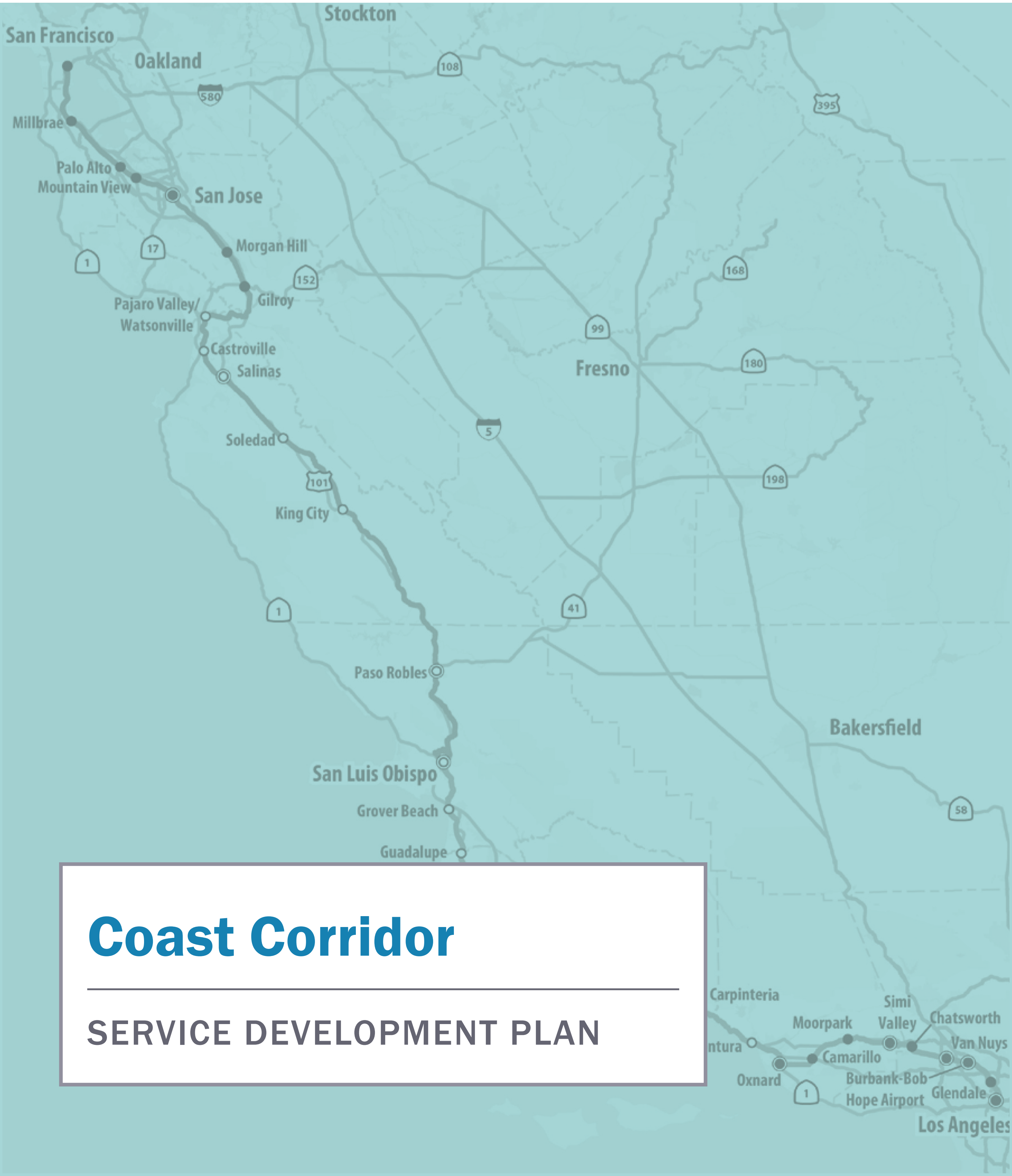
Appendix C

Coast Corridor Service Development Plan

MAY 2013



Coast Corridor

SERVICE DEVELOPMENT PLAN

FINAL SUBMITTAL

May 2013

SERVICE DEVELOPMENT PLAN

Coast Corridor

Prepared for

California Department of Transportation

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List of Acronyms

AB – Assembly Bill

ABS – Automatic Block System

ACE – Altamont Corridor Express

AMBAG – Association of Monterey Bay Area Governments

ARB – Air Resources Board

ATLC – Active Transportation and Livable Communities

Authority – California High-Speed Rail Authority

BART – Bay Area Rapid Transit

BATA – Bay Area Toll Authority

BRT – Bus Rapid Transit

Build Alternative – Build/Improved Passenger Services Alternative

CAA – Clean Air Act

CAD – computer aided design

CALCOG – California Association of Councils of Governments

Caltrain – Peninsula Corridor Joint Powers Board

Caltrans – California Department of Transportation

CBD – Central Business District

CEC – California Energy Commission

CFMP – California Freight Mobility Plan

CIB – California Interregional Blueprint

COFC – container-on-flat-car

COG – Council of Governments

Corridor – Coast Corridor

CP – Control Point

CRCC – Coast Rail Coordinating Council

CSLRA – California Shortline Railroad Association

CSRP – California State Rail Plan

CTC – Centralized Traffic Control

CTI – Commuter Train Interference

CWR – continuous welded rail

D.C. – District of Columbia

DOR – Division of Rail

DOTP – Division of Transportation Planning

EIR/EIS – Environmental Impact Report/Environmental Impact Statement

ENR Index – Engineering News Record Construction Cost Index

FAA – Federal Aviation Administration

FAF – Freight Analysis Framework

FEIR – Final Environmental Impact Report

FRA – Federal Railroad Administration

FTA – Federal Transit Administration

FTI – Freight Train Interference

GHG – greenhouse gas

GIS – Geographic Information Systems

HSIPR – High Speed Intercity Passenger Rail Program

HSR – High-Speed Rail

HSR R&R Model – HSR Ridership and Revenue Model

I-5 – Interstate 5

IOS – Initial Operating Segment

JPA – Joint Powers Authority

LA Metro – Los Angeles County Metropolitan Transportation Authority

LAUS – Los Angeles Union Station

LAX – Los Angeles International Airport

LOSSAN – Los Angeles—San Diego—San Luis Obispo

LOSSAN North – San Luis Obispo—Los Angeles

LOSSAN South – Los Angeles—San Diego – San Luis Obispo

LRTPs – Long Range Transportation Plans

MAS – maximum allowable speed

MP – mile post

MPO – Metropolitan Planning Organization

MTC – Metropolitan Transportation Commission

MUNI – San Francisco Municipal Railway

NAAC – Native American Advisory Committee

NAAC – Native American Advisory Committee (NAAC)

NAICS – North American Industry Classification System

NCTD – North County Transit District

NCURS – Northern California Unified Rail Service

NGEC – Next-Generation Equipment Committee

NO2 – Nitrogen Dioxide

No-Build Alternative – No-Build/No-Action Alternative

O&M – Operating and maintenance

OCTA – Orange County Transportation Authority

OTP – on-time performance

PISOP – Public Involvement and Stakeholder Outreach Plan

PM_{10} – Respirable Particulate Matter

$PM_{2.5}$ – Fine Particulate Matter

PSDP – Preliminary Service Development Plan

PTC – Positive Train Control

PTI – Passenger Train Interference

RCTF – Rural Counties Task Force

ROW – right-of-way

RTC – Rail Traffic Controller

RTE – Routing

RTIPs – Regional Transportation Improvement Plans

RTPA – Regional Transportation Planning Agency

RTPs – Regional Transportation Plans

SamTrans – San Mateo County Transit District

SBCAG – Santa Barbara County Association of Governments

SBMTD – Santa Barbara Metropolitan Transit District

SCAG – Southern California Association of Governments

SCCRTC – Santa Cruz County Regional Transportation Commission

SCRRA – Southern California Regional Rail Authority

SCS – Sustainable Communities Strategies

SCTG – Standard Classification of Transported Goods

SCVTA – Santa Clara Valley Transportation Authority

SDMTS – San Diego Metropolitan Transit System

SDP – Service Development Plan

SED – socioeconomic data

SFO – San Francisco International Airport

SGC – Strategic Growth Council

SIP – State Implementation Plan

SJCOG – San Joaquin Council of governments

SJRRC – San Joaquin Regional Rail Commission

SLOCOG – San Luis Obispo Council of Governments

SLORTA – San Luis Obispo Regional Transit Authority

SR – State Route

STB – Surface Transportation Board

STIP – State Transportation Improvement Program

STIPs – Statewide Transportation Improvement Programs

TAC – Technical Advisory Committee

TAMC – Transportation Agency for Monterey County

TAZ – transportation analysis zones

TOD – Transit Oriented Development

TOFC – trailer-on-flat-car

TWC – Track Warrant Control

U.S. – United States

U.S. 101 – U.S. Highway 101

UPRR – Union Pacific Railroad

USDOT – U.S. Department of Transportation

VCTC – Ventura County Transportation Commission

VISTA – Ventura Intercity Service Transit Authority

1.0 Introduction

The Service Development Plan (SDP) for improved intercity passenger rail service in the Coast Corridor (Corridor) describes the Corridor, identifies proposed service expansion, and operational improvements. Additionally, the SDP presents the rationale for improved and expanded services, identifies candidate rail infrastructure investments needed to support growth and deliver improved operations, and screens the proposed improvements for further study. A summary of the findings and recommendations can be found in Chapter 14.

Preparation of the SDP required coordination and review from the Federal Railroad Administration (FRA), National Railroad Passenger Corporation (Amtrak), California Department of Transportation (Caltrans), Division of Rail (DOR), the Coast Rail Coordinating Council (CRCC), Union Pacific Railroad (UPRR), the Los Angeles County Metropolitan Transportation Authority (LA Metro), the Southern California Regional Rail Authority (SCRRA) (more commonly referred to as Metrolink), Ventura County Transportation Commission (VCTC), the Santa Barbara County Association of Governments (SBCAG), the San Luis Obispo Council of Governments (SLOCOG), the Transportation Agency for Monterey County (TAMC), Santa Clara Valley Transportation Authority (SCVTA), the Peninsula Corridor Joint Powers Board (Caltrain) which owns and operates Caltrain, and the California High-Speed Rail Authority (Authority).

1.1 Background

The 474-mile Coast Corridor, which runs from San Francisco to Los Angeles, currently serves a mix of regional commuters and intercity leisure travelers. Portions of the Corridor are also the future sites of proposed segments of the California High-Speed Rail (HSR) program.

Current passenger rail services are operated by Caltrain, Amtrak, and Metrolink. Current services include:

- Caltrain commuter rail service between San Francisco and Gilroy.
- The *Coast Starlight*, operated by Amtrak between Seattle and Los Angeles.
- The *Pacific Surfliner*, operated by Amtrak between San Luis Obispo and San Diego, with financial support from Caltrans.
- Metrolink's Ventura County Line, a commuter rail line operated between Montalvo in Ventura County and Los Angeles Union Station (LAUS) in Los Angeles County.
- Metrolink's Antelope Valley Line, a commuter rail line between Lancaster and LAUS.

Longer term plans include the introduction of HSR services in the segment of the corridor between Burbank Junction and LAUS, and in the segment between San Francisco and Gilroy. There are also plans for peak period conventional commuter service between the cities of Santa Barbara and Ventura in order to mitigate constrained vehicular peak period travel.

Freight rail services are operated by UPRR, providing service that roughly parallels the United States (U.S.) 101 corridor between San Francisco Bay Area in the north, and the Los Angeles region in the south. The corridor carries low levels of freight traffic – ranging from about two to six trains per day north of Oxnard and eight to 16 trains per day in the San Fernando Valley – and is mostly considered as a "secondary" or "relief" line to the much busier Central Valley line to the east. The line does not see any containerized cargo – instead it carries bulk commodities such as fertilizer, lumber, aggregate, and coal, and is also used to reposition empty rail cars and containers. Despite its low traffic density, this line offers important redundancy to the Central Valley line.

Exhibit 1.1: Coast Corridor

The *Coast Daylight* service is a proposed new intercity rail route to supplement the *Coast Starlight*, and fill a gap in rail services between the cities of San Francisco, San José, Salinas, San Luis Obispo, Santa Barbara, Ventura, and Los Angeles. The existing Amtrak long-haul *Coast Starlight* train operating through the coast corridor is not scheduled to serve the needs of intra-state travelers between the San Francisco Bay Area and Los Angeles and Starlight trains are subject to delays especially in the southbound direction because they originate in Seattle. The proposed *Coast Daylight* service, on the other hand, would originate and terminate in San Francisco and would be scheduled to complement the *Coast Starlight* schedule with a reliable intercity service to address the needs of communities between the San Francisco Bay Area and Los Angeles. In addition, the *Coast Starlight* only makes a limited number of stops between Oakland and Los Angeles, as is appropriate for a long-distance, multi-state train. The *Coast Daylight* would have more than twice as many stops which provide better access to local markets.

The initial one round-trip daily *Coast Daylight* service would be provided by extending the operation of an existing *Pacific Surfliner* train from the current northern terminus at San Luis Obispo to San Francisco. As a result, no additional rail infrastructure improvements within the Surfliner North territory between San Luis Obispo and Los Angeles would be required. Expansion of the *Coast Daylight* service to an ultimate two round-trips per day would be accomplished by scheduling an overnight train which would operate when traffic levels are generally lower than daytime traffic levels at most locations along the corridor; it is not anticipated that the added service would generate significant requirements for additional infrastructure.

In the corridor, the tracks are owned by the Caltrain, UPRR, VCTC, and LA Metro, and service is operated by Caltrain, UPRR, Amtrak, and Metrolink. The following segments make up the track that is defined as the Coast Corridor:

- Caltrain trackage between San Francisco and San José.
- UPRR “Coast Subdivision” between San José and San Luis Obispo.
- UPRR “Santa Barbara Subdivision” between San Luis Obispo and Las Posas just west of Moorpark.
- SCRRA “Ventura Subdivision” between Las Posas and Burbank Junction.
- SCRRA “Valley Subdivision” between Burbank Junction and Control Point Taylor.
- SCRRA “River Subdivision” between Control Point Taylor and LAUS.

Outside the urbanized commuter rail territory, most of the corridor is single-track. Double-track exists between San Francisco and San José and between Moorpark and LAUS. Single-track is the norm from San José to Moorpark. Sidings are limited in number and length, and significant sections still use Automatic Block System (ABS) signal control and manual switches, requiring dispatcher approval to proceed.

Passenger rail services through the Coast Corridor are an integral element of plans to provide alternatives to reliance on private automobiles, to provide faster commuter service to key employment destinations, and to maintain linkages to other destinations in Northern and Southern California.

1.1.1 Organization of the Coast Corridor SDP

As shown below, the SDP includes the following chapters:

1. Introduction
2. Purpose and Need
3. Rationale
4. Identification of Alternatives
5. Evaluation of Alternatives

6. Planning Methodologies
7. Outreach Efforts
8. Ridership Demand and Revenue Forecast
9. Operations Modeling
10. Stations and Access Analysis
11. Conceptual Engineering and Capital Programming
12. Operating and Maintenance and Capital Replacement Forecast
13. Public Benefits and Impacts Analysis
14. Key Findings

1.2 Relationship of the Coast Corridor SDP to Other Documents

1.2.1 SDP Support for State Rail Plan

This SDP includes planning analyses which form the basis for the service concepts and improvements included in the California State Rail Plan (CSRP). This SDP is prepared in coordination with, and is a subset of the CSRP. The Coast Corridor SDP will be consistent with the SDPs for other State-supported rail services and will be consistent with planning by the California High-Speed Rail Authority (Authority) as documented in the *California High-Speed Rail Program Revised 2012 Business Plan (2012 Business Plan).*

1.2.2 Integration with other SDPs

The Coast Corridor overlaps the Pacific Surfliner North Corridor from San Francisco to Los Angeles. The SDP for the Coast Corridor analyzes the segment of the corridor north of San Luis Obispo. The SDP for the Pacific Surfliner North Corridor analyzes the segment of the corridor south of San Luis Obispo. The Coast Corridor SDP has been coordinated with the SDPs for connecting corridors and services, including Pacific Surfliner North, Pacific Surfliner South, Capitol Corridor, and HSR.

1.2.3 Relationship to Corridor Environmental Analyses

This SDP describes proposed additional intercity rail service between San Francisco and Los Angeles. The southern portion of the corridor, from San Luis Obispo to Los Angeles (LOSSAN North) overlaps with the Pacific Surfliner North Corridor and the proposed *Coast Daylight* train would be an extension of an existing *Pacific Surfliner* round-trip between San Luis Obispo and Los Angeles. Therefore this SDP only addresses infrastructure improvements north of San Luis Obispo. Infrastructure improvements south of San Luis Obispo are addressed in the Pacific Surfliner North SDP. Improvements in the segment between San Luis Obispo and Burbank Junction will be considered in an environmental assessment currently being prepared by Caltrans District 5 in San Luis Obispo. Improvements in the segment between Burbank Junction and Los Angeles are currently being studied as part of the planning for HSR.

At the north end of the Coast Corridor, no infrastructure improvements are proposed between San Francisco and San José to specifically support the *Coast Daylight*. However, Caltrain is pursuing adding a fourth track between the Santa Clara and San José station to provide more capacity and improve reliability, and is currently studying the need for additional improvements beyond the fourth track. It should be noted that Caltrain has not approved operation of the *Coast Daylight* over their property. Between San José and Gilroy, the only improvement project is SCVTA's double-tracking, which already has been environmentally cleared by SCVTA. Environmental evaluation of additional service between Gilroy and Salinas will be addressed in an ongoing Environmental Assessment prepared by TAMC in coordination with the Federal Transit Administration (FTA). Improvements in the remaining 134 miles between Salinas and San Luis Obispo will be addressed in an ongoing tiered Environmental Impact

Report/Environmental Impact Statement (EIR/EIS) managed by SLOCOG in coordination with Caltrans and the Federal Railroad Administration.

The Salinas to San Luis Obispo environmental study will evaluate Corridor information, including identification and assessment of a future program of rail corridor service scenarios and system improvements based on existing intercity travel demand and future growth, along with existing and future goods movement needs. The environmental document will identify and assess the following components that are reflected in the SDP:

- Alternative technology and service scenarios.
- System improvements, including stations, tracks, sidings, signal systems, and related rail system components.
- Capital and operating costs.
- Funding needs and available resources.
- Phasing options prioritizing proposed improvements.
- Interface with regional and local transit systems.

In addition, the environmental process will provide an updated perspective on agency, stakeholder, and public plans, needs, and perceptions that will be invaluable to the development of a viable SDP.

2.0 Purpose and Need

This Purpose and Need Statement is intended to provide the basis for Coast Corridor planning efforts, including the identification and evaluation of service development alternatives through the SDP process. The SDP study effort identifies and evaluates the need for conventional rail improvements to help relieve the growing capacity and congestion constraints on intercity travel using existing air, highway and passenger rail infrastructure in the Coast Corridor between the San Francisco Bay Area and Los Angeles. It also will assess how incremental improvements would serve the purpose of improving the existing rail infrastructure, helping to relieve congestion and capacity constraints, while offering reliable, safe and time-efficient travel. The overall goal of the proposed improvements identified and evaluated in the SDP effort is to improve mobility and reliability in this part of the state's rail system by expanding service, decreasing trip times and improving rail infrastructure in a cost-effective and environmentally sensitive manner.

The 470-mile-long Corridor consists of three segments: the northern segment (77 miles) from San Francisco to Gilroy (known as the Caltrain Corridor), the middle segment (171 miles) from Gilroy to San Luis Obispo, and the southern segment (222 miles) from San Luis Obispo to Los Angeles (which corresponds to the northern half of the Pacific Surfliner Corridor, also known as the Los Angeles—San Diego—San Luis Obispo (LOSSAN) Corridor, as shown in Exhibit 2.1. Caltrain is the seventh-busiest commuter rail system in the U.S., and the only one in the top ten that operates only a single line. The Pacific Surfliner Corridor is the second-busiest intercity passenger rail corridor in the U.S., second only to the Boston—Washington, District of Columbia (D.C.) Northeast Corridor.

The Corridor spans ten counties: San Francisco, San Mateo, Santa Clara, Santa Cruz, San Benito, Monterey, San Luis Obispo, Santa Barbara, Ventura, and Los Angeles. The southern segment of the Corridor shared with the *Pacific Surfliner* typically operates in a coastal plain bordered by mountains to the east and the Pacific Ocean to the west. In Los Angeles County, the alignment between Los Angeles Union Station and Burbank Junction facilitates a significant amount of passenger and freight rail activity, including the *Pacific Surfliner*, *the Coast Starlight,* the Metrolink Ventura County and Antelope Valley lines, as well as UPRR freight activity. At Burbank Junction, the Corridor turns northwest to run through the heavily urbanized San Fernando Valley and through the communities, agricultural areas, and commercial development of Ventura County. At this point, the Corridor enters a narrow coastal plain bordered by steep hillsides and mountains on one side and the ocean on the other. In central Santa Barbara County, the alignment turns inland to run through hilly terrain that is undeveloped or used for livestock and other agricultural purposes. The alignment travels through the Santa Maria Valley plain and then reenters hilly terrain to connect into San Luis Obispo County.

With regard to passenger operations, the middle segment of the Corridor between Gilroy and San Luis Obispo is currently served only by *Coast Starlight* trains. North of San Luis Obispo, the alignment crosses a pass through the Santa Lucia Mountains to reach the agriculturally-rich Salinas Valley. Most of the valley lies in Monterey County and is the least populous section of the Corridor. At the north end of the county, the alignment again nears the ocean for a short distance, then turns east to cross a pass through the Santa Cruz Mountains to reach Santa Clara County. Monterey and Santa Clara Counties do not share a border; between the two counties, the alignment travels along the short Santa Cruz/San Benito County line. At the south end of the Santa Clara Valley, the alignment reaches the Caltrain Corridor at Gilroy.

The northern segment of the Corridor between San Francisco and Gilroy is served by Caltrain commuter trains. From Gilroy, the alignment turns northwest to reach the urbanized Silicon Valley, centered on San José. Between San Francisco and San José the Corridor passes through San Mateo County, following a coastal plain with hills and mountains on one side and the San Francisco Bay on the other.

Exhibit 2.1: Coast Corridor

Corridor tracks from the Los Angeles County Line to Moorpark are jointly owned by the UPRR and the VCTC, and are operated by SCRRA, more commonly known as Metrolink. Corridor tracks from the Los Angeles County Line to the Burbank Junction are jointly owned by the UPRR and LA Metro. From the Burbank Junction to LAUS the tracks are owned entirely by LA Metro. North from Moorpark to the vicinity of the Capitol Caltrain Station in San José, the tracks are owned and operated by UPRR (formerly by the Southern Pacific Railroad). Similar to the arrangement at the south end of the Corridor, the tracks north from the vicinity of the San José/Diridon Station to San Francisco are owned by the Peninsula Corridors Joint Powers Board, which includes SCVTA, the San Mateo County Transit District (SamTrans), and the City and County of San Francisco.

The Coast Corridor is served by a transportation system that includes air, highway, and rail services. In terms of seat capacity, the top air route in the U.S. connects Los Angeles International Airport (LAX) and San Francisco International Airport (SFO), and additional routes spanning the Corridor serve the Oakland, San José, Burbank and Long Beach airports. All of these airports provide nationwide connections. In addition, the Santa Barbara Airport provides access to major west coast cities, as well as Phoenix and Denver; the Santa Maria Airport offers three flights a day to/from Los Angeles; and two regional airlines provide connections from the San Luis Obispo Airport to Los Angeles, San Francisco, and Phoenix.

Interstate 5 (I-5) in the Central Valley – east of the Corridor – serves as the backbone of the state highway network, connecting the two dominant metropolitan regions at either end of the Corridor. Within the Corridor, a single major highway connects northern Santa Clara County and Los Angeles County –

the primarily four-lane U.S.101. State Route 46 (SR-46) provides an important link between the Central Valley and San Luis Obispo County – with some older two-lane highways providing connections through surrounding areas.

2.1 Purpose

In the Corridor, travel demand will continue to increase as population and employment are forecasted to rise through 2050. As a response to limited highway capacity along the congested Corridor, travelers will continue to seek more reliable and attractive alternate modes of transportation. Intercity rail ridership is expected to grow as it has in previous decades, but will require improvements that address significant rail system capacity constraints. As highway congestion intensifies, travel delays increase and travel reliability declines, rail becomes an increasingly attractive option for personal, business, and goods-movement travel. In addition, rising fuel costs contribute to a demand for a less expensive means of intercity travel. And as regions face increasing air quality and greenhouse gas (GHG) emission impacts, more sustainable means of moving people and goods are sought. As a result, there are new opportunities to expand rail service in the Corridor, which will require improvements to increase rail capacity to serve the growing need.

The purpose of the proposed rail improvements to the Corridor is to enhance safety and develop a faster and more reliable passenger and freight rail system that provides added capacity in response to increased travel demand between San Francisco and Los Angeles, and the intermediate cities. The existing capacity of the Corridor's transportation system is insufficient to meet existing and future demand, and the current and projected future system congestion will continue to result in reduced reliability, slower travel speeds, increased travel times, and deteriorated air quality. In summary, rail system improvements are required to address the following Corridor challenges:

- Future growth in county populations and travel demand for passenger trips between Los Angeles, Ventura, Santa Barbara, San Luis Obispo, Monterey, Santa Clara, San Mateo, and San Francisco Counties as documented in the growth in person trips in Metropolitan Planning Organization (MPO) Regional Transportation Plans (RTPs), the adopted *California State Rail Plan for 2007-08 to 2017-18 (California State Rail Plan) (2008)*, the *LOSSAN North Corridor Strategic Plan (2007)*, and *LOSSAN Corridorwide Strategic Implementation Plan* (April 2012).
- Unreliability of Corridor travel due to congestion and delays, weather conditions (e.g. closure of I-5 at the Grapevine grade redirects auto to coastal routes), periodic fires, and accidents, with adverse impacts on the quality of life and economic well-being of residents, businesses, and tourism throughout the Corridor.
- Poor and deteriorating air quality and pressure on natural resources as a result of expanded highway construction, motor vehicle use, and congestion.
- The interstate highway system, commercial airports, and conventional passenger rail system serving the intercity travel market are currently operating at or near capacity and will require large public investments for expansion and maintenance in order to accommodate future growth over the next 20 years and beyond.
- Expansion of the intercity rail system has not kept pace with the significant increase in population, employment, travel, and tourism in the Corridor during recent years.
- Growing Corridor rail capacity constraints will result in rail congestion and travel delays due to single-track operations, inadequate and infrequent passing sidings, and antiquated signaling, resulting in, for example, a current operational speed of 40 miles per hour in the southern segment of the Corridor between Oxnard and LAUS.

- Aging rail infrastructure, such as tracks, switches, and bridges, that in some cases has not been upgraded or improved in over 100 years.
- Increasing frequency of accidents on intercity highways and rail lines in congested travel chokepoints, as well as the potential for more accidents at at-grade railroad crossings.

Travel Time

Among the critical factors that impact the public's choice of transportation are travel time and reliability. Travel time is critical for all travelers but particularly for work and business-related trips, which require a more time-certain arrival. Based on future projections of increasing highway congestion and resulting travel delays, rail travel has the potential to be relatively faster. Point-to-point travel times, especially during daily commute periods is currently shorter for automobile travel than by rail; however, rail has the potential to be relatively faster in the future as automobile travel slows with increasing congestion. Total travel time for rail includes time required to reach a station, waiting for the next scheduled train, reaching the boarding area, checking and retrieving luggage, securing a rental car or taxi or boarding transit, and onward travel to reach the final destination. If rail is to be a viable alternative to the automobile, it must provide point-to-point times significantly faster than the automobile, since rail cannot provide door-to-door service. The lack of door-to-door service is partially offset by the advantage that rail destinations are usually located in the heart of a community, and close cooperation with local transit agencies can improve connecting travel to the final destination.

Similarly, accessibility of trip destinations from rail stations supports rail's competitiveness with respect to air travel, which also cannot provide door-to-door service. Downtown rail stations are generally more convenient to travelers' ultimate destinations than airports, which are typically located in peripheral locations outside of city centers. Air travelers must build in several hours to their trips to access airports (often via chronically congested freeways), process through security checks, and account for unforeseen delays.

Some of the proposed Corridor improvements listed in Chapter 4 would reduce travel time by expanding Corridor capacity through increased operating speeds and efficiency. These improvements would benefit both freight and passenger rail services and their customers, motorists using U.S. 101, and the communities in which the improvements are located. As travel times are decreased and reliability is increased in the Corridor, rail stands to attract substantial ridership from weary auto or air travelers.

Safety

Projected growth in the movement of people and goods by auto and rail over the next two decades underscores the need for improved safety. With more and more vehicles on highways and more frequent and faster trains, the potential for automobile/rail collisions increase. To help ensure that future increases in rail traffic occur without a corresponding increase in hazard, the State of California supports Operation Lifesaver, an extensive rail safety information and education program. In the past, Congress has also recognized the need to improve rail crossings and has provided necessary funding. The proposed rail improvements will reduce or eliminate the hazards of highway/rail crossings, as well as provide new or upgraded pedestrian crossings along the Corridor.

Environmental Benefits and Impacts

Increasing Corridor population and travel demand will require transportation system capacity improvements, which can have negative impacts on regional and local air quality and natural resources. The Corridor is particularly sensitive to both of these impact areas. The Central Coast portion of the Corridor is environmentally sensitive, and expansion of the highway system beyond current plans would have significant air quality, community, and environmental impacts. Conversely, rail system improvements would be made primarily within existing right-of-way (ROW), minimizing impacts to natural resources.

The Clean Air Act (CAA) makes “transportation conformity” the responsibility of the U.S. Department of Transportation (USDOT) and MPOs. Transportation conformity addresses air quality attainment and maintenance strategies contained in the State Implementation Plan (SIP), which are used to evaluate transportation alternatives, including no-project/no-action alternatives. With respect to federal air quality conformity requirements, the San Francisco Bay Area and the Los Angeles Basin and are currently designated as Non-Attainment for Ozone, Respirable Particulate Matter (PM_{10}), and Fine Particulate Matter ($PM_{2.5}$) based on state and federal air quality standards. Los Angeles County is also identified as Non-Attainment for Nitrogen Dioxide (NO_2) and lead state standards. Throughout the State, greenhouse gas emissions must also be reduced in response to Assembly Bill (AB) 32 (Schwarzenegger 2006), the Global Warming Solutions Act.

Meeting federal and state air quality standards over the next 20 to 40 years will likely require reductions in the total distance traveled by vehicles. This can be accomplished by integrating land use development and transportation planning; implementing operational improvements; developing transportation demand strategies; using new technologies that improve transportation efficiencies; and providing alternatives to single-occupant automobile travel. The proposed *Coast Daylight* rail improvements would help implement these strategies. Moving passengers by rail produces significantly less pollution per passenger mile traveled as compared to typical automobile use, and rail expansion would aid in reducing emissions throughout the Corridor.

2.2 Need

The need for rail improvements to the Corridor was established through an analysis of the Corridor’s existing and future population and employment information, travel markets and demand, and Corridor rail system trip purpose.

2.2.1 Corridor Transportation Market Challenges

Currently home to over 15 million people, the Corridor’s population is forecast to grow by approximately 32 percent – or by 5 million new residents – by 2040, as shown in Table 2.1. While the population increase will occur primarily in Los Angeles and Santa Clara Counties, which are projected to grow by 33 and 35 percent, respectively, Ventura and San Luis Obispo Counties are expected to grow at even higher rates – 37 and 50 percent, respectively.

Employment growth Corridor-wide is expected to keep pace with population growth, though at a somewhat slower rate of 31 percent. Over 1.9 million new jobs are expected in Corridor counties by 2040. As with population increase, Los Angeles and Santa Clara counties are projected to lead in employment growth – followed by San Francisco, which is expected to attract jobs at a rate ten percentage points (37 percent) greater than population. However, the highest rates of employment growth are projected for Santa Barbara and Ventura counties – at rates of 45 and 59 percent, respectively.

Isolating the mid-Corridor population by removing the counties of the dominant metropolitan areas at the ends of the Corridor (San Francisco, San Mateo, Santa Clara, and Los Angeles) from the totals still reveals a considerable population of nearly 2 million, which is expected to grow by 36 percent by 2040. In the Corridor’s four Central Coast counties (Monterey, San Luis Obispo, Santa Barbara and Ventura), job growth is expected to outpace population growth – increasing by 42 percent. Expanded passenger rail service has the potential to meet the travel needs of the intermediate counties as they continue to grow in population and employment.

Table 2.1: Corridor Population and Employment Forecast for 2011–2040

	2011	2015	2020	2025	2030	2035	2040	Change 2011–40	Percent Change
Total Population (Thousands)	15,364	15,967	16,827	17,705	18,561	19,462	20,355	+4,990	+32%
Population Density (Pop. / Sq. Mi.)	901	936	987	1,038	1,088	1,141	1,193	+292	+32%
Total Households (Thousands)	5,205	5,481	5,757	5,970	6,154	6,324	6,483	+1,278	+25%
Total Employment (Thousands)	6,167	6,712	6,961	7,211	7,487	7,800	8,108	+1,941	+31%

2.2.2 Source: Moody's Economy.com, 2011. Corridor Transportation Market Opportunities

While the portions of the Corridor in Los Angeles, San Francisco and San Mateo counties and much of Santa Clara County are densely developed, the remainder of the Corridor is characterized by a variety of urbanized, agricultural, and undeveloped areas. Key land uses in the Corridor include employment and commercial centers, civic centers, public and private colleges, cultural and entertainment venues, industrial and warehousing, agriculture, and open space. Larger cities along the corridor include Los Angeles, Burbank, Oxnard, Santa Barbara, Santa Maria, San Luis Obispo, Salinas, Gilroy, San José, Palo Alto, San Mateo, and San Francisco.

The Corridor's destinations and activity centers result in a diverse set of local and regional travel markets:

- Commuters accessing employment centers located in downtown Los Angeles, the San Fernando Valley, Oxnard, Santa Barbara, San Luis Obispo, Salinas, Silicon Valley, and San Francisco.
- Agricultural workers traveling to jobs and delivery trucks taking products to shipping locations.
- Students, teachers, and employees traveling to and from public and private educational institutions, including the California State University at Northridge, California State University at Channel Islands, the University of California at Santa Barbara, California Polytechnic State University at San Luis Obispo, California State University at Monterey Bay, San José State University, Santa Clara University, Stanford University, University of California at San Francisco, and multiple community colleges.
- Visitors accessing the area's many tourist destinations including main street shopping and entertainment areas such as downtown Ventura, Santa Barbara, San Luis Obispo, and Monterey; beaches, museums, theaters and special event generators; historic missions; and numerous wineries.

- Residents and visitors traveling to the many state, regional, and local recreational facilities in the Corridor, some of which attract out-of-state visitors, such as Morro Bay, Pismo Beach, Montana del Oro State Park, Pinnacles National Park, and Golden Gate National Recreational Area.
- Travelers from Santa Cruz, Monterey, San Luis Obispo, Santa Barbara, Ventura, and Los Angeles counties connecting to the future HSR system at Los Angeles and Gilroy.

2.2.3 Current and Forecasted Demand

Although the primary focus of this study is the improvement of the intercity passenger rail system, total rail travel demand along the Corridor includes commuter services. The demand for each service is described below, followed by a summary of the overall existing and proposed capacity of the Corridor.

From 2000 to 2030, the Corridor's travel market is forecast to grow by approximately 12 percent – from 784 to 876 million annual trips, as shown in Table 2.2. While the greatest county-to-county flows are projected to occur within the dominant metropolitan regions at the ends of the Corridor (between San Francisco, San Mateo, and Santa Clara Counties, and between Los Angeles and Ventura Counties), some of the highest rates of travel growth are expected between county pairs that include the Central Coast: Santa Barbara and Ventura Counties (29 percent), Monterey and Santa Clara Counties (30 percent), and Monterey and San Luis Obispo Counties (40 percent).

The trip calculation data is developed from the Authority ridership and revenue model which uses 2000 as the base data, therefore 2000 is the most recent data available.

Table 2.2: Percent Change in Annual Two-Way Person Trips between 2000 and 2030

County	**San Fran-cisco**	**San Mateo**	**Santa Clara**	**Mon-terey**	**San Luis Obispo**	**Santa Barbara**	**Ventura**	**Los Angeles (North)**	**Total**
San Francisco	–	–	–	–	–	–	–	0%	17%
San Mateo	3%	–	–	–	–	–	–	0%	3%
Santa Clara	32%	12%	–	–	–	–	–	0%	16%
Monterey	20%	13%	30%	–	–	–	–	0%	0%
San Luis Obispo	20%	25%	27%	40%	–	–	–	0%	40%
Santa Barbara	0%	0%	22%	-9%	–	–	–	83%	8%
Ventura	0%	0%	100%	0%	0%	29%	–	35%	32%
Los Angeles (South County)	9%	0%	23%	20%	17%	18%	-6%	35%	12%
Total	*6%*	*12%*	*13%*	*28%*	*23%*	*24%*	*-6%*	*35%*	*12%*

Source: The Authority Model. Trips between San Luis Obispo and Santa Barbara Counties are included in the same region under the Authority Model and are therefore not captured in this analysis.

Intercity Rail Trips

Intercity rail trips in California have experienced significant growth in the past decade, as shown in Table 2.3. During the period from 1998 to 2010, *Pacific Surfliner* and Amtrak California ridership rose 69 percent and 94 percent, respectively. With projected increases in population and freeway congestion, it is anticipated that intercity rail ridership in the Corridor and throughout the state will continue to increase. With the investment of additional improvements in the rail system, rail travel will become more attractive to intercity travelers and result in further ridership increases in the Corridor. The *Coast Daylight Implementation Plan (2000)* projected 216,000 riders during its first year of operation, growing at a rate of seven percent a year during the first three years of service.

Table 2.3: Amtrak California Ridership

Route (Period)	***Pacific Surfliner***[(1)] (Calendar Year)	**Total Amtrak California Ridership** (Calendar Year)
1998	1,559,997	2,694,179
1999	1,547,049	2,805,133
2000	1,594,189	3,157,038
2001	1,737,532	3,514,613
2002	1,796,442	3,642,213
2003	2,228,042	4,151,699
2004	2,431,085	4,370,811
2005	2,543,156	4,584,540
2006	2,667,969	4,773,813
2007	2,736,016	5,045,643
2008	2,876,167	5,580,773
2009	2,568,218	5,058,320
2010	2,640,225	5,231,126
1998-2010 (% Change)	*69.2%*	*94.2%*

Source: Caltrans.
Notes:
(1) *Pacific Surfliner* ridership includes entire Corridor from San Luis Obispo to San Diego.

Commuter Rail Trips

Commuter services within the Corridor are operated by two transportation agencies. Metrolink operates commuter rail services within Los Angeles and Ventura County, while Caltrain operates commuter service within Santa Clara, San Mateo, and San Francisco Counties. In 2011, as many as 61 Metrolink trains operated along various segments of the southern segment of the Corridor on a given weekday. Daily commuter train volume is expected to increase to 90 trains by 2030, as identified in the *LOSSAN Corridorwide Strategic Implementation Plan (April 2012).* However, this document did not address the increase in travel demand for commuter and intercity service in the segment between Burbank Junction and LAUS expected when the HSR Initial Operating Section becomes operational between Merced and the San Fernando Valley. In the northern segment of the Corridor 86 Caltrain trains are operated daily. This figure is expected to increase to 114 trains following electrification and introduction of new rolling stock, which the *Caltrain Short Range Transit Plan 2008-2017 (2008).* Currently, electrification is planned for implementation in 2019.

2.2.4 Corridor Capacity Constraints

The Corridor's existing patterns of population and employment location and visitor destinations have resulted in weekday and weekend congestion along U.S. 101, particularly in the major metropolitan areas at either end of the Corridor. Continued growth in population and employment in the future is expected to generate increased travel demand in the Corridor. Since a majority of the travel demand is anticipated to be met by automobile travel, increased highway congestion is expected. Some of this new demand will be met by non-automobile modes due to increased transit availability, as well as land use development patterns that encourage non-automobile modes of travel.

In addition, several locations in the Corridor exhibit an imbalance of jobs to housing. In the southern portion of Santa Barbara County, less affluent employees travel to and from more affordable housing that can be found in surrounding jurisdictions, particularly to the north in the Santa Maria Valley in the northern portion of Santa Barbara County, and to the south in the cities of Ventura and Oxnard in Ventura County. Many residents of Ventura County with limited professional employment opportunities must travel to work in other areas, including Los Angeles, Santa Clarita, and Santa Barbara. This imbalance of homes to jobs causes heavy commute travel along U.S. 101 during the morning and evening peak hours from Santa Barbara County south through Los Angeles County. A similar pattern is evident in the northern segment of the Corridor, where workers are priced out of jobs-rich Silicon Valley and seek more affordable housing in southern Santa Clara County and other peripheral locations of the Bay Area.

Aside from the major international airports at the ends of the Corridor, airport access is limited, flights are expensive, and total travel time is similar to driving, unless the destination is outside the state. Between Los Angeles and Santa Clara Counties, the Corridor is served by a single major highway, U.S. 101, which experiences frequent congestion and travel delays. The Corridor's four passenger rail services are frequently at-capacity during peak periods.

Significant Highway Congestion

With expected population and employment growth, travel demand will increase; a majority of this growth is anticipated to be met by automobile travel, leading to increased congestion and delays on U.S. 101, particularly at urban chokepoints. Motorists entering or leaving the two major metropolitan regions during peak commute periods encounter significant congestion on capacity-constrained freeways, extending a trip that under optimal conditions may take seven hours by several additional hours. Planning a trip to avoid peak periods requires either early departures or late arrivals, which for many drivers is an unattractive trade-off. Weekend travel does not spare motorists delay either, as some of the worst congestion takes place outside of the workweek.

Highway congestion has a negative impact on the region's economy and efficiency, results in environmental impacts, and reduces quality of life for residents. Due to the physical setting and existing development along the Central Coast, there is limited physical space available for expansion of the existing highway system or the construction of new highway alternatives.

Inadequate Rail System Capacity

Corridor rail service, which provides an alternative means of travel, could accommodate an increasing portion of the projected growth in travel demand. However, service is constrained by infrastructure that is significantly undersized for current rail volumes, much less future service, without significant system improvements. The segment of the Corridor south of Santa Barbara shared with *Pacific Surfliner* service operates at or beyond design capacity, as does the segment north of San José shared with Caltrain service. *Pacific Surfliner* and Metrolink services are heavily utilized and are frequently overcrowded at peak times on weekdays and weekends. About 75 percent of the 470-mile Corridor has only single-track operations, and communications systems are outdated. Considering a future of population increases, higher fuel prices, more congestion on parallel highways, and longer commutes, the demand for the Corridor's rail service is projected to grow.

Capacity of the Intercity Transportation System

The capacity of the interstate highway and passenger rail systems serving the intercity travel market has not kept pace with the increase in population and tourism in the state. In fact, in recent years, Caltrans and Amtrak have documented more than 50,000 standees on *Pacific Surfliner* trains during peak hour and seasonal peak periods. These passengers have paid full price but often cannot find an available seat during peak travel demand periods. This has impacted the quality of service, with many first time riders indicating they are unlikely to return for a future train trip. Similarly, the reservation-only *Coast Starlight* is often fully booked during the peak summer and holiday travel periods, and must turn away passengers.

Additional need for improvements in the Corridor relate to track capacity constraints and shared-track conflicts between passenger and freight trains. Various segments of the Corridor are currently constrained by the lack of adequate passing or second main tracks. Trains stack at either end of single-track sections, resulting in delays and reducing the attractiveness of rail as a travel mode choice. More than 80 percent of the southern segment has only single-track operations, and sidings are limited in number and length. More than 90 percent of the middle segment between San Luis Obispo and Gilroy has only single-track operations; however, capacity is available due to its lower levels of traffic. The northern segment of the Corridor between Gilroy and San Francisco is single-tracked for less than 25 percent of its length, but the relatively high frequency of Caltrain service challenges capacity constraints.

In addition to track capacity limitations, there are deficiencies in the current signal systems. Throughout the Corridor, communication systems are outdated with many sections of single-track operations still using Automatic Block System (ABS) signal control and manual switches, with dispatcher approval required to proceed. Further, the coastal topography with its river crossings and curves results in less than optimal train speeds, and in some locations there is space for only one track. Thus, emphasis should be placed on improving track capacity and signal systems where tangent track and less restrictive locations permit.

2.3 Scope and Objective of the Plan

2.3.1 Scope

The Corridor faces significant mobility challenges today and in the future. Continued growth in population, employment, and tourism activity is expected to generate increased travel demand in the Corridor. By 2040, the Corridor's population will grow by approximately 20 percent from 16 million to 19 million residents, straining the existing transportation network. As discussed in previous sections, increasing travel demand, system constraints and capacity limitations highlight the need for improvements in the Corridor. Development of an effective rail system is necessary to meet the future mobility needs of residents, businesses, and visitors. The Coast Corridor faces continuing transportation challenges as evidenced by the following:

- <u>Increasing population and travel demand</u>. By 2040, Corridor population is forecast to grow by approximately 32 percent to a total of 20 million residents, with a corresponding increase in travel demand. While nearly 90 percent of the population growth will occur in the major metropolitan areas at the ends of the Corridor (Los Angeles, Santa Clara, San Mateo, and San Francisco

Counties), the forecast increase of 688,000 new residents represents a significant increase for the four less populated counties in the Corridor.

- Constrained travel options. While the Corridor is served by a transportation system that includes air, highway, and rail modes, system access and capacity is insufficient to meet future travel demand. Air access is limited, with major airline service available at only two Corridor airports outside of the major metropolitan areas at the ends of the Corridor. Between Los Angeles County and northern Santa Clara County, the Corridor is served by a single major highway – the primarily four-lane U.S. 101 – which experiences frequent congestion and travel delays. While four passenger rail services operate in the Corridor, trains are often delayed due to the primarily single-track rail system.
- Significant highway congestion. A majority of the future travel demand is anticipated to be met by automobile travel, leading to increased congestion. The Corridor's highway system experiences frequent congestion and travel delays, particularly at urban chokepoints, making travel times unreliable. There is limited space available for expansion of the highway system or the construction of new highway alternatives.
- Constrained rail system capacity. Corridor rail service could accommodate an increasing portion of projected travel demand growth by providing an alternative mode, but service is constrained by infrastructure that is significantly undersized for the volumes it currently accommodates, much less future service, without significant system improvements. Existing train services are often fully booked during peak travel periods.
- Aging rail infrastructure. Investment in Corridor rail service has not kept pace with population and travel demand growth, and many tracks, signals and bridges have not been upgraded or improved in decades. Improvements would allow shorter travel times and greater reliability, making rail a more attractive and competitive choice.
- Safety concerns. Increasing potential for accidents in congested rail chokepoints underscores the need for upgraded signaling and improved maintenance. Growing frequency of rail-related collisions call for improved highway/rail crossings and new or upgraded pedestrian crossings.
- Need for increased travel capacity without impacting air quality and natural resources. Increasing Corridor travel demand requires transportation system capacity improvements, which can have negative impacts on regional and local air quality and greenhouse gas emissions, as well as natural resources. Meeting federal and state air quality standards over the next 20 to 40 years will likely require reductions in total vehicle miles traveled. Rail system improvements would achieve air quality benefits with minimal impact on natural resources.

Corridor improvement projects will be identified and evaluated in order to improve mobility and reliability in this congested part of the state's rail system. The proposed improvements would allow for a more reliable, safe, competitive, and attractive intercity travel option. These improvements would provide additional capacity to relieve some of the projected near- and long-term demand on the highway system, potentially slowing the need to further expand highways and airports, or reduce the scale of those expansions, including their associated cost and impacts on communities and the environment. Rail improvements would augment the highway system, creating an interconnected, multimodal solution, allowing for better mobility throughout the Corridor. Improved rail infrastructure would contribute to the viability of the Corridor, provide connectivity with local transit systems, and allow future integration with the planned California HSR system.

2.3.2 Objectives

As stated above, preparation of an updated CSRP has been initiated. In the current *California State Rail Plan (2008)*, Caltrans has described the overall objectives and policies for intercity rail improvements as:

- Increase the cost-effectiveness of State-supported intercity passenger rail systems.
- Increase capacity on existing routes.
- Reduce running times to attract additional riders and to provide a more attractive service.
- Enhance the safety of State-supported intercity rail service.

The Corridor-specific objectives include:

- Develop a plan for the continued improvement of the Corridor that complements and incorporates the recommendations of the SDP developed for the northern segment of the Pacific Surfliner Corridor.[i]
- Clearly demonstrate the purpose and need for new or improved passenger rail service.
- Analyze alternatives for providing the new or improved service, and identify the alternative that best addresses the purpose and need.
- Demonstrate the financial and operational feasibility of the selected alternative, including identification of operational improvements required to support new or improved service.
- Describe how implementation of the selected alternative may be divided into discrete phases.

Within a multi-modal strategy, improving rail service in this Corridor would provide the following benefits:

- Address increasing travel needs.
- Provide a direct connection between Los Angeles and San Francisco, the largest unserved intercity rail market in the State.
- Provide an alternative for those who cannot or choose not to drive or fly.
- Alleviate demand on constrained highway system in urban areas.
- Reduce travel times.
- Increase reliability and safety.
- Increase travel capacity with minimal impacts to the Corridor's natural resources and potential benefits to air quality.

3.0 Rationale

The Coast Corridor would serve a vital function in providing intercity rail services between the cities of San Francisco, San José, Salinas, San Luis Obispo, Santa Barbara, Ventura, and Los Angeles. Intercity rail service in the Corridor would provide capacity benefits, multi-modal system benefits, operational benefits, and environmental benefits.

Additionally, Corridor rail system improvements would benefit other transportation systems that would interface with the Corridor rail service:

- Support Corridor operations. Many trips span the service areas of both the Coast and Pacific Surfliner Corridors, and improvements in the northern portion of the Corridor will ensure the successful utilization of both segments. Improvements in the Coast Corridor would complement and support the improvements identified for the Pacific Surfliner Corridor, which is experiencing similar travel demand growth and congestion and capacity constraints.
- Support Capitol Corridor operations. As is the case at the southern end of the corridor, many trips span the service areas of both the Coast and Capitol Corridors, and improvements in the Coast Corridor would complement and support the improvements identified for the Capitol Corridor.
- Support San Joaquin Corridor operations. Connecting bus service between the Coast Corridor at Paso Robles and the San Joaquin Corridor at Hanford will allow faster rail-to-bus-to-rail trips between the stations on the Central Coast and stations in the San Joaquin Valley. These trips will become even faster once the new Northern California Unified Rail Service[ii] outlined in the *2012 Business Plan* begins operating over the first construction section between Fresno and Bakersfield. Travel time will be reduced even further on initiation of electrified high-speed rail service in the Central Valley.
- Support operations of the future HSR system. The Corridor will connect with the HSR system at Los Angeles and Gilroy. As a result, the Coast Corridor will provide important rail feeder services to the HSR system, providing rail connections for passengers from Santa Cruz, Monterey, San Luis Obispo, Santa Barbara, Ventura, and Los Angeles counties.
- Provide rail access to communities not currently served along the Coast route. Between San José and San Luis Obispo, the *Coast Daylight* would stop at the following existing and new stations not currently served by the *Coast Starlight*: Gilroy, Pajaro, Castroville, Soledad, and King City.
- Provide network connectivity and integration. Improvements would increase connectivity and provide integration with *Capitol Corridor* and *Pacific Surfliner* routes. For example, riders originating on the Coast Corridor would be able to transfer and continue on a trip to Orange County, San Diego County, or to the East Bay.
- Provide connectivity with local transit systems. Corridor improvements would provide for a stronger interface with transit services operating to and from the Corridor's passenger rail stations. Corridor stations include the following: San Francisco, Millbrae, Palo Alto, Mountain View, San José, Gilroy, Pajaro, Castroville, Salinas, Soledad, King City, Paso Robles, San Luis Obispo, Grover Beach, Guadalupe-Santa Maria, Lompoc-Surf, Goleta, Santa Barbara, Carpinteria, Ventura, Oxnard, Camarillo, Moorpark, Simi Valley, Chatsworth, Van Nuys, Burbank-Bob Hope Airport, Glendale, and Los Angeles Union Station.

It should be noted that investments needed to expand passenger service and improve passenger service performance objectives will also benefit goods movement in the State by enhancing the capacity and reliability of the route as an alternative to the principal north-south corridors located in the Central Valley. Intercity passenger rail improvements in the Corridor would return direct intercity rail service to San Francisco for the first time in over 40 years.

3.1 Capacity Benefits

Corridor improvements, if needed, would provide additional capacity to serve Coast Corridor growth in a cost-effective manner with minimal impacts to local communities, natural resources, and air quality. The improvements have independent utility, are not dependent on the completion of other Corridor programs to be successful, and provide measurable benefits to intercity rail service.

Providing additional highway system capacity could have negative impacts on regional and local air quality, local communities, and natural resources. With respect to air quality in the Coast Corridor, the San Francisco Bay Area and the Los Angeles Basin are currently designated as Non-Attainment for Ozone, PM_{10}, and $PM_{2.5}$ based on state and federal air quality standards. Los Angeles County is also identified as Non-Attainment for NO_2 and lead state standards. Meeting federal and state air quality standards over the next 20 to 40 years will likely require reductions in the total distance traveled by vehicles. The Corridor passes through residential neighborhoods and the commercial centers of many communities, and operates through environmentally sensitive settings. Rail system capacity could be increased within existing ROW with air quality benefits and minimal impacts to local communities and natural resources.

3.2 Multi-Modal System Benefits

Increased intercity passenger rail service is a key component of multi-modal strategies identified in the Corridor's regional and county goals and plans. While the Corridor is served by a transportation system that includes air, highway, and rail services, existing system capacity is insufficient to meet the future travel demands. Between Monterey and Ventura Counties the Corridor is served by a single major highway – the primarily four-lane U.S. 101. Regional and county multi-modal transportation plans have been developed in recognition of future growth and have adopted the rail mode as a key element.[(iii)] Provision of improved intercity rail service plans in the Coast Corridor would support regional and county goals and plans related to growth, smart growth, economic development, air quality and greenhouse gas emissions, sustainability, and provision of a balanced transportation system.[(iv)] Improving passenger rail service would enhance rail travel as an increasingly viable and attractive option for personal and business trips, and would provide an alternative mode of travel, particularly for those residents who do not or cannot drive.

3.3 Operational Benefits

Improvements to the Coast Corridor's rail system infrastructure, such as improved signaling, would improve operational reliability for both passenger and freight trains. Attracting more customers to intercity rail through improved performance will offer a key mobility choice.

As presented in Chapter 8, the operations simulation modeling shows that the proposed capital program would produce capacity and operational benefits, including improved on-time performance (OTP), increased average train speed over portions of the route, and the additional capacity required to increase train frequencies.

4.0 Identification of Alternatives

This chapter describes the alternatives evaluated in this study effort: 1) the No-Build/No-Action Alternative (No-Build Alternative), which is a baseline discussion of the continued operation of the current Corridor system with no improvements (other than those already funded), and 2) the Build/Improved Passenger Service Alternative (Build Alternative), which is a list of potential improvement projects for the Coast Corridor to support the proposed *Coast Daylight* intercity passenger rail service. It should be noted that the improvements identified as part of the No-Build Alternative include projects that are partially funded (for completion of environmental and engineering studies) and projects that are fully funded through construction. The identified projects were anticipated to receive future priority funding and/or implementation. Due to the corridor-level planning and analysis of an SDP, which is intended to define the broad differences between the No-Build and Build Alternatives, the level of detail for any of the proposed improvement projects is conceptual in nature. Subsequent project-specific engineering and environmental analysis would be performed to provide more detailed information on implementation costs and environmental impacts for individual projects included in the Build Alternative.

4.1 Previous Corridor Planning Studies

Several planning and feasibility studies have identified and proposed improvements for the Coast Corridor. Amtrak completed the *California Passenger Rail System: 20-Year Improvement Plan Technical Report* (*Amtrak 20-Year Plan)* in March 2001. In terms of recent studies, UPRR has recommended a series of improvements to accommodate the new *Coast Daylight* service.[v] Environmental documents have also been completed or are currently underway to meet federal- and state-required environmental review for improvements in the Coast Corridor. The segment north of Salinas was studied in the *Caltrain Extension to Monterey County Passenger Rail Stations Final Environmental Impact Report (FEIR) (2006)* prepared for the TAMC. SLOCOG is conducting an environmental review for the segment between Salinas and San Luis Obispo. As part of their review, SLOCOG compiled a list of proposed improvements from the *Amtrak 20-Year Plan (2001)* and the UPRR recommendations. Various studies have also examined the potential for new stations, including the *Caltrain Extension to Monterey County Passenger Rail Stations FEIR (2006)* and the *Coast Daylight Implementation Plan (2000)*.

Together, these previous studies have proposed the following type of Corridor infrastructure improvements:

- Track upgrades including second main tracks, curve realignments, and cross-tie replacement.
- Siding improvements including lengthening and rehabilitation.
- Signal and communication system upgrades such as implementation of continuous Centralized Traffic Control (CTC),[vi] upgrading the signal and wayside detector systems, and adding fiber and microwave systems.
- New intercity rolling stock, both tilting and non-tilting.
- Station projects, including the platform expansion/extension and reconstruction, pedestrian crossings, parking, and associated facilities for connecting modes (bus/shuttle stations, bicycle facilities, sidewalks, and access roads).

4.1.1 Corridor Rail Service Plans

The current proposed service plan for the Coast Corridor calls for adding one round-trip daily train operating between San Francisco and Los Angeles. The existing long-haul Amtrak *Coast Starlight* train would continue to operate in the Corridor. The initial single daily round-trip service would be provided by extending the operation of an existing *Pacific Surfliner* train from the current northern terminus at San

Luis Obispo to San Francisco. As a result, no additional rail infrastructure improvements within the *Pacific Surfliner* territory between San Luis Obispo and Los Angeles would be required. Expansion of the *Coast Daylight* service to the ultimate two round-trips per day would be accomplished by scheduling an additional round-trip train which would operate overnight when rail traffic levels are generally lower than daytime traffic levels at most locations along the corridor; it is not anticipated that the added service would generate significant requirements for additional infrastructure. The improvements between San Luis Obispo and Los Angeles identified in the Pacific Surfliner North SDP will benefit the *Coast Daylight* trains.

Current freight operations average approximately six trains or fewer north of Oxnard, eight to 16 trains to San Fernando Valley points and 18 daily trains in the Corridor between the Burbank Junction and Los Angeles Union Station. Future Corridor local freight service is not expected to increase significantly, however two additional through trains are projected over the longer term. Future freight trains may increase in length, and when coupled with the passenger rail service increases, inadequate sidings and other rail capacity constraints will negatively impact freight and intercity rail performance.

4.1.2 Corridor Rail Service Improvements

A list of Coast Corridor improvements to support the new *Coast Daylight* service have been identified from previous studies. These projects were evaluated, with consideration given to implementation in a cost-effective and environmentally sensitive manner. The improvement projects fall into eight categories:

- Track Upgrades. The key to operating at maximum authorized speeds in mixed use (passenger and freight) operations is the condition of the infrastructure (rail, ties, and sidings), track geometry, signal system and level of maintenance. Improvements such as additional and extended sidings, double-tracking, and curve realignments are necessary in order to maintain the Corridor as a FRA Class IV railroad.[vii] In addition to system infrastructure improvements, there are ongoing rail and tie replacement needs. While the UPRR has made and continues to make infrastructure upgrades, the Corridor, while maintained to FRA standards, is characterized by single-track operations, short sidings or lack of sidings, manually-thrown switches, and an outdated signaling system. Much of the track is older, which requires a much greater level of maintenance to operate at maximum allowable speeds (MAS). The track geometry requires trains to operate at slower than maximum FRA allowable speed (79 mph), and siding lengths and conditions make train meets both difficult and time consuming.
- Signal Upgrades. The signal system north of San Luis Obispo is a conjunction of state-of-the-art CTC, operated by a dispatcher who controls train movements from a remote location, and ABS, which requires the dispatcher to communicate directly with each train crew before the train can obtain authority to proceed through “blocks” to their destination. It should be noted that installation of Positive Train Control (PTC) may be a required UPRR investment.
- Siding and Siding Extensions. A siding is a short section of track adjacent to a main track, used for meeting or passing trains. Sections of the Corridor have sidings needing extension, or provision of new sidings to maximize the utility of the existing track configuration. Extending and upgrading existing sidings where possible would provide additional capacity, reduce trip times, and improve operational reliability for both passenger and freight traffic. Constrained siding availability and length would impact the ability of passenger trains and freight trains to pass each other, affecting travel times, reliability, and the potential attractiveness of a new passenger service in the Coast Corridor. Meanwhile, market factors (labor costs, locomotive fleet utilization, etc.) are leading to longer freight trains. The operational result is that passenger trains, rather than freight trains, are frequently forced into a siding when two trains meet because the siding is not long enough to accommodate the freight trains. Where siding lengths of 5,000 feet were once sufficient, freight trains now operate at lengths approaching 9,000 feet. Corridor sidings where meets are expected to occur, whether new or extensions of existing facilities, thus need to have

a minimum length of 10,000 feet. As sidings are lengthened, they should also be upgraded to permit higher speeds.

- Construction of Second Main Tracks. Providing additional segments of mainline tracks in areas of heavy rail traffic would allow for increased train frequencies, improved operational reliability, increased capacity, and decreased train delays.
- Curve Realignments. Curve realignments allow for reduced trip times by increasing train speeds on curved tracks and prolonging track life, reducing the frequency of repair or maintenance needs.
- Station Improvements. Station improvements include providing new or improved station platforms, improved transit connectivity, and customer amenities such as additional parking, electronic signage with real-time arrival and departure information, and automated ticket vending machines. Benefits of station improvements include increased platform capacity and safety, and improved customer service and information.
- Rolling Stock Upgrades. Rolling stock upgrades include purchasing new railcars and locomotives to operate the proposed passenger services. In addition to improving the passenger experience (e.g., amenities, ride comfort), new rolling stock can offer tangible travel time benefits—trains with tilting capabilities, for example, can reduce or eliminate the need for trains to reduce speed on low-radius curves, allowing trains to maintain higher average speeds.

4.2 No-Build Alternative

The No-Build Alternative provides a baseline discussion of the continuation of the current Corridor system with no improvements beyond those rail improvement projects that have approved local, county, state, and federal funding. These are documented in county Long-Range Transportation Plans (LRTPs), Regional Transportation Improvement Plans (RTIPs), Caltrans' California Intercity Rail Capital Program, and the Statewide Transportation Improvement Program (STIP), along with federally-funded projects under the High-Speed Intercity Passenger Rail Program (HSIPR). As of July 2012, no specific approved and funded improvement projects have been identified for the Coast Corridor north of San Luis Obispo. The No-Build Alternative between San Luis Obispo and Los Angeles (identified in the Pacific Surfliner North Corridor SDP) will benefit the *Coast Daylight* trains.

Portions of the second main track between Tamien and Gilroy have already been designed and/or completed and Caltrain is pursing adding a fourth track between the San José and Santa Clara station to provide more capacity and improve reliability. Caltrain is planning to electrify their route between San Francisco and San José; this is currently scheduled for completion in 2019. Eventually, HSR trains would share the electrified Caltrain tracks to reach San Francisco. The electrification project includes purchase of new commuter train equipment for Caltrain that can take advantage the electrified railroads higher acceleration and deceleration rates, thereby providing faster running times. It should be noted that analysis has not been conducted to examine the impacts of the operation of one or two *Coast Daylight* trains in the electrified Caltrain Corridor. A longer-term project is extension of Caltrain and HSR service to the new Transbay Transit Center in San Francisco. This extension involves construction of a 1.5-mile tunnel north of the existing terminal station at 4th and King. The tunnel will be designed for operation of electric high-speed and commuter equipment. Therefore, *Coast Daylight* trains would need to terminate at the 4th and King Station, or be equipped with dual-mode (diesel and pantograph) locomotives to allow travel through the tunnel to the Transbay Transit Center.

4.3 Build Alternative

Major infrastructure improvements are required to provide a reliable, safe, competitive, and attractive intercity travel option. The Build Alternative provides a set of county-wide and site-specific improvement projects for the Coast Corridor to address infrastructure constraints. Projects are identified based on the previous studies and plans presented. The proposed capital investments are grouped by timeframe into near-term (2012–2014), mid-term (2015–2020), and long-term (2020–2040). In order to be classified as a near-term project, the funding status must be "Allocated" or "Programmed." Mid-term projects are either "Partially Programmed" or "Unfunded". Long-term projects are "Unfunded" and have costs that are unlikely to be covered by existing funding streams within the next 20 years. These three timeframe categories are meant as rough planning guides, and not to limit the time-period when a project may be initiated. Planning-level project cost estimates for many of the identified improvement projects have already been developed in the sources consulted in developing the list of proposed improvements. A systematic review of the projects indicated that these cost estimates were generally reasonable and acceptable for planning purposes, and contained sufficient detail to permit their use in this SDP. However, many of the cost estimates were developed in previous years and are no longer current. As a result, a cost escalation factor was applied to bring these specific estimates to Year 2012 dollars. See Section 11.2.

This chapter lists the near-term, mid-term, and long-term improvements that have been identified and validated through prior planning studies. These projects are graphically identified in Exhibit 4.1. It should be noted that these projects are not required to be implemented for the addition of one or two new *Coast Daylight* trains. Rail capacity modeling, ridership, and subsequent operational analyses were conducted as part of the service development planning process and the improvements were further stratified into: 1) high-priority near-term and mid-term improvements which would have a reasonable likelihood of being funded and implemented by 2020; and 2) other improvements which would remain in the long-term corridor development plan and which would be implemented subject to funding. The resulting stratified list is discussed in Chapter 14.Near-Term (2012–2014) and Mid-Term (2015–2020) Improvements

Table 4.1 presents the near-term and mid-term improvements that have been identified in previous studies and plans as noted.

Table 4.1: Proposed Near-Term (2012–2014) and Mid-Term (2015–2020) Rail Improvement Projects

ID No.	**Project Description**	**Cost** (Millions, Year 2012 dollars)	**Source(s)**
Near-Term (2012–2014)			
NA	*Coast Daylight* Track and Signal Project (new track, siding extensions for extension of *Pacific Surfliner*)[(1)]	$25.90	STIP, Proposition 1B (Intercity Rail Improvement)
Mid-Term (2015–2020)			
CD-1	Gilroy to San Luis Obispo track upgrades: continuous welded rail (CWR), tie replacement, ballasting, track surfacing, track structure realignment, rehabilitation of Salinas and Soledad sidings, turnout replacement.	$115.00	*Amtrak 20-Year Plan (2001)*
CD-2	Gilroy to San Luis Obispo signal upgrades: CTC extension (Gilroy to Soledad) and island CTC (San Lucas to Bradley)	$100.00	*Amtrak 20-Year Plan (2001)*
CD-3	Sargent to Aromas curve realignments	$175.00	*Amtrak 20-Year Plan (2001)*
M-1	Watsonville Wye curve realignments	$16.00	*Amtrak 20-Year Plan (2001)*
M-2	New station at King City	NA	*Amtrak 20-Year Plan (2001)*
M-3	New Soledad Multi-Modal Station	$4.00	AMBAG RTP (financially-constrained)
M-4	New San Lucas siding (Mile Post (MP) 168.2)	$11.00	*Amtrak 20-Year Plan (2001)*
M-5	Extension of Bradley siding	$12.00	*Amtrak 20-Year Plan (2001)*
SLO-6	Cuesta second main track	$165.00	*Amtrak 20-Year Plan (2001)*
NA	Rolling stock (two modern, tilt-capable trainsets)	$40.00	*Amtrak 20-Year Plan (2001)*
NA	Rolling stock (two modern trainsets with locomotives)	$40.00	*Amtrak 20-Year Plan (2001)*
NA	Grade crossing safety and mobility enhancements	$20.00	NA

Notes:
(1) Some elements of the project scope may be duplicated by other projects listed here.
- "NA" indicates that an identification number or estimated cost is not available.

4.3.1 Long-Term (2020–2040) Improvements

Table 4.2 presents the long-term improvements that have been identified in previous studies and plans as noted.

Table 4.2: Proposed Long-Term (2020–2040) Rail Improvement Project

ID No.	Project Description	Cost (Millions, Year 2012 dollars)	Source(s)
CD-4	Install powered switches at existing sidings (Corporal, Logan, Watsonville Junction, Castroville, North Salinas, Salinas, Gonzales, Soledad, San Ardo, McKay, and Santa Margarita)	NA	Union Pacific Railroad
M-6	Moss Landing curve realignments	$3.70	*Amtrak 20-Year Plan (2001)*
M-7	Extension of Castroville siding	$9.00	*Amtrak 20-Year Plan (2001)*
M-8	New Spence siding (MP 122.4)	$22.00	*Amtrak 20-Year Plan (2001)*
M-9	Harlem to Metz track realignment	$40.00	*Amtrak 20-Year Plan (2001)*
M-10	New Chalone Creek siding (MP 148.0)	$23.00	*Amtrak 20-Year Plan (2001)*
M-11	Coburn curve realignment	$1.00	*Amtrak 20-Year Plan (2001)*
M-12	Extension of King City siding	NA	Union Pacific Railroad
M-13	MP 165 track realignment	$28.00	*Amtrak 20-Year Plan (2001)*
M-14	MP 172 track realignment	$2.00	*Amtrak 20-Year Plan (2001)*
M-15	Getty to Bradley curve realignments	$36.00	*Amtrak 20-Year Plan (2001)*
SLO-1	McKay to Wellsona curve realignments	$15.00	*Amtrak 20-Year Plan (2001)*
SLO-2	New Wellsona siding (MP 206.6)	$21.00	*Amtrak 20-Year Plan (2001)*
SLO-3	Wellsona to Paso Robles curve realignments	$94.00	*Amtrak 20-Year Plan (2001)*
SLO-4	Templeton to Henry curve realignments	$107.00	*Amtrak 20-Year Plan (2001)*
SLO-5	Henry to Santa Margarita curve realignments	$45.00	*Amtrak 20-Year Plan (2001)*

Notes:
(1) Some elements of the project scope may be duplicated by other projects listed here.
- "NA" indicates that an identification number or estimated cost is not available.

Exhibit 4.1: Coast Corridor Improvements, San Francisco to Gilroy

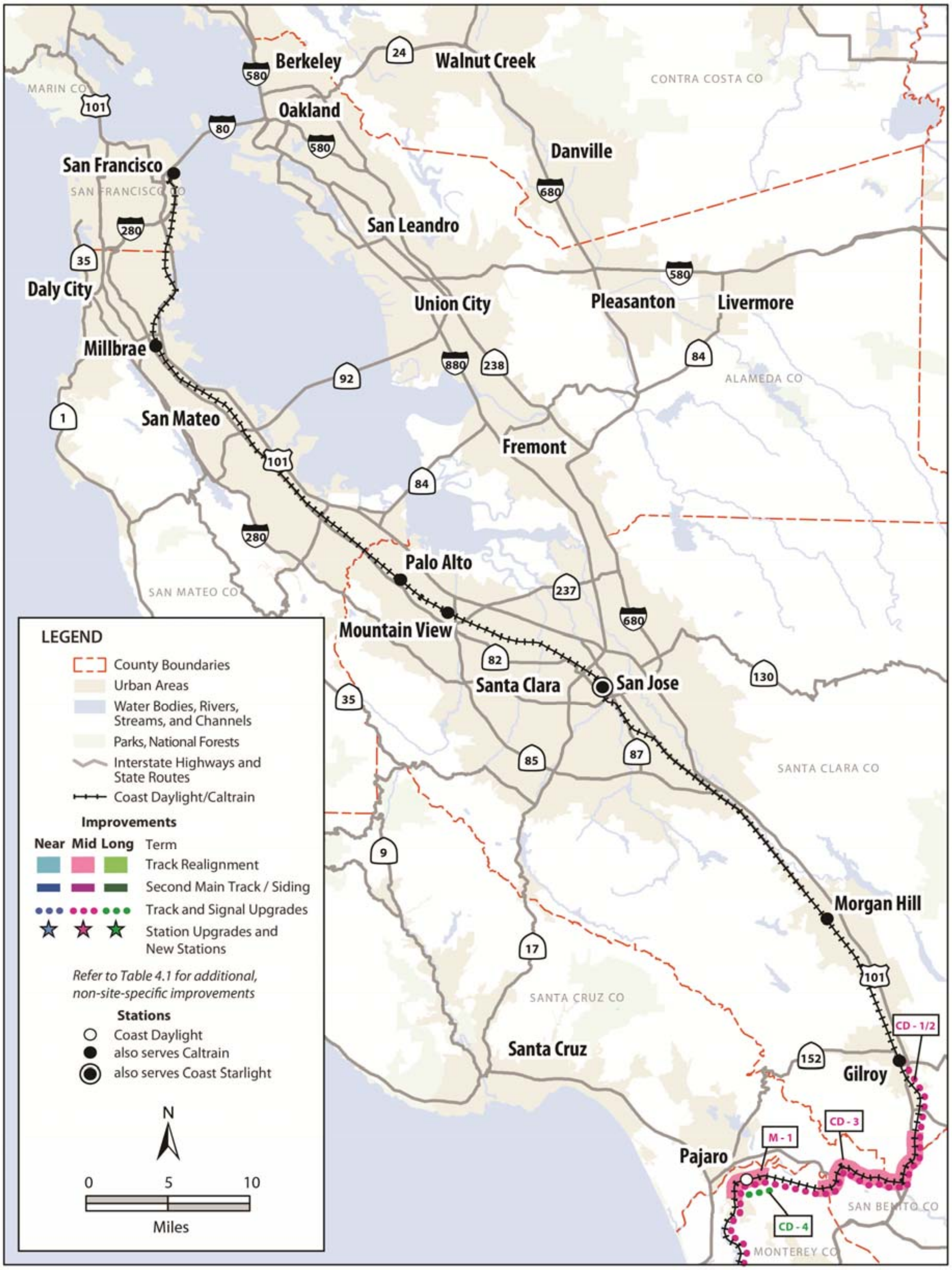


Exhibit 4.2: Coast Corridor Improvements, Gilroy to King City

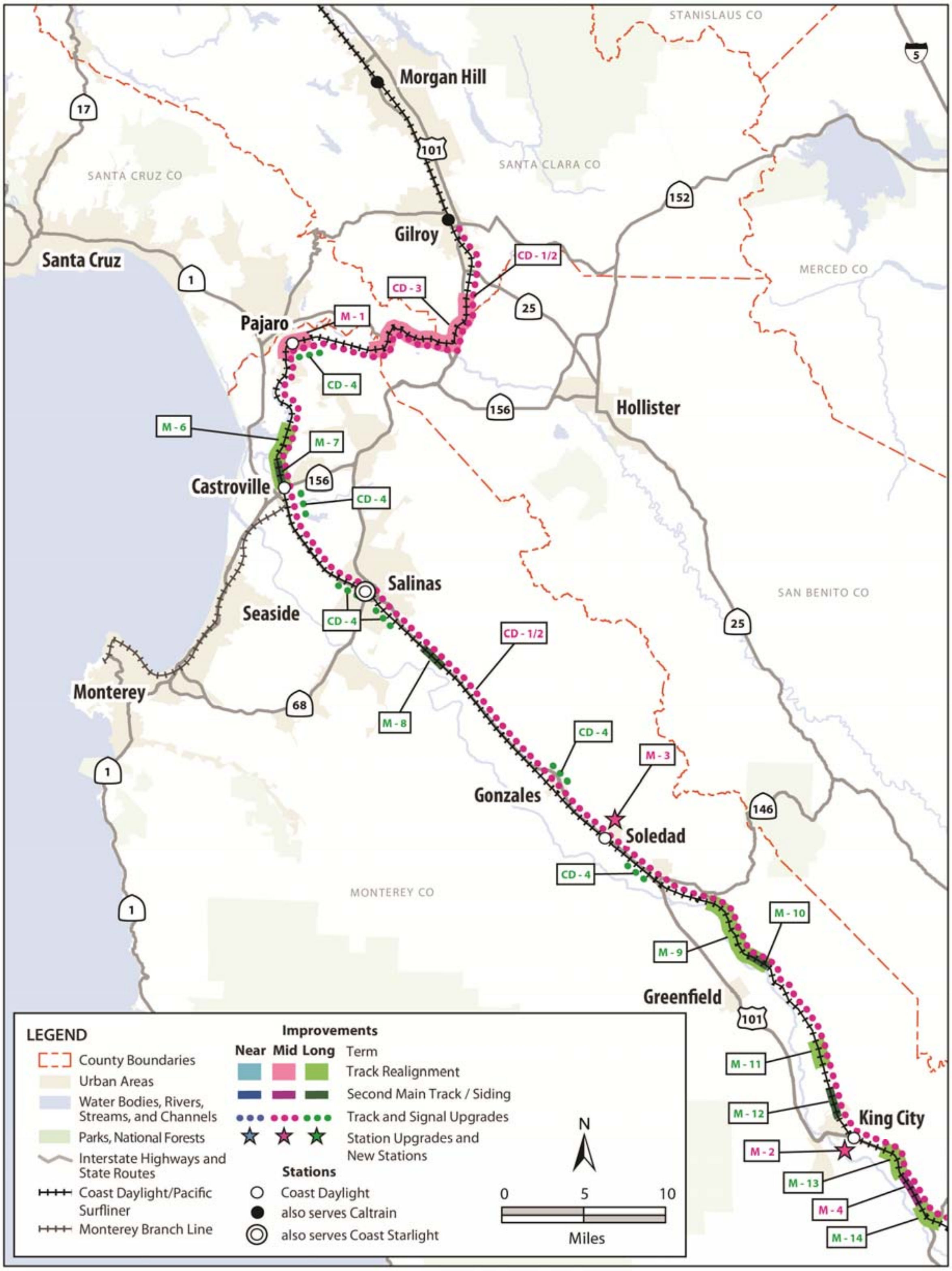
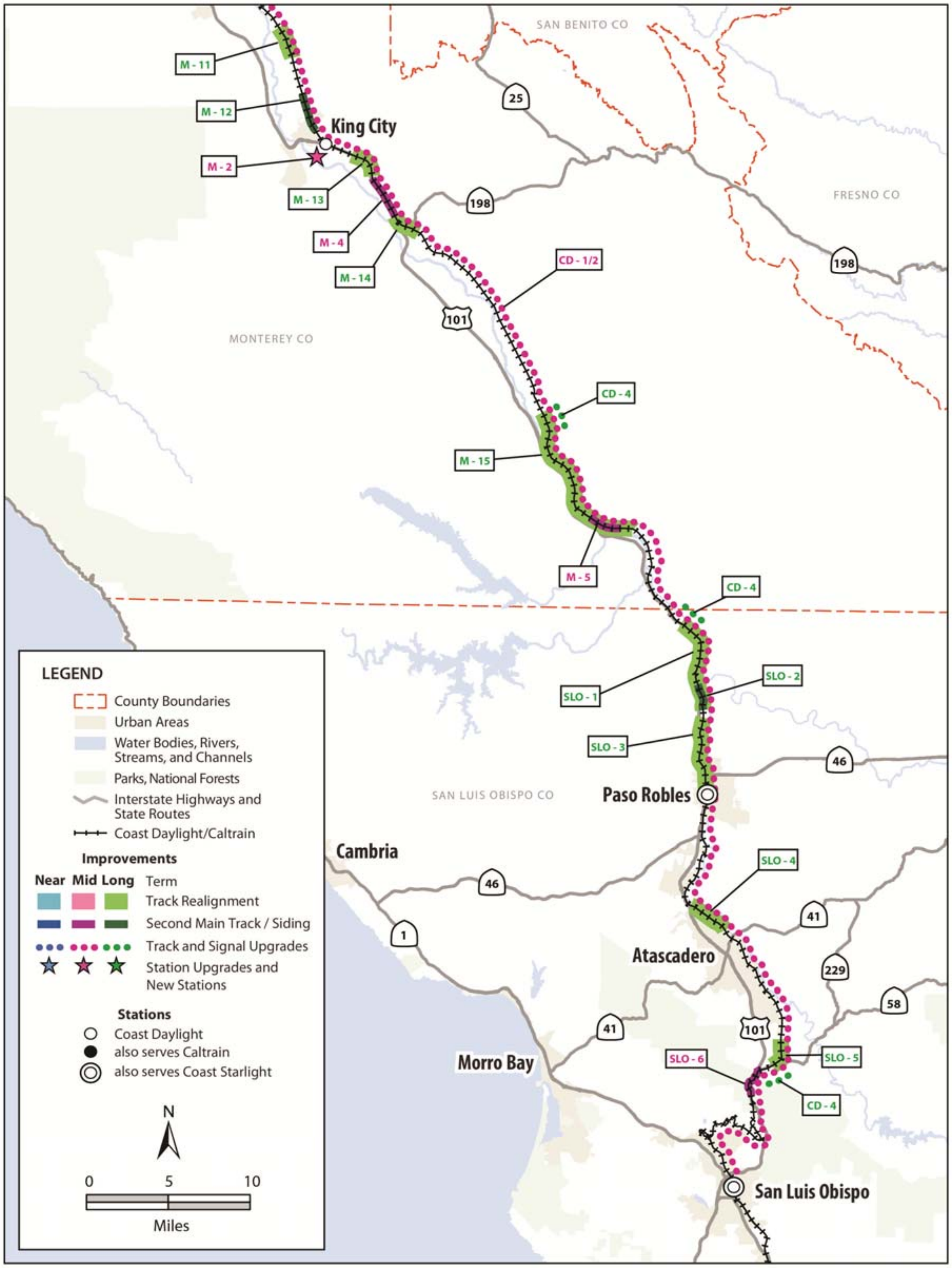


Exhibit 4.3: Coast Corridor Improvements, King City to San Luis Obispo



5.0 Evaluation of Alternatives

The No-Build Alternative and Build Alternative were evaluated to determine the reasonableness and feasibility of the alternatives, in order to identify those alternatives that will be carried forward into further analysis. The criteria assess how well each alternative meets the following:

- The purpose and need for the action.
- Technical feasibility (ROW and engineering constraints).
- Economic feasibility (market potential and/or ridership, capital and operating costs).
- Environmental concerns.

5.1 Purpose and Need Criteria

The following criteria assess how each alternative meets the Corridor purpose and need, considering factors relating to the passenger's experience in using rail services, such as travel times, station locations and availability of connections, and service reliability and frequency.

Travel Time

The No-Build Alternative is represented by the *Coast Starlight*, which is currently scheduled to take 10 hours, 53 minutes running southbound between San José and Los Angeles. For the Build Alternative, the *Coast Daylight* would have a southbound scheduled running time of 11 hours, 42 minutes between the same two points. A similar comparison can be made of northbound running times, where the *Coast Starlight* takes 10 hours, 2 minutes and the *Coast Daylight* would take 11 hours, 30 minutes.

The *Coast Daylight* takes longer than the *Coast Starlight* because the *Coast Daylight* will make 23 intermediate stops between San José and Los Angeles compared to the *Coast Starlight's* eight intermediate stops, as shown in Exhibit 5.1. On average over both directions, each additional stop takes about 4.5 minutes. The time for each stop would include dwell time at the platform to unload and load passengers plus time required for the train to decelerate and accelerate.

Though faster running times for both services would be desirable, the capital costs of the improvements necessary to achieve this objective exceed foreseeable funding levels. Previous studies have identified a number of speed improvement projects, which could be incrementally pursued as funding permits, once the basic *Coast Daylight* service is operating.

Station Location

Compared to the No-Build Alternative, the Build Alternative would provide new stations at Soledad and King City. New stations at Pajaro and Castroville would be constructed as part of the proposed Capitol Corridor extension. Existing stations at Gilroy, Salinas and Paso Robles would see increased train frequencies. These station locations were evaluated with respect to their ability to serve existing jobs and residential neighborhoods, convenience for accessing important destinations, and potential to enhance the building fabric in the station area. All of the stations are located within existing communities, and most are near the center of town and the Central Business District (CBD). This part of California was primarily settled as the railroad was extended south from San José and the towns usually grew up around the train stations. Stations located adjacent the CBD are also located near the densest concentrations of jobs and housing, and are convenient to major destinations. However, in several towns topography or other circumstances have placed the stations on the outskirts, to greater or lesser degree. The situation at each station is summarized below:

Exhibit 5.1: *Coast Daylight* Stations

- Gilroy. The existing station is located adjacent to the CBD and already fits within the building fabric of the historic downtown area.
- Pajaro. This new station would be located next to the UPRR Watsonville Yard. Pajaro is a small community located approximately 1.5 miles from the Watsonville CBD. The land adjacent to the Pajaro station is primarily agricultural, with some industrial (railroad) and commercial uses. Though it is not an ideal site from an urban design perspective, it is in the best location to serve the surrounding area, and is located within the closest possible proximity of the Watsonville CBD. This station would be constructed as part of the proposed Capitol Corridor extension.
- Castroville. This new station would be located on the site of the historic train station, which has been demolished. Castroville is the junction point between the San José–Salinas mainline and the Monterey Branch line. There are local plans to reintroduce rail service on the Monterey branch, and the Castroville station is intended primarily to serve as a connecting point between the proposed Monterey service and proposed intercity/commuter service between San José and Salinas. It is one mile from the CBD. This station would be constructed as part of the proposed Capitol Corridor extension.
- Salinas. The existing station is located adjacent to the CBD and is part of a larger area targeted for Transit-Oriented Development (TOD) by the City of Salinas.
- Soledad. This new station would be located adjacent to the CBD and is in an area targeted by the City for more intensive mixed use development.
- King City. This new station would be located adjacent to the CBD. The immediate surrounding area is industrial, limiting the potential for urban design improvements.
- Paso Robles. The existing station is located adjacent to the CBD and generally fits into the character of its neighborhood.

Connections

Compared to the No-Build Alternative, the Build Alternative would provide improved intermodal connections and accessibility due to increased train frequency north of San Luis Obispo and the addition of several new stations. Potential bus connections between the Coast Corridor and the San Joaquin Corridor would allow passengers to make faster rail/bus trips between the Salinas Valley and the San Joaquin Valley. These connections could include additional service on the bus route between Paso Robles and Hanford via SR-46 and SR-41, and a bus new route between Gilroy and Merced via SR-152 and SR-59.

Under the Build Alternative, new stations would be located at Soledad and King City. Existing stations at Gilroy, Salinas and Paso Robles would see increased train frequencies. Stations at Pajaro and Castroville would be built as part of the proposed Capitol Corridor extension to Salinas. The Pajaro station serves Watsonville and Santa Cruz County, while the Castroville station provides a connection to the Monterey Peninsula, including potential local rail service. The Soledad and King City stations would serve the southern Salinas Valley.

At San José, connections to Stockton could be made with Altamont Corridor Express (ACE) trains and San Joaquin Thruway buses. San José also provides a connection to the Capitol Corridor, providing rail service between the Central Coast, the East Bay and the Sacramento Valley, and the Millbrae Station has a BART connection to SFO. By bringing intercity rail service directly into San Francisco, the Build Alternative would provide connections to local San Francisco Municipal Railway (MUNI) rail and bus services. Connections at LAUS to Metrolink and *Pacific Surfliner* service to San Diego provide a second train frequency for trips between the Salinas Valley and Southern California.

The *2012 Business Plan* outlines the plan for integration of high-speed trains with existing intercity and commuter/regional rail systems via coordinated infrastructure (the system) and scheduling, ticketing and other means (operations). This blended system will allow rail operators to take advantage of new and improved infrastructure to enhance existing service. Early investments include first construction section of the Initial Operating Segment (IOS), new Northern California Unified Rail Service (NCURS), and an accelerated closure of the rail service gap between Northern and Southern California. The IOS, which is scheduled to be completed in 2022, will connect the Central Valley to the Los Angeles Basin via the San Fernando Valley. This segment will bring initial high-speed, electric passenger rail operations to California. The *2012 Business Plan* provides for the integration, or blending, of the HSR project by upgrading existing rail systems to provide near-term benefits to passengers, while connecting to, and laying the foundation for, the future HSR system. In addition to securing funding for statewide rail infrastructure investments, the Authority is participating in the development and implementation of NCURS as outlined in the *2012 Business Plan*. The Northern California Unified Rail Service seeks to enhance passenger rail service from Northern to Southern California through collaboration by the participating agencies and sharing of equipment, interlining trains, sharing track capacity, common ticketing and public information services, and leveraging of funding resources. NCURS would use the first construction section of the IOS in the interim period until the initiation of full high-speed service and will provide a link between Amtrak and other systems, such as ACE, and Caltrain, to create a new, improved network. Expanded Northern California Unified Rail Service is expected to be operational in 2022. The connections described above at San Jose, and via bus at Gilroy and Paso Robles would become more attractive as NCURS service was expanded and high-speed service began in the Central Valley.

Reliability

With the Build Alternative, rail operations will improve, including freight trains and the *Coast Starlight*. Extensions of selected sidings and the installation of power switches and island CTC[viii] at these locations will reduce the time required for some train meets.

Frequency

Under the Build Alternative, intercity passenger train frequencies would double in the segment between San Luis Obispo and San José. This segment is currently served by one daily round-trip *Coast Starlight* train which is assumed to continue in operation in the future. Between Gilroy and San José, the *Coast Daylight* would be an additional round-trip to the three northbound morning commuter trains and two southbound evening commuter trains operated by Caltrain. Relative to this Caltrain service, the *Coast Daylight* would operate in the off-peak direction, allowing more flexibility for travelers between San José and Gilroy. North of San José, the *Coast Daylight* service would add two one-way trips to Caltrain's current schedule of 86 one-way trains, while south of San Luis Obispo, the *Coast Daylight* service would replace an existing *Pacific Surfliner* train, so there would be the current level of train frequencies in this segment.

Expansion of the *Coast Daylight* service to two round-trips per day would be accomplished by scheduling a new pair of daily overnight trains between Los Angeles and San Francisco. The new trains would supplement existing *Pacific Surfliner* and Caltrain service at their respective ends of the Corridor by providing additional late evening departures and early morning arrivals at San Francisco and Los Angeles. Evening rail traffic is generally lower than daytime traffic levels at most locations along the Corridor; it is not anticipated that the expanded service would generate significant requirements for additional infrastructure. It should be noted that Caltrain has not reviewed/approved a new long distance train in the current Caltrain Corridor or in the potential future electrified Caltrain/HSR Corridor.

Ridership

The ridership forecast for the *Coast Daylight* service described in Chapter 8 forecast 124,000 passengers in 2020, growing to 274,000 passengers in 2040. The ridership forecast did not account for the significant passenger rail improvements now envisioned in the *2012 Business Plan*. The *2012 Business Plan* calls for Northern California Unified Rail Service providing higher frequencies and faster running times between the San Joaquin Valley and San José markets via the San Joaquin Valley, as early as 2018. Beyond that date, the San Joaquin Valley service will be upgraded to electrified high-speed rail providing even higher frequencies and faster running times. As a result, it is likely that some diversion of riders from the *Coast Daylight* to the San Joaquin Valley service would occur. It is expected that some riders traveling between San Francisco and Los Angeles will opt for the upgraded San Joaquin Valley service once it becomes available, due to shorter travel times.

This potential decrease in end-to-end *Coast Daylight* riders could be offset by increased *Coast Daylight* ridership in some of the regional markets, because new routes and faster service will make the rail mode more attractive. For example, the Northern California Unified Rail Service will reduce rail running times in the Valley, which will make rail/bus/rail trips between the Central Coast and San Joaquin Valley communities faster and more attractive via the *Coast Daylight* and the connecting Paso Robles–Hanford bus (e.g., a trip from Grover Beach to Fresno). Similarly, additional rail service between San José and Stockton would make rail trips between the Salinas/Monterey area and the northern San Joaquin Valley more attractive (e.g., a trip from Salinas to Tracy).

5.2 Technical Feasibility

The following criteria assess the technical feasibility of each alternative, identifying ROW requirements and possible disruptions to railroad operations, state highways, or adjacent property for each alternative.

ROW Requirements

It appears feasible to construct the siding improvements identified in UPRR's most recent list of recommended improvements (January 2011) within the existing UPRR ROW. In Soledad, there already is a park-and-ride lot at the proposed station site which could serve rail passengers. Therefore, no additional ROW would be required. ROW may need to be acquired in King City for parking and transit facilities at the station site. Suitable vacant properties are available. In both cities, station platforms would be located within the UPRR ROW.

Conceptual engineering work for the TAMC Gilroy to Salinas rail extension project includes layouts for new stations at Pajaro and Castroville. The Pajaro station would be located on vacant UPRR property that is outside the operating railroad ROW. The Castroville station would be located partially within the UPRR ROW and partially on vacant privately-owned property.

In summary, ROW requirements for the Build Alternative are minimal relative to the length of the corridor and will not displace residential uses.

Disruption to Railroads, Highways or Adjacent Property

Review of the improvements identified in UPRR's most recent listing and in documents related to the Gilroy to Salinas rail service extension identified the following potential disruptions to railroads, state highways, and adjacent property that could result from implementation of the Build Alternative:

- The parking area for the Castroville station is proposed for property that is part of a warehouse facility. All loading and unloading activities have been moved to the opposite side of the warehouse building. As a result, acquisition of this property for parking would not disrupt the current business.

- The Pajaro station is located adjacent to the UPRR Watsonville Yard. Some track and roadway relocations would be required to construct the station. The yard can remain operational while these relocations are accomplished, and its function would not be affected by the relocations.
- An existing stub-end house track at the Gilroy station would need to be extended southward across Tenth Street (SR-152) in order to create a double-ended siding. This would require some alteration to the Tenth Street/Monterey Road intersection.

5.3 Economic Feasibility

The following criteria assess the economic feasibility of each alternative, identifying capital and operating costs, as well as independent utility and the potential for phasing.

Capital Cost

The capital cost estimates from prior studies had limited utility for evaluating the alternatives either because the estimates are more than ten years old (e.g. the *Coast Daylight Implementation Plan (2000)* and the *Amtrak 20-Year Plan (2001)*) or because they are based on station designs that provide much more capacity than necessary to support one daily round-trip *Coast Daylight* train (e.g. the Gilroy to Salinas rail service extension reports). However, it is possible to make some general order of magnitude observations about the relative cost of different types of improvement projects:

- Siding extensions and island CTC: $10-20 million per mile, plus $2-3 million per new switch.
- New stations: $5-10 million each.
- Curve realignments: $20-150 million for each 5-10 mile segment.
- Second main track: $10-$20 million per mile, depending on topography.

These cost ranges indicate that adding one northbound and one southbound train, without increasing travel speeds, may be possible for a total cost of $25-70 million, not including new equipment or track and signal upgrades. Reducing running times by realigning curves is a more costly proposition as is adding significant capacity through double-tracking. This suggests that initial efforts should focus on improvements necessary to begin operating a second daily passenger round-trip at current operating speeds. Travel time reductions and/or additional trains can be achieved as funding becomes available.

Operating Cost

Based on an operating and maintenance cost rate of $67.30 per revenue-mile,[ix] the incremental additional daily operating and maintenance (O&M) costs of running one daily northbound train and one daily southbound train for 248 miles between San Francisco and San Luis Obispo would be $34,000.

Independent Utility

The Build Alternative is a usable and reasonable expenditure, even if no additional transportation improvements are made in the area. Siding extensions and island CTC would benefit all trains operating in the corridor, both freight and passenger, improving their reliability and decreasing running time. (Island CTC refers to installation of CTC only at sidings to allow dispatcher operation of switches, thereby reducing the time required for a train to move into and out of a siding.) New stations in Soledad and King City will act as transit centers for their communities, providing a central location where residents can access other transportation services besides rail.

Phasing Potential

Phasing can be viewed in two ways, either as incremental implementation of improvement projects or as incremental expansion of rail service. The existing condition of infrastructure in the corridor provides many opportunities for phasing-in improvements. Improvement projects could be grouped by type into packages and prioritized for implementation. For example, if the policy objective was to start service without improving running time, a daily pair of *Coast Daylight* trains could be accomplished with minimum track capacity upgrades and station investments. As funding became available, more track capacity projects could be implemented, such as new or extended sidings, thereby improving reliability for all trains in the corridor. Another package of improvements could include track and signal upgrades to provide higher speeds and more efficient operations. Station expansion and enhancement projects are another group that could be implemented independently from the other project packages.

Due to the limited scope of the proposed service improvement in the Build Alternative (initially one daily round-trip train, eventually expanding to two round-trips), opportunities for incremental expansion of rail service are limited; i.e., this is not a situation where four daily round-trips are currently running and there could be a choice of expanding to six, eight or ten round-trips. One potential phasing scenario would be to gradually extend existing service that is currently operating in the corridor. For example, *Pacific Surfliner* trains that currently terminate in San Luis Obispo could be extended to serve Paso Robles. However, this particular option is problematic because slow rail speeds over Cuesta Grade cause a significant differential between rail and highway travel time between Paso Robles and San Luis Obispo. A more viable phasing opportunity may exist at the north end of the corridor, where Caltrain or *Capitol Corridor* service could be extended to Salinas.

5.4 Environmental Resources and Quality

The following criteria assess major environmental concerns with respect to the improvements identified in UPRR's most recent listing and in documents related to the Gilroy to Salinas rail service extension.

Geologic Constraints

None of the improvements defined above appear to have geologic constraints, such as fault crossings, coastal areas, or known areas of high landslide susceptibility.

Wetlands / Nature Preserves / Environmentally Sensitive Areas

The preliminary environmental assessment included in the *Coast Daylight Implementation Plan (2000)* recommended site specific studies of biological resources at the King City station. Though this assessment did not address the Soledad station, a site specific study would be appropriate at that location as well. Review of the other improvements indicates no other concerns in this category.

Cultural / Parks / Section 4(f) / Farmland or Agricultural Zones

The *Coast Daylight Implementation Plan (2000)* also recommended site specific studies of historic structures and archeological resources at the King City station. Once again, these studies would also be appropriate at the Soledad station. The remaining improvements are within the existing railroad ROW where this criterion is generally not applicable.

Sensitive Receivers

The *Coast Daylight Implementation Plan (2000)* environmental assessment noted that adding one train in each direction would add a cumulative noise source, but this would not be a significant impact. High-level review indicates that the improvements defined above would not change visual/scenic resources, or affect built-up areas with institutional, medical, school and/or residential properties adjacent to the ROW.

5.5 Conclusions

The alternatives evaluation indicates that the Build Alternative of adding one (and eventually two) daily trains in each direction, operating at current speeds, is consistent with expected funding resources. Besides increasing the frequency of trains in the corridor between San Francisco and San Luis Obispo, the new service will allow faster trips between the Central Coast and the San Joaquin Valley via Thruway bus connections and the new Northern California Unified Rail Service outlined in the *2012 Business Plan*. However, further examination is needed of the HSR program's potential impact on the number of San Francisco–Los Angeles riders forecast for the *Coast Daylight*.

The alternatives evaluation also indicates that ROW requirements for the Build Alternative are minimal, as are the expected impacts on railroads, state highways and adjacent properties. No significant environmental impacts are expected. Finally, there is good potential for phasing the Build Alternative by incrementally making improvements to the corridor. However, there is low potential for phased additions of service since there is only one (eventually two) round-trip per day. Opportunities for phasing new services are limited to incremental extensions of existing service, such as extending the *Capitol Corridor* from San Jose to Salinas, or the *Pacific Surfliner* from San Luis Obispo to Paso Robles.

6.0 Planning Methodologies

This chapter describes the basic elements of the methodology used in developing the SDP. The chapter also addresses the planning horizons utilized and the major overall assumptions employed throughout the SDP.

Beginning early in the study process, methodologies were developed for use when conducting various analyses necessary to preparing the SDP. The SDP contains summary discussions of these methodologies. The methodologies for some of the more substantial disciplines (such as ridership and operations simulation) are summarized in the particular chapter that describes the results of that discipline’s analysis. The other methodologies are summarized in this chapter.

6.1 Planning Horizons

Two planning horizons are employed in the development of the SDP: a near-term horizon with service levels and improvements to be realized by 2020, and a long-term horizon with service levels and improvements to be realized by 2040.

6.1.1 Year 2020 (Near-Term)

The near-term horizon reflects an initial level of operation to increase corridor service between the San Francisco Bay Area and Los Angeles beyond that provided by the existing *Coast Starlight*, meeting ridership demand in the corridor through 2020. Improvements needed to accommodate one new daily northbound train and one new daily southbound train per day, with forecast 2020 freight traffic levels, are considered within this planning horizon.

It should be noted that a “Blended Service” plan is being prepared to address use of the California HSR first construction section of the IOS and that the target date for revenue operations on the IOS is 2018. However, ridership forecasting for the initiation of blended service is being prepared for the 2020 horizon year. Accordingly, the 2020 ridership estimates for all intercity corridors statewide will reflect the impact of blended service to the extent that such impacts are discernible.

6.1.2 Year 2040 (Long-Term)

The long-term horizon reflects a vision of expanded corridor service between the San Francisco Bay Area and Los Angeles, meeting ridership demand in the corridor expected by 2040. Improvements needed to accommodate one additional pair of daily *Coast Daylight* trains beyond the start-up service of one pair of daily trains, considering freight traffic levels projected to 2040, are considered in this planning horizon.

The Year 2040 Long Term ridership forecasts include the effects of the completion of the Phase 1 HST system statewide. The Phase 1 high-speed rail network includes HSR service from San Francisco to Anaheim, utilizing blended operations on the Caltrain segment between San Francisco and San Jose as well as on the Los Angeles to Anaheim segment, and dedicated HSR tracks between San Jose and Los Angeles.

6.2 Major Overall Assumptions

The major overall assumptions used in the SDP with regard to socioeconomic data, freight rail forecasting, market analysis, GIS, and screening of alternatives are presented in this section.

6.2.1 Socioeconomic Data

Passenger and freight demand forecasting, market analysis, and subsequent planning analysis rely upon a future year statewide socioeconomic forecast encompassing households, population, jobs, workers, household incomes, and other variables. Moody's 2011 Economy.Com socioeconomic data (SED) was selected for use in all planning and forecasting efforts on this SDP. These forecasts have a number of advantages, including:

- Economy.com SED forecasts are currently being used for both the Amtrak/California Intercity Passenger Rail Forecasting Model (Amtrak/Caltrans Model) and the HSR Ridership and Revenue Model (HSR R&R Model).[x]
- Economy.com SED forecasts were developed in 2011 and represent the most up-to-date forecasts that best reflect the continued economic slowdown (prior SED forecasts anticipated a shorter recession and more robust upturn in the California economy).
- Economy.com also produces a consistent set of economic output data used in the freight rail forecasts.

6.2.2 Forecasting Assumptions

Base values or methodologies are presented for the following planning assumption categories:

- Cost Assumptions, including automobile operating costs, bridge tolls, airfares, intercity conventional rail fares, high-speed rail fares, and station parking costs.
- Travel Times for automobile and air.
- Headways for air.
- Wait Times for airports and rail stations.
- Terminal Processing Times for airports and rail stations.

These values are derived in large part from assumptions supporting modeling activities for the Authority, however, some assumptions such as conventional rail fares and parking costs are based on assumptions in the Amtrak/Caltrans Model. Travel times and headways for high-speed rail and conventional rail routes are not reported here as planning assumptions, since they were defined through the scenario development process.

Cost Assumptions

Relevant cost assumptions include automobile operating costs; fares for conventional rail, high-speed rail, and air travel; and access/egress costs such as parking charges at airports and stations. All costs, except conventional rail fares, are reported in 2005 dollars. Costs were inflated to a common dollar year for the purposes of modeling.

Automobile Operating Costs – Automobile operating costs are comprised of actual fuel and nonfuel operating costs. Automobile ownership costs, including purchase costs and insurance, are not included in operating costs since under standard demand forecasting procedures they do not factor into the day-to-day decisions of whether to use the vehicle for a particular trip. As of June 2011, the high-speed rail analysis assumes fuel operating costs of 15.625 cents per vehicle per mile.[xi] Nonfuel operating costs include maintenance and repair, motor oil, parts, and accessories. Nonfuel costs are assumed fixed at 60 percent of gas operating costs, or 9.375 cents per mile. Estimated total automobile operating costs are therefore equivalent to 25 cents per mile, and are assumed constant in real dollars for all analysis years. These automobile operating cost base assumptions are consistent with those specified by the Metropolitan Transportation Commission for use in the HSR R&R Model.

Bridge Tolls – Bay Area bridge tolls are assumed at current levels set by the Bay Area Toll Authority (BATA): $6 for peak travel; $5 for off-peak travel.

Airfares – Market-to-market airfare assumptions are based on year 2000 and 2005 Federal Aviation Administration (FAA) surveys of air market prices for use in high-speed rail modeling.

Conventional Rail Fares – Conventional rail market-to-market base fare assumptions were developed for the *Pacific Surfliner* based on the existing fare structures in the corridor. The *Coast Daylight* will share the same route and stations of the *Pacific Surfliner* between Los Angeles and San Luis Obispo. Conventional rail fares are assumed constant in real dollars for all analysis years.

HSR Fares – For high-speed rail analysis, HSR fares are assumed set at 83 percent of airfares with a maximum market-to-market fare of $72. Fares are assumed constant in real dollars for all analysis years.

Station Parking Costs – Parking costs are identified by mode:

- Air – Airport parking cost assumptions (in 2005 dollars, per trip) range from $25.50 at Oakland to $18.50 at Burbank, while costs at minor airports range from $12.00 at Santa Barbara to $6.00 at Oxnard and Monterey.

  Base airport parking cost assumptions were derived from data collections performed by MTC staff for San Francisco and Oakland Airports and by Cambridge Systematics staff for Los Angeles Airport. These values reflect current airport parking costs used in high-speed rail modeling as of August 2011. Costs are assumed constant in real dollars for all analysis years.

- Conventional Rail – Conventional rail station parking cost assumptions (per trip) are as follows:
  - $12 – Goleta, San Diego.
  - $6 – LA Union Station, Sacramento.
  - $3 – Anaheim, Bakersfield, Burbank, Commerce, Fresno, Fullerton, Irvine, Livermore, Merced, Modesto, Pleasanton, San Jose, Santa Clara, Stockton, Tracy, Tustin.
  - $0 – All other stations.

  This pricing mechanism was adopted based on market cost assumptions developed by the program management team for high-speed rail analysis, and used for scenario runs conducted after 2007.

- High-Speed Rail – High-speed rail station parking cost assumptions currently assumed for modeling purposes range from $36 at San Francisco to $32 at Los Angeles, while costs at minor stations range from $21 at Burbank to $6 at Gilroy. Parking costs (in 2005 dollars) are assumed constant in real dollars for all analysis years. In the case of joint conventional rail and high-speed rail stations, the high-speed rail prices will be used.

Travel Times

Base travel time assumptions for auto and air travel between market pairs are fixed variables. Conventional and high-speed rail travel times are subject to level of service scenario assumptions. The following proposed levels are consistent with the most recent model run assumptions used by the Authority.

Automobile – Peak-period region-to-region automobile travel time assumptions for year 2030 are based on the average auto speed and travel time assumptions used by the HSR R&R Model, which assumes a maximum annual decrease in automobile speeds of 0.5 miles per hour.

Air – Air travel times are based on existing HSR R&R Model assumptions, which utilize FAA data samples from years 2000 and 2005. Market-to-market air travel time assumptions are assumed constant for all analysis years.

Headways

Air travel service headways are assumed constant for all analysis years. Service headways for conventional and high-speed passenger rail are established during scenario development.

Wait Times

Wait time refers to the average time spent between arriving at the airline gate or train platform and the closing of the airplane or train door after passengers have boarded. Air wait times are assumed to be held constant at 55 minutes based on a review of surveys conducted in support of the HSR R&R Model.

Rail travel wait times are lower than air travel wait times for a variety of reasons, including multiple train boarding points, proof-of-purchase ticketing, baggage-related delays, etc. The HSR R&R Model assumes wait times of 15 minutes on both high-speed and conventional rail modes.

Terminal Processing Times

Both airports and rail terminals are subject to terminal processing times, or the amount of time passengers must endure from the time they arrive at the terminal via their access mode to the point they reach the gate. This includes time spent walking between access points and the terminal, time spent receiving a ticket and checking baggage, security, and other factors. In the HSR R&R Model, terminal processing times are determined from a combination of peer review recommendations and subsequent refinements, and vary based on the characteristics of the airport or terminal.

Airports:

- At LAX and SFO – 24 minutes for non-business/commute trips and 22 minutes for business/ commute trips.
- At other airports – 20 minutes for non-business/commute trips and 18 minutes for business/ commute trips.

High-Speed Rail:

- At downtown or terminal high-speed rail stations (e.g., Los Angeles and San Francisco) – 12 minutes.
- At other high-speed rail stations – 8 minutes.

Conventional Rail:

- At stations that serve only conventional rail – 3 minutes.
- At stations that serve high-speed rail and conventional rail – 10 minutes.

6.2.3 Freight Rail Forecasting Methodology

A key element in the SDP is an examination of the impact of future train volume changes on the rail system. Changes from present train traffic volumes will affect the performance of the system, its capital needs, and potential shifts in mode share between rail and other competing modes. Since train volume changes are not uniform across the entire network, some sections may be subject to substantial volume gains, others could face stable demand, while yet others could face declines.

Economists classify the movement of goods (i.e., transportation) as a “derived” demand, by providing the necessary linkage between locations where goods are produced and where they are consumed. The act of transporting a good between two locations has no value per se; it creates value when there is an economic need for that good at the destination, and the combined cost of production at origin and its transportation to the destination is less than that for any other geographic source or material substitute.

These linkages between production and consumption are indicated through an examination of freight flows moving between geographic origins and destinations.

Data Sources

Two different data sources were used for this effort:

1. The Federal Highway Administration's Freight Analysis Framework (FAF3) database – which contains aggregated annual volume summaries by origin-destination geography, mode, and commodity – provides this information on a historical basis, using a combination of actual data and modeled behavior.
2. The Surface Transportation Board's (STB) Confidential Carload Waybill Sample also provides freight flow data for the rail mode only and is used as an input to the FAF.

These two data sources, used in combination, provide most of the information needed to produce a base year commodity flow database and forecast. The commodity flow database is then used to estimate daily train flows at the line level for base year and forecast years in addition to identifying flows by other modes that may represent potential markets for diversion to rail.

Approach

The freight forecasting process was structured in a series of five tasks discussed below, following an accepted and commonly used approach. While the first four steps are fixed, the last step entails some adjustment, depending on the availability of actual train counts.

Step 1 – Aggregate STB Waybill data by commodity, shipment type (carload rail and mixed mode, e.g., intermodal), and FAF3 geographic zones, which consist of six goods movement analysis zones, shown in Table 6.1. Four of these zones represent the metropolitan regions designated in the FAF3 commodity flow dataset. The fifth FAF3 zone (called "the remainder of California" in FAF3) is divided into two zones- the San Joaquin Valley and the remainder of California.

Table 6.1: The Six Good Movement Analysis Zones

Goods Movement Analysis Zone	Counties Included
Los Angeles/Long Beach	Los Angeles, Orange, Riverside, San Bernardino, Ventura
San Diego	San Diego
Sacramento	El Dorado, Nevada, Placer, Sacramento, Sutter, Yolo, Yuba
San Jose/ San Francisco, Oakland	Alameda, Contra Costa, Marin, Napa, San Benito, San Francisco, San Mateo, Santa Clara, Santa Cruz, Solano, Sonoma
San Joaquin Valley	Fresno, Kern, Kings, Madera, Merced, San Joaquin, Stanislaus, Tulare
Remainder of California	All counties not designated in the other five regions

Step 2 – Using FAF3, calculate multiplier (growth rate) for change in rail traffic volumes (tonnage and value) between 2007 and 2035 by commodity, shipment type, and FAF3 zones.

Step 3 – For the container traffic associated with the ports of Los Angeles, Long Beach, and Oakland, acquire current long-range forecasts and use them to create growth rate tonnage multipliers for 2007 to 2035. Port-related traffic is segregated in the waybill by examining the container initials, equipment type, and service lanes in which it appears. A base year adjustment is made for transshipped traffic (i.e., containers that are unloaded in the port region and then reloaded into domestic containers and trailers for movement inland) by using available data.

Step 4 – Apply tonnage multiplier calculated in previous step against each row in the STB waybill data, using crosswalk between FAF3 zone and Standard Point Location Code (SPLC) used in the waybill data, FAF commodity (Standard Classification of Transported Goods (SCTG), and Waybill commodity (Standard Transportation Commodity Code (STCC). The net result is an STB waybill with a forecast showing tonnage, number of carloads, and value for each extant origin, destination, carrier (route), and commodity combination. As needed, the regional tonnage and carload totals are adjusted to avoid introducing distortions in volume growth.

Step 5 – Generate trains. Using the base case and forecast waybills from Step 3, estimate train volumes using the methodology that was developed in the Association of American Railroads' 2007 *National Rail Freight Infrastructure Capacity and Investment Study*. This methodology entailed the estimation of the number of carloads moving over the network on a representative day, with volumes allocated among four types of train service based on the commodity being carried and the type of operation:

- Auto – For assembled motor vehicles moving in multilevel cars.
- Unit Train – For grain, coal, and other bulk commodities usually moving as a single train between origin and destination.
- Intermodal – For commodities moving in containers or truck trailers.
- General Merchandise – All other carload rail shipments, including commodities moved in box and tank cars.

The number of trains of each type needed to move the cars are estimated using information on the typical number of cars hauled by train service type, obtained from available industry and STB reports. The number of intermodal trains needed is based on the number of intermodal units (e.g., container-on-flat-car (COFC) units and trailer-on-flat-car (TOFC) units). Train counts are calibrated against existing train count data wherever possible.

The base year train count data developed from the freight forecasting methodology was compared against current train count data assembled based on meetings with the Class 1 railroads and other sources such as the LOSSAN service restructuring study underway in Southern California as well as prior data on existing conditions. Adjustments were made to minimize disparities.

6.2.4 Market Analysis

This section outlines the methodology used to estimate current and future travel market trends in the passenger sector. Market analysis defines the magnitude and nature of travel (the number of people that travel; their income and travel needs; origins and destinations, etc.), as well as the underlying drivers of this travel (population, employment, income growth, etc.). Market analysis is critical since these assumptions affect other aspects of SDP development such as the number and timing of trains, pricing strategies, infrastructure location (tracks, sidings, terminals, stations), and resulting ridership, revenue and public/private benefits.

The market analysis was primarily developed using the Authority's Ridership and Revenue Model (R&R Model) which consists of separate, yet integrated, components for forecasting long-distance interregional travel and intraregional travel within urban areas. Interregional travel is forecast using a new set of models derived from survey data collected for the HSR project combined with other relevant survey data sources. The model forecasts all interregional trips by purpose and length (trip frequency), identifies which region the interregional trips will be going to (destination choice), and then estimates which access, egress, and line-haul mode the interregional trip will use (mode choice). Intraregional models are based on trip tables generated from the MPO models, with customized mode choice models for the Bay Area and Los Angeles metropolitan regions. Trips by mode from the interregional and intraregional models are aggregated prior to the assignment step. The interregional trip frequency models allow forecasting of induced travel based on improved accessibilities due to new modes and faster options.

For the SRP effort, the socioeconomic assumptions in the R&R Model were updated. Population and Employment figures were derived from the Moody's 2011 Economy.com dataset. Figures were obtained and aggregated at the county level for both statewide and corridor analysis. Employment North American Industry Classification System (NAICS) codes were grouped into four categories: wholesale, retail, professional services, and other employment. Population and Employment Density was estimated using land area information obtained via the 2000 U.S. Census.

Underlying trip tables for travel within the LA Basin were provided by the Southern California Association of Governments (SCAG), while travel within San Francisco Bay Area zones was provided by MTC. These tables were adjusted based on Moody's Economy.com (2011) data. All trip tables reflect "No-Build" conditions, without high-speed rail service. The interregional model is based on trip frequency and destination choice models that utilize socioeconomic data directly and are influenced by accessibility between zones through logsums[(xii)] reported under the R&R Model's mode choice model. Origin/destination information contained in R&R Model transportation analysis zones (TAZs) was aggregated to the county (and subcounty) level.

As the last step of the market analysis process, County-To-County Travel Market Trip Tables (all modes) for years 2000 and 2030 were derived from the HSR R&R Model.[(xiii)] Three large counties were separated into subcounty zones to provide more detail:

- Los Angeles is divided into Los Angeles (North County) and Los Angeles (South County).
- Riverside is divided into Riverside (West County) and Riverside (Coachella Valley).
- San Diego is divided into San Diego (City), San Diego (North Coast), San Diego (Interstate 15 (I-15) Corridor), and San Diego (East County).

6.2.5 GIS Methodology

This section summarizes the methodology and approach taken to develop the GIS information used in developing the SDP. As a starting basis, Caltrans and the Authority provided existing relevant data from CT Earth, the Caltrans Statewide Travel Demand Model, the Statewide Freight Model, and Caltrans and the Authority GIS geospatial data and files for the statewide rail system. Building upon existing GIS information, a geospatial library for the existing and future rail system and rail services and facilities was developed in ArcGIS 9.3+.

A comparative analysis of the best available source of rail line data was conducted to determine which base layer provided the most efficient starting point for the GIS network update. To develop the data layers and attributes, an existing conditions inventory was constructed and built on the *California State Rail Plan (2008)*. Features of the passenger rail inventory include intercity passenger rail lines (Amtrak California state and national lines), connecting bus service lines and station locations, intercity passenger rail station locations, proposed high-speed rail corridors and station locations, commuter rail systems and station locations, location of at-grade crossings, and passenger rail maintenance facilities.

A GIS database design was developed to store the data layers deemed feasible for data development. Data layers were reviewed against current ortho imagery such as that available in Google Earth. Attributes and features were populated and verified, route-by-route, to ensure the physical characteristics of the existing passenger rail system were accurate and could be used for GIS-spatial and other analysis. This included characteristics such as shared corridor rail owner, rail operator, service frequency, condition, and station-level statistics. Corridors that are currently out of service were also noted.

6.2.6 Alternatives Analysis Methodology

This section presents the methodology developed for the PSDP component of the SDP. The PSDP approach presented below includes the identification of PSDP criteria and the methodology for preliminary service development planning.

The PSDP evaluation was based on prior studies of the Coast and related corridors, including:

- *Coast Daylight Implementation Plan (2000).*
- *Amtrak 20-year Plan (2001).*
- UPRR Presentations to the Coast Rail Coordinating Committee (January 2011 and March 2012).
- *Caltrain Extension to Monterey County Passenger Rail Stations Final Environmental Impact Report (2006), or FEIR.*
- *LOSSAN Corridorwide Strategic Implementation Plan (2012).*
- Current service planning for Blended Service in Northern and Southern California.
- Current environmental planning work.

These studies identified a wide range of improvement projects including siding extensions, signaling upgrades, curve realignments, new stations, and enhancements to existing stations. The efficacy of many of these improvements will be tested in the operations simulation analysis, which is a subsequent phase of the SDP. At this point in the development of the SDP, it was appropriate to provide an evaluation of candidate Corridor-level improvements to focus further work and refine the concepts. Therefore, the PSDP methodology was designed to assemble and evaluate service plans and improvement lists that have been under development and/or implementation for some time, in order to create a foundation for further refinement.

The PSDP criteria address how alternatives are determined to be reasonable and feasible, in order to be carried forward into further analysis. The criteria assess how well each alternative meets the following:

- The Purpose and Need for the action. Considering factors relating to the passenger's experience in using corridor rail services, such as travel time, station locations and availability of connections, and service reliability and frequency.
    - The travel time of corridor services as identified under each alternative was estimated in minutes based on present timetables and prior studies.
    - Intermodal connections and accessibility at the stations defined in the project description of each alternative were identified by working with local service providers and planning agencies. Factors considered included the extent to which the station serves existing jobs and neighborhoods, proximity to important destinations, and ability to complement or enhance the building fabric of the station area.
    - Reliability of the services identified under each alternative, with its proposed improvements, were determined based on current operating conditions.
    - The frequency of corridor services that each alternative would support was identified based on the market potential, corridor capacity and the schedule of existing corridor services.
    - Generalized levels of corridor ridership expected under each alternative were developed from new market analyses.

- Technical feasibility. Identifying ROW requirements, engineering constraints, physical route characteristics, capacity-constrained existing facilities or infrastructure, safety impacts and possible disruptions to railroad operations, highways, or adjacent property for each alternative.
    - Based on information in prior studies, ROW requirements to accommodate required improvements for the alternatives, such as new track outside of the ROW of the existing corridor services were identified.
    - Using information in prior studies disruptions to railroads, state highways, or adjacent property that would result from implementation of each alternative were identified. In general, such disruptions were not expected to occur where the service proposed in the alternative operates on tracks used by existing passenger services.
- Economic feasibility. Identifying capital and operating costs, as well as the independent utility and potential for phasing.
    - If conceptual engineering cost estimates were available from prior studies, capital costs (not including ROW) for each alternative were identified.
    - Historical train mile / hour operating and maintenance cost data were used to estimate operating and maintenance (O&M) costs of each alternative.
    - Based on the project description, the independent utility of each alternative with respect to the corridor Purpose and Need was assessed (i.e. a description was provided of how the alternative would be a usable and reasonable expenditure, even if no additional transportation improvements are made in the area).
    - Potential phased implementation scenarios for the alternatives that can result in service improvements that have independent utility and reflect constructability considerations were described.
- Major environmental concerns. Considering natural resources, cultural resources, and sustainability metrics.
    - Prior studies and high-level field review were used to identify fault crossings, Alquist-Priolo fault zones, coastal areas, and known areas of high landslide susceptibility adjacent to the ROW for each alternative.
    - Prior studies and/or high-level field review were used to identify wetlands and streams crossed by or adjacent to the ROW of each alternative. Known threatened and endangered species habitat, or other known environmentally sensitive areas adjacent to the ROW of each alternative were also identified.
    - Based on prior studies and/or high-level field review, parklands, notable historic structures, known archeological sites, and/or farmlands or known lands in Williamson Act contract within the ultimate ROW of each alternative were identified. This criterion was generally not applicable where the service proposed in the alternative operates on tracks used by existing passenger services.
    - To assess noise and vibration impacts, and potential changes to visual/scenic resources, built-up areas with institutional, medical, school and/or residential properties adjacent to the ROW of each alternative were identified based on prior studies and/or high-level field review. This criterion was generally not applicable where the service proposed in the alternative operates on tracks used by existing passenger services.

7.0 Outreach Efforts

This section describes the public/agency involvement in developing the Coast Corridor SDP as well as the CSRP statewide outreach effort as described in Chapter 4 of the State Rail Plan.

At the time of developing the Coast Corridor SDP, separate environmental studies were ongoing or completed along the Coast Corridor including the legally required outreach providing information on the project alternatives, potential impacts and proposed mitigation. These include the *Pacific Surfliner North Tier 1 EIR/EIS* (led by Caltrans District 5), *Salinas to San Luis Obispo Tier 1 EIR/EIS* (managed by SLOCOG), and *Caltrain Extension to Monterey County Passenger Rail Stations Final EIR (2006)* (managed by the TAMC). Outreach efforts for the CSRP and Coast Corridor were coordinated with these various ongoing environmental studies. Scoping meetings were held to collect public input for the environmental review, these meetings were held on August 28, 2012 in Salinas and on August 29, 2012 in San Luis Obispo.

General outreach for the CSRP included the project website, advisory committee meetings, collateral materials and stakeholder outreach briefings. These outreach efforts also involved Coast Corridor specific information as it relates to the overall SDP development process. The following outlines the specific outreach efforts and coordination for the Coast Corridor SDP. The final Coast Corridor SDP report was vetted through the appropriate Caltrans agencies and other committees in early 2013.

7.1 Stakeholder Meetings

Presentations summarizing the goals, process, and schedule for the Coast Corridor SDP were provided to various Caltrans agencies, stakeholders, rail corridor committees and railroads during 2012 to ensure that key decision makers and executive staff were well informed and updated on the status of the SDP process and findings prior to submittal of the administrative draft.

7.1.1 California State Rail Plan Advisory Committee

A CSRP Advisory Committee was formed by Caltrans Division of Rail to provide input and expertise in the development of the CSRP and service development plans throughout the state including the Coast Corridor. Representatives from federal, state, and regional agencies and freight and passenger rail agencies comprised the committee to ensure a broad and diverse group of interests were represented. Participant groups included:

- Amtrak
- BNSF
- The Authority
- California Transportation Commission
- Capitol Corridor Joint Powers Authority (CCJPA)
- CRCC
- FRA
- Los Angeles—San Diego—San Luis Obispo Rail Corridor Agency—North Corridor (LOSSAN North)
- Los Angeles—San Diego—San Luis Obispo Rail Corridor Agency—South Corridor (LOSSAN South)

- San Joaquin Valley Rail Committee (SJVRC)
- State of California Business, Transportation and Housing Agency (BT&H)
- Union Pacific Railroad
- Caltrans Internal Coordination

Coast Corridor information, as part of the overall SDP development effort was presented to Caltrans Management and related agency groups including: BT&H, CTC and others. Specific SDP information was also part of the five public CSRP meetings held throughout the state in early 2013.

A collaborative effort was also established with Caltrans District 5 and 7 Public Information Officers (PIOs) and Planning Deputies to assist with reaching out to corridor district stakeholders. PIOs were provided an information packet (fact sheet, frequently asked questions (FAQ), and website links and other CSRP materials) including a "Meeting-in-a-Box" PowerPoint presentation containing information on the Coast Corridor. They were also asked to help in getting the CSRP/SDP message out to stakeholders. Administrative Draft chapters for the Coast Corridor were also sent to PIO's and Planning Deputies for their review and comments. The packet of information was used to educate the Districts on the CSRP and SDP process and to provide adequate reference materials should stakeholders inquire about the Coast Corridor study and outreach process.

7.1.2 State Agencies/Regional Agencies

Status and updates were provided to the SB 391 related state agencies and regional agencies (MPOs, RTPAs and COGs) related to the Coast Corridor including distribution of the same CSRP information packets discussed above. The agencies listed below were encouraged to review the materials and participate in the five public meetings held throughout the state in early 2013. The following agencies were provided a presentation on the status and process of developing the SDP's including Coast Corridor:

- State Agencies. The following SB 391 agencies received overview CSRP briefings including general SDP information only.
    - Strategic Growth Council (SGC)
    - Native American Advisory Committee (NAAC)
    - California Association of Councils of Governments (CALCOG)
    - Active Transportation and Livable Communities (ATLC)
    - Rural Counties Task Force (RCTF)

  The Air Resources Board (ARB) and California Energy Commission (CEC) received an information packet but did not receive a briefing.
- Metropolitan Planning Organizations, Regional Transportation Planning Agencies (RTPAs) and Councils of Governments (COGs).
- Representatives from the following agencies participated on the LOSSAN Rail Corridor Agency or CRCC rail committees where they received draft Coast Corridor documents:
    - SLOCOG
    - SBCAG
    - VCTC
    - SCAG
    - LA Metro
    - SCVTA

  - Santa Cruz County Regional Transportation Commission (SCCRTC)
  - TAMC
  - Caltrain

7.1.3 SDP Rail Corridor Committees and Railroads

As part of the CSRP Advisory Committee the LOSSAN, CRCC, freight, passenger and passenger rail representatives received the draft Coast Corridor SDP to review and provide comments. In addition, each member was tasked with coordinating the input needed to inform the SDP development process prior to the submittal of the Administrative Draft. Status reports and updates on the SDP and interim deliverables were also provided through specific presentations to the Advisory Committee. However, briefings were not scheduled to individual passenger and commuter rail owners and operators. Each of the agencies below received the CSRP chapters and draft Coast Corridor SDP for review and comment:

- Rail Corridor Board and Committees:
  - Federal Railroad Administration
  - LOSSAN Joint Powers Authority (JPA) Board of Directors
  - LOSSAN Technical Advisory Committee (TAC)
  - San Joaquin Valley Rail Committee
- Freight Railroads, Class 1/Shortline Railroads:
  - Union Pacific Railroad
  - BNSF Railway
  - California Shortline Railroad Association
- Passenger Railroads (Owners and Operators):
  - Caltrain
  - Los Angeles County Metropolitan Transportation Authority
  - Ventura County Transportation Commission (VCTC)
  - Southern California Regional Rail Authority
  - Amtrak
  - Peninsula Corridor Joint Powers Board
  - San Joaquin Regional Rail Commission (SJRRC)
  - Altamont Corridor Express
  - San Mateo County Transit District (SamTrans)
  - San Diego Metropolitan Transit System (SDMTS) – Coaster
  - North County Transit District (NCTD) – Coaster
  - Orange County Transportation Authority (OCTA) – Metrolink
  - Santa Cruz Regional Transportation Commission
  - Santa Clara Valley Transportation Authority (SCVTA)
  - Transportation Agency for Monterey County (TAMC)
- Metropolitan Planning Organizations
  - San Joaquin Council of Governments (SJCOG)
  - Santa Barbara County Association of Governments (SBCAG)
  - San Luis Obispo Council of Governments (SLOCOG)

- o Southern California Association of Governments (SCAG)

7.2 Public Meetings

One round of five public meetings was held throughout the state in early 2013 to discuss the CSRP and SDP areas including the Coast Corridor. These public meetings garnered stakeholder input and supported the Coast Corridor environmental outreach efforts. Meetings were held in the following cities/locations:

- Fresno (February 21, 2013)
- Los Angeles (February 20, 2013)
- Sacramento (February 12, 2013)
- San Diego (February 19, 2013)
- San Francisco Bay Area (February 14, 2013)

Table 7.1: Stakeholder Meetings Involving Coast Corridor

Date	Meeting	Location
February 15, 2012	CSRP Advisory Committee	Caltrans Headquarters, Sacramento
June 6, 2012	CSRP Advisory Committee	Caltrans Headquarters, Sacramento
September 19, 2012	CSRP Advisory Committee	Caltrans Headquarters, Sacramento
November 14, 2012	CSRP Advisory Committee	Caltrans Headquarters, Sacramento
December 19, 2013	CSRP Advisory Committee	Caltrans Headquarters, Sacramento
September 14, 2012	BT&H	Caltrans Headquarters, Sacramento
September 14, 2012	CTC Staff	Caltrans Headquarters, Sacramento
November 2012	BT&H	Caltrans Headquarters, Sacramento
January 2013	BT&H	Caltrans Headquarters, Sacramento
December 2012	SGC	Sierra Hearing Room, Sacramento
November 14, 2012	NAAC	Sacramento
October 30, 2012	CALCOG	SACOG Board Room, Sacramento
May 2012	ATLF	Sacramento
November 15, 2012	ATLF	Sacramento
November 16, 2012	RCTF	Caltrans Headquarters, Sacramento
April 20, 2012	CRCC	SBCAG, Santa Barbara
May 10, 2012	LOSSAN TAC	LA Metro, Los Angeles
June 29, 2012	LOSSAN TAC	San Diego

Date	Meeting	Location
July 13, 2012	CRCC	Amtrak Office, Oakland
August 9, 2012	LOSSAN TAC	LA Metro, Los Angeles
August 30, 2012	LOSSAN/CRCC Joint Meeting	San Luis Obispo
September 6, 2012	LOSSAN TAC	San Diego
October 4, 2012	LOSSAN TAC	LA Metro, Los Angeles
November 8, 2012	LOSSAN TAC	San Diego
December 6, 2012	LOSSAN TAC	San Diego
January 2013	LOSSAN Board	San Diego

8.0 Ridership Demand and Revenue Forecast

This section of the SDP addresses the methods, assumptions and outputs for travel demand forecasts, and the expected revenue from the proposed services.

8.1 Passenger Rail Forecast

Passenger Rail Ridership (and revenue) forecasts were prepared for baseline and future conditions along the Coast Corridor, using a 2020 and 2040 forecast year. An overview of the methodology and approach, study area, data sources and assumptions, travel demand model, and resulting ridership forecasts is provided below.

8.1.1 Methodology and Approach

The 2020 and 2040 ridership forecasts were prepared using the Amtrak/California Intercity Passenger Rail Forecasting Model (Amtrak/Caltrans Model), a forecasting model developed by AECOM for the California Department of Transportation and Amtrak to provide consistent ridership and ticket revenue forecasts in support of short- and long-term rail passenger service planning in California. The Amtrak/Caltrans Model is based on extensive market and traveler behavior research throughout California (and nationwide), historical rail ridership and revenue data and trends, and demographic data. It provides coverage across the three existing California state-supported passenger rail corridors (including major thruway bus connections to/from rail) and addresses travel by intercity passenger rail, auto, and air (for trips between Northern and Southern California).

8.1.2 Study Area Definition

The overall study area addressed by the Amtrak/Caltrans model is illustrated by Exhibit 8.1. The Pacific Surfliner North, Pacific Surfliner South, Amtrak's *Coast Starlight* and the proposed *Coast Daylight*, are also shown in this figure, since these services and their markets have important interactions with respect to the *Coast Daylight*. Specifically, the proposed *Coast Daylight* train service will operate as an extension of *Pacific Surfliner* trains, providing a one-seat ride from San Francisco to Los Angeles. Ridership/revenue on these shared trains will be accounted for as follows:

- Travel north of San Luis Obispo (which is the northern end of the *Pacific Surfliner* service area), such as a trip from San Luis Obispo to San Francisco, is assigned to the *Coast Daylight*.
- Travel between points north of San Luis Obispo and points south of San Luis Obispo, such as a trip from San Francisco to Los Angeles, is also assigned to the *Coast Daylight*.
- Travel entirely south of San Luis Obispo, such as a trip from San Luis Obispo to Los Angeles, is assigned to the *Pacific Surfliner*.

In addition, the *Coast Daylight* serves many markets in common with Amtrak's *Coast Starlight*, which would continue to operate between Los Angeles, San Jose, Oakland and points north of Oakland. Regions of particular importance to these SDP forecasts are San Francisco and San Jose at the northern end; Monterey Bay and the Central Coast; and Los Angeles at the southern end.

Exhibit 8.1: Study Area Map

8.1.3 Data Sources and Assumptions

The Amtrak/Caltrans Model is based on extensive travel survey data collected between 2005 and 2008 from existing automobile and rail users at key locations within California.

Modal service characteristics represent the key independent variables in forecasting the shares of travel captured by each mode of travel. These characteristics, often referred to as impedances, include:

- Travel time (minutes).
- Travel cost (dollars).
- Frequency of service (departures per day).

Future growth estimates are based on socio-economic data and forecasts developed by Moody's Economy.com. Key measures include forecasts of population, employment, and income.

8.1.4 Travel Demand Model

Structure

The Amtrak/Caltrans Model utilizes a two-stage model system. The first stage forecasts the growth in the total number of person trips in each market and the second stage predicts the market share captured by each available mode in each market. Both stages are dependent on the service characteristics of each mode and the characteristics of the corridor population. The key market segments addressed in the forecasting model system are defined and evaluated by origin-destination market pair and trip purpose (commute, business, recreation, and other).

The first stage of the Amtrak/Caltrans Model addresses the growth in the total intercity person travel volumes and includes “natural” growth and “induced” demand. The second stage of the Amtrak/Caltrans Model is the mode share component, which estimates the percentage of the total person travel by the following three different modes of intercity travel (auto, intercity rail, and air). The key variables in the mode share model include:

- Line-haul travel time for all modes.
- Access/egress time for intercity rail and air.
- Travel cost or fare.

Network and Service Characteristics

Detailed rail service inputs were developed for baseline conditions and four future service scenarios. The “Baseline” is defined by the current service levels, which do not include any state-supported train service, like the *Coast Daylight* between San Francisco and Los Angeles, but does include:

- Five daily round-trips on *Pacific Surfliner* trains between Goleta and Los Angeles, two of which extend all the way to San Luis Obispo, with connecting bus service at Santa Barbara (three) or San Luis Obispo (one of two) to/from the Bay Area.
- Amtrak’s *Coast Starlight*, which provides one daily round-trip between points north of the Bay Area, Emeryville, Oakland, San Jose, San Luis Obispo, and Los Angeles.

The future “Build” scenarios differ for forecast years 2020 and 2040, and include new *Coast Daylight* train service as follows:

- In 2020, a new daily round-trip between San Francisco and Los Angeles, operated as an extension of an existing *Pacific Surfliner* round-trip that now terminates at San Luis Obispo.
- In 2040, a second daily round-trip between San Francisco and Los Angeles, operating on an overnight schedule.

In addition, other changes would be implemented in 2020 and 2040 within the *Pacific Surfliner* service area south of San Luis Obispo.[xiv] Table 8.1 summarizes the train frequencies provided in the Baseline and 2020 and 2040 Build scenarios.

Table 8.1: Summary of Train Frequencies by Scenario

	Daily Train Frequencies (round-trips)		
	Baseline	**Build 2020**	**Build 2040**
Pacific Surfliner			
San Luis Obispo—Los Angeles	2 daily	2 daily(1)	4 daily(1)
Goleta—Los Angeles (including above)	5 daily	6 daily(1)	7 daily(1)
Coast Daylight San Francisco—Los Angeles	-	1 daily	2 daily
Amtrak's *Coast Starlight* Seattle—Emeryville—SLO—Los Angeles	1 daily	1 daily	1 daily

Notes:
(1) Includes trains providing *Coast Daylight* service north of San Luis Obispo

8.1.5 Baseline and Future Scenarios Forecasted Ridership

Using the Amtrak/Caltrans Model, ridership and ticket revenue forecasts were prepared for 2020 and 2040 baseline and future service scenarios. Table 8.2 summarizes these results by type of service for the *Coast Daylight* and parallel *Coast Starlight* market segments only. Forecast results associated with *Pacific Surfliner* markets, which are south of San Luis Obispo, are addressed in the Pacific Surfliner North SDP.

The results show generally expected growth in ridership/revenue as new *Coast Daylight* frequencies are implemented in 2020 and in 2040. The relative contribution of the second *Coast Daylight* round-trip is lower because it provides an overnight schedule that is not as convenient to some intermediate markets plus there is generally diminishing impact of adding new frequencies, particularly when one also considers the availability of *Pacific Surfliner* connecting bus service to/from many of the same markets. The small increases in *Coast Starlight* ridership and revenue result from small improvements in travel time as well as adding a stop at the new King City station served by the *Coast Daylight*.

8.2 Revenue Forecast

Revenue includes ticket revenue associated with fares paid by train rides and auxiliary revenue associated with on-board food and beverage service.

8.2.1 Ticket Revenue Forecast

Ticket revenue forecasts are simply the product of the ridership forecasts, described above, and the average fares by station pair market. The table below also summarizes the forecasted ticket revenue. All ticket revenue forecasts are expressed in 2012 dollars and are consistent with the latest near-term forecasts developed by Amtrak and Caltrans for current state-supported intercity passenger rail services within California.

Table 8.2: 2020 and 2040 Annual Forecasts for *Coast Daylight* Service Options

	Forecast Year 2020		Forecast Year 2040	
	Baseline	**Build**	**Baseline**	**Build**
Annual Ridership				
Coast Daylight Markets North of San Luis Obispo	0	87,000	0	217,000
Markets Thru San Luis Obispo	0	37,000	0	57,000
Subtotal	*0*	*124,000*	*0*	*274,000*
Coast Starlight Markets North of San Luis Obispo	74,000	73,000	103,000	107,000
Markets Thru San Luis Obispo	28,000	32,000	37,000	43,000
Subtotal	*102,000*	*105,000*	*140,000*	*150,000*
Ticket Revenue (2012 dollars)				
Coast Daylight Markets North of San Luis Obispo	$0	$5,000,000	$0	$12,500,000
Markets Thru San Luis Obispo	$0	$1,200,000	$0	$1,900,000
Subtotal	*$0*	*$6,200,000*	*$0*	*$14,400,000*
Coast Starlight Markets North of San Luis Obispo	$5,000,000	$5,000,000	$6,900,000	$7,300,000
Markets Thru San Luis Obispo	$1,000,000	$800,000	$1,300,000	$1,100,000
Subtotal	*$6,000,000*	*$5,800,000*	*$8,200,000*	*$8,400,000*

8.2.2 Auxiliary Revenue Forecast

Typically, where detailed revenue sources are unavailable, the forecasting of auxiliary revenue is represented as a percentage of the total operation revenue. Auxiliary revenue is not substantial for the current network. Since there currently are no programs in place to increase auxiliary revenue sources in the future year scenarios, auxiliary revenue forecasts are not expected to be considerable.

9.0 Operations Modeling

This section of the SDP describes the rail operation simulations for the Coast Corridor. For the purposes of this study, the Coast Corridor is defined as operating between San Luis Obispo and San Jose in the existing year (2012) and between San Luis Obispo and San Francisco in future years. Railroad operations dynamic simulations were undertaken to provide a thorough review of the capacity issues affecting the corridor, using RailOPS simulation software.

The modeling includes all rail activity in the corridor, including freight, intercity passenger rail and commuter rail. Though the discussion focuses on operations modeling of this specific corridor, the methodology itself encompasses a statewide system approach. The simulation model includes the rail network for all of the SDP corridors and the rail activity loaded onto the model reflects movements from all potential sources that would be using a particular section of track.

The service network analysis models and methodologies used are described in detail, including the method through which potential infrastructure improvements were identified and incorporated into the modeling effort. This section specifically describes how stochastic operations were incorporated into the modeling effort, in terms of operational reliability of scheduled rail service, operational variability of non-scheduled rail service and equipment and infrastructure reliability. Base case and alternative specific schedules for existing and new services, and operating windows and schedules are provided. Equipment compositions (consists) for all services included in the operations modeling are described.

The origin of the rail infrastructure network employed in the operations modeling is described in this chapter as well as any major infrastructure-related assumptions employed in the operations modeling is also provided. The outputs from operations modeling of all base case and alternative scenarios are provided, specifically: stringline diagrams, heatmaps, and delay matrices. Stringline diagrams are graphs which show the time on the horizontal axis, and train stations on the vertical axis in order to show train positions over time. The background color on the stringline diagram indicates the number of main tracks available for each track segment. Heatmaps show a schematic representation of the corridor with different colors used to indicate the level of track occupation, i.e. the percent of time a train is physically occupying each section of track. Delay matrices list the average minutes of delay per train operated for each train service by location.

The following scenarios were modeled for three planning horizon years:

- Existing Year (2012). includes the existing network, passenger schedules currently in operation, and existing freight volumes.
- Year 2020 Base Case: includes the Existing Year network, plus any network improvements expected to be completed by 2020. Passenger schedules include any schedule refinements plus additional services to be implemented by 2020. Freight volumes include projected increases for the 2020 horizon.[xv]
- Year 2020 Alternative Case: includes the Year 2020 Base Case schedules and network, plus any additional improvements identified through the modeling effort recommended for the 2020 horizon.
- Year 2040 Base Case: includes the 2020 Alternative Case network along with any network improvements expected to be completed by 2040, along with schedules refinements planned for the 2040 horizon and any project increases freight volume for 2040.
- Year 2040 Alternative Case: includes the Year 2040 Base Case schedules and network, plus any additional improvements identified through the modeling effort recommended for the 2040 horizon.

9.1 Modeling Methodology

The dynamic simulation model was developed using RailOPS,[xvi] which provides large area network dispatching and conflict resolution. RailOPS is a software simulation engine supported by a suite of pre- and post-processing support tools that allows explicit and realistic representation of the details of rail operations and provides the flexibility and extensibility to construct an analogue of almost any rail operation. The model can run continuously for any amount of simulated time, as appropriate. The RailOPS simulation model is the equivalent of the Rail Traffic Controller (RTC)[xvii] simulation model.

The Existing Year network was setup using scale GIS drawings of the California rail system for an accurate representation of the current infrastructure. Passenger timetables are defined in the model, while freight services are generated throughout the day as needed based on future volume projections, scheduled so as to not interfere with passenger traffic. Priority is given to scheduling freight trains during the day if capacity exists so as to avoid having trains in populated areas during late night / early morning hours. In addition, each track segment has at least a three hour block overnight during which no trains are scheduled to allow for general rolling maintenance. The average length of freight trains for the Existing Year is 7,000 feet based on current operating data from UPRR. For Year 2020 and Year 2040 scenarios, the average freight train length was increased to 10,000 feet to represent the effect of increasing freight train lengths over time. However; the simulation was not used to determine optimal future siding lengths to accommodate freight trains, which will be based on engineering judgment. The 10,000 feet future train length is nominal and used to represent increasing train lengths over time, but is not a specific prediction about the expected average length of freight trains in Year 2020 or Year 2040. The simulation was used to determine major infrastructure upgrades such as siding extension locations, additional main track, additional station platforms, etc, but was not used to address engineering issues such as grade separations, pedestrian access, or bridge rehabilitation.

Railway network details for input include:

- Scale computer-aided design (CAD) drawings based on detailed GIS information.
- A schematic drawing.
- Railway details such as switches, signals, stations, and transfer locations can also be included as required.
- Priority logic.

Operational details for input include:

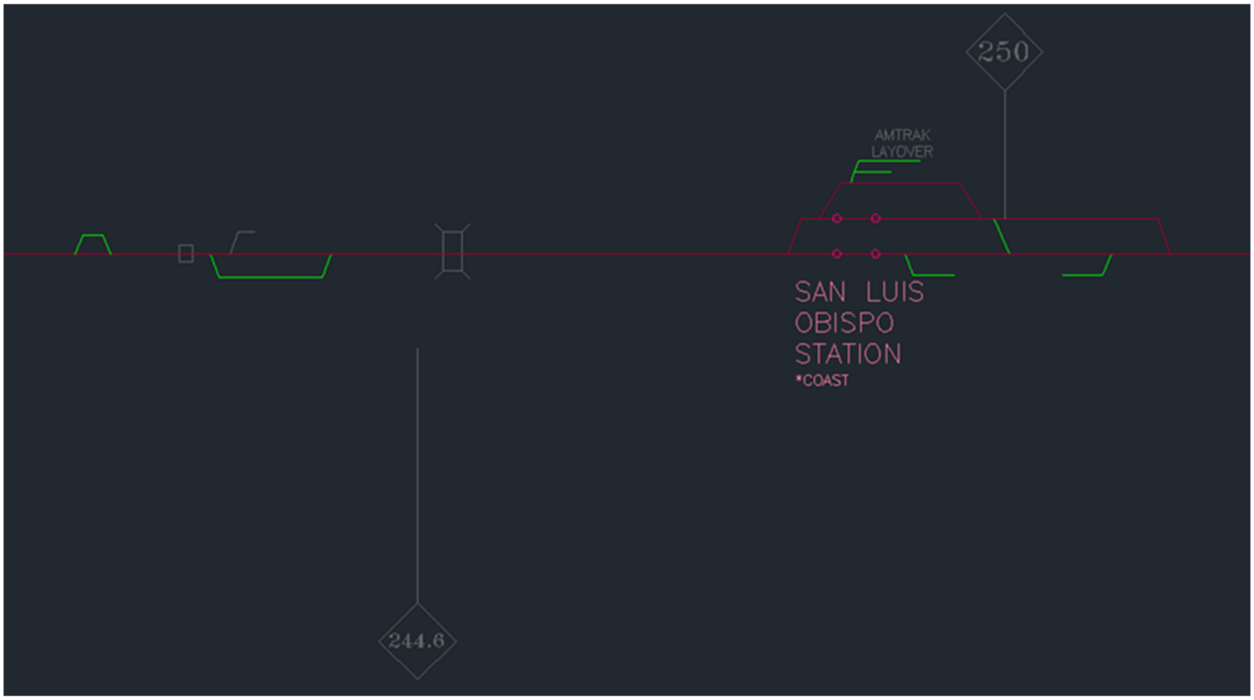
- Service dispatch frequency.
- Service timetables and dwell times.
- Rolling stock information such as lengths, running speeds, and accelerations.

Outputs for the Coast Corridor simulation include:

- Detailed animation to scale or as a schematic showing block occupation.
- Delay measures by location and service.
- Stringline diagrams.
- Heatmaps showing utilization by area.

Exhibit 9.1 shows a RailOPS screenshot of a small segment of the Coast Corridor network in the schematic layout, centered at San Luis Obispo.

Exhibit 9.1: RailOPS Schematic View of San Luis Obispo Station



9.1.1 Service Network Analysis

The RailOPS modeling process consists of the following steps:

1. Model Validation: The Existing Year scenario is validated by comparing actual operating data on average minutes of delay per train service from passenger rail operators (Amtrak) to RailOPS delays outputs (see Section 9.1.2 for validation results).
2. Year 2020 Base Case:
    - First, any infrastructure improvements expected to be complete before 2020 are added to the Existing Year rail network to create a Year 2020 Base Case network.
    - The model is then run on the Year 2020 Base Case network with the Existing Year passenger services and freight volumes projected for 2020 to determine if the Year 2020 Base Case network can accommodate increases in freight train volume without any passenger volume increases.
    - If the Existing Year passenger train volumes can meet an OTP goal of 87 percent with Year 2020 freight volumes, the freight increases are considered feasible. If not, necessary schedule refinements to reduce freight conflicts with passenger trains are identified. If schedule refinements are insufficient, network infrastructure improvements are identified and implemented until the passenger OTP goal is met.
    - Next, complete passenger schedules including any expected new passenger services for the Year 2020 horizon are implemented on the Year 2020 Base Case network along with the previously added Year 2020 freight train volumes. Model outputs are then analyzed to see if passenger trains are able to meet the OTP goal of 87 percent.
    - If any passenger services have an OTP of lower than 87 percent, first schedule refinements to reduce passenger train conflicts are identified. If schedule refinements are insufficient, network infrastructure improvements are identified and implemented until the passenger OTP goal is met.

3. Year 2020 Alternative Case:
    - The Year 2020 Alternative Case is the end product of the Year 2020 Base Case modeling process outlined in Step 2. It includes projected passenger and freight volumes for 2020 and any improvements to the Year 2020 Base Case network necessary to reach the OTP goal of 87 percent for all passenger train services operating in 2020.
4. Year 2040 Base Case:
    - First, the Year 2040 Base Case network is developed by adding any network improvements expected to be completed by 2040 to the Year 2020 Alternative Case network, which includes previously identified necessary improvements for the Year 2020 horizon.
    - The model is then run on the Year 2040 Base Case network with the Year 2020 passenger services and freight volumes projected for 2040 to determine if the Year 2040 Base Case network can accommodate increases in freight train volume without any passenger volume increases.
    - If the Year 2020 passenger train volumes can meet an on-time performance (OTP) goal of 87 percent with Year 2040 freight volumes, the freight increases are considered feasible. If not, schedule refinements to reduce freight conflicts with passenger trains are identified. If schedule refinements are insufficient, network infrastructure improvements are identified and implemented until the passenger OTP goal is met.
    - Next, complete passenger schedules including any expected new passenger services for the Year 2040 horizon are implemented on the Year 2040 Base Case network along with the previously added Year 2040 freight train volumes. Model outputs are then analyzed to see if passenger trains are able to meet the OTP goal of 87 percent.
    - If any passenger services have an OTP of lower than 87 percent, first schedule refinements to reduce passenger train conflicts are identified. If schedule refinements are insufficient, network infrastructure improvements are identified and implemented until the passenger OTP goal is met.
5. Year 2040 Alternative Case:
    - The Year 2040 Alternative Case is the end product of the Year 2040 Base Case modeling process outlined in Step 4. It includes projected passenger and freight volumes for 2040 and any improvements to the Year 2040 Base Case network necessary to reach the OTP goal of 87 percent for all passenger train services operating in 2040.

The modeling methodology is intended to determine overall needs on the Coast Corridor only and does not determine the responsibility or allocation of costs to address these needs.

9.1.2 Operational, Equipment and Infrastructure Reliability

Train reliability is crucial to operators in meeting OTP goals. On the Coast network, there are several elements of infrastructure which may impede reliability. Elevation changes between San Luis Obispo and San Francisco (which Amtrak will provide service to in future years) contribute to limited speeds in the region, reducing the ability of trains to recover from delays by accelerating to a maximum speed between stations. There is also a segment of track between Santa Margarita and Salinas which is operated under Track Warrant Control (TWC), rather than CTC. Under TWC, train operators are given permission to move from block to block through radio communication with UPRR dispatchers. At the end of each block, the train must wait for permission to go forward once again. With CTC, all of this is managed more efficiently centrally via remotely controlled signals and switches, reducing the amount of time trains spend waiting for dispatching instructions and improving reliability.

Amtrak currently operates one passenger train service on the Coast network: the *Coast Starlight*. One additional service, the *Coast Daylight*, has also been proposed for future years. The types of delays tracked by Amtrak for its Coast Corridor service are summarized in Table 9.1.

Table 9.1: Delay Code Definitions

Code	Code Description	Explanation
Host Railroad Responsible Delays		
FTI	Freight Train Interference	Delays from freight trains
PTI	Passenger Train Interference	Delays for meeting or following All Other passenger trains
CTI	Commuter Train Interference	Delays for meeting or following commuter trains
DSR	Slow Order Delays	Temporary slow orders, except heat or cold orders
DCS	Signal Delays	Signal failure or All Other signal delays, wayside defect-detector false-alarms, defective road crossing protection, efficiency tests, drawbridge stuck open
DBS	Debris	Debris strikes
RTE	Routing	Routing-dispatching delays including diversions, late track bulletins, etc.
DMW	Maintenance of Way	Maintenance of Way delays including holds for track repairs or MW foreman to clear
DTR	Detour	Delays from detours
Amtrak Responsible Delays		
ADA	Passenger Related	All delays related to disabled passengers, wheel chair lifts, guide dogs, etc
HLD	Passenger Related	All delays related to passengers, checked-baggage, large groups, etc
SYS	Crew & System	Delays related to crews including lateness, lone-engineer delays
ENG	Locomotive Failure	Mechanical failure on engines.
CCR	Cab Car Failure	Mechanical failure on Cab Cars
CAR	Car Failure	Mechanical failure on all types of cars
SVS	Servicing	All switching and servicing delays
CON	Hold for Connection	Holding for connections from All Other trains or buses.
ITI	Initial Terminal Delay	Delay at initial terminal due to late arriving inbound trains causing late release of equipment
INJ	Injury Delay	Delay due to injured passengers or employees.
OTH	Miscellaneous Delays	Lost-on-run, heavy trains, unable to make normal speed, etc
Third Party Delays		
NOD	Unused Recovery Time	Waiting for scheduled departure time at a station
CUI	Customs	U.S. and Canadian customs delays; Immigration-related delays
POL	Police-Related	Police/fire department holds on ROW or on-board trains
TRS	Trespassers	Trespasser incidents including road crossing accidents, trespasser / animal strikes, vehicle stuck on track ahead, bridge strikes
MBO	Drawbridge Openings	Movable bridge openings for marine traffic where no bridge failure is involved
WTR	Weather-Related	All severe-weather delays, landslides or washouts, earthquake-related delays, heat or cold orders

Table 9.2: *Coast Starlight* Service Delay Minutes by Segment within the Coast Corridor [1,2]

Segment	ADA	CAR	CTI	DBS	DCS	DMW	DSR	ENG	FTI	HLD	INJ	NOD	OTH	POL	PTI	RTE	SVS	SYS	TRS	WTR	Grand Total
San Luis Obispo – Paso Robles	37	7		2	29	58	456	110	**33**	238		23	181	6	**217**	**13**		581	18	5	2014
Paso Robles – Salinas	34	10			112	14	256	46	**4**	283	42	26	17		**9**	**5**	53	567	45	3	1526
Salinas – San Jose	15	6	**7**		3453	73	497	33		169		179	7	38		**41**	20	212		40	4790
Grand Total	86	23	**7**	2	3594	145	1209	189	**37**	690	42	228	205	44	**226**	**59**	73	1360	63	48	8330

Notes:

(1) Delays recorded by Amtrak between May 1, 2012 and July 31, 2012

(2) CTI, FTI, PTI, and RTE in bold are the four categories against which the Existing Year model is validated

Table 9.2 summarizes the delays experienced by *Coast Starlight* train services operating between May 1, 2012 and July 31, 2012, the time period used for validation of the Existing Year network, using the delay types found in Table 9.1. The *Coast Starlight* is currently the only Amtrak service operating within the Coast Corridor, although a second future service, the *Coast Daylight*, has also been proposed.

Four types of train interference delay are highlighted in Table 9.2: commuter train interference (CTI), freight train interference (FTI), passenger train interference (PTI), and routing (RTE). To validate the Existing Year network with existing schedules, RailOPS outputs for average delay minutes per train were compared to these four delay types. The other types of delays are from random events not related to potential scheduling issues, such as weather, mechanical failures, or passenger issues. If model results without any of these random events have the same amount of delay as indicated by Amtrak from train interference alone, then the schedule and network are validated. If average model delay is within 25 percent of the average delays per train from Table 9.2, the Existing Year scenario is considered validated. A 25 percent threshold is considered sufficient for validating the *Coast Starlight* service on the Coast Corridor as there is little train interaction delay overall, so model interaction delays within 25 percent of Amtrak's reported delays also indicates the same low level of delays.

The data in Table 9.2 correspond to 184 total trains operated on segments between San Luis Obispo and San Jose.

Train interaction delays amount to only 4 percent of the total delays listed during this period by Amtrak for the *Coast Starlight* service. This is because the service primarily runs over a region with a low volume of other rail activity. The service also does not extend into the local Caltrain passenger service network.

The other types of delays reported by Amtrak on the *Coast Starlight* service within the Coast Corridor primarily consist of:

- Passenger related issues (10 percent): Assisting disabled passengers (ADA), injuries (INJ), and large groups or baggage issues (HLD).
- Mechanical issues on the train (3 percent): Either locomotives (ENG), or railcars (CAR).
- Coordination or local track and signal issues (79 percent): Waiting for a scheduled departure time at a station (NOD), slow orders (DSR), debris on the tracks (DBS), signal failures (DCS) or switch/signal serving (SVS), crew-related delays (SYS), and track maintenance holds (DMW).
- Miscellaneous rare events (4 percent): E.g. police holds (POL), bad weather (WTR), trespassers (TRS), etc.

Most delays to the *Coast Starlight* service within the Coast Corridor are due to signaling issues due to multiple segments of track operating under Automatic Block Signaling, which is not centrally controlled.

9.2 Integrated Operating Timetables

9.2.1 Existing Year Schedules

Schedules developed by Amtrak (effective May 7, 2012) and used for the Existing Year model validation are shown in Table 9.3. These schedules include only stations within the *Coast Corridor*. The *Coast Starlight* service currently runs between Los Angeles Union Station and Seattle. San Luis Obispo is the first station within the Coast Corridor to the south, so the *Coast Starlight* operation considered for analysis in this chapter is between San Luis Obispo (the southernmost station within the Coast Corridor) and San Jose (the northernmost station served by the *Coast Starlight* within the Coast Corridor).

Table 9.3: Existing Year *Coast Starlight* Service Schedule within the Coast Corridor (1)

Coast Starlight	**11 (South)**	**14 (North)**
	Daily	**Daily**
San Luis Obispo	3:20 pm	3:43 pm
Paso Robles	1:38 pm	4:45 pm
Salinas	11:48 am	6:36 pm
San Jose	10:07 am	8:27 pm

Notes:
(1) From Amtrak Schedule Effective November 7, 2011

In addition to the passenger train service operating on the Coast Corridor, there are also daily freight trains operated by UPRR. Table 9.4 summarizes the number of freight trains included in the Existing Year simulation on each segment of Coast Corridor. The table includes two types of freight trains, both operated by UPRR. The first type is long-haul freight trains, those travelling across the entire Corridor or a significant portion of it. The second type is local freight trains which operate over short segments of the corridor, generally travelling no more than 50 miles in any direction. The average length of freight trains in this analysis is 7,000 feet in the Existing Year based on current operating data, with the average length in Year 2020 and Year 2040 set nominally at 10,000 feet to represent the trend of increasing train lengths over time. Note that while local freight train volumes were included in analysis for each Corridor, none of these were reported to be operating within the Coast Corridor by UPRR. There also is no freight traffic within the Coast corridor in the Existing Year north of San Jose; this is assumed to remain the case for Year 2020 and Year 2040.

Table 9.4: Existing Year UPRR Freight Trains per Day

From	To	Long-Haul	Local
San Luis Obispo	Paso Robles	2	NA
Paso Robles	Salinas	2	NA
Salinas	Gilroy	2	NA
Gilroy	San Jose	2	NA

Notes:
- "NA" indicates that an identification number or estimated cost is not available.

Freight trains are usually not operated according to a particular schedule. For modeling purposes, freight trains are slotted-in between scheduled passenger trains where capacity exists so as to not impede passenger train movements with a minimum of three hours of track downtime available overnight on each track segment to allow for ongoing maintenance.

9.2.2 Year 2020 Schedules

Amtrak schedules for Year 2020 are given in Tables 9.5 and 9.6 from the April 2012 Revised Long-Term (2030) Timetable in *LOSSAN Corridorwide Strategic Implementation Plan (2012)*, with modifications where necessary to allow for adequate transit times or train passing.

One daily southbound and one daily northbound *Coast Daylight* train are proposed by 2020.

Table 9.5: Year 2020 *Coast Starlight* Service Schedule within the Coast Corridor [1]

Coast Starlight	**11 (South)**	**14 (North)**
	Daily	**Daily**
San Luis Obispo	3:20 pm	3:43 pm
Paso Robles	1:38 pm	4:45 pm
Salinas	11:48 am	6:47 pm
San Jose	10:07 am	8:38 pm

Notes:
(1) From Revised Long-Term (2030) Timetable in *LOSSAN Corridorwide Strategic Implementation Plan (2012)*

Table 9.6: Year 2020 *Coast Daylight* Service Schedule within the Coast Corridor [1]

Coast Daylight	**South**	**North**
	Daily	**Daily**
San Luis Obispo	1:49 pm	12:07 pm
Paso Robles	12:12 pm	1:20 pm
King City	11:17 am	2:40 pm
Soledad	10:52 am	3:05 pm
Salinas	10:11 am	3:31 pm
San Jose	8:06 am	5:27 pm
San Francisco	7:07 am	6:32 pm

Notes:
(1) From Revised Long-Term (2030) Timetable in *LOSSAN Corridorwide Strategic Implementation Plan (2012)*
(2) Sunday – Saturday

Table 9.7 lists Year 2020 UPRR freight trains. No freight traffic currently operates within the Coast Corridor north of San Jose or into San Francisco. This remained the case in future year operational assumptions as freight growth projections were based on current operational data.

Table 9.7: Year 2020 UPRR Freight Trains per Day

From	To	Long-Haul	Local
San Luis Obispo	Paso Robles	4	NA
Paso Robles	Salinas	4	NA
Salinas	Gilroy	4	NA
Gilroy	San Jose	4	NA

Notes:
- "NA" indicates that an identification number or estimated cost is not available.

It should be noted that electrification of Caltrain will not occur until after the year 2020.

9.2.3 Year 2040 Schedules

Amtrak schedules for Year 2040 are given in Tables 9.8 and 9.9 from the April 2012 Revised Long-Term (2030) Timetable in *LOSSAN Corridorwide Strategic Implementation Plan (2012)*, with modifications where necessary to allow for adequate transit times or train passing.

Table 9.8: Year 2040 *Coast Starlight* Service Schedule within the Coast Corridor [(1)]

Coast Starlight	11 (South)	14 (North)
	Daily	Daily
San Luis Obispo	3:20 pm	3:13 pm
Paso Robles	1:50 pm	4:15 pm
Salinas	11:48 am	6:17 pm
San Jose	10:07 am	8:08 pm

Notes:
(1) From Revised Long-Term (2030) Timetable in *LOSSAN Corridorwide Strategic Implementation Plan*, *(2012)*

Table 9.9: Year 2040 *Coast Daylight* Service Schedule within the Coast Corridor [(1)]

Coast Daylight	South	South	North	North
	Daily	Daily	Daily	Daily
San Luis Obispo	1:49 pm	3:43 am	12:07 pm	12:30 am
Paso Robles	12:12 pm	2:06 am	1:20 pm	1:35 am
King City	11:17 am	1:11 am	2:40 pm	2:39 am
Soledad	10:52 am	12:51 am	3:05 pm	3:00 am
Salinas	10:11 am	12:10 am	3:31 pm	3:26 am
San Jose	8:06 am	10:20 pm	5:27 pm	5:30 am
San Francisco	7:07 am	9:20 pm	6:32 pm	6:30 am

Notes:
(1) From Revised Long-Term (2030) Timetable in *LOSSAN Corridorwide Strategic Implementation Plan*, *(2012)*

Table 9.10 lists Year 2040 UPRR freight trains. No freight traffic currently operates within the Coast Corridor north of San Jose or into San Francisco. This remained the case in future year operational assumptions as freight growth projections were based on current operational data.

Table 9.10: Year 2040 UPRR Freight Trains per Day

From	To	Long-Haul	Local
San Luis Obispo	Paso Robles	4	NA
Paso Robles	Salinas	4	NA
Salinas	Gilroy	4	NA
Gilroy	San Jose	4	NA

Notes:
- "NA" indicates that an identification number or estimated cost is not available.

It should be noted that the HSR service will be in place by the year 2040 after the completion of the Bay to Basin segment in the year 2026 and Phase 1 Blended Service in the year 2029.

9.3 Equipment Consists

This section summarizes the type of equipment used for train services operating on the Coast Corridor, including locomotives and car types, where available.

9.3.1 Intercity Passenger Rail Services

Amtrak *Coast Starlight*

The *Coast Starlight* primarily operates using the General Electric Genesis P42DC locomotive, the primarily locomotive type employed by the Amtrak fleet. The *Coast Starlight* service operates Superliner double-decked passenger cars. A typical *Coast Starlight* train consist includes: four coaches, one first-class Pacific Parlour car, one Sightseer Lounge car, one dining car, three sleeper cars, one Transition Sleeper, and one baggage car.

9.3.2 Freight Rail Services

Unlike passenger service, freight train consists across the network are not uniform. Train length, railcar type, and number of locomotives will vary depending on the type of cargo and distance to be traveled. Average train length for modeling purposes in 7,000 feet for the Existing Year based on 2012 operating data, and 10,000 feet in Year 2020 and Year 2040 to represent the trend of increasing average train lengths over time. The model was not used to make specific predictions about future freight train lengths or optimal siding lengths.

9.4 Rail Infrastructure Characteristics

This section describes the significant characteristics of the Coast Corridor network, including: locations where CTC has been implemented, locations with potentially insufficient sidings, and the number of main tracks available across the network.

9.4.1 Rail Infrastructure Network Background

For the purposes of this modeling effort, the Coast Corridor is defined as operating between San Luis Obispo and San Jose in the Existing Year and between San Luis Obispo and San Francisco in Year 2020 and Year 2040.

The region of track over which Caltrain operates between San Francisco and San Jose has CTC implemented. Caltrain has plans for electrification of service in a common corridor into San Francisco. The number of main tracks varies from two to four across most of the network.

South of San Jose, many sections of track use Automatic Block Signaling rather than CTC. TWC is also used between Santa Margarita and Salinas. With TWC, train operators are given permission to move from block to block through radio communication with UPRR dispatchers. At the end of each block, the train must wait for permission to go forward once again. With CTC, all of this is managed centrally via remotely controlled signals and switches, reducing the amount of time trains spend waiting for dispatching instructions. Most of the Santa Margarita to Salinas region has a single main track, although there are two main tracks between San Jose and Coyote, about 13 miles south of San Jose.

9.4.2 Infrastructure-related Assumptions

For the Existing Year modeling effort, the rail infrastructure was based on existing conditions as given in schematic track charts or shown in scaled network drawings. For the Year 2020 and Year 2040 Base Case modeling efforts, no immediate improvements were identified for inclusion. The Base Case network for these scenarios is the same as the Existing Year network.

9.5 Model Outputs

This section summarizes the RailOPS modeling results for the Existing Year model validation as well as Year 2020 and Year 2040 modeling efforts. Improvements identified through the modeling effort are included in the Year 2020 and Year 2040 Alternative Case sections.

9.5.1 Existing Year

This section summarizes RailOPS outputs for the Existing Year schedule validation. Service schedules are considered validated if the overall delay per service matches the Amtrak reference delay values to within 25 percent when compared across each segment and the entire service overall.

Tables 9.11 through 9.12 compare average minutes of delay per train operated from RailOPS outputs to the same values reported by Amtrak for the *Coast Starlight* service.

Table 9.11: Average Delay Comparison – *Coast Starlight* Service, Northbound

From	To	**Average Delay per Train Departure** (Minutes)		
		RailOPS Average	**Amtrak Reported**	**Difference**
San Luis Obispo	Paso Robles	1.4	1.4	0.0
Paso Robles	Salinas	0.1	0.1	0.0
Salinas	San Jose	0.8	0.3	0.5
Total		*2.3*	*1.8*	*0.5*
Overall Difference (%)			*21.7%*	

Table 9.12: Average Delay Comparison – *Coast Starlight* Service, Southbound

From	To	**Average Delay per Train Departure** (Minutes)		
		RailOPS Average	**Amtrak Reported**	**Difference**
Salinas	San Jose	0.0	0.2	-0.2
Paso Robles	Salinas	0.0	01	-0.1
San Luis Obispo	Paso Robles	1.4	1.4	0.0
Total		*1.4*	*1.8*	*-0.3*
Overall Difference (%)				*-21.4%*

Exhibit 9.2 through 9.5 show stringline diagrams of each train operated on the Coast Corridor network in RailOPS. Exhibit 9.6 shows a track occupancy heatmap for a 24-hour period, while Exhibit 9.7 shows a track occupancy heatmap for the peak commute period between 7:00am and 9:00am.

Exhibit 9.2: Existing Year 12:00am – 6:00am Coast Stringline Diagram

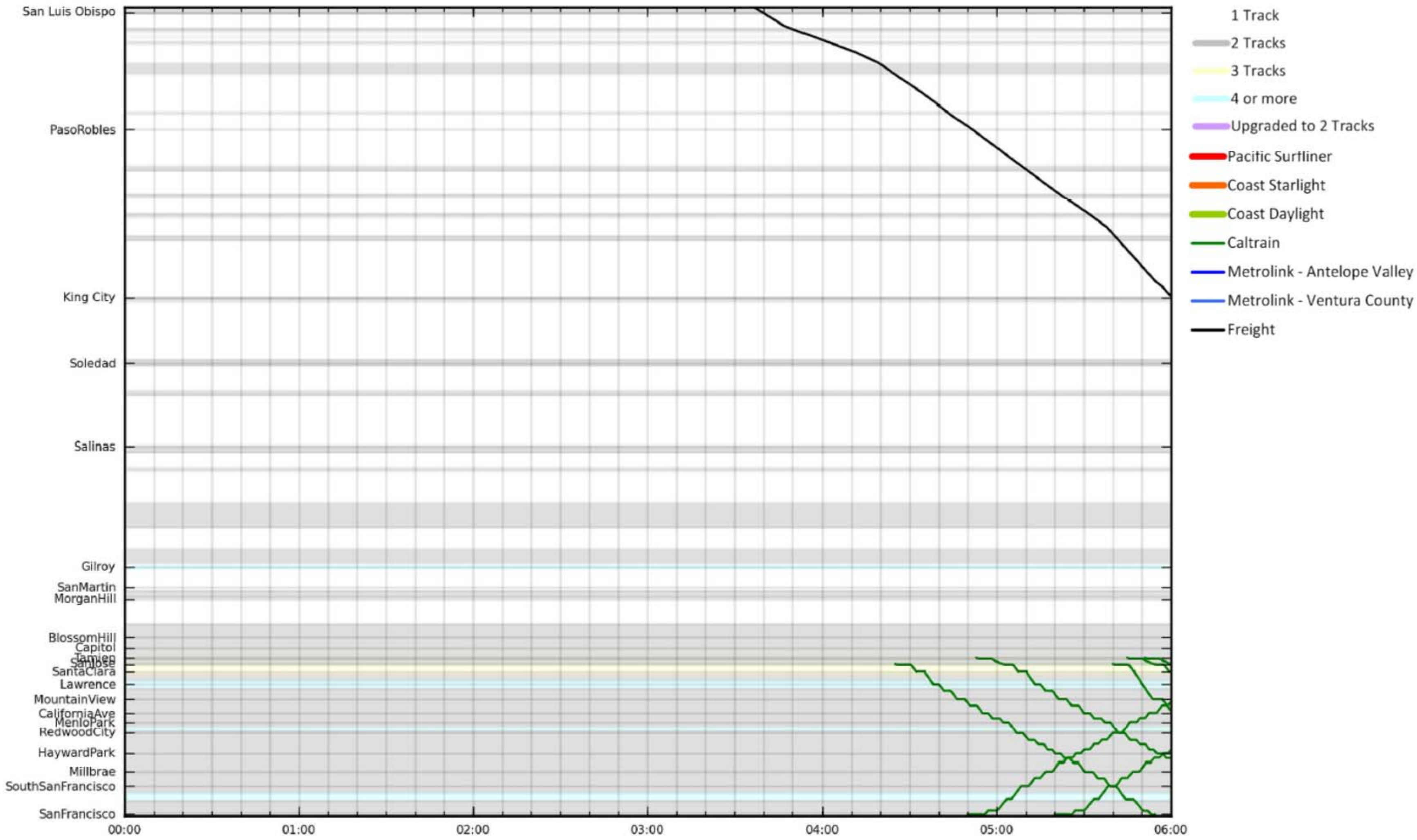


Exhibit 9.3: Existing Year 6:00am – 12:00pm Coast Stringline Diagram

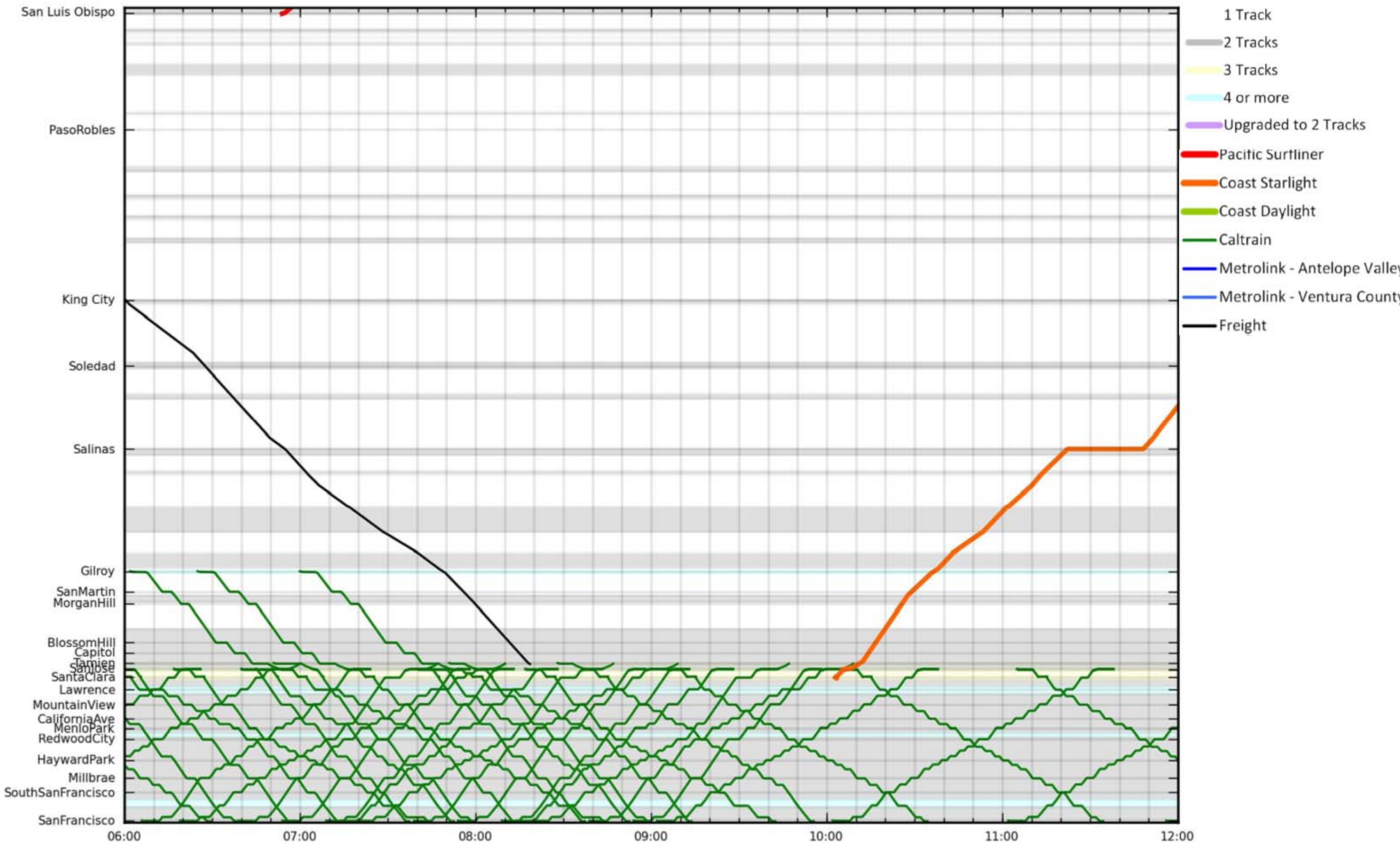


Exhibit 9.4: Existing Year 12:00pm – 6:00pm Coast Stringline Diagram

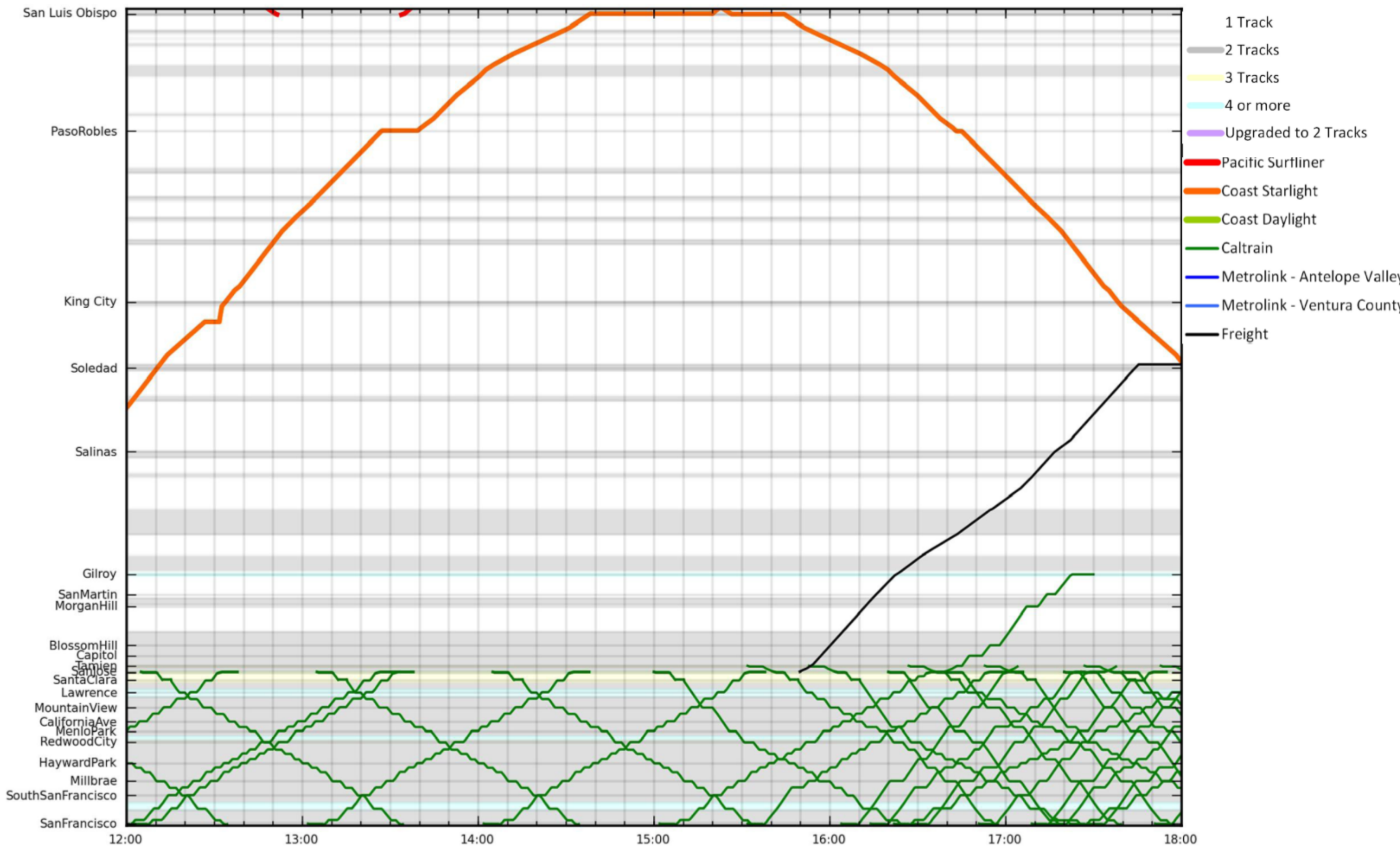


Exhibit 9.5: Existing Year 6:00pm – 12:00am Coast Stringline Diagram

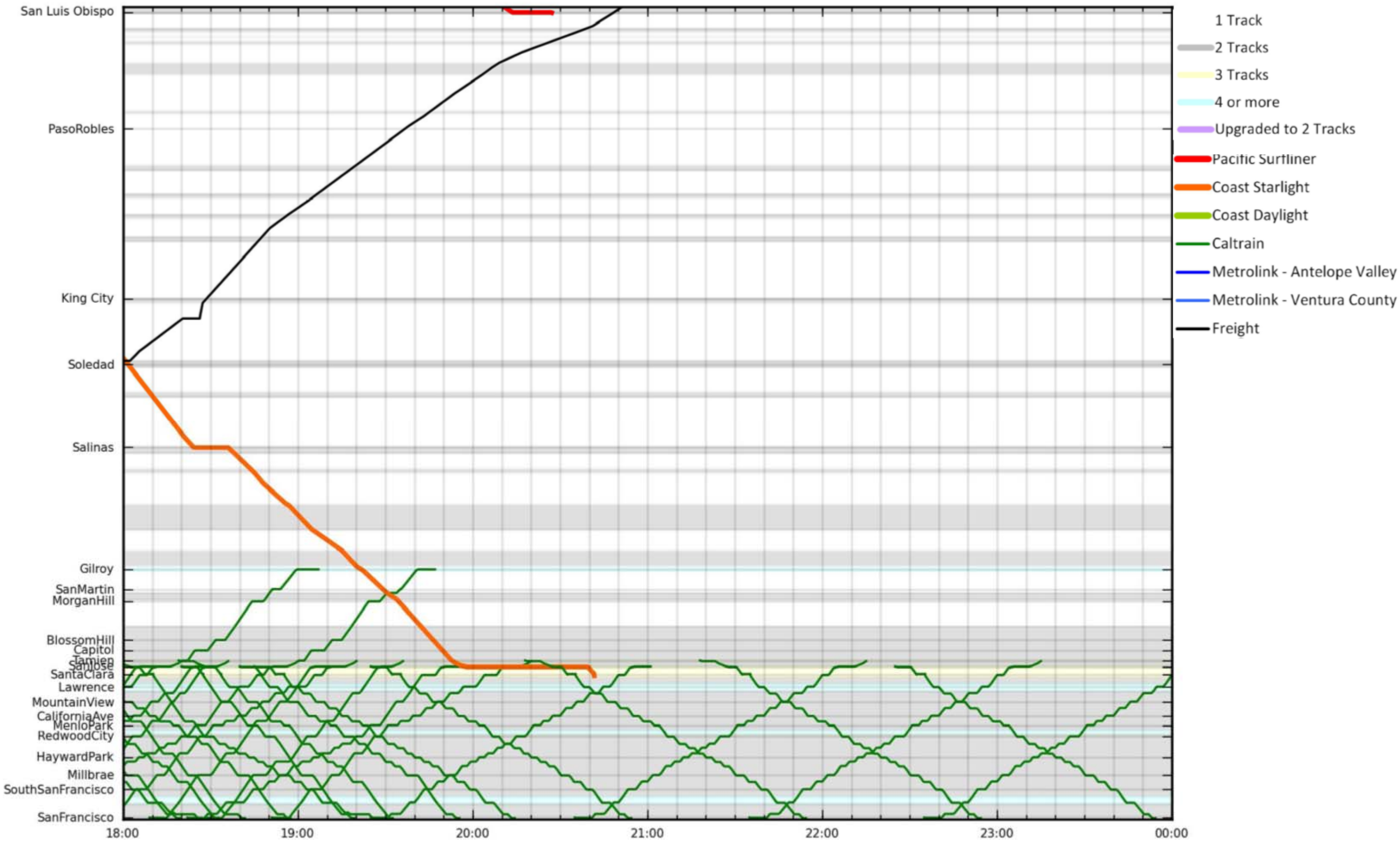
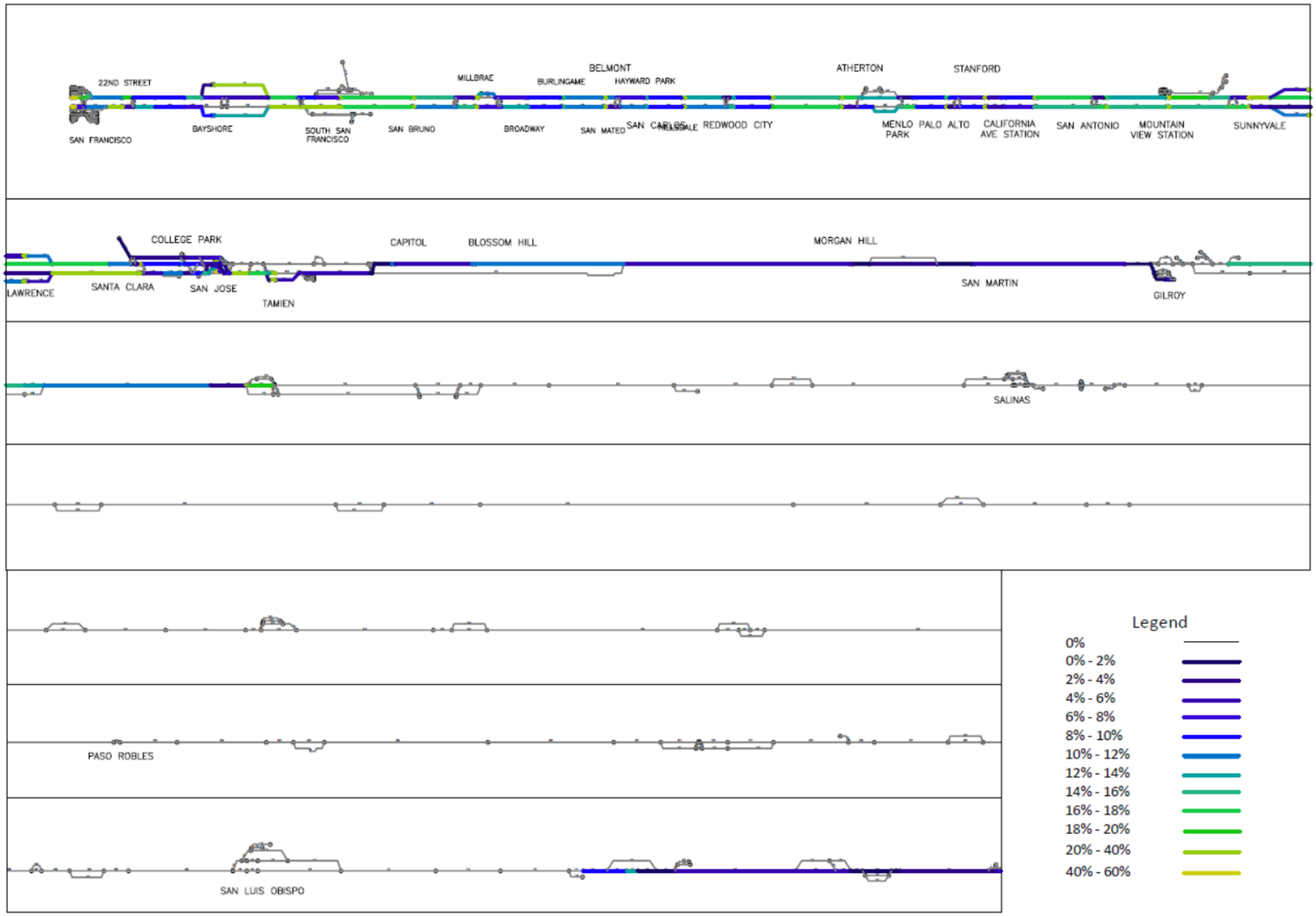


Exhibit 9.6: Existing Year 24-Hour Coast Corridor Track Occupancy Heatmap

Exhibit 9.7: Existing Year 7:00am – 9:00am Coast Corridor Track Occupancy Heatmap



On a 24-hour basis, overall track occupancy levels are low, with most segments being occupied by a train under five percent of the day. The peak commute hour heatmap from 7:00 am to 9:00 am in Exhibit 9.7 shows track occupancy levels during hours with the highest level of passenger and commuter train traffic. During these hours, there are some instances of track occupancy levels up to 40 percent within the Caltrain operating region.

9.5.2 Year 2020 Base Case

The Year 2020 Base Case model is used to determine the expected OTP of train services on the Coast Corridor. If any intercity passenger service (Amtrak's *Coast Starlight* and *Coast Daylight* services in Year 2020) have an OTP of lower than 87 percent, improvements are identified as required to improve OTP. RailOPS considers a train on-time to a station if it arrives within five minutes of its scheduled arrival time. OTP values in actual operations are likely to be lower than model results due to random real-world delays such as passenger loading, medical emergencies, severe weather, etc. OTP values of less than 100 percent in model results are typically due to train interference effects only.

One immediate infrastructure improvement was identified for inclusion in the Year 2020 Base Case model within the Coast Corridor: implementation of CTC beginning at the Santa Margarita siding (milepost 229.6) until the McKay siding (milepost 202.3). Most of the delays within the Coast Corridor in the Existing Year are a result of outdating signaling infrastructure, including the use of track warrant control (TWC) rather than CTC in the approximately 120 miles of track between Santa Margarita and Salinas. Implementing CTC between Santa Margarita and McKay, a single tracked region with four siding locations, may significantly improve OTP in this region.

The model was run with Year 2020 freight traffic as given in Table 9.7 while maintaining Existing Year passenger traffic levels. Additional freight traffic had no impact on passenger OTP levels, so the passenger trains listed in Tables 9.5 and 9.6 for Year 2020 were implemented along with Year 2020 freight levels.

Table 9.13 lists the resulting OTP of each intercity service at each station on the Coast Corridor from the Year 2020 Base Case model with complete Year 2020 freight and passenger traffic levels. Note that blank entries in the *Coast Starlight* column indicate that the service is not planned to stop at that location.

Table 9.13: Year 2020 Base Case Model Intercity Passenger Service OTP

Stations	*Coast Starlight*	*Coast Daylight*
San Luis Obispo	100%	100%
Paso Robles	100%	100%
Salinas	100%	100%
San Jose	100%	100%
San Francisco		100%

Model results yielded 100 percent OTP for both Amtrak services at each station on the Coast Corridor. This is because Year 2020 traffic levels are still low, with only four passenger trains and four freight trains operating each day in either direction between San Luis Obispo and San Jose; this is a total of only four northbound trains and four southbound trains every 24 hours outside of the Caltrain region. This leaves sufficient network capacity to schedule trains such that there are no interference effects, resulting in 100 percent OTP levels. In real-world operations, OTP levels will be somewhat lower due to random and unforeseeable events such as severe weather, passenger emergencies, police holds, etc.

Exhibit 9.8 through 9.11 show stringline diagrams of each train operated on the Coast Corridor network in RailOPS in the Year 2020 Base Case model. Exhibit 9.12 shows a track occupancy heatmap for a 24-hour period, while Exhibit 9.13 shows a track occupancy heatmap for the peak commute period between 7:00 am and 9:00 am.

Exhibit 9.8: Year 2020 Base Case 12:00am – 6:00am Coast Corridor Stringline Diagram

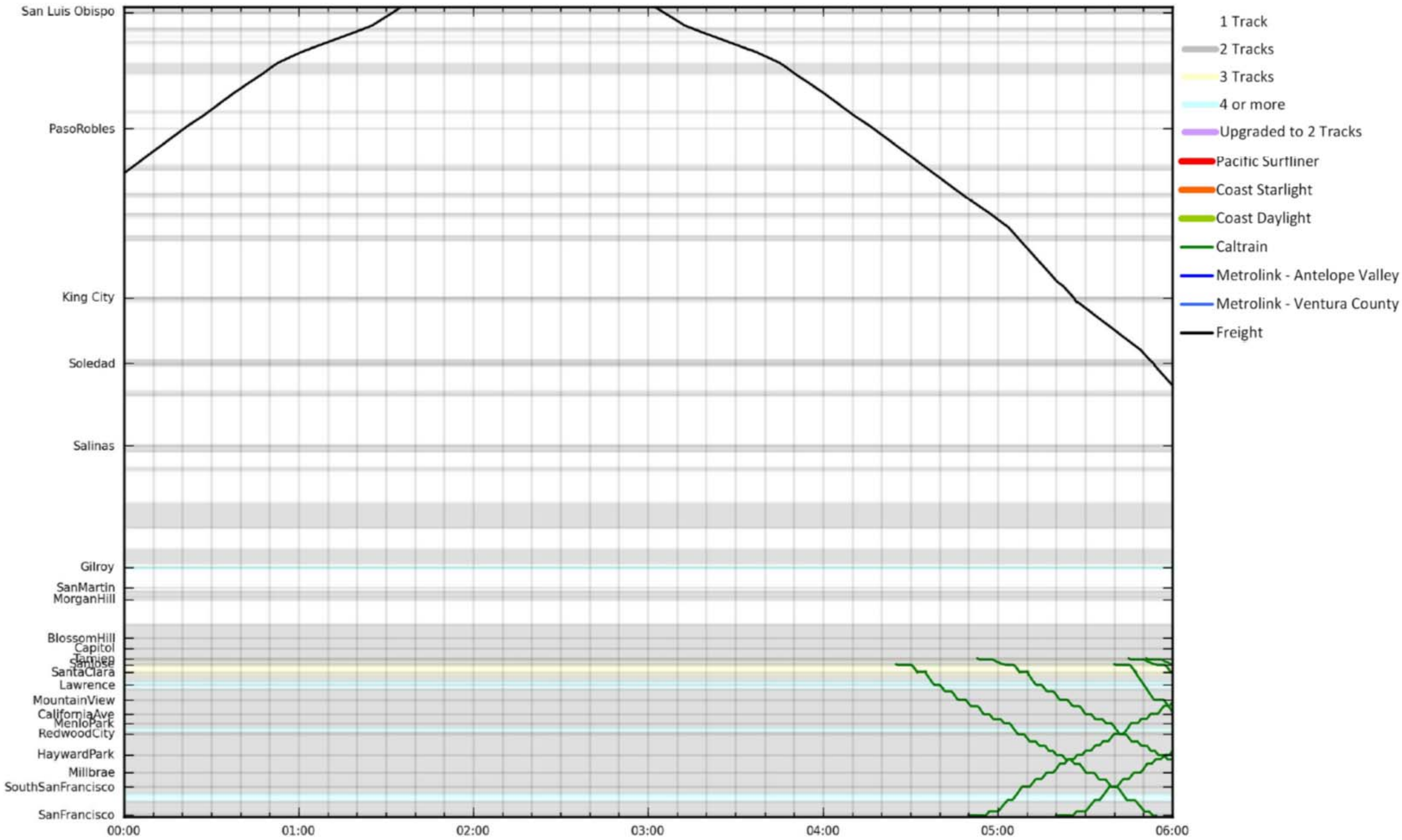


Exhibit 9.9: Year 2020 Base Case 6:00am – 12:00pm Coast Corridor Stringline Diagram

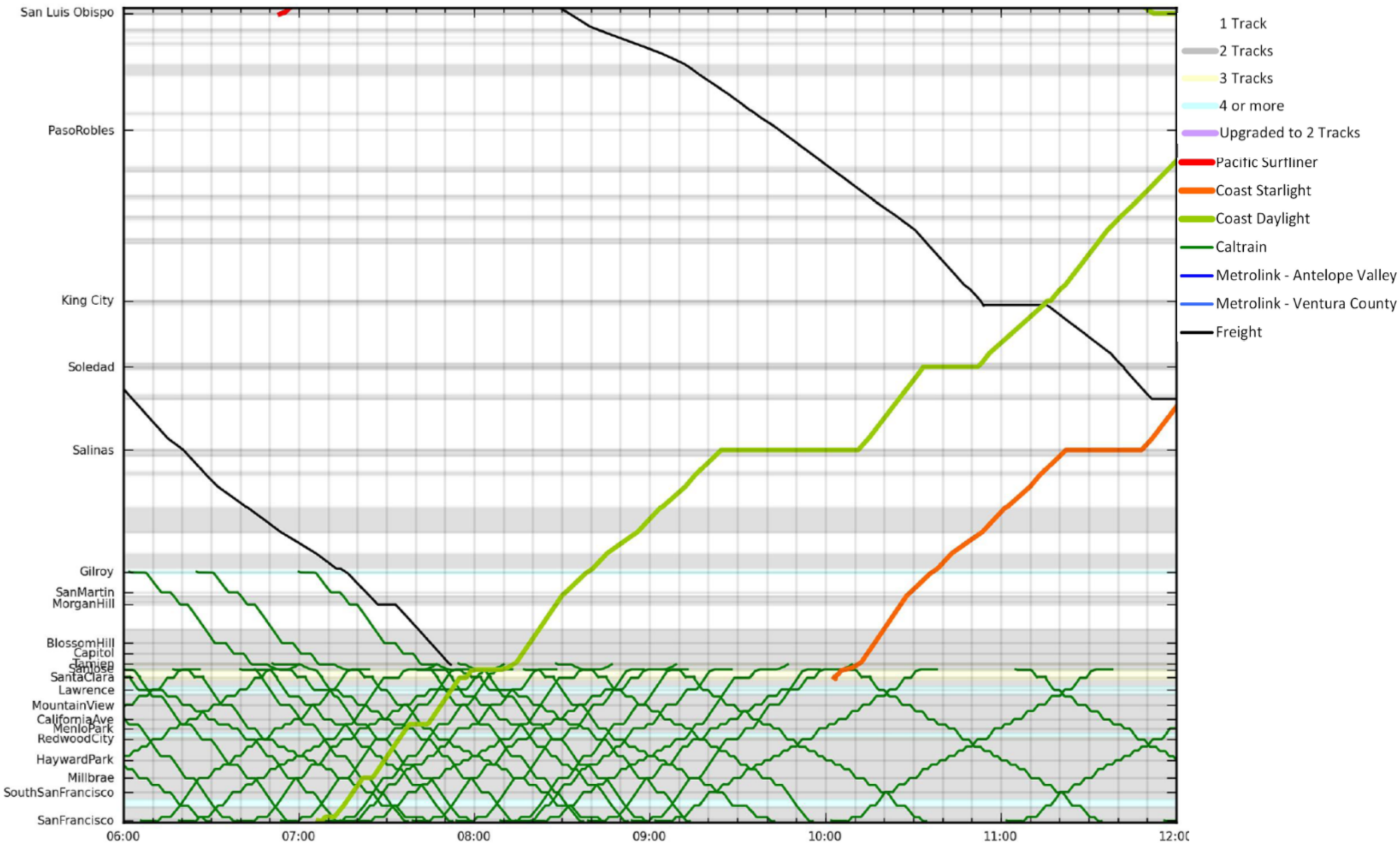


Exhibit 9.10: Year 2020 Base Case 12:00pm – 6:00pm Coast Corridor Stringline Diagram

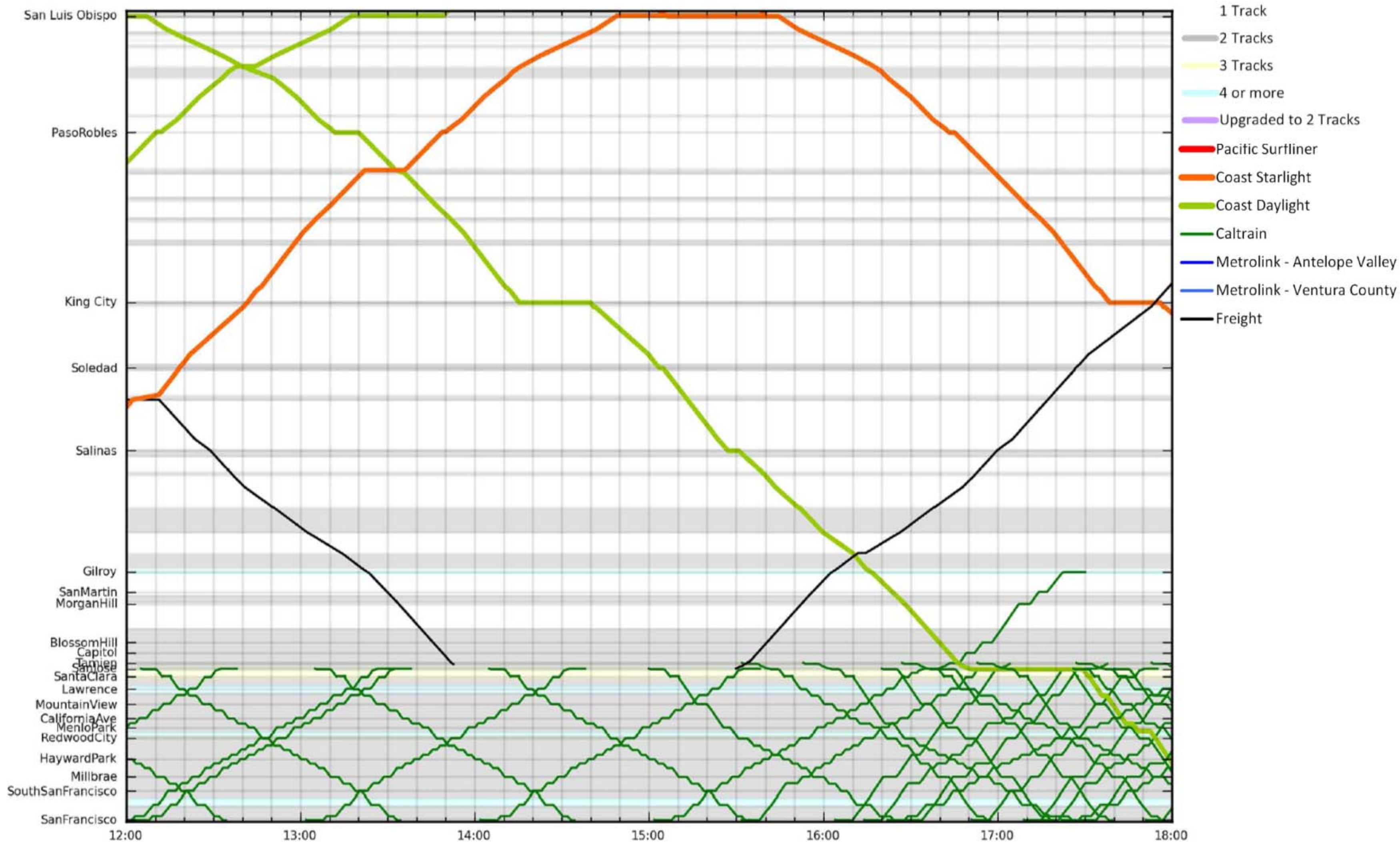


Exhibit 9.11: Year 2020 Base Case 6:00pm – 12:00am Coast Corridor Stringline Diagram

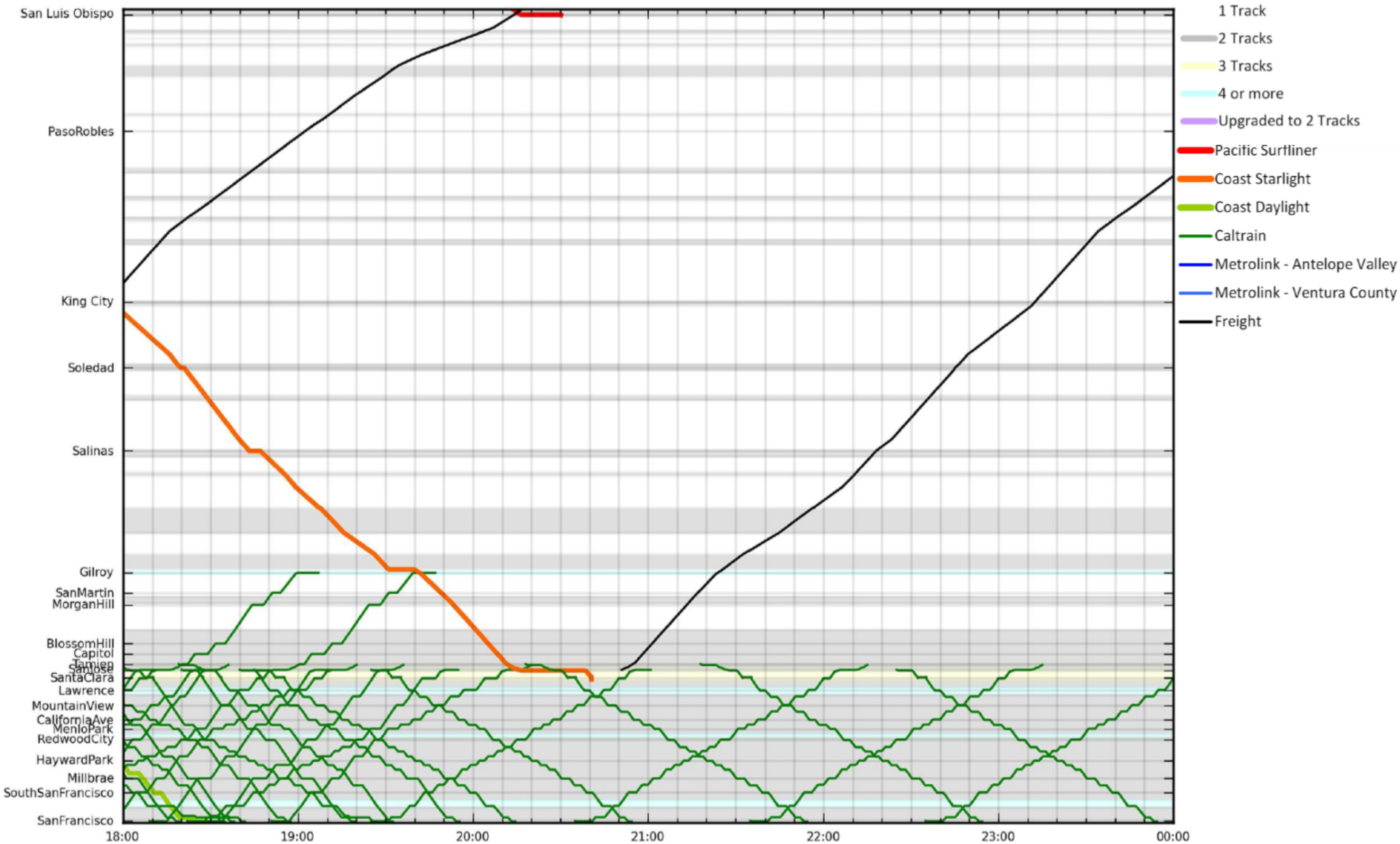


Exhibit 9.12: Year 2020 Base Case 24-Hour Coast Corridor Track Occupancy Heatmap

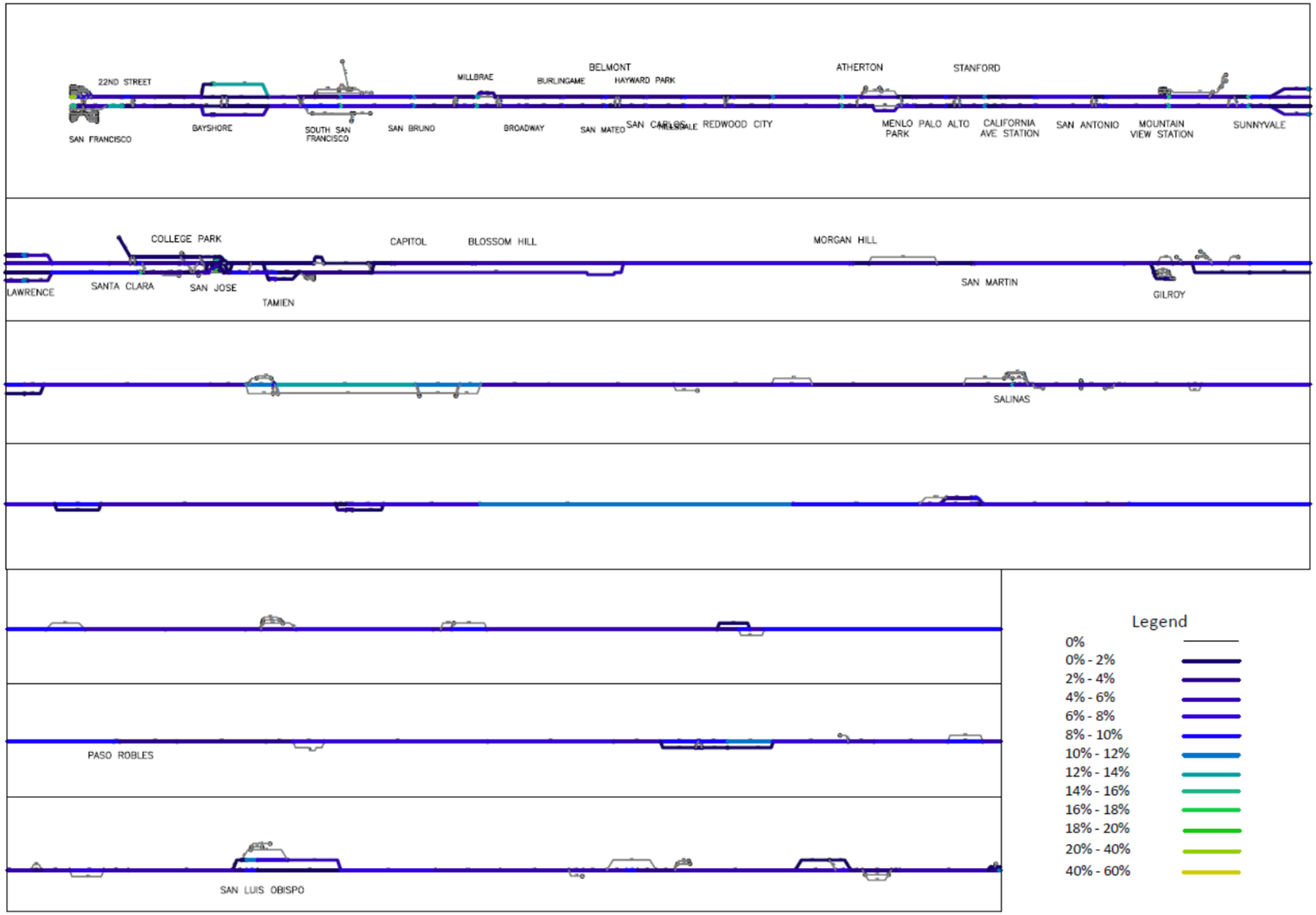
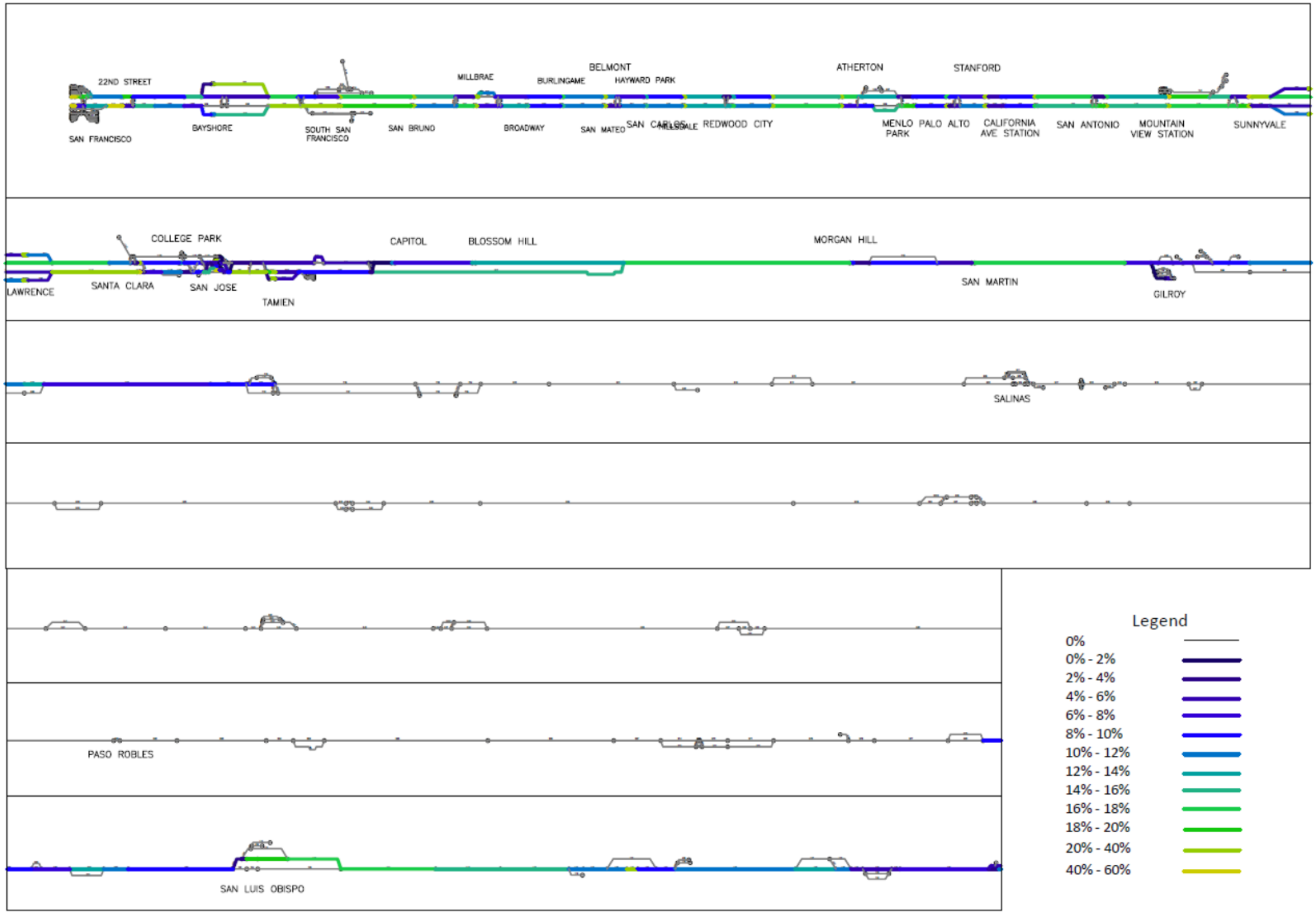


Exhibit 9.13: Year 2020 Base Case 7:00am – 9:00am Coast Corridor Track Occupancy Heatmap



Based on the results from Table 9.13, no necessary improvements were identified. With the relatively light levels of train traffic in the Year 2020 Base Case (four daily Amtrak trains and four daily freight trains), minimum performance goals can be reached without additional improvements beyond the recommended implementation of CTC between Santa Margarita and McKay. With adequate dispatching such that freight trains do not interfere with scheduled passenger trains, there is sufficient capacity within the Coast Corridor to accommodate ten trains in a 24-hour time span. It is important to note however that if higher levels of future rail traffic are desired than the modest levels assumed for this analysis, additional improvements may be required to accommodate them.

Because the Year 2020 Base Case results did not yield any required improvements to accommodate rail traffic growth, there is no Alternative Case for Year 2020. Table 9.14 summarizes the minutes of delay per train departure results for Year 2020 within the Coast Corridor for the two intercity passenger services expected to be operating in 2020: the *Coast Starlight* and the proposed *Coast Daylight*.

Table 9.14: Year 2020 Coast Corridor RailOPS Outputs

Stations		Average Delay per Train Departure (min)			
		Coast Starlight		***Coast Daylight***	
From	**To**	**Northbound**	**Southbound**	**Northbound**	**Southbound**
San Luis Obispo	Paso Robles	1.4	0.0	0.0	4.6
Paso Robles	Salinas	0.0	21.7	0.0	0.0
Salinas	San Jose	6.3	0.0	0.0	2.7
San Jose	San Francisco	NA	NA	22.7	0.0
	Total	*7.7*	*21.7*	*22.7*	*7.3*

Notes:

- "NA" Indicates not applicable

The delays in this region are primarily as a result of scheduled waits to avoid interference between the *Coast Daylight* and *Coast Starlight*, or to avoid interference with Caltrain traffic in the case of the *Coast Daylight* which has to traverse this region to serve San Francisco.

9.5.3 Year 2040 Base Case

The Year 2040 Base Case model is used to determine the expected OTP of train services on the Coast Corridor. If any intercity passenger service (Amtrak's *Coast Starlight* and *Coast Daylight* services in Year 2040) have an OTP of lower than 87 percent, improvements are identified as required to improve OTP. RailOPS considers a train on-time to a station if it arrives within five minutes of its scheduled arrival time. OTP values in actual operations are likely to be lower than model results due to random real-world delays such as passenger loading, medical emergencies, severe weather, etc. OTP values of less than 100 percent in model results are typically due to train interference effects only.

The Year 2040 Base Case model infrastructure is identical to the Year 2020 Base Case model as no necessary improvements were identified for Year 2020 aside from the implementation of CTC starting at Santa Margarita in a region using TWC in the Existing Year. This was also included in the Year 2020 Base Case.

The model was run with Year 2040 freight traffic as given in Table 9.10 while maintaining Year 2020 passenger train traffic levels. Since no freight traffic growth was projected between Year 2020 and Year 2040, there was no impact on passenger OTP levels. Next, the passenger train levels in Tables 9.8 and 9.9 for Year 2040 were implemented along with Year 2040 freight.

Table 9.15 lists the resulting OTP of each intercity service at each station on the Coast Corridor from the Year 2040 Base Case model with complete Year 2040 freight and passenger train schedules. Note that blank entry in the *Coast Starlight* column indicates that the service will continue to exit the Coast Corridor at San Jose on its way to Seattle, rather than continue into San Francisco as the *Coast Daylight* is proposed to do.

Table 9.15: Year 2040 Base Case Model Intercity Passenger Service OTP

Stations	*Coast Starlight*	*Coast Daylight*
San Luis Obispo	100%	100%
Paso Robles	100%	100%
Salinas	100%	100%
San Jose	100%	96%
San Francisco		100%

Model results yielded 100 percent OTP for the *Coast Starlight* at each station on the Coast Corridor. The *Coast Daylight* had 100 percent OTP at each station except San Jose, which had a 96 percent OTP. OTP levels remain high in Year 2040 because Year 2040 traffic levels for freight are identical to Year 2020 (four trains per day), while Year 2040 passenger traffic added just two trains per day (one additional *Coast Daylight* train in each direction). This is a total of six passenger trains and four freight trains operating each day in either direction, or a total of five northbound trains and five southbound trains every 24 hours outside of the Caltrain region. As in Year 2020, in Year 2040 this level of traffic results in sufficient network capacity to schedule trains such that there is little to no impact from train interference effects, resulting in high OTP levels. In real-world operations, OTP levels will be somewhat lower due to random and unforeseeable events such as severe weather, passenger emergencies, police holds, etc.

Exhibit 9.14 through 9.17 show stringline diagrams of each train operated on the Coast Corridor network in RailOPS in the Year 2040 Base Case model. Exhibit 9.18 shows a track occupancy heatmap for a 24-hour period, while Exhibit 9.19 shows a track occupancy heatmap for the peak commute period between 7:00 am and 9:00 am.

Exhibit 9.14: Year 2040 Base Case 12:00am – 6:00am Coast Corridor Stringline Diagram

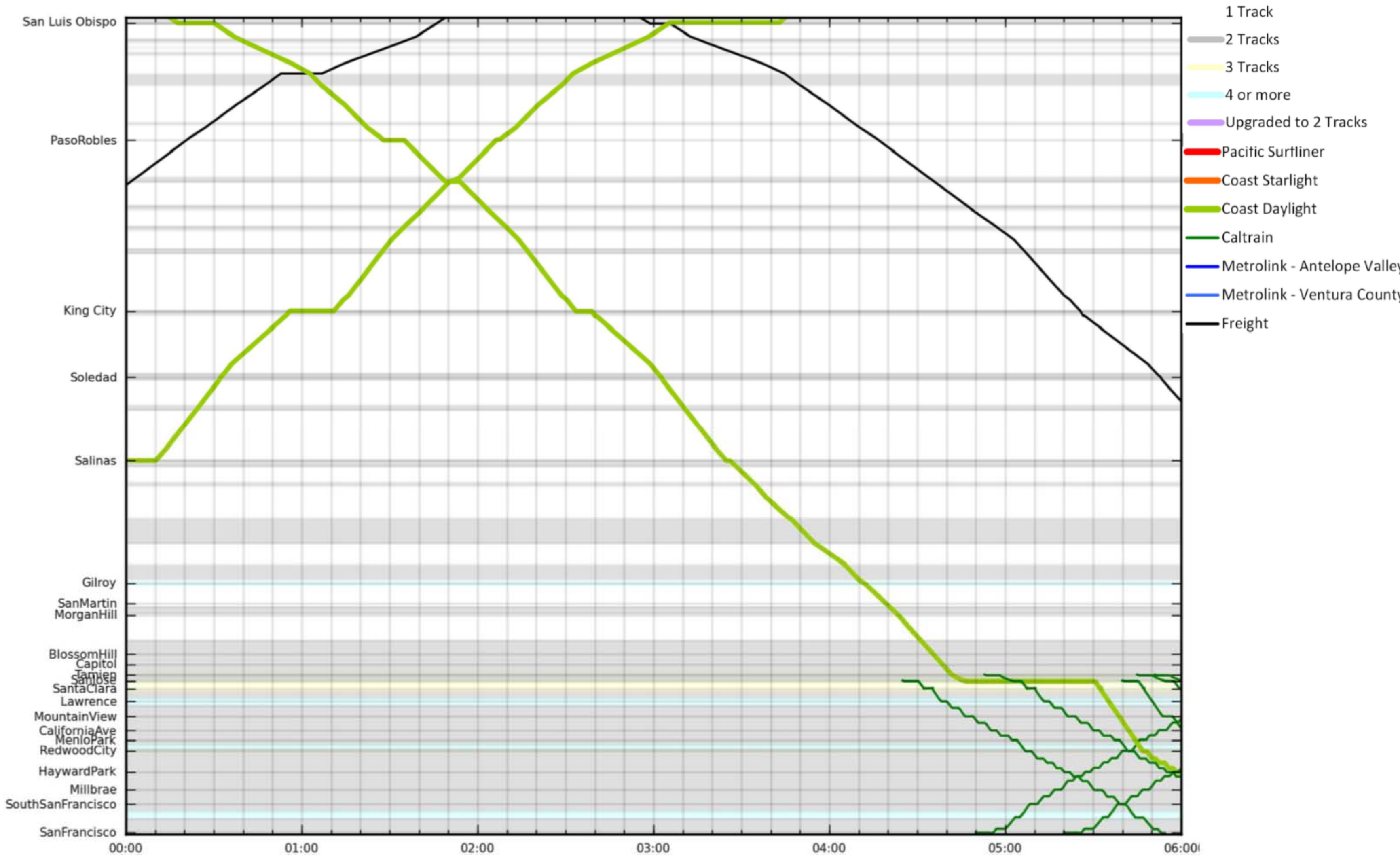


Exhibit 9.15: Year 2040 Base Case 6:00am – 12:00pm Coast Corridor Stringline Diagram

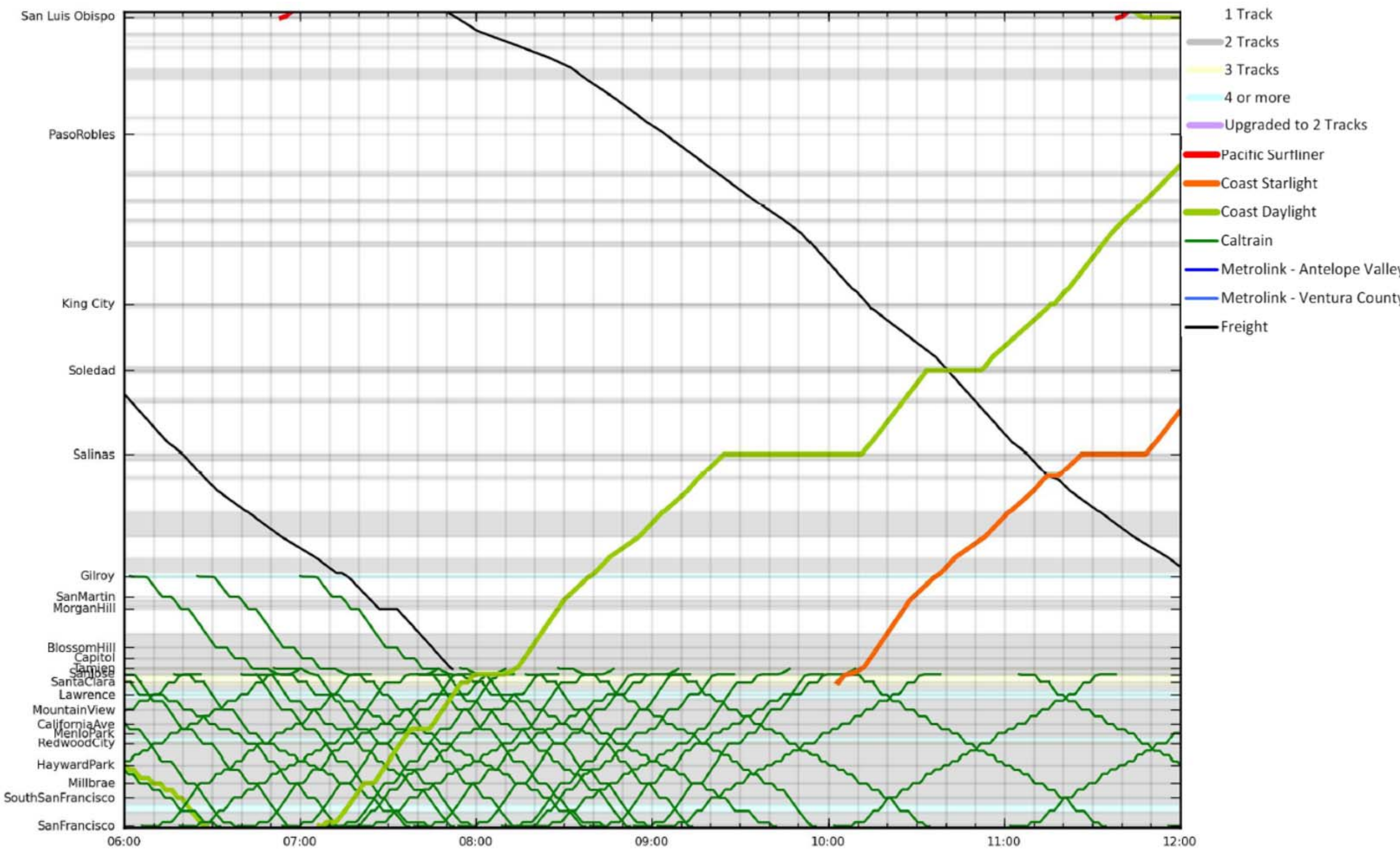


Exhibit 9.16: Year 2040 Base Case 12:00pm – 6:00pm Coast Corridor Stringline Diagram

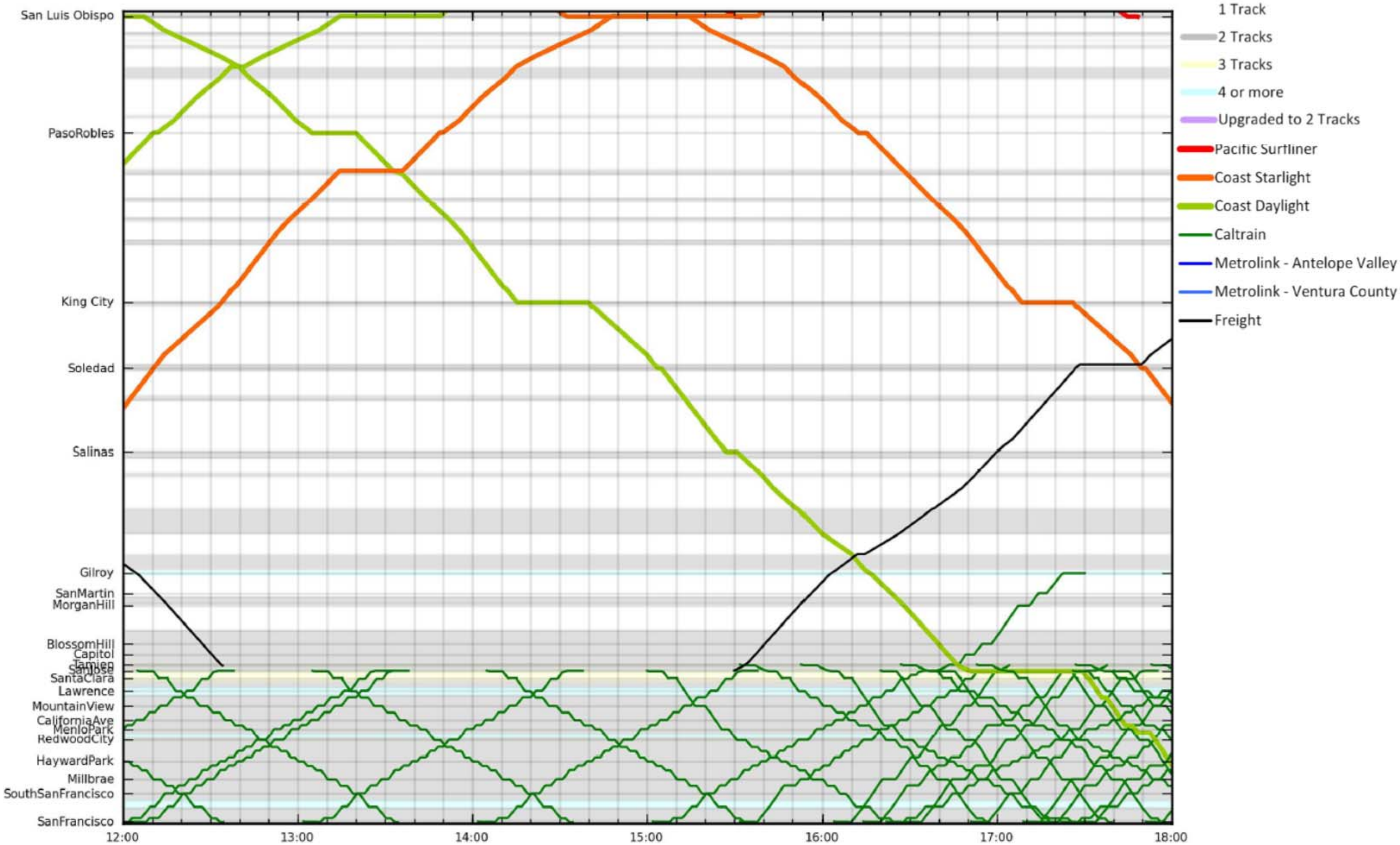


Exhibit 9.17: Year 2040 Base Case 6:00pm – 12:00am Coast Corridor Stringline Diagram

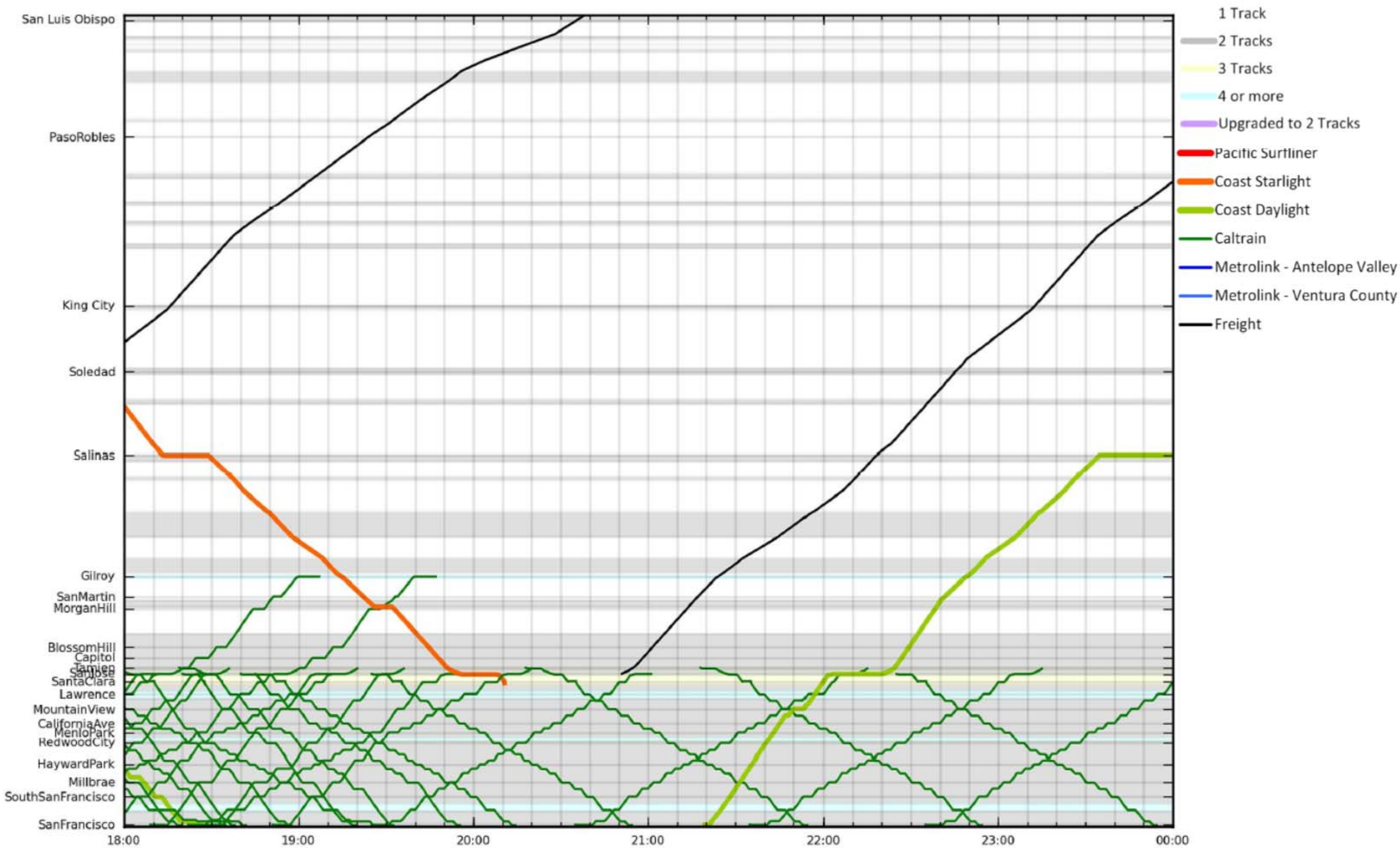


Exhibit 9.18: Year 2040 Base Case 24-Hour Coast Corridor Track Occupancy Heatmap

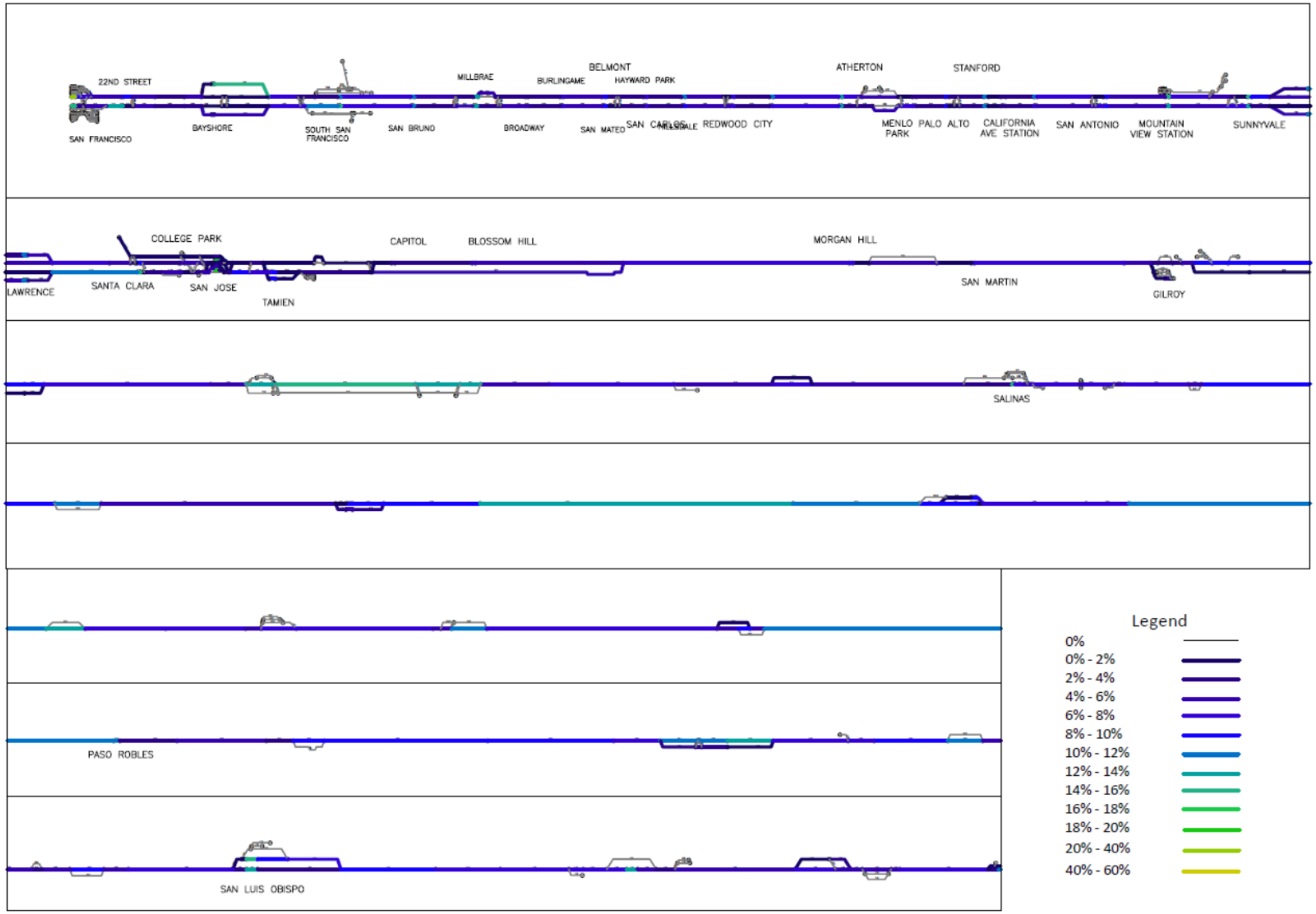
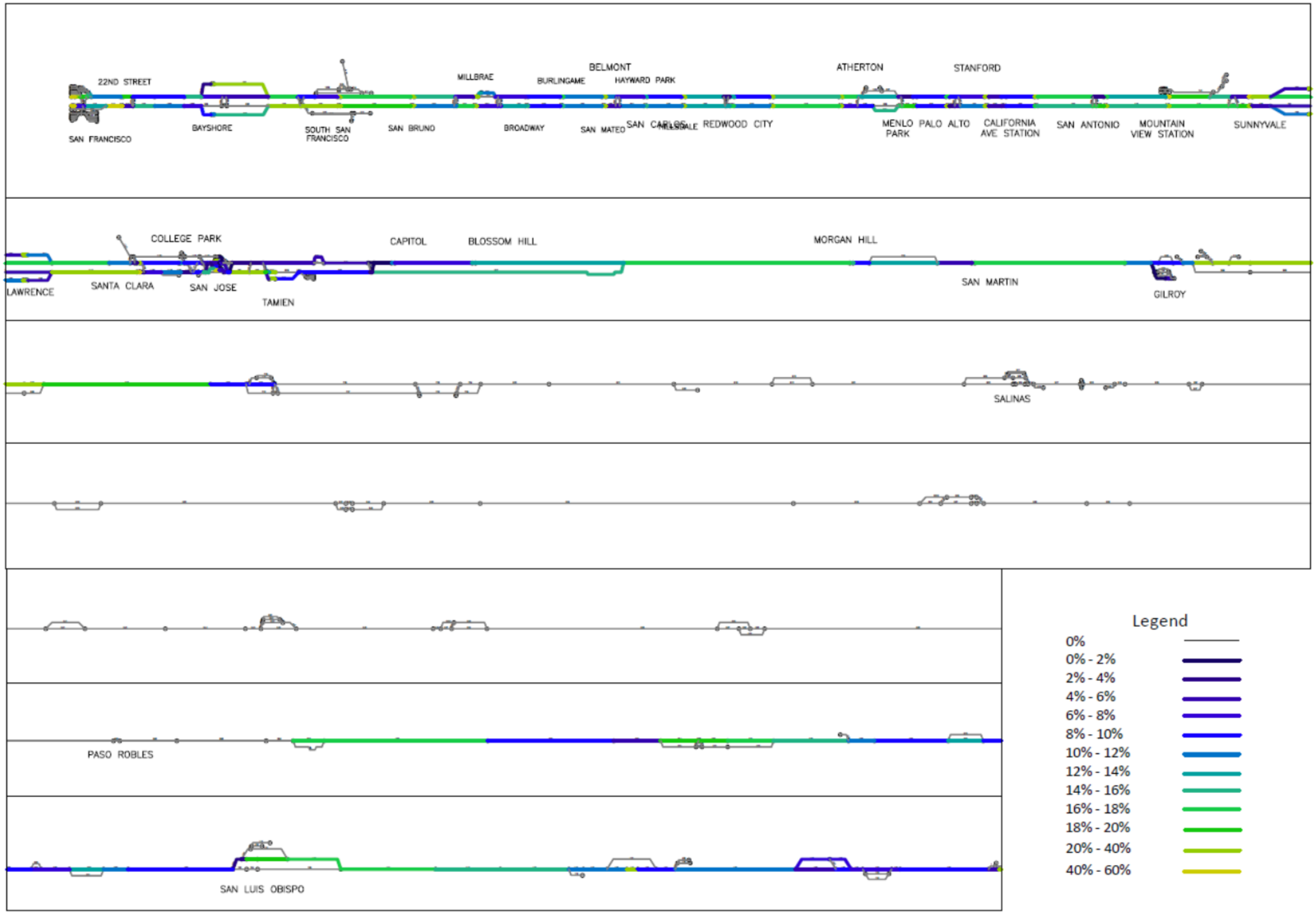


Exhibit 9.19: Year 2040 Base Case 7:00am – 9:00am Coast Corridor Track Occupancy Heatmap



Based on the results from Table 9.15, no necessary infrastructure improvements were identified. As in Year 2020, the relatively light levels of train traffic in the Year 2040 Base Case (six daily Amtrak trains and four daily freight trains), minimum performance goals can be reached without additional improvements beyond the recommended implementation of CTC between Santa Margarita and McKay included in the Year 2020 and Year 2040 Base Cases. With adequate dispatching such that freight trains do not interfere with scheduled passenger trains, there is sufficient capacity within the Coast Corridor to accommodate 10 trains in a 24-hour time span. It is important to note however that if higher levels of future rail traffic are desired than the modest levels assumed for this analysis, additional improvements may be required to accommodate them.

Because the Year 2040 Base Case results did not yield any required improvements to accommodate rail traffic growth, there is no Alternative Case for Year 2040. Table 9.16 summarizes the minutes of delay per train departure results for Year 2040 within the Coast Corridor for the two intercity passenger services expected to be operating in Year 2040: the *Coast Starlight* and the proposed *Coast Daylight*.

Table 9.16: Year 2040 Coast Corridor RailOPS Outputs

Stations		**Average Delay per Train Departure (Minutes)**			
		Coast Starlight		***Coast Daylight***	
From	**To**	**Northbound**	**Southbound**	**Northbound**	**Southbound**
San Luis Obispo	Paso Robles	1.4	0.0	0.0	2.9
Paso Robles	Salinas	0.0	21.7	0.0	0.9
Salinas	San Jose	16.5	3.7	0.3	1.5
San Jose	San Francisco	NA	NA	20.1	5.4
	Total	*16.5*	*25.3*	*20.4*	*10.8*

Notes:

- "NA" indicates that an identification number or estimated cost is not available.

As with Year 2020 delay results, the delays on the Coast Corridor in Year 2040 are primarily as a result of scheduled waits to avoid interference between the *Coast Daylight* and *Coast Starlight*, or to avoid interference with Caltrain traffic in the case of the *Coast Daylight* which has to traverse this region to serve San Francisco.

9.6 Equipment and Train Crew Scheduling

According to Amtrak, *Coast Starlight* service train staffing depends on the number of passengers and location within the corridor, but they generally consist of 15 to 17 people: two engineers, a conductor, an assistant conductor, three sleeping car attendants, two Coach Car attendants, a Lounge Car attendant, a Parlour Car attendant, and four to six Dining Car attendants. The proposed *Coast Daylight* staffing levels would likely be similar to the current *Pacific Surfliner* service, which typically includes five people: an engineer, a conductor, an assistant conductor, a Café-Car attendant, and a Business Class attendant.

Employee shift scheduling is dependent on a number of factors, including employee seniority, length of the train's route, and type of employee (i.e., whether they are an operating employee or train attendant). Operating employees (engineers, conductors, and assistant conductors) have shift lengths determined by crew base locations and Federal Hours of Service requirements, such as a maximum of 12 work hours per day. For the *Coast Starlight*, operating crews are exchanged at San Luis Obispo within the Coast Corridor; other crew change locations for the *Coast Starlight* service are outside the Corridor, such as at Sacramento. On-board employees (primarily train attendants) typically remain with a train for the entire run.

9.7 Terminal, Yard and Support Operations

Amtrak owns a yard facility in Los Angeles to provide support for Amtrak trains and equipment system-wide, including the *Coast Starlight* service. This yard would also be used to support the proposed *Coast Daylight* service. Amtrak switching locomotives are also located at the Los Angeles facility, which is also used for system-wide fleet repairs and overhauls.

10.0 Station and Access Analysis

This chapter addresses the location of the stations to be served by the proposed new *Coast Daylight* services, how stations will accommodate the proposed services, how passengers will access stations, and how intermodal connections will be integrated at the stations.

The chapter identifies existing stations and considers new or expanded stations along the *Coast Daylight* corridor, characterizing existing and planned service integration and coordination. Current intermodal connectivity is analyzed, and key capital projects that would improve multimodal connectivity are presented. A typology of station types is developed, reflecting that stations sharing certain key characteristics would ideally be developed with common features.

For proposed service expansion which utilizes existing stations, the analysis is focused on identifying necessary safety, capacity and operational improvements in the stations themselves or in connecting bus and rail transit service. In the few cases where new rail stations are considered, potential sites and facilities are addressed, along with considerations to address safety, capacity and operational functionality. New station analysis will include potential alternatives for station locations, adequacy of station capacity, intermodal connectivity, and access options. For both existing as well as new stations, key land use considerations such as Transit-Oriented Development potential, Complete Streets and Sustainable Communities Strategies (SCS) are evaluated.

10.1 Station Location Analysis

10.1.1 Methodology

The methodology employed to evaluate the station locations includes a review of the existing stations along the Amtrak and Caltrain corridors to determine potential locations for station improvements or the addition of new stations. Available station services (i.e., staffing and ticketing machines) and multimodal access (i.e., transit connections, parking, taxi service, rental car services, bicycle facilities) were studied to identify which stations require improvements and where new stations would be required under the proposed expanded service in the corridor.

Criteria addressing station location include:

- The extent to which the station location capitalizes on and serves existing jobs and residential neighborhoods.
- The level of convenience provided to the passenger in accessing important destinations in the station area or nearby.
- The potential for the station to complement and enhance the building fabric and streetscape in the station area.

Recent policy has been adopted to ensure that federally-planned facilities, such as corridor rail stations, include consideration of sites that are pedestrian friendly, near existing employment centers, accessible to public transit, and emphasize existing central cities.[xviii] Such policy aligns with California state law SB 375 (Steinberg 2008), which requires the linking of transportation and land use in SCSs.

10.1.2 Potential Station Locations

Potential *Coast Daylight* station locations are proposed along the length of the existing Amtrak *Coast Starlight* and Caltrain routes, roughly following U.S. 101, as shown in Exhibit 1.1. The proposed terminal stations are the existing San Francisco Fourth and King Caltrain Station in the north, and Los Angeles

Union Station in the south, with 27 intermediate stops. Of the 29 proposed stations, 25 are existing Amtrak or Caltrain stations, and four are proposed new stations. Caltrain has not approved use of the stations along their portion of the Corridor.

The extension of corridor service along the coastal route currently served only by the long-distance *Coast Starlight* introduces the potential for additional stations. Amtrak's long-distance services cater to longer trips, with greater intervals between stations, while state-supported services make stops as frequently as every five to ten miles in some segments of a corridor. For the latter, the best travel times are not as important as providing convenient access. This service will add approximately one hour to the *Coast Starlight* schedule which is already slow. The *Coast Daylight* schedule may affect rider choice particularly for longer distance trips, such as travelling from Santa Barbara to San Francisco. On the other hand, each new station opens up an entire community from which to draw ridership, potentially attracting dozens of additional riders.

The following new stations are proposed with initiation of *Coast Daylight* service:

- Soledad
- King City

As the *Coast Daylight* will be an extension of the existing *Pacific Surfliner* service, a similar service regime would be implemented along the balance of the corridor; consequently communities such as King City and Soledad are of sufficient size to justify a station. Government Code Section 14035.9. states in part that The department shall give reasonable priority to stations, stops, and routes which serve visitors to prisons, particularly when alternative public transportation is minimal or nonexistent. The Soledad station fulfills the intent of this section. In addition, stations at Pajaro/Watsonville and Castroville would provide access to communities along Monterey Bay

Stations are already established at regular intervals along the commuter-oriented Caltrain corridor. The *Coast Daylight* would stop at select stations at 10- to 20-mile intervals, where key intermodal connections can be made and major activity centers can be served, reflecting the Caltrain "Baby Bullet" stops. Gilroy and Morgan Hill are potential stops, and San Jose is a station serving multiple modes and a major central business district. San Jose would provide a connection the planned Northern California Unified Rail Service, and Gilroy will be a high-speed rail connection. Mountain View and Palo Alto feature downtowns of appreciable size, nearby employment concentrations and major institutions, such as Stanford University. Mountain View provides a connection to the VTA Light Rail system. Millbrae is also selected as an intermediate station on the way to the San Francisco terminus, due to its intermodality and connectivity to SFO.

The location of station facilities in communities identified for new stations is dependent on many factors. These include population, surrounding land uses and links to other transportation modes. In order to function properly as multimodal hubs, transfers must be easily made between modes at the station, whether public transit or private auto. Sufficient parking at the stations also is a requirement, while ensuring that auto access does not compromise other modes.

New stations may take advantage of a historic station or its site to further historic preservation and revitalization goals. As railroads typically anchored the early development of California cities and towns, stations have historically occupied prime locations in downtown districts.

10.1.3 Transit-Oriented Development, Joint Use and Joint Development Opportunities

Ideally, stations are located in proximity of complementary land uses. Locations near existing commercial and residential areas maximize ridership potential and function as a gateway to a city's major activity centers. Appropriate to the scale of the community, TOD and SCS initiatives also factor into station area planning. Smaller communities may not support the density typically associated with TOD, nor may the ridership at their stations justify such investment. However, the existing stations in larger communities such as Salinas, San Luis Obispo, Santa Barbara, and along the Caltrain and Metrolink corridors, are potential candidates for station-oriented infill development.

Table 10.1 provides a preliminary assessment of TOD potential at corridor stations. Stations in the core urban areas of the Bay Area and Los Angeles have the highest potential, as these stations host multiple transit services and have a greater market for higher-density, mixed-use development. An exception is Burbank-Bob Hope Airport station, which focuses on intermodal connections and is not surrounded by developable parcels. Stations on the periphery of the two major metropolitan regions and in the larger communities of the intermediate corridor offer medium potential, with moderate levels of transit service and a more limited market for TOD-style residences, offices and retail. Smaller communities in the intermediate corridor exhibit low TOD potential, lacking both frequent connecting services and a demand for compact, mixed-use development at scale.

TOD at stations furthers Caltrans policy to promote integrated land use and transportation. Such policy depends on, as well as supports, the efforts of local jurisdictions to maintain and redevelop their station-area districts and increase housing and employment opportunities for their residents. Caltrans and corridor committees can build upon initiatives such as the transit village plan for Simi Valley station, as they engage local planners in TOD-related efforts.

While TOD brings development to station environs, joint use and joint development add value to stations by placing additional uses and activity in station buildings and properties themselves. Businesses and offices can profit from close proximity to rail service, and passengers can benefit from convenient access to these uses. Typical examples appropriate to the corridor include cafés, newsstands, car wash/detailing services, and other vendors that cater to rail passengers. Complementary retail uses can draw upon the non-passenger market of the surrounding area, enlivening the station and addressing security issues. Retailers can also fill the role of providing basic information about train services and local transportation options at unstaffed stations or outside of staffed hours.

Due to lack of available property surrounding corridor stations, joint development may not be possible. Potential for joint use around stations in the San Francisco Bay Area and in the Los Angeles metropolitan area is greater, but may be constrained by existing development adjacent to the station and limited room for expansion. Other more frequent services in these areas, such as Metrolink or Caltrain, would drive joint development rather than *Coast Daylight* service.

At intermediate stations along the corridor, sufficient property may be available for joint development, but the relatively small number of daily trains may not be sufficient to spur joint use and joint development alone. However, provided the location would support the business with or without the presence of rail service, joint development may still be viable. Neighboring parcels may provide better opportunities for integrating complementary businesses, as is the case for a car rental agency at Emeryville station in the San Francisco Bay Area.

Table 10.1 presents the existing amenities and staffing at corridor stations, as well as an assessment of their joint use / joint development potential. Opportunities for joint use and joint development are on par with TOD potential at most stations, but are lower in cases where the station's function as an origin or destination is less important than the station's location in the surrounding region. So while the area around Millbrae station is a prime infill site, the station's primary role is in facilitating intermodal connections. Intermediate stations along the Caltrain or Metrolink segments of the corridor, such as Morgan Hill or Camarillo, have lower joint development potential than neighboring "end-of-line" stations such as Gilroy and Oxnard, respectively, even though TOD potential is comparable in both of the adjacent communities.

Table 10.1: Station Joint Development and TOD Potential

Station	Existing Amenities / Staffing	Joint Use / Development Potential	TOD Potential
San Francisco (Fourth and King)	Staffed, ticket office, ticket machines, restrooms, phones, restaurants	High	High
Millbrae	Unstaffed, ticket machines, restrooms, phones	Medium	High
Palo Alto	Unstaffed, ticket machines, restrooms, phones, coffee shop	High	High
Mountain View	Unstaffed, ticket machines, phone, refreshment cart	High	High
San Jose	Staffed, ticket office, ticket machines, restrooms, phones	High	High
Morgan Hill	Unstaffed, ticket machines, restrooms, phones	Low	Medium
Gilroy	Unstaffed, ticket machines, restrooms, phones	Medium	Medium
Pajaro/Watsonville	N/A	Low	Low
Castroville	N/A	Low	Low
Salinas	Staffed, ticket counter, baggage check, restrooms, phones	Medium	Medium
Soledad	N/A	Low	Low
King City	N/A	Low	Low
Paso Robles	Staffed, restrooms, phones	Medium	Medium
San Luis Obispo	Staffed, ticket office, ticket machines, restrooms, phones, baggage check	High	High
Grover Beach	Unstaffed, platform only	Low	Low
Guadalupe	Unstaffed, platform only	Low	Low
Surf	Unstaffed, platform only	Low	Low
Goleta	Unstaffed, platform only	Low	Low

Station	Existing Amenities / Staffing	Joint Use / Development Potential	TOD Potential
Santa Barbara	Staffed, ticket office, restrooms, phones, baggage check	High	High
Carpinteria	Unstaffed, platform only	Low	Medium
Ventura	Unstaffed, phones	Low	Medium
Oxnard	Staffed, ticket office, ticket machines, restrooms, phones, baggage check	Medium	Medium
Camarillo	Unstaffed, platform only	Low	Medium
Moorpark	Unstaffed, platform only	Low	Medium
Simi Valley	Unstaffed, platform only	Low	Medium
Chatsworth	Unstaffed, platform only	Medium	High
Van Nuys	Staffed, ticket office, ticket machines, restrooms, phones, baggage check	High	High
Burbank-Bob Hope Airport	Unstaffed, platform only	Low	Low
Glendale	Unstaffed, platform only	Low	High
Los Angeles (Union Station)	Staffed, ticket office, ticket machines, restrooms, phones, baggage check, ATMs	High	High

10.2 Station Operations Analysis

Station operations include a number of considerations related to the needs of corridor passengers (ticketing, baggage handling, information provision) and other supporting functions. Station operations also facilitate access by various modes and promote intermodal connections. Operational analysis of corridor stations includes the identification of existing services and amenities provided at the stations, their track and platform configuration, and surrounding land uses. Stations are classified based on their relative importance: statewide, regional or local.

Table 10.2 differentiates stations still further, defining five station categories based on the physical characteristics of stations: the density and type of urban form of the station area; auto access, as indicated by parking cost; and intermodal access, as represented by connecting rail and passenger services. These five station prototypes capture the wide range of station contexts and connectivity functions found throughout the state in an easily-applied framework.

Table 10.2: Station Prototypes

Station Category	Density and Urban Form	Auto Access	Typical Intermodal Access Modes
Statewide Significance			
"Urban Activity Center" • San Francisco (Fourth and King) • San Jose • Los Angeles (Union Station)	High density; mixed-use, grid-based primary downtown in major metropolitan area	• High parking cost • Taxi	• Future HSR service • Amtrak long-distance service • Amtrak corridor service • Amtrak Thruway bus • Commuter rail • Rail transit • Local transit • Shuttles (e.g., hotels)
Regional Significance			
"Developed Urban Area" • Millbrae • Palo Alto • Mountain View • Burbank – Bob Hope Airport	Middle density; mixed-use, grid-based secondary downtown in major metropolitan area	• Moderate parking cost • Taxi	• Amtrak long-distance service • Amtrak corridor service • Amtrak Thruway bus • Commuter rail • Rail transit • Local transit • Shuttles
"Minor Downtown or Activity Center" • Gilroy • San Luis Obispo • Santa Barbara • Oxnard • Chatsworth • Glendale	Middle to low density; grid-based downtown in low-density suburban area or outside major metropolitan area	• Moderate to low parking cost • Taxi	• Amtrak long-distance service • Amtrak corridor service • Amtrak Thruway bus • Commuter rail • Local transit • Shuttles • Future HSR at Gilroy
Local Significance			
"Outlying or Suburban Area with Moderate Transit Connectivity" • • Pajaro (1) • Castroville(1) • Salinas • Paso Robles • Grover Beach • Guadalupe • Ventura • Moorpark • Van Nuys	Low density; exurban or outlying	• Low parking cost / free parking	• Amtrak long-distance service • Amtrak corridor service • Amtrak Thruway bus • Commuter rail terminus • Local transit • Shuttles

Station Category	Density and Urban Form	Auto Access	Typical Intermodal Access Modes
"Outlying or Suburban Area with Limited Transit Connectivity" • Morgan Hill • Soledad(2) • King City(2) • Surf/Lompoc • Goleta • Carpinteria • Camarillo • Simi Valley	Low density; exurban or outlying	• Free parking	• Amtrak corridor service • Commuter rail • Local transit • Shuttles

Notes:
(2) Proposed new stations for the *Capitol Corridor* extension to Salinas
(3) Proposed new stations for *Coast Daylight*

- Statewide Significance. The "Urban Activity Center" station prototype has statewide significance. These stations are located in the high-density, mixed-use primary downtowns of major metropolitan areas. Auto access, while important, is not dominant and parking costs are high. All types of connecting passenger services are typically represented at these stations. Long-distance as well as corridor services stop at these stations, and by virtue of the fact that these stations are located in major cities, a broad range of regional and local transit services are also represented. Trains serve the station throughout the day, often at regular intervals. The number of daily passengers and trains warrants a broad spectrum of amenities, including staffed ticketing offices, restrooms, phones, and vendors. "Urban Activity Center" stations in the corridor include San Francisco (Fourth and King), San Jose, and Los Angeles Union Station.
- Regional Significance. Stations with regional significance may be "Developed Urban Area" prototypes if in an area of middle density in a major metropolitan area; or "Minor Downtown or Activity Center" prototypes if in a lower-density suburban area, or outside of a major metropolitan area. The areas around these stations feature middle to lower-density development in grid-based downtowns, with moderate to low parking costs. Stations with regional importance typically host both long-distance as well as corridor trains; within metropolitan regions they may have commuter rail or rail transit options. Several trains may serve the station throughout the day, but not necessarily at regular intervals. Regionally-significant stations may feature amenities such as staffed ticketing offices, restrooms, phones, and vendors, especially if outside the major metropolitan areas.
- "Developed Urban Area" stations in the corridor include Millbrae, Palo Alto, Mountain View, and Burbank-Bob Hope Airport. "Minor Downtown or Activity Center" stations in the corridor include Gilroy, San Luis Obispo, Santa Barbara, Oxnard, Chatsworth, and Glendale.
- Local significance. Stations with local significance are "Outlying or Suburban Area" prototypes, with moderate or limited transit connectivity. A station with moderate transit connectivity is a connection point for Amtrak Thruway buses or a commuter rail terminus. A station with limited transit connectivity is served primarily by local buses; if also served by commuter rail, such stations are intermediate stops and are not primary transfer points. The areas around these stations are outlying or exurban in character, with a dominant focus on auto access and low cost or free parking. Stations with local significance typically will not serve long-distance trains, only

corridor trains. Locally-important stations within metropolitan regions may in some cases have commuter rail or rail transit options, but most will have only local bus service. Trains may be limited to only a few services in each direction throughout the day. Amenities are typically limited at locally-significant stations, and most are unstaffed.

“Outlying or Suburban Area” stations with moderate transit connectivity include Pajaro, Castroville, Salinas, Paso Robles, Grover Beach, Guadalupe, Ventura, Moorpark and Van Nuys. “ Outlying or Suburban Area” stations with limited transit connectivity include Morgan Hill, Surf/Lompoc, Goleta, Carpinteria, Camarillo, and Simi Valley. The new station facilities planned for Soledad and King City are expected to be of this prototype.

10.3 Intermodal Connectivity

10.3.1 Integration of Non-Program Operations and Services

Introducing new passenger rail service between Los Angeles and San Francisco would open up new travel markets in the intermediate regions, requiring integration with existing and future transportation modes. These other modes are crucial to the effectiveness of corridor rail service, and include Amtrak long-distance services, future HSR service, Amtrak Thruway buses, commuter rail (Metrolink and Caltrain), scheduled airline service (at San Francisco International Airport, San Jose International Airport, Santa Barbara Municipal Airport, and Burbank-Bob Hope Airport), and taxi/car rental services.

The particular mode or modes that would be used in combination with a corridor rail trip depends on trip purpose and length, among other factors. The available intermodal connections available at each station are presented in Table 10.3 at the end of the chapter.

The *Coast Starlight*, Amtrak’s long-distance service in the corridor, provides service to northern California, Oregon and Washington. Passengers originating at or destined to locally-significant stations not served by the *Coast Starlight* would transfer at common stations such as Salinas or San Jose.

Commuter rail, on the other hand, would provide a similar “feeder” role for the proposed corridor service. Passengers originating at or destined to stations where proposed corridor service would not stop, such as Redwood City Caltrain station or Northridge Metrolink station, would transfer at a common station such as Palo Alto or Simi Valley.

Similarly, Amtrak Thruway buses would extend origin and destinations to off-corridor points such as Monterey, Kettleman City, Solvang, and Santa Paula, and connect to the San Joaquin rail service in the Central Valley. Transfers would be made at intermodal rail/Thruway bus stations such as Salinas, Paso Robles, Santa Barbara, and Ventura.

Future HSR service would connect at Gilroy and Los Angeles, providing a fast alternative for trips to off-corridor points in the Central Valley. The Gilroy transfer point would also provide the opportunity for faster trips between the Salinas Valley and Southern California via HSR.

Implementation of corridor service will also create connections to origins and destinations outside of the state, by virtue of airport connections at Burbank, Santa Barbara, San Jose and Millbrae. The terminal of Burbank Bob Hope Airport is a short walk or shuttle ride from the corridor station of the same name, and offers flights to major cities of the Intermountain West and along the West Coast. San Francisco International Airport is a short ride via BART service from Millbrae station, and offers flights to dozens of national and international destinations. Santa Barbara station can also be reached by a taxi ride from Goleta station, and Caltrain and a shuttle connect between San Jose’s station and its airport.

To facilitate access between other off-corridor points, taxi service is available at most stations and many are also in proximity of rental car agencies, as indicated in Table 10.3.

Local rail transit, as operated by BART and San Francisco Municipal Railway, Valley Transportation Authority (SCVTA) in San Jose, and LA Metro, also provides intermodal connections in the major metropolitan areas of the corridor. In these areas and throughout the corridor, local bus systems, vans and shuttles round out local transit options. The particular services available at each station are presented in Table 10.3.

10.3.2 Intermodal Integration Measures

Intermodal integration consists of measures and improvements to coordinate the modes outlined in the previous section with corridor service and with each other. Intermodal connections are facilitated by two major types of considerations: operational characteristics and physical characteristics.

Operational Characteristics

Operational characteristics of stations contribute to their function and value as intermodal connections. Passenger connections are preferably “cross platform”, or at a minimum a common concourse connection, for direct rail to rail connections. Equally important as the physical layout of the station and platforms is the scheduling for the necessary connectivity, which is discussed as follows.

Schedule Coordination

Schedule coordination refers to efforts to minimize delay for passengers transferring between modes. Each service operates according to a schedule reflecting travel speed, stops and service frequency, which differ from service to service. In general, schedule coordination is organized by hierarchy of service; for example, faster trains serving intercity and regional destinations arrive last at a connectivity station and are the first to leave. Slower trains serving local destinations arrive first and wait for passengers to transfer from all of the faster/intercity trains that they are scheduled to meet.

The same principle applies for the local transportation system, whether consisting of light rail, buses, shuttles or vans. Local transit services would arrive early enough to transfer their passengers to the corridor rail service, and wait for the arriving passengers from these higher-speed systems to continue to their local destination.

Schedule coordination requires a high level of reliability and on-time performance. Existing rail services often do not operate at their full potential of speed and reliability, largely due to the shared infrastructure of the passenger/freight network. The improvements described in Chapter 14 are designed to address these issues, and will contribute to the opportunity to implement schedule coordination among services in the corridor.

Schedule coordination is most important when a connection is being made to a less frequent service, during off-peak periods, or to the last trip offered during the service day. Conversely, schedule coordination is relatively unimportant for major origin and destination stations that have very frequent service.

Three schedule coordination strategies can be implemented, depending on the services involved: pulse schedules, directional schedule coordination, and dependent linked schedules.

- Pulse Schedules. At a station with a pulse schedule, services converge at regular intervals at a hub and depart after a short interval during which transfers can be made. Pulse schedules would be implemented at rail stations that serve as hubs of Amtrak Thruway buses or local transit services. Lines would either terminate at these stations, or observe a period of several minutes to allow transfers to be completed.
- Directional Schedule Coordination. In this variation of a pulsed schedule, Thruway or local transit services operating forward in the peak direction of travel would “pulse” directly following train

arrivals. This type of schedule coordination has the advantage of not requiring the services involved to be held for each other, as in the case of pulse schedules. However, it affords convenient transfers only in one direction of travel – transferring passengers in the opposite direction of the coordinated schedule would face longer waits.

- Dependent Linked Schedules. Transfer times can be reduced to an absolute minimum with dependent linked schedules. When a train arrives, a Thruway bus or vehicle of another feeder service can be scheduled to be having a layover and can immediately receive transferring passengers. However, this requires high reliability on the part of both services, as delays on one line would affect service along the other line in the forward direction of travel.

Fare integration

Fare integration addresses the cost and inconvenience of paying a second fare when transferring between services Caltrans has implemented fare integration with its "Free Transit Transfer Program" and its cross ticketing "Rail 2 Rail Program". The Free Transit Transfer Program offers passengers of corridor services free transfer passes to the services of local transit authorities. The "Rail 2 Rail Program" allows Metrolink and Amtrak monthly ticket holders to have access to both systems' trains within the geographical extents of their tickets. Also, fares between Burbank-Bob Hope Airport and Los Angeles Union Station have been equalized, and tickets issued by the two operators are interchangeable along this segment of the corridor. These successful programs can be enhanced and improved in the Metrolink segment of the corridor, and have obvious transferability to the portion of the corridor shared with Caltrain.

Physical Characteristics

Just as operational characteristics contribute to a station's function and value as an intermodal connection, so do physical characteristics. They involve the station's location within the urban fabric of the communities it serves, as well as the functional layout of station facilities.

Station Configurations

Depending on their size and importance in the statewide network, as well as particular site characteristics and constraints, stations may have a broad range of configurations, with implications for intermodal connectivity.

The simplest station configuration is an at-grade platform alongside a single track. With a second passenger track, two side platforms or a central platform may be used. With additional tracks, combinations of center and side platforms may be employed. As long as tracks are at ground level, passengers may typically cross tracks at grade to reach the outer platform. Various design considerations can improve the safety of such crossings. With more than two platforms and/or greater levels of train traffic, underground or overhead concourses may be implemented to convey passengers to platforms, avoiding at-grade crossings. As space allows, ramps can be used to facilitate movement from ground level to the concourses and avoid the cost of escalators and elevators.

The simplest stations have only a shelter next to the platform, but many have a station building offering an indoor waiting environment and amenities as warranted by the level of station activity. The station building itself will typically be located on one side of the tracks, with intermodal connections facilitated within or through the facility.

Locally-significant stations, as defined in Section 10.2, will typically have a single platform serving both directions, while regionally-significant stations may have a second platform, one for each direction. Multiple-track stations with additional platforms, and above- or below-grade track crossings, are typically limited to stations of statewide importance.

Particularly where the services of different operators converge, the infrastructure may not have been designed with transferring passengers in mind. Thus, transfers may range from a cross-platform situation to those that require changes in level and a substantial walk between platforms and stops. The elderly and passengers with disabilities in particular may face considerable obstacles in transferring from one mode to another.

Regardless of station size or configuration, safety concerns must be addressed as intermodal integration measures are considered. At new stations, UPRR now requires “station tracks” (sidings for passenger trains at stations) along with outside platforms connected by pedestrian bridges. This avoids the situation of pedestrians crossing tracks, but at considerable cost. Where pedestrians are permitted to cross tracks, safety can be improved by a number of measures, such as gates that restrict pedestrian flows, devices that provide visual and acoustic warnings of approaching trains, and barriers arranged to slow pedestrians down and face them in the direction of oncoming trains. These measures are especially warranted where passengers may be rushing to make connections between trains and buses.

Key capital projects to improve the safety and capacity of corridor stations are presented in Table 10.3.

Table 10.3: Key Capital Projects for Intermodal Integration

Station	Project	Source
Pajaro/Watsonville	New station	“Commuter Rail Extension to Monterey County Project Update Memorandum”, Monterey County Planning Commission, June 27, 2011
Castroville	New station	“Commuter Rail Extension to Monterey County Project Update Memorandum”, Monterey County Planning Commission, June 27, 2011
Salinas	Station upgrade	*Amtrak 20-year Plan (2001)*
Soledad	New station	*Coast Daylight Implementation Plan*, June 2000, Coast Rail Coordinating Council
King City	New station	*Coast Daylight Implementation Plan*, June 2000, Coast Rail Coordinating Council
Oxnard	New northbound platform	*LOSSAN North Draft Programmatic EIR/EIS (Programmatic EIR/EIS) (2011)*
Los Angeles (Union Station)	Union Station Run-Through Tracks	*Programmatic EIR/EIS (2011)*

Station Access and Wayfinding

Connections between a station and the surrounding land uses are typically provided by the local street system. The grid-based street system of the original settlement area of many California cities and towns often coincides with station locations, and fosters a fine grain of connectivity and multiple routes of access. Stations in more suburban contexts that developed after widespread adoption of automobile travel may offer fewer routes and points of access. In either case, the railroad itself may act as a barrier, resulting in circuitous routes of access that may be particularly discouraging to pedestrian and bicycle access.

Pedestrian and bicycle access may be enhanced with new grade crossings or overcrossings and undercrossings, as appropriate to the surrounding context. Table 10.4 presents the “Bicycle Facilities” currently available at each station. Three classes of bicycle facilities are defined; Class I (bike path or bike trail separate from motorized traffic), Class II (designated bike lane on a roadway), and Class III (roadway signed or marked for bicycle travel but shared with motor vehicles). Some stations may warrant bicycle lockers, bike share services and other amenities for cyclists.

Consistent and clear signage and wayfinding systems should be integrated into the station property and buildings, orienting transferring passengers. While stations themselves may integrate multiple modes, and facilitate intermodal connections within a single building or property, some connections may depend on the local street system. In such cases, it is important that high standards of sidewalk and streetscape conditions are maintained, and that appropriate wayfinding elements guide passengers to and from the station as they transfer between modes.

As considerations are made for accommodating various modes of access, the following hierarchy should be observed, in order of increasing distance from the immediate station entrance or platform access:

- Passenger pick-up / drop-off and taxi stands and bicycle parking.
- Shuttle bus stops and car share parking.
- Fixed route bus stops and rental auto parking and facilities.
- Auto parking.

Amtrak Thruway bus or local transit access may be provided with a simple stop along the street outside a station, or facilitated with an off-street terminal with multiple bays for different buses, shuttle and van services. Such facilities provide an opportunity for vehicles to lay over at the end of their routes and to organize services for passenger convenience. This is particularly useful for Amtrak Thruway coaches, which require staging areas for luggage loading and unloading.

Auto access is facilitated with designated areas for passenger pick-up and drop-off and taxi stands, as well as parking and rental car facilities. Table 10.4 presents the “Taxi/Rental Car” opportunities currently available at each station. Appropriate signage along major routes, such as interstate and state highways, is important in guiding motorists to stations and to the various functional components of the station. In addition, the local road system may need to be reviewed to determine if station-area streets are adequate for station-related traffic, particularly in association with new service and service expansion.

Parking facilities serving a station may be publicly or privately operated; provided free or subject to hourly or daily fees; dedicated or shared with adjacent uses; and provided on surface lots or in structures. Parking availability may have a major influence in ridership, while parking provisions may limit the land use potential of the station area. Table 10.4 indicates the amount and distribution of parking at corridor stations.

Table 10.4: Station Access Summary

Station	Parking	Taxi/Rental Car	Transit Connections				Bicycle Facilities	Other Communities Served
			Local & Regional Rail	Local & Regional Bus	Amtrak Services	Airports		
San Francisco (4th and King)	None on-site; nearby public lots available	Taxi zone on Townsend Street, car rental within 1 mile	Commuter Rail (Caltrain), Light Rail (MUNI Metro)	Bus (MUNI)	Amtrak Thruway bus Route 99 (Emeryville – San Francisco)	N/A	180 lockers, 22 bike racks, Warm Planet Bikes Parking; bikeways on 2nd, 3rd, 4th, 5th, Townsend, Embarcadero	N/A
Millbrae	2,900 spaces	Taxi zone within parking lot, car rental via airport	Heavy Rail (BART), Commuter Rail (Caltrain)	Bus (SamTrans), Shuttles (Caltrain, Genentech)	N/A	BART to San Francisco International Airport	28 lockers, 28 bike racks; bikeways 1 mile from station area	San Bruno, Daly City, So. SF, Burlingame
Palo Alto	389 spaces	Taxi within parking lot, car rental adjacent to station	Commuter Rail (Caltrain)	Bus (SamTrans, SCVTA), Shuttles (Caltrain)	N/A	N/A	Shared access bike storage shed; substantial number of bikeways in station vicinity	Menlo Park, East Palo Alto, Mountain View, Sunnyvale
Mountain View	340 spaces	Taxis along west side of West Evelyn Ave btw Hope St and View St, additional taxis park along View St; car rental approx. 1 mi away along El Camino Real	Commuter Rail (Caltrain)	Bus (SCVTA), Shuttles (Caltrain)	N/A	N/A	116 lockers, 25 bike racks; Class II bikeways on West Evelyn Ave, Central Expy, Calderon Ave, and Shoreline Blvd; access to Stevens Creek Trail	Los Altos, Sunnyvale, Cupertino
San Jose	581 spaces	Taxi zone on Crandall Street, car rental within 0.5 miles	Commuter Rail (Caltrain, ACE), Light Rail (SCVTA)	Bus (SCVTA, MST), Shuttles(Caltrain, DASH)	*Coast Starlight*, *Capitol Corridor*; Amtrak Thruway bus Route 6 (Stockton – San Jose), Route 17 (Oakland – San Francisco – San Jose – Santa Barbara), Route 21 (Santa Barbara – San Jose)	Caltrain to Santa Clara Station and SCVTA Airport Flyer to San Jose International Airport	48 lockers, 18 bike racks; bikeways in station vicinity, access to Guadalupe River Trail	Santa Clara, Campbell, Cupertino, Milpitas
Morgan Hill	486 spaces	Taxi on call, car rental over 1 mile away	Commuter Rail (Caltrain)	Bus (SCVTA, MST)	N/A	N/A	Class II bikeways in the immediate vicinity of the station	N/A
Gilroy	471 spaces	Taxi on-call, car rental within 0.5 miles	Commuter Rail (Caltrain)	Bus (SCVTA, MST, San Benito County Express, Greyhound)	At Bus Station: Amtrak Thruway bus Route 21 (Santa Barbara – San Jose)	N/A	Class III bikeways in the immediate vicinity of the station	Hollister
Pajaro/Watsonville	N/A	N/A	N/A	Bus (MST); Bus at Watsonville Transit Center (SCMTD, Greyhound)	N/A	N/A	Bikeways 1 mile from station area	Santa Cruz
Castroville	236 spaces to be provided	N/A	N/A	Bus (MST)	N/A	N/A	N/A	Prunedale
Salinas	31 short-term spaces, 13 long-term spaces	Taxi on-call, car rental 1 mile away	N/A	Bus (MST, Greyhound)	*Coast Starlight*; Amtrak Thruway bus Route 17 (Oakland – San Francisco – San Jose – Santa Barbara), Route 21 (Santa Barbara – San Jose), Route 36, Route 68 (Salinas – Carmel)	N/A	Bikeways within 1 mile of station area	Marina, Seaside, Monterey
Soledad	43 spaces	N/A	N/A	Bus (MST)	N/A	N/A	Class II bikeways in the immediate vicinity of the station	Gonzales
King City	N/A	Car rental 1 mile away	N/A	Bus (MST, Greyhound)	At Bus Station: Amtrak Thruway bus Route 17 (Oakland – San Francisco – San Jose – Santa Barbara), Route 21 (Santa Barbara – San Jose), Route 36	N/A	No bikeways	Greenfield
Paso Robles	10 short-term spaces, 10 long-	Taxi on-call, car rental within 0.5 miles	N/A	Bus (Paso Express, SLORTA, MST,	At Bus Station: Amtrak Thruway bus Route 17	N/A	Minimal bicycle facilities in the vicinity of the station	Templeton, Atascadero

Station	Parking	Taxi/Rental Car	Transit Connections				Bicycle Facilities	Other Communities Served
			Local & Regional Rail	Local & Regional Bus	Amtrak Services	Airports		
	term spaces			Greyhound)	(Oakland – San Francisco – San Jose – Santa Barbara), Route 21 (Santa Barbara – San Jose), Route 36			
San Luis Obispo	20 short-term spaces, 30 long-term spaces	Taxi on-call, car rental 1 mile away	N/A	Bus (SLO Transit, Greyhound)	*Coast Starlight*, *Pacific Surfliner*; Amtrak Thruway bus Route 17 (Oakland – San Francisco – San Jose – Santa Barbara), Route 18a (Santa Maria – Hanford), Route 21 (Santa Barbara – San Jose), Route 36	N/A	Direct access to Class I, II, and III facilities	Morro Bay, Baywood-Los Osos
Grover Beach	71 short-term spaces, 71 long-term spaces	Car rental within 0.5 miles	N/A	Bus (SCAT)	*Pacific Surfliner*; Amtrak Thruway bus Route 17 (Oakland – San Francisco – San Jose – Santa Barbara), Route 18a (Santa Maria – Hanford), Route 21 (Santa Barbara – San Jose), Route 36	N/A	Direct access to Class II facilities	Pismo Beach, Arroyo Grande
Guadalupe	28 spaces	N/A	N/A	On-Demand Bus Service (SMOOTH Inc.)	*Pacific Surfliner, bus stops at Santa Maria*	N/A	N/A	Nipomo
Surf	5 spaces	N/A	N/A	N/A	*Pacific Surfliner, bus stops at Lompoc*	N/A	N/A	Vandenberg AFB
Goleta	27 spaces	Taxi on-call, car rental 1 mile away	N/A	Bus (SBMTD)	*Pacific Surfliner, bus from Los Angeles to Goleta.*	Taxi to Santa Barbara Municipal Airport	Class II bikeways less than 1 mile from station	Isla Vista, Solvang, Santa Ynez
Santa Barbara	100 short-term spaces, 50 long-term spaces	Taxi within parking lot, car rental adjacent to station	N/A	Bus (SBMTD, Greyhound)	*Coast Starlight*, *Pacific Surfliner*; Amtrak Thruway bus Route 4 (Los Angeles – Santa Barbara), Route 17 (Oakland – San Francisco – San Jose – Santa Barbara), Route 21 (Santa Barbara – San Jose)	N/A	Direct access to Class II facilities	Montecito
Carpinteria	120 spaces	Taxi on-call, car rental 1 mile away	N/A	Bus (SBMTD)	*Pacific Surfliner*; Amtrak Thruway bus Route 10 (Bakersfield – Oxnard – Santa Barbara)	N/A	Direct access to Class II facility adjacent to station	N/A
Ventura	20 spaces	Taxi on-call, car rental within 0.5 miles	N/A	N/A	*Pacific Surfliner*; Amtrak Thruway bus Route 4 (Los Angeles – Santa Barbara), Route 17 (Oakland – San Francisco – San Jose – Santa Barbara)	N/A	Direct access to Class I facility adjacent to station	Ojai, Santa Paula
Oxnard	125 short-term spaces, 450 long-term spaces	Taxi within parking lot, car rental at airport (1.5 mi away)	Commuter Rail (Metrolink)	Bus (Gold Coast Transit, VISTA)	*Coast Starlight*, *Pacific Surfliner*; Amtrak Thruway bus Route 4 (Los Angeles – Santa Barbara), Route 10 (Bakersfield – Oxnard – Santa Barbara)	Amadeus Shuttle, Roadrunner Shuttle, Ventura County Airporter (to LAX)	N/A	N/A
Camarillo	10 spaces	Car rental 1 mile away	Commuter Rail (Metrolink)	N/A	*Pacific Surfliner, bus from Los Angeles to Goleta.*	Roadrunner Shuttle (to LAX)	N/A	N/A
Moorpark	200 spaces	Taxi on-call	Commuter Rail (Metrolink)	Bus (VISTA)	*Pacific Surfliner, bus from Los Angeles to Goleta.*	N/A	N/A	Thousand Oaks, Fillmore

Station	Parking	Taxi/Rental Car	Transit Connections				Bicycle Facilities	Other Communities Served
			Local & Regional Rail	Local & Regional Bus	Amtrak Services	Airports		
Simi Valley	80 spaces	Taxi on-call, car rental 1 mile away	Commuter Rail (Metrolink)	Bus (Simi Valley Transit)	*Coast Starlight*, *Pacific Surfliner*; Amtrak Thruway bus Route 4 (Los Angeles – Santa Barbara)	N/A	Bikeways within 1 mile of station area	N/A
Chatsworth	68 spaces	Car rental adjacent to station	Commuter Rail (Metrolink)	BRT (LA Metro), Bus (LA Metro)	*Pacific Surfliner*; Amtrak Thruway bus Route 4 (Los Angeles – Santa Barbara)	N/A	Bikeways within 1 mile of station area	Calabasas
Van Nuys	240 spaces	Car rental 2 miles away	Commuter Rail (Metrolink)	Bus (LA Metro, LADOT)	*Coast Starlight*, *Pacific Surfliner*; Amtrak Thruway bus Route 1c (Bakersfield – Van Nuys – Torrance), Route 4 (Los Angeles – Santa Barbara)	N/A	N/A	Encino
Burbank-Bob Hope Airport	50 spaces	Taxi within parking lot, car rental at airport adjacent to station	Commuter Rail (Metrolink)	Bus (LA Metro)	*Coast Starlight*, *Pacific Surfliner*; Amtrak Thruway bus Route 1c (Bakersfield – Van Nuys – Torrance)	Direct connection to Airport	Bikeways within 1 mile of station area	N/A
Glendale	242 short-term spaces, 100 long-term spaces	Car rental within 0.5 miles	Commuter Rail (Metrolink)	Bus (LA Metro, Glendale Beeline)	*Pacific Surfliner*; Amtrak Thruway bus Route 4 (Los Angeles – Santa Barbara)	N/A	N/A	Pasadena
Los Angeles (Union Station)	600 short-term spaces, 1,000 long-term spaces	Taxi within parking lot, car rental adjacent to station	Heavy Rail (LA Metro Red Line, Purple Line), Commuter Rail (Metrolink), Light Rail (LA Metro Gold Line, future Regional Connector)	BRT (LA Metro Silver Line, Silver Streak), Bus (LADOT, Foothill Transit, Santa Clarita Transit, Santa Monica Big Blue Bus, LA Metro, etc.)	*Coast Starlight*, *Pacific Surfliner*, *Southwest Chief, Sunset Limited, Texas Eagle*; Amtrak Thruway bus Route 1a (Bakersfield – San Diego), Route 1b (Bakersfield – Los Angeles – San Pedro), Route 4 (Los Angeles – Santa Barbara)	LAX Flyaway (LAWA)	Class II bikeways within 1 mile	N/A

10.4 Station Access

This section provides a detailed summary of station access at each station along the corridor. While all stations have pedestrian access and are accessible for disabled passengers, other modes of access to the existing and proposed stations are described, as presented in Table 10.4. For the proposed new stations, which will also be ADA-accessible, the description reflects the most recent planning activities.

San Francisco (Fourth and King)

The San Francisco Fourth and King Station is a staffed multimodal transit station that serves as the northern terminus for Caltrain's commuter line, with numerous amenities including a ticket office, ticket machines, restrooms, phones, and vendors. It provides connections to the MUNI bus and light rail systems in addition to Amtrak Thruway bus Route 99. There is no on-site parking available; however, there are numerous public lots available nearby as well as car rental options within one mile of the station. A taxi zone is located on Townsend Street adjacent to the station. Bicycle routes on Second Street, Third Street, Fourth Street, Fifth Street, Townsend Street, and the Embarcadero also serve the station, and the adjacent Warm Planet Bikes provides ample bicycle parking that includes 180 bike lockers and 22 bike racks.

Millbrae

This station is the main transit hub for transfers to and from San Francisco International Airport, accessible via a short BART ride. The station is served by Caltrain, and San Mateo County Transit District (SamTrans) provides local bus service.

Station parking offers 2,900 spaces, and a taxi zone is located on-site. Bikeways are located within one mile, and 28 bicycle lockers and 28 bicycle racks are offered at the station.

Palo Alto

This station provides multimodal access with transit connections between Caltrain, SamTrans and SCVTA buses, and Caltrain shuttles. Numerous bikeways are located within the station vicinity and a shared access bicycle storage facility is available on-site. A parking lot with 389 spaces and taxi zone facilitates auto access, as does a car rental area adjacent to the station.

Mountain View

This station provides multimodal connections with Caltrain service and SCVTA light rail and bus service. Bikeways are provided on several key streets surrounding the station, and bike racks and lockers are provided at the station. Vehicular access to the station is facilitated by an on-site surface parking lot with 340 spaces, complemented by a taxi and shuttle bus zone along West Evelyn Avenue adjacent to the station.

San Jose

San Jose Diridon Station provides 581 parking spaces, complimented by a taxi zone outside the station on San Fernando Street and car rental within one-half mile of the station. The Guadalupe River Trail as well as other smaller bikeways near the station facilitate bicycle access, and 48 lockers and 18 bike racks are provided at the station.

This station is a commuter rail hub, served by Caltrain and the Altamont Corridor Express (ACE), as well as *Capitol Corridor* service with connections to numerous Bay Area and northern California destinations and the *Coast Starlight* with connections to Oregon and Washington. Both light rail and bus transit is operated by SCVTA, and additional bus service is provided by Monterey-Salinas Transit (MST). Caltrain operates shuttles to the station, which is also served by the free Downtown Area Shuttle (DASH). SCVTA operates a free Airport Flyer shuttle between San Jose International Airport and Santa Clara Caltrain station, the next station in the northbound direction.

Morgan Hill

This station is served by Caltrain (limited to commute periods) and bus routes. Parking provisions amount to 486 spaces and taxi service is available on-call. The nearest car rental providers are located over one mile from the station. A limited number of Class II bikeways are within the immediate station vicinity.

Gilroy

This station includes a bus terminal that facilitates transit connections between Caltrain and a number of bus-based services, which are operated by SCVTA, MST, San Benito County Express, and Greyhound.

Parking provisions amount to 471 spaces and taxi service is available on-call. Car rental services are available within one-half mile of the station. Class III bikeways in the immediate vicinity of the station provide additional multi-modal access.

Pajaro

This is a new station facility at the UPRR Watsonville Junction, near the intersection of Salinas Road and Railroad Avenue, for the proposed *Capitol Corridor* extension to Salinas. Plans for the station include a bus and shuttle shelter to facilitate connections with services provided by MST, the Santa Cruz Metropolitan Transit District (SCMTD), Greyhound, and Amtrak Thruway buses. A parking lot with a total of 416 spaces is proposed in conjunction with the new station. No bicycle facilities are provided in the immediate vicinity of the proposed station site.

Castroville

This is also a new station for the proposed *Capitol Corridor extension to Salinas. T*he location of the proposed Castroville Station is still under consideration and intermodal connections have yet to be determined. A very limited sidewalk and bicycle network is currently available in the surrounding area of both potential site locations, but additional bicycle facilities, sidewalks, and circulation roadways are proposed in conjunction with the station. At both potential sites, approximately 236 parking spaces would be provided and bus connections with MST Routes 27 and 28 would be facilitated.

Salinas

The current station is served only by the *Coast Starlight*, but would be upgraded with the inception of the *Capitol Corridor* extension from San Jose. Five MST routes serve the station and the Salinas Transit Center, which is located two blocks south of the station. The Salinas Transit Center is served by an additional six MST routes, as well as Greyhound.

Four Amtrak Thruway buses, Route 55, 17, 68, and 21, provide connections to the *Capitol Corridor* and *Pacific Surfliner* routes, as well as intermediate destinations. The surrounding residential neighborhoods and central business district within one mile of the station feature an extensive system of sidewalks and bikeways.

Soledad

The City of Soledad has worked with the Coast Rail Coordinating Council to develop a plan for a new station in Soledad along Front Street at Main Street. An existing park-and-ride lot at this location provides 43 spaces. Additional access to this future station would be provided by MST bus routes and Class II bikeways within the immediate vicinity of the station.

King City

A new station in King City is proposed in conjunction with the initiation of the *Coast Daylight*, consisting of a platform with limited amenities. MST, Greyhound, and Amtrak Thruway buses, Route 68, 17, and 18 currently operate in the city and would be expected to adjust their routes to serve the new station. There is limited pedestrian access to the proposed site, with sidewalks generally provided along First Street but not along Railroad Avenue. Currently, no bicycle facilities are provided within the immediate vicinity of the proposed station site.

Paso Robles

Paso Robles is served by the *Coast Starlight.* Five transit providers offer bus service to this station: Paso Express, San Luis Obispo Regional Transit Authority (SLORTA), MST, Greyhound, and Amtrak Thruway bus Route 17,18A, 21, 36. Auto access is facilitated by 10 short-term and 10 long-term parking spaces, as well on-call taxi service and car rental opportunities within one-half mile of the station. Bicycle facilities are minimal in the area surrounding the station.

San Luis Obispo

The San Luis Obispo Station is served by the *Coast Starlight* and the *Pacific Surfliner*. The station provides a total of 50 parking spaces (20 short-term and 30 long-term) adjacent to the station, and on-call taxi service is offered. Car rental service is available approximately one mile from the station. Bus service is provided by San Luis Obispo Transit, Greyhound, and Amtrak Thruway bus Routes 17, 18A, 21, and 36. An extensive bicycle network consisting of Class I, II, and III facilities lies within the immediate vicinity of the station.

Grover Beach

The Grover Beach Station is served by the *Pacific Surfliner.* It is an unstaffed, platform-only station but provides 71 short-term and 71 long-term parking spaces, and car rental provider is located nearby. Access to Class II bicycle facilities is available from the station as well as transfers to South County Area Transit and Amtrak Thruway bus Routes 17, 18A, 21, and 36.

Guadalupe

Served by the *Pacific Surfliner,* access provisions to this station are limited to a 28-space parking lot and on-demand bus service provided by SMOOTH, Inc.

Lompoc Surf

Served by the *Pacific Surfliner,* access provisions to this station are limited to a five-space parking lot.

Goleta

Served by the *Pacific Surfliner,* this unstaffed, platform-only station is accessed by bus service provided by Santa Barbara Metropolitan Transit District (SBMTD) and a parking lot with 27 spaces. Taxi service is available on-call, and a car rental provider is located within one mile. Class II bikeways lead up to within one-mile of the station for bicycle access. The station is a short taxi ride from Santa Barbara Municipal Airport.

Santa Barbara

This station is served by the *Pacific Surfliner* and the *Coast Starlight*. Auto access at Santa Barbara Station is facilitated by a parking lot with 100 short-term parking spaces, 50 long-term parking spaces, as well as a taxi loading zone. Car rental services are located adjacent to the station. Transit connections are provided by SBMTD, Greyhound, and three Amtrak Thruway bus Route 4, 10, 17, 21. Additionally, the station has direct access to Class II bikeways.

Carpinteria

Served by the *Pacific Surfliner,* this platform-only station features a parking lot with 120 spaces. On-call taxi service is provided and car rental services are available approximately one mile from the station. Bus connections are provided by SBMTD and Amtrak Thruway Route 10. Class II bicycle facilities are located adjacent to the station.

Ventura

The Ventura Station is served by *Pacific Surfliner* and can be accessed by two Amtrak Thruway bus Route 10, as well as a Class I bicycle facility adjacent to the station. Auto access is facilitated by a 20-space parking lot, on-call taxis, and car rental services within one-half mile of the station.

Oxnard

This station is served by The Oxnard Station is served by the *Pacific Surfliner*, the *Coast Starlight*, Metrolink commuter rail, Gold Coast Transit, Ventura Intercity Service Transit Authority (VISTA), and Amtrak Thruway buses Route 4, 10, , as well as a shuttle to LAX. A taxi zone is located at the station, and rental cars are available approximately one and one-half miles away. Station parking with 125 short-term spaces and 450 long-term spaces is provided.

Camarillo

This station is served by the *Pacific Surfliner*, Metrolink and bus lines operated by VISTA, as well as a Roadrunner Shuttle providing direct service to LAX. Parking provisions are limited to a ten-space lot, and car rentals are available approximately one mile from the station.

Moorpark

The Moorpark Station is served by the *Pacific Surfliner*, Metrolink and a VISTA route, and offers a 200-space park-and-ride lot. No bicycle network is provided within the immediate vicinity.

Simi Valley

This station is served by the *Pacific Surfliner* and the *Coast Starlight*. The Simi Valley Station is served by Metrolink and bus access is provided by Simi Valley Transit as well as Amtrak Thruway bus Route 4. Parking for 80 vehicles is provided, with taxi service available on-call and car rentals within one mile of the station. Bikeways are also located within a one-mile radius of the station.

Chatsworth

This station is served by the *Pacific Surfliner* and Metrolink and can be accessed via LA Metro buses, including the LA Metro Orange Line Bus Rapid Transit (BRT), as well as Amtrak Thruway bus Route 4. A 68-space parking lot is provided at the station, along with adjacent car rental services. Bicycle access is facilitated by bikeways within one mile of the station.

Van Nuys

This station is served by the *Pacific Surfliner* and the *Coast Starlight*. The Van Nuys Station offers a staffed ticket office and baggage check and is also served by Metrolink. Auto access to the station is facilitated by a park-and-ride lot with 240 spaces, and car rentals are available approximately two miles away. Los Angeles Department of Transportation (LADOT) and LA Metro both operate bus service to the station, which includes frequent LA Metro Rapid service. Amtrak Thruway bus Routes 1C and 4 also connect to the station.

Burbank-Bob Hope Airport

This station is served by the *Pacific Surfliner* and the *Coast Starlight*. The Burbank-Bob Hope Airport Station facilitates multimodal connections to various modes of transportation, and is also served by Metrolink. The station and the airport terminal are within walking distance and shuttles are also provided. A 50-space lot provides dedicated parking for the station, and car rentals are available at the airport. The station is also served by LA Metro and Amtrak Thruway Route 1C buses. Bikeways are located within one mile of the station.

Glendale

The Glendale Station is served by the *Pacific Surfliner* and Metrolink. This station offers 242 short-term and 100 long-term parking spaces, and car rentals are also available within close proximity of the station. LA Metro, Glendale Beeline, and Amtrak Thruway buses also serve the station. There are no bicycle facilities within the immediate vicinity of the station.

Los Angeles Union Station

Union Station functions as Los Angeles' main intermodal hub and provides connections between auto, several rail lines, buses, shuttles, and Class II bikeways. Amtrak services include the *Pacific Surfliner*, *Southwest Chief, Coast Starlight, Texas Eagle,* and *Sunset Limited.* Metrolink operates a network of commuter rail lines centered on Union Station. The LA Metro Red and Purple (heavy rail subway) and Gold (light rail) Lines converge at this station, and will be augmented by the future Regional Connector, allowing through light rail service on the Blue and Expo Lines. A large bus terminal hosts Amtrak Thruway buses and services operated by LA Metro, LA, Foothill Transit, Santa Clarita Transit, Santa Monica Big Blue Bus, as well as a LAX Flyaway shuttle service providing direct service to LAX. Long- and short-term parking for 1,600 vehicles is also provided at the station.

11.0 Conceptual Engineering and Capital Programming

11.1 Rail Equipment and Infrastructure Improvements Identification

Improvements for the Coast Corridor were primarily identified based on projects described in the *Amtrak 20-year Plan (2001)*. Additional sources of proposed improvements were also consulted, including, but not limited to, the following:

- State and federal grant programs such as California's STIP or the federal HSIPR.
- Financially-constrained and unconstrained project lists contained in the RTP's of the respective MPOs, in this case the MTC, AMBAG and the SLOCOG
- *Caltrain Extension to Monterey County: Alternatives Analysis (2007)*.
- Input from local host and tenant railroads.

The majority of the improvements identified for the Coast Corridor include the following types of projects:

- Extension of existing sidings (or construction of new sidings).
- Realignment of tracks / curves.

In addition to these projects, other identified improvements include new stations (Soledad and King City); track and signal upgrades; construction of new main tracks (e.g., in the Cuesta Pass); and acquisition of new rolling stock.

11.2 Project Cost Estimates

11.2.1 Methodology and Assumptions

Planning-level project cost estimates for many of the identified improvement projects have already been developed in the *Amtrak 20-year Plan (2001)* and the other sources consulted in developing the list of proposed improvements. A systematic review of the projects indicated that these cost estimates were generally reasonable and acceptable for planning purposes, and contained sufficient detail to permit their use in the SDP. However, many of the cost estimates were developed in previous years and are no longer current. As a result, a cost escalation factor was applied to bring these specific estimates to Year 2012 dollars. The escalation factor was based upon the increase in the Engineering News Record Construction Cost Index (ENR Index) evaluated between the time of the prior estimate compared to current year (2012) values. The ENR Index reflects the cumulative effect of bumps and dips in the economy relative to engineered construction projects and as such is a reasonable basis to adjust cost. This methodology reflects actual cost experience for similar projects over the intervening period of time. New cost estimates were developed for project cost estimates that did not appear reasonable based on the information available regarding project scope. As additional project development activities are accomplished, and/or new information regarding project scope becomes available cost figures should be updated.

11.2.2 Cost Estimates and Documentation

As part of validating the cost estimates from the various sources, typical Year 2012 unit cost ranges were developed for common improvement projects. These unit cost ranges are summarized in Table 11.1.

Table 11.1: Typical Unit Cost Ranges for Improvement Projects

Project Type	**Unit Costs** (Year 2012 dollars)			
	Unit	**Low**	**Medium**	**High**
Siding extension and island CTC	track-foot	$1,300	$1,900	$2,500
Curve realignments	track-foot	$1,000	$2,500	$4,000

The planning level unit prices and project cost estimates for improvements included in this SDP are consistent with recent cost estimates received from BNSF and/or UPRR reflecting more advanced engineering and/or more current base price information. (The cost factors for the most typical improvement category – siding extensions/island CTC and double-tracking have been validated against current cost estimates reflecting higher levels of engineering (either preliminary engineering or final design) received from the railroads for work on California lines and the evaluation has determined that these factors will provide a substantial contingency to address current and/or near-term implementation.)

The development of "low", "medium", and "high" estimates of typical project costs allows for flexibility in the cost estimation process to account for project- or location-specific features which may suggest actual costs that are lower or higher than the medium (i.e., "average") cost for that type of project. For example, construction of retaining walls, bridges, or other civil/structural elements may result in higher total costs for some curve realignment projects such as Sargent–Aromas, Watsonville Wye, and Harlem–Metz. In these situations, the "high" estimate was used.

The resulting total costs for each of the identified improvements are summarized in Table 11.2.

Table 11.2: Total Cost for Improvement Projects

Project	**Cost** (Millions, Year 2012 dollars)	**Source(s)**
Near-Term (2012 to 2014)		
Coast Daylight Track and Signal Project (new track, siding extensions for extension of *Pacific Surfliner*)(1)	$25.90	STIP, Proposition 1B (Intercity Rail Improvement)
Mid-Term (2015 to 2020)		
Gilroy to San Luis Obispo track upgrades: CWR, tie replacement, ballasting, track surfacing, track structure realignment, rehabilitation of Salinas and Soledad sidings, turnout replacement.	$115.00	*Amtrak 20-year Plan (2001)*
Gilroy to San Luis Obispo signal upgrades: CTC extension (Gilroy to Soledad) and island CTC (San Lucas to Bradley)	$100.00	*Amtrak 20-year Plan (2001)*
Sargent to Aromas curve realignments	$175.00	*Amtrak 20-year Plan (2001)*
Watsonville Wye curve realignments	$16.00	*Amtrak 20-year Plan (2001)*
New Soledad Multi-modal Station	$4.00	AMBAG RTP (financially-constrained)

Project	**Cost** (Millions, Year 2012 dollars)	**Source(s)**
New King City Station	NA	*Amtrak 20-year Plan (2001)*
New San Lucas siding (mile post (MP) 168.2)	$11.00	*Amtrak 20-year Plan (2001)*
Extension of Bradley siding	$12.00	*Amtrak 20-year Plan (2001)*
Cuesta second main track	$165.00	*Amtrak 20-year Plan (2001)*
Rolling stock (two modern, tilt-capable trainsets)	$40.00	*Amtrak 20-year Plan (2001)*
Rolling stock (two modern trainsets with locomotives)	$40.00	*Amtrak 20-year Plan (2001)*
Grade crossing safety and mobility enhancements	$20.00	*Amtrak 20-year Plan (2001)*
Long-Term (2020 to 2040)		
Install powered switches at existing sidings (Corporal, Logan, Watsonville Junction, Castroville, North Salinas, Salinas, Gonzales, Soledad, San Ardo, McKay, and Santa Margarita)	NA	UPRR
Moss Landing curve realignments	$3.70	*Amtrak 20-year Plan (2001)*
Extension of Castroville siding	$9.00	*Amtrak 20-year Plan (2001)*
New Spence siding (MP 122.4)	$22.00	*Amtrak 20-year Plan (2001)*
Harlem to Metz track realignment	$40.00	*Amtrak 20-year Plan (2001)*
New Chalone Creek siding (MP 148.0)	$23.00	*Amtrak 20-year Plan (2001)*
Coburn curve realignment	$1.00	*Amtrak 20-year Plan (2001)*
Extension of King City siding	NA	*Amtrak 20-year Plan (2001)*
MP 165 track realignment	$28.00	*Amtrak 20-year Plan (2001)*
MP 172 track realignment	$2.00	*Amtrak 20-year Plan (2001)*
Getty to Bradley Curve Realignments	$36.00	*Amtrak 20-year Plan (2001)*
McKay to Wellsona curve realignments	$15.00	*Amtrak 20-year Plan (2001)*
New Wellsona siding (MP 206.6)	$21.00	*Amtrak 20-year Plan (2001)*
Wellsona to Paso Robles curve realignments	$94.00	*Amtrak 20-year Plan (2001)*
Extension of Templeton siding	$15.00	*Amtrak 20-year Plan (2001)*
Templeton to Henry curve realignments	$107.00	*Amtrak 20-year Plan (2001)*

Project	Cost (Millions, Year 2012 dollars)	Source(s)
Henry to Santa Margarita curve realignments	$45.00	*Amtrak 20-year Plan (2001)*

Notes:
(1) Some elements of the project scope may be duplicated by other projects listed here.
(2) Part of the *Capital Corridor* Extension to Salinas.
- "NA" indicates that the estimated cost information is not available.

In terms of capital costs related to rolling stock, Metrolink's recent order of 20 Tier 4-compliant EMD F125 locomotives for $129.4 million suggests a unit cost of approximately $6.5 million per locomotive, while the recent $352 million joint order between Caltrans and the Illinois Department of Transportation (representing the states of Illinois, Michigan, and Missouri) for 130 new bi-level passenger cars, built to Passenger Rail Investment and Improvement Act of 2008 (PRIIA) 305 Next-Generation Equipment Committee (NGEC) specifications, suggests a unit cost of approximately $2.7 million per passenger car.[xix,xx]

For Year 2020, the *Coast Daylight* schedule would comprise one round-trip, effectively operating as an extended *Pacific Surfliner* service north of San Luis Obispo. Currently, both of the *Pacific Surfliner* round-trips serving stations north of Goleta turn back at San Luis Obispo. As a result, to operate the *Coast Daylight* according to the proposed schedule, at least one additional trainset would be required. As the *Coast Daylight* would operate as an extended *Pacific Surfliner*, it is assumed that the consists would be identical to existing *Pacific Surfliner* trains, comprising one locomotive, one business class car, one café car, two to three coach cars, and one cab control car.

Based on the previously-discussed unit costs, the new trainset required to operate the proposed Year 2020 *Coast Daylight* schedule is expected to cost approximately $22.7 million.

For Year 2040, the proposed *Coast Daylight* schedule would comprise the one round-trip in the Year 2020 schedule, plus an additional overnight round-trip. As this additional round-trip would not coincide with any corresponding *Pacific Surfliner* trips arriving at or departing from San Luis Obispo, two additional trainsets would need to be purchased to operate the proposed Year 2040 *Coast Daylight* schedule.

In addition, the second *Coast Daylight* round-trip would be operated as an overnight service, and it is assumed that train consists would comprise one locomotive, three sleeper cars, one café car, one coach car, and one cab control car. Sleeper cars typically cost slightly more than other passenger cars, due to the need for additional interior furnishings including ventilation and plumbing. Assuming a 15 percent cost premium above typical passenger cars, the proposed Year 2040 *Coast Daylight* schedule is expected to require an additional $47.8 million for equipment beyond the proposed Year 2020 schedule.

11.3 Project Schedule and Prioritization

The *Amtrak 20-year Plan (2001)* provides some detail on the prioritization and recommended timeline of improvements to the Coast Corridor, classifying improvements into "immediate", "near-term", and "vision" projects. This prioritization scheme and timeline are partially reflected in the grouping of proposed improvements into the near-term (2012–2014), mid-term (2015–2020), and long-term (2020–2040) timeframes in Table 11.2, supplemented by information regarding the funding status (e.g., programmed or allocated, part of a financially-constrained or unconstrained RTP, etc.).

The only near term project identified is the *Coast Daylight* Track and Signal Project, which has been programmed to receive funding under STIP and Proposition 1B's Intercity Rail Improvement program.

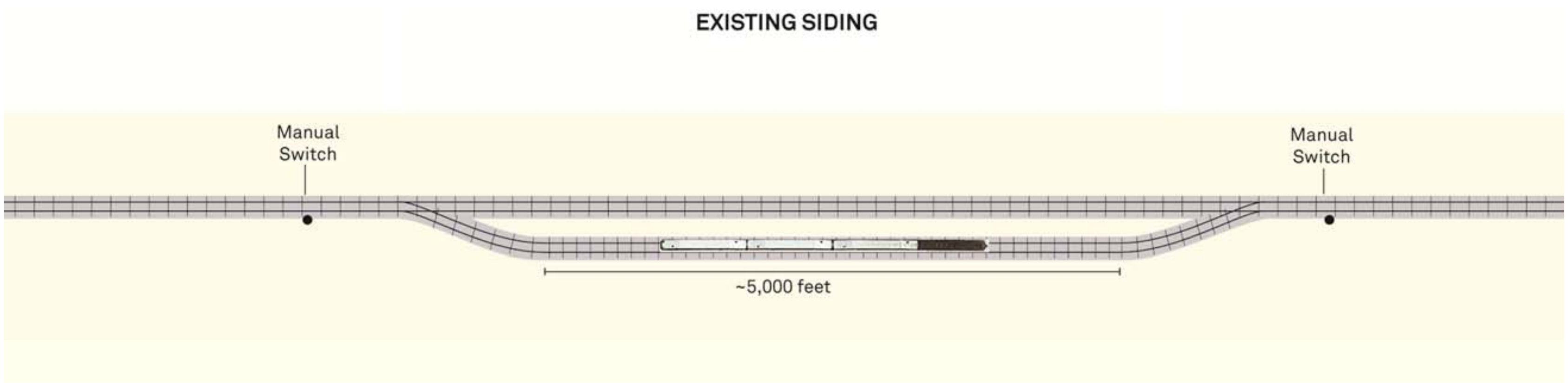
The remaining improvements are in either the mid-term or long term timeframes, with most in the conceptual stage and lacking any identified funding.

11.4 Conceptual Engineering Design Documentation

The *Amtrak 20-year Plan (2001)* and other sources provide details on most of the proposed improvements at a conceptual planning level. Those details are summarized below for common improvement types.

- Siding extension. Siding extensions generally involve increasing siding length to 10,000 feet to better accommodate passing movements (either between freight and passenger trains or between trains in opposing directions). Switches would be powered and the extended siding designed with Number 24 turnouts (40 miles per hour (mph) through switch) to streamline passing movements. All track and ties on the siding would be replaced as needed to maintain Class IV or V standards. A conceptual siding extension is illustrated in Exhibit 11.1.
- Curve realignment. Curve realignments would involve redesigning and reconstructing track curves to eliminate slowdowns and reduce travel times by permitting higher speeds. Track curves would either be removed completely or reduced to a two- or three-degree maximum curvature, increasing maximum train speeds to 79 mph (and possibly 90 mph in the future). Auxiliary measures such as ROW acquisition and construction of retaining walls or new structures may be required to facilitate the realignment. A conceptual curve realignment is illustrated in Exhibit 11.2.

Exhibit 11.1: Conceptual Siding Extension



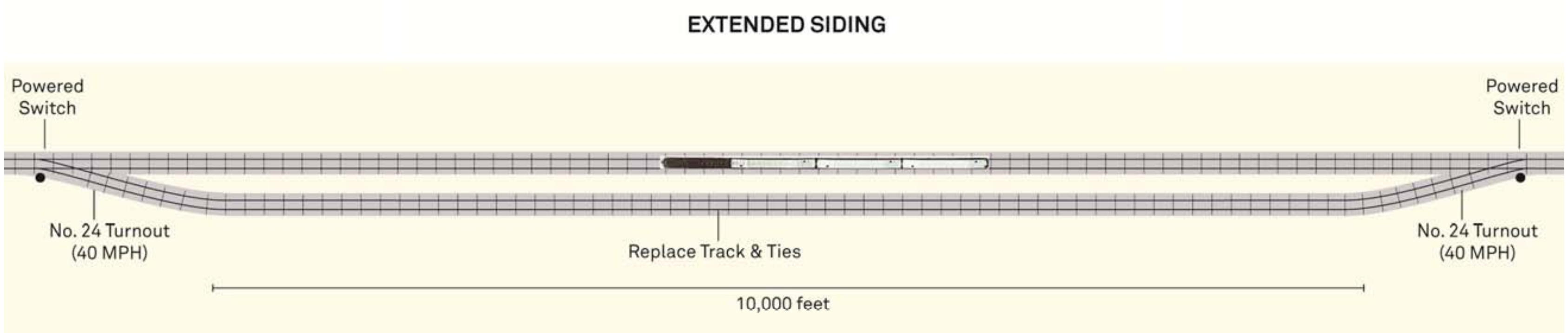
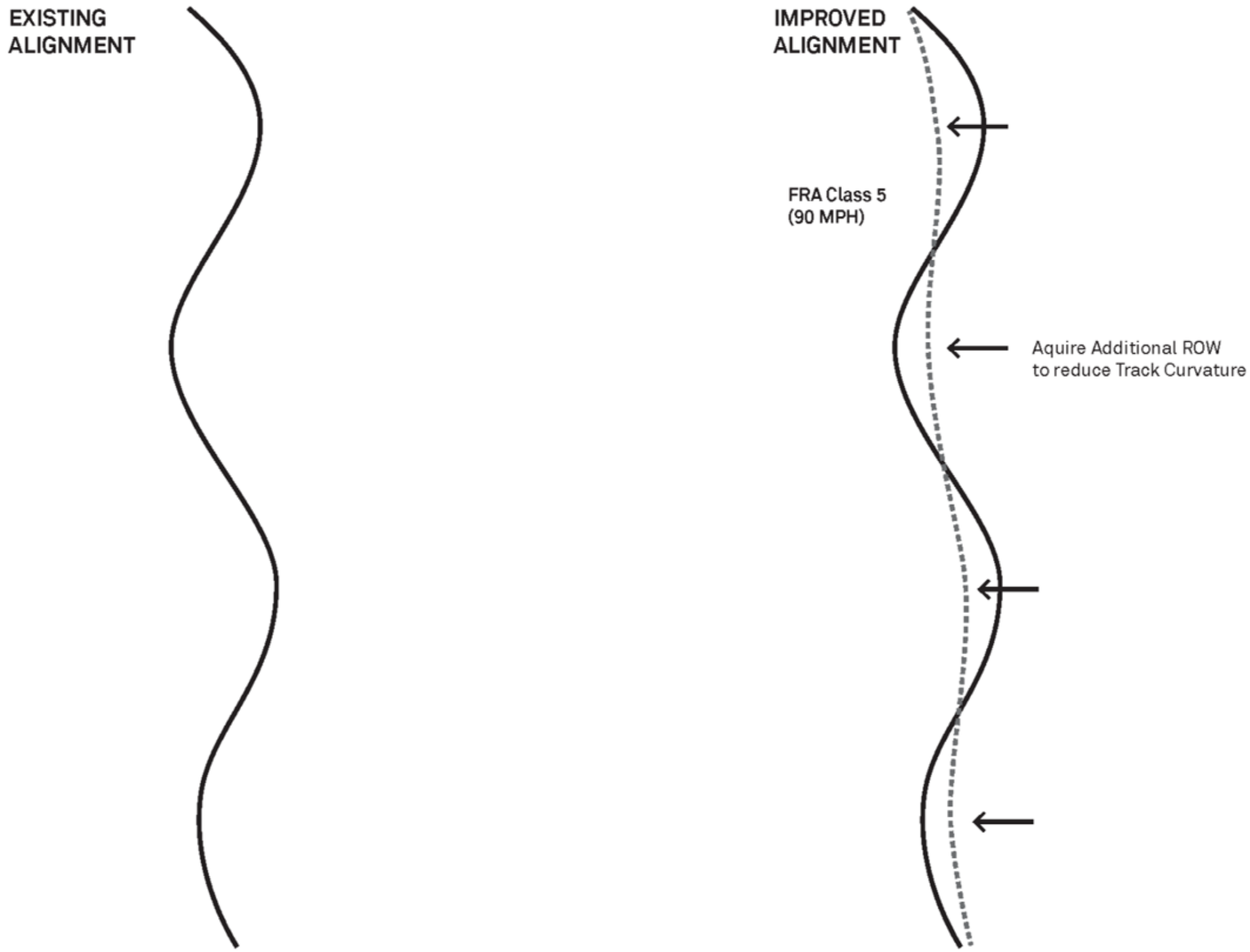


Exhibit 11.2: Conceptual Curve Realignment



12.0 Introduction

This chapter of the SDP presents operating and financial projections for each forecast year of the planned intercity passenger rail service in the Coast Corridor. The methods, assumptions and outputs for operating expenses for the train services are addressed. Documentation of key assumptions is included, along with a description of how unit costs and quantities are derived.

An estimate of the Profit and Loss Statement for the route is also presented, as well as details of capital replacement costs.

12.1 Costing Methodologies and Assumptions

The Operating and Maintenance cost estimates are developed by deriving the cost per train mile and applying this unit cost to the number of train miles operated by forecast year. The unit cost per train mile is calculated based on recent operating experience of the *Pacific Surfliner*, the route of which is common to approximately half of the planned Coast Corridor service.

The total operating expenses for the proposed train services include rail operations – maintenance of way, maintenance of equipment, transportation (train movement), station and on-board services – as well as administration and marketing costs. Expenses covering heavy overhaul of equipment are considered capital costs and are not included. The unit cost per train mile is the quotient of the total annual O&M expenses divided by the annual train miles. The expenses, which are presented in Table 12.1, are averaged over the past two state fiscal years (FY 2010-11 and 2011-12) to determine the unit cost of $67.30.

Table 12.1: Operational Expenses – *Pacific Surfliner* Route

	State Fiscal Year 2010-11	**State Fiscal Year 2011-12**
Rail Operations • Maintenance of Way • Maintenance of Equipment • Transportation (Train Movement) • Station • On-board Services	$98,826,221	$106,401,372
Administration	$1,500,000	$1,500,000
Marketing	$2,300,000	$2,300,000
Total Annual Operating and Maintenance Costs	*$102,626,221*	*$110,201,372*
Annual Train Miles	1,600,001	1,563,915
Unit Cost per Train Mile	$64.14	$70.47
Average Unit Cost per Train Mile	*$67.30*	

Source: "Statistical History 2004-2011 – *Pacific Surfliner, San Joaquin, Capitol Corridor*", Caltrans, 2012

The factors (or driving variables) influencing the operating cost are based on the physical characteristics of the lines supporting the service and the operating plan, which in turn is based on operational and capacity analysis and significant operations decisions. Such decisions include the location of crew bases and maintenance facilities, as well as basic schedule concepts, which are developed in a manner consistent with achieving efficient operations and favorable O&M costs.

12.2 Summary of Operating Costs

The total operating costs are developed for the forecast years in base year dollars, based on a unit cost per train mile of $67.30. Because Coast Corridor service is a proposed, and not an existing service, base year operating costs are not applicable. Daily roundtrips in the forecast years are the same for both weekdays and weekend days.

Total annual O&M costs for one daily Coast Corridor roundtrip in 2020 are estimated at about $12.2 million (base year dollars), which does not include the costs associated with the existing *Pacific Surfliner* North Corridor roundtrip between LAUS and San Luis Obispo that would be extended to San Francisco, converting it to a Coast Corridor roundtrip. With the addition of a second Coast Corridor roundtrip to San Francisco by 2040, annual O&M costs in the corridor would amount to nearly $24.4 million (base year dollars).

Table 12.2: Operating Costs by Service Year

Coast Corridor	Base Year (Existing)	Forecast Year 2020	Forecast Year 2040
Route Miles (one way)	NA	248	248
Daily Roundtrips	NA	1	2
Annual Train Miles	NA	181,040	362,080
Annual Operating and Maintenance Costs (Base Year Dollars)	*NA*	*$12,184,000*	*$24,368,000*

Source: *Coast Daylight* Operating Plans, AECOM, 2012

Notes:

- "NA" indicates not applicable
- Rout miles are from San Francisco to San Luis Obispo

12.3 Route Profit and Loss Statement

An estimate of the Profit and Loss Statement for the route is provided, based on revenue and operating cost forecasts.

Table 12.3: Estimated Profit and Loss

	Forecast Year 2020	Forecast Year 2040
Annual Ridership	124,000	274,000
Route Profit / Loss		
Ticket revenue (2012$)	$6,200,000	$14,400,000
O&M Costs	$12,184,000	$24,368,000
Subsidy Required	($5,984,000)	($9,968,000)
Subsidy per Rider	($48.26)	($36.38)

12.4 Capital Replacement Costs

Capital replacement or economic depreciation is the portion of the value of physical plant and equipment that is used up in the production of passenger train service. These additional capital costs beyond those incurred in the initial implementation of the Service Development Program are anticipated to be required due to economic depreciation, obsolescence and lifecycle replacement and other factors. This would include track renewal, bridge replacement or rehabilitation, station renovation or replacement, signal system upgrades and rolling stock rehabilitation and replacement. Capital replacement costs exceed routine maintenance and ordinary repairs, which are included in O&M costs categorized in Section 12.2 above.

Capital replacement is usually treated as a discretionary expense in any particular year. It may be deferred when funds are unavailable but ultimately must be allocated to maintain the infrastructure, plant and rolling stock so the operation remains safe and reliable over the long term. Many of these capital replacement expenditures are incurred and paid for by the host railroads or local communities.

Track renewal and bridge maintenance and replacement is paid for and scheduled by the host railroads. Trackage rights fees paid by Amtrak and Caltrans includes an apportioned cost allocated for capital replacement in addition to routine and ordinary maintenance of infrastructure. Station renovation and/or replacement costs are usually paid for by local communities often with funding support from Caltrans. However, rolling stock is a critical capital replacement cost item and a major annual budget consideration.

Funding for the rolling stock overhaul program varies by budget year based on the specific overhauls planned for that particular budget year. There are no longer funds available for the overhaul program which were appropriated each year by the Budget Act. Article XIX of the State Constitution. Thus, SHA funds cannot be used for the overhaul program, nor is there any dedicated funding source for the overhaul work needed in the future as the equipment ages.

As the *Coast Daylight* is a proposed service, new locomotives and passenger cars would need to be purchased to operate the service. Despite the fact that one of the daily round-trips in Year 2040 would be operated as an overnight service and require sleeper cars exclusively for the service, however, the *Coast Daylight* is generally expected to share rolling stock with the other State-supported Amtrak California routes. Both the shared fleet, as well as any new cars or locomotives purchased with implementation of the *Coast Daylight,* would require major overhaul and replacement. Some benchmark cost estimates based on railcar and locomotive overhaul and replacement programs for the existing Amtrak California fleet are included in the following subsections.

Railcar Overhaul and Replacement

California owns its own fleet of 88 railcars and 17 locomotives and has spent over $300 million on the design and acquisition of railcars and locomotives since the early 1990's. The Northern California fleet, which is used on both the *San Joaquin* and *Capitol Corridor*, is entirely State-owned. It includes 78 cars – 66 California Cars and 12 new *Pacific Surfliner* fleet cars, and 17 locomotives – 15 Electro Motive Division F59PHI and two General Electric Dash-8 units.

California acquired the original 66 bi-level "California Cars" between 1995 and 1997. The "California Car" fleet is comprised of four distinctive car types –- cab, trailer, coach and food service cars. In 2001, California purchased and placed into service an additional 22 cars. The cars were acquired as an option to Amtrak's 40 car *Pacific Surfliner* fleet order for Southern California. Twelve of the State-owned cars were assigned to Northern California operations, and ten cars were assigned to *Pacific Surfliner* operations. In 2012, 14 Comet I coaches were purchased from New Jersey Transit to be rebuilt for use on the *San Joaquin* Corridor. Passenger railcars have an economic useful life of approximately 30 years. On-going routine maintenance keeps the railcars reliable and attractive to customers.

Caltrans received $245 million in ARRA funds for equipment acquisition to replace some of the existing railcars and locomotives and to add capacity to the existing fleet. Caltrans and several Midwest states initiated a joint procurement of new railcars that will be compatible with existing equipment and recently awarded a contract to Sumitomo for railcars produced by Nippon Sharyo in Rochelle, Illinois. The equipment to be purchased will be designed and built using specifications approved by the Passenger Rail Investment and Improvement Act of 2008 (PRIIA) Section 305 Next-Generation Equipment Committee (NGEC). California will receive a total of 42 NGEC railcars. The railcars will include 29 allocated for capacity increases while the remaining 13 will be used to replace older or damaged equipment.

In 2003-04, Caltrans contracted for the midlife (eight-year) overhaul of the original 66 "California Cars." Design, engineering and the completion of the overhaul and testing of the four pilot (prototype) cars (cab, coach, foodservice and baggage) was completed in 2004-05, and midlife overhauls of the remainder of the fleet were completed in 2008.

However, additional work was still required to bring the cars up to current industry standards. Caltrans awarded a $13.1 million contract to Alstom for the complete replacement of the door systems and upgrade of the wheelchair lifts, as well as heavy cleaning of vehicle interior including upholstery and carpets; rebuilding and new flooring in toilet rooms; 110 volt convenience outlets at every seat; as well as other additions and improvements to the cars. In future years, the newer 22 cars (12 in the Northern California fleet and ten in the Southern California fleet) will need their midlife overhaul. Table 12.4 provides information on the overhaul program.

Table 12.4: Intercity Railcar Overhaul Program (Millions of dollars)

State Fiscal Year	**Projected Overhaul Funding Needs** (Million Dollars)
2011-12	$ 16.1
2012-13	$ 18.4
2013-14	$ 14.4
2014-15	$ 11.9
2015-16	$ 11.9
2016-17	$ 21.0
2017-18	$ 25.5
2018-19	$ 24.5
2019-20	$ 23.5

Source: Caltrans, Division of Rail

Locomotive Overhaul and Replacement

Caltrans purchased nine Electro Motive Division F59PHI locomotives that were delivered in 1994 and 1995. The locomotives have a maximum operating speed of 110 mph; include emission reduction technology and other features to improve operational and functional safety. Two additional General Electric Dash-8 locomotives were purchased from Amtrak in 1994. In 2001, Caltrans acquired an additional six model F59PHI locomotives. A locomotive has a projected economic life of approximately 20 years.

The current locomotive replacement schedule is being changed as a result of a major program currently underway to re-power the locomotives with new Tier 4 EPA standard head-end power (HEP) units, which supply electrical power to the train. Three locomotives have already had this upgrade. Caltrans currently has a contract to re-power five more locomotives beginning in February 2013. These repowering processes typically take approximately 6 weeks to complete at a cost of $260,000 per HEP unit. The schedule of specific locomotives to be retrofitted is still to be determined. This program is anticipated to give two more overhaul cycles to the equipment. Repowered locomotives will be overhauled again in eight years and then at year 16 will be replaced.

The joint procurement of locomotives with the Midwest states is proceeding. ARRA funds have been allocated to purchase six new NGEC locomotives capable of speeds up to 125 mph MAS. Procurement documents are being prepared and will likely be advertised in 2013.

13.0 Public Benefits and Impact Analysis

This chapter describes the public benefits and impacts associated with passenger and freight rail improvements for the *Coast Daylight* route. This analysis encompasses potential transportation, environmental, and economic effects for rail system users and non-users.

13.1 Operational and Transportation Output Benefits

The ridership and revenue forecasting process described in Chapter 8 provides a mechanism for calculating vehicle miles traveled (VMT), vehicle hours traveled (VHT), and travel mode changes as passenger rail service is expanded.

13.1.1 Travel Mode Changes

Passenger rail ridership increases arise from travelers diverting from air or personal vehicles or from taking entirely new trips (“induced travel”). These travel mode changes occur due to improved passenger rail travel times, reliability, and service frequencies that can be obtained with capital projects and service expansion. The ridership forecasting tools project that expanded service for the *Coast Daylight* route will reduce statewide personal vehicle travel by about 100,000 annual person trips in 2020 and 200,000 annual person trips in 2040. Statewide air trips are projected to decrease by 50,000 annual person trips in 2040.

13.1.2 Personal Vehicle Travel

The ridership forecasting tools were also used to project 2020 VMT and VHT changes by region, reflecting the illustrative service plan assumptions for the *Coast Daylight* route. The regions were defined as follows: Sacramento, Bay Area, San Joaquin Valley, Central Coast, Los Angeles, San Diego, and Rest of California.

The forecasts show a small daily VMT reduction in most regions, with the largest reductions occurring in the Central Coast region, followed by the Bay Area and Los Angeles regions. For the Central Coast, daily VMT is projected to fall by about 11,000 miles in 2020 and 26,000 miles in 2040. At the statewide level, daily VMT is projected to drop by about 23,000 miles in 2020 and 55,000 miles in 2040. (Both these decreases are a zero percent reduction at the statewide level.) The forecast shows a slight reduction in daily VHT (or hours spent driving) in several subregions with daily statewide VHT falling about 550 hours in 2020 and 1,300 hours in 2040. (Both these statewide decreases are a zero percent reduction at the statewide level.) Once again, the Central Coast has the largest reduction of the regions, dropping by 310 hours in 2020 and 710 hours in 2040.

13.1.3 Air Travel

Diversion of air trips to conventional and high-speed intercity passenger rail may lead to reduced aircraft operations for intra-California air travel. The most recent analysis, which was conducted for the 2008 *Bay Area to Central Valley High-Speed Train (HST) Program Environmental Impact Report/Environmental Impact Statement (EIR/EIS)* estimated that the full statewide high-speed rail (HSR) system (Phases I and II) could result in approximately 280,000 fewer annual commercial aircraft operations at California airports (a five percent reduction). This magnitude of aircraft operation reduction was projected to reduce air travel delay each year by about 13.9 million passenger hours.

13.2 User and Non-User Economic Benefits

Passenger and freight rail improvements will benefit the State in a number of ways, and many of these benefits are quantifiable. For example, improved passenger rail service directly benefits travelers who shift from autos to trains for travel within the State. As more people use rail, those who remain on California's highways enjoy the benefits of reduced congestion levels, saving themselves time on their trips. Finally, more passenger rail trips will also translate to lower air pollution emissions. These benefits are measurable by monetizing values generated from the ridership and revenue forecasting tools described in Chapter 8.

The benefits quantified in this analysis divide into "user benefit" and "non-user benefit" categories.

13.2.1 User Benefits Analysis and Results

User benefits accrue to individuals as they shift from airplanes or personal vehicle to passenger rail. These travelers place a monetary value on riding comfortable, reliable, and safe trains. Passengers also value the dependability provided by rail in almost all weather conditions, allowing travel even as flights are canceled and driving is treacherous. The user benefits for rail passengers are a reflection of these advantages.

User benefits in this analysis include intercity rail passengers who shift to rail for their trips, plus induced travel (i.e., new trips that would not have taken place otherwise if the rail improvements had not been made). The passenger rail user benefits reflect these advantages and are measured by consumer surplus, which is the difference between how much passengers are willing to pay and the actual train fare that is paid. User benefits were estimated through a process known as log-sum calculation,[xxi] which is derived from "values of time" and other mathematical equations in the ridership forecasting models.

Annual user benefits are projected to total $4.2 million (2012 dollars) for the illustrative year 2020 service plan assumptions, and $14.1 million for the year 2040 service plan assumptions. The 2020 user benefit total includes an $4.1 million benefit for intercity travelers and a $100,000 benefit for urban area travelers. The 2040 user benefit total includes a $13.9 million benefit for intercity travelers and a $200,000 benefit for urban area travelers.

13.2.2 Non-User Benefits Analysis and Results

Non-user benefits include highway delay reductions, safety improvements, and lower pollution emissions that result from a less intensive use of motor vehicles on California's roadways. These benefits are measured by monetizing the VMT and VHT changes shown in Table 13.1.

Vehicle Crash and Air Pollution Reduction Benefits

Expanded passenger rail service will reduce VMT and, by extension air pollution and crashes. For this analysis, VMT reductions were converted to monetary benefits using rates of 14.7 cents per mile for crash reduction[xxii] and 2.1 cents per mile for air pollution reduction[xxiii] (both are in 2012 dollars). The monetized accident and pollution reduction benefits are shown by region in Tables 13.3 and 13.4 for years 2020 and 2040, respectively.

Highway Delay Benefits

Traffic congestion is a perennial problem in California and it imposes costs on the State's people in the form of lost time. Hours not spent at work, with family, or other activities such as exercising or entertainment translate to economic and social losses for the State. Improved rail service will reduce traffic delays by diverting personal vehicle travel to intercity passenger rail.

For this analysis, VHT reductions were monetized using values of time (in 2012 dollars per hour) for intercity business and non-work trips of $72.36 and $20.97, respectively.[xxiv] Tables 13.3 and 13.4 summarize these results by subregion.

Table 13.1: Year 2020 Non-User Benefits by Subregion

Region	**Annual Benefits** (in millions in 2012 dollars)		
	Highway Crash Reduction	**Air Pollution Reduction**	**Highway Delay Reduction**
Sacramento Region	$-	$-	$-
Bay Area	$0.2	$0.0	$1.3
San Joaquin Valley	$0.2	$0.0	$0.9
Central Coast & Monterey Bay	$0.6	$0.1	$4.6
Greater Los Angeles Region	$0.2	$0.0	$1.2
San Diego	$0.1	$0.0	$0.2
Rest of California	$-	$-	$-
Statewide Total	*$1.2*	*$0.2*	*$8.1*

Table 13.2: Year 2040 Non-User Benefits by Subregion

Region	**Annual Benefits** (in millions in 2012 dollars)		
	Highway Crash Reduction	**Air Pollution Reduction**	**Highway Delay Reduction**
Sacramento Region	$-	$-	$-
Bay Area	$0.5	$0.1	$3.3
San Joaquin Valley	$0.4	$0.1	$2.5
Central Coast & Monterey Bay	$1.4	$0.2	$12.7
Greater Los Angeles Region	$0.6	$0.1	$4.1
San Diego	$0.1	$0.0	$0.3
Rest of California	$-	$-	$-
Statewide Total	*$2.9*	*$0.4*	*$22.9*

13.2.3 Summary of User and Non-User Benefits

Table 13.5 summarizes the total benefits of the expanded passenger rail service levels. The benefits are closely divided between the intercity passenger rail travelers and the personal vehicle operators who continue to use California's roadways.

While this analysis forecast major benefit components for California's economy, data and analysis methods were not readily available to capture all potential benefits. Some examples are as follows:

- Increased rail usage may reduce highway maintenance.
- Potential direct and indirect economic impacts of increased spending for rail capital investments, train operations, and maintenance.
- Reduced in-state air travel may lead to fewer in-state flights at California's congested airports. This situation might reduce delays for remaining flights or free up capacity for transcontinental and international flights.

- New highway-rail grade separations might reduce the projected number of train-vehicle crashes, further increasing the benefits shown in Tables 13.3 and 13.4.
- Improved rail operations might reduce fuel-related costs for freight and passenger rail operators.
- Potential economic development benefits from HSR that are expected to strengthen the competitiveness of California's industries, major metropolitan areas, and intermediate cities by more effectively connecting markets and encouraging business interactions that further stimulate growth.

Table 13.3: Summary of Annual User and Non-User Benefits

Benefits Summary	**2020**	**2040**
User Benefits		
Intercity Passenger	$4.1	$13.9
Urban Passenger	$0.1	$0.2
Non-User Benefits		
Accident Reduction	$1.2	$2.9
Pollution Reduction	$0.2	$0.4
Highway Delay Reduction	$8.1	$22.9
Total Benefits	*$13.7*	*$40.3*

Note:
Table values are in millions in year 2012 dollars.

13.3 Environmental Effects

This section describes the potential environmental effects of the proposed capital and service improvements for the *Coast Daylight* route.

13.3.1 Air Quality Emissions

Table 13.1 illustrates that *Coast Daylight* rail services are projected to reduce automobile and truck VMT throughout California. VMT reductions lead directly to reduced emissions of carbon dioxide (CO_2) and key mobile source pollutants.[(xxv)] Air quality emissions were forecast using the California Air Resources Board Emissions Factor (EMFAC) model[(xxvi)] coupled with the VMT forecasts.([xxvii]).

Tables 13.6 through 13.11 summarize the reduction in emissions due to reduced VMT for key pollutants by region within California. The column titled "'No Action' EMFAC Emissions" shows the baseline total statewide mobile source emissions by pollutant," assuming continuation (but no expansion) of current passenger rail routes and service levels. The "Emissions Reduction from Service Plan" column indicates each pollutant's projected emission reduction under the illustrative service plan assumptions. The emission reduction projections are organized by pollutant in the following tables:

- Table 13.6 shows the reduction in carbon dioxide (CO_2) emissions to quantify GHG emission reduction benefits.
- Table 13.7 and 13.8 show the reduction in reactive organic gases (ROG) and oxides of nitrogen (NO_x) respectively; these are precursor emissions that contribute to the formation of ground level ozone and secondary aerosols.
- Table 13.9 shows the reduction in carbon monoxide (CO) emissions.
- Table 13.10 shows the reduction in particulate matter between 2.5 and 10 microns (PM_{10}).

- Table 13.11 shows the reduction in particulate matter smaller than 2.5 microns ($PM_{2.5}$).

Table 13.4: Carbon Dioxide Emission Reduction

Region	2020		2040	
	Emission Reduction from Service Plan	"No Action" EMFAC Emissions	Emission Reduction from Service Plan	"No Action" EMFAC Emissions
Sacramento Region	-	7,286,000	-	8,274,000
Bay Area	600	30,941,000	1,200	33,194,000
San Joaquin Valley	600	25,218,000	1,500	34,123,000
Central Coast & Monterey Bay	1,800	6,069,000	3,900	6,507,000
Greater Los Angeles Region	600	81,412,000	1,600	94,233,000
San Diego	100	13,947,000	200	16,365,000
Rest of California	-	11,191,000	-	13,360,000
Statewide Total	*3,700*	*176,064,000*	*8,400*	*206,056,000*

Note:
Table values are in tons per year.

Table 13.5: Reactive Organic Gas Emission Reduction

Region	2020		2040	
	Emission Reduction from Service Plan	"No Action" EMFAC Emissions	Emission Reduction from Service Plan	"No Action" EMFAC Emissions
Sacramento Region	-	3,700	-	3,100
Bay Area	<1	19,000	<1	15,400
San Joaquin Valley	<1	11,000	<1	10,900
Central Coast & Monterey Bay	1	3,000	2	2,400
Greater Los Angeles Region	<1	39,000	<1	32,000
San Diego	<1	7,000	<1	6,500
Rest of California	-	7,100	-	5,300
Statewide Total	*2*	*90,800*	*3*	*75,600*

Note:
Table values are in tons per year.

Table 13.6. Oxides of Nitrogen Emission Reduction

Region	2020		2040	
	Emission Reduction from Service Plan	"No Action" EMFAC Emissions	Emission Reduction from Service Plan	"No Action" EMFAC Emissions
Sacramento Region	-	7,600	-	5,300
Bay Area	<1	34,800	1	23,000
San Joaquin Valley	<1	36,300	2	30,400
Central Coast & Monterey Bay	3	7,900	3	4,900
Greater Los Angeles Region	<1	93,100	1	69,300
San Diego	<1	13,900	<1	10,300
Rest of California	-	18,000	-	12,100
Statewide Total	*5*	*211,600*	*7*	*155,300*

Note:
Table values are in tons per year.

Table 13.7: Carbon Monoxide Emission Reduction

Region	2020		2040	
	Emission Reduction from Service Plan	"No Action" EMFAC Emissions	Emission Reduction from Service Plan	"No Action" EMFAC Emissions
Sacramento Region	-	33,800	-	26,100
Bay Area	3	151,300	4	109,800
San Joaquin Valley	2	93,300	4	84,700
Central Coast & Monterey Bay	9	31,600	13	20,800
Greater Los Angeles Region	3	347,500	4	271,500
San Diego	<1	63,100	<1	53,100
Rest of California	-	56,200	-	38,300
Statewide Total	*18*	*776,800*	*26*	*604,300*

Note:
Table values are in tons per year.

Table 13.8: Large Particle (PM_{10}) Emission Reduction

Region	2020		2040	
	Emission Reduction from Service Plan	"No Action" EMFAC Emissions	Emission Reduction from Service Plan	"No Action" EMFAC Emissions
Sacramento Region	-	1,100	-	1,300
Bay Area	<1	4,700	<1	5,400
San Joaquin Valley	<1	3,400	<1	4,800
Central Coast & Monterey Bay	<1	900	<1	1,000
Greater Los Angeles Region	<1	11,900	<1	14,600
San Diego	<1	2,000	<1	2,600
Rest of California	-	1,600	-	1,900
Statewide Total	*<1*	*25,600*	*1*	*31,700*

Note:
Table values are in tons per year

Table 13.9. Small Particle (PM2.5) Emission Reduction

Region	2020		2040	
	Emission Reduction from Service Plan	"No Action" EMFAC Emissions	Emission Reduction from Service Plan	"No Action" EMFAC Emissions
Sacramento Region	-	500	-	600
Bay Area	<1	2,100	<1	2,500
San Joaquin Valley	<1	1,700	<1	2,300
Central Coast & Monterey Bay	<1	410	<1	500
Greater Los Angeles Region	<1	5,500	<1	6,800
San Diego	<1	900	<1	1,200
Rest of California	-	700	-	900
Statewide Total	*<1*	*11,810*	*<1*	*14,800*

Note:
Table values are in tons per year.

13.3.2 Climate Change Assessment

In 2008, through the Governor's Executive Order S-13-08, Caltrans was charged with examining a preliminary assessment of the State's transportation system vulnerability to sea-level rise.[xxviii] Caltrans also developed guidance on incorporating sea-level rise in Project Initiation Documents in May 2011.[xxix]

In 2012, the National Research Council confirmed that tide gages show that global sea level has risen about 7 inches during the 20th century, and recent satellite data shows that the rate of sea-level rise is accelerating.[xxx] Scientists have continued to narrow predictions of climate change and scenarios that include sea-level rise, temperature rise, as well as the variability of precipitation. Both passenger and freight rail systems in California are susceptible to the impacts of a changing climate.

This section outlines the potential effects of changes in storm activity, sea levels, temperature, and precipitation patterns on the rail network, paying specific attention to coastal tracks and bridges. California is climactically diverse, with bioregions that span from the coastal marine to the Sonoran desert, and associated infrastructure are found statewide. Accordingly adaptation strategies may take on a very local approach.

Projected Climate Change Consequences and Possible Rail System Effects

Future projections of climate change for California have been synthesized by the 2009 California Climate Change Scenarios Assessment and the 2012 Reports on the Third Assessment from the California Climate Change Center, which examined changes in average temperatures, precipitation patterns, sea-level rise, and extreme events.[xxxi] In California, the physical impacts on railroads from these changes include inundation, landslides, flooding, high winds, intense waves, storm surge, accelerated coastal erosion, and change in construction material durability.[xxxii] The following sections provide a summary of the potential consequences of climate change and the affiliated impacts to the state rail system.

Temperature

Current emissions model scenarios all project hotter conditions by the end of the century, with business as usual projecting a 1°C increase by 2100. Temperature levels are expected to rise more quickly and be higher by the end of the century under higher emissions scenarios.

Rail tracks are laid on top of and within a range of land surfaces, including cleared pavement right-of-way (ROW), solid earth and a network of bridges and tunnels. Expected increases in temperature and temperature extremes may produce a range of new effects, including the following:

- More freeze-thaw conditions may occur, creating frost heaves and potholes on road and bridge surfaces and compromising rail beds.
- Longer periods of extreme heat can cause deformation of rail lines and derailments, or at a minimum, speed restrictions.[xxxiii] Buckled rails and heat kinks result from overheated rails that expand and cannot be contained by the material supporting the track.
- Higher heat can increase cost to cool equipment, and equipment may even have to be redesigned if inadequate for increased temperature. Many urban rail systems are controlled by a system of complex electrical train control and communications systems that are sensitive to overheating with substations, signal rooms, and electrical boxes designed with ventilation and air conditioning.[xxxiv]
- Increased extreme heat can also strain overhead catenary wires, cause overheating of vehicles, and lead to failed air conditioning systems within the vehicle itself.

An overall extension of extreme heat days can cause challenges for customer service and worker safety; passengers waiting on platforms in hot weather, or construction and maintenance crews working in cramped spaces in indoor vehicle maintenance facilities.

Precipitation

Projected changes in precipitation are less clear-cut than for temperature. The seasonal pattern of cool, wet winters and hot, dry summers, typical of a Mediterranean climate, is likely to continue. However, the amount of precipitation is likely to change; and, where and how much rain and snow fall differs with emission scenarios.

Expected changes in precipitation, both for averages as well as extremes, will produce a range of new impacts, including:

- The frequency, intensity, and duration of intense precipitation events contribute to design specifications for transportation infrastructure; and projected changes may necessitate design specification updates for rail beds and storm water drainage around rail tracks.[(xxxv)]
- More intense precipitation may cause flooding of coastal rail lines. Low-lying bridge and tunnel entrances for rail and rail transit will be more susceptible to flooding, and thousands of culverts could be undersized for flows. In urban rail systems, during heavy rain storms, the volume of water can exceed the capacity of street storm water drains and systems, leaving no capacity to accommodate water pumped out of subway tunnels.[(xxxvi)]
- Changing precipitation may result in erosion and subsidence of rail beds, causing interruption or disruption of rail traffic. As a result, commuter and freight trains could experience extensive delays due to damaged or inundated tracks.[(xxxvii)]
- The changing precipitation (for instance, changes from frozen to liquid precipitation) may change runoff patterns, increasing the risk of floods, landslides, slope failures, and consequent damage to rail beds, especially rural rail beds in the winter and spring months.

Sea-Level Rise

Sea levels have risen by about seven inches on the California coast in the past century.[(xxxviii)] Present sea-level rise projections suggest that global sea levels in the 21st century can be expected to be much higher. These projections are summarized in the State of California Sea-Level Rise Interim Guidance Document[(xxxix,xl)] and shown in Table 13.12.

Higher water levels may also increase coastal bluff erosion rates; change environmental characteristics that affect material durability (e.g., pH and chloride concentrations); lead to increased groundwater levels; and change sediment movement both along the shore and at estuaries and river mouths. These issues for existing and planned rail ROWs at the planning and project level will need to be addressed. Caltrans recently developed a project screening process to plan for the impact of different potential sea levels based on a facility's importance for statewide travel, community safety, and other factors.[(xli)]

Table 13.10: Sea-Level Rise Projections

Mean Sea-Level Rise (Meters)	Year to Reach Projected Sea-Level Rise in High (A2) Scenario	Year to Reach Projected Sea-Level Rise in Low (B1) Scenario
0.0	2000	2000
0.5	2054	2057
1.0	2083	2098
1.4	2100	2125

Source: OPC, 2011
Note:
(1) The State has agreed on two emissions scenarios (A2 and B1) from the Special Report on Emissions Scenarios from the Intergovernmental Panel on Climate Change (IPCC) representing a range of possible futures.(xlii)

Extreme Events

Gradual changes in average temperature, precipitation and sea level have been described. However, it is likely that the State will face a growing number of additional climate change-related extreme events, such as heat waves, wildfires, droughts, and floods.[(xliii)]

Region-Specific Impacts to the State Rail Network

The Central and South Coast will be susceptible to changes in temperature and precipitation, but the biggest threat will be sea-level rise on the coastal railways, including Amtrak *Coast Starlight* and the state-supported *Pacific Surfliner*. Numerous other local and regional rail lines, such as Los Angeles County Metro Rail, Metrolink, COASTER, and SPRINTER also span segments of the coastal areas at risk.

The South Coast is a particularly dense and urbanized region, and the rail system there is a critical asset for both passenger and goods movement. Sea-level rise and storm surges, along with weather-related landslides, could disrupt parallel, roadway transportation infrastructure, such as U.S. 101 and the Pacific Coast Highway, leaving railroads the potential alternative mode in the area. Railroads also supported the tourism industry in the Central and South Coast by bringing tourists to coastal attractions. With passenger rail lines contributing to the high-value tourist industry for the State, the economic effects are substantial.

Potential Adaptation Options for the California State Rail Network

Of the various climate stressors, sea-level rise and inland flooding pose the biggest climate impact to the California state rail network. Adaptation strategies should be coordinated with a wide range of stakeholders, including other state agencies (e.g., California Emergency Management Agency, California Natural Resources Agency); federal agencies (e.g., U.S. Army Corps of Engineers and regional and local partners metropolitan planning organizations, counties, and cities), potential strategies may include:

- Improving the drainage around rail stations and rail facilities, and increasing the capacity for storm water drainage.
- Retrofitting entrances to stations to minimize volume of floodwater that might inundate the station, and placing water-sensitive elements above a flood elevation.
- Elevating railroad tracks, rail beds, and/or station sites, but still maintaining adequate clearances.
- Conducting partial or temporary closures in extreme events, and providing alternative routes for goods movement.
- Constructing a permanent or temporary floodwall/barrier to manage tidal flows.
- Building levees and strengthening coastal armoring around key high-risk locations.
- Providing supportive hazard mitigation and emergency evacuation plans.
- In the most extreme cases, abandoning the asset or finding alternate routes for the coastal rail lines and at-risk stations under consideration.

13.3.3 Land Use and Community Benefits

Intercity passenger rail, commuter rail, and freight rail services are important components of California's transportation system, providing benefits to the State that extend beyond the mobility of people and goods. Safe and efficient rail systems contribute to community, land use, safety, and public health benefits. This section describes the community and greening benefits further by safe and efficient passenger and freight rail services enjoyed by rail users, as well as the greater public.

Proposed capital and operational improvements can be broken down into the following categories:

- Rail line improvements improve the speed, capacity, reliability, and safety of a railroad corridor. Rail line improvements may include double-tracking, siding improvements, curve realignments, and panelized turnouts to increase capacity and improve safety and travel times. Community and greening benefits resulting from rail line improvements include reduced braking and acceleration noise, reduced idling on sidings, and enhanced safety.

- Grade separations may be considered a subset of rail line improvements, but these improvements are so prevalent and such an important part of the rail improvement plan that they are noted separately. Grade separations improve the safety, speed, capacity, and reliability of rail service by eliminating dangerous at-grade crossings of rail and highway systems. More specifically, greening and community benefits of grade separation improvements include reduced braking and acceleration noise, less traffic disruption, reduced idling at crossing, enhanced safety, and removal of barriers and walls dividing the community.
- Bridges are planned along some corridors. Existing bridges require widening to accommodate expected passenger rail and freight rail activity, and new bridge construction is planned to accommodate proposed track extensions. Community and greening benefits resulting from these improvements include providing enhanced supporting wildlife corridors/crossings, providing agriculture access, and may reduce barriers dividing communities.
- New rail corridor construction and line extensions provide service to new areas. Examples include the Coachella Valley, and XpressWest corridors. Community and greening benefits resulting from rail line extensions include reduced emissions, encouraging non-motorized transportation modes, and land use benefits supporting vibrant transit-oriented development (TOD).
- Signal and train control improvements provide integrated command, control, communications, and information systems for controlling train movements with safety, security, precision, and efficiency. Community and greening benefits resulting from these improvements include reduced braking and acceleration noise, reduced idling on sidings, enhanced safety, and less traffic disruption.
- Rolling stock improvements include purchasing new railcars/locomotives, and upgrading existing railcars/locomotives. In addition to improving the passenger experience (e.g., amenities, ride comfort), new rolling stock can offer tangible travel time benefits – for example, trains with tilting capabilities can reduce or eliminate the need for trains to reduce speed on low-radius curves, allowing trains to maintain higher average speeds. Community and greening benefits resulting from these improvements include reduced braking and acceleration noise expanded system capacity, and emission reductions from cleaner locomotives.
- Electrification converts a railroad corridor to be fully powered by electricity. Community and greening benefits resulting from electrification include reduced pollution and noise, which may have the further effect of encouraging TOD along the rail line.
- Station and station access improvements may include providing new or improved station platforms; enhanced pedestrian and bike facilities; and customer amenities, such as additional parking, shuttle service to enhance access to the station, electronic signage with real-time arrival and departure information, and enhanced lighting. Community and greening benefits resulting from station improvements include enhanced safety, mitigation of issues related to noise and emissions from locomotives, land use benefits supporting vibrant TOD communities, and promotion of multimodal transportation options such as bicycling or pedestrian activity, which may help reduce obesity and improve broader measures of health throughout the community.
- Freight terminal improvements include new and expanded freight rail yards and intermodal facilities. Greening benefits of these projects include the mitigation of noise and pollution concerns and diversion of trucks from the highway system, as well as improved efficiency and safety.

The way these benefits accrue to users and non-users of the rail system differs somewhat by rail service type. The accrued benefits are described in more detail for passenger rail (both intercity and commuter) and the freight rail system in the following section.

Intercity and Commuter Passenger Rail

Passenger rail includes a complex system of intercity and commuter rail to connect cities across the State. Intercity passenger rail in California serves metropolitan and rural areas, and provides service between regions in the State. Commuter rail service is a key component of the State's integrated rail system serving local travel and providing regional connections to and from intercity Amtrak service. Safe and efficient intercity and commuter passenger rail services that are well-integrated with local transportation options can contribute to community and greening benefits to users and non-users of the system in regards to community livability, land use, safety, and public health.

As with the intercity passenger rail system, community and greening benefits of commuter rail service improvements may be valued differently for users and non-users of the system. Benefits that result from improvements to California's commuter rail system also extend beyond better transportation service provided to users of the system. Generally, the capital and operation improvements to the State's commuter rail systems have the potential to impact local road congestion; alternate transportation options (i.e., non-motorized transportation, transit, etc.); land use patterns; community livability; the environment; and public health.

For users, improved passenger rail service that operates more safely, comfortably, and efficiently will enhance personal mobility and offer travelers greater diversity of transportation options. Capital and operational improvements, such as grade separation projects, double-track projects, station improvements, and service frequency improvements, are examples of projects that will improve the attractiveness and viability of rail travel as the preferred mode for many intercity and commuter trips. Rail station improvements that enhance pedestrian and bike facilities and amenities and increase TOD around station areas will be important factors encouraging users to utilize active transportation modes to access stations. Users of passenger rail may enjoy economic benefits associated with a reduced travel cost compared to automobile ownership/travel. Providing more varied and affordable travel modes also mitigates transportation equity and environmental justice issues for users of the passenger rail system.

Passenger rail improvements may bring about community and greening benefits for non-users in several ways. Shifting the rail system to a cleaner energy source through projects like electrification will reduce greenhouse gas emissions and diesel-generated criteria air pollutants from system operations. Increasing the appeal of rail travel through grade separation projects, double-track projects, station improvements, and service frequency improvements will encourage people to shift from driving single-occupancy vehicles (SOV) to comparatively cleaner and safer rail travel. Non-users will also enjoy reduced congestion on roadways as drivers shift to train travel. That mode shift will translate to congestion relief for the non-users along parallel highway corridors. TODs supported by the commuter rail services facilitate concentrations of homes, shops, and jobs nearby rail stations. Thus, users and non-users may enjoy access to vibrant TOD communities with diverse and accessible recreational and employment opportunities. Benefits may also be enjoyed by non-users as more compact development presents more opportunities to integrate walking and biking for mobility purposes.

One of the most important roles that improved passenger rail service plays is that of supporting the development of livable communities. The *Vision California* scenario modeling project[(xliv)] undertaken by the State of California found significant economic, fiscal, health, water and environmental co-benefits from the State, regions, and localities choosing to grow through TOD and infill near existing and future local and intercity rail service. Households could save over $7,250 per year in auto costs and utility bills. Local governments could save more than $47 billion in infrastructure costs (water pipes, sewers, roads, and utility lines) while gaining over $120 billion in new revenue. Reduced health incidences would save approximately $1.9 billion a year by 2035. By 2050 water saving would total 19 million acre-feet. Over 3,700 square miles less farmland, open space, and recreation areas would be lost to development, and 75 million metric tons of less GHG would be created by 2050. These enormous indirect benefits from smarter growth and development choices would be above and beyond the direct user and non-user benefits discussed above.

Freight Rail

Freight rail operations in California help link the State to both domestic and international markets. The freight railroad system in California consists of an expansive network of Class I railroads, short line railroads, and switching yards/terminals stretching more than 5,000 miles across the State. Safe and efficient freight rail services that are well-integrated with the State's transportation system can contribute to community and greening benefits to users and non-users of the system in the areas of safety, job creation, noise reduction, the environment, and public health.

For planning analysis, benefits to users and non-users of the freight rail system will depend on the varying perspectives and freight knowledge of stakeholders and whether they are more focused on the impacts on track, the rolling stock, or the freight facilities, for example. For users of the freight rail system (i.e., shippers), service and infrastructure improvements that allow the system to operate more safely and efficiently will reduce freight transportation costs. Rail grade separation projects, double-track projects, and freight facility improvements are examples of projects that will improve the reliability and economic competitiveness of freight rail travel as a preferred mode for freight trips.

Freight rail improvements may also bring about community and greening benefits for non-users in several ways. For example, the GenSet technology (short for "Generator Set" or sets of engines turning a generator) replaces the large diesel engine and generator found in almost all existing freight locomotives with two or three much smaller diesel engines and generators providing fuel consumption reduction and improved air quality benefits. Shifting the rail system to a cleaner energy source through projects that expand the use of GenSet Locomotives at switching yards, implement idling limit devices, and eventually facilitate electrification will reduce GHG emissions and benefit public health in communities located near rail lines terminals. However, for the electrification of passenger and freight rail to occur, enough electricity must be available in the California power grid. Enhancing freight rail movement through grade separation projects will improve safety and reduce congestion and the associated emissions from vehicle idling, reduce conflicts between trains traffic within neighboring communities, and improve community connectivity by removing divisive at-grade tracks. Rail line improvements may reduce noise along freight corridors, and new freight intermodal terminals will create jobs.

14.0 Key Findings

This chapter presents the key findings of the SDP prepared for the Corridor. The purpose of the Corridor planning effort was to identify and evaluate possible rail improvements to relieve the growing capacity and congestion constraints on passenger and freight travel using the Corridor's rail infrastructure which is operating near its design capacity. The Corridor faces significant mobility challenges as continued growth in population, employment, and tourism activity is projected to generate increased travel demand straining the existing rail network. The Corridor needs infrastructure improvements to improve mobility, reliability, and safety in this part of the state's rail system by expanding service, decreasing trip times, and improving rail capacity in a cost-effective and environmentally sensitive manner.

Two alternatives were evaluated for the SDP: 1) the No-Build Alternative, which provides a baseline discussion of the continued operation of the existing Corridor system with no improvements beyond those identified in current programming and funding plans through 2040; and, 2) the Build Alternative, which proposes adding 1 round trip daily train between San Francisco and Los Angeles, with eventual expansion to 2 daily round trips. The Build Alternative included a list of improvement projects to support increased passenger service levels, as identified in previous planning studies. These projects were evaluated to determine their reasonableness and feasibility in addressing the identified Corridor purpose and need for action. As part of the evaluation process, operational system modeling was conducted as documented in Chapter 9. The operational analysis concluded that the Corridor's existing rail network, as represented by the No-Build Alternative, was not capable of accommodating the Corridor's future travel needs, and that some of the service and capital improvements identified in the Build Alternative were necessary to serve future travel needs.

The Build Alternative, and the improvement projects it provides, best meets the project goals and purpose and need. Implementation of this alternative would result in a faster, safer, and more reliable passenger and freight rail system. It would remove existing operational constraints and provide additional capacity in response to increased travel demand between Los Angeles and San Francisco. The viability of the proposed projects included in the Build Alternative was assessed based on the following criterion:

- Environmental impacts.
- Technical feasibility based on ROW and engineering constraints.
- Economic feasibility based on a comparison of capital and operating costs to anticipated levels of capital funding and the revenue generated by market potential and/or ridership.

The SDP analytical efforts identified that the proposed improvement projects listed in the Build Alternative would have minimal environmental impacts to local communities and natural resources while resulting in air quality benefits. The Build alternative is technically and economically feasible.

The Build Alternative would provide additional capacity to serve improved intercity rail service plans in the Corridor that would support regional and county goals and plans related to growth, smart growth, economic development, air quality and greenhouse gas emissions, sustainability, and provision of a balanced transportation system.

The Corridor improvements would provide additional capacity to serve forecast growth in a cost-effective manner. The improvements would have independent utility, are not dependent on the completion of other Corridor programs to be successful, and provide measurable benefits to intercity rail service. The projects planned to be completed by 2020 are consistent with expected funding resources, and would provide more frequent and reliable service that would be more attractive to potential riders, thereby increasing the service revenue potential.

14.1 Operational Initiative Priority

Future Coast Corridor service plans have been developed by the Coast Rail Coordinating Council building upon the prior *Coast Daylight Implementation Plan (June 2000)* and verified by the analysis included in this SDP. The resulting service increases are designed to address the forecasted rail system demand by adding daily trains operating between San Francisco and Los Angeles. The existing long-haul Amtrak *Coast Starlight* train would continue to operate in the Corridor. By 2020, an initial single daily round trip service would be provided by extending the operation of an existing *Pacific Surfliner* train from the current northern terminus at San Luis Obispo to San Francisco.

The new *Coast Daylight* train's terminal stations would be the existing San Francisco Fourth and King Caltrain Station in the north, and LAUS in the south, with 27 intermediate stops. Of the 29 proposed stations, 25 are existing Amtrak or Caltrain stations, and four are proposed new stations: Pajaro and Castroville which would be implemented as part of the *Capitol Corridor* extension to Salinas, and, Soledad and King City, which are part of the *Coast Daylight* project.

By 2040, an additional daily *Coast Daylight* round trip train would operate overnight between San Francisco and Los Angeles.

Operational priorities to support the planned increase in rail activity would include implementation of infrastructure improvements to improve rail system capacity and reliability that currently negatively impact intercity passenger and freight rail performance. These improvements are provided by the Build Alternative and are discussed below.

14.2 Capital Funding Project Priority

The Corridor's rail system infrastructure is currently operating near its design capacity, and the Build Alternative provides improvement projects that are required to accommodate the forecasted rail activity and improve mobility and reliability in this part of the state's rail system. Projects were identified from prior studies, including the *Amtrak 20-Year Improvement Plan (2001)*, the Programmatic EIR/EIS under preparation, UPRR recommendations, and studies prepared by Corridor MPOs. Reflecting system operational needs and projected funding availability, the identified Corridor improvement projects are organized into two phasing categories: 1) Near-Term and Mid-Term (2012 to 2020) and 2) Long-Term (2020 to 2040). Priority would be given to Corridor capital projects providing equipment, new stations, and increased capacity and reliability such as signal upgrades. Implementing CTC between Santa Margarita and McKay, a single tracked region with four siding locations, would significantly improve on time performance for both passenger and freight trains. As increased funding became available, travel time could be improved through more costly curve realignment projects.

Table 14.1 presents the near-term and long-term improvements that have been identified in previous studies and plans, and through the operational system modeling done for this SDP. The operation modeling results indicate that both the near-term and long-term *Coast Daylight* service plans could be operated upon implementation of this relatively small set of capital improvements. Consistent with the corridor-level planning and SDP analysis, the level of detail for any of the proposed improvement projects is conceptual in nature. Subsequent project-specific engineering and environmental analysis would be performed to provide more detailed information on implementation costs and environmental impacts for the individual projects presented.

Table 14.1: Proposed Rail Improvement Projects

Project Description	**Source**	**County**	**Improve-ment Type**	**Estimated Project Cost** (Millions, Year 2000 Dollars)	**Funding and Status**
Near-Term (2012 - 2014) & Mid-Term (2015 - 2020)					
Implement CTC between McKay and Santa Margarita (MP 202.3 to 229.6)	(2), (3)	San Luis Obispo	Signal	n/a	Unfunded
Purchase one intercity trainset	(1)	n/a	Rolling stock	n/a	Unfunded
Construct new station in Soledad (MP 140)	(3), (4)	Monterey	Station	$4.0 (5)	Unfunded
Construct new station in King City (MP 161)	(1), (3)	Monterey	Station	-- (6)	Unfunded
Long-Term (2020 - 2040)					
Purchase two intercity trainsets	(1)	n/a	Rolling stock	n/a	Unfunded

Sources: *California Passenger Rail System – 20-Year Improvement Plan: A Summary Report*, Amtrak, March 2001; *Coast Daylight Service: Add Daily LA-San Francisco Train Pair (Replaces pair of LA-San Luis Obispo Surfliners)*, UPRR, January 2011 (presentation); *Potential Coast Corridor Improvements for Environmental Review 07172012*, Circlepoint (Microsoft Word document); Personal communication with Pete Rodgers, SLOCOG; *Monterey Bay Area Mobility 2035*, AMBAG, June 2010

Notes:

(1) Project sourced from *California Passenger Rail System – 20-Year Improvement Plan: A Summary Report*.

(2) Project sourced from *Coast Daylight* Service: Add Daily LA-San Francisco Train Pair (Replaces pair of LA-San Luis Obispo *Surfliners*). January 2011.

(3) Project sourced from Potential Coast Corridor Improvements for Environmental Review 07172012.

(4) Project sourced from personal communication with Peter Rodgers, SLOCOG.

(5) AMBAG RTP (financially constrained)

(6) Cost for three station projects (Pajaro, Salinas, and King City) is $7.3 million (2000) per *California Passenger Rail System – 20-Year Improvement Plan: A Summary Report.*

End Notes

(i) It should be noted that the SDP does not analyze capacity improvements between Control Point (CP) Lick (in San Jose) and San Francisco. These improvements are being analyzed separately by on-going Caltrain and UPRR operations modeling efforts.

(ii) Northern California Unified Service is the restructuring and integration of San Joaquin Corridor, ACE, and Capitol Corridor operations to provide connections between Sacramento, Oakland and San Jose and the HSR tracks in the San Joaquin Valley.

(iii) e.g., SLOCOG *2010 Regional Transportation Plan – Preliminary Sustainable Communities Strategy,* page 5-28.

(iv) e.g., TAMC *2010 Regional Transportation Plan,* page 3-131.

(v) *Coast Daylight Service: Add Daily LA-San Francisco Train Pair (Replaces pair of LA-San Luis Obispo Surfliners)*, UPRR, January 2011 (presentation);

(vi) Centralized Traffic Control is a railroad signaling system that allows a dispatcher in a remote location to operate switches and otherwise control the movement of trains.

(vii) Class 4 track is maintained to safely operate freight trains up to 60 mph and passenger trains up to 80 mph. This is the typical class for mainline track that hosts freight and passenger service. Factors influencing the classification of track include the condition of rail and rail joints, proper distance between rails (gauge), rail alignment, and the condition of crossties.

(viii) Island CTC is a short, isolated section of CTC in the vicinity of a siding. Island CTC is usually installed where there are long stretches of single-track between sidings. The intervening single-track does not have CTC.

(ix) Revenue-mile is the number of miles traveled by paying passengers. Revenue miles are calculated by multiplying the number of paying passengers by the distance traveled.

(x) See Chapter 8 for a description of the two models.

(xi) The two models assume very similar auto fuel operating costs. Amtrak/Caltrans model assumes a 16 cents per mile average derived from 2011 AAA auto operating cost estimates.

(xii) In travel demand modeling, logsum is a composite measure of utility – or benefit – that is derived by making a specific trip. Logsum is used in choice-based models to predict the likelihood of a traveler selecting a particular option (such as destination, mode or route) given a set of socioeconomic and accessibility conditions.

(xiii) The HSR R&R Model was chosen for this purpose over the Caltrans/Amtrak Model because the latter did not produce all-mode trip tables for future years. The HSR R&R Model was developed for the Authority purposes and was only calibrated to produce trip tables for years 2000 and 2030.

(xiv) Since future HSR service was not included in the service assumptions, the forecasts do not include induced ridership generated from potential HSR connections at San Jose or at Los Angeles.

(xv) Freight volumes for Year 2020 and Year 2040 were developed by Cambridge Systematics using current UPRR operating data projected based on economic indicators

(xvi) RailOPS is a rail simulation program developed by AECOM

(xvii) RTC is a rail simulation program developed by Berkeley Simulation Software, LLC

(xviii) Executive Order 13514 – Federal Leadership in Environmental, Energy, and Economic Performance

(xix) "Metrolink to buy newest, cleanest locomotives" (December 18, 2012) http://www.metrlinktrains.com/news/news_items/news_id/836.html. Accessed February 14, 2013.

(xx) "Multi-state partnership announces intent to award contract for next generation of American trains" (September 27, 2012), http://www.dot.ca.gov/hq/paffairs/news/pressrel/12pr121.htm. Accessed February 14, 2013.

[xxi] An explanation of the log-sum process and its application to this analysis is available in "Economic Growth Effects Analysis for the Bay Area to Central Valley Program-Level Environmental Impact Report and Tier 1 Environmental Impact Statement", Appendix A, California High-Speed Rail Authority, July 2007.

[xxii] Federal Highway Administration, *Highway Economic Requirements System*.

[xxiii] National Research Council, *Hidden Costs of Energy: Unpriced Consequences of Energy Production and Use*, Committee on Health, Environmental, and Other External Costs and Benefits of Energy Production and Consumption, 2009.

[xxiv] The values of time were adjusted to 2012 dollars and sourced from, "Information Requested in —Section 3.2 Validation and Documentation of the Independent Peer Review of the California High Speed Rail Ridership and Revenue Forecasting Process, 2005-10, Draft Report for Internal Review," Cambridge Systematics, February 7, 2011, available on California High Speed Rail Authority website.

[xxv] This analysis addressed reactive organic gases (ROG), oxides of nitrogen (NO_x), carbon monoxide (CO), large particles (PM_{10}), and small particles ($PM_{2.5}$).

[xxvi] The analysis used the EMFAC 2011 model.

[xxvii] 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: a) improved rail system efficiency through reduced locomotive idling and improved locomotive fuel economy; b) reduced aircraft operations from air to rail modal shifts; c) reduced vehicle acceleration and deceleration from highway bottleneck elimination; and d) shifting of freight from trucks to rail .Emission increases might arise from: a) additional locomotive operation due to expanded service levels; and b) passenger travel to/from intercity passenger rail stations.

[xxviii] Caltrans, *Vulnerability of Transportation Systems to Sea Level Rise: Preliminary Assessment*, submitted by Business, Transportation, and Housing Agency, February 2009.

[xxix]Caltrans, *Guidance on Incorporating Sea Level Rise for Use in the Planning and Development of Project Initiation Documents*, May 16, 2011.

[xxx] National Research Council. *Sea-Level Rise for the Coasts of California, Oregon and Washington: Past, Present, and Future*. National Academies Press, 2012.

[xxxi] Cayan, D., M. Tyree, M. Dettinger, H. Hidalgo, T. Das, E. Maurer, P. Peter Bromirski, N. Graham, and R. Flick, *Climate Change Scenarios and Sea Level Rise Estimates for the California 2008 Climate Change Scenarios Assessment*, PIER Research Report, CEC-500-2009-014, Sacramento, California: California Energy Commission. 2009 and Reports on the Third Assessment from the California Climate Change Center, http://www.climatechange.ca.gov/adaptation/third_assessment/.

[xxxii] Kahrl, F., and D. Roland-Holst, *Climate Change in California: Risk and Response*, University of California Press, 2012.

[xxxii] National Research Council of the National Academies (NRC), *Potential Impacts of Climate Change on U.S. Transportation*, Transportation Research Board Special Report 290, Washington, D.C., 2008.

[xxxiii] National Research Council of the National Academies (NRC), *Potential Impacts of Climate Change on U.S. Transportation*, Transportation Research Board Special Report 290, Washington, D.C., 2008

[xxxiv]Federal Transit Administration Office of Budget and Policy, *Flooded Bus Barns and Buckled Rails: Public Transportation and Climate Change Adaptation*, FTA Report No. 0001, August 2011.

[xxxv] National Research Council of the National Academies (NRC), *Potential Impacts of Climate Change on U.S. Transportation*, Transportation Research Board Special Report 290, Washington, D.C., 2008.

[xxxvi]Federal Transit Administration Office of Budget and Policy, *Flooded Bus Barns and Buckled Rails: Public Transportation and Climate Change Adaptation*, FTA Report No. 0001, August 2011.

(xxxvii) National Research Council of the National Academies (NRC), *Potential Impacts of Climate Change on U.S. Transportation*, Transportation Research Board Special Report 290, Washington, D.C., 2008.

(xxxviii) National Research Council. Sea-Level Rise for the Coasts of California, Oregon and Washington: Past, Present, and Future. National Academies Press, 2012.

(xxxix) Ocean Protection Council (OPC), *State of California Sea-Level Rise Interim Guidance Document*, Ocean Protection Council. 2011.

(xl) The recent sea-level rise publication from the NRC *titled Sea-Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future* (NRC 2012) revises some of the projections included in the OPC report and Caltrans guidance. Caltrans is working with other State agencies to determine specific sea-level rise values to incorporate into future planning and design documents. As new state guidance becomes available it will be important to incorporate that information into future planning assessments and update Caltrans guidance, as appropriate.

(xli) California Department of Transportation, Climate Change Working Group, Guidance on Incorporating Sea Level Rise, May 19, 2011.

(xlii) These are both scenarios evaluated by California for statewide climate assessments. Each scenario leads to a projection of possible emissions levels based on population growth rate, economic development, and other factors. Ultimately, the effect on climate change depends on the amount and the rate of accumulation of heat-trapping gases in the atmosphere that these scenarios suggest. Of the two options provided, the A2 scenario is the more realistic choice for decision-makers to use for climate adaptation planning. Generally, the B1 scenario might be most appropriately viewed as a version of a “best case” or “policy” scenario for emissions, while A2 is more of a status quo scenario incorporating incremental improvements. These two scenarios are represented above.

(xliii) Mastrandrea, M. D., C. Tebaldi, C. P. Snyder, S. H. Schneider, *Current and Future Impacts of Extreme Events in California*, PIER Research Report, CEC-500-2009-026-D, Sacramento, California: California Energy Commission, 2009.

(xliv) California High Speed Rail Authority and Strategic Growth Council funded project. http://www.visioncalifornia.org/

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