station, and the downtown Santa Fe Depot in San Diego. At Oceanside Transit Center, connections are available to Metrolink commuter service to Los Angeles and to North County Transit District's (NCTD's) SPRINTER light-rail service to Escondido via Vista and San Marcos. Other stations have connections to San Diego Transit and San Diego Trolley. Passengers can connect to San Diego State University at the Old Town Transit Center via the San Diego Trolley's Green Line, and bus service from Santa Fe Depot to the San Diego International Airport. Transit connections in northern San Diego County are provided by NCTD BREEZE buses, including several services branded as "COASTER Connection" routes that provide peak-hour commute shuttle service to COASTER stations in the Sorrento Valley.

All COASTER Passenger Intermodal Facilities

Table A.6: Rail and Thruway Bus Connections to Airports[3]

Airport	Rail Corridor	Station	Public Transit Connection between Rail Station and Airport
Arcata-Eureka	*San Joaquin* Bus	McKinleyville	No connection. Bus stops at terminal.
Burbank Bob Hope	*Pacific Surfliner*, *Coast Starlight*, Metrolink (Ventura County Line)	Burbank – Airport Station	Regional Intermodal Transportation Center (RITC) is within walking distance of main terminal (shuttle also available)
Fresno-Yosemite International	*San Joaquin*	Fresno	Fresno Area Express
John Wayne	*Pacific Surfliner*	Santa Ana	OCTA
	Metrolink (Orange County/ Inland Empire Lines)	Tustin	iShuttle
Long Beach	*San Joaquin* bus	Long Beach	Long Beach Transit
Los Angeles International	*Pacific Surfliner*, *Coast Starlight*, Metrolink	Los Angeles Union Station	LAX Flyaway bus shuttle
	San Joaquin Bus	Van Nuys Flyaway	LAX Flyaway bus shuttle
San Jose Mineta International	*Capitol Corridor*, *ACE*, Caltrain	Santa Clara	VTA Airport Flyer
Oakland International	*Capitol Corridor*	Oakland Coliseum	Oakland Airport Connector
	BART	Coliseum/Oakland Airport	Oakland Airport Connector
	San Joaquin	Richmond	BART
Ontario International	*San Joaquin* Bus	Ontario	Omnitrans
	Metrolink	East Ontario, Fontana	Omnitrans

[3] Cambridge Systematics, Inc., 2016.

Airport	Rail Corridor	Station	Public Transit Connection between Rail Station and Airport
Palm Springs	*San Joaquin* Bus	Palm Springs	No connection. Bus stops at terminal.
Sacramento International	*Capitol Corridor*, *San Joaquin* trains and buses	Sacramento	Yolobus
San Diego International	*Pacific Surfliner*, COASTER	Santa Fe Depot	SDMTS
San Francisco International	BART	San Francisco International Airport	AirTrain
	Caltrain	Millbrae	BART

[a] Thruway bus services listed provide airport connections from Amtrak stations

Sonoma-Marin Area Rail Transit (SMART)

Feeder bus and shuttle services will connect to multiple SMART stations. The northern terminus of the Phase 1 line is at Sonoma County Airport. Phase 2 – South will extend to Larkspur Ferry, which services San Francisco.[4]

[4] Sonoma-Marin Area Rail Transit, *What is SMART?*, 2016. Accessed 2016.

Table A.7: Commuter Rail Services

Name	Route	Primary Administrator	Administration of Key Functions
Altamont Commuter Express (ACE)	Stockton–San Jose	San Joaquin Regional Rail Commission (SJRRC)	Operations and equipment maintenance: Herzog Transit Services Track ownership: UPRR is primary track owner. PCJPB owns track between Santa Clara and San Jose.
Caltrain	San Francisco–Gilroy	Peninsula Corridor Joint Powers Board (PCJPB)	Managing agency, including planning: San Mateo County Transit District Operations and equipment maintenance: TransitAmerica Services Track ownership: Counties, UPRR
COASTER	Oceanside -San Diego	North County Transit District (NCTD)	Operations and equipment maintenance: Bombardier Track Ownership: San Diego Metropolitan Transit System joint track owner within San Diego (NCTD owns other portions)
Metrolink	Multiple routes in Los Angeles, Ventura, San Bernardino, Riverside, Orange, San Diego Counties	Southern California Regional Rail Authority (SCRRA)	Operations: Amtrak Bombardier: Equipment maintenance Track ownership: SCRRA Member Agencies, BNSF, UPRR, NCTD
Sonoma-Marin Area Rail Transit District (SMART)	Santa Rosa to San Rafael (2017) and potential expansion to Cloverdale and Larkspur at a later date	SMART District	Contracted Operations / Maintenance

Sources: Caltrain, *Joint Powers Agreement Peninsula Corridor Project*, 1996, accessed 2016; Caltrain, Caltrain Board Approves TransitAmerica to Run Train System (2011), accessed 2016; ACE, History of ACE, accessed 2016; North County Transit District, *Comprehensive Strategic, Operating, and Capital Plan FY 2017 – FY* 2026 (2016), accessed 2016; Metrolink, About Us, accessed 2016 SCRRA, Contract No. OP137-17 (2016), accessed 2016, http://metrolink.granicus.com/ DocumentViewer.php?file =metrolink_f5361c74f445ce4300fbfd0f04e15f b0.pdf&view=1.

Existing Passenger Rail Performance

This section presents performance information for the three State-supported intercity passenger rail routes.

State-Supported Passenger Rail System Performance

- Table A.8, Table A.9 and Table A.10 provide route-specific performance for the *Pacific Surfliner*, *San Joaquin*, and *Capitol Corridor*, respectively.

Table A.8: *Pacific Surfliner* Route Performance

Performance Measure	Actual							
	FFY 08	FFY 09	FFY 10	FFY 11	FFY 12	FFY 13	FFY 14	FFY 15
Total Annual Revenue (in Millions of Dollars)	$53.2	$48.4	$51.2	$57.6	$61.55	$66.26	$70.40	$75.84
Total Annual Expenses (in Millions of Dollars)	$88.5	$86.6	$95.7	$99.7	$104.07	$105.38	$102.73	$114.22
Revenue – State Portion[a] (in Millions of Dollars)	$38.3	$34.9	$35.8	$40.3	$43.08	$46.38	$70.40	$75.84
Expenses – State Portion (in Millions of Dollars)	$63.0	$61.6	$67.0	$69.8	$72.88	$73.76	$102.73	$114.22
Farebox Ratio – State Portion	60.8%	56.6%	53.5%	57.7%	59.1%	62.9%	68.5%	66.4%
Annual State Costs[b] (in Millions of Dollars)	$24.7	$26.8	$31.2	$29.6	$29.79	$27.39	$32.32	$38.39
State Costs – Administration (in Millions of Dollars)	$1.5	$1.5	$1.5	$1.5	$1.50	$1.50	$1.50	$1.50
State Costs – Marketing (in Millions of Dollars)	$2.3	$2.3	$2.3	$2.3	$2.30	$2.30	$2.30	$2.30
State Cost per Passenger	$12.18	$14.75	$17.05	$15.16	$16.12	$14.49	$12.05	$13.58
State Cost per Passenger Mile	$0.15	$0.18	$0.21	$0.18	$0.19	$0.17	$0.22	$0.22
State Cost per Train Mile	$21.89	$23.35	$27.86	$26.38	$27.31	$24.49	$31.37	$34.29
Annual Ridership – Total Route	2,898,859	2,592,996	2,613,604	2,786,972	2,640,342	2,700,806	2,681,173	2,827,134
Annual Passenger Miles – Total Route	240,761,326	213,655,854	215,640,101	230,759,084	223,501,233	232,275,532	205,497,275	246,451,396
Annual Train Miles – Total Route	1,612,497	1,638,188	1,599,515	1,601,816	1,558,015	1,597,429	1,471,731	1,599,430
On-Time Performance	76.1%	83.1%	76.3%	77.5%	75.5%	84.8%	77.0%	77.9%

Performance Measure	Actual							
	FFY 08	FFY 09	FFY 10	FFY 11	FFY 12	FFY 13	FFY 14	FFY 15
Frequency (Daily Round Trips)								
San Diego-Los Angeles[c]	11	11	11	11	11	11	11	11
Los Angeles-Goleta	5	5	5	5	5	5	5	5
Goleta-San Luis Obispo	2	2	2	2	2	2	2	2

Source: Caltrans rail operational database.
Note: This table is intended to satisfy the performance evaluation requirements of AB 528.
[a] State portion measures of revenue, expenses, and farebox ratio reflect the 70 percent of the route that is State supported.
[b] State costs do not include equipment lease costs, and may include minor capital project costs.
[c] One additional weekend round trip.

Table A.9: *San Joaquin* Route Performance

Performance Measure	Actual							
	FFY 08	FFY 09	FFY 10	FFY 11	FFY 12	FFY 13	FFY 14	FFY 15
Annual Revenue (in Millions of Dollars)	$31.3	$29.6	$33.2	$37.8	$41.09	$41.83	$41.22	$40.46
Total Annual Expenses (in Millions of Dollars)	$68.3	$65.1	$67.8	$69.8	$73.09	$73.26	$81.86	$80.02
Farebox Ratio	45.8%	45.5%	48.9%	54.2%	56.2%	57.1%	50.4%	50.6%
Annual State Costs[a] (in Millions of Dollars)	$37.1	$35.5	$33.6	$32.0	$32.00	$31.43	$40.64	$39.56
State Costs–Administration (in Millions of Dollars)	$1.3	$1.3	$1.3	$1.3	$1.30	$1.30	$1.30	$1.30
State Costs – Marketing (in Millions of Dollars)	$1.5	$1.5	$1.5	$1.5	$1.50	$1.50	$1.50	$1.50
State Cost per Passenger	$39.03	$38.17	$34.36	$29.96	$27.96	$25.77	$34.20	$33.61
State Cost per Passenger Mile	$0.27	$0.27	$0.24	$0.20	$0.19	$0.18	$0.25	$0.24
State Cost per Train Mile	$27.78	$26.65	$25.26	$24.02	$23.93	$23.88	$30.45	$29.74
Annual Ridership	949,611	929,172	977,834	1,067,441	1,144,616	1,219,818	1,188,228	1,177,073
Annual Passenger Miles	139,004,634	133,711,704	139,405,193	156,427,566	166,336,873	170,076,164	165,538,347	164,249,895
Annual Train Miles	1,334,289	1,330,956	1,330,280	1,331,481	1,337,454	1,316,044	1,334,853	1,330,060
On-Time Performance	82.6%	89.6%	90.7%	89.5%	88.1%	77.7%	75.4%	73.4%

Performance Measure	Actual							
	FFY 08	FFY 09	FFY 10	FFY 11	FFY 12	FFY 13	FFY 14	FFY 15
Frequency (Daily Round Trips)								
Oakland-Bakersfield[b]	4	4	4	4	4	4	4	4
Sacramento-Bakersfield	2	2	2	2	2	2	2	2

Source: Caltrans rail operational database.
Note: This table is intended to satisfy the performance evaluation requirements of AB 528.
[a] State costs do not include equipment lease costs, and may include minor capital project costs.
[b] Starting in June 2016, the San Joaquin began offering 5 Oakland-Bakersfield round trips per day.

Table A.10: *Capitol Corridor* Route Performance

Performance Measure	Actual							
	FFY 08	FFY 09	FFY 10	FFY 11	FFY 12	FFY 13	FFY 14	FFY 15
Annual Revenue (in Millions of Dollars)	$23.8	$23.5	$24.2	$27.1	$29.49	$29.20	$29.23	$30.09
Total Annual Expenses (in Millions of Dollars)	$53.3	$51.0	$53.9	$57.9	$59.41	$58.64	$57.71	$58.06
Farebox Ratio	44.6%	46.1%	44.9%	46.9%	49.6%	49.8%	50.6%	51.8%
Annual State Costs[a] (in Millions of Dollars)	$29.6	$27.5	$29.7	$30.2	$29.92	$29.45	$28.48	$27.96
State Costs – Administration (in Millions of Dollars)	$1.3	$1.3	$1.3	$1.3	$2.72	$2.72	$2.72	$2.72
State Costs – Marketing (in Millions of Dollars)	$1.2	$1.2	$1.2	$1.2	$1.20	$1.20	$1.20	$1.20
State Cost per Passenger	$17.46	$17.18	$18.78	$17.65	$17.13	$17.31	$20.07	$18.96
State Cost per Passenger Mile	$0.27	$0.27	$0.29	$0.28	$0.27	$0.26	$0.30	$0.28
State Cost per Train Mile	$24.88	$23.17	$25.06	$25.16	$24.92	$25.30	$24.66	$23.90
Annual Ridership	1,693,580	1,599,625	1,580,619	1,708,618	1,746,397	1,701,185	1,419,134	1,474,873
Annual Passenger Miles	109,881,568	102,282,980	101,250,743	109,073,594	111,191,130	112,158,131	96,160,598	98,942,984
Annual Train Miles	1,188,104	1,186,351	1,184,181	1,198,842	1,200,493	1,164,118	1,154,770	1,169,957
On-Time Performance	86.0%	92.3%	93.1%	94.9%	93.9%	95.0%	95.3%	93.0%

Performance Measure	Actual							
	FFY 08	FFY 09	FFY 10	FFY 11	FFY 12	FFY 13	FFY 14	FFY 15
Frequency (Daily Round Trips)								
San Jose-Oakland	7	7	7	7	7	7	7	7
Oakland-Sacramento[b]	16	16	16	16	15	15	15	15
Sacramento-Auburn	1	1	1	1	1	1	1	1

Source: Caltrans rail operational database.
Note: This table is intended to satisfy the performance evaluation requirements of AB 528.
[a] State costs do not include equipment lease costs, and may include minor capital project costs.
[b] About 12 weekend round trips.

California's Freight Railroad System

Table A.11: Class I Railroad Operating Characteristics[5]

Name	Employees	Payroll (Millions of Dollars)	Route Miles Owned	Route Miles w/ Trackage Rights	Total Miles Operated	Originating Carloads	Terminating Carloads
UPRR	4,783	$462.8	2,773[6]	515[7]	3,292	1,537,094,034	1,594,670
BNSF	3,655	$283.8	1,149	965	2,114	1,948,082	1,982,279

Rail Line Abandonments

This section describes rail infrastructure whose owners have filed for abandonment with the STB since 2005. With approval to abandon a line, the right-of-way can be freed for other uses, including rail banking (e.g., preservation for potential future use as a rail line), reversion to line-side property owners, or redevelopment as a trail or transit line. Rail lines are usually abandoned because they are unprofitable to operate due to declining traffic potential—either on the line alone, or in the larger region. Due to the declining traffic, these lines commonly suffer from deferred maintenance, which raises operating costs and further reduces their commercial viability. Because developable land is scarce and sold at a premium, abandoned rail lines and adjacent right-of-way offer one way to accommodate the need for passenger rail service, non-motorized transport, and recreational activity.

Table A.12 identifies rail line abandonment filings since 2005.

Table A.12: Rail Line Abandonment Filings with the FRA, 2005 to 2015[8]

Owner/Line	Name	Year	Counties	City	Length
UPRR; Santa Clara Valley Transportation Authority		2013	Alameda		1.97
UPRR		2013	Riverside; San Bernardino		1.27
Alameda Belt Line Railroad		2012	Alameda		2.61

[5] Sources: UPRR *California Fact Sheet 2015*;; BNSF *California Fact* Sheet 2014; 2013 *California State Rail Plan*

[6] Caltrans, *2013 California State Rail Plan,* 2013.

[7] Ibid.

[8] Source: FRA Abandonment filings (this source was last modified Nov. 2015)

Owner/Line	Name	Year	Counties	City	Length
UPRR; Santa Clara Valley Transportation Authority		2012	Plumas; Lassen		8.95
BNSF		2012	Los Angeles		5.3
UPRR		2011	Riverside; San Bernardino		3.73
BNSF Railway		2011	Los Angeles		4.85
Almanor Railroad Co.		2010	Plumas, Lassen	Clear Creek	12.3
BNSF	Alameda Beltline RR	2010	Alameda		2.0
UPRR	Brea Chemical Industrial Lead	2010	Orange	Brea	1.2
UPRR	South San Francisco Industrial Lead	2010	San Mateo		0.6
SDIY		2009	San Diego	Escondido	1.4
Arizona and California Railroad Co.		2009	San Bernardino and Riverside		49.4
Tulare Valley RR Co.		2009	Tulare	Ducor	5.9
UPRR	McHenry Industrial Lead	2009	San Joaquin and Stanislaus		5.2
UPRR (Nevada-CA)	Lassen Valley Railway LLC	2009			22.3
UPRR	Lakewood Industrial Lead	2008	Los Angeles	Lakewood	0.3
San Joaquin Valley RR Co.	South Exeter Branch	2008	Tulare		30.6
San Joaquin Valley RR Co.	South Exeter Branch	2008	Tulare		9.2
UPRR	Santa Monica Industrial Lead	2008	Los Angeles	Los Angeles	0.4
LA Metro	Santa Monica Industrial Lead	2008	Los Angeles		0.3
UPRR	Loyalton Industrial Lead	2007	Plumas and Sierra		11.1
UPRR	Loyalton Industrial Lead	2007	Sierra	Loyalton	0.7
BNSF		2007	Riverside	Riverside	0.5
UPRR	Riverside Industrial Lead	2007	Riverside		0.3
UPRR (Nevada-CA)	Flanigan Industrial Lead	2006			21.8
UPRR (Nevada-CA)	Susanville Industrial Lead	2006	Wendal, Lassen		0.6
UPRR	Pearson Industrial Lead	2006	Yuba		4.8
Sunset Railway Co/ San Joaquin Valley RR	Sunset Subdivision	2005	Kern	Levee	0.2
McCloud RR Co.		2005	Siskiyou, Shasta		80.0

Owner/Line	Name	Year	Counties	City	Length
Los Angeles Junction Railway		2005	Los Angeles	Maywood	0.5
Santa Clara Valley Transportation Authority	Industrial Line	2005	Santa Clara		0.2
Santa Clara Valley Transportation Authority	Milpitas Line	2005	Alameda	Fremont	2.8
UPRR	Tustin Industrial Lead	2005	Orange	Orange	1.5
UPRR	Holtville Industrial Lead	2005	Imperial County		9.38

An alternative to abandonment is to cease service over a line without pursuing formal abandonment. This approach allows a carrier to reinstate service when conditions change, with little or no regulatory requirements. For example, a railroad may retain an out-of-service line that may have a viable potential traffic base, but requires costly improvements for which funding needs to be secured; or offers an alternative route that may be needed in the future to accommodate traffic growth. An example of the former is the former Northwestern Pacific Railroad line between Windsor and Eureka (now owned by the North Coast Rail Authority); of the latter, UPRR's Mococo line between Tracy and Port Chicago (UPRR's Tracy Subdivision).

Major Rail Projects Funded under Section 130

There are 18 major rail projects funded under Section 130 along the State-supported intercity passenger rail corridors (*Capitol Corridor*, *San Joaquin*, and *Pacific Surfliner*). These projects are listed below by existing road crossing (city/county), in order from most improvements needed to least:

- **Rosecrans/Marquardt** (Santa Fe Springs / Los Angeles County)
- **Cutting Boulevard** (Richmond / Contra Costa County)
- **Washington Street** (San Diego / San Diego County)
- **La Palma Avenue** (Anaheim / Orange County)
- **Grand Ave/Santa Ana** (Santa Ana / Orange County)
- **Vineland Avenue** (Near Burbank / Los Angeles County)
- **Grand Avenue/Carlsbad** (Carlsbad / San Diego County)
- **Los Nietos Road** (Santa Fe Springs / Los Angeles County)

- **Ferry Street** (Martinez / Contra Costa County)
- **Mission Avenue** (Oceanside / San Diego County)
- **Church Avenue** (Fresno / Fresno County)
- **Hesperian Boulevard** (San Leandro / Alameda County)
- **Grape Street** (San Diego / San Diego County)
- **Hawthorn Street** (San Diego / San Diego County)
- **7th Street** (Hanford / Kings County)
- **Kansas Avenue** (Near Guernsey / Kings County)
- **11th Avenue** (Hanford / Kings County)
- **Bellevue Avenue** (Atwater / Merced County)

Trends and Forecasts

Highway Congestion Analysis

Table A.13, below, presents 5 years of mainline Annual Average Daily Traffic (AADT) volumes obtained from the Caltrans Freeway Performance Measurement System (PeMS) database for specific locations along I-5, I-10, and I-80. These freeways parallel existing BNSF and UPRR lines. The changes in AADT over the years demonstrate the traffic growth patterns. Many areas have been seen traffic increase over the last 5 years; the increases are not limited to metropolitan areas like Los Angeles and San Francisco Counties. Traffic volumes are also seen to be increasing in inland counties like Merced and Stanislaus Counties (along I-5), and Solano and Placer Counties (along I-80).

Table A.13: AADT per Location on I-5, I-10 and I-80 from 2011 to 2015

I-10 EB Mainline AADT									
County	City	Abs PM	Location	# of Lane	2011	2012	2013	2014	2015
LA	Santa Monica	0.93	20th St	3	65114	68654	66078	64693	66063
San Bernardino	Ontario	52.06	4th St	4	96569	103836	101423	102218	101784
Riverside	Banning	99.27	San Gorgonio OC	4		58389	60779	61996	
	Coachella	152.7	Brown Arroyo	2		14120	13466		
I-10 WB Mainline AADT									
County	City	Abs PM	Location	# of Lane	2011	2012	2013	2014	2015
LA	Santa Monica	0.48	14th St	3	66592	72211	71467	70945	72107
San Bernardino	Ontario	52.06	4th St	4	99574	100117	100611	101709	101541
Riverside	Coachella	152.7	Brown Arroyo	2		14545	14077	14175	

I-80 EB Mainline AADT									
County	City	Abs PM	Location	# of Lane	2011	2012	2013	2014	2015
San Francisco	San Francisco	3.3	Bay Bridge S - Curve	5	96721	89851	93316	119657	129000
Alameda	Oakland	6.74	1400' E of Bay Bridge	6		94645	100845	120253	133699
Solano	Un-incorporated	51.44	E of Pleasant Valley OC	4	73032	66166	72154	81310	96992
Sacramento	Un-incorporated	98.1	WB Green Back Lane	4	76610	78094	78688	80909	83143
Placer	Un-incorporated	145.92	Alta Rd	2	12738	12884	13198	13682	14778

I-80 WB Mainline AADT									
County	City	Abs PM	Location	# of Lane	2011	2012	2013	2014	2015
San Francisco	San Francisco	3.3	Bay Bridge	5	106917	116261	117334	127608	
Alameda	Oakland	6.74	1400' E of Bay Bridge	5		127469	146370	145419	146282
Solano	Un-incorporated	51.44	E of Pleasant Valley OC	4	82472	84761	67710	83239	96167
Sacramento	Un-incorporated	98	WB Elkhorn Blvd	4	69582	70238	70429	72109	72956
Placer	Un-incorporated	145.92	Alta Rd	2	12890	13123	13185	13473	14719

I-5 NB Mainline AADT									
County	**City**	**Abs PM**	**Location**	**# of Lane**	**2011**	**2012**	**2013**	**2014**	**2015**
San Diego	San Diego	13.02	National Ave.	4	66695	72609	70703	72939	75413
	Oceanside	52.30	Oceanside Blvd	4	87945	93027	89034	90142	91600
Orange	Santa Ana	103.50	1st St	5	137509	139825	138231	136079	136264
LA	LA	150.35	Sunland Blvd	4	81430	83703			79546
	Un-incorporated	194.62	Smokey Bear Rd	4			41611	37729	40216
Kern	Un-incorporated	258.95	N of SR 58 (Rest Area)	2			19791	18975	19761
Merced	Un-incorporated	390.10	S of Off Ramp to Vista Point Rd	2	18134	19455	21029		
Stanislaus	Un-incorporated	433.70	Sperry Ave	2	20504	22119	21901	22945	23666
San Joaquin	Stockton	478.96	Mosher Slough	3	40193	24973	41041	34450	
Sacramento	Sacramento	524.19	Del Paso Rd	3			48495	51739	54757

I-5 NB Mainline AADT									
County	**City**	**Abs PM**	**Location**	**# of Lane**	**2011**	**2012**	**2013**	**2014**	**2015**
San Diego	San Diego	13.02	S of 29th	4	65594	70198	68096	69591	72275
	Oceanside	52.27	Oceanside Blvd	4	86069	90579	86429	87497	88963
Orange	Santa Ana	103.09	4th St	5	141327	143675	141838	143360	143236
LA	LA	152.41	Penrose St	4	59263	57738			89045
Kern	Un-incorporated	258.88	N of SR 58 (Rest Area)	2			20753	20201	21001
Merced	Un-incorporated	391.1	S of On Ramp from Rte 165/Mercy	2	16445	17578	18048	16502	
Stanislaus	Un-incorporated	433.64	Sperry Ave	2	19329	20839	20569	21457	22628
San Joaquin	Stockton	478.57	N of Hammer Lane	3		42647	39806	39772	
Sacramento	Sacramento	524.29	EB Del Paso Rd	4	60808	61646	58015	58696	60727

Source: PeMs Website (pems.dot.ca.gov)
Note: Abs PM = Absolute Post Mile

This trend of increasing traffic volume is also seen in the amount of time segments of these freeways experience Level of Service (LOS) D or worse throughout the course of a typical day. Table A.14 shows the percentage during the AM (6 to 9 am) and PM peak (4 to 7 pm) hours that a freeway (within a specific county) is experiencing LOS D or worse. It can be seen that portions of the freeways at LOS D or worse are increasing over the 5-year period. This trend is observed in both metropolitan counties like Alameda (along I-80) and Los Angeles (along I-10), and in counties in the Central Valley like Merced and San Joaquin (along I-5).

Table A.14: Percentage of Flow Worse Than or Equal to LOS D on I-5, I-10, and I-80 from 2011 to 2015

I-80 EB Alameda County Segment Mainline Weekday – % Worse Than or Equal to LOS D					
Time	**2011**	**2012**	**2013**	**2014**	**2015**
6:00	0	0	0	0.31	0
7:00	0	0	0.55	1.89	4.32
8:00	0	1.09	5.11	3.4	8.36
16:00	43.79	58.61	76.21	66.54	78.52
17:00	44.18	65.3	79.53	69.02	78.09
18:00	38.21	61.91	77.99	66.55	79.66
I-80 WB Alameda County Segment Mainline Weekday – % Worse Than or Equal To LOS D					
Time	**2011**	**2012**	**2013**	**2014**	**2015**
6:00	23.29	25.19	24.57	23.33	38.93
7:00	42.62	40.88	42.62	42.66	52.53
8:00	40.7	35.31	32.71	34.21	36.14
16:00	6.12	13.86	22.15	19.58	27.08
17:00	10.03	15.44	27.85	22.49	30.93
18:00	7.47	11.19	10.65	9.82	12.1

I-80 WB Sacramento County Segment Mainline Weekday – % Worse Than or Equal To LOS D					
Time	**2011**	**2012**	**2013**	**2014**	**2015**
6:00	17.88	19.09	29.3	25.41	39.12
7:00	68.21	54.88	60.59	58.47	71.64
8:00	64.81	41.64	56.38	43.76	45.8
16:00	9.2	1.06	24.15	28.35	42.33
17:00	7.23	2.14	24.11	27.01	40.52
18:00	1.03	0.66	7.19	6.62	7.38
Note: no data available for EB					

I-10 EB LA County Segment Mainline Weekday – % Worse Than or Equal To LOS D					
Time	**2011**	**2012**	**2013**	**2014**	**2015**
6:00	0.58	23.29	5.87	1.97	1.49
7:00	39.49	55.2	38.78	39.62	42.36
8:00	49.37	64.19	50.73	50.41	54.02
16:00	83.45	82.32	84.1	83.93	86.27
17:00	84.46	85.94	87.15	86.34	89.18
18:00	83.29	83.22	81.32	83.98	87.58
Note: No data available for other counties					

I-10 WB LA County Segment Mainline Weekday – % Worse Than or Equal To LOS D					
Time	**2011**	**2012**	**2013**	**2014**	**2015**
6:00	71.11	66.24	76.06	82.05	82.85
7:00	74.25	84.53	86.41	88.92	87.18
8:00	67.74	79.73	80.34	83.68	85.83
16:00	31.55	48.44	39.06	34.1	40.86
17:00	44.42	57.44	55.12	51.1	57.71
18:00	40.38	42.51	42.64	41.3	45.38
Note: No data available for other counties					

I-5 NB Merced County Segment Mainline Weekday – % Worse Than or Equal To LOS D					
Time	**2011**	**2012**	**2013**	**2014**	**2015**
6:00	19.77	18.45	21.26	19.99	22.75
7:00	45.24	44.89	46.04	46.66	45.93
8:00	43.2	42.22	44.66	44.51	41.71
16:00	41.08	43.37	41.99	39.78	45.26
17:00	43.49	46.08	44.03	42.12	47.18
18:00	28.93	33.03	30.27	29.37	34.62
I-5 SB Merced County Segment Mainline Weekday – % Worse Than or Equal To LOS D					
Time	**2011**	**2012**	**2013**	**2014**	**2015**
6:00	23.08	27.4	34.29	31.19	33.36
7:00	45.09	43.39	49.22	43.06	46.53
8:00	40.97	39.62	43.62	37.75	41.92
16:00	48.15	43.14	48.35	43.11	45.96
17:00	50.61	46.88	51.35	44.68	47.88
18:00	32.88	28.2	34.32	28.05	29.71
I-5 NB San Joaquin County Segment Mainline Weekday – % Worse Than or Equal To LOS D					
Time	**2011**	**2012**	**2013**	**2014**	**2015**
6:00	0	0	0	0	0
7:00	0	0	0	0.41	3.65
8:00	0	0.52	0	0	0
16:00	6.21	5.43	10.37	7.61	13.21
17:00	6.91	9.78	11.04	3.79	11.08
18:00	0	1.19	0	0	0.31

Note: No data available for SB
Source: PeMs Website (pems.dot.ca.gov)

Freight Demand and Growth

Methodology

In estimating train volumes, the 2018 Rail Plan builds on the analysis conducted for the 2013 Rail Plan. For this Plan, the basic methodology for deriving base year (2013) and future year (2040) train volumes entailed adjusting train volumes from the 2013 Rail Plan to reflect expected changes in commodity flows using more recent data. The 2013 Plan conducted a network assignment of 2007 and 2040 rail tonnage flows to estimate daily average freight train volumes. The 2013 Rail Plan also validated the 2007 train volume estimates against freight train counts using available Class I (BNSF and UPRR) train count data for selected rail segments. Train volumes in Southern California were also compared to train volumes as estimated using the San Pedro Bay Ports' QuickTrip – Train Builder model. In using the 2013 Rail Plan train volume analysis as a foundation, the 2018 analysis yielded consistent results in an efficient manner.

For the 2018 Rail Plan, train volume estimation proceeded as follows:

- First, rail commodity flows were aggregated by service type (i.e., intermodal or carload) into a geographical set of rail segments. Using the origins and destinations of the current plan's rail commodity flows, traffic was assigned to rail segments using the 2013 Rail Plan's network assignment.

- Next, the ratios of the 2018 plan's base year tonnages (2013) to the previous plan's base year tonnages (2007) were calculated. Those ratios were then applied to the 2007 train volumes to estimate the 2013 train volumes.

- The estimation of future year train volumes for the current plan proceeded similarly. The ratios of the current plans forecast year tonnages (2040) to the previous plan's base year tonnages (2007) were calculated. Those ratios were then applied to the 2007 train volumes to estimate the 2018 Rail Plan's forecast year train volumes.

- The resulting train count data were incorporated into the capacity analysis that was conducted as part of the Service Development Plan, the results of which are provided in Section A.2.2.7.

Freight Flow

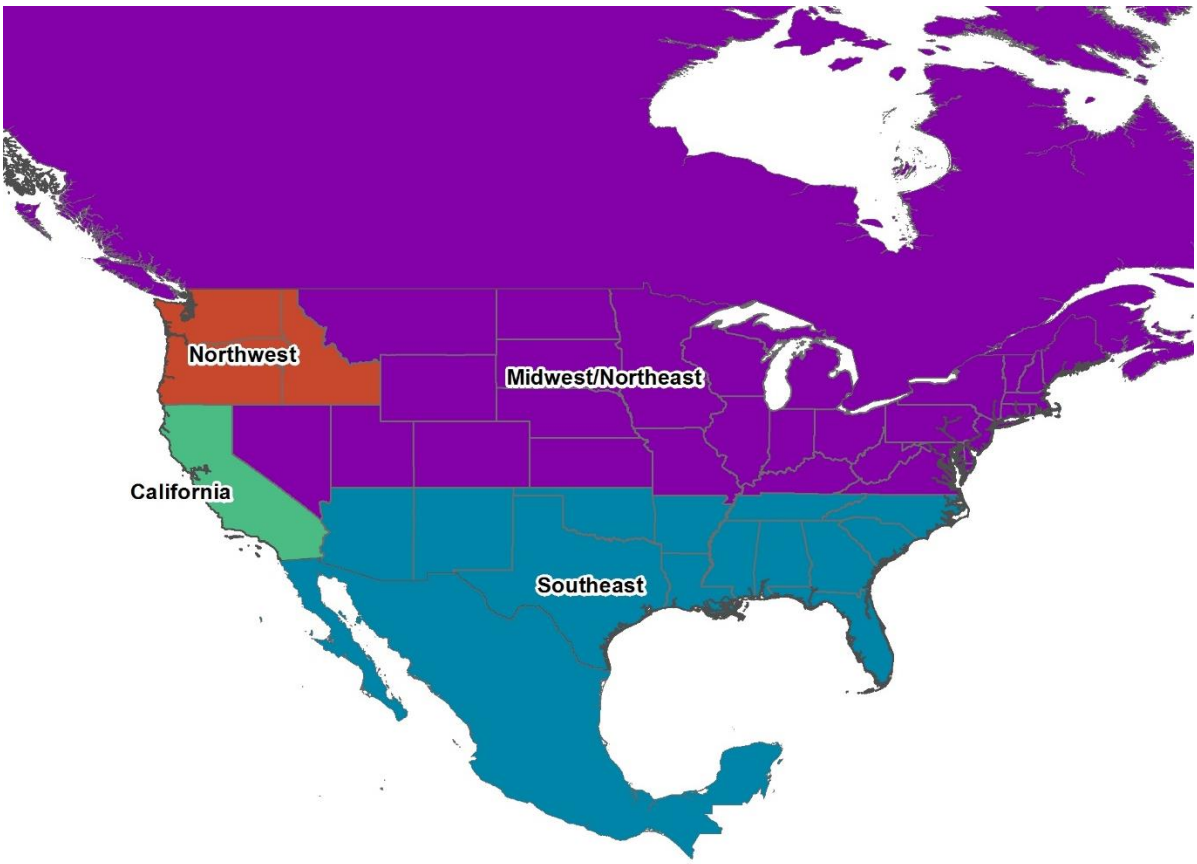


Exhibit A.4: Freight Flow Direction Categorization

California Rail Funding

State Funding

State Funding Accounts - Automatic Grade Crossing Warning Device Maintenance Fund

Table A.15 shows claims and claims paid under the Automatic Grade Crossing Warning Device Maintenance Fund. Claims are made by railroads to collect funding for the share of maintenance costs for automatic warning devices (typically 50 percent) owed by local roadway authorities (city or county). Claims paid reflect the actual amount paid by Caltrans for the maintenance of the automatic warning devices. Crossings refer to highway-rail crossings.

Table A.15: Grade Crossing Warning Device Maintenance Fund Claims and Budgets[9]

Fiscal Year	Number of Crossings	Total Claims (Millions of Dollars)	Total Paid (Millions of Dollars)
2005-2006	2,797	$4.09	$1.0
2006-2007	2,788	$3.90	$1.0
2007-2008	2,754	$3.85	$2.0
2008-2009	2,702	$3.81	$2.0
2009-2010	2,710	$3.83	$2.0
2010-2011	2,690	$3.80	$2.0
2011-2012	2,667	$3.78	$2.0
2012-2013	2,655	$3.76	$2.0
2013-2014	2,662	$3.77	$2.0

9 CPUC, Grade Crossing Maintenance Fund Program, February 2016.

Appendix A.6
Proposed Passenger Improvements and Investments

Overview of Capital Cost Methodology

Definitions

Rough-Order-of-Magnitude Cost Estimate: an estimate prepared during the pre-design stage when the project is between 0 and 5 percent design development.

Construction Costs: Costs to construct the project, including the labor, equipment, and material costs; subcontractors' overhead and profit; and the general contractor's overhead and profit.

Project Costs: Complete project cost, including the construction costs, right-of-way acquisitioning, design, construction and project management fees, and professional services.

Escalation: An adjustment factor that is meant to account for annual labor and commodity increases in construction materials, labor, and professional services.

Allocated Contingency: Also known as design contingency, this is an allowance carried in the estimate detail that accounts for expected design development and unknowns at the time of the estimate.

Unallocated Contingency: Also known as construction contingency, this is an allowance carried at the executive summary level to account for unexpected changes that may occur during construction, including unknown or undocumented site conditions.

Urban Rail: Passenger transportation on rail in urban areas, including light rail transit and heavy rail transit (BART and LA Metro.) Only specific urban rail projects that are considered to be significant regional connectors are included in the State Rail Plan.

Intercity Rail (Also referred to as Regional Rail and Commuter Rail): Passenger transportation on rail that connects two or more cities, typically longer distances than Urban Rail (Amtrak, Metrolink, Caltrain.)

High-Speed Rail: Passenger transportation on HSR infrastructure. This includes projects in the California High Speed Rail (CSRP) and the Xpress West project (XpressWest). The State Rail Plan contains the entire CSRP program, including Phase 1 under construction, Phase 1 planned, and Phase 2 planned. The XpressWest project includes two segments: the Victorville to Las Vegas segment published by Xpress West, and a connection from Victorville to Palmdale.

Introduction

This document is an Independent Cost Estimate and Cost Methodology Report prepared by AECOM for the 2018 California State Rail Plan. This estimate is a high-level rough-order-of-magnitude estimate based on an assortment of projects that are at the 0 percent design stage. The costs provided in this estimate are at the corridor level, and are not meant to represent individual projects. It is expected that these corridor-level totals will be subdivided into projects and phases as part of project implementation planning and design development. No design has been performed at this time at the project level.

This technical memorandum is intended to meet the following goals as defined by Caltrans and AECOM:

- Document the methodology and criteria used to complete the capital cost estimate.
- Present the rough-order-of-magnitude capital cost estimate figures.
- Provide detailed assumptions, project elements, unit prices, and pricing sources for review by the Caltrans team.

Purpose

This document presents the rough-order-of-magnitude capital costs for the proposed infrastructure improvements associated with the 2018 Rail Plan. This document presents the methodology used in preparing the costs, as well as the estimate criteria, pricing sources, and assumptions. This estimate is representative of the most realistic price under stable bidding conditions for a project with the given assumptions and criteria. Any variance to the assumptions listed in this report could be the cause for a variance in the design and construction costs for the corridor improvements. This estimate is not intended to be a prediction of an under-designed system or a low-bid estimate. Likewise, this estimate is not intended to be a prediction of an over-designed system or open ended contract.

This document was prepared with the intended purpose of providing a strategic planning overview of the estimated probable capital cost of completing the program of projects needed to achieve the vision of an integrated passenger rail network and improved freight rail system supporting the stated goals of the California Transportation Plan 2040.

Estimate Methodology and Criteria

Estimate Methodology

Estimate Level

The estimates of probable capital costs at this stage include planning-level estimates of cost that take into consideration factors such as complexity, environment, geographic location (urban, suburban, rural), proximity to active tracks, and other such factors that may significantly influence the costs. Therefore, planning-level estimates of probable cost are gross-order-of-magnitude estimates intended to be indicative and inform the prioritization of investment decisions, and are not to be interpreted as engineer estimates.

Estimate Format

The estimate of probable cost is presented with totals listed by corridor-level improvements. These costs are summarized into improvements by region. Key quantities are given for each corridor to identify the essential project elements. Corridor estimates are based on either sourced information, or built up using a capital cost unit price catalog. This catalog follows the FRA Standardized Cost Categories (SCC), with unit costs for typical elements identified based on an average project cost. For unique high-cost improvements such as intercity stations, local stops, regional terminals, and major iconic intermodal hubs, maintenance yards, shops, and administrative buildings, a lump sum opinion of cost is assumed based on a range of low, medium, and high comparable costs derived from recent projects of similar scope.

Estimate Procedure

Step 1 – Capacity Charts/Network Graphs:

The 2040 Strategic Service Plan service type, frequency (system pulse), required average line speed, departure and arrival times, and route nodes used to develop corridor-specific improvements and build related capital cost estimates. This service plans were used to identify capacity requirements at the corridor level throughout the state. These capacity requirements are the primary basis for all project descriptions and assumptions in this estimate.

Step 2 – Corridor Investigation:

The corridors were investigated by a visual survey of the existing infrastructure using a combination of Google Earth mapping and consulting team professional knowledge of the existing conditions. The existing infrastructure was compared with future capacity requirements from the Capacity / Network charts. The planning team then compared the existing infrastructure to the future capacity requirements to identify the specific project components.

Step 3 – Pricing Research and Create Corridor Estimates:

An estimate of probable capital cost was prepared for each corridor by using sourced data or building up a cost estimate by using sourced information, or using a capital cost unit price catalog.

The cost catalog identified a "menu" of prototypical improvements, consisting of approximately 30 elements. Unit costs were developed for each element, using historical cost data from other projects. Cost factors, mark-ups, and adjustments were added as needed to develop pricing for new impacts not previously included in estimates, and / or adjust prior cost estimates to reflect a consistent cost estimate system.

For costs that are not sourced, corridor estimates were built up using the cost catalog. The corridor estimate applied unit costs to the programmatic project developments identified in Step 2. Measurements were taken to determine lengths (in route miles) of guideway type with assumptions for at-grade, aerial, or underground alignment.

Estimate Criteria

Pricing Sources and Standard Cost Categories

Sourced Projects

- 2016 Draft CAHSRA Business Plan (2016)
- Capitol Corridor 2014 Vision Plan Update Final Report (2014)
- Redlands Passenger Rail Project Fact Sheet (2015)
- XpressWest Media Kit (2011)

Cost Catalog

Unit costs have been developed from historical cost data, both internal and gathered from due diligent research. Many unit prices are based on the average or more conservative higher-end of the statistical averages. All costs have been appropriately adjusted with location and escalation factors to be comparable to California in the Plan Year of 2018.

10 Track Structures & Track – includes elevated structures (bridges and viaducts), embankments and open cuts, retaining wall systems, tunnels, culverts and drainage, track (ballasted and non-ballasted), and special trackwork. Unit costs are averages based on cost estimates and bid results from Caltrain, Metrolink, BART, and LA Metro. Pricing is included for new single track, new double track, and relocation of existing track.

20 Stations, Terminals, Intermodal – includes rough grading, excavation, station structures, enclosures, finishes, equipment; mechanical and electrical components including heating, ventilation, and air conditioning; station power, lighting, public address/customer information systems; and safety systems such as fire detection and prevention, security surveillance, access control, and life safety systems. Unit costs are averages based on cost estimates and bid results from Caltrain, Metrolink, BART, and LA Metro. A range of costs has been used depending on the intent of the design, with a range from low, medium, and high, to iconic. Iconic refers to a major hub such as Los Angeles Union Station or San Francisco's Transbay Terminal.

30 Support Facilities: Yards, Shops, Administration Buildings – includes rolling stock service, inspection, storage, heavy maintenance and overhaul facilities and equipment, as well as associated yard tracks and electrification. In addition, maintenance-of-way facilities are also included in this cost category. Unit costs are averages based on cost estimates and bid results from Caltrain, Metrolink, BART, and LA Metro. A range of costs has been used, depending on the intent of the design, ranging from low to and high.

40 Sitework, Right-of-Way, Land, Existing Improvements – includes cost of demolition, hazardous materials removals, environmental mitigation, utility relocations, noise mitigation, intrusion protection, grade separations, roadway improvements, acquisition of real estate, and temporary facilities and other indirect costs.

50 Systems – includes all costs of implementing Automatic Train Control (ATC) systems, inclusive of Positive Train Control (PTC) and intrusion detection, where it is applicable. Includes costs of traction power supply system such as supply, paralleling, and switching substations, as well as connections to the power utilities; and traction power distribution system in the form of Overhead Contact System (OCS). Unit costs are averages based on cost estimates and bid results from Caltrain, Metrolink, BART, and LA Metro. Unit costs are averages based on cost estimates and bid results from Caltrain, Metrolink, BART, and LA Metro. A range of costs has been used depending on the geography of the design, ranging from rural and suburban to urban. A sitework cost has been included for every mile of at-grade, aerial, and underground construction.

60 Right-of-Way – Land acquisition purchase required for guideway, stations, and facilities. Unit costs are based on the California High Speed Rail Authority's Business Plan. Urban right-of-way is estimated at 90 percent of the costs for the San Francisco to San Jose segment. Suburban right-of-way costs are 67 percent of the San Francisco to San Jose cost. Rural San Francisco to San Jose costs are estimated at 25 percent of the San Francisco to San Jose cost.

70 Vehicles – includes costs for acquisition of the trainsets (design, prototype unit, and production and delivery of trainsets to the project site on an annual basis). This estimate excludes all rolling stock.

80 Professional Services – includes all professional, technical, and management services related to the design and construction of infrastructure (Categories 10 through 60) during the preliminary engineering, final design, and construction phases of the project/program (as applicable). A 30 percent mark-up has been used to account for all professional services.

Contingency

Allocated Contingency (or Pre-Construction Design Development)

Allocated contingency represents a percentage of unknown or undeveloped scope that has not been implemented into the design documents. Because there is no design on any project, this estimate uses the maximum of 30 percent contingency. This contingency is expected to be reduced when the projects are designed.

Unallocated Contingency (or Change Order Contingency)

Unallocated contingency added to the construction and professional services costs at 10 percent of the estimate. Unallocated contingency represents costs above and beyond in the project budget, for such changes that are likely to occur during the construction. The construction contingency allowance carried by the owner in the project budget should remain constant throughout the design process.

Contract Procurement & Construction Fee

No assumptions have been made regarding contract procurement and delivery method. The unit costs include appropriate allowances to cover contractor fees, overhead, general conditions, and general requirements. The FRA format does not include a specific location for the contractor's General Conditions; therefore, the contractor's General Conditions have been included throughout the estimate at the unit cost level.

Cost Basis Year

AECOM established 2018 as the base year of all the cost estimates prepared for the 2018 Rail Plan. Any previous data that have a different base year—for example, Sepulveda Pass Final Compendium Report (2012), Capital Corridor 2014 Vision Plan Update Final Report, and 2016 Draft CAHSRA Business Plan—have been adjusted to match the base year established for the 2018 Rail Plan.

Cost Escalation Methodology and Calculations

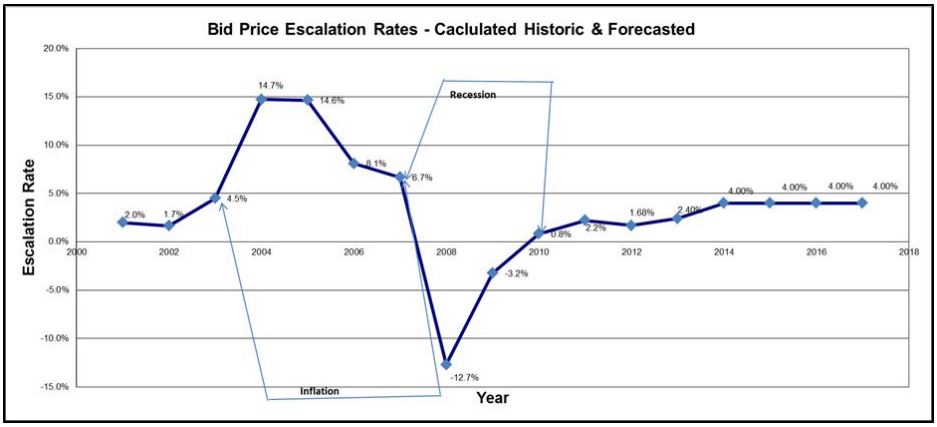
The regional rail/commuter rail unit prices in the estimate detail are priced in 2018 value. Any sourced project data have been escalated from the published report date to the year 2018. An

adjustment for cost escalation has been added to account for the anticipated cost increases between the published date and the 2018 cost basis year.

The HSR unit prices in the estimate detail are also priced in future value of the cost basis year. However, the adjustment for cost escalation has been performed at the summary level to account for the anticipated cost increases between the CAHSRA report year (2016) and the cost basis year (2018). The sum of the main elements has been escalated by 4 percent annually.

Escalation adjustment is meant to account for normal market growth across the state. The long-range annual escalation factor has been calculated by aggregating escalation procured from several government and consulting sources, including California Department of Transportation, American General Contractors, Turner Construction, Cumming Corporation, Davis Langdon, Engineering News Record, and the Los Angeles Bureau of Engineering. The average escalation factor calculated when aggregating the data is 3.99 percent. This estimate rounds the escalation rate up to 4 percent per year for long-range estimating purposes. Table A.29 depicts the reference long-term escalation rates, sources, and the average escalation rate of all the reference sources.

The following graph shows the average annual escalation data during the past 12 years, and the projected escalation rates through 2018.



Sources: Escalation rates have been calculated by aggregating long-range historic trends and forecasts from the following sources: Caltrans Average Highway Contract Prices 2000-2012, ENR- LA BCI & CCI 2000-2012, AGC Construction & Materials Outlook, May 1, 2013.

Qualifications

- This estimate should be used for high-level visioning purposes only, and not for grant applications or other decision making for specific projects.
- Any flaws or errors in the ridership modeling or production of the network graphs are carried through, and affect the estimate totals.
- Actual project costs could range +/- 30 percent.

Emissions Inventory Analysis Supporting Information

2010 and 2040 Freight Locomotive Emissions Analysis

Emission rates by certification tier used for freight locomotives are reported in Table A.16, and the locomotive fleet make-up is presented in Table A.17. Weighted emission rates, in terms of grams per gallon of diesel, are shown in Table A.18.

Freight activity was provided in terms of estimated ton-miles in each air basin for 2013, 2040, and "2040-High." Straight line interpolation was used to extrapolate 2011 ton-miles, and converted to fuel consumption, then scaled to match the most recent California Air Resources Board (CARB) estimated fuel consumption estimate of 210 million gallons of fuel consumed annually[10]. Estimated ton-miles and scaled fuel consumption were extrapolated for a 2010 baseline year; and scaled fuel economy was estimated for the 2040 and "2040-high" activity estimates (Table A.19). Estimated emissions from freight were estimated by combining these fuel consumption data with the emission rates (Table A.20).

2010 and 2040 Passenger Locomotive Emissions Analysis

Passenger locomotive emissions were estimated, first assuming no electrification based on existing CARB passenger locomotive data, [11,12] and scaling factors based on estimated passenger miles of travel (PMT) in each air basin (Table A.21, Table A.22, and Table A.23). This approach implicitly assumes the mix of locomotive technologies assumed by CARB. The 2035 inventory was used directly to represent 2040, assuming there would not be changes to the locomotive fleet and train schedules between 2035 and 2040. Subsequent adjustments are made on these tables to account for electrification. Statewide emissions from the CARB inventory were used as a control total; emissions were allocated to each air basin based on the relative distribution of passenger miles of travel in each air basin.

Table A.24 provides PMT data used to scale the CARB emissions inventory. The 2040 with-demonstration data were broken out into electric and diesel operation by assuming that in the San Joaquin Valley, Mojave Desert, San Francisco Bay Area, South Coast, and San Diego, 100 percent of the increases in PMT sources in 2040 (relative to 2040 no plan, and 50 percent of the 2010 to 2040 growth without the demonstration plan) would be electrified and have zero

[10] Nicole Dolney and M. Malchow, (2014) Locomotive Inventory Update: Line Haul Activity, CARB tech distribution ref. (Presentation), 2014, California Air Resources Board.

[11] For criteria pollutants: CARB (2016) ARB's Emission Inventory Activities, California Air resources Board, Accessed 2016).

[12] For CO_2: Statewide total based on June 2016 California GHG Inventory, less estimated freight CO_2 emissions.

emissions. Table A.25 then presents the 2040 with-demonstration emissions assuming electrification.

CO_2 emissions from electric power generation were then incorporated into the draft CSRP. Estimates were based on the megawatt-hours required to power locomotives in each air basin; and emission factors for power generation assuming California's Renewable Portfolio Standard. The final draft will present emissions assuming that all of the electricity used to power the system will be generated from renewable resources such as solar and wind.

2010 and 2040 On-Road Vehicle Emissions Analysis

On-road emissions were estimated based on emissions for 2010 and 2040 that were calculated using EMFAC 2014, run for each air basin in California. For passenger vehicles, emission rates were derived from EMFAC and applied to passenger-vehicle miles of travel estimates from the CSRP, by air basin. 2010 and 2040 passenger vehicle miles of travel, without the 2040 rail plan, were scaled to match EMFAC 2014 estimates. Scaling is necessary because the statewide travel demand model network is courser than the regional model networks that EMFAC default vehicle miles of travel (VMT) is based on. The 2040 scaling factor was then applied to the reduced 2040 passenger vehicle VMT with the CSRP, and the resulting VMT was used in estimating with CSRP emissions. Commercial vehicle VMT and emissions were taken directly from EMFAC 2014.

Table A.26 shows the resulting vehicle emissions inventory for 2010, 2040, and 2040 with the CSRP.

2020 and 2025 Emissions

Straight line interpolation was used to estimate emissions for intermediate analysis years.

Table A.27 and Table A.28 show estimated grams of carbon dioxide emitted per passenger mile of travel from passenger locomotives and on-road passenger vehicles; these data are derived from the preceding tables.

Table A.16: Freight Locomotive Emission Factors

Certification Tier	Manufacture Year	g/bhp-hr					
		CO2	ROG	NOx	CO	PM10	PM2.5
Pre Tier	Pre 1973	491.20	0.48	13.00	1.28	0.32	0.310
Tier 0	1973-2001	491.20	0.48	8.60	1.28	0.32	0.310
Tier 0r	2008+	491.20	0.30	7.20	1.28	0.20	0.194
Tier 1	2002-2004	491.20	0.47	6.70	1.28	0.32	0.310
Tier 1r	2008+	491.20	0.29	6.70	1.28	0.20	0.194
Tier 2	2005	491.20	0.26	4.95	1.28	0.18	0.175
Tier 2r	2008+	491.20	0.13	4.95	1.28	0.08	0.078
Tier 3	2012-2014	491.20	0.13	4.95	1.28	0.08	0.078
Tier 4	2015+	491.20	0.04	1.00	1.28	0.015	0.015
Certification Tier	Manufacture Year	g/gal @ 20.8 bhp-hr/gal					
		CO2	ROG	NOx	CO	PM10	PM2.5
Pre Tier	Pre 1973	10217	9.98	270.40	26.62	6.66	6.448
Tier 0	1973-2001	10217	9.98	178.88	26.62	6.66	6.448
Tier 0r	2008+	10217	6.24	149.76	26.62	4.16	4.035
Tier 1	2002-2004	10217	9.78	139.36	26.62	6.66	6.448
Tier 1r	2008+	10217	6.03	139.36	26.62	4.16	4.035
Tier 2	2005	10217	5.41	102.96	26.62	3.74	3.640
Tier 2r	2008+	10217	2.70	102.96	26.62	1.66	1.622
Tier 3	2012-2014	10217	2.70	102.96	26.62	1.66	1.622
Tier 4	2015+	10217	0.83	20.80	26.62	0.312	0.312

Source: EPA *Emission Factors for Locomotives*, (2009), EPA-420-F-09-025.

Table A.17: Freight Locomotive Fleet Certification Mix

Certification Tier	Without SCAB MOU			With SCAB* MOU (Used for SCAB)			Avg. of SCAB & Non-SCAB Fleet (Used outside of SCAB)		
	2010	2013	2040	2010	2013	2040	2010	2013	2040
Pre-Tier									
Tier 0	47.6%	18.8%		20.5%	10.4%		34.05%	14.60%	
Tier 0r	21.4%	40.7%		9.7%	24.4%		15.55%	32.55%	
Tier 1	8.4%	3.5%		3.7%	2.6%		6.05%	3.05%	
Tier 1r	3.8%	9.0%	1.4%	1.9%	4.8%	1.4%	2.85%	6.90%	1.4%
Tier 2	18.8%	18.5%		64.2%	38.6%		41.50%	28.55%	
Tier 2r		2.5%	5.4%		5.4%	5.4%		3.95%	5.4%
Tier 3		7.0%	9.2%		13.8%	9.2%		10.40%	9.2%
Tier 4			84.0%			84.0%			84.0%

* SCAB = South Coast Air Basin

Source: Nicole Dolney and M. Malchow (2014) Locomotive Inventory Update: Line Haul Activity, CARB tech distribution ref. (Presentation), November 7, 2014, California Air Resources Board.

Table A.18: Weighted Emission Rates for Freight Locomotives

Pollutant	Without SCAB MOU			With SCAB* MOU (Used for SCAB)			Avg. of SCAB & Non-SCAB Fleet (Used outside of SCAB)		
	2010	2013	2040	2010	2013	2040	2010	2013	2040
CO2 (g/gal)	10,217	10,217	10,217	10,217	10,217	10,217	10,217	10,217	10,217
ROG (g/gal)	8.15	6.56	1.18	6.60	5.71	1.18	7.38	6.14	1.18
NOx (g/gal)	153.55	140.83	34.46	125.10	124.97	34.46	139.33	132.90	34.46
CO (g/gal)	26.62	26.62	26.62	26.62	26.62	26.62	26.62	26.62	26.62
PM10 (g/gal)	5.48	4.40	0.56	4.50	3.84	0.56	4.99	4.12	0.56
PM2.5 (g/gal)	5.31	4.27	0.56	4.37	3.73	0.56	4.84	4.00	0.56

Table A.19: Estimated Annual Gallons of Diesel Consumed by Freight Operations (in millions)

Air Basin	2010	2040	2040 High
Mojave Desert	71.0	101.0	104.1
Mountain Counties	14.4	25.2	25.2
North Central Coast	1.4	2.2	2.2
Northeast Plateau	5.3	7.1	7.1
Sacramento Valley	21.9	31.8	31.8
Salton Sea	4.9	7.3	8.8
San Diego County	1.9	3.0	3.0
San Francisco Bay	7.8	14.3	14.3
San Joaquin Valley	45.0	62.7	62.7
South Central Coast	3.3	3.9	3.9
South Coast	30.5	44.6	58.5

Table A.20: Estimated Freight Locomotive Emissions

Pollutant	Bay Area & N Cal	Greater LA and LOSAN South	LOSAN North and Central Coast	Xpress West and Inland Empire	Cantal Valley	Total
2010 Freight Locomotive Emissions (Tons/Day)						
CO2	1,525	997	144	2,343	1,390	6,399
ROG	1.10	0.65	0.10	1.69	1.00	4.55
NOx	20.79	12.29	1.96	31.95	18.95	85.95
CO	3.97	2.60	0.37	6.11	3.62	16.67
PM10	0.74	0.44	0.07	1.14	0.68	3.08
PM2.5	0.72	0.43	0.07	1.11	0.66	2.99
2040 (Low Activity) Freight Locomotive Emissions (Tons/Day)						
CO2	2,420	1,470	189	3,343	1,935	9,356
ROG	1.75	0.96	0.14	2.41	1.40	6.65
NOx	33.00	18.12	2.57	45.58	26.38	125.67
CO	6.31	3.83	0.49	8.71	5.04	24.38
PM10	1.18	0.65	0.09	1.63	0.94	4.50
PM2.5	1.15	0.63	0.09	1.58	0.92	4.37
2040 (High Activity) Freight Locomotive Emissions (Tons/Day)						
CO2	2,420	1,896	189	3,483	1,935	9,923
ROG	1.75	1.23	0.14	2.52	1.40	7.03
NOx	33.00	23.35	2.57	47.50	26.38	132.81
CO	6.31	4.94	0.49	9.08	5.04	25.86
PM10	1.18	0.84	0.09	1.70	0.94	4.76
PM2.5	1.15	0.81	0.09	1.65	0.92	4.62

Table A.21: 2010 Passenger Locomotive Emissions without Plan (based on CARB 2010 statewide inventory)

	Bay Area & N Cal	Greater LA and LOSAN South	LOSAN North and Central Coast	Xpress West and Inland Empire	Cantal Valley	Total
CO2 (Tons/Day)	*283.62*	*109*	*8*	*2*	*138*	541
ROG (Tons/Day)	*0.30*	*0.12*	*0.01*	*0.00*	*0.15*	0.58
NOx (Tons/Day)	*5.28*	*2.04*	*0.16*	*0.04*	*2.56*	10.08
CO (Tons/Day)	*0.46*	*0.18*	*0.01*	*0.00*	*0.22*	0.87
PM10 (Tons/Day)	*0.11*	*0.04*	*0.00*	*0.00*	*0.05*	0.21
PM2.5 (Tons/Day)	*0.10*	*0.04*	*0.00*	*0.00*	*0.05*	0.20
Passenger miles traveled	2,025,908	781,541	59,433	14,881	982,879	3,864,641

Table A.22: 2040 Passenger Locomotives Emissions without Plan (based on CARB 2035 statewide inventory)

	Bay Area & N Cal	Greater LA and LOSAN South	LOSAN North and Central Coast	Xpress West and Inland Empire	Cantal Valley	Total
CO2 (Tons/Day)	572.15	136	11	3	345	1,068
ROG (Tons/Day)	0.44	0.10	0.01	0.00	0.26	0.82
NOx (Tons/Day)	7.69	1.83	0.15	0.05	4.64	14.35
CO (Tons/Day)	0.67	0.16	0.01	0.00	0.40	1.25
PM10 (Tons/Day)	0.16	0.04	0.00	0.00	0.10	0.30
PM2.5 (Tons/Day)	0.15	0.04	0.00	0.00	0.09	0.28
Passenger miles traveled	4,086,958	973,808	80,275	24,320	2,465,647	7,631,007

Table A.23: 2040 Passenger Locomotives Emissions with Plan (based on PMT scaling of 2040 no plan data and no electrification)

	Bay Area & N Cal	Greater LA and LOSAN South	LOSAN North and Central Coast	Xpress West and Inland Empire	Cantal Valley	Total
CO2 (Tons/Day)	2,968	3,777	104	1,575	5,578	19,849
ROG (Tons/Day)	2.28	2.90	0.08	1.21	4.28	14.34
NOx (Tons/Day)	39.87	50.74	1.40	21.15	74.93	266.62
CO (Tons/Day)	3.47	4.42	0.12	1.84	6.53	21.97
PM10 (Tons/Day)	0.83	1.06	0.03	0.44	1.57	4.97
PM2.5 (Tons/Day)	0.78	0.99	0.03	0.41	1.46	4.87
Passenger miles traveled	21,204,118	26,982,374	742,253	11,246,981	39,845,493	100,021,220

Table A.24: 2040 Passenger Miles of Travel by Air Basin

Air Basin	2010 Baseline	2040 No-Build	2040 Demonstration (Total)	2040 Demonstration (Electric)	2040 Demonstration (Diesel)
North Coast			62,368		62,368
Northeast Plateau					
Sacramento Valley	277,149	533,131	4,537,482	4,132,342	405,140
Mountain Counties	1,226	1,838	38,644		38,644
Lake County					
Lake Tahoe					
Great Basin Valleys					
San Joaquin Valley	982,879	2,465,647	39,845,493	38,121,231	1,724,263
North Central Coast	8,422	15,900	520,998		520,998
Mojave Desert	14,375	24,006	10,784,900	10,765,710	19,190
South Central Coast	51,011	64,375	221,255		221,255
Salton Sea	506	313	462,081		462,081
San Francisco Bay	1,747,533	3,551,989	16,565,624	13,915,864	2,649,761
South Coast	721,824	896,862	22,674,116	21,864,773	809,343
San Diego County	59,717	76,946	4,308,258	4,239,927	68,331
Total	*3,864,641*	*7,631,007*	*100,021,220*	93,039,845	6,981,375
Aggregated to Planning Areas					
Bay Area & N Cal	2,025,908	4,086,958	21,204,118	18,048,205	3,155,913

Air Basin	2010 Baseline	2040 No-Build	2040 Demonstration (Total)	2040 Demonstration (Electric)	2040 Demonstration (Diesel)
Greater LA and LOSAN South	781,541	973,808	26,982,374	26,104,700	877,674
LOSAN North and Central Coast	59,433	80,275	742,253		742,253
Xpress West and Inland Empire	14,881	24,320	11,246,981	10,765,710	481,271
Cantal Valley	982,879	2,465,647	39,845,493	38,121,231	1,724,263

Bay Area and N. Cal = North Coast, Northeast Plateau, Sacramento Valley, Mountain Counties, Lake County, Lake Tahoe, San Francisco Bay Area
Greater LA and LOSAN South = South Coast, San Diego County
LOSAN North and Central Coast = North Central Coast, South Central Coast
Xpress West and Inland Empire = Great Basin Valleys, Mojave Desert, Salton Sea
Central Valley = San Joaquin Valley

Table A.25: 2040 Passenger Locomotives Emissions with Plan (based on PMT scaling of 2040 no plan data, with electrification)

	Bay Area & N Cal	Greater LA and LOSAN South	LOSAN North and Central Coast	Xpress West and Inland Empire	Cantal Valley	Total
CO2 (Tons/Day)	441.81	123	104	67	241	977
ROG (Tons/Day)	0.34	0.09	0.08	0.05	0.19	0.75
NOx (Tons/Day)	5.93	1.65	1.40	0.91	3.24	13.13
CO (Tons/Day)	0.52	0.14	0.12	0.08	0.28	1.14
PM10 (Tons/Day)	0.12	0.03	0.03	0.02	0.07	0.27
PM2.5 (Tons/Day)	0.12	0.03	0.03	0.02	0.06	0.26
Diesel Passenger miles traveled	3,155,913	877,674	742,253	481,271	1,724,263	6,981,374

Table A.26: Emissions Based on EMFAC 2014 Emissions Inventory Scaled by Changes in Passenger Vehicle (LDA, LDT1, LDT2, MDV, MC) VMT in Each Air Basin

	Bay Area & N Cal	Greater LA and LOSAN South	LOSAN North and Central Coast	Xpress West and Inland Empire	Cantal Valley	Total
2010 Baseline (Tons/Day)						
CO2 (Tons/Day)	140,463	238,338	27,627	34,394	62,532	503,353
ROG (Tons/Day)	149.0	207.7	30.8	34.0	59.5	480.98
NOx (Tons/Day)	352.1	469.3	67.6	116.1	225.1	1,230.13
CO (Tons/Day)	1,201.9	1,793.2	256.3	279.1	439.4	3,969.91
PM10 (Tons/Day)	22.5	34.6	4.3	6.5	12.0	79.99
PM2.5 (Tons/Day)	13.3	19.5	2.5	4.4	8.3	47.90
VMT	253,744,662	425,988,835	50,814,352	55,250,354	93,058,417	878,856,620
2040 No Plan (Tons/Day)						
CO2 (Tons/Day)	106,453	185,041	19,051	32,252	62,980	405,777
ROG (Tons/Day)	30.3	50.6	5.7	8.3	12.8	107.73
NOx (Tons/Day)	57.7	87.5	8.9	17.4	44.4	215.93
CO (Tons/Day)	199.2	357.2	38.1	59.9	84.7	739.10
PM10 (Tons/Day)	18.9	32.0	3.6	5.0	9.1	68.52
PM2.5 (Tons/Day)	7.7	13.1	1.5	2.0	3.7	28.06
VMT	327,697,848	554,658,688	62,930,263	81,789,654	149,282,777	1,176,359,230
2040 with Plan (Tons/Day)						
CO2 (Tons/Day)	104,429	179,830	18,259	31,540	59,032	393,090
ROG (Tons/Day)	29	49	5	8	11	102.99
NOx (Tons/Day)	57	87	9	17	44	213.80
CO (Tons/Day)	194	344	36	58	75	707.27
PM10 (Tons/Day)	18	31	3	5	8	65.82
PM2.5 (Tons/Day)	8	13	1	2	3	26.96
VMT	318,824,265	533,299,372	59,560,214	78,670,294	132,319,796	1,122,673,942

	Bay Area & N Cal	Greater LA and LOSAN South	LOSAN North and Central Coast	Xpress West and Inland Empire	Cantal Valley	Total
Plan Emission Reduction Benefit (Tons/Day)						
CO2 (Tons/Day)	2,024	5,211	792	712	3,948	12,687
ROG (Tons/Day)	0.77	1.93	0.31	0.31	1.42	5
NOx (Tons/Day)	0.34	0.85	0.16	0.16	0.62	2
CO (Tons/Day)	5.08	13.10	2.11	2.14	9.40	32
PM10 (Tons/Day)	0.45	1.07	0.17	0.16	0.85	3
PM2.5 (Tons/Day)	0.18	0.44	0.07	0.06	0.35	1
VMT	8,873,582	21,359,317	3,370,049	3,119,360	16,962,981	53,685,288

Table A.27: Passenger Locomotive Emissions per Passenger Mile Traveled (g/PMT)

	2010 baseline (g/PMT)	2040 no plan (g/PMT)	2040 demonstration (g/PMT)
CO2	127.00	127.00	8.86
ROG	0.14	0.10	0.01
NOx	2.37	1.71	0.12
CO	0.20	0.15	0.01
Exhaust PM10	0.05	0.04	0.00
Exhaust PM2.5	0.05	0.03	0.00

Table A.28: Passenger Vehicle Emissions per Passenger Mile Traveled (g/PMT)

	2010	2040
Trip length	5.50	4.93
CO2	363	179
ROG	0.38	0.07
NOx	0.34	0.03
CO	3.28	0.46
PM10	0.04	0.04
PM2.5	0.02	0.02

Based on assumed vehicle occupancy of 1.2 passengers per vehicle

Economic Benefits

These tables represent the California State Rail Plan, including **all** projects. They should be analyzed in the same manner as those in the previous report.

Findings:

In Table 1 below we report the direct construction expenditures associated with California State Rail projects as an aggregate, all in constant $2018 values. By 2040 these projects are expected to total just over $181 billion.

Table A.29: Direct Expenditures for All California State Rail Plan Projects (000s, $2018)

Direct Expenditure	2022	2027	2040	Total
Total by Period	$ 28,498,345	$ 77,659,538	$ 75,212,582	$ 181,370,465

As shown, the direct expenditures associated with the California State Rail Plan result in total output for the California economy of over $344 billion – a multiplier effect of 1.9[13]. Resulting in a total employment impact across affected industries of over 2 million person-years of employment, and labor income of over $126 billion.

The IMPLAN model also calculates tax revenues associated with this economic activity, in terms of State and local and Federal taxes. The tax impacts here are for taxes for which revenues can be directly inferred from economic expenditures, such as sales or income taxes.

The total tax revenues anticipated from the expenditures are close to **$9 billion** for State and local and close to **$24 billion** for Federal taxes by 2040.

[13] Total output includes the initial direct expenditures. It also includes all labor income in terms of wages and salaries.

Table A.30: Total Economic Impacts: Employment, Income, and Total Expenditures (000s, $2018)

Impact Summary	2022	2027	2040	Total
Direct Expenditure Impacts (A):				
Employment (Person Years)	$ 180,656	$ 492,298	$ 476,786	$ 1,149,740
Labor Income ($)	$ 11,154,666	$ 30,397,070	$ 29,439,296	$ 70,991,032
Output ($)	$ 28,478,301	$ 77,604,918	$ 75,159,683	$ 181,242,902
Indirect Expenditure Impacts (B):				
Employment (Person Years)	$ 57,498	$ 156,685	$ 151,748	$ 365,931
Labor Income ($)	$ 3,990,015	$ 10,873,007	$ 10,530,412	$ 25,393,434
Output ($)	$ 11,972,622	$ 32,626,045	$ 31,598,038	$ 76,196,705
Induced Expenditure Impacts (C):				
Employment (Person Years)	$ 85,342	$ 232,561	$ 225,234	$ 543,137
Labor Income ($)	$ 4,655,404	$ 12,686,230	$ 12,286,502	$ 29,628,136
Output ($)	$ 13,679,629	$ 37,277,732	$ 36,103,157	$ 87,060,518
Total Impacts (A + B + C):				
Employment (Person Years)	$ 323,496	$ 881,544	$ 853,768	$ 2,058,808
Labor Income ($)	$ 19,800,085	$ 53,956,307	$ 52,256,210	$ 126,012,602
Output ($)	$ 54,130,552	$ 147,508,695	$ 142,860,878	$ 344,500,125

Table A.31: Tax Revenue Impacts (000s, $2018)

Tax Summary	2022	2027	2040	Total
State and Local				
Sales Tax	$ 679,895	$ 1,852,751	$ 1,794,373	$ 4,327,019
Income Tax	$ 640,383	$ 1,745,079	$ 1,690,094	$ 4,075,556
Social Security	$ 49,245	$ 134,195	$ 129,966	$ 313,406
Total	$ 1,369,523	$ 3,732,025	$ 3,614,433	$ 8,715,981
Federal				
Excise Taxes	$ 124,297	$ 338,715	$ 328,043	$ 791,055
Income Tax	$ 1,812,387	$ 4,938,852	$ 4,783,235	$ 11,534,474
Social Security	$ 1,822,988	$ 4,967,742	$ 4,811,214	$ 11,601,944
Total	$ 3,759,672	$ 10,245,309	$ 9,922,492	$ 23,927,473

2027 and 2040 Capital Projects Details

Table A.32: 2027 Capital Projects Details

Planning Area	Corridor	2027 Projects	2027 Cost [14]
South Bay Area	San Francisco-San Jose-Gilroy	San Francisco-San Jose Grade Separations, Level Boarding, Longer Trains and Performance Improvement (Phase 1)	$5,000,000
		San Jose-Gilroy Service Increase	
		Diridon Station Mobility Hub Phase 1	
		Downtown Extension from 4th & King to Transbay Terminal	
		Corridor Capacity & Safety Improvement Project Development	
	Altamont, East Bay (south of Oakland) & Dumbarton	Oakland-San Jose Capacity Increase for Passenger and Goods Movement	$2,300,000
		Tri-Valley Connectivity Between BART and the Statewide Rail Network	
		Dumbarton Rail Crossing Integration with Statewide Rail Network (Phase 1)	
		Altamont Corridor Capacity Increase for Passenger and Goods Movement	
		I-680 Integrated Express Bus	
	Multiple	Regional Network & Service Integration Project Development (Peninsula, Dumbarton, East Bay, Altamont)	$20,000

[14] Estimated costs in 2018 dollars. These costs are planning-level estimates and require further study in implementation.

Planning Area	Corridor	2027 Projects	2027 Cost [14]
North Bay Area	San Francisco-Oakland	New Transbay Crossing Project Development	$60,000
	Oakland-Sacramento	Martinez Station Capacity Improvement for Corridor Connectivity	$100,000
		Stockton-Martinez Capacity Upgrades for Bi-Hourly Service	
		Corridor-Wide Station Capacity & Safety Improvements	
	Multiple	North Bay to Sacramento Network & Service Integration Project Development (Marin, Sonoma, Napa, Solano, Yolo, Sacramento, Contra Costa, Alameda)	$10,000
	Larkspur-Cloverdale	SMART Sonoma County Airport to Cloverdale Extension, including Fleet	$350,000
Central Valley/Sierra Nevada	Sacramento-Roseville	Placer County Service Expansion (Ph 2)	$200,000
	Fresno/Merced-Stockton-Sacramento	Regional Rail Expansion to Merced & Sacramento	$950,000
		Hourly Service from Fresno to Sacramento	
		Madera Mobility Hub	
		Sierra Nevada Integrated Express Bus	
		North State Integrated Express Bus Expansion	
Central Coast	Gilroy-Goleta	Bi-Hourly Integrated Service from Salinas & Hollister to Gilroy	$250,000
		San Luis Obispo-Salinas Intercity Rail Increase and Bi-Hourly Integrated Service	
		Bi-Hourly Integrated Service from Paso Robles to the Central Valley	

Planning Area	Corridor	2027 Projects	2027 Cost [14]
		Goleta-San Luis Obispo Intercity Rail Increase and Bi-Hourly Integrated Service	
LOSSAN North	Goleta/Santa Clarita-Burbank-LA	Bi-Hourly Express Service Goleta-LA	$550,000
		Hourly Local Service Chatsworth-LA	
		Hourly Local Service Santa Clarita-LA	
Vegas to Palmdale	Victorville to Las Vegas	HSR Palmdale-Las Vegas	$10,500,000
	Palmdale to Victorville		
LA Urban Mobility Corridor	LA Union Station	LA Union Station Passenger Capacity Expansion & Run Through Tracks	$2,500,000
	Burbank-LA-Anaheim	Corridor Capacity & Grade Separation Projects for 1st Phase of Integrated Local and Express Service	
Inland Empire	Multiple	1st Phase Integrated Local and Express Service Los Angeles-San Bernardino	$950,000
		1st Phase Integrated Local Service Los Angeles-Riverside-Perris Valley	
		1st Phase Integrated Local Service Riverside-Orange County	
		Initial Service to Coachella Valley	
LOSSAN South	Anaheim-San Diego	1st Phase Integrated Local and Express Service LA-Anaheim-San Diego	$950,000
Statewide	Multiple	Amtrak/State Equipment Replacement, Fleet Capacity Expansion & Maintenance Facility Investment	$900,000
		Corridor Service Improvement - Capitalized Maintenance	$20,000
		HSR Central Valley to Bay Area	$21,100,000

Planning Area	Corridor	2027 Projects	2027 Cost [14]
		Integrated Express Bus in Partnership with Regional Service	$150,000
		Project Development for Statewide Network Investments	$100,000
		Fare Integration - Phase 2	$40,000
Total			**S47,000,000**

Table A.33: 2040 Capital Projects Details

Planning Area	Corridor	2040 Projects	2040 Cost [15]
South Bay Area	San Francisco-San Jose	San Francisco-San Jose Grade Separations, Level Boarding, Longer Trains and Performance Improvement (Phase 2)	$3,300,000
		Implement Regional Rail Utilizing New Transbay Crossing	
		HSR Corridor Investment for Phase 1 Service	
	Altamont, East Bay (south of Oakland) & Dumbarton	Implement Regional Rail Utilizing New Transbay Crossing, including East Bay services in Alameda County	$1,700,000
		Implement Integrated Regional Rail Service Utilizing Altamont and Dumbarton Rail Corridors	
North Bay Area	Multiple	New Transbay Crossing	$18,400,000
		BART-Conventional Rail Mobility Hub Investments	
		Implement Express & Regional Rail Utilizing New Transbay Crossing, including new alignment with high-level crossing to Solano County and significantly faster travel times	
		Stockton-Richmond Capacity Upgrades for Hourly Service	
		Regional Rail Expansion from Sonoma and Napa Counties to Solano County	
Central Valley/Sierra	Multiple	Implement Full Integrated Rail Service to Placer County	$4,900,000

[15] Estimated costs in 2018 dollars. These costs are planning-level estimates and require further study in implementation.

Planning Area	Corridor	2040 Projects	2040 Cost [15]
		Implement Blended Rail Service from Merced to Sacramento with Express and Local Service	
		Implement Regional Rail Connecting Lemoore, Hanford, Porterville and Visalia with the Statewide Rail Network	
Central Coast	Gilroy-Goleta	Hourly Integrated Rail Service from Salinas to Gilroy	$1,500,000
		Implement Regional Rail Connecting Monterey and Santa Cruz to the Statewide Rail Network	
		Implement Central Coast Rail & Express Bus Service from Salinas to Goleta	
LOSSAN North	Goleta/Santa Clarita-Burbank-LA	Hourly Express Service Goleta-LA	$700,000
		Implement Half-Hourly Express & Local Rail Service Chatsworth-LA	
		Implement Half-Hourly Local Rail Service Santa Clarita-LA	
Inland Empire	Multiple	Integrated Local and Express Service Los Angeles-San Bernardino	$17,300,000
		Integrated Local and Express Service Los Angeles-Riverside	
		Integrated Local Service Riverside-Orange County	
		Blended Rail Services from Los Angeles, Riverside, and San Bernardino to Ontario Airport	
		High Speed Rail Services from San Diego to Ontario Airport, continuing to Inland Empire and Los Angeles on Blended Service corridors	
		Integrated Local Service Extension to Hemet	

Planning Area	Corridor	2040 Projects	2040 Cost [15]
		Integrated Express Rail Service on New Alignment to Coachella Valley	
LOSSAN South	Anaheim-San Diego	Implement Half-Hourly Local and Express Services LA-Anaheim-San Diego	$1,200,000
	San Diego-Mexican Border	Implement Enhanced Rail Service to Mexican Border	
Statewide	Multiple	Statewide Fleet and Maintenance Facility Investments	$550,000
		Corridor Service Improvement - Capitalized Maintenance	$50,000
		HSR Phase 1 Service (including completion of LA Urban Mobility Corridor Investments, excluding capital investment included in other projects)	$35,400,000
Total			**$85,000,000**

Appendix A.7
Public Outreach and Stakeholder Involvement Details

Freight Meetings

Date	Freight Railroad	Type of Outreach
2/4/2016	California Freight Advisory Committee	In-person meeting
5/5/2016	Santa Maria Railroad	In-person Interview
5/6/2016	Pacific Harbor Lines	In-person Interview
5/11/2016	Pacific Sun Railroad	Phone Interview
5/19/2016	Central California Traction	Phone Interview
5/24/2016	Northwestern Pacific	Phone Interview
5/25/2016	Richmond Pacific	Phone Interview
5/27/2016	Modesto & Empire Traction	Phone Interview
6/8/2016	Sierra Northern	In-person Interview
6/8/2016	Sacramento Valley Railroad	In-person Interview
11/9/2016	BNSF	In-person briefing
8/17/2016	CA Short Line Railroad Association	In-person briefing
9/12/2016	California Freight Advisory Committee	In-person meeting
11/10/2016	CA Short Line Railroad Association	In-person briefing
11/14/2016	Union Pacific	In-person briefing

Network Integration Strategic Service Planning (NI SSP) Agency Meetings

Date	Agency	Type of Outreach
6/27/2016	Transportation Agency for Monterey County	In-person meetings
6/27/2016	San Luis Obispo Council of Governments	In-person meetings
6/27/2016	Santa Cruz County Regional Transportation Commission	In-person meetings
6/27/2016	San Benito Council of Governments	In-person meetings
6/28/2016	Caltrain	In-person meetings
6/28/2016	Metropolitan Transportation Commission	In-person meetings
7/6/2016	Southern California High Speed Rail Authority	In-person meetings
7/6/2016	LOSSAN Joint Powers Authority	In-person meetings
7/6/2016	Orange County Transportation Authority	In-person meetings
7/7/2016	Alameda County Transportation Commission	In-person meetings
7/7/2016	San Francisco County Transportation Authority	In-person meetings
7/7/2016	Valley Transportation Authority	In-person meetings
7/8/2016	Sacramento Area Council of Governments	In-person meetings
7/8/2016	Sacramento Regional Transit	In-person meetings
7/8/2016	Sonoma-Marin Area Rail Transit	In-person meetings
7/11/2016	Metrolink	In-person meetings
7/11/2016	Riverside County Transportation Commission	In-person meetings
7/12/2016	San Bernardino Association of Governments	In-person meetings
7/13/2016	San Diego Association of Governments	In-person meetings
7/13/2016	North County Transit District	In-person meetings
7/13/2016	San Diego Metropolitan Transit System	In-person meetings
7/14/2016	Southern California Association of Governments	In-person meetings
7/14/2016	California High-Speed Rail Authority	In-person meetings
7/15/2016	Santa Barbara County Association of Governments	In-person meetings
7/19/2016	Placer County Transportation Planning Agency	In-person meetings
8/1/2016	Transportation Agency for Monterey County	In-person meetings

Date	Agency	Type of Outreach
8/9/2016	California High-Speed Rail Authority	In-person meetings
8/10/2016	San Joaquin Joint Powers Authority	In-person meetings
8/17/2016	California Short Line Railroad Association	In-person meetings

Advocacy Meetings

Date	Organization	Type of Outreach
9/30/2016	The Nature Conservancy	In person meeting
11/14/2016	ClimatePlan Transportation Working Group	Phone meeting

Native American Tribes that Received Consultation

Date invitation letter sent December 28, 2016

Timeline of consultation January 2017- May 2017

Date of request/response	Request format	Requesting tribe	District
Jan 1 2017	*Email/letter/call*	*Name*	#
1/4/2017	Email	Big Sandy Rancheria	6
1/12/2017	Email	Federated Indians of Graton Rancheria	4
1/10/2017	Email	Modoc Tribe of Oklahoma	2
1/17/2017	Email	Agua Caliente Band of Cahuilla	8
1/23/2017	Letter	Table Mountain Rancheria	6
3/2/2017	Letter	United Auburn Indian Community of the Auburn Rancheria	3

Public Survey Results

As part of the effort to develop the 2018 California State Rail Plan (Rail Plan), Caltrans released an early engagement survey in January 2016 seeking public input for inclusion. This summary report provides an overview of the survey results. The survey was available through the Caltrans website and distributed to an extensive rail plan mailing list; through organizations represented on the Rail Plan stakeholder advisory committee, and through press releases and Amtrak and Caltrans social media sites. The survey received a total of 2,189 responses between January 27 and March 4, 2016.

The goal of this survey was to obtain input from a large range of current and potential rail riders in California to help guide the Rail Plan which will present a vision for California's future passenger and freight rail network, and address strategies to achieve a modernized and integrated rail system. The Rail Plan fulfills state and federal rail plan requirements, and is an important element in the comprehensive examination of transportation investment strategies for the next 50 years.

Survey questions inquired about respondents' current usage of California rail, their opinions on the current state of California rail, and their highest priorities for improving California rail in the future. Additional optional demographic questions helped garner general information on respondents' affiliations, age, gender, income, race, and contact information to enter them into a raffle for a $50 Amtrak gift card. Five winners from across the State were randomly selected and contacted.

Survey Results

- The top reasons WHY current rail riders use rail: The top reason (more than 75%) were convenience and enjoyment of riding the train. Following that, respondents selected saving money, time, and safety as their top reasons for using the train.
- The TOP FIVE IMPROVEMENTS Caltrans should make to passenger train services were focused on a) serving more places / expand coverage; b) adding more trains per day; c) improving connections with local transit, bicycle, and pedestrian access; d) improving on-time performance and reliability; and e). making transfers between different trains easier and faster.
- The MOST IMPORTANT FREIGHT RAIL IMPROVEMENTS were listed as: a) separating freight from passenger lines and b) encouraging more use of freight rail for shipping to relieve roadway congestions.
- For SAFETY IMPROVEMENTS, an overwhelming majority of respondents believed the highest priority should be improving crossings with grade separations.
- WHY NOT the Train? The main factors selected as preventing respondents from choosing the train as a regular means of travel were a) trains not operating frequently enough; and b) trains not going where respondents want to go. (Less than 6% of respondents chose trains being too crowded or inadequate bicycle facilities as their reasons for not using the train regularly.)
- Top choices selected for how the rail network should SUPPORT ECONOMIC GROWTH were: a) providing more mobility choices for people to encourage economic activity, b) fostering transit oriented development, and c) reducing highway congestion.

Detailed Responses

The following provide a detailed breakdown of the responses received and a sample of additional write-in responses, where applicable.

What do you use or would like to use rail travel for? (Please select all that apply.)

Answer Options	Response Percent
Exploring the state/ tourism	70.5%
Visiting family or friends	67.2%
Long distance travel	66.8%
Short distance travel	66.1%
Special events (e.g. attend a sporting event)	61.8%

Answer Options	Response Percent
Commuting	53.8%
Occasional business travel	51.8%

If you are a current rail passenger, which passenger rail systems have you been on? (Please select all that apply.)

Answer Options	Response Percent
Bay Area Rapid Transit (BART)	57.5%
Amtrak (AMTK) long distance services: California Zephyr, Coast Starlight, Southwest Chief, Sunset Limited	52.3%
Pacific Surfliner	38.9%
SF Muni Railway	38.1%
Caltrain	36.2%
Los Angeles County Metro Rail	36.1%
Metrolink	35.9%
Capitol Corridor	33.1%
San Diego Trolley	29.3%
San Joaquin	20.5%
Coaster	19.9%
Sacramento Regional Transit District Light rail	19.9%
Santa Clara Valley Transportation Authority light rail	16.4%
Sprinter	10.3%
Other (please specify)	6.3%
Altamont Corridor Express	4.5%

If you are a current rail passenger, why do you use rail? What do you use or want to use rail travel for? (Please select all that apply.)

Answer Options	Response Percent
Convenience – it allows me to enjoy my time while travelling (working, sleeping, reading, talking)	81.6%
I enjoy riding the train	75.5%
Cheaper than car (if adding all costs of gas, time lost and parking)	44.1%
It's safer than driving	41.5%
It saves me time (faster than driving when considering door to door travel time)	38.7%
I can transport my bicycle	20.2%
Other (please specify)	16.4%

Answer Options	Response Percent
I don't have a car/other personal transportation	9.5%
I don't have a driver's license	3.9%

Additional write-in responses:

- Lower stress than driving
- Climate Crisis requires us to emit less GHG
- Unlike bus or airplane modes, passenger rail allows me to change cars during the trip. This increases comfort: stretch legs, get away from noisy passengers, find car with cooler or warmer climate.
- Better for the environment

Please rate your current rail transportation options in California based on your level of agreement with this statement: "Rail gets me where I want to go in a timely manner with minimal inconvenience"?

Answer Options	Response Percent
Agree	27.0%
Disagree	24.8%
Neutral	24.4%
Strongly disagree	13.9%
Strongly Agree	6.4%
No opinion	3.6%

What are the most important improvements that that you think Caltrans should make to passenger train services in California (high-speed, intercity and commuter)? Please select your top 5.

Answer Options	Response Percent
Serve more places (expanding coverage)	70.6%
More trains per day	61.1%
Improve connections with local transit services, bicycle and pedestrian access	53.0%
Improving on-time performance and reliability	45.9%
Easier/faster transfers between different trains	33.1%
Reducing ticket costs	30.9%

Answer Options	Response Percent
Improving stations (e.g., shops, cleanliness, security, and open restrooms, more parking)	28.2%
Improving amenities on-board trains (dining and café cars, restrooms, seats and tables, bicycle racks, etc.)	20.7%
Easier ticketing and fare collection across the state	18.8%
Other (please specify)	16.4%
Using cleaner fuel for less pollution from trains	15.4%
Reduce noise produced by trains in communities	6.0%

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Other (please specify)	16.4%
Using cleaner fuel for less pollution from trains	15.4%
Reduce noise produced by trains in communities	6.0%

Other comments:

- Passengers deserve priority over cargo on many lines as well as High Speed Rail within state and beyond
- Improved speed. Must compete with cars on speed.
- Make trains faster: Upgrade from 79 to 110mp wherever possible, build HSR.
- Adding security to prevent thefts and harassment Hyperloop!

- Longer hours of service (late-night)

What prevents you from choosing the train as a regular means of travel? Please choose all that apply.

Answer Options	Response Percent
Train schedules are not convenient/ don't operate often enough	51.2%
Trains don't go where I want to go	45.2%
There are no good connections from the train station to my destination	32.0%
No train station near where I live (more than 15- 20 minutes away)	31.8%
No easy public transportation connection to the train station from where I live	31.5%
Taking the train takes too long	31.1%
I would have to change trains/ buses	20.9%
It's too expensive	18.3%
Comment (please specify)	18.1%
It's not reliable	13.3%
Parking at train station is full when I need it	11.2%
Inadequate bicycle facilities	5.5%
It's too crowded	5.5%

Other comments:

- There is no parking at station, others are too expensive to park
- It's hard to do without my car at the destination
- Need direct link to major airports
- Harassment of women, profane music, loud music (LA Blue Line)

What do you think Caltrans' highest priority should be for investments to enhance rail safety?

Answer Options	Response Percent
Improve crossings with grade separations (e.g., build over- or under-crossings, sealed corridor) to allow trains to be faster while reducing the possibility of collisions with vehicles, pedestrians, bicyclists, etc.	72.0%
Improve the safety and security of train and transportation terminals (i.e. airports, shipping ports, etc.)	9.3%
Prepare for emergencies, response, and recovery for all modes of transportation from human and natural disasters	6.6%
Don't know	6.3%

Answer Options	Response Percent
Other (please specify)	5.9%

California's freight rail system is privately operated and provides many of the tracks utilized by public passenger trains. What do you think California's highest priority should be to improve its freight rail system?

Answer Options	Response Percent
Separate freight from passenger lines	36.4%
Encourage more use of freight rail for shipping to relieve congestion from trucks on roadways	22.0%
Grade separate rail freight lines within city limits to reduce traffic impacts through town	13.3%
Provide more freight rail lines to move trucks off of the highways	10.1%
Don't know	7.3%
Other (please specify)	4.9%
Reduce environmental pollution from trains	3.0%
Encourage local economies to reduce the need for transporting goods far distances	3.0%

How should the rail network support economic growth? Please select your top three.

Answer Options	Response Percent
Provide more mobility choices and better access for people to get to where they want to go to encourage economic activity (work, businesses, parks, shopping, sporting events)	74.3%
Foster transit oriented development near train stations (mixture of housing, office, retail and/or other amenities in a walkable neighborhood and located within a half-mile of public transportation)	55.3%
Reduce highway congestion	47.7%
Make train stations into destinations with shopping, housing and business districts	39.7%
Improve the efficiency of the freight system, get more freight to move by train rather than truck	34.8%
Contribute towards state and federal Air Quality Requirements	17.5%
Other (please specify)	6.1%
Don't know	1.6%

Respondent Demographics

INTEREST / ASSOCIATION	RESPONSE %
Current rail passenger	64.0%
Interested member of the California public	57.0%
Previous rail passenger	33.7%
Local or state government employee	21.9%
Potential rail passenger (never taken a train)	8.3%
Advocacy group/NGO	5.3%
Local, metropolitan or regional planning agency	4.1%
Community leader/or elected official	3.0%
Passenger rail operating agency	2.3%
Freight rail provider	1.5%
Transportation Industry representative	1.2%
Tribal Representative	0.5%
TIME SPENT COMMUTING PER WORKDAY	**RESPONSE %**
Less than 30 minutes	30.1%
30 minutes – 1 hour	27.3%
1-2 hours	19.5%
2-3 hours	6.4%
More than 3 hours	3.4%
Do not commute to work	13.2%
HOUSEHOLD INCOME	**RESPONSE %**
$0 to $9,999	1.7%
$10,000 to $24,999	3.7%
$25,000 to $49,999	9.8%
$50,000 to $74,999	14.0%
$75,000 to $99,999	14.6%
$100,000 to $124,999	16.5%
$125,000 to $149,999	7.1%
$150,000 to $174,999	7.5%
$175,000 to $199,999	3.8%
$200,000 and up	9.3%

AGE	RESPONSE %
Under 19	1.0%
20-24	4.9%
25-34	20.6%
35-44	17.9%
45-54	18.9%
55-59	12.7%
60-64	10.2%
65-74	9.3%
75 to 84	2.5%
85 years and older	0.3%
GENDER	**RESPONSE %**
Female	26.1%
Male	72.8%
RACE OR ETHNICITY	**RESPONSE %**
White or Caucasian	71.2%
Asian-American/Pacific Islander	8.6%
Spanish, Hispanic, or Latino	7.1%
Multiple ethnicities	4.4%
Black or African-American	2.8%
Native American /Alaska Native	1.8%
LANGUAGE SPOKEN AT HOME	**RESPONSE %**
English	97.8%
Spanish	3.0%
Chinese (Cantonese or Mandarin)	2.1%
Tagalog	0.9%
Other	2.3%

Conclusion

The more than 2,000 responses to the 2018 California State Rail Plan Survey helped shape the vision for the Draft Rail Plan. This vision will guide California's future passenger and freight rail network. According to responses to the survey, top priorities and themes include:

- To expand coverage and increase service for passenger rail. These were the top two priorities for improving passenger rail and the top two factors preventing people from using rail regularly. Additional priorities include: Improve transfers, connections with local transit, reliability and on-time-performance

- The majority of respondents choose rail because they enjoy riding the train, and the train is often cheaper than using a car
- They use or would like to use rail for a variety of different reasons, from leisure travel to commuting
- Highest priority for safety improvements are to improve crossings with grade separations