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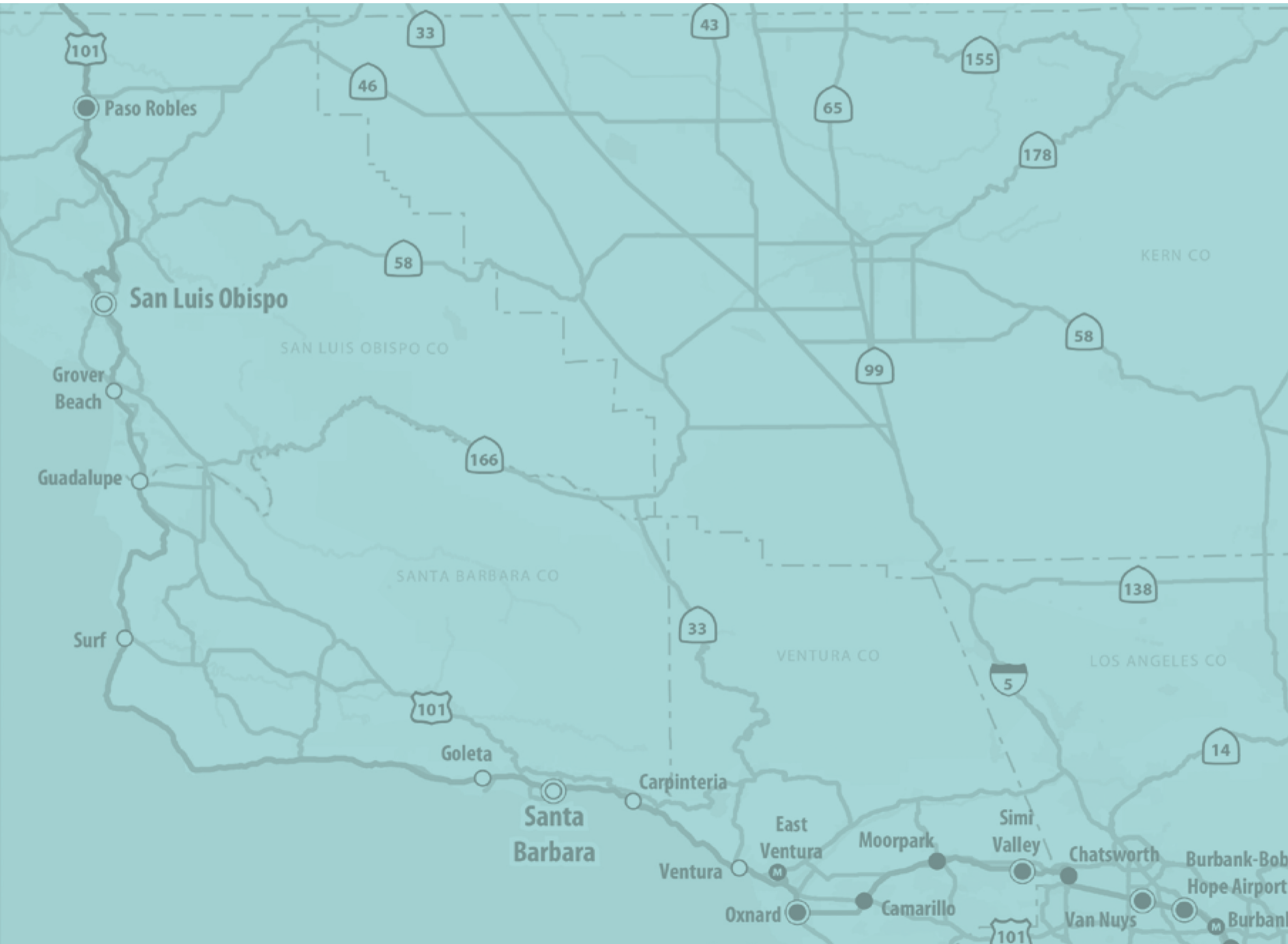

Pacific Surfliner North Corridor

SERVICE DEVELOPMENT PLAN

FINAL SUBMITTAL

May 2013

SERVICE DEVELOPMENT PLAN

Pacific Surfliner North Corridor

Prepared for

California Department of Transportation

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Contents

List of Tables

List of Exhibits

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List of Acronyms

ABS – Automatic Block System

ACE – Altamont Corridor Express

ADA – Americans with Disabilities Act

Amtrak – National Railroad Passenger Corporation

Amtrak/Caltrans Model – Amtrak/California Intercity Passenger Rail Forecasting Model

ARB – Air Resources Board

ARRA – American Recovery and Reinvestment Act of 2009

ATLC – Active Transportation and Livable Communities

Authority – California High-Speed Rail Authority

AVLISP – Antelope Valley Line Infrastructure Improvement Strategy

BRT – Bus Rapid Transit

BT&H – State of California Business, Transportation and Housing Agency

Build Alternative – Build/Improved Passenger Services Alternative

CAD – computer-aided design

CALCOG – California Association of Councils of Governments

Caltrain – Peninsula Corridor Joint Powers Board

Caltrans – California Department of Transportation

CCJPA – Capitol Corridor Joint Powers Authority

CEC – California Energy Commission

CIB – California Interregional Blueprint

COFC – container-on-flat-car

COGs – Councils of Governments

Corridor – Pacific Surfliner North Corridor

CP – Control Point

CRCC – Coast Rail Coordinating Council

CRIS – Caltrans Reporting Information System

CSLRA – California Shortline Rail Association

CSRP – California State Rail Plan

CTC – Centralized Traffic Control

CTI – commuter train interference

D.C. – District of Columbia

DOR – Division of Rail

EIR/EIS – Environmental Impact Report/Environmental Impact Statement

ENR Index – Engineering News Record Construction Cost Index

FAA – Federal Aviation Administration

FAF3 – Federal Highway Administration's Freight Analysis Framework

FAQ – frequently asked questions

FRA – Federal Railroad Administration

FTI – freight train interference

FTIP – Federal Transportation Improvement Program

FY – fiscal year

GenSet – Generator Set

GHG – greenhouse gas

GIS – Geographic Information Systems

GPS – Global Positioning System

HOV – high-occupancy vehicle

HEP – head-end power

HSIPR – High-Speed Intercity Passenger Rail

HSR – High-Speed Rail

HSR R&R Model – High-Speed Rail Ridership and Revenue Model

I-15 – Interstate 15

IRCP – Intercity Rail Capital Projects

JPA – Joint Powers Authority

LA Metro – Los Angeles County Metropolitan Transportation Authority

LADOT – Los Angeles Department of Transportation

LAUS – Los Angeles Union Station

LAX – Los Angeles International Airport

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

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

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

LRTPs – long range transportation plans

MAS – Maximum Allowable Speed

MOW – maintenance-of-way

MP – Mile Post

MPO – metropolitan planning organization

NAAC – Native American Advisory Committee

NAICS – North American Industry Classification System

NCTD – North County Transit District

NGEC – Next-Generation Equipment Committee

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

NO_2 – Nitrogen Dioxide

NOI – Notice of Intent

NOP – Notice of Preparation

O&M – operating and maintenance

OCTA – Orange County Transportation Authority

OTP – on-time performance

PIOs – Public Information Officers

PISOP – Public Involvement and Stakeholder Outreach Plan

PM_{10} – Respirable Particulate Matter

$PM_{2.5}$ – Fine Particulate Matter

PRIIA – Passenger Rail Investment and Improvement Act

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

RTPAs – Regional Transportation Planning Agencies

RTPs – Regional Transportation Plans

SACOG – Sacramento Area Council of Governments

SANDAG – San Diego Association of Governments

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

SCCRA – Southern California Regional Rail Authority

SCCRTC – Santa Cruz County Regional Transportation Commission

SCRIP – Southern California Regional Interconnector Project

SCRPWG – Southern California Rail Partners Working Group

SCS – Sustainable Communities Strategies

SCTG – Standard Classification of Transported Goods

SDMTS – San Diego Metropolitan Transit Systems

SDP – Service Development Plan

SGC – Strategic Growth Council

SHA – State Highway Account

SJCOG – San Joaquin Council of Governments

SJRRC – San Joaquin Regional Rail Committee

SJVRC – San Joaquin Valley Rail Committee

SLOCOG – San Luis Obispo Council of Governments

SPLC – Standard Point Location Code

SR – State Route

StanCOG – Stanislaus Council of Governments

STB – Surface Transportation Board

STCC – Standard Transportation Commodity Code

STIP – Statewide Transportation Improvement Program

TAC – Technical Advisory Committee

TAMC – Transportation Agency for Monterey County

TAZs – transportation analysis zones

TOD – Transit-Oriented Development

TOFC – trailer-on-flat-car

U.S. – United States

UPRR – Union Pacific Railroad

VCTC – Ventura County Transportation Commission

VISTA – Ventura Intercity Service Transit Authority

1.0 Introduction

The Service Development Plan (SDP) for the northern portion of the Pacific Surfliner Corridor (Corridor) describes the Corridor and existing services, identifies proposed service expansion and operational improvements, presents the rationale for such expanded and improved services, and identifies candidate rail infrastructure investments needed to support growth and deliver improved operations. The planning horizon for this document is through 2040. A summary of the SDP findings and recommendations can be found in Chapter 14.

The SDP documents the analysis of the service improvements for the preferred service improvement package by defining and analyzing the two service options based on an evaluation of rail capacity, land use, capital improvements and costs, environmental impacts, operation and maintenance (O&M) costs, and ridership and revenue forecasts. 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 Union Pacific Railroad (UPRR), Southern California Regional Rail Authority (SCRRA), California High-Speed Rail Authority (Authority), the Los Angeles–San Diego–San Luis Obispo (LOSSAN) Rail Corridor Agency, Southern California Association of Governments (SCAG), the Los Angeles County Metropolitan Transportation Authority (LA Metro), and the Coast Rail Coordinating Council (CRCC) which is a coalition of coastal county transportation planning agencies including the Ventura County Transportation Commission (VCTC), the Santa Barbara County Association of Governments (SBCAG), the San Luis Obispo Council of Governments (SLOCOG), the Santa Cruz County Regional Transportation Commission, and the Transportation Agency for Monterey County (TAMC).

This SDP reflects the proposed implementation of California High-Speed Rail (HSR) service, which would operate parallel to SCRRA's Antelope Valley Line to the Burbank Junction where it would join up with the Pacific Surfliner Corridor to run south to Los Angeles Union Station (LAUS). Access to the HSR system for Pacific Surfliner North passengers is currently planned to occur at LAUS. The SDP is consistent with planning by the Authority as documented in the *California High-Speed Rail Program Revised 2012 Business Plan* (*2012 Business Plan*). Construction of the section of the Initial Operating Segment (IOS) between Bakersfield and the San Fernando Valley in the Los Angeles Basin is scheduled for completion in 2022. The Phase 1 system plan will extend HSR service from San Francisco to Los Angeles by 2029 and to Anaheim in the future.

The *2012 Business Plan* identifies a blended system approach which refers to the integration of high-speed trains with existing intercity passenger and regional commuter rail systems by way of coordinating infrastructure investment, scheduling, ticketing, and other means. Under the blended system approach, passenger feeder service would be provided by intercity rail service from an interim San Fernando Valley terminus station along the SCRRA's Antelope Valley Line. This SDP does not include an analysis of the impacts of the *2012 Business Plan*. The impacts of the HSR plan on the Burbank Junction to LAUS portion of the Corridor are currently being studied through additional operations modeling studies being performed by the Authority which may influence service frequencies and specific capital investments in this portion of the Corridor. For that reason, this SDP does not identify intercity projects between Burbank Junction and LAUS, but defers definition of the necessary improvements until completion of the ongoing HSR analysis.

1.1 Background

The Pacific Surfliner Corridor, which runs from San Luis Obispo to San Diego, is the second-most heavily traveled passenger rail corridor in the United States (U.S.), behind only the Boston-Washington District of

Columbia (D.C.) Northeast Corridor. The 351-mile Pacific Surfliner Corridor carries approximately 2.8 million annual passengers on a variety of intercity rail services. The primary passenger markets are a mix of regional business travelers and intercity leisure travelers. A portion of the Pacific Surfliner Corridor (Burbank Junction–Los Angeles–Anaheim) also coincides with a proposed segment of the California HSR system.

The Pacific Surfliner Corridor consists of two primary segments, the northern segment (222 miles) from San Luis Obispo to Los Angeles, and the southern segment (129 miles) from Los Angeles to San Diego. This SDP addresses the San Luis Obispo to Los Angeles portion, identified as the Pacific Surfliner North Corridor in this study (refer to Exhibit 1.1), which operates through four counties: Los Angeles, Ventura, Santa Barbara, and San Luis Obispo.

Passenger rail services are operated in the northern portion of the Pacific Surfliner Corridor by Amtrak and SCRRA, more commonly known as Metrolink. Current services include:

- The *Coast Starlight*, operated by Amtrak between Seattle and Los Angeles.
- The *Pacific Surfliner*, operated by Amtrak between San Luis Obispo and Los Angeles. Funding of the service is shared by Caltrans and Amtrak, who jointly administer the Corridor service. Starting in 2013-14, all direct cost of the route will be funded and administered by Caltrans.
- Ventura County Line commuter service, operated by Metrolink between East Ventura (formerly Montalvo) and LAUS. The rail line is owned by the Los Angeles County Metropolitan Transportation Authority (LA Metro) and Ventura County Transportation Commission (VCTC) between LAUS and Moorpark in Ventura County, while the tracks north of Moorpark are owned by UPRR.
- Antelope Valley Line commuter service is operated by Metrolink between Lancaster and LAUS and owned by LA Metro. Between Lancaster and Downtown Burbank, UPRR has a freight operating permit.

Freight rail services are operated by UPRR, providing service that roughly parallels the U.S. 101 corridor between Oakland 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 18 trains per day in the San Fernando Valley to LAUS portion of the Corridor – and is considered to be a “secondary” or “relief” line to the much busier Central Valley line to the east. The line does not serve 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. The UPRR has made major improvements to the line in recent years, including track and Centralized Traffic Control (CTC) signal improvements in Santa Barbara County. Future improvements proposed by UPRR are included in the infrastructure projects presented in Chapter 4.

Freight rail operations in the Corridor provide service to Port Hueneme in Ventura County, the only deep-water port between the Ports of Long Beach/Los Angeles and Oakland. Port Hueneme has seen an increase in activity over the past several years. Freight cargo includes a mix of agricultural products (e.g. cattle, feed, and produce) and bulk commodity (e.g., gravel and rock). There is some activity related to the inbound/outbound disparity in goods traffic at the Ports of Long Beach and Los Angeles, which results in a surplus of empty containers. A ship must be fully unloaded before it can receive empty containers, and since Oakland is the last port of call before a ship returns to the Far East, the empty containers are transported north by rail from southern California.[i]

More than 80 percent of the Corridor service operates on a single-track basis. The tracks vary from double-track operations north from LAUS to the city of Moorpark in Ventura County, to primarily single-

Exhibit 1.1: Pacific Surfliner North Corridor

track operations north of Santa Barbara to San Luis Obispo. Sidings are limited in number and length, and at some locations, spurs, which are not connected to the main line track at both ends and therefore require passenger trains to pull off the main line track, wait, and then reverse onto the main line to proceed, are provided instead of sidings. In addition, curve realignments are required to increase speed and safety, and significant sections of single-track still use Automatic Block System (ABS) signal control and manual switches, requiring dispatch approval to proceed.

The environmental conditions in this Corridor range from the highly urbanized areas in Los Angeles to suburban communities and highly sensitive environmental spaces along the California coastline. North of the city of Ventura, a majority of the Corridor alignment operates along bluffs in a narrow coastal plain adjacent to the Pacific Ocean. As demonstrated by storms over the years, the bluffs are easily eroded by ocean and rainfall activity, a process which is likely to increase with continued sea level rise.

Passenger rail services through the Pacific Surfliner North Corridor are an integral element of regional and county plans to provide alternatives to reliance on private automobiles, to provide faster commuter service to key employment destinations, to increase network integration, and to maintain linkages to other destinations in California.

The Pacific Surfliner North Corridor has been the subject of numerous studies to understand, plan, and develop passenger services in order to provide an attractive alternative to highway travel. The most recent study – the *LOSSAN Corridorwide Strategic Implementation Plan* – was completed in 2012. Development of the plan's strategic recommendations was based on the following efforts:

- Evaluation of the policy and physical state of the Corridor.
- Assessment of operating conditions, including identification of capacity bottlenecks.
- Identification of funded or programmed capital investments.

Passenger rail activity growth over the last ten years has significantly impacted the Corridor's physical capabilities as well as the line dispatchers' abilities to route traffic safely and efficiently. The following Corridor service policies and programs have been identified for improving system capacity and safety:

- Positive Train Control (PTC). The FRA mandated the installation of PTC systems by December 2015 through passage of the Federal Rail Safety Improvement Act of 2008. PTC is intended to keep trains under their maximum speed limit and within the limits of authorization to be on a specific track. The nationwide deployment of PTC was prompted by a collision of UPRR freight and Metrolink passenger trains in this portion of the Pacific Surfliner Corridor. Demonstrating the importance of PTC, the single-track segment of the Corridor where the accident occurred has a practical daily train capacity of 50 trains, and is nearing capacity with more than 44 trains per day. In the Corridor, a Global Positioning System (GPS)-based PTC technology will be overlaid on the existing wayside signal system, and will be able to identify the positions of all trains on the line and automatically stop errant trains. Implementation of PTC will contribute to increased track capacity without the associated capital investment in track improvements. Funding for PTC has been documented in the Statewide Transportation Improvement Program (STIP) and included in the Federal High-Speed Intercity Passenger Rail (HSIPR) Program.
- Metrolink Sealed Corridor Initiative. The SCRRA is developing, designing, and implementing a comprehensive strategy to enhance the safety of trains, passengers, motorists, pedestrians, and neighboring land uses within and along the Ventura–Los Angeles county portions of the Pacific Surfliner Corridor north of LAUS. Currently, the open nature of the right-of-way (ROW) (many grade crossings and frequent pedestrian and vehicular trespassing) limits top operating speeds and reduces service reliability. The planned strategy incorporates safety measures to

systematically reduce the opportunity for accidents at grade crossings and other locations along this section of Metrolink service. Improvements may include: closure of some crossings and grade separations at others; and crossing-specific enhancements, such as four-quadrant gates, median separators, signal system improvements, new signs, and new pavement striping. In the future, the Sealed Corridor Initiative will be expanded south of LAUS to other Metrolink lines. North of Moorpark, Metrolink operates on ROW owned by UPRR, and the *SCRRA Strategic Assessment (2007)* recognizes the challenges in coming to an agreement with UPRR on the capital improvements that might be associated with the Sealed Corridor Initiative.[(ii)]

- Metrolink Maintenance-of-Way (MOW) Facility and Communications Improvements. SCCRA has funding and is developing plans for MOW facility and fiber optics/communications improvements within the Ventura–Los Angeles–Orange counties portion of the Pacific Surfliner Corridor.

This SDP represents a blueprint for meeting the Corridor's transportation demand by increasing travel options, service levels, system capacity, and service reliability, while enhancing the safety and accessibility of rail travel. Currently, intercity passenger service is heavily utilized, with some over-capacity trains at peak times. Passenger demand is forecast to further increase in the near term, and minor service improvements are planned. Longer term plans include the introduction of HSR services on the segment of the Corridor between Burbank Junction and LAUS, and provision of peak period commuter service between the cities of Santa Barbara and Ventura in order to mitigate constrained vehicular peak period travel. Expansion of passenger rail services through the Corridor are an integral element of regional plans to improve network integration and 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 Pacific Surfliner North SDP

As shown below, this SDP includes the following Chapters:

Chapter

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 Pacific Surfliner North SDP to Other Documents

1.2.1 SDP Support for State Rail Plan

The SDP includes planning analyses which formed the basis for the service concepts and improvements included in the 2013 California State Rail Plan (CSRP). It was prepared in coordination with, and is a subset of the CSRP. Integration and coordination of this planning effort with HSR is important as a portion of the Corridor coincides with a proposed segment of the HSR program which will result in shared ROW between the Burbank Junction and LAUS. The Pacific Surfliner North SDP is also consistent with planning by the Authority as documented in the *2012 Business Plan*.

1.2.2 Integration with other SDPs

The Pacific Surfliner North Corridor SDP is consistent with the SDPs for other State-supported rail services. The Pacific Surfliner North SDP was coordinated with the SDPs for connecting corridors and services, including Pacific Surfliner South and Coast Corridor, and HSR system plans.

The northern portion of the Pacific Surfliner Corridor overlaps the Coast Daylight Corridor from San Francisco to Los Angeles. The SDP for the Pacific Surfliner North Corridor analyzes the segment of the Corridor south of San Luis Obispo to LAUS.

1.2.3 Relationship to Corridor Environmental Analyses

The *San Luis Obispo to Los Angeles* (*LOSSAN North*) *Proposed Rail Corridor Improvements Programmatic Environmental Impact Report/Environmental Impact Statement (EIR/EIS)* (*Programmatic EIR/EIS*, currently under preparation by Caltrans, provided a strong foundation for development of the Pacific Surfliner North SDP. The *Programmatic EIR/EIS* provided 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 identified and assessed system improvements that are reflected in the SDP, including stations, tracks sidings, signal systems and related rail system components. In addition, the environmental process provided an updated perspective on agency, stakeholder, and public plans, needs, and perceptions that were invaluable to the development of a viable SDP. The impacts of the HSR plan on the Burbank Junction to LAUS portion of the Corridor are currently being studied through additional operations modeling studies being performed by the Authority which may influence service frequencies and specific capital investments in this portion of the Corridor. For that reason, this SDP does not identify intercity projects between Burbank Junction and LAUS, but defers definition of the necessary improvements until completion of the ongoing HSR analysis.

2.0 Purpose and Need

This Purpose and Need Statement is intended to provide the basis for planning efforts for the northern portion of the Pacific Surfliner Corridor through 2040, including the identification and evaluation of service development alternatives through the Service Development Plan 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 Corridor between San Luis Obispo and Los Angeles. It also assesses 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 was to improve mobility and reliability in this part of the State's rail system by expanding service, increasing travel reliability, and improving rail infrastructure in a cost-effective and environmentally sensitive manner.

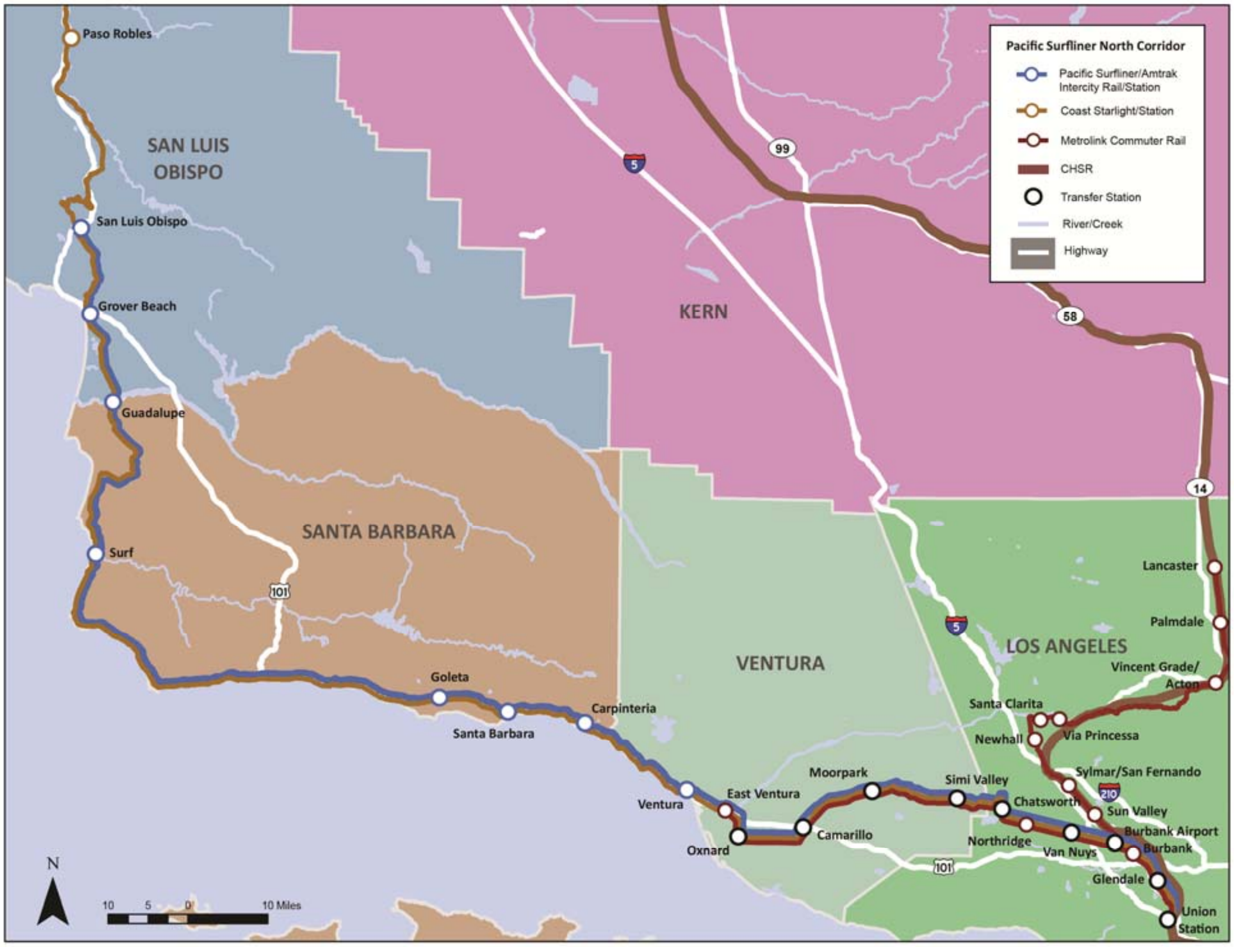
The Pacific Surfliner North Corridor refers to the 222-mile long corridor segment between the city of San Luis Obispo's Amtrak station and LAUS running through four counties – Los Angeles, Ventura, Santa Barbara, and San Luis Obispo (refer to Exhibit 2.1). The Corridor service operates through a wide variety of physical settings from the flat, heavily-urbanized areas of Los Angeles County to the sparsely-populated agricultural areas and coastal mountain regions in the northern three counties. In Los Angeles County, the alignment runs north from LAUS through the cities of Los Angeles, Glendale, and Burbank. This segment has a high level of passenger and freight rail activity, and in the future, the Corridor section between Burbank Junction and LAUS will accommodate HSR service and interim blended service operations connecting travelers arriving at the San Fernando Station south to LAUS. It should be noted that the impacts of HSR on the Burbank Junction to LAUS portion of the Corridor are currently being studied and, as such, are not reflected in this SDP. At the Burbank Junction, the northbound tracks split, with the Corridor turning to run northwest through the heavily-developed, urbanized San Fernando Valley, and the Antelope Valley Line (operated by Metrolink) turns north to operate through Santa Clarita, Palmdale, and Lancaster north to the Central Valley. California HSR service will operate north from LAUS approximately parallel to the Antelope Valley Line on a new alignment.

The Corridor runs northwest to Chatsworth, then through the Santa Susana Mountains to enter Ventura County where it passes through residential communities, agricultural land, and commercial development to the Ventura Amtrak Station, and then travels north along the edge of a narrow coastal plain. The rail tracks operate near sea level north to the vicinity of Santa Barbara, where the alignment transitions to run along a narrow coastal alignment to a point near Casmalia, north of Lompoc. At that point, the alignment turns inland to travel through coastal mountain canyons that are undeveloped or used for livestock and agricultural purposes. The alignment travels through the primarily agricultural Santa Maria Valley plain, and then reenters the coastal mountains to connect into downtown San Luis Obispo.

2.1 Purpose

The purpose of the proposed rail service and project improvements to the Pacific Surfliner North Corridor is to develop a safer and more reliable passenger and freight rail system that provides added capacity in response to increasing travel demand. Currently, Corridor intercity rail passenger service is heavily utilized and passenger demand is forecast to further increase. Existing service, when it operates to schedule, provides competitive peak period travel times to that provided by the congested highway system. The existing capacity of the Corridor's rail system is insufficient to meet future demand, and projected future rail system congestion will continue to result in slower travel speeds and reduced reliability.

Exhibit 2.1: Pacific Surfliner North Corridor and Counties



As more than 80 percent of the Corridor system consists of single-track operations, it is not possible to increase service frequencies and system capacity, as well as travel speeds, without significant cost for double-tracking. Increased Corridor service growth and improved reliability of operations designed to provide an attractive alternative to highway travel can be accommodated with less expensive system improvements, such as siding and communication system projects. Therefore the purpose of this SDP is focused on improved reliability and increased frequencies.

Rail system improvements are required to address the following Corridor challenges:

- Increase in travel demand due to growing Corridor population and employment.
- Constrained travel options due to the Corridor's physical setting.
- Constrained rail operations due to the condition of the existing rail system infrastructure.
- Need for increased rail system capacity, reliability, and safety to serve projected rail passenger ridership and freight rail activity.
- Need to improve system capacity with minimal impacts to local communities, natural resources, and air quality.

Corridor rail system improvements would contribute to the viability of the southern portion of the Pacific Surfliner Corridor, support operations of the future HSR system, and increase use of local transit system connections.

The purpose of the Corridor planning effort is to identify and evaluate possible rail improvements to relieve the growing capacity and congestion constraints on intercity travel using the Corridor's rail infrastructure which is operating near or at its design capacity. The project purpose for improved intercity Corridor rail improvements has been established and documented in Metropolitan Planning Organization (MPO) Regional Transportation Plans (RTPs), county transportation commission-developed Long Range Transportation Plans (LRTPs), the adopted *California State Rail Plan for 2007-08 to 2017-18 (California State Rail Plan) (2008)*, the *LOSSAN North Corridor Strategic Plan (2007)*, *LOSSAN Long-Term 2030 Operational Analysis (2011)*, *LOSSAN Corridorwide Strategic Implementation Plan (2012)*, and the *2012 Business Plan*. Corridor improvements are required to: address the forecasted growth in population, employment, and resulting travel demand; improve the rail infrastructure to accommodate the projected increase in rail passenger ridership and freight rail activity; and provide additional capacity while minimizing impacts to Corridor communities, natural resources, and air quality and greenhouse gas (GHG) emissions.

Increase in Travel Demand

Between 2010 and 2040, the northern portion of the Pacific Surfliner Corridor – including the counties that the Corridor runs through – is projected to experience a 33.2 percent increase in population to a total of 15.4 million residents, along with a 31.3 percent increase in employment with a resulting total of 5.7 million jobs. While a majority of the Corridor's population and employment growth will occur in the Los Angeles County portion of the Corridor, the three northern counties are forecasted to have significant population increases with San Luis Obispo County experiencing the highest population growth rate of 50.2 percent, and Ventura County having the highest employment increase of 58.8 percent.

While a majority of the future travel demand is still anticipated to be met by automobile, travel on the only highway serving this travel corridor is projected to experience increasing congestion and delays. In the future, an increasing portion of the projected trip growth will be accommodated on *Pacific Surfliner* intercity service as well as Metrolink commuter service. Today, *Pacific Surfliner* North and Metrolink passenger services are heavily utilized and are frequently over-capacity at peak times – on weekends for *Pacific Surfliner* service and on weekdays for Metrolink travelers; and passengers experience travel delays due to infrastructure constraints such as single-track operations. It should also be noted that the increase in connectivity provided by the future HSR system is expected to result in an increase in travel demand on the *Pacific Surfliner* and Metrolink routes.

Protection of Communities, Natural Resources, and Air Quality

Implementing Corridor transportation system capacity improvements are required to accommodate the forecasted travel demand growth. Expanded highway construction, automobile usage, and congestion could result in pressures on local communities, natural resources, and air quality conditions. This is especially true in the environmentally-sensitive setting of the Central Coast portion of the Corridor where the alignment is adjacent to Pacific Ocean beaches, along ocean cliffs, and through undeveloped coastal canyons. In addition, the Corridor operates through the residential and downtown commercial areas of the cities and communities that it serves. Expansion of the highway system would negatively impact the quality of life and economic well-being of Corridor residents and businesses. Rail system improvements would minimize any impacts to natural resources with construction of infrastructure projects occurring primarily within the existing rail right-of-way.

Travelers on the Corridor's highway system experience increasing congestion with corresponding air quality impacts. The Corridor is particularly sensitive to air quality impacts as two of the Corridor counties – Los Angeles and Ventura – 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. Expansion of the highway system beyond current plans would have significant air quality impacts as meeting increasingly stringent state and federal air quality standards will likely require reductions in the total miles traveled by automobiles. Accommodating future travel demand on rail service would produce significantly less pollution per passenger mile traveled compared to typical automobile use, and would aid in reducing emissions throughout the Corridor and region. In addition, expanded rail service would lessen GHG emissions compared to typical automobile use and would help meet GHG standards set by the State of California in 2005. Improved intercity rail service plans in the Corridor would support regional and county goals and plans related to smart growth, sustainability, economic development, air quality and greenhouse gas emissions, and provision of a balanced transportation system.

2.2 Need

The Corridor's travel need is for more passenger rail service to address the frequently at capacity existing rail service, and to serve the projected growth in future travel demand. The need for rail improvements to the Corridor was established based on: future Corridor population and employment growth, and a corresponding increase in travel demand; limited travel options; constrained existing rail system infrastructure; the need for improved travel times, reliability, and enhanced safety; and the need to meet the GHG standards set by the State of California in 2005.

2.2.1 Corridor Transportation Market Challenges

Corridor Population Growth

The population in the Pacific Surfliner North Corridor is projected to increase by 33.2 percent between 2011 and 2040 with more than 3.8 million new residents for a total of 15.4 million residents by 2040 as shown in Table 2.1.

Table 2.1: Pacific Surfliner North Corridor Population Density Forecasts for 2011 to 2040

	2011	2015	2020	2025	2030	2035	2040
Population (Thousands)	11,570	12,050	12,700	13,400	14,050	14,720	15,400
Population Density (Pop/Sq. Mi.)	970	1,010	1,065	1,120	1,175	1,230	1,290

Source: Moody's Economy.com, 2011.

Along with the forecasted population growth, the Corridor's population density will increase by 33 percent between 2011 and 2040 from 970 to 1,290 residents per square mile. It should be noted that the average population density reflects the Corridor-wide average, not the urbanized average. The urbanized Corridor population density, which would indicate strong support for passenger rail system usage, would in fact be much higher due to the significant amount of rugged topography and protected coastal areas in all four Corridor counties.

The distribution of new Corridor residents is projected to be as follows, with a majority of the growth projected to occur in Los Angeles County, as presented in Table 2.2:

- Los Angeles County – 3.3 million new residents, or 85 percent of the Corridor's future population.
- Ventura County – 309,000 new residents (eight percent).
- San Luis Obispo County – 140,000 new residents (four percent).
- Santa Barbara County – 120,700 new residents (three percent).

While a majority of the future total population growth will occur in the Los Angeles County portion of the Corridor, the three northern counties are projected to experience a significant percentage growth in population, with San Luis Obispo County forecasted to have the highest growth rate.

Table 2.2: Pacific Surfliner North Corridor Population Forecasts by County (2011 to 2040)

County	2011	2040	Percent Growth
San Luis Obispo	279,275	419,255	50.1%
Santa Barbara	415,935	536,645	29.0%
Ventura	823,650	1,132,280	37.5%
Los Angeles	10,048,450	13,317,360	32.5%
Corridor Total	*11,567,310*	*15,405,540*	*33.2%*

Source: Moody's Economy.com, 2011.

Corridor Employment Growth

Over the next 30 years, employment in the Corridor is expected to grow by 1.4 million jobs (31.3 percent) to a total of 5.7 million jobs as shown in Table 2.3. The distribution of new jobs is projected to be as follows with a majority of the employment growth occurring in Los Angeles County:

- Los Angeles County – 1.1 million new jobs, or 82 percent of the Corridor's future employment.
- Ventura County – 162,000 new jobs (12 percent).
- Santa Barbara County – 73,800 new jobs (five percent).
- San Luis Obispo County – 7,100 new jobs (one percent).

Table 2.3: Pacific Surfliner North Corridor Employment Forecasts (2011 to 2040)

	2011	2015	2020	2025	2030	2035	2040
Employment (Thousands)	4,345	4,716	4,888	5,065	5,266	5,491	5,704

Source: Moody's Economy.com, 2011.

While a majority of the Corridor's future total employment growth will occur in Los Angeles County, when evaluating the percentage of employment growth on a county basis as shown in Table 2.4, Ventura County is forecasted to experience a significant percentage of job growth in the future. Between 2011 and 2040, Ventura County employment is projected to increase by 58.8 percent – more than double the growth rate expected for Los Angeles County.

Table 2.4: Pacific Surfliner North Corridor Employment Forecast by County (2011 to 2040)

County	2011	2040	Percent Growth
Ventura	275,560	437,550	58.8%
Santa Barbara	163,420	237,245	45.2%
Los Angeles	3,808,200	4,924,370	29.3%
San Luis Obispo	98,030	105,090	7.2%
Corridor Total	*4,345,210*	*5,704,255*	*31.3%*

Source: Moody's Economy.com, 2011.

2.2.2 Corridor Transportation Market Opportunities

Cities served by the northern portion of the Pacific Surfliner Corridor include Los Angeles, Glendale, Burbank, Oxnard, Ventura, Santa Barbara, Santa Maria, and San Luis Obispo, as well as smaller communities that also serve as local and regional destinations. Key land uses in the Corridor include employment centers, civic centers, public and private colleges, cultural and entertainment venues, agricultural sites, parks, and recreational resources. The Corridor's destinations and activity centers result in a diverse set of local and regional travel markets:

- Commuters traveling to employment centers located in downtown Los Angeles, Burbank, Glendale, Oxnard, Ventura, Goleta, Santa Barbara, and San Luis Obispo. Other key employment destinations include Port Hueneme Naval Base and Point Mugu Naval Air Station located near Oxnard, and Vandenberg Air Force Base located near the Surf Amtrak Station in Lompoc.
- Agricultural workers traveling to and from work, 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, and many specialized, regional, and local schools.
- Visitors traveling to the Corridor's many tourist destinations including: main street shopping and entertainment areas: in downtown Ventura, Santa Barbara, San Luis Obispo, and Solvang; art and history museums, theaters, and special event generators; historic locations such as Hearst Castle and several California missions; and numerous wineries.
- Residents and visitors traveling to the many state, regional, and local recreational facilities, including beaches, Channel Islands National Park, Morro Bay State Park, Montana de Oro State Park, San Simeon State Park, and the Los Padres National Forest.

Corridor Rail System Trip Purpose

Table 2.5 shows a comparison of the northern portion of the Pacific Surfliner Corridor trip purpose from 2000 to 2030 with only minor changes projected to occur. In 2000, 70 percent of trips along this portion of the Pacific Surfliner Corridor were made for recreational or other purposes, while 30 percent were business or commute trips. By 2030, the share of business trips is projected to increase to 32 percent, and a corresponding minor decrease in recreation and other travel. While this trip breakdown is similar in both portions of the Pacific Surfliner Corridor, the percentage of recreation/other trips is well above statewide levels, reflecting the high number of tourist destinations located throughout the Pacific Surfliner Corridor.

Table 2.5: Existing and Forecast Pacific Surfliner North Trip Purpose (2000 to 2030)

Trip Purpose	Pacific Surfliner North		Pacific Surfliner South		Statewide(1)	
	2000	2030	2000	2030	2000	2030
Business/Commute	30%	32%	30%	31%	55%	55%
Recreation/Other	70%	68%	70%	69%	45%	45%

Notes:
(1) The Amtrak/Caltrans Model's existing 22 state analysis zones were used as the basis for the statewide travel data.

2.2.3 Current and Forecasted Demand for All Modes

Table 2.6 presents a summary of the annual county-to-county, two-way person trips for 2000 and the travel projected for 2030 and 2040 for all travel modes in the following Corridor segments:

- SLO-SB – between San Luis Obispo and Santa Barbara counties.
- SB-VEN – between Santa Barbara and Ventura counties.

- VEN-LA – between Ventura and Los Angeles counties.
- SLO-LA – total Corridor end-to-end travel between San Luis Obispo and Los Angeles counties.

The market analysis evaluated Los Angeles County as a whole as well as divided into two unique travel market areas: Los Angeles County (South) representing the heavily-populated Los Angeles Basin north to the mountains bordering the edge of the San Fernando Valley, and Los Angeles County (North) north to the county border, including the Santa Clarita and Antelope valleys.

Table 2.6: Pacific Surfliner North Corridor – County-to-County Annual Two Person-Trips. (All Modes) by Segment (Millions) (1)

Year	SLO-SB	SB-VEN	VEN-LA	Total SLO–LA	Percent Change From 2000
2000	0.7	27.2	194.6	208.9	--
2030	0.8	33.7	185.1	203.1	-2.8%
2040	0.8	35.9	182.0	202.1	-3.3%

Source: HSR R&R Model

The market analysis was prepared to support Corridor planning efforts by identifying market potential based on current and future total annual, county-to-county, two-way person trips for all modes. While this market analysis evaluated all trips in the counties comprising the Pacific Surfliner Corridor, it does not project future Corridor-specific trips. The northern portion of the Pacific Surfliner Corridor parallels the U.S. 101 corridor (particularly north from Ventura), which is currently very congested during peak periods, and as a result of the geography (narrow coastal plain bordered by mountains and the Pacific Ocean), there is limited ability for highway system expansion. The 2006 *101 in Motion* study, discussed below, documented significant peak period congestion from the Ventura County line to just north of Goleta in Santa Barbara County, with projections for worsening congestion (all day congestion) in the future.

Therefore, even though total, county-to-county trips are projected to decline, ridership demand in the northern portion of the Pacific Surfliner Corridor is projected to increase, as indicated in Chapter 8. The market analysis captures the overall decrease in county-to-county trips, reflecting the future decline in trips between Los Angeles and Ventura counties, but it does not capture changes in longer distance travel between Los Angeles and Santa Barbara counties, for example. The Pacific Surfliner service meets the demand for these longer distance trips, rather than short distance commute trips.

In this portion of the Pacific Surfliner Corridor, the market analysis results show a forecasted decline in total county-to-county travel (all modes) as the result of fewer annual two-way trips between Los Angeles and Ventura counties between 2000 and 2030 and continuing through 2040. The decrease in total Los Angeles County-to-Ventura County travel activity is primarily due to the projected employment growth in Ventura County, which will enable more Ventura County residents to live and work in the same county, and not travel to Los Angeles County for employment.

The market analysis showed that future travel between the three northern counties would increase, as would travel between Los Angeles County (North) and Ventura County to the growing Santa Clarita Valley job center north along the SR-126 corridor, with a projected 33.7 percent increase from 17.0 million annual two-way trips in 2000 to 22.9 million trips in 2030) (see Table 2.8).

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 2.7 presents a more detailed breakdown of the projected county-to-county travel patterns for 2000, 2030, and 2040.

Table 2.8 presents the county-to-county, two-way person trips (all modes) in millions for 2000 and 2030 for the "extended" Pacific Surfliner North Corridor – those counties directly connected to the Corridor via Amtrak intercity and Metrolink commuter service – and the number of trips between the identified counties. The information below lists the top four counties that each Corridor county has existing and future travel connections with. In summary, the travel patterns show similar travel patterns for 2000 and 2030, with minor changes forecasted to occur for San Luis Obispo County.

Table 2.7: Current and Projected Pacific Surfliner North Corridor Total Annual County-to-County, Two-Way Person Trips (All Modes) by Segment (Millions)

Trip Origin and Destination	**Corridor Travel Segments** (Millions)		
	SLO-SB	**SB-VEN**	**VEN-LA** [1]
2000			
Los Angeles to Ventura	--	--	181.8
Los Angeles to Santa Barbara	--	12.2	12.2
Los Angeles to San Luis Obispo	0.6	0.6	0.6
Ventura to Santa Barbara	--	14.3	--
Ventura to San Luis Obispo	0.1	0.1	--
Total Trips Per Segment	*0.7*	*27.2*	*194.6*
2030			
Los Angeles to Ventura	--	--	170.0
Los Angeles to Santa Barbara	--	14.4	14.4
Los Angeles to San Luis Obispo	0.7	0.7	0.7
Ventura to Santa Barbara	--	18.5	--
Ventura to San Luis Obispo	0.1	0.1	--
Total Trips Per Segment	*0.8*	*33.7*	*185.1*
2040			
Los Angeles to Ventura	--	--	166.1
Los Angeles to Santa Barbara	--	15.2	15.2
Los Angeles to San Luis Obispo	0.7	0.7	0.7
Ventura to Santa Barbara	--	19.9	--
Ventura to San Luis Obispo	0.1	0.1	--
Total Trips Per Segment	*0.8*	*35.9*	*182.0*

Source: The Authority Model

Notes:

(1) Total county-to-county travel is projected to decline between Ventura and Los Angeles counties in the future, while county-to-county travel will increase between Ventura County and the northern portion of Los Angeles County (the Santa Clarita Valley). The shift in travel demand is due to the projected growth in Ventura County employment, and the decline in the need to travel to Los Angeles County for employment.

Table 2.8: Current and Projected Pacific Surfliner North Corridor Total Annual County-to-County, Two-Way Person Trips (All Modes) (Millions)

Corridor County	**Top County Connections** (2000)	**Annual Trips** (Millions)	**Top County Connections** (2030)	**Annual Trips** (Millions)
San Luis Obispo	Monterey	9.4	Monterey	13.2
	Santa Clara	1.1	Santa Clara	1.4
	Orange	0.7	Alameda	1.2
	San Francisco	0.5	Orange	1.0
Santa Barbara	Monterey	2.3	Monterey	2.1
	Orange	1.1	Orange	1.5
	Alameda	1.0	Alameda	1.1
	Santa Clara	1.0	Santa Clara	1.1
Ventura	Los Angeles (North)	17.0	Los Angeles (North)	22.9
	Orange	4.6	Orange	3.8
	San Bernardino	1.2	San Bernardino	3.8
	Kern	1.0	Kern	1.7
Los Angeles (South)	Orange	690.0	Orange	707.3
	San Bernardino	250.3	San Bernardino	344.3
	Los Angeles (North)	138.3	Los Angeles (North)	186.7
	Riverside	99.8	Riverside	146.6

Source: HSR R&R Model

The following summarizes the key connections for each Corridor county:

- San Luis Obispo County – has stronger travel connections north to Monterey (9.4 million) and Santa Clara counties, than to the south with the other Corridor counties (0.7 million).
- Santa Barbara County – has strong connections north to Monterey County (2.3 million) and south to Orange County (1.1 million).
- Ventura County – has the strongest travel connections south to Los Angeles County, more than 3.7 times higher than the next highest (Orange County) and beyond to San Bernardino County.
- Los Angeles County – has the strongest connection south to Orange County – more than two times the number of trips made to the next highest county – San Bernardino County.

2.2.4 Corridor Capacity Constraints

As discussed above, between 2000 and 2040, the Corridor is projected to experience a 33.2 percent increase in population, and a 31.3 percent increase in employment. Travel between the three northern counties will increase as will trips between Northern Los Angeles County and Ventura County, while total county trips between Los Angeles and Ventura County will decrease. Travel activity between Ventura and Santa Barbara counties is projected to have the largest increase with a 32.0 percent trip growth translating to 9.9 million additional annual trips. While a majority of the future travel demand is still anticipated to be met by automobile travel, an increasing portion of the projected trip growth will be accommodated on *Pacific Surfliner* as well as Metrolink routes due to the constraints of other travel options as described in further detail below.

Constrained Travel Options

The four counties of the Corridor are served by a transportation system that includes air, highway, and rail services. The existing travel options are constrained by the Corridor's physical setting and limited opportunities for highway and air connections. North of Los Angeles County, the Corridor is either located primarily in a narrow coastal plain bordered by steep mountains to the east and the Pacific Ocean to the west with the periodic flat areas heavily developed or occupied by agricultural crops. In this area, the Corridor is served by a single major highway – the primarily four-lane U.S. 101 – with some two-lane highways providing connections through the bordering coastal mountains. Current travel demand generated by residents and the area's growing tourism activities results in frequent Corridor highway congestion and travel delays. The *101 in Motion Study*, completed by SBCAG with the cooperation of Caltrans District 5 in 2006, evaluated 2000 and 2030 travel patterns along U.S. 101 from the Ventura County line to just north of Goleta. The results showed travel demand overwhelming the highway design capacity with projections for Level of Service (LOS) F throughout the entire day by 2030. The current and future highway congestion results in a high number and severity of accidents, and has a negative impact on the Corridor's economy and efficiency and quality of life for residents. Due to the topographic setting and the urban development patterns along the Central Coast section of the Corridor (north from Ventura), there is limited physical space available for expansion of the existing highway system or the construction of new highway alternatives.

Limited air travel access is available with only the Burbank-Bob Hope Airport at the southern end of the Corridor providing national connections. The Santa Barbara, Santa Maria, and San Luis Obispo airports provide limited access to Los Angeles, San Francisco, and Phoenix. The only connection to the future HSR system will be located in the Los Angeles County portion of the Corridor at either a San Fernando Valley station north of the Burbank Junction, or at LAUS. Rail system improvements are important to accommodating future travel growth in this constrained Corridor.

Constrained Rail System Infrastructure

Improvement and expansion of the Corridor's intercity rail system has not kept pace with the travel demand resulting from existing increases in population, employment, and travel demand. The rail system infrastructure serving the Corridor's intercity travel market is currently operating at or beyond its design capacity, and requires major improvements to meet existing demand and projected growth over the next 30 years. More than 80 percent of the Corridor is single-track with infrequent sidings that generally have not been modified to accommodate todays' freight trains. Additionally, communication systems are outdated with many sections of the alignment still using ABS signal control and manual track switches with dispatch approval required. Without improvement, the existing Corridor rail capacity and operating constraints will result in increasing rail congestion and travel delays.

Need for Improved Travel Frequency, Reliability, and Safety

Among the critical factors that impact the public's choice of transportation are travel frequency, reliability, and safety. Travel frequency and reliability are critical for all travelers, but particularly for work and business-related trips which require a more time-certain arrival. As highway congestion intensifies, travel delays increase and travel reliability worsens, non-automobile modes such as rail become more attractive options for travel. The Corridor's highway system currently experiences significant congestion during peak periods and has limited opportunities for expansion. With the projected annual trip growth, automobile travelers will experience increasing highway congestion and resulting travel delays. Corridor rail travel has the potential to serve future travel demand with more frequent, reliable, and safer service if system improvements are made. Currently, intercity and commuter rail travelers have limited service options, and experience frequent delays and reduced reliability and safety due to single-track operations, limited sidings, and outdated communication systems.

The Corridor is also experiencing an increase in highway congestion, particularly in travel chokepoints on the U.S. 101 freeway, such as between Santa Barbara and Ventura, and in the Camarillo area. Passenger rail safety is of pressing concern in this Corridor due in large part to a major passenger-freight train accident in a single-track segment in the Chatsworth area in 2007. The FRA-mandated installation of Positive Train Control systems through the passage of the Rail Safety Improvement Act of 2008 is intended to increase safety and improve passenger and freight train operation efficiency by providing real-time train location information. The first phase of PTC system implementation is underway for the Corridor between LAUS and the Moorpark Station. Additionally, UPRR plans for PTC installation north of Moorpark. Capacity and operating improvements are required to further increase the safety of passenger and freight rail operations in this Corridor.

2.3 Scope and Objective of the Plan

2.3.1 Scope

The northern portion of the Pacific Surfliner Corridor faces significant mobility challenges as continued growth in population, employment, and tourism activity is projected to generate increased travel demand straining the existing transportation network. Development of an effective passenger rail system is necessary to meet the future mobility needs of residents, businesses, and visitors. The Corridor faces future transportation challenges as evidenced by the following:

- Constrained Travel Options. While the Corridor is served by a transportation system that includes air, highway, and rail services, system capacity is insufficient to meet the future travel demands. Corridor airport access is limited in the number of facilities and connections provided, primarily to other California cities. North of Los Angeles County, the Corridor is served by a single major highway – the primarily four-lane U.S. 101 – which experiences frequent congestion and travel delays. Due to the Corridor's physical setting, there is limited space for the expansion of the highway system or the construction of new highway alternatives. While the Corridor has three passenger rail services providing intercity and west coast travel options, trains are frequently at-capacity during peak periods, and system riders experience frequent travel delays due to the primarily single-track rail system.
- Significant Highway Congestion. Current travel demand generated by residents and visitors results in frequent highway congestion and travel delays, particularly at urban chokepoints along the U.S. 101. With the projected population and employment growth, a majority of the future travel demand is anticipated to be met by automobile travel, which will result in increased highway congestion. There is limited space and funding available for highway system improvements. As highway congestion intensifies, travel delays will increase and reliability decline. With travel frequency, reliability, and safety, improvements, rail travel could become an increasingly attractive option for personal, business, and goods-movement trips.
- Constrained Rail System Capacity. Corridor rail service could accommodate an increasing portion of the projected travel demand growth, but operational capacity is constrained by a track system that is undersized for the rail volumes it currently accommodates much less any future service increases. More than 80 percent of the 222-mile Pacific Surfliner North Corridor is single-track with inadequate sidings that can result in trains stacking at either end of the single-track section, resulting in delays and reducing the attractiveness of rail as a travel mode choice. While improvements have been made, communication systems are outdated in portions of the alignment due to the continued usage of ABS signal control and manual switches which require dispatcher approval to proceed, reducing travel reliability. The Corridor's rail system is currently

operating beyond its design capacity and major infrastructure improvements are required to provide a more reliable, safe, competitive, and attractive intercity travel option. All of these infrastructure problems also limit the ability of all the Corridor's rail services to increase frequency.

- Need for Increased Travel Capacity Without Impacting Air Quality, Communities, and Natural Resources. Growing Corridor travel demand will require transportation system capacity and operating improvements, which could have negative impacts on regional and local air quality, local communities, and natural resources. Improvements in the Pacific Surfliner North Corridor are particularly sensitive in these impact areas as two of the Corridor counties – Los Angeles and Ventura – 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. Rail activity in the Corridor passes through residential neighborhoods and the commercial centers of many communities, and operates in the environmentally sensitive setting of the Central Coast portion of the Corridor. 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. Rail system capacity could be increased with air quality benefits (including GHG emissions) and minimal impacts to local communities and natural resources.

Expansion of the Corridor's intercity rail system has not kept pace with the significant increase in population, employment, travel, and tourism, and will require improvements to meet existing demand and future growth. These proposed Corridor rail infrastructure projects would provide for a reliable, safe, and attractive intercity travel option. Rail system improvements would provide additional capacity that would relieve some of the projected near-term 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, reducing their associated cost, community, and environmental impacts. The identified Corridor rail improvements would augment the highway system, thereby creating an interconnected, multimodal solution, allowing for better mobility throughout the Corridor. In addition, Corridor rail improvements would contribute to the viability of the Pacific Surfliner South Corridor, support the successful implementation of the planned HSR system, and provide connectivity with local transit systems.

2.3.2 Objectives

The overall objectives for statewide intercity rail improvements are:

- 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.
- Improve the safety of state-supported intercity rail service.

The Corridor-specific objectives for this Service Development Plan include:

- Develop a plan for the continued improvement of the northern segment of the Pacific Surfliner Corridor that complements and incorporates the recommendations of the SDP developed for the southern segment of the Pacific Surfliner Corridor.
- 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.
- Alleviate demand on constrained highway system.
- Increase reliability and safety.
- Increase travel capacity with minimal impacts to the Corridor's communities and natural resources.
- Provide potential benefits to air quality.

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3.0 Rationale

The Pacific Surfliner Corridor is the second busiest intercity passenger rail corridor in the nation, with a level of activity and ridership second only to that of the Northeast Corridor between Boston and Washington, D.C. The northern portion of the Corridor serves a vital function in providing intercity rail services between the cities of San Luis Obispo, Santa Barbara, Ventura, and Los Angeles.

Improvements in the Corridor are required to develop a faster and more reliable passenger and freight rail system. The improvements would enhance safety and provide added capacity in response to increasing travel demand due to Corridor population and employment growth. The existing rail system is experiencing increasing congestion constraints due to infrastructure that is operating near or at its design capacity. Corridor rail system improvements would provide the following benefits:

- Provide additional capacity to serve Corridor growth in a cost-effective manner with minimal impacts to local communities, natural resources, and air quality and greenhouse gas emissions.
- Increase use of intercity passenger rail service as part of a multi-modal strategy identified in regional and county goals and plans.
- Improve rail operations by reducing travel times and increasing reliability and safety.
- Encourage economic development in the Corridor by increasing accessibility to employment centers.

Corridor rail system improvements would benefit other transportation systems that interface with the Pacific Surfliner North Corridor rail service; they would:

- Support Pacific Surfliner Corridor operations. Many trips occur on both portions of the Pacific Surfliner Corridor, and improvements in the northern portion will ensure the successful utilization of both segments. System projects in northern portion of the Pacific Surfliner Corridor would complement and support the improvements identified for the southern portion of the Corridor, which is experiencing similar travel demand growth and congestion and capacity constraints.
- Support operations of the future California High-Speed Rail system. Amtrak and Metrolink will provide important rail feeder services to the HSR system, connecting passengers from San Luis Obispo, Santa Barbara, Ventura, and Los Angeles counties to either LAUS or an interim station in the San Fernando Valley area of Los Angeles County.
- Provide a stronger interface with transit services. Corridor improvements would provide a stronger interface with transit services operating to and from the Corridor's passenger rail stations because of increased frequency of service. Corridor stations include the following: Los Angeles Union Station, Glendale, Burbank-Bob Hope Airport, Van Nuys, Chatsworth, Simi Valley, Moorpark, Camarillo, Oxnard, Ventura, Carpinteria, Santa Barbara, Goleta, Lompoc-Surf, Guadalupe-Santa Maria, Grover Beach, and San Luis Obispo; and the Metrolink-only stations in Downtown Burbank and East Ventura.

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. The investments would enhance the capacity and reliability of the route as an alternative to the north-south freight corridors located in the Central Valley.

3.1 Capacity Benefits

Corridor rail service could serve an increasing portion of the Corridor's projected travel demand growth, but the operational capacity is constrained by a system that is inadequate for the rail volumes it currently serves. Corridor improvements would provide additional capacity to serve travel growth in a cost-effective manner with minimal impacts to local communities, natural resources, and air quality.

Improvements identified for the Build/Improved Passenger Service Alternative (Build Alternative) would make intercity passenger rail service more cost-effective by reducing travel time, improving on-time performance (OTP), enhancing safety, and increasing the maximum authorized speed for both passenger and freight trains. The improvements have independent utility, are not dependent on the completion of other Corridor programs to be successful, and would provide measurable benefits to intercity rail service.

Providing additional highway system capacity to accommodate the projected travel growth could have negative impacts on regional and local air quality, local communities, and natural resources. The Corridor is particularly sensitive to air quality impacts as two of the Corridor counties – Los Angeles and Ventura – 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 under state standards. Meeting state and federal air quality standards over the next 20 to 40 years will likely require reductions in the total miles traveled by vehicles. The Corridor passes through residential neighborhoods and the commercial centers of many communities, and operates through environmentally sensitive coastal settings. Rail system capacity could be increased within existing rights-of-way 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 future travel demands. North of Los Angeles County, the Corridor is served by a single major highway – the primarily four-lane U.S. 101. Due to the Corridor's constrained and environmentally sensitive physical setting, there is limited space for expansion of the highway system, and construction of new highway alternatives is not feasible due to the terrain.

Regional and county multi-modal transportation plans have been developed in recognition of future growth and the Corridor's physical constraints, and have adopted the rail mode as a key element of a multi-modal strategy. [iii] Improved intercity rail service plans in the Corridor would support regional and county goals and plans related to smart growth, sustainability, economic development, air quality and greenhouse gas emissions, and provision of a balanced transportation system. Improving passenger rail service would enhance rail travel as an increasingly viable and attractive option for personal and business trips, and would reduce pressure to expand the Corridor's highway system.

3.3 Operational Benefits

Improvements to the Corridor's intercity rail system have not kept pace with the growth in travel demand. The rail system infrastructure is currently operating at or near its design capacity, with travel time, reliability, and safety impacts for passenger service. Prior studies, such as the *LOSSAN Corridorwide Strategic Implementation Plan (2012)*, have projected an almost doubling of yearly rail ridership in the Corridor from 2.7 million riders annually in 2011 to 4.7 million in the 2030. Recent (2011) operational reliability generally ranged between 60 percent and 80 percent on-time performance, which is well below the goal of 90 percent. Improvements to the Corridor's rail system infrastructure, such as upgraded signaling and critical sidings, would improve operational reliability and safety in this portion of the Pacific Surfliner Corridor. Attracting more customers to both intercity and commuter rail through improved performance will offer travelers a key mobility choice.

Operations simulation modeling shows that the proposed capital program would produce capacity and operational benefits, including reductions in train travel times, improved on-time performance, increased speed, and the additional capacity required to support more frequent train service.

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4.0 Identification of Alternatives

This chapter describes the alternatives that are being evaluated in this Service Development Plan: 1) the No-Build/No-Action Alternative (No-Build Alternative), which provides a baseline discussion of the continued operation of the current northern portion of the Pacific Surfliner Corridor system with no improvements (other than those already funded); and 2) the Build Alternative which provides a set of improvement projects for the Corridor to accommodate increased passenger service levels. 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. Consistent with the corridor-level planning and analysis of a 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 for individual projects included in the Build Alternative in order to provide more detailed information on implementation costs and environmental impacts.

4.1 Previous Corridor Planning Studies

Starting with the Amtrak-sponsored *California Passenger Rail System: 20-Year Improvement Plan Technical Report* (*Amtrak 20-Year Plan)* completed in March 2001, a wide range of planning and feasibility studies have been prepared, and proposed improvement projects identified for the Pacific Surfliner North Corridor. Recent plans identifying Corridor improvements include the *LOSSAN North Corridor Strategic Plan (2007)*, the current *California State Rail Plan (2008)*, *Pacific Surfliner Corridor Operational Analysis (2009)*, *LOSSAN Corridor Strategic Assessment Final Report (2010)*, the *Pacific Surfliner 2010 Development Plan (2010),* the *2012 Business Plan*, and the *LOSSAN Corridorwide Strategic Implementation Plan (2012)*. As part of the LOSSAN strategic assessment efforts, 2030 passenger and freight rail operational plans were developed for the entire Pacific Surfliner Corridor from San Luis Obispo to San Diego. A majority, if not all, of the improvement projects identified in these previous planning efforts have been included in the project list presented in this SDP. Previous plans have proposed the following type of Corridor infrastructure improvements:

- Track upgrades including second and third main tracks, crossovers, curve realignments, and crosstie replacement.
- Siding improvements including siding lengthening and rehabilitation.
- System improvements including bridge and overpass upgrades, grade separation projects, and grade crossing safety projects.
- Signal and communication system upgrades such as the implementation of continuous Centralized Traffic Control.[iv] upgrading the signal and wayside detector systems, and. adding fiber and microwave systems.
- Station projects including the addition of second platforms, pedestrian crossings, and parking.

In a parallel effort, a program-level (Tier 1) EIR/EIS (the *Programmatic EIR/EIS*) was initiated with the publication of a Notice of Preparation (NOP) on December 20, 2010, and a Notice of Intent (NOI) in the Federal Register on January 4, 2011. The *Programmatic EIR/EIS (*currently under preparation), was prepared due to the comprehensive nature and scope of the proposed Pacific Surfliner North Corridor improvements, and would be followed by project-specific environmental analyses that “tier” off the resulting program document. The environmental scoping process identifies areas of potential concern related to the proposed Corridor improvements, including, but not limited to, the types of service being proposed, including cities and stations served, route alternatives, ridership projections, identification of major terminal area or facility capacity constraints, impacts to air quality, local communities, and natural resources. Throughout the Corridor, comments from the scoping process consistently indicated the need for an improved rail system in anticipation of future growth in travel demand in the Corridor, continued poor air quality, outdated rail infrastructure, unreliability of service, and increasing frequency of accidents. The capacity of the Southern California and Central Coast intercity transportation system was seen as insufficient to meet future travel demand, and the resulting projected highway system congestion would continue to result in reduced reliability, increased travel times, degraded air quality, and increased pressure on natural resources.

Other plans related to the northern portion of the Pacific Surfliner Corridor have included Metrolink commuter rail strategic plans prepared by the SCRRA and Regional Transportation Plans (RTPs) prepared by the Corridor's MPOs.[v]

4.1.1 SCRRA Strategic Assessment

The SCRRA completed the *SCRRA Strategic Assessment (2007)* for its Metrolink commuter rail system through 2030. Approved by the SCRRA Board in January 2007, the plan developed future service scenarios for all of its rail lines, including the Ventura County Line operating north from LAUS to Moorpark in the Corridor. Future commuter rail service levels for the Ventura County Line were used to determine the capacity constraints expected in the Corridor, and support the need for new sidings, double-tracking, and other rail capacity improvements to allow for reliable operations of all rail services. The resulting $1.1 billion long-range capital improvement plan was developed to support a doubling of Metrolink's passenger capacity. A majority, if not all, of the projects identified in this long-range improvement plan are included in the project list presented in this SDP. Two Ventura County Line projects will have significant benefits for the Pacific Surfliner North Corridor:

- Metrolink Sealed Corridor Initiative. This comprehensive strategy will enhance the safety of trains, passengers, motorists, and pedestrians along the Ventura–Los Angeles county portions of the Corridor north to the Moorpark Station. Currently, the open nature of the right-of-way (with frequent at-grade crossings and pedestrian and vehicular trespassing) limits operating speeds and reduces service reliability. Safety measures will be implemented to reduce the opportunity for accidents at at-grade crossings, and other locations. Improvements may include: closure or grade separation of some crossings; and crossing-specific safety projects, such as four-quadrant gates, median separators, signal system improvements, and new signage and pavement striping.
- Positive Train Control. Implementation of a Positive Train Control system will serve as an important step to improving operational reliability and safety, and increasing capacity and travel speed north to the Moorpark Station, and is scheduled for completion by 2013.

4.1.2 Regional Transportation Plans

Reflecting the forecasted growth in the Corridor population over the next 20 years, the corresponding increase in travel demand, and the projected significant deterioration in the freeway level of service, the RTPs and related studies prepared by Corridor MPOs have increasingly included alternative travel modes such as the increased use of intercity passenger rail services. In the northern portion of the Pacific Surfliner Corridor, the MPOs include the San Luis Obispo Council of Governments, the Santa Barbara County Association of Governments, and the Southern California Association of Governments for Ventura and Los Angeles counties. In developing their RTPs, the Corridor's MPOs have stated a desire for intercity rail service within their jurisdictions as part of a balanced, multimodal transportation system. Rail system improvements, such as those summarized in Table 4.1, have been included in the Corridor RTPs as integral components in improving rail service. A majority, if not all, of the projects identified in the Corridor RTPs have been included in the project list presented in this SDP.

Table 4.1: RTP-Identified Rail System Improvement Projects

County/MPO	Proposed Improvements
San Luis Obispo/SLOCOG	• Installation of centralized and improved signal control; • Curve realignments; • Double tracking; • Extension of existing sidings and the addition of new sidings; • Grade improvements; and, • Positive train control and new train technologies.
Santa Barbara/SBCAG	• Additional sidings to increase Corridor capacity; • Signal and switch improvements; and, • Improved commuter service between Santa Barbara and Ventura counties.
Ventura and Los Angeles/SCAG	Reflecting Metrolink's capital improvement plan, proposed improvements include: • Positive train control and new train technologies; • Selective double-tracking on critical route segments; • Switching and signaling improvements; • Communication system improvements; • Station improvements; and, • Additional rolling stock and new/improved maintenance facilities.

Two studies were prepared by Corridor MPOs resulting in proposed rail service improvements:

- The 101 in Motion Program, led by Santa Barbara County Association of Governments (SBCAG), was initiated in October 2003 as an effort to identify short-and long-term mobility solutions for the U.S. 101 Freeway, which is the major north-south link through Santa Barbara County. It was completed in 2006. Population growth in the "South Coast" area of Santa Barbara and Ventura counties and the lack of affordable housing in Santa Barbara County contribute to increased commuter travel resulting in freeway congestion and delays. The 101 In Motion Program recommendations and action plan, approved by the SBCAG Board, included the development of an additional High-Occupancy Vehicle (HOV) lane in both directions on U.S. 101, additional transit services throughout the county and proposed commuter rail service connecting Ventura and Santa Barbara counties. The proposed commuter rail service would share the Pacific Surfliner North Corridor with other passenger and freight services.
- The Ventura/Santa Barbara Rail Study was undertaken by SCAG at the request of SBCAG and VCTC to review new travel options, including increased rail service during commuter-friendly hours between western Ventura County and Santa Barbara. The study concluded that, in order to increase the level of passenger rail service along the Corridor, significant track and signal improvements, capacity enhancements and equipment purchases would be required. Further implementation evaluation efforts are currently underway with the involvement of SBCAG, VCTC, UPRR, and Metrolink.

4.1.2 Corridor Rail Service Plans

Future *Pacific Surfliner* service plans have been developed in a collaborative effort by Caltrans and the Los Angeles-San Diego-San Luis Obispo Rail Corridor Agency (LOSSAN), a group of elected officials representing rail owners, operators, and planning agencies within the *Pacific Surfliner* Corridor between San Luis Obispo and San Diego. Caltrans and its regional and local partners have conducted joint corridor-wide planning activities over many years, the most recent example being the adopted *LOSSAN Corridorwide Strategic Implementation Plan* (Final Report). The identified service increases are designed to address the forecasted rail system demand through an increase in the number of weekday intercity and commuter trains along with new passenger rail services. The train volumes represent more frequent Pacific Surfliner and Metrolink intercity services, along with the introduction of commuter rail service between Ventura and Santa Barbara counties. The rail improvements discussed in the following section will be required to accommodate the forecasted rail activity based on operational analyses.

The future service assumptions presented in Table 4.2 are for years 2014 and 2030 for consistency with the *LOSSAN Corridorwide Strategic Implementation Plan* which is a consensus plan that was developed by the stakeholders on the LOSSAN corridor. However, these service projections were used to represent the years 2020 and 2040, respectively in Chapters 9, 10, and 12 for operations modeling, ridership and revenue modeling, and estimating operations and maintenance costs. The years 2020 and 2040 were used to be consistent with the horizon year periods in the 2013 California State Rail Plan. This SDP is a building block to the 2013 California State Rail Plan, therefore it was necessary to use the same horizon years for modeling output in both documents..Planning for integrated HSR and conventional rail in the Los Angeles basin has been initiated since the release of the *2012 Business Plan*; however, it has not yet been completed. Table 4.2 does not include additional train volumes required to uniquely serve the HSR IOS terminus in the San Fernando Valley. Additional analysis is currently underway by the Authority in conjunction with the Southern California Rail Partners Working Group (SCRPWG). This SDP does not identify intercity projects, or additional train service, between Burbank Junction and LAUS, required to support implementation of HSR, but defers definition of the necessary service and system improvements until completion of the ongoing HSR analysis.

Consistent with the *LOSSAN Corridorwide Strategic Implementation Plan* and HSR planning, future rail services being planned or proposed in the Pacific Surfliner Corridor includes the following:

- Future HSR service will be operated on separate tracks within the segment of the Corridor between the Burbank Junction and LAUS in Los Angeles County. HSR service on the Corridor is estimated to be fully implemented by 2029. Restructuring and expanding Metrolink and/or *Pacific Surfliner* services are being studied as an initial feeder network to the phased HSR system. It would provide service which would interface with an interim terminal station in the San Fernando Valley prior to the HSR system's extension south to LAUS. It should be noted that the Authority is completing an assessment of capacity and frequencies to serve the San Fernando Valley Terminus. The operations modeling is ongoing, as such, the improvements (i.e., capacity investments) that may be required between Burbank and LAUS are not included, or reflected, in this SDP.
- New commuter service between Ventura and Santa Barbara counties would provide one northbound morning peak period train and one southbound peak period train by 2014, with future service expanding to eight daily peak period trains by 2030. While plans have not been finalized, the current plans call for Metrolink to operate and maintain the service with funding provided by Ventura and Santa Barbara counties, and other sources to be determined.

Table 4.2: Future Daily Train Volumes by Corridor Segment (Round-Trips)

Weekday Service	LAUS-Moorpark[1]		Moorpark-E. Ventura		E. Ventura-Goleta[2]		Goleta-San Luis Obispo	
	2014	2030	2014	2030	2014	2030	2014	2030
Pacific Surfliner[3]	5	7	5	7	5	7	2	4
Coast Starlight	1	1	1	1	1	1	1	1
Metrolink Ventura County Line	15	22	3	9(2)	--	--	--	--
Metrolink Antelope Valley Line[4]	15	23	NA	--	--	--	--	--
Ven-SB Commuter[5]	--	--	--	--	1	4	--	--
Subtotal	*36*	*53*	*9*	*17*	*7*	*12*	*3*	*5*
UP Freight (through) UP Freight (local)[1]	6 2 – 8	6 2 – 8	6 2	6 2	6 2	6 2	4 1	4 1
Total	*45 – 51*	*56 – 62*	*18*	*24*	*16*	*20*	*8*	*14*

Sources: *LOSSAN Corridorwide Strategic Implementation Plan: Short-Term Business Case, Operations Analysis*, December 14, 2011; freight train existing count from Union Pacific; projections by AECOM.

Notes:

(1) Higher freight traffic levels are in the San Fernando Valley, east of Gemco.

(2) Represents average of seven northbound and nine southbound weekday trains.

(3) Volumes includes timeslots for proposed Coast Daylight trains and includes one daytime round trip and one overnight round trip.

(4) These trains operate only on the portion of the Corridor between LAUS and Burbank Junction.

(5) Proposed service would extend north to the Goleta Station where Pacific Surfliner storage and light maintenance facilities proposed for use are located.

\- "NA" indicates not applicable.

- Longer-term plans propose the introduction of Metrolink service along a primarily VCTC-owned unused railroad right-of-way between the cities of Ventura and Santa Clarita in Los Angeles County to serve the increasing SR-126 Corridor travel demand between Ventura County and Los Angeles County (North).

Current freight operations average approximately 18 daily trains in the Corridor between Burbank Junction and LAUS, eight to 16 trains to San Fernando Valley points, and six trains or fewer north of Oxnard. Future Corridor local freight service is not expected to increase significantly; however two additional through trains are projected over the longer term. Future freight consists 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 passenger rail performance.[vi]

4.1.3 Corridor Rail Service Improvements

Projects have been identified in the Corridor that improve mobility and reliability in a cost-effective and environmentally sensitive manner. For this SDP, projects were identified from prior studies, including the *Amtrak 20-Year Plan (2001)* and current *California State Rail Plan (2008)*, the *Programmatic EIR/EIS (currently* under preparation), the LOSSAN Corridor Rail Authority, SCRRA commuter rail strategic plans, UPRR project recommendations, and studies prepared by Corridor MPOs. The identified rail improvement projects fall into the following seven 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, curve realignments, and overpass/bridge improvements 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 portion north of Goleta, while maintained to FRA Class IV 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 relatively old, which requires a much greater level of maintenance to operate at maximum allowable speeds. The track geometry requires trains to operate at slower than maximum FRA allowable speed (79 mph) and siding lengths and conditions makes train meets both difficult and time consuming.
- Signal Upgrades. The signal system between Los Angeles and Goleta is state of the art with the Centralized Traffic Control operated by a dispatcher who controls train movements from a remote location. North of Goleta, the signal system is an Automatic Block System, requiring the dispatcher to communicate directly with each train crew before the train can obtain authority to proceed through "blocks" to their destination. Some locations, such as the Gaviota siding, have what is referred to as island CTC which are controlled by the dispatcher. [viii]
- 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 require new sidings to make the most out of the existing track configuration or have sidings requiring extension. 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 impact peak period intercity and commuter passenger travel between Moorpark and Oxnard, and all rail travel between Gaviota and San Luis Obispo. Market factors (labor costs, locomotive fleet utilization, etc.) are leading to longer freight trains. The operational result is that passenger trains are frequently forced into the siding when two trains meet because freight trains no longer fit. Where siding lengths of 5,000 feet were sufficient at one time, freight trains now operate at lengths approaching 9,000 feet. Corridor sidings, whether new or extensions of existing facilities, need to be a minimum length of 10,000 feet. As sidings are lengthened, they will 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 trains to travel at up to their maximum allowed speed. The benefits of additional main tracks are increased train frequencies, improved operational reliability, increased capacity, and decreased train delays. It should be noted that additional track segments may be required on the segment from Burbank to Los Angeles to achieve the identified benefits.
- Curve Realignments. Curve realignments allow for reduced trip times by increasing train speeds on the curves, and prolong the rail life, reducing the frequency of track repairs or maintenance.
- Grade Separations. These costly improvements eliminate dangerous at-grade crossings of rail and highway systems. Because cars and trucks are less sensitive to grades than trains, typically a grade separation is designed with the roadway relocated under or over the rail line. Grade separations reduce accidents and increase train performance, while providing community benefits, such as reducing noise (through the elimination of the need to sound the train’s horn) and improve local traffic flow by reducing vehicular delays at crossings.
- Station Improvements. Station improvements include providing new or improved station platforms, increased frequency of connections with local transit systems, and providing customer improvements 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, improved customer service and information.

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 projects that have approved local, county, state, and federal funding. These projects are documented in county LRTPs, Regional Transportation Improvement Plans (RTIPs), Caltrans's California Intercity Rail Capital Program, and the Statewide Transportation Improvement Program, along with federally-funded projects under the High-Speed Intercity Passenger Rail Program. Rail projects included in the No-Build Alternative are listed in Table 4.3. These are projects that, due to their programming and funding status will most likely be built. Therefore they are considered part of the base-line or No-Build alternative.

Table 4.3: No-Build Alternative Rail Improvement Projects

Project Description	**Cost** (Millions, Year 2012 dollars)	**Source(s)**
Grover Beach Station expansion (new bus facilities, parking, and bike facilities)	$1.23	Proposition 1B – Public Transportation Modernization, Improvement, and Service Enhancement Account (PTMISEA)
Ortega siding (reconstruction)	$20.00	HSIPR (ARRA), *LOSSAN Corridorwide Strategic Implementation Plan (Final Report),* STIP, Intercity Rail Capital Projects Database (IRCP), Santa Barbara County Measure A
Seacliff siding extension and curve realignment	$28.00	HSIPR, *LOSSAN Corridorwide Strategic Implementation Plan (Final Report)*, STIP, IRCP, Santa Barbara County Measure A
Control Point (CP) Bernson (De Soto) to CP Raymer second main track and Northridge Station second platform	$72.96	HSIPR, STIP, Proposition 1B (Intercity Rail Improvement), *LOSSAN Corridorwide Strategic Implementation Plan (Final Report)*
Van Nuys Station second platform	$40.00	HSIPR
Total	*$162.19*	

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. New cost estimates were developed for project cost estimates that did not appear reasonable based on the information available regarding project scope.

4.3 Build Alternative (Rail Improvement Alternatives in Draft EIR/EIS)

The Corridor's rail system is currently operating beyond its design capacity and major infrastructure improvements are required to enhance safety and provide a more reliable, competitive, and attractive intercity travel option as identified in the operational analysis presented in Chapter 9. The Build Alternative provides a set of Corridor-wide and site-specific improvement projects for the northern portion of the Pacific Surfliner Corridor that address infrastructure constraints. These improvement projects would allow for the addition of the frequencies shown on Table 4.2 for the Pacific Surfliner route in 2030. These frequencies are: two additional daily round-trips from San Luis to Goleta for a total of seven round-trips. Two additional round-trips would continue to San Luis Obispo for a total of four round-trips.

The *LOSSAN North Corridor Strategic Plan (Final)* and *LOSSAN Corridorwide Strategic Implementation Plan (Final)* provided detail on the prioritization and recommended timeline of improvements in the San Luis Obispo–Los Angeles corridor. The proposed improvements are grouped into near-term (2013 to 2015), mid-term (2016 to 2020), and long-term (2021 to 2040) timeframes. Near-term and mid-term projects are presented in Table 4.4 and long-term improvements are listed in Table 4.5, and are supplemented by information regarding the funding status (e.g., programmed or allocated, part of a financially-constrained or unconstrained RTP, etc.). The proposed improvement projects are graphically illustrated in Exhibits 4.1, 4.2, and 4.3.

The *Pacific Surfliner* corridor is a "joint use" corridor, with most segments currently shared with commuter service or planned to be shared with commuter rail service. Between East Ventura and LAUS, the corridor is shared with Metrolink. Between San Luis Obispo and LAUS, the Corridor is planned to be shared with the *Coast Daylight*, and between Goleta and East Ventura with the proposed Ventura-Santa Barbara commuter service. Most projects listed in the following tables would benefit both Pacific Surfliner intercity services as well as existing and future commuter services.

Planning-level project cost estimates for many of the identified improvement projects have already been developed as part of the *LOSSAN North Corridor Strategic Plan (2007) ,the LOSSAN Corridorwide Strategic Implementation Plan* and 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 Service Development Plan. 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. New cost estimates were developed for project cost estimates that did not appear reasonable based on the information available regarding project scope All of the near-term, mid-term, and long-term improvements that have been identified and validated through prior planning studies are being advanced as part of this Service Development Plan. The operations analysis described in Chapter 9 indicates that the 2030 train volumes shown in Table 4.2 could be implemented upon completion of the near-term and mid-term projects listed on Table 4.4.

4.3.1 Near-Term (2013 to 2015) and Mid-Term (2016 to 2020) Improvements

Table 4.4 presents the near-term and mid-term improvements that have been identified in previous studies and plans, and are being evaluated in the *Programmatic EIR/EIS (*currently under preparation).

Table 4.4: Proposed Near-Term (2013 to 2015) and Mid-Term (2016 to 2020) Rail Improvement Projects

ID No.	Project Description	Cost (Millions, Year 2012 dollars)	Source(s)
Near-Term (2013 to 2015)			
V-1	Camarillo Station improvements (platform and pedestrian circulation, passenger station building/restrooms, and related construction of new siding between Oxnard and Camarillo)	$4.42(1)	SCAG RTP in the Federal Transportation Improvement Program (FTIP)
V-2	Moorpark Station and Simi Valley Station grade crossing improvements	$0.75(1)	SCAG RTP (FTIP)
LA-1	New CP Raymer universal crossover	$5.00(1)	*LOSSAN Corridorwide Strategic Implementation Plan (Final Report)*
LA-2	Vanowen Street/Buena Vista Street SCCRA crossing improvements (Burbank)	$3.21(1)	SCAG RTP (financially-constrained)
LA-3	Doran Street/San Fernando Road SCRRA crossing grade separation (Glendale)	$40.00(1)	ARRA, Proposition 1A, Southern California Potential Early Investment Projects
LA-4	West Broadway/Brazil Street/San Fernando Road SCRRA grade crossing improvements (Glendale)	$60.14	SCAG RTP (FTIP), Caltrans Reporting Information System (CRIS)
LA-5	Riverside Drive grade separation replacement (Los Angeles)	$57.73	CRIS, IRCP
LA-6	North Spring grade separation reconstruction (Los Angeles)	$49.26	CRIS, IRCP
Mid-Term (2016 to 2020)			
SB-1	San Luis Obispo to Santa Barbara track upgrades (maximum speed 79 mph)	$90.00	*LOSSAN North Corridor Strategic Plan (Final)*
SB-2	Installation of powered switches at Grover, Callender, Surf, and Sudden	NA	UPRR
SB-3	Extension of Guadalupe siding and installation of island CTC	$23.60	*LOSSAN North Corridor Strategic Plan (Final)*
SB-4	Extension of Narlon siding	NA	UPRR
SB-5	Upgrades at Narlon, Honda, and Concepcion sidings (powered switches, track/tie replacement, and island CTC)	$35.40	*LOSSAN North Corridor Strategic Plan (Final)*
SB-6	Extension of Tangair siding, curve realignment, and installation of island CTC)	$14.00	*LOSSAN North Corridor Strategic Plan (Final)*
SB-7	Extension of Concepcion siding	NA	UPRR

ID No.	Project Description	Cost (Millions, Year 2012 dollars)	Source(s)
SB-8	New Sandyland siding	$20.00	*LOSSAN North Corridor Strategic Plan (Final)*
SB-9	New siding at Carpinteria Station	$11.80	*LOSSAN North Corridor Strategic Plan (Final)*
NA	Ventura County farm grade crossing improvements	$0.60	SCAG RTP (FTIP)
V-3	East Ventura (Montalvo) Curve realignment	$2.40	*LOSSAN North Corridor Strategic Plan (Final)*
V-4	Santa Clara River curve realignment	$7.00	*LOSSAN North Corridor Strategic Plan (Final)*
V-5	Extension of Leesdale siding	$17.00	*LOSSAN North Corridor Strategic Plan (Final)*
V-6	CP West Camarillo curve realignments	$6.00	*LOSSAN North Corridor Strategic Plan (Final)*
V-7	Strathearn siding curve realignment	$1.20	*LOSSAN North Corridor Strategic Plan (Final)*
LA-7	Vanowen Street/West Empire Avenue/Clybourn Avenue SCRRA crossing grade-separation	NA	SCAG RTP (FTIP)
LA-8	Burbank Junction track realignment and high-speed switches[(2)]	$10.00	*LOSSAN North Corridor Strategic Plan* (Final)
LA-9	Extension of Burbank siding	$7.00	*California Passenger Rail System: 20-Year Improvement Plan Technical Report (2001)*
LA-10	Burbank to Los Angeles third main track	$145.00	*California Passenger Rail System: 20-Year Improvement Plan Technical Report (2001)*
LA-11	Sonora Avenue/Air Way SCRRA crossing improvements	$3.70[(1)]	SCAG RTP (FTIP)
LA-12	Grandview Avenue/San Fernando Road/Air Way SCRRA crossing grade separation	$45.00[(1)]	Southern California Potential Early Investment Projects
LA-13	Chevy Chase Drive/Alger Street SCRRA crossing improvements	$45.00[(1)]	Southern California Potential Early Investment Projects
LA-14	Relocation of Glendale Slide	$3.30[(1)]	Southern California Potential Early Investment Projects
LA-15	Redesign of Glendale Station	$20.00[(1)]	Southern California Potential Early Investment Projects
LA-16	North Main Street SCRRA crossing improvements	$5.00[(1)]	Southern California Potential Early Investment Projects
LA-17	North Main Street grade separation (Los	$91.28[(1)]	SCAG RTP (financially-

ID No.	Project Description	Cost (Millions, Year 2012 dollars)	Source(s)
	Angeles)		constrained)
LA-18	Southern California Regional Interconnector Project (SCRIP) – LAUS run-through tracks[3]	$350.0	Southern California Potential Early Investment Projects

Notes:
- (1) Source document does not specify cost year. A review of available information concerning project scope concluded that no cost escalation or other adjustments are necessary.
- (2) The Burbank Junction track realignment and high-speed switches project description is subject to change based on the HSR Authority modeling effort.
- (3) Union Station run-through tracks will likely be subject to an environmental document being prepared by LA Metro.
- "NA" indicates not applicable.

4.3.2 Long-Term (2021 to 2040) Improvements

The long-term projects listed in Table 4.5 are those that were identified in previous studies and plans, and are being evaluated in the *Programmatic EIR/EIS (*currently under preparation).

Table 4.5: Proposed Long-Term (2021 to 2040) Rail Improvement Projects

ID No.	Project Description	Cost (Millions, Year 2012 dollars)	Source(s)
SLO-7	Hadley to Callender Curve Realignments	$290.00	*LOSSAN North Corridor Strategic Plan (Final)*
SLO-8	Grover Beach Station second platform and track	$75.00[1]	*LOSSAN Corridorwide Strategic Implementation Plan (Final Report)*
SB-10	South San Luis Obispo to Goleta continuous CTC	$295.00	*LOSSAN North Corridor Strategic Plan (Final)*
SB-11	MP 276 track realignment and highway 1 overpass replacement	$23.60	*LOSSAN North Corridor Strategic Plan (Final)*
SB-12	Extension of Waldorf siding	$25.00[1]	*LOSSAN Corridorwide Strategic Implementation Plan (Final Report)*
SB-13	Extension of Devon siding	$15.00[1]	*LOSSAN Corridorwide Strategic Implementation Plan (Final Report)*
SB-14	Devon to Tangair curve realignments	$231.00	*LOSSAN North Corridor Strategic Plan (Final)*
SB-15	Santa Barbara County curve realignments (Surf to Arguello, Sudden to Concepcion, Concepcion to Gato Curve, San Augustine to Sacate, Gaviota to	$677.00	*LOSSAN North Corridor Strategic Plan (Final)*

ID No.	Project Description	Cost (Millions, Year 2012 dollars)	Source(s)
	Tajiguas, Tajiguas to Ellwood)		
SB-16	Extension of Capitan siding	$15.00[(1)]	*LOSSAN Corridorwide Strategic Implementation Plan (Final Report)*
SB-17	Extension of Goleta siding	$11.80	*LOSSAN North Corridor Strategic Plan (Final)*
V-8	New Rincon siding	$11.80	*LOSSAN North Corridor Strategic Plan (Final)*
V-9	East Ventura Wye	$55.00[(1)]	*LOSSAN Corridorwide Strategic Implementation Plan (Final Report)*
V-10	Oxnard Station second platform	$20.00[(1)]	*LOSSAN Corridorwide Strategic Implementation Plan (Final Report)*
V-11	Oxnard to Camarillo second main track	$17.00	*LOSSAN North Corridor Strategic Plan (Final)*
V-12	New North Camarillo crossover	$1.20	*LOSSAN North Corridor Strategic Plan (Final)*
V-13	MP 423 to CP Las Posas second main track	$60.00	*LOSSAN North Corridor Strategic Plan (Final)*
V-14	CP Strathearn to Simi Valley second main track	$50.00	*LOSSAN North Corridor Strategic Plan (Final)*
V-15	Los Angeles Avenue/Argus Avenue/Ralston Street SCRRA crossing grade separation (Simi Valley)	$110.00	*LOSSAN North Corridor Strategic Plan (Final)*
V-16	Simi Valley to CP Davis (Hasson) second main track (extension of Santa Susana siding)	$40.00[(1)]	*LOSSAN Corridorwide Strategic Implementation Plan (Final Report)*

Notes:
(1) Some elements of the project scope may be duplicated by other projects listed here.

Exhibit 4.1: Pacific Surfliner North Corridor Improvements, San Luis Obispo to Santa Barbara

Exhibit 4.2: Pacific Surfliner North Corridor Improvements, Santa Barbara to Moorpark

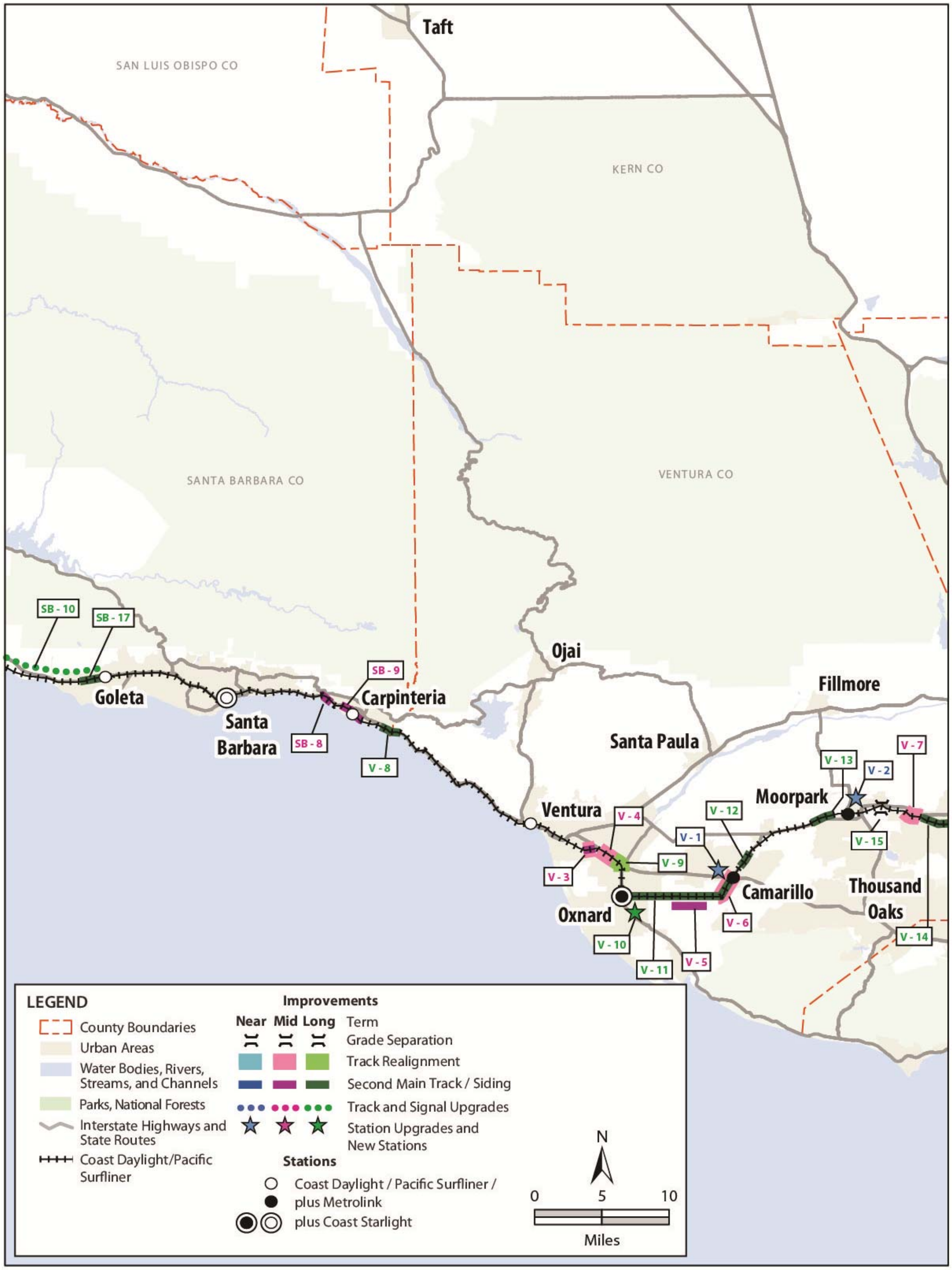
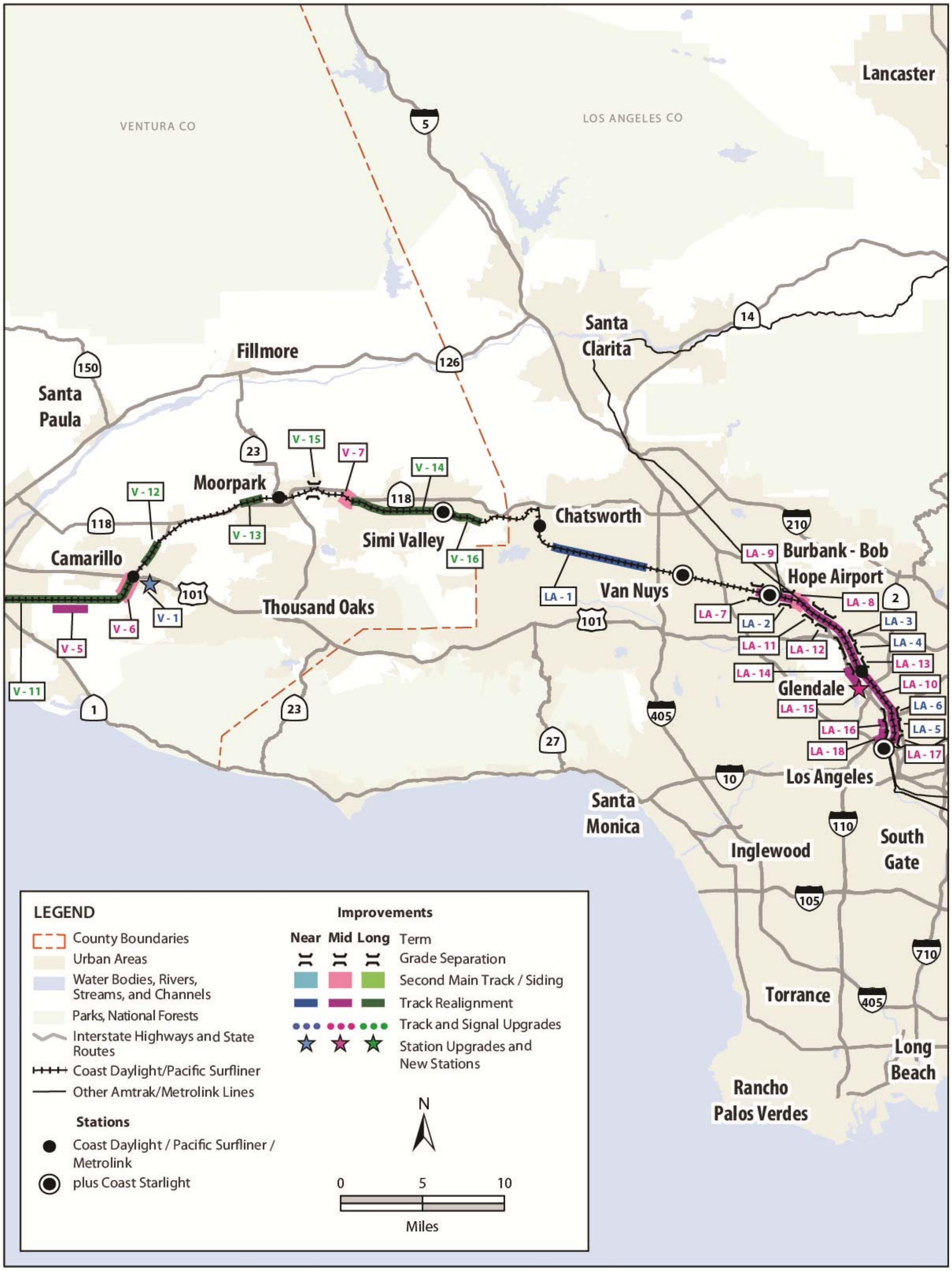


Exhibit 4.3: Pacific Surfliner North Corridor Improvements, Moorpark to Los Angeles



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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 the alternative that will be carried forward into further analysis. The evaluation was based on information from prior studies of the northern portion of the Pacific Surfliner Corridor and related service corridors (*Coast Starlight* and future *Coast Daylight*) program environmental documents prepared by Caltrans, and recently completed rail corridor improvement projects. The evaluation was also based on technical and economic information developed for this SDP.

As described in Section 4.2, the no-build alternative provides a baseline for analysis and consists of the current Pacific Surfliner frequency levels and projects with approved funding. The build-alternative includes a set of capital projects that will allow increased frequencies identified in the LOSSAN Corridorwide Stategic Implementation Plan as follows: by 2030 2 more daily round trips from Los Angeles to Goleta for a total of 7 with 2 of those trips continuing from Goleta to San Luis Obispo for a total of 4 round-trips.

The evaluation criteria assess how well each alternative meets the following:

- The Purpose and Need for the action.
- Technical feasibility based on right-of-way and engineering constraints.
- Economic feasibility based on market potential and/or ridership, capital and operating costs.
- Major 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 Corridor rail services, such as travel frequency times, availability of connections, and service reliability,and frequency. The primary purpose of the proposed action is to provide additional more frequent and reliable service in a cost-effective manner in response to increasing travel demand.

Frequency

Under the Build Alternative, intercity passenger train frequencies would increase in both the northern Corridor segment between San Luis Obispo and Santa Barbara (Goleta), and in the southern Corridor segment between Goleta and Los Angeles. The northern Corridor segment is currently served by two daily *Pacific Surfliner* trains in each direction, while the southern section is served by five round trips. . Under the Build Alternative, daily train service by 2030 would increase to seven round trips between Los Angeles and Goleta. Between Los Angeles and San Luis Obispo by 2030 by 2030 two additional trains would continue to San Luis Obispo (for a total of four round trips), with one of those trains continuing to San Francisco as a Coast Daylight train.

Reliability

With the Build Alternative, the reliability of all passenger and freight trains operating in the Corridor would improve. Considering that 80 percent of the Corridor is single-track, extensions of selected sidings and the installation of power switches and island CTC at the siding locations would reduce the time required for trains to pass one another when required, and allow for improved schedule adherence. The No-Build Alternative would not provide these benefits and would continue the current constrained operational conditions with frequent travel delays.

Improving travel time reliability is more challenging due to more than 80 percent of the existing Corridor system being single-track operations. Previous studies have identified a comprehensive list of speed and capacity improvement projects, which could decrease travel speed. However, the capital cost of the proposed improvements necessary to achieve reduced travel time, primary extensive double-tracking, exceeds foreseeable funding levels.

Station Location

This criterion is not applicable because the Build Alternative would use the stations currently accessed by the existing *Pacific Surfliner* service.

Connections

Compared to the No-Build Alternative, the Build Alternative would provide improved intermodal connections and accessibility due to increased train frequency between San Luis Obispo and Los Angeles. In particular, the increase in the number of trains between Santa Barbara and San Luis Obispo would improve rail accessibility. Currently, of the five daily scheduled connections between Santa Barbara and San Luis Obispo, three must be made by Amtrak Thruway bus (Route 17). Of the seven scheduled connections between Santa Barbara and LAUS, two must be made by Amtrak Thruway bus (Route 1). Increased train service would eliminate the need for intermodal transfers in Los Angeles and Santa Barbara, and would permit a more efficient and comfortable service for travelers.

Connecting bus and circulator service is provided at the Santa Barbara, Oxnard, Chatsworth, Van Nuys, Burbank-Bob Hope Airport, and Glendale stations by local transit operators; and an extensive system of connecting bus and rail service is provided at LAUS. Replacing Amtrak bus service between Santa Barbara and San Luis Obispo with train service would eliminate passenger access at Solvang, Buellton, Lompoc Visitors Center, and Santa Maria.

Ridership

The current ridership in the northern portion of the Pacific Surfliner Corridor is 345,100 annual riders, which does not include passengers from the southern portion of the Pacific Surfliner Corridor. For the Build Alternative, annual ridership is projected to increase by 43.7 percent to 496,000 annual riders in 2020 and by 232.4 percent to 802,000 annual riders in 2040 as presented in Table 8.2. Ridership in this Corridor will be even higher when considering riders traveling north beyond LAUS from the southern portion of the Pacific Surfliner Corridor, *Coast Starlight*, future *Coast Daylight*, and Metrolink travel.

It is important to note that the ridership forecasts do not anticipate or account for the significant CHSR-related passenger rail improvements identified in the *2012 Business Plan*. The *2012 Business Plan* calls for higher frequencies and faster running times between the San Francisco and Los Angeles markets as early as 2018. 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). Early investments include construction of the IOS, funding for Southern California projects that will support HSR operations, 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. 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 the future, California HSR service will operate in the portion of the Pacific Surfliner Corridor located between Burbank Junction and LAUS. An interim terminal station is proposed in the San Fernando Valley north of the Burbank Junction along the Antelope Valley Line with shuttle service being provided to LAUS. Access to the HSR system for passengers in the northern portion Pacific Surfliner Corridor North passengers is currently planned to occur from LAUS. It is expected that Pacific Surfliner Corridor ridership will increase with the introduction of faster HSR service in the Central Valley and future Bay Area connections, making rail travel a more attractive choice. It should be noted that the alternatives evaluated in this SDP do not include the results of concurrent modeling studies that are currently underway to analyze the impacts of an interim HSR terminus, and the resulting frequencies and capacity improvements required to serve that station.

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

At the SDP-level of analysis, it appears feasible to construct the siding improvements identified in previous study efforts within the existing rail ROW. There are some possible constraints between the Ventura and Santa Barbara stations where the alignment runs adjacent to the U.S.101 Freeway through sensitive coastal areas and residential communities. It appears that acquisition of residential property would not be required, but rail system improvements may bring operational impacts closer to residents. Physical impacts to coastal resources may occur if new bridges or retaining walls are required. Future more detailed engineering work will identify if additional ROW and appropriate sound mitigation measures are required.

In summary, ROW requirements for the Build Alternative are minimal considering the length of the Corridor, and would primarily occur within existing ROW and would not displace residential uses.

Disruption to Railroads, Highways or Adjacent Property

The proposed rail system projects are primarily located within the existing rail ROW, and there would be no impacts to highways or adjacent property. Construction sites would be carefully selected to minimize disruption of highway operations and property access. There would be minor impacts during construction of the proposed system improvements to highways and adjacent properties.

5.3 Economic Feasibility

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

Capital Cost

The capital cost estimates from prior studies, including the *LOSSAN Corridorwide Strategic Implementation Plan (2012)* which provided a usable range of capital costs for evaluating the alternatives and provided support for the identification of the following general order of magnitude costs for the different types of improvement projects:

- Siding extensions, including island CTC: $10-20 million per mile, plus $5 million per new switch.
- Signal upgrades, including county-wide CTC improvements: $60 million (for Santa Barbara and San Luis Obispo County improvements).
- Curve realignments: $20-150 million for each 5-10 mile segment.
- Second main track: $10-$20 million per mile depending on topography.

Previously identified signal improvements in Ventura County include signal upgrades north from the Moorpark Station (end of Metrolink ownership). It should be noted that no cost estimate was provided for these signal improvements which are related to future implementation of the Ventura-Santa Barbara Commuter Rail Service.

These cost ranges indicate that providing siding extensions and CTC system improvements in this Corridor would provide significant operational improvements at a lower cost level than the other proposed projects. Reducing running times and increasing operational reliability by realigning curves is a more costly proposition as is adding Corridor capacity through double-tracking. The identified higher-cost projects would be implemented 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 113 miles between Goleta and Los Angeles would be $16,000. The incremental additional daily operating and maintenance costs of running one daily northbound train and one daily southbound train for 222 miles between San Luis Obispo and Los Angeles would be $30,000.

Independent Utility

The Build Alternative is a usable and reasonable expenditure, even if no additional transportation improvements are made in the Corridor. Siding extensions and island CTC would benefit all trains operating in the Corridor, both freight and passenger, improving their reliability and decreasing running time.

Phasing Potential

Projects to improve passenger and freight operations in the northern portion of Pacific Surfliner Corridor have been identified through previous state rail plans and corridor studies, and the *Programmatic EIR/EIS* currently under preparation, effort for this Corridor. Improvements were prioritized as follows in order to provide the most cost-effective operational results:

- Track and signal upgrades to support higher operational speeds and more efficient operations.
- Siding improvements to increase existing track capacity and operational reliability.
- Minimal station investments as required for higher operational speeds and increased safety.
- Curve realignments to support higher operational speeds.

5.4 Environmental Resources and Quality

The following criteria assess major environmental concerns with respect to the proposed rail system improvements identified in the Build Alternative. Findings are based on the *Programmatic EIR/EIS* currently under preparation, previous planning studies, and a high-level review.

Geologic Constraints

The northern portion of the Pacific Surfliner Corridor passes through an area with a significant number of active and inactive earthquake faults, and the identified rail improvements may be immediately impacted by approximately 12 of the fault systems identified in the *Programmatic EIR/EIS (*currently under preparation). Possible liquefaction zones have been identified from Pismo Beach to south of Guadalupe, along the creek north of the Lompoc-Surf Station, surrounding the cities of Goleta and Santa Barbara, along the Carpinteria section, and throughout the city of Oxnard.

The portion of the Corridor between Ventura and Santa Barbara traverses along the coastline through coastal plains parallel to U.S. 101. In this area, steep slopes of weak marine rocks have periodically failed over the last century. Between Santa Barbara and Pismo Beach, the rail corridor has also been cut into coastal bluffs which have experienced minor and localized slope failures. Along the northern end of Vandenberg Air Force Base, proposed curve realignments were identified as having a medium potential for causing slope instability.

Wetlands / Nature Preserves / Environmentally Sensitive Areas

The preliminary environmental assessment provided in the *Programmatic EIR/EIS* currently under preparation identified the major potentially environmentally sensitive areas along the rail corridor in San Luis Obispo County, south of Pismo Beach, between the northern edge of Vandenberg Air Force Base and the area south of the Lompoc-Surf Station, and other possible impact areas in the Carpinteria and Sea Cliff sections, as well as north of the Ventura Station along the Ventura River.

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

The preliminary environmental assessment of the Build Alternative in the *Programmatic EIR/EIS* currently under preparation identified that operational impacts to historic structures, archeological and paleontological resources, parks and recreational resources, and farmland/agricultural zones would be not be significant as a majority of the improvements would be located within the existing railroad ROW. As new work is undertaken, there is the high possibility of paleontological resources being impacted during segment improvements in coastal areas. There would be the potential for construction-related impacts to identified resources and mitigation measures would be identified to reduce potential impacts during the preparation of project-specific environmental documentation.

Noise-Sensitive Receptors

Noise-sensitive receptors are noise-sensitive locations such as dwelling units or other fixed, developed sites where human activity may be adversely affected by project-related noise. The preliminary environmental assessment included in the Build Alternative and identified in the *Programmatic EIR/EIS* currently under preparation identified residential receptors related to the following improvements:

- San Luis Obispo – Santa Barbara track upgrades.
- Goleta service track extension and improvements and the Sandyland, Ortega, and Carpinteria siding improvements.
- Seacliff siding improvement.
- Oxnard Station north platform improvement.
- Camarillo – North Camarillo crossover.
- Simi Valley to CP Strathearn second main track.
- San Fernando Valley improvements, such as CP Raymer to CP Bernson second main track and Van Nuys Station second platform.
- Downtown Los Angeles – LAUS run-through tracks.

Proposed rail improvements would contribute to a higher cumulative noise source, and more detailed project-specific analysis would be undertaken to assess and mitigate noise and vibration impacts.

A review of visual and scenic impacts resulting from project implementation identified that rail system improvements would not significantly change the Corridor’s visual and scenic resources, or affect built areas with institutional, medical, school and/or residential properties adjacent to the ROW.

5.5 Conclusions

The evaluation indicates that the Build Alternative of two more daily round trips from Los Angeles to Goleta for a total of seven with two of those trips continuing from Goleta to San Luis Obispo for a total of four, meets the evaluation criteria. Besides the increased frequency of trains in the Corridor, implementation of the proposed improvement projects would provide for more reliable trips between the Central Coast and the Los Angeles Metropolitan area. Additional rail service will help to provide an alternative to auto travel in the highly congested U. S. 101 corridor. The increased frequencies would also provide improved access to future HSR service as identified in the *2012 Business Plan*. It should be noted, however, that future HSR service operations cannot be determined until additional modeling has been completed.

The evaluation also indicates that ROW requirements for the Build Alternative are minimal, as are the expected impacts on railroad operations, state highways, and adjacent properties. No significant environmental impacts are expected. There is high potential for phased implementation of the projects identified in the Build Alternative reflecting projected funding availability. The Corridor infrastructure provides many opportunities for the phasing of improvements, and projects could be grouped by type into packages and prioritized for implementation. As stated above, priority could be given to Corridor projects providing improved travel frequency improved travel time and increased ,reliability, and safety such as siding improvements and signal upgrades. As increased funding becomes available, implementation of the more costly curve realignment and second main track projects could be accomplished.

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.

6.1 Planning Horizons

Two planning horizons are employed in the development of the SDP planning and forecasting methodologies: a near-term horizon of 2020, and a long-term horizon with service levels and improvements to be realized by 2040. The years 2020 and 2040 were used to be consistent with the horizon year periods in the 2013 California State Rail Plan.

However, different horizon years were used for the future service assumptions (presented in Table 4.2) The years 2014 and 2030 were used for consistency with the *LOSSAN Corridorwide Strategic Implementation Plan* which is a consensus plan that was developed by the stakeholders on the LOSSAN corridor. These service projections were used to represent the years 2020 and 2040, respectively in Chapters 9, 10, and 12 for operations modeling, ridership and revenue modeling, and estimating operations and maintenance costs. This SDP is a building block to the 2013 California State Rail Plan, therefore it was necessary to use the same horizon years for modeling output in both documents.

6.1.1 Year 2020 (Near Term)

The near-term horizon reflects an initial level of operation to provide additional train frequencies, faster running times and improved reliability between Los Angeles, Santa Barbara, and San Luis Obispo, meeting ridership demand in the Corridor through 2020. The frequencies planned for 2014 in the LOSSAN Corridorwide Strategic Implementation Plan were applied to 2020 in the planning methodologies, for the reasons discussed above.

Construction of the section of the Initial Operating Segment (IOS) of HSR between Bakersfield and the San Fernando Valley in the Los Angeles Basin is scheduled for completion in 2022. The *2012 Business Plan* identifies a “blended” system approach, which will provide interim feeder service (provided by existing intercity passenger and regional commuter rail systems). The impacts of the HSR plan on the Burbank Junction to LAUS portion of the Corridor are currently being studied, and the SDP does not identify service frequencies in this portion of the Corridor.

6.1.2 Year 2040 (Long Term)

The long-term horizon reflects a vision of expanded Corridor service between Los Angeles and San Luis Obispo, meeting ridership demand in the Corridor expected by 2040. Improvements include those required to increase service and improve reliability. The frequencies planned for 2030 in the *LOSSAN Corridorwide Strategic Implementation Plan* were applied to 2040 in the planning methodologies, for the reasons discussed above.

The Year 2040 Long Term ridership forecasts include the effects of the completion of the Phase 1 HSR system statewide. The Phase 1 HSR 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 High-Speed Rail 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, 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 of 2012 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 (MTC) for use in the HSR R&R Model.

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 – The most recent conventional rail market-to-market base fare assumptions for the Pacific Surfliner were identified. Conventional rail fares are assumed constant in real dollars for all analysis years. Validated fare data is embedded in the Amtrak/Caltrans model, and the model results have been calibrated.

High-Speed Rail 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 $19.00 at Los Angeles to $18.50 at Burbank, while costs at minor airports range from $12.00 at Santa Barbara to $6.00 at Oxnard. Base airport parking cost assumptions were derived from data collection performed by Cambridge Systematics staff for Los Angeles Airport. These values reflect current airport parking costs used in HSR 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 – San Diego.
  - $6 – LA Union Station.
  - $3 – Anaheim, Bakersfield, Burbank, Commerce, Fresno, Fullerton, Irvine, Tustin.
  - $2 – Santa Barbara (with validation by station staff).
  - $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 $32 at Los Angeles, while costs at minor stations range from $21 at Burbank to $16 at San Fernando. 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 HSR 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 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 Los Angeles International Airport (LAX) – 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) – 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 FAF3.

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 Goods 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, we 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 San Francisco Bay 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 Preliminary Service Development Plan (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 northern portion of the Pacific Surfliner Corridor North and related corridors, including:

- *Amtrak California Passenger Rail System: 20-Year Improvement Plan Technical Report* (March 2001).
- *LOSSAN Corridor Strategic Assessment* (January 2010).
- UPRR Presentations to the Coast Rail Coordinating Committee (January 2011 and March 2012).
- *LOSSAN Corridorwide Strategic Implementation Plan* (April 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, grade crossing improvements, 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.

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7.0 Outreach Efforts

This section describes the public and agency involvement in developing the Service Development Plan for the northern portion of the Pacific Surfliner North Corridor, Service Development Plan as well as the California State Rail Plan statewide outreach effort, as described in Chapter 4 of the State Rail Plan.

At the time the Pacific Surfliner North SDP was being developed, a separate process was ongoing to prepare a *Programmatic EIS/EIR*, including the legally required outreach providing information on the project alternatives, potential impacts, and proposed mitigation. These outreach efforts for the northern portion of the Pacific Surfliner North Corridor were led by Caltrans District 5, and coordinated with the efforts of the CSRP and Pacific Surfliner North Corridor SDP outreach.

General outreach for the CSRP included the project website, advisory committee meetings, collateral materials and stakeholder outreach briefings. These outreach efforts also involved Pacific Surfliner North Corridor specific information as it related to the overall SDP development process. The following discussion presents the specific outreach efforts and coordination for the Pacific Surfliner North SDP. The final Pacific Surfliner North SDP was vetted through the appropriate Caltrans divisions and other committees in early 2013.

7.1 Stakeholder Meetings

Presentations summarizing the goals, process, and schedule for the Pacific Surfliner North Corridor SDP were provided to various Caltrans divisions, 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 the Caltrans DOR to provide input and expertise in the development of the CSRP and service development plans through the state, including the Pacific Surfliner Corridor. Representatives from federal, state, and regional agencies along with freight and passenger rail agencies comprised the committee to ensure a broad and diverse group of interests were represented. Participant groups included:

- National Railroad Passenger Corporation (Amtrak)
- BNSF Railway (BNSF)
- California High-Speed Rail Authority (CHSR)
- California Shortline Rail Association (CSLRA)
- California Transportation Commission (CTC)
- Capitol Corridor Joint Powers Authority (CCJPA)
- Coast Rail Coordinating Council (CRCC)
- Federal Railroad Administration (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 (UPRR)
- Caltrans Internal Coordination

Information on the northern portion of the Pacific Surfliner Corridor information, as part of the overall SDP development effort, was presented to Caltrans Management and related agency groups including: BT&H, California Transportation Commission, and others. Specific SDP information was included in 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 Pacific Surfliner North. They were also asked to help in getting the CSRP/SDP message out to stakeholders. Administrative Draft chapters for the Corridor Pacific Surfliner North 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 Pacific Surfliner North study and outreach process.

7.1.2 State Agencies/Regional Agencies

Status and updates were provided to state and regional agencies (MPOs, Regional Transportation Planning Agencies (RTPAs), and Councils of Governments (COGs) related to the northern portion of the Pacific Surfliner North 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 SDPs, including these Corridor’s Pacific Surfliner North SDP:

- State Agencies. The following agencies received overview CSRP briefings including general SDP information only:
    - Native American Advisory Committee (NAAC)
    - California Association of Councils of Governments (CALCOG)
    - Active Transportation and Livable Communities (ATLC)
    - Rural Counties Task Force (RCTF)
    - Air Resources Board (ARB)
- The California Energy Commission (CEC) and Strategic Growth Council (SGC) received an information packet, but did not receive a briefing.
- Metropolitan Planning Organizations, Regional Transportation Planning Agencies and Councils of Governments. Representatives from the following agencies participated on the LOSSAN Rail Corridor Agency or CRCC rail committees where they received draft Pacific Surfliner documents:
    - San Luis Obispo Council of Governments (SLOCOG)
    - Santa Barbara County Association of Governments (SANBAG)
    - Ventura County Transportation Commission (VCTC)
    - Southern California Association of Governments (SCAG)

- Los Angeles County Metropolitan Transportation Authority (LA Metro)

7.1.3 SDP Rail Corridor Committees and Railroads

As part of the CSRP Advisory Committee the LOSSAN, CRCC, and freight and passenger rail representatives received the draft Pacific Surfliner North SDP to review and provide comments. In addition, each member was tasked with coordinating input required 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 following agencies received the draft Pacific Surfliner North 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)
  - Coast Rail Coordinating Council (CRCC)
- Freight Railroads: Class 1/Shortline Railroads
  - Union Pacific Railroad (UPRR)
  - BNSF Railway (BNSF)
  - California Shortline Rail Association (CSRLA)
- Passenger Railroads (Owners and Operators)
  - Los Angeles County Metropolitan Transportation Authority
  - Ventura County Transportation Commission
  - Southern California Regional Rail Authority
  - National Railroad Passenger Corporation
  - California High Speed Rail Authority
  - Peninsula Corridor Joint Powers Board
- Metropolitan Planning Organizations
  - San Luis Obispo Council of Governments
  - Santa Barbara County Association of Governments
  - Southern California Association of Governments

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 northern portion of the Pacific Surfliner Corridor. These public meetings garnered stakeholder input and supported the Corridor Pacific Surfliner North 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)

Stakeholder meetings involving the northern portion of the Pacific Surfliner North Corridor are summarized in Table 7.1.

Table 7.1: Stakeholder Meetings Involving Pacific Surfliner North 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
October 30, 2012	CALCOG	SACOG Board Room, Sacramento
November 15, 2012	ATLC	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	SANDAG, San Diego
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	SANDAG, San Diego
October 4, 2012	LOSSAN TAC	LA Metro, Los Angeles
November 8, 2012	LOSSAN TAC	SANDAG, San Diego
December 6, 2012	LOSSAN TAC	LA Metro, Los Angeles
January 16, 2013	LOSSAN Board	LA Metro, Los Angeles
February 7, 2013	LOSSAN TAC	LA Metro, Los Angeles
February 20, 2013	LOSSAN Board	LA Metro, Los Angeles
March 7, 2013	SCAG Transportation Committee	SCAG, Los Angeles
March 7, 2013	LOSSAN TAC	LA Metro, Los Angeles
March 22, 2013	LOSSAN Board	SBCAG, Santa Barbara
April 4, 2013	LOSSAN TAC	SANDAG, San Diego

8.0 Ridership Demand and Revenue Forecast

This section of the Service Development Plan 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 in the northern portion of the Pacific Surfliner 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 Model, a forecasting model developed by AECOM for Caltrans 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).

A more detailed description of the Amtrak/Caltrans Model is provided in the *Passenger Rail Ridership and Revenue Forecasting Methodology* document prepared in October 2011.

8.1.2 Study Area Definition

The overall study area addressed by the Amtrak/Caltrans Model is illustrated in Exhibit 8.1. The Pacific Surfliner Corridor is divided into two segments: Pacific Surfliner North and Pacific Surfliner South. The proposed *Coast Daylight,* and Amtrak's *Coast Starlight* are also shown in this figure since these services and their markets have important interactions with respect to the *Pacific Surfliner North* service. Specifically, the proposed *Coast Daylight* train service will operate as an extension of *Pacific Surfliner* trains currently terminating in San Luis Obispo – providing a one-seat ride from San Francisco to Los Angeles. Additionally, it should be noted, that most of the *Pacific Surfliner* trains operating north of Los Angeles operate as through trains from San Diego, providing a one-seat ride to/from San Diego. Ridership/revenue on these shared trains will be accounted for as follows:

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

In addition, the Pacific Surfliner trains serve some markets in common with Amtrak's Coast Starlight, which would continue to operate between Los Angeles, San Jose, Oakland, and points north of Oakland.

Exhibit 8.1: Pacific Surfliner North Corridor Study Area Map

- Travel entirely south of Los Angeles, such as a trip from Los Angeles to San Diego, is assigned to the *Pacific Surfliner South*.

In addition, the *Pacific Surfliner* trains serve some 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 the Central Coast at the northern end and Los Angeles, Orange, and San Diego counties at the southern end.

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/California 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/California Model addresses the growth in the total intercity person travel volumes and includes "natural" growth and "induced" demand. The second stage of the Amtrak/California 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 includes:

- 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.
- Ten Metrolink train round-trips providing weekday service on Metrolink's Ventura line, which uses the same railroad and shares some stations with the *Pacific Surfliner* North Corridor as far north as Oxnard. (Metrolink serves a different Ventura station than the *Pacific Surfliner*.)

The future "Build" scenarios differ for forecast years 2020 and 2040, as follows:

- In 2020, a sixth daily round-trip is added between Goleta and Los Angeles, resulting in a total of six *Pacific Surfliner* round-trips between Goleta and Los Angeles.
- In 2040:
  - A seventh daily round-trip is added between Goleta and Los Angeles, resulting in a total of seven *Pacific Surfliner* round-trips between Goleta and Los Angeles.
  - Two additional daily round-trips are extended from Goleta to San Luis Obispo, resulting in a total of four *Pacific Surfliner* round-trips between San Luis Obispo and Los Angeles.

In addition, *Coast Daylight* service is initiated north of San Luis Obispo in 2020 with one round- trip and an additional round- trip is added in 2040, but this does not result in any new frequencies south of San Luis Obispo not already accounted for above. 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

Services	**Daily Train Frequencies** (round-trips)		
	Baseline	**Build 2020**	**Build 2040**
Pacific Surfliner North			
San Luis Obispo–Los Angeles	2 daily[1]	2 daily[1]	4 daily[1]
Goleta–Los Angeles (including above)	5 daily[1]	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
Metrolink			
Ventura Line	10 weekday	10 weekday	10 weekday

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/California 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 Pacific Surfliner North and parallel Coast Starlight market segments only. Forecast results associated with Pacific Surfliner South markets, which are south of Los Angeles, are addressed in the Pacific Surfliner South SDP.

The results show generally expected growth in ridership/revenue as new Pacific Surfliner North frequencies are implemented in 2020 and in 2040. Additional frequencies to San Luis Obispo, however, tend to be relatively more productive because the current level of service is lower, so there is more of an upside, and the average yields are higher because of the longer trip lengths involved. In general, there is a diminishing impact of adding new frequencies.

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.

Table 8.2: 2020 and 2040 Annual Forecasts for Pacific Surfliner North Service Options

Services	Forecast Year 2020		Forecast Year 2040	
	Baseline	**Build**	**Baseline**	**Build**
Annual Ridership				
Metrolink Ventura Line	1,373,000	1,309,000	2,037,000	1,859,000
Pacific Surfliner North				
Markets North of Los Angeles	467,000	496,000	658,000	802,000
Markets Thru Los Angeles	541,000	599,000	773,000	915,000
Pacific Surfliner Subtotal	*1,008,000*	*1,095,000*	*1,431,000*	*1,717,000*
Coast Daylight Markets Thru San Luis Obispo	0	37,000	0	57,000
Coast Starlight Markets Thru San Luis Obispo	28,000	32,000	37,000	43,000
Subtotal	28,000	69,000	37,000	100,000
Total	*1,036,000*	*1,164,000*	*1,468,000*	*1,817,000*
Ticket Revenue (2012 dollars)				
Metrolink Ventura Line	$9,000,000	$8,600,000	$13,300,000	$12,200,000
Pacific Surfliner North				
Markets North of Los Angeles	$11,500,000	$11,800,000	$16,100,000	$18,800,000
Markets Thru Los Angeles	$17,700,000	$19,300,000	$25,300,000	$30,200,000
Pacific Surfliner Subtotal	$29,200,000	$31,100,000	$41,400,000	$49,000,000
Coast Daylight Markets Thru San Luis Obispo	$0	$1,200,000	$0	$1,900,000
Coast Starlight Markets Thru San Luis Obispo	$1,000,000	$800,000	$1,300,000	$1,100,000
Subtotal	$1,000,000	$2,000,000	$1,300,000	$3,000,000
Total	*$30,200,000*	*$33,100,000*	*$42,700,000*	*$52,000,000*

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 tables above also summarize 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.

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.

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9.0 Operations Modeling

This section of the Service Development Plan describes the rail operation simulations for the northern portion of the Pacific Surfliner Corridor. For the purposes of this study, the Pacific Surfliner North Corridor is defined as operating between San Luis Obispo and Los Angeles Union Station. Railroad operation dynamic simulations were undertaken specifically for this SDP to provide a thorough review of the capacity issues affecting the corridor, using RailOPS simulation software.

It should be noted that the Authority is performing other operations modeling and studies. The purpose of the Antelope Valley Line Infrastructure Improvement Strategy (AVLIISP) study (2011) was to identify infrastructure improvements that enhance the corridor safety, increase passenger rail service, improve operating efficiency, and reduce travel times in the rail corridor between the cities of Palmdale and Lancaster and LAUS.[xiv] The Palmdale to Los Angeles Supplemental Alternatives Analysis Report (Authority, April 2012) analyzes potential alignment alternatives, station locations, and design options for the Palmdale to Los Angeles HSR section.[xv]

The modeling includes all rail activity in the Corridor, including freight, intercity passenger 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. 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.[xvi]

- 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,[xvii] 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) simulation model. [xviii]

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 Union Pacific Railroad. 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.

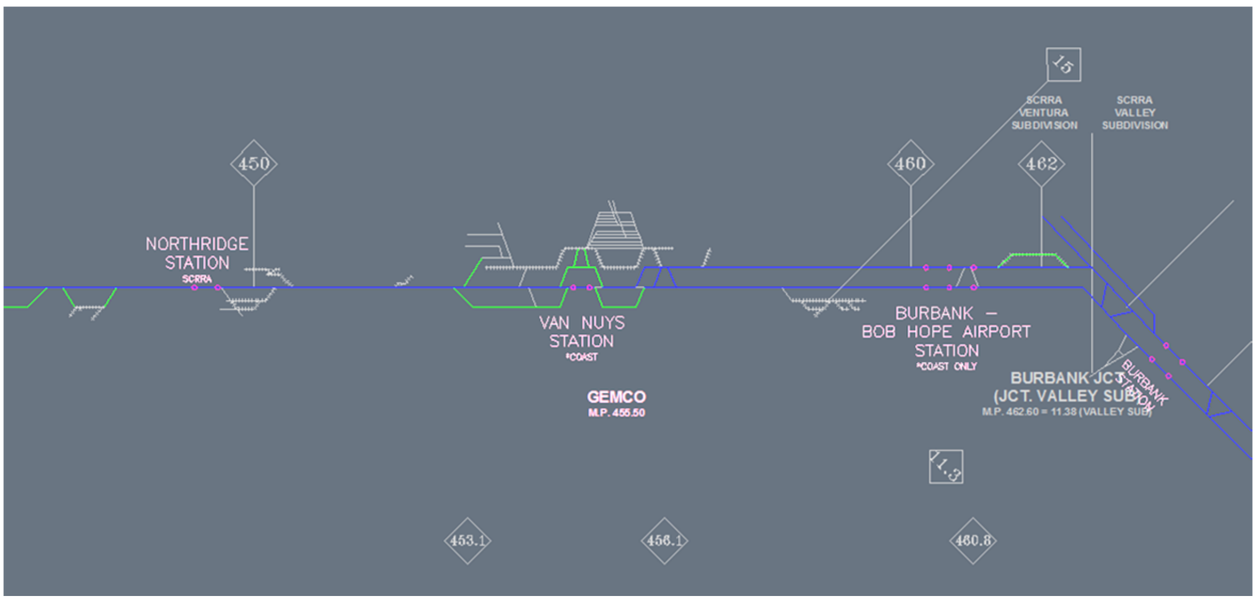
- Rolling stock information such as lengths, running speeds, and accelerations.

Outputs for the Pacific Surfliner North simulation include:

- Detailed animations 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 Pacific Surfliner North network in the schematic layout, centered at Van Nuys Station.

Exhibit 9.1: RailOPS Schematic View of Burbank & Van Nuys Region



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:
    - o 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.
    - o 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.
    - o If the Existing Year intercity passenger train volumes can meet an intercity passenger rail on-time performance goal of 87 percent (Corridor commuter passenger service has a different on-time performance goal) with Year 2020 freight volumes, the freight increases

are considered feasible. If not, necessary schedule refinements to reduce freight conflicts with intercity passenger trains are identified. If schedule refinements are insufficient, network infrastructure improvements are identified and implemented until the intercity passenger OTP goal is met.

- Next, complete intercity passenger schedules including any expected new passenger services, along with SCRRA-identified commuter passenger schedules, 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 intercity passenger trains are able to meet the intercity OTP goal of 87 percent.
- If any intercity 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 intercity and commuter passenger and freight volumes for 2020 and any improvements to the Year 2020 Base Case network necessary to reach the intercity passenger OTP goal of 87 percent for all intercity 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 intercity passenger 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 intercity passenger OTP goal is met.
    - Next, complete passenger schedules including any expected new intercity and commuter 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 intercity passenger trains are able to meet the intercity passenger OTP goal of 87 percent.
    - If any intercity 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 intercity 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 intercity passenger train services operating in 2040.

The modeling methodology is intended to determine overall needs on the northern portion of the Pacific Surfliner North 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 northern portion of the Pacific Surfliner Corridor network, there are a number of elements of infrastructure which impede reliability. In particular, there are many stretches of single-track, particularly between Goleta and San Luis Obispo. There are also long distances between sidings, contributing to significant cascading delays between passenger trains. In addition, some of these existing sidings are shorter than the average freight train length of 7,000 feet used in the Existing Year analysis, making them unable to accommodate most freight trains. As freight train lengths are expected to increase over time, these short sidings will be able to accommodate even fewer trains in Year 2020 and Year 2040 without siding extensions. The modeling methodology was not however used to determine an ideal future siding length.

Many switches in this region also operate using manually thrown switches, which force train crews to stop a train, manually realign the switch, and then wait for the train to clear the switch before the signal can be reset. Each of these switches may take about ten minutes to clear, resulting in increased travel time.

Amtrak operates two passenger train services across the northern portion of the Pacific Surfliner Corridor: the *Pacific Surfliner* and the *Coast Starlight*. The types of delays tracked by Amtrak for its Pacific Surfliner North Corridor services are summarized in Table 9.1.

Tables 9.2 and 9.3 summarize the delays experienced by *Pacific Surfliner* and *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.

Four types of train interference delay are highlighted in Tables 9.2 and 9.3: 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. If average model delay is within 15 percent of the average delays per train from Tables 9.2 and 9.3, the Existing Year scenario is considered validated. 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 Existing Year schedule and network are validated.

The data in Table 9.2 correspond to 368 total trains operated on segments between San Luis Obispo and Goleta, and 920 total trains operated on segments between Goleta and LAUS.

Train interaction delays amount to just over half (52 percent) of the total delays listed during this period by Amtrak for the *Pacific Surfliner* service. Of the train interaction delays, 64 percent were caused by passenger train interaction among trains on the *Pacific Surfliner* and *Coast Starlight* intercity passenger services. The largest levels of PTI delay occur on the sections of track between Santa Barbara and Van Nuys, a region that is largely single-tracked with widely-spaced siding locations. An additional 35 percent of train interaction delays result from commuter train interaction due to the Metrolink services operating in the region between the LAX and Ventura. A majority of these delays occur on the Chatsworth–Van Nuys segments. The Van Nuys station has two tracks served by only a single platform, which may be a contributing factor to the region’s commuter train interaction delays, due to trains waiting for the platform to clear in order to proceed. Almost three quarters (73 percent) of the total commuter train interaction delays occur along the single-tracked region between Camarillo and Van Nuys. Relatively little of the interaction delays are caused by either freight train interaction or routing delays – three percent and eight percent of the total interaction delays, respectively. The most significant delays in the routing category occur around Camarillo at about 30 percent of the corridor-wide routing delay.

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 right-of-way 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: *Pacific Surfliner* Service Delay Minutes by Segment [1, 2]

Segment	ADA	CAR	CCR	CON	CTI	DBS	DCS	DMW	DSR	ENG	FTI	HLD	INJ	ITI	NOD	OTH	POL	PTI	RTE	SVS	SYS	TRS	WTR	Grand Total
San Luis Obispo-Guadalupe	18	1		40			44	42	43	23	**15**	78		50	66	16			**54**		35			525
Guadalupe-Lompoc-Surf	26	18	3				159	16		12	**33**	61			267	17		**1232**	**32**		71			1947
Lompoc-Surf-Goleta	33	9	4			50	315	155	3	112	**96**	73			35	71		**474**	**32**	27	75	11	5	1580
Goleta-Santa Barbara	173	8		48		18	1	73	55	11		623			141		11	**112**	**21**		72	10		1377
Santa Barbara-Ventura	54	6	1		**3**	26	79	46	31	4	**10**	109			430	19	50	**1898**	**70**		44	119		2999
Ventura-Oxnard	98	32			**74**		57	20	18	24	**20**	194			27	8		**1070**	**65**		15	58		1780
Oxnard-Camarillo	19				**21**		30	21	9	2	**79**	57			124	1		**1161**	**64**		29	77		1694
Camarillo-Simi Valley	71	33			**690**	2	197	57	105	61	**80**	235			953	24	1	**910**	**222**		58	25		3724
Simi Valley-Chatsworth	79	19			**458**		38			3	**9**	366			496	10		**818**	**31**		48	6		2381
Chatsworth-Van Nuys	96	14			**1165**		153			8	**30**	210			265	30	4	**294**	**38**		3	488		2798
Van Nuys-Burbank	70	11			**30**		69	5		8	**3**	249			167	32		**19**	**2**		8			673
Burbank-Glendale	60	15			**298**		127	3	10		**15**	257			78	16	1	**9**	**72**		7	4		972
Glendale-LA Union	33	56	53	191	**432**		38	7		254	**11**	87		72	12	121		**101**	**259**	58	96	4		1885
Grand Total	*830*	*222*	*61*	*279*	***3171***	*96*	*1307*	*445*	*274*	*522*	*401*	***2599***	*0*	*122*	*3061*	*365*	*67*	***8098***	***962***	*85*	*561*	*802*	*5*	*24335*

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 9.3: *Coast Starlight* Service Delay Minutes by Segment [1, 2]

Segment	ADA	CAR	CON	CTI	DCS	DMW	DSR	DTR	ENG	FTI	HLD	INJ	ITI	NOD	OTH	POL	PTI	RTE	SVS	SYS	TRS	Grand Total
LA Union-Burbank	13	58	17	**89**	10	3		23	83	**126**	127	9	9		8		**1**	**34**	240	15		865
Burbank-Van Nuys		3		**315**	20						201				7		**30**			22	244	842
Van Nuys-Simi Valley	13			**39**	27					**18**	74				4		**454**	**91**		3		723
Simi Valley-Oxnard	23	6		**329**	77	23	34			**20**	114				29		**228**	**13**		8		904
Oxnard-Santa Barbara	22	3		**79**	11	29	33		7	**29**	161			127	70		**57**	**9**		40	18	695
Santa Barbara-San Luis Obispo		45			402	26	26		59	**77**	134		7	577	2	24	**3989**	**98**	389	276	20	6151
Grand Total	*71*	*115*	*17*	***851***	*547*	*81*	*93*	*23*	*149*	***270***	*811*	*9*	*16*	*704*	*120*	*24*	***4759***	***245***	*629*	*364*	*282*	*10180*

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

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

- Passenger related issues (14 percent): assisting disabled passengers (ADA), large groups or baggage issues (HLD).
- Mechanical issues on the train (three percent): either locomotives (ENG), or railcars (CAR) or cab cars (CCR).
- Coordination or local track and signal issues (26 percent). This category includes late inbound trains at an initial terminal causing delayed release of equipment (ITI), slow order (DSR), holding for connecting trains or buses (CON), debris on the tracks (DBS), signal failures (DCS), switch/signal serving (SVS), and track maintenance holds (DMW).
- Miscellaneous rare events (five percent): including bad weather (WTR) and trespassers (TRS).

Passenger-related delays are most common between Goleta and Santa Barbara, mostly due to large groups and baggage loading. Train mechanical issues were unusual overall, but most common on the southern-most portions of the network from Glendale to LAX. Track and switching related delays were most common between Lompoc-Surf and Goleta, a region that is largely operating under track warrant control (TWC) via radio dispatching with UPRR operators, rather than Centralized Traffic Control.

Table 9.3 summarizes Amtrak's reported delays for the *Coast Starlight* service between May 1, 2012 and July 31, 2012. The data in Table 9.3 corresponds to 184 total *Coast Starlight* trains operated on each segment.

For the *Coast Starlight* service, train interactions resulted in 60 percent of the total delays reported by Amtrak over this period on the Pacific Surfliner North network. Of the train interaction delays, 78 percent were PTIs from Amtrak's *Pacific Surfliner* and *Coast Starlight* service trains, with 65 percent of this PTI delay between Santa Barbara and San Luis Obispo, a region that is largely single tracked with long distances between sidings in many locations. CTI delays due to Metrolink traffic accounted for 14 percent of train interaction delays, mostly near Van Nuys due to the single platform issue. FTIs and RTEs each amounted to 4 percent of the train interaction delay.

A majority of *Coast Starlight* service delays occur between Santa Barbara and San Luis Obispo (60 percent). In addition to the train interference delays, there are significant signaling-related delays which may be due to the regions antiquated signaling and switching infrastructure.

The other types of delays on the *Coast Starlight* service within the Pacific Surfliner North Corridor primarily consist of:

- Passenger related issues (9 percent): assisting disabled passengers (ADA), large groups or baggage issues or injuries (INJ).
- Mechanical issues on the train (3 percent): either locomotives or railcars.
- Local track system or signal issues (16 percent). Signal failures (DCS), or switch/signal serving (SVS), detours (DTR), and track maintenance holds (DMW).
- Amtrak-related coordination issues (7 percent): includes late inbound trains at an initial terminal causing delayed release of equipment, and holding for connecting trains or buses (CON).
- Miscellaneous rare events (5 percent): includes slow orders (DSR), police holds (POL), and trespassers.

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 Tables 9.4 – 9.6. These schedules include only stations within the northern portion of the Pacific Surfliner Corridor, although many of these trains start or terminate at locations outside the Corridor.

Table 9.4: Existing Year *Pacific Surfliner* Service Northbound Schedule (1)

***Pacific Surfliner* North**	**761**	**1761**	**763**	**769**	**777**	**785**
	M-F (2)	**Sa-Su (3)**	**Daily**	**Daily**	**Daily**	**Daily**
Los Angeles	7:35am	7:45am	9:05am	12:25pm	3:00pm	7:10pm
Glendale	7:48am	7:57am	9:17am	12:37pm	3:12pm	7:22pm
Burbank Airport	8:00am	8:08am	9:27am	12:47pm	3:22pm	7:32pm
Van Nuys	8:10am	8:17am	9:36am	12:56pm	3:31pm	7:41pm
Chatsworth	8:26am	8:31am	9:49am	1:09pm	3:44pm	7:54pm
Simi Valley	8:45am	8:45am	10:01am	1:21pm	4:00pm	8:06pm
Moorpark	8:57am	8:57am	--	1:34pm	--	--
Camarillo	9:10am	9:10am	10:24am	1:48pm	4:21pm	8:29pm
Oxnard	9:21am	9:21am	10:37am	1:59pm	4:32pm	8:40pm
Ventura	9:35am	9:35am	10:53am	2:13pm	4:56pm	8:59pm
Carpinteria	10:06am	10:06am	11:15am	2:41pm	5:20pm	9:21pm
Santa Barbara	10:22am	10:22am	11:40am	3:00pm	5:42pm	9:45pm
Goleta	10:34am	10:34am	11:53am	3:13pm	5:54pm	9:58pm
Lompoc-Surf	11:40am	11:40am				
Guadalupe-Santa Maria	12:16pm	12:16pm				
Grover Beach	12:35pm	12:35pm				
San Luis Obispo	1:00pm	1:00pm				

Notes:

- "-- " Indicates that the train does not stop
- (1) From Amtrak Schedule Effective May 7, 2012
- (2) Monday – Friday Only
- (3) Saturday – Sunday Only

Table 9.5: Existing Year *Pacific Surfliner* Service Southbound Schedule (1)

Pacific Surfliner **South**	**768** **M-F**	**774** **Daily**	**784** **Daily**	**790** **M-F(2)**	**1790** **Sa-Su(3)**	**796** **Daily**
San Luis Obispo		6:55am		1:35pm	1:55pm	
Grover Beach		7:14am		1:55pm	2:15pm	
Guadalupe-Santa Maria		7:30am		2:11pm	2:31pm	
Lompoc-Surf		8:05am		2:51pm	3:11pm	
Goleta	6:30am	9:12am	1:50pm	3:57pm	4:17pm	6:45pm
Santa Barbara	6:43am	9:26am	2:03pm	4:12pm	4:35pm	6:58pm
Carpinteria	6:58am	9:41am	2:18pm	4:27pm	4:50pm	7:14pm
Ventura	7:23am	10:03am	2:40pm	4:49pm	5:16pm	7:36pm
Oxnard	7:37am	10:17am	2:56pm	5:07pm	5:30pm	7:50pm
Camarillo	7:48am	10:36am	3:07pm	--	--	8:01pm
Moorpark	8:05am	--	3:20pm	5:36pm	5:59pm	--
Simi Valley	8:20am	11:02am	3:35pm	5:54pm	6:15pm	8:38pm
Chatsworth	8:35am	11:23am	3:52pm	6:12pm	6:28pm	8:50pm
Van Nuys	8:50am	11:36am	4:13pm	6:25pm	6:40pm	9:05pm
Burbank Airport	8:59am	11:44am	4:22pm	6:37pm	6:48pm	9:13pm
Glendale	9:11am	11:54am	4:32pm	6:50pm	6:59pm	9:23pm
Los Angeles	9:25am	12:15pm	4:55pm	7:10pm	7:15pm	9:45pm

Notes:
(1) From Amtrak Schedule Effective May 7, 2012
(2) Monday – Friday Only
(3) Saturday – Sunday Only

Table 9.6: Existing Year *Coast Starlight* Service Schedule (1)

Coast Starlight	**11 (South)** **Daily**	**14 (North)** **Daily**
San Luis Obispo	3:20pm	3:43pm
Santa Barbara	6:17pm	12:48pm
Oxnard	7:05pm	11:55am
Simi Valley	7:38pm	11:23am
Van Nuys	8:05pm	10:52am
Burbank-Bob Hope Airport	8:15pm	10:42am
Los Angeles Union Station	9:00pm	10:25am

Notes:
(1) From Amtrak Schedule Effective May 7, 2012.

In addition, two Metrolink commuter rail services operate on a portion of the Pacific Surfliner North Corridor: Metrolink–Ventura Country (East Ventura–LAUS) and Metrolink–Antelope Valley (Burbank Junction–LAUS). Schedules for Metrolink–Ventura County Southbound and Northbound are provided in Tables 9.7 and 9.8, respectively. Schedules for Metrolink–Antelope Valley Southbound and Northbound are provided in Tables 9.9 and 9.10, respectively.

Table 9.7: Existing Year Metrolink Ventura County Southbound Schedule [1]

Metrolink Ventura County Southbound	100 M-F	900 M-F	102 M-F	104 M-F	106 M-F	902 M-F	108 M-F	110 M-F	112 M-F	116 M-F	904 M-F	906 M-F	150 M-F	910 M-F	118 M-F
East Ventura			5:25am	6:03am	6:42am										
Oxnard			5:39am	6:17am	6:56am										
Camarillo			5:49am	6:27am	7:06am										
Moorpark	5:04am		6:00am	6:38am	7:17am			8:25am		2:25pm					4:57pm
Simi Valley	5:17am		6:13am	6:51am	7:30am			8:38am		2:38pm					5:10pm
Chatsworth	5:28am		6:24am	7:02am	7:41am		8:25am	8:49am	10:45am	2:49pm			4:30pm		5:27pm
Northridge	5:33am		6:29am	7:07am	7:46am		8:30am	8:54am	10:50am	2:54pm			4:35pm		5:32pm
Van Nuys	5:41am		6:37am	7:15am	7:54am		8:38am	9:02am	10:58am	3:02pm			4:43pm		5:45pm
Burbank Airport	5:49am	6:13am	6:45am	7:23am	8:02am	8:35am	8:46am	9:10am	11:06am	3:10pm	3:37pm	4:15pm	4:55pm	5:05pm	5:53pm
Downtown Burbank	5:55am	6:17am	6:52am	7:30am	8:08am	8:39am	8:52am	9:16am	11:12am	3:16pm	3:41pm	4:19pm	5:00pm	5:10pm	5:59pm
Glendale	6:02am	6:23am	6:59am	7:37am	8:15am	8:45am	8:59am	9:23am	11:21am	3:23pm	3:47pm	4:25pm	5:06pm	5:15pm	6:06pm
LA Union Station	6:15am	6:38am	7:12am	7:50am	8:28am	9:00am	9:15am	9:40am	11:35am	3:40pm	4:00pm	4:40pm	5:20pm	5:30pm	6:20pm

Notes:

(1) From Metrolink Schedule Effective May 7, 2012

Table 9.8: Existing Year Metrolink Ventura County Northbound Schedule [(1)]

Metrolink Ventura County Northbound	901 M-F	101 M-F	103 M-F	903 M-F	905 M-F	907 M-F	107 M-F	109 M-F	909 M-F	155 M-F	115 M-F	117 M-F	911 M-F	119 M-F	121 M-F	123 M-F
LA Union Station	5:38am	6:50am	7:15am	8:00am	8:25am	8:50am	9:50am	1:00pm	3:05pm	3:15pm	3:35pm	4:25pm	4:33pm	5:10pm	5:55pm	6:40pm
Glendale	5:48am	7:00am	7:25am	8:10am	8:35am	9:00am	10:00am	1:10pm	3:15pm	3:25pm	3:45pm	4:35pm	4:43pm	5:20pm	6:05pm	6:50pm
Downtown Burbank	5:54am	7:06am	7:31am	8:16am	8:41am	9:06am	10:06am	1:18pm	3:21pm	3:31pm	3:51pm	4:41pm	4:49pm	5:26pm	6:11pm	6:56pm
Burbank Airport	6:01am	7:11am	7:36am	8:25am	8:50am	9:15am	10:11am	1:23pm	3:30pm	3:36pm	3:56pm	4:46pm	4:58pm	5:31pm	6:16pm	7:01pm
Van Nuys		7:22am	7:43am				10:18am	1:30pm		3:43pm	4:03pm	4:53pm		5:38pm	6:23pm	7:08pm
Northridge		7:30am	8:00am				10:26am	1:38pm		3:51pm	4:11pm	5:01pm		5:46pm	6:31pm	7:16pm
Chatsworth		7:37am	8:10am				10:35am	1:45pm		4:05pm	4:18pm	5:08pm		5:53pm	6:38pm	7:23pm
Simi Valley		7:52am						1:57pm			4:30pm	5:20pm		6:05pm	6:50pm	7:35pm
Moorpark		8:10am						2:15pm			4:47pm	5:32pm		6:17pm	7:08pm	7:47pm
Camarillo												5:43pm		6:28pm		7:58pm
Oxnard												5:53pm		6:38pm		8:14pm
East Ventura												6:12pm		6:57pm		8:37pm

Notes:
(1) From Metrolink Schedule Effective May 7, 2012

Table 9.9: Existing Year Metrolink Antelope Valley Southbound Schedule [(1)]

Metrolink Antelope Valley Southbound	200 M-F	202 M-F	204 M-F	282 M-F	206 M-F	208 M-F	210 M-F	284 M-F	212 M-F	286 M-F	214 M-F	216 M-F	218 M-F	220 M-F	222 M-F
Downtown Burbank	5:30am	6:31am	7:03am	7:25am	7:51am	8:27am	9:34am	10:10am	10:28am	12:29pm	1:15pm	3:06pm	3:56pm	5:41pm	7:50pm
Glendale	5:37am	6:38am	7:09am		7:58am	8:33am	9:41am	10:17am	10:35am	12:35pm	1:22pm	3:13pm	4:03pm	5:48pm	7:57pm
LA Union Station	5:53am	6:55am	7:26am	7:40am	8:15am	8:52am	10:00am	10:30am	10:50am	12:49pm	1:35pm	3:30pm	4:20pm	6:10pm	8:20pm

Notes:
(1) From Metrolink Schedule Effective May 7, 2012

Table 9.10: Existing Year Metrolink Antelope Valley Northbound Schedule [(1)]

Metrolink Antelope Valley Northbound	201 M-F	203 M-F	281 M-F	205 M-F	283 M-F	207 M-F	209 M-F	211 M-F	213 M-F	215 M-F	285 M-F	217 M-F	219 M-F	221 M-F	223 M-F
LA Union Station	6:30am	7:30am	8:10am	9:20am	10:45am	11:20am	1:55pm	3:45pm	4:00pm	4:45pm	5:35pm	5:50pm	6:30pm	7:40pm	9:15pm
Glendale	6:41am	7:40am	8:19am	9:30am	10:55am	11:30am	2:05pm	3:55pm	4:10pm	4:55pm		6:00pm	6:40pm	7:50pm	9:25pm
Downtown Burbank	6:47am	7:46am	8:25am	9:36am	11:01am	11:36am	2:11pm	4:01pm	4:16pm	5:01pm	5:49pm	6:06pm	6:46pm	7:56pm	9:31pm

Notes:
(1) From Metrolink Schedule Effective May 7, 2012.

In addition to the passenger train services operating on the Pacific Surfliner North Corridor, there are also daily freight trains operated by UPRR. The section of the Corridor with the greatest freight volume is between Los Angeles and Burbank, where there are 18 freight train movements per day. Table 9.11 summarizes the number of freight trains included in the Existing Year simulation on each segment of Pacific Surfliner North Corridor. The table includes two types of freight trains, both operated by UPRR. The first type is long-haul freight trains, those travelling through the entire Pacific Surfliner Corridor or a significant portion of the northern Corridor section. 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.

Table 9.11: Existing Year UPRR Freight Trains per Day

From	To	Long-Haul	Local
LA Union	Glendale	10	8
Glendale	Burbank	10	8
Burbank	Gemco	8	8
Gemco	Van Nuys	6	2
Van Nuys	Chatsworth	6	2
Chatsworth	CP Davis	6	2
CP Davis	Simi Valley	4	2
Simi Valley	Moorpark	4	2
Moorpark	Camarillo	4	2
Camarillo	Oxnard	4	2
Oxnard	Ventura	4	2
Ventura	Carpinteria	4	2
Carpinteria	Santa Barbara	4	2
Santa Barbara	Goleta	4	NA
Goleta	Lompoc-Surf	4	NA
Lompoc-Surf	Guadalupe	4	NA
Guadalupe	Callender	4	2
Callender	Grover Beach	2	NA
Grover Beach	San Luis Obispo	2	NA

Notes:
- “NA” indicates not applicable

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 9.12 – 9.14 from the April 2012 Revised Long-Term (2030) Timetable in *LOSSAN Corridorwide Strategic Implementation Plan (2012)*, with modifications where necessary.

Table 9.12: Year 2020 *Pacific Surfliner* Service Northbound Schedule [1]

***Pacific Surfliner* North**	***Coast Daylight***	**763**	**769**	**777**	**785**	**PS10W**
	Daily	**Daily**	**Daily**	**Daily**	**Daily**	**Daily**
Los Angeles	7:05am	9:05am	12:25pm	3:00pm	7:10pm	5:34pm
Glendale	7:15am	9:17am	12:37pm	3:12pm	7:22pm	5:44pm
Burbank Airport	7:27am	9:27am	12:47pm	3:22pm	7:32pm	5:56pm
Van Nuys	7:36am	9:36am	12:56pm	3:31pm	7:41pm	6:04pm
Chatsworth	7:47am	9:49am	1:09pm	3:44pm	7:54pm	6:16pm
Simi Valley	7:59am	10:01am	1:21pm	4:00pm	8:06pm	6:28pm
Moorpark	8:12am	--	1:34pm	--	--	6:41pm
Camarillo	8:24am	10:24am	1:48pm	4:21pm	8:29pm	6:53pm
Oxnard	8:36am	10:37am	1:59pm	4:32pm	8:40pm	7:04pm
Ventura	8:48am	10:53am	2:13pm	4:56pm	8:59pm	7:16pm
Carpinteria	9:07am	11:15am	2:41pm	5:20pm	9:21pm	7:40pm
Santa Barbara (Arrive)	9:21am	11:40am	3:00pm	5:40pm	9:45pm	7:54pm
Santa Barbara (Depart)	9:23am	11:45am	3:10pm	5:42pm	9:50pm	7:56pm
Goleta	9:36am	11:55am	3:20pm	5:54pm	10:00pm	8:07pm
Lompoc-Surf	10:33am			7:06pm		
Guadalupe-Santa Maria	11:05am			7:43pm		
Grover Beach	11:36am			8:00pm		
San Luis Obispo (Arrive)	11:57am			8:30pm		
San Luis Obispo (Depart)	12:07pm					

Notes:

- "-- " Indicates that the train does not stop

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

Table 9.13: Year 2020 *Pacific Surfliner* Service Southbound Schedule (1)

***Pacific Surfliner* South**	**768** Daily	**774** Daily	**784** Daily	**PS07E** Daily	***Coast Daylight*** Daily	**796** Daily
San Luis Obispo (Depart)		6:55am			1:35pm	
Grover Beach		7:14am			1:55pm	
Guadalupe-Santa Maria		7:30am			2:11pm	
Lompoc-Surf		8:05am			2:51pm	
Goleta	6:30am	9:12am	1:50pm	7:57am	3:57pm	6:45pm
Santa Barbara (Arrive)	6:41 am	9:24am	2:01am	8:08am	4:10pm	6:56 am
Santa Barbara (Depart)	6:43am	9:26am	2:03pm	8:10am	4:12pm	6:58pm
Carpinteria	6:58am	9:41am	2:18pm	8:23am	4:27pm	7:14pm
Ventura	7:23am	10:03am	2:40pm	8:42am	4:49pm	7:36pm
Oxnard	7:37am	10:17am	2:56pm	8:56am	5:07pm	7:50pm
Camarillo	7:48am	10:36am	3:07pm	9:08am	5:18pm	8:01pm
Moorpark	8:05am		3:20pm	9:22am	5:36pm	--
Simi Valley	8:20am	11:02am	3:35pm	9:38am	5:54pm	8:38pm
Chatsworth	8:35am	11:23am	3:52pm	9:52am	6:12pm	8:50pm
Van Nuys	8:50am	11:36am	4:13pm	10:03am	6:25pm	9:05pm
Burbank Airport	8:59am	11:44am	4:22pm	10:12am	6:37pm	9:13pm
Glendale	9:11am	11:54am	4:32pm	10:22am	6:50pm	9:23pm
Los Angeles	9:25am	12:15pm	4:55pm	10:34am	7:10pm	9:45pm

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

Table 9.14: Year 2020 *Coast Starlight* Service Schedule (1)

Coast Starlight	**11 (South)** Daily	**14 (North)** Daily
San Luis Obispo	3:20pm	3:43pm
Santa Barbara	6:02pm	12:48pm
Oxnard	7:05pm	11:52am
Simi Valley	7:48pm	11:19am
Van Nuys	8:22pm	10:55am
Burbank-Bob Hope Airport	8:31pm	10:44am
Los Angeles Union Station	9:00pm	10:25am

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

Metrolink commuter rail service schedules for Year 2020 are presented in Tables 9.15 – 9.19. Tables 9.15 – 9.18 contain Metrolink Ventura County and Antelope Valley schedules which are largely unchanged from those in use for the Existing Year. Table 9.19 contains the schedule for the proposed new Ventura County–Santa Barbara commuter service.

Table 9.15: Year 2020 Metrolink Ventura County Southbound Schedule [(1)]

Metrolink Ventura County Southbound	100 M-F	900 M-F	102 M-F	104 M-F	106 M-F	902 M-F	108 M-F	110 M-F	112 M-F	116 M-F	904 M-F	906 M-F	150 M-F	910 M-F	118 M-F
East Ventura			5:25am	6:03am	6:42am										
Oxnard			5:39am	6:17am	6:56am										
Camarillo			5:49am	6:27am	7:06am										
Moorpark	5:04am		6:00am	6:38am	7:17am			8:25am		2:25pm					4:57pm
Simi Valley	5:17am		6:13am	6:51am	7:30am			8:38am		2:38pm					5:10pm
Chatsworth	5:28am		6:24am	7:02am	7:41am		8:25am	8:49am	10:45am	2:49pm			4:30pm		5:27pm
Northridge	5:33am		6:29am	7:07am	7:46am		8:30am	8:54am	10:50am	2:54pm			4:35pm		5:32pm
Van Nuys	5:41am		6:37am	7:15am	7:54am		8:38am	9:02am	10:58am	3:02pm			4:43pm		5:45pm
Burbank Airport	5:49am	6:13am	6:45am	7:23am	8:02am	8:35am	8:46am	9:10am	11:06am	3:10pm	3:37pm	4:15pm	4:55pm	5:05pm	5:53pm
Downtown Burbank	5:55am	6:17am	6:52am	7:30am	8:08am	8:39am	8:52am	9:16am	11:12am	3:16pm	3:41pm	4:19pm	5:00pm	5:10pm	5:59pm
Glendale	6:02am	6:23am	6:59am	7:37am	8:15am	8:45am	8:59am	9:23am	11:21am	3:23pm	3:47pm	4:25pm	5:06pm	5:15pm	6:06pm
LA Union Station	6:15am	6:38am	7:12am	7:50am	8:28am	9:00am	9:15am	9:40am	11:35am	3:40pm	4:00pm	4:40pm	5:20pm	5:30pm	6:20pm

Notes:
[(1)] Version 3A Timetable from *LOSSAN Corridorwide Strategic Implementation Plan*, April 2012

Table 9.16: Year 2020 Metrolink Ventura County Northbound Schedule [1]

Metrolink Ventura County Northbound	901 M-F	101 M-F	103 M-F	903 M-F	905 M-F	907 M-F	107 M-F	109 M-F	909 M-F	153 M-F	115 M-F	117 M-F	911 M-F	119 M-F	121 M-F	123 M-F
LA Union Station	5:38am	6:50am	7:15am	8:00am	8:25am	8:50am	9:50am	1:00pm	3:05pm	3:20pm	3:35pm	4:25pm	4:33pm	5:10pm	5:55pm	6:40pm
Glendale	5:48am	7:00am	7:25am	8:10am	8:35am	9:00am	10:00am	1:10pm	3:15pm	3:30pm	3:45pm	4:35pm	4:43pm	5:20pm	6:05pm	6:50pm
Downtown Burbank	5:54am	7:06am	7:31am	8:16am	8:41am	9:06am	10:06am	1:18pm	3:21pm	3:36pm	3:51pm	4:41pm	4:49pm	5:26pm	6:11pm	6:56pm
Burbank Airport	6:01am	7:11am	7:36am	8:25am	8:50am	9:15am	10:11am	1:23pm	3:30pm	3:41pm	3:56pm	4:46pm	4:58pm	5:31pm	6:16pm	7:01pm
Van Nuys		7:22am	7:43am				10:18am	1:30pm		3:48pm	4:03pm	4:53pm		5:38pm	6:23pm	7:08pm
Northridge		7:30am	8:00am				10:26am	1:38pm		3:56pm	4:11pm	5:01pm		5:46pm	6:31pm	7:16pm
Chatsworth		7:37am	8:10am				10:35am	1:45pm		4:02pm	4:18pm	5:08pm		5:53pm	6:38pm	7:23pm
Simi Valley		7:52am						1:57pm			4:30pm	5:20pm		6:05pm	6:50pm	7:35pm
Moorpark		8:10am						2:15pm			4:47pm	5:32pm		6:17pm	7:08pm	7:47pm
Camarillo												5:43pm		6:28pm		7:58pm
Oxnard												5:53pm		6:38pm		8:14pm
East Ventura												6:12pm		6:57pm		8:37pm

Notes:
(1) Version 3A Timetable from *LOSSAN Corridorwide Strategic Implementation Plan*, April 2012

Table 9.17: Year 2020 Metrolink Antelope Valley Southbound Schedule [1]

Metrolink Antelope Valley Southbound	200 M-F	202 M-F	204 M-F	282 M-F	206 M-F	208 M-F	210 M-F	284 M-F	212 M-F	286 M-F	214 M-F	216 M-F	218 M-F	220 M-F	222 M-F
Downtown Burbank	5:30am	6:31am	7:21am	6:45am	7:51am	8:27am	9:34am	10:10am	10:28am	12:29pm	1:15pm	3:06pm	3:56pm	5:41pm	7:50pm
Glendale	5:37am	6:38am	7:28am		7:58am	8:33am	9:41am	10:17am	10:35am	12:35pm	1:22pm	3:13pm	4:03pm	5:48pm	7:57pm
LA Union Station	5:53am	6:55am	7:45am	7:00am	8:15am	8:52am	10:00am	10:30am	10:50am	12:49pm	1:35pm	3:30pm	4:20pm	6:10pm	8:16pm

Notes:
(1) Version 3A Timetable from *LOSSAN Corridorwide Strategic Implementation Plan*, April 2012

Table 9.18: Year 2020 Metrolink Antelope Valley Southbound Schedule [1]

Metrolink Antelope Valley Northbound	**201**	**203**	**281**	**205**	**283**	**207**	**209**	**211**	**213**	**215**	**285**	**217**	**219**	**221**	**223**
	M-F[2]	**M-F**	**M-F**	**M-F**	**M-F**	**M-F**	**M-F**	**M-F**	**M-F**	**M-F**	**M-F**	**M-F**	**M-F**	**M-F**	**M-F**
LA Union Station	6:30am	7:30am	8:10am	9:20am	10:45am	11:20am	1:55pm	3:45pm	4:00pm	4:45pm	5:35pm	5:50pm	6:30pm	7:40pm	9:15pm
Glendale	6:41am	7:40am	8:19am	9:30am	10:55am	11:30am	2:05pm	3:55pm	4:10pm	4:55pm		6:00pm	6:40pm	7:50pm	9:25pm
Downtown Burbank	6:47am	7:46am	8:25am	9:36am	11:01am	11:36am	2:11pm	4:01pm	4:16pm	5:01pm	5:49pm	6:06pm	6:46pm	7:56pm	9:31pm

Notes:
(1) Version 3A Timetable from *LOSSAN Corridorwide Strategic Implementation Plan*, April 2012

Table 9.19: Year 2020 Metrolink Ventura County – Santa Barbara Schedule [1]

Metrolink Ventura County – Santa Barbara	**M1001 (Northbound)**	**M1004 (Southbound)**
	M-F	**M-F**
East Ventura	6:55am	6:22pm
Ventura	7:04am	6:07pm
Carpinteria	7:24am	5:47pm
Santa Barbara	7:38am	5:32pm
Goleta	7:50am	5:20pm

Notes:
(1) Version 3A Timetable from *LOSSAN Corridorwide Strategic Implementation Plan*, April 2012

Table 9.20 lists Year 2020 UPRR freight trains. It is expected that the volume of local short-haul trains will not increase significantly in the future; as these trains travel only short distances of under 50 miles each way and are dispatched only when they will not interfere with passenger traffic, they are not expected to significantly impact operations.

Table 9.20: Year 2020 UPRR Freight Trains per Day

From	To	Long-Haul	Local
LA Union	Glendale	12	8
Glendale	Burbank	12	8
Burbank	Gemco	10	8
Gemco	Van Nuys	8	2
Van Nuys	Chatsworth	8	2
Chatsworth	CP Davis	8	2
CP Davis	Simi Valley	6	2
Simi Valley	Moorpark	6	2
Moorpark	Camarillo	6	2
Camarillo	Oxnard	6	2
Oxnard	Ventura	6	2
Ventura	Carpinteria	6	2
Carpinteria	Santa Barbara	6	2
Santa Barbara	Goleta	6	NA
Goleta	Lompoc-Surf	6	NA
Lompoc-Surf	Guadalupe	6	NA
Guadalupe	Callender	6	2
Callender	Grover Beach	4	NA
Grover Beach	San Luis Obispo	4	NA

Notes:

- "NA" indicates not applicable

9.2.3 Year 2040 Schedule

Amtrak schedules for Year 2040 are given in Tables 9.21 – 9.31 from the April 2012 Revised Long-Term (2030) Timetable in *LOSSAN Corridorwide Strategic Implementation Plan*, with modifications where necessary.

Table 9.21: Year 2040 *Pacific Surfliner* Service Northbound Schedule [(1)]

***Pacific Surfliner* North**	***Coast Daylight* Daily**	**763 Daily**	**PS04W Daily**	**PS06W Daily**	**PS08W Daily**	**PS10W Daily**	***Coast Daylight* Daily**
Los Angeles	7:05am	8:44am	11:00am	12:56pm	3:34pm	5:34pm	8:19pm
Glendale	7:15am	8:54am	11:10am	1:06pm	3:44pm	5:44pm	8:30pm
Burbank Airport	7:27am	9:05am	11:21am	1:17pm	3:56pm	5:56pm	8:41pm
Van Nuys	7:36am	9:14am	11:30am	1:25pm	4:05pm	6:04pm	--
Chatsworth	7:47am	9:25am	11:39am	1:37pm	4:16pm	6:16pm	8:59pm
Simi Valley	7:59am	9:47am	11:55am	1:49pm	4:29pm	6:28pm	9:11pm
Moorpark	8:12am	9:59am		2:02pm	4:43pm	6:41pm	--
Camarillo	8:24am	10:21am	12:14pm	2:14pm	4:55pm	6:53pm	9:32pm
Oxnard	8:36am	10:33am	12:25pm	2:25pm	5:07pm	7:04pm	9:43pm
Ventura	8:48am	10:45am	12:37pm	2:41pm	5:20pm	7:16pm	9:55pm
Carpinteria	9:07am	11:04am	12:52pm	3:00pm	5:41pm	7:40pm	--
Santa Barbara (Arrive)	9:21am	11:18am	1:08pm	3:14pm	5:55pm	7:54pm	10:24pm
Santa Barbara (Depart)	9:23am	11:20am	1:10pm	3:16pm	5:57pm	7:56pm	10:26pm
Goleta	9:36am	11:31am	1:21pm	3:27pm	6:08pm	8:07pm	10:39pm
Lompoc-Surf	10:33am		2:19pm	4:29pm			
Guadalupe-Santa Maria	11:05am		2:57pm	5:01pm			
Grover Beach	11:31am		3:12pm	5:28pm			
San Luis Obispo (Arrive)	11:57am		3:32pm	5:48pm			12:20am
San Luis Obispo (Depart)	12:07pm						12:30am

Notes:

- "-- " Indicates that the train does not stop
- (1) Version 3A Timetable from *LOSSAN Corridorwide Strategic Implementation Plan*, April 2012

Table 9.22: Year 2040 *Pacific Surfliner* Service Southbound Schedule [(1)]

Pacific Surfliner **South**	**Coast Daylight**	**768**	**774**	**784**	**PS07E**	***Coast Daylight***	**796**
	Daily	**Daily[(2)]**	**Daily**	**Daily**	**Daily**	**Daily**	**Daily**
San Luis Obispo (Arrive)	3:40am					1:36pm	
San Luis Obispo (Depart)	3:43am		6:55am	11:40am		1:49pm	
Grover Beach	--		7:14am	11:58am		2:07pm	
Guadalupe-Santa Maria	4:14am		7:30am	12:13pm		2:23pm	
Lompoc-Surf	4:45am		8:05am	12:45pm		2:56pm	
Goleta	5:43am	6:30am	9:12am	1:47pm	7:57am	3:54pm	6:45pm
Santa Barbara (Arrive)	5:56am	6:41am	9:24am	1:59pm	8:08am	4:09pm	6:56 pm
Santa Barbara (Depart)	5:58am	6:43am	9:26am	2:01pm	8:10am	4:11pm	6:58pm
Carpinteria		6:58am	9:41am	2:14pm	8:23am	4:22pm	7:14pm
Ventura	6:29am	7:23am	10:03am	2:34pm	8:42am	4:41pm	7:36pm
Oxnard	6:41am	7:37am	10:17am	2:46pm	8:56am	4:53pm	7:50pm
Camarillo	6:53am	7:48am	10:36am	2:58pm	9:08am	5:09pm	8:01pm
Moorpark	--	8:05am		3:12pm	9:22am	5:23pm	
Simi Valley	7:19am	8:20am	11:02am	3:26pm	9:38am	5:37pm	8:38pm
Chatsworth	7:32am	8:35am	11:23am	3:39pm	9:52am	5:50pm	8:50pm
Van Nuys	--	8:50am	11:36am	3:51pm	10:03am	6:02pm	9:05pm
Burbank Airport	7:48am	8:59am	11:44am	3:59pm	10:12am	6:10pm	9:13pm
Glendale	7:58am	9:11am	11:54am	4:09pm	10:22am	6:20pm	9:23pm
Los Angeles	8:09am	9:25am	12:15pm	4:21pm	10:34am	6:31pm	9:45pm

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

Table 9.23: Year 2040 *Coast Starlight* Service Schedule [(1)]

Coast Starlight	**11 (South)**	**14 (North)**
	Daily	**Daily**
San Luis Obispo	3:20pm	3:13pm
Santa Barbara	6:02pm	12:18pm
Oxnard	7:05pm	11:22am
Simi Valley	7:48pm	10:49am
Van Nuys	8:22pm	10:25am
Burbank-Bob Hope Airport	8:31pm	10:14am
Los Angeles Union Station	9:00pm	9:55am

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

Metrolink commuter rail service schedules for Year 2040 are given in Tables 9.24 – 9.33.

Table 9.24: Year 2040 Metrolink Ventura County Northbound Schedule (1 of 2) [1]

Metrolink Ventura County Northbound	VC01 M-F	VC02 M-F	VC03 M-F	VC04 M-F	VC05 M-F	VC06 M-F	VC07 M-F	VC08 M-F	VC09 M-F
LA Union Station	6:10am	6:30am	7:19am	7:38am	8:29am	9:12am	9:56am	12:39pm	2:37pm
Glendale	6:20am	6:40am	7:29am	7:48am	8:39am	9:23am	10:06am	12:49pm	2:47pm
Downtown Burbank	6:26am	6:46am	7:35am	7:54am	8:46am	9:29am	10:12am	12:55pm	2:53pm
Burbank Airport	6:31am	6:51am	7:40am	7:59am	8:51am	9:34am	10:17am	1:00pm	2:58pm
Van Nuys	6:38am	6:58am	7:47am	8:06am	8:58am	9:41am	10:24am	1:07pm	3:05pm
Northridge	6:46am	7:05am	7:54am	8:13am	9:05am	9:48am	10:31am	1:14pm	3:12pm
Chatsworth	6:53am	7:11am	8:00am	8:19am	9:10am	9:54am	10:37am	1:20pm	3:18pm
Simi Valley	7:05am	7:27am	8:14am	8:30am	9:25am	10:05am	10:52am	1:31pm	3:34pm
Moorpark	7:17am	7:38am	8:25am	8:41am	9:38am	10:17am	11:03am	1:42pm	3:45pm
Camarillo	7:30am		8:35am			10:27am			
Oxnard	7:40am		8:45am			10:37am			
East Ventura	7:55am		9:00am			10:53am			

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

Table 9.25: Year 2040 Metrolink Ventura County Northbound Schedule (2 of 2) [(1)]

Metrolink Ventura County Northbound	VC10	VC11	VC12	VC13	VC14	VC15	VC16	VC17	VC18
	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F
LA Union Station	4:24pm	4:44pm	5:04pm	5:25pm	5:55pm	6:29pm	7:03pm	8:44pm	9:59pm
Glendale	4:34pm	4:54pm	5:14pm	5:36pm	6:05pm	6:40pm	7:13pm	8:54pm	10:09pm
Downtown Burbank	4:41pm	5:01pm	5:20pm	5:42pm	6:11pm	6:46pm	7:20pm	9:00pm	10:16pm
Burbank Airport	4:46pm	5:06pm	5:25pm	5:47pm	6:16pm	6:51pm	7:25pm	9:05pm	10:21pm
Van Nuys	4:53pm	5:13pm	5:32pm	5:54pm	6:23pm	6:58pm	7:32pm	9:12pm	10:28pm
Northridge	5:00pm	5:20pm	5:39pm	6:01pm	6:30pm	7:05pm	7:39pm	9:19pm	10:35pm
Chatsworth	5:05pm	5:25pm	5:45pm	6:07pm	6:36pm	7:11pm	7:44pm	9:25pm	10:40pm
Simi Valley	5:19pm	5:45pm	6:04pm	6:20pm	6:50pm	7:24pm	7:56pm	9:36pm	10:52pm
Moorpark	5:35pm	5:57pm	6:17pm	6:31pm	7:04pm	7:36pm	8:07pm	9:47pm	11:03pm
Camarillo	5:46pm		6:27pm		7:14pm		8:18pm		
Oxnard	6:03pm		6:37pm		7:24pm		8:27pm		
East Ventura	6:18pm		6:51pm		7:39pm		8:42pm		

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

Table 9.26: Year 2040 Metrolink Ventura County Southbound Schedule (1 of 2) [1]

Metrolink Ventura County Southbound	VC01 M-F	VC02 M-F	VC03 M-F	VC04 M-F	VC05 M-F	VC06 M-F	VC07 M-F	VC08 M-F	VC09 M-F
East Ventura	3:48am		4:53am		5:48am		6:50am		8:12am
Oxnard	4:01am		5:07am		6:01am		7:03am		8:27am
Camarillo	4:11am		5:17am		6:11am		7:13am		8:37am
Moorpark	4:22am	5:00am	5:28am	6:00am	6:23am	6:46am	7:25am	7:54am	8:51am
Simi Valley	4:34am	5:11am	5:40am	6:11am	6:35am	6:56am	7:39am	8:05am	9:03am
Chatsworth	4:46am	5:23am	5:52am	6:23am	6:47am	7:09am	7:51am	8:18am	9:15am
Northridge	4:53am	5:28am	5:57am	6:28am	6:53am	7:15am	7:57am	8:24am	9:21am
Van Nuys	5:00am	5:36am	6:05am	6:36am	7:00am	7:22am	8:05am	8:31am	9:28am
Burbank Airport	5:07am	5:43am	6:12am	4:43am	7:07am	7:29am	8:12am	8:38am	9:35am
Downtown Burbank	5:12am	5:48am	6:17am	6:48am	7:16am	7:34am	8:18am	8:43am	9:41am
Glendale	5:19am	5:54am	6:24am	6:55am	7:24am	7:40am	8:25am	8:49am	9:47am
LA Union Station	5:29am	6:04am	6:34am	7:05am	7:34am	7:50am	8:35am	8:59am	9:58am

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

Table 9.27: Year 2040 Metrolink Ventura County Southbound Schedule (2 of 2) (1)

Metrolink Ventura County Southbound	VC10	VC11	VC12	VC13	VC14	VC15	VC16	VC17	VC18
	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F
East Ventura	9:43am	11:58am	1:56pm						8:03pm
Oxnard	9:56am	12:11pm	2:09pm						8:12pm
Camarillo	10:06am	12:21pm	2:19pm						8:23pm
Moorpark	10:19am	12:32pm	2:30pm	3:30pm	4:30pm	5:00pm	5:40pm	6:49pm	8:35pm
Simi Valley	10:31am	12:44pm	2:42pm	3:45pm	4:43pm	5:11pm	5:57pm	7:03pm	8:47pm
Chatsworth	10:43am	12:56pm	2:54pm	3:57pm	4:54pm	5:24pm	6:09pm	7:15pm	8:58pm
Northridge	10:49am	1:02pm	3:00pm	4:03pm	5:00pm	5:30pm	6:14pm	7:21pm	9:04pm
Van Nuys	10:56am	1:09pm	3:07pm	4:10pm	5:07pm	5:37pm	6:22pm	7:28pm	9:11pm
Burbank Airport	11:03am	1:16pm	3:14pm	4:17pm	5:14pm	5:44pm	6:29pm	7:35pm	9:18pm
Downtown Burbank	11:08am	1:21pm	3:19pm	4:22pm	5:19pm	5:48pm	6:34pm	7:41pm	9:24pm
Glendale	11:15am	1:28pm	3:26pm	4:28pm	5:25pm	5:56pm	6:40pm	7:47pm	9:30pm
LA Union Station	11:25am	1:38pm	3:36pm	4:38pm	5:35pm	6:06pm	6:51pm	7:57pm	9:41pm

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

Table 9.28: Year 2040 Metrolink Antelope Valley Northbound Schedule (1 of 2) (1)

Metrolink Antelope Valley Northbound	AV01	AV02	AV03	AV04	AV05	AV06	AV07	AV08	AV09	AV10	AV11	AV12
	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F
LA Union Station	6:22am	6:56am	7:29am	7:54am	8:14am	8:37am	9:39am	11:49am	1:44pm	2:24pm	3:49pm	4:16pm
Glendale	6:32am	7:06am	7:39am	8:04am	8:24am	8:47am	9:49am	11:59am	1:54pm	2:34pm	3:59pm	4:26pm
Downtown Burbank	6:39am	7:13am	7:46am	8:10am	8:31am	8:54am	9:56am	12:05pm	2:00pm	2:41pm	4:06pm	4:33pm

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

Table 9.29: Year 2040 Metrolink Antelope Valley Northbound Schedule (2 of 2) [1]

Metrolink Antelope Valley Northbound	AV13	AV14	AV15	AV16	AV17	AV18	AV19	AV20	AV21	AV22	AV23
	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F
LA Union Station	4:34pm	4:54pm	5:11pm	5:18pm	5:44pm	6:05pm	6:10pm	6:49pm	7:13pm	7:44pm	10:14pm
Glendale	4:44pm	5:04pm	5:21pm	5:28pm	5:54pm	6:15pm	6:24pm	6:59pm	7:23pm	7:54pm	10:24pm
Downtown Burbank	4:51pm	5:11pm	5:28pm	5:35pm	6:01pm	6:21pm	6:31pm	7:06pm	7:31pm	8:01pm	10:31pm

Notes:

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

Table 9.30: Year 2040 Metrolink Antelope Valley Southbound Schedule (1 of 2) [1]

Metrolink Antelope Valley Southbound	AV01	AV02	AV03	AV04	AV05	AV06	AV07	AV08	AV09	AV10	AV11	AV12
	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F
Downtown Burbank	6:07am	6:27am	6:40am	6:55am	7:09am	7:25am	8:00am	8:08am	8:27am	8:55am	9:19am	11:17am
Glendale	6:13am	6:34am	6:47am	7:02am	7:16am	7:32am	8:07am	8:16am	8:34am	9:02am	9:25am	11:24am
LA Union Station	6:24am	6:44am	6:57am	7:12am	7:26am	7:42am	8:17am	8:26am	8:44am	9:12am	9:36am	11:34am

Notes:

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

Table 9.31: Year 2040 Metrolink Antelope Valley Southbound Schedule (2 of 2) [1]

Metrolink Antelope Valley Southbound	AV13	AV14	AV15	AV16	AV17	AV18	AV19	AV20	AV21	AV22	AV23
	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F	M-F
Downtown Burbank	1:07pm	2:07pm	3:07pm	3:52pm	4:27pm	5:07pm	5:27pm	5:38pm	6:02pm	7:07pm	9:37pm
Glendale	1:15pm	2:14pm	3:15pm	3:58pm	4:34pm	5:14pm	5:35pm	5:44pm	6:09pm	7:14pm	9:44pm
LA Union Station	1:25pm	2:25pm	3:25pm	4:09pm	4:45pm	5:25pm	5:45pm	5:55pm	6:19pm	7:25pm	9:54pm

Notes:

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

Table 9.32: Year 2040 Metrolink Ventura County – Santa Barbara Northbound Schedule [(1)]

Metrolink Ventura County – Santa Barbara Northbound	VSB01	VSB02	VSB03	VSB04
	M-F	M-F	M-F	M-F
East Ventura	5:56am	6:53am	8:49am	5:34pm
Ventura	6:10am	7:03am	8:59am	5:48pm
Carpinteria	6:28am	7:20am	9:17am	6:07pm
Santa Barbara (Arrive)	6:41am	7:33am	9:29am	6:20pm
Santa Barbara (Depart)	6:43am	7:35am	9:31am	6:22pm
Goleta	6:52am	7:44am	9:40am	6:31pm
North Goleta	6:56am	7:48am	9:44am	6:35pm

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

Table 9.33: Year 2040 Metrolink Ventura County – Santa Barbara Southbound Schedule [(1)]

Metrolink Ventura County – Santa Barbara Southbound	VSB01	VSB02	VSB03	VSB04
	M-F	M-F	M-F	M-F
North Goleta	7:21am	4:02pm	5:19pm	7:10pm
Goleta	7:25am	4:13pm	5:22pm	7:21pm
Santa Barbara (Depart)	7:36am	4:24pm	5:33pm	7:32pm
Santa Barbara (Arrive)	7:38am	4:26pm	5:35pm	7:34pm
Carpinteria	7:49am	4:36pm	5:51pm	7:49pm
Ventura	8:07am	4:55pm	6:09pm	8:08pm
East Ventura	8:19am	5:07pm	6:21pm	8:20pm

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

Table 9.34 lists Year 2040 UPRR freight trains UPRR. It is assumed the volumes of local short-haul trains will not be significantly changed.

Table 9.34: Year 2040 UPRR Freight Trains per Day

From	To	Long-Haul	Local
LA Union	Glendale	14	8
Glendale	Burbank	14	8
Burbank	Gemco	10	8
Gemco	Van Nuys	8	2
Van Nuys	Chatsworth	8	2
Chatsworth	CP Davis	8	2
CP Davis	Simi Valley	6	2
Simi Valley	Moorpark	6	2
Moorpark	Camarillo	6	2
Camarillo	Oxnard	6	2
Oxnard	Ventura	6	2
Ventura	Carpinteria	6	2
Carpinteria	Santa Barbara	6	2
Santa Barbara	Goleta	6	NA
Goleta	Lompoc-Surf	6	NA
Lompoc-Surf	Guadalupe	6	NA
Guadalupe	Callender	6	2
Callender	Grover Beach	4	NA
Grover Beach	San Luis Obispo	4	NA

Notes:

- "NA" indicates not applicable

9.3 Equipment Consists

This section summarizes the type of equipment used for train services operating on the northern portion of the Pacific Surfliner Corridor, including locomotive, engine, and car types, where available.

9.3.1 Intercity Passenger Rail Services

Amtrak *Pacific Surfliner*

Pacific Surfliner service trains operate primarily using the General Motors EMD F59PHI diesel-electric locomotive along with the Superliner car, a double-decked passenger car. Typically, *Pacific Surfliner* trains consist of one F59PHI locomotive, one business class car, one café car, two to three coach cars, and one cab control car from which the engineer operates the locomotive.

Amtrak *Coast Starlight*

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

9.3.2 Commuter Rail Services

Metrolink

Metrolink employs General Motors F59PH and F59PHI locomotive types, known as 'California' locomotives. Metrolink trains use Bombardier double-decked coach cars. Metrolink's fleet also includes ROTEM cars.

9.3.3 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 Pacific Surfliner North 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 Pacific Surfliner North Corridor is defined as operating between San Luis Obispo and LAUS.

The portion of the Corridor between Goleta and Los Angeles is generally designed to modern standards, with features such as CTC to more efficiently manage train dispatching.

The stretch of track between Goleta and San Luis Obispo is antiquated compared to the modern railroad environment. Most of this section of track has manual switches, rather than electric remotely-operated switches which do not require trains to come to a stop. With manual switches, a train crew member must physically disembark the train and manually realign the switch, resulting in increased travel time and reduced network capacity.

The northern portion of the Pacific Surfliner Corridor has few sidings north of Goleta, which limits the times at which freight trains can be dispatched without interfering with passenger trains. Further exacerbating the problem, not all of the relatively small number of sidings is long enough to accommodate modern freight trains.

The number of available main tracks varies across the Corridor. In the southern-most portion of the network between Van Nuys and LAUS, there are two main tracks available, with a third main track available on short segments between Glendale and Los Angeles. North of Van Nuys, a vast majority of the network has only one main track, with the exception of short segments, such as a the segment of second main track in Santa Barbara.

In addition, unlike the segment of the Corridor south of Goleta, most of the network between San Luis Obispo and Goleta is not operated using CTC. 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. This process is referred to as track warrant control. By contrast, 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. TWC is used across a 100-mile section of track between South San Luis Obispo and Ellwood, which is located near Goleta.

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 Base Case modeling effort, Table 9.35 lists the near-term network improvements relevant to the modeling effort assumed to be completed by 2020; the complete list of improvements can be found in Chapter 4.

Table 9.35: Rail Network Improvements Included in Year 2020 Base Case Simulation

Project Location	Project Description
Santa Barbara County (Ortega Siding)	Extend & Signal Upgrades
Los Angeles County (CP Raymer–CP Bernson)	Second Main Track
Los Angeles County (Van Nuys)	Van Nuys North Platform
Los Angeles Region	UPRR PTC Technology Implementation

The Year 2040 Base Case model will also include the improvements identified in Table 9.35, as well as any additional recommended improvements identified in the Year 2020 Alternative Case model.

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 15 percent when compared across each segment and the entire service overall.

Tables 9.36 through 9.39 compare average minutes of delay per train operated from RailOPS outputs to the same values reported by Amtrak for the *Pacific Surfliner* and *Coast Starlight* services.

Table 9.36: Average Delay Comparison – *Pacific Surfliner* Service, Northbound

From	To	Average Delay per Train Departure (Minutes)		
		RailOPS Average	Amtrak Reported	Difference
LAX	Glendale	0.9	0.9	0.0
Glendale	Burbank	0.6	0.6	0.0
Burbank	Van Nuys	0.1	0.1	0.0
Van Nuys	Chatsworth	0.6	0.6	0.0
Chatsworth	Simi Valley	1.9	1.5	0.4
Simi Valley	Camarillo	0.9	1.2	-0.3
Camarillo	Oxnard	1.2	1.3	-0.1
Oxnard	Ventura	2.1	2.2	-0.1
Ventura	Santa Barbara	3.8	3.1	0.7
Santa Barbara	Goleta	0.3	0.2	0.1
Goleta	Lompoc-Surf	3.0	2.5	0.5
Lompoc-Surf	Guadalupe	0.1	0.2	-0.1
Guadalupe	San Luis Obispo	0.3	0.3	0.0
Total		*15.6*	*14.7*	*0.9*
Overall Difference (%)				*6.0%*

Table 9.37: Average Delay Comparison – *Pacific Surfliner* Service, Southbound

From	To	Average Delay per Train Departure (Minutes)		
		RailOPS Average	Amtrak Reported	Difference
San Luis Obispo	Guadalupe	2.0	0.1	1.9
Guadalupe	Lompoc-Surf	7.1	6.9	0.2
Lompoc-Surf	Goleta	1.5	0.7	0.8
Goleta	Santa Barbara	0.0	0.1	-0.1
Santa Barbara	Ventura	1.8	1.2	0.6
Ventura	Oxnard	0.7	0.5	0.2
Oxnard	Camarillo	1.8	1.6	0.2
Camarillo	Simi Valley	2.6	2.9	-0.3
Simi Valley	Chatsworth	1.4	1.3	0.1
Chatsworth	Van Nuys	2.3	2.8	-0.5
Van Nuys	Burbank	0.1	0.1	0.0
Burbank	Glendale	0.2	0.2	0.0
Glendale	LAX	0.9	0.9	0.0
Total		*22.2*	*19.3*	*2.9*
Overall Difference (%)				*13.2%*

Table 9.38: Average Delay Comparison – *Coast Starlight* Service, Northbound

From	To	**Average Delay per Train Departure** (Minutes)		
		RailOPS Average	**Amtrak Reported**	**Difference**
LAX	Burbank	0.2	0.1	0.1
Burbank	Van Nuys	0.0	0.0	0.0
Van Nuys	Simi Valley	4.1	3.4	0.7
Simi Valley	Oxnard	6.0	6.3	-0.3
Oxnard	Santa Barbara	1.5	1.5	0.0
Santa Barbara	San Luis Obispo	21.9	22.4	-0.5
Total		*33.7*	*33.8*	*-0.1*
Overall Difference (%)				*-0.5%*

Table 9.39: Average Delay Comparison – *Coast Starlight* Service, Southbound

From	To	**Average Delay per Train Departure** (Minutes)		
		RailOPS Average	**Amtrak Reported**	**Difference**
Santa Barbara	San Luis Obispo	23.6	22.8	0.8
Oxnard	Santa Barbara	0.4	0.4	0.0
Simi Valley	Oxnard	0.4	0.1	0.3
Van Nuys	Simi Valley	3.1	3.2	-0.1
Burbank	Van Nuys	3.7	3.7	0.0
LAX	Burbank	2.6	2.6	0.0
Total		*33.7*	*32.7*	*1.0*
Overall Difference (%)				*2.9%*

Exhibits 9.2 – 9.5 show stringline diagrams of each train operated on the Pacific Surfliner North network in RailOPS. Exhibits 9.6 and 9.7 are heatmaps showing a Pacific Surfliner North Corridor schematic with varying colors of track used to denote the percentage of time a train is occupying a particular segment in model results. 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 Pacific Surfliner North Stringline Diagram

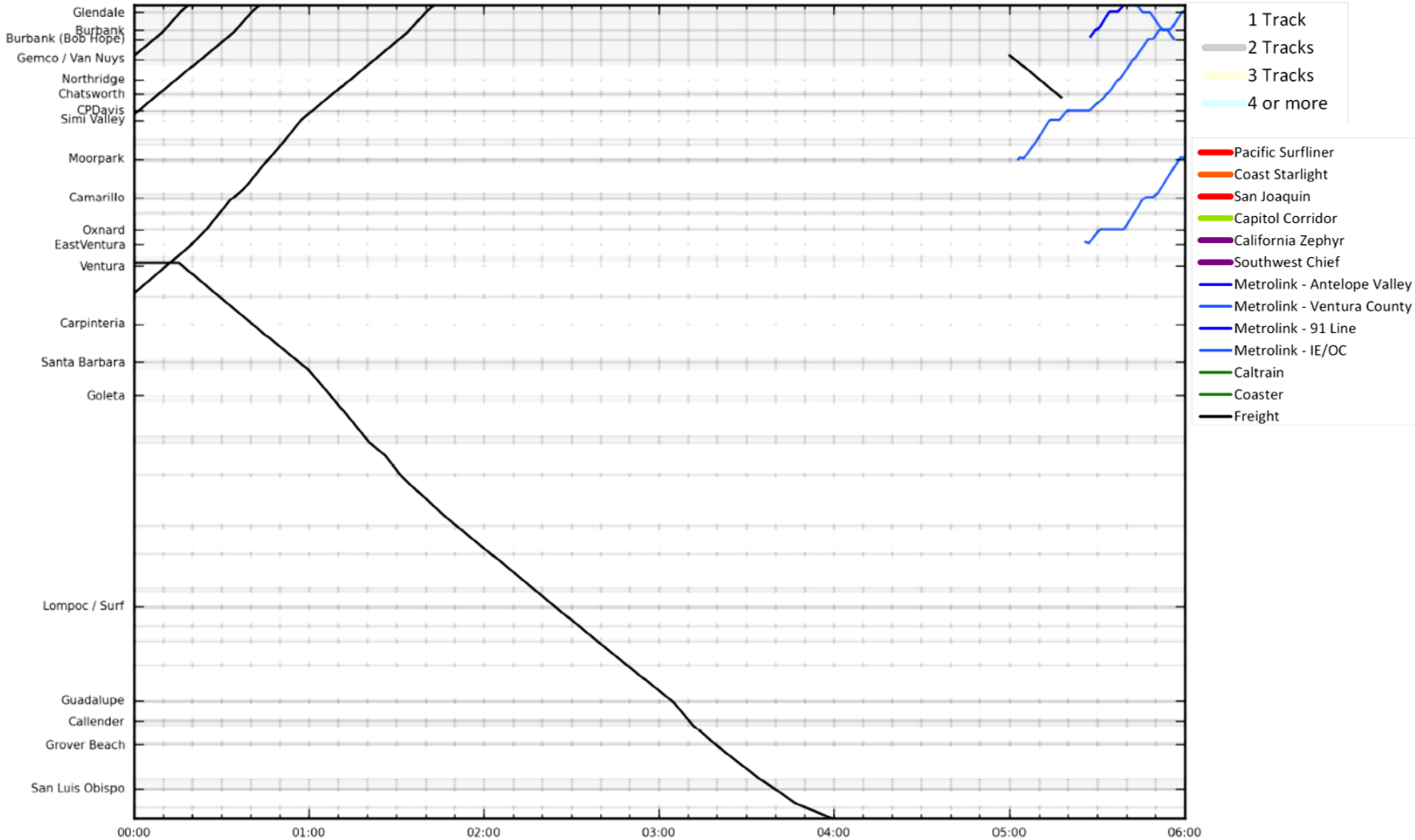


Exhibit 9.3: Existing Year 6:00am – 12:00pm Pacific Surfliner North Stringline Diagram

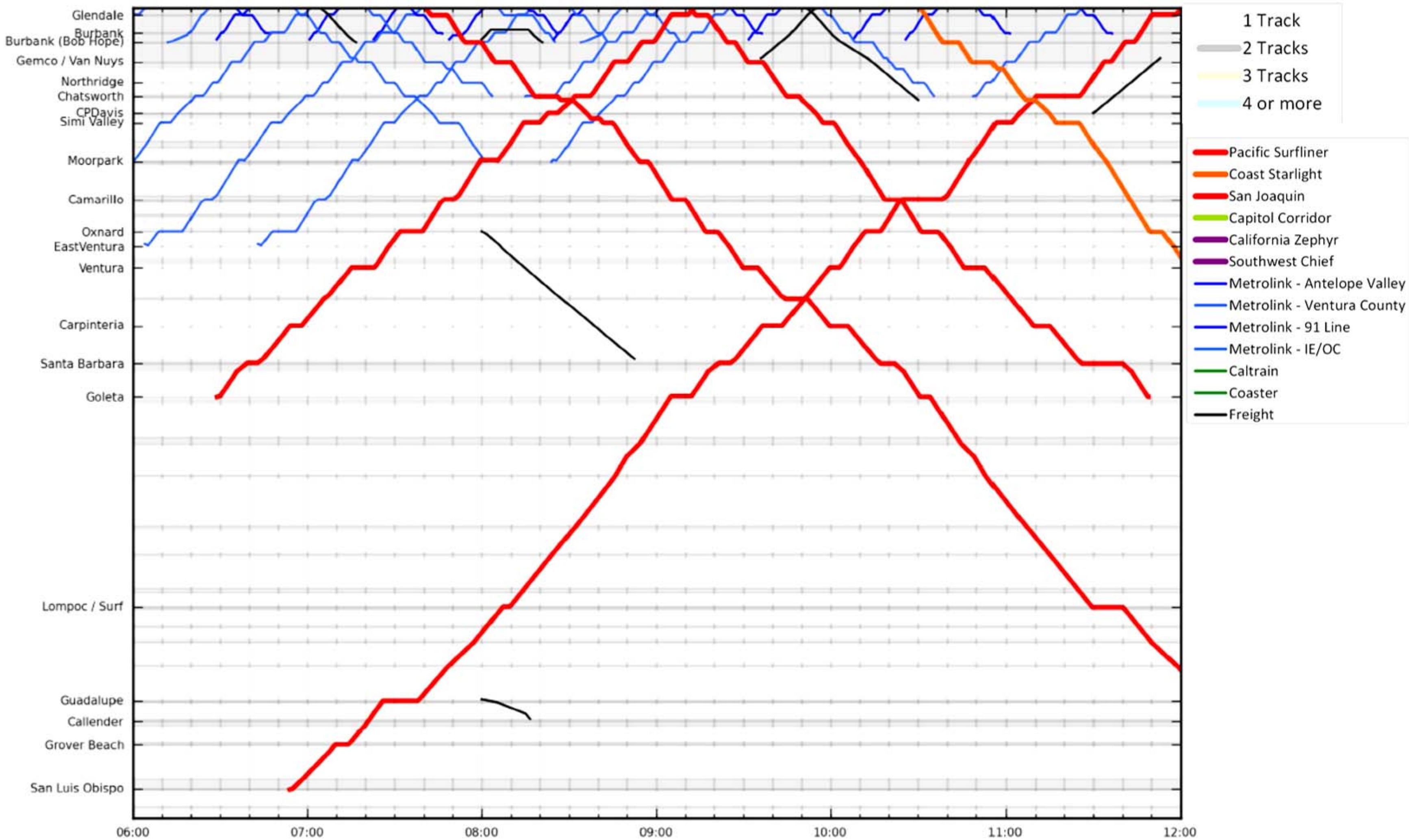


Exhibit 9.4: Existing Year 12:00pm – 6:00pm Pacific Surfliner North Stringline Diagram

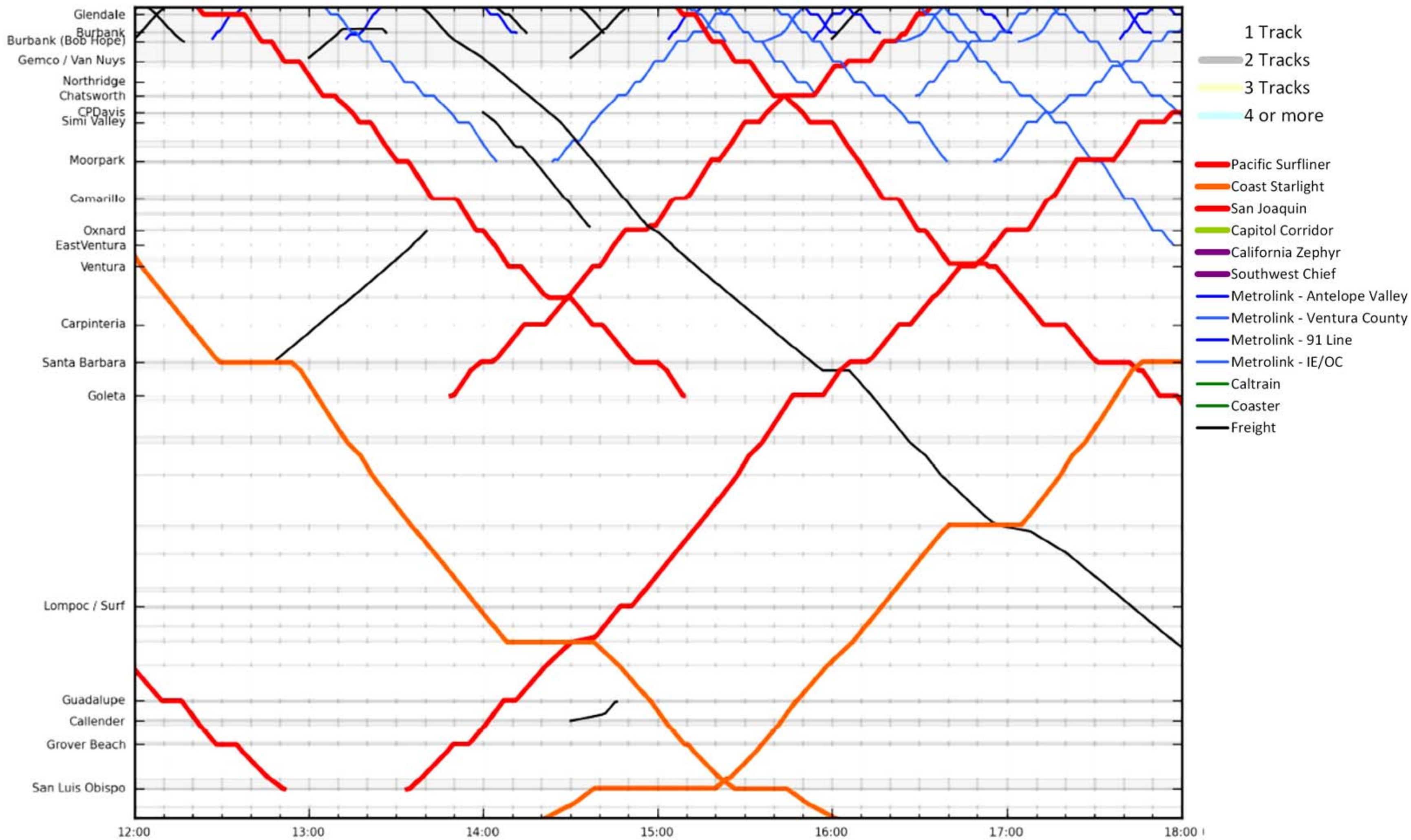


Exhibit 9.5: Existing Year 6:00pm – 12:00am Pacific Surfliner North Stringline Diagram

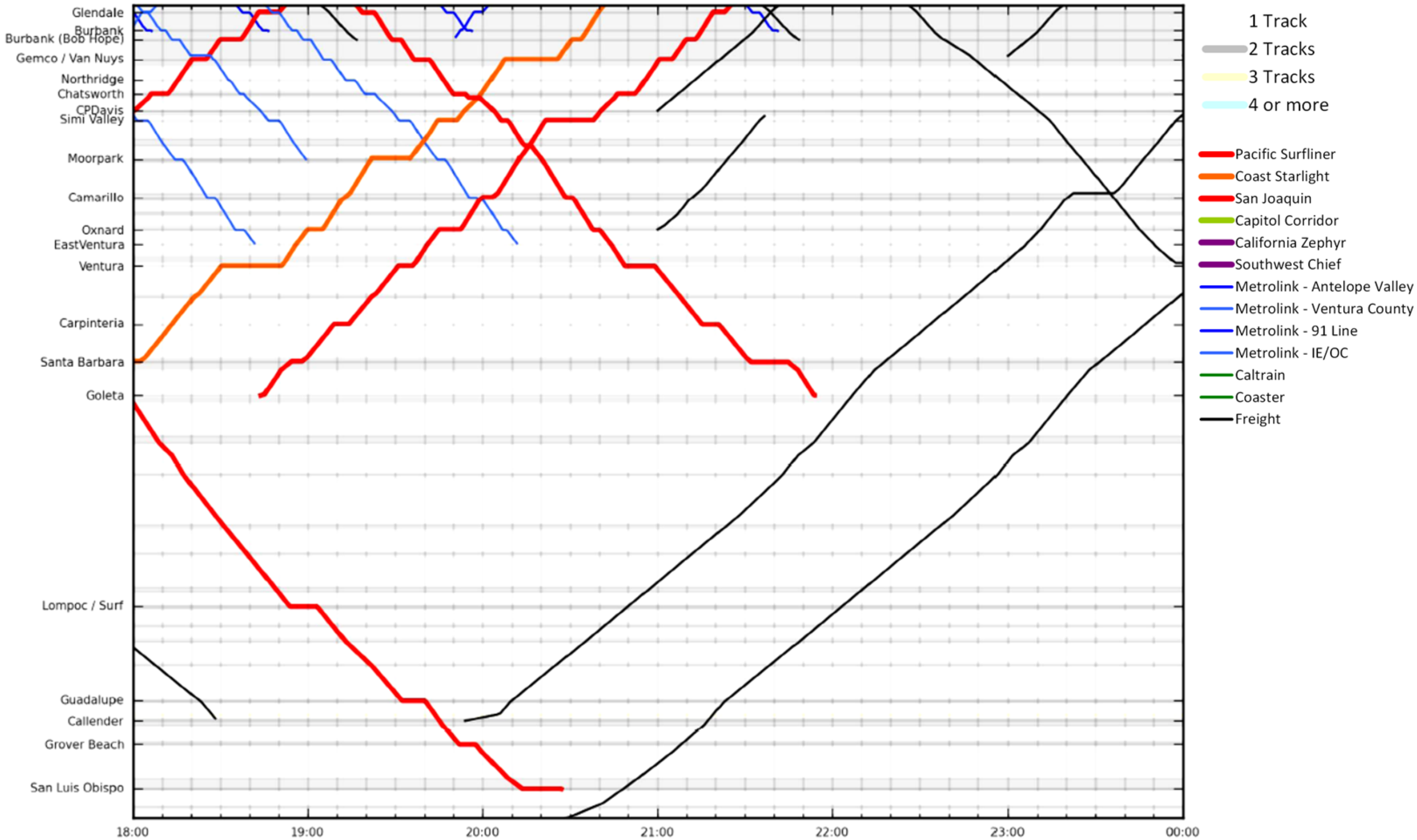


Exhibit 9.6: Existing Year 24-Hour Track Occupancy Heatmap

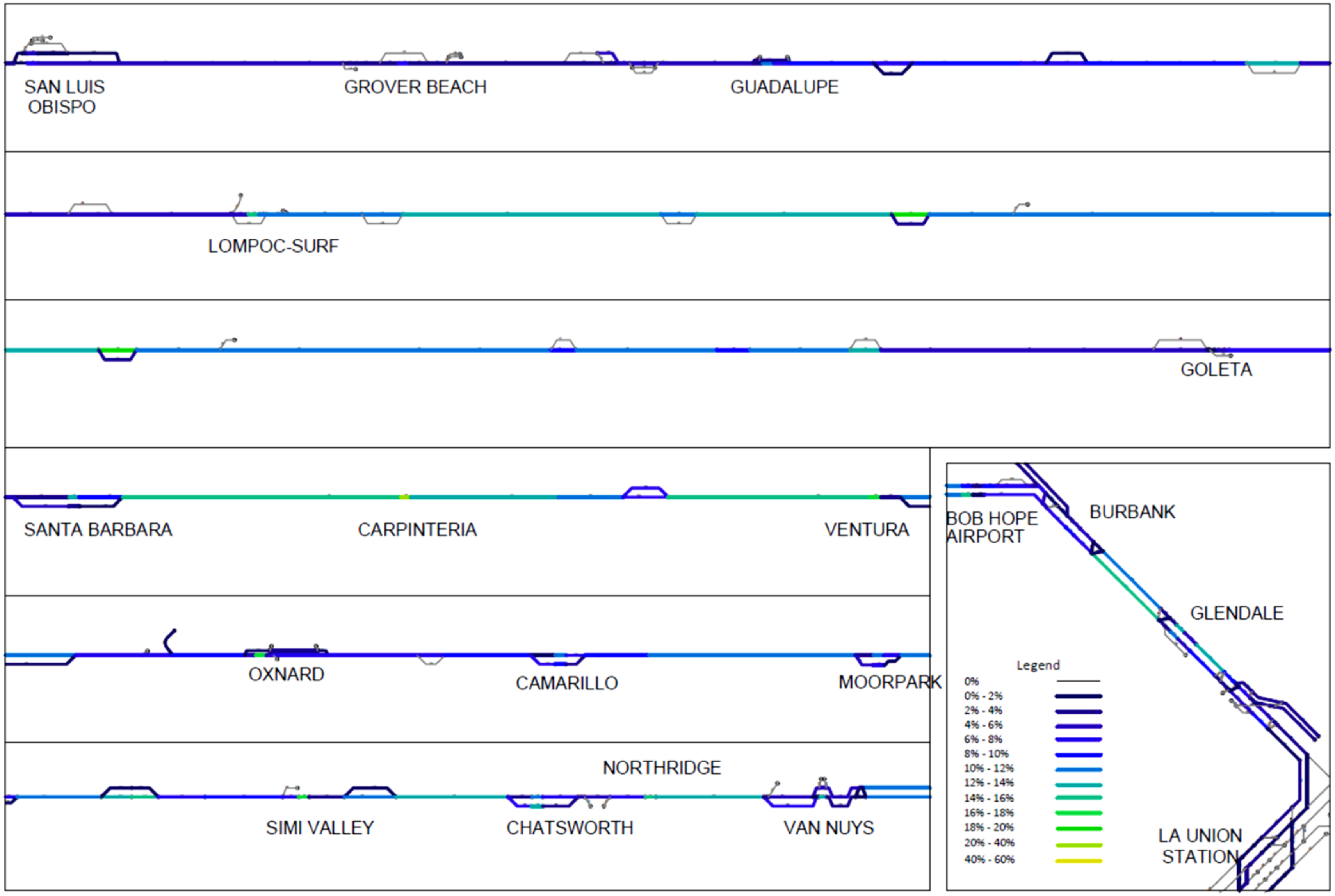
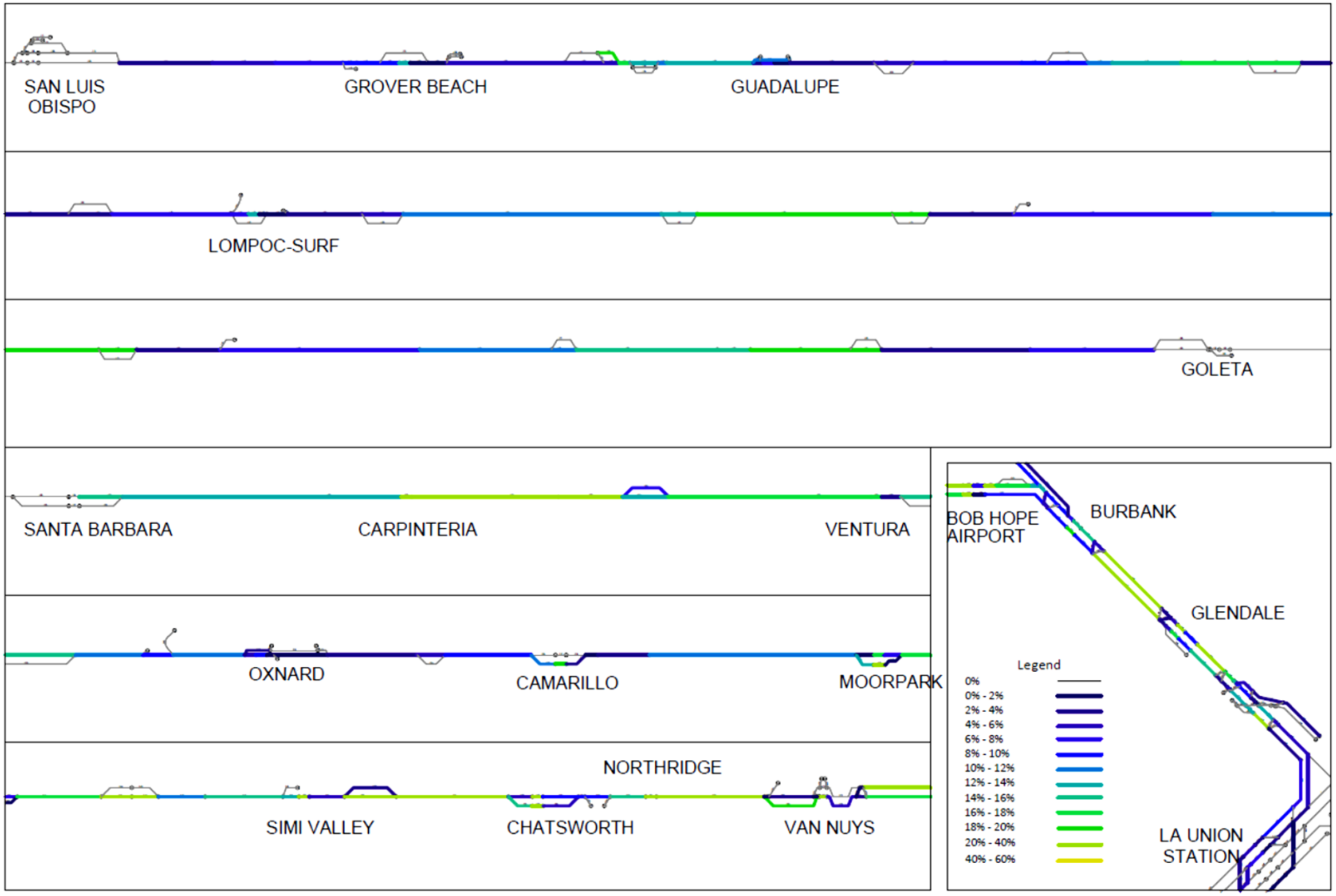


Exhibit 9.7: Existing Year 7:00am – 9:00am Track Occupancy Heatmap



On a 24-hour basis, overall track occupancy levels are low, with most segments being occupied by a train under 5 percent of the day, particularly south of Van Nuys where the network has more than one main track. Some single tracked sections of the corridor North of Van Nuys reach occupancy levels of 14 percent – 16 percent on a 24-hour basis, particularly between Lompoc-Surf and Ventura. No segments have greater than 20 percent occupancy over 24 hours because few passenger or commuter trains operate overnight.

The peak commute hour heatmap from 7:00am to 9:00am in Exhibit 9.7 shows track occupancy levels during hours with the highest level of passenger and commuter train traffic. During these hours, there is a greater frequency of track occupancy levels over 20 percent. The Burbank–Glendale segment shows occupancy levels over 40 percent during peak commute periods, indicating a potential need for capacity improvements. In the mostly single-tracked corridor north of Van Nuys, several segments have track occupancy levels over 20 percent. The section of single main track leading into Van Nuys from Chatsworth has a 20 – 40 percent occupancy level, which contributes to conflicts in this region due to the single platform at Van Nuys.

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 northern portion of the Pacific Surfliner corridor, this model will be revised based on modeling and studies currently being conducted by the Authority. If any of the intercity passenger services (Amtrak's *Pacific Surfliner*, *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.

The Year 2020 Base Case model incorporates the infrastructure upgrades listed in Table 9.35. The model was run with Year 2020 freight traffic as given in Table 9.20 while maintaining Existing Year passenger traffic levels. Additional freight traffic had no impact on passenger OTP levels, so the passenger trains listed in Tables 9.12 – 9.20 for Year 2020 were implemented along with Year 2020 freight levels.

Table 9.40 lists the resulting OTP of each intercity service at each station on the Pacific Surfliner North network 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.

Exhibits 9.8 through 9.11 show stringline diagrams of each train operated on the Pacific Surfliner North network in RailOPS in the Year 2020 Base Case model.

Based on the results shown in Table 9.40, improvements are required for each service to reach 87 percent OTP at the Carpinteria and Ventura Stations for the *Pacific Surfliner* service, and at Oxnard for the *Coast Daylight* service.

Table 9.40: Year 2020 Base Case Model Intercity Passenger Service RailOPS OTP Results

Station	***Coast Starlight***	***Surfliner North***	***Coast Daylight***
San Luis Obispo	100%	100%	100%
Grover Beach		100%	100%
Guadalupe		100%	100%
Lompoc-Surf		100%	100%
Goleta		90%	100%
Santa Barbara	100%	90%	100%
Carpinteria		**80%**	100%
Ventura		**80%**	100%
Oxnard	100%	90%	**50%**
Camarillo		100%	100%
Moorpark		100%	100%
Simi Valley	100%	100%	100%
Chatsworth		100%	100%
Van Nuys	100%	100%	100%
Burbank-Bob Hope Airport	100%	100%	100%
Glendale		100%	100%
Los Angeles Union Station	100%	100%	100%

Notes:

- Bold indicates an OTP of lower than 87 percent. Where OTP is less than 87 percent, improvements are required.

Exhibit 9.8: Year 2020 Base Case 12:00am – 6:00am Pacific Surfliner North Stringline Diagram

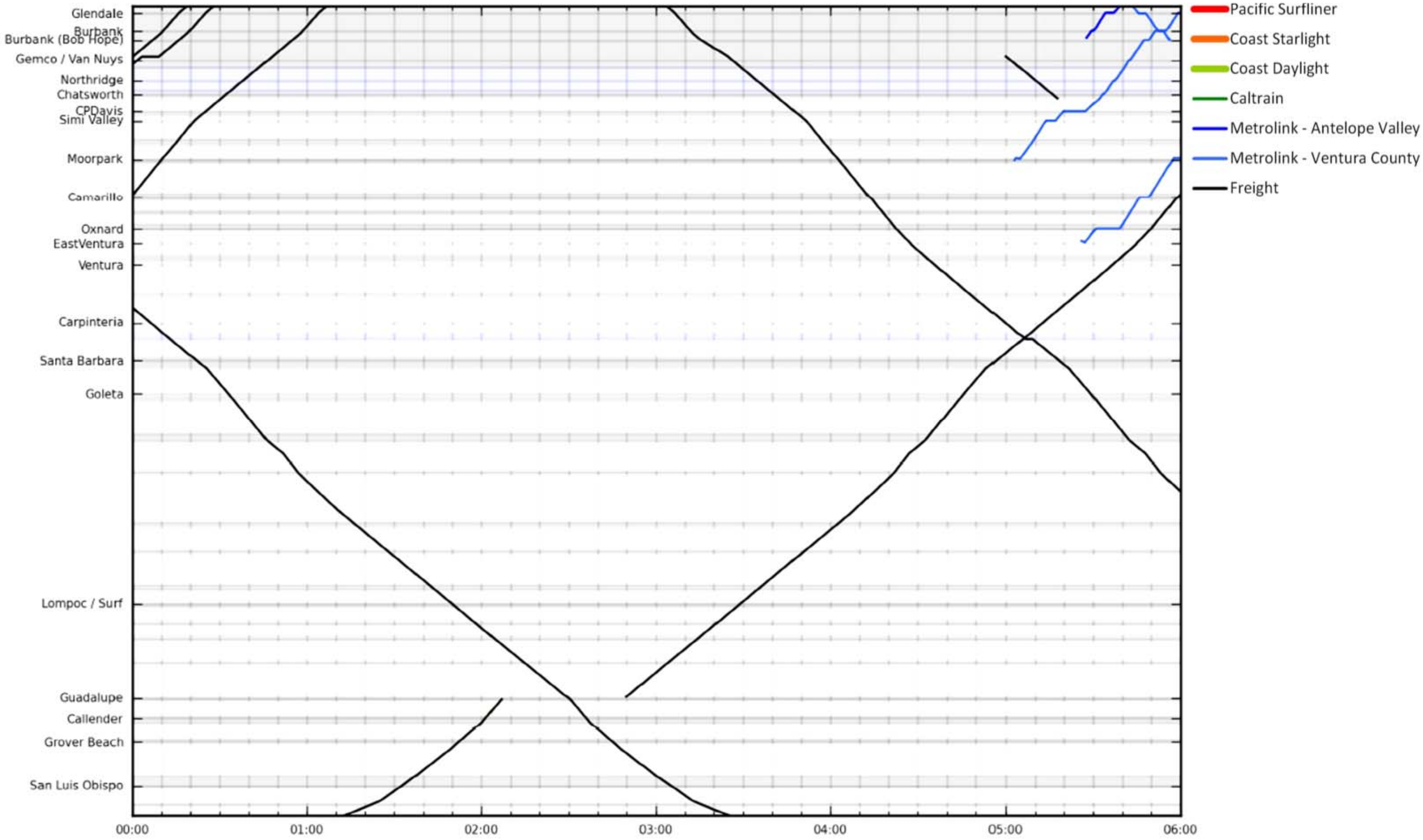


Exhibit 9.9: Year 2020 Base Case 6:00am – 12:00pm Pacific Surfliner North Stringline Diagram

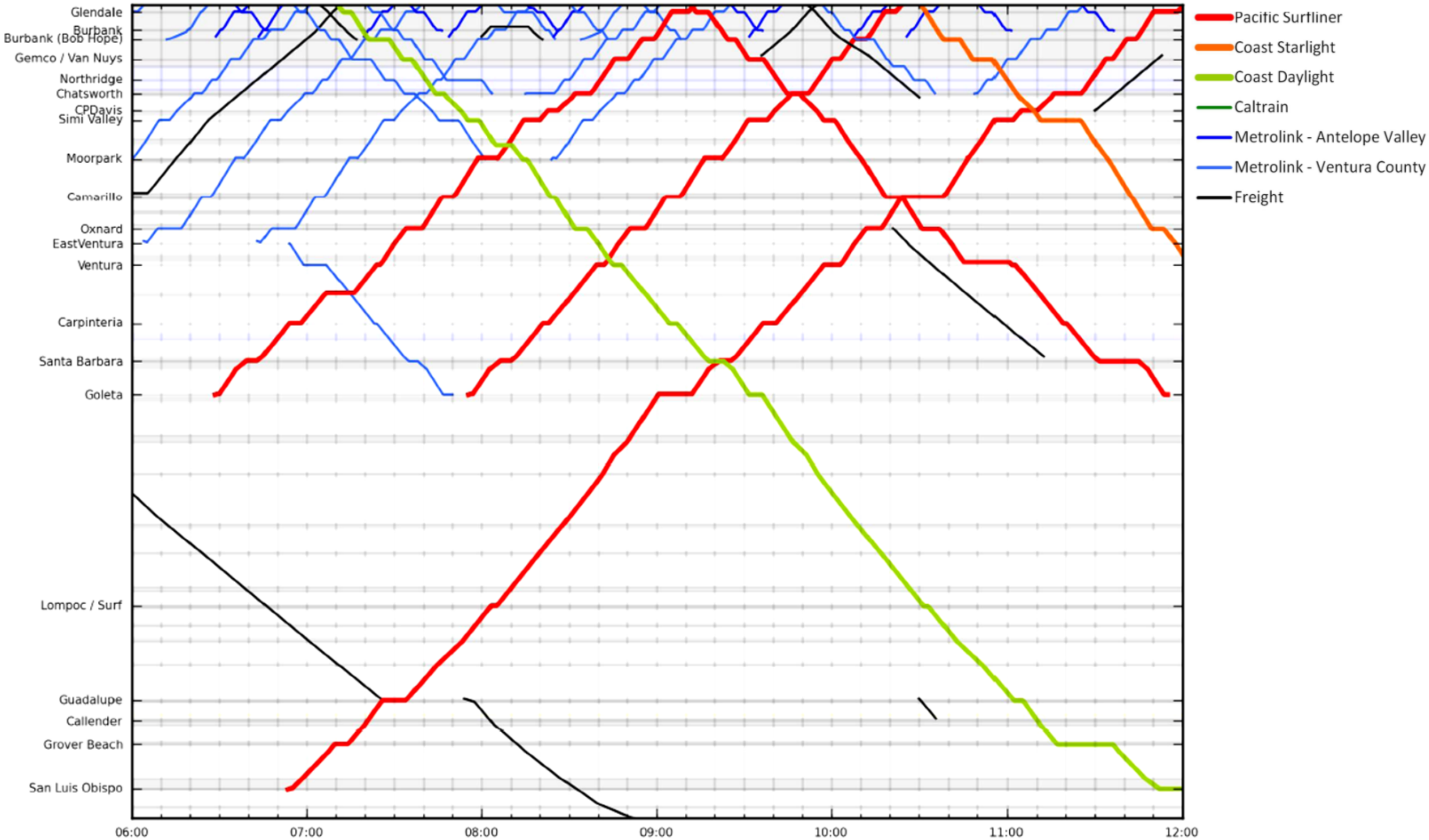


Exhibit 9.10: Year 2020 Base Case 12:00pm – 6:00pm Pacific Surfliner North Stringline Diagram

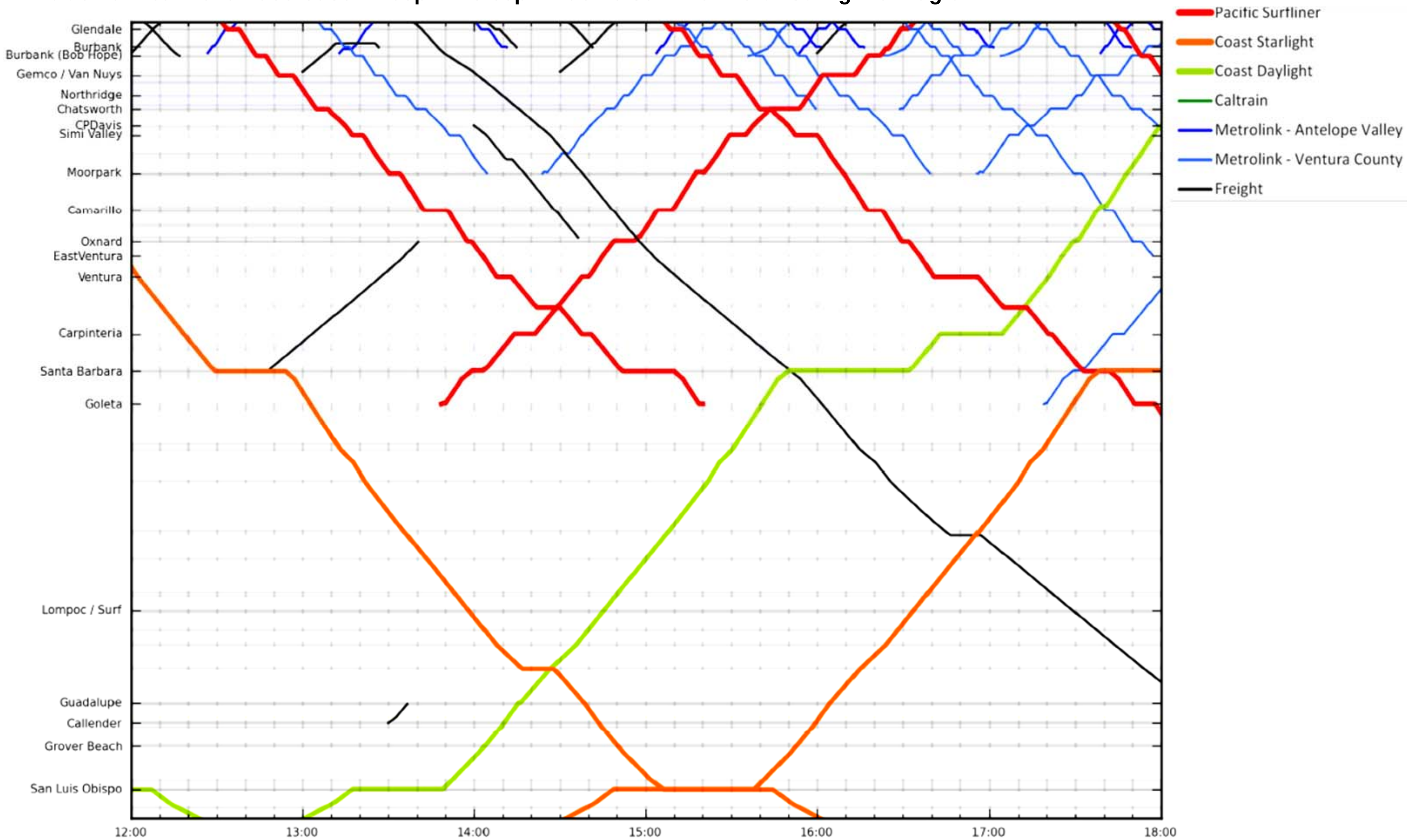
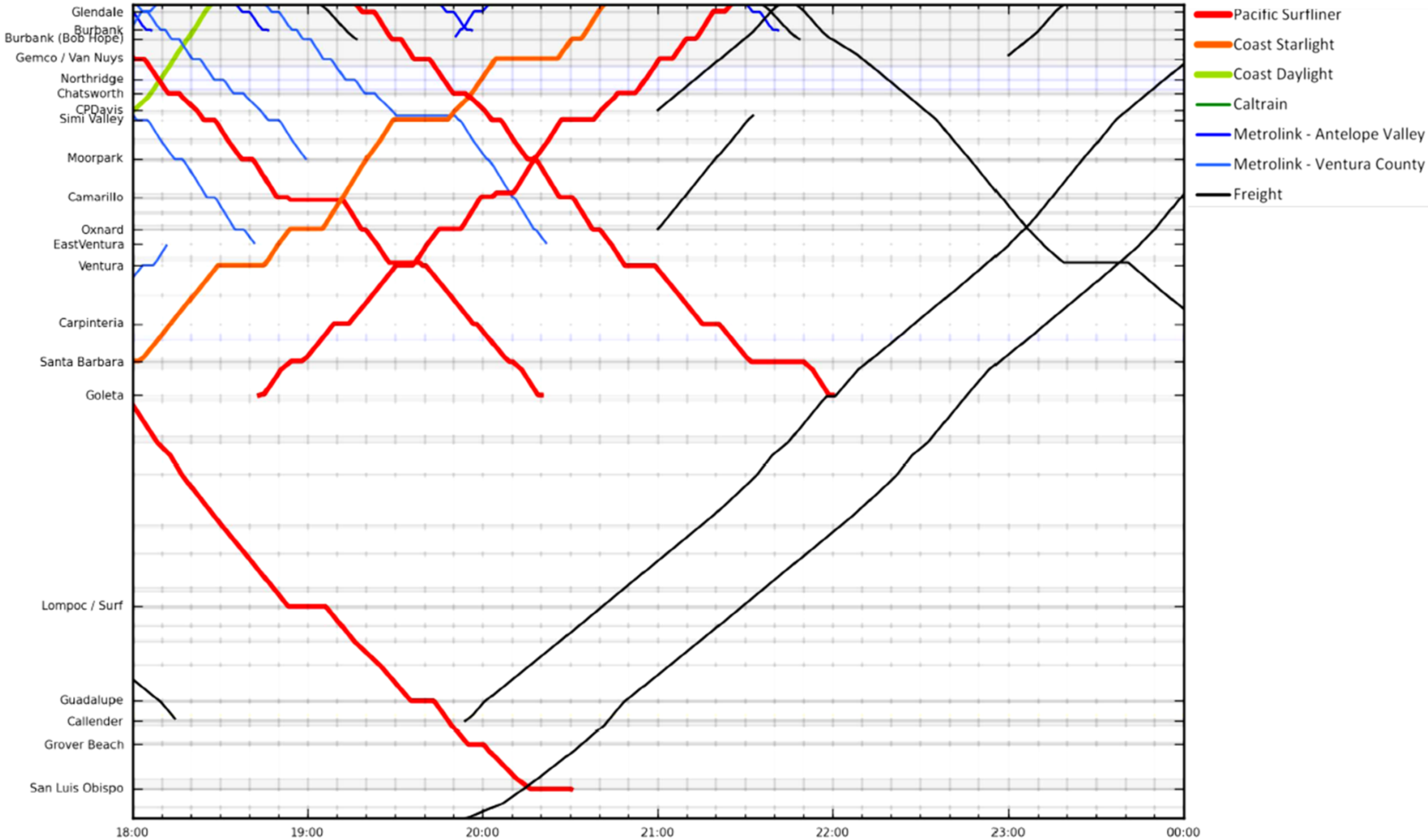


Exhibit 9.11: Year 2020 Base Case 6:00pm – 12:00am Pacific Surfliner North Stringline Diagram



9.5.3 Year 2020 Alternative Case

Network improvements identified from the Year 2020 Base Case model to increase intercity passenger services OTP to a minimum of 87 percent are listed in Table 9.41; these improvements are also incorporated in the Year 2040 Base Case model.

Table 9.41: Rail Network Improvements Included in Year 2020 Alternative Case Simulation

Track Segment	Recommended Improvement
Oxnard–Camarillo	Extend Leesdale siding
Carpinteria–Ventura	Extend Seacliff siding

The Leesdale and Seacliff sidings indicated in Table 9.41 were extended in the simulation model to avoid freight problems in what is a congested area for passenger services. Currently, the Leesdale siding is less than 6,000 feet, while the Seacliff siding is less than 5,000 feet, both are too short to accommodate the average freight train length of 7,000 feet in the Existing Year. An optimal siding length to handle future year train lengths was not determined, but a minimum siding length of 10,000 feet was identified as presented in Chapter 11.0. In addition, one schedule change was made within the Pacific Surfliner North Corridor to the *Coast Daylight* service for Year 2020: the service's Oxnard departure time was adjusted ahead to allow for the Surfliner North 777 service to depart Ventura and pass the southbound *Coast Daylight* train.

Table 9.42 lists Year 2020 Alternative Case model OTP percentages for each intercity passenger service after incorporating the improvements identified in Table 9.41. Note that blank entries in the Coast Starlight column indicate that the service is not planned to stop at that location.

Table 9.42: Year 2020 Alternative Case Model Intercity Passenger Service RailOPS OTP Results

Stations	Coast Starlight	Pacific Surfliner	Coast Daylight
San Luis Obispo	100%	100%	100%
Grover Beach		100%	100%
Guadalupe		100%	100%
Lompoc-Surf		100%	100%
Goleta		100%	100%
Santa Barbara	100%	100%	100%
Carpinteria		100%	100%
Ventura		89%	100%
Oxnard	100%	90%	100%
Camarillo		100%	100%
Moorpark		100%	100%
Simi Valley	100%	93%	100%
Chatsworth		100%	100%
Van Nuys	100%	100%	100%
Burbank-Bob Hope Airport	100%	100%	100%
Glendale		100%	100%
Los Angeles Union Station	100%	100%	100%

The OTP of the northern portion of the Pacific Surfliner North improved in the Year 2020 Alternative Case between Oxnard and Goleta due to the schedule change to the Coast Daylight at Oxnard allowing the Pacific Surfliner train to pass the Coast Daylight at Oxnard and maintain its schedule. The Coast Daylight OTP at Oxnard improved for the same reason, although more padding time was added into the Coast Daylight schedule to maintain the Pacific Surfliner departure time.

Tables 9.43 – 9.45 compare average minutes of delay per train departure from RailOPS outputs for the Year 2020 Base Case and Year 2020 Alternative Cases for each intercity passenger service.

Table 9.43: Year 2020 Base Case and Alternative Case *Pacific Surfliner* Service RailOPS Outputs

Stations		Average Delay per Train Departure (Minutes)			
		Northbound		Southbound	
From	To	Year 2020 Base Case	Year 2020 Alt Case	Year 2020 Base Case	Year 2020 Alt Case
Los Angeles Union Station	Glendale	1.5	1.5	0.9	0.9
Glendale	Burbank	0.8	0.8	0.2	0.2
Burbank	Van Nuys	0.1	0.1	0.1	0.1
Van Nuys	Chatsworth	0.6	0.6	1.7	1.7
Chatsworth	Simi Valley	0.2	0.2	1.6	1.6
Simi Valley	Camarillo	0.7	0.7	3.5	3.5
Camarillo	Oxnard	4.8	3.6	1.2	1.2
Oxnard	Ventura	5.5	0.2	0.2	0.2
Ventura	Santa Barbara	9.9	2.7	1.9	2.2
Santa Barbara	Goleta	1.9	0.0	0.0	0.0
Goleta	Lompoc-Surf	3.6	3.6	0.0	0.0
Lompoc-Surf	Guadalupe	0.1	0.1	3.9	3.9
Guadalupe	San Luis Obispo	0.3	0.3	0.0	0.0
Total		*29.7*	*14.2*	*15.2*	*15.5*

Table 9.44: Year 2020 Base Case and Alternative Case *Coast Daylight* Service RailOPS Outputs

Stations		Average Delay per Train Departure (Minutes)			
		Northbound		Southbound	
From	To	Year 2020 Base Case	Year 2020 Alt Case	Year 2020 Base Case	Year 2020 Alt Case
Los Angeles Union Station	Oxnard	2.6	2.6	3.3	8.4
Oxnard	Santa Barbara	0.0	0.0	21.4	11.8
Santa Barbara	San Luis Obispo	0.0	0.0	24.6	24.6
Total		*2.6*	*2.6*	*49.3*	*44.8*

Table 9.45: Year 2020 Base Case and Alt Case *Coast Starlight* Service RailOPS Outputs

Stations		**Average Delay per Train Departure** (Minutes)			
		Northbound		**Southbound**	
From	**To**	**Year 2020 Base Case**	**Year 2020 Alt Case**	**Year 2020 Base Case**	**Year 2020 Alt Case**
Los Angeles Union Station	Burbank	0.0	0.0	2.6	2.6
Burbank	Van Nuys	0.0	0.0	3.7	3.7
Van Nuys	Simi Valley	0.0	0.0	0.0	0.0
Simi Valley	Oxnard	6.0	6.0	0.0	0.0
Oxnard	Santa Barbara	1.5	1.5	15.5	15.5
Santa Barbara	San Luis Obispo	6.0	6.0	18.0	18.0
Total		*13.5*	*13.5*	*39.8*	*39.8*

Delay minutes to the *Pacific Surfliner* service were reduced in the northbound direction north of Oxnard due to the adjusted *Coast Daylight* schedule allowing it to pass Oxnard on time. While the average delay minutes in the southbound direction did increase from the Year 2020 Base Case to the Year 2020 Alternative Case, the increase was not significant, amounting to 0.3 minutes of delay per train departure across the corridor, or less than 20 seconds per train departure. Overall the southbound delay results are essentially unchanged from the Base to Alternative cases.

Coast Daylight average delay minutes were reduced in the Year 2020 Alternative Case in the southbound direction between Oxnard and Santa Barbara due to the siding extensions listed in Table 9.41, resulting in a reduction in conflicts with freight trains.

Exhibits 9.12 – 9.15 show stringline diagrams of each train operated on the Pacific Surfliner North network in RailOPS in the Year 2020 Alternative Case model. Exhibit 9.16 shows a track occupancy heatmap for a 24-hour period. Exhibit 9.17 shows a track occupancy heatmap for the peak commute period between 7:00am and 9:00am.

Exhibit 9.12: Year 2020 Alternative Case 12:00am – 6:00am Pacific Surfliner North Stringline Diagram

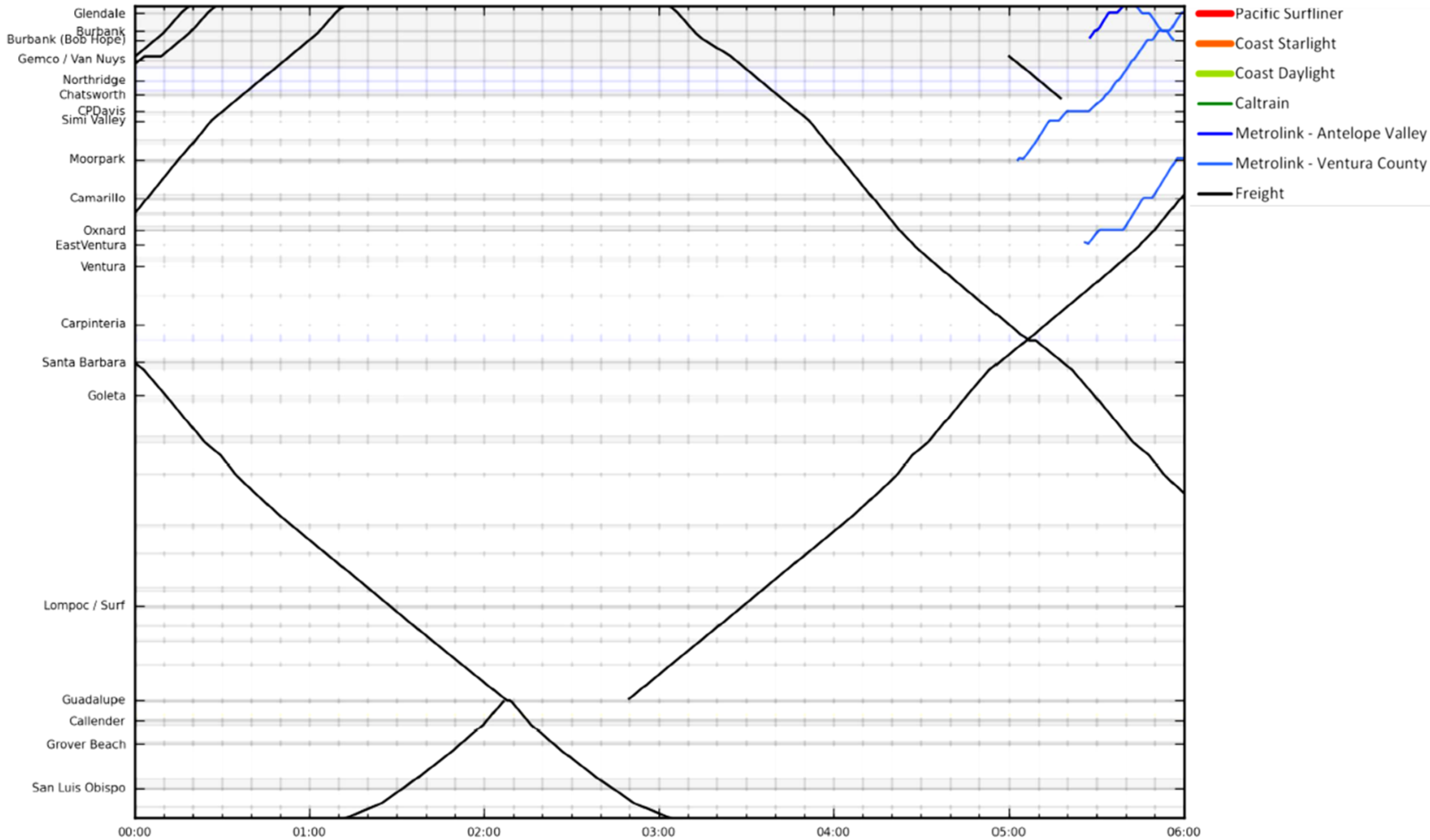


Exhibit 9.13: Year 2020 Alternative Case 6:00am – 12:00pm Pacific Surfliner North Stringline Diagram

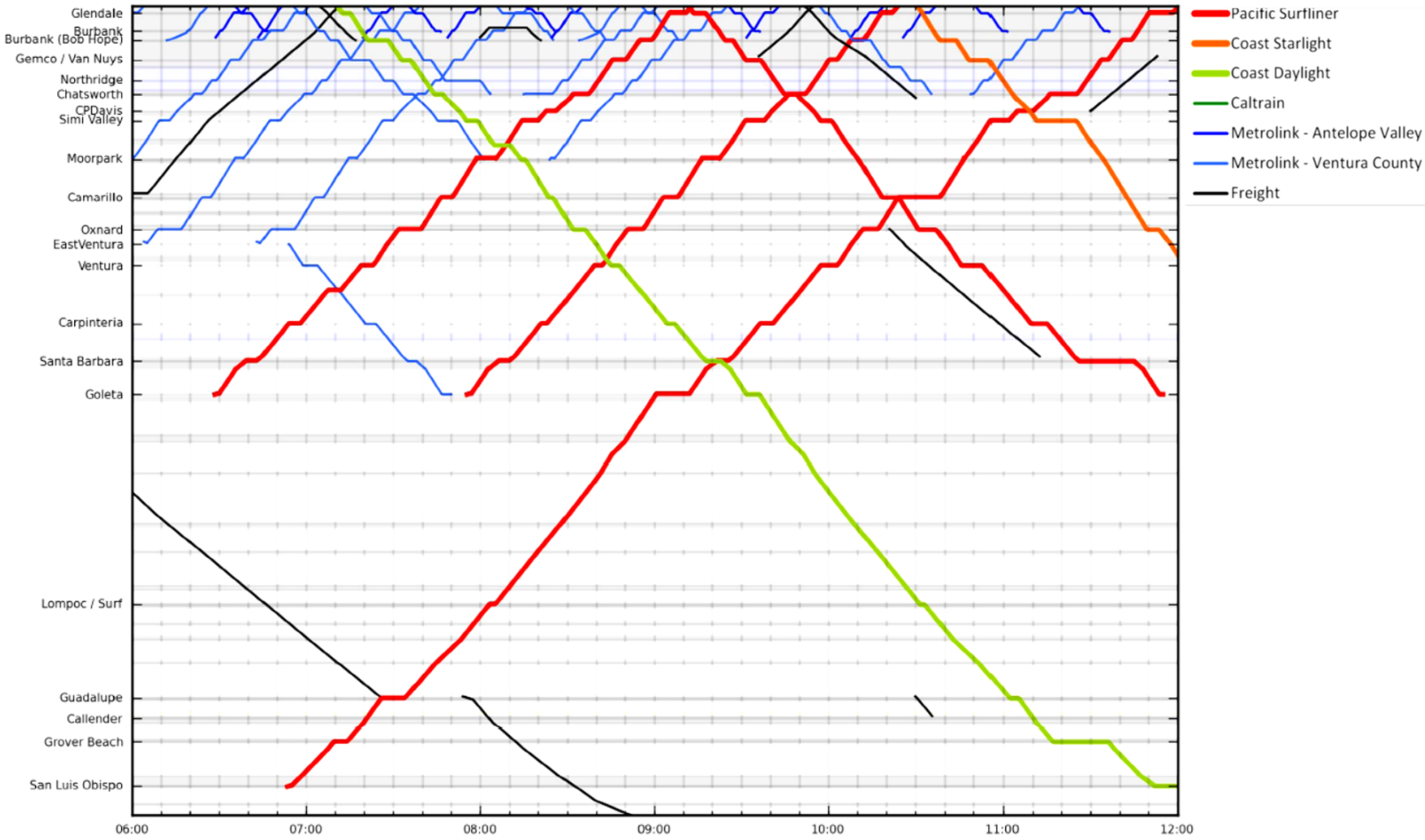


Exhibit 9.14: Year 2020 Alternative Case 12:00pm – 6:00pm Pacific Surfliner North Stringline Diagram

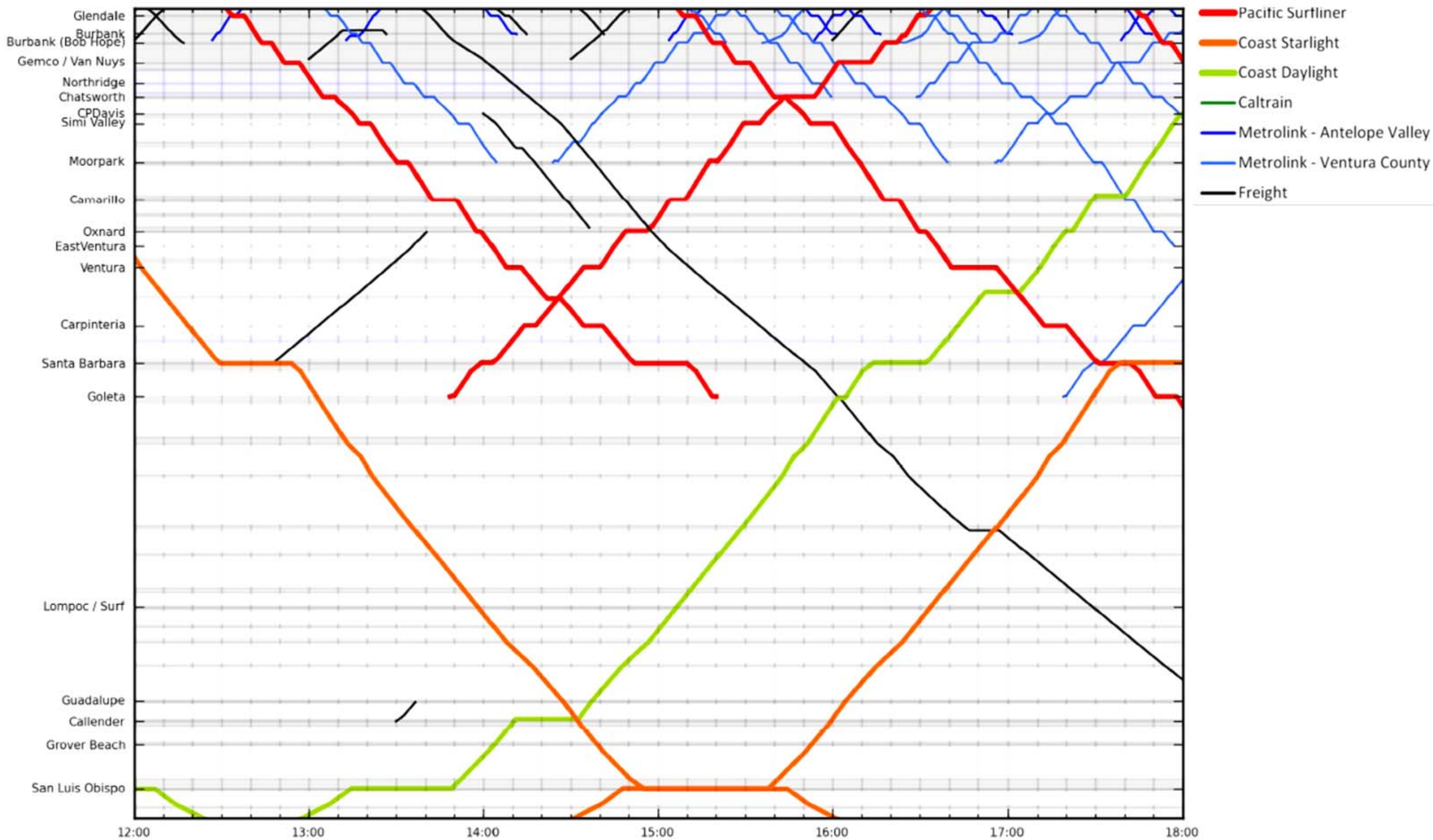


Exhibit 9.15: Year 2020 Alternative Case 6:00pm – 12:00am Pacific Surfliner North Stringline Diagram

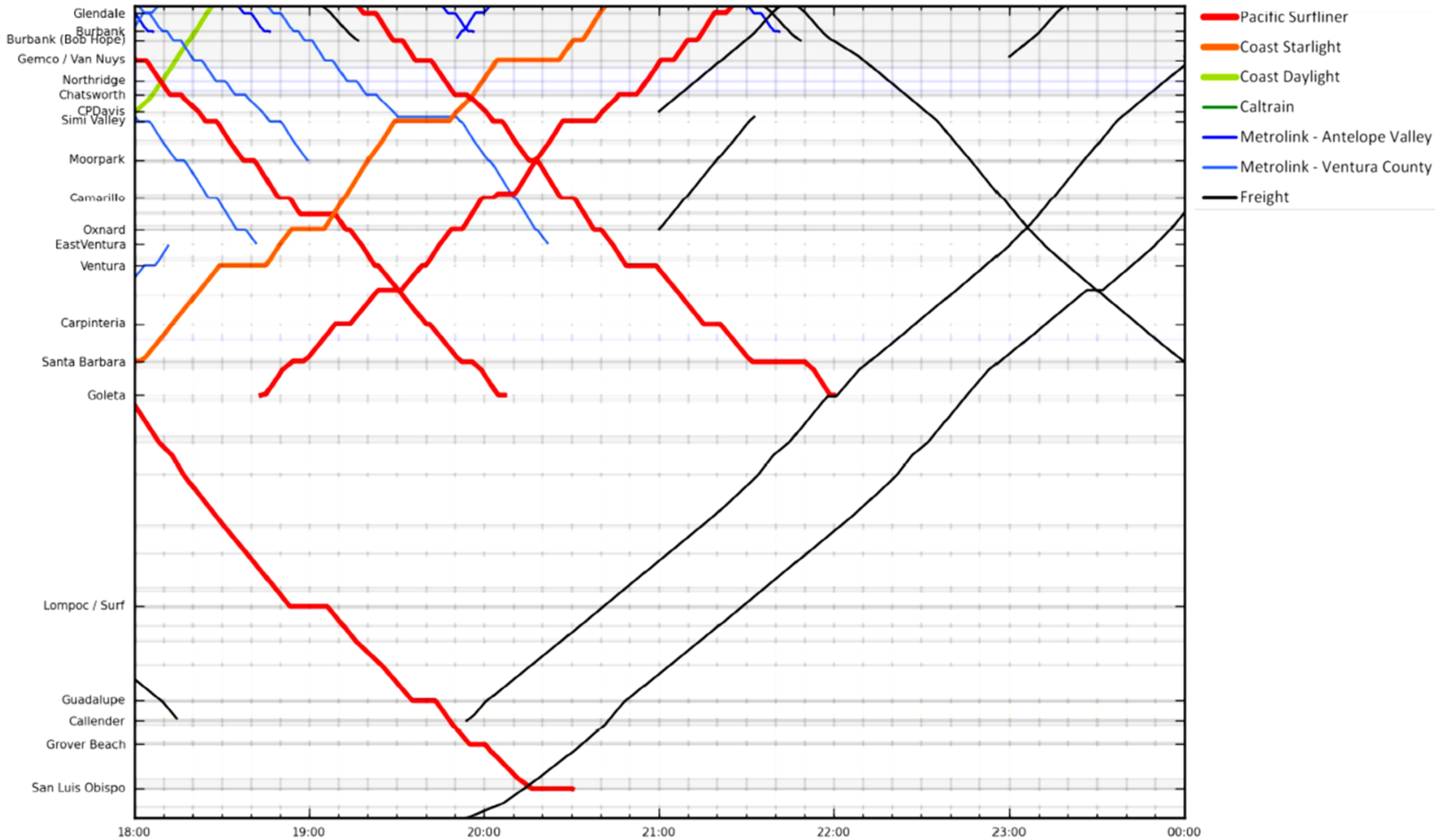


Exhibit 9.16: Year 2020 Alternative Case 24-Hour Track Occupancy Heatmap

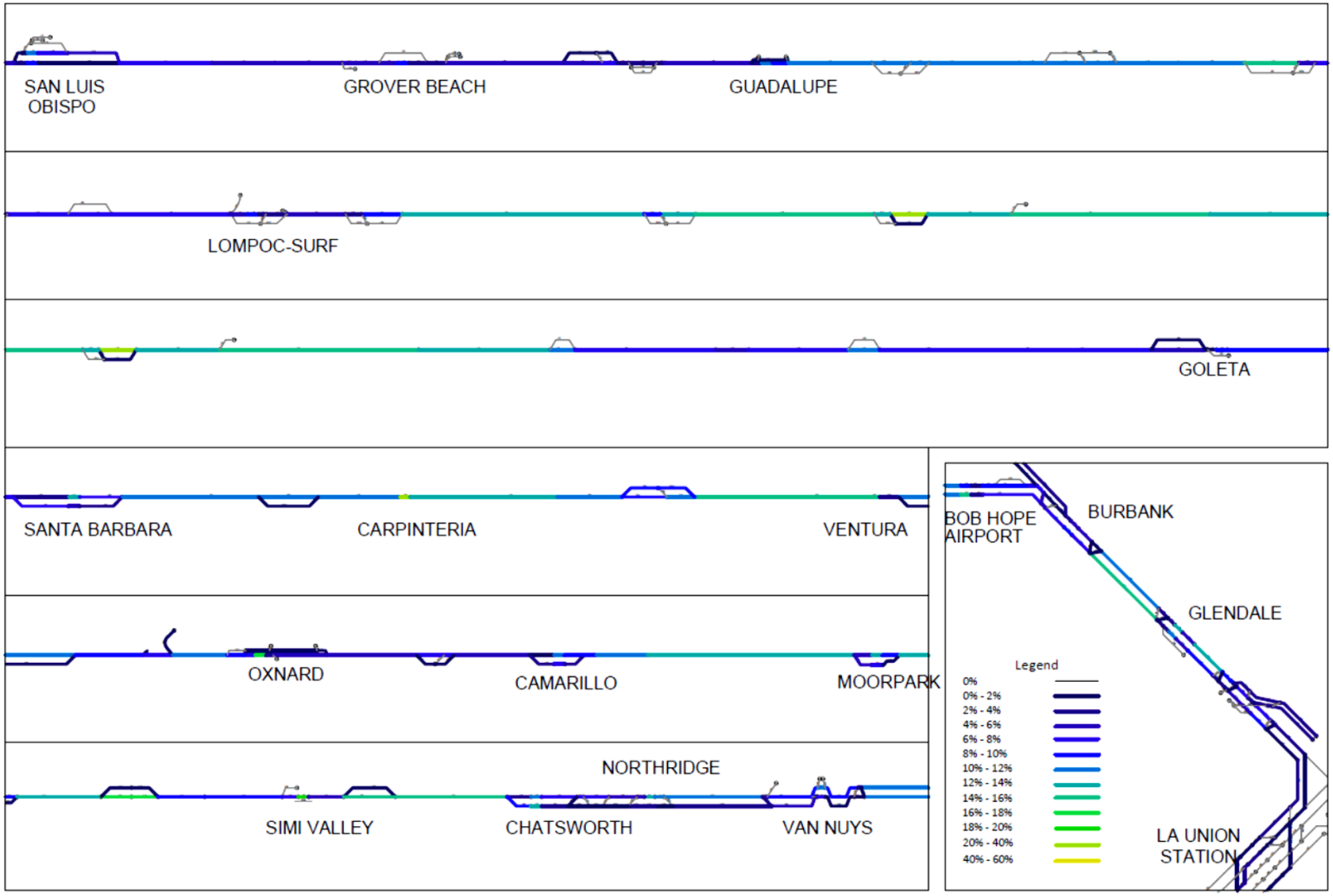
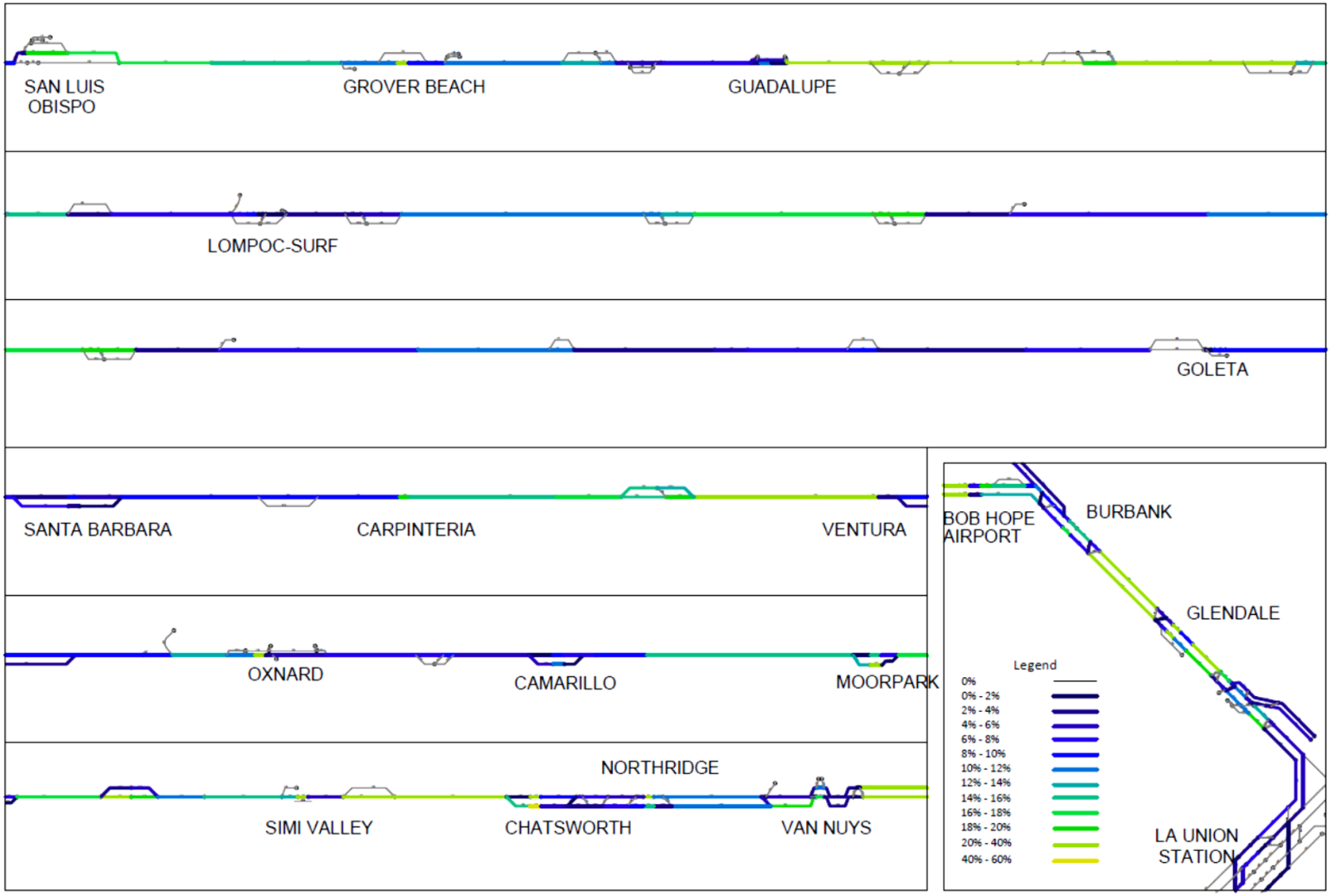


Exhibit 9.17: Year 2020 Alternative Case 7:00am – 9:00am Track Occupancy Heatmap



9.5.4 Year 2040 Base Case

The Year 2040 Base Case model is used to determine the expected OTP of intercity train services on the northern portion of the Pacific Surfliner Corridor. If any of the intercity passenger services (Amtrak's *Pacific Surfliner*, *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.

The Year 2040 Base Case model incorporates the infrastructure upgrades listed in Table 9.35, as well as the improvements listed in Table 9.41 identified in the Year 2020 Alternative Case. The model was first run with Year 2040 freight traffic as given in Table 9.34 while maintaining Year 2020 passenger traffic levels. Additional freight traffic had no impact on passenger OTP levels, so the passenger trains listed in Tables 9.21 – 9.33 for Year 2040 were then implemented along with Year 2040 freight levels. Table 9.46 lists the resulting OTP of each intercity service at each station with the northern portion of the Pacific Surfliner North network 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 9.46: Year 2040 Base Case Model Intercity Passenger Service RailOPS OTP Results

Stations	*Coast Starlight*	*Surfliner North*	*Coast Daylight*
San Luis Obispo	100%	100%	100%
Grover Beach		100%	100%
Guadalupe		100%	100%
Lompoc-Surf		100%	100%
Goleta		100%	100%
Santa Barbara	100%	100%	100%
Carpinteria		100%	100%
Ventura		89%	100%
Oxnard	100%	90%	100%
Camarillo		100%	100%
Moorpark		100%	100%
Simi Valley	100%	93%	100%
Chatsworth		100%	100%
Van Nuys	100%	100%	100%
Bob Hope Airport	100%	100%	100%
Glendale		100%	100%
Los Angeles Union Station	100%	100%	100%

While none of the OTP levels in Table 9.46 are less than 87 percent, these values represent the highest OTP values possible in actual operations as they are impacted only by train interaction effects. In reality, OTP levels are likely to be somewhat lower as they will also be impacted by random factors such as passenger loading delays, bad weather, etc (see Table 9.1). As such, recommended infrastructure upgrades intended to reduce delays and improve OTP were identified for the Year 2040 Alternative Case model.

Exhibits 9.18 – 9.21 show stringline diagrams of each train operated on the Pacific Surfliner North network in RailOPS in the Year 2040 Base Case model.

Exhibit 9.18: Year 2040 Base Case 12:00am – 6:00am Pacific Surfliner North Stringline Diagram

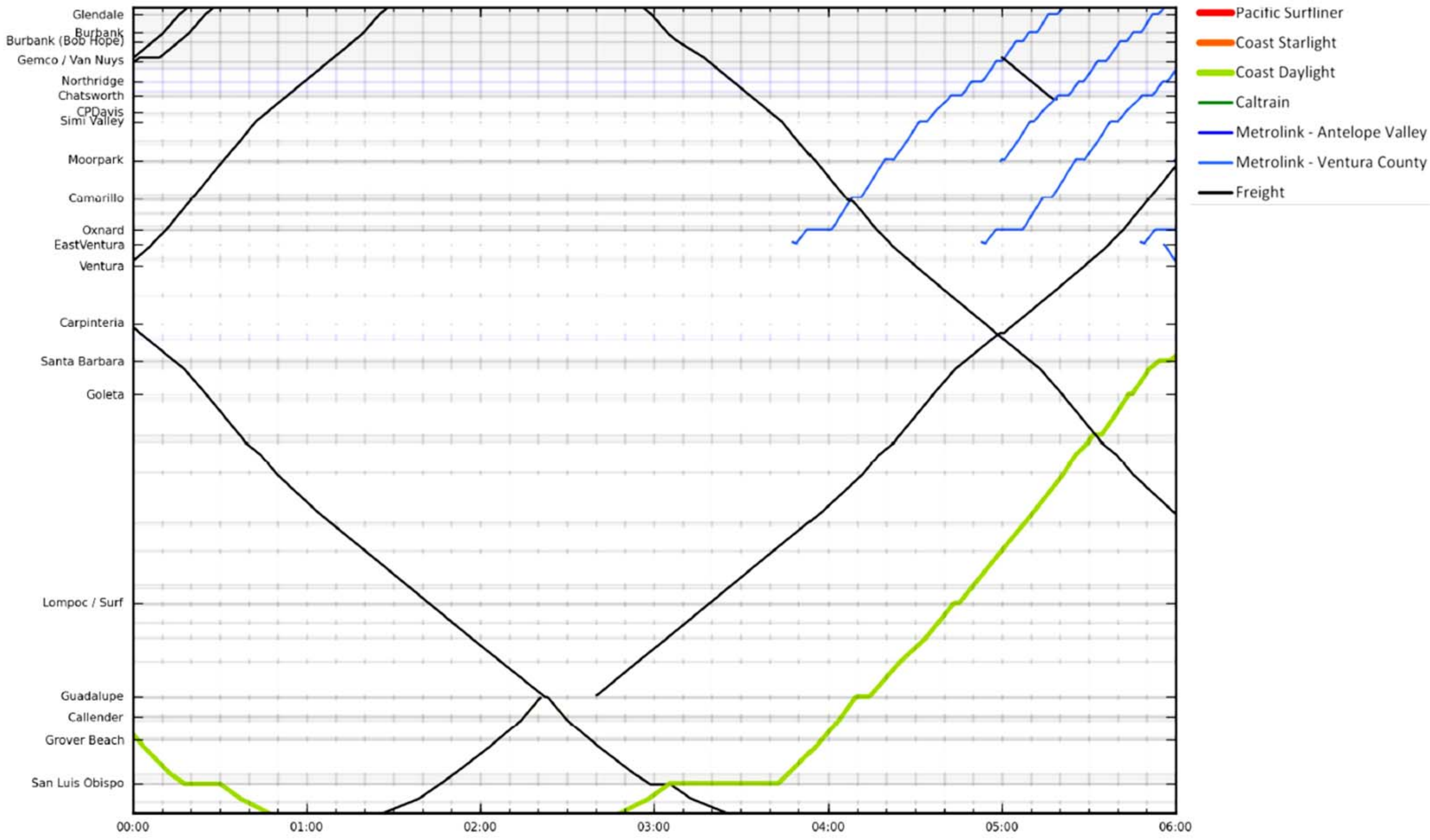


Exhibit 9.19: Year 2040 Base Case 6:00am – 12:00pm Pacific Surfliner North Stringline Diagram

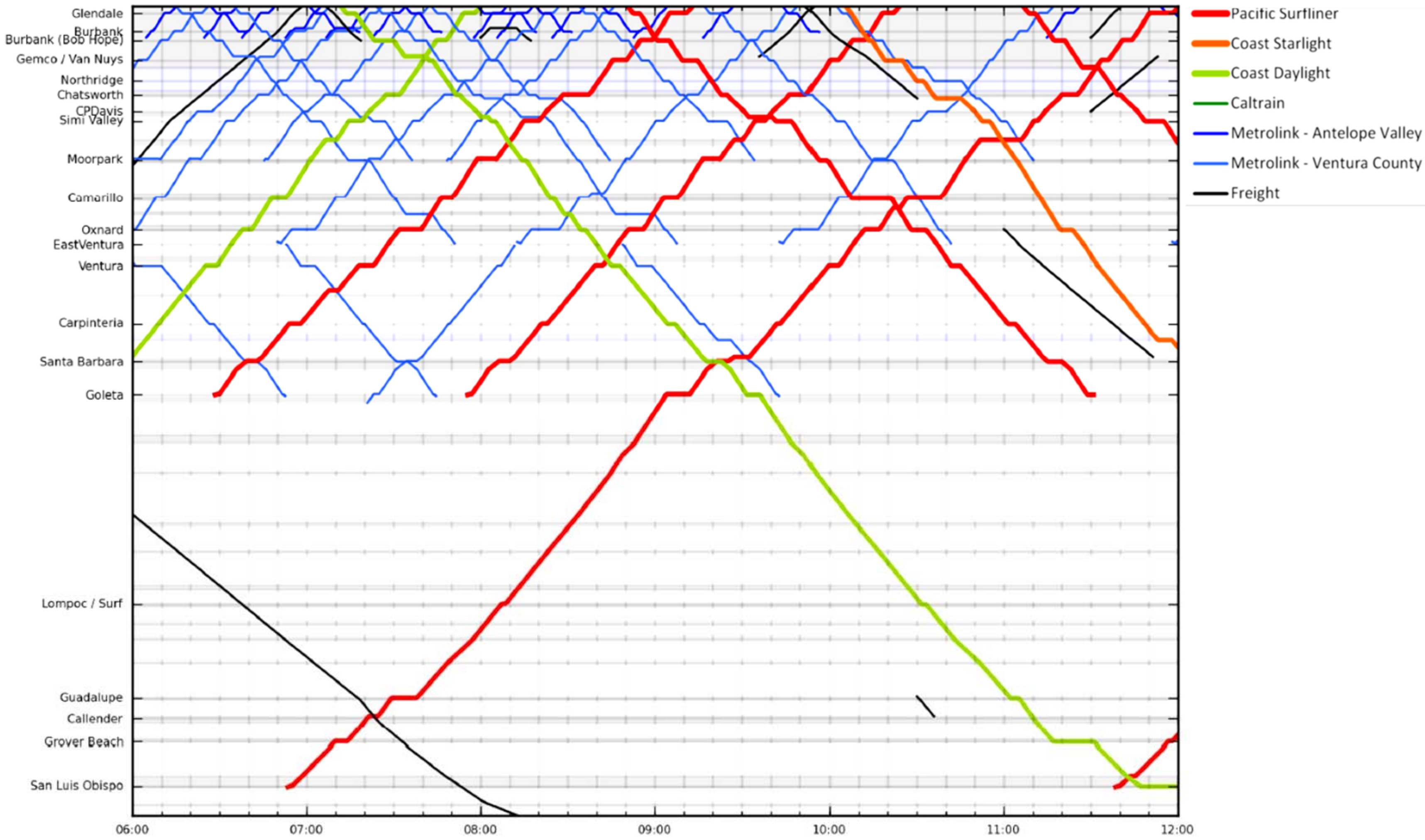


Exhibit 9.20: Year 2040 Base Case 12:00pm – 6:00pm Pacific Surfliner North Stringline Diagram

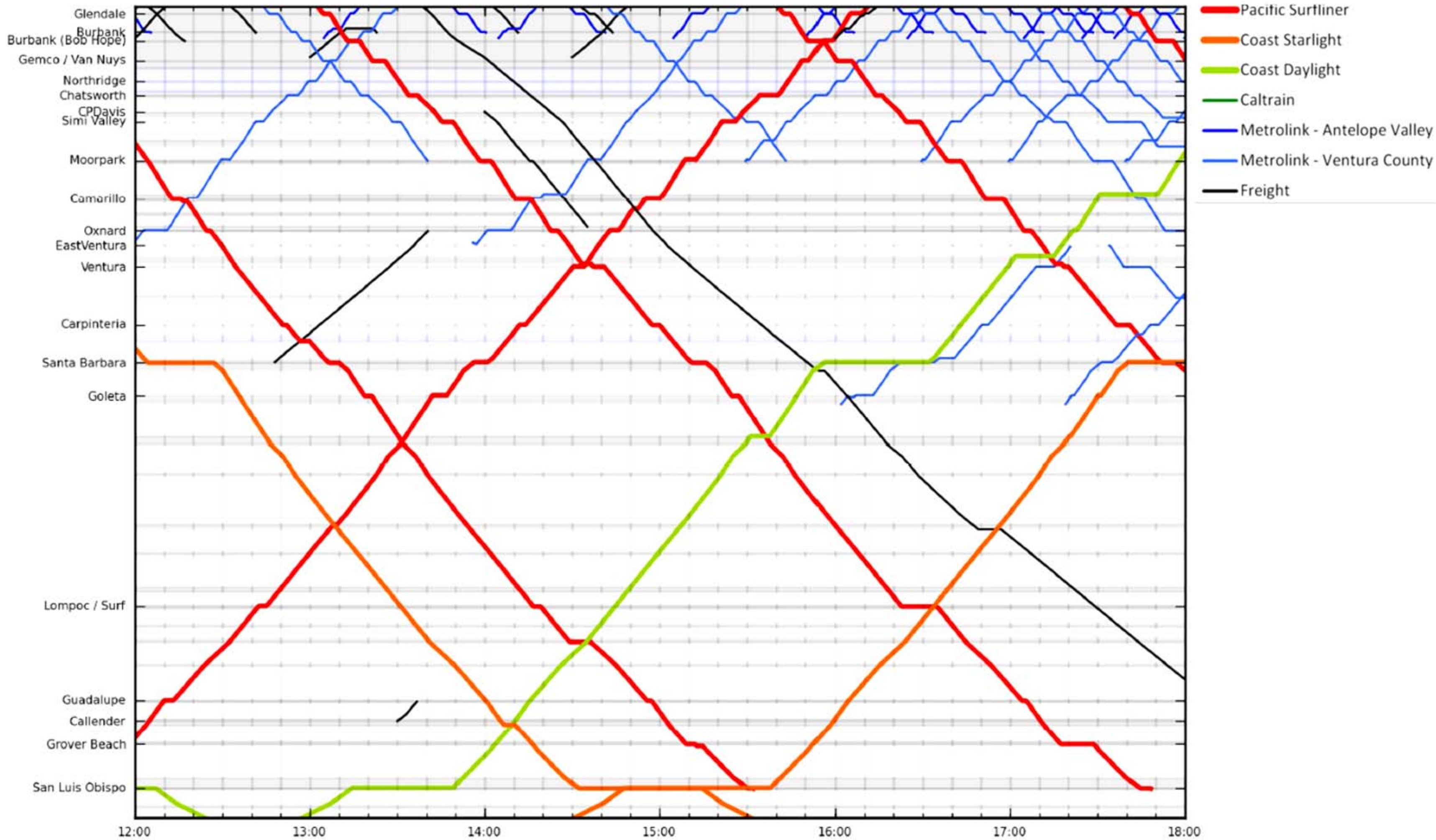
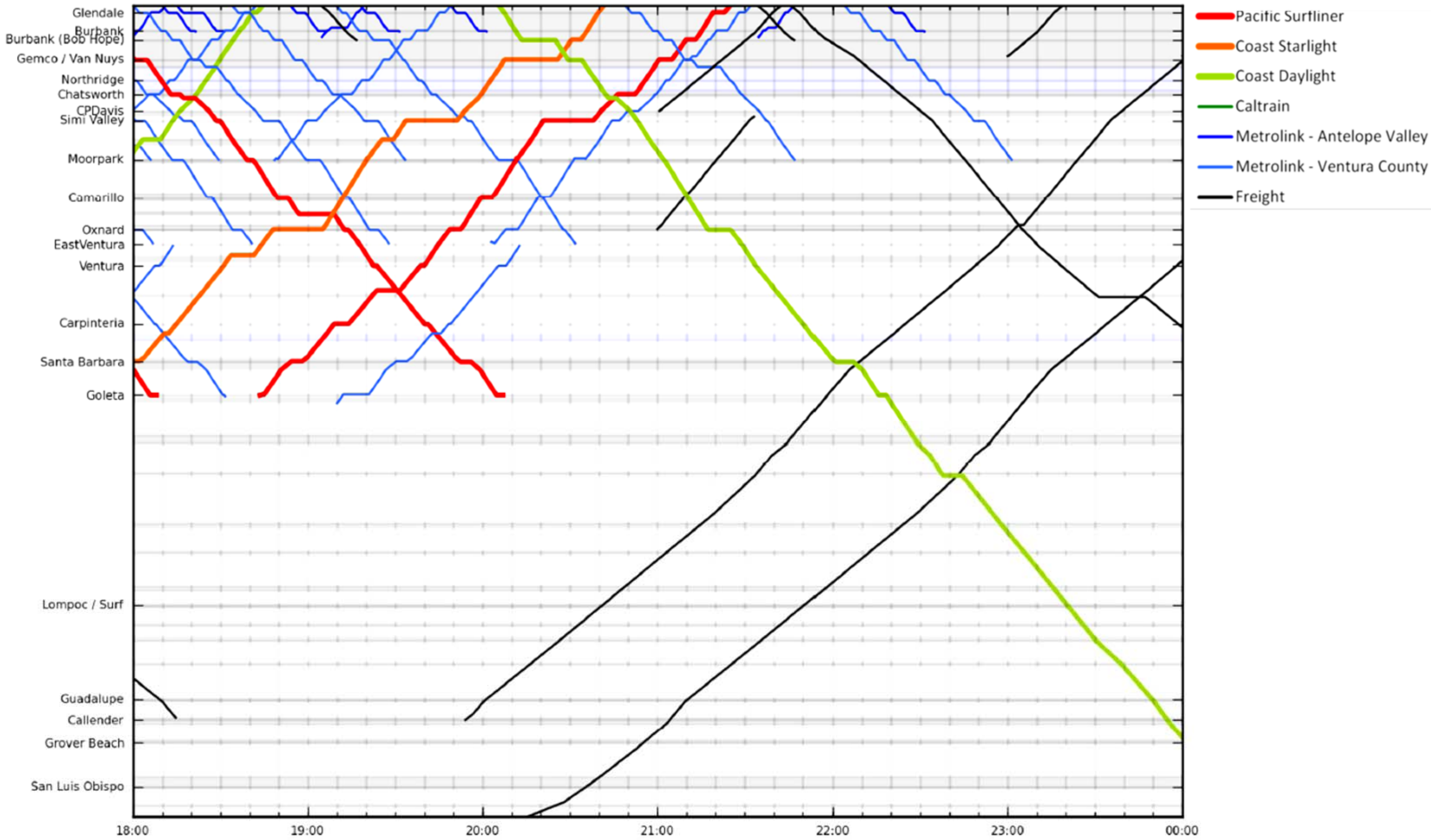


Exhibit 9.21: Year 2040 Base Case 6:00pm – 12:00am Pacific Surfliner North Stringline Diagram



Based on the results from Table 9.46, high priority network infrastructure improvements are identified. Regions with high levels of track occupancy and locations of train delays are identified from the Year 2040 Base Case track occupancy and stringline diagrams to determine appropriate locations for improvements to increase intercity passenger OTP. These improvements are incorporated into the Year 2040 Alternative Case model.

9.5.5 Year 2040 Alternative Case

Network improvements identified from the Year 2040 Base Case model are listed in Table 9.47. While none of the OTP levels shown in Table 9.46 are less than 87 percent, these values represent the highest intercity passenger service OTP values possible in actual operations as they are impacted only by train interaction effects. In reality, intercity OTP levels are likely to be somewhat lower as they will also be impacted by random factors such as passenger loading delays, bad weather, etc. As such, recommended infrastructure upgrades intended to reduce delays and improve intercity OTP were identified for the Year 2040 Alternative Case model.

Table 9.47: Rail Network Improvements Included in Year 2040 Alternative Case Simulation

Track Segment	Recommended Improvement
Oxnard Station	Add second platform

The schedule for Year 2040 requires two platforms at Oxnard in order for the *Coast Starlight* and *Pacific Surfliner* trains to service Oxnard and pass each other simultaneously. This also improves the operational flexibility in the area. Further improvements to OTP can be made by also upgrading Simi Valley to double platforms, although to a lesser extent than Oxnard; this lower-priority improvement was not included in final model results.

Some schedule changes were also made in the Year 2040 models to adjust train meets and improve intercity passenger OTP. A conflict arose at the San Luis Obispo station wherein three trains would need to occupy the two platforms at San Luis Obispo at the same time (a *Coast Starlight* northbound, *Coast Starlight* southbound, and a *Pacific Surfliner* northbound train) around 3:30pm. The *Coast Starlight* northbound service was adjusted 30 minutes earlier to solve this conflict.

Table 9.48 lists Year 2040 Alternative Case model OTP percentages for each intercity passenger service after incorporating the network improvements identified in Table 9.47. Note that blank entries in the Coast Starlight column indicate that the service is not planned to stop at that location.

Pacific Surfliner service OTP was improved in the Year 2040 Alternative Case compared to the Year 2040 Base Case at Ventura and Oxnard due to the second platform added to the Oxnard station. The *Coast Daylight* service OTP also improved between Oxnard and Goleta due to the second Oxnard platform.

Tables 9.49 – 9.51 compares average minutes of delay per train departure for the Year 2040 Base Case and Year 2040 Alternative Cases for each intercity passenger service.

Average delay per *Pacific Surfliner* service train operated was reduced in both the northbound and southbound directions in the Year 2040 Alternative Case primarily due to the addition of the second platform at Oxnard and related effects.

The additional Oxnard platform also led to reduced delays for the *Coast Daylight* service in the Year 2040 Alternative Case.

The *Coast Starlight* service also has reduced average delays with a second platform at Oxnard.

Table 9.48: Year 2040 Alternative Case Model Intercity Passenger Service RailOPS OTP Results

Stations	*Coast Starlight*	*Pacific Surfliner*	*Coast Daylight*
San Luis Obispo	100%	100%	100%
Grover Beach		100%	100%
Guadalupe		100%	100%
Lompoc-Surf		100%	100%
Goleta		100%	100%
Santa Barbara	100%	100%	100%
Carpinteria		100%	100%
Ventura		100%	100%
Oxnard	100%	100%	100%
Camarillo		100%	100%
Moorpark		100%	100%
Simi Valley	100%	93%	100%
Chatsworth		100%	100%
Van Nuys	100%	100%	100%
Burbank-Bob Hope Airport	100%	100%	100%
Glendale		100%	100%
Los Angeles Union Station	100%	100%	100%

Table 9.49: Year 2040 Base Case and Alternative Case *Pacific Surfliner* Service RailOPS Outputs

Stations		**Average Delay per Train Departure** (Minutes)			
		Northbound		**Southbound**	
From	**To**	**Year 2040 Base Case**	**Year 2040 Alt Case**	**Year 2040 Base Case**	**Year 2040 Alt Case**
LAX	Glendale	0.9	0.9	1.0	1.0
Glendale	Burbank	0.6	0.6	0.0	0.0
Burbank	Van Nuys	0.1	0.1	0.1	0.1
Van Nuys	Chatsworth	0.6	0.6	1.7	1.7
Chatsworth	Simi Valley	2.3	2.3	0.4	0.4
Simi Valley	Camarillo	0.2	0.2	7.0	7.0
Camarillo	Oxnard	3.8	1.4	2.0	1.9
Oxnard	Ventura	1.7	1.9	0.9	0.0
Ventura	Santa Barbara	2.6	1.0	3.0	1.5
Santa Barbara	Goleta	0.0	0.1	0.0	0.0
Goleta	Lompoc-Surf	0.0	0.2	1.2	1.6
Lompoc-Surf	Guadalupe	6.5	6.3	3.9	3.9
Guadalupe	San Luis Obispo	1.9	1.9	2.5	2.5
Total		*21.2*	*17.4*	*23.8*	*21.6*

Table 9.50: Year 2040 Base Case and Alternative Case *Coast Daylight* Service RailOPS Outputs

Stations		**Average Delay per Train Departure** (Minutes)			
		Northbound		**Southbound**	
From	**To**	**Year 2040 Base Case**	**Year 2040 Alt Case**	**Year 2040 Base Case**	**Year 2040 Alt Case**
LAX	Oxnard	4.8	3.6	11.8	11.7
Oxnard	Santa Barbara	0.1	0.0	7.3	1.5
Santa Barbara	San Luis Obispo	3.2	3.2	4.2	4.2
Total		*8.1*	*6.8*	*23.3*	*17.4*

Table 9.51: Year 2020 Base Case and Alternative Case *Coast Starlight* Service RailOPS Outputs

Stations		**Average Delay per Train Departure** (Minutes)			
		Northbound		**Southbound**	
From	**To**	**Year 2040 Base Case**	**Year 2040 Alt Case**	**Year 2040 Base Case**	**Year 2040 Alt Case**
LAX	Burbank	3.9	3.9	2.6	2.6
Burbank	Van Nuys	0.5	0.5	3.7	3.7
Van Nuys	Simi Valley	9.7	9.7	3.2	3.2
Simi Valley	Oxnard	3.3	3.4	3.0	3.0
Oxnard	Santa Barbara	6.7	2.8	6.8	0.9
Santa Barbara	San Luis Obispo	13.1	13.1	19.5	19.4
Total		*37.2*	*33.4*	*38.8*	*32.8*

Exhibits 9.22 – 9.25 show stringline diagrams of each train operated on the northern portion of the Pacific Surfliner North network in RailOPS in the Year 2020 Alternative Case model. Exhibit 9.26 shows a track occupancy heatmap for a 24-hour period, while Exhibit 9.27 shows a track occupancy heatmap for the peak commute period between 7:00am and 9:00am.

Exhibit 9.22: Year 2040 Alternative Case 12:00am – 6:00am Pacific Surfliner North Stringline Diagram

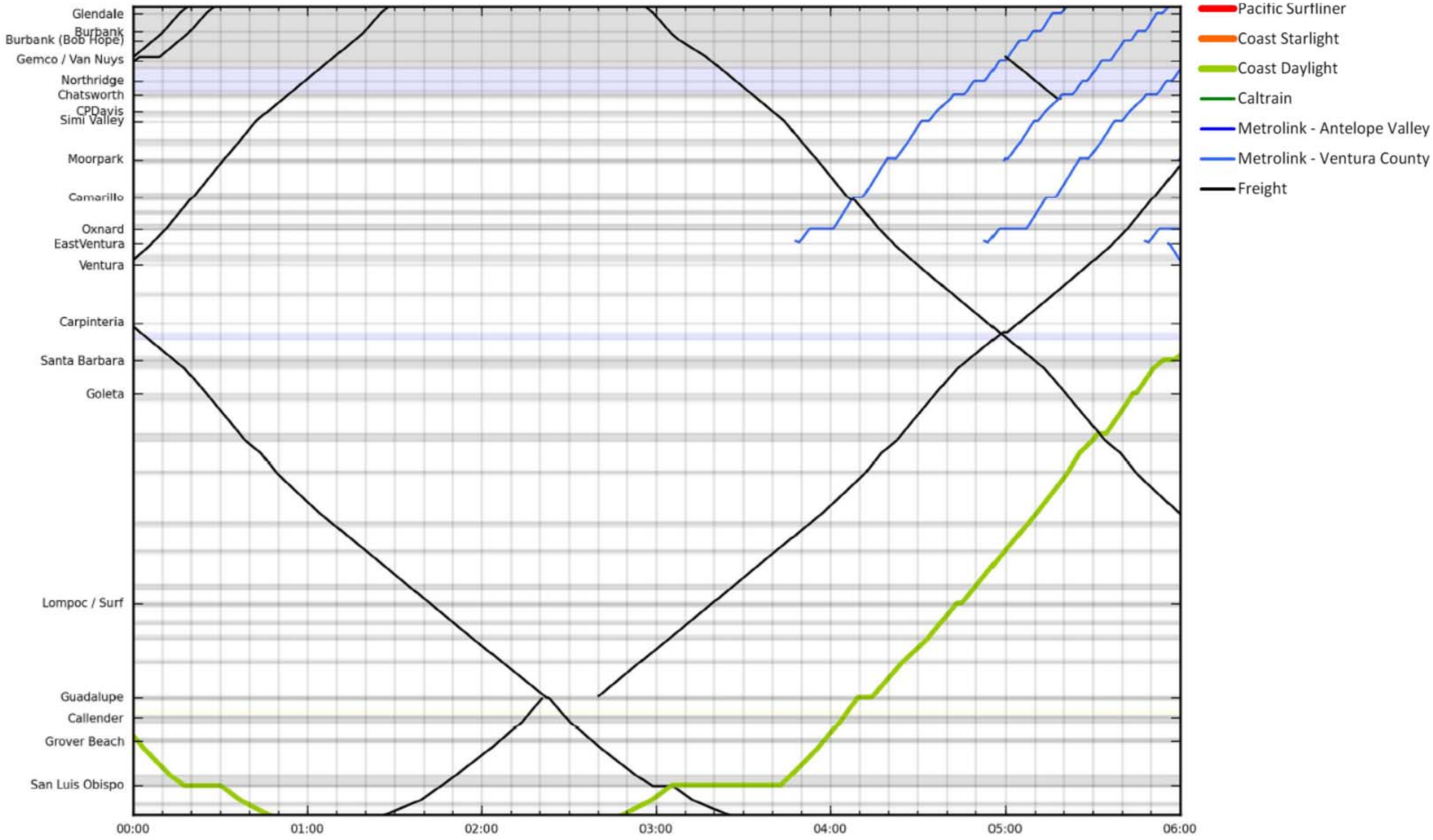


Exhibit 9.23: Year 2040 Alternative Case 6:00am – 12:00pm Pacific Surfliner North Stringline Diagram

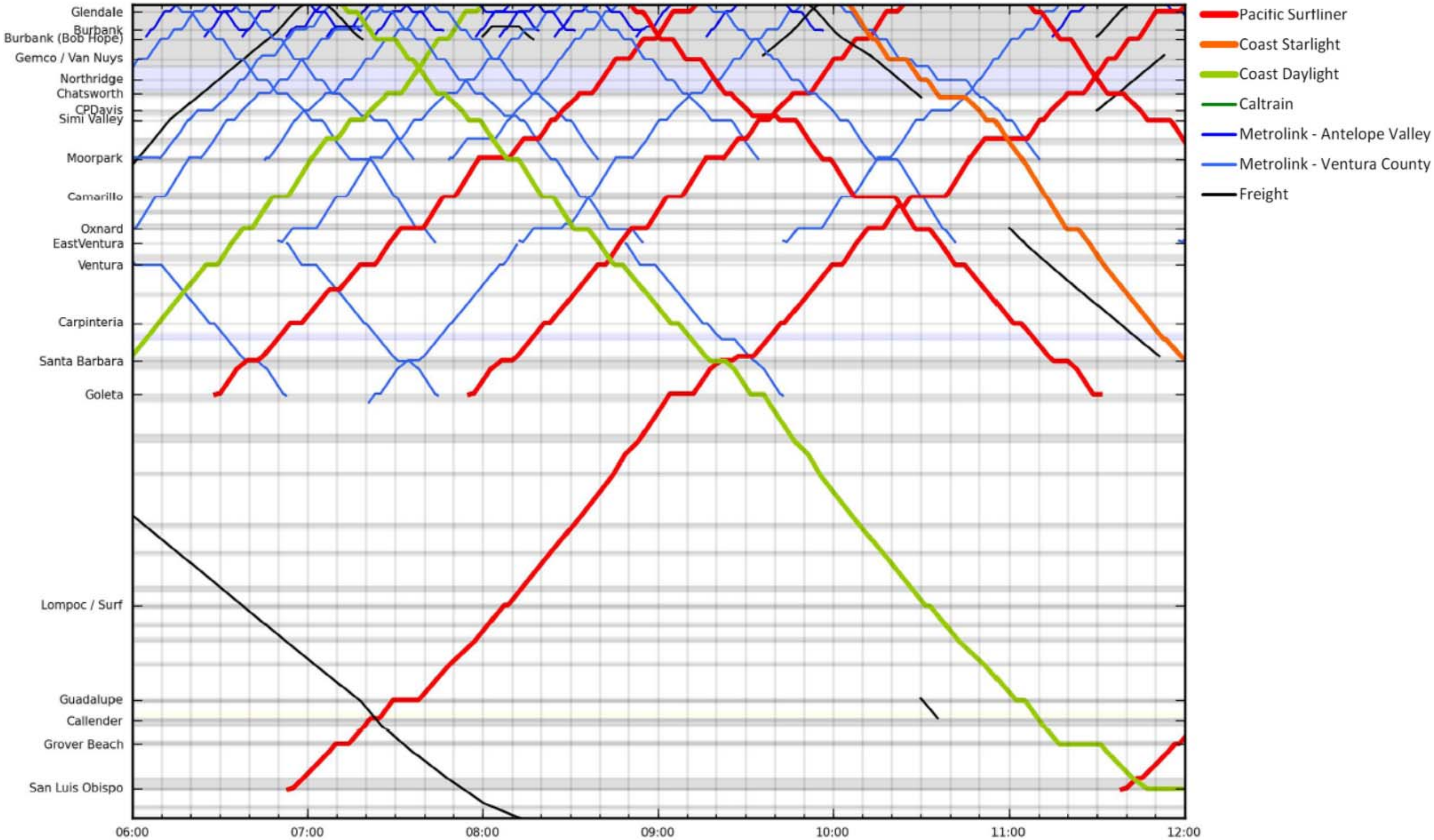


Exhibit 9.24: Year 2040 Alternative Case 12:00pm – 6:00pm Pacific Surfliner North Stringline Diagram

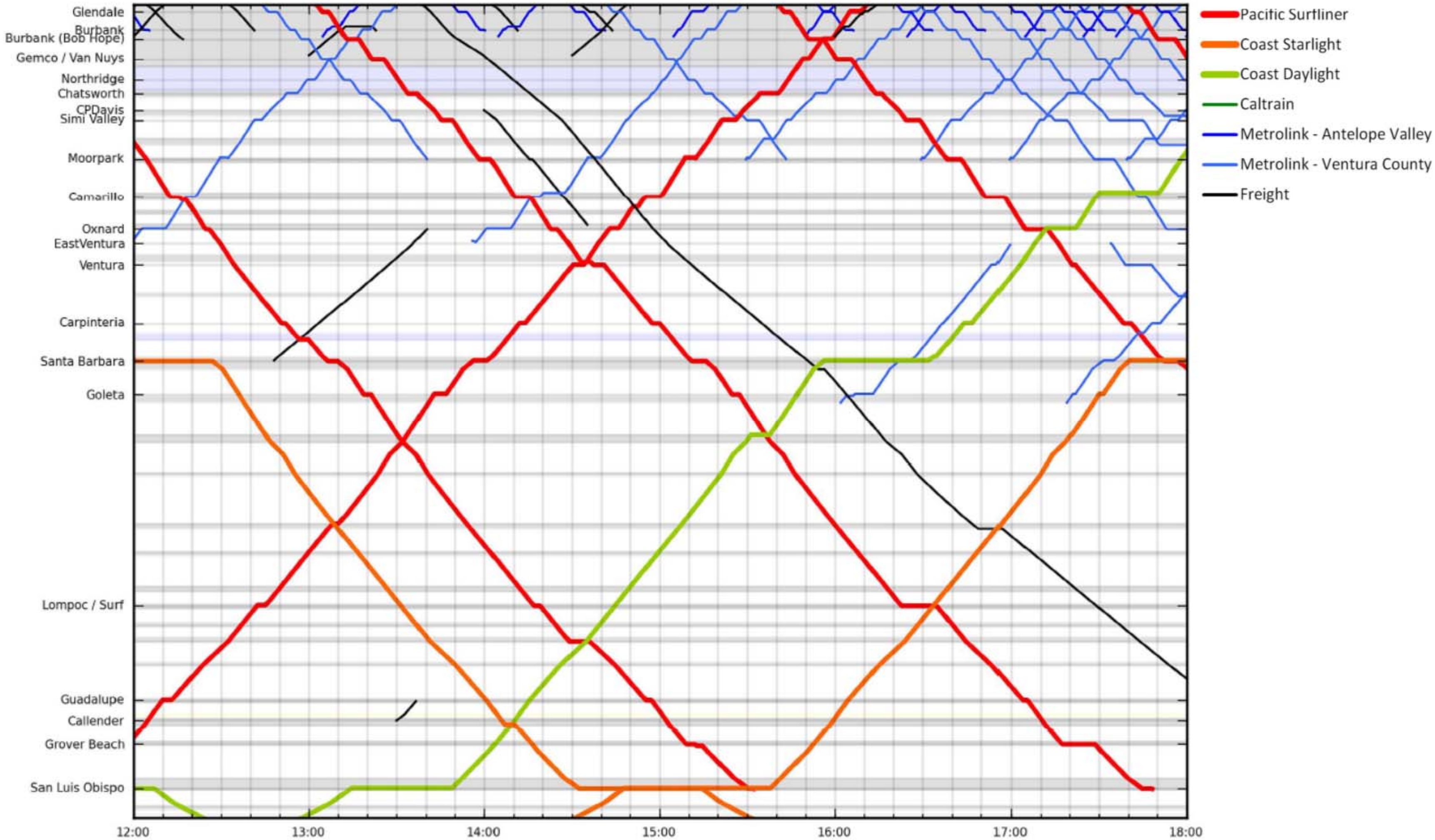


Exhibit 9.25: Year 2040 Alternative Case 6:00pm – 12:00pm Pacific Surfliner North Stringline Diagram

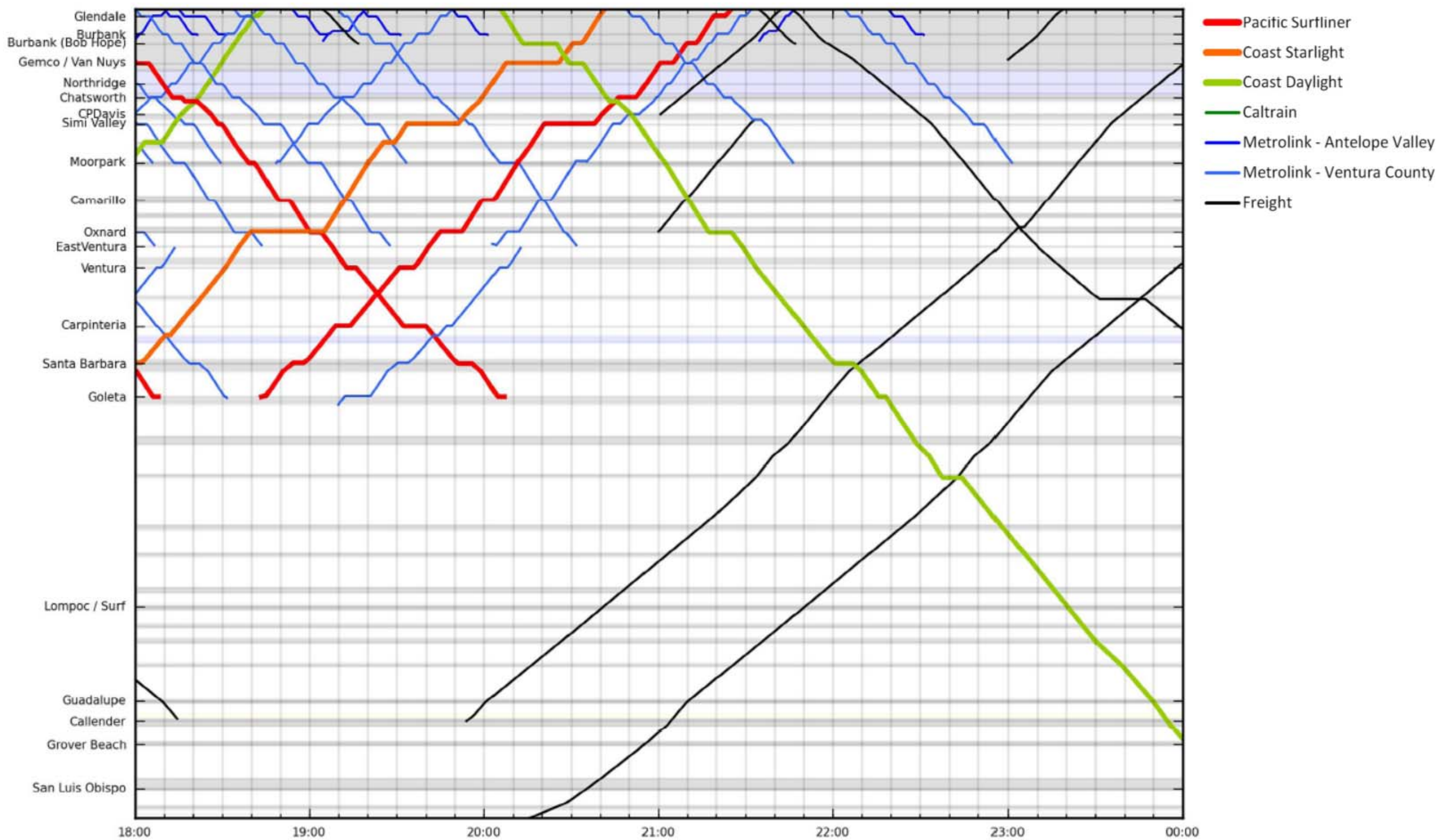


Exhibit 9.26: Year 2040 Alternative Case 24-Hour Track Occupancy Heatmap

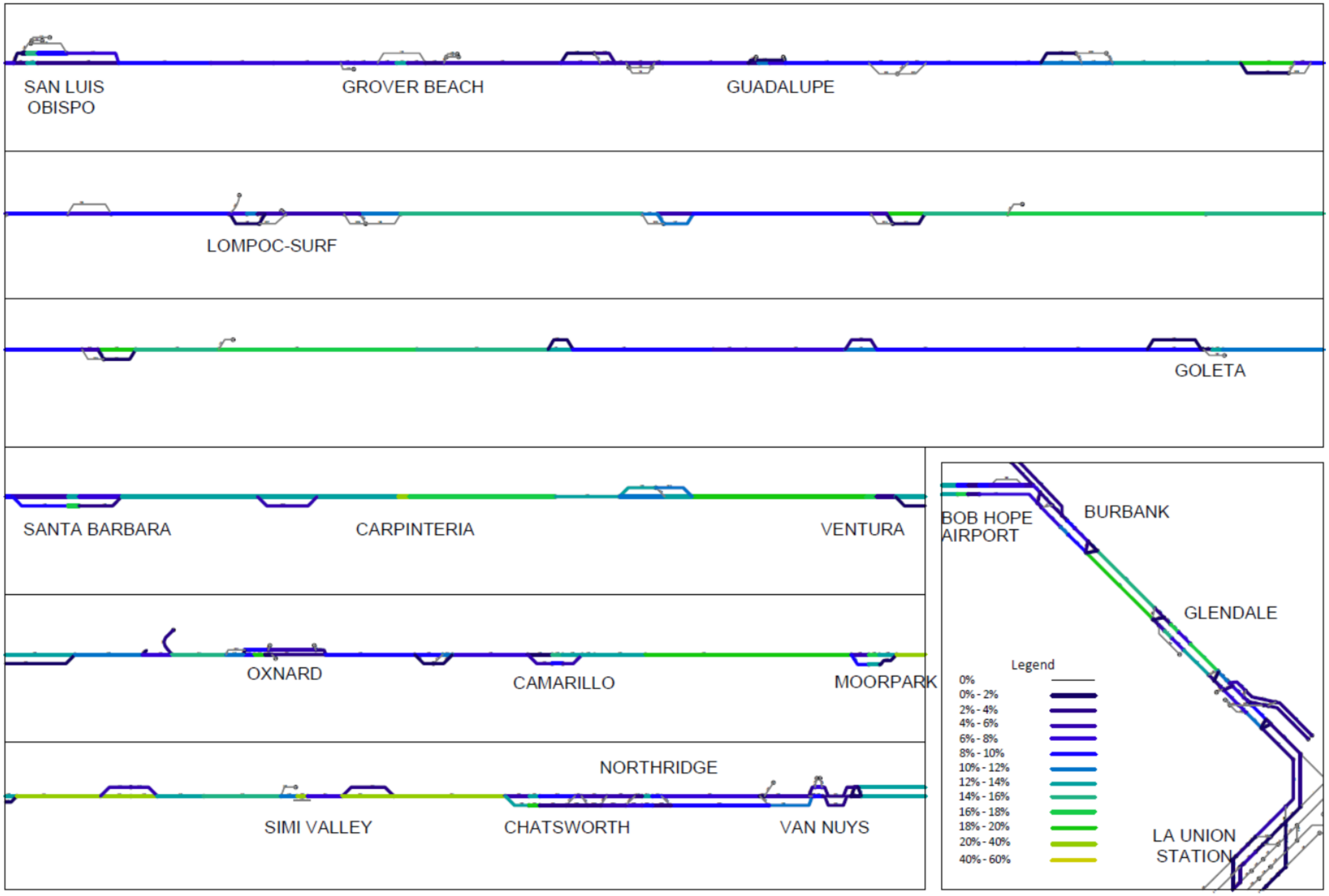
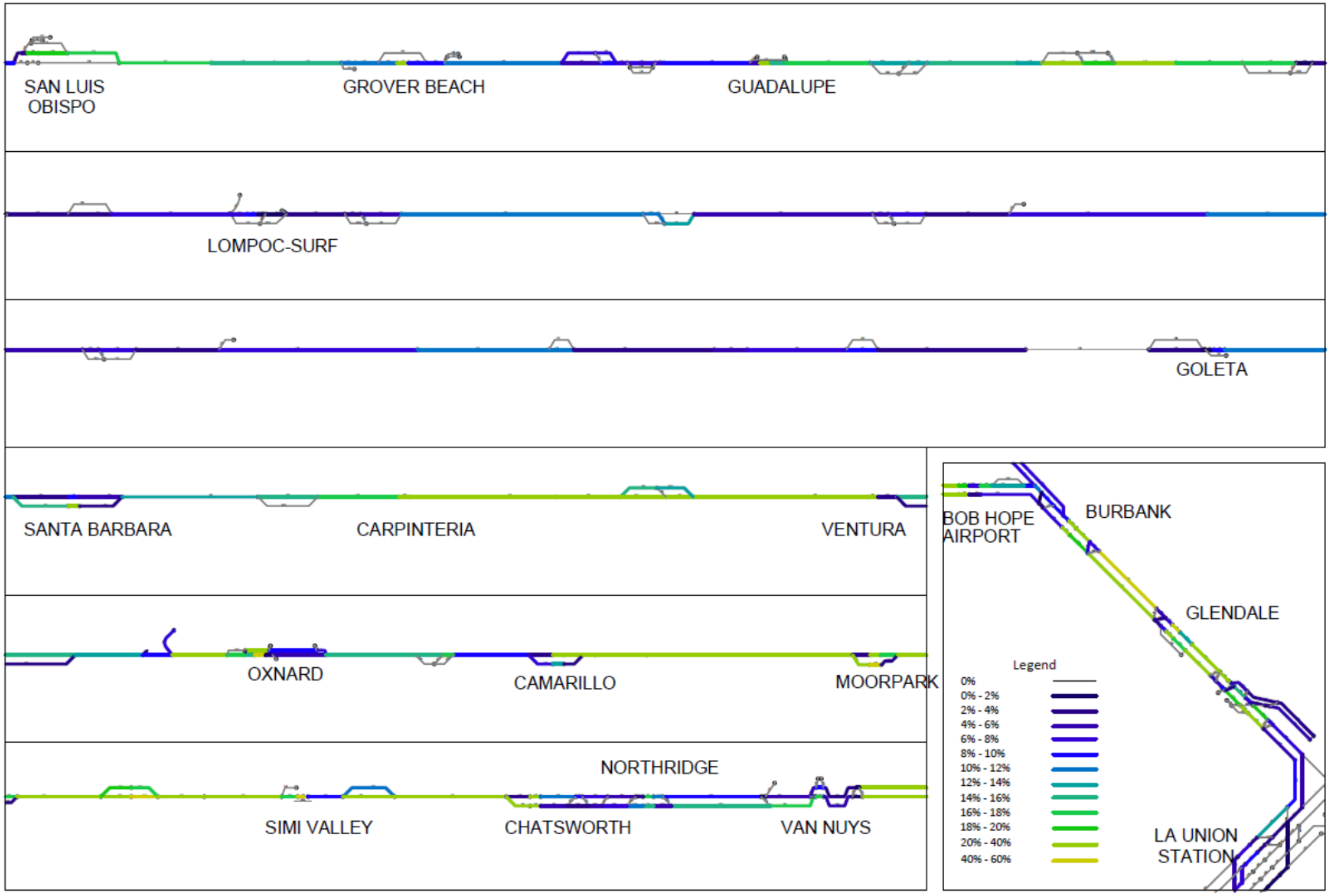


Exhibit 9.27: Year 2040 Alternative Case 7:00am – 9:00am Track Occupancy Heatmap



9.6 Equipment and Train Crew Scheduling

According to Amtrak, trains on the *Pacific Surfliner* service are usually staffed by crews consisting of five people: an engineer, a conductor, an assistant conductor, a Café-Car attendant, and a Business Class attendant. There is more variation in staffing level on the *Coast Starlight* service depending 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 Parlor Car attendant, and four to six Dining Car attendants. The proposed *Coast Daylight* staffing levels would likely be similar to the *Pacific Surfliner* service.

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 northern portion of the Pacific Surfliner Corridor; other crew change locations for the *Coast Starlight* service are outside the Corridor, such as at Sacramento. For the *Pacific Surfliner* service, crew change locations within the northern portion of the Pacific Surfliner Corridor are at San Luis Obispo and Los Angeles. 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 support of the *Pacific Surfliner* and *Coast Starlight* train services in Los Angeles. This yard would also be used in support of the proposed *Coast Daylight* service. Some of the Amtrak switching locomotives are located at the Los Angeles facility, which is also used to provide support for Amtrak trains and equipment system-wide, not just on the *Pacific Surfliner* and *Coast Starlight* services. This includes system-wide fleet repairs and overhauls. Smaller layover facilities are also in place in support of the *Pacific Surfliner* service at San Luis Obispo and Goleta.

Amtrak's *Pacific Surfliner* service has a fleet of fifty cars, of which forty are owned by Amtrak and ten are owned by Caltrans. The *Pacific Surfliner* service also has a fleet of 14 locomotives, all owned by Amtrak. The base fleet for the *Pacific Surfliner* is also augmented with additional Amtrak-owned single and bi-level cars. The amount of time required for maintenance of rolling stock varies depends on a number of variables, including scheduled equipment turns, availability of specific fleet and equipment types, and equipment mileage, manufacturer, and repair history.

10.0 Station and Access Analysis

This chapter addresses the location of the stations to be served by the proposed expanded *Pacific Surfliner* 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 along the northern portion of the Pacific Surfliner 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.

The analysis is focused on identifying necessary safety, capacity and operational improvements in the stations themselves or in connecting bus and rail transit service. Key land use considerations such as Transit-Oriented Development (TOD) 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 corridor to determine potential locations for station improvements. Available station services (i.e., staffing and ticketing machines) and multimodal access (i.e., transit connections, parking, taxi service, rental car services, and bicycle facilities) were studied to identify which stations require improvements 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.[xix] 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

The northern portion of the Pacific Surfliner Corridor stretches between San Luis Obispo and Los Angeles, roughly following U.S. 101, as shown in Exhibit 10.1. Of the 17 existing Amtrak stations, seven are also served by *Coast Starlight* trains, and nine are served by Metrolink. Access to *Pacific Surfliner* service is considered appropriate with the current station spacing, and no plans in conjunction with the proposed service improvements call for building new *Pacific Surfliner* stations, or adding stops at intermediate Metrolink stations, such as Northridge or Downtown Burbank. (The East Ventura Station is not located on the *Pacific Surfliner* alignment).

Exhibit 10.1: Map of Existing Stations

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 stations in larger communities such as San Luis Obispo, Santa Barbara, and along the Metrolink segment of the Corridor, 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 area of 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 Los Angeles metropolitan region and in the larger communities of the outlying 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 outlying corridor exhibit low TOD potential, lacking both frequent connecting services and a demand for compact, mixed-use development.

Table 10.1: Station Joint Development and TOD Potential

Station	Existing Amenities / Staffing	Joint Use / Development Potential	TOD Potential
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
Lompoc-Surf	Unstaffed, platform only	Low	Low
Goleta	Unstaffed, platform only	Low	Low
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

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 agencies 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 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 local rail service, would drive joint development rather than *Pacific Surfliner* 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. Intermediate stations along the Metrolink segment of the Corridor, such Camarillo, have lower joint development potential than the neighboring “end-of-line” station of Oxnard, even though TOD potential is comparable in both of the adjacent communities.

10.2 Station Operations Analysis

Station operations include a number of considerations related to the needs of Corridor passengers (such as ticketing, baggage handling, and 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 three 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 three 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" • Los Angeles (Union Station)	High density; mixed-use, grid-based primary downtown in major metropolitan area	• High parking cost • Taxi	• 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" • 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 • Local transit • Shuttles
"Outlying Downtown or Activity Center" • 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
Local Significance			
"Exurban or Outlying Area with Moderate Transit Connectivity" • Grover Beach • Ventura • Van Nuys • Camarillo • Moorpark • Simi Valley	Low density; exurban or outlying	• Low parking cost / free parking	• Amtrak corridor service • Amtrak Thruway bus and/or • commuter rail terminus • Local transit • Shuttles
"Exurban or Outlying Area with Limited Transit Connectivity" • Guadalupe • Lompoc-Surf • Goleta • Carpinteria	Low density; exurban or outlying	Free parking	• Amtrak corridor service • Local transit • Shuttles

- 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. Los Angeles Union Station represents an "Urban Activity Center" station in the Corridor.
- 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 "Outlying 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.

  Burbank-Bob Hope Airport represents a "Developed Urban Area" station in the Corridor. "Outlying Downtown or Activity Center" stations in the Corridor include San Luis Obispo, Santa Barbara, Oxnard, Chatsworth, and Glendale.
- Local significance. Stations with local significance are "Exurban or Outlying 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.

  "Exurban or Outlying Area" stations with moderate transit connectivity include Grover Beach, Ventura, Van Nuys, Camarillo, Moorpark, and Simi Valley. "Exurban or Outlying Area" stations with limited transit connectivity include Guadalupe, Lompoc-Surf, Goleta, and Carpinteria.

10.3 Intermodal Connectivity

10.3.1 Integration of Non-Program Operations and Services

Expanding passenger rail service between San Luis Obispo and Los Angeles 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, Amtrak Thruway buses, commuter rail (Metrolink), scheduled airline service (at 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 transfer at common stations such as San Luis Obispo or Santa Barbara.

Commuter rail, on the other hand, provides a similar "feeder" role for the corridor service. Passengers originating at or destined to stations where corridor service does not stop, such as the Northridge Metrolink station, transfer at common stations such as Simi Valley.

Similarly, Amtrak Thruway buses would extend origin and destinations to off-corridor points such as 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 Santa Barbara and Ventura.

Expanded Corridor service will also create connections to origins and destinations outside of the state, by virtue of airport connections at Burbank and Santa Barbara. 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. The Santa Barbara station can also be reached by a taxi ride from the Goleta station.

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 and bus transit, as provided by LA Metro also provides intermodal connections. In the Los Angeles area and throughout the Corridor, local bus systems, vans and shuttles round out the 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 required to provide the necessary connectivity, as discussed further below.

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, then 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 4 are designed to address these issues, and will contribute to the implementation of 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 in position 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 a Metrolink and Amtrak monthly ticket holder to have access to both systems’ trains within the geographical extents of their tickets. Also, fares between Burbank-Bob Hope Airport and LAUS have been equalized, and tickets issued by the two rail operators are interchangeable along this segment of the Corridor. These successful programs can be enhanced and improved in conjunction with expanded corridor service.

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 intermodal coordination, safety, and capacity of Corridor stations are presented in Table 10.3.

Table 10.3: Key Capital Projects for Intermodal Coordination

Station	Project	Source
Grover Beach	Station facilities expansion	Programmed funding (PTMISEA)
	Second platform	*LOSSAN North Corridor Strategic Plan (Final)*
Guadalupe [(1)]	Second platform	*LOSSAN Corridorwide Strategic Implementation Plan (Final Report)*
Carpinteria	New station area siding	*LOSSAN North Corridor Strategic Plan (Final)*
East Ventura [(1)]	Relocate station (to	*LOSSAN Corridorwide Strategic Implementation Plan*

Station	Project	Source
	support future Ventura-Santa Barbara commuter service operations)	*(Final Report)*
Oxnard	Second platform	*LOSSAN Corridorwide Strategic Implementation Plan (Final Report)*
Camarillo	Station, platform, and pedestrian crossing improvements	*SCAG RTP*
Moorpark	Station grade crossing	*SCAG RTP*
Simi Valley	Station grade crossing	*SCAG RTP*
Northridge [1]	Second platform	*LOSSAN Corridorwide Strategic Implementation Plan (Final Report)*
Van Nuys	Second platform	*LOSSAN Corridorwide Strategic Implementation Plan (Final Report)*
Burbank-Bob Hope Airport	Regional Intermodal Transportation Center	Under construction
Glendale [2]	Station redesign and second platform	*Southern California Potential Early Investment Projects*
Los Angeles (Union Station)	Union Station Run-Through Tracks	*Southern California Potential Early Investment Projects, LOSSAN Corridorwide Strategic Implementation Plan (Final Report)*

Notes:
(1) Station improvement projects identified in previous plans, but not included in *California State Rail Plan*.
(2) Redesign of the Glendale station may be deferred to completion of HSR plans.

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 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.

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 Americans with Disabilities Act (ADA)-accessible, other modes of access to the existing and proposed stations are described, as presented in Table 10.4.

Table 10.4: Station Access Summary

Station	Parking	Taxi/Rental Car	Transit Connections				Bicycle Facilities	Other Communities Served
			Local & Regional Rail (1)	Local & Regional Bus (2)	Amtrak Services	Airports		
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
Lompoc-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

Station	Parking	Taxi/Rental Car	Transit Connections				Bicycle Facilities	Other Communities Served
			Local & Regional Rail [1]	Local & Regional Bus [2]	Amtrak Services	Airports		
Camarillo	10 spaces	Car rental 1 mile away	Commuter Rail (Metrolink)	N/A	*Pacific Surfliner*	Roadrunner Shuttle (to LAX)	N/A	N/A
Moorpark	200 spaces	Taxi on-call	Commuter Rail (Metrolink)	Bus (VISTA)	*Pacific Surfliner*	N/A	N/A	Thousand Oaks, Fillmore
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 Angele – San Pedro), Route 4 (Los Angeles–Santa Barbara)	LAX Flyaway (LAWA)	Class II bikeways within 1 mile	N/A

Notes:

(1) Commuter rail (Metrolink) service uses the same platforms as *Pacific Surfliner* trains at all stations except Los Angeles. At LAUS, transfer connections from *Pacific Surfliner* trains and Thurway bus services to local and regional rail services are located within a short walk within the same transportation center facility.

(2) Location of local and regional bus services varies by station – a majority of bus services are located within each *Pacific Surfliner* station area, while others require a short walk. For example, at the Carpinteria Station, the nearest local bus stop is located approximately two blocks or 0.2 miles away.

San Luis Obispo

The San Luis Obispo 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 an unstaffed, platform-only station but provides 71 short-term and 71 long-term parking spaces, and a 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

Access provisions to this station are limited to a 28-space parking lot and on-demand bus service provided by SMOOTH, Inc.

Lompoc-Surf

Access provisions to this station are limited to a five-space parking lot.

Goleta

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

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 routes 10, 17, and 21. Additionally, the station has direct access to Class II bikeways.

Carpinteria

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 can be accessed by two Amtrak Thruway Bus routes 4, 17 and 21 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

The Oxnard Station is served by Metrolink commuter rail and Gold Coast Transit, Ventura Intercity Service Transit Authority (VISTA), and Amtrak Thruway buses, 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 Metrolink commuter rail 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 Metrolink commuter rail and a VISTA route, and offers a 200-space park-and-ride lot. No bicycle network is provided within the immediate vicinity.

Simi Valley

The Simi Valley Station is served by Metrolink commuter rail 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 Metrolink commuter rail 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

The Van Nuys Station offers a staffed ticket office and baggage check and is also served by Metrolink commuter rail. 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

The Burbank-Bob Hope Airport Station facilitates multimodal connections to various modes of transportation, and is also served by Metrolink commuter rail. 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 also served by Metrolink commuter rail. 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 routes 4, 17, and 21 also serve the station. There are no bicycle facilities within the immediate vicinity of the station.

Los Angeles Union Station

LAUS functions as Los Angeles' main intermodal hub and provides connections between auto, several rail lines, buses, shuttles, and Class II bikeways. Metrolink operates a network of commuter rail lines centered at LAUS. The LA Metro Red and Purple (heavy rail subway) and Gold (light rail) lines converge at this station. A large bus terminal hosts buses and services operated by LA Metro, LADOT, 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. A separate bus area accommodates Amtrak Thruway buses.

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11.0 Conceptual Engineering and Capital Programming

11.1 Rail Equipment and Infrastructure Improvements Identification

Improvements for the northern portion of the Pacific Surfliner Corridor were identified based on projects described in previous studies and plans, as documented in the *Programmatic EIR/EIS* currently under preparation. The majority of the improvements identified for the Corridor include the following types of projects:

- Extension of existing sidings (or construction of new sidings).
- Implementation of island Centralized Traffic Control.(xx)
- Construction of second main tracks.
- Realignment of tracks/curves.

In addition to these projects, other identified improvements include a new crossover north of Camarillo Station; track class upgrades between San Luis Obispo and Santa Barbara; a grade separation at Los Angeles Avenue/State Route (SR)-118 in Ventura; a new northbound platform at Oxnard Station; and new run-through tracks at Los Angeles Union Station.

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. 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. 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 Hadley–Callender, Devon–Tangair, and Concepcion–Gato. In these situations, the “high” estimate was used.

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
Second main track	track-foot	$3,000	$5,500	$8,000
Curve realignments	track-foot	$1,000	$2,500	$4,000

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

Table 11.2: Total Costs for Improvement Projects

Project Description	**Cost (Millions, Year 2012 dollars)**	**Source(s)**
Near-Term (2013 to 2015)		
Camarillo Station improvements (platform and pedestrian circulation, passenger station building/restrooms, and related construction of new siding between Oxnard and Camarillo)	$4.42[(1)]	SCAG RTP (FTIP)
Moorpark Station and Simi Valley Station grade crossing improvements	$0.75[(1)]	SCAG RTP (FTIP)
Vanowen Street/Buena Vista Street SCCRA crossing improvements (Burbank)	$3.21[(1)]	SCAG RTP (financially-constrained)
West Broadway/Brazil Street/San Fernando Road SCRRA grade crossing improvements (Glendale)	$60.14	SCAG RTP (FTIP), CRIS
Riverside Drive grade separation replacement (Los Angeles)	$57.73	CRIS, IRCP
North Spring grade separation reconstruction (Los Angeles)	$49.26	CRIS, IRCP
Mid-Term (2016 to 2020)		
San Luis Obispo to Santa Barbara track upgrades (maximum speed 79 mph)	$90.00	*LOSSAN North Corridor Strategic Plan (Final)*
Installation of powered switches at Grover, Callender, Lompoc-Surf, and Sudden	NA	UPRR
Extension of Guadalupe siding and installation of island CTC	$23.60	*LOSSAN North Corridor Strategic Plan (Final)*

Extension of Narlon siding	NA	UPRR
Upgrades at Narlon, Honda, and Concepcion sidings (powered switches, track/tie replacement, and island CTC)	$35.40	*LOSSAN North Corridor Strategic Plan (Final)*
Extension of Tangair siding, curve realignment, and installation of island CTC	$14.00	*LOSSAN North Corridor Strategic Plan (Final)*
Extension of Concepcion siding	NA	UPRR
New Sandyland siding	$20.00	*LOSSAN North Corridor Strategic Plan (Final)*
New siding at Carpinteria Station	$11.80	*LOSSAN North Corridor Strategic Plan (Final)*
Ventura County farm grade crossing improvements	$0.60	SCAG RTP (FTIP)
East Ventura (Montalvo) Curve realignment	$2.40	*LOSSAN North Corridor Strategic Plan (Final)*
Santa Clara River curve realignment	$7.00	*LOSSAN North Corridor Strategic Plan (Final)*
Extension of Leesdale siding	$17.00	*LOSSAN North Corridor Strategic Plan (Final)*
CP West Camarillo curve realignments	$6.00	*LOSSAN North Corridor Strategic Plan (Final)*
Strathearn siding curve realignment	$1.20	*LOSSAN North Corridor Strategic Plan (Final)*
New CP Raymer universal crossover	$5.00[(1)]	*LOSSAN Corridorwide Strategic Implementation Plan (Final Report)*
Vanowen Street/West Empire Avenue/Clybourn Avenue SCRRA crossing grade-separation	NA	SCAG RTP (FTIP)
Burbank Junction track realignment and high-speed switches [(2)]	$10.00	LOSSAN North Corridor Strategic Plan (Final)
Extension of Burbank siding	$7.00	*California Passenger Rail System: 20-Year Improvement Plan Technical Report (2001)*
Burbank to Los Angeles third main track	$145.00	*California Passenger Rail System: 20-Year Improvement Plan Technical Report (2001)*
Sonora Avenue/Air Way SCRRA crossing improvements	$3.70[(1)]	SCAG RTP (FTIP)
Grandview Avenue/San Fernando Road/Air Way SCRRA crossing improvements	$45.00[(1)]	Southern California Potential Early Investment Projects
Chevy Chase Drive/Alger Street SCRRA crossing improvements	$45.00[(1)]	Southern California Potential Early Investment Projects
Relocation of Glendale Slide	$3.30[(1)]	Southern California Potential Early Investment Projects
Redesign of Glendale Station	$20.00[(1)]	Southern California Potential Early Investment Projects
North Main Street SCRRA crossing improvements	$5.00[(1)]	Southern California Potential Early Investment Projects
North Main Street grade-separation (Los Angeles)[(3)]	$91.28[(1)]	SCAG RTP (financially-constrained)

Southern California Regional Interconnector Project – LAUS run-through tracks[4]	$350.00	Southern California Potential Early Investment Projects
Long-Term (2021 to 2040)		
South San Luis Obispo to Goleta continuous CTC	$295.00	*LOSSAN North Corridor Strategic Plan (Final)*
Hadley to Callender Curve Realignments	$290.00	*LOSSAN North Corridor Strategic Plan (Final)*
MP 276 track realignment and Highway 1 overpass replacement	$23.60	*LOSSAN North Corridor Strategic Plan (Final)*
Devon to Tangair curve realignments	$231.00	*LOSSAN North Corridor Strategic Plan (Final)*
Santa Barbara County curve realignments (Lompoc-Surf to Arguello, Sudden to Concepcion, Concepcion to Gato Curve, San Augustine to Sacate, Gaviota to Tajiguas, Tajiguas to Ellwood)	$677.00	*LOSSAN North Corridor Strategic Plan (Final)*
Oxnard Station second platform	$20.00[1]	*LOSSAN Corridorwide Strategic Implementation Plan (Final Report)*
Oxnard to Camarillo second main track	$17.00	*LOSSAN North Corridor Strategic Plan (Final)*
New North Camarillo crossover	$1.20	*LOSSAN North Corridor Strategic Plan (Final)*
MP 423 to CP Las Posas second main track	$60.00	*LOSSAN North Corridor Strategic Plan (Final)*
CP Strathearn to Simi Valley second main track	$50.00	*LOSSAN North Corridor Strategic Plan (Final)*
Los Angeles Avenue/Argus Avenue/Ralston Street SCRRA crossing grade-separation (Simi Valley)	$110.00	*LOSSAN North Corridor Strategic Plan (Final)*
Simi Valley to CP Davis (Hasson) second main track (extension of Santa Susana siding)	$40.00[1]	*LOSSAN Corridorwide Strategic Implementation Plan (Final Report)*

Notes:
- (1) Source document does not specify cost year. A review of available information concerning project scope concluded that no cost escalation or other adjustments are necessary.
- (2) The Burbank Junction track realignment and high-speed switches project description is subject to change based on the HSR Authority modeling effort.
- (3) Some elements of the project scope may be duplicated by other projects listed here.
- (4) Union Station run-through tracks will likely be subject to an environmental document being prepared by LA Metro.
- \- "NA" indicates not applicable or not available.

11.2.3 Rolling Stock Cost Estimates

In terms of capital costs related to rolling stock, for Year 2020, the *Pacific Surfliner* would continue to have five round-trips north of Los Angeles – while one of the *Pacific Surfliner* round-trips would be converted to the new *Coast Daylight* service (requiring the purchase of one new trainset), based on the scheduled arrivals and departures at the outer terminals at Goleta and San Luis Obispo, there would be no additional trainsets required specifically for the *Pacific Surfliner*.

For Year 2040, the *Pacific Surfliner* would have seven round-trips north of Los Angeles. Although there would be changes to schedules, based on the proposed arrival and departure times at the outer terminals at Goleta and San Luis Obispo, there would be no additional trainsets required specifically for the *Pacific Surfliner*. Under Year 2040, an additional *Coast Daylight* round-trip would be provided as an overnight service, however, which would require the purchase of two new trainsets.

Railcar Overhaul and Replacement

The current Pacific Surfliner fleet includes 50 cars and 14 locomotives. The only state-owned equipment in this fleet is ten cars. The 50 Pacific Surfliner cars were purchased and placed in service in 2002. At that time, Amtrak acquired 40 cars and the State acquired 22 cars as an option to Amtrak's car order, ten of which are used on the Pacific Surfliner route.

Caltrans received $245 million in American Recovery and Reinvestment Act of 2009 (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 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.

Locomotive Overhaul and Replacement

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

11.3 Project Schedule and Prioritization

The *LOSSAN North Corridor Strategic Plan (2007)* provides some detail on the prioritization and recommended timeline of improvements in the San Luis Obispo–Los Angeles Corridor. This prioritization scheme and timeline are reflected in the grouping of proposed improvements into the immediate (2013 to 2015), near-term (2016 to 2020), and long-term (2021 to 2040) timeframes in Table 11.2. It should be noted that some projects identified in the "immediate" timeframe in the *LOSSAN North Corridor Strategic Plan (2007),* such as the Camarillo Station pedestrian crossing, have already been completed and no longer appear in the list of proposed improvements for this SDP.

The *LOSSAN Corridorwide Strategic Implementation Plan (2012)* also includes some existing corridor bottleneck segments, and this information can be useful in determining the relative importance of specific segments in the northern portion of the Pacific Surfliner Corridor to overall train delay and level of service. Proposed SDP improvements in more critical segments of the Corridor should be considered higher priorities than improvements in less critical segments of the Corridor. The ranking of Corridor bottleneck segments as provided in the *LOSSAN Corridorwide Strategic Implementation Plan (2012)* is summarized in Table 11.3.

Table 11.3: *LOSSAN Corridorwide Strategic Implementation Plan (2012)* Bottleneck Segment Rankings – Northern Portion of Pacific Surfliner North Corridor

Segment	Rank	
	Within LOSSAN Corridor	Within Pacific Surfliner North Corridor
San Luis Obispo to Goleta	11	6
Goleta to East Ventura	5	4
East Ventura to Moorpark	3	3
Moorpark to Chatsworth (Ventura County)	1	1
Moorpark to Chatsworth (Los Angeles County)	NA	NA
Chatsworth to Burbank Airport	2	2
Burbank Airport to Los Angeles (Union Station)	6	5

Source: *LOSSAN Corridorwide Strategic Implementation Plan*, April 2012.
Notes:
- "NA" indicates not applicable or not available.

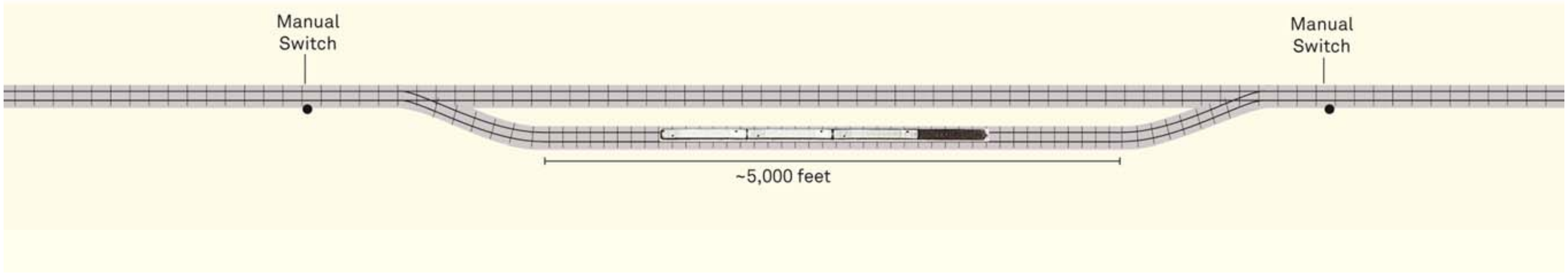
11.4 Conceptual Engineering Design Documentation

The *LOSSAN North Corridor Strategic Plan (2007)* provides 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 mph through switch) to streamline passing movements. All track and ties on the siding would be replaced as required. 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 right-of-way 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.
- Second main track. A second main track involves construction of an additional track to increase operational reliability and capacity at strategic locations along the mainline, reducing conflicts between freight and passenger trains and / or permitting operation of more passenger train services. Similar to siding extensions, the second track would feature Number 24 turnouts, and be designed with the requisite signaling and infrastructure (e.g., new bridges). A conceptual second main track is illustrated in Exhibit 11.3.

Exhibit 11.1: Conceptual Siding Extension

EXISTING SIDING



EXTENDED SIDING

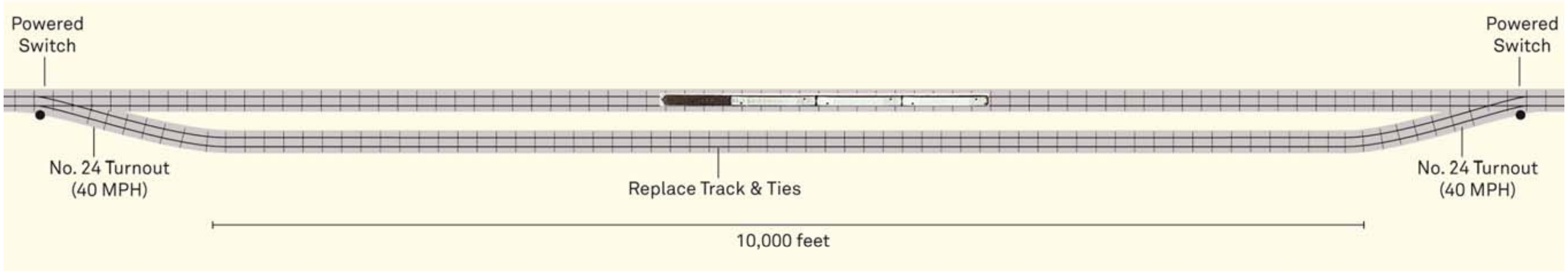


Exhibit 11.2: Conceptual Curve Realignment

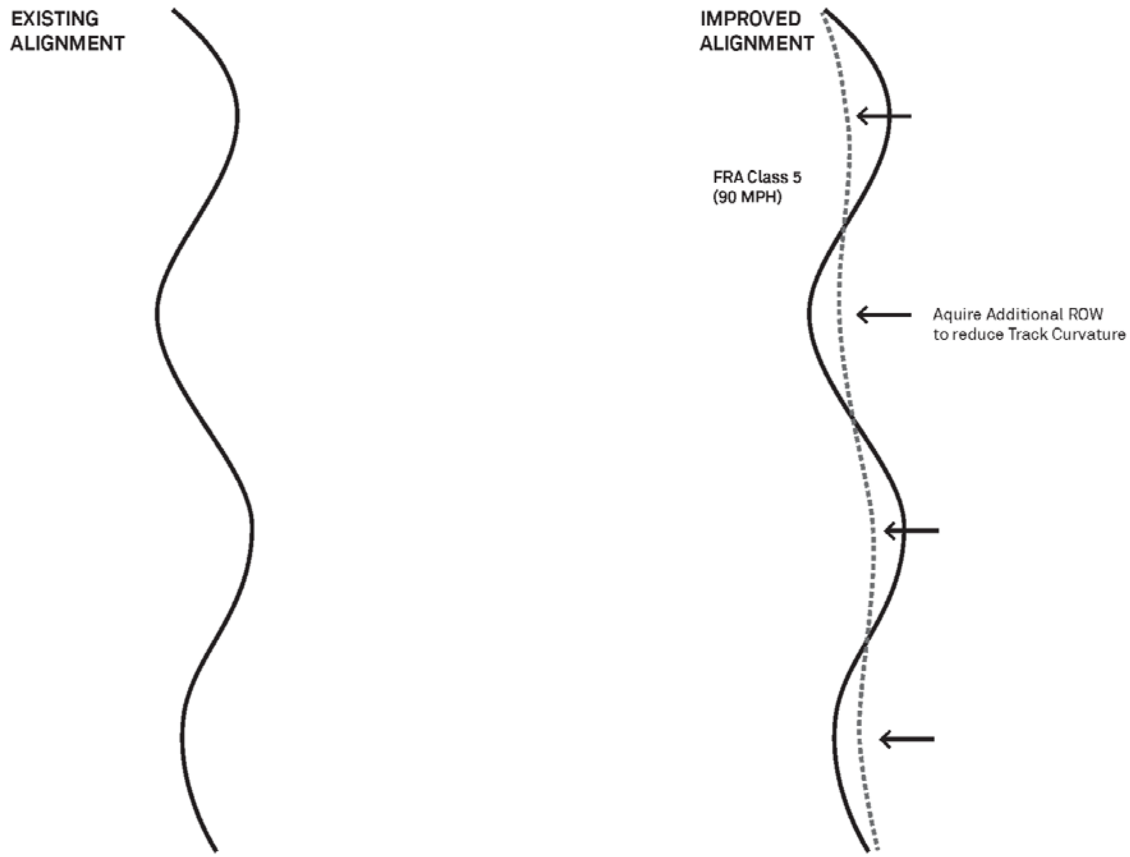
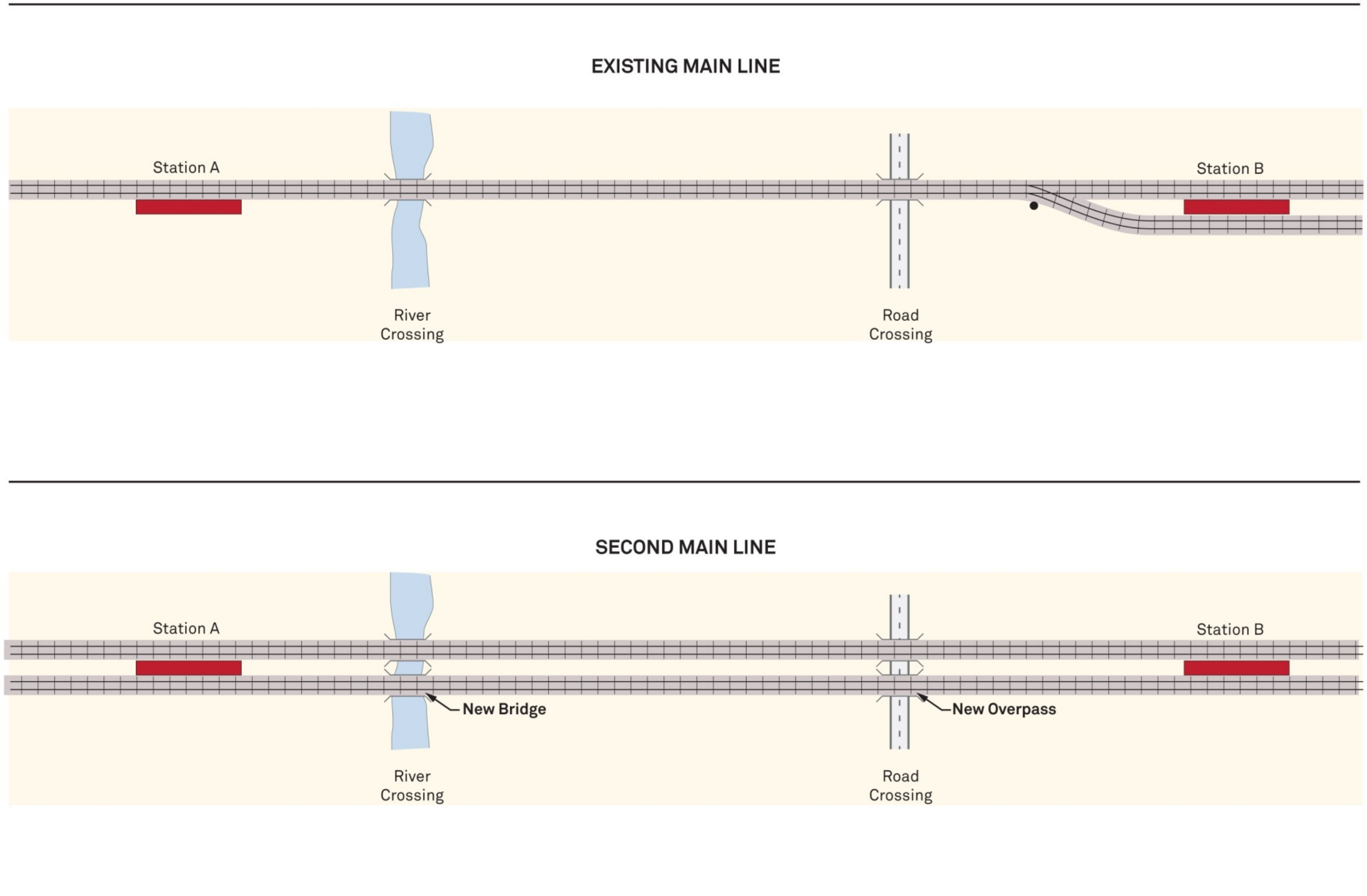


Exhibit 11.3: Conceptual Second Main Track



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12.0 Operating and Maintenance Costs and Capital Replacement Forecast

This chapter of the SDP presents operating and financial projections for each forecast year of the intercity passenger rail service in the northern portion of the Pacific Surfliner 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* 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 FY 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. Daily roundtrips in the forecast years are the same for both weekdays and weekend days.

Total annual O&M costs for intercity passenger rail service in the northern portion of the Pacific Surfliner Corridor currently amount to nearly $38.5 million. With an additional roundtrip between Los Angeles Union Station (LAUS) and Goleta planned by 2020, total O&M costs are estimated to be to approximately $44.0 million (base year dollars). With an additional roundtrip between LAUS and Goleta, and the extension of two roundtrips between LAUS and Goleta to San Luis Obispo by 2040, annual O&M costs are estimated to be nearly $60.3 million (base year dollars).

Table 12.2: Operating Costs by Service Year

Pacific Surfliner North Corridor		**Base Year (Existing)**	**Forecast Year 2020**	**Forecast Year 2040**
Route Miles (one way)	LAUS – Goleta	113	113	113
	LAUS - San Luis Obispo	222	222	222
Daily Roundtrips	LAUS – Goleta	3	4	3
	LAUS - San Luis Obispo	2	2	4
Annual Train Miles		571,590	654,080	895,710
Annual Operating and Maintenance Costs (Base Year Dollars)		*$38,468,000*	*$44,020,000*	*$60,281,000*

Source: Pacific Surfliner North Operating Plans, AECOM, 2013

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	1,095,000	1,717,000
Route Profit / Loss		
Ticket revenue (2012 dollars)	$31,100,000	$49,000,000
O&M Costs	$44,020,000	$60,281,000
Subsidy Required	$12,920,000	$11,281,000
Subsidy per Rider	$11.80	$6.57

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 SDP 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 PTA funds available for the overhaul program, which were appropriated each year by the Budget Act. Article XIX of the State Constitution prohibits the use of State Highway Account (SHA) funds for mass transit vehicle acquisition or maintenance. 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.

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. 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 in 2009 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, with a total of 21 to be allotted to the *Pacific Surfliner* fleet.

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 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

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

Although Caltrans has its own fleet of locomotives, these are used exclusively for Northern California services, and locomotives used on the *Pacific Surfliner* are owned by Amtrak, and this is expected to continue into the future. Although Caltrans is working to purchase six new State-owned locomotives together with the previously-mentioned 42 railcars, these locomotives would be allocated to the *San Joaquin* and *Capitol Corridor* fleets.

Locomotives have a projected economic life of approximately 20 years, but overhauls can extend the life of units beyond this timeframe, delaying the need for replacement. In particular, a program is currently underway to re-power Caltrans’ fleet of 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 six 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. Although this program is for State-owned locomotives in the Northern California fleet, Amtrak would be required to carry out similar overhaul programs or purchase new locomotives to achieve compliance with Tier 4 emissions standards.

13.0 Public Benefits and Impact Analysis

This chapter describes the public benefits and impacts associated with passenger and freight rail improvements for the northern portion of the *Pacific Surfliner*. 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 *Pacific Surfliner* route north of LAUS will reduce statewide personal vehicle travel by about 100,000 annual person trips in 2020 and 250,000 annual person trips in 2040.

13.1.2 Personal Vehicle Travel

Table 13.1 summarizes the projected 2020 VMT and VHT changes by subregion. Table 13.2 provides similar information for year 2040. These results reflect the illustrative service plan assumptions for the *Pacific Surfliner* route.

Table 13.2: Year 2020 Changes in Daily Vehicle Miles Traveled (VMT) and Vehicle Hours Traveled (VHT)

Region	**VMT**		**VHT**	
	Change	**Percent Change**	**Change**	**Percent Change**
Sacramento	~0	~0%	~0	~0%
Bay Area	(3,900)	~0%	(90)	~0%
San Joaquin Valley	(3,000)	~0%	(50)	~0%
Central Coast	(11,200)	-0.03%	(310)	-0.04%
Los Angeles	(4,000)	~0%	(90)	~0%
San Diego	(1,000)	~0%	(20)	~0%
Rest of California	~0	~0%	~0	~0%
Statewide Total	*(23,100)*	~0%	*(550)*	~0%

Notes:

- Value reflect the illustrative service plan assumptions for the *Pacific Surfliner* route. Negative values indicate reductions from "baseline" or "no project" assumptions.

Table 13.3: Year 2040 Changes in Daily Vehicle Miles Traveled (VMT) and Vehicle Hours Traveled (VHT)

Region	VMT		VHT	
	Change	Percent Change	Change	Percent Change
Sacramento	~0	~0%	~0	~0%
Bay Area	(8,600)	~0%	(180)	~0%
San Joaquin Valley	(8,200)	-0.01%	(140)	~0%
Central Coast	(26,400)	-0.07%	(710)	-0.07%
Los Angeles	(10,700)	~0%	(230)	~0%
San Diego	(1,100)	~0%	(20)	~0%
Rest of California	~0	~0%	~0	~0%
Statewide Total	*(54,900)*	~0%	*(1,280)*	~0%

Notes:

- Value reflect the illustrative service plan assumptions for the *Pacific Surfliner* route. Negative values indicate reductions from "baseline" or "no project" assumptions.

The forecasts show a daily VMT reduction in most regions. At the statewide level, daily VMT is projected to drop by about 23,000 miles in 2020 and 55,000 miles in 2040. 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.

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 *Bay Area to Central Valley High-Speed Train Program Environmental Impact Report/Environmental Impact Statement (2008)* estimated that the full statewide 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 crash reductions and 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 dangerous. 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 a $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 Year 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.

Table 13.4: Year 2020 Non-User Benefits by Subregion

Region	**Annual Benefits** (Millions, Year 2012 dollars)		
	Highway Crash Reduction	**Air Pollution Reduction**	**Highway Delay Reduction**
Sacramento Region	NA	NA	NA
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	NA	NA	NA
Statewide Total	*$1.2*	*$0.2*	*$8.1*

Notes:
- "NA" indicates not applicable or not available.

Table 13.5: Year 2040 Non-User Benefits by Subregion

Region	**Annual Benefits** (Millions, Year 2012 dollars)		
	Highway Crash Reduction	**Air Pollution Reduction**	**Highway Delay Reduction**
Sacramento Region	NA	NA	NA
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	NA	NA	NA
Statewide Total	*$2.9*	*$0.4*	*$22.9*

Notes:
- "NA" indicates not applicable or not available.

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.

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.
- Reduced in-state air travel may lead to fewer in-state flights at California's congested. 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 13.6: 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*

Notes:

- Table values are in tons per year.

13.3 Environmental Effects

This section describes the potential environmental effects of the proposed capital and service improvements for the northern portion of the Pacific Surfliner Corridor.

13.3.1 Air Quality Emissions

Table 13.1 illustrates that improved *Pacific Surfliner* 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 total statewide mobile source emissions by pollutant. "No Action" assumes continuation (but no expansion) of current passenger rail routes and service levels. The "Emissions Reduction from 'No Action'" column indicates each pollutants projected emission reduction arising from 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 13.7: Carbon Dioxide Emission Reduction

Region	2020		2040	
	Emission Reduction from “No Action”	“No Action” EMFAC Emissions	Emission Reduction from “No Action”	“No Action” EMFAC Emissions
Sacramento Region	NA	7,286,000	NA	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	NA	11,191,000	NA	13,360,000
Statewide Total	*3,700*	*176,064,000*	*8,400*	*206,056,000*

Notes:
- Table values are in tons per year.
- “NA” indicates not available or not applicable.

Table 13.8: Reactive Organic Gas Emission Reduction

Region	2020		2040	
	Emission Reduction from “No Action”	“No Action” EMFAC Emissions	Emission Reduction from “No Action”	“No Action” EMFAC Emissions
Sacramento Region	NA	3,700	NA	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	NA	7,100	NA	5,300
Statewide Total	*2*	*90,800*	*3*	*75,600*

Notes:
- Table values are in tons per year.
- “NA” indicates not available or not applicable.

Table 13.9: Oxides of Nitrogen Emission Reduction

Region	**2020**		**2040**	
	Emission Reduction from "No Action"	**"No Action" EMFAC Emissions**	**Emission Reduction from "No Action"**	**"No Action" EMFAC Emissions**
Sacramento Region	NA	7,600	NA	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	NA	18,000	NA	12,100
Statewide Total	*5*	*211,700*	*7*	*155,300*

Notes:
- Table values are in tons per year.
- "NA" indicates not available or not applicable.

Table 13.10: Carbon Monoxide Emission Reduction

Region	**2020**		**2040**	
	Emission Reduction from "No Action"	**"No Action" EMFAC Emissions**	**Emission Reduction from "No Action"**	**"No Action" EMFAC Emissions**
Sacramento Region	NA	33,800	NA	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	NA	56,200	NA	38,300
Statewide Total	*18*	*776,800*	*26*	*604,400*

Notes:
- Table values are in tons per year.
- "NA" indicates not available or not applicable.

Table 13.11: Large Particle (PM_{10}) Emission Reduction

Region	2020		2040	
	Emission Reduction from "No Action"	"No Action" EMFAC Emissions	Emission Reduction from "No Action"	"No Action" EMFAC Emissions
Sacramento Region	NA	1,100	NA	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	NA	1,600	NA	1,900
Statewide Total	*<1*	*25,500*	*1*	*31,700*

Notes:
- Table values are in tons per year.
- "NA" indicates not available or not applicable.

Table 13.12: Small Particle ($PM_{2.5}$) Emission Reduction

Region	2020		2040	
	Emission Reduction from "No Action"	"No Action" EMFAC Emissions	Emission Reduction from "No Action"	"No Action" EMFAC Emissions
Sacramento Region	NA	500	NA	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	NA	700	NA	900
Statewide Total	*<1*	*11,892*	*<1*	*14,700*

Notes:
- Table values are in tons per year.
- "NA" indicates not available or not applicable.

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 gauges 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 could be 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. 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 [xxxviii,xxxix] 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.[xl]

Table 13.13: 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:
- 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.[xli]

Extreme Events

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

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 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.(xliii)

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 MPOs, 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 intercity rail system also extend beyond better transportation service provided to users of the system. Generally, the capital and operation improvements to the state's intercity rail systems have the potential to impact local road congestion; alternate transportation options (i.e., nonmotorized 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 (GHG) 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 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, shortline 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 facilitate eventually 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 Service Development Plan prepared for the northern portion of the Pacific Surfliner 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 or at 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 which have existing identified funding; and, 2) the Build Alternative, which provides a set of improvement projects to accommodate increased passenger service levels. The alternatives 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 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 Luis Obispo counties. The viability of the proposed projects included in the Build Alternative was assessed based on the following criterion:

- Environmental impacts.
- Technical feasibility based on right-of-way 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 included 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 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 identified infrastructure projects could be accommodated within the existing railroad right-of-way and system improvements are technically feasible. The Corridor improvements would provide additional capacity to serve forecasted 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 near-term and mid-term infrastructure projects, as presented in Table 4.4 of Section 4.3.1, would allow the addition of the frequencies in the Build Alternative of two additional daily round trips from Los Angeles to Goleta for a total of seven with two of those trips continuing from Goleta to San Luis Obispo for a total of four round-trips. Operations simulation modeling described in Chapter 9 confirms that the near-term and mid-term projects listed below in Table 14.2 would allow the Build Alternative frequencies. This increased service would provide more reliable service that would be more attractive to potential riders, thereby increasing the service revenue potential.

14.1 Operational Initiative Priority

Future Pacific Surfliner Corridor service plans have been developed by the Los Angeles-San Luis Obispo-San Diego (LOSSAN) Rail Corridor Agency in cooperation with Caltrans building upon the prior LOSSAN Corridor work as documented in the *LOSSAN Corridorwide Strategic Implementation Plan (2012)*. The resulting service increases, as identified in the supporting near-term (2014) and long-term (2030) operational plans are designed to address the forecasted rail system demand through the provision of increased weekday service along with new services.

By 2030, the following operational revisions are planned to be made in the northern portion of the Pacific Surfliner Corridor, as identified by work completed in this SDP process:

- Two additional daily round-trips from Los Angeles to Goleta for a total of seven round-trips.
- Two additional round trips would be extended from Goleta to San Luis Obispo, for a total of four round-trips.
- Two additional Pacific Surfliner trains would be extended from San Luis Obispo north to San Francisco to provide Coast Daylight service.
- Daily High-Speed Rail service would operate in the Burbank Junction and LAUS portion of the Corridor. Blended “feeder” service would connect travelers from the IOS terminal station in the San Fernando Valley to LAUS prior to extension of the HSR system further south. The “feeder” train service would provide a one-seat interim connection south to LAUS. On-going HSR studies will influence service frequencies.
- While Corridor local freight activity is not expected to increase significantly, two additional through freight trains are projected to be added, and future freight consists may increase in length.

Operational priorities to support the planned increase in rail activity would include implementation of the following improvements:

- Passenger safety initiatives such as the FRA-mandated installation of PTC between LAUS and Moorpark and the safety improvements identified in the Metrolink Sealed Corridor Initiative (described in Sections 1.1 and 4.1). PTC is fully funded and anticipated to be completed and in operation by the end of 2013.
- Passenger service improvements at the Corridor’s existing stations, such as the provision of new and/or improved station platforms, electronic signage with real-time arrival and departure information, automated ticket vending machines, and improved transit connectivity.
- System infrastructure improvements required to improve rail system capacity and speed constraints that currently negatively impact intercity passenger and freight rail performance 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 at 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 congested part of the state’s rail system. Projects were identified from prior studies, including the *Amtrak 20-Year Plan (2001)*, the *California State Rail Plan (2008)*, the *Programmatic EIR/EIS* currently under preparation, the *LOSSAN Corridorwide Strategic*

Implementation Plan (2012), Southern California Regional Rail Authority commuter rail strategic plans, Union Pacific Railroad recommendations, and studies prepared by Corridor Metropolitan Planning Organizations. The resulting project lists do not reflect the proposed implementation of HSR service and the operational modeling studies being performed by the Authority which may influence service frequencies and specific capital investments in the portion of the Corridor between Burbank Junction and LAUS.

Reflecting system operational needs and projected funding availability, the identified Corridor improvement projects are organized into three phasing categories: 1) Near-Term (2013 to 2015); 2) Mid-Term (2016 to 2020); and, 3) Long-Term (2021 to 2040).

In order to support the forecasted 2020 service levels, presented in Table 4.2 in Section 4.1.1, priority would be given to:

- Completion of Corridor infrastructure projects already partially or fully funded as listed below in Table 14.1.
- Projects identified, first, in the near-term (2013 to 2015) improvement list, and, second, in the mid-term (2016 to 2020) improvement list, based on the methodology described in Section 4.3, as presented in Table 14.2.
- Infrastructure projects that would also support implementation of the HSR system (in the Los Angeles County portion of the Corridor) for which HSR funding may be available.

Table 14.1: Identified Rail Improvement Projects

Project Description	**Cost** (Millions, Year 2012 dollars)	**Source(s)**
Immediate (Baseline)		
Grover Beach Station expansion (new bus facilities, parking, and bike facilities)	$1.23	Proposition 1B (Public Transportation Modernization, Improvement, and Service Enhancement Account)
Ortega siding (reconstruction)	$20.00	HSIPR (ARRA), STIP, IRCP, Santa Barbara County Measure A, *LOSSAN Corridorwide Strategic Implementation Plan (2012)*
Seacliff siding extension and curve realignment	$28.00	HSIPR, STIP, IRCP, Santa Barbara County Measure A, *LOSSAN Corridorwide Strategic Implementation Plan (2012)*
Control Point Bernson (De Soto) to CP Raymer second main track and Northridge Station second platform	$72.96	HSIPR, STIP, Proposition 1B (Intercity Rail Improvement), *LOSSAN Corridorwide Strategic Implementation Plan (2012)*
Van Nuys Station second platform	$40.00	HSIPR
Total	*$162.19*	

Notes:
(1) Some elements of the project scope may be duplicated by other projects listed here.
(2) Source document does not specify cost year. A review of available information concerning project scope concluded that no cost escalation or other adjustments are necessary.

A systematic review of the projects in Tables 14.1 and 14.2 indicated that these cost estimates were generally reasonable and acceptable for planning purposes, and contained sufficient detail to permit their use in the Service Development Plan. 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. New cost estimates were developed for project cost estimates that did not appear reasonable based on the information available regarding project scope. Additional description of the cost estimation methodology, assumptions and documentation is provided in Section 11.2.

Table 14.1 presents the projects assumed in the No Build Alternative for which funding has been identified.

Table 14.2 presents the near-term and mid-term improvements determined to be necessary for the Build Alternative. 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 will be performed to provide more detailed information on implementation costs and environmental impacts for the individual projects presented below as funding for the project becomes available.

Table 14.2: Proposed Near-Term (2013 to 2015) and Mid-Term (2016 to 2020) Rail Improvement Projects

Project Description	**Cost** (Millions, Year 2012 dollars)	**Source(s)**
Near-Term (2013 to 2015)		
Camarillo Station improvements (platform and pedestrian circulation, passenger station building/restrooms, and related construction of new siding between Oxnard and Camarillo)	$4.42[1]	SCAG RTP (FTIP)
Moorpark Station and Simi Valley Station grade crossing improvements	$0.75[1]	SCAG RTP (FTIP)
Vanowen Street/Buena Vista Street SCCRA crossing improvements (Burbank)	$3.21[1]	SCAG RTP (financially-constrained)
West Broadway/Brazil Street/San Fernando Road SCRRA grade crossing improvements (Glendale)	$60.14	SCAG RTP (FTIP), Caltrans Reporting Information System (CRIS)
Riverside Drive grade separation replacement (Los Angeles)	$57.73	CRIS, IRCP
North Spring grade separation reconstruction (Los Angeles)	$49.26	CRIS, IRCP
Mid-Term (2016 to 2020)		
San Luis Obispo to Santa Barbara track upgrades (maximum speed 79 mph)	$90.00	*LOSSAN North Corridor Strategic Plan (Final)*

Project Description	**Cost** (Millions, Year 2012 dollars)	**Source(s)**
Installation of powered switches at Grover, Callender, Surf, and Sudden	NA	UPRR
Extension of Guadalupe siding and installation of island CTC	$23.60	*LOSSAN North Corridor Strategic Plan (Final)*
Extension of Narlon siding	NA	UPRR
Upgrades at Narlon, Honda, and Concepcion sidings (powered switches, track/tie replacement, and island CTC)	$35.40	*LOSSAN North Corridor Strategic Plan (Final)*
Extension of Tangair siding, curve realignment, and installation of island CTC)	$14.00	*LOSSAN North Corridor Strategic Plan (Final)*
Extension of Concepcion siding	NA	UPRR
New Sandyland siding	$20.00	*LOSSAN North Corridor Strategic Plan (Final)*
New siding at Carpinteria Station	$11.80	*LOSSAN North Corridor Strategic Plan (Final)*
Ventura County farm grade crossing improvements	$0.60	SCAG RTP (FTIP)
East Ventura (Montalvo) Curve realignment	$2.40	*LOSSAN North Corridor Strategic Plan (Final)*
Santa Clara River curve realignment	$7.00	*LOSSAN North Corridor Strategic Plan (Final)*
Extension of Leesdale siding	$17.00	*LOSSAN North Corridor Strategic Plan (Final)*
CP West Camarillo curve realignments	$6.00	*LOSSAN North Corridor Strategic Plan (Final)*
Strathearn siding curve realignment	$1.20	*LOSSAN North Corridor Strategic Plan (Final)*
Vanowen Street/West Empire Avenue/Clybourn Avenue SCRRA crossing grade-separation	NA	SCAG RTP (FTIP)
Burbank Junction track alignment and high-speed switches [(2)]	$10.00	*LOSSAN North Corridor Strategic Plan (Final)*
Extension of Burbank siding	$7.00	*California Passenger Rail System: 20-Year Improvement Plan Technical Report (2001)*
Burbank to Los Angeles third main track	$145.00	*California Passenger Rail System: 20-Year Improvement Plan Technical Report (2001)*
Sonora Avenue/Air Way SCRRA crossing improvements	$3.70[(1)]	SCAG RTP (FTIP)

Project Description	**Cost** (Millions, Year 2012 dollars)	**Source(s)**
Grandview Avenue/San Fernando Road/Air Way SCRRA crossing grade separation	$45.00[1]	Southern California Potential Early Investment Projects
Chevy Chase Drive/Alger Street SCRRA crossing improvements	$45.00[1]	Southern California Potential Early Investment Projects
Relocation of Glendale Slide	$3.30[1]	Southern California Potential Early Investment Projects
Redesign of Glendale Station	$20.00[1]	Southern California Potential Early Investment Projects
North Main Street SCRRA crossing improvements	$5.00[1]	Southern California Potential Early Investment Projects
North Main Street grade-separation (Los Angeles)[2]	$91.28[1]	SCAG RTP (financially-constrained)
Southern California Regional Interconnector Project—LAUS run-through tracks[3]	$350750.00	Southern California Potential Early Investment Projects

Notes:

(1) Source document does not specify cost year. A review of available information concerning project scope concluded that no cost escalation or other adjustments are necessary.
(2) The Burbank Junction track realignment and high-speed switches project description is subject to change based on the HSR Authority modeling effort.
(3) Some elements of the project scope may be duplicated by other projects listed here.
(4) Union Station run-through tracks will likely be subject to an environmental document being prepared by LA Metro.
- "NA" indicates not applicable.

End Notes

(i) Port of Long Beach Container Trade in TEUs, http://www.polb.com/economics/stats/latest_teus.asp; TEU Statistics (Container Counts); Port of Los Angeles, http://www.portoflosangeles.org/maritime/stats.asp; Container Statistics, Port of Oakland, http://www.portofoakland.com/maritime/facts_cargo.asp.

(ii) *SCRRA Strategic Assessment* (January 26, 2007), http://gatewaycog.org/HSR_Project/lib/Ridership-SCRRA_Strategic_Assessment.pdf

(iii) For example, the *101 in Motion Study* (July 2006) presents the Santa Barbara County Association of Governments' "Add a Lane and a Train" initiative.

(iv) 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.

(v) *LA Metro: Long Range Transportation Plan* (2009)*; Southern California Association of Governments: Regional Transportation Plan* (2004)*; Santa Barbara County Association of Governments: 101 in Motion* (July, 2006); *Ventura County: Comprehensive Transportation Plan* (in process); *San Luis Obispo County: Land Use and Circulation Elements Update* (in process).

(vi) Consist is a group of rail vehicles that make up a train, or a group of locomotives connected together for Multiple-Unit operation.

(vii) Class IV 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 Centralized Traffic Control 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 High-Speed Rail Authority purposes and was only calibrated to produce trip tables for years 2000 and 2030.

(xiv)) http://www.scribd.com/doc/85367533/Antelope-Valley-Line

(xv) http://www.cahighspeedrail.ca.gov/assets/0/152/232/437/808b042a-ac99-411a-b61e-a9c3be52df55.pdf

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

(xvii) RailOPS is a rail simulation program developed by AECOM.

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

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

(xx) Island CTC refers to when the switches, or control points, at a remote siding location are controlled by the dispatcher, minimizing the investment of installing CTC throughout a corridor.

(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.

(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.

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[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.

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