I-80 CMCP

Comprehensive Multimodal Corridor Plan

Caltrans

I-80 CMCP
COMPREHENSIVE MULTIMODAL CORRIDOR PLAN

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I-80
COMPREHENSIVE MULTIMODAL CORRIDOR PLAN

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I accept this Comprehensive Multimodal Corridor Plan for the I-80 corridor as a document informing the regional transportation process.

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Disclaimer

The information, opinions, commitments, policies, and strategies detailed in this document are those of Caltrans District 3 and District 4 and do not necessarily represent the information, opinions, commitments, policies, and strategies of partner agencies or other organizations identified in this document.

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- City of Davis
- City of Dixon
- City of Fairfield
- City of Sacramento
- City of Suisun City
- City of Vacaville
- City of Vallejo
- City of West Sacramento
- City of Winters
- Colfax – Todd's Valley Consolidated Tribe
- Cortina Rancheria – Kletsel Dehe Band of Wintun Indians
- Dixon Readi Ride
- Fairfield and Suisun Transit System
- Federal Highway Administration – California Division
- Ione Band of Miwok Indians
- Metropolitan Transportation Commission
- Napa Valley Transportation Authority
- Nashville Enterprise Miwok-Maidu-Nishinam Tribe
- Sacramento Area Bicycle Advocates
- Sacramento Area Council of Governments
- Sacramento County
- Sacramento County Department of Transportation
- Sacramento Metropolitan Air Quality Management District
- Sacramento Regional Transit District
- San Francisco Bay Area Air Quality Management District
- Shingle Springs Band of Miwok Indians
- Solano County
- Solano County Transit
- Solano Express (Soltrans)
- Solano Transportation Authority
- The Confederated Villages of Lisjan
- Travis Air Force Base
- University of California, Davis
- Union Pacific Railroad Company Engineering
- Vacaville City Coach
- WALKSacramento
- Water Emergency Transportation Authority
- Wilton Rancheria
- Yolo County Transportation District
- Yocha Dehe Wintun Nation
- Yolo County
- Yolo County Department of Community Services
- Yolo Solano Air Quality Management District

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List of Acronyms

§	Section
AB	Assembly Bill
AMTRAK	American Track (National Railroad Passenger Corporation)
AQMD	Air Quality Management District
ATP	Active Transportation Program
BAAQMD	Bay Area Air Quality Management District
BART	Bay Area Rapid Transit
CalEPA	California Environmental Protection Agency
CalSTA	California State Transportation Agency
Caltrans	California Department of Transportation
CAPTI	Climate Action Plan for Transportation Infrastructure
CCJPA	Capitol Corridor Joint Powers Authority
CDT	Caltrans Core Development Team
CFMP	California Freight Mobility Plan
CMCP	Comprehensive Multimodal Corridor Plan
CNG	Compressed Natural Gas
COVID-19	Coronavirus disease 19
CSRP	2018 California State Rail Plan
CTC	California Transportation Commission
CTP	California Transportation Plan
DOTP	Division of Transportation Planning
DPLAS	Division of Planning, Local Assistance, and Sustainability
DTPLA	Division of Transportation Planning and Local Assistance
EO	Executive Order
FAST	Fairfield Suisun Transit
FTC	Fairfield Transit Center
GHG	Greenhouse Gas Emissions
GIS	Geographic Information System
HCD	Housing and Community Development
HOT	High Occupancy Toll
HOV	High Occupancy Vehicle
HPI	Healthy Places Index
HQ	Headquarters
HSIP	Highway Safety Improvement Program
I	Interstate
INFRA	Infrastructure for Rebuilding America
IPEDS	Integrated Postsecondary Education Data System
IRRS	Interregional Road System
ITIP	Interregional Transportation Improvement Program
ITS	Intelligent Transportation Systems
MPO	Metropolitan Planning Organization
MTC	Metropolitan Transportation Commission
NAAQS	National Ambient Air Quality Standards
NCES	National Center for Education Statistics
NHFP	National Highway Freight Program
NHS	National Highway System

NSFHP	National Significant Freight and Highway Projects
NSFLTP	Nationally Significant Federal Lands and Tribal Projects
P&R	Park and Ride
PEP	Public Engagement Plan
PHD	Person-Hours of Delay
PPEC	Planning Public Engagement Contract
Rail Plan	California State Rail Plan 2018
RAISE	Rebuilding American Infrastructure with Sustainability and Equity
ROW	Right of Way
RTP	Regional Transportation Plan
RTIP	Regional Transportation Improvement Program
SACOG	Sacramento Area Council of Governments
SacRT	Sacramento Regional Transit District
SACSIM	Sacramento Activity-Based Travel Simulation Model
SB	Senate Bill
SCCP	Solutions for Congested Corridors Program
SFOBB	San Francisco-Oakland Bay Bridge
SHS	State Highway System
SMF	Caltrans Smart Mobility Framework
SMP	Strategic Management Plan
SNABM	Solano Napa Activity Based Model
SolTrans	Solano County Transit
SR	State Route
STA	Solano Transportation Authority
STBG	Surface Transportation Block Grant Program
STIP	State Transportation Improvement Program
SVS	Sacramento Valley Station
TAC	Technical Advisory Committee
TCEP	Trade Corridor Enhancement Program
TDM	Travel Demand Management
TIGERweb	Topologically Integrated Geographic Encoding and Referencing
TIRCP	Transit and Intercity Rail Capital Program
UC	University of California
US	United States
USDOT	United States Department of Transportation
VHD	Vehicle Hours of Delay
VHT	Vehicle Hours of Travel
VISSIM	Two Verkehr In Städten – SIMulationsmodel
VMT	Vehicle Miles Traveled
WETA	Water Emergency Transportation Authority
YCTD	Yolo County Transportation District
YSCAQMD	Yolo-Solano County Air Quality Management District
ZEV	Zero-Emission Vehicle

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Executive Summary

Purpose

The Solano/Yolo/Sacramento Interstate 80 (I-80) CMCP will assist local, regional, and state agencies as they deal with the infrastructure, livability, economic, and sustainability needs related to the transportation system.

This system planning document is part of the long-range transportation planning process for the California Department of Transportation (Caltrans). The system planning process fulfills Caltrans statutory responsibility as owner/operator of the State Highway System (SHS) (Government Code Section [§] 65086) by identifying future improvements to the SHS. Through system planning, Caltrans focuses on developing an integrated multimodal transportation system that meets Caltrans goals of safety and health; stewardship and efficiency; sustainability, livability and economy; system performance; and organizational excellence.

The main purpose of the I-80 CMCP is to create an effective and efficient decision-making process focusing on developing solutions that increase accessibility and mobility, improve safety, and enhance the quality of life and environment within the study corridor. This process will determine what specific improvements to the existing transportation network are necessary to achieve the desired outcomes of corridor users, stakeholders, and the public agencies that own and operate corridor facilities. The CMCP provides the framework for agencies along the corridor to strategize future improvements and position partners to be more competitive and eligible for state, regional, and federal funding applications such as the Senate Bill (SB) 1 Solutions for Congested Corridors Program (SCCP) which requires a CMCP.

Vision Statement

Provide a safe, efficient, accessible, and connected transportation system that emphasizes public transit, walking, and biking to enhance transportation options to reduce our overall dependence on the automobile. These objectives will be achieved through collaboration, creativity, and sustainability with transportation partners and the public.

Due to the statewide and regional significance of the corridor between the Bay Area, Sacramento Region and outlining areas such as the Lake Tahoe Basin, Caltrans District 3 and District 4 have partnered on this joint CMCP effort for the I-80 and United States (US) 50 corridors to better understand the issues on the corridor and to plan appropriately for all modes of transportation and facility types, some of which includes passenger rail line, freight rail line, ports, local parallel arterial roadways, bicycle, and pedestrian facilities.

Corridors Characteristics

- The corridors are the primary link between the San Francisco Bay Area, Sacramento Region, and outlining areas such as the Lake Tahoe Basin.
- The corridors serve local, regional, and interregional traffic of people and goods across an urban, suburban, rural, and open space landscape.
- The corridors are a crucial part of the Northern California freight industry as they connect to I-5 and create the most northern interregional freight hub in California.
- The corridors carry an increasingly large amount of traffic.
- Corridor motorists experience increasing delays and unreliable travel times.
- Barriers and gaps exist in the corridor active transportation network.

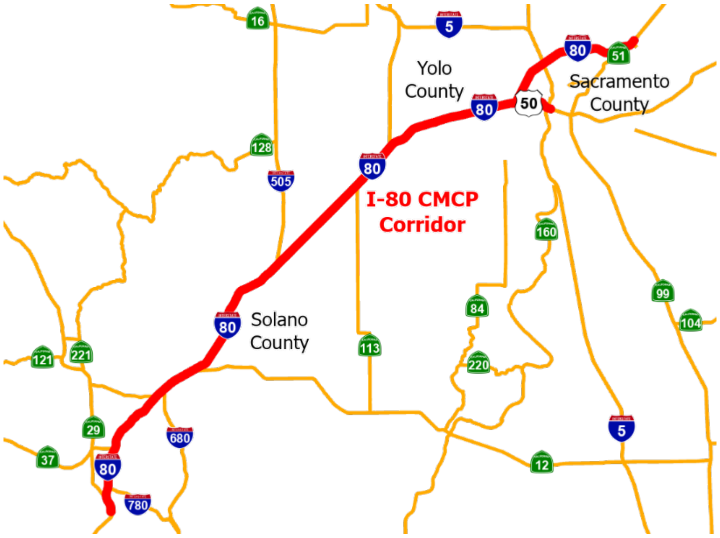


Figure ES 1 | Corridor Characteristics

The I-80 CMCP Corridor Study Area Overview

The I-80 corridor serves a variety of transportation needs ranging from daily commute travel between Solano, Yolo, and Sacramento counties to goods movement and recreational travel throughout Northern California and the western US. The I-80 CMCP covers the entire I-80 corridor in Solano and Yolo Counties and a portion of Sacramento County as the route ends at the State Route (SR) 51 junction in the City of Sacramento. This CMCP also includes a portion of US 50 in Yolo and Sacramento counties, starting at the I-80 junction in the City of West Sacramento and ending at the I-5 junction in Sacramento.

Improvement projects will improve corridor operations, increase travel choices, and close existing gaps in the existing multimodal transportation system. **Figure ES 2** and **Figure ES 3** Illustrate a portion of the over 200 proposed multimodal transportation projects included in the I-80 CMCP (see **Table 9.2** for a full list of projects). The purpose of the proposed projects is to reduce vehicle miles traveled (VMT), greenhouse gas emissions (GHG), and improve livability in the community through operational strategies such as managed lanes, technological advancements, and increased multimodal options. The CMCP projects include improvements to roadways, transportation systems management programs/strategies, transit service and facilities, and active transportation facilities.

I-80 and US 50 corridors include parallel local roadways, transit lines, and bikeways located within one mile of the corridor. Major transportation hubs include Port of Venicia Ferry Terminal, Vallejo Transit Center, Fairfield Transit Center, and Vacaville Transit Center in Solano County. In Yolo and Sacramento counties the major transportation hubs include University of California (UC) Davis Memorial Union, UC Davis Silo, Amtrak train station in the City of Davis, West Sacramento Transit Center, Port of West Sacramento, Sacramento International Airport, and Sacramento Valley Station (SVS).

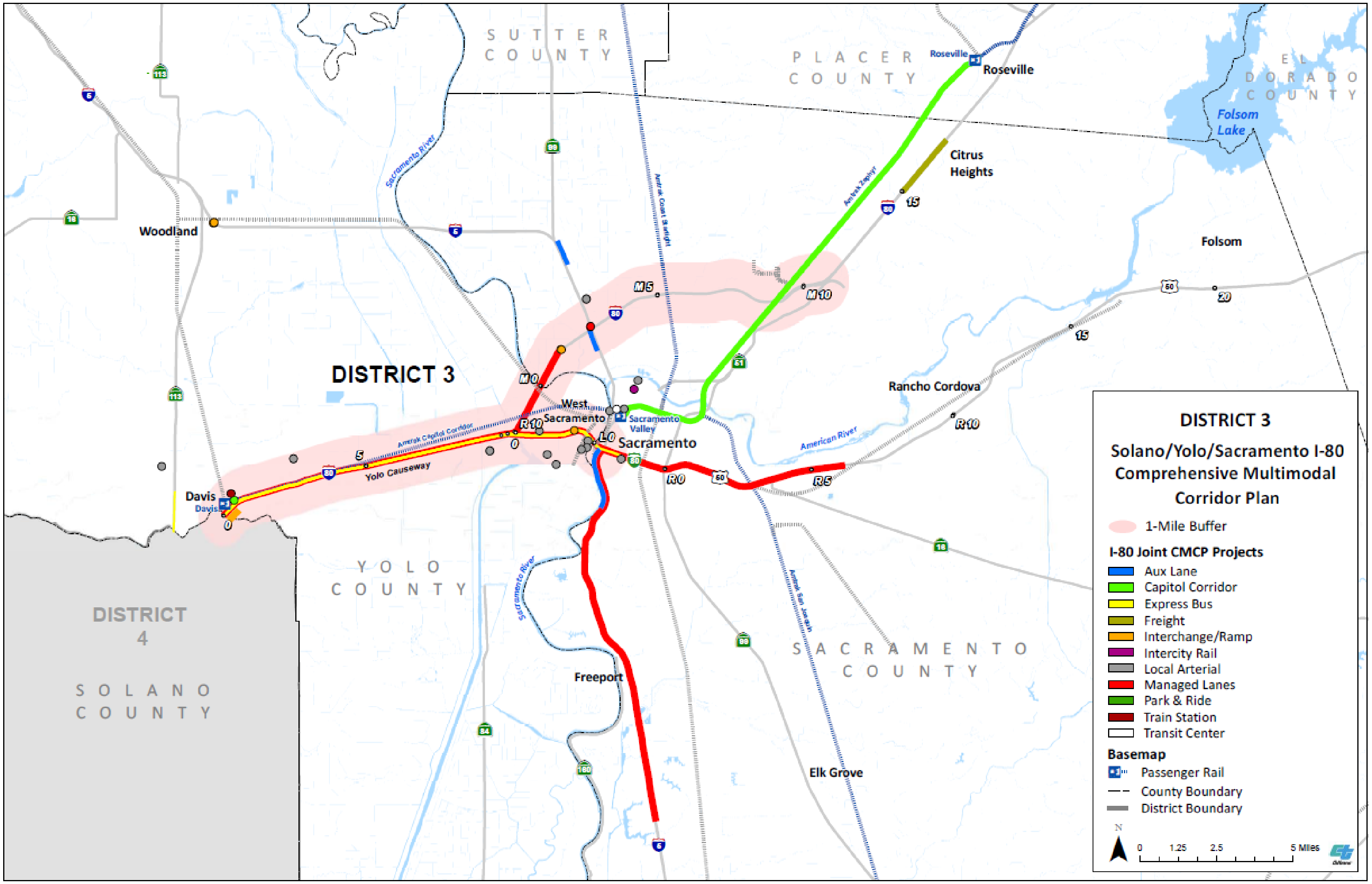


FIGURE ES 2 | I-80 CMCP YOLO AND SACRAMENTO COUNTIES PROPOSED PROJECTS

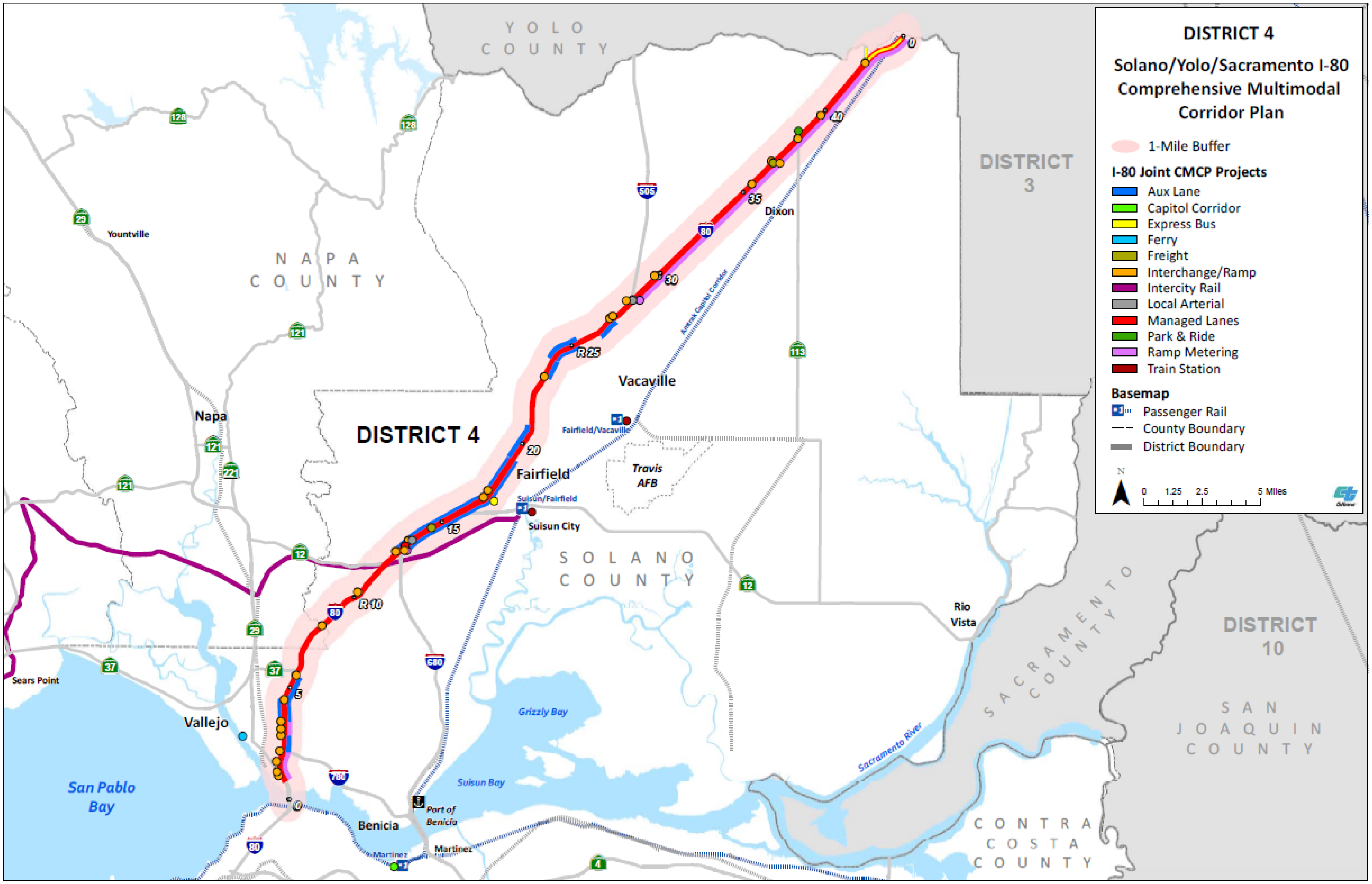
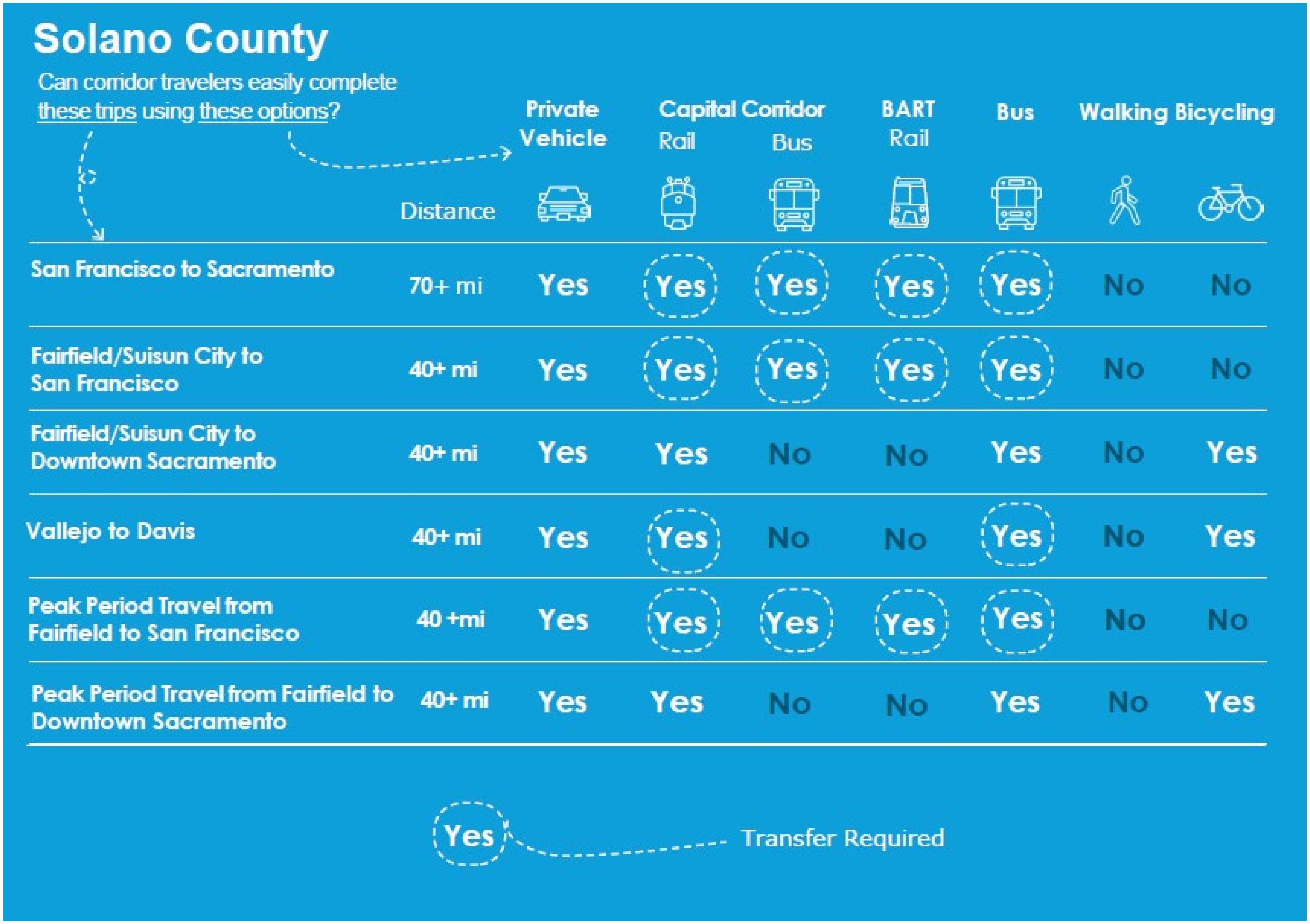


FIGURE ES 3 | I-80 CMCP SOLANO COUNTY PROPOSED PROJECTS



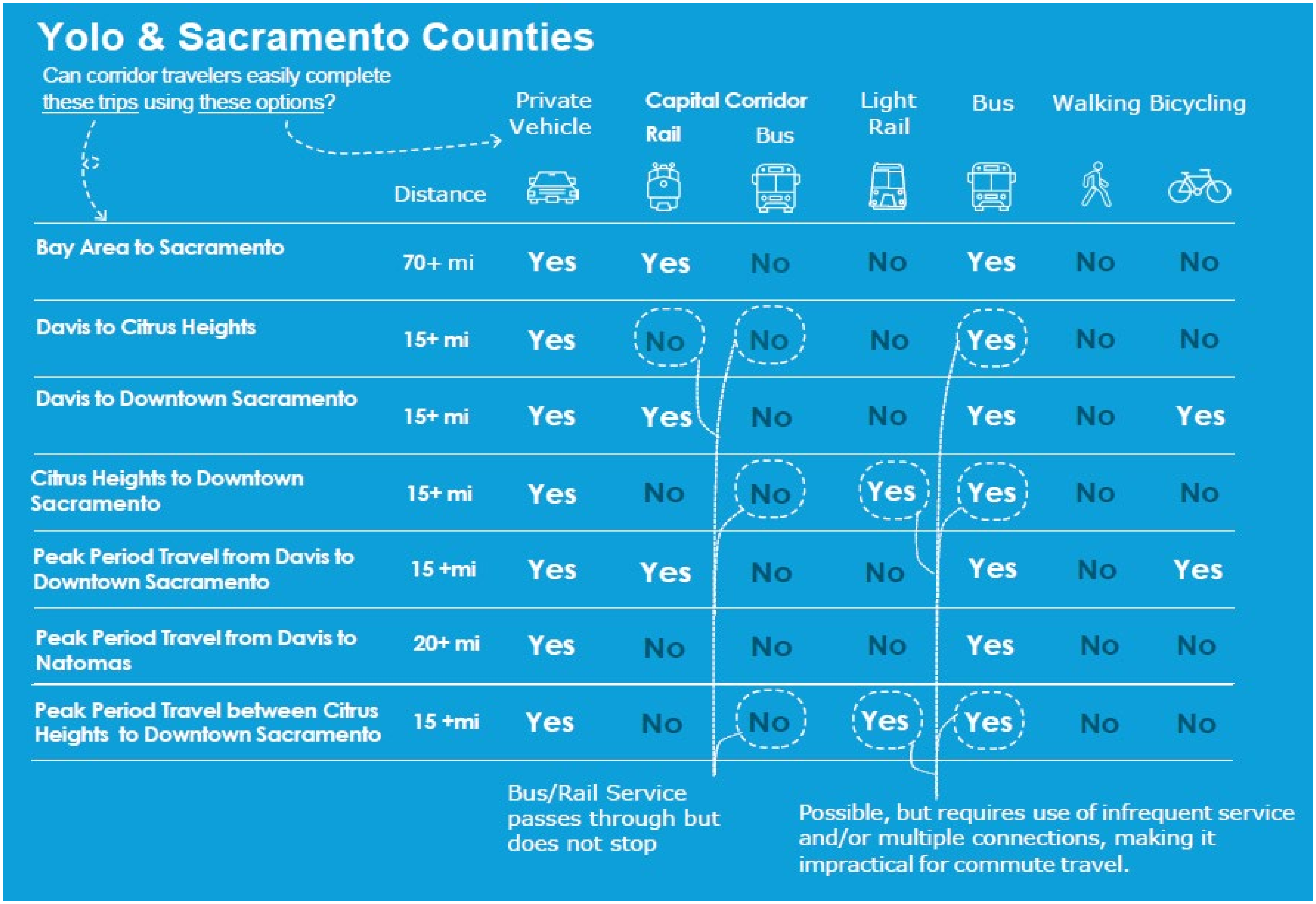
Solano County

Can corridor travelers easily complete these trips using these options?

	Distance	Private Vehicle	Capital Corridor Rail	Capital Corridor Bus	BART Rail	Bus	Walking	Bicycling
San Francisco to Sacramento	70+ mi	Yes	(Yes)	(Yes)	(Yes)	(Yes)	No	No
Fairfield/Suisun City to San Francisco	40+ mi	Yes	(Yes)	(Yes)	(Yes)	(Yes)	No	No
Fairfield/Suisun City to Downtown Sacramento	40+ mi	Yes	Yes	No	No	Yes	No	Yes
Vallejo to Davis	40+ mi	Yes	(Yes)	No	No	(Yes)	No	Yes
Peak Period Travel from Fairfield to San Francisco	40 +mi	Yes	(Yes)	(Yes)	(Yes)	(Yes)	No	No
Peak Period Travel from Fairfield to Downtown Sacramento	40+ mi	Yes	Yes	No	No	Yes	No	Yes

(Yes) Transfer Required

Figure ES 4 | Solano County Existing Corridor Travel Options



Yolo & Sacramento Counties

Can corridor travelers easily complete these trips using these options?	Distance	Private Vehicle	Capital Corridor		Light Rail	Bus	Walking	Bicycling
			Rail	Bus				
Bay Area to Sacramento	70+ mi	Yes	Yes	No	No	Yes	No	No
Davis to Citrus Heights	15+ mi	Yes	No	No	No	Yes	No	No
Davis to Downtown Sacramento	15+ mi	Yes	Yes	No	No	Yes	No	Yes
Citrus Heights to Downtown Sacramento	15+ mi	Yes	No	No	Yes	Yes	No	No
Peak Period Travel from Davis to Downtown Sacramento	15 +mi	Yes	Yes	No	No	Yes	No	Yes
Peak Period Travel from Davis to Natomas	20+ mi	Yes	No	No	No	Yes	No	No
Peak Period Travel between Citrus Heights to Downtown Sacramento	15 +mi	Yes	No	No	Yes	Yes	No	No

Bus/Rail Service passes through but does not stop

Possible, but requires use of infrequent service and/or multiple connections, making it impractical for commute travel.

FIGURE ES 5 | YOLO AND SACRAMENTO COUNTIES EXISTING TRAVEL OPTIONS

Public Engagement

The public engagement process for the I-80 CMCP was to inform the public of the plan and solicit input from key stakeholders and the public for future corridor improvements:

- 49 agencies along the corridor made up the stakeholder group, which met on a quarterly basis. A subset of the stakeholder group was identified to create the TAC that met monthly.
- Two public engagement activities were held on the I-80 CMCP website to solicit virtual input and feedback.
- Altogether, the outreach activities attracted over 2,678 participants.

Corridor Projects

The multimodal corridor guidelines of Caltrans and the California Transportation Commissions (CTC) recommend a number of performance measures for multimodal corridor planning. The I-80 CMCP has used many of these key performance measures to assess current and future transportation system conditions. A number of key performance measures were used to measure the current transportation system as well as to assess potential transportation improvements. The performance measures were assessed using the available transportation models (Solano Napa Activity Based Model [SNABM] and Sacramento Activity-Based Travel Simulation Model [SACSIM19] models) in five separate scenarios. A qualitative analysis was also completed on the individual projects to help understand the potential effectiveness of those projects to improve the transportation system for all users.

Projects modeled for performance in the CMCP were fiscally constrained or programmed at the time of the CMCP document's development and completion. All CMCP implementation priority projects, be they constrained or unconstrained/conceptual, are subject to change and possible inclusion in the Regional Transportation Plan (RTP) managed by each MPO through regular 4-year updates.

To reduce and potentially mitigate induced VMT and GHG emissions from certain VMT and GHG inducing projects, the I-80 CMCP includes various types of active transportation projects like the construction of new river and freeway crossings; additional transit/rail/light rail tracks, layover/platform facilities, operation assistance, track modifications for higher speeds, and intelligent transportation system (ITS) elements like transit signal priority to increase service frequency and improve travel time reliability; and road diets on local arterials to reduce the number of vehicular lanes to accommodate low stress pedestrian and/or bicycle facilities. Therefore, the overall CMCP induced VMT and GHG will be reduced and/or mitigated with these multimodal projects, but a more specific project level analysis would need to be completed for each project.

Altogether, the I-80 CMCP includes over 200 multimodal transportation improvement projects (see **Figure ES 6**) along the study corridor, including over 100 projects being active transportation projects, 22 transit, 60 freeway, 15 arterial and several freight and conceptual projects (see **Table 9.2** for full list of projects). **Figure ES 2** and **Figure ES 3** illustrate a portion of the projects along the I-80 and US 50 corridors.

FIGURE ES 6 | MULTIMODAL TRANSPORTATION IMPROVEMENT PROJECTS

Plan Performance

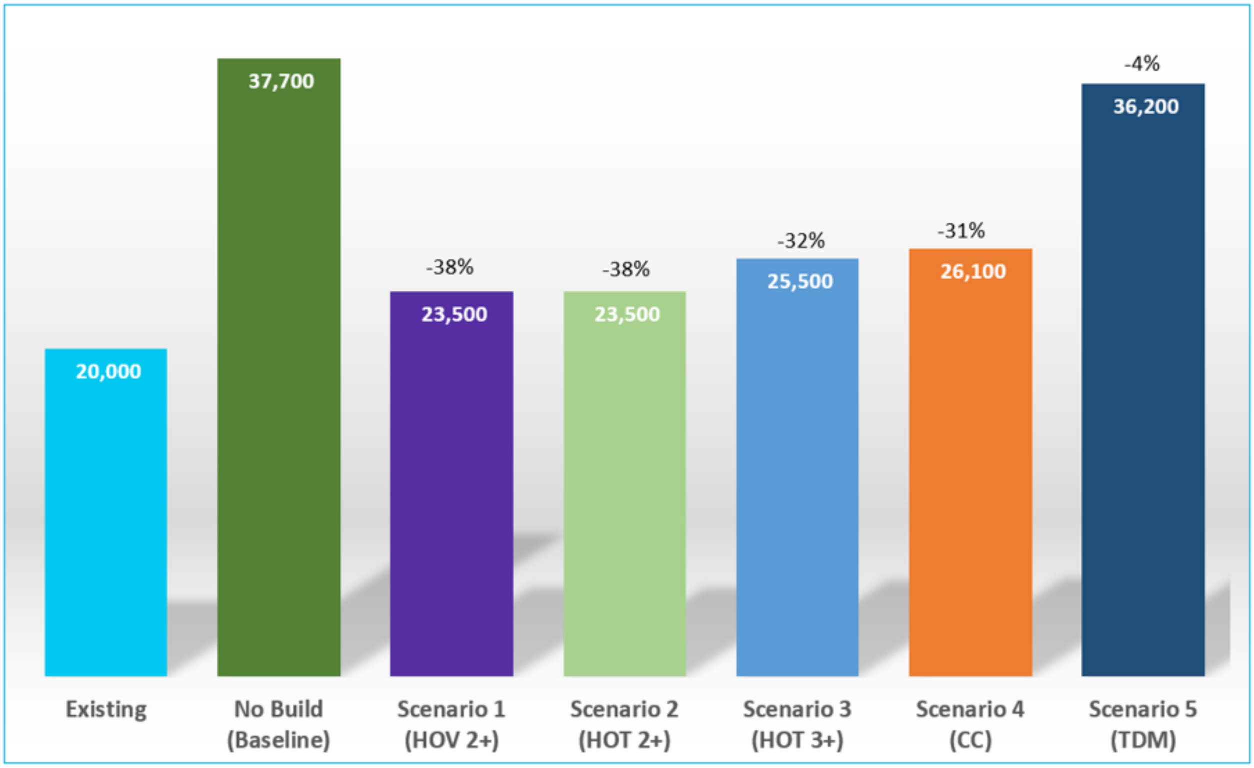
Table ES 1 and **Figure ES 7** illustrates the demand modeling analysis summary for the I-80 CMCP which shows a 2% increase in VMT but at the same time shows a 35% reduction in vehicle hours of delay (VHD) and 4% reduction in vehicle hours of travel (VHT). The reduction in delay helps with the goal of reducing GHG. The slight increase in VMT can be addressed by analyzing unfunded projects and quantify the VMT reduction that can be achieved. With the reduction in VMT that can be achieved, this will also allow for further reduction in VHD and VHT. Below is an overview of the scenarios analyzed in this CMCP.

- **Existing |** This scenario represents year 2019 and its existing conditions.
- **No Build |** This scenario estimates future traffic volumes for 2040 only as a result of population and employment growth to show how the corridor would perform without improvements except for the projects that are currently under construction and projects that are fully funded and will be implemented by 2040. The following future build scenarios utilize the projects in the no build scenario with either the addition of a managed lane, improvements to the Capitol Corridor, or enhancements to travel demand management (TDM)/active transportation.
- **Future Build Scenario 1 | HOV 2+ |** This scenario assesses the changes resulting from completing an HOV 2+ lane along the I-80 corridor study area.
- **Future Build Scenario 2 | HOT 2+ |** This scenario assesses the changes resulting from the addition of HOT 2+ lanes along the I-80 corridor study area. This scenario includes all the projects included in Scenario 1 and it converts the HOV lanes in Scenario 1 to HOT 2+ lanes.
- **Future Build Scenario 3 | HOT 3+ |** This scenario assesses the changes resulting from a HOT 3+ lane along the I-80 corridor study area. This scenario is similar to Scenario 2 but with different occupancy requirements for the HOT lanes.
- **Future Build Scenario 4 | Capitol Corridor Improvement |** This scenario assesses improvements to the Capitol Corridor Intercity Rail service between San Jose and Sacramento.
- **Future Build Scenario 5 | Travel Demand Management / Active Transportation Enhancement |** This scenario assesses the changes resulting from assumed changes in travel behavior due to TDM programs as well as future implementation of active transportation facilities and shift of some trips to active transportation.

TABLE ES 1 | DAILY VMT/VHT/VHD COMPARISON BY SCENARIOS

Scenario	VMT	VHT	VHD	Average Speed	Difference VMT from Baseline	Difference VHT from Baseline	Difference Delay from Baseline	Difference Speed from Baseline
Existing	10,370,700	182,300	20,000	56.9	-	-	-	-
No Build (Baseline)	11,878,600	224,100	37,700	53.0	-	-	-	-
Scenario 1 (HOV 2+)	12,260,900	215,000	23,500	57.0	382,300	(9,100)	(14,200)	4.0
Scenario 2 (HOT 2+)	12,286,000	215,400	23,500	57.0	407,400	(8,700)	(14,200)	4.0
Scenario 3 (HOT 3+)	12,072,000	214,100	25,500	56.4	193,400	(10,000)	(12,200)	3.4
Scenario 4 (CC)	10,997,500	197,100	26,100	55.8	(881,100)	(27,000)	(11,600)	2.8
Scenario 5 (TDM)	11,804,000	223,000	36,200	52.9	(74,600)	(1,100)	(1,500)	-0.1

** Numbers are rounded to nearest thousand*



** Numbers in Table 9 are presented as visuals in above bar charts*

FIGURE ES 7 | VEHICLE HOURS OF DELAY COMPARISON BY SCENARIO

PERFORMANCE MEASURES

Figure ES 8 illustrates the performance measures of the I-80 CMCP. Specific performance measures were developed based on CTC requirements and refined based on public engagement and stakeholder collaboration.

Safety

- The CMCP includes operational improvements such auxiliary lanes and interchange improvements that are designed to improve safety of the system
- The CMCP also identifies a network of active transportation facilities and projects that will improve safety and accessibility for bicyclists and pedestrians

Efficiency

- Multimodal strategies such as passenger rail, transit and active transportation will promote mode shift and improve freeway efficiency
- Many operational improvements such as managed lanes, auxiliary lanes and ramp metering also offer significant congestion relief benefits

Reliability

- Projects that offer safety and efficiency benefits often improves freeway reliability
- When implemented at the right locations, auxiliary lanes and bus-on-shoulder operations will improve express bus service reliability

Multimodal Accessibility

- Infrastructure and operational improvements to the transit system will improve reliability and accessibility to high quality transit options along I-5

Air Pollution and Greenhouse Gas Emissions Reduction

- Multimodal projects such as Capitol Corridor improvements and express bus projects along with programs outlined in the CMCP, will decrease GHG emissions

Economic Prosperity

- The projects and programs included in the I-5 CMCP will provide congestion relief benefits and reduce truck and freight rail travel times
- The CMCP includes improvements at truck scales and projects to provide more truck parking, supporting safe and efficient movement of trucks

Asset Management

- The I-5 CMCP recommends new and improved existing bicycle and pedestrian infrastructure at freeway crossings and local road junctions
- It also includes projects to modernize and fill gaps in existing Traffic Operations System (TOS) assets at on ramps and freeway-to-freeway connectors to reduce congestion

Efficient Land Use

- Service expansion/enhancement of transit and rail services will promote mode shift
- Improvements at major transit and rail stops/stations will support more efficient land use

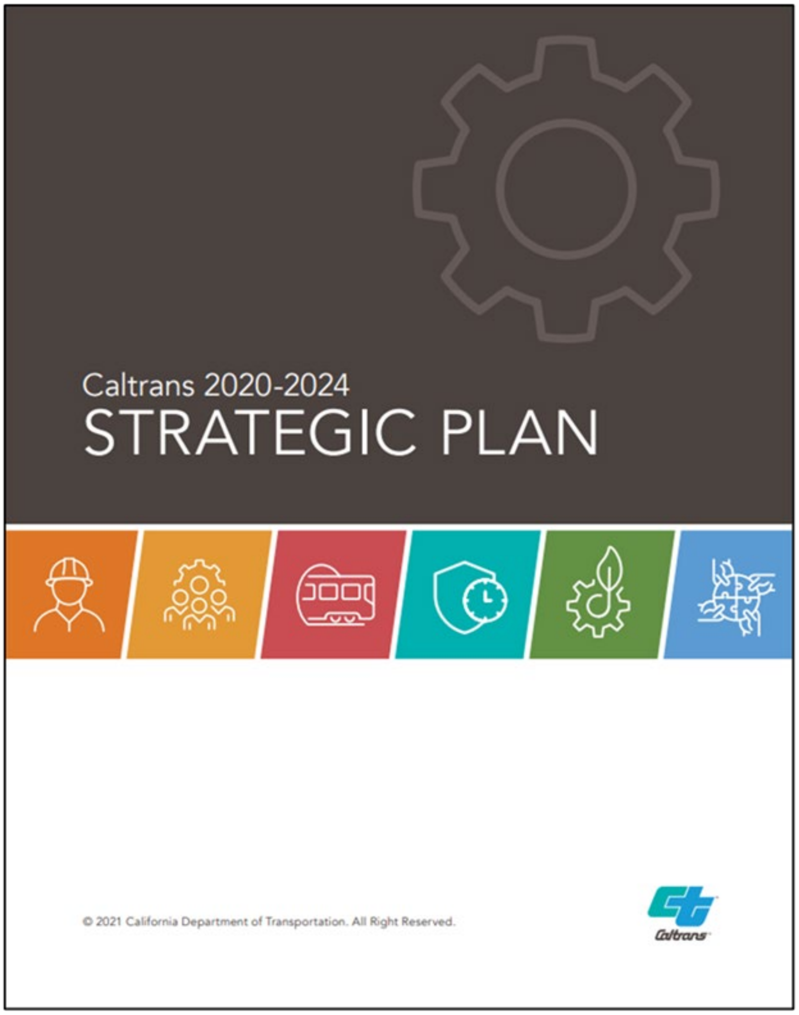
FIGURE ES 8 | I-80 CMCP PERFORMANCE MEASURES

State and Local Responsibility

Improvements to the transportation network are the responsibility of both Caltrans and local agencies. However, with responsibility comes opportunity to leverage funding sources and collaborate on projects in a manner that benefit both Caltrans and local agencies. Local developments that add cumulative impacts to these corridors, or the regional and local transportation network, may necessitate local jurisdictions provide nexus based, proportional fair-share funding for future transportation improvements and mitigations.

Strategic Management and Performance

Caltrans Strategic Management Plan (SMP) is the road map of Caltrans role, expectations, and activities, and includes performance measures to bring about transparency, accountability, sustainability, and innovation. The SMP highlights the Department goals which are health, stewardship and efficiency, sustainability, livability and economy, system performance, and organizational excellence.



Caltrans 2020-2024

STRATEGIC PLAN

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FIGURE ES 9 | CALTRANS STRATEGIC MANAGEMENT PLAN

Chapter 1 | Introduction

1.1 | Interstate 80/United States 50 Corridor Overview

I-80 serves local, regional, and interregional traffic of people and goods across an urban, suburban, rural, and open space landscape. This Interstate is one of the two such facilities that extend east of the San Francisco Bay Area region and is vital to interregional and regional commuting, freight movement, and recreational travel. I-80 is the primary corridor connecting the San Francisco Bay Area to the Sacramento Region and beyond. The I-80 corridor serves as an important freight corridor for the movement of agricultural goods between the Sacramento Valley's Port of West Sacramento and Port of Oakland and provides an essential link to the Ports of Richmond, San Francisco, and Redwood City via connecting routes.

Beyond the west limits of the corridor, I-80 travels through western Contra Costa and Alameda Counties and makes a vital connection to I-880 and I-580 providing access to the East Bay communities, Central Valley, and Marin County via the Richmond-San Rafael Bridge. Here, the route intersects intraregional routes SR 4 and SR 13 which provide continuation eastward into interior Alameda and Contra Costa Counties, with connections to SR 24, I-680, and SR 242. Crossing over the San Francisco-Oakland Bay Bridge (SFOBB), I-80 travels through the County and City of San Francisco where it joins US 101/I-280 connecting to the San Mateo peninsula.

From Solano County, I-80 transitions into Yolo County with connections to SR 113 and US 50 before connecting with I-5 and SR 51 in Sacramento County as it heads northeast through Nevada and Placer Counties towards the Nevada State line. Within the City of Sacramento, I-80 connects to I-5 on the northern end of the city limits whereas the US 50 section of the corridor scope connects with I-5 through the Sacramento downtown core with eventual connections to El Dorado County, Lake Tahoe Basin, and the Nevada State line. Through these two divergent routes, several state routes meet both I-80 to the north and US 50 to the south: feeding into the activity taking place along the corridor, transporting agricultural goods, commuters, and travelers.

Within the corridor, the Yolo Bypass Wildlife Area and floodplain limits east-west linkages, funneling all modes of transportation into the narrow I-80 corridor between the City of Davis, City of West Sacramento, and City of Sacramento. Within a cross-section of less than a quarter mile exists the Capitol Corridor inter-regional rail line, I-80 and US 50, and a dedicated Class I multi-use bicycle and pedestrian path that links the City of Davis with downtown Sacramento.

Within the Sacramento region, the route carries seasonal recreational traffic and is a primary corridor for goods movement from San Francisco and Oakland as it head north through the cities of Vallejo, Fairfield, Dixon, Davis, West Sacramento, and Sacramento. I-80 and US 50 continue east after Sacramento until they cross the Nevada State line.

1.2 | Solano County

Solano County is situated midway between San Francisco and Sacramento. The county is home to rolling hillsides, waterfronts, and fertile farmland and offers a mix of rural and suburban lifestyles with access to the urban amenities associated with two of the nation's most dynamic metropolitan regions. The County limits residential and commercial development outside of the cities, thus preserving approximately 80 percent of the land for open space or agricultural uses. The county boasts a thriving agricultural economy, biotechnology, and other growth industries. I-80 traverses through the county to the northeast, from the Carquinez Bridge to the Solano/Yolo County line.

City of Vallejo is located at the northeastern edge of the San Francisco Bay Region. It is within commute distance of major employment centers in the Bay Area such as San Francisco and Oakland, and within acceptable commute range of Sacramento. Vallejo has a variety of land uses, including the California State University Maritime Academy, Mare Island, and Six Flags Discovery Kingdom Theme Park. I-80 travels northward through the center of Vallejo beginning at the Carquinez Bridge toll plaza, and contains junctions with SR 29, I-780, and SR 37 before continuing to the northeast toward Fairfield.

City of Fairfield is the county seat of Solano County. The city is the midpoint between San Francisco and Sacramento, located approximately 40 miles from the city center of both cities, as well as 40 miles from the city center of Oakland. Travis Air Force Base is located on the eastern edge of Fairfield. I-80 passes through Fairfield to the northeast toward Vacaville. This section of the facility contains a junction with I-680, as well as the Cordelia Commercial Vehicle Enforcement Facility.

City of Vacaville is comprised of just under 27 square miles and is bordered by rolling hillsides, fruit orchards and fertile farmland. Vacaville is a vibrant community in one of the fastest growing areas of the nation and has become home to some of the largest life-science companies in the world. The city's rich history has transformed the community from a small agricultural town into a thriving and progressive city. I-80 passes through Vacaville to the northeast toward Dixon, and the facility contains junctions with SR 179 and I-505.

City of Dixon is a small sized city located in the northeastern corner of Solano County that maintains its gold rush era charm. Living in Dixon offers residents a sparse suburban feel. I-80 travels through the city to the northeast toward Davis, and most of the Dixon's land area lies on the eastbound

1.3 | Yolo County

Located directly between the rapidly growing regions of Sacramento and the Bay Area, Yolo County is home to a vast array of infrastructure, serving as a primary rail and interstate transportation corridor for northern California. Union Pacific, Burlington Northern and Santa Fe, and Amtrak all operate through Yolo County. Most notably the Amtrak corridor runs parallel to a majority of I-80 and US 50 corridors in the county. The primary mode through the county is via automobile for people and trucks for goods movement which primarily use the I-80 and US 50 corridors. This need creates congestion along the corridors which are exacerbated by neighboring interstates such as I-5 and I-505 and major trip generators such as the Sacramento International Airport and Port of West Sacramento. The induced congestion on I-80 and US 50 corridors impact the county's economy which is primarily based on agriculture. Yolo County has led the State in agricultural preservation practices for the last several decades, primarily by directing growth into the incorporated cities where services are available and where development can occur more efficiently.

City of Davis is a mid-sized city with a small-town atmosphere, it contains diverse land uses including UC Davis adjacent to I-80. Davis has more than 50 miles of bicycle paths and more bicycles per capita than any other city in the nation. I-80 passes through Davis and onto the Yolo Causeway, a 3.2-mile-long elevated viaduct that crosses the Yolo Bypass floodplain connecting Davis and West Sacramento.

City of West Sacramento contains both established neighborhoods and new development. The city is increasingly being discovered by new residents and businesses. West Sacramento offers small town charm with a business-friendly attitude in a convenient location near downtown Sacramento and the greater Sacramento Metropolitan Area. I-80 traverses northeast through West Sacramento until it crosses the Sacramento River at Garden Highway. With US 50 beginning at the I-80/US 50 split in West Sacramento, the route traverses the northern city limits. It shares a designation for five miles with Business 80.

1.3 | Sacramento County

Sacramento County is home to the California State Capitol and has a population of approximately 1.55 million people over an area of 994 square miles[1]. The county is bordered by Contra Costa and San Joaquin counties on the south, Amador and El Dorado counties on the east, Placer and Sutter counties on the north, and Yolo and Solano counties on the west. Sacramento County boasts one of the strongest commerce economies in the state, facilitated by an international airport and direct access to the San Francisco Bay in the southernmost part of the county. It also acts as the most northern freight hub for north-south connections between Southern California and the Oregon State line, and east-west connections between the Bay Area and the Nevada State line.

City of Sacramento is the urban core of the County and the metropolitan region. While a mid-sized city, it is the largest city in the region. The City of Sacramento is made up of older neighborhoods developed before the automobile became the dominant mode of transportation where newer and lower density neighborhoods were developed after World War II. I-80 travels through a variety of neighborhoods such as the Natomas and North Sacramento communities, which are predominately low-density residential housing with pockets of commercial and industrial land uses.

Operationally, within the CMCP study area, as I-80 traverses the northern limits of the City of Sacramento, the route crosses I-5 in the Natomas community and the Capital City freeway (SR 51) north of the Arden Arcade community. Outside of the CMCP study area, I-80 continues through North Highlands within Sacramento County before it enters the City of Citrus Heights.

In contrast to I-80, US 50 begins at the I-80 junction on the western limits of the City of West Sacramento, crosses through the city, and into the core of Sacramento. Within the CMCP study area, the US 50 section ends at the I-5 interchange just east of the Sacramento River. Outside of the CMCP study area, US 50 continues just south of the Sacramento downtown core, crosses the SR 51 and SR 99 junction as it heads east towards the cities of Rancho Cordova and Folsom.

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[1] Sacramento County "Demographics and Facts" https://www.saccounty.net/Government/Pages/DemographicsandFacts.aspx

Chapter 2 | Corridor Goals, Objectives, and Performance Measures

The purpose of the subsequent sections is to tie in the policies and objectives of the statewide plans with those of the CMCP. As discussed previously, the purpose of the CMCP, similar to other Caltrans and State plans and policies, is to provide a safe, efficient, accessible, and connected system of transportation that emphasizes multimodal options, reduces GHS, and VMT. This is achieved through collaboration, creativity, and sustainability through collaboration with our partners.

2.1 | Multimodal Corridor Planning Guidance

This CMCP was developed based on the adopted CTC CMCP guidelines and Caltrans Corridor Planning Guidebook (February 2020). These corridor planning guides provide the framework for assessing transportation improvement projects as part of the Road Repair and Accountability Act of 2017, or SB 1. SB 1 requires that funding shall be available for projects that make specific performance improvements and are part of a comprehensive corridor plan designed to reduce congestion in highly traveled corridors by providing more transportation choices for residents, commuters, and visitors to the area, while preserving the character of the local community and creating opportunities for neighborhood enhancement projects. The I-80 CMCP closely follows both the CTC and Caltrans corridor planning guides.

Based on the CTC and Caltrans guidance, objectives of the comprehensive multimodal corridor planning process may include but are not necessarily limited to:

- Define multimodal transportation deficiencies and opportunities for optimizing system operations.
- Identify the types of projects necessary to reduce congestion, improve mobility, and optimize multimodal system operations along highly traveled corridors.
- Identify funding needs.
- Further state and Federal ambient air standards and GHG reduction standards pursuant to the California Global Warming Solutions Act of 2006 (Division 25.5, commencing with §38550, of the Health and Safety Code) and SB 375 (Chapter 728, Statutes of 2008).
- Preserve the character of local communities and create opportunities for neighborhood enhancements.
- Identify projects that achieve a balanced set of transportation, environmental, and community access improvements.

2.2 | Corridor Planning Process Guide

The Caltrans Corridor Planning Process Guide (February 2020) is for creating new or updating corridor plans and studies. Caltrans develops multimodal transportation corridor plans with partners that help identify transportation improvements resulting in a range of concepts and projects that are consistent with Caltrans goals and policies. The Guide outlines a planning approach in helping develop multimodal transportation plans through an Eight-Step Corridor Planning Process, per the Caltrans Corridor Planning guidebook (see **Figure 2.1**).

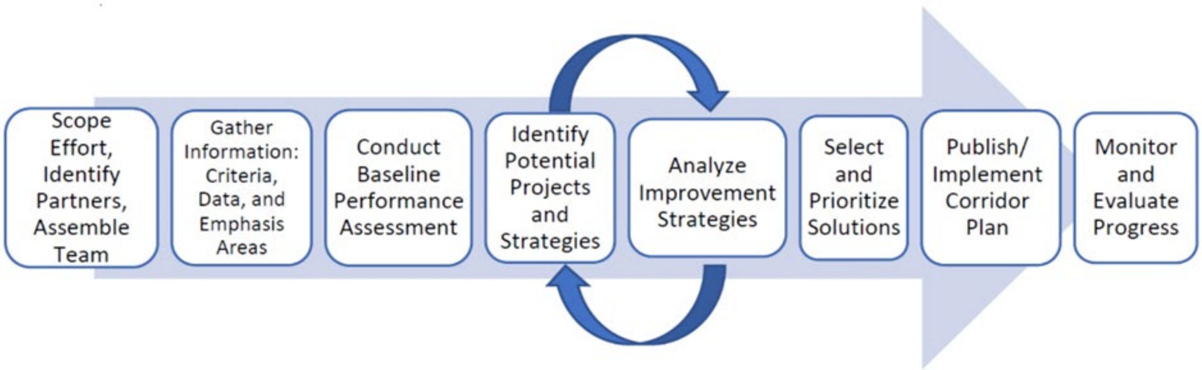
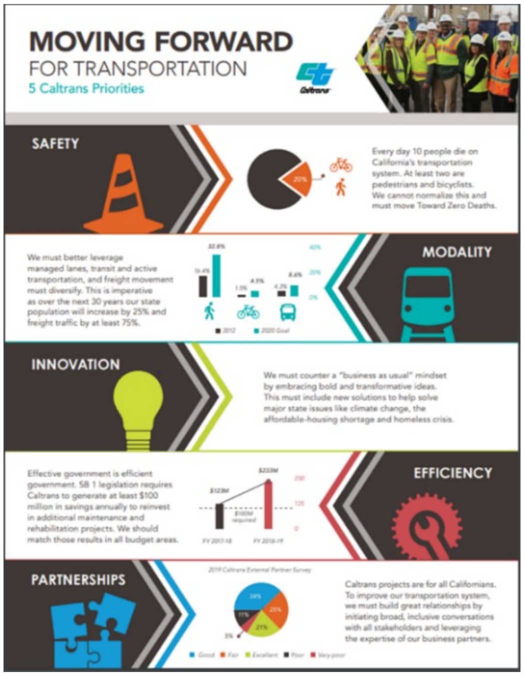


FIGURE 2.1 | EIGHT-STEP CORRIDOR PLANNING PROCESS

A key element of the CMCP is to reduce congestion in highly traveled and highly congested corridors through performance improvements. To measure projects or groups of projects which result in performance improvements in the study area, a set of transportation performance metrics is applied. Some of these metrics can be assessed using quantitative data such as transportation model output, while others are qualitatively evaluated based on project type, project location, and other factors. This is consistent with the CTC guidelines which state “in recognition that data availability and modeling capabilities vary by agency based on available resources, the Commission expects agencies to address plan and project performance qualitatively and quantitively to the degree reasonable given technical and financial resources available during the planning process. As part of the comprehensive multimodal corridor planning process, a plan-level corridor performance assessment must be conducted and documented to clearly outline system performance and trends.” The evaluations provided in this plan clearly document the conditions, including congestion levels, in the overall study area. Per the CTC and Caltrans CMCP guidelines, it is critical to create multimodal corridor plans that closely match the local and regional goals and objectives for transportation planning.



Every day 10 people die on California's transportation system. At least two are pedestrians and bicyclists. We cannot normalize this and must move Toward Zero Deaths.

We must better leverage managed lanes, transit and active transportation, and freight movement must diversify. This is imperative as over the next 30 years our state population will increase by 25% and freight traffic by at least 75%.

We must counter a "business as usual" mindset by embracing bold and transformative ideas. This must include new solutions to help solve major state issues like climate change, the affordable-housing shortage and homeless crisis.

Effective government is efficient government. SB 1 legislation requires Caltrans to generate at least $100 million in savings annually to reinvest in additional maintenance and rehabilitation projects. We should match those results in all budget areas.

Caltrans projects are for all Californians. To improve our transportation system, we must build great relationships by initiating broad, inclusive conversations with all stakeholders and leveraging the expertise of our business partners.

FIGURE 2.2 | 5 CALTRANS PRIORITIES

The I-80 CMCP is built on a variety of guidance documents, stakeholder input, regional and State plans, and policies, and exemplifies the five Caltrans priorities from Moving Forward to Transportation. These key priorities are the focus of the I-80 CMCP, consistent with Climate Action Plan for Transportation Infrastructure (CAPTI), and its project recommendations.

The purpose of the system planning process is to identify the existing and future route conditions and needs for a corridor. This I-80 CMCP is a complex, multi-jurisdictional planning document that identifies future needs within the corridor that is currently experiencing high levels of congestion, and is a foundation document that supports the partnership-based, integrated management of various travel modes (transit, cars, trucks, bicycles) and infrastructure (rail, roads, highways, information systems, bike routes) in a corridor so that mobility along the corridor is provided in the most efficient and effective manner possible.

2.3 | Climate Action Plan for Transportation Infrastructure

The California Transportation Agency (CalSTA) adopted CAPTI[2] on July 12, 2021, which is an overarching framework and statement of intent for aligning State transportation infrastructure investments with California's climate, health, and social equity goals with priority given to "fix-it-first" as stated in SB 1. The CAPTI serves as statewide policy to meet the Governor's Climate goals and directs the CalSTA, Caltrans, and the CTC to address climate change as described in Executive Orders (EO) N-79-20 and N-19-19.

The CAPTI investment framework consists of:

- Investing in networks of safe and accessible bicycle and pedestrian infrastructure
- Addressing social and racial equity by reducing public health and economic harms and maximizing community benefits
- Building toward an integrated, statewide rail and transit network
- Investments in light, medium, and heavy-duty Zero-Emission Vehicle (ZEV) infrastructure
- Making safety improvements to reduce fatalities and severe injuries of all users towards zero
- Promoting projects that do not significantly increase passenger vehicle travel
- Promoting compact infill development while protecting residents and businesses from displacement
- Protecting natural and working lands
- Assessing physical climate risk

CAPTI strategies include cultivating and accelerating sustainable transportation by leading with State investments and advancing State transportation leadership on climate and equity through improved planning and project partnerships. CAPTI efforts will support the California Transportation Plan (CTP) 2050 goals to meet State climate change targets, mandates, and policies. CAPTI is also closely aligned with Caltrans 2020-2024 SMP which showcases a fundamental shift for Caltrans to lead climate action as a top priority.

2.4 | California Transportation Plan 2050

The CTP 2050, adopted by Caltrans in 2021, presents a vision for California's future transportation system and articulates strategic goals, policies, and recommendations to improve multimodal mobility and accessibility while reducing GHG. The CTP is committed to addressing the immediate threats of Coronavirus disease 19 (COVID-19), long-standing systemic injustice, and California's firm commitment to combat climate change and the many risks it poses to our infrastructure and communities.

SB 391 requires the CTP to address how the state will achieve maximum feasible emissions reductions in order to attain a statewide reduction of GHG to 1990 levels by 2050. The CTP outlines advancements in clean fuel technologies, continued shifts toward active transportation, transit, and shared mobility; efficient land use development practices; and how continued shifts to telework can collectively reduce transportation emissions to support these goals.

The CTP 2050 also reinforces long-held values such as improving system safety, improving mobility and accessibility, advancing environmental health and justice, and enhancing quality of life. In long-range

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[2] https://calsta.ca.gov/-/media/calsta-media/documents/capti-2021-calsta.pdfation Infrastructure

planning, it is crucial that the strategies, goals, and projects identified for each corridor further the goals of CTP 2050. This will result in reducing GHG while improving transportation for all users.

2.5 | Caltrans Smart Mobility Framework Guide 2020

The Smart Mobility Framework (SMF) guides implementation of multimodal transportation strategies in support of compact and sustainable communities through a broad range of transportation and housing choices. Smart Mobility 2010: A Call to Action for the New Decade, provided concepts and tools to incorporate smart mobility principles into all phases of transportation decision-making. This was developed in partnership with the US Environmental Protection Agency (EPA), the Governor's Office of Planning and Research, and the California Department of Housing and Community Development (HCD).

In December of 2020, the Caltrans 2020 SMF guide introduced strategies, performance measures, and analysis methods for implementing smart mobility, organized around five themes: network management, multimodal choices, speed suitability, accessibility and connectivity, and equity. The guide also describes the application of five "place types" to identify transportation planning and project development priorities across the state. These place types describe existing geographic areas based on location, land use, density, and other characteristics:

- Central Cities
- Urban Communities
- Suburban Communities
- Rural Areas
- Protected Lands and Special Use Areas

Each of the place types correspond to transportation planning priorities and serves as a guide, not a rule, for development of recommendations. Planners consider the specific characteristics of a given planning area in addition to local, regional, and State plans when recommending strategic transportation system investments.

SB 743 directs use of VMT, as a metric in place of Level of Service, to better measure transportation-related environmental impacts of any project and promote the reduction of GHG, the development of multimodal transportation networks and a diversifying land uses. The SMF guide incorporates the intention of SB 743, as well as social equity and environmental justice, which are integral to all planning decisions. The SMF guides Caltrans and stakeholder agencies in assessing how well plans, programs, and projects support Smart Mobility.

2.6 | Vulnerability Assessment

In 2019, Caltrans completed a Climate Change Vulnerability Assessment for each District that identifies segments of the SHS vulnerable to climate change impacts including precipitation, temperature, wildfire, storm surge, and sea level rise. These studies involved applying climate data to refine the agency's understanding of potential climate impacts to the SHS, and Caltrans coordinated with various state and federal agencies and academic institutions to obtain the best available climate data for California. Discussions with professionals from various engineering disciplines helped identify how changing climate hazards may affect highways, including their design. The assessment allowed Caltrans to begin to understand how climate change may affect the highway and identified a subset of SHS assets on which to focus future adaptation efforts.

2.7 | Adaptation Priorities Report

Released in 2020, the Adaptation Priorities Report for each District picked up where the 2019 Climate Change Vulnerability Assessments left off. These reports include a prioritized list of assets that are potentially exposed to climate change impacts in each Caltrans District. The prioritization methodology in the reports considers, amongst other things, the timing of the climate impacts, their severity and extensiveness, the conditions of each asset (a measure of the sensitivity of the asset to damage), the number of system users affected, and the level of network redundancy in the area. Prioritization scores are generated for each potentially exposed asset based on these factors and used to rank them.

2.8 | Transit Planning

California EO N-79-20 (Newsom) highlights the need to build towards an integrated, statewide rail and transit network, consistent with the 2018 California State Rail Plan (CSRP), in order to provide seamless and affordable multimodal travel options for all.

California's transit systems face challenges due to sprawling and low-density land use patterns. When destinations are far apart, it becomes harder to efficiently serve more people with fewer vehicles, resulting in worsening chronic roadway congestion. Aside from major urban areas, many transit systems routes and scheduling are not well-connected or coordinated and required varying or inconvenient payment methods.

2.9 | Equity and Transit

Local planning efforts need to include all aspects and modes of travel involved in a trip to ensure mobility for seniors, people with disabilities, and lower income communities. Lower-income communities of color own fewer cars and have a greater reliability on transit to fulfill their transportation needs. Unreliable transit networks, in terms of time and frequency, creates a burden for individuals reliant on the transit system. As the population ages, the share of Californians living with a disability is expected to increase. Seniors and other people with disabilities often rely on public transit to meet daily travel needs.

2.10 Improving Transit

Looking to the future, Caltrans, along with the California Air Resources Board (CARB) and CalSTA formed the California Integrated Travel Project (Cal-ITP) to improve transit scheduling coordination, payment methods, and trip-planning data by creating industry standards for California's transit providers.

2.11 | Bicycle Planning

The CMCP was developed in cooperation with the public and local and regional partners to ensure that the recommended bicycle improvements on the SHS complement proposals for local and regional networks. The CMCP considers all types of bicycle trips but prioritizes bicycle trips to daily necessities such as to work, school, shopping, recreational, or connection to transit. The CMCP helps inform future investments on the State and local transportation bicycle network. This is critical as many funding programs require consideration of complete streets improvements as part of a project. Programs such as the State and regional Active Transportation Program (ATP) fund complete street projects that include strategies to increase biking trips or enhance safety.

2.12 | Broadband

Broadband service has become an essential element of communication, an engine of economic activity as it provides educational opportunity, civic engagement, access to health care, teleworking, and much more. Income, education, disability status, age, race, and ethnicity all correlate with broadband availability and use. Residents in less populated areas generally have less access to broadband services. State highway right of way (ROW) can be a source of expanding the broadband network which could provide increased accessibility to tribal land, rural communities, and priority populations.

California Governor's EO S-23-06, Twenty-First Century Government, directed establishment of the California Broadband Task Force to bring together Caltrans, public, and private stakeholders to identify opportunities to facilitate broadband installation across the State. Assembly Bill (AB) 1549 of 2016 requires Caltrans to notify broadband deployment organizations on construction methods suitable for broadband installation through Caltrans website. This would bring together private and public partnership for opportunities to increase advanced communication technologies. In 2018, Caltrans developed the "Incorporating Wired Broadband Facility on State Highway Right-of-Way User Guide," providing guidelines on Caltrans processes for wired broadband providers to incorporate wired broadband facilities in State highway ROW.

In 2021, the California Advanced Services Fund provided $645 million for the California Public Utility Commission to provide broadband access to no less than 98% of California households in each region.[3] It has funded 17 regional broadband consortia across the State that have identified "Strategic Broadband Corridors" which are now used as part of Caltrans planning efforts to provide broadband services to areas currently without broadband access and build out facilities in Equity Priority Community areas. Caltrans encourages developing partnerships with stakeholders and the regional broadband consortium during planning, environmental scoping, and project development to integrate broadband into projects.

2.13 | Caltrans Equity Statement

State Departments of Transportation are bound by law to consider the needs of residents with low incomes, communities of color, people with limited English proficiency, seniors, the disabled, and other communities, and individuals when developing transportation plans.[4]

Caltrans acknowledges that communities of color and priority populations have experienced fewer benefits and a greater share of negative impacts associated with our State transportation system. Some of these disparities reflect a history of transportation decision-making, policies, processes, planning, design, and construction that put up barriers, divided communities, and amplified racial inequities, particularly in our Black and Brown neighborhoods."[5]

Caltrans recognizes our leadership role and unique responsibility to eliminate barriers and provide more equitable transportation for all Californians. This understanding is the foundation for intentional decision-making that recognizes past and stops current harms from our actions.

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[3] California Advanced Services Fund

[4] The US Department of Transportation Title IV program https://www.transportation.gov/mission/department-transportation-title-vi-program

[5] California State Transportation Agency Secretary David Kim's Statement on Racial Equity, Justice and Inclusion in Transportation. https://calsta.ca.gov/press-releases/2020-06-12-statement-on-racial-equity

To ensure our processes and projects address equity, Caltrans is developing public outreach methodologies for increasing participation from priority populations members and local community-based organizations as part of our planning and project development processes.

2.14 | Environmental Justice

Information used in identifying potential environmental justice issues are documented in corridor plans so transportation projects can address the fair treatment and meaningful involvement of all people, regardless of race, color, national origin, or income. This applies to the Caltrans processes, from the early stages of transportation planning and investment decision making, through construction, operations, and maintenance phases. Title VI of the Civil Rights Act of 1964 states "No person in the US shall, on the ground of race, color, or national origin be excluded from participation in, be denied the benefits of, or be subjected to discrimination under benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance." EO 12898, issued in 1994, gave a renewed emphasis to Title VI and added low-income populations to those protected by the principles of environmental justice[6]

There are three fundamental principles at the core of environmental justice:[7]

- To avoid, minimize, or mitigate disproportionately high and adverse human health and environmental effects, including social and economic effects, on minority populations and low-income populations.
- To ensure the full and fair participation by all potentially affected communities in the transportation decision-making process.
- To prevent the denial of, reduction in, or significant delay in the receipt of benefits by minority and low-income populations.

2.15 | California Climate Investments Priority Populations

According to SB 535, priority populations are disproportionately affected by environmental pollution, low income, high unemployment, low levels of home ownership, high rent burden, sensitive populations[8], or low levels of educational attainment. In AB 1550, low-income communities are census tracts with median household incomes at or below 80 percent of the statewide median income or with median incomes at or below the threshold designated as low income by the US HCD. Both AB 1550 and a formula to direct a larger percentage of State GHG-reduction funds to invest in priority populations and low-income communities.

2.16 | Priority Populations

Priority populations defines communities that were previously referred to as an underserved community. The equity measure analyzes scenarios and defines priority populations based on variables that includes minority populations, low-income areas, less English proficient populations, seniors (age 75 and older), zero-vehicle households, single-parent households, people with disabilities, and rent-burdened households.

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[6] https://www.transportation.gov/transportation-policy/environmental-justice/environmental-justice-strategy

[7] https://www.fhwa.dot.gov/environment/environmental_justice/

[8] https://www.epa.gov/expobox/exposure-assessment-tools-lifestages-and-populations-highly-exposed-or-other-susceptible

2.17 | 2018 California State Rail Plan

The CSRP is a strategic plan with operating and capital investment strategies that guide the coordination and development of a statewide travel system. The CSRP is an important element in the comprehensive planning and analysis of statewide transportation investment strategies detailed in the CTP 2040. In concert with CTP 2040 and other plans, the CSRP will help improve air quality, invigorate cities, and provide increased mobility for California in the future. State, local, and regional transportation plans build off the CSRP to increase regional rail capacity, develop transit networks, and set land use recommendations that benefit from enhanced connectivity. Federal and State grant awards and funding decisions will consider project alignment with the 2040 Passenger Rail Vision and strategies reflected in the CSRP.

Consistent with federal and State laws, the CSRP proposes a unified statewide rail network that better integrates passenger and freight service, connects passenger rail to other transportation modes, and supports smart mobility. The CSRP aims to capture an increasing percentage of travel demand by rail. The rail system has the potential capacity to provide more service, with more efficient performance with longer trains, more frequent services, better connectivity, and greater ease of access. Addressing these areas will grow the number of riders and reduce average costs per passenger. More trains, with shorter headways and faster travel times, can be more competitive with automobiles and airlines, thus motivating travelers to use rail and transit more frequently. This will provide another option for travelers to be less dependent on automobiles and air travel.

2.18 | California Freight Mobility Plan 2020

The guiding vision of the California Freight Mobility Plan (CFMP) 2020[9] is to guide freight sustainability in California from three perspectives: economic vitality, environmental stewardship, and social equity. The CFMP has seven goals to ensure California's freight transportation system continually works towards greater efficiency, less-pollution, and higher-capacity in its freight facilities, equipment, and operations. The CMFP development was advised by the California Freight Advisory Committee, a group of representatives from private and public sector freight stakeholders from airports, seaports, railroads, shippers, carriers, and industry workforce. The CFMP analyzed California's freight system from seven regional perspectives to highlight the uniqueness and the different needs of each region. The CFMP also includes project lists for each region that serve as a basis for the SB 1 Trade Corridor Enhancement Program (TCEP) funding.

2.19 | Interregional Transportation Strategic Plan 2021

The Interregional Transportation Strategic Plan (ITSP) 2021[10] provides guidance for the identification and prioritization of projects to improve interregional movement of people, vehicles, and goods, and achieve a sustainable, integrated, and efficient transportation that enhances California's economy and livability. The California State Legislature recognized the importance of interregional travel and the need for the State to target investments in key corridors through the designation of the Interregional Road System (IRRS). As part of this effort, 93 important interregional routes identified in the 1989 Blueprint Legislation (a ten-year transportation funding package created by AB 471, SB 300, and AB 973).

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[9] https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/cfmp-2020-final/final-cfmp-2020-chapters-1-to-6-remediated-a11y.pdf

[10] https://dot.ca.gov/programs/transportation-planning/multi-modal-system-planning/interregional-transportation-strategic-plan

SB 45, 1997 dedicated 25 percent of State Transportation Improvement Program (STIP) funding to interregional highways and passenger rail, and 75 percent to regional transportation improvements. The State portion of interregional improvement funds is programmed in the Interregional Transportation Improvement Program (ITIP) every two years. The goals and objectives of the ITSP apply to a subset of the IRRS and intercity rail corridors, thereby guiding investments decisions to prioritize projects of the ITIP. The ITIP was updated in 2021 and there is an addendum under development that will be completed in 2022.

2.20 | Corridor Goals and Objectives

As previously discussed, the CTC and Caltrans guiding documents contain recommended corridor planning goals, objectives, performance metrics, and evaluation criteria for assessing transportation improvement projects at the corridor level. These goals, objectives, and performance measures are shown below in **Table 2.1**.

TABLE 2.1 | PERFORMANCE METRICS

Goals	Objectives	Performance Metrics
1. Safety	1.1 Reduce the number of incidents within the corridor	• Number/severity/type of collisions on freeways • Number/severity/type of bicycle collisions • Number/severity/type of pedestrian collisions
2. Efficiency	2.1 Reduce recurring delay along the I-80 corridor	• Vehicle Hours of Delay (VHD) • Person Hours of Delay (PHD)
	2.2 Improve productivity along the I-80 corridor	• Person throughput • Freight throughput • Transit Ridership
	2.3 Increase vehicle occupancy by mode	• Vehicle occupancy rate • Percentage of non- Single Occupancy Vehicles (SOV) compared to SOV by mode • Share of alternative modes
3. System Reliability	3.1 Improve freeway travel time reliability	• Travel time by mode • Buffer time index, or the amount of extra "buffer" time needed to be on-time 95 percent of the time • Planning time index is the ratio of the 95th percent peak period travel time to the free flow travel time
	3.2 Reduce non-recurring delay along the I-80 corridor	• Response time of non-recurring incidents (planned) • Clearing time of non-recurrent incidents (collisions)
	3.3 Improve transit on-time performance	• Transit on-time performance • Number of transit operational improvements
4. Multimodal Accessibility and Connectivity	4.1 Improved access and connections to existing or future multimodal transportation hubs	• Number of transit access improvements including new connection points • Number of active transportation improvements at transportation hubs
	4.2 Reduce gaps in the bicycle network	• Bicycle lane miles by facility classification, • Bike/ped freeway crossing spacing/density
	4.3 Reduce gaps in the pedestrian network	• Pedestrian walkway miles, including bike/pedestrian overcrossings

Goals	Objectives	Performance Metrics
5. Air Pollution and GHS Reduction	5.1 Reduce VMT and/or VHD	• Total VMT and VHD • Per capita VMT and VHD
	5.2 Reduce criteria pollutants	• Emissions of criteria pollutants, including carbon monoxide (CO), lead, nitrogen dioxide (NO2), ozone (O3), particulate matter, and sulfur dioxide (SO2)
	5.3 Reduce GHG	• Emissions of GHG
6. Economic Prosperity	6.1 Increase freight efficiency	• Freight throughput
	6.2 Promote access to jobs	• Share of jobs accessible in congested conditions
	6.3 Reduce per-capita delay on freight network	• Per-capita delay on freight network
7. Modern Infrastructure and Asset Management	7.1 Close gaps in Transportation Operation Systems (TOS) elements, such as Ramp Metering, Vehicle Detection Sites, Closed-Circuit Television Cameras and Changeable Message Signs	• Number of TOS elements installed • Presence of fiber-optic
	7.2 Ensure good TOS element health	• TOS elements uptime percentage
		• Percentage of TOS elements inspected or maintained within the last X number of years
	7.3 Improve pavement conditions	• Pavement condition index rating
	7.4 Upgrade facilities to meet best practice in design of multimodal facilities	• Number of bike facility upgrades from unclassified, Class 3, Class 2 to Class 2 enhanced, and Class 4 • Bike/ped freeway crossing spacing/density • Number of transit operational improvements
8. Efficient Land Use	8.1 Reduce reliance on single occupancy vehicles	• Non-SOV mode share • Non-vehicle mode share
	8.2 Reduce trip length and overall trips generated	• Per capita VMT

Chapter 3 | Demographics, Land Use and Trip Generators

The following sections discuss demographic characteristics, land uses, and major trip generators along the corridors. These factors provide background on existing and future travel patterns along the corridors based on how residents and commuters utilize the freeways. The demographic data utilized included in this chapter came from the 2019 Census Bureau database to stay consistent with the most current data available for the smart mobility framework analysis at the end of this chapter. This is also consistent with the use of 2019 data as the base year for the modeling analysis in this CMCP.

3.1 | Solano County

Solano County extends north of San Pablo Bay to Yolo County and the Central Valley to the east. The county is centrally located between the San Francisco Bay Area and the Sacramento metropolitan region. The county is approximately 910 square miles, 830 square miles of land, and 80 square miles of water. Approximately 14 percent of the total land area is within seven cities, four of which border I-80. They are Dixon, Fairfield, Vacaville, and Vallejo.

Solano County has a population of 441,829 (2019). The median household income is $81,472 (2019), about eight percent higher than the median income for all California households ($75,235). Most people in Solano County commute by driving alone, and the average commute time is 33.2 minutes.

According to data from the National Center for Education Statistics (NCES) Integrated Postsecondary Education Data System (IPEDS)[11], the largest colleges and universities in Solano County are Solano Community College (total enrollment 13,507 in 2019-2020), Touro University California (total enrollment 1,460 in 2019-2020), and California State University Maritime Academy (total enrollment 1,016 in 2019-2020).

The median property value in Solano County is $442,700, less than half of the median property value across the greater San Francisco Bay Area region ($995,841). Many Solano County residents commute to job centers located in other parts of the Bay Area due to more affordable housing. The majority commute by driving alone, and the average commute time is 32.6 minutes.

TABLE 3.1 | SOLANO COUNTY DEMOGRAPHIC DATA[12]

Solano County	
Total Population (2019)	441,829
White	52.6%
Black or African American	13.9%
American Indian and Alaska Native	0.5%
Asian	15.4%
Native Hawaiian and other Pacific Islander	0.9%
Two or More Races	7.5%
Not Hispanic or Latino	73.5%

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[11] National Center for Education Statistics Integrated Postsecondary Education Data System. https://nces.ed.gov/ipeds/use-the-data

[12] US Census American Community Survey: 2019 ACS 5-Year Data Profile https://www.census.gov/acs/www/data-tables-and-tools/data-profiles/2018

Solano County	
Population Density (people/square mile)	537.62
Total Households (occupied housing units)	149,865
Average Household Size	2.88
Owner-Occupied Housing Units	61.5%
Renter-Occupied Housing Units	38.5%
Households with No Vehicle Available	4.9%
Median Household Income (dollars)	$81,472
Mean Travel Time to Work (minutes)	33.2

City of Vallejo

Vallejo is located northeast of San Pablo Bay, in the southern portion of Solano County. The city is at the junction of several major highways and is approximately 30 miles from major employment centers of San Francisco and Oakland, and 60 miles from Sacramento. Vallejo has many landmarks including the California State University Maritime Academy, Mare Island, and Six Flags Discovery Kingdom Theme Park. I-80 and I-780 along with SR 37 divide the city. I-80 within the study limits travels northerly through Vallejo beginning at the Carquinez Bridge, and has junctions with SR 29, I-780, and SR 37 before continuing northeast toward Fairfield.

Demographics

Vallejo had a population of 121,267 in 2019, making it the most populous city in Solano County, accounting for about 27 percent of Solano County's total population. Vallejo is one of the most ethnically diverse cities in Solano County. The population has nearly equal share of Hispanic (26.3%), White (35.3%), African American (20.3%), and Asian (23.8%) residents.

The educational level for persons 25 years and older with a high school diploma or higher is 87.9 percent, with 26.1 percent with a bachelor's degree or higher (2019). The median household income (2019) is $69,405, about eight percent lower than California's overall median household income. Nearly seven percent of households in Vallejo do not have access to a vehicle, the highest of all cities in Solano County. Vallejo residents also have the longest average travel time to work in Solano County, at about 36.5 minutes.

TABLE 3.2 | CITY OF VALLEJO DEMOGRAPHIC DATA[13]

City of Vallejo	
Total Population (2019)	121,267
White	35.3%
Black or African American	20.3%
American Indian and Alaska Native	20.3%
Asian	23.8%
Native Hawaiian and other Pacific Islander	1.1%
Some Other Race	12.2%
Two or More Races	7.0%
Hispanic or Latino (of any race)	26.3%

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[13] US Census Bureau, "Quick Facts, Vallejo City, California" https://www.census.gov/quickfacts/vallejocitycalifornia

City of Vallejo	
Population Density (people/square mile)	3,986.42
Total Households (occupied housing units)	42,048
Average Household Size	2.85
Owner-Occupied Housing Units	55.5%
Renter-Occupied Housing Units	44.5%
Median Household Income (dollars)	$69,405
Mean Travel Time to Work (minutes)	36.5

Land Uses and Major Trip Generators

Currently, the urbanized area of Vallejo is primarily residential. According to the Vallejo General Plan (GP) 2040 (2017), single-family and multi-family residents occupy 40 percent of land within the city limits. Commercial land uses account for eight percent, and industrial and manufacturing uses, concentrated primarily on Mare Island, make up five percent. Vacant and undeveloped land account for six percent of the total land area, consisting of wetlands, parks, and natural open space.[14]

Major Trip Generators in Vallejo

- California State University Maritime Academy
- San Francisco Bay Ferry Terminals
- Vallejo Ferry Terminal
- Mare Island Ferry Terminal
- Mare Island
- Six Flags Discovery Kingdom Theme Park
- Solano Community College
- Touro University California

City of Fairfield

Fairfield is the County seat of Solano County. The city is at the approximate midpoint (40 miles) between San Francisco/Oakland and Sacramento. Travis Air Force Base is located on the eastern edge of Fairfield. I-80 traverses the northwest portion of Fairfield toward Vacaville. The junction with I-680 and SR 12 is a major interchange with I-80 and there are major projects planned to improve the interchange complex. The Cordelia Commercial Vehicle Enforcement Facility both east and westbound is located adjacent to I-80 within the I-80/I-680/SR 12 interchange.

Demographics

Fairfield had a population of 115,282 in 2019 and is Solano County’s second largest city, accounting for about 26 percent of the County’s total population.

The educational level for persons aged 25 years and above with a high school diploma or higher was 85.6 percent, with 25.6 percent having a bachelor’s degree or higher. The median income (2019) is $84,557, about 11 percent higher than the median income for all California households.

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[14] City of Vallejo General Plan. https://www.cityofvallejo.net/city_hall/departments___divisions/planning_and_development_services/planning_division/general_plan_2040

TABLE 3.3 | CITY OF FAIRFIELD DEMOGRAPHIC DATA[15]

City of Fairfield	
Total Population (2019)	115,282
White	49.4%
Black or African American	15.2%
American Indian and Alaska Native	0.5%
Asian	16.9%
Native Hawaiian and other Pacific Islander	1.3%
Some Other Race	8.6%
Hispanic or Latino (of any race)	29.3%
Population Density (people/square mile)	2,771.87
Total Households (occupied housing units)	36,751
Average Household Size	3.09
Owner-Occupied Housing Units	59.3%
Renter-Occupied Housing Units	40.7%
Households with No Vehicles Available	4.9%
Median Household Income (dollars)	$84,557
Mean Travel Time to Work (minutes)	32.5

Land Uses and Major Trip Generators

Currently, the Fairfield area is characterized by three distinct communities: unincorporated Cordelia, central Fairfield, and the Travis Air Force Base/Northeast area. Fairfield is surrounded by undeveloped hills to the north and west. To the east and northeast are grazing and prairie grasslands. To the south, beyond the neighboring city of Suisun City, is the largest remaining wetland of San Francisco Bay, Suisun Marsh. Suisun Valley, an unincorporated area and one of the county's most productive and intensive agricultural regions, adjoins Fairfield and separates the central city from Cordelia. Several large corporations are located in Fairfield, including Anheuser-Busch, Clorox, and Jelly Belly Candy Company.

Major Trip Generators in Fairfield

- Travis Air Force Base
- Jelly Belly Candy Company
- Anheuser-Busch
- Clorox
- Solano Town Center Shopping Mall

City of Suisun City

Suisun City is rich in water-oriented natural and recreational resources, as well as historic architecture and other heritage resources. Natural watercourses traverse the community providing opportunities to increase recreational access. The Suisun Marsh, the largest contiguous brackish water marsh remaining on the west coast of North America, surrounds the City on the south. Throughout the City, there are views of the Suisun Marsh, Vaca Hills to the north, the Coastal Range beyond to the west, and the Montezuma Hills to the southeast. The City is located on the eastbound side of I-80, near the junction of I-80 and SR 12.

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[15] US Census Bureau, "Quick Facts, Fairfield City, California" https://www.census.gov/quickfacts/fairfieldcitycalifornia

Demographics

Suisun City has a population of 29,488 (2019), accounting for just under seven percent of Solano County's total population.

The educational level for persons aged 25 years and above with a high school diploma or higher is 88.8 percent, with 21.9 percent having a bachelor's degree or higher (2019). The median income (2019) is $93,529, about 20 percent higher than the median income for all California households and the highest of all cities along the I-80 corridor.

TABLE 3.4 | SUISUN CITY DEMOGRAPHIC DATA[16]

Suisun City	
Total population (2019)	29,488
White	42.4%
Black or African American	21.1%
American Indian and Alaska Native	0.5%
Asian	20.4%
Native Hawaiian and Other Pacific Islander	0.4%
Some Other Race	6.9%
Two or More Races	8.3%
Hispanic or Latino (of any race)	26.8%
Not Hispanic or Latino	73.2%
Population Density (people/square mile)	7353.62
Total Households (occupied housing units)	9,310
Average Household Size	3.15
Owner-Occupied Housing Units	62.1%
Renter-Occupied Housing Units	37.9%
Households with No Vehicles Available	4.3%
Median Household Income (dollars)	93,529
Mean Travel Time to Work (minutes)	35.8

Land Uses and Major Trip Generators

Single-family residential occupies more land within Suisun City than any other use, with some multi-family and mixed-use development located in the downtown area. The majority of the City's commercial land uses are located in one of three retail shopping centers. According to the Suisun City 2035 GP[17], most of the City is built out, with only 5 percent of the land classified as vacant and available for development, and less than 1 percent of the City's land is used for agriculture.

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[16] US Census Bureau, "Quick Facts, Suisun City, California" https://www.census.gov/quickfacts/fairfieldcitycalifornia

[17] City of Suisun City General Plan. https://www.suisun.com/departments/development-services/planning/general-plan/

Major Trip Generators in Suisun City

- Downtown Suisun City
- Suisun Waterfront District
- Suisun Wildlife Center
- Heritage Park Shopping Center
- Sunset Shopping Center
- Marina Shopping Center

City of Vacaville

Vacaville comprises just under 27 square miles and is surrounded by rolling hillsides, fruit orchards and fertile farmland. Vacaville is a vibrant community and has become home to some of the largest life science companies in the world, such as Genentech, Alza, and Thermo-Fisher Scientific. The city's rich history has transformed the community from a small agricultural town into a thriving city. I-80 bisects Vacaville heading northeast toward Dixon. This segment of I-80 also includes the junction with I-505.

Demographics

Vacaville has a total population of 98,875 (2019), accounting for about 22 percent of Solano County's total population.

The educational level for persons 25 years and older with a high school diploma or higher is 89.1 percent, with 23.5 percent of persons 25 years and older having a bachelor's degree or higher. The median household income (2019) is $87,823, about 14 percent higher than the median income for all California households.

TABLE 3.5 | CITY OF VACAVILLE DEMOGRAPHIC DATA[18]

City of Vacaville	
Total Population (2019)	98,875
White	65.7%
Black or African American	10.1%
American Indian and Alaska Native	0.7%
Asian	7.8%
Native Hawaiian and other Pacific Islander	0.9%
Some Other Race	6.6%
Two or More Races	8.1%
Hispanic or Latino (of any race)	24.8%
Not Hispanic or Latino	75.2%
Population Density (people/square mile)	3,310.18
Total Households (occupied housing units)	32,698
Average Household Size	2.81
Owner-Occupied Housing Units	62.0%
Renter-Occupied Housing Units	38.0%
Households with No Vehicles Available	4.3%
Median Household Income (dollars)	$87,823
Mean Travel Time to Work (minutes)	28.7

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[18] US Census Bureau, "Quick Facts, Vacaville city, California" https://www.census.gov/quickfacts/vacavillecitycalifornia

Land Uses and Major Trip Generators

Most of Vacaville is single-family residential, with retail uses concentrated along I-80 and mixed uses in downtown Vacaville. There are two large retail centers located along I-80, the Vacaville Premium Outlets and Nut Tree Plaza. Vacaville has significant amounts of vacant land designated for development as well. The city has a growing employment base in the areas of biotechnology and pharmaceuticals and is home to Genentech. The city has 5.7 million square feet of research and development and manufacturing space in three large business parks and over 1,000 acres of additional vacant industrial land.

Major Trip Generators in Vacaville

- Nut Tree Plaza
- Vacaville Premium Outlets
- Vacaville Commons Shopping Center
- Genentech
- Nut Tree Airport

City of Dixon

Dixon is a small agricultural city located in the northeastern corner of Solano County that maintains its gold rush era charm. Living in Dixon offers residents a low-density suburban environment. The small-town character is a source of pride in Dixon. The community is surrounded by agricultural lands and open space that are intrinsic to its identity, and residents value the “Main Street” charm of downtown Dixon. I-80 bisects the city with Davis in Yolo County to the east. There is a junction with SR 113 which passes through downtown Dixon. Most of the city’s land area is east of I-80.

Demographics

Dixon has a population of 20,084 in 2019, making it the least populous city in Solano County, accounting for just under five percent of Solano County’s total population. Dixon also has the lowest population density of all cities in Solano County. More housing units are owner-occupied in Dixon (69.9%) than any other city along the I-80 CMCP corridor.

The educational level for persons 25 years and older with a high school diploma or higher is 78.3 percent, with 17.4 percent of persons 25 years and older having a bachelor’s degree or higher (2019). The median household income (2019) is $82,507, about nine percent higher than the median household income for all California households.

TABLE 3.6 | CITY OF DIXON DEMOGRAPHIC DATA[19]

City of Dixon	
Total Population (2019)	20,084
White	69.8%
Black or African American	1.9%
American Indian and Alaska Native	0.7%
Asian	5.1%
Native Hawaiian and other Pacific Islander	0.4%
Two or More Races	7.1%
Hispanic or Latino (of any race)	42.4%
Not Hispanic or Latino	57.6%

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[19] US Census Bureau, “Quick Facts, Dixon city, California” https://www.census.gov/quickfacts/dixoncitycalifornia

City of Dixon	
Population Density (people/square mile)	2,828.73
Total Households (occupied housing units)	6,062
Average Household Size	3.31
Owner-Occupied Housing Units	69.9%
Renter-Occupied Housing Units	30.1%
Households with No Vehicles Available	2.4%
Median Household Income (dollars)	$82,570
Mean Travel Time to Work (minutes)	29.9

Land Uses and Major Trip Generators

Development is concentrated in the hubs of commercial businesses in the downtown area and adjacent to the freeway interchanges. Industrial uses are concentrated on the east side of the city, north of the downtown area, and there are large tracts of undeveloped land at the northern edge of the city limits. According to the Dixon GP Update (2020), nearly 40 percent of all land in Dixon is undeveloped which includes vacant as well as agricultural land designated for urban uses. Residential uses, including single and multi-family units occupy about 22 percent of land within the city, public uses 12 percent, industrial uses 7.5 percent, and commercial uses 3.6 percent.[20]

Major Trip Generators in Dixon

- Downtown Dixon
- Dixon Canning (Campbell's)
- Superior Packing
- Goldstar Foods

3.2 | Yolo County

Yolo County is northeast of Solano County and east of Sacramento County where I-80 begins to connect to the Sacramento metropolitan region. It is directly west of the State's capitol in Sacramento and northeast of the Bay Area counties of Solano and Napa. The county is approximately 1,021 square miles, the eastern two-thirds of the county consists of nearly level alluvial fans, flat plains, and basins, while the western third is largely composed of rolling terraces and steep uplands used for dry-farmed grain and range. The elevation ranges from slightly below sea level near the Sacramento River around Clarksburg to 3,000 feet along the ridge of the western mountains.

Yolo County has a population of 217,352 (2019). The median household income is $70,228 (2019), about seven percent lower than the median income for all California households.[21] Most people in Yolo County commute by driving alone, and the average commute time is 24 minutes.

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[20] City of Dixon General Plan Update.https://www.ci.dixon.ca.us/DocumentCenter/View/16259/Dixon-General-Plan_digital

[21] US Census American Community Survey: 2019 ACS 5-Year Data Profile

According to NCES IPEDS, the largest colleges and universities in Yolo County are Woodland Community College (total enrollment of 6,313 in 2019-2020)[22] and the UC Davis (total enrollment of 41,236 in 2019-2020).[23]

TABLE 3.7 | YOLO COUNTY DEMOGRAPHIC DATA[24]

Yolo County	
Total Population (2019)	217,352
White	69.3%
Black or African American	2.7%
American Indian and Alaska Native	0.6%
Asian	14.%
Native Hawaiian and other Pacific Islander	0.4%
Two or More Races	6.3%
Hispanic or Latino	31.6%
White alone, not Hispanic or Latino	68.4%
Population Density (people/square mile)	214.2
Total Households (occupied housing units)	74,296
Average Household Size	2.81
Owner-Occupied Housing unit	51.6%
Renter-Occupied Housing Units	48.4%
Median Household Income (dollars)	$70,228
Mean Travel Time to Work (minutes)	24.0

City of Davis

Davis is a mid-sized city covering 9.9 square miles with a small-town atmosphere east of the Solano County line. It contains a variety of land uses including the UC Davis campus adjacent to I-80. Davis is approximately 15 miles from Sacramento and 70 miles from San Francisco and Oakland. Commuters between the two metropolitan areas utilize I-80 which runs through the southern edge of Davis. Travelers heading northbound from Davis utilize the junction at SR 113 to connect to the Woodland and the Sacramento International Airport.

The City of Davis has a strong connection to bicyclists with more than 50 miles of bicycle paths and more bicycles per capita than any other city in the nation. This includes bicycle connections between Davis and West Sacramento with the existing Class I bike path facility along the Yolo Causeway.

Demographics

Davis has a total population of 68,543 (2019), accounting for about 32 percent of Yolo County's total population. Davis is the largest city in the county and is situated northeast of the I-80 and SR 113

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[22] National Center for Education Statistics, "Woodland Community College" https://nces.ed.gov/ipeds/datacenter/institutionprofile.aspx?unitId=455512

[23] National Center for Education Statistics, "University of California – Davis" https://nces.ed.gov/ipeds/datacenter/institutionprofile.aspx?unitId=110644

[24] US Census American Community Survey: 2019 ACS 5-Year Data Profile https://www.census.gov/acs/www/data/data-tables-and-tools/data-profiles/2018/

junction. Davis identified as a college town in California is known as one of the "top bicycling cities in the county" and considered the bicycle capital of the US.

The educational level for persons 25 years or older with a high school graduate degree or higher is 97.5 percent, with 75.2 percent of persons 25 years or older having a bachelor's degree or higher. The median household income is $69,379 (2019), about eight percent lower than the median income for all California households. Davis has the highest unavailability of vehicles of all cities along the I-80 CMCP corridor, where 9.3% of households have no vehicles available. Davis also has the highest population density of all cities along the corridor, with about 6,875 people per square mile.

TABLE 3.8 | CITY OF DAVIS DEMOGRAPHIC DATA[25]

City of Davis	
Total Population (2019)	68,543
White	64.6%
Black or African American	2.2%
American Indian and Alaska Native	0.4%
Native Hawaiian and other Pacific Islander	0.3%
Two or More Races	6.4%
Hispanic or Latino (of any race)	13.6%
Not Hispanic or Latino	86.4%
Population Density (people/square mile)	6,874.92
Total Households (occupied housing units)	24,630
Average Household Size	2.70
Owner-Occupied Housing Units	43.2%
Renter-Occupied Housing Units	56.8%
Households with No Vehicles Available	9.3%
Median Household Income (dollars)	$69,379
Mean Travel Time to Work (minutes)	22.6

Land Uses and Major Trip Generators

Davis is primarily residential with a small downtown. The majority of trip generators are related to the UC Davis campus which includes a variety of attractions, some of which include the Arboretum, the Robert Mondavi Center, and the Jan Shrem and Maria Manetti Shrem Museum of Art.

Major Trip Generators in Davis

- UC Davis
- The Arboretum at UC Davis
- Davis Community Park
- US Bicycling Hall of Fame
- Bohart Museum of Entomology
- Jan Shrem and Maria Manetti Shrem Museum of Art
- The Robert Mondavi Center

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[25] US Census American Community Survey: 2019 ACS 5-Year Data Profile
https://www.census.gov/acs/www/data/data-tables-and-tools/data-profiles/2019/

City of West Sacramento

West Sacramento is a mid-sized city with a total population of 53,519 (2019), West Sacramento covers 21.43 square miles, with Davis to the east and Sacramento to the east. The city is primarily residential land uses with a mixture of light industrial area and commercial areas. The primary trip generators in the city include the Port of West Sacramento, Sutter Health Park for the Sacramento River Cats (Triple A affiliates for the San Francisco Giants), and the West Sacramento waterfront. The Port of West Sacramento is an inland port situated 90 miles from the San Francisco Bay where ships enter before proceeding up the Sacramento River to the Port. Exports from West Sacramento include “bagged and bulk rice, cement, lumber, fertilizers, and project cargoes like wind generators.”[26]

Demographics

West Sacramento had a population of 53,151 (2019), accounting for about 25 percent of Yolo County’s total population.

The educational level for persons 25 years or older with a high school graduate degree or higher is 83.5 percent, with 29.9 percent of persons 25 years or older having a bachelor’s degree or higher (2019). West Sacramento’s median household income (2019) is $70,699, about six percent lower than the median income for all California households.

TABLE 3.9 | CITY OF WEST SACRAMENTO DEMOGRAPHIC DATA[27]

City of West Sacramento	
Total Population (2019)	53,151
White	66.3%
Black or African American	5.3%
Asian	10.7%
Native Hawaiian and other Pacific Islander	1.1%
Some Other Race	6.3%
Two or More Races	9.9%
Hispanic or Latino (of any race)	30.1%
Not Hispanic or Latino	69.9%
Population Density (people/square mile)	2,475.59
Total Households (occupied housing units)	18,577
Average Household Size	2.84
Owner-Occupied Housing Units	56.9%
Renter-Occupied Housing Units	43.1%
Households with No Vehicles Available	8.0%
Median Household Income (dollars)	$70,699
Mean Travel Time to Work (minutes)	24.7

Land Uses and Major Trip Generators

West Sacramento land uses include commercial, mixed uses near the Sacramento River waterfront, suburban development, and light industrial use near the Port of West Sacramento. Specific key attractions to generate trips include Sutter Health Park and the West Sacramento’s waterfront.

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[26] City of West Sacramento, “Port of West Sacramento”. https://www.cityofwestsacramento.org/government/departments/city-manager-s-office/port-of-west-sacramento

[27] US Census American Community Survey: 2019 ACS 5-Year Data Profile

Below is a list of major trip generators in the vicinity of the corridor, some of which are outside of the CMCP limits but influence travel within the corridor.

Major Trip Generators in and around West Sacramento

- The Bridge District
    - Sutter Health Park home of the River Cats (AAA affiliate of the San Francisco Giants)
- The Washington District
- Sacramento River Waterfront
    - Provides water related activities including boating, fishing, and paddle boarding
- Port of West Sacramento
    - Rowing club hosts NCAA championship races

3.3 | Sacramento County

Sacramento County is heart of the Sacramento region and lies next to various counties such as Yolo, Placer, and El Dorado. It is the location of major interregional junctions with routes such as I-5, I-80, US 50, and SR 99.

Sacramento County has a total population of 1.5 million (2019). The median household income is $67,151 (2019), about 11 percent lower than the median income for all California households. Most people in Sacramento County commute by driving alone, and the average commute time is 26.6 minutes.

According to the NCES IPEDS, the largest colleges and universities in Sacramento County are the California State University, Sacramento (total enrollment of 31,902 in 2018)[28], American River Community College (total enrollment of 31,366 in 2018)[29] and Sacramento City College (total enrollment of 21,379 in 2018).[30]

The five largest ethnic groups in Sacramento County are White (Non-Hispanic) (44.1 percent), Asian (Non-Hispanic) (15.8 percent), White (Hispanic) (12.6 percent), Black or African American (Non-Hispanic) (9.54 percent), and Some Other Race (Hispanic) (7.52 percent). 34 percent of the people in Sacramento County speak a non-English language, and 90.7 percent are US citizens[31].

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[28] National Center for Education Statistics, "California State University - Sacramento" https://nces.ed.gov/ipeds/datacenter/institutionprofile.aspx?unitId=110617

[29] National Center for Education Statistics, "American River College" https://nces.ed.gov/ipeds/datacenter/institutionprofile.aspx?unitId=109208

[30] National Center for Education Statistics, "Sacramento City College"

[31] US Census Bureau, "Quick Facts, Sacramento County, California." https://www.census.gov/quickfacts/sacramentocountycalifornia

TABLE 3.10 | SACRAMENTO COUNTY DEMOGRAPHIC DATA[32]

Sacramento County	
Total Population (2019)	1,524,553
White	57.3%
American Indian and Alaska Native	0.7%
Asian	15.7%
Native Hawaiian and Other Pacific Islander	1.1%
Some other race	7.9%
Two or more races	7.5%
Hispanic or Latino (of any race)	23.2%
Not Hispanic or Latino	76.8%
Population Density (people/square mile)	1,579.41
Total households (occupied housing units)	543,025
Average household size	2.76
Owner-occupied housing units	56.4%
Renter-occupied housing units	43.6%
Households with No vehicles available	6.6%
Median household income (dollars)	$67,151
Mean travel time to work (minutes)	27.8

City of Sacramento

Sacramento is the capitol of California and located east of the Sacramento river. Located in Sacramento County, it has a population of 513,624 spanning 97.92 square miles. Sacramento is the largest city in Sacramento County by land area as well as the most populous city along the I-80 CMCP corridor. It is directly adjacent to West Sacramento, separated by the Sacramento River. The city is in the process of revitalizing its downtown core with the creation of the Downtown Commons, which is anchored by the Golden 1 Arena, and a focus on infill development such as the Railyard Specific Plan that will include a new Major League Soccer stadium and a Kaiser Permanente Medical Center.

Demographics

Sacramento has a population of 500,930 (2019). The educational level for persons 25 years or older with a high school graduate degree or higher is 84.7 percent, with 32.6 percent of persons 25 years or older having a bachelor’s degree or higher (2019). The median household income in Sacramento is $62,335 (2019), about 17 percent lower than the median income for all California households and the lowest of all cities along the I-80 corridor.

TABLE 3.11 | CITY OF SACRAMENTO DEMOGRAPHIC DATA[33]

City of Sacramento	
Total Population (2019)	500,930
White	46.3%
Black or African American Alone	13.2%
American Indian and Alaska Native	0.7%
Asian	18.9%

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[32] US Census American Community Survey: 2019 ACS 5-Year Data Profile https://www.census.gov/acs/www/data/data-tables-and-tools/data-profiles/2019/

[33] US Census Bureau, “Quick Facts, City of Sacramento, California.” https://www.census.gov/quickfacts/sacramentocitycalifornia

City of Sacramento	
Native Hawaiian and other Pacific Islander	1.7%
Some Other Race	11.7%
Two or More Races	7.4%
Hispanic or Latino	28.9%
Not Hispanic or Latino	71.1%
Population Density (people/square mile)	5,079.91
Total Households (occupied housing units)	185,331
Average Household Size	2.66
Owner-Occupied Housing Unit	48.5%
Renter-Occupied Housing Units	51.5%
Households with No Vehicles Available	8.6%
Median Household Income (dollars)	$62,335
Mean Travel Time to Work (minutes)	26.2

Land Uses and Major Trip Generators

Sacramento includes a series of hub communities of urban/suburban design, commercial land uses in dense urban and suburban communities, commercial uses in dense urban centers and office parks as well as industrial uses such as Land Park neighborhood in South Sacramento and East Sacramento which includes the “Fabulous Forties” neighborhood. There are also several institutional uses and sports venues such as the Golden 1 Center which is a multi-use complex that is home to the Sacramento Kings and various concerts, conventions, and other entertainment events. This venue is the primary economic anchor for the Sacramento Downtown Commons[34] which also includes mixed land uses such as restaurants, hotels, and commercial land uses on the former Downtown Plaza shopping center which is within proximity of the I-80/US 50 corridor.

Included in Sacramento County is Natomas as one of the communities in the City of Sacramento that is a major center of employment, retail, and entertainment facilities. Below is a list of major trip generators in the vicinity of the corridor, some of which are outside of the CMCP limits but influence travel within the corridor.

Major Trip Generators in the Corridor

- Downtown Sacramento
- Golden 1 Arena
- California State University, Sacramento
- Sacramento City College
- Mercy General Hospital
- Sutter Hospital

3.4 | Priority Populations

With the development of the CTP 2050, Caltrans has identified equity as one of the strategic goals for the transportation system in California. CTP 2050 aims to advance social equity by actively directing support, resources, and protections to priority populations, and ensuring that the highest quality transportation options are available to those most in need. To help advance the equity goal, Caltrans is

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[34] https://en.wikipedia.org/wiki/Golden_1_Center

committed to working with local partners to improve the lives of residents in priority populations to provide a transportation network that accommodates al users, while providing a safe and reliable transportation network that serves all people and respects our shared environment.

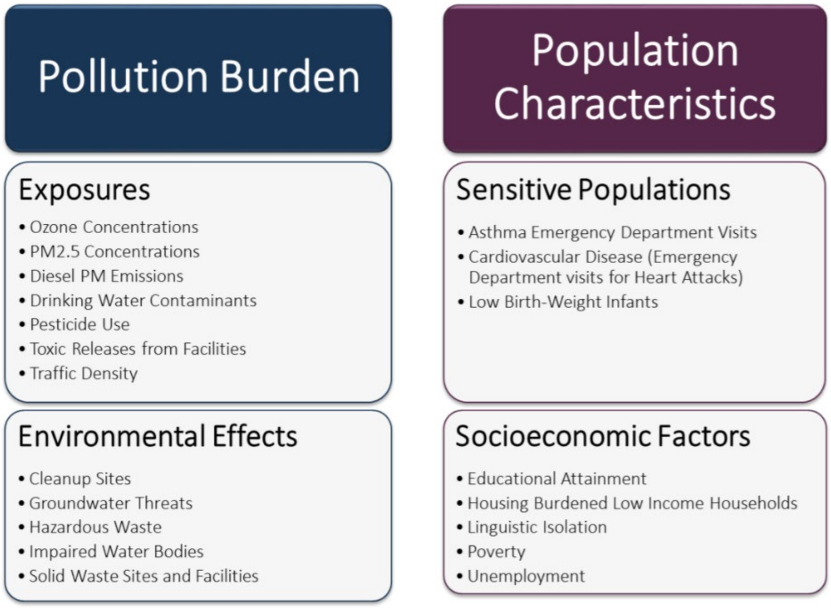
The State of California, as of 2022, does not have a uniform definition of what constitutes a priority population, formerly referenced commonly as undeserved communities. Generally, priority populations refer to communities throughout California which are impacted disproportionately from a combination of economic, health, and environmental burdens. These include poverty, high unemployment, air and water pollution, presence of hazardous wastes and a high incidence of asthma and heart disease.

In 2012, SB 535 was passed, which requires that, in addition to reducing GHG, a quarter of the funding received from Cap-and-Trade auction proceeds must be spent towards projects that provide meaningful and assured benefits to priority populations. This requirement was further modified by AB 1550 (2016) where a minimum of 25 percent of the proceeds be invested in projects that are located within and benefiting individuals living in priority populations.

Pursuant to SB 535 requirements, the California Environmental Protection Agency (CalEPA) has been directed to identify priority populations in the State. In response, CalEPA developed CalEnviroScreen, a tool that helps identify California communities by census tract that are disproportionately burdened by and vulnerable to multiple sources of pollution, based on geographic, socioeconomic, public health and environmental hazard criteria.

Identifying Priority Populations within the Corridor

To identify priority populations within the corridor, the Caltrans Core Development Team (CDT) reviewed and analyzed data from CalEnviroScreen and the California Healthy Places Index (HPI). CalEnviroScreen uses a series of thresholds to identify a community's potential for being defined as a priority population. See below for factors considered by CalEnviroScreen in determining a priority populations.[35]



Pollution Burden

Exposures
- Ozone Concentrations
- PM2.5 Concentrations
- Diesel PM Emissions
- Drinking Water Contaminants
- Pesticide Use
- Toxic Releases from Facilities
- Traffic Density

Environmental Effects
- Cleanup Sites
- Groundwater Threats
- Hazardous Waste
- Impaired Water Bodies
- Solid Waste Sites and Facilities

Population Characteristics

Sensitive Populations
- Asthma Emergency Department Visits
- Cardiovascular Disease (Emergency Department visits for Heart Attacks)
- Low Birth-Weight Infants

Socioeconomic Factors
- Educational Attainment
- Housing Burdened Low Income Households
- Linguistic Isolation
- Poverty
- Unemployment

FIGURE 3.1 | CALENVIRONSCREEN FACTORS

Each of these factors (see **Figure 3.1**) were evaluated with a percentile assigned to each census tract. An average score was calculated for Pollution Burden factors and Population Characteristics factors, respectively. The two average scores were then combined to arrive at a final score, expressed as a percentile. This percentile represents the risks a census tract is facing. Census tracts with a higher percentile are more vulnerable to environmental

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[35] https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-30

burden and represent priority populations in the State.

The CDT used the following methodology/steps to identify priority populations based on CalEnviroScreen data:

- Import the CalEnviroScreen shapefiles into Geographic Information System (GIS) to show all census tracts in Solano, Yolo, and Sacramento counties.
- Filtered census tracts by percentile, those scoring 70 percent or greater were retained.
- Applied a two-mile buffer around the I-80 CMCP study area.
- Census tracts with a percentile of 70 percent or greater that are located within the two-mile buffer were identified as priority populations.

Census tracts identified using the above method represent CalEnviroScreen priority populations in the corridor. See **Figure 3.2** and **Appendix I** for the locations of these census tracts and associated data for different factors from CalEnviroScreen.

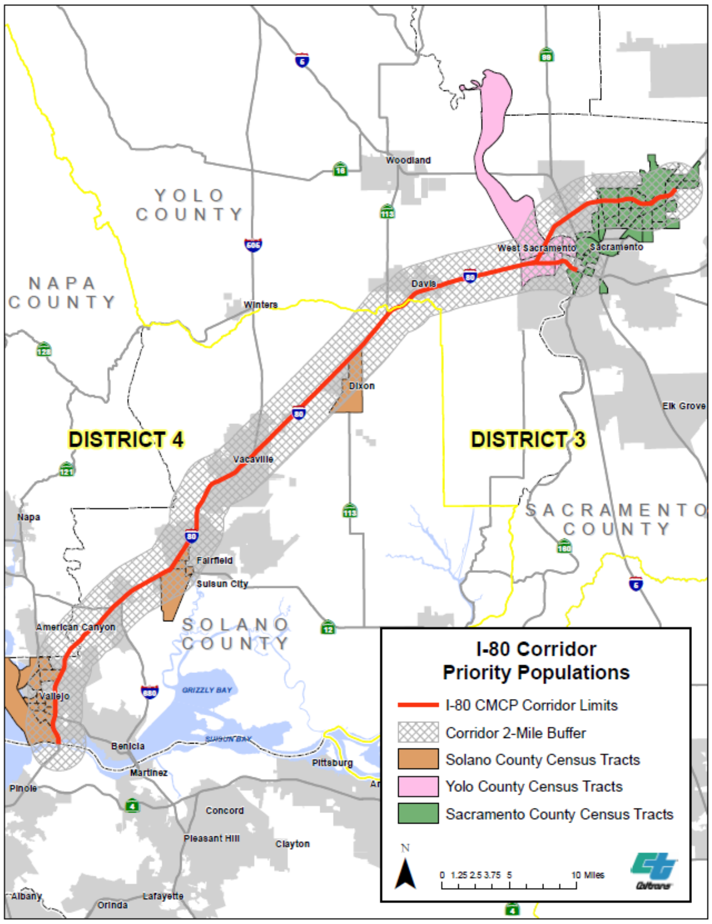

FIGURE 3.2 | PRIORITY POPULATION CENSUS TRACTS MAP

There is a total of 38 census tracts along the corridor that meet the priority populations selection criteria. The majority of these census tracts are found in Sacramento County, including the only two census tracts that scored above the 95th percentile, representing the most vulnerable communities along the corridor. Yolo County has four census tracts that meet the same criteria, three of which are in West Sacramento, the highest percentile being 93 percent. Solano County has six census tracts that meet the criteria, five of which are found in Vallejo and one in Fairfield. Most of Solano County census tracts received a percentile in the range of 75 to 90.

California Healthy Places Index

In addition to CalEnviroScreen, the CTC's 2018 CMCP guidelines recommends the California HPI, an interactive data and mapping tool that provides a detailed snapshot of the social determinants of health at the census tract level across California. HPI was developed by the Public Health Alliance of Southern California and the Virginia Commonwealth University's Center on Society and Health in collaboration with health departments and data experts across the State. Much like CalEnviroScreen[36], which uses environmental, health, and

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[36] CalEnviroScreen. https://oehha.ca.gov/calenviroscreen

socioeconomic information to help identify priority populations that are most affected by many sources of pollution, the HPI uses this information to help predict health outcomes and life expectancy within these communities.

To be included in the California HPI, census tracts must meet eligibility criteria based on a population size of 1,500 or greater, and less than 50 percent of the population living in group quarters. The US Census Bureau classifies all people not living in housing units (house, apartment, mobile home, rented rooms) as living in group quarters. Group quarters include living arrangements such as college dormitories, military barracks, nursing homes, and correctional facilities. Some census tracts within the I-80 corridor have been excluded from the HPI due to not satisfying at least one of these criteria.

The California HPI combines 25 community characteristics into a single indexed HPI Score. The HPI score for each census tract is then ranked and a percentile assigned to show how a census tract compares to the rest of the State. **Appendix II** shows the HPI scores and percentiles for census tracts identified through the priority population's selection process described before. A smaller HPI score, and a higher percentile indicate a census tract is more vulnerable compared to others. There are seven census tracts in Sacramento County, one in Yolo County, and one in Solano County that received a percentile greater than 90th.

Caltrans Smart Mobility Framework Guide 2020

The SMF guides implementation of multimodal transportation strategies in support of compact and sustainable communities through a broad range of transportation and housing choices. *Smart Mobility 2010: A Call to Action for the New Decade,* developed in partnership with the US EPA, the Governor's Office of Planning and Research, and the California HCD, provided concepts and tools to incorporate smart mobility principles into all phases of transportation decision-making.

As discussed in Chapter 2 of this CMCP, the SMF introduced strategies, performance measures, and analysis methods for implementing smart mobility. **Table 3.12** shows detailed characteristics of each of the five place types described in the SMF guide.

TABLE 3.12 | PLACE TYPE CHARACTERISTICS

Type	Description	Metrics
Central Cities	High density, mixed-use places with well-connected grid street networks, high levels of transit service, and pedestrian supportive environments.	• Average populations density: 40,000 • Average transit mode share: 33% • Average road density: 28
Urban Communities	Moderately dense places, mostly residential but with mixed-use centers. Housing is varied in density and type. Transit is available to connect neighborhoods to multiple destinations. Fine-grained network of streets with good connectivity for pedestrians and bicyclists.	• Average population density: 15,500 • Average transit mode share: 10% • Average road density: 26
Suburban Communities	Primarily lower density residential with a high proportion of detached housing. Some interspersed retail and services, but little mixing of housing with commercial uses. Street networks often have poor connectivity. Low levels of transit service, large amounts of surface parking, and inconsistent pedestrian networks.	• Average population density: 6,800 • Average transit mode share: 3% • Average road density: 19
Rural Areas	Very low-density places with widely spaced towns separated by farms, vineyards, orchards, or grazing lands. Includes rural towns that provide a mix of housing, services, and public institutions in compact form that serve surrounding rural areas. May include tourist and recreation destinations which can significantly affect land uses, character, and mobility needs. Very limited modal choices.	• Average population density: 340 • Average transit mode share: 1% • Average road density: 3.5
Protected Lands and Special Use Areas	Lands protected from development by virtue of ownership, long-term regulation, or resource constraints. Also includes large tracts of single use lands that are outside of, or poorly integrated with, their surroundings.	• Not Applicable

Each of the place types correspond to transportation planning priorities and serves as a guide, not a rule for development of recommendations. Planners consider the specific characteristics of a given planning area in addition to local, regional, and State plans when recommending strategic transportation system investments.

Smart Mobility Framework Place Types Within the I-80 Corridor

The land use and transportation system characteristics of place types strongly influence travel behavior. Locations with higher density, and mixed-use development patterns, coupled with well-connected multimodal transportation systems, encourages shorter trips and travel by non-automobile modes, both of which tend to reduce VMT.

The three main metrics used to determine place type are population density, transit mode share, and road density. Population density and transit mode share numbers were obtained from the US Census. The American Community Survey 5-Year Data includes total population and transit mode share at the city, census tract, and block group levels. Land area data is available from Topologically Integrated Geographic Encoding and Referencing (TIGERweb), a web-based mapping service provided by the US Census Bureau. Population density is defined as persons per square mile, calculated by dividing total population by the study area. Road density is calculated as the ratio of total length of all roads to the land area within the specified area. The total length of all roads is obtained by intersecting TIGERweb line shapefiles from the US Census Bureau with each study area boundary, using a GIS mapping application.

For the I-80 corridor, place type analysis was conducted at the city level for all cities along the corridor. Areas between these cities were not analyzed as they are known to be mainly rural areas and protected lands. A deeper analysis at the census tract level was performed for the downtown areas of the cities of Sacramento, Davis, Vallejo, Fairfield, and Vacaville. The results are included in **Table 3.13**.

Table 3.13 | Smart Mobility Framework Place Type metric

Cities	Metric				Place Type
	Land Area (square mile [sq. mi.])	Population Density	Road Density	Transit Mode Share (%)	
Vallejo	30.42	3986.42	17.88	5.7	Suburban Community
Fairfield	41.59	2771.87	14.26	2.1	Suburban Community
Suisun City	4.01	7353.62	24.82	5.1	Suburban Community
Vacaville	29.87	3310.18	14.44	1.2	Suburban Community
Dixon	7.1	2828.73	15.01	0.3	Suburban Community
Davis	9.97	6874.92	20.84	7.6	Suburban Community
West Sacramento	21.46	2475.59	14.29	1.9	Suburban Community
Sacramento	98.61	5079.91	20.21	3.3	Suburban Community
Downtown Sacramento	9.46	5506.39	20.46	4.85	Suburban/Central City
Downtown Davis	0.8	6434.34	24.15	8.6	Suburban/Urban Community
Downtown Vallejo	2.39	6125.94	3.37	18.42	Suburban Community
Downtown Fairfield	25.65	1124.84	1.15	1.3	Suburban Community
Downtown Vacaville	4.71	2044.88	1.37	0.62	Suburban Community

For some areas, there was a need for professional judgment of place type because the metrics do not match a single place type category. Using the place type metrics alone, downtown Sacramento was identified as a Suburban Community. This is because although downtown Sacramento has high road density, it has low population density and low transit mode share. The low population density and transit mode share is because downtown Sacramento consists of mostly commercial and office land uses and is lacking in housing. However, the Sacramento Central City Specific Plan acknowledges this lack of housing and puts forth a planning framework for increasing housing options in the downtown area. Because of this, and the fact that downtown Sacramento has the high road density to support high transit mode share given a higher population density, it can be assumed that the population density and transit mode share will increase as housing options are added and thus the area has been identified as a Central City. The SMF also lists downtown Sacramento as an example of a Central City.

Similarly, downtown Davis was identified as a Suburban Community using the place type metrics alone. This is because although downtown Davis has high road density and relatively high transit mode share, it has low population density. It also consists of mostly commercial land uses and has inadequate housing opportunities. The downtown Davis Specific Plan acknowledges this lack of housing and seeks to expand housing options to the downtown area. Because of this, and the fact that downtown Davis has high road density as well as relatively high transit mode share, it can be assumed that the population density and transit mode share will increase as housing options are added and thus the area has been identified as an Urban Community.

A deeper analysis was also conducted on the downtown areas of Vallejo, Fairfield, and Vacaville. However, there was not sufficient evidence to support identifying them as a different place type than what was found based on the place type metrics alone.

Transportation Project Priorities

Place types are a tool to classify neighborhoods, towns, cities, and larger areas for purposes of making investment, planning, and management decisions that advance smart mobility and help determine transportation needs. The SMF identifies transportation project priorities for each place type so a greater location efficiency can be achieved, and more smart mobility benefits can be realized in the future. **Table 3.14** lists the SMF transportation project priorities for the place types along the I-80 corridor.

TABLE 3.14 | SMART MOBILITY FRAMEWORK TRANSPORTATION PROJECT PRIORITIES

Place Type	Transportation Project Priorities
Central Cities	• Direct service by high capacity and high-speed transit serving local and regional destinations and state-wide destinations • Creation and improvement of major transportation hubs connecting modes for intercity and international travel as well as intra- and inter-regional movement • Coordination of transit and related systems to provide convenient multimodal trips • Pedestrian facilities with high amenity levels • Extensive network of bicycle facilities • Shared mobility opportunities • Complete Streets facility treatments • Limited parking to reduce demand • Projects providing service, facility, and connectivity improvements to provide an equivalent level of activity connectedness to all population groups • Design and speed compatibility with surroundings

	• Operating strategies to optimize use of existing roadway capacity
Urban Communities	• Pedestrian facilities with high amenity levels • Extensive network of bicycle facilities • Convenient opportunities for multimodal transfers and transit transfers • Design and speed compatibility with surroundings • Shared mobility opportunities • Complete Streets facility treatments • Limited parking to reduce demand
Suburban Communities	• Improvements to network connectivity to reduce route/trip lengths and opportunities to encourage non-SOV trips • Complete Street facility treatments near schools and areas with an opportunity to transition to Urban Community place types • Transit, on-demand transit, or rideshare implementation attached to employment centers where appropriate • Access management and speed management on arterial streets

Chapter 4 | Multimodal Facilities and Needs

As a multimodal transportation corridor, the I-80 corridor serves the movement of people and goods with a variety of transportation modes. This chapter describes public transit services, park and ride (P&R) facilities, bicycle and pedestrian facilities, private commuter shuttle services, and micro/shared mobility options as available transportation modes within the I-80 corridor. It also identifies programmed, planned, and in some cases visionary multimodal projects within the corridor. In addition, the chapter summarizes the ZEV and Broadband infrastructure, Transportation Systems Management and Operations strategies and equipment that are currently deployed within the corridor and examines the networks and major trip generators for freight movement.

Caltrans has adopted Deputy Directive 64-R2[37] to incorporate complete streets into all phases of project development. At the regional and county levels, Metropolitan Transportation Commission (MTC) has complete streets requirements in order to qualify for certain funding programs, such as the One Bay Area Grant program. Sacramento and Yolo counties both have complete streets requirements in order to meet Sacramento Area County of Governments (SACOG) ATP funding requirements created under SB 99 in 2013.[38]

4.1 | Transit Services

A number of public transit agencies provide services within the I-80 corridor. Some agencies are specialized in one type of service, while others provide a variety of transit services. The following section outlines the express bus service, local bus service, light rail, Capitol Corridor, transit centers, and ferry service.

Express Bus Service

Solano Transportation Authority (STA)/Solano Express manages a fleet comprised of a total of 37 buses, 19 of which are operated by Fairfield Suisun Transit (FAST) and the remaining 18 by Solano County Transit (SolTrans), which provides both express-intercity and local bus service in and beyond Solano County. In addition, Napa Vine also provide express bus service within the corridor.

The Yolo County Transportation District (YCTD) fleet of Yolobus buses consist of 44 transit size coaches powered by Compressed Natural Gas (CNG), six highway coaches that run on clean diesel and 10 cutaway buses and vans that primarily serve the elderly and disabled. Yolobus services Yolo County which covers West Sacramento, Davis, and Woodland.

The Sacramento Regional Transit District (SacRT) fleet consists of 205 buses powered by CNG and 23 shuttle vans. SacRT operates 78 fixed bus routes with connecting bus service in the Sacramento area covering 440 square miles. In addition to serving the City of Sacramento, SacRT serves the Sacramento International Airport, much of the norther portion of Sacramento County that includes the incorporated cities of Citrus Heights and Rancho Cordova, as well as unincorporated areas of Sacramento County that includes the Arden Arcade, Carmichael, Fair Oaks, Florin, Gold River, North Highlands, Orangeville, Rio Linda, and Rosemont communities. Recently SacRT expanded its transit system by taking over the Elk Grove Transit service known as e-tran. SacRT operates e-tran as a contractor for the City of Elk Grove replacing MV Transportation Incorporated.

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[37] https://www.calbike.org/wp-content/uploads/2019/08/DD64_R2.pdf

[38] file:///C:/Users/s131651/Downloads/Status%20of%20the%20State%20and%20Regional%20Active%20Transportation%20Program%20Competitions_202108242114376.pdf

Table 4.1 lists the express bus routes that travel along the I-80 corridor.

TABLE 4.1 | EXPRESS BUS ROUTES ALONG I-80 IN SOLANO COUNTY

Operator	Route	Origin-Destination	Between Interchanges		Approximate length along I-80 (miles)
FAST	Blue	Downtown Sacramento – Pleasant Hill Bay Area Rapid Transit (BART) Station	Jefferson Avenue – I-80	I-680 Fairfield	44.0
	Green (GX)	Suisun City Amtrak Station – El Cerrito Del Norte BART Station	SR 12 E	Cutting Boulevard El Cerrito	28.3
	7	Fairfield Transportation Center – Solano Community College – Green Valley Shopping Center	SR 12 W	Suisun Valley Road Fairfield	3.3
SolTrans	38	Gateway Plaza – Jesse Bethel High School	Magazine Street	E. Lincoln Road Vallejo	2.1
	82	Vallejo Transit Center – El Cerrito Del Norte BART Station – San Francisco Ferry Building	I-780	Fremont Street San Francisco	28.9
	Red	Suisun City Amtrak Station – Del Norte BART Station	SR 12 W	SR 37	11.0
			I-780	Cutting Boulevard El Cerrito	14.6
Napa Vine	21	Soscol Gateway Transit Center – Suisun City Train Depot	SR 12W	SR 12 E	4.2
Yolobus	43/43R	Downtown Sacramento – Davis/UC Davis	Tower Bridge Gateway	Mace Boulevard	9.4
	230	West Davis – downtown Sacramento	SR 113/I-80 Interchange	Tower Bridge Gateway	13.8
SacRT	138	Silo Terminal (Davis) – UC Davis Medical Center	SR 113/I-80 Interchange	Stockton Boulevard	17.3

Local Bus Service

Within Yolo County, YCTD operates Yolobus which is the only fixed route bus service. Yolobus operates five local routes that serve primary connections within Davis, West Sacramento, downtown Sacramento, and eastern part of Solano County. Yolobus also provides daily service to Sacramento International Airport and is the only public transit providing daily service to Cache Creek Casino Resort. YCTD operates two types of routes, a regular routes which operates hourly during five to seven days a week, and commuter and express routes that only operate at peak times in the mornings and evenings, Monday through Friday.

Within Sacramento County, the primary local bus service is provided by SacRT which does not primarily utilize I-80 as part of its bus routes as their routes mostly intersect I-80 on the local street network at interchange locations.

There are three local transit operators within Solano County providing fixed route bus service: SolTrans operates nine local routes that serve primary connections within Vallejo and Benicia. FAST operates eight local routes Monday through Saturday and a single weekday school route, while Vacaville City Coach offers service on six local routes Monday through Saturday. Additionally, SolTrans complements their local service in Benicia by partnering with Lyft to offer rides from Benicia to retail and medical locations within Benicia and Vallejo. Aside from fixed route service, both FAST and Vacaville City Coach offers a Dial-a-Ride paratransit service, while Dixon Readi-Ride provides weekday Dial-a-Ride transit service to all Dixon residents that also connects to Vacaville and Davis. A list of fixed bus routes that cross and/or travel adjacent to I-80 in Solano, Yolo, and Sacramento counties is included in **Table 4.2**.

TABLE 4.2 | FIXED ROUTE BUS SERVICE

Operator	Route	Origin-Destination	Crossing I-80	Major Roads adjacent to I-80
FAST	1	Fairfield Transportation Center – Armijo High School – Fairfield-Wal Mart	Not Applicable	Texas Street/N. Texas Street
	2	Solano Town Center - Grange Middle School – Vacaville/Fairfield Amtrak Station	Not Applicable	Travis Boulevard
	3	Fairfield Transportation Center- Solano Town Center – Fairfield Wal Mart	Travis Boulevard Texas Street	Travis Boulevard, Texas Street, Air Base Parkway
	4	Fairfield Smart & Final – David Grant USAF Medical Center	Not Applicable	N. Texas/Air Base Parkway
	5	Fairfield Transportation Center – Suisun City Amtrak Station – Suisun City Senior Center	Not Applicable	Beck Avenue/Cordelia Road
	8	Green Valley Shopping Center – Rodriguez High School – Cordelia Hills Elementary School	Green Valley Road	Business Center Drive
SolTrans	3	Vallejo Transit Center – Beverly Hills Elementary School – Curtola P&R	I-780	SR 29
			Magazine Street	
	6	Vallejo Transit Center – Rosewood Hogan Middle School	Tennessee Street	Admiral Callaghan Lane
	7A	Vallejo Transit Center – Solano Community College	Columbus Parkway	Fairgrounds Drive
			Redwood Parkway	Admiral Callaghan Lane
	7B	Vallejo Transit Center – Gateway Plaza – Sereno Transit Center	Solano Avenue	Admiral Callaghan Lane
			Redwood Parkway	
	8	Vallejo Transit Center – Rosewood Hogan Middle School	Benicia Road	Not Applicable
	Yellow	Vallejo Transit Center – Pleasant Hill and Walnut Creek BART Stations	I-780	Curtola Parkway
Vacaville City Coach	1	Vacaville Transportation Center – Kaiser Medical Center	Leisure Town Road	Yellowstone Drive
	2	Vacaville Transit Plaza – Davis Street P&R	Not Applicable	E. Monte Vista Avenue
	3	Vacaville Transportation Center – Foxboro Elementary School	Not Applicable	Nut Tree Parkway
	4	Vacaville Transportation Center – Genentech - Kaiser Medical Center	Vaca Valley Parkway	I-80/I-505/Orange Drive/Nut Tree Parkway
	5	Vacaville Transit Plaza – Vacaville Transportation Center	Alamo Drive	Nut Tree Parkway
	6	Vacaville Transit Plaza – Vacaville Transportation Center	Nut Tree Road	Not Applicable
YoloBus	42A/42B	Yolo County Intercity Loop (Clockwise and Counterclockwise)	Enterprise Boulevard	Mace Boulevard

Operator	Route	Origin-Destination	Crossing I-80	Major Roads adjacent to I-80
	35	Southport Local (West Sacramento Transit Center – Southport)	Westacre Road	Not Applicable
	39	Southport – Sacramento Commute	5th Street	Not Applicable
	240	West Sacramento – Sacramento Shuttle	Reed Avenue	West Capitol Avenue
	241	West Sacramento – Sacramento Commute	Enterprise Boulevard	West Capitol Avenue
SacRT	11	Land Park/City College - Natomas/Club Center	Truxel Road	Not Applicable
		Natomas/Del Paso Road – W. El Camino Avenue & Watt Avenue	Truxel Road	Not Applicable
	11	Land Park/City College - Natomas/Club Center	Truxel Road	Not Applicable
	13	Natomas/Del Paso Road – W. El Camino Avenue & Watt Avenue	Truxel Road	Not Applicable
	15	Arden Way/Del Paso Road Station – Watt Avenue/I-80 Station	Watt Avenue	Not Applicable
	19	Arden Way/Del Paso Road Station - Watt Avenue & Alverta	Norwood Avenue	Not Applicable
	26	Watt Avenue & Elverta Road - University/65th Street Station	Watt Avenue	Not Applicable
	84	Watt Avenue/Manlove - Watt Avenue & Elverta Road	Watt Avenue	Not Applicable
	93	Louis & Orlando – Watt Avenue/I-80	Watt Avenue	Not Applicable
	113	Truxel/Gateway Park to Arden Way Del Paso Road	Northgate Boulevard	Not Applicable
	142	Downtown Sacramento – Sacramento International Airport	I-80/I-5 Interchange	Not Applicable
Unitrans	A	Amtrak/5th Street Alhambra	Mace Boulevard	5th Street
	K	Lake/Arlington/Arthur	Not Applicable	Russel Boulevard
	L	E 8th Street/Pole Line/Moore/Loyola	Not Applicable	East 8th Street
	M	B Street/Cowell/Drew	Cowell Boulevard	Not Applicable
	O	Amtrak/5th Street/Alhambra/Target	Not Applicable	5th Street, Alhambra Drive, 2nd Street
	P & Q	Davis Perimeter Clockwise and Counterclockwise	Pole Line Road, Mace Boulevard	Russel Boulevard, 5th Street, Cowell Boulevard, Covell Boulevard
	Z	Amtrak/Cantrill/5th Street	Not Applicable	5th Street, Alhambra, and 2nd Street

Light Rail

SacRT operates three light rail lines in the greater Sacramento metropolitan region, the Blue Line, Green Line, and Gold Line. The Blue Line runs from the Watt Avenue/I-80 station to the Cosumnes River College station in Elk Grove and intersects with segment 8 of the I-80 corridor at the Watt Avenue/I-80 station. The Green Line runs from the 13th Street station in downtown Sacramento to the Richards Boulevard/Township 9 station just north of downtown Sacramento, with long range plans for an extension to the Sacramento International Airport. These plans will extend the light rail line by 13 miles north from downtown Sacramento and the River District to communities in North Natomas and eventually the airport. The Green Line extension, when complete, will cross the I-80 corridor in segment 8. The Gold Line runs from the SVS in downtown Sacramento to the Historic Folsom Station in Folsom.

In 2020 SacRT was awarded $23.6 million in funding from the SB 1 TIRCP managed by CalSTA to purchase eight new low-floor light rail vehicles to enable low-floor operations on the Gold Line. This project leverages investment in targeted low-floor conversions along the Gold Line awarded in 2018, providing better accessibility to passengers with disabilities, bicycles, and strollers, and help reduce traffic congestion.

TABLE 4.3 | LIGHT RAIL

City	Rail Line	Station Name
Sacramento	Blue Line	Watt Avenue/I-80
		Watt Avenue/I-80 West
		Roseville Road
		Marconi Avenue/Arcade Boulevard
	Green Line	Township 9 Station
	Gold Line	SVS
	All Three Lines	7th Street & Capitol
		8th Street & Capitol
		8th Street & O Street
		Archives Plaza
		13th Street Station

Amtrak/Capitol Corridor

The Capitol Corridor, which began service in 1991, is a 168-mile intercity-passenger train route that connects San Jose to Oakland and Sacramento. This is one of three intercity passenger train corridors that Caltrans provides the necessary funds to operate the service. Additionally, Caltrans owns the rolling stock. Since 1998, the route has been administered by the Capitol Corridor Joint Powers Authority (CCJPA). The service provides connections to Auburn, Roseville, and San Francisco (via thruway bus service) as well as to BART stations at the Richmond and Oakland Coliseum Stations.

FIGURE 4.1 | AMTRAK'S CAPITOL CORRIDOR PHOTO

Along the I-80 corridor, this service runs between Sacramento (with limited service to Auburn) and San Jose with two Solano County stations (Suisun/Fairfield Station and the recently opened Fairfield-Vacaville Station), one Yolo County Station (Davis Station) and one Sacramento County station (SVS). These stations provide a crucial connection between the intercity rail service and local transit services.

Current TIRCP funded projects include third track service between Sacramento and Roseville, integrated ticketing, South Bay Connection and Link 21 program alternative development. Additional planned system improvements include operational enhancements and investments focusing on passenger service between San Jose and Sacramento by increasing speeds to reduce headways and travel time. Construction of additional sidings and /or alternative alignments and replacing existing infrastructure to reduce or eliminate bottlenecks and chokepoints causing delays in the movement of freight and passengers along the corridor.

Transit Centers

In addition to the Amtrak stations within the corridor that serve as transportation hubs, there are transit centers that provide connections between local and regional bus transit option. Within Solano County there are three transit centers, the Fairfield Transportation Center which is served by FAST and SolTrans Blue, Green, and Red Express lines, and acts as a P&R facility with 640 available parking spaces. The Vacaville Transportation Center which is served by the FAST Blue Line and Vacaville City Coach express service. This facility also provides 225 parking and 22 vanpool spaces. Lastly, the Vallejo Transit Center serves as the mega-transfer point for bus traffic between both Napa and Solano County outbound to San Francisco and other Bay Area communities. Facilities at this transit center include a twelve-bay bus shelter for riders, public parking, and proximity to connections at Vallejo Ferry Terminal.

There are five transportation centers within Sacramento and Yolo counties that serve as hubs for connections between local and regional transit options. City of Davis in Yolo County has three transit center locations serving the I-80 corridor inter-system transfer: Train Depot (Capitol Corridor, Amtrak, Unitrans) and the UC Davis Memorial Union (Yolobus and Unitrans), and the UC Davis Silo (FAST and Unitrans). Sacramento County is served by the West Sacramento Transit Center (Yolobus and SacRT) and SVS in downtown Sacramento serves as a transit center for SacRT.

Ferry Service

Water Emergency Transportation Authority (WETA) is a regional public transit agency tasked with operating and developing ferry service on the San Francisco Bay and coordinating water transit response to regional emergencies. Under the brand name San Francisco Bay Ferry, WETA currently serves the cities of Alameda, Oakland, Richmond, San Francisco, South San Francisco, and Vallejo, utilizing a fleet of twelve high speed passenger-only ferry vessels. The Vallejo Ferry – San Francisco route is the busiest service in the entire system, regularly reaching 97 percent occupancy. During the summer, the Vallejo

Terminal operates fifteen outgoing and fourteen incoming boats during the weekdays and seven outgoing and incoming boats on weekends. The Ferry Terminal is located next to the Vallejo Transit Center which is directly connected to SolTrans local fixed and regional express routes (the Solano Express Red and Yellow Lines), and the Napa eVine Routes 11 and 29. There are plans to increase service for Solano Express and the Vallejo Ferry as part of SB 1 funding and potential future bridge toll funding increases from Regional Measure 3.

4.2 | Park and Ride Facilities

The Caltrans P&R Program facilitates access to transit and ride-sharing services along freeway corridors with the goal of reducing congestion and VMT. A mode shift away from single-occupancy vehicles (SOV) helps reduce congestion, improves air quality, and helps Caltrans meet its sustainability goals. Due to limited funding capacity for P&R projects, Caltrans is focusing on collaboration with local jurisdictions, regional and transit agencies to develop partnership opportunities to enhance, expand, and/or construct P&R facilities.

Existing Park and Ride Inventory along the I-80 Corridor

Along the I-80 corridor in Solano County, there are 17 locations either owned and maintained by Caltrans or local jurisdictions featuring just under 1,900 parking spaces[39], and most facilities including ZEV charging stations, bicycle storage, and access to transit for I-80 corridor travelers.

Along the District 3 portions of the I-80 corridor in Yolo and Sacramento Counties, there are two P&R locations either owned and maintained by Caltrans or local jurisdictions featuring 1,667 parking spaces. More information about the current Caltrans P&R inventory and the services available at each can be seen below in **Table 4.4**. In addition, **Table 4.5** displays 14 P&R facilities within the I-80 corridor that are operated and maintained by local jurisdictions.

TABLE 4.4 | CALTRANS OWNED PARK AND RIDE FACILITIES

City	Location	Parking Spaces	Electric Charging Spaces	Bike Parking	Transit Services
Vallejo	Magazine Street & I-80	19	No	No	No
	Benicia Road & I-80	80	No	No	No
Vacaville	Cliffside Drive & Mason Street	125	No	No	No
West Sacramento	Enterprise Boulevard @ I-80 (North)	96	No	No	Yes
	Enterprise Boulevard @ I-80 (South)	79	No	No	No

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[39] http://www.dot.ca.gov/d4/parkandride/

TABLE 4.5 | LOCALLY OWNED PARK AND RIDE FACILITIES ALONG I-80

City	Location	Parking Spaces	Electric Charging Spaces	Bike Parking	Transit Services
Vallejo	Curtola Parkway & Lemon Street	592	4	Yes	SolTrans, Solano Express Yellow Line
	Lemon Street & Curtola Parkway	64		Yes	SolTrans
	Vallejo Transit Center Sacramento Street	900	4	Yes	SolTrans, VINE, VA Medical Shuttle, Private Bus, Solano Express Red & Yellow Lines
	Vallejo Ferry Terminal Mare Island Way & Georgia Street				San Francisco Bay Ferry
Fairfield	Red Top Road Northwest of I-80	214	No	Yes	Private Bus
	Fairfield Transportation Center (Casdenasso Drive)	640	2	Yes	FAST, Rio Vista Delta Breeze, VINE, Solano Express Blue, Green, & Red Lines
	Oliver Road & Hartford Avenue	178	No	No	No
Suisun City	Suisun City Train Depot (Main Street & Lotz Way)	306	3	Yes	Capitol Corridor, FAST, Rio Vista Delta Breeze, Greyhound, VINE, Solano Express Green & Red Lines
Vacaville	Davis Street & I-80	250	4	Yes	Vacaville City Coach, Yolobus-Saturdays, VA Medical Shuttle (on request)
	Bella Vista Avenue & I-80	201	8	Yes	No
	Vacaville Transportation Center	249	No	No	Vacaville City Coach, FAST, Yolobus weekdays, Solano Express Blue Line
	Leisure Town Road & I-80	45	2	No	No
Dixon	Market Lane & Pits School Road	90	No	Yes	Dixon Redi-Ride, Solano Express Blue Line, Private Bus
	N. Jefferson & West B Street	114	No	Yes	Dixon Redi-Ride
Davis	County Road 32 at Mace Boulevard	147	Yes	No	Yes
Sacramento	Watt Avenue/I-80	248	No	No	Yes
	Roseville Road	1,087	No	No	Yes

Planned Park and Ride Facility Improvements in the I-80 Corridor

The following P&R projects are planned for the I-80 corridor in Solano, Yolo, and Sacramento counties:

- Vallejo: Curtola P&R Battery Electric Bus Infrastructure Improvements | Install two 300-kilowatt inductive battery electric bus chargers.
- Vallejo: Vallejo Station Parking Structure | Construct parking structure and a pedestrian link between Vallejo Transit Center and Ferry Terminal.
- Vallejo: Fairgrounds Drive P&R | Construct a P&R facility to coordinate with Solano Express and car/vanpool needs.
- Fairfield: Fairfield Transit Center (FTC) Phase II | Reconfigure access into and out of the FTC and construct additional parking spaces.
- Suisun City: Construct a new parking structure to accompany new Amtrak ridership and housing.
- Vacaville: Construct a multi-level parking structure at Vacaville Transit Center and create shuttle to the Fairfield-Vacaville Amtrak/Capital Corridor rail station.
- City of West Sacramento: Enterprise south P&R | Upgrade existing P&R to align with shift towards mobility hub. Proposed enhancements include installation of four direct current rapid charging stations, 10 dual-port level 2 charging stations, bus shelter, and bike lockers.

4.3 | Bike and Pedestrian Facilities

Biking and walking are important active transportation modes to address the corridor goals. While bicycles and pedestrians are prohibited on I-80 and US 50 within the I-80 CMCP study area, this CMCP focuses on freeway crossings as well as local facilities that are parallel to the freeway to accommodate active transportation modes. A network of bicycle and pedestrian facilities was developed, which was informed by the Caltrans District 4 Bike Plan[40] and Pedestrian Plan[41], the STA Countywide Active Transportation Plan[42], Caltrans District 3 Caltrans Active Transportation Plan, SACOG's bike and pedestrian project list, and the City of Sacramento's active transportation projects.

The bicycle and pedestrian network developed in this I-80 CMCP envisions a seamless network of pedestrian and bicycle facilities that would provide safe and reliable access to transit and schools, and a contiguous parallel cycling route within a 1-mile buffer of the corridor that would allow cyclists to traverse the three counties by traveling across segments of local and regional network facilities. A list of existing bike facilities and planned projects was first compiled from the plans referenced above and an accompanying web map (see **Figure 4.2** and **Figure 4.3**) was developed to help visualize the network and identify gaps. Next, the planned projects were verified with respective stakeholder agencies. Additional projects were then proposed by the CDT to close the gaps and those proposals were vetted by corridor stakeholders and added to the web map to form the final I-80 CMCP bicycle and pedestrian network.* The planned and proposed projects are further discussed in Chapter 9 (see **Table 9.2**).

Overall, a total of 43 freeway crossings along the corridor were identified in Solano County, seven in Yolo County and nine in Sacramento County. It should be noted that the I-80 CMCP network connects to other local facilities and is part of the larger active transportation network.

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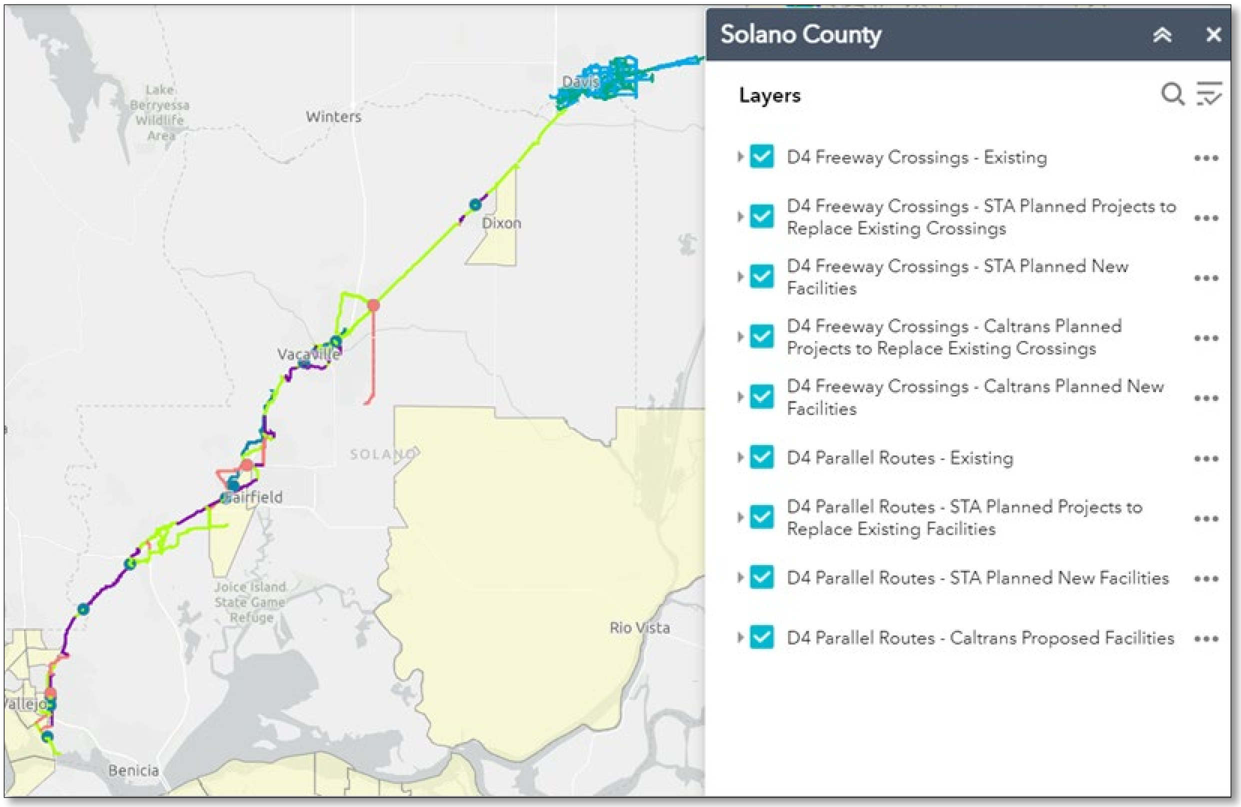
[40] https://dot.ca.gov/caltrans-near-me/district-4/d4-popular-links/d4-bike-plan

[41] https://storymaps.arcgis.com/stories/9a25b6f7dcf146328663b62660a0b6f9

[42] https://sta.ca.gov/documents_and_report/solano-countywide-active-transportation-plan/

*Some of the projects or project segments in Solano County are outside the 1-mile buffer area due to how they are coded in the geodatabase of the Solano Countywid Active Transportation Plan



Solano County

Layers

☑ D4 Freeway Crossings - Existing

☑ D4 Freeway Crossings - STA Planned Projects to Replace Existing Crossings

☑ D4 Freeway Crossings - STA Planned New Facilities

☑ D4 Freeway Crossings - Caltrans Planned Projects to Replace Existing Crossings

☑ D4 Freeway Crossings - Caltrans Planned New Facilities

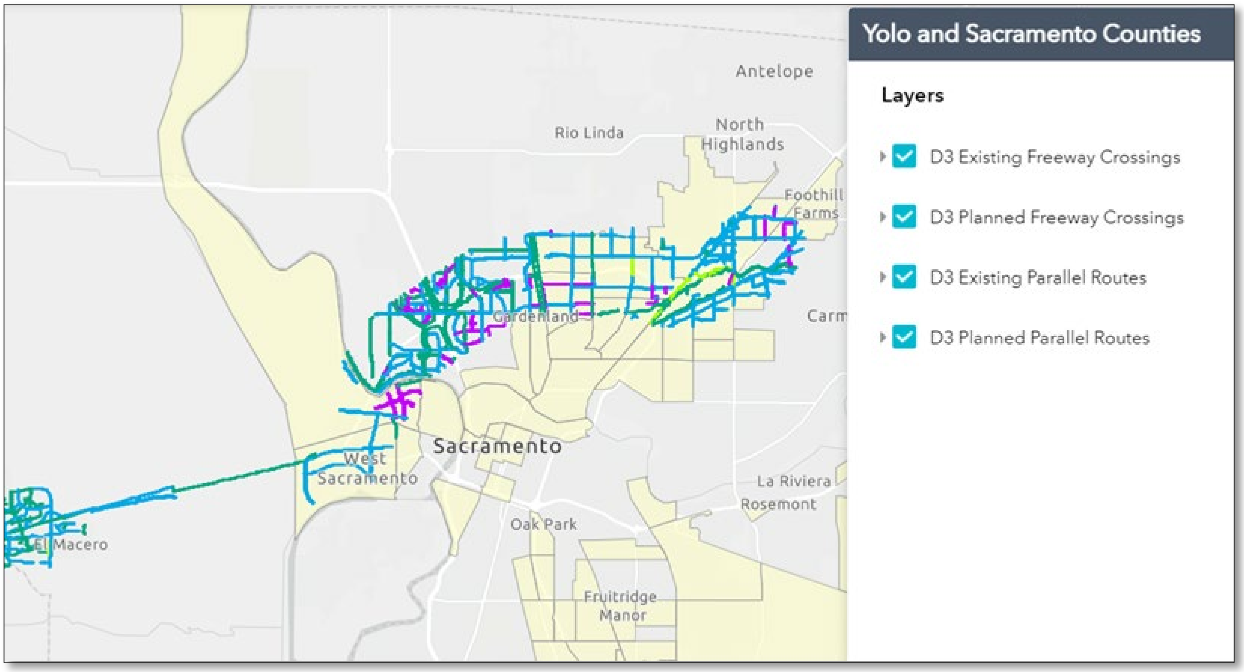
☑ D4 Parallel Routes - Existing

☑ D4 Parallel Routes - STA Planned Projects to Replace Existing Facilities

☑ D4 Parallel Routes - STA Planned New Facilities

☑ D4 Parallel Routes - Caltrans Proposed Facilities

FIGURE 4.2 | BICYCLE AND PEDESTRIAN WEB MAP SOLANO COUNTY



Yolo and Sacramento Counties

Layers

☑ D3 Existing Freeway Crossings

☑ D3 Planned Freeway Crossings

☑ D3 Existing Parallel Routes

☑ D3 Planned Parallel Routes

FIGURE 4.3 | BICYCLE AND PEDESTRIAN WEB MAP YOLO AND SACRAMENTO COUNTIES

4.4 | Transportation Demand Management

Transportation demand management also known as traffic demand management or TDM is a broad application of incentive driven programs and strategies aimed at reducing Single Occupancy Vehicle (SOV) travel demand and shifting that demand to other active and transit modes for multiple users of a corridor during traditional travel periods when demand is high and during non-traditional travel periods when certain transportation service are not available. Such incentive programs include, but not limited to the following:

- Alternative mode travel incentives
- Carpool van incentives
- Subsidized transit passes
- Parking management programs
- Guaranteed ride home programs
- Alternative mode trip planning websites and applications

The Solano Mobility Program is an example of TDM programs in District 4 that includes the Safe Routes to School program that promotes active transportation modes to and from local schools and the Solano Community College Transportation Fee Program that lets students with ID ride Solano Express and local buses for free within the County.

The Yolo Commute is an example of TDM program in District 3 that includes ride matching services representing a commitment by public and private sector stakeholders and communities to address the increasing mobility needs the regional and help alleviate traffic congestion, air pollution, and fuel consumption. Sacramento Transportation Management Association also offers additional TDM options serving the Sacramento downtown area for commuters along the I-80 corridor

SACOG launched a new Innovative Mobility program in 2019 that combines traditional TDM activities with the development and testing of innovative mobility solutions. A major component of this new program is to fund demonstration projects that solve transportation challenges with new mobility solutions in the form of an accelerator program. Another large part of the program is to expand the reach of existing and new tools, programs, and incentives that reduce emissions and VMT.

4.5 | Other Mobility Services

Mobility Hubs

MTC has established a Mobility Hub Program with the goals focusing on coordination of existing and planned transit service, improving the safety, value, and experience of using transit, reducing GHG while promoting sustainable transportation modes, and achieving equitable mobility through low-cost and needs based anti-displacement measures.

The program defines a Mobility Hub as a location within a community that enables all users of the transportation network access to multiple transportation options and supportive amenities that offer safe, comfortable, and seamless transfer between different travel modes such as micro mobility/transit, and TDM programs ran by single or multijurisdictional Mobility Hub Managers or Agencies. Types of hubs include Regional downtown, Urban District, Emerging Urban District, Suburban-Rural, Pulse and Opportunity Hubs, each gaining its characterization based on the function of the facility (train/bus station), the capacity level, frequency and number of transit/bus service providers serving that location, the access to car, bike, and scooter shared services and an estimation of probable demand for Transportation Network Companies (TNC) like Uber and other for hire services like taxis. Using these criteria, the program's Implementation Playbook (April 2021) identifies three Mobility Hubs within the I-80 CMCP corridor.

- The Suisun-Fairfield Capitol Corridor/Amtrak Station is characterized as an "Emerging Urban District Hub" type for its access to high-capacity/frequency transit and bus service. Its lack of shared mobility services and the moderate demand for TNCs like Uber and other for-hire services.
- Fairfield and Vacaville Transportation Centers are characterized as Suburban-Rural Hub types due its P&R service and access to regional rail, frequent and infrequent local feeder bus services within car/bike share markets, and a moderate demand for TNCs and taxis.

In addition to the MTC program, Caltrans District 4 is currently conducting its own Mobility Hub Concept Study. The study will evaluate opportunities for the development of mobility hubs on Caltrans ROW within District 4 connecting multiple transportation modes, enable the integration of emerging technologies, and by provide travelers with the services and amenities supportive of sustainable travel. The result will select optimal candidate locations for mobility hub concepts and will inform future mobility hub projects.

4.6 | Transportation Systems Management and Operations

Caltrans is committed to effective TSMO strategies to optimize the performance of California's transportation systems for all users and modes of travel. Successful TSMO strategies require proactive integration of the transportation systems to efficiently move people and goods along highly congested urban corridors. Examples of TSMO strategies include but are not limited to ramp metering, traffic signal synchronization, ITS/TOS, and managed lanes. Efficiency can often be achieved by operational improvements through ITS deployment. Operations and Maintenance (O&M) resources are essential to achieve Caltrans fix-it-first target for ITS elements. As TSMO strategies are developed and implemented, additional ITS/TOS elements within the corridor are often required and O&M resource needs will continue to grow.

Caltrans Ramp Metering Development Plan[43]

As required by Caltrans DD-35-R1, each District that currently operates, or expects to operate ramp meters within the next ten years, shall prepare a Ramp Metering Development Plan (RMDP). According to the 2017 RMDP, there is a total of 49 existing and/or programmed ramp meters and another 38 planned ramp meter projects in District 4 on I-80 in Solano County, a top priority corridor for ramp metering implementation and activation. For District 3, there is a total of 43 existing ramp meters and 25 programmed and/or planned ramp meters on I-80 in Yolo and Sacramento counties, per the draft 2021 Ramp Metering Development Plan. Some of these programmed and/or planned ramp meters include the installation of a ramp meter for the High Occupancy Vehicle Preferential Lane of on-ramps that already meter the general-purpose lane.

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[43] http://www.dot.ca.gov/trafficops/tm/ramp.html

4.7 | Broadband

Broadband service has become an essential element of communication, an engine of economic activity, educational opportunity, civic engagement, access to health care, teleworking and much more. Income, education, disability status, age, race, and ethnicity all correlate with broadband availability and use. Residents in less populated areas generally have less access to broadband services. State highway ROW can be a source of expanding the broadband network which could provide increased accessibility to rural and other priority populations, including Tribal lands.

California Governor's EO N-73-20 creates the California Broadband Council and mandates the development of the California State Broadband Action Plan which directs CalSTA, Caltrans and the CTC examine their processes and implement the deployment of fiber optic and fiber optic conduit of the "middle mile" along the SHS. With Governor Newsom's approval of SB 156 Communications: Broadband in July 2021, a $6 billion multiyear investment was established to expand, enhance, operate, and maintain high-speed broadband internet infrastructure to unserved and priority populations. Caltrans will work closely with the newly established Office of Broadband and Digital Literacy to construct a statewide open-access middle-mile broadband network.[44] Caltrans encourages developing partnerships with stakeholders and the regional broadband consortium during planning, environmental scoping, and project development to integrate broadband into projects.

4.8 | Freight Network, Facilities, and Trip Generators

I-80 is identified on the federally designated National Highway Freight Network (NHFN) as a Primary Highway Freight System (PHFS) route and is part of the Surface Transportation Assistance Act of 1982 National Network. The corridor directly serves the Port of West Sacramento and provides freight connections to the agricultural and manufacturing producers throughout Solano, Yolo, and Sacramento counties. The State is committed to a broader, long-term vision for accelerating the transition of California's multimodal freight system from its already robust stature to a safer, more efficient, and reliable, and less polluting freight system.

I-80 is also part of MTC's Northern California Megaregion Goods Movement Study, with support from Caltrans, the San Joaquin Council of Governments (SJCOG), SACOG, and the Association of Monterey Bay Area Governments (AMBAG). The megaregion contains many goods movement clusters (also known as freight-dependent industries), and I-80 is critical in connecting the San Francisco Bay Area to the Sacramento Valley/Central Valley.

4.9 | Zero-Emission Vehicle Infrastructure

At the federal level, I-80 from San Francisco to the California/Nevada border is ready for the refueling of Battery Electric Vehicle (BEV), CNG and Fuel Cell Electric Vehicles (FCEV) in FHWA's Alternative Fuel Corridors program. For a route to gain such status, FHWA requires that EV charging facilities be readily available at least every 50 miles or less, and AFC facilities be available very 100 miles or less. Currently, there are twenty-seven ZEV charging stations in the corridor serving battery, plug-in, natural gas, and hydrogen fuel powered private and commercial vehicle along the route in the urbanized areas of Vallejo, Fairfield, and Vacaville. And a total of 73 total ZEV charging stations dispersed in the urbanized areas of Davis, West Sacramento, and Sacramento. The sites include big box retailers like Walmart and Target, motel/hotel chains, locally operated P&R lots, privately owned and operated gas/truck stops, transit

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[44] https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202120220SB156

centers, and intercity rail stations accessible by priority populations and all users of the various transportation networks.

Directed by the Governor's EO N-79-20, the Office of Business and Economic Development (GO-Biz), the California ZEV Marketing Development Strategy, and the CAPTI, the Department has developed the ZEV Action Plan. The ZEV Action Plan lays out the State's path forward in the implementation of the goals and objective of the Governor's ZEV program to underserved, low-income, and Black, Indigenous, and People of Color Communities.

FIGURE 4.4 | CITY OF SACRAMENTO CURBSIDE CHARGING

Chapter 5 | Corridor Performance

5.1 | Introduction

The I-80 CMCP corridor spans three counties in two Metropolitan Planning Organization (MPO) regions. As a result, modeling of the corridor was separated into nine segments (see **Figure 5.1**) based on political boundaries, traffic volumes, as well as existing and planned lane configurations. For detailed maps by segment see **Appendix VI**. In total, the CMCP study area includes the entire I-80 corridor in Solano and Yolo Counties between the Carquinez Bridge and SR 51 junction in the City of Sacramento. A portion of US 50 is also included in this study area which begins at the I-80 interchange in West Sacramento and ends at the I-5 interchange in Sacramento. Due to the size of the corridor, and to take advantage of existing analyses, the modeling for the CMCP includes work from Cambridge Systematics (CS), Fehr and Peers, and Caltrans District 3 Modeling and Forecasting staff. The segments analyzed, performance measures, and modeling results were agreed upon by the TAC and stakeholder groups.

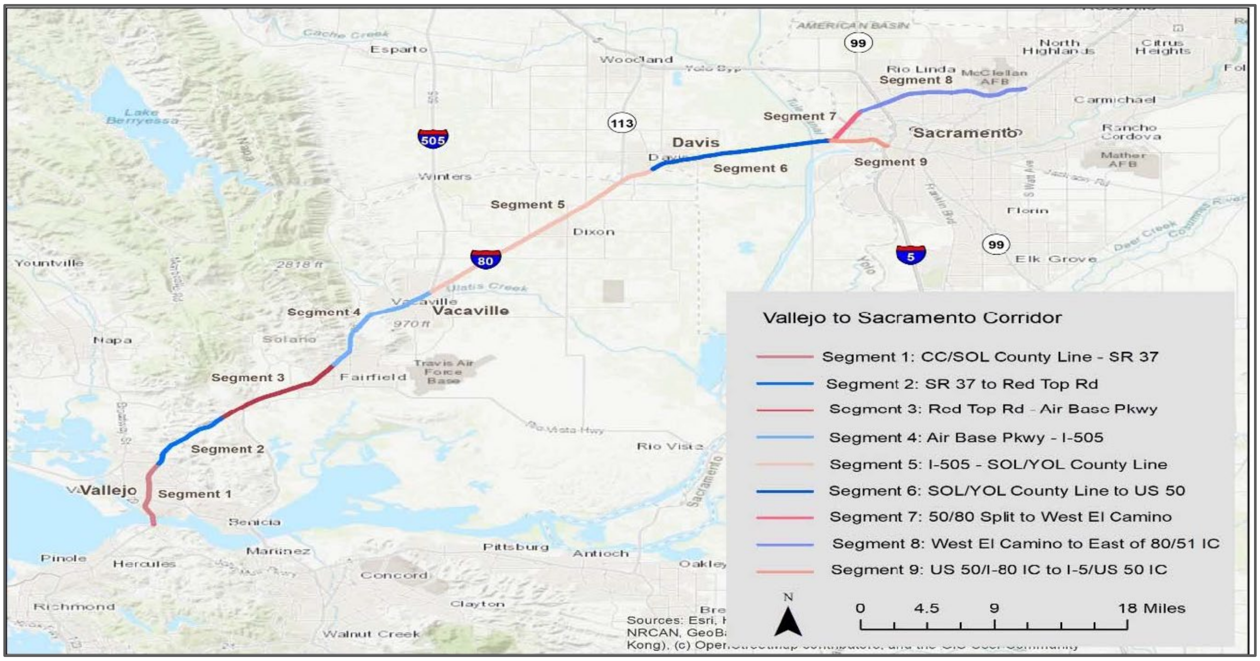


FIGURE 5.1 | I-80 CMCP CORRIDOR SEGMENT MAP

In Solano County, which covers Segments 1-5, CS performed a traffic operations analysis using both travel demand modeling and a microsimulation analysis for select segments that are currently experiencing congestion.

In Yolo and Sacramento Counties, Fehr and Peers conducted a project-level travel demand modeling analysis for Segments 6, 7, and 9, consistent with the scope and analysis from the I-80/US 50 Managed Lanes project.

Within Sacramento County, Caltrans District 3 Forecasting and Modeling staff conducted a travel demand modeling analysis for Segment 8 as this section of the corridor goes beyond the scope analyzed by Fehr and Peers as part of the I-80/US 50 Managed Lanes project.

This chapter highlights the findings from the final I-80 corridor Modeling and Analysis Project report completed by CS and findings from the US 50 Managed Lanes Study (see full report in **Appendix III)**.

5.2 | Model Development

This section presents a summary of the model development for the I-80 CMCP corridor analysis.

As stated earlier in the CMCP, the corridor encompasses two MPOs which utilize separate models for their respective RTPs. Due to this, data from the SNABM and the SACSIM19 were used in the I-80 Corridor Modeling and Analysis Project Summary report. As part of this effort, it required our team to match the traffic counts and reconcile the volumes of the SNABM model to the SACSIM19 model at the Solano and Yolo County line along I-80, I-505, and SR 113 corridors. This was needed to allow the two models to work cohesively together and ensure that the resulting traffic numbers form one set of contiguous data to the best extent feasible. Consistent with the map in **Figure 5.1**, traffic data for segments 1-5 were extracted from the SNABM model and segments 6-9 from the SACSIM19 model.

Two Verkehr In Städten – SIMulationsmodel (VISSIM {German for "Traffic in cities - simulation model”}) models were developed for two locations along the I-80 corridor at the cities of Vallejo and Fairfield. The microsimulation model networks include all freeway mainline and ramp segments, managed lanes, interchange ramps, and ramp intersections in the Vallejo and Fairfield study areas. The microsimulation model in the Vallejo area begins at the Alfred Zampa Memorial Bridge on the western edge of the model and extends to the east of Columbus Parkway/SR 37 interchange ramps (see **Figure 5.2**). The microsimulation model in the Fairfield area starts from west of the Red Top Road ramps and extends to east of Manuel Campos Parkway (see **Figure 5.3**). The freeway ramps and ramp terminal intersections are also included in the analysis. The microsimulation models were used to analyze existing conditions, Future No Build Scenario and three Future Build Scenarios (see section 5.5 for more detail), and the modeling networks match those of the travel demand forecasting models for each of the corresponding scenarios. Microsimulation analysis results are not included in this chapter, because microsimulation was conducted for select segments in Solano County only. The full microsimulation analysis report can be found in Appendix D-2 (Microsimulation Model Traffic Demand) as part of the I-80 Corridor Modeling and Analysis Project Summary report.

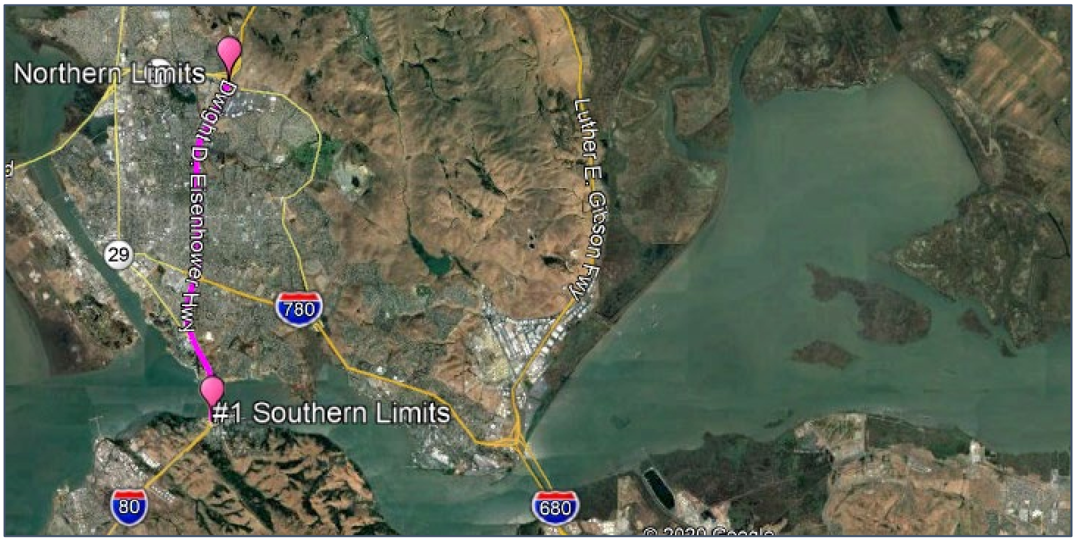


FIGURE 5.2 | I-80 VALLEJO AREA SIMULATION MODEL COVERAGE

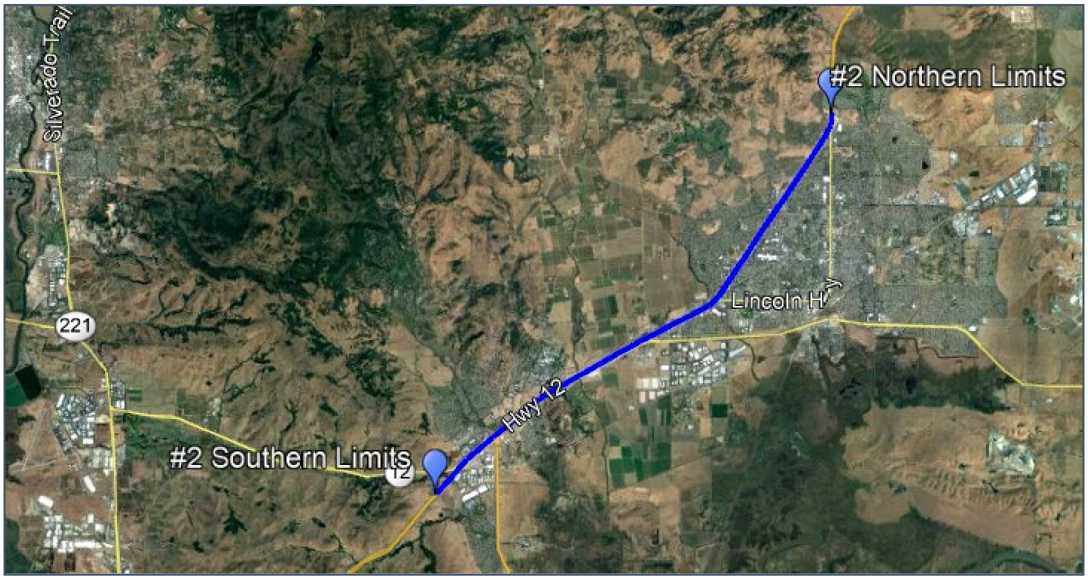


FIGURE 5.3 | I-80 FAIRFIELD AREA SIMULATION MODEL COVERAGE

The travel demand model and microsimulation model analyzed typical weekday traffic operating conditions, including A.M. (6:00 A.M.-10:00 A.M.) and P.M. (3:00 P.M. to 7:00 P.M.) peak periods. The models are not able to assess weekend conditions as there is not sufficient background data to support weekend models (lack of full weekend volume data and no regional travel demand models for weekend time periods). Also, weekend traffic analysis is typically not completed for corridor studies because the weekday commute peaks generally represent the worst-case conditions in most areas.

However, it is recognized that weekends have potential for increased congestion and different traffic peak periods than those that occur on the weekdays, due to higher levels of recreational and tourist activities. To assess weekend versus weekday conditions along I-80, some key performance metrics have been reviewed and compared between the weekday and weekend including speeds, location and extent of queues and traffic volumes. **Appendix B** of the I-80 Corridor Modeling and Analysis Project Summary report (see **Appendix III**) includes a memorandum with weekday to weekend operating conditions comparison. The weekday to weekend comparison found that along I-80 weekday conditions are generally worse than the weekends, although significant congestion was observed on Saturdays at some locations.

The modeling included an analysis of the existing conditions, the development of the Future No Build scenario as well as five Future Build scenarios. Due to the COVID-19 pandemic, and related Caltrans directives on data collection (no in-field data collection after March 2020), the team was unable to collect new data in the field, thus available historical data sources were used and applied. The existing scenario represents year 2019, or the last year of normal travel demand and operations before the beginning of the COVID-19 pandemic, which significantly changed the travel conditions throughout 2020 and 2021. As a result, 2019 was chosen as the year to replicate typical existing conditions for purposes of the modeling and analysis.

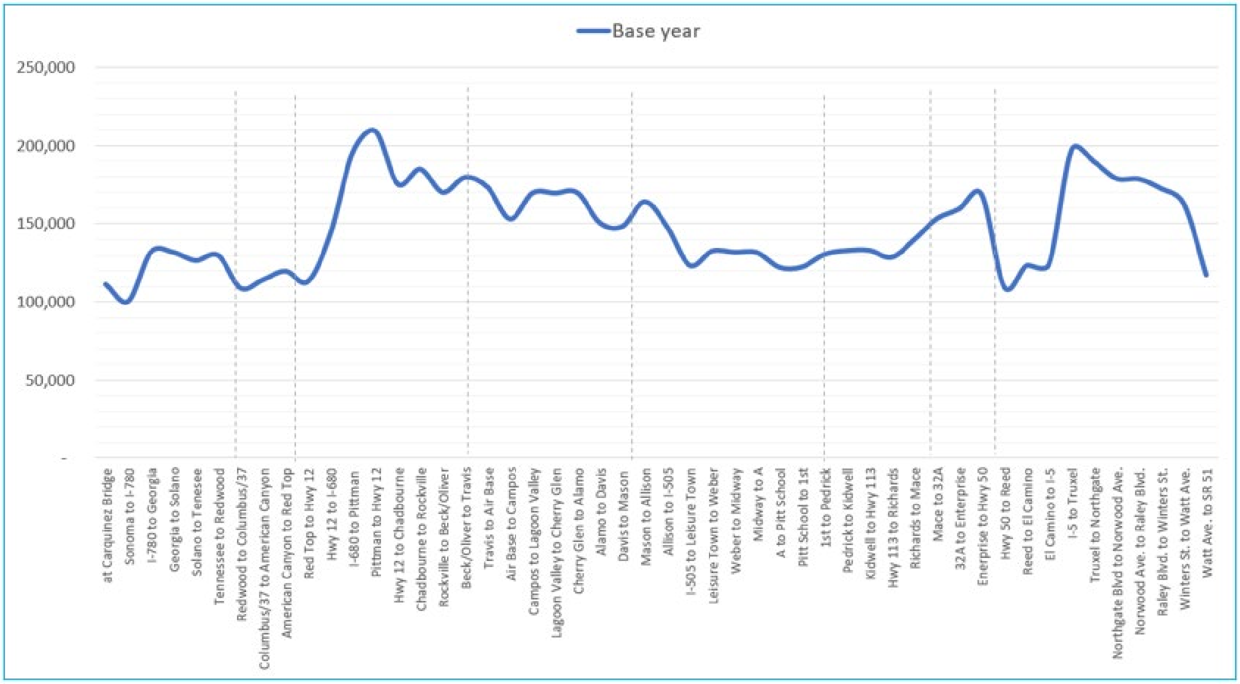
Future Build scenarios were developed through collaboration between both Caltrans District 3 and 4 and staff from CS. Caltrans staff included members from the CDT, Modeling and Forecasting, Traffic Operations, and Program Project Management from both districts. These scenarios were then approved by the I-80 CMCP TAC and stakeholder members. A detailed description of the Future Build scenarios can be found in *Section 5.5 | 2040 Future Year Build Scenarios*. Each Future Build scenario package of projects was measured against key transportation performance measures such as VMT, VHT and VHD.

5.3 | Existing Conditions

5.3.1 | I-80 Existing Conditions Traffic Volumes (Segments 1-8)

Existing travel demand models were updated to match existing 2019 conditions. Model enhancements and network updates were performed by CS on the SNABM model to make the model volumes match with observed field volumes. Detailed information of the base year model results is included in the base year memorandum in **Appendix C** of the I-80 Corridor Modeling and Analysis Project Summary report included in I-80 CMCP.

Figure 5.4 shows the daily traffic along the I-80 corridor in both directions combined. The corridor within the study area carries from 100,000 to over 200,000 vehicles on a daily basis in both directions, depending on location. The peak flow occurs near the I-680 junction with I-80, in Segment 3, which is nearly matched in the eastern portion of the study area in Sacramento. As shown in **Figure 5.5** and **Figure 5.6**, more than 95% of this vehicular traffic is auto traffic. There are less than 5% trucks along the corridor with about one-fifth of the vehicular traffic is shared ride (more than one occupant per vehicle).



Source: SNABM and SACSIM19 models

Figure 5.4 | Existing Daily Traffic on I-80 (both directions combined

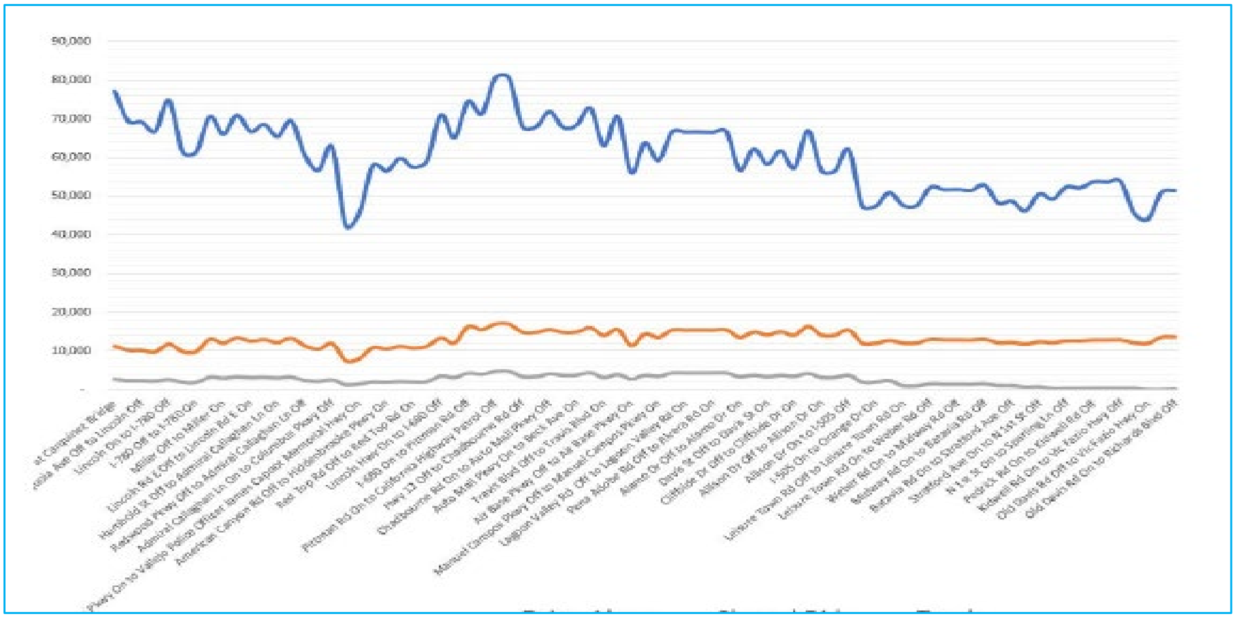


FIGURE 5.5 | I-80 EASTBOUND AUTO VOLUMES BY MODE AND TRUCK VOLUMES

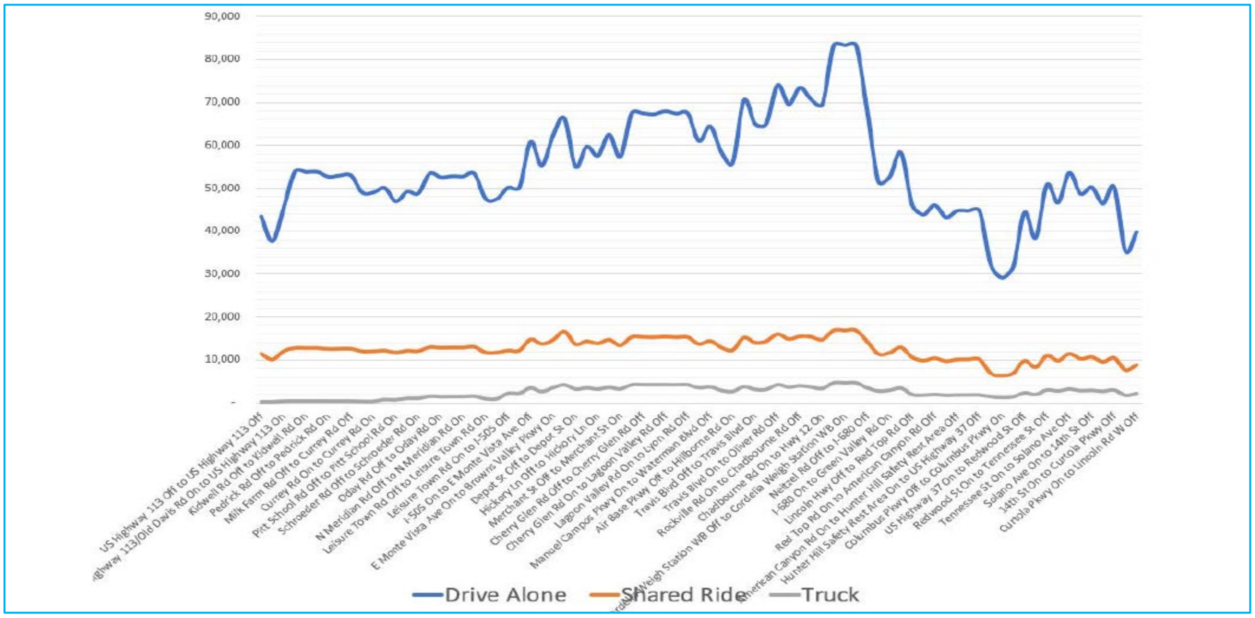


FIGURE 5.6 | I-80 WESTBOUND AUTO VOLUMES BY MODE AND TRUCK VOLUMES

5.3.2 | US 50 Existing Conditions Traffic Volumes (Segment 9)

The US 50 corridor within the study area carries from 140,000 to over 157,000 vehicles on a daily basis in both directions, depending on location. The peak flow occurs between Harbor and Jefferson Boulevards between I-80 and I-5 in Sacramento.

TABLE 5.1 | US 50 DAILY TRAFFIC VOLUMES (BOTH DIRECTIONS)

Daily Volumes Both Directions	I-80 to Harbor Boulevard	Harbor Boulevard to Jefferson Boulevard	5^Th^ Street Off-Ramp to I-5
	140,143	157,629	141,981

5.4 | 2040 No Build Scenario

The purpose of this scenario is to estimate future traffic volumes for 2040 along the I-80 corridor as a result of population and employment growth. It also shows how the corridor would perform without improvements except for projects that are currently under construction and projects that are fully funded and will be implemented by 2040. This scenario is assessed using the SNABM and SACSIM19 travel demand forecasting models. In addition, two simulation models were developed and calibrated to existing conditions and a 2040 No Build scenario was created within the VISSIM modeling platform.

The 2040 No Build scenario includes one of the key inputs to the model using socioeconomic data (SED) which is the basis of the activity of individual simulated households and persons. These key inputs include population, households, jobs, income, and other variables that affect trip making, producing an overview of the range of traffic demand growth expected along the I-80 corridor. The 2040 No Build scenario also includes assumptions regarding the freeway and arterial roadway networks. Model roadway networks are different for the base year model and 2040 No Build model due to planned improvements.

5.4.1 | 2040 Planned Projects in 2040 No Build Scenario

Before performing future analysis model runs, the 2040 highway model network was updated to include all under-construction and approved and fully funded roadway projects that will be completed by 2040.

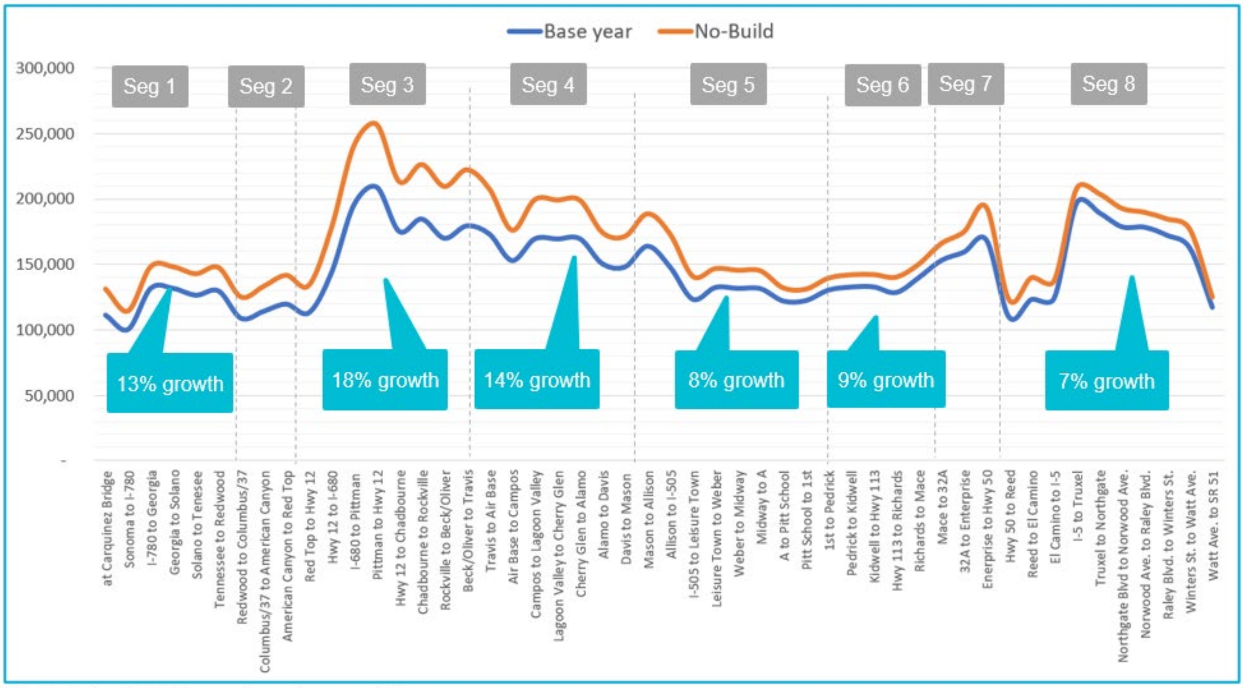
Below is a list of network updates:

- I-80 / I-680 / SR 12 Interchange Project
- Jepson Parkway Project
- SR 37/Fairgrounds Drive Interchange Project
- I-80/Richards Boulevard Interchange Project
- I-80/W. El Camino Avenue Interchange Project

5.4.2 | I-80 Volume Comparison

Future year 2040 traffic model results show a growth range of 7% to 18% along I-80 with a median growth of 12%. The growth varies along the corridor depending on location and reflecting the different SED growth projections in various parts of the corridor study area. There is higher estimated future growth in Segments 3 and 4 of the I-80 corridor compared to the eastern sections. The lowest growth is in Segment 8 between west of W. El Camino Avenue to east of SR 51 interchange. See **Figure 5.7** for the growth details along the corridor in terms of projected volume growth between the existing base year and 2040. Average growth is shown for each of the study area segments. Note **Figure 5.8** and **Figure 5.9** show volume comparisons for Segment 1 to Segment 8, which are all along I-80.

There is higher estimated future growth in the mid- and western sections of the corridor compared to the eastern sections. The lowest growth is between I-505 and the SR 113.

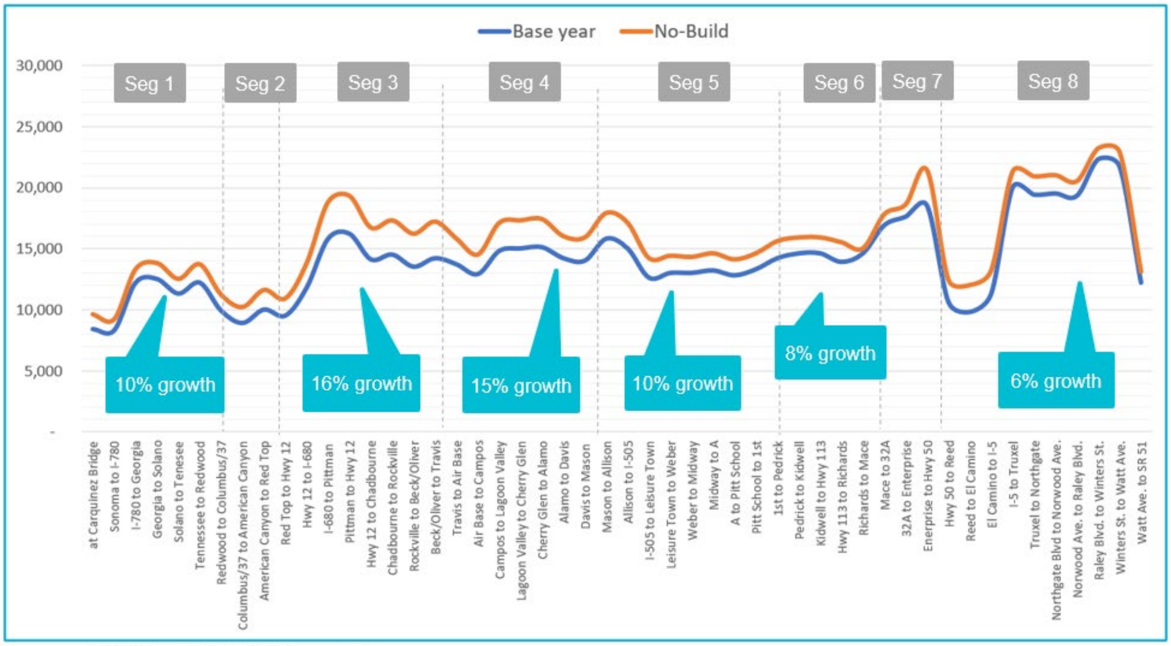


No-Build = 2040 future baseline conditions

Source: SNABM and SACSIM19 models

Figure 5.7 | Future (2040) No Build Daily Traffic Growth on I-80 Corridor (both directions combined)

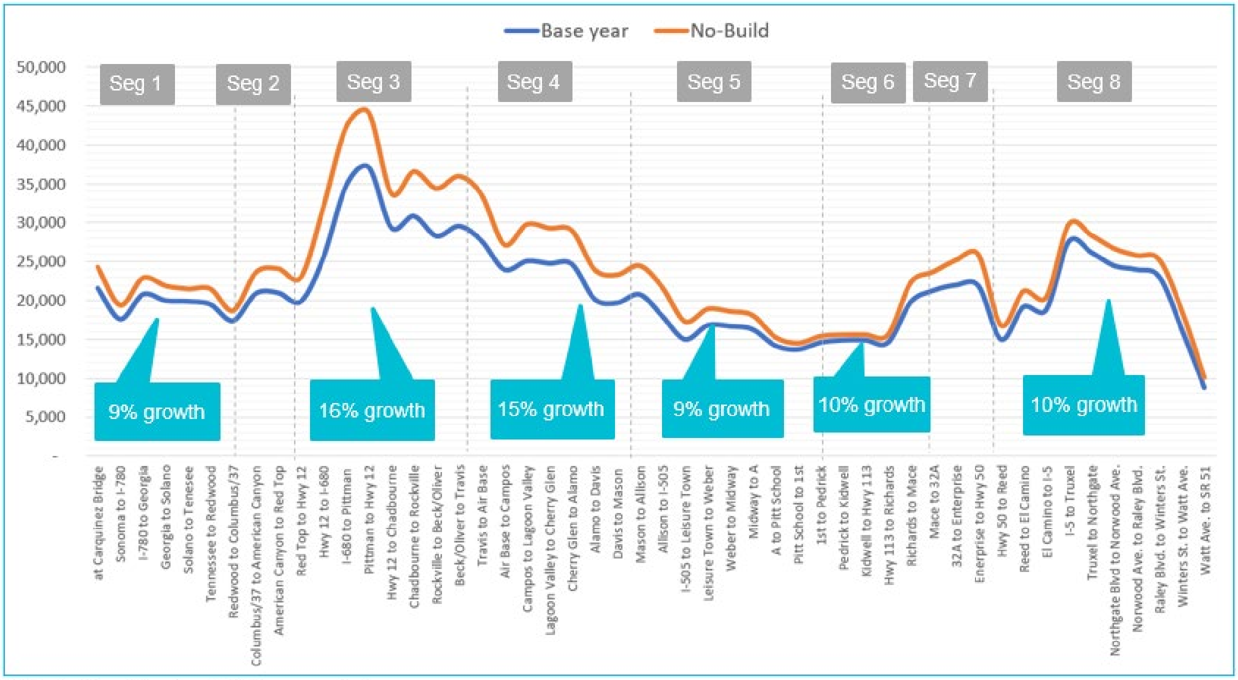
The A.M. peak period eastbound growth (see **Figure 5.8**) is slightly lower than the forecast growth in the westbound direction (see **Figure 5.9**). In the mid-section, between Red Top Road and I-505 (Segments 3 and 4) the model projects growth of 15% to 16% which is about 2,000 to 2,500 more vehicles for the four-hour period (6:00 A.M. to 10:00 A.M.) and in the western and eastern portions of the corridor the projected growth is in the range of 6% to 8%. **Figure 5.8** shows the details of the A.M. peak period eastbound traffic volume growth percentages and numeric growth in traffic flow.



Source: SNABM and SACSIM19 models

FIGURE 5.8 | FUTURE (2040) NO BUILD A.M. PERIOD EASTBOUND TRAFFIC GROWTH ON I-80 CORRIDOR

Similar to the daily growth, A.M. peak period westbound traffic (see **Figure 5.9**) is projected to grow in the range of 9% to 16%. More growth is observed in the mid-section; between Red Top Road and I-505. The farther eastern and western sections grow by about 10%. **Figure 5.9** shows the details of the A.M. peak period westbound traffic volume growth percentages and numeric growth in traffic flow.

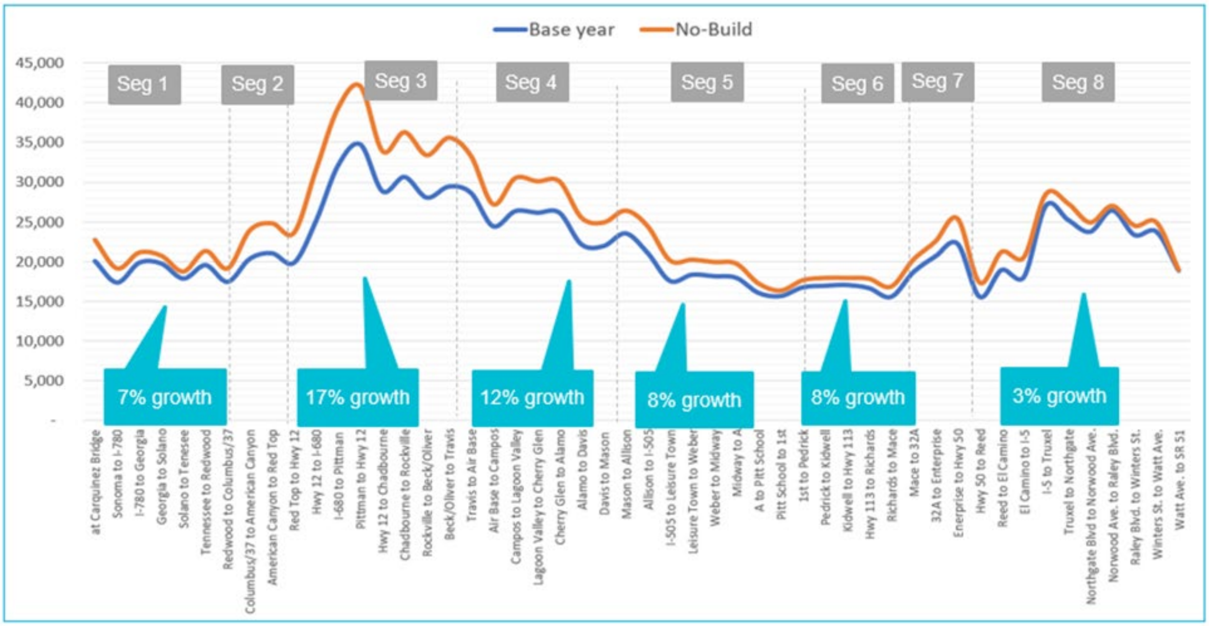


** Peak direction for this time period*

Source: SNABM and SACSIM19 models

FIGURE 5.9 | FUTURE (2040) NO BUILD A.M. PERIOD WESTBOUND* TRAFFIC GROWTH ON I-80 CORRIDOR

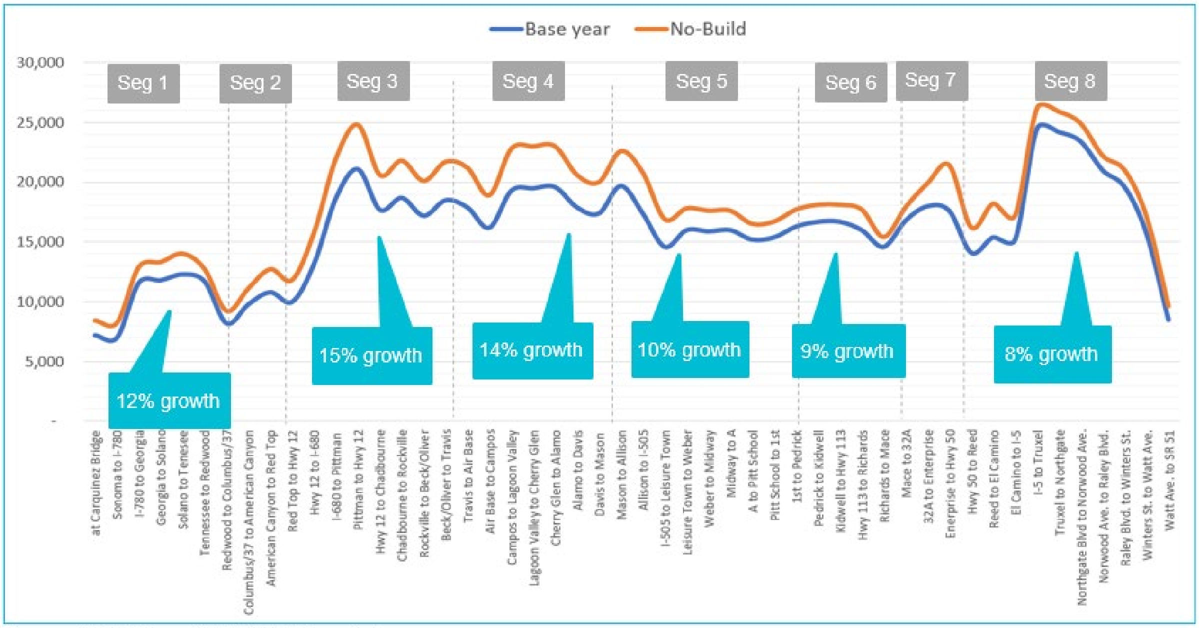
The P.M. period westbound growth is less than the projected P.M. period eastbound direction growth, as the P.M. period eastbound is the peak direction for this period. In a similar pattern to the above statement the mid-section traffic growth is greater for this time period as well. In the middle part of the corridor the traffic grows in the range of 14% to 15%, or about 3,500 to 6,000 more vehicles in the four-hour time period. The eastern and western sections grow in the range of 8% to 9%, or about 1,400 to 1,600 more vehicles for the four-hour time period. **Figure 5.10** and **Figure 5.11** show the details for P.M. period traffic growth along the I-80 corridor in eastbound and westbound direction, respectively.



** Peak direction for this time period*

Source: SNABM and SACSIM19 models

FIGURE 5.10 | FUTURE (2040) NO BUILD P.M. PERIOD EASTBOUND * TRAFFIC GROWTH ON I-80 CORRIDOR



Source: SNABM and SACSIM19 models

FIGURE 5.11 | 2040 FUTURE YEAR P.M. PEAK WESTBOUND VOLUMES

5.4.3 | I-80 VMT, VHT, and VHD Comparison

Under the future No Build conditions, the added population and jobs will generate new trips in the area and the results are shown as the increase in the VMT, VHT, and VHD. VHT and delay also increase significantly from existing to 2040 based on the model results. **Table 5.2** shows the details of the VMT, VHT, and VHD change to 2040. VMT, VHT and VHD data presented below is for freeway segments only in the I-80 CMCP corridor study area. The models project that VMT will increase along the I-80 corridor by about 15%. The model predicts that VMT will go up from 10.3 million miles traveled per day to over 11.8 million miles traveled per day along the I-80 corridor study area. VHT and VHD increase more than VMT due to the increase in congestion which exponentially increases and impacts vehicles on the system. This is especially true where there is already congestion or conditions nearing the point of heavy congestion with resulting vehicle queues.

TABLE 5.2 | VEHICLE MILES TRAVELED, HOURS TRAVELED, AND DELAY COMPARISON

	VMT	VHT	VHD
Base year	10,370,700	182,300	20,000
2040 No-Build	11,878,600	224,100	37,700
Total. Difference	1,507,900	41,800	17,700
Percent Difference	14.5%	22.9%	88.5%

5.4.4 | US 50 Future (2040) No Build Scenario

Figure 5.12 shows existing and future No Build volume growth along US 50 (Segment 9). The model estimates indicate 9% growth is expected to occur along US 50 (Segment 9) in the next 20 years. The growth varies along the corridor depending on location and reflecting the different SED growth projections in various parts of the corridor study area.

The highest estimated future growth occurs between 5th Street and I-5. The lowest growth of 7% occurs between I-80 and Jefferson Boulevard.

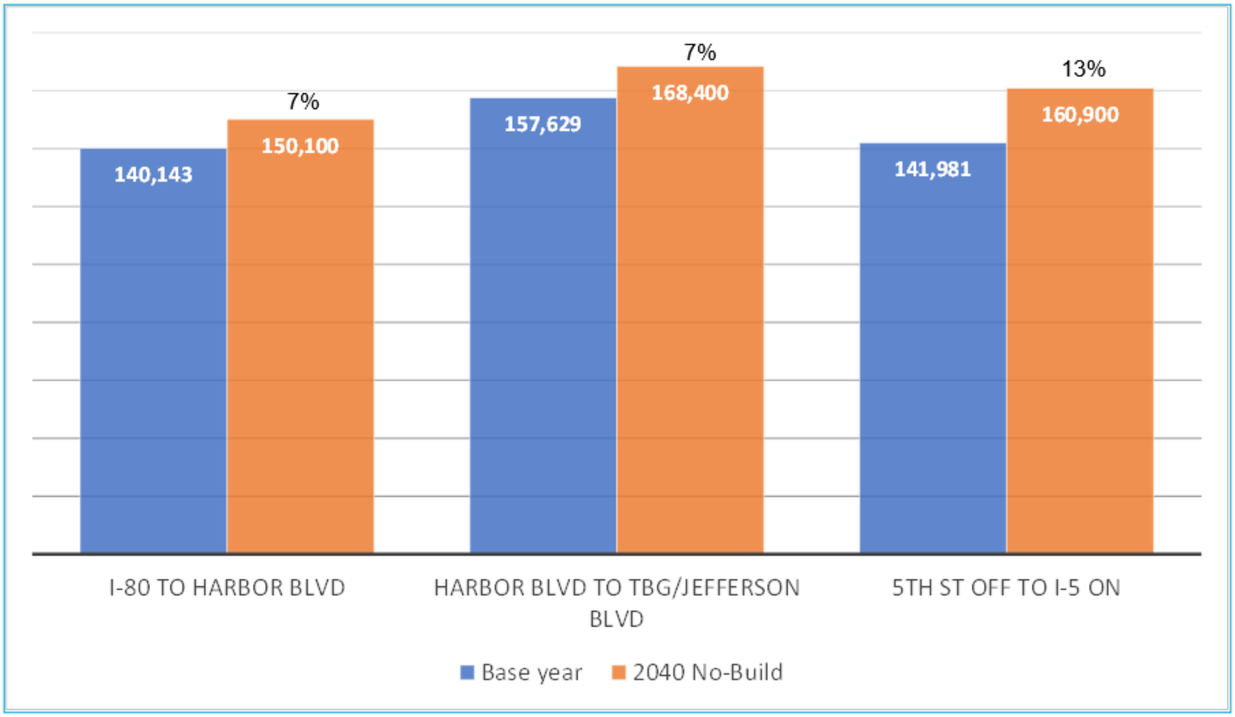


FIGURE 5.12 | US 50 FUTURE (2040) TRAFFIC VOLUMES (BOTH DIRECTIONS)

5.5 | 2040 Future Year Build Scenarios

Future Build scenarios were developed through collaboration between both Caltrans District 3 and 4 and staff from CS. Caltrans staff included members from the CDT, Modeling and Forecasting, Traffic Operations, and Program, Project, and Asset Management from both districts. These scenarios were then approved by the I-80 CMCP TAC and stakeholder members. All future analyses use the 2040 horizon year, which matches the Napa-Solano and SACSIM19 Travel Model years of analysis.

The purpose of the scenarios is to test packages of improvement strategies and projects to assess how effective they would be at alleviating future transportation congestion.

The following performance measures are compared in this section to assess the effects of each alternative against the No Build alternative. The comparative performance measures are:

- Corridor volumes
- Person throughput (Vehicle Occupancy)
- VMT
- VHT
- VHD

All the performance measures reported are for four-hour A.M. (6:00 A.M. – 10:00 A.M.) and P.M. (3:00 P.M. – 7:00 P.M.) peak periods, as well as for a typical weekday. There are a total of five Future Build scenarios that are assessed using the travel demand models.

Future Build Scenario 1 | HOV 2+

This scenario assesses the changes resulting from completing a HOV 2+ lane along I-80 study corridor. Currently, in the study corridor, the HOV lanes exist from Red Top Road to Air Base Parkway and from W. El Camino Avenue to SR 51. The HOV 2+ model scenario added HOV lanes on I-80 from the Solano County line (Carquinez Bridge) in Vallejo to east of I-80/SR 51 Interchange in Sacramento County and along US 50 between I-80 and I-5. This scenario includes all the projects included in the 2040 No Build scenario plus financially constrained RTP projects that are not fully funded and select unconstrained projects and SHOPP projects. This scenario is assessed using the travel demand forecasting models for the corridor as well as the focused corridor microsimulation model.

Future Build Scenario 2 | HOT 2+

This scenario assesses the changes resulting from the addition of HOT 2+ lanes along I-80 CMCP study area. This scenario includes all the projects included in Scenario 1 and it converts the HOV lanes in Scenario 1 to HOT 2+ lanes. High occupancy vehicles will travel for free in HOT 2+ lanes and single occupancy vehicles will have to pay full toll to use HOT 2+ lanes. This scenario is assessed using the travel demand forecasting models for the corridor as well as the focused corridor microsimulation model.

Future Build Scenario 3 | HOT 3+

This scenario assesses the changes resulting from HOT 3+ lane along I-80 CMCP study area. This scenario is similar to Scenario 2 but with different occupancy requirements for the HOT lanes. In this scenario, in the HOT lanes, vehicles with 3+ occupancy will travel for free, vehicles with 2 occupants will pay half toll and single occupancy vehicles will have to pay the full toll. This scenario is assessed using the travel demand forecasting models for the corridor as well as the focused corridor microsimulation models.

Future Build Scenario 4 | Capitol Corridor Improvement

This scenario assesses improvements to the Capitol Corridor Intercity Rail service between San Jose and Sacramento. The Capitol Corridor system is planning future improvements to its services which will enable more people to use the commuter rail as an alternative to driving on the I-80 corridor. The assumed improvements included 110 miles per hour top speed, a high-bridge between Benicia and Martinez, and 1/2-hourly service. Data was provided by Capitol Corridor and Caltrans Division of Rail and Mass Transportation regarding the future forecasted increases in passenger service and that information was used to model a similar reduction in people driving on the I-80 CMCP study area. This scenario is assessed using the travel demand forecasting models.

Future Build Scenario 5 | Travel Demand Management / Active Transportation Enhancement

This scenario assesses the changes resulting from assumed changes in travel behavior due to TDM programs as well as future implementation of active transportation facilities and shift of some trips to active transportation. Since it is not possible to model every trip that uses active transportation, this modeling scenario assumes future reduction in auto trips due to shift to active transportation as well as other changes such as increased work at home or shifts to off peak travel. This scenario is assessed using the travel demand forecasting models.

5.6 | 2040 Future Build Scenario Volumes

5.6.1 | I-80 Future Build Scenario Volumes

The traffic volumes for the 2040 managed lanes alternative scenarios are compared to the 2040 No Build scenario in this section, followed by comparisons of the Capitol Corridor Alternative and the TDM alternative to the 2040 No Build. The assumed operating hours of the managed lanes are during A.M. and P.M. peak periods, which are 6:00 A.M. to 10:00 A.M. and 3:00 P.M. to 7:00 P.M., respectively.

5.6.2 I-80 Volume Comparison of Scenarios 1(HOV 2+), 2(HOT 2+), and 3(HOT 3+)

All three managed lanes alternatives are projected to carry more traffic volume along the freeway corridor (General Purpose and Managed Lanes together) than the future No Build scenario. The lowest growth sections are the areas that do not have additional capacity assumed to be added to the mainline. They are as follows:

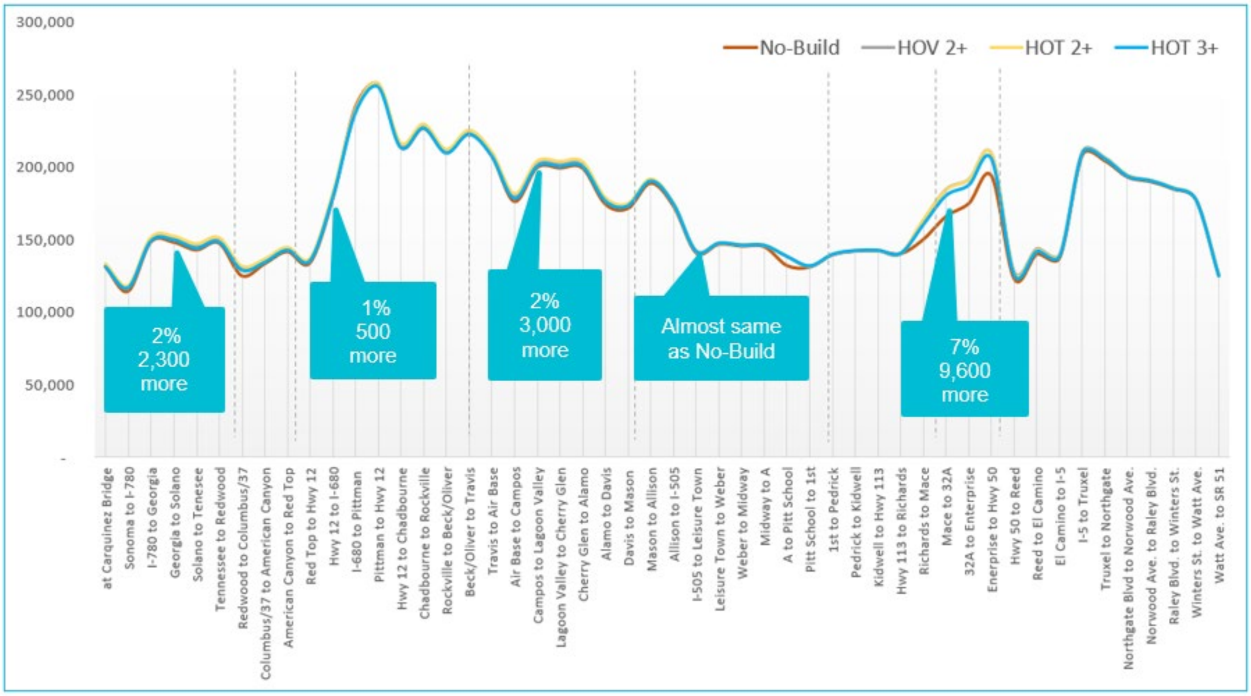
- Highway 12 to Air Base Road
- W. El Camino Avenue to Northgate Boulevard

These HOV and HOT project scenarios assume added mainline capacity to all other sections of the study area. Based on the model results, the highest growth is observed between SR 113 and US 50 (Segments 6 and 7). This section has 9,500 to 12,700 more vehicles under the managed lane build scenarios along I-80 CMCP study area at the daily level, compared to 2040 No Build scenario, which represents about a 7% increase in traffic throughput.

Next highest growth is observed between Air Base Parkway and I-505 (Segment 4). This is consistent for all three managed lanes alternatives. This section has 3,000 to 3,600 more vehicles under the three Build scenarios at the daily level, compared to the 2040 No Build scenario, which is about a 2% increase in traffic. For alternatives 1 (HOV 2+) and 2 (HOT 2+), this section has 3,000 to 4,300 more vehicles at daily level in both directions, compared to 2040 No Build scenario, which is about a 2% increase in traffic. For alternative 3 (HOT 3+), where only HOV 3+ was free, the increase in total daily traffic is only 1% in this corridor.

Figure 5.13 shows the comparison of daily traffic along the I-80 corridor for all three managed lane alternatives as compared to the 2040 No-Build alternative.

West of Red Top Road (Segment 1 and 2) and east of US 50 (Segment 9), the I-80 CMCP study area sections carry 2,000 to 3,000 more vehicles at the daily level in both directions under the HOV/HOT Build scenarios as compared to the No Build scenario which is about a 2% increase in traffic.



2%
2,300
more

1%
500
more

2%
3,000
more

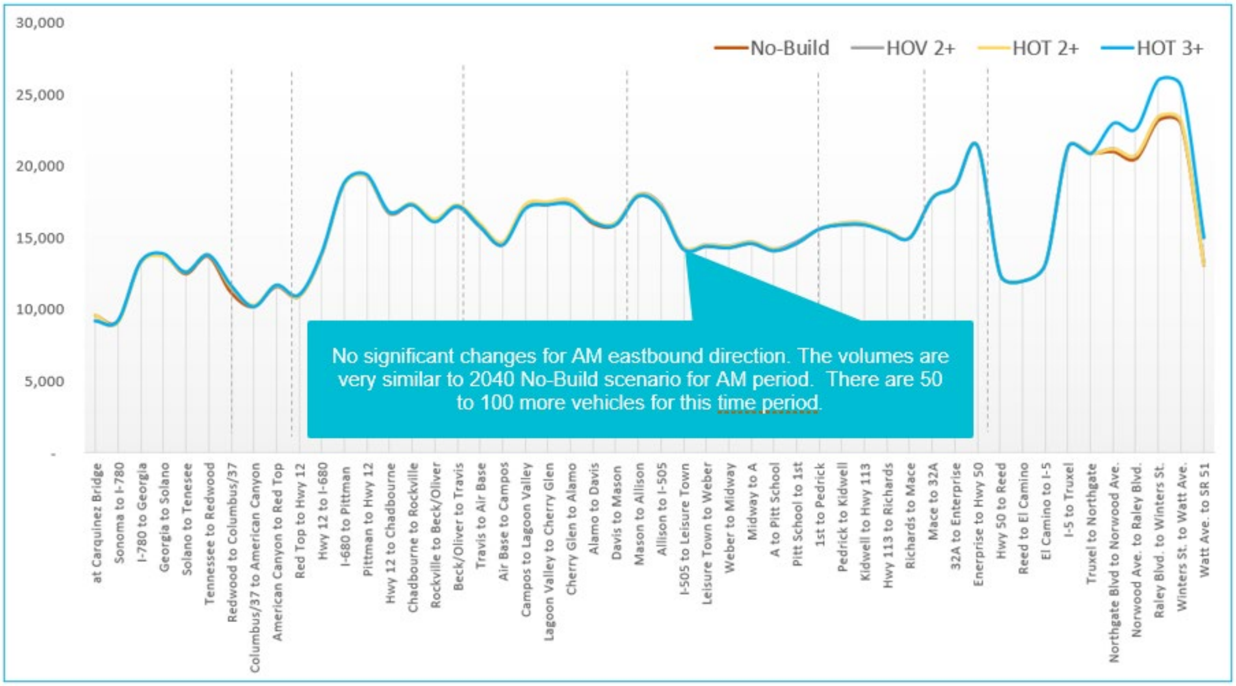
Almost same
as No-Build

7%
9,600
more

Source: SNABM and SACSIM19 models

FIGURE 5.13 | FUTURE (2040) DAILY TRAFFIC ON I-80 BY SCENARIO (BOTH DIRECTIONS)

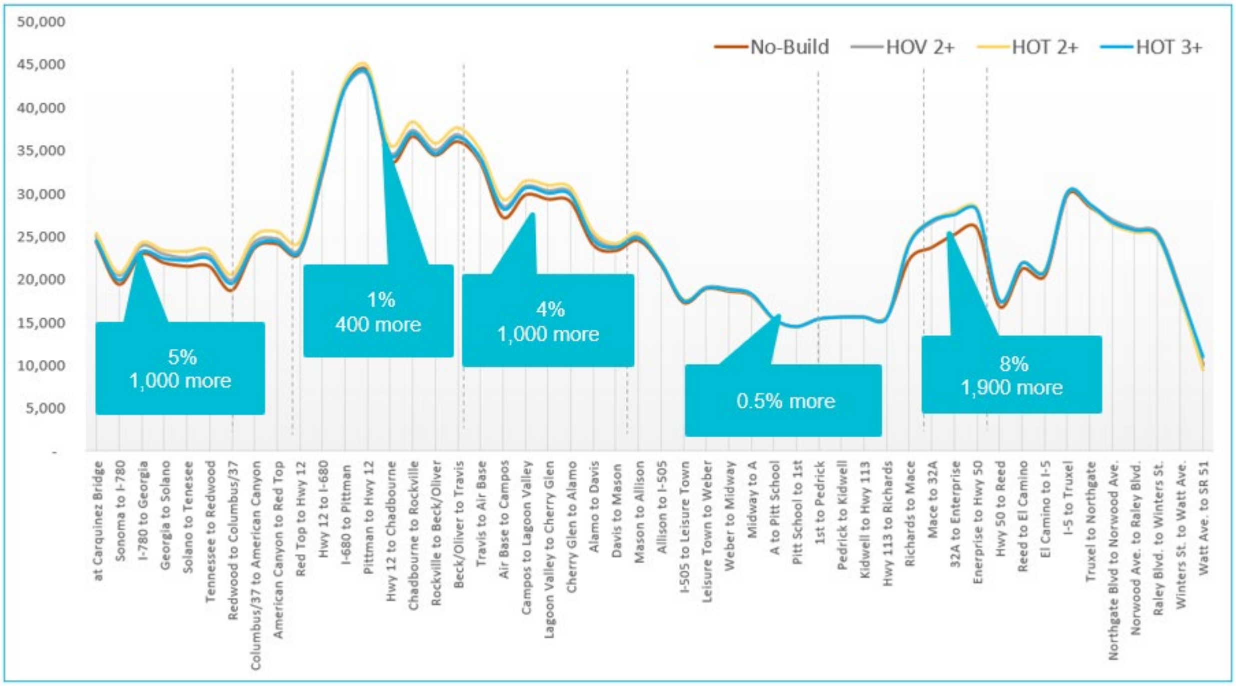
The following sections show the peak period level observations from the model for the HOV and HOT alternatives. For this corridor the A.M. peak period flow is in the westbound direction and the P.M. peak period flow is in the eastbound direction. **Figure 5.14** and **Figure 5.15** show A.M. peak period traffic comparison for eastbound and westbound direction, respectively. **Figure 5.16** and **Figure 5.17** show P.M. peak period traffic comparison for eastbound and westbound direction, respectively.



No significant changes for AM eastbound direction. The volumes are very similar to 2040 No-Build scenario for AM period. There are 50 to 100 more vehicles for this time period.

Source: SNABM and SACSIM19 models

FIGURE 5.14 | FUTURE (2040) A.M. PEAK PERIOD EASTBOUND TRAFFIC ON I-80 BY SCENARIO



5%
1,000 more

1%
400 more

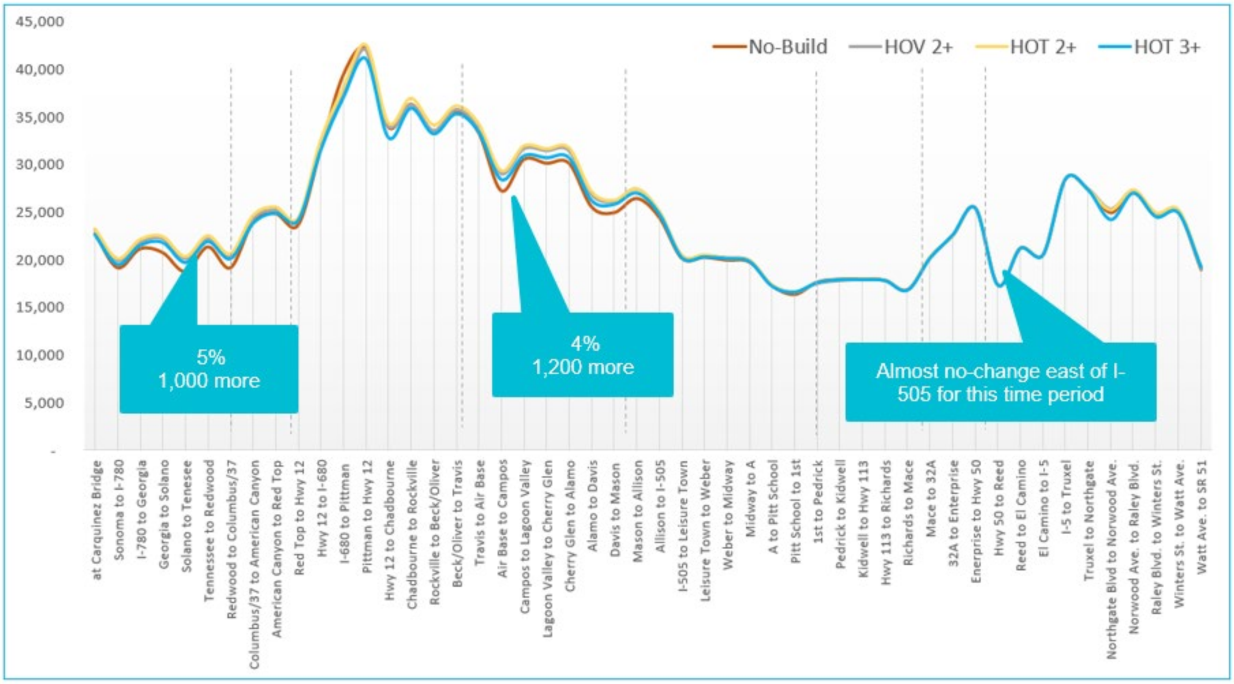
4%
1,000 more

0.5% more

8%
1,900 more

Source: SNABM and SACSIM19 models

FIGURE 5.15 | FUTURE (2040) A.M. PEAK PERIOD WESTBOUND TRAFFIC ON I-80 BY SCENARIO



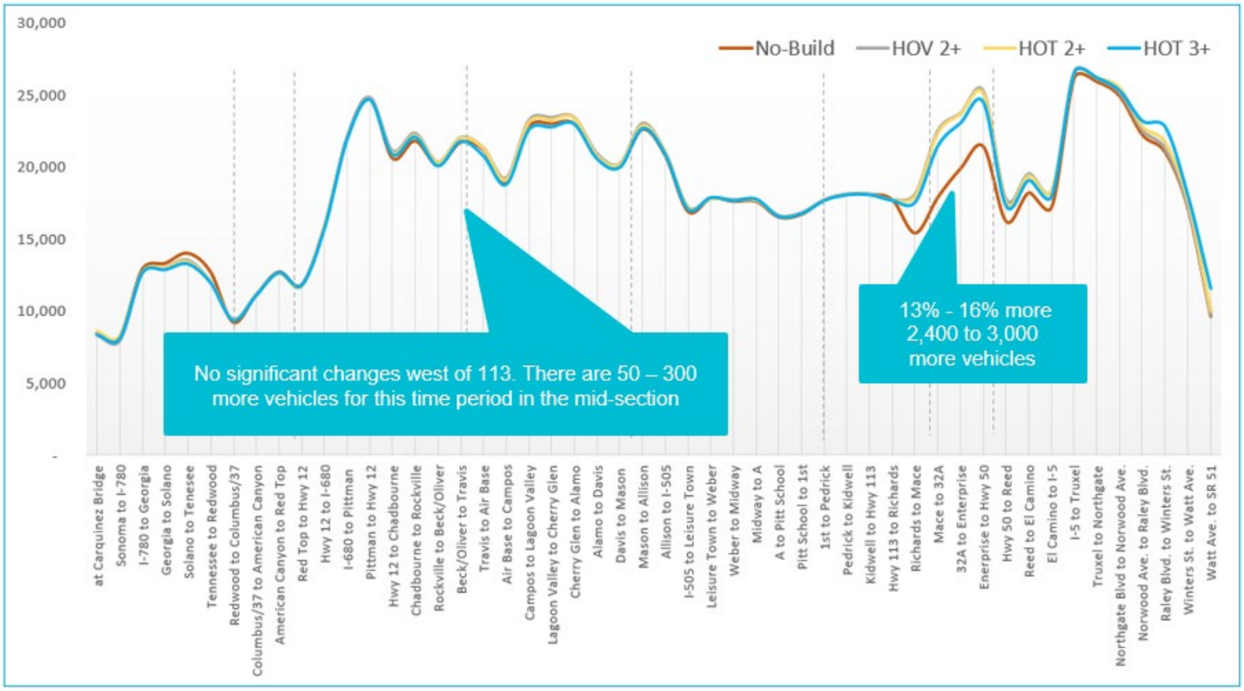
5%
1,000 more

4%
1,200 more

Almost no-change east of I-505 for this time period

Source: SNABM and SACSIM19 models

FIGURE 5.16 | FUTURE (2040) P.M. PEAK PERIOD EASTBOUND TRAFFIC ON I-80 BY SCENARIO



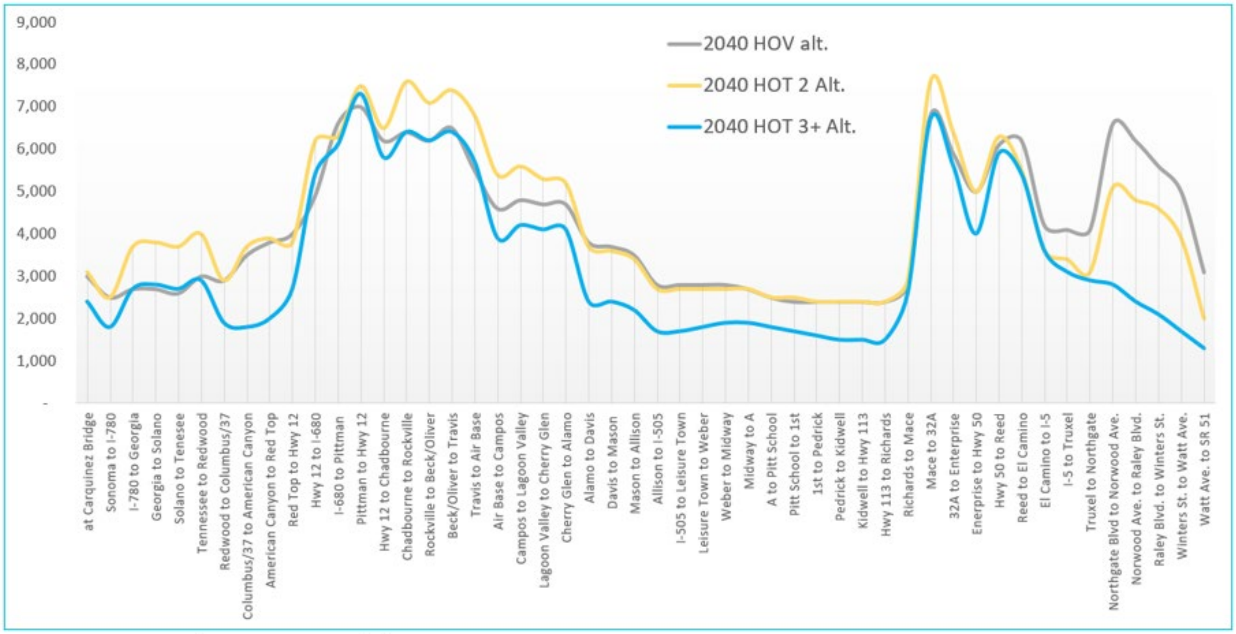
No significant changes west of 113. There are 50 – 300 more vehicles for this time period in the mid-section

13% - 16% more
2,400 to 3,000
more vehicles

Source: SNABM and SACSIM19 models

FIGURE 5.17 | FUTURE (2040) P.M. PEAK PERIOD WESTBOUND TRAFFIC ON I-80 BY SCENARIO

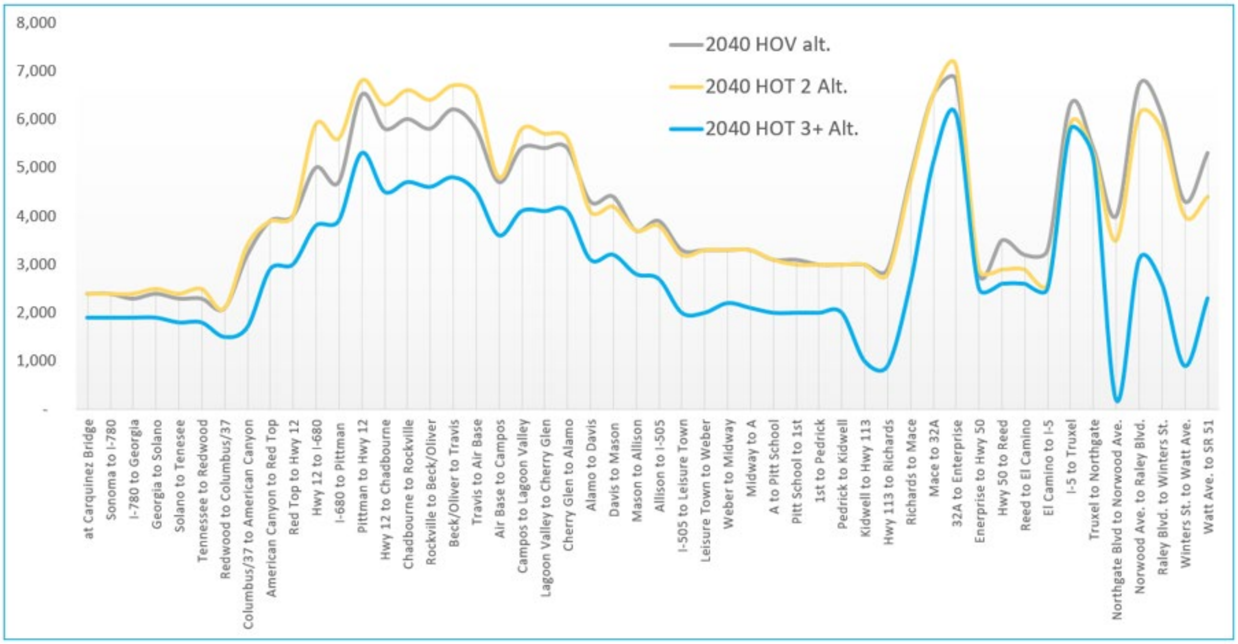
The assumed future managed lanes are shown to carry from 10,000 to 50,000 vehicles at the daily level in both directions combined within the I-80 CMCP study area. During peak periods, the assumed future managed lanes are shown to carry from 2,000 to 7,000 vehicles in peak direction within the study area. These represent the four-hour model time periods. **Figure 5.18** and **Figure 5.19** show A.M. westbound and P.M. eastbound managed lane volumes, respectively. A.M. westbound and P.M. eastbound represent the peak direction of managed lane volumes.



Source: SNABM and SACSIM19 models

FIGURE 5.18 | FUTURE (2040) A.M. WESTBOUND MANAGED LANE I-80 TRAFFIC BY SCENARIO

During P.M. peak period, the sections from Red Top Road to Air Base (Segment 3) and from the US 50/I-80 split to W. El Camino Avenue (Segment 7) carries the most traffic in the assumed future managed lanes, in the range of 6,000 to 7,000 vehicles in eastbound direction (see **Figure 5.19**). The level of traffic projected in the managed lanes is very similar for HOV and HOT 2+ alternatives.



Source: SNABM and SACSIM19 models

FIGURE 5.19 | FUTURE (2040) P.M. EASTBOUND MANAGED LANE I-80 TRAFFIC BY SCENARIO

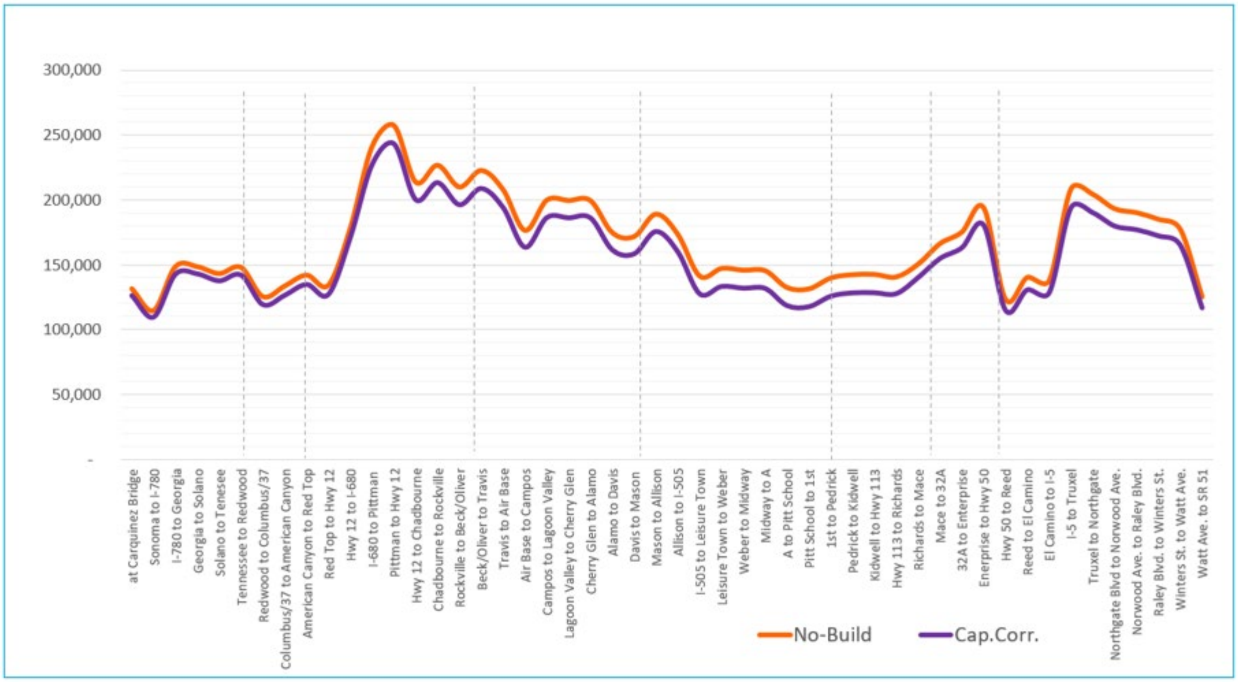
There is a slight drop in projected traffic demand in managed lanes for HOT 3+ alternative, which is due to the requirement for HOV 2 to pay to use the lanes under this scenario, which deters some users from taking these lanes. The section between Northgate Boulevard and SR 51 (Segment 8) has less volume in HOT 3+ scenario compared to other managed lane scenarios during both A.M. and P.M. peak periods. The toll paying traffic in this section is projected to shift to general purpose lane due to available capacity.

Note that in the A.M. eastbound and P.M. westbound directions (which are the off-peak directions of flow) the managed lanes are shown to carry far fewer vehicles, thus figures/charts are not provided for these directions and time periods. This lower demand is due to the reduced incentive for drivers to use the managed lanes in the off-peak directions, which have less congestion and lower delay, thus lower propensity for drivers to use the managed lanes.

Capitol Corridor Improvement Scenario Comparison

The Capitol Corridor Improvement alternative, which accounts for the assumed Capitol Corridor project enhancements, has a significant effect on the I-80 corridor traffic according to Capitol Corridor I-80 Modeling memorandum prepared by STEERS dated November 8, 2021 (see **Appendix IV**). Without Capitol Corridor improvement project(s) the forecasted ridership is approximately 2.5 million in 2040. With Capitol Corridor project(s) the corridor is forecasted to have a ridership of 7.3 million, which is an additional 4.8 million riders per year.

As shown in **Figure 5.20,** traffic on I-80 corridor is reduced in the range of 4% to 10% due to a shift in trips to the parallel transit option along the Capitol Corridor, with improvements. Based on the modeling projections, there are 5,000 to 14,000 less vehicles per day on the I-80 corridor under this Build alternative. This alternative also is projected to reduce traffic demand by about 500 vehicles during the peak period hours.

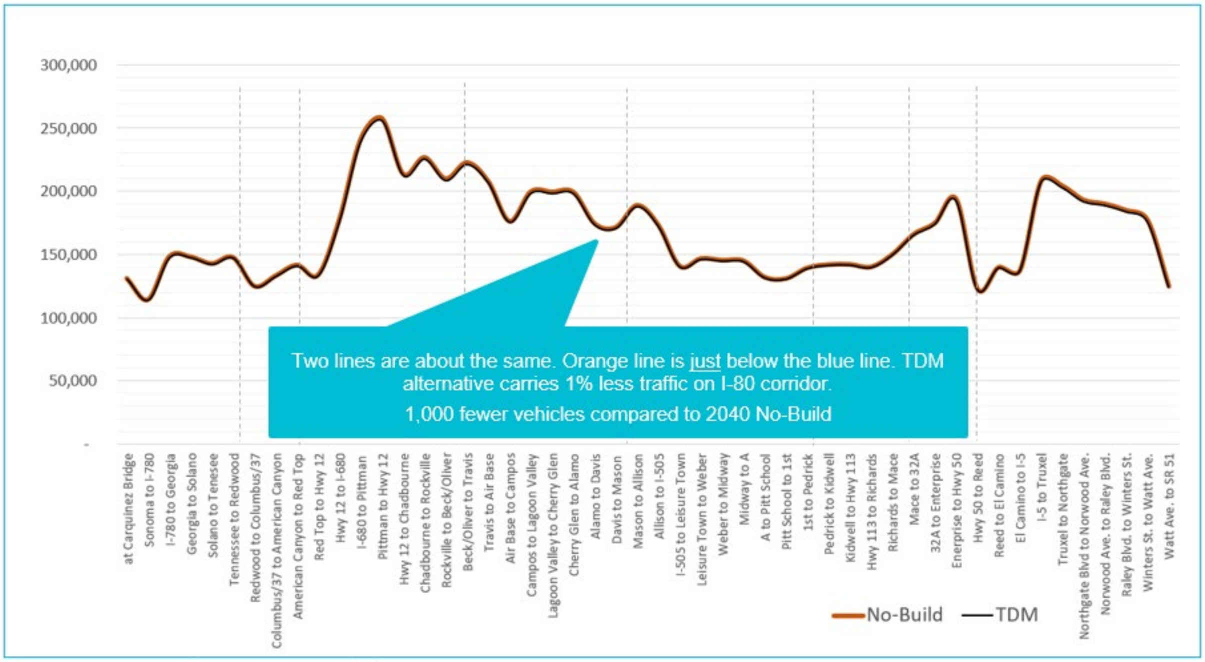


Source: SNABM and SACSIM19 models

FIGURE 5.20 | FUTURE (2040) CAPITOL CORRIDOR IMPROVEMENT SCENARIO DAILY TRAFFIC (BOTH DIRECTIONS)

TDM/Active Transportation Enhancement Scenario Comparison

The TDM/Active Transportation Enhancement scenario assesses the changes resulting from assumed changes in travel behavior due to TDM programs as well as future implementation of active transportation facilities and shift of some trips to active transportation. The TDM alternative modeling results indicate about one percent less traffic demand as compared to 2040 No Build alternative along the I-80 CMCP study area. **Figure 5.21** shows daily traffic demand on I-80 for the No Build and TDM alternative. This alternative accounts for assumed increases in work at home and shifting to other non-auto modes (besides transit such as walk or bike for shorter trips or due to relocation). Under this alternative, about 1,000 fewer vehicle trips would occur on I-80 at the daily level which will be equivalent to about 100 fewer vehicles during the peak hours.



Two lines are about the same. Orange line is just below the blue line. TDM alternative carries 1% less traffic on I-80 corridor.

1,000 fewer vehicles compared to 2040 No-Build

Source: SNABM and SACSIM19 models

FIGURE 5.21 | FUTURE (2040) DAILY TRAFFIC ON I-80 TRAVEL DEMAND MANAGEMENT / ACTIVE TRANSPORTATION ENHANCEMENTS SCENARIO (BOTH DIRECTIONS)

5.6.2 | US 50 Future Build Scenarios Volumes

Figure 5.22 shows future volumes under the five different alternatives along US 50. All three managed lanes alternatives are projected to carry more traffic volume along the freeway corridor (General Purpose and Managed Lanes together) than the future No Build scenario. Based on the model results, the highest growth is observed between I-80 and Harbor Boulevard. This section has 7,900 to 10,000 more vehicles under the Build scenarios along US 50 at the daily level, compared to 2040 No Build scenario, which represents about a 4% increase in traffic throughput.

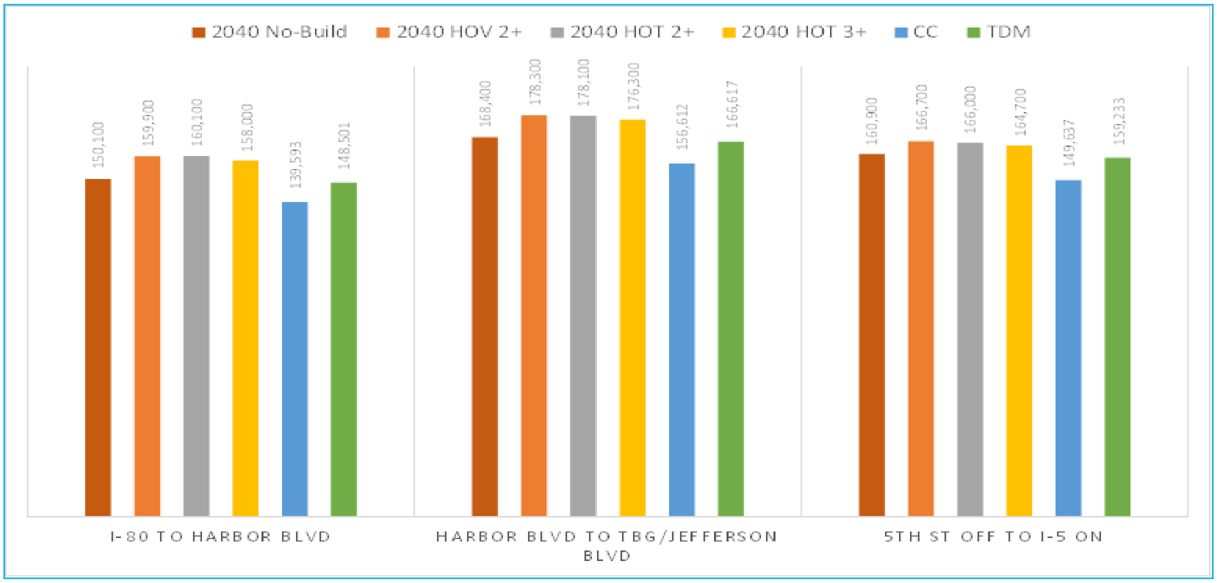


FIGURE 5.22 | FUTURE (2040) DAILY TRAFFIC ON US 50 UNDER THE FUTURE ALTERNATIVES (BOTH DIRECTIONS)

5.7 | 2040 Future Build Scenario Vehicle Occupancy

Table 5.3 shows vehicle occupancy by segment for each scenario. Vehicle occupancy data is for the entire freeway segment including the general purpose and managed lanes. Overall, vehicle occupancy for a segment is similar across different alternatives. The vehicle occupancy data is used to calculate person throughput. The person throughput pattern across alternatives will be similar to volume patterns.

TABLE 5.3 | VEHICLE OCCUPANCY BY SEGMENT BY ALTERNATIVE

Occupancy	Existing	No Build (Baseline)	Scenario 1 (HOV 2+)	Scenario 2 (HOT 2+)	Scenario 3 (HOT 3+)	Scenario 4 (CC)	Scenario 5 (TDM)
Segment 1	1.31	1.31	1.32	1.28	1.28	1.32	1.31
Segment 2	1.31	1.34	1.34	1.34	1.34	1.35	1.34
Segment 3	1.31	1.35	1.35	1.34	1.35	1.36	1.35
Segment 4	1.33	1.35	1.36	1.35	1.35	1.37	1.37
Segment 5	1.34	1.37	1.37	1.37	1.37	1.39	1.37
Segment 6	1.33	1.34	1.34	1.34	1.34	1.34	1.34
Segment 7	1.31	1.31	1.32	1.32	1.33	1.31	1.31
Segment 8	1.33	1.31	1.31	1.34	1.35	1.31	1.31
Segment 9	1.31	1.32	1.33	1.34	1.34	1.32	1.32

5.8 | 2040 Future Build Scenario VMT, VHT, and VHD

5.8.1 | Corridor-wide VMT/VHT/VHD Comparison of Scenarios

Daily level VMT, VHT, and VHD are compared in this section for the I-80 CMCP study area. As previously noted, two models were used to obtain VMT, VHT and VHD data. The SNABM model was utilized to obtain data for freeway segment between the Carquinez Bridge and SR 113/City of Davis and for the eastern portion of I-80, data were obtained from the I-80/US 50 Managed Lanes project which used the SACSIM19 model.

Scenario 1 | HOV 2+

HOV 2+ scenario carries about the same number of vehicles or slightly more vehicles along the I-80 corridor. This alternative has 3% higher VMT within the entire I-80 corridor than 2040 No-Build. This alternative has fewer VHT and less delay as a result of the improvements. Within the study area there are about 9,100 fewer hours of travel which is 4% reduction in VHT. This alternative has about 14,200 fewer hours of delay compared to the No Build scenario, which is a 38% reduction in delay. **Table 5.4** shows VMT, VHT and VHD comparison between Build Scenario 1 and the No Build Scenario.

TABLE 5.4 | FUTURE (2040) HOV 2+ ALTERNATIVE VMT/VHT/VHD COMPARISON

HOV Alt. Comparison	VMT	VHT	VHD
2040 Baseline	11,878,600	224,100	37,700
2040 Scenario 1 [HOV alt.]	12,260,900	215,000	23,500
Num. Diff.	382,300	-9,100	-14,200
Percent Diff.	3.2%	-4.1%	-37.7%

Scenario 2 | HOT 2+

Similar to the HOV 2+ scenario, the HOT 2+ alternative also carries about the same number of vehicles or slightly more vehicles along I-80 within the study area. This alternative also has 3% higher VMT than 2040 No Build. This alternative has fewer VHT and less delay. Within the study area there are about 8,700 fewer hours of travel which is 3.9% reduction in VHT. This alternative has about 14,200 fewer hours of delay compared to the No Build scenario, which is a 38% reduction in delay. **Table 5.5** VMT, VHT and VHD comparison between Build Scenario 2 and the No Build Scenario

TABLE 5.5 | FUTURE (2040) HOT 2+ ALTERNATIVE VMT/VHT/VHD COMPARISON

HOT 2 Alt. Comparison	VMT	VHT	VHD
2040 Baseline	11,878,600	224,100	37,700
2040 Scenario 2 [HOT 2 alt.]	12,286,000	215,400	23,500
Num. Diff.	407,400	-8,700	-14,200
Percent Diff.	3.4%	-3.9%	-37.7%

Scenario 3 | HOT 3+

The HOT 3+ scenario carries slightly more vehicles on I-80 CMCP study area. This alternative has slightly higher VMT than 2040 No Build; 1.6% higher VMT increase. This alternative also has fewer VHT and less delay. Within the I-80 CMCP study area there are about 10,000 fewer hours of travel which is a 4.5% reduction in VHT. This alternative has about 12,200 fewer hours of delay compared to the No Build scenario, which is a 32% reduction in delay. **Table 5.6** shows VMT, VHT and VHD comparison between Build scenario 3 and the No Build scenario.

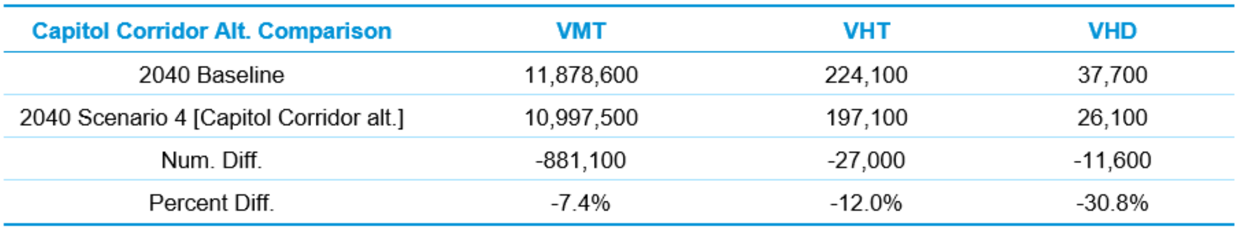
TABLE 5.6 | FUTURE (2040) HOT 3+ ALTERNATIVE VMT/VHT/VHD COMPARISON

HOT 3+ Alt. Comparison	VMT	VHT	VHD
2040 Baseline	11,878,600	224,100	37,700
2040 Scenario 3 [HOT 3+ alt.]	12,072,000	214,100	25,500
Num. Diff.	193,400	-10,000	-12,200
Percent Diff.	1.6%	-4.5%	-32.4%

Scenario 4 | Capitol Corridor Improvements

The Capitol Corridor Improvements scenario has fewer auto trips in the study area due to the shift in trips from automobile to transit mode. Accordingly, this alternative has lower VMT than 2040 No Build; 7.4% lower VMT. This alternative also has fewer VHT and less delay. Within the study area there are about 27,000 fewer hours of travel which is a 12% reduction in VHT. This alternative has about 11,600 fewer hours of delay compared to the No Build scenario, which is a 31% reduction in delay. **Table 5.7** shows VMT, VHT and VHD comparison between Build scenario 4 and No Build scenario.

Table 5.7 | Future (2040) Capitol Corridor Improvements Alternative VMT/VHT/VHD Comparison

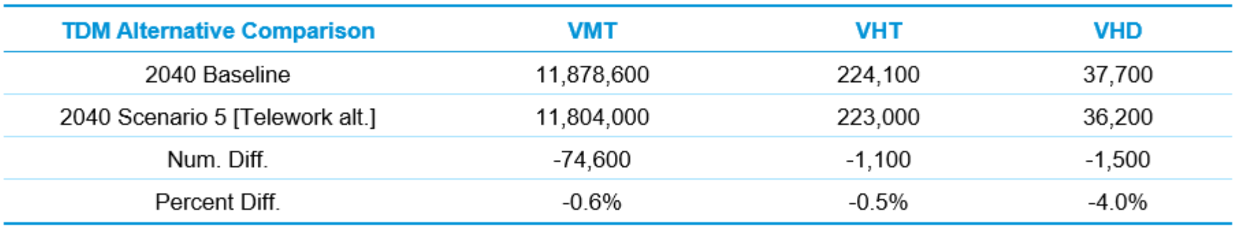


Capitol Corridor Alt. Comparison	VMT	VHT	VHD
2040 Baseline	11,878,600	224,100	37,700
2040 Scenario 4 [Capitol Corridor alt.]	10,997,500	197,100	26,100
Num. Diff.	-881,100	-27,000	-11,600
Percent Diff.	-7.4%	-12.0%	-30.8%

Scenario 5 | Travel Demand Management/Active Transportation Enhancement

The TDM alternative has fewer trips in the study area due to the TDM strategies which would shift trips from automobile to work at home as well as other modes such as walk and bike (for example as people relocate to live close to work). Due to this, this alternative has lower VMT than the 2040 No Build; about 1% lower VMT. This alternative also has fewer VHT and less delay. Within the study area there are about 1,100 fewer hours of travel which is less than 1% reduction in VHT. This alternative has about 1,500 fewer hours of delay compared to the No-Build scenario, which is a 4% reduction in delay. **Table 5.8** shows VMT, VHT and VHD comparison between Build scenario 5 and the No Build scenario.

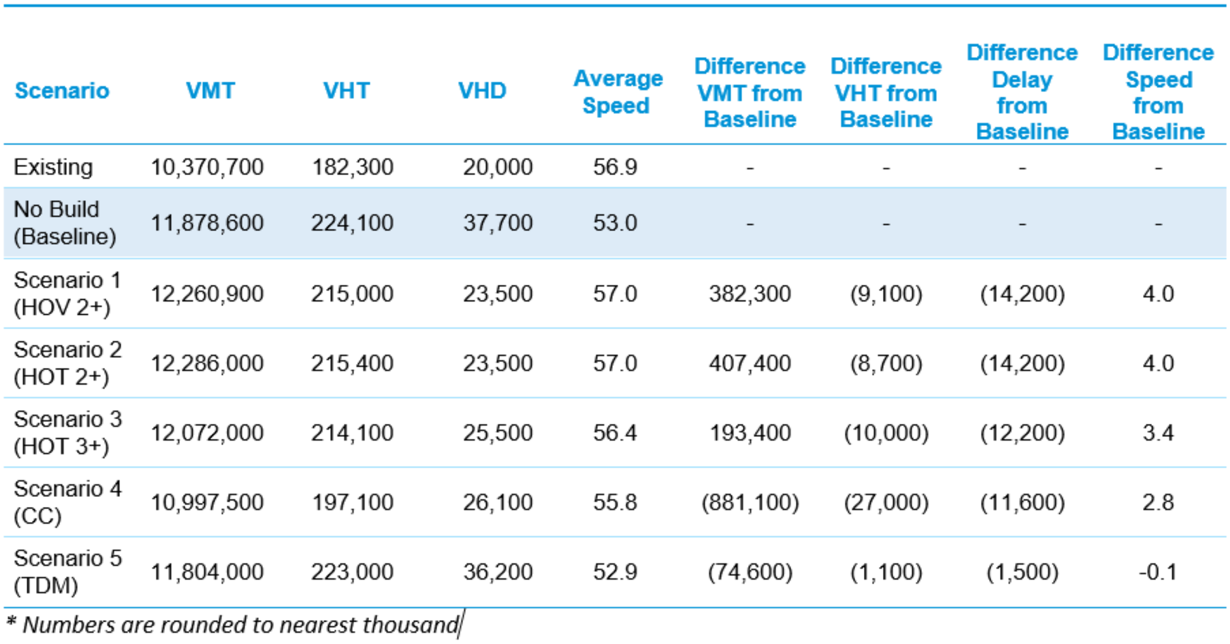
Table 5.8 | Future (2040) Travel Demand Management Alternative VMT/VHT/VHD Comparison



TDM Alternative Comparison	VMT	VHT	VHD
2040 Baseline	11,878,600	224,100	37,700
2040 Scenario 5 [Telework alt.]	11,804,000	223,000	36,200
Num. Diff.	-74,600	-1,100	-1,500
Percent Diff.	-0.6%	-0.5%	-4.0%

Table 5.9 shows daily VMT, VHT and VHD comparison between all scenarios.

Table 5.9 | Daily VMT/VHT/VHD Average Speed Comparison



Scenario	VMT	VHT	VHD	Average Speed	Difference VMT from Baseline	Difference VHT from Baseline	Difference Delay from Baseline	Difference Speed from Baseline
Existing	10,370,700	182,300	20,000	56.9	-	-	-	-
No Build (Baseline)	11,878,600	224,100	37,700	53.0	-	-	-	-
Scenario 1 (HOV 2+)	12,260,900	215,000	23,500	57.0	382,300	(9,100)	(14,200)	4.0
Scenario 2 (HOT 2+)	12,286,000	215,400	23,500	57.0	407,400	(8,700)	(14,200)	4.0
Scenario 3 (HOT 3+)	12,072,000	214,100	25,500	56.4	193,400	(10,000)	(12,200)	3.4
Scenario 4 (CC)	10,997,500	197,100	26,100	55.8	(881,100)	(27,000)	(11,600)	2.8
Scenario 5 (TDM)	11,804,000	223,000	36,200	52.9	(74,600)	(1,100)	(1,500)	-0.1

** Numbers are rounded to nearest thousand*

The Capitol Corridor Improvements (Scenario 4) has the lowest VMT in the future year, with 7.4% less VMT than the future No Build condition. Managed lane alternatives (Scenarios 1, 2, and 3) have higher VMT that future No Build scenario; however, all the build scenarios have less delay than the future No Build scenario. Average speeds are also shown to increase for all scenarios with the exception of the TDM alternative, which matches close to the No Build.

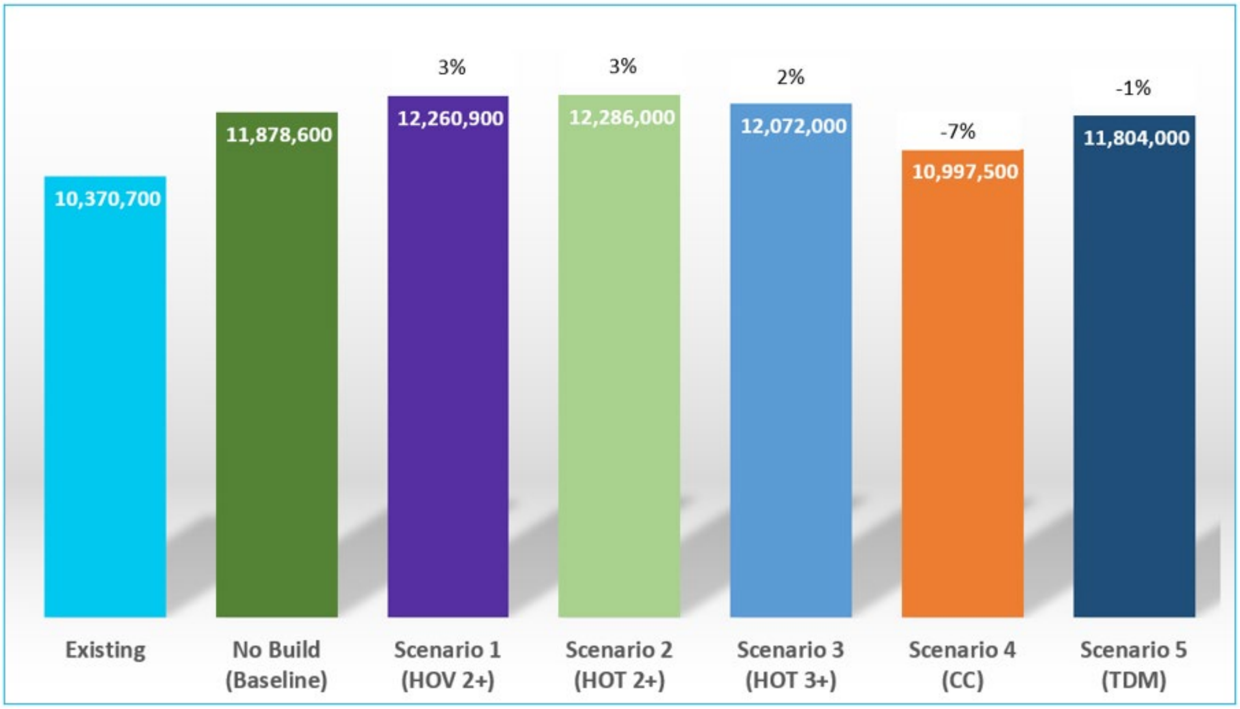
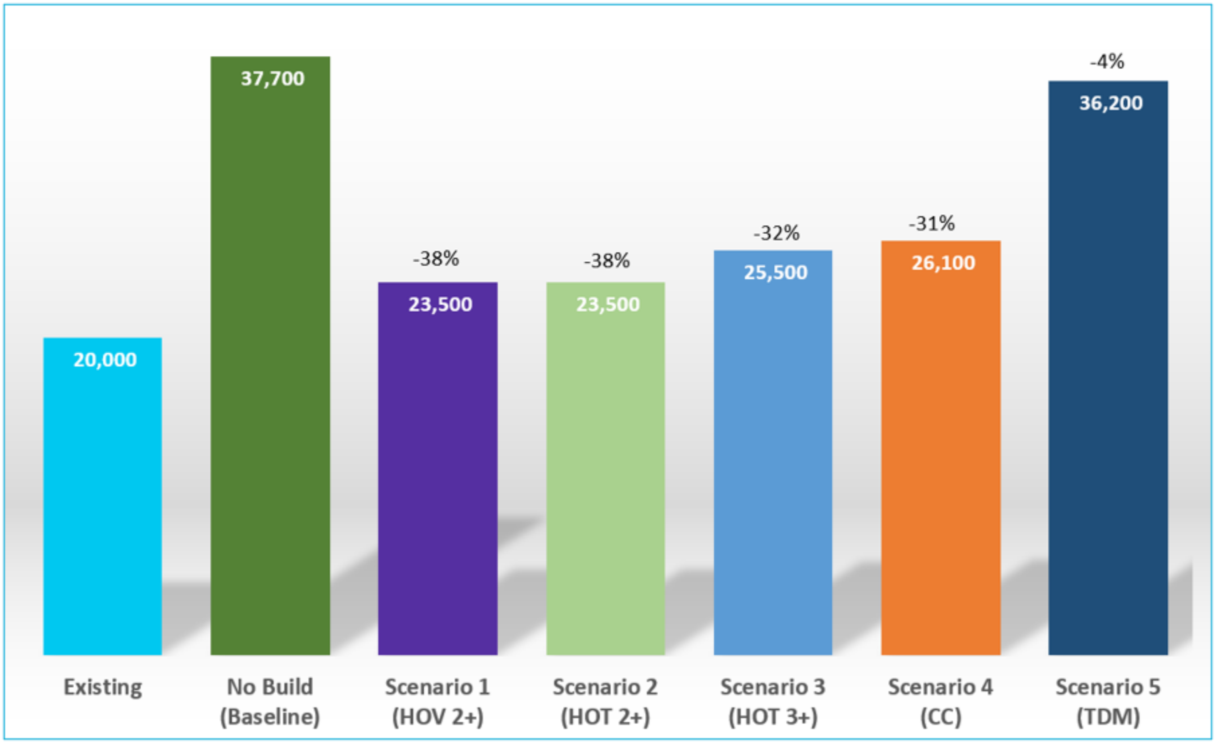


FIGURE 5.23 | VEHICLE MILES TRAVELED COMPARISON BY SCENARIO



** Numbers in Table 9 are presented as visuals in above bar charts*

FIGURE 5.24 | VEHICLE HOURS OF DELAY COMPARISON BY SCENARIO

5.8.2 | Segment-wise VMT/VHT/VHD Comparison of Scenarios

This section of the report compares the VMT, VHT, and VHD statistics by each of the study corridor segments, for all scenarios. **Table 5.10** and **Figure 5.25** show VMT by the I-80 CMCP corridor segments. Note that segments 5 and 6 have the highest VMT in comparison to other segments due to length of these segments.

TABLE 5.1 | SEGMENT-WISE VMT SCENARIO BY SEGMENT COMPARISON

VMT Existing		No Build	Scenario 1 (HOV 2+)	Scenario 2 (HOT 2+)	Scenario 3 (HOT 3+)	Scenario 4 (CC)	Scenario 5 (TDM)
Segment 1	599,253	707,754	720,294	727,412	714,154	673,703	703,323
Segment 2	644,114	784,513	790,052	797,427	785,308	740,415	779,499
Segment 3	1,265,284	1,590,933	1,600,456	1,613,637	1,592,651	1,497,606	1,583,578
Segment 4	1,415,368	1,718,748	1,745,161	1,753,694	1,728,043	1,588,330	1,712,551
Segment 5	1,841,808	2,110,063	2,109,565	2,109,321	2,108,598	1,889,628	2,108,208
Segment 6	2,134,113	2,273,815	2,480,485	2,486,624	2,445,911	2,109,562	2,251,077
Segment 7	455,042	510,007	551,380	553,984	540,110	473,166	504,907
Segment 8	1,469,104	1,593,641	1,620,302	1,602,208	1,525,546	1,478,522	1,577,705
Segment 9	546,638	589,089	643,255	641,681	631,649	546,536	583,199
I-80 Corridor	10,370,700	11,878,600	12,260,900	12,286,000	12,072,000	10,997,500	11,804,000

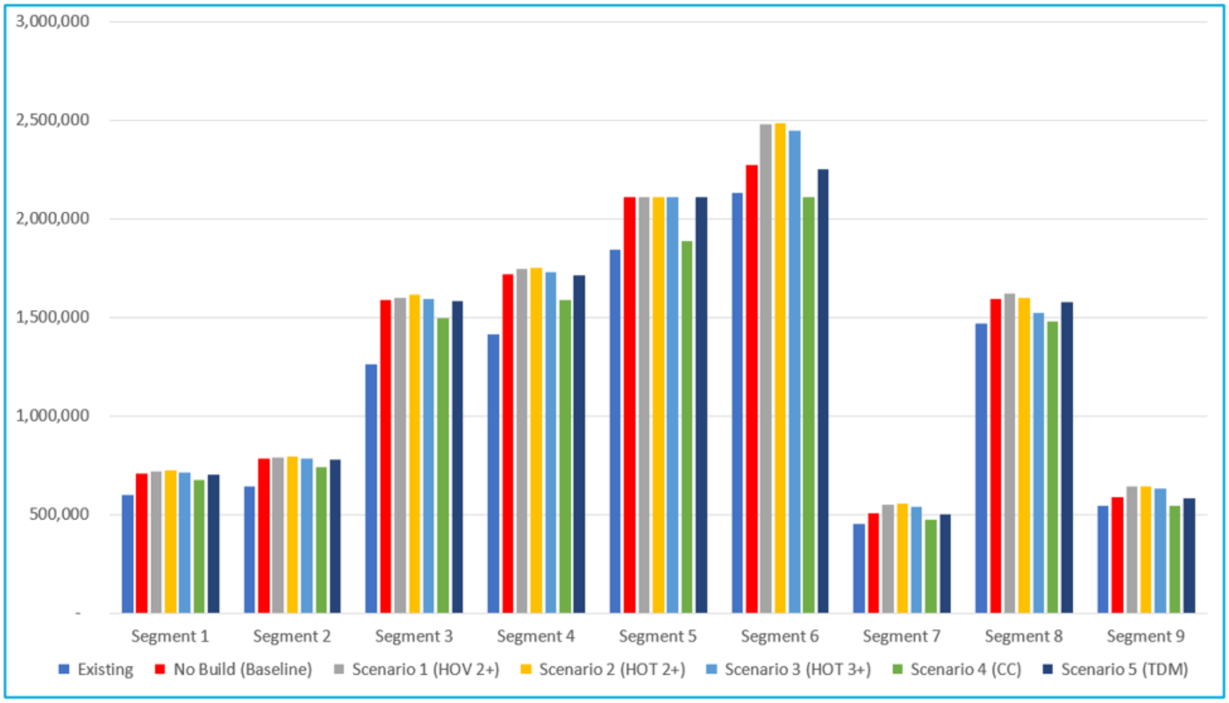


FIGURE 5.25 | VMT BY SEGMENT BY ALTERNATIVE

Table 5.11 and **Figure 5.26** show VHT by the I-80 corridor study segments. Note that segments 5 and 6 have the highest VHT in comparison to other segments and Segments 1, 7 and 9 have least VHT.

TABLE 5.11 | SEGMENT-WISE VHT BY SCENARIO

VHT	Existing	No Build (Baseline)	Scenario 1 (HOV 2+)	Scenario 2 (HOT 2+)	Scenario 3 (HOT 3+)	Scenario 4 (CC)	Scenario 5 (TDM)
Segment 1	9,739	12,171	11,895	12,019	11,750	11,362	12,021
Segment 2	10,166	12,989	12,534	12,707	12,599	12,051	12,847
Segment 3	20,935	29,097	29,326	29,930	29,320	26,663	28,767
Segment 4	23,149	31,896	29,147	29,366	29,184	28,179	31,604
Segment 5	29,259	35,425	33,445	33,430	33,866	30,533	35,377
Segment 6	44,827	52,830	48,393	47,971	48,345	45,534	52,758
Segment 7	7,768	8,824	9,282	9,292	9,192	7,606	8,812
Segment 8	25,942	28,507	28,900	28,701	28,056	24,570	28,468
Segment 9	10,473	12,332	12,120	11,961	11,822	10,629	12,315
I-80 Corridor	182,300	224,100	215,000	215,400	214,100	197,100	223,000

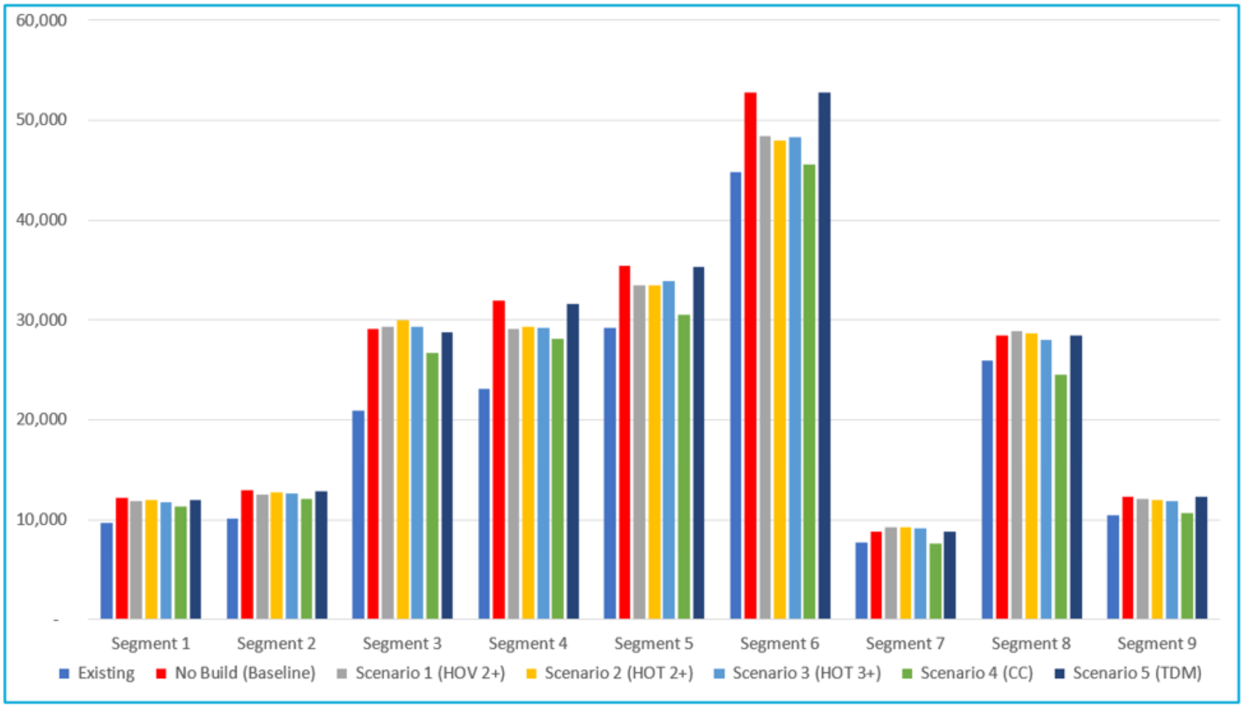


FIGURE 5.26 | VHT BY SEGMENT BY SCENARIO

Table 5.12 and **Figure 5.27** show VHD by I-80 corridor segment. Segment 6 has highest VHD in comparison to other segments and segments 2 and 7 has least VHD.

TABLE 5.12 | SEGMENT-WISE VHD BY SCENARIO

VHT	Existing	No Build (Baseline)	Scenario 1 (HOV 2+)	Scenario 2 (HOT 2+)	Scenario 3 (HOT 3+)	Scenario 4 (CC)	Scenario 5 (TDM)
Segment 1	520	1,282	814	828	763	997	1,201
Segment 2	253	885	366	428	505	634	821
Segment 3	1,435	4,396	4,569	4,989	4,707	3,442	4,187
Segment 4	1,343	5,129	2,195	2,294	2,502	3,512	4,941
Segment 5	913	2,761	939	935	1,369	1,351	2,742
Segment 6	11,046	16,834	9,347	8,824	9,797	11,677	16,142
Segment 7	517	704	580	548	644	488	675
Segment 8	2,676	3,279	3,254	3,337	3,892	2,274	3,144
Segment 9	1,271	2,417	1,484	1,343	1,346	1,677	2,318
I-80 Corridor	20,000	37,700	23,500	23,500	25,500	26,100	36,200

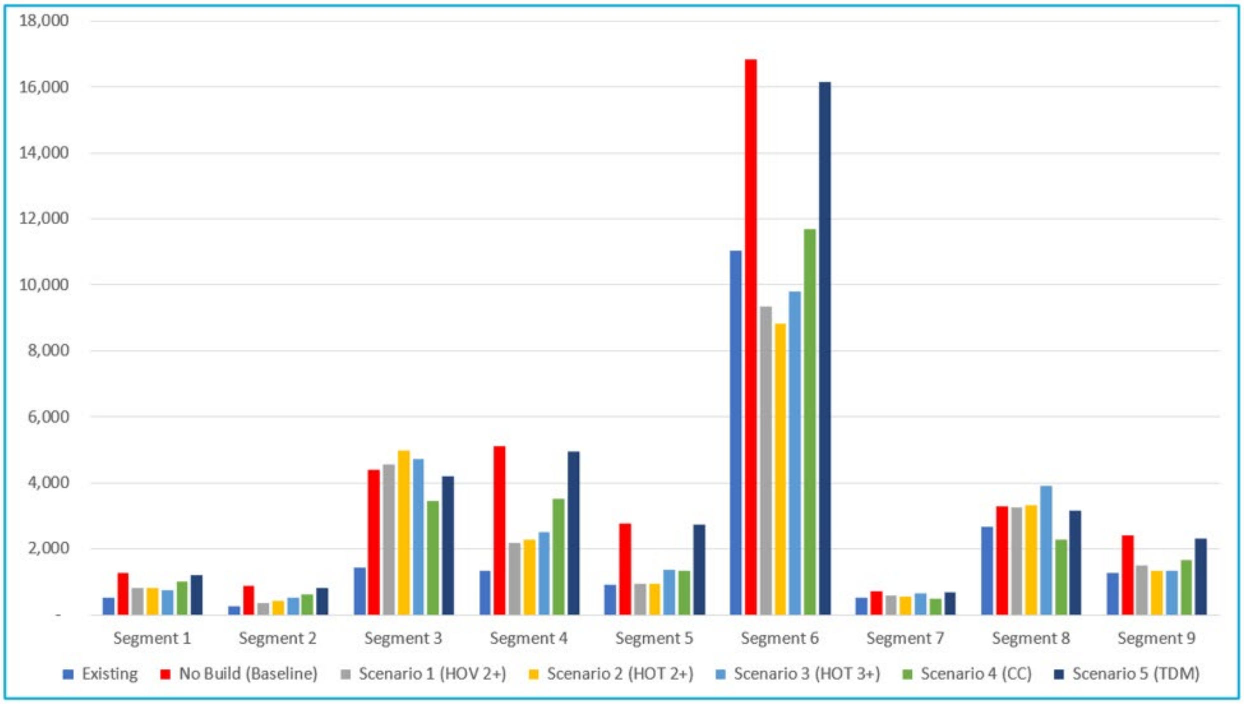


FIGURE 5.27 | VHD BY SEGMENT BY SCENARIO

5.9 | Benefit Cost Analysis

This section reports on the Benefit Cost Analysis (BCA) for the future Build scenarios including methodology, model data inputs, and results.

5.9.1 | Benefit Cost Analysis Methodology

The California Life-Cycle Benefit/Cost Analysis Corridor Model (Cal-B/C Corridor) Version v7.1 was utilized to conduct the BCA for the I-80 CMCP scenarios. Cal-B/C Corridor is a Microsoft Excel spreadsheet that provides economic benefit-cost analysis for a range of transportation projects.

Cal-B/C Corridor estimates user benefits in four main categories:

- Travel time savings due to faster travel speeds on highways, or faster or more frequent service on transit modes.
- Vehicle operating cost savings on highways due to lower costs from more efficient travel speeds or avoided vehicle operating and out-of-pocket costs when travelers switch from highways to transit.
- Safety benefits on highways due to safety improvements or for transit riders who switch from highways to a safer transit mode.
- Emissions benefits on highways due to travel at less polluting speeds or by reductions in VMT due to suppressed trips or mode shifts to transit.

5.9.2 | Benefit Cost Analysis Model Inputs and Assumptions

The following inputs were used for the Cal-B/C calculations:

- Cost Estimate – Project costs are estimated from available sources including the MTC RTP, SACOG MTP/SCS, and Caltrans for both Districts 3 and 4 projects. Cost estimates for each

scenario were calculated based on available information. No cost was assumed for demand management or programmatic improvements that could reduce travel demand.
- VMT and VHT – VMT and VHT for each scenario were obtained for A.M. and P.M. peak period from the microsimulation model.
- All other inputs were the same for all scenarios such as truck percentages, average vehicle occupancy, and safety data.

Estimated costs and assumptions used in Cal-B/C calculations can be found in the I-80 Corridor Modeling and Analysis Project Summary report (see **Appendix III).**

5.9.3 | Benefit Cost Analysis Results

Table 5.13 | Benefit Cost Ratio by CMCP Segments **5.13** shows benefit-cost ratios of the I-80 CMCP for each of the Build scenarios. Among the five scenarios, Scenario 4 (Capital Corridor Improvements) has the best (highest) benefit cost ratio. Scenario 4 has least cost among the scenarios and does provide more benefits due to model projected shift from single occupancy vehicle to transit. As shown, the Cal-B/C varies widely by segment, primarily based on the cost of the improvements.

TABLE 5.13 | BENEFIT COST RATIO BY CMCP SEGMENTS

	Scenario 1 (HOV 2+)	Scenario 2 (HOT 2+)	Scenario 3 (HOT 3+)	Scenario 4 (CC)	Scenario 5 (TDM)
Segment 1	0.08	-0.04	0.23	1.58	0.36
Segment 2	0.32	0.07	0.49	46.26	15.71
Segment 3	0.00	-0.08	-0.02	0.55	0.08
Segment 4	0.82	0.59	0.81	6.98	0.15
Segment 5	0.42	0.42	0.43	4.18	0.07
Segment 6	-0.29	-0.18	0.09	82.21	6.87
Segment 7	-1.52	-1.62	-1.15	2.19	0.55
Segment 8	-0.45	-0.36	1.06	3.90	39.63
Segment 9	-1.15	-1.00	-0.62	7.88	0.73
I-80 Corridor	**0.03**	**-0.02**	**0.22**	**3.05**	**0.27**

Note that Cal-B/C analyses include all fully funded RTP projects, financially constrained RTP projects that are not fully funded, and some selected unconstrained projects and SHOPP projects. These projects are included in all 5 scenarios and are not part of Future No Build. For example, Segment 3 includes the I-80/I-680/SR 12 Interchange project, which has an estimated cost of $380 million. The entire cost of this project is included in the analysis, even though the entire benefit of this project is not captured. The resulting analysis results capture only the portion of benefit along I-80, not along I-680 or SR 12 or any other parallel routes which may also benefit. This is one of the limitations of the Cal-B/C analysis. These results of Cal-B/C analyses should be used for comparing scenarios only, rather than ultimate project implementation decisions. To measure the benefit-cost analysis of a particular project a separate analysis would be required using model results to show the with and without performance metrics for each particular project.

Chapter 6 | Environmental / Sustainability / Climate Change

California has been on the forefront of climate change policy, planning, and research across the nation. With rising GHG, climate and extreme weather conditions continue to impact California's population and infrastructures. Caltrans recognizes that outside of its own efforts, there are regional efforts to mitigate the effects of climate change. Coordination with local governments and stakeholders is crucial to ensure that climate analyses and adaptations are developed in partnership. Regional coordination will be especially important to combat stressors like rising temperature, volatile precipitation levels, and an increase in wildfire severity. Majority of the information in this chapter comes from the Caltrans Climate Change Vulnerability Assessment Technical Report and Map. This report was produced to provide an in-depth overview on the potential implications of climate change to Caltrans assets, and how climate data can be applied in decision-making.

6.1 | Corridor Setting

Spanning three counties, the I-80 CMCP corridor lies at the intersection of numerous geographical and geological features that, in conjunction with variations in hydrology and climate, has resulted in the formation of unique ecological conditions. Urban areas occur throughout with the greatest concentration of development occurring along I-80, the main transportation artery that generally runs southwest to northeast.

About 20 percent of the unincorporated land along the corridor in Solano County is undeveloped open space, including marshlands and watershed, creeks, and other waterways that support wildlife habitat. Just over half of lands along the corridor are in agricultural use. Agricultural land supports very few native species and provides few foraging areas, nesting or den sites, or wildlife corridors.

In Yolo County, outside the cities and other developed portions, much of the region consists of annual grasslands that are dominated by non-native grasses and forbs. The regions agricultural lands consist of irrigated hayfields and croplands, which includes areas used for hay production and fallow farm fields. There are several small pockets of oak woodland that are also present along the corridor. Between Davis and West Sacramento lies the Yolo Bypass Wildlife Area. This roughly 16,770 acre, ecologically rich, protected area is managed by the California Department of Fish and Wildlife and consists of various natural resources including rice fields, grasslands, seasonal and permanent wetlands, and riparian woodland communities. The I-80 corridor in Sacramento County is largely urban in nature.

FIGURE 6.1 | I-80 YOLO CAUSEWAY PHOTO

6.2 | Environmental Factors

Environmental Considerations

The purpose of this environmental scan is to conduct a high-level identification of potential environmental factors that may require future detailed analysis in the project development process. This is a general qualitative evaluation of the environmental factors in the corridor for planning purposes to identify issues early that may significantly affect project cost and schedule prior to the project development process. Information presented here is not meant to represent all environmental issues that exist within the corridor vicinity. The major factors are given an impact probability rating of Low-Medium-High or a No or Yes depending on their presence in the corridor and shown in **Table 6.1**. Environmental considerations for project funding include mitigation and restoration costs, including protection of critical habitat and open space.

TABLE 6.1 | ENVIRONMENTAL FACTORS

Segment			1	2	3	4	5	6	7	8	9
Air Quality*	**CO_2**		A	A	A	A	A	A	A	A	A
	Lead		A	A	A	A	A	A	A	A	A
	NO_2		U	U	U	U	U	U	U	U	U
	Ozone		NA	NA	NA	NA	NA	NA	NA	NA	NA
	Particulate Matter	**2.5**	NA	NA	NA	NA	NA	NA	NA	NA	NA
		10	U	U	U	U	U	U	NA	NA	NA
	SO2		A	A	A	A	A	U	U	U	U
Bay Conservation and Development Commission Jurisdiction			Yes	No	No	No	No	No	No	No	No

Segment	1	2	3	4	5	6	7	8	9
Climate Change/Sea Level Rise	Low	Low	Low	Low	Low	Low	Low	Low	Low
Cultural Resources	Low	Low	Low	Low	Low	Low	Low	Low	Med
Farm/Timberland[i]	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No
Fish Passage	Low	Low	Low	Low	Low	High	Low	Low	Low
Floodplain	100 year	100 year	100 Year	100 Year	100 Year	100 Year	100 Year	100 Year	100 Year
Habitat Connectivity[45]	Low	High	Med	Low	Low	Low	Med	Low	Low
Hazardous Materials	Low	Low	Med	Low	Low	Low	Low	Low	Low
Naturally Occurring Asbestos	Low	Low	Low	Low	Low	Low	Low	Low	Low
Visual Aesthetics	Low	Low	Low	Low	Low	Low	Low	Low	Low
Seismic	Low	Low	Med	Med	Low	Low	Low	Low	Low
Section 4(f) Land	Low	Med	High	High	Low	Low	High	Med	Low
Special Status Species	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Waters and Wetlands	High	Low	High	Low	Low	Low	Med	Low	Low

A=Attainment, NA=Non-Attainment, U=Unclassified
*Source: Environmental Protection Agency (EPA), National Ambient Air Quality Standards (NAAQS) Data

Air Quality

There are three Air Quality Management Districts (AQMD) covering the I-80 CMCP corridor. The California Legislature created the Bay Area Air Quality Management District (BAAQMD) in 1955, as the first regional air pollution control agency in the country. BAAQMD is tasked with regulating stationary sources of air pollution in the nine-county Bay Area, except for northern parts of Sonoma and Solano Counties which fall under the jurisdiction of the Yolo-Solano County Air Quality Management District (YSCAQMD). YSCAQMD was created in 1971 by a joint-powers agreement between the Yolo and Solano County Boards of Supervisors. The Sacramento Metropolitan AQMD, created in 1959 by the Sacramento Board of Supervisors, monitors air quality for the Sacramento Valley basin east of Yolo County. Each AQMD is governed by a Board of Directors composed of locally elected officials from each of the represented counties, with the number of board members proportionate to population. Projects need to be consistent with the air quality conformity analysis performed for the current RTPs and Regional Transportation Improvement Program.

Air quality conformity is determined by the US EPA which promulgates existing National Ambient Air Quality Standards (NAAQS) for each criteria air pollutant based on state monitoring and modeling of each pollutant. NAAQS are applied to determine if an AQMD is in conformity. If the air quality criteria pollutant meets or exceeds the NAAQS, the area is in attainment; otherwise, the area is in non-attainment. If EPA cannot make a determination, the area is designated “Unclassified.”

Farm/Timberland

Prime farmland has the best combination of physical and chemical composition to sustain long-term agricultural production. This agricultural land has high soil quality, desirable growing season, and ideal water supply to produce sustained high yields. Land must have been used for irrigated agricultural production at some time during the four years prior to the mapping date to receive such a designation. Prime farmland is in Suisun Valley north of Fairfield (Segment 3), and in the unincorporated areas of Solano County (Segments 4 and 5). Agriculture is the primary business in Yolo County. Ninety-two percent of the land surface of Yolo County is off-limits to residential, commercial, and industrial development uses. Sixty-seven percent of the unincorporated area of the county is protected under

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[45] Essential Connectivity Layer, https://map.dfg.ca.gov/bios/

Williamson Act contracts to provide further long-term protection of these lands[46] (Segments 9, 10, and 11).

Habitat and Biological Resources

The San Francisco Bay Area and Sacramento Valley region, which includes Solano, Yolo, and Sacramento counties, has been characterized as a biodiversity hotspot at both global and national levels since there are inland, saltwater, freshwater habitats, and vast watersheds feeding into the Sacramento River and the Delta. This geographical area is known as the California Floristic Province, or a biodiversity hotspot containing species and plant life that cannot be found elsewhere in the world. The corridor area is home to a number of threatened or endangered species, such as the Swainson's hawk, burrowing owl, giant garter snake, and California red-legged frog.

The Suisun Marsh is located in southern Solano County and is bordered by I-680 to the west and on the east by the Sacramento-San Joaquin Delta. It is a critical part of the San Francisco Bay-Delta estuary ecosystem and encompasses more than ten percent of California's remaining natural wetlands, serving as resting and feeding ground for thousands of waterfowl migrating on the Pacific Flyway. It also supports 80 percent of the State's commercial salmon fisheries by providing important tidal rearing areas for juvenile fish and provides critical protection of the drinking water for 22 million people by preventing saltwater intrusion into the Delta. Suisun Marsh is within the jurisdiction of the Bay Conservation and Development Commission.

The Sacramento Valley region, which includes Sacramento and Yolo counties, has been characterized as a biodiversity hotspot at both global and national scales since it includes inland, saltwater, and freshwater habitats and vast watersheds feeding the Sacramento River and the Delta. Myers et. al (2000) classifies this geographical area as the California Floristic Province, of which there are only three other areas as biodiverse as it is in North America because of its assortment of flora, fauna, and habitat. The structure, composition, and functionality of ecosystems in the area are home to a number of sensitive species, such as the Swainson's Hawk, Burrowing Owl, Giant Garter Snake, and California Red-Legged Frog.

Stretching along the bottom of the valley floor with elevations ranging from about 15 to 90 feet above sea level, habitats along the I-80 corridor are different depending on whether you are in a developed region. Within the highly developed areas of the major cities, including the greater Sacramento area and Davis, habitats would mostly be classified as either urban with ornamental trees and other landscaped planting, or barren where areas naturally or artificially contain less than 2 percent herbaceous vegetation cover or less than 10 percent tree or shrub cover. Outside the cities and other developed portions, much of the region consists of annual grasslands that are dominated by non-native grasses and forbs, or irrigated hayfield and cropland, which includes areas used for hay production and fallow farm fields. Small pockets of oak woodland are also present.

This stretch of I-80 covers the Lower American, Upper Coon-Upper Auburn, and Lower Sacramento watersheds, in addition to a small portion of the Upper Putah watershed at the Yolo/Solano county line. Virtually all watercourses, save some maintained canal systems for agricultural irrigation, contain extensive riparian vegetative communities in areas that interface between land and the river stream system. This is especially true for the major rivers such as the Sacramento River, Prospect Slough, Putah Creek, and Arcade Creek, including their larger floodplains. Because these larger systems are receiving

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[46] https://www.yolocounty.org/home/showpublisheddocument/14465/635289380535200000

all the waters and nutrients originating from the higher areas outside the valley, these areas provide vast amounts of food, water, migration, and dispersal corridors, in addition to escape, nesting, and roosting habitat for numerous wildlife species while providing shade, sediment, nutrient or chemical regulation, and stream bank stability. These areas are also a source of input for large woody debris or organic matter to the channel, which are necessary habitat elements for fish and other aquatic species. Due to the flat topography and local relief of the region, wetlands are present in areas where water persists long enough to create anaerobic conditions. Wetlands provide additional habitat benefits to wildlife as well as their water detention and water recharge properties. A special kind of wetland, vernal pools, are depressions in areas where a hard, underground layer prevents rainwater from draining downward into the subsoils. These areas support plant and animals that a specifically adapted to vernal pool ecology.

There are several wildlife species that reside throughout this area of I-80 corridor including threatened and endangered, or otherwise regulated species. Major species include but are not limited to: Valley Elderberry Longhorn Beetle, Giant Garter Snake, Swainson’s Hawk, Tricolored Blackbird, multiple vernal pool and rare plant species, and anadromous fish within the major rivers. Notably, the Yolo Causeway bridge contains one of the largest maternal colonies of Mexican free-tailed bats in the state of California and is well known to the residences and non-governmental agencies in the region. The bridge also provides ample habitat for mud-nesting birds like swallows.

Historic/Cultural Resources

The National Register of Historic Places includes properties located within and along the I-80 corridor. Native American archaeological sites are found in rural settings where homesteads, ranches, or farms were once present in the corridor. Architecturally significant properties located within the corridor will most likely be associated with the agricultural history of the area. State or locally listed historic properties are located in the general vicinity of the corridor as well. Impacts to these resources would need to be further studied during project development based on project location and scope.

Parks/Open Space

The US Code 49 §303[47] 4(f) sets federal policy to preserve the natural beauty of open space and historic areas. Resources include publicly owned parks, recreation areas, wildlife or waterfowl refuges, and historic sites. Caltrans Environmental staff will determine the need for a Section 4(f) evaluation based on a specific project potential to impact 4(f) resources located in a given study area. Mitigation for impacts will be developed where appropriate in corridor specific areas. Where specific projects for the I-80 CMCP do not involve new ROW acquisition, potential impacts to 4(f) resources could result due to the proximity of project related construction the Yolo Bypass since these 4(f) resources are directly adjacent to the I-80 corridor. The Fairfield Linear Park in Fairfield, Lagoon Valley Hills Park and Pena Adobe Historical Site in Vacaville and Peytonia Slough Ecological Reserve in unincorporated Solano County represent examples of land potentially protected by Section 4(f) in Solano County. In south Sacramento, downtown Sacramento, and Natomas, more City and County Parks are located along the I-80 corridor.

Special Status Species

"Special Status Species” is a universal term used in the scientific community for species that are considered sufficiently rare that they require special consideration and/or protection and should be, or have been, listed as rare, threatened, or endangered by the Federal and/or State governments.

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[47] https://www.law.cornell.edu/uscode/text/49/303

Special Status Species occur along the I-80 corridor; the most abundant animal species include, but are not limited to, giant garter snake (*Thamnophis gigas*), song sparrow (Modesto population) (*Melospiza melodia*), Western, yellow-billed cuckoo (*Coccyzus americanus*), Swainson's hawk (*Buteo swainsoni*), burrowing owl (*Athene cunicularia*), tricolored blackbird (*Agelaius tricolor*), and a rare population of purple martin (*Progne subis*) located near downtown Sacramento. The I-80 corridor crosses the Sacramento River which is habitat for Central Valley steelhead (*Oncorhynchus mykiss irideus*), longfin smelt (*Spirinchus thaleichthys*), Sacramento splittail (*Pogonichthys macrolepidotus*), Central Valley spring-run chinook salmon (*Oncorhynchus Tshawytscha pop. 11*), and Sacramento winter-run chinook salmon (*Oncorhynchus Tshawytscha pop. 7*), which are all special status species.

Seismic

The area surrounding the corridor is seismically active. During a seismic event there could be liquefaction in some locations. The Green Valley Fault, a branch of the slip-strike San Andreas fault system, crosses the I-80 corridor just west of Fairfield in Segment 3, in a northwest to southeast direction beginning in Foss Valley in Napa County and ending in unincorporated Contra Costa County at the Concord Fault. The Cordelia Fault, a sibling of the Green Valley Fault, also crosses the corridor in Segment 3 at Cordelia Junction in a northwest to southeast direction originating at the Sonoma Volcanic area north of Fairfield to the Cordelia Slough in the Grizzly Island Wildlife Area. Lastly, the Vaca Fault is the northerly extension of the Pittsburg-Kirby Hills Fault found in Contra Costa County. It crosses the corridor in Segment 4 just west and through the center of Vacaville in the same northwest to southeast direction beginning in the Vaca Mountains northwest of Vacaville, running beneath Travis Air Force Base, and ending in the unincorporated Solano County community of Birds Landing.

Earthquakes and seismic activity will always pose a threat to California’s infrastructure. Since 1700 there have been 78 recorded earthquakes that either met a magnitude greater than or equal to 6.5, caused loss of life, or created more than $200,000 in damage[48]. There are no known fault lines that intersect with I-80 corridor in Caltrans District 3. The nearest fault zone to I-80 is a north-south running fault line that begins south of Dixon, passes through Rio Vista, and ends south of Brentwood (along SR 4)[49]. This unnamed fault zone has not had a major earthquake since 1892[50].

6.3| Climate Change

Climatic and extreme weather conditions in California are expected to change, with atmospheric warming contributing to higher seas, changing precipitation patterns and higher temperatures. These changing conditions are anticipated to affect the SHS in a variety of ways and may increase exposure to environmental factors beyond the facilities’ original design considerations, requiring adaptive responses. Changing climate conditions and associated extreme weather changes present a series of challenges in delivering resilient transportation facilities. The primary concern is that changing conditions such as extreme weather events or permanent inundation may impact the public or the transport of goods and services through the I-80 corridor.

Sea Level Rise

Sea level rise (SLR) is perhaps the best documented and most accepted impact of climate change, which can be directly tied to increased levels of GHG. The Governor’s EO B-18-12 (April 25, 2012) directed

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[48] California Department of Conservation: https://www.conservation.ca.gov/cgs/Pages/Earthquakes/Earthquakes-Significant.aspx

[49] Office of Planning and Research: https://sitecheck.opr.ca.gov/

[50] Map Sheet 49, Epicenters of and Areas Damaged by M>5 California Earthquakes, 1800-1999: https://www.conservation.ca.gov/cgs/Documents/Publications/Map-Sheets/MS_049.pdf

State agencies to reduce GHG by twenty percent by 2020. Observations of sea levels along the California coast, and global climate models indicate that California's coast will experience rising sea levels over the next century. The effects of SLR will have impacts on all modes of transportation, significantly increasing the challenge to transportation managers in ensuring reliable transportation routes are available. Inundation of even small segments of the intermodal transportation system can render much larger portions impassable, disrupting connectivity and access to the wider transportation network. Caltrans seeks to address SLR and GHG by partnering with local and regional stakeholders to address climate change on the SHS and local streets and roads.

If left unmanaged, the impacts from future flooding and coastal erosion could pose considerable risks to life, safety, critical infrastructure, natural and recreational resources, and have impacts on the economy. Although the I-80 mainline is not expected to be inundated, a large section of Union Pacific tracks will likely be subject to sea level rise and storm surge related inundation. Disruption to rail operations may lead to increased travel demand on the I-80 corridor and local arterials. Current projections published by the Ocean Protection Council in 2018 suggest that sea levels at the San Francisco tide gauge could rise by 1.9 feet by 2050 and 6.9 feet by 2100. Based on sea level rise mapping data from the Bay Conservation and Development Commission, rail operations could be impacted by sea level rise by the Year 2050 which may affect travel on I-80.

According to the CCJPA Sea Level Rise Vulnerability Assessment[51], sea level rise poses several vulnerabilities to the Capitol Corridor rail system. Portions of the railroad tracks are physically vulnerable to sea level rise and liquefaction due to their geographic location in wetlands and on soft sandy soils. The ballast (the strata of granular materials upon which the railroad track is laid) and earth embankment are susceptible to washout in cases of strong wave action and high water. In the event of railroad tracks being submerged in water, trains are not permitted to pass due to the design of railroad equipment and safety reasons. The tracks are functionally vulnerable to disruptions of external electricity sources, which powers the signal system, and train service on the entire track system is impacted if one section of track is out-of-service. The vulnerabilities of the signal system are closely linked with the vulnerabilities of the railroad track system as the two systems are located in the same place and are reliant on each other.

The major vulnerability to the portion of Capitol Corridor within the I-80 corridor is due to the tracks crossing wetlands, which are very likely to be impacted by the effects of sea level rise. Soil subsidence in the wetlands is already a concern and is the cause for much of the current railroad track maintenance. Permanent inundation of the tracks is likely to occur with as little as two feet of sea level rise, and temporary flooding of the tracks may occur with a 5-year extreme storm tide level. The station will be vulnerable to disruption if road access from Suisun City is flooded. Many of the key access roads are expected to be impacted by sea level rise starting at two feet.

Additionally, train stations can be vulnerable to flooding, and will become more vulnerable to flooding as climate change increases the frequency and severity of flood events. The only rail station located in the I-80 corridor is the Suisun/Fairfield station. The station is not situated near any bodies of water but is near the FEMA 1% annual chance flood zone. Impeded road access to the station due to sea level rise will be a concern. At 3 feet of sea level rise, roads needed to access the Suisun/Fairfield station will become permanently inundated, and at 5 feet of sea level rise, the station will be almost entirely surrounded by water.

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[51] Capitol Corridor Joint Powers Authority Sea Level Rise Vulnerability Assessment (2014) http://www.adaptingtorisingtides.org/wp-content/uploads/2015/04/CCJPA-SLR-Vulnerability-Assessment_Final.pdf

Temperature

Temperature rise is an important facet of climate change. Summer temperatures are projected to continue rising, and a reduction of soil moisture, which exacerbates heat waves, is projected for much of California. Materials exposed to high temperatures over long periods of time will deform. Pavements in particular can be deteriorated by exposure to high temperatures. The Caltrans Vulnerability Assessment Report[52] analyzed change in the average minimum temperature for the Years 2025, 2055, and 2085.

Solano County is expected to see an increase of 1.5 to 3.9 degrees Fahrenheit by year 2025. By year 2055, Solano County is expected to see an increase of 3.5 to 4.9 degrees Fahrenheit. By 2085, Solano County will see an increase of six to 7.9 degrees Fahrenheit, and portions of the county near Fairfield and Vallejo will see an increase of up to 8.9 degrees Fahrenheit.

Yolo and Sacramento counties are expected to see an increase of 2 to 5.9 degrees Fahrenheit by year 2025. By year 2055, Sacramento and Yolo counties are expected to see an increase of 4 to 7.9 degrees Fahrenheit by 2055, and 8 to 11.9 degrees Fahrenheit by 2085. These increasing temperatures would need to be considered as a part of pavement design for any projects planned for the corridor, and more frequent maintenance of the existing pavement facilities may be needed.

The consideration of the timing of climate change differs for pavement design when compared to other assets. Many of Caltrans assets, including roadways, bridges, and culverts, will likely be in place for many decades or longer, and therefore decisions made today for these types of assets need to incorporate a longer view than is the case for asphalt pavement. Asphalt pavement is replaced approximately every 20-25 years, or sooner if quality degrades more rapidly.

Precipitation

Increasing temperatures are expected to result in changing precipitation events, due to an increase in energy and moisture in the atmosphere. Increased precipitation levels, combined with other changes in land use and land cover, can increase the risk of damage or loss from flooding. Transportation assets in California are affected by precipitation in a variety of ways, such as inundation/flooding due to heavy rainfall events, landslides and washouts, or structural damage from heavy rain events. Many of these impacts may lead to disruptions of key transportation infrastructure and services.

The Caltrans Vulnerability Assessment Report used Representative Concentration Pathways (RCP) 8.5 (high-emissions scenario) to analyze the 100-year storm rainfall event. The assessment was done for the Years 2025, 2055, and 2085. Most of Caltrans District 4 Solano County is expected to see a zero to 4.9 percent increase in precipitation, with some portions of the county experiencing a five to 9.9 percent increase by 2055. Most of Caltrans District 3 Yolo and Sacramento counties are expected to see a zero to 4.9 percent increase in precipitation, with some portions of Sacramento County experiencing a five to 9.9 percent increase by 2055.

The primary concern with regard to transportation assets is not the overall volume of rainfall observed over an extended period, but rather the expectation of changing future conditions for heavy precipitation and the potential for increasing damage to the SHS. The impact of changing precipitation events should be considered during project design and the need for regular monitoring and

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[52] Caltrans, & WSP. (2018). *Caltrans Climate Change Vulnerability Assessments: District 4* (pp. 1-73, Tech.). CA: Caltrans. https://dot.ca.gov/programs/transportation-planning/office-of-smart-mobility-climate-change/climate-change

maintenance should be highlighted, because it is difficult to identify vulnerable assets and their locations at the planning level.

Wildfire

Wildfire frequency and intensity is expected to be affected by changes in climate due to increasing temperatures, changing precipitation patterns, and resulting changes to land cover. Wildfire can be a direct risk to travelers on California roadways, transportation system operations and maintenance, and Caltrans infrastructure. Wildfires can indirectly contribute to landslide and flooding exposure, by burning off soil-stabilizing land cover and reducing the capacity of the soils to absorb rainfall. Both factors can contribute to dramatically higher runoff and the presence of debris that can clog culverts or bridge openings. Wildfire smoke can impact visibility and the health of the public.

The Caltrans Climate Change Vulnerability Assessment Report examined which areas in District 3 and District 4 pose medium, high, and very high levels of concern and where roadway would be exposed to potential wildfires. The report analyzed the likelihood of wildfires for the Years 2025, 2055, and 2085. With this assessment, no portion of the I-80 corridor would be exposed to potential wildfires. In addition, the California Department of Forestry and Fire Protection's (Cal Fire) Fire and Resource Assessment Program (FRAP)[53] assesses the amount and extent of California's forests and rangelands, analyzes their conditions, and identifies alternative management and policy guidelines. Through the FRAP, Cal Fire examines which areas throughout the State pose moderate, medium, high, very high, and extreme wildland fire threat within State Responsibility Areas and establishes Fire Hazard Severity Zones based on this data. Cal Fire has responsibility for wildland fire protection and prevention in the SRA only. Local Responsibility Areas (LRA) are incorporated cities, urban regions, agriculture lands, and other areas where the local government is responsible for wildfire protection. Within the I-80 corridor, only parts of Solano County are located within the SRA. The remainder of the District 4 portion of the corridor and the entirety of the District 3 portion are located in LRAs, and fire threat data from Cal Fire is not available for those areas. Based on mapping data from Cal Fire, the Solano portion of the I-80 corridor experiences moderate to very high fire threat. In particular, the entirety of segment 2 (Post Mile 5.8 – Post Mile R11.4) experiences very high fire threat. In the past few years, the area has experienced devastating wildfires. In August 2020, the LNU Lightning Complex fires occurred across Lake, Napa, Sonoma, Solano, and Yolo counties. The complex of fires was composed of several lightning-sparked fires and began when the Hennessey Fire grew to merge with the Gamble, Green, Markley, Spanish, and Morgan Fires. In Solano County, the LNU Lightning Complex fires burned in the hills surrounding Fairfield and Vacaville, destroyed 1,491 structures, and burned a total area of 363,220 acres.

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[53] California Department of Forestry and Fire Protection's (Cal Fire) Fire and Resource Assessment Program (FRAP) https://frap.fire.ca.gov/

Chapter 7 | Stakeholder and Public Engagement

Over the course of developing this multijurisdictional I-80 CMCP, there has been continuous collaboration between the CDT, TAC, and the stakeholder group. This collaboration's goal is to accurately identify multimodal needs and propose projects and strategies to address those needs to achieve a multimodal system on the I-80 corridor.

Public engagement is a critical component of the I-80 CMCP. All corridor stakeholders were in agreement that public input would inform the CMCP development and meaningful public engagement should be carried out. To achieve this, the CDT was able to secure public engagement support from Moore Iacofano Goltsman, Incorporated (MIG) through Caltrans Planning Public Engagement Contract (PPEC) in developing the Public Engagement Plan (PEP) and conducting engagement activities.

7.1 | Public Agency Engagement

The collaboration with the public agency stakeholders began with an in-person kick-off meeting on December 9, 2019, where the project scope, scope and timeline/deliverables were revealed. It was also decided that public agency stakeholders would be divided up into two groups: the TAC and the stakeholder group. Soon thereafter, COVID-19 protocols and safety concerns meant that all TAC and stakeholder meetings would be hosted through a virtual platform.

Technical Advisory Committee and Stakeholder Group

The I-80 CMCP TAC was composed of professional engineering and planning staff from MPOs and Regional Transportation Planning Agencies, County Transportation Agencies, major transit operators, and Tribal governments throughout the I-80 corridor. Staff representing Caltrans Districts 3 and 4 included Planning, Modeling and Forecasting, Traffic Operations, and Program, Project, and Asset Management, as well as Caltrans Headquarters (HQ) representatives from Division of Transportation Planning (DOTP) and Division of Rail and Mass Transportation. The TAC serves as working group to provide guidance on key technical issues. The TAC was scheduled to meet monthly or as needed over the course of CMCP development.

The I-80 CMCP stakeholder group was composed of representatives from cities, counties, transit operators, Federal Highway Administration, Solano-Yolo and Sacramento Metropolitan AQMDs, and Tribal governments. The stakeholders met quarterly over the course of the CMCP development.

To date there have been 16 TAC meetings. The focus of these meetings is for consensus on building CMCP chapters, modeling methodology, modeling scenarios and projects list, and the approval of the CMCP. TAC members are also tasked with reviewing deliverables to ensure the information is thorough and accurate.

Charter

The I-80 CMCP Charter was drafted beginning in winter 2019 and completed in summer 2020. The document describes the CMCP's purpose and need, objectives, deliverables, and milestones, as well as the roles and responsibilities of the TAC, stakeholder group, and Caltrans District 3 and 4 Corridor Managers. In addition, the Charter identifies known risks, constrains and discrepancies and includes strategies to address these risks and constraints. The I-80 CMCP final Charter can be viewed in **Appendix V**.

7.2 | Public Engagement

In February 2020, the Caltrans HQ DOTP Office of Multimodal System Planning approved a Corridor Planning Process Guide. This, together with the CTC CMCP guidelines, provides guidance to in preparing comprehensive corridor plans including a substantial emphasis on involvement with partner agencies, stakeholders, and the public.

The overall goal for the public outreach and engagement work of this CMCP is to develop and implement a meaningful and informed public engagement process that fully supports and informs the development of the I-80 CMCP. This involved informing and educating stakeholders and the public, while also building consensus, collaboration, and constructive relationships.

Planning Public Engagement Contract and Public Engagement Plan

While Caltrans staff are experienced with public agency stakeholder engagement, there generally lacks skills and experience with public engagement, because it is a new requirement for corridor planning. As a result, it was acknowledged in the early stage of the I-80 CMCP development that additional public engagement support from a consultant would be needed, and it would be acquired through a PPEC administered by Caltrans HQ DOTP, which is also documented in the CMCP Charter. The PPEC is a task order-based contract, where the contractor MIG provides strategic public engagement services that helps Caltrans to design, prepare for, conduct, and evaluate public engagement efforts to improve the outcome of Caltrans transportation planning efforts. MIG also provides trainings and helps Caltrans staff develop public engagement skills.

A Task Order was executed in August 2020, which outlined the description, schedule, and costs of the tasks MIG would perform to support the I-80 CMCP public engagement. A PEP was developed as part of the PPEC Task Order that included the following: the PEP target audience(s); the timing and platforms of the public outreach within; and the roles and responsibilities of Caltrans District 3 and 4 staff, MIG, and Caltrans HQ DOTP, and Division of Procurement and Contracting in Sacramento.

Next, the CDT, MIG, and the PPEC Contract Manager organized multiple brainstorming sessions focusing on the overall public outreach program's messaging and what platforms would be utilized in order to deliver a robust pallet of information to the public. Ultimately it was agreed that the strategy would include a notification campaign and developing a dedicated CMCP website, which would include CMCP information and document and house various public engagement events and activities. designed to encourage participation and solicit public feedback.

First Round of Public Engagement

The first round of public engagement involved a virtual public open house. This included the launching of the CMCP website: www.I80CMCP.com, which contains key CMCP information. An online survey was also made available throughout Solano, Yolo, and Sacramento counties. Public notifications for the virtual open house started a week prior to the commencement of the event. The following outreach channels were used to promote the virtual open house including outreach to priority populations:

- Caltrans District 3 and 4, SACOG, YCTD and STA/SolTrans websites
- SACOG, YCTD and STA commissions' mailing lists
- KRCA Channel 3 Sacramento
- The CMCP website
- Caltrans District 3, District 4, and HQ social media platforms

Virtual Public Open House and CMCP website a Virtual Open House was held from January 8, 2021, to January 31, 2021, centered around a dedicated CMCP website: www.I80CMCP.com. The website offers access to a variety of information such as an introductory video, a corridor map, CMCP goals and the CMCP fact sheet. An online survey was also made available on the website during the open house. The website serves as a central location for project information, announcements, schedule, and milestones and allows the public to provide input. The CMCP website also links to the Caltrans website for further information on current and near-term projects, highway conditions and interactive maps. The CMCP website remains accessible after the virtual open house concluded, with approximately 2,678 visitors to date which included outreach to priority populations based on outreach from TAC and stakeholder members that cover priority populations.

In addition to the launching of the CMCP website and the online survey, attendees also had the opportunity to participate in two live call-in question and answer sessions that aired on January 12, 2021, at noon to 1:00 P.M. and on January 14, 2021, at 5:30 P.M. to 6:30 P.M. hosted by Caltrans District 3 and District 4 Corridor Planning Managers.

Online Survey

To assist in managing the collection of public input, the www.I80CMCP.com website also included an online survey for the duration of the virtual open house. The survey was design to gather the following information:

- How people were using the I-80 corridor.
- When people were using I-80.
- Who are the people using I-80.
- What travel mode people used when traveling on I-80.
- Where people were going and the reason for their trips.

The survey contained a total of 10 questions, including one open-ended question which provided an opportunity for persons to add any additional information or comments. A total of 269 respondents filled out the survey. The responses demonstrated that trips on the I-80 corridor are primarily used for commuting and recreation with destinations in the Sacramento Valley and the San Francisco Bay Area. While there was significant travel reported during weekday commute hours as the survey indicated, there was also significant weekend travel during the mid-day and afternoon. Tallying the survey data, users identified the following top priorities for the I-80 corridor: System Reliability, Multimodal Accessibility, and Connectivity and Congestion which are consistent with the CMCP goals and objectives.

FIGURE 7.1 | I-80 CMCP WEBSITE PHOTO

Second Round of Public Outreach

The second and final round of public outreach was completed on July 27, 2022. This was needed to provide the public the opportunity to provide feedback on the proposed projects (**Table 9.2**).

The public outreach included a proposed project map, project table (**Table 9.2**) with descriptions and a qualitative rating for each project using the ratings from **Table 9.1**. There was also an active transportation network web-based map within the study area. The following outreach channels were used to promote the second public outreach including priority populations:

- Caltrans District 3 and 4, SACOG, YCTD, SacRT, and STA/SolTrans websites
- SACOG, YCTD and STA commissions' mailing lists
- Caltrans District 3, District 4, and HQ social media platforms

This final outreach generated six comments from the public. Most of the comments received were in relation to suggestions on additional active transportation connections and/or projects. These comments have been shared with the project managers overseeing the local Caltrans SHS projects in their respectively assigned areas. In total the I-80 CMCP received over website 2,678 views throughout the development of this plan which included outreach to priority populations based on outreach from TAC and stakeholder members that cover priority populations.

Board and Community Presentations

During the development of I-80 CMCP the CDT has continuously collaborated with partner agencies and local community organizations. This included public presentations to various committees or Boards who represent or work in coordination with priority populations. Below is a list of presentations made during the development of the CMCP.

- Willowbank County Service Area Advisory Committee
- Sacramento Transportation Management
- SacRT Board Meeting
- Sacramento Regional Transit Mobility Advisory Committee
- SACOG Regional Partnership Meeting

Chapter 8 | Tribal Government

For the I-80 CMCP, Caltrans has reached out to the Native American Tribal Governments located in the corridor study area. Due to COVID-19 constraints and many tribal governments having to close occurring at the beginning of the outreach efforts by Caltrans only some of the tribes have participated in either the TAC or stakeholder capacity. However, all the tribes have been invited to TAC or stakeholder meetings which included materials being discussed in the meeting invitations.

The following section is a list of the Native American Tribal Governments in the I-80 CMCP study area.

Buena Vista Rancheria of Me-Wuk Indians

Also known as:	Buena Vista Rancheria of Me-Wuk Indians of California Sierra Miwok
Recognition	Federally Recognized
County:	Amador
Tribal Affiliation:	Me-Wuk
Website:	https://www.bvtribe.com/
Land Acreage:	Approximately 67 acres
Tribal Membership:	Unknown
Adjacent Highways:	SR 99 and SR 16
Gaming Facilities Owned:	Harrah's Northern California Casino

Colfax – Todd's Valley Consolidated Tribe

Also known as:	Colfax – Todd's Valley Consolidated Tribe of the Colfax Rancheria
Recognition	Non-Federally Recognized
County:	Nevada, Placer, and Sacramento
Tribal Affiliation:	Nisenan Maidu & Miwok
Website	https://colfaxrancheria.com/
Land Acreage:	Approximately 40 Acres
Tribal Membership:	None, lost trust land in 1966 and lost federal recognition
Adjacent Highways:	I-80
Gaming Facilities Owned:	None

Ione Band of Miwok Indians

Also known as:	None Known
Recognition	Federally Recognized
County:	Amador, El Dorado, and Sacramento
Tribal Affiliation:	Miwok
Website:	https://ionemiwok.net/
Land Acreage:	Approximately 220 Acres
Tribal Membership	Approximately 800
Adjacent Highways:	I-5
Gaming Facilities Owned:	None

Kletsel Dehe Wintun Nation

Also known as:	Cortina Indian Rancheria Cortina Rancheria
Recognition	Federally Recognized
County:	Colusa and Solano
Tribal Affiliation:	Wintun (Patwin)
Website:	https://www.kletseldehe.org/
Land Acreage:	Approximately 640 Acres
Tribal Membership	Approximately 21
Adjacent Highways:	I-5, SR 16, and SR 20
Gaming Facilities Owned:	None

Nashville Enterprise Miwok Maidu – Nishiham Tribe

Also known as:	Nashville – El Dorado Miwok-Maidu-Nishinam
Recognition	Non-federally Recognized
County:	Glenn
Tribal Affiliation	None
Website:	Unknown
Land Acreage:	Unknown
Tribal Membership	Approximately Unknown
Adjacent Highways:	US 50 and SR 49
Gaming Facilities Owned:	None

Shingle Springs Band of Miwok Indians

Also Knows As:	Shingle Springs Rancheria (Verona Tract)
Recognition	Federally Recognized
County:	El Dorado, Placer, Sacramento, Yolo
Tribal Affiliation:	Miwok
Website:	https://www.shinglespringsrancheria.com/
Land Acreage:	Approximately 160 Acres
Tribal Membership	Approximately 500
Adjacent Highways:	US 50
Gaming Facilities Owned:	Red Hawk Casino

The Confederated Villages of Lisjan

Also known as:	Ohlone
Recognition	Federally Recognized
County:	Alameda, Contra Costa, Solano, Napa, and San Joaquin
Tribal Affiliation:	None
Website:	https://sogoreate-landtrust.org
Land Acreage:	Unknown
Tribal Membership	Unknown
Adjacent Highways:	I-880 and I-580
Gaming Facilities Owned:	None

United Auburn Indian Community of the Auburn Rancheria

Also known as:	Auburn Rancheria
Recognition	Federally Recognized
County:	Placer
Tribal Affiliation:	None
Website:	https://www.auburnrancheria.com
Land Acreage:	Approximately 22 Acres
Tribal Membership	Approximately 170
Adjacent Highways:	I-80, SR 193, and SR 49
Gaming Facilities Owned:	Thunder Valley Casino

Wilton Rancheria

Also known as:	Wilton Rancheria Me-Wuk Me-Wuk Indian Community of the Wilton Rancheria
Recognition	Federally Recognized
County:	Colusa County (573 acres)
Tribal Affiliation:	Me-Wuk
Website:	https://wiltonrancheria-nsn.gov/
Land Acreage:	Approximately 38 Acres
Tribal Membership	Approximately 700
Adjacent Highways:	SR 99
Gaming Facilities Owned:	Sky River Casino

Yocha Dehe Wintun Nation, California

Also known as:	Rumsey Rancheria Yocha Dehe Rumsey Indian Rancheria of Wintun
Recognition	Federally Recognized
County:	Colusa, Napa, Solano, and Yolo
Tribal Affiliation:	Wintun (Patwin)
Website:	https://www.yochadehe.org/
Land Acreage:	Approximately 800+ acres (tribe also owns large amounts of non-trust land)
Tribal Membership	Approximately 65
Adjacent Highways:	SR 16
Gaming Facilities Owned:	Cache Creek Casino

Chapter 9 | Recommended Strategies

9.1 | Recommended Multimodal Projects

The recommended multimodal projects by this CMCP includes highway, active transportation, and public transportation projects. The recommended highway projects include managed lanes, auxiliary lanes, interchange reconfigurations and/or ramp improvements, ramp metering and local arterial projects that will help improve the operations of the freeway mainlines. Recommended rail and transit projects include service enhancements to the Capitol Corridor and express bus services as well as improvements at train stations, transportation centers and P&R lots that support transit services. Most projects are financially constrained and are included in the RTPs from MTC and SACOG. The unconstrained projects include projects from other plans and studies as well as project concepts proposed by the CDT, Caltrans Traffic Operations, Caltrans Modeling and Forecasting, Caltrans Program, Project, and Asset Management, TAC, and stakeholders.

As discussed in Chapter 4, this CMCP also includes a list of active transportation projects. These projects, along with existing facilities in the corridor, form the CMCP bicycle and pedestrian network and can be accessed on this web map.

9.2 | Additional Project Evaluation

In addition to the planning level modeling analysis of improvement scenarios, projects were assessed with a qualitative methodology using key selected performance measures. The reason for this type of evaluation is that the modeling tools, while very effective in evaluating certain types of projects, have limitations. For example, some of the CMCP goals are not quantifiable, while some project types cannot be easily modeled. These include bicycle and pedestrian projects, certain types of safety-related projects, local arterial projects that are outside of the modeling network. The following key performance measures are derived from the CMCP goals which are informed by a combination of plans, programs, goals, and objectives outlined from state (CTC and Caltrans), regional (MTC and SACOG), and local partners. The following performance measures were used to qualitatively assess the improvements:

- VMT Reduction
- Person Throughput
- Safety Improvement
- Mode Share/Mode Shift
- PHD
- Improve Accessibility/Travel Time by Mode
- Reduce GHG and Improve Air Quality
- Improve System Reliability

These performance measures were used to assess the potential transportation system improvements in the study area. The intent is not to rank the improvements or measure them against each other, but rather to inform the I-80 CMCP and how these projects address the overall goals and objectives related to state, regional, and local plans.

9.3 | Project Evaluation Scoring Methodology by Project Type

A set of rules were applied by project type for each performance metric to determine if that project type has a greater or lesser benefit as it relates to the performance measures. For example, some types of transportation improvements may significantly improve safety but not necessarily reduce congestion, while others may reduce VMT but not significantly affect system reliability.

The qualitative ratings of Low, Medium, or High were assigned based on a classification of project types against the performance measures listed above. The ratings represent a starting point for further evaluation at an individual project level, which can be further refined in the environmental process or other more detailed project-focused modeling or analytical exercises. **Table 9.1** shows the qualitative project type assessment based on performance measures. Main project types that included active transportation, transit, arterial, highway, ZEV infrastructure and freight projects were rated Low, Medium or High.

It is critical to understand that individual projects may have greater or lesser benefit than represented by their generic classification used for the rating in **Table 9.1** depending on a number of factors, for example: 1) the scope and scale of the specific project; 2) the context within which the project is being proposed (e.g. a more congested or less congested setting); and 3) the cost or funding status of the project (e.g. a smaller scale lower scoring project could have high cost-effectiveness where the cost is also low). **Table 9.2** shows the detailed ratings of each individual project.

These caveats are important because it is not feasible to conduct a quantitative project-level evaluation for each project within the framework of the I-80 CMCP. The SACSSIM 19 and Napa/Solano regional travel model and the simulation models are also not effective in assessing individual active transportation (bike and pedestrian) projects. When a project goes through environmental review or is submitted for State or federal funding consideration, the projects will undergo a more rigorous analysis of the quantitative benefits associated with that project, in the specific context within which it will be implemented. This includes an assessment of the benefits against project costs, resulting in a cost-effectiveness assessment. This process has become well established with the advent of the SB 1 competitive programs.

Therefore, any project given a low rating in **Table 9.2** could prove to have greater benefits and greater cost-effectiveness in a more detailed project-level evaluation in a site-specific context. As a result, it is important not to pre-judge any individual project based on a rating alone but view it in its unique application. That said, the performance measure classification process and ratings are useful in highlighting the strengths and weaknesses of projects in each class.

Table 9.1 | Project Category Evaluation

Project Type	Subcategory	Safety (collision on state ROW)	*Efficiency - recurring congestion	System Reliability non-recurring congestion	*Multimodal Accessibility and Connectivity	*Air Pollution and Greenhouse Gas Emissions Reduction	Economic Prosperity - freight / access to jobs, goods, and services	Modern Infrastructure and Asset Management	*Efficient Land Use
Active Transportation (Bike / Pedestrian)									
	Freeway Crossings	M	L	L	M	L	L	M (including pedestrians, as well as equipment that supports pedestrian movement [signals, beacons, etc.])	M
	Parallel (parallel Class I bike paths and bikeways on parallel arterials)	M	L	L	M	M (mode rate effects due to existing low mode share)	M	M	M
Transit									
	Capitol Corridor (service expansion)	M (reduce congestion-related collisions)	H	M	H	H	M	M	M
	Capitol Corridor - Station Area Improvements	L	L	L	M	L	L	L	H
	Express Bus	M	H	M	H	H	M	L	M
	Light Rail	L (not parallel to I-80)	H	M	H	H	M	M	M
	Park & Ride	M	H	M	H	H	M	M	M
	Transit Centers	M	H	M	H	H	M	M	H

Project Type	**Subcategory**	**Safety (collision on state ROW)**	***Efficiency - recurring congestion**	**System Reliability non-recurring congestion**	***Multimodal Accessibility and Connectivity**	***Air Pollution and Greenhouse Gas Emissions Reduction**	**Economic Prosperity - freight / access to jobs, goods, and services**	**Modern Infrastructure and Asset Management**	***Efficient Land Use**
Transit									
	Ferry (parking)	L	L	L	M	L	L	L	M
	Streetcar	L (not parallel to I-80)	L	L	H	H	M	M	M
Freeway									
	Auxiliary Lanes (with transit)	H	H	H	M	M (location specific)	M	M	M
	Auxiliary Lanes (without transit)	H	M	M	L	L	L	M	L
	ITS (and Broadband / Ramp / Meters / Transit Signal Prioritization	H	H	H	M	M (smoother traffic flow, but no mode shift)	M	H	M
	Interchange / Ramps (geometric)	M	M	M	M	M	M	M	M
	Managed Lanes	M	H	M	H	M	M	M	M
Arterial									
	Road Widening or Extension	M	M	L	L	L	M	L	L
Zero Emission Vehicles (ZEV) Infrastructure		L	L	L	L	H	L	M	L
Freight									
	Truck Scales	M	M	L	L	H	H	H	L
	Truck Parking	H	L	L	L	M	H	M	L
	Rest Areas	H	L	L	L	L	H	L	L
	Pull Outs	H	L	L	L	L	M	L	L

*These performance measures include a quantitative analysis that will be outlines in Chapter 5 of the CMCP. Performance measures that were not included in the quantitative analysis is because there are no outputs associated with them in the Travel Demand Modeling.

TABLE 9.2 | I-80 CMCP RATED PROJECTS

District	Project Name	Project Description	Category	Subcategory	Safety (collisions on state row)	Efficiency - recurring congestion	System Reliability - non-recurring congestion	Multimodal Accessibility and Connectivity	Air Pollution and Greenhouse Gas Emissions Reduction	Economic Prosperity - freight/access to jobs, goods, and services	Modern Infrastructure and Asset Management	Efficient Land Use
3	Watt Ave Class IV Cycle Track	Construct Class IV Cycle Track on Watt Avenue from I-80 westbound north to Winona Road and Auburn Boulevard to Pope.	Active Transportation (Bike/Pedestrian)	Parallel	M	L	L	M	M	M	M	M
3	Auburn Boulevard Bike Lane	Construct Class II bike lane on Auburn Boulevard parallel to I-80 eastbound from Highway 244 to Pasadena Avenue.	Active Transportation (Bike/Pedestrian)	Parallel	M	L	L	M	M	M	M	M
3	El Camino Class I Shared Use Path	Construct Class I shared use path on El Camino Avenue form the I-80 west to El Centro Road on the north side.	Active Transportation (Bike/Pedestrian)	Parallel	M	L	L	M	M	M	M	M
3	N. Market Bike Lane	Construct Class II bike lane on N. Market Boulevard from Gateway Park to Northgate Boulevard	Active Transportation (Bike/Pedestrian)	Parallel	M	L	L	M	M	M	M	M
3	Sacramento to Roseville Third Main Track - Phase 1	On the Union Pacific (UP) mainline, from near the Sacramento and Placer County boarder to the Roseville Station area in Placer County. Construct a layover facility, install various UP Railroad Yard track improvements, required signaling, and construct the most northern eight miles of third mainline track between Sacramento and Roseville (largely all in Placer county), which will allow up to two additional round trips (for a total of three round trips) between Sacramento and Roseville.	Transit	Capitol Corridor (service expansion)	M (reduce congestion-related collisions)	H	M	H	H	M	M	M
3	Sacramento to Roseville Third Main Track - Phase 2	On the UP mainline, from SVS approximately 9.8 miles toward the Placer County line. Construct third mainline track including all bridges and required signaling. Project improvements will permit service capacity increases for Capitol Corridor in Placer County, with up to seven additional round trips added to Phase 1-CAL18320 (for a total of ten round trips) between Sacramento to Roseville including track and station improvements.	Transit	Capitol Corridor (service expansion)	M (reduce congestion-related collisions)	H	M	H	H	M	M	M

District	Project Name	Project Description	Category	Subcategory	Safety (collisions on state row)	Efficiency - recurring congestion	System Reliability - non-recurring congestion	Multimodal Accessibility and Connectivity	Air Pollution and Greenhouse Gas Emissions Reduction	Economic Prosperity - freight/access to jobs, goods, and services	Modern Infrastructure and Asset Management	Efficient Land Use
3	Operating Assistance for the UC Davis Medical Center Shuttle Service	Between UC Davis and UC Davis Medical Center with limited stops in between: Operating assistance for three years. Operations would take place weekdays, approximately between 5:30 A.M. and 8:30 P.M.	Transit	Express Bus	M	H	M	H	H	M	L	M
3	Green Line SVS Loop & K Street to H Street Improvements (final Design & Construction)	In Sacramento, two elements to accommodate the future Streetcar Project as well as future Green Line service: (1) SVS Loop - segment of the Green Line at the SVS including: Relocate the existing/temporary light rail(LRT) Station on H Street to a new north-south axis west of 5th Street; New platform and LRT station near the existing Amtrak station; new Station on the east side of N 7th Street near Railyards Boulevard that would serve the future MLS Stadium area; double-tracking on H Street from 7th Street to west of 5th Street, from west of 5th Street north to new station near Amtrak, and east along a future F Street. RT has been working with the City of Sac and the MLS Developers to advance this concept. (2) Relocation of the existing LRT tracks on K Street from 12th Street west to 7th Street. The tracks would be relocated to the center of (future) two-way H Street and would connect the LRT line between 12th, 7th, and 8th Streets with new stations near 12th Street and City Hall on H Street. SacRT has been working with the City of Sacramento and SACOG to advance this concept. Expanded SacRT facilities will include track, special trackwork, Overhead Catenary System, traction power system, signaling system, platforms, and storage tracks.	Transit	Light Rail	L (not parallel to I-80)	H	M	H	H	M	M	M
3	Green Line: MOS2 Township 9 to North	SacRT Green Line LRT: Extend LRT from Township 9 to North Natomas town center.	Transit	Light Rail	L (not parallel to I-80)	H	M	H	H	M	M	M

District	Project Name	Project Description	Category	Subcategory	Safety (collisions on state row)	Efficiency - recurring congestion	System Reliability - non-recurring congestion	Multimodal Accessibility and Connectivity	Air Pollution and Greenhouse Gas Emissions Reduction	Economic Prosperity - freight/access to jobs, goods, and services	Modern Infrastructure and Asset Management	Efficient Land Use
3	SVS Transit Center (Bus Mobility Center)	A multi-level bus terminal. An elevated concourse and circulation deck connecting to the light rail station, and other improvements at SVS. At least four SacRT route could make use of the Bus Mobility Center in the near-term.	Transit	Transit Centers	M	H	M	H	H	M	M	H
3	Natomas Town Center (CON)	Construction of the Phase 1 of the downtown/Riverfront Streetcar. The alignment runs from West Sacramento Civic Center/Riverfront Street to the Midtown entertainment, retail, and residential district of Sacramento. (Project Development programmed separately under VAR56127, for $14,570,000.).	Transit	Streetcar	L	L	L	H	H	M	M	M
3	Downtown Riverfront Streetcar Project	The downtown / Riverfront Streetcar Project will connect the SVS (Sacramento intermodal transportation facility) to Sutter Health Park (AAA Professional Baseball Park, formerly known as Raley Field) in West Sacramento. (Total Project Cost: $130,518,412. Project Development programmed separately under VAR56127, for $21,666,284.).	Transit	Streetcar	L	L	L	H	H	M	M	M
3	Davis Crossover and Signal Project	Replace track crossovers and railroad signal system at East Davis for faster operation and increased reliability.	Transit	Capitol Corridor (service expansion)	M (reduce congestion-related collisions)	H	M	H	H	M	M	M
4	SMART East-West Service	Intercity passenger rail service between Sonoma, Marin and Solano Counties connecting with SMART service to San Rafael/Petaluma at the SMART Novato-Hamilton Station and Capitol Corridor and Solano Express Regional Bus service at the Suisun City Capitol Corridor/Amtrak Station.	Transit	Intercity Passenger Rail	M	H	M	H	H	M	M	M
4	Oakland to Sacramento Signal Upgrades	Improved reliability of signal system achieved by upgrading outdated signal equipment.	Transit	Capitol Corridor (service expansion)	M	H	M	H	H	M	M	M

District	Project Name	Project Description	Category	Subcategory	Safety (collisions on state row)	Efficiency - recurring congestion	System Reliability - non-recurring congestion	Multimodal Accessibility and Connectivity	Air Pollution and Greenhouse Gas Emissions Reduction	Economic Prosperity - freight/access to jobs, goods, and services	Modern Infrastructure and Asset Management	Efficient Land Use
4	Martinez Station Turnaround	Increases capacity on Capitol Corridor from Sacramento to Oakland (assuming additional CC trains).	Transit	Capitol Corridor (service expansion)	M	H	M	H	H	M	M	M
4	110 miles per hour Speed Upgrades	Miscellaneous Track Upgrades allowing increase speed in sections suitable for speed increases; also includes any needed signal and other track infrastructure modifications.	Transit	Capitol Corridor (service expansion)	M	H	M	H	H	M	M	M
4	Frequency Increases to half-hourly optional peak service	New High-level Carquinez Bridge Crossing and Benicia Siding Project.	Transit	Capitol Corridor (service expansion)	M	H	M	H	H	M	M	M
4	Link21 Project	Improvements via Link21 Project that improve I-80 corridor throughput; projects under Link21 are in development at this time (2021/2022).	Transit	Capitol Corridor (service expansion)	M	H	M	H	H	M	M	M
3	Davis Station ADA Underpass & Platform	Reconfigure passenger access; island platform, underpass access, track modifications.	Transit	Capitol Corridor-Station Area Improvements	L	L	L	M	L	L	L	H
4	Suisun-Fairfield Amtrak Station Transit and downtown Parking Structure	Construct a new parking garage to meet parking demand near the Suisun-Fairfield Amtrak Station and new housing developments.	Transit	Capitol Corridor-Station Area Improvements	L	L	L	M	L	L	L	H
4	Fairfield-Vacaville Train Station Building, Access, and Parking	Construction of a station building to provide shelter and seating for transit passengers. Construction of an access road into the station to improve route efficiency, and safe ingress and egress for buses, pedestrians, and bicyclists. Parking lot expansion and enhancements including safety features, lighting, parking lot solar array, and additional amenities.	Transit	Capitol Corridor-Station Area Improvements	L	L	L	M	L	L	L	H
4	Solano Express Bus to BRT-lite Transition: Capital Improvements and Implementation	Transition from Express Bus and build out a functioning BRT-lite system in Solano County. Implement improvements including Transit Signal Prioritization (TSP), adaptive signal timing, and ramp metering.	Transit	Express Bus	M	H	M	H	H	M	L	M

District	Project Name	Project Description	Category	Subcategory	Safety (collisions on state row)	Efficiency - recurring congestion	System Reliability - non-recurring congestion	Multimodal Accessibility and Connectivity	Air Pollution and Greenhouse Gas Emissions Reduction	Economic Prosperity - freight/access to jobs, goods, and services	Modern Infrastructure and Asset Management	Efficient Land Use
4	Dixon Solano Express Blue Line Park and Ride Facility	Relocate existing park and ride on SR 113 from downtown Dixon to the north side of I-80 in the vicinity of the on and off ramps.	Transit	Park & Ride	M	H	M	H	H	M	M	M
4	Fairfield Transportation Center (FTC) - Phase 2	Construct additional parking spaces, access improvements, and transit improvements in and around the FTC.	Transit	Transit Center	M	H	M	H	H	M	M	H
4	Vallejo Station Parking Structure Phase B	Vallejo: Baylink Ferry Terminal; Construct two phased parking structure to consolidate surface parking for ferry operations; create a pedestrian link between bus transit facility and existing ferry terminal building adjacent to ferry parking structure.	Transit	Ferry	L	L	L	M	L	L	L	M
3	I-5 Aux Lanes	Southbound from US 50 to Sutterville Road (Indirect effects on US 50).	Freeway	Auxiliary Lanes (without transit)	M	L	M	L	L	L	L	L
3	I-5 Auxiliary Lane	Southbound from I-80 to West El Camino Avenue.	Freeway	Auxiliary Lanes (without transit)	M	L	M	L	L	L	L	L
3	I-5 Auxiliary Lane (NB) from Del Paso Road to SR 99 NB connector ramp	In Sacramento County construct auxiliary lanes on I-5 from Del Paso Road off ramp to SR 99 NB connector ramp (Post Mile 28.817/29.772).	Freeway	Auxiliary Lanes (without transit)	M	L	M	L	L	L	L	L
3	I-80/Richards Boulevard Interchange	In Davis: At the I-80/Richards Boulevard Interchange; reconstruct the north side of Richards Boulevard Interchange to remove the loop on- and off-ramps and replace with new ramp in diamond configuration. Includes traffic signal installation. Install new Class II bike lanes and a parallel Class I trail (0.5 mi of Class I and 1 mi of Class II). (CMAQ funds are for eligible bike/ped components only.). Toll Credits for CON.	Freeway	Interchange/Ramps (geometric)	M	M	M	M	M	M	M	L
3	I-80 at W. El Camino Avenue Interchange	Expand the W. El Camino Avenue Interchange on I-80 from 2 to 4 lanes and modify ramps.	Freeway	Interchange/Ramps (geometric)	M	M	M	M	M	M	M	L
3	U.S. 50/Jefferson Blvd. Interchange	Jefferson Boulevard Interchange--expand the ramps and signals from 1 to 2 lanes, add ramp metering and turn lanes, and related street closures.	Freeway	Interchange/Ramps (geometric)	M	M	M	M	M	M	M	L

District	Project Name	Project Description	Category	Subcategory	Safety (collisions on state row)	Efficiency - recurring congestion	System Reliability - non-recurring congestion	Multimodal Accessibility and Connectivity	Air Pollution and Greenhouse Gas Emissions Reduction	Economic Prosperity - freight/access to jobs, goods, and services	Modern Infrastructure and Asset Management	Efficient Land Use
3	I-5 / 113 Connector Phase 2	Phase 2 - Construct northbound I-5 to southbound SR 113 freeway to freeway connection.	Freeway	Interchange/Ramps (geometric)	L	L	L	L	L	L	L	L
3	I-5 / SR 113 Interchange	Construct new Interchange: northbound SR 113 to SB I-5 freeway to freeway connection. Phase 3.	Freeway	Interchange/Ramps (geometric)	L	L	L	L	L	L	L	L
3	Yolo Causeway Express Lanes	Expand causeway to 8 lanes (2 Managed Lanes + 6 General Purpose lanes), improve the existing bike path.	Freeway	Managed Lanes	M	H	M	H	H	M	M	M
3	US 50 HOV Lanes (I-5 to Watt Avenue)	US 50 HOV Lanes - Construct High Occupancy Vehicle (HOV) Managed Lanes - Managed lanes on US 50 [project covers PE: from I-5 to 0.8 mile east of Watt Avenue (Post Mile L0.2/R6.1) and CON: from 0.3 mile west of SR 99 to 0.8 mile east of Watt Avenue (Post Mile L2.2/R6.1)] (project description may change based on results from the Managed Lanes Study. Project is being evaluated for Expressed Toll Lanes, High Occupancy Toll Lanes, HOV lanes). 0H08U.	Freeway	Managed Lanes	M	H	M	H	M	M	M	M
3	I-5 HOV Lanes Phase 1	In Sacramento County on I-5, from US 50 to Morrison Creek. Add high-occupancy vehicle (HOV) lanes (i.e., bus/carpool lanes) and sound walls in both directions (Post Mile 12.9/22.5) [EFIS ID 0312000165]; see 03-3C002 (CAL20467) for Phase 2 [PA&ED being done under 03-3C000 (CAL17840)]. (Toll Credits for PE and ROW) (Emission Benefits in kg/day: 52.9 NOx, 50.4 ROG, 10.5 Post Mile 10) [CTIPS ID 107-0000-0880] (The I-5 HOV Lanes - Phase 1 project (03-3C001/CAL20466) will be combined for construction with the I-5 Road Rehab project (03-0H100/CAL20700) and the I-5 Fiber Optics Installation project (03-4F450/CAL20693) to form the overall I-5 corridor enhancement project (03-0H10U). Project description may change based on results from the Managed Lanes Study. Project is being evaluated for Expressed Toll Lanes, High Occupancy Toll Lanes, HOV lanes.	Freeway	Managed Lanes	M	H	M	H	M	M	M	M

District	Project Name	Project Description	Category	Subcategory	Safety (collisions on state row)	Efficiency - recurring congestion	System Reliability - non-recurring congestion	Multimodal Accessibility and Connectivity	Air Pollution and Greenhouse Gas Emissions Reduction	Economic Prosperity - freight/access to jobs, goods, and services	Modern Infrastructure and Asset Management	Efficient Land Use
3	I-5 HOV Lanes Phase 2	In Sacramento County on I-5, from 1.1 mile south of Elk Grove Boulevard to just north of Morrison Creek - Add managed lane facility (Post Mile 9.7/13.1) [EFIS ID 0312000171]; see 03-3C001 (CAL20466) for Phase 1 [PA&ED being done under 03-3C000 (CAL17840)]. (project description may change based on results from the Managed Lanes Study. Project is being evaluated for Expressed Toll Lanes, High Occupancy Toll Lanes, HOV lanes).	Freeway	Managed Lanes	M	H	M	H	M	M	M	M
3	I-5 and I-80 Managed Lane Connectors and Lanes to downtown	Reconstruct I-5/I-80 Interchange, including managed lane facility connectors, and construction of managed lane facility on I-5 from the I-5/I-80 Interchange to downtown Sacramento (Post Mile 26.7/27.0) [EFIS ID 0300000313] (Emission Benefits in kg/day 1.0 ROG) (project description may change based on results from the Managed Lanes Study. Project is being evaluated for Expressed Toll Lanes, High Occupancy Toll Lanes, HOV lanes).	Freeway	Managed Lanes	M	H	M	H	M	M	M	M
4	I-80 eastbound auxiliary lane between I-780 and Georgia Street in Vallejo	Construct eastbound auxiliary Lane between the I-780 on-ramp and the Georgia Street off-ramp.	Freeway	Auxiliary Lanes (with transit)	H	H	H	M	M	M	M	M
4	I-80 eastbound and westbound auxiliary lanes between Tennessee Street in Vallejo Redwood Street	Construct eastbound and westbound auxiliary lanes between the Tennessee Street on-ramp and the Redwood Street off-ramp.	Freeway	Auxiliary Lanes (with transit)	H	H	H	M	M	M	M	M
4	I-80 eastbound auxiliary lane between Redwood Street and SR 37 in Vallejo Redwood Street	Construct eastbound auxiliary lane between Redwood Street and SR 37 with two lane off-ramp.	Freeway	Auxiliary Lanes (with transit)	H	H	H	M	M	M	M	M
4	Provide auxiliary lanes on I-80 in eastbound and westbound directions from I-680 to Airbase Parkway	Project provides auxiliary lanes on I-80 in the eastbound and westbound directions from I-680 to Airbase Parkway; and remove the I-80/Auto Mall Parkway hook ramps and Collector-Distributor road slip-ramp.	Freeway	Auxiliary Lanes (with transit)	H	H	H	M	M	M	M	M

District	Project Name	Project Description	Category	Subcategory	Safety (collisions on state row)	Efficiency - recurring congestion	System Reliability - non-recurring congestion	Multimodal Accessibility and Connectivity	Air Pollution and Greenhouse Gas Emissions Reduction	Economic Prosperity - freight/access to jobs, goods, and services	Modern Infrastructure and Asset Management	Efficient Land Use
4	I-80 eastbound auxiliary lane between Air Base Parkway and North Texas Street/Manual Campos Parkway in Fairfield	Construct westbound auxiliary lane between Air Base Parkway and North Texas Street/Manual Campos Parkway.	Freeway	Auxiliary Lanes (with transit)	H	H	H	M	M	M	M	M
4	I-80 eastbound auxiliary Lane between Cherry Glenn Road and Pleasant Valley Road in Vacaville	Construct eastbound auxiliary lane between Cherry Glenn Road and Pleasant Valley Road.	Freeway	Auxiliary Lanes (without transit)	H	M	M	L	L	L	M	L
4	I-80 eastbound and westbound auxiliary lane between Alamo Drive and Pleasant Valley Road in Vacaville	Construct eastbound and westbound auxiliary lane between Alamo Drive and Pleasant Valley Road.	Freeway	Auxiliary Lanes (without transit)	H	M	M	L	L	L	M	L
4	I-80 westbound auxiliary lane between Alamo Drive and Pleasant Valley Road in Vacaville	Construct westbound auxiliary lane between Alamo Drive and Pleasant Valley Road.	Freeway	Auxiliary Lanes (without transit)	H	M	M	L	L	L	M	L
4	I-80 eastbound auxiliary lanes between Cliffside Drive and Allison Drive in Vacaville	Construct eastbound auxiliary lane between Cliffside Drive and Allison Drive with a two-lane off-ramp at Allison Drive.	Freeway	Auxiliary Lanes (without transit)	H	M	M	L	L	L	M	L
4	I-80 Ramp Metering from the Carquinez Bridge Toll Plaza to Redwood Steet	Install and activate eastbound and westbound ramp metering from the Carquinez Bridge Toll Plaza to Redwood Steet.	Freeway	Ramp Metering	H	H	H	M	M	M	H	M
4	I-80/680 freeway to freeway connector ramp metering in Fairfield	I-80 West to 680 South and 680 North to I-80 East – ramp metering freeway-to-freeway connectors.	Freeway	Ramp Metering	H	H	H	M	M	M	H	M
4	I-80/I-505 freeway to freeway connector ramp metering in Vacaville	I-80 East to I-505 North and I-505 South to West I-80 ramp metering to freeway-to-freeway connectors.	Freeway	Ramp Metering	H	H	H	M	M	M	H	M
4	I-80 ramp metering from the I-505 Interchange to the Yolo County line	Install and activate eastbound ramp metering from the I-505 Interchange to the Yolo County line.	Freeway	Ramp Metering	H	H	H	M	M	M	H	M
4	I-80/SR 29 ramp improvements in Vallejo	Widen westbound on-ramp from SR 29/Sonoma Boulevard.	Freeway	Interchange / Ramps (geometric)	M	M	M	M	M	M	M	M

District	Project Name	Project Description	Category	Subcategory	Safety (collisions on state row)	Efficiency - recurring congestion	System Reliability - non-recurring congestion	Multimodal Accessibility and Connectivity	Air Pollution and Greenhouse Gas Emissions Reduction	Economic Prosperity - freight/access to jobs, goods, and services	Modern Infrastructure and Asset Management	Efficient Land Use
4	I-80/Maritime Academy Drive Ramp Improvements in Vallejo	Reconstruct - widen I-80 westbound Maritime Academy Drive on-ramp.	Freeway	Interchange / Ramps (geometric)	M	M	M	M	M	M	M	M
4	I-80/Magazine Street ramp improvements in Vallejo	Reconstruct - widen I-80 eastbound and westbound Magazine Street on-ramp.	Freeway	Interchange / Ramps (geometric)	M	M	M	M	M	M	M	M
4	I-80/780-Curtola Parkway ramp improvements in Vallejo	Modify I-80/780 Curtola Parkway - eastbound and westbound on-ramps from 780 Curtola Parkway for Transit/TPS.	Freeway	Interchange / Ramps (geometric)	M	M	M	M	M	M	M	M
4	I-80/Georgia Street ramp improvements in Vallejo	Modify Georgia Street eastbound and westbound on-ramps.	Freeway	Interchange / Ramps (geometric)	M	M	M	M	M	M	M	M
4	I-80/Spring Street ramp improvements in Vallejo	Reconstruct - widen I-80 eastbound Spring Street on-ramp.	Freeway	Interchange / Ramps (geometric)	M	M	M	M	M	M	M	M
4	I-80/Tennessee Street Ramp Improvements in Vallejo	Modify Tennessee Street East and westbound on-ramps.	Freeway	Interchange / Ramps (geometric)	M	M	M	M	M	M	M	M
4	Redwood Parkway Interchange, Phase 2	Improve Interchange at Redwood Parkway.	Freeway	Interchange / Ramps (geometric)	M	M	M	M	M	M	M	M
4	I-80/SR 37-Columbas Parkway Interchange Improvements in Vallejo	I-80/SR 37/Columbus Parkway Interchange improvements.	Freeway	Interchange / Ramps (geometric)	M	M	M	M	M	M	M	M
4	American Canyon Overcrossing	Class I multi use path over the Interchange between American Canyon Road and McGary Road	Freeway	Interchange / Ramps (geometric)	M	M	M	M	M	M	M	M
4	I-80/Red Top Road Ramp improvements in Fairfield	Widen eastbound on-ramp from Red Top Road.	Freeway	Interchange / Ramps (geometric)	M	M	M	M	M	M	M	M
4	I-80/I-680/SR 12 Interchange (Packages 2-7)	Packages 2-7 provide direct connectivity from I-680 northbound to SR 12 westbound, widens I-680 and I-80 near the Interchange, and improves connections to Red Top road off-ramp. Express lane direct connectors are included in RTPID 17-10-0061.	Freeway	Interchange / Ramps (geometric)	M	M	M	M	M	M	M	M
4	I-80/Green Valley Road ramp improvements in Fairfield	Widen eastbound and westbound on-ramps from Green Valley Road.	Freeway	Interchange / Ramps (geometric)	M	M	M	M	M	M	M	M
4	I-80/Suisun Valley Road ramp improvements in Fairfield	Widen eastbound on and off ramps from Suisun Valley Road.	Freeway	Interchange / Ramps (geometric)	M	M	M	M	M	M	M	M

District	Project Name	Project Description	Category	Subcategory	Safety (collisions on state row)	Efficiency - recurring congestion	System Reliability - non-recurring congestion	Multimodal Accessibility and Connectivity	Air Pollution and Greenhouse Gas Emissions Reduction	Economic Prosperity - freight/access to jobs, goods, and services	Modern Infrastructure and Asset Management	Efficient Land Use
4	I-80 N. Texas Street Ramp improvements in Fairfield	Widen eastbound off-ramp N. Texas Street for Transit/TPS.	Freeway	Interchange / Ramps (geometric)	M	M	M	M	M	M	M	M
4	I-80/Beck Avenue ramp improvements in Fairfield	Widen eastbound on-ramp from Beck Avenue for Transit/TPS.	Freeway	Interchange / Ramps (geometric)	M	M	M	M	M	M	M	M
4	Lagoon Valley Interchange	Widen Lagoon Valley Road bridge for additional left turn capacity. Sidewalk, intersection signal improvements at ramps, and approach roadway work. TIF funded.	Freeway	Interchange / Ramps (geometric)	M	M	M	M	M	M	M	M
4	I-80/Allison Drive ramp improvements in Vacaville	Widen eastbound and westbound Allison Drive on and off ramps for Transit/TPS.	Freeway	Interchange / Ramps (geometric)	M	M	M	M	M	M	M	M
4	I-80/Browns Valley Parkway ramp improvements in Vacaville	Widen westbound Browns Valley Parkway on-ramp for Transit/TPS.	Freeway	Interchange / Ramps (geometric)	M	M	M	M	M	M	M	M
4	I-505/I-80 Connector	Remove/Reconstruct/Realign 80/505/East Monte Vista Avenue/Orange Drive connections and bridges.	Freeway	Interchange / Ramps (geometric)	M	M	M	M	M	M	M	M
4	Widen Orange Drive to eastbound I-80	Intersection and ramp widening at Orange/Lawrence with I-80 eastbound.	Freeway	Interchange / Ramps (geometric)	M	M	M	M	M	M	M	M
4	Widen Vaca Valley Parkway	Widen to six lanes between I-505 and I-80.	Freeway	Interchange / Ramps (geometric)	M	M	M	M	M	M	M	M
4	I-80/Vaca Valley Parkway ramp improvements in Vacaville	Widen eastbound and westbound Vaca Valley Parkway / Leisure Town Road on and off-ramps for Transit/TPS	Freeway	Interchange / Ramps (geometric)	M	M	M	M	M	M	M	M
4	West A Street and I-80 Interchange upgrade	Upgrade in phases the existing I-80 on-ramp and reconstruct the existing roadway overcrossing.	Freeway	Interchange / Ramps (geometric)	M	M	M	M	M	M	M	M
4	Pitt School Road and I-80 Interchange upgrade	Improvements include widening the overcrossing structures to four lanes and on- and off-ramp improvements particularly on the eastside of Pitt School Road. Project may be implemented in phases over the next ten years. Improvements to area roadways.	Freeway	Interchange / Ramps (geometric)	M	M	M	M	M	M	M	M
4	I-80/Pitt School Road Ramp Improvements in Dixon	Widen eastbound and westbound Pitt School Road on and off-ramps for Transit/TPS.	Freeway	Interchange / Ramps (geometric)	M	M	M	M	M	M	M	M

District	Project Name	Project Description	Category	Subcategory	Safety (collisions on state row)	Efficiency - recurring congestion	System Reliability - non-recurring congestion	Multimodal Accessibility and Connectivity	Air Pollution and Greenhouse Gas Emissions Reduction	Economic Prosperity - freight/access to jobs, goods, and services	Modern Infrastructure and Asset Management	Efficient Land Use
4	SR 113 South and I-80 Interchange improvements	Improvements to the area's roadways required to improve traffic circulation.	Freeway	Interchange / Ramps (geometric)	M	M	M	M	M	M	M	M
4	Milk Farm Road and I-80 Interchange upgrade	Interchange improvements consistent with finding of I-80/I-680/I-780. Major Investment and Corridor Study completed by Solano Transportation Authority and Caltrans. May include relocation of Milk Farm Road. Project may be implemented in phases. Increased traffic due to development (mostly the northeast quadrant) will require the need to improve the existing interchange.	Freeway	Interchange / Ramps (geometric)	M	M	M	M	M	M	M	M
4	Pedrick Road and I-80 Interchange upgrade	Improvements include realignment of both on-ramps and relocation of Sparling and Sievers Roads. Project may be implemented in phases depending on the pace of development.	Freeway	Interchange / Ramps (geometric)	M	M	M	M	M	M	M	M
4	I-80 Managed Lanes through Vallejo (Carquinez Bridge to SR 37)	Construct Managed Lane on I-80 from Carquinez Bridge to SR 37 in both directions.	Freeway	Managed Lanes	M	H	M	H	M	M	M	M
4	I-80 Managed Lanes (SR 37 to Red Top Road)	Construct Managed Lane on I-80 from SR 37 to Red Top Road in both directions.	Freeway	Managed Lanes	M	H	M	H	M	M	M	M
4	I-80 Managed Lanes (Red Top Road to I-505)	The Solano I-80 Managed Lanes Project (project) will construct approximately 18 miles of managed lanes in the I-80 corridor through conversion of existing HOV lanes to express lanes from west of Red Top Road to east of Air Base Parkway and highway widening for new express lanes from east of Air Base Parkway to east of I-505.	Freeway	Managed Lanes	M	H	M	H	M	M	M	M
4	I-680 Express Lanes: I-80 westbound to I-680 southbound and I-680 northbound to I-80 eastbound direct connectors	Express lanes on I-680/I-80 Interchange in Solano County - widen to add express lane direct connectors I-80 westbound to I-680 southbound and I-680 northbound to I-80 eastbound. This complements the larger interchange project of RTP ID 17-08-0009.	Freeway	Managed Lanes	M	H	M	H	M	M	M	M
4	I-80 Managed Lanes (I-505 to Yolo County line)	Construct managed lanes in both directions on I-80 from I-505 to the Yolo County line.	Freeway	Managed Lanes	M	H	M	H	M	M	M	M

District	Project Name	Project Description	Category	Subcategory	Safety (collisions on state row)	Efficiency - recurring congestion	System Reliability - non-recurring congestion	Multimodal Accessibility and Connectivity	Air Pollution and Greenhouse Gas Emissions Reduction	Economic Prosperity - freight/access to jobs, goods, and services	Modern Infrastructure and Asset Management	Efficient Land Use
3	Riverfront Street extension	Riverfront Street, from Mill Street to the existing 3-way intersection at 5th Street, S. River Road., and 15th Street (0.3 mi): Extend as a two-lane roadway with sidewalks, protected bicycle lanes, lighting, and landscaping. At existing 3-way intersection construct the new four-way intersection to include Riverfront Street extension. Also, 15th Street, from Jefferson Boulevard to future 4-way intersection at River Road, 5th Street, and Riverfront Street: Realign roadway.	Arterial	Road Widening or Extension	M	M	L	L	L	M	L	L
3	Railyards Streets	Construct New Road/Bike/Pedestrian improvements to implement Railyards Specific Plan.	Arterial	Road Widening or Extension	L	L	L	L	L	L	L	L
3	I Street Bridge Replacement	I Street Bridge, over Sacramento River and complex of bridge approach structures. Replace existing 2 lane bridge with a 2-lane bridge on a new alignment. Project includes bridge approaches 22C0154, 24C0006, 24C0364L, 24C0364R, 24C0351J.	Arterial	Road Widening or Extension	L	L	L	L	L	L	L	L
3	Enterprise Crossing	Amendment to feasibility study, complete design, environmental clearance and construction of a proposed joint flood-protection improvement and transportation connection linking Southport to the Port Industrial Complex.	Arterial	Road Widening or Extension	M	M	L	L	L	M	L	L
3	Broadway Bridge	From West Sacramento to Sacramento, across the Sacramento River, construct the Broadway Bridge, a new southern crossing of the Sacramento River. Project includes Auto, transit, bicycle, and pedestrian facilities. (Local funding is split between the Cities of Sacramento and West Sacramento).	Arterial	Road Widening or Extension	M	M	L	L	L	M	L	L

District	Project Name	Project Description	Category	Subcategory	Safety (collisions on state row)	Efficiency - recurring congestion	System Reliability - non-recurring congestion	Multimodal Accessibility and Connectivity	Air Pollution and Greenhouse Gas Emissions Reduction	Economic Prosperity - freight/access to jobs, goods, and services	Modern Infrastructure and Asset Management	Efficient Land Use
3	Lower American River Crossing	New all-modal Bridge: between downtown Sacramento and South Natomas across the Lower American River. Includes: Auto, transit, bicycle, and pedestrian facilities. Scale and features to be determined through need and purpose study anticipated to begin in 2012.	Arterial	Road Widening or Extension	L	L	L	L	L	L	L	L
3	South River Road Reconfiguration (Phase 3)	Reconstruct South River Road to 4-lanes from 15th Street to the 19th Street extension and restripe Village Parkway to Stonegate Boulevard, including restriping the 4-lane bridge from 2-lanes to 4-lanes over barge canal.	Arterial	Road Widening or Extension	L	L	L	L	L	L	L	L
3	Covell Boulevard Widening	Widen: 4 lanes from Shasta Drive to Denali Drive Includes: bike lanes and a center median.	Arterial	Road Widening or Extension	L	L	L	L	L	L	L	L
3	Mace Boulevard Curve	In Davis, between Alhambra Drive and Alhambra Drive (Mace curve), widen from 2 to 4 lanes, provide bike lanes, a landscaped median, and turn lanes.	Arterial	Road Widening or Extension	M	M	L	L	L	M	L	L
3	East Commerce Way B	In Sacramento, extend East Commerce Way from Arena Boulevard. to Natomas Crossing Drive, as a 6-lane road.	Arterial	Road Widening or Extension	L	L	L	L	L	L	L	L
3	Industrial Boulevard Widening	In West Sacramento, Industrial Boulevard from the Palamidessi Bridge at the Barge Canal to Harbor Boulevard: widen from 4 to 6 lanes.	Arterial	Road Widening or Extension	M	M	L	L	L	M	L	L
3	Lake Washington Boulevard. Bridge Widening	Lake Washington Boulevard: Widen the Palamidessi bridge over the barge canal from 4 to 6 lanes.	Arterial	Road Widening or Extension	L	L	L	L	L	L	L	L
3	Harbor Boulevard Widening	Harbor Boulevard, West Capitol Avenue to Industrial: widen 4 to 6 lanes.	Arterial	Road Widening or Extension	M	M	L	L	L	M	L	L
3	Broadway Complete Street Phase I	Phase I: In Sacramento, Broadway from 3rd Street to 16th Street, convert four lane arterial to two lane arterial with buffered bike lanes, median improvements, sidewalk improvements and streetscape enhancements. Create surface street (29th Street) from X Street to SR 99 south. PA&ED will be completed for the entire 2-mile corridor, from 29th Street to 3rd Street.	Arterial	Road Widening or Extension	L	L	L	L	L	L	L	L

District	Project Name	Project Description	Category	Subcategory	Safety (collisions on state row)	Efficiency - recurring congestion	System Reliability - non-recurring congestion	Multimodal Accessibility and Connectivity	Air Pollution and Greenhouse Gas Emissions Reduction	Economic Prosperity - freight/access to jobs, goods, and services	Modern Infrastructure and Asset Management	Efficient Land Use
4	Suisun Valley Road Expansion Study and Implementation	Analysis of by-pass traffic on Suisun Valley Road from I-80 to Napa County line; Implementation of recommended improvements.	Arterial	Road Widening or Extension	M	M	L	L	L	M	L	L
3	Antelope Truck Scales. 03-0H530	In Sacramento City in Sacramento and Citrus Heights 0.7 miles east of Greenback Lane overcrossing to 0.3 miles east of Antelope Road.	Freight	Truck Scales	M	M	L	L	H	H	H	L
4	I-80 westbound Cordelia Truck Scales Relocation Project	Project upgrades existing truck scales on westbound I-80 in Solano County. Existing westbound truck scales are located on the most congested freeway segment of I-80 in Solano County. Scales are outdated and cannot process the current and future truck volumes on westbound I-80. Trucks are slow to enter and leave the scales because of short ramps, adding to existing traffic congestion and safety issues on I-80.	Freight	Truck Scales	M	M	L	L	H	H	H	L
4	Dixon Truck Plaza	Located on Currie Road in Dixon, north of I-80, the project would include retail, a hotel, truck parking, charging stations for electric vehicles and electric trucks, and Soltrans transit vehicle charging and storage.	Freight	Truck Parking	H	L	L	L	M	H	M	L
	Conceptual											
3	Operating Assistance for Route 42 Intercity and Express Bus Service	Bus service connecting Davis and Sacramento along I-80 with limited stops in between for Express Services, and additional local stops for Route 42: Operating assistance for three years. Operations would take place weekdays (Express and Route 42), and weekends (Route 42), approximately between 5:30 A.M. and 11:00 P.M.	Transit	Express Bus	M	H	M	H	H	M	L	M
3	Bus on Shoulder	Project allowing for safe and effective operation of Bus Only lanes on I-80 shoulders during times of high congestion.	Transit	Express Bus	M	H	M	H	H	M	L	M

District	Project Name	Project Description	Category	Subcategory	Safety (collisions on state row)	Efficiency - recurring congestion	System Reliability - non-recurring congestion	Multimodal Accessibility and Connectivity	Air Pollution and Greenhouse Gas Emissions Reduction	Economic Prosperity - freight/access to jobs, goods, and services	Modern Infrastructure and Asset Management	Efficient Land Use
4	I-80 Improvements at SR 113 North Interchange	Reduction of excess lanes on eastbound I-80. At the SR-113 interchange the freeway expands from 3 to 6 lanes, and then abruptly drops 3 lanes creating a lot of losses in throughput. Removing the excess lanes should improve capacity and throughput.	Freeway	Operational Improvement (Mainline Lane Reduction)	H	H	H	L	M	M	L	L

Chapter 10 | Funding Sources

This chapter includes a comprehensive summary of various funding sources that can be used by Caltrans and I-80 corridor partners and stakeholders to implement the recommended projects. These include funding related local, regional, and state funding programs. The sections below describe potential grant programs to assist in the funding and development of projects outlined in the CMCP.

10.1 | Senate Bill 1 Competitive Programs

Solutions for Congested Corridors Program

The CTC administers the SCCP to provide funding to achieve a balanced set of transportation, environmental, and community access improvements to reduce congestion throughout the State. transportation agencies and Caltrans may nominate projects for funding.

Trade Corridor Enhancement Program

The TCEP focuses on routes and transportation infrastructure vital to California's trade and freight economy. Caltrans and regional entities can be project sponsors. Regional funding targets are set for specific regions in the State.

10.2 | Federal Funding Sources

Federal transportation funding is administered by the United States Department of Transportation (USDOT) and authorized by Federal transportation bills. The most recent transportation funding bill, Infrastructure Investment and Jobs Act/Bipartisan Infrastructure Law (IIJA/BIL) was signed into law in 2021. Much of the funding available through the USDOT’s Highway Trust Fund is allocated to California based on the state’s population. The State of California, in turn, distributes those funds to local agencies by formula or through competitive grant programs. For instance, the majority of the federally funded Surface Transportation Program funding in California is programmed through the STIP. Additionally, California’s ATP consolidated most of the Federal and state funding sources for bicycle and pedestrian projects.

Through the IIJA/BIL, USDOT provides competitive discretionary funding programs for transportation projects, notable ones include Infrastructure for Rebuilding America (INFRA) which emphasizes highway and goods movement projects and Rebuilding American Infrastructure with Sustainability and Equity (RAISE) which emphasizes capital investments in surface transportation that will have significant local or regional impact.

Highlighted below in **Table 10.1**, lists the USDOT programs that may be utilized for the I-80 CMCP projects.

TABLE 10.1 | FEDERAL FUNDING SOURCES

Name	Funding Type	Eligible Modes/Description
INFRA	Discretionary	A Federal discretionary grant program reviewed by USDOT. Emphasis on highway and goods movement projects.
RAISE	Discretionary	A Federal discretionary grant program reviewed by USDOT. Emphasis on multimodal projects.
New Starts and Small Starts (Federal Transit Administration Section 5309)	Discretionary	Funds light rail, heavy rail, commuter rail, streetcar, and bus rapid transit projects.
Highway Safety Improvement Program (HSIP)	Discretionary	Federally allocated to the State by formula, the HSIP program is available for roadway safety projects through a competitive program administered by Caltrans.
Congestion Mitigation Air Quality	Formula	Federally designated air quality containment areas receive funding by formula to program local and regional projects.
Rail-Highway Crossings (Section 130) Program	Discretionary	Safety improvements to reduce the number of fatalities, injuries, and crashes at public railway-highway crossings.
Grade Separation (Section 190) Program	Discretionary	This competitive grant program provides $15 million each year to local agencies for the construction grade separation projects.
National Highway Freight Program (NHFP)	Discretionary	The Fixing America's Surface Transportation Act established NHFP to improve the efficient movement of freight on the National Highway Freight Network.
National Highway Performance Program	Discretionary	The NHPP provides support for the condition and performance of the National Highway System (NHS), for the construction of new facilities on the NHS.
Nationally Significant Federal Lands and Tribal Projects (NSFLTP)	Discretionary	The NSFLTP program provides funding for constructing, reconstructing, and rehabilitating nationally significant projects on Federal or Tribal lands.
National Significant Freight and Highway Projects (NSFHP)	Discretionary	The NSFHP provides financial assistance—competitive grants or credit assistance—to nationally and regionally significant freight and highway projects that align with the program goals to: improve safety, efficiency, and reliability of the movement of freight and people; generate national or regional economic benefits and an increase in US global economic competitiveness; reduce highway congestion and bottlenecks; Improve connectivity between modes of freight

Name	Funding Type	Eligible Modes/Description
		transportation; enhance the resiliency of critical highway infrastructure and help protect the environment; improve roadways vital to national energy security; address the impact of population growth on the movement of people and freight, mitigate impacts of freight movements on communities.
Surface Transportation Block Grant Program (STBG)	Formula	STBG provides flexible funding that states and local governments may use for projects on any Federal-aid highway, including the National Highway System; bridge projects on any public road; transit capital projects; and public bus terminals and facilities.
Federal Transit Administration Sections 5303, 5304, 5305	Discretionary	Provides procedural and funding requirements for multimodal transportation planning in States and metropolitan areas. Planning must be cooperative, continuous, and comprehensive leading to long-range plans and short-range programs that reflect transportation investment priorities. Funds are available to States and Metropolitan Planning Organizations for planning activities.
Federal Transit Administration Section 5307	Formula	The Urbanized Area Formula Funding program provides Federal resources to urbanized areas and to governors for transit capital and operating assistance and for transportation related planning.
Federal Transit Administration Section 5311	Formula	This program provides formula-based funding for capital and/or operating assistance to rural areas with a population fewer than 50,000 where many residents rely on public transit to reach their destinations.
Federal Transit Administration Section 5312	Discretionary	This program supports research activities that improve the safety, reliability, efficiency, and sustainability of public transportation by investing in the development, testing, and deployment of innovative technologies, materials, and processes.
Federal Transit Administration Section 5337	Formula	The State of Good Repair program is dedicated to repairing and upgrading the Nation’s rail transit systems along with high-intensity motor bus systems that use high-occupancy vehicle lanes, including bus rapid transit.
Federal Transit Administration Section 5339	Formula	The Bus and Bus Facilities Infrastructure Investment Program (49 US Code 5339) provides Federal resources to states and direct recipients to replace, rehabilitate and purchase buses and related equipment. This programs also allows for the construction of bus-related facilities, including technological changes or innovations to modify low or no emission vehicles or facilities.
Federal Transit Administration Transit-Oriented	Discretionary	Provides funding to advance planning efforts that support transit-oriented development (TOD) associated with new fixed-guideway and core capacity improvement projects. TOD focuses growth around transit stations to promote ridership,

Name	Funding Type	Eligible Modes/Description
Development Planning Pilot		affordable housing near transit, revitalized downtown centers and neighborhoods, and encourage local economic development.
Recreational Trails Program	Discretionary	The Recreational Trails Program provides funds annually for recreational trails and trails-related projects. The RTP is administered at the Federal level by the Federal Highway Administration. It is administered at the state level by the California Department of Parks and Recreation.

Sources: US Department of Transportation; California Department of Transportation; Cambridge Systematics.

In addition to these Federal funding sources, the IIJA/BIL continues the Transportation Infrastructure Finance and Innovation Act (TIFIA) Program, which provides Federal credit assistance to eligible surface transportation projects, including highway, transit, intercity passenger rail, some types of freight rail, intermodal freight transfer facilities, and some modifications inside a port terminal.

The IIJA/BIL continues the authority of the TIFIA program to provide to States, localities, or other public authorities, as well as private entities undertaking projects sponsored by public authorities, three distinct types of financial assistance:

- Secured loans are direct Federal loans to project sponsors offering flexible repayment terms and providing combined construction and permanent financing of capital costs.
- Loan guarantees provide full-faith-and-credit guarantees by the Federal Government to institutional investors, such as pension funds, that make loans for projects.
- Lines of credit are contingent sources of funding in the form of Federal loans that may be drawn upon to supplement project revenues, if needed, during the first 10 years of project operations. [23 US Code 603 and 604]

10.3 | State Funding Sources

With the passage of California SB 1, the Road Repair and Accountability Act of 2017, the State of California has additional transportation funding for local and regional projects. SB 1 augmented existing sources of funding, such as the ATP and State Highway Operation and Protection Program, and created entirely new funding programs, such as the SCCP and Trade Corridor Enhancement programs. **Table 10.2** highlights the state funding sources that are most relevant to the I-80 CMCP projects.

TABLE 10.2 | STATE FUNDING SOURCES

Name	Funding Type	Eligible Modes/Description
Local Streets and Roads	Formula	Cities and counties receive funds for road maintenance, safety projects, railroad grade separations, complete streets, and traffic control devices.
SCCP	Discretionary	Regional transportation authorities and Caltrans may nominate projects for funding to achieve a balanced set of transportation, environmental, and community access improvements to reduce congestion.
TCEP	Discretionary	Caltrans and regional entities can be project sponsors. Funding is available for infrastructure improvements in the

Name	Funding Type	Eligible Modes/Description
		Central Coast, Bay Area, Central Valley, LA/Inland Empire, and San Diego/Border.
Local Partnership Program (LPP)	60% Discretionary 40% Formula	Eligible funding for "self-help" counties. *Most transportation improvements are eligible.
State Highway Operation and Protection Program (SHOPP)	Formula	Projects are selected by Caltrans and adopted by the CTC. Projects included in the program are limited to capital improvements relative to the maintenance, safety, operation, and rehabilitation of the SHS that do not add new capacity to the system. SB 1 has provided additional funding capacity to this program.
STIP	Formula	Projects are proposed by regional transportation agencies and approved by the CTC on a bi-annual basis. The majority of the STIP funding comes from Federal sources. SB 1 has provided additional funding capacity to this program.
TIRCP	Discretionary	Discretionary program administered by Caltrans and the CalSTA. Funds transformative capital improvements that will modernize California's intercity, commuter, and urban rail systems, and bus and ferry transit systems, to significantly reduce emissions of greenhouse gases, VMT, and congestion.

*Counties that have passed local option sales tax measures to fund transportation improvements.
Source: California Department of Transportation, California Transportation Commission.

Appendices

Appendix I

I-80 CMCP Census Tracts Table

Appendix II

I-80 CMCP Healthy Places Index Census Tracts Table

Appendix III

I-80 Corridor Modeling and Analysis Project Summary

Appendix IV

STEERS I-80 Modeling Report

Appendix V

Executed Project Charter

Appendix VI

I-80 CMCP

Segment Maps

Appendix I | I-80 CMCP Census Tracts Table

Census Tract	ZIP	Population (2019)	CES 4.0 Score	CES 4.0 Percentile	County	Approximate Location
6113010204	95691	5189	45.33	82.31	Yolo	West Sacramento
6113010101	95605	6796	49.37	87.27	Yolo	West Sacramento
6113010203	95691	5355	59.83	95.60	Yolo	West Sacramento
6113010102	95837	7729	56.34	93.44	Yolo	Unincorporated Yolo County area
6067007413	95821	7438	54.70	92.28	Sacramento	Sacramento
6067007301	95652	5067	45.69	82.84	Sacramento	McClellan Park
6067007501	95841	6866	42.76	79.08	Sacramento	Foothill Farms
6067007424	95660	3852	36.92	70.46	Sacramento	North Highlands
6067006202	95815	3644	52.56	90.57	Sacramento	Sacramento
6067006201	95821	7359	48.19	85.73	Sacramento	Arden-Arcade
6067006102	95821	3367	41.18	76.89	Sacramento	Arden-Arcade
6067006003	95821	4960	38.27	72.57	Sacramento	Arden-Arcade
6067006002	95821	4566	40.04	74.99	Sacramento	Arden-Arcade
6067007503	95841	5549	36.63	70.05	Sacramento	North Highlands
6067007007	95833	5756	43.17	79.74	Sacramento	Sacramento
6067006800	95815	7168	43.19	79.80	Sacramento	Sacramento
6067006702	95838	7927	47.74	85.16	Sacramento	Sacramento
6067006701	95838	9349	43.63	80.30	Sacramento	Sacramento
6067006600	95815	7385	44.08	80.98	Sacramento	Sacramento
6067006500	95838	7004	46.71	84.09	Sacramento	Sacramento
6067006101	95821	4886	44.21	81.11	Sacramento	Arden-Arcade
6067005502	95815	5779	55.71	93.04	Sacramento	Sacramento
6067006400	95838	5521	57.44	94.13	Sacramento	Sacramento
6067006300	95815	5161	51.06	88.91	Sacramento	Sacramento
6067001101	95814	2583	42.20	78.30	Sacramento	Sacramento
6067007001	95833	4205	45.71	82.88	Sacramento	Sacramento
6067002700	95817	3404	37.93	72.01	Sacramento	Sacramento
6067002200	95818	5103	42.65	78.90	Sacramento	Sacramento
6067002000	95818	2617	50.79	88.63	Sacramento	Sacramento
6067000700	95814	2567	59.74	95.55	Sacramento	Sacramento
6067000600	95814	1123	45.68	82.83	Sacramento	Sacramento
6067000500	95814	3461	43.69	80.36	Sacramento	Sacramento
6067005505	95825	5997	42.80	79.19	Sacramento	Arden-Arcade
6067005301	95811	1598	68.71	98.80	Sacramento	Sacramento
6095250801	94592	4135	48.52	86.18	Solano	Unincorporated Solano County area
6095251803	94589	4846	38.38	72.77	Solano	Vallejo
6095251902	94589	6173	41.76	77.74	Solano	Vallejo
6095251901	94589	5119	42.35	78.52	Solano	Vallejo
6095251600	94590	2580	40.13	75.18	Solano	Vallejo
6095251500	94590	4326	41.33	77.16	Solano	Vallejo
6095251200	94590	3663	41.92	77.92	Solano	Vallejo

Appendix I | I-80 CMCP Census Tracts Table

Census Tract	ZIP	Population (2019)	CES 4.0 Score	CES 4.0 Percentile	County	Approximate Location
6095251000	94590	2654	41.93	77.96	Solano	Vallejo
6095250900	94590	2654	57.13	93.97	Solano	Vallejo
6095251100	94590	3124	39.01	73.51	Solano	Vallejo
6095250701	94590	3529	65.12	97.87	Solano	Vallejo
6095252604	94533	3900	37.31	71.04	Solano	Fairfield
6095252502	94533	2106	41.67	77.58	Solano	Fairfield
6095252401	94533	4705	39.10	73.64	Solano	Fairfield
6095252402	94534	5549	46.89	84.28	Solano	Unincorporated Solano County area
6095251802	94589	2770	52.66	90.65	Solano	Vallejo
6095253402	95620	8343	36.89	70.39	Solano	Dixon

Appendix II | I-80 CMCP HPI Census Tracts

HPI Score	HPI Percentile	City	County	Census Tract
-0.07	45.43	Sacramento	Sacramento	6067000500
N/A	N/A	Sacramento	Sacramento	6067000600
N/A	N/A	Sacramento	Sacramento	6067000700
N/A	N/A	Sacramento	Sacramento	6067000800
-0.31	30.80	Sacramento	Sacramento	6067001101
-0.33	29.31	Sacramento	Sacramento	6067002000
0.11	56.41	Sacramento	Sacramento	6067002100
-0.57	16.93	Sacramento	Sacramento	6067002200
N/A	N/A	Sacramento	Sacramento	6067005301
-0.47	21.66	Arden-Arcade	Sacramento	6067006003
-0.31	30.64	Arden-Arcade	Sacramento	6067006101
-0.51	19.70	Arden-Arcade	Sacramento	6067006102
-0.87	5.31	Arden-Arcade	Sacramento	6067006201
-0.77	8.52	Sacramento	Sacramento	6067006202
-0.81	7.42	Sacramento	Sacramento	6067006300
-0.73	9.77	Sacramento	Sacramento	6067006400
-1.11	1.45	Sacramento	Sacramento	6067006500
-0.32	30.51	Sacramento	Sacramento	6067006701
-0.79	7.92	Sacramento	Sacramento	6067006702
-1.08	1.73	Sacramento	Sacramento	6067006800
-0.70	11.06	Sacramento	Sacramento	6067007001
-0.25	34.43	Sacramento	Sacramento	6067007007
-0.67	12.70	McClellan Park	Sacramento	6067007301
-0.57	16.76	Sacramento	Sacramento	6067007413
-0.73	9.83	North Highlands	Sacramento	6067007424
-0.42	24.38	Foothill Farms	Sacramento	6067007501
-0.37	27.06	North Highlands	Sacramento	6067007503
-0.17	39.59	North Highlands	Sacramento	6067007504
-0.49	20.57	Vallejo	Solano	6095250701
-0.10	43.86	Unincorporated Solano County	Solano	6095250801
-1.34	0.33	Vallejo	Solano	6095250900
-0.68	12.15	Vallejo	Solano	6095251802
-0.63	14.17	Vallejo	Solano	6095251901
-0.59	16.01	Unincorporated Solano County	Solano	6095252402
-0.49	20.47	West Sacramento	Yolo	6113010101
-0.53	18.77	Unincorporated Solano County	Yolo	6113010102
-0.97	3.41	West Sacramento	Yolo	6113010203
-0.28	32.50	West Sacramento	Yolo	6113010204

I-80 Corridor Modeling and Analysis Project Summary

As part of the On-call Transportation Analysis and Training Sercies Contract

Alternative Analysis Modeling Methodology and Results

prepared for

Caltrans Districts 3 & 4

prepared by

Cambridge Systematics, Inc.

March 25, 2022

www.camsys.com

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Cambridge Systematics, Inc.
515 S. Figueroa Street, Suite 1975
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date

March 25, 2022

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1.0 Introduction

As a part of the Caltrans On-call Transportation Analysis and Training Services contract, Cambridge Systematics (CS) has assisted Caltrans with operations analysis for the I-80 Comprehensive Multimodal Corridor Plan (CMCP) work effort. Cambridge Systematics was scoped to perform traffic operation analysis using both the regional travel demand model and microsimulation models to assess the performance of future improvements. Within the District 4 portion of the corridor, the travel demand modeling analysis was completed using the Solano-Napa Activity Based Travel Demand Model (SNABM). Within the District 3 portion of the corridor in Yolo-Sacramento Counties, data from the I-80 US 50 Managed Lanes Study, which used the SACSIM19 model, was applied to the analysis. In addition, two VISSIM software-based microsimulation models were also developed for I-80 corridor segments which are located in the cities of Fairfield and Vallejo. Using these modeling tools, the transportation systems were assessed for existing and future conditions. The results contained in this report will be used as part of the CMCP that Caltrans is developing.

This document summarizes the results of traffic analysis for the Existing and Future alternatives using the Solano-Napa and SACSIM19 models. The document also summarizes the existing microsimulation model development process, although the details of the microsimulation results are documented separately. The study area for the travel demand model analysis using the Solano-Napa model incudes the I-80 freeway between Carquinez Bridge in Solano County to SR 113 near Davis, and the I-80 corridor to the east of that point was assessed using SACSIM19 model results. The I-80 Fairfield microsimulation model starts from west of the Red Top Road ramps and extends to east of Manuel Campos Parkway. The I-80 Vallejo microsimulation model begins at the Alfred Zampa Memorial Bridge on the western edge of the model and extends to the east of Columbus Pkwy/ SR 37 interchange ramps. The freeway ramps and ramp terminal intersections are also included in the analysis and modeling effort.

1.1 Alternative Scenario Description

The analysis scenarios were developed in consultation with the project team from Caltrans. Due to the relative strengths of the travel demand models and the simulation model, they were each used to assess specific scenarios and transportation improvement strategies. For example, the travel demand models are the best tools to assess growth in overall travel in the corridor, transit usage, and mode shift, while the microsimulation model is the best tool to assess detailed traffic operations analysis along the freeway where there is heavy congestion and to assess physical and operational improvements on the freeway and ramps. All of the future analysis uses the 2040 horizon year, which matches the Napa-Solano and SACSIM19 Travel Model years of analysis.

As noted, future alternative improvement scenarios were developed by Caltrans staff and the consulting team. The purpose of the scenarios is to test improvement strategies and projects to assess how effective they would be at alleviating future transportation problems. The results of the analysis will be used to help develop the CMCP project list and understand the benefits of projects and packages of projects, as measured against key transportation performance metrics. The future alternative scenarios are defined as follows:

- **Future No Build (Baseline)**: The purpose of this scenario is to establish the future conditions as of 2040 along the corridor, given implementation of all known funded projects through 2040 with growth in traffic to 2040. Projects included in the baseline scenario are I-80 / I-680 / SR 12 Interchange Project, Jepson Parkway Project, SR 37/Fairgrounds Drive Interchange Project, and I-80 interchanges at Richards Boulevard and West El Camino Avenue. This scenario is assessed using the SNABM and SACSIM19 travel demand models for the corridor. In addition, the simulation models were developed, calibrated to existing conditions and a 2040 Baseline Scenario was created within the VISSIM modeling platform.

- **Future Build Scenario 1 (HOV 2+):** This scenario assesses the changes resulting from completing a High Occupancy Vehicle (HOV) 2+ lane along I-80 study corridor. Currently, in the study corridor the HOV lanes exist from Red Top Road to Air Base Parkway. The HOV 2+ model scenario added HOV lanes on I-80 from the Solano County line (Carquinez Bridge) in Vallejo to east of I-80/SR-51 interchange in Sacramento County and along US 50 between I-80 and I-5. This scenario includes all the projects included in Future Baseline scenario plus financially constrained RTP projects that are not fully funded and select unconstrained projects and SHOPP projects. This scenario is assessed using the travel demand model for the corridor as well as the focused corridor microsimulation model.

- **Future Build Scenario 2 (HOT 2+):** This scenario assesses the changes resulting from the addition of High Occupancy Toll(HOT) 2+ express lanes along I-80 study corridor. This scenario includes all the projects included in Scenario 1 and it converts the HOV lane in Scenario 1 to HOT 2+ lane. High occupancy vehicles will travel for free in HOT 2+ lane and single occupancy vehicles will have to pay full toll to use HOT 2+ lane. This scenario is assessed using the travel demand model for the corridor as well as the focused corridor microsimulation model.

- **Future Build Scenario 3 (HOT 3+):** This scenario assesses the changes resulting from HOT 3+ express lane along I-80 study corridor. This scenario is similar to Scenario 2 but with different occupancy requirements for the HOT lane. In this scenario, in the HOT lane, vehicles with 3+ occupancy will travel for free, vehicles with 2 occupancy will pay half toll and single occupancy vehicles will have to pay the full toll. This scenario is assessed using the travel demand model for the corridor as well as the focused corridor microsimulation model.

- **Future Build Scenario 4 (Capitol Corridor Scenario)**: This scenario assesses improvements to the Capitol Corridor Intercity Rail service between San Jose and Sacramento. The Capitol Corridor system is planning future improvements to its services which will enable more people to use the commuter rail as an alternative to driving on I-80. Data was provided by Capitol Corridor and Caltrans Division of Rail and Mass

Transportation regarding the future forecasted increases in passenger service and that information was used to model a similar reduction in people driving on I-80. This scenario is assessed using the travel demand model.

- **Future Build Scenario 5 (TDM/Active Transportation)**: This scenario assesses the changes resulting from assumed changes in travel behavior due to transportation demand management (TDM) programs as well as future implementation of active transportation facilities and shift of some trips to active transportation. Since it is not possible to model every trip that uses active transportation, this modeling scenario assumes future reduction in auto trips due to shift to active transportation as well as other changes such as increased work at home or shifts to off peak travel. This scenario is assessed using the travel demand model.

Appendix A includes the list of projects included in the future scenarios.

2.0 Model Development

This section presents a summary of the model development for the I-80 corridor analysis, which was conducted in support of the I-80 corridor CMCP. The analysis was conducted using both the Solano-Napa travel demand model and the SACSIM19 model. Microsimulation models that were developed in the VISSIM platform for the weekday AM (6:00-10:00) and PM (3:00 to 7:00) peak periods are used for more detailed analysis which is documented separately.

The travel demand model and microsimulation model analyze typical weekday traffic operating conditions. The models are not able to assess weekend conditions as there is not sufficient background data to support weekend models (lack of full weekend volume data and no regional travel demand models for weekend time periods). Also, weekend traffic analysis is typically not completed for corridor studies because the weekday commute peaks generally represent the worst case conditions in most areas.

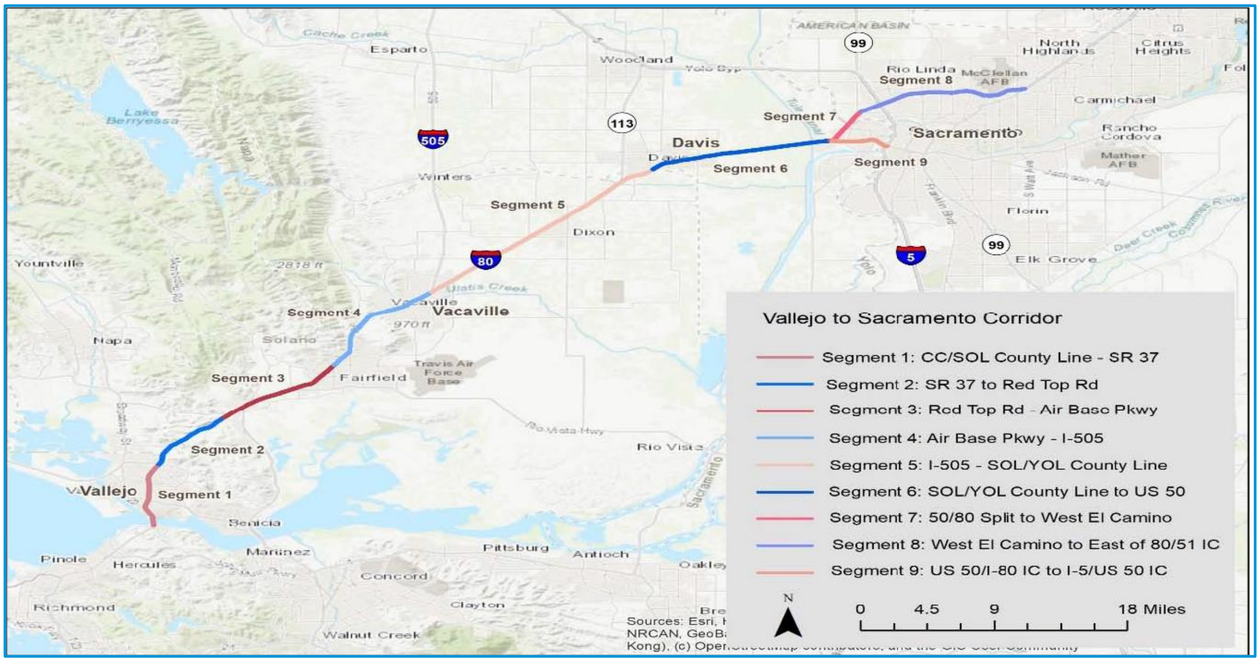
However, it is recognized that weekends can also have congestion due to higher levels of recreational and tourist activities and different peak periods than occur on weekdays. To assess weekend versus weekday conditions along I-80, some key performance metrics have been reviewed and compared between the weekday and weekend including speeds, location and extent of queues and traffic volumes. Appendix B includes a memorandum with comparisons of weekday to weekend operating conditions. The weekday to weekend comparison found that along I-80 weekday conditions are generally worse than on weekends, although significant congestion was observed on Saturdays at some locations.

The existing scenario represents year 2019, or the last year of normal travel demand and operations before the beginning of the COVID-19 pandemic, which significantly changed the travel conditions throughout 2020 and 2021. Thus, 2019 was chosen as the year to replicate typical existing conditions for purposes of the modeling and analysis.

2.1 Travel Demand Model

Travel demand model study area extends from the Contra Costa / Solano Countyline to Yolo County and the I-80 / SR-51 interchange in Sacramento County. No single travel demand model covers this entire study corridor and therefore, data from the Solano Napa Activity Based Model as well as the Sacramento Activity Based Travel Model (SACSIM19) was extracted to understand the traffic volumes along the entire corridor. Figure 1 shows the nine segments that have been defined for the corridor. Traffic data for segments 1 to 5 was extracted from the SNABM model and 6-9 from the SACSIM19 model. Cambridge Systematics and TJKM team, worked on SNABM model and Fehr & Peers worked on SACSIM19 model, as part of the Yolo 80 Managed Lanes project, and provided data from that model for the eastern portion of the study area (within District 3).

Figure 1: I-80 CMCP Study Area and Segments



The model enhancements and network corrections were performed to improve the SNABM model to match with the traffic counts and to reconcile the volumes of the Solano model to that of the Sacramento model at the Caltrans District 3 and 4 border at Solano-Yolo County line, so that the resulting traffic numbers form one set of contiguous data, to the extent feasible. The traffic volumes of SNABM were reconciled with volumes from SACSIM19 at the county borders for mainly three facilities – I-80, I-505 and SR-113.

After the model comparisons, a traffic forecast balancing exercise was performed, new model runs were conducted and comparisons of data at the model borders and in the overall corridor were performed. Following these model development procedures, the SNABM model was ready for use in the CMCP effort. The detailed Base Year Travel Demand Model calibration memorandum was submitted to Caltrans and is included in Appendix C.

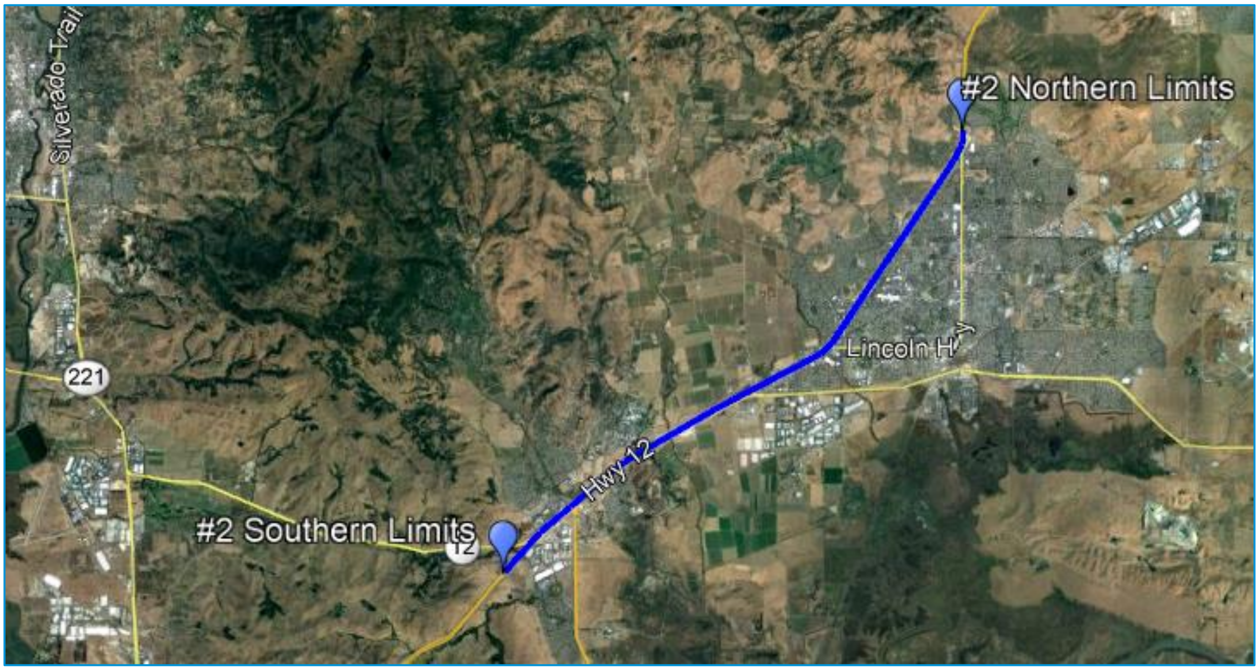
2.2 Microsimulation Model

Two microsimulation models were developed in vicinity of the Cities of Vallejo and Fairfield. The microsimulation model network includes all freeway mainline and ramp segments, managed lanes (HOV), interchange ramps, and ramp intersections in the Vallejo and Fairfield Study Areas. The I-80 microsimulation model in the Vallejo area begins at the Alfred Zampa Memorial Bridge on the western edge of the model and extends to the east of Columbus Pkwy/ SR 37 interchange ramps. Figure 2 shows the portion of the I-80 corridor Study Area that is covered by the Vallejo area model.

Figure 2: I-80 Vallejo Area Simulation Model Coverage

The I-80 microsimulation model in the Fairfield area starts from west of the Red Top Road ramps and extends to east of Manuel Campos Parkway. Figure 3 shows the portion of the I-80 corridor Study Area that is covered by the Fairfield area model.

Figure 3: I-80 Fairfield Area Simulation Model Coverage



The models were run five times to obtain average results for scenarios 1, 2 and 3, avoiding the undesirable effect from outlier runs that can skew results due to outlier simulations. It is important to note that the same calibration parameters were utilized for both AM and PM simulation periods used in the travel demand model.

The microsimulation model calibration results show that model output data such as volume, congestion, and travel times in model resemble the existing conditions for weekday AM and PM peak periods. The detailed simulation model calibration memorandum was submitted to Caltrans and is included in Appendix D. Appendix D also contains detailed simulation model analysis results.

3.0 I-80 Corridor Analysis Results

This section focuses on the travel demand modeling results for all nine analysis segments shown in previously referenced Figure 1.

The extent of I-80 corridor is from Carquinez Bridge to the west and SR 51 to the east. As noted, no single travel model covers this 66 mile length of the corridor. To analyze the entire corridor, the results presented in this report are based on the following three sources:

1. Application work conducted by Cambridge Systematics using the Solana-Napa Travel Model which covers from Carquinez Bridge to Route 113/ west end of Davis. [Approximate 43 mile section]

2. Application work that was conducted for the I-80/US 50 Yolo Managed Lanes Study using the SACSIM-19 model [these data/results were provided to CS by Caltrans]. This covers from Route 113/Davis to Northgate Blvd. [Approximate 18 mile section]

3. Application work conducted by Caltrans District 3 Staff for the eastern end of the corridor from Northgate Blvd. to SR 51. [Approximate 6 mile section]

This section of the report is separated into three sub-sections:

1. Existing Year Traffic Flow (sub-section 3.1)

2. 2040 No-Build Growth (sub-section 3.2)

3. 2040 Alternatives Analysis (sub-section 3.3)

These sub-sections compare traffic volumes along the I-80 corridor for the various scenarios including No-build and future with improvements. Daily volumes are compared between multiple scenarios by direction as well as for both directions combined. AM and PM period volumes are compared directionally, since the peak periods have directional imbalance, whereas daily level traffic is more balanced. Please note that AM and PM are four-hour time periods as derived from the models.

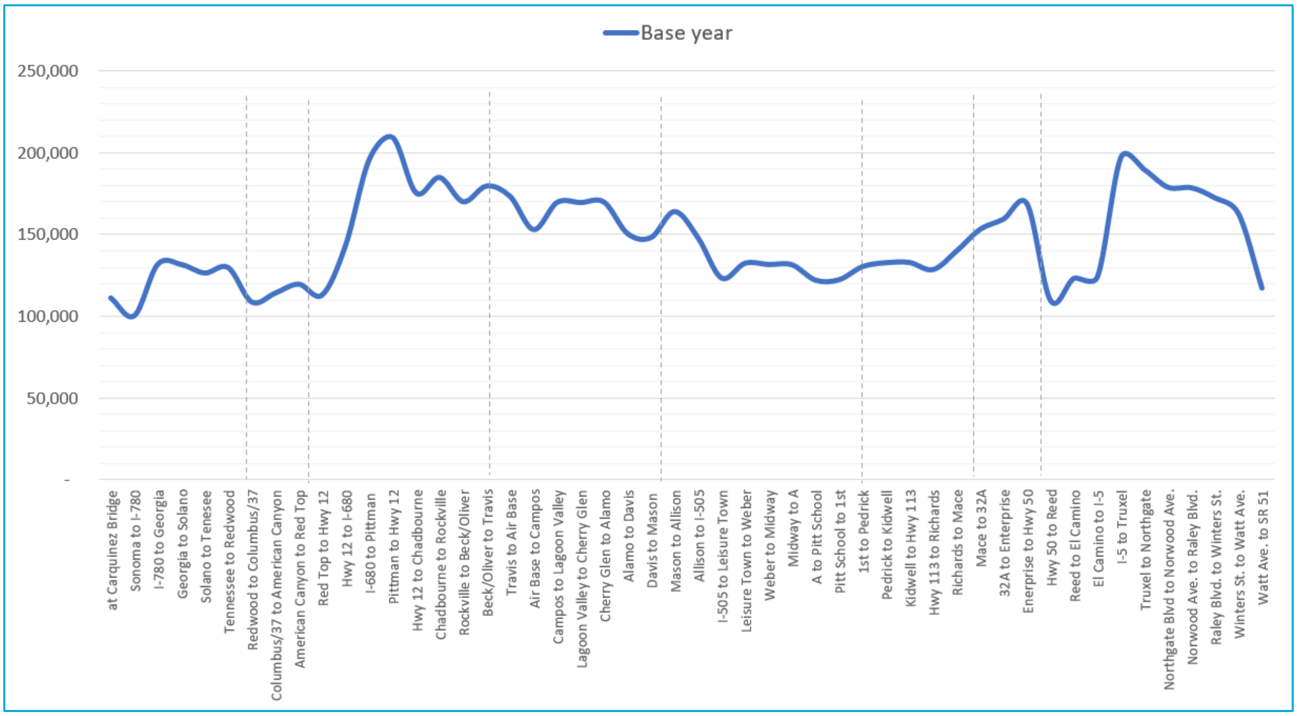
In addition to analysis of physical and operational roadway and transit improvement alternatives, this section also includes analysis of assumed mode shift due to TDM and active transportation projects and programs.

3.1 Existing Year Traffic Flow

Existing travel demand models were updated to match existing year 2019 conditions. The model enhancements and network updates were performed on the SNABM model to make the model volume to match with observed field volumes. Details of the base year model results are presented in the base year travel demand model memorandum (Appendix C).

Volumes presented in the reported are obtained from SNABM and SACSIM19 models. The I-80 corridor within the study area carries from 100,000 to over 200,000 vehicles on a daily basis in both directions, depending on location. The peak flow occurs near the I-680 junction with I-80 in Segment 3, which is nearly matched in the eastern portion of the study area in Sacramento. More than 95% of this vehicular traffic is auto traffic. There are less than 5% trucks along this corridor. About one-fifth of the vehicular traffic is shared ride (more than one occupant per vehicle). Figure 4 shows the daily traffic along the I-80 corridor.

Figure 4: Existing (2019) Daily Traffic on I-80 [both directions combined]



Source: SNABM and SACSIM19 models

3.2 2040 No-Build Growth

This sub-section of the report compares the growth between existing base year and the 2040 No-Build conditions. Travel demand models use information to process and estimate the existing and future traffic forecasts. One of the key inputs to the model is the socio-economic data (SED) which are the basis of the activity of individual simulated households and persons. These include population, households, jobs, income, and other variables that affect trip making. Trips are estimated in the travel demand models using these SED inputs.

This section provides a comparison of these key SED inputs. This gives an overview of the range of traffic demand growth expected along the study corridor. Also, this section covers other input assumptions from the network side, in this case the freeway and arterial roadway networks. Model roadway networks are different for the base year model and 2040 No-Build model due to planned improvements. There will be some projects that are already committed or funded and will be constructed between now and the next 20 years, and these are documented. After these two key model inputs (SED and network), the model results are compared, including corridor volumes, Vehicle Miles Traveled (VMT), Vehicle Hours of Travel (VHT), Vehicle Hours of Delay (VHD), Person Hours of Delay and mode-shares to determine if there are any significant changes in volumes, operating conditions, or mode changes/shifts that the models are predicting between now and future.

3.2.1 2040 Planned Projects in 2040 No-Build Scenario

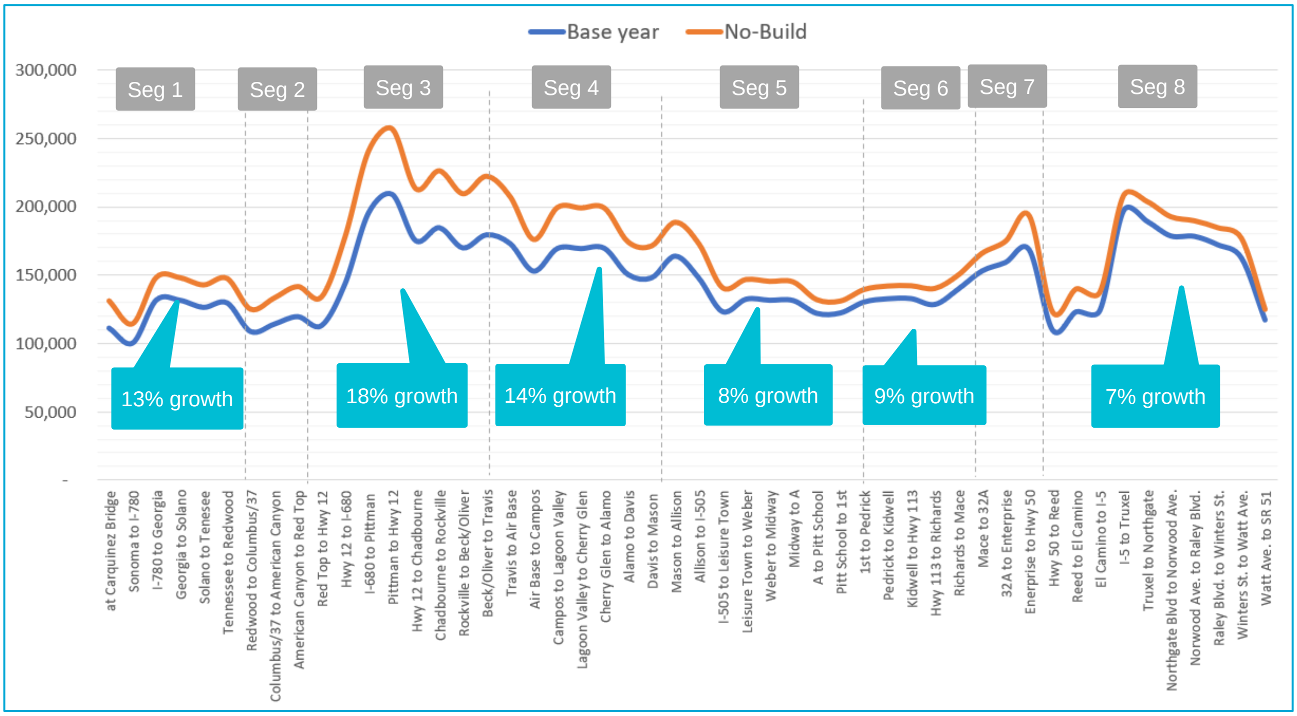
Before performing future analysis model runs, the 2040 highway model network was updated to include all under-construction and approved roadway projects that will be completed by 2040. Below is a list of network updates:

- I-80 / I-680 / SR 12 Interchange Project: Added a new slip ramp from SR12 to Green Valley Road and an off ramp from EB I-80 to Green Valley Road on southbound I-680. Added a new lane to the EB SR12 to EB I-80 Connector Bridge.
- Jepson Parkway Project: Extended and widened Leisure Town Road in east Vacaville to connect to Vanden Road in Fairfield. Widened Walters Road in Suisun City and the I-80 / Leisure Town Road Interchange in Vacaville.
- SR 37/Fairgrounds Drive Interchange Project
- I-80/West El Camino Avenue Interchange
- I-80/Richards Boulevard Interchange

3.2.2 Corridor Volumes Comparison

The model estimates indicate that significant growth is expected to occur in the study corridor in next 20 years on the I-80 freeway. Future year 2040 traffic model results show a growth range of 7% to 18% along I-80 with a median growth of 12% over the existing year. The growth varies along the corridor depending on location and reflecting the different SED growth projections in various parts of the corridor study area. There is higher estimated future growth in the Segments 3 and 4 of the corridor compared to the eastern sections. The lowest growth is on Segment 8 between west of El Camino to east of SR 51 interchange. Please see Figure 5 for the growth details along the corridor in terms of projected volume growth between the existing base year and 2040. Average growth is shown for each of the study area segments. Note the figures below show volume comparisons for Segment 1 to Segment 8, which are all along I-80. Since segment 9 is for US 50 and not along I-80, the information for Segment 9 is presented separately in Section 3.3.2.4.

Figure 5: Future (2040) Baseline Daily Traffic Growth on I-80 Corridor [both directions combined]



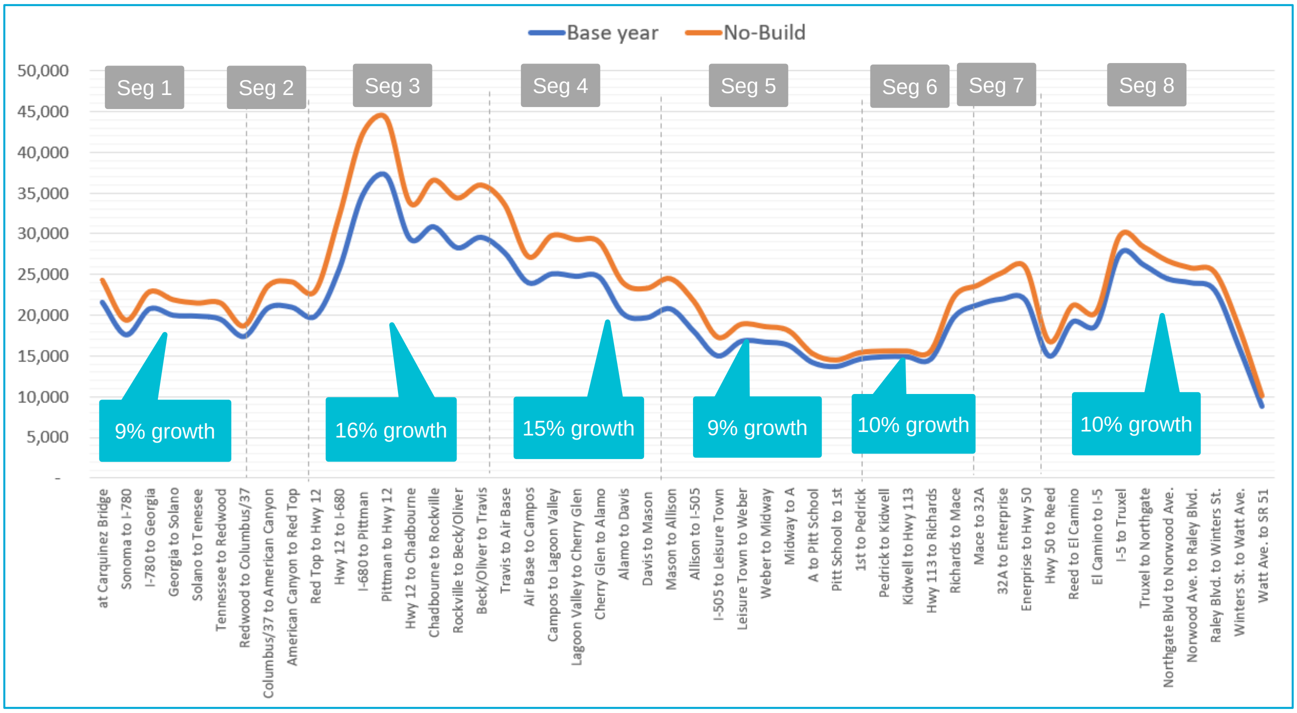
No-Build = 2040 future baseline conditions

Source: SNABM and SACSIM19 models

Similar to the daily growth, AM peak period westbound traffic is projected to grow in the range of 9% to 16%. More growth is observed in the mid-section; between Red Top Road and I-505 (Segments 3 and 4). The farther eastern and western sections grow by about 10%. Figure 6 shows the details of the AM peak period westbound traffic volume growth percentages and numeric growth in traffic flow.

The AM peak period eastbound growth is slightly lower than the forecast growth in the westbound direction. In the mid-section; between Red Top Road and I-505 (Segments 3 and 4) the model projects growth of 15% to 16% which is about 2,000 to 2,500 more vehicles for the four hour period [6 a.m. to 10 a.m.]. In the eastern portions of the corridor (Segment 6 and 8) the projected growth is in the range of 6% to 8%. Figure 7 shows the growth percentages and numeric growth in traffic flow.

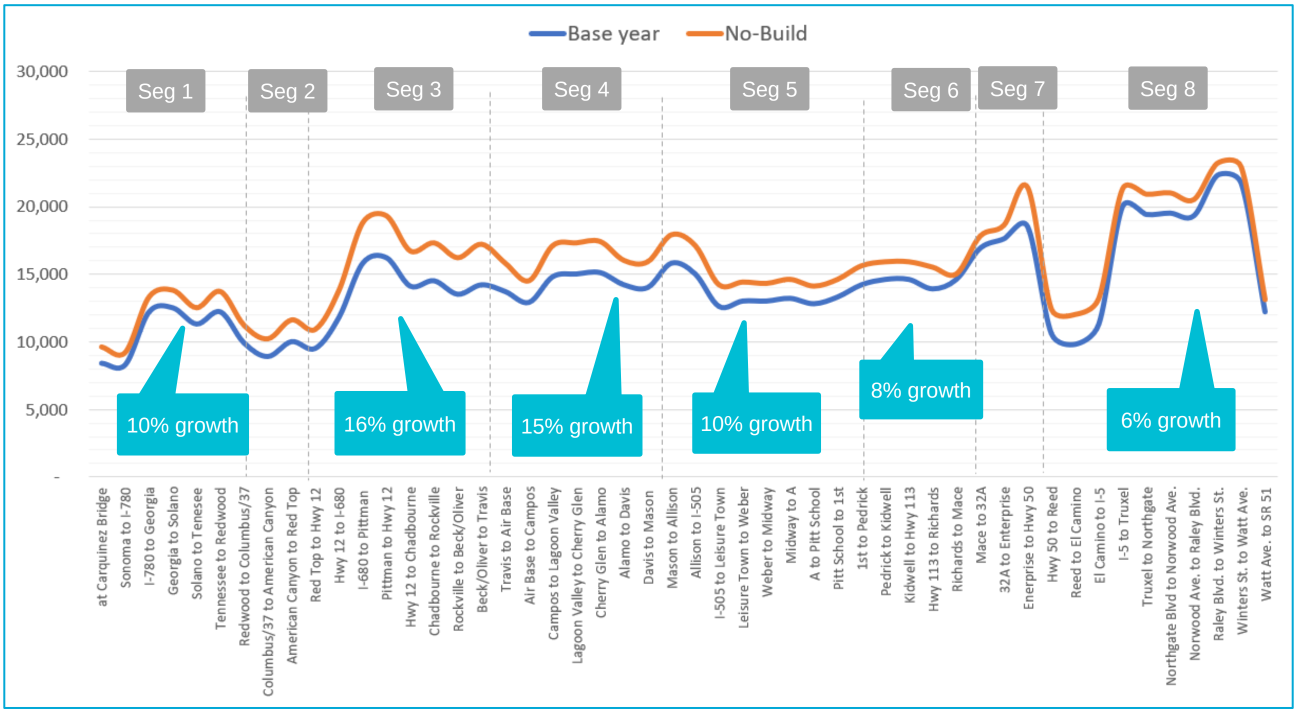
Figure 6: Future (2040) Baseline AM Period Westbound* Traffic Growth on I-80 Corridor



** Peak direction for this time period*

Source: SNABM and SACSIM19 models

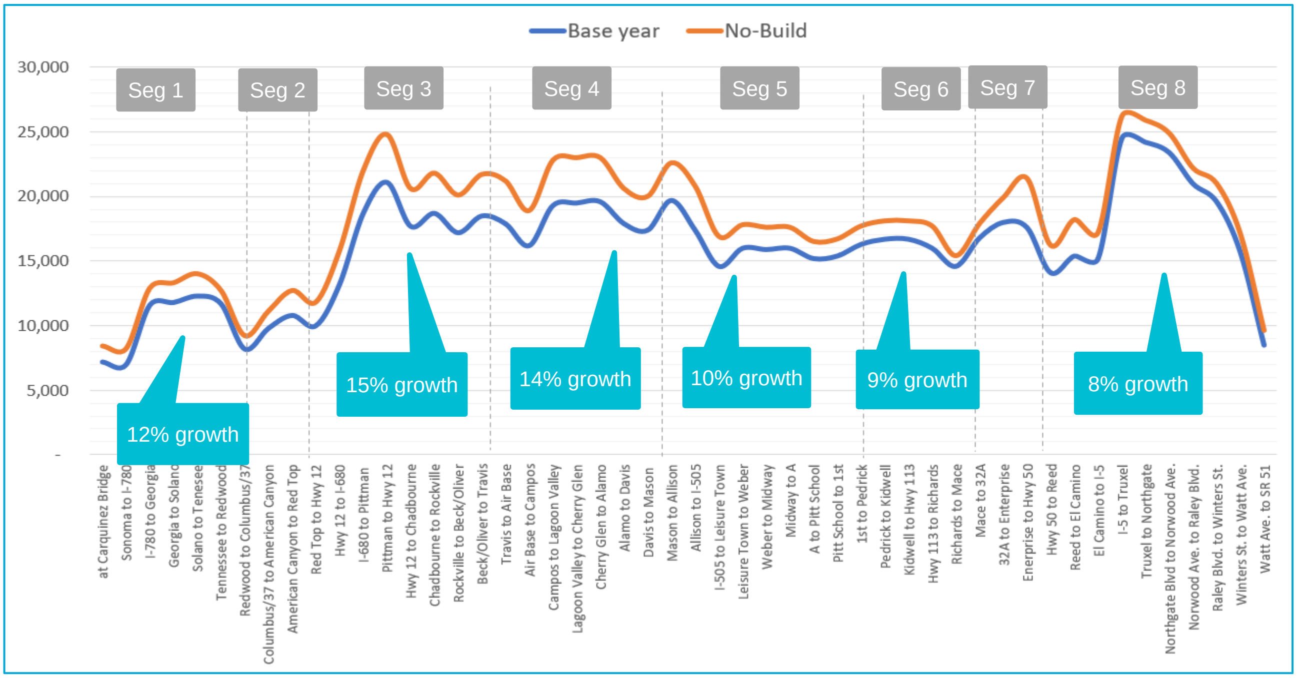
Figure 7: Future (2040) Baseline AM Period Eastbound Traffic Growth on I-80 Corridor



Source: SNABM and SACSIM19 models

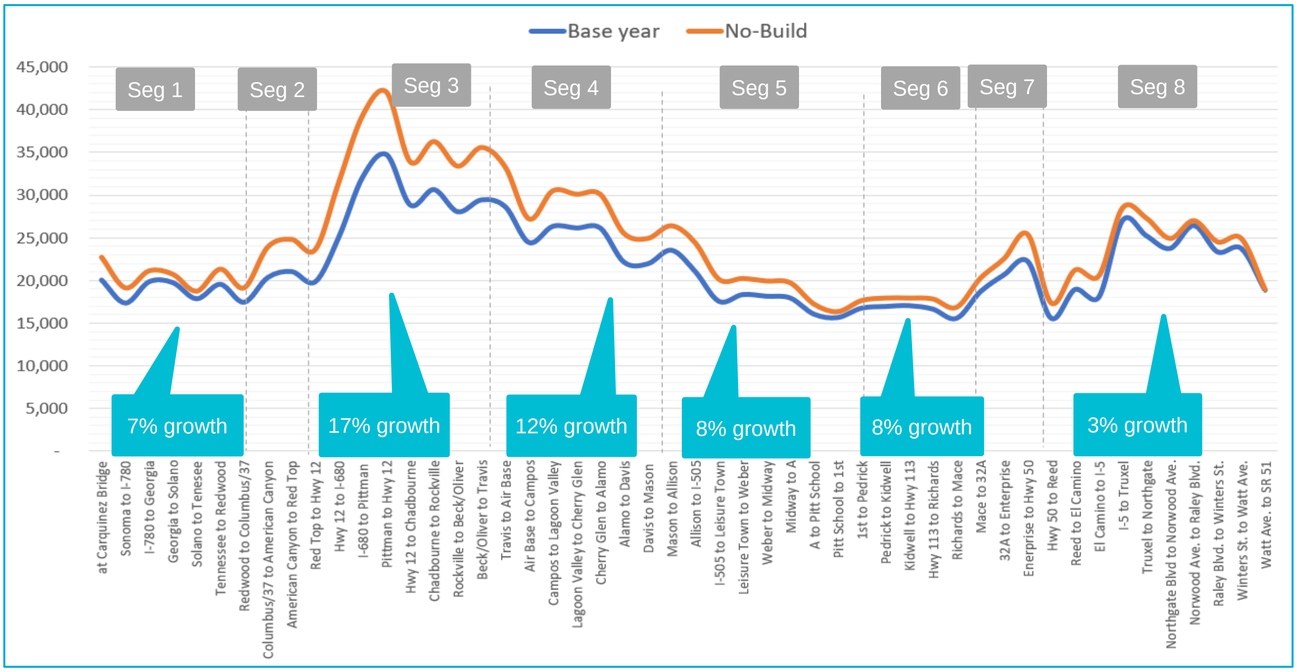
The PM period westbound growth is less than the projected PM period eastbound direction growth, as the PM period eastbound is the peak direction for this period. In a similar pattern to the above, the mid-section (Segment 3 and 4) traffic growth is greater for this time period as well. In the Segment 3 and 4 the traffic grows in the range of 14% to 15%, or about 3,500 to 6,000 more vehicles in the four hour time period. The eastern sections grow in the range of 8% to 9%, or about 1,400 to 1,600 more vehicles for the four-hour time period. Figure 8 and Figure 9 show the details for PM period traffic growth along I-80 corridor in westbound and eastbound direction, respectively.

Figure 8: Future (2040) Baseline PM Period Westbound Traffic Growth on I-80 Corridor



Source: SNABM and SACSIM19 models

Figure 9: Future (2040) Baseline PM Period Eastbound* Traffic Growth on I-80 Corridor



** Peak direction for this time period*
Source: SNABM and SACSIM19 models

3.2.3 VMT / VHT / VHD Comparison

Under the future No-build condition, the models project that Vehicle Miles Travelled will increase along the I-80 CMCP corridor by about 15%. The model predicts that the VMT will go up from 10.3 million miles travelled per day to over 11.8 million miles travelled per day along I-80 corridor study area. The added population and jobs will generate new trips in the area and the results are shown as the increase in the VMT, VHT and the Delay (VHD).

VHT and delay also increase significantly from existing to 2040 based on the model results. Table 1 shows the details of the VMT, VHT and VHD change to 2040. VMT, VHT and VHD data presented below is for freeway segments only in I-80 CMCP corridor. Delay and hours of travel increase more than VMT due to the increase in congestion which exponentially increases and impacts vehicles on the system. This is especially true where there is already congestion or conditions nearing the point of heavy congestion with resulting vehicle queues.

Table 1: Vehicle Miles Traveled, Hours Traveled and Delay Comparison

	VMT	VHT	VHD
Base year	10,370,700	182,300	20,000
2040 No-Build	11,878,600	224,100	37,700
Total. Difference	1,507,900	41,800	17,700
Percent Difference	14.5%	22.9%	88.5%

3.3 2040 Alternatives Analysis

This sub-section of the report compares the 2040 No Build (baseline) scenario and 2040 Build scenarios. The following performance measures are compared in this section to assess the effects of each alternative against the no-build alternative. The comparative performance measures are:

- Corridor volumes;
- Person throughput (Vehicle Occupancy);
- Vehicle miles travelled (VMT);
- Vehicle hours travelled (VHT); and
- Vehicle hours of delay (VHD).

All the performance measures reported are for four hour AM (6AM – 10AM) and PM (3 PM – 7 PM) peak periods, as well as for a typical weekday, similar to travel demand models. There are a total of five build alternative scenarios that are assessed using the travel demand models. They are:

- **Future Build Scenario 1 HOV 2+**: This scenario assesses the changes resulting from completing a High Occupancy Vehicle (HOV) 2+ lane along I-80 study corridor.
- **Future Build Scenario 2 (HOT 2+)**: This scenario assesses the changes resulting from the addition of High Occupancy Toll(HOT) 2+ express lanes along I-80 study corridor.
- **Future Build Scenario 3 (HOT 3+)**: This scenario assesses the changes resulting from HOT 3+ express lane along I-80 study corridor.
- **Future Build Scenario 4 (Capitol Corridor Improvement Scenario)**: This scenario assesses improvements to the Capitol Corridor Intercity Rail service between San Jose and Sacramento.
- **Future Build Scenario 5 (TDM/Active Transportation Enhancement Scenario)**: This scenario assesses the changes resulting from assumed changes in travel behavior due to transportation demand management (TDM) programs as well as future implementation of active transportation facilities and shift of some trips to active transportation.

Please refer to Chapter 1 for the description of each alternative scenario for details.

3.3.1 Projects in 2040 Build Alternatives

In addition to the planned and programmed projects that were included in the 2040 No-Build network, there are additional projects that were assumed as part of the build alternative model networks. As noted, the project team held multiple coordination meetings to develop the alternative scenarios. Note that the first three scenarios (HOV and the two HOT alternatives) match the definitions as the Yolo Managed Lanes Study in the eastern portion of the study corridor using the SACSIM19 model. The final two alternative scenarios were assessed for the Solano portion of the corridor using the Napa-Solano Model, and the Yolo and Sacramento portion was assessed by Caltrans District 3 staff using SACSIM19 data. The alternative scenario projects list is presented in Appendix A.

3.3.2 Corridor Volumes Comparison

The 2040 managed lanes alternative scenarios traffic volumes are compared to 2040 No-Build in this section, followed by comparisons of the Capitol Corridor Alternative and the TDM alternative to the 2040 No-Build. The assumed operating hours of the managed lanes are during AM and PM peak periods, which are 6 AM to 10 AM and 3 PM to 7 PM, respectively.

3.3.2.1. Managed Lanes Alternatives Traffic Volumes Comparison

All three managed lanes alternatives are projected to carry more traffic volume along the freeway corridor (General Purpose and Managed Lanes together) than the future No-Build scenario. The lowest growth sections are the areas that do not have additional capacity assumed to be added to the mainline; which are:

- Highway 12 to Air Base Road
- El Camino to Northgate

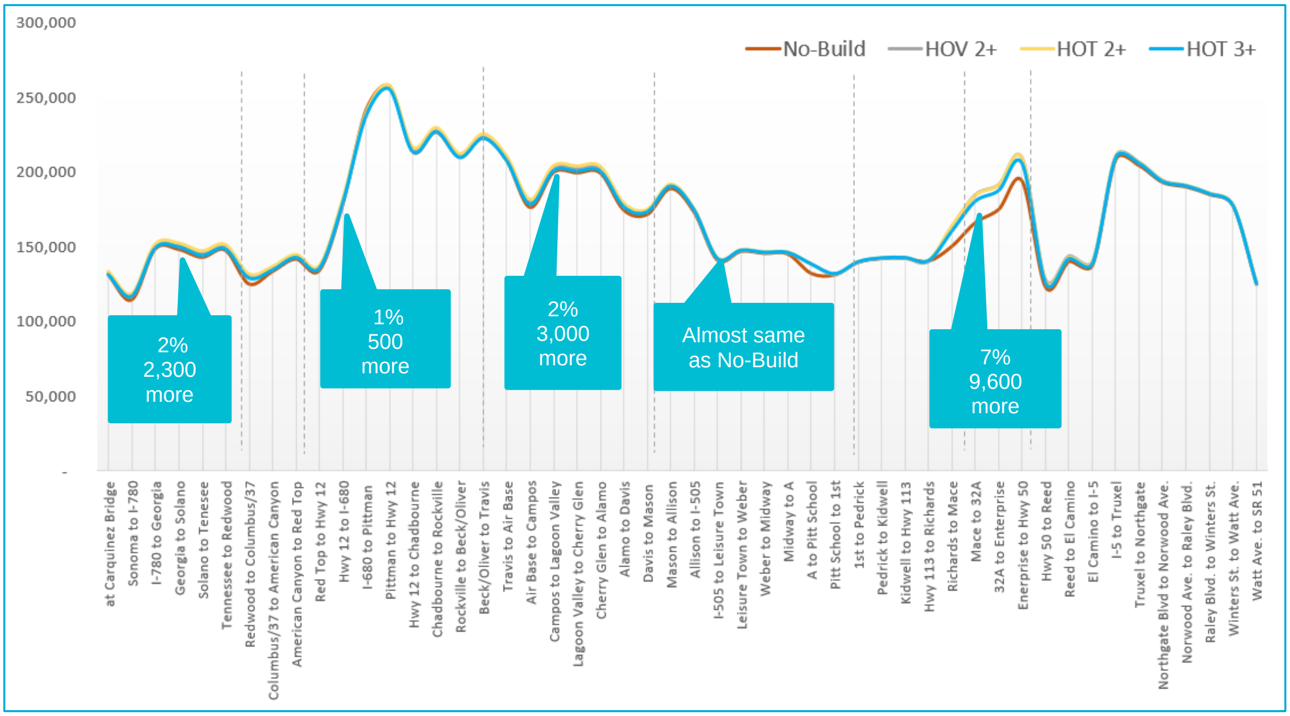
These HOV and HOT project scenarios assume added mainline capacity to all other sections of the study area. Based on the model results, the highest growth is observed between Route 113 and Highway 50 (Segments 6 and 7). This section has 9,500 to 12,700 more vehicles under the managed lane build scenarios along I-80 at the daily level, compared to 2040 No-Build scenario, which represents about a 7% increase in traffic throughput.

Next highest growth is observed between Air Base Road and I-505 (Segment 4). This is consistent for all three managed lanes alternatives. This section has 3,000 to 3,600 more vehicles under the Build scenarios at the daily level, compared to 2040 No-Build scenario, which is about a 2% increase in traffic. For alternatives 1 and 2, this section has 3,000 to 4,300 more vehicles at daily level in both directions, compared to 2040 No-Build scenario, which is about a 2% increase in traffic. For alternative 3, where only HOV3+ was free, the increase in total daily traffic is only 1% in this corridor.

Figure 10 shows the comparison of daily traffic along the I-80 corridor for all three managed lane alternatives as compared tot the 2040 No-Build alternative.

West of Red Top Road (Segment 1 and 2) and east of Highway 50 (Segment 8), the study corridor sections carry 2,000 to 3,000 more vehicles at the daily level in both directions under the HOV/HOT Build scenarios as compared to the No-Build scenario which is about a 2% increase in traffic.

Figure 10: Future (2040) Daily Traffic on I-80 by Alternative [both directions combined]



2% 2,300 more

1% 500 more

2% 3,000 more

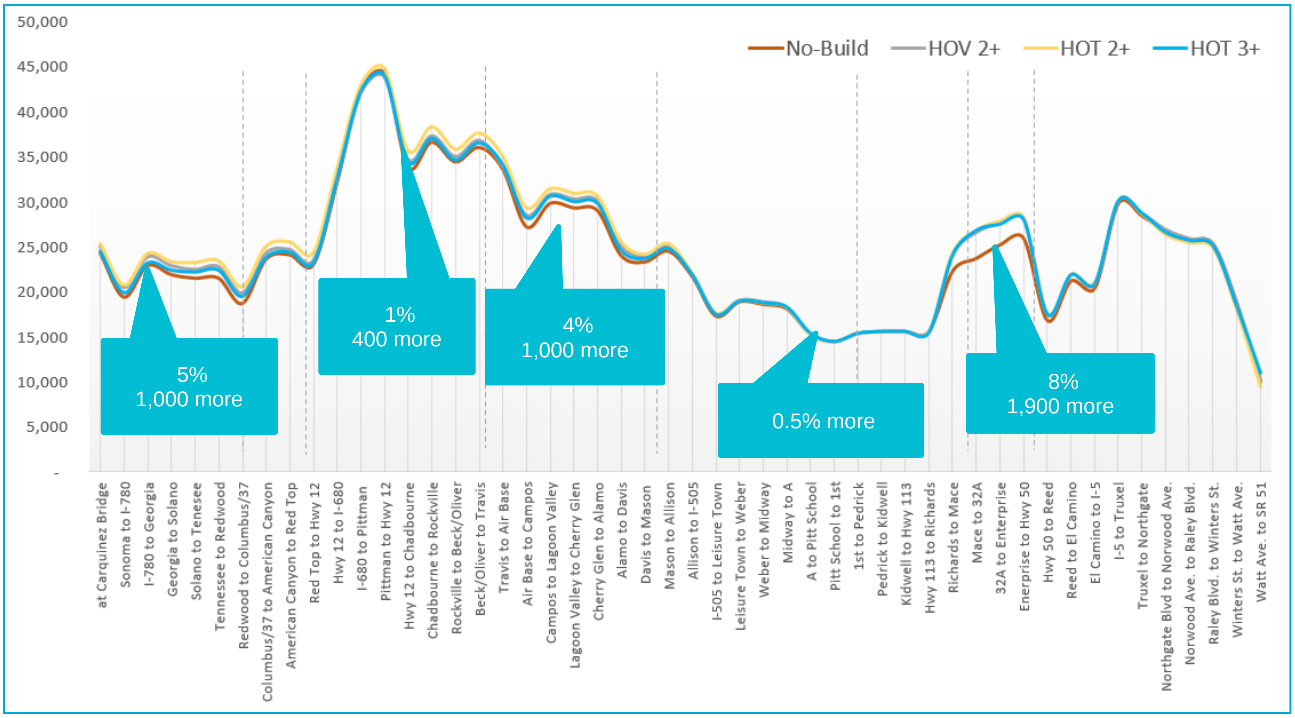
Almost same as No-Build

7% 9,600 more

Source: SNABM and SACSIM19 models

The following sections of the report show the peak period level observations from the model for the HOV and HOT alternatives. For this corridor the AM peak flow is in the westbound direction and the PM peak flow is in the eastbound direction. Figure 11 and Figure 12 show AM peak period traffic comparison for westbound and eastbound direction, respectively. Figure 13 and Figure 14 show PM peak period traffic comparison for westbound and eastbound direction, respectively.

Figure 11: Future (2040) AM Period Westbound* Traffic on I-80 by Alternative



5%
1,000 more

1%
400 more

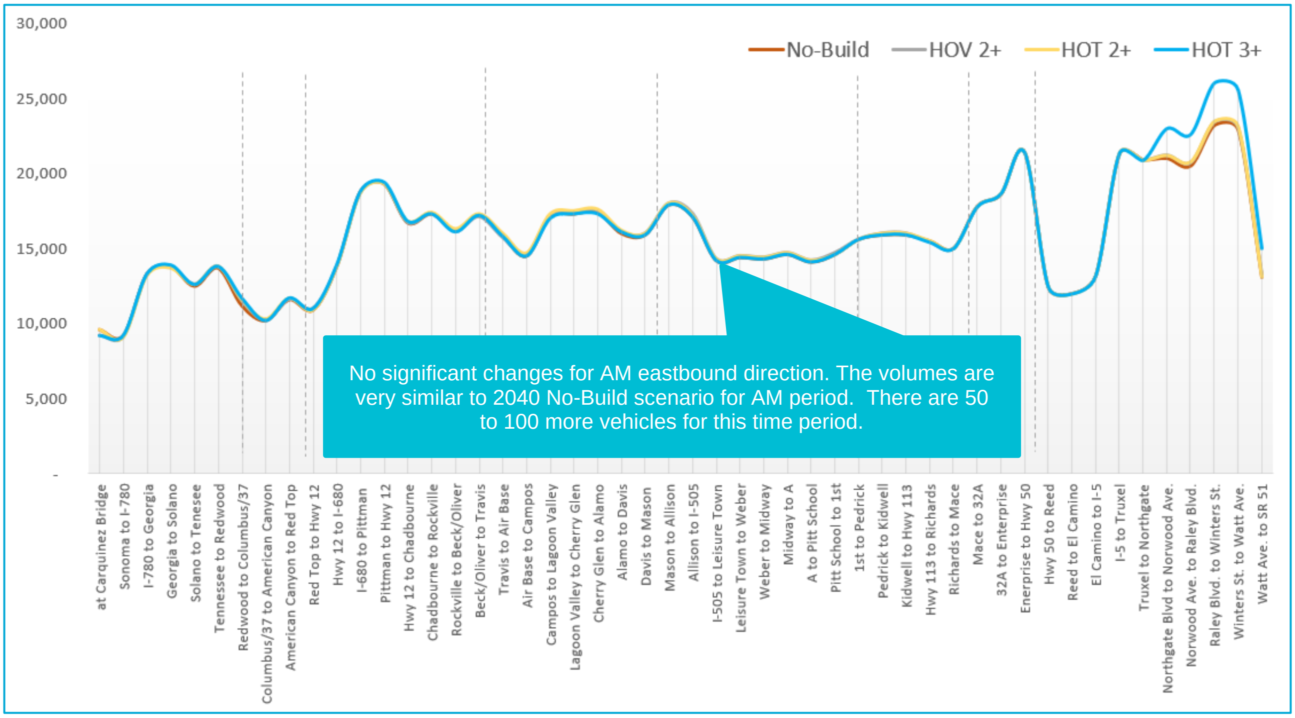
4%
1,000 more

0.5% more

8%
1,900 more

Source: SNABM and SACSIM19 models

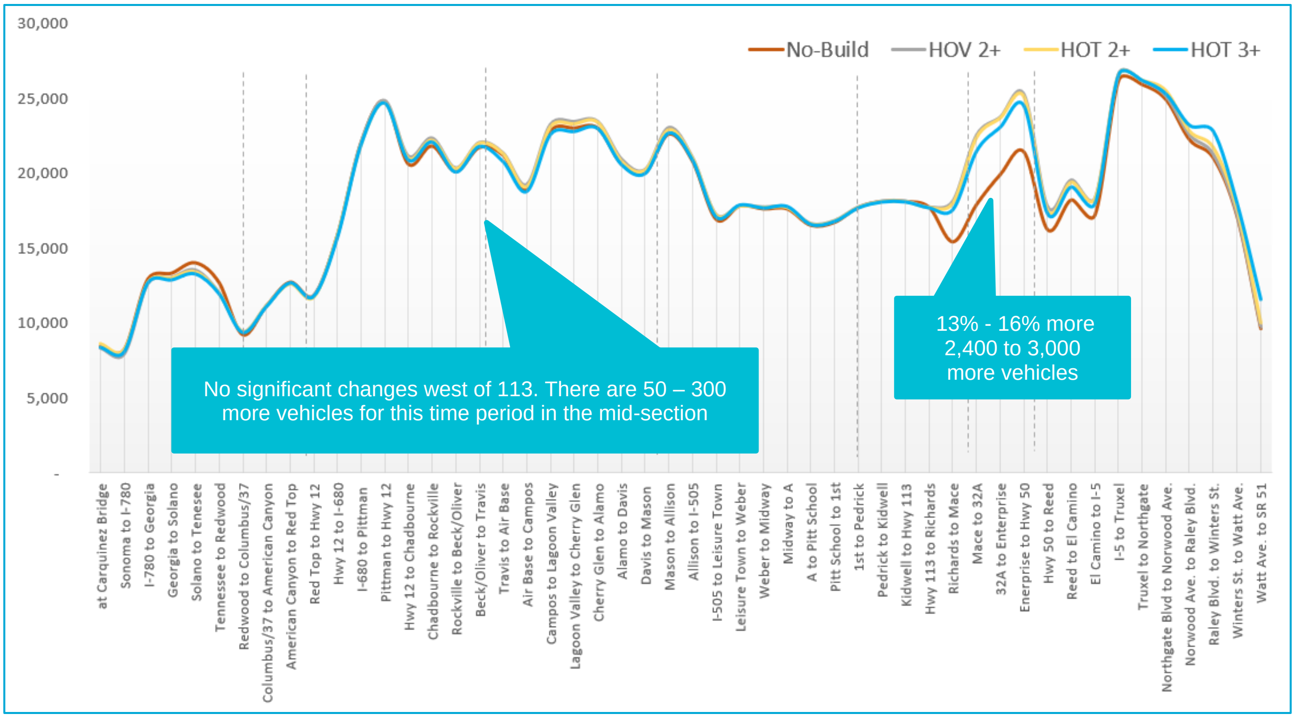
Figure 12: Future (2040) AM Period Eastbound Traffic on I-80 by Alternative



No significant changes for AM eastbound direction. The volumes are very similar to 2040 No-Build scenario for AM period. There are 50 to 100 more vehicles for this time period.

Source: SNABM and SACSIM19 models

Figure 13: Future (2040) PM Period Westbound Traffic on I-80 by Alternative

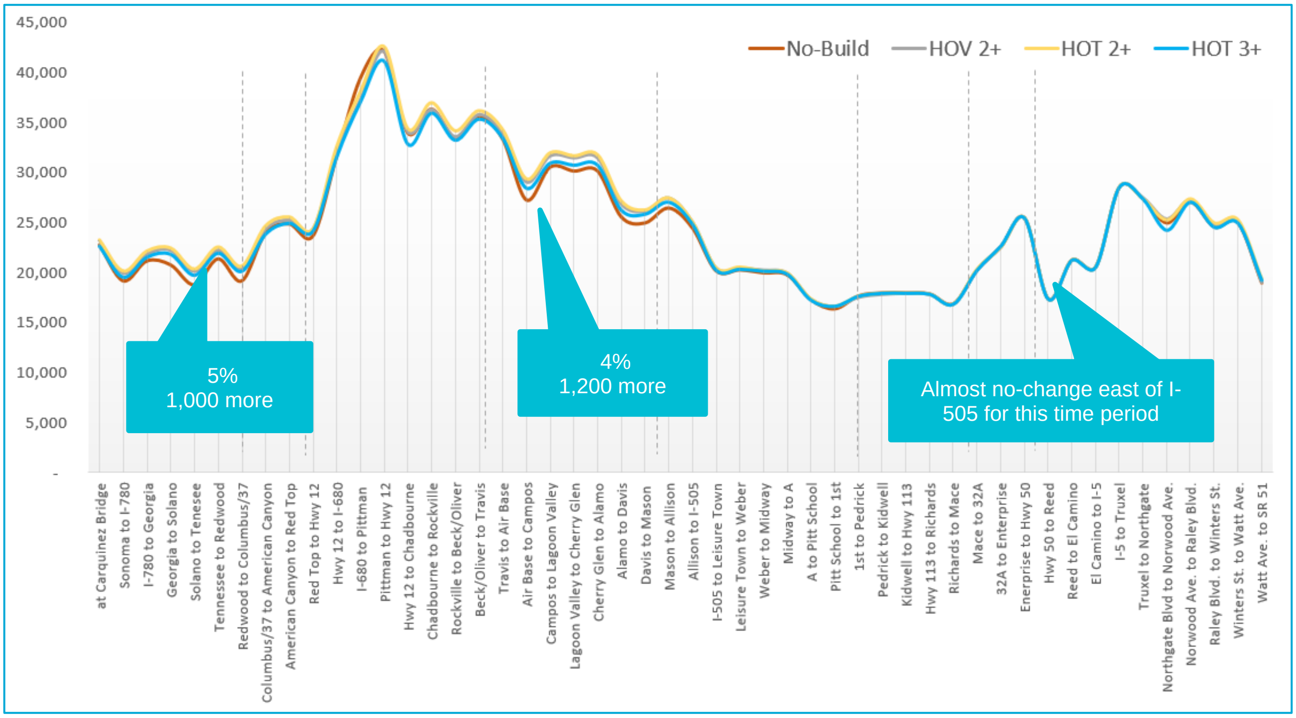


No significant changes west of 113. There are 50 – 300 more vehicles for this time period in the mid-section

13% - 16% more
2,400 to 3,000
more vehicles

Source: SNABM and SACSIM19 models

Figure 14: Future (2040) PM Period Eastbound Traffic on I-80 by Alternative



5%
1,000 more

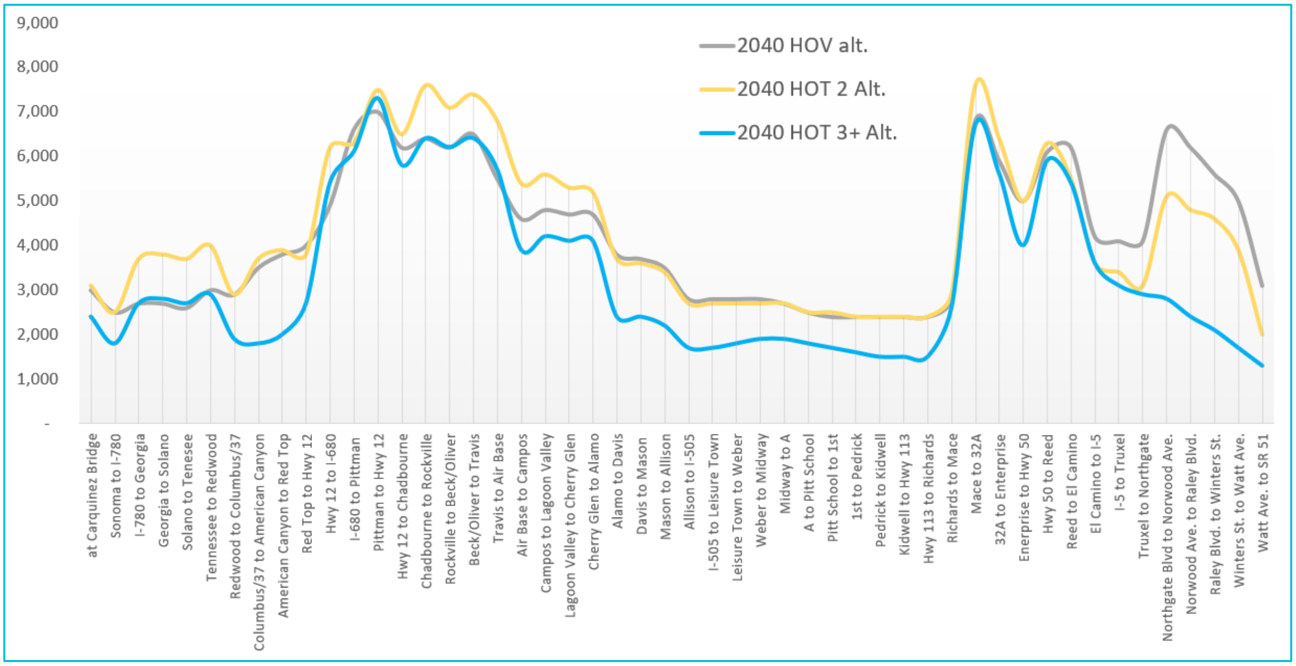
4%
1,200 more

Almost no-change east of I-505 for this time period

Source: SNABM and SACSIM19 models

Traffic in assumed future managed lanes: The assumed future managed lanes are shown to carry from 10,000 to 50,000 vehicles at the daily level in both directions combined within the study corridor. During peak periods, the assumed future managed lanes are shown to carry from 2,000 to 7,000 vehicles in peak direction within the study corridor. These represent the four-hour model time periods. Figure 15 and Figure 16 show AM westbound and PM eastbound managed lane volumes, respectively. AM westbound and PM eastbound represent the peak direction of managed lane volumes.

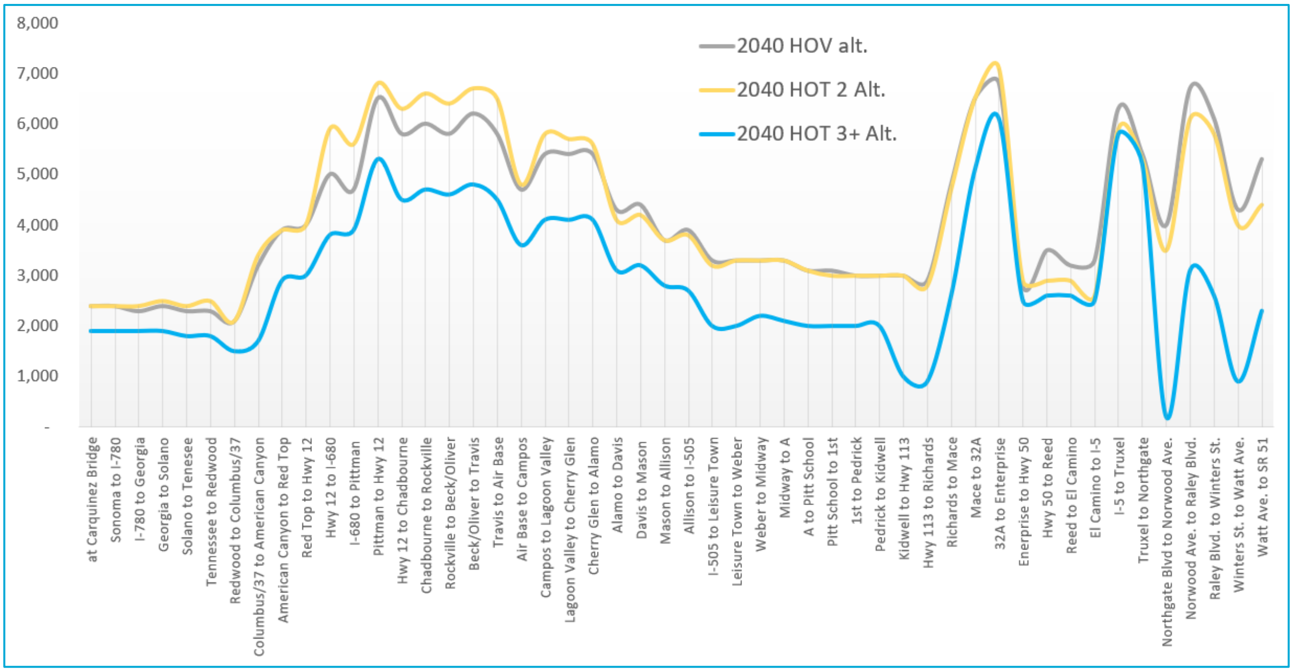
Figure 15: Future (2040) AM Westbound Managed Lane Traffic on I-80 by Alternative



Source: SNABM and SACSIM19 models

During AM peak period in westbound direction, HOT 2+ lanes alternatives carry more volumes between Highway 12 and the City of Davis compared to the HOV 2+ alternative. For entire corridor, the HOT 2+ alternative carries the most out of the three managed lane alternatives. Overall, the model results indicate that the HOT 3+ would carry the fewest vehicles of the three managed lanes alternatives. The PM period has similar patterns with minor variations.

Figure 16: Future (2040) PM Eastbound Managed Lane Traffic on I-80 by Alternative



Source: SNABM and SACSIM19 models

During PM peak period, the sections from Red Top Road to Air Base (Segment 3) and from 50/80 split to West El Camino (Segment 7) carries the most traffic in the assumed future managed lanes in the range of 6,000 to 7,000 vehicles in eastbound direction. The level of traffic projected in the managed lanes is very similar for HOV and HOT 2+ alternatives.

There is a slight drop in projected traffic demand in managed lanes for HOT 3+ alternative, which is due to the requirement for HOV 2 to pay to use the lanes under this scenario, which deters some users from taking these lanes. The section between Northgate Boulevard and SR-51 (Segment 8) has less volume in HOT 3+ scenario compared to other managed lane scenarios during both AM and PM peak periods. The toll paying traffic in this section is projected to shift to general purpose lane due to available capacity.

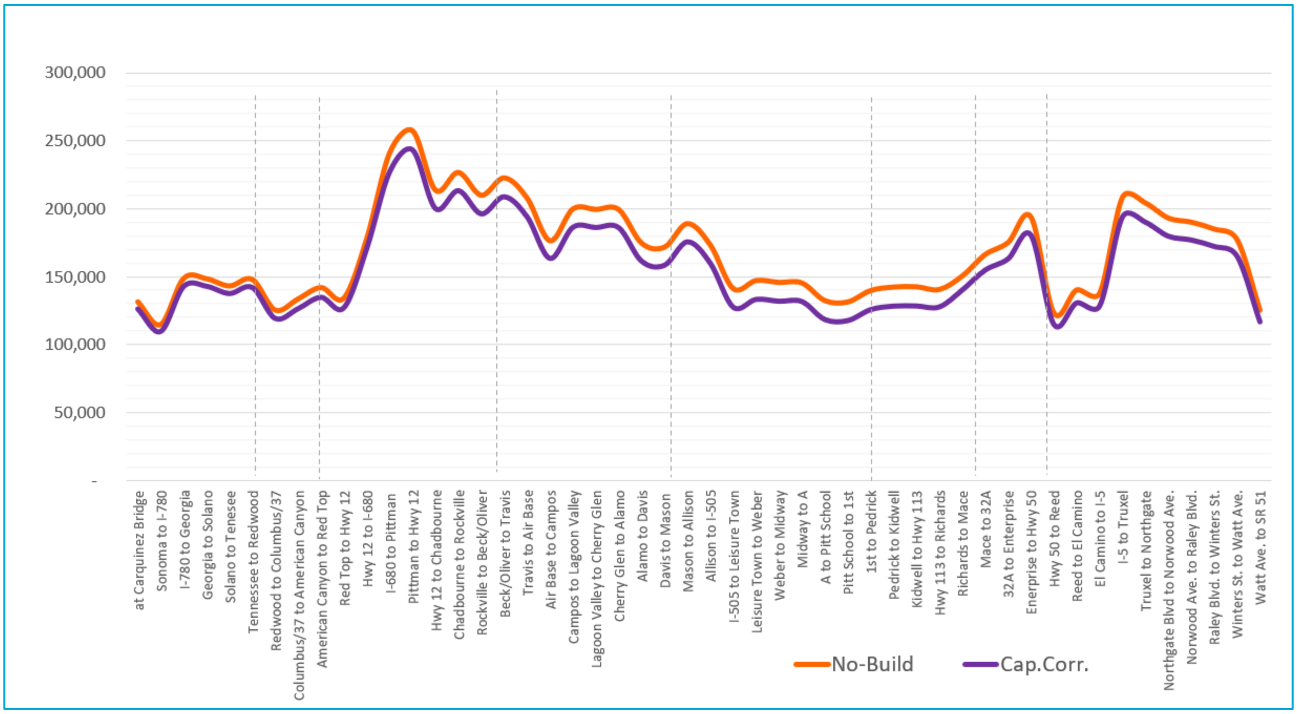
Note that in the AM eastbound and PM westbound directions (which are the off-peak directions of flow) the managed lanes are shown to carry far fewer vehicles, thus figures/charts are not provided for these directions and time periods. This lower demand is due to the reduced incentive for drivers to use the managed lanes in the off-peak directions, which have less congestion and lower delay, thus lower propensity for drivers to use the managed lanes.

3.3.2.2. Capitol Corridor Alternative Traffic Volumes Comparison

The Capitol Corridor transit improvement alternative, which accounts for the assumed Capitol Corridor project enhancements, has a significant effect on the I-80 corridor traffic according to the modeling results. According to the “Capitol Corridor I-80 Modeling” memorandum prepared by Steer (dated November 8, 2021), without Capitol Corridor improvement project the forecasted ridership is approximately 2.5 million in 2040. With Capitol Corridor project the corridor is forecasted to have ridership of 7.3 million, which is additional 4.8 million riders per year.

Figure 17 shows daily traffic on I-80 by Capitol Corridor alternative and No Build. As shown in figure, traffic on I-80 corridor is reduced in the range of 4% to 10% due to a shift in trips to the parallel transit option along the Capitol Corridor, with improvements. Based on the modeling projections, there are 5,000 to 14,000 less vehicles per day on the I-80 corridor under this build alternative. This alternative also is projected to reduce traffic demand by about 500 vehicles during the peak hours.

Figure 17: Future (2040) Daily Traffic on I-80 Under the Capitol Corridor Alternative [Both Directions]

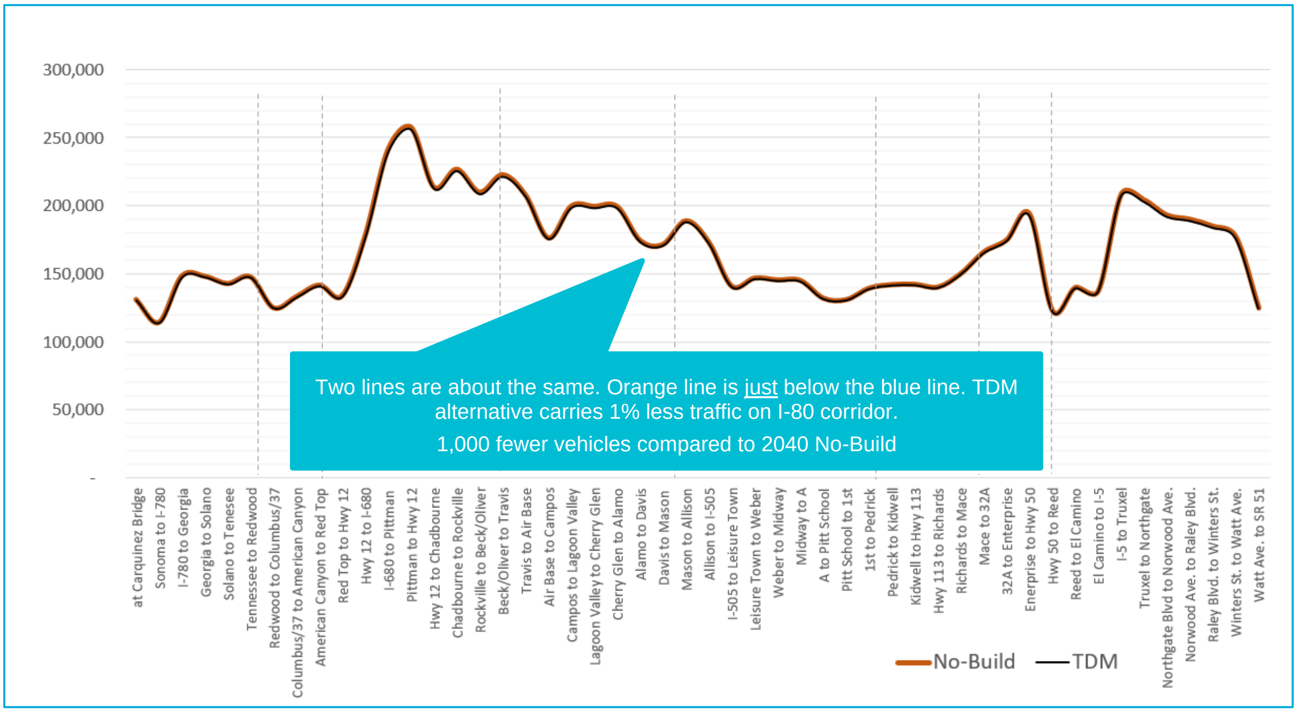


Source: SNABM and SACSIM19 models

3.3.2.3. TDM Alternative Traffic Volumes Comparison

This scenario assesses the changes resulting from assumed changes in travel behavior due to transportation demand management (TDM) programs as well as future implementation of active transportation facilities and shift of some trips to active transportation. The travel demand management alternative modeling results indicate about one percent less traffic demand as compared to 2040 No-Build alternative along the I-80 study corridor. Figure 18 shows daily traffic demand on I-80 for the TDM alternative and under No Build. This alternative accounts for assumed increases in work at home and shifting to other non-auto modes (besides transit such as walk or bike for shorter trips or due to relocation). Under this alternative, about 1,000 fewer vehicle trips would occur on I-80 at the daily level which will be equivalent to about 100 fewer vehicles during the peak hours.

Figure 18: Future (2040) Daily Traffic on I-80 Under the TDM Alternative [Both Directions]



Two lines are about the same. Orange line is just below the blue line. TDM alternative carries 1% less traffic on I-80 corridor.

1,000 fewer vehicles compared to 2040 No-Build

Source: SNABM and SACSIM19 models

3.3.2.4. US-50 Segment (Segment 9)

Figure 19 shows existing and future no-build volume growth along US-50 segment. The model estimates indicate 9% growth is expected to occur along US-50 segment in next 20 years. The growth varies along the corridor depending on location and reflecting the different SED growth projections in various parts of the corridor study area. There is higher estimated future growth between 5th Street and I-5 segment. The lowest growth of 7% occurs between I-80 and Jefferson Boulevard.

Figure 20 shows future volumes under different alternatives along US-50. All three managed lanes alternatives are projected to carry more traffic volume along the freeway corridor (General Purpose and Managed Lanes together) than the future No-Build scenario. Based on the model results, the highest growth is observed between I-80 and Harbor Boulevard. This section has 7,900 to 10,000 more vehicles under the Build scenarios along US-50 at the daily level, compared to 2040 No-Build scenario, which represents about a 4% increase in traffic throughput.

Figure 19: Future (2040) Daily Traffic Growth on US-50 (Segment 9) [both directions combined]

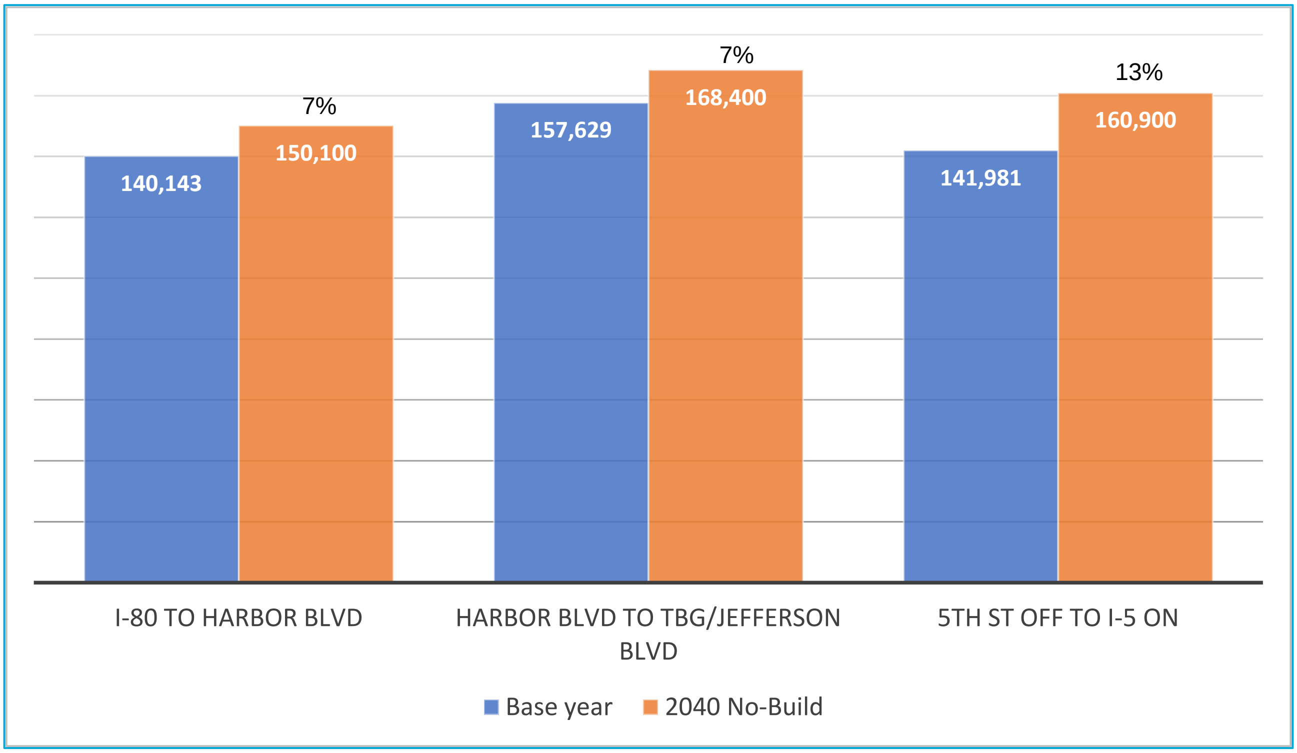
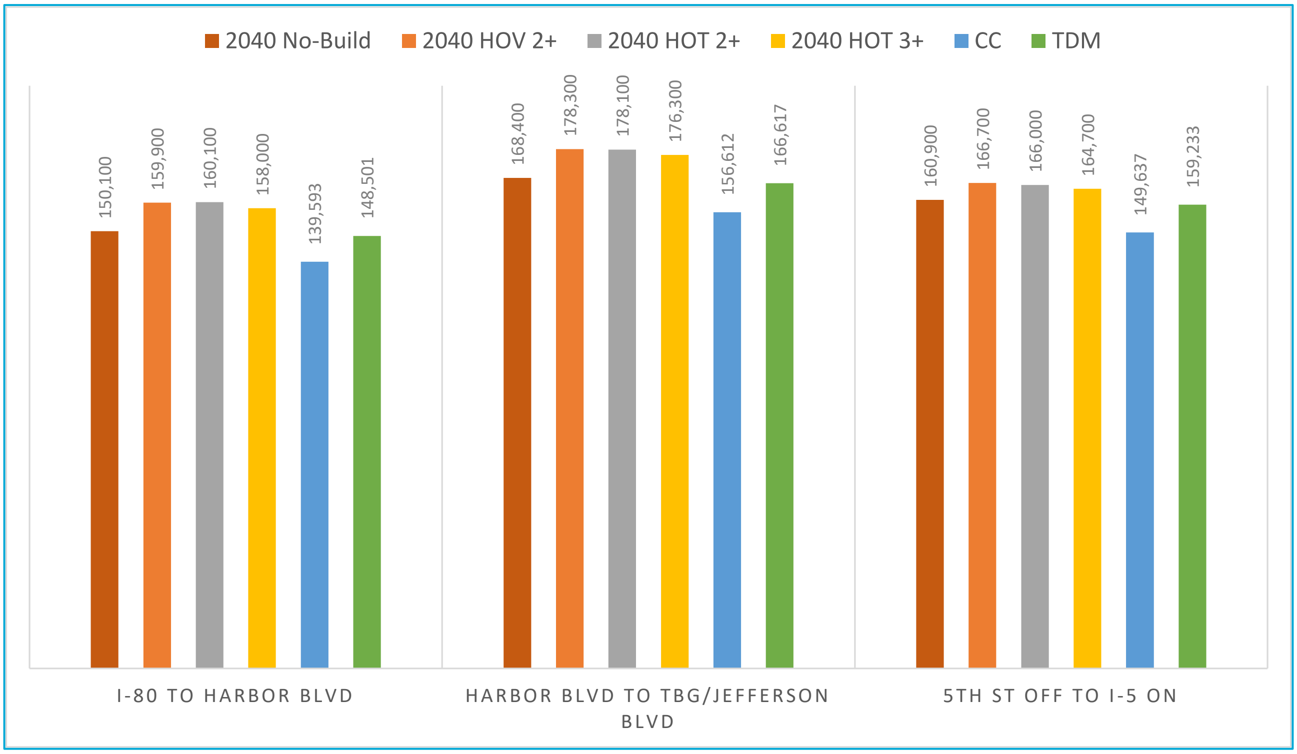


Figure 20: Future (2040) Daily Traffic on US-50 Under the Future Alternatives [Both Directions]



3.3.3 Vehicle Occupancy

Table 2 shows vehicle occupancy by segment for each alternative. Vehicle occupancy data is for the entire freeway segment including the general purpose and managed lanes. Overall, vehicle occupancy for a segment is similar across different alternatives. The vehicle occupancy data is used to calculate person throughput. The person throughput pattern across alternatives will be similar to volume patterns as shown above.

Table 2: Vehicle Occupancy by Segment by Alternative

Occupancy	Existing	No Build (Baseline)	Scenario 1 (HOV 2+)	Scenario 2 (HOT 2+)	Scenario 3 (HOT 3+)	Scenario 4 (CC)	Scenario 5 (TDM)
Segment 1	1.31	1.31	1.32	1.28	1.28	1.32	1.31
Segment 2	1.31	1.34	1.34	1.34	1.34	1.35	1.34
Segment 3	1.31	1.35	1.35	1.34	1.35	1.36	1.35
Segment 4	1.33	1.35	1.36	1.35	1.35	1.37	1.37
Segment 5	1.34	1.37	1.37	1.37	1.37	1.39	1.37
Segment 6	1.33	1.34	1.34	1.34	1.34	1.34	1.34
Segment 7	1.31	1.31	1.32	1.32	1.33	1.31	1.31
Segment 8	1.33	1.31	1.31	1.34	1.35	1.31	1.31
Segment 9	1.31	1.32	1.33	1.34	1.34	1.32	1.32

3.3.4 Corridor-wide VMT / VHT / VHD Comparison

Daily level VMT, VHT, and VHD is compared in this section for I-80 freeway corridor. As noted elsewhere in this report, two models are used to obtain VMT, VHT and VHD data. The SNABM model was utilized to obtain data for freeway segment between the Carquinez Bridge to 113/City of Davis. For eastern portion of the I-80 are obtained from the Yolo Managed Lanes Study and the SACSIM19 model.

3.3.4.1. Scenario #1 [HOV 2+]

HOV 2+ alternative carries about the same number of vehicles or slightly more vehicles along the I-80 freeway. This alternative has 3% higher vehicle miles travelled within the entire I-80 corridor than 2040 No-Build. This alternative has fewer vehicle hours travelled and less delay as a result of the improvements. Within the study are there are about 9,100 fewer hours of travel which is 4% reduction in VHT. This alternative has about 14,200 fewer hours of delay compared to the No-Build scenario; which is a 38% reduction in delay. Table 3 shows VMT, VHT and VHD comparison between Build Scenario 1 and the No Build Scenario.

Table 3: Future (2040) HOV2+ Alternative VMT/VHT/VHD Comparison

HOV Alt. Comparison	VMT	VHT	VHD
2040 Baseline	11,878,600	224,100	37,700
2040 Scenario 1 [HOV alt.]	12,260,900	215,000	23,500
Num. Diff.	382,300	-9,100	-14,200
Percent Diff.	3.2%	-4.1%	-37.7%

3.3.4.2. Scenario #2 [HOT 2+]

Similar to the HOV 2+ alternative, the HOT 2+ alternative also carries about the same number of vehicles or slightly more vehicles along I-80 within the study area. This alternative also has 3% higher vehicle miles travelled than 2040 No-Build. This alternative has fewer vehicle hours travelled and less delay. Within the study are there are about 8,700 fewer hours of travel which is 3.9% reduction in VHT. This alternative has about 14,200 fewer hours of delay compared to the No-Build scenario; which is a 38% reduction in delay. Table 4 shows VMT, VHT and VHD comparison between Build Scenario 2 and the No Build Scenario.

Table 4: Future (2040) HOT 2+ Alternative VMT/VHT/VHD Comparison

HOT 2 Alt. Comparison	VMT	VHT	VHD
2040 Baseline	11,878,600	224,100	37,700
2040 Scenario 2 [HOT 2 alt.]	12,286,000	215,400	23,500
Num. Diff.	407,400	-8,700	-14,200
Percent Diff.	3.4%	-3.9%	-37.7%

3.3.4.3. Scenario #3 [HOT 3+]

The HOT 3+ alternative carries slightly more vehicles on I-80 within the study area. This alternative has slightly higher vehicle miles travelled than 2040 No-Build; 1.6% higher VMT increase. This alternative also has fewer vehicle hours travelled and less delay. Within the study are there are about 10,000 fewer hours of travel which is 4.5% reduction in VHT. This alternative has about 12,200 fewer hours of delay compared to the No-Build scenario; which is 32% reduction in delay. Table 5 shows VMT, VHT and VHD comparison between Build Scenario 3 and the No Build Scenario.

Table 5: Future (2040) HOT 3+ Alternative VMT/VHT/VHD Comparison

HOT 3+ Alt. Comparison	VMT	VHT	VHD
2040 Baseline	11,878,600	224,100	37,700
2040 Scenario 3 [HOT 3+ alt.]	12,072,000	214,100	25,500
Num. Diff.	193,400	-10,000	-12,200
Percent Diff.	1.6%	-4.5%	-32.4%

3.3.4.4. Scenario #4 [Capitol Corridor Improvements]

The Capitol Corridor Improvements alternative has fewer auto trips in the study area due to the shift in trips from automobile to transit mode. Accordingly, this alternative has lower vehicle miles travelled than 2040 No-Build; 7.4% lower VMT. This alternative also has fewer vehicle hours travelled and less delay. Within the study are there are about 27,000 fewer hours of travel which is a 12% reduction in VHT. This alternative has about 11,600 fewer hours of delay compared to the No-Build scenario; which is a 31% reduction in delay. Table 6 shows VMT, VHT and VHD comparison between Build Scenario 4 and No Build Scenario.

Table 6: Future (2040) Capitol Corridor Alternative VMT/VHT/VHD Comparison

Capitol Corridor Alt. Comparison	VMT	VHT	VHD
2040 Baseline	11,878,600	224,100	37,700
2040 Scenario 4 [Capitol Corridor alt.]	10,997,500	197,100	26,100
Num. Diff.	-881,100	-27,000	-11,600
Percent Diff.	-7.4%	-12.0%	-30.8%

3.3.4.5. Scenario #5 [Travel Demand Management]

The TDM alternative has fewer trips in the study area due to the travel demand management strategies which would shift trips from automobile to work at home as well as other modes such as walk and bike (for example as people relocate to live close to work). So, this alternative has lower vehicle miles travelled than 2040 No-Build; about 1% lower VMT. This alternative also has fewer vehicle hours travelled and less delay. Within the study are there are about 1,100 fewer hours of travel which is less than 1% reduction in VHT. This alternative has about 1,500 fewer hours of delay compared to the No-Build scenario; which is a 4% reduction in delay. Table 7 shows VMT, VHT and VHD comparison between Build Scenario 5 and the No Build Scenario.

Table 7: Future (2040) TDM Alternative VMT/VHT/VHD Comparison

TDM Alternative Comparison	VMT	VHT	VHD
2040 Baseline	11,878,600	224,100	37,700
2040 Scenario 5 [Telework alt.]	11,804,000	223,000	36,200
Num. Diff.	-74,600	-1,100	-1,500
Percent Diff.	-0.6%	-0.5%	-4.0%

3.3.4.6. Scenario Comparison

Table 8 shows daily VMT, VHT and VHD comparison between all scenarios. Figure 21 and Figure 22 show VMT and VHD comparison between scenarios, respectively.

Table 8: Daily VMT / VHT / VHD / Average Speed Comparison

Scenario	VMT	VHT	VHD	Average Speed	Difference VMT from Baseline	Difference VHT from Baseline	Difference Delay from Baseline	Difference Speed from Baseline
Existing	10,370,700	182,300	20,000	56.9	-	-	-	-
No Build (Baseline)	11,878,600	224,100	37,700	53.0	-	-	-	-
Scenario 1 (HOV 2+)	12,260,900	215,000	23,500	57.0	382,300	(9,100)	(14,200)	4.0
Scenario 2 (HOT 2+)	12,286,000	215,400	23,500	57.0	407,400	(8,700)	(14,200)	4.0
Scenario 3 (HOT 3+)	12,072,000	214,100	25,500	56.4	193,400	(10,000)	(12,200)	3.4
Scenario 4 (CC)	10,997,500	197,100	26,100	55.8	(881,100)	(27,000)	(11,600)	2.8
Scenario 5 (TDM)	11,804,000	223,000	36,200	52.9	(74,600)	(1,100)	(1,500)	-0.1

** Numbers are rounded to nearest thousand*

The Capitol Corridor Alternative (Scenario 4) has lowest VMT in the future year, with 7.4% less VMT than the future no-build condition. Managed lane alternatives (Scenarios 1, 2, 3) have higher VMT than future no-build scenario, however, all the build scenarios have less delay than the future no-build scenario. Average speeds are also shown to increase for all scenarios with the exception of the TDM alternative, which matches close to No-build.

Figure 21: Vehicle Miles Comparison

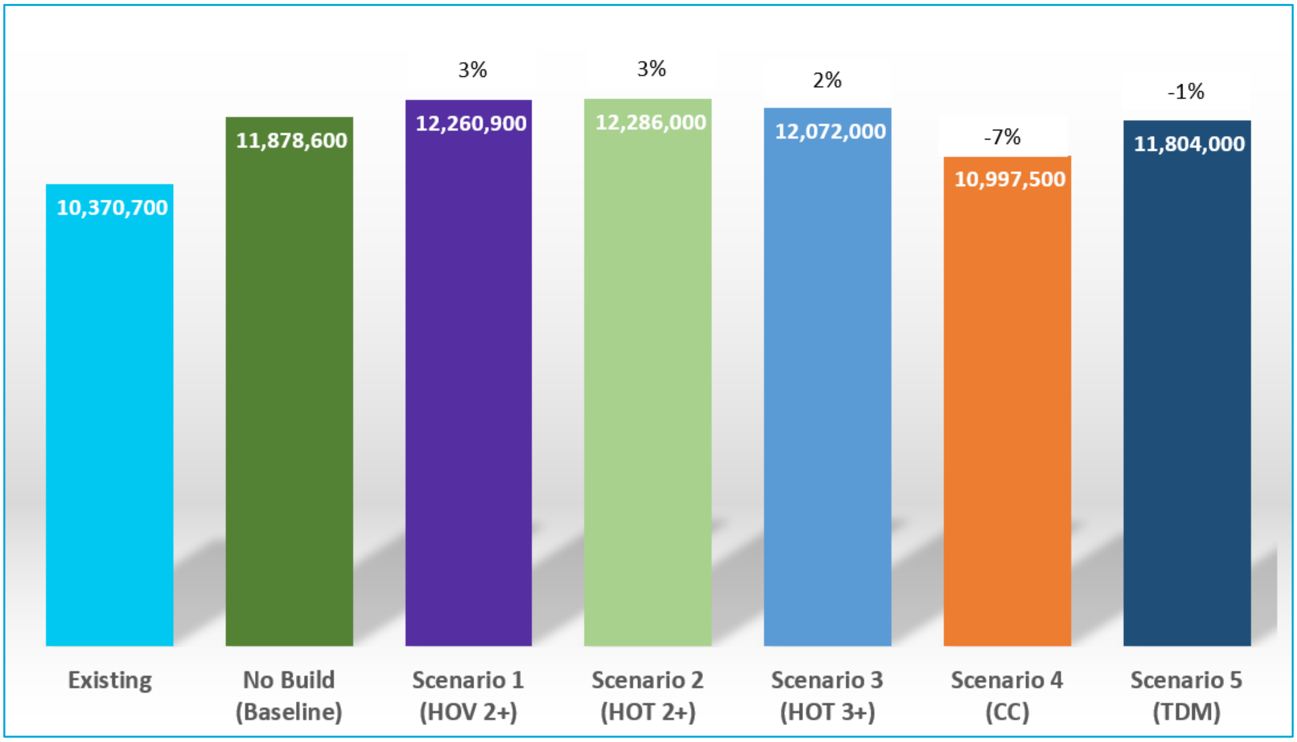
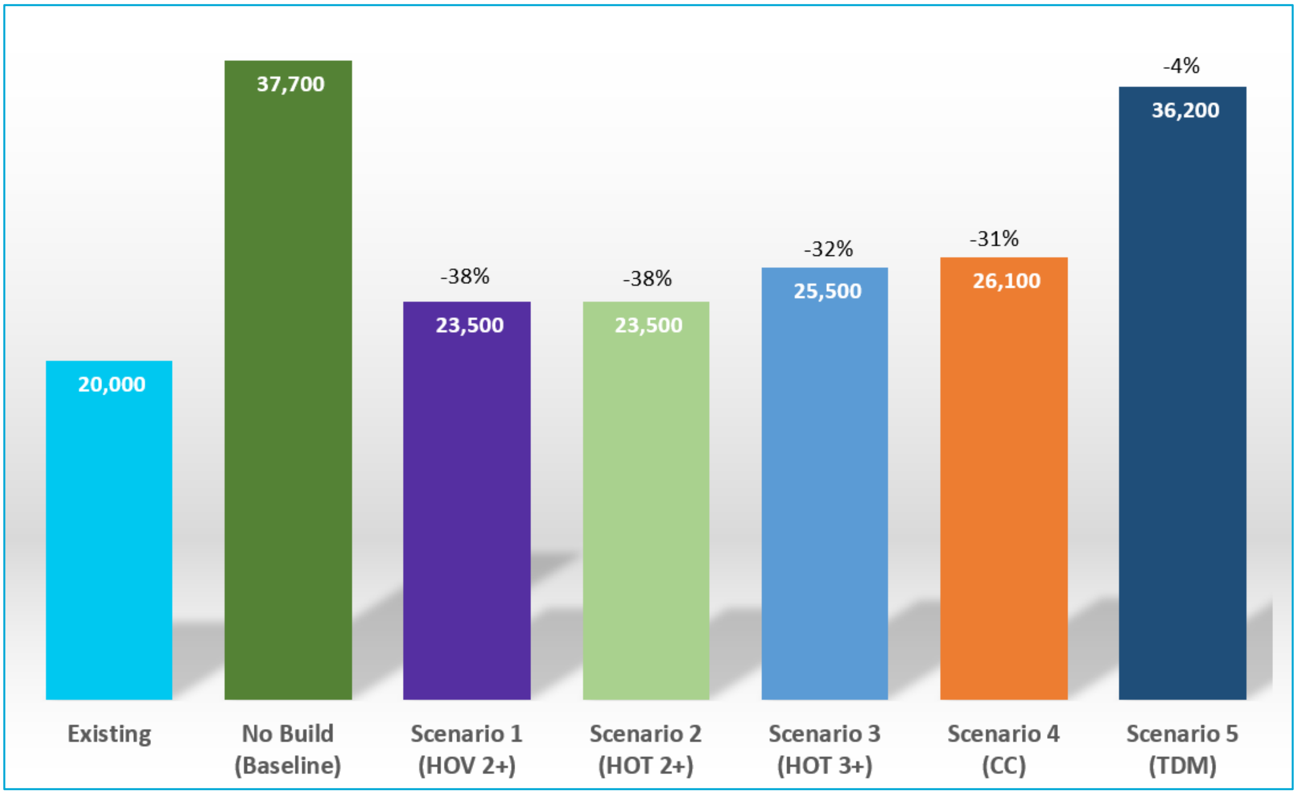


Figure 22: Vehicle Hours of Delay Comparison [base year to 2040]



** Numbers in Table 9 are presented as visuals in above bar charts*

3.3.5 Segment-wise VMT / VHT / VHD Comparison

This section of the report compares the VMT, VHT and VHD statistics by each of the study corridor segments, for all scenarios.

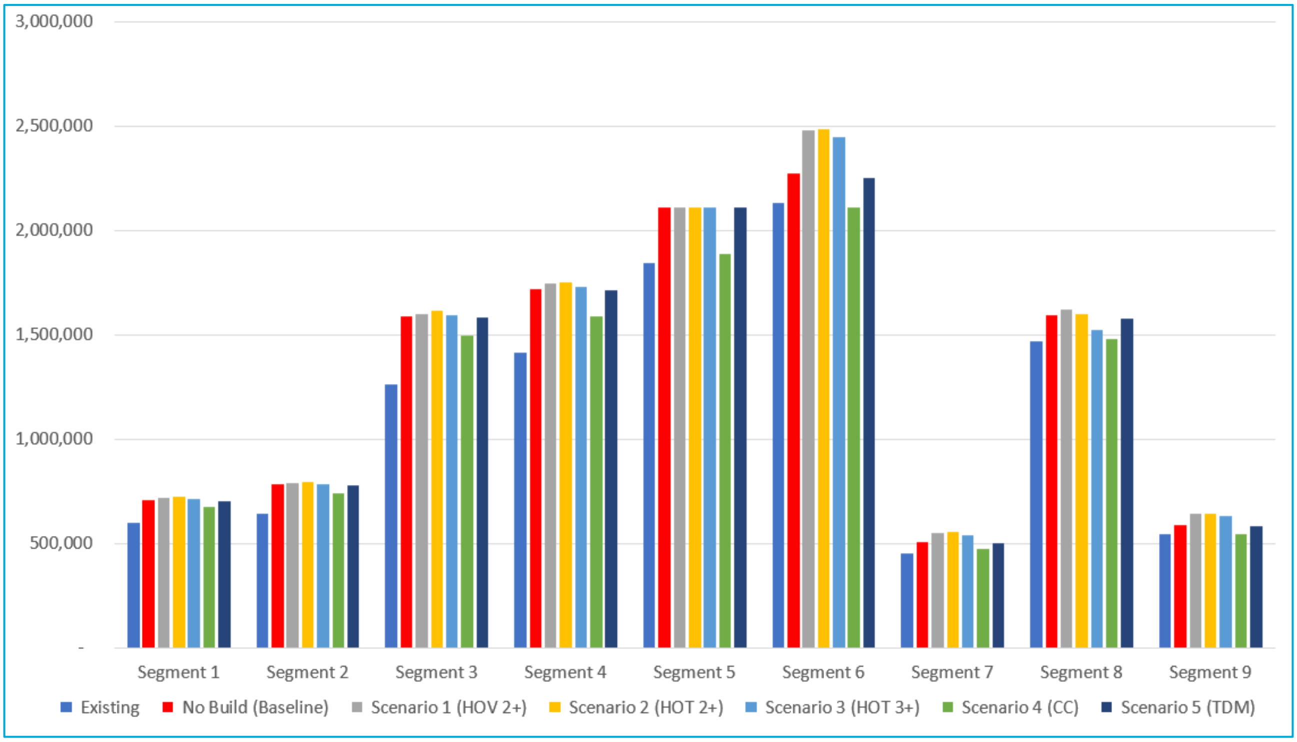
3.3.5.1. VMT Comparison by Segment

Table 9 and Figure 23 show VMT by the I-80 corridor study segments. Note that segments 5 and 6 have the highest VMT in comparison to other segments due to length of these segments.

Table 9: Segment-wise VMT by Alternatives

VHT	Existing	No Build (Baseline)	Scenario 1 (HOV 2+)	Scenario 2 (HOT 2+)	Scenario 3 (HOT 3+)	Scenario 4 (CC)	Scenario 5 (TDM)
Segment 1	599,253	707,754	720,294	727,412	714,154	673,703	703,323
Segment 2	644,114	784,513	790,052	797,427	785,308	740,415	779,499
Segment 3	1,265,284	1,590,933	1,600,456	1,613,637	1,592,651	1,497,606	1,583,578
Segment 4	1,415,368	1,718,748	1,745,161	1,753,694	1,728,043	1,588,330	1,712,551
Segment 5	1,841,808	2,110,063	2,109,565	2,109,321	2,108,598	1,889,628	2,108,208
Segment 6	2,134,113	2,273,815	2,480,485	2,486,624	2,445,911	2,109,562	2,251,077
Segment 7	455,042	510,007	551,380	553,984	540,110	473,166	504,907
Segment 8	1,469,104	1,593,641	1,620,302	1,602,208	1,525,546	1,478,522	1,577,705
Segment 9	546,638	589,089	643,255	641,681	631,649	546,536	583,199
I-80 Corridor	10,370,700	11,878,600	12,260,900	12,286,000	12,072,000	10,997,500	11,804,000

Figure 23: VMT by Segment by Alternatives



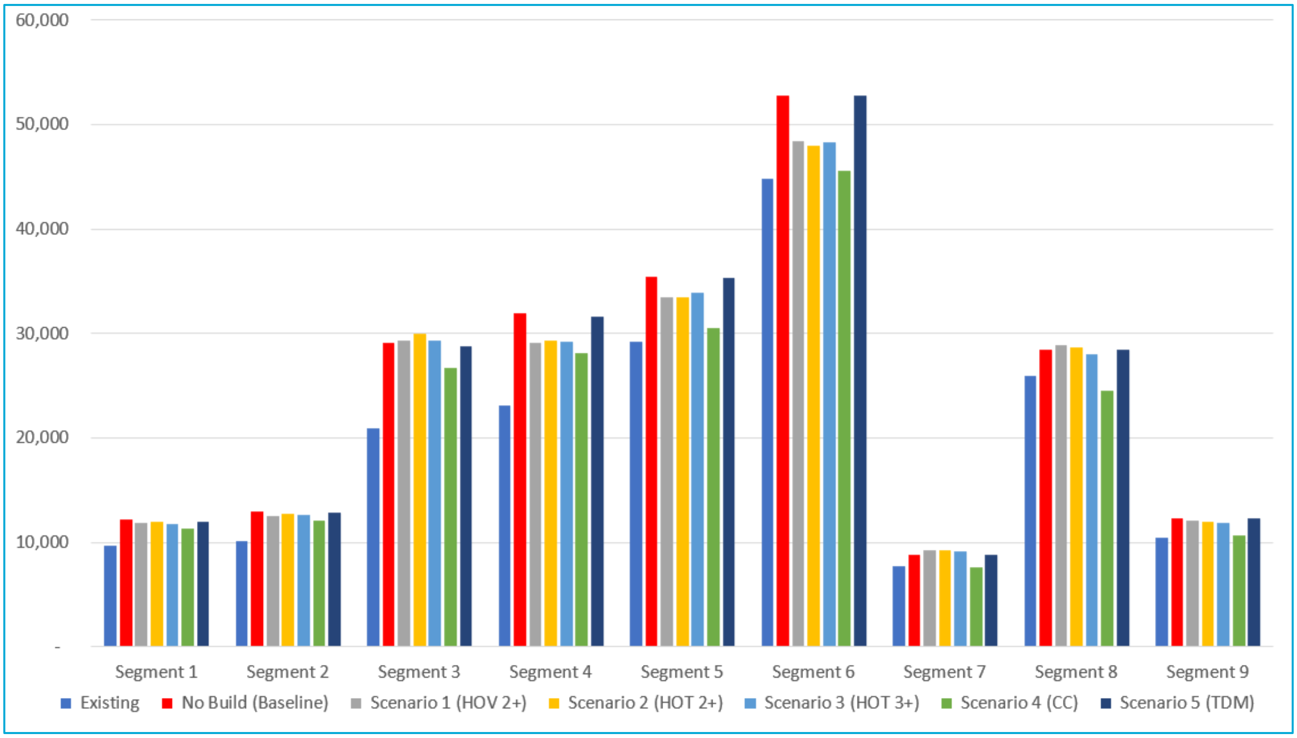
3.3.5.2. VHT Comparison by Segment

Table 10 and Figure 24 show VHT by the I-80 corridor study segments. Note that segments 5 and 6 have the highest vehicle hours of travel in comparison to other segments and Segments 1, 7 and 9 have least vehicle hours of travel.

Table 10: Segment-wise VHT by Alternatives

VHT	Existing	No Build (Baseline)	Scenario 1 (HOV 2+)	Scenario 2 (HOT 2+)	Scenario 3 (HOT 3+)	Scenario 4 (CC)	Scenario 5 (TDM)
Segment 1	9,739	12,171	11,895	12,019	11,750	11,362	12,021
Segment 2	10,166	12,989	12,534	12,707	12,599	12,051	12,847
Segment 3	20,935	29,097	29,326	29,930	29,320	26,663	28,767
Segment 4	23,149	31,896	29,147	29,366	29,184	28,179	31,604
Segment 5	29,259	35,425	33,445	33,430	33,866	30,533	35,377
Segment 6	44,827	52,830	48,393	47,971	48,345	45,534	52,758
Segment 7	7,768	8,824	9,282	9,292	9,192	7,606	8,812
Segment 8	25,942	28,507	28,900	28,701	28,056	24,570	28,468
Segment 9	10,473	12,332	12,120	11,961	11,822	10,629	12,315
I-80 Corridor	182,300	224,100	215,000	215,400	214,100	197,100	223,000

Figure 24: VHT by Segment by Alternatives



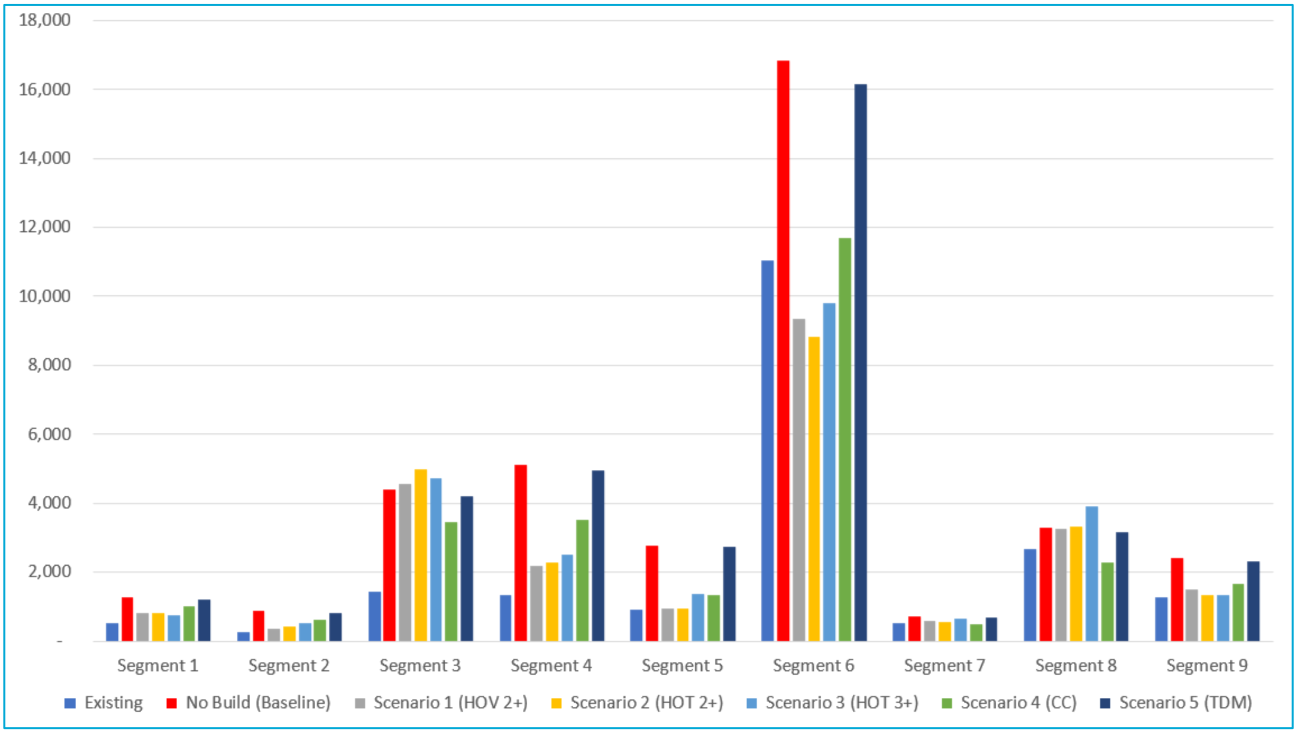
3.3.5.3. VHD Comparison by Segment

Table 11 and Figure 25 show VHD by I-80 corridor segment. Segment 6 has highest vehicle hours of delay in comparison to other segments and segments 2 and 7 has least vehicle hours of delay.

Table 11: Segment-wise VHD by Alternatives

VHT	Existing	No Build (Baseline)	Scenario 1 (HOV 2+)	Scenario 2 (HOT 2+)	Scenario 3 (HOT 3+)	Scenario 4 (CC)	Scenario 5 (TDM)
Segment 1	520	1,282	814	828	763	997	1,201
Segment 2	253	885	366	428	505	634	821
Segment 3	1,435	4,396	4,569	4,989	4,707	3,442	4,187
Segment 4	1,343	5,129	2,195	2,294	2,502	3,512	4,941
Segment 5	913	2,761	939	935	1,369	1,351	2,742
Segment 6	11,046	16,834	9,347	8,824	9,797	11,677	16,142
Segment 7	517	704	580	548	644	488	675
Segment 8	2,676	3,279	3,254	3,337	3,892	2,274	3,144
Segment 9	1,271	2,417	1,484	1,343	1,346	1,677	2,318
I-80 Corridor	20,000	37,700	23,500	23,500	25,500	26,100	36,200

Figure 25: VHD by Segment by Alternatives



4.0 Benefit Cost Analysis

This section reports on the Benefit-Cost Analysis (BCA) for the future Build scenarios including methodology, model data inputs, and results.

4.1 Benefit Cost Analysis Methodology

The California Life-Cycle Benefit/Cost Analysis Corridor Model (Cal-B/C Corridor) Version v7.1 was utilized to conduct the BCA for the I-80 CMCP scenarios. Cal-B/C Corridor is a Microsoft Excel spreadsheet that provides economic benefit-cost analysis for a range of transportation projects.

Cal-B/C Corridor estimates user benefits in four main categories:

- Travel time savings due to faster travel speeds on highways, or faster or more frequent service on transit modes.
- Vehicle operating cost savings on highways due to lower costs from more efficient travel speeds or avoided vehicle operating and out-of-pocket costs when travelers switch from highways to transit.
- Safety benefits on highways due to safety improvements or for transit riders who switch from highways to a safer transit mode.
- Emissions benefits on highways due to travel at less polluting speeds or by reductions in VMT due to suppressed trips or mode shifts to transit.

4.2 Benefit Cost Analysis Model Inputs and Assumptions

The following inputs were used for the Cal-B/C calculations:

- Cost Estimate – Project costs are estimated from available sources including the Metropolitan Transportation Commission (MTC) RTP and Caltrans for both Districts 3 and 4 projects. Cost estimates for each scenario were calculated based on available information. No cost was assumed for demand management or programmatic improvements that could reduce travel demand.
- Vehicle Miles Travelled (VMT) and Vehicle Hours Travelled (VHT) – VMT and VHT for each scenario were obtained for AM and PM peak period from the microsimulation model.
- All other inputs were the same for all scenarios such as truck percentages, average vehicle occupancy, and safety data.

Appendix E includes estimated costs and assumptions used in Cal-B/C calculations.

4.3 Benefit Cost Analysis Results

Table 12 shows benefit-cost ratios of the I-80 CMCP for each of the Build scenarios. Among the five scenarios, Scenario 4 (Capital Corridor) has the best (highest) benefit cost ratio. Scenario 4 has least cost among the scenarios and does provide more benefits due to model projected shift from single occupancy vehicle to transit. As shown, B/C varies widely by segment, primarily based on the cost of the improvements.

Table 12: Benefit Cost Ratio by CMCP Segments

	Scenario 1 (HOV 2+)	Scenario 2 (HOT 2+)	Scenario 3 (HOT 3+)	Scenario 4 (CC)	Scenario 5 (TDM)
Segment 1	0.08	-0.04	0.23	1.58	0.36
Segment 2	0.32	0.07	0.49	46.26	15.71
Segment 3	0.00	-0.08	-0.02	0.55	0.08
Segment 4	0.82	0.59	0.81	6.98	0.15
Segment 5	0.42	0.42	0.43	4.18	0.07
Segment 6	-0.29	-0.18	0.09	82.21	6.87
Segment 7	-1.52	-1.62	-1.15	2.19	0.55
Segment 8	-0.45	-0.36	1.06	3.90	39.63
Segment 9	-1.15	-1.00	-0.62	7.88	0.73
I-80 Corridor	**0.03**	**-0.02**	**0.22**	**3.05**	**0.27**

Note that Cal-B/C analyses include all fully funded RTP projects, financially constrained RTP projects that are not fully funded, and some selected unconstrained projects and SHOPP projects. These projects are included in all 5 scenarios and are not part of Future No Build. For example, Segment 3 includes the I-80/I-680/SR-12 Interchange project, which has an estimated cost of $380 million. The entire cost of this project is included in the analysis, even though the entire benefit of this project is not captured. The resulting analysis results capture only the portion of benefit along I-80, not along I-680 or SR-12 or any other parallel routes which may also benefit. This is one of the limitations of the Cal-B/C analysis. These results of Cal-B/C analyses should be used for comparing scenarios only, rather than ultimate project implementation decisions. To measure the benefit-cost analysis of a particular project a separate analysis would be required using model results to show the with and without performance metrics for each particular project.

Appendix A

List of projects included in the future scenarios

List of Projects included in Future Scenarios

Project	Description
I-80/I-680/SR 12 Interchange (Packages 2 and 2A)	Packages 2-7 provide direct connectivity from I-680 NB to SR12 WB, widens I-680 and I-80 near the Interchange, and improves connections to Red Top Road off-ramp. HOV/Express lane direct connectors are included in Package 6 (RTPID 17-10-0061). Package 2 and 2A completed/under construction.
I-80/I-680/SR 12 Interchange (Packages 3-7)	Packages 2-7 provide direct connectivity from I-680 NB to SR12 WB, widens I-680 and I-80 near the Interchange, and improves connections to Red Top Road off-ramp. HOV/Express lane direct connectors are included in Package 6 (RTPID 17-10-0061).
Construct four-lane Jepson Parkway from Route 12 to Leisure Town Road at I-80	Constructs Phase B in Vacaville and Phase 1B and 1C in Fairfield.
I-80 WB Truck Scales	Project upgrades existing truck scales on WB I-80 in Solano County. Existing westbound truck scales are located on the most congested freeway segment of I-80 in Solano County. Scales are outdated and cannot process the current and future truck volumes on WB I-80. Trucks are slow to enter and leave the scales because of short ramps, adding to existing traffic congestion and safety issues on I-80.
SR 37/Fairgrounds Dr. DDI	
Redwood Parkway Interchange, Phase 2	Improve Interchange at Redwood Parkway
TMS life cycle replacement project on Routes 80 and 680	TMS life cycle replacement project in Solano County on Routes 80 and 680
Install Fiber Communications	SOL 80 from Route 780 to the Yolo County Line. Install Fiber Communications
At I-80/780 interchange Improvement	At I-80/780 interchange, widen westbound I-80 to eastbound I-780 connector and westbound I-780 to eastbound I-80 connectors
Construct an auxiliary lane on EB I-80 from Air Base Pkwy to Manuel Campos Pkwy/N Texas St	Construct an auxiliary lane on EB I-80 from Air Base Pkwy to Manuel Campos Pkwy/W Texas St
Install TOS/Ramp Metering	In Solano County, from .20 miles east of Allison Dr. to Yolo County Line install TOS/Ramp Metering
I-80 Express Lanes through Vallejo (Carquinez Bridge to SR 37)	Construct Express Lane on I-80 from Carquinez Bridge to SR 37 in both directions.
I-80 Express Lanes SR 37 to Red Top Road	Construct Express Lane on I-80 from SR 37 to Red Top Road in both directions.
I-80 Express Lanes (Red Top Rd. to I-505)	The Solano I-80 Managed Lanes Project (project) will construct approximately 18 miles of managed lanes in the I-80 corridor through conversion of existing HOV lanes to express lanes from west of Red Top Road to east of Air Base Parkway and highway widening for new express lanes from east of Air Base Parkway to east of I-505
Provide auxiliary lanes on I-80 in EB and WB directions from I-680 to Airbase Parkway	Project provides auxiliary lanes on I-80 in the EB & WB directions from I-680 to Airbase Parkway; and remove the I-80/Auto Mall Parkway hook ramps and Collector-Distributor Road slip-ramp.
Lagoon Valley Interchange	Widen Lagoon Valley Road Bridge for additional left turn capacity. Sidewalk, intersection signal improvements at ramps, approach roadway work. TIF funded.
Widen Vaca Valley I/C	Widen Vaca Valley bridge over I-80 from 2-lanes to 4-lanes

Project	Description
West A St and I-80 Interchange Upgrade	Upgrade in phases the existing I-80 on-ramp and reconstruct the existing roadway overcrossing.
Pitt School Rd and I-80 Interchange Upgrade	Improvements include widening the overcrossing structures to four lanes and on- and off-ramp improvements particularly on the eastside of Pitt School Rd. Project may be implemented in phases over the next ten years. Improvements to area roadways.
Hwy 113 and I-80 Interchange Improvements	Improvements to the area's roadways required to improve traffic circulation.
Milk Farm Rd and I-80 Interchange Upgrade	Interchange improvements consistent with finding of I-80/I-680/I-780 Major Investment and Corridor Study completed by Solano Transportation Authority and Caltrans. May include relocation of Milk Farm Rd. Project may be implemented in phases. Increased traffic due to development (mostly the northeast quadrant) will require the need to improve the existing interchange.
Pedrick Rd and I-80 Interchange Upgrade	Improvements include realignment of both on-ramps and relocation of Sparling and Sievers Roads. Project may be implemented in phases depending on the pace of development.
I-505/I-80 Connector	Remove/Reconstruct/Realign 80/505/East Monte Vista Avenue/Orange Drive connections and bridges
Roadway Operations	This category includes projects that improve roadway, intersection, or interchange operations, ITS, as well as other transportation system management. This project also includes a realigning of SR 113 around downtown Dixon to I-80.
Suisun Valley Rd Expansion Study and Implementation	Analysis of by-pass traffic on Suisun Valley Road from I-80 to Napa County line; Implementation of recommended improvements
Widen Orange Drive to EB I-80	Intersection and ramp widening at Orange/Lawrence with I-80 EB
Widen Vaca Valley Parkway	Widen to six lanes between I-505 and I-80
Solano Express Bus to BRT-lite Transition: Capital Improvements and Implementation	Transition from Express Bus and build out a functioning BRT-lite system in Solano County. Implement improvements including Transit Signal Prioritization (TSP), adaptive signal timing, and ramp metering
Fairfield-Vacaville Train Station Building, Access, and Parking	Construction of a station building to provide shelter and seating for transit passengers. Construction of an access road into the station to improve route efficiency, and safe ingress and egress for buses, pedestrians, and bicyclists. Parking lot expansion and enhancements including safety features, lighting, parking lot solar array, and additional amenities.
Vallejo Station Parking Structure Phase B	Vallejo: Baylink Ferry Terminal; Construct two phased parking structure to consolidate surface parking for ferry operations; create a pedestrian link between bus transit facility and existing ferry terminal building adjacent to ferry parking structure.
Fairfield Transportation Center (FTC) - Phase 2	Construct additional parking spaces, access improvements, and transit improvements in and around the FTC
Solano Express Blue Line Park and Ride Facility	Relocate existing park and ride on Hwy 113 from downtown Dixon to the north side of I-80 in the vicinity of the on and off ramps.
Transit and Downtown Parking Structure	Construct a new parking garage to meet parking demand near the Suisun-Fairfield Amtrak Station and new housing developments
I-80 Eastbound Auxiliary Lane between I-780 and Georgia Street in Vallejo	Construct Eastbound Auxiliary Lane between the I-780 on-ramp and the Georgia Street off-ramp
I-80 Eastbound and Westbound Auxiliary Lanes between Tennessee Street in Vallejo	Construct Eastbound and Westbound Auxiliary Lanes between the Tennessee Street on-ramp and the

Project	Description
I-80 Eastbound Auxiliary Lane between Redwood Street and SR 37 in Vallejo	Construct Eastbound Auxiliary Lane between Redwood Street and SR 37 with two lane off-ramp
I-80 EB Auxiliary Lane between Cherry Glenn Rd and Pleasant Valley Rd in Vacaville	Construct Eastbound Auxiliary Lane between Cherry Glenn Rd and Pleasant Valley Rd
I-80 EB and WB Auxiliary Lane between Alamo Drive and Pleasant Valley Road in Vacaville	Construct Eastbound and Westbound Auxiliary Lane between Alamo Drive and Pleasant Valley Road
I-80 WB Auxiliary Lane between Alamo Drive and Pleasant Valley Road in Vacaville	Construct Westbound Auxiliary Lane between Alamo Drive and Pleasant Valley Road
I-80 EB Auxiliary Lanes between Cliffside Drive and Allison Drive in Vacaville	Construct Eastbound Auxiliary Lane between Cliffside Drive and Allison Drive with a two lane off-ramp at Allison Dr.
I-80 Ramp Metering	Install and Activate East and Westbound Ramp Metering from the Carquinez Bridge Toll Plaza to Redwood Street
I-80 Ramp Improvements in Vallejo	Widen Westbound on-ramp from SR 29/Sonoma Boulevard
I-80 Ramp Improvements in Vallejo	Reconstruct-Widen I-80 Westbound Maritime Academy Drive on-ramp
I-80 Ramp Improvements in Vallejo	Reconstruct-Widen I-80 Eastbound and westbound Magazine Street on-ramp
I-80 Interchange Improvements in Vallejo	I-80/I-780 - Curtola Parkway Interchange Improvements
I-80 Ramp Improvements in Vallejo	Modify I-80/780 Curtola Parkway - East and westbound on-ramps from 780 Curtola Parkway for Transit/TPS
I-80 Ramp Improvements in Vallejo	Modify Georgia Street East and westbound on-ramps
I-80 Ramp Improvements in Vallejo	Reconstruct-Widen I-80 Eastbound Spring Street on-ramp
I-80 Ramp Improvements in Vallejo	Modify Tennessee Street East and westbound on-ramps
I-80 Interchange Improvements in Vallejo	I-80/SR 37/Columbus Parkway Interchange Improvements
I-80 Ramp Improvements in Fairfield	Widen Eastbound on-ramp from Red Top Road
I-80 Ramp Improvements in Fairfield	Widen Eastbound and Westbound on-ramps from Green Valley Road
I-80 - 680 Interchange Improvements in Fairfield	I-80 West to 680 South and 680 North to I-80 East - RM Fwy to Fwy Connectors
I-80 Ramp Improvements in Fairfield	Widen Eastbound on and off ramps from Suisun Valley Road
I-80 Ramp Improvements in Fairfield	Widen Eastbound off-ramp N. Texas Street for Transit/TPS

Project	Description
I-80 Ramp Improvements in Fairfield	Widen Eastbound on-ramp from Beck Ave. for Transit/TPS
I-80 Ramp Improvements in Vacaville	Widen East and West bound Allison Drive on and off ramps for Transit/TPS
I-80 Ramp Improvements in Vacaville	Widen Westbound Browns Valley Parkway on-ramp for Transit/TPS
I-80 Interchange Improvements in Vacaville	I-80 East to I-505 North and I-505 South to West I-80 RM Fwy to Fwy Connectors
I-80 Managed Lanes	Construct managed lanes in both directions on I-80 from I-505 to the Yolo Countyline
I-80 Ramp Improvements in Vacaville	Widen East and West bound Vaca Valley Parkway /Leisure Town Road on and off ramps for Transit/TPS
I-80 Ramp Improvements in Dixon	Widen East and West bound Pitt School Road on and off ramps for Transit/TPS
US 50 HOV Lanes	US 50 HOV Lanes: Downtown Sacramento to 0.8 mile east of Watt Avenue (by 2029)
I-5 HOV Lanes	I-5 HOV Lanes: Airport Boulevard to 1.1 miles south of Elk Grove Boulevard (by 2029)
I-5 Auxiliary Lane: Southbound from US 50 to Sutterville Road	I-5 Auxiliary Lane: Southbound from US 50 to Sutterville Road (by 2029)
I-80/I-5 HOV Connector Ramps	I-80/I-5 HOV Connector Ramps: New HOV connector ramps Westbound I-80 to Southbound I-5, and Northbound I-5 to Eastbound I-80 and new Eastbound I-80 to Northbound I-5 connector (by 2049)
I-80/Richards Boulevard Interchange	I-80/Richards Boulevard Interchange: Reconstruct the westbound ramps to replace the loop on- and off-ramps with new ramps in diamond configuration (by 2049)[1]
I-80/West El Camino Avenue Interchange	I-80/West El Camino Avenue Interchange: Expand overpass from 2 to 4 lanes and modify ramps (by 2049)
US 50/Jefferson Boulevard Interchange	US 50/Jefferson Boulevard Interchange: Expand ramps and signals from 1 to 2 lanes, add ramp metering and turn lanes (by 2049)
I-5 Auxiliary Lane: Southbound from I-80 to West El Camino Avenue (by 2049)	I-5 Auxiliary Lane: Southbound from I-80 to West El Camino Avenue (by 2049)
I-5 Auxiliary Lane: Northbound from Del Paso Boulevard to SR 99 (by 2049)	I-5 Auxiliary Lane: Northbound from Del Paso Boulevard to SR 99 (by 2049)
I-5/SR 113 Connector Ramp: New connector ramp between Northbound I-5 and Southbound SR 113 (by 2049)	I-5/SR 113 Connector Ramp: New connector ramp between Northbound I-5 and Southbound SR 113 (by 2049)
I-5/SR 113 Connector Ramp: New connector ramp between Northbound SR 113 and Southbound I-5 (by 2049)	I-5/SR 113 Connector Ramp: New connector ramp between Northbound SR 113 and Southbound I-5 (by 2049)
I-80/US-50 Managed Lanes	On I-80 just west of Davis in both directions from the Kidwell Rd IC in Solano County (D4) to the US-50/I-5 interchange and I-80/West El Camino interchange in Sacramento: Construct managed lanes, pedestrian/bicycle facilities and ITS elements (project description may change based on results from the Managed Lanes Study. Project is being evaluated for Expressed Toll Lanes, High Occupancy Toll Lanes, HOV lanes and reversible lanes). EA 3H900

Project	Description
Added bus service across the Yolo Causeway between UC Davis, Downtown Sacramento, and UC Davis Medical Center in Sacramento (by 2029)	Added bus service across the Yolo Causeway between UC Davis, Downtown Sacramento, and UC Davis Medical Center in Sacramento (by 2029)
Capitol Corridor	Capitol Corridor: Construct third mainline track between Sacramento and Roseville to support additional service, which includes higher frequency of trains between these stations and also through Davis to/from the San Francisco Bay Area (by 2029)
SacRT Green Line Light Rail: Improvements to the Green Line	SacRT Green Line Light Rail: Improvements to the Green Line through downtown to include a loop to the Sacramento Valley Station, relocation of tracks to H Street, and new station near North 7th Street and Railyards Boulevard (by 2029)
SacRT Green Line Light Rail: Extend light rail from Township 9	SacRT Green Line Light Rail: Extend light rail from Township 9 (in Sacramento River District) to North Natomas Town Center (by 2029)
Downtown Riverfront Streetcar Phase 1:	Downtown Riverfront Streetcar Phase 1: Construct Phase 1 of the Downtown Riverfront Streetcar, between Midtown Sacramento and West Sacramento Civic Center (by 2049)
Downtown Riverfront Streetcar Phase 2	Downtown Riverfront Streetcar Phase 2: Construct Phase 2 of the Downtown Riverfront Streetcar between Sacramento and West Sacramento, South to R Street and Broadway corridors (by 2049)

Appendix B

I-80 Corridor – Weekday to Weekend Operating Conditions Comparison Memorandum

CAMBRIDGE
SYSTEMATICS
Think Forward

Technical Memorandum

TO: Caltrans D3/D4

FROM: Cambridge Systematics

DATE: September 1, 2021

RE: I-80 Corridor – Weekday to Weekend Operating Conditions Comparison

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This memorandum compares weekday and weekend traffic operating conditions along the I-80 corridor in key portions of the study area covered by the I-80 Comprehensive Multimodal Corridor Plan Study (CMCP). Typical weekday traffic operating conditions are being analyzed for the CMCP using a travel demand model (based on the Solano/Napa subregional model) and two simulation models which cover a portion of the study corridor in the Cities of Vallejo and Fairfield. However, the models are not able to assess weekend conditions as there is not sufficient background data to support weekend models (lack of full weekend volume data and no regional travel demand models for weekend time periods). Also, weekend traffic analysis is typically not completed for corridor studies because the weekday commute peaks generally represent the worst case conditions in most areas.

However, it is recognized that weekends can also have congestion due to higher levels of recreational and tourist activities and different peak periods than occur on weekdays. To assess weekend versus weekday conditions along I-80, some key performance metrics have been reviewed and compared between the weekday and weekend including speeds, location and extent of queues and traffic volumes.

For the portion of the corridor that is being assessed using microsimulation (two segments in the cities of Fairfield and Vallejo), detailed comparisons have been made of volumes, speeds, queues and congestion points. In the other portions of the corridor, volume comparisons have been completed, however data is not available for detailed comparisons of speed and congestion in those locations. The detailed comparison of traffic conditions was done based on congestion patterns (speed heat maps), speeds and volumes during weekdays and weekend days during April 2019.

The following section of this memo discusses the traffic conditions for each direction of I-80 in simulation model area within the cities of Fairfield and Vallejo.

Weekday to Weekend Speed Comparison

Fairfield – Eastbound

Figures 1 to 3 show speed “heat maps” for I-80 eastbound in Fairfield, for weekday, Saturday, and Sunday, respectively. The heat maps are a method of graphically portraying the observed speeds throughout the study area during both the AM and PM peak periods. Please note that a few weekdays experience atypical non-recurring congestion and those are removed from heat map figures so that the remaining days represent typical weekday peak conditions. Note that on weekends the peak periods often occur during the mid-day rather than in the AM or PM commute peak periods, as typically occurs on weekdays. Thus, the Mid-day (MD) period is also used as a basis of comparison for weekends because that represents the worse case conditions on weekends in some locations. The mid-day is not assessed on weekdays because the mid-day traffic and congestion are lower on weekdays as compared to weekday commute peak periods. Based on the data presented in the speed heat map, in the eastbound direction the following comparisons are made:

- The AM period is almost congestion free during both weekdays and weekends.
- On weekdays, the PM period is severely congested after Airbase Pkwy, where the roadway narrows from 5 lanes to 4 lanes and also the HOV lane ends. The queue usually reaches to Suisun Rd.
- On Saturdays, the MD and PM periods are congested between Airbase and Manuel Campos Parkways, although the weekend queue is shorter than the weekday queue, and it sometimes reaches to Travis Blvd.
- On Sundays, congestion and queues occur, during MD and PM periods after Airbase Pkwy, although the queues are shorter in length than Saturdays.
- Overall, in this segment the weekday congestion is the worst, followed by Saturday which has similar congestion patterns to the weekday but with queues that are smaller than weekdays. Sundays are mostly congestion free except for some slowing and shorter queues in the PM period.

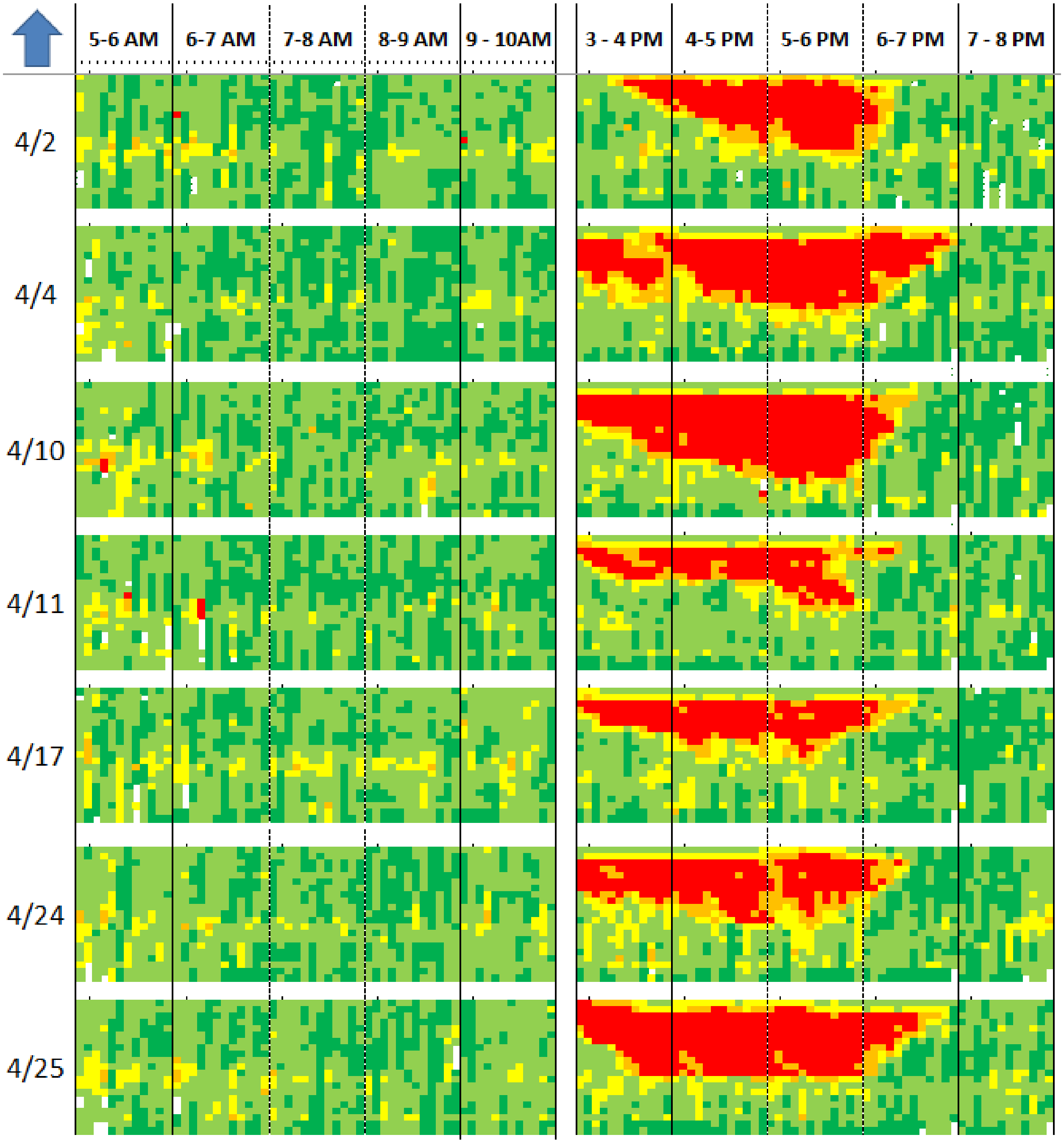


Figure 1- Weekday Heat Map- Fairfield Eastbound

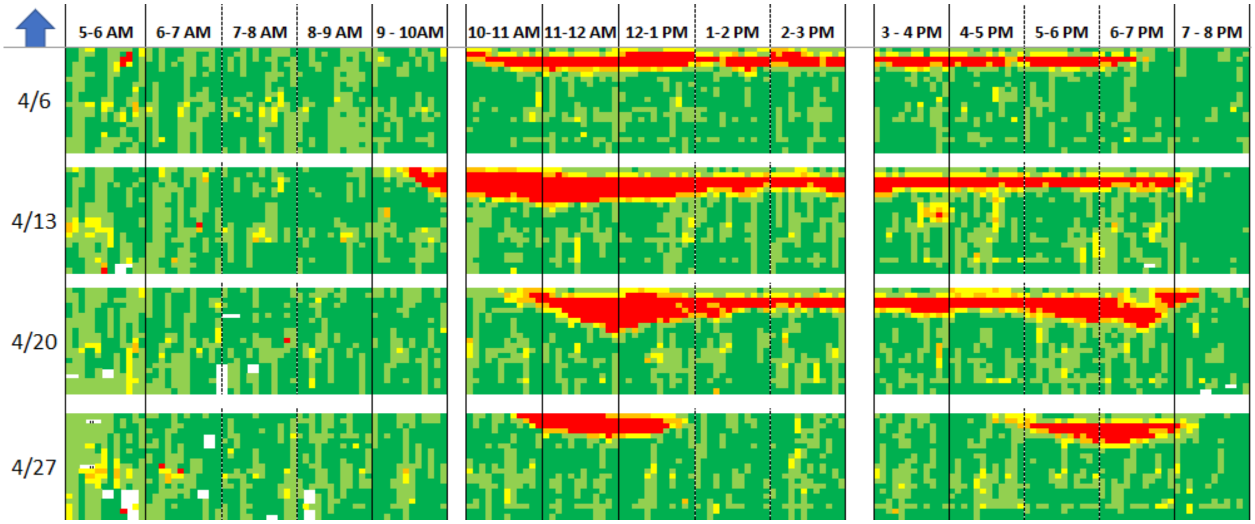


Figure 2- Saturday Heat Map- Fairfield Eastbound

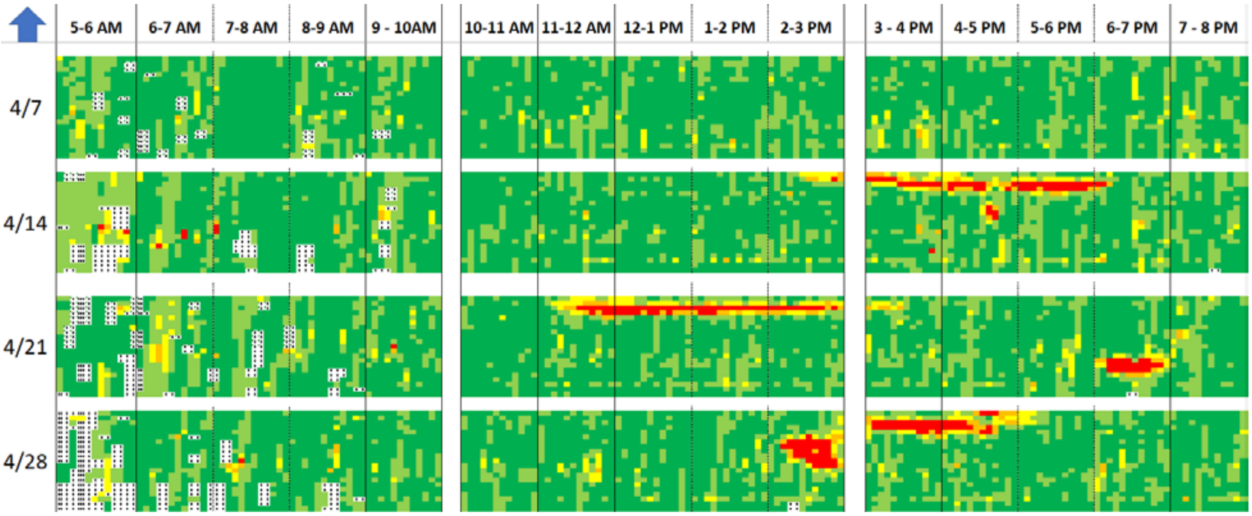


Figure 3- Sunday Heat Map- Fairfield Eastbound

Fairfield – Westbound

Figures 4 to 6 show speed heat map for I-80 westbound in Fairfield, for weekday, Saturday, and Sunday, respectively. Based on the data presented in the speed profiles, in the westbound direction the following comparisons are made:

- On Weekdays, there is minor congestion after SR 12 East onramp during both AM and PM periods.
- On weekends, Saturday and Sunday, there is no congestion observed during any period except for two locations on Saturday April 13 and Sunday April 28. Those points of

congestion during the PM period of April 13 and April 28 appear to be non-recurring slowdowns that could be caused by incidents.

- Overall, in this segment, the weekend is similar to weekdays with mostly good operating speeds and only some congestion related to incidents.

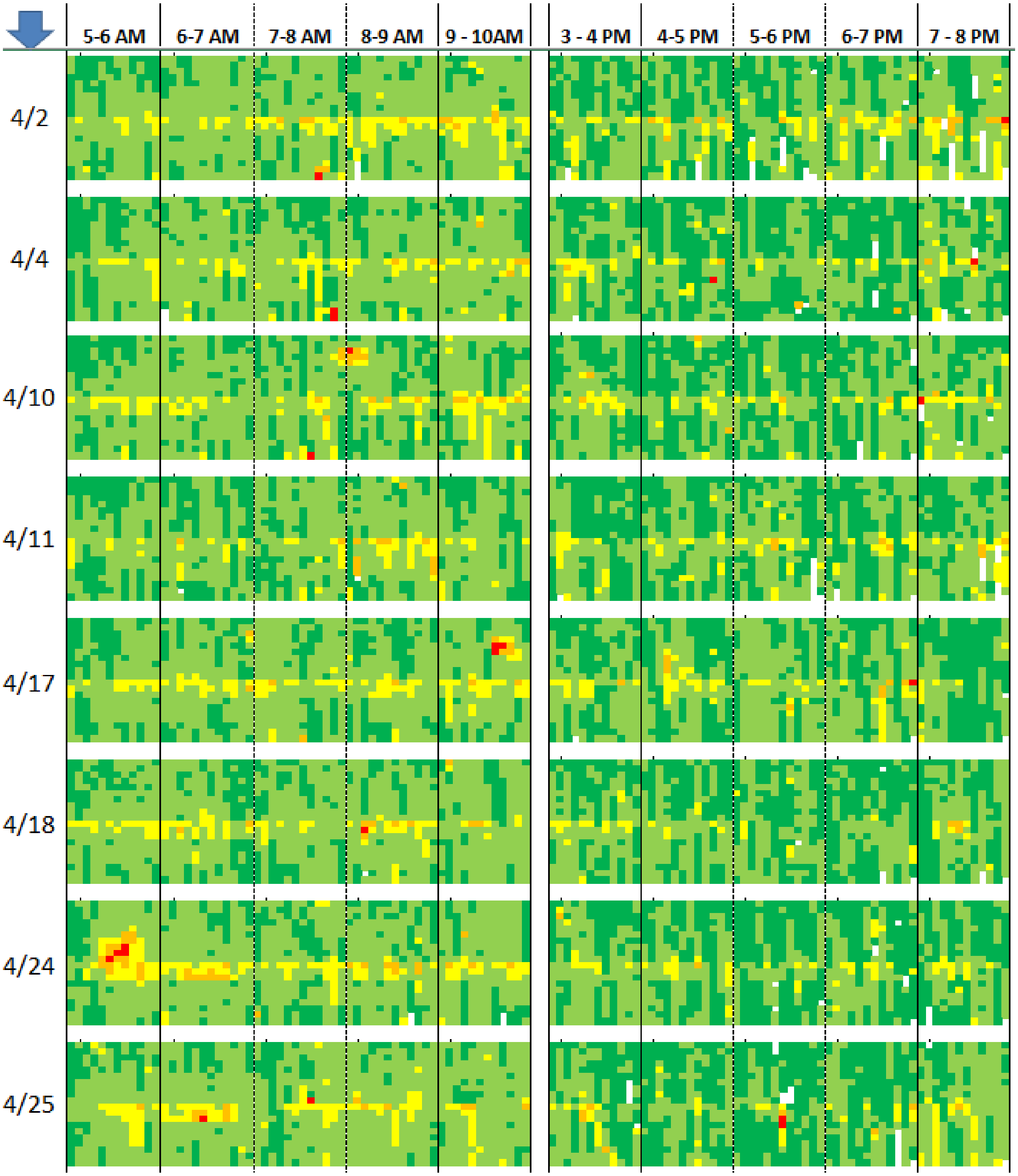


Figure 4- Weekday Heat Map- Fairfield Westbound

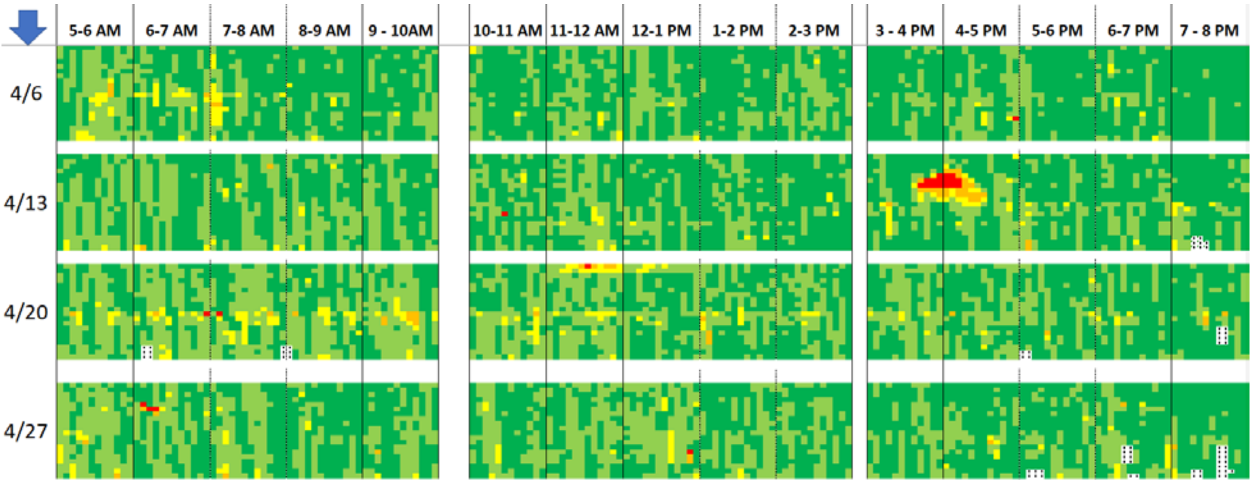


Figure 5- Saturday Heat Map- Fairfield Westbound

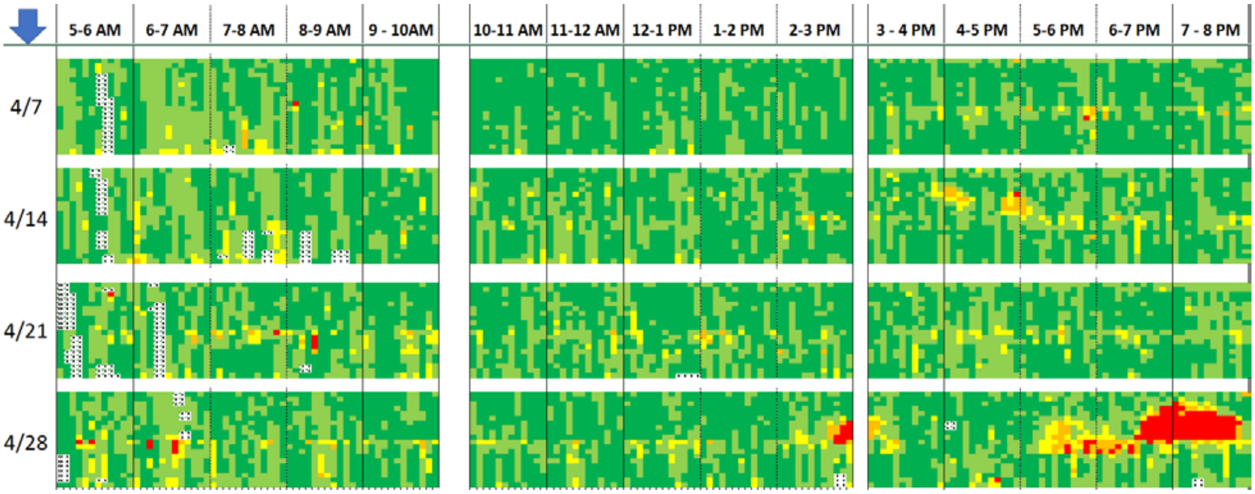


Figure 6- Sunday Heat Map- Fairfield Westbound

Vallejo – Eastbound

Figures 7 to 9 show speed heat maps for I-80 eastbound in Vallejo, for weekday, Saturday, and Sunday, respectively. Based on the data presented in the speed profiles, in the eastbound direction the following comparisons are made:

- During weekdays, there is congestion around the toll plaza that persists throughout AM and PM peak periods.

- In addition during weekdays, there are two bottlenecks during PM peak period that are overlap, one after Tennessee St onramp and one after I-780 on-ramp. The queue from these bottlenecks usually reaches back to the toll plaza.

- On Saturdays, the PM peak period congestion pattern is similar to weekday for AM and PM periods. Midday and AM have similar congestion patterns to each other, but the congestion is much less than during the PM period, showing slowdowns at the toll plaza.

- On Sundays, congestion mostly exists at the toll plaza throughout the day, being more severe during the PM period.

- Overall, in this segment, the weekday congestion and queues are worse, but Saturday experiences significant congestion in the PM peak. Sunday is less congested, but still experiences some areas of slowing.

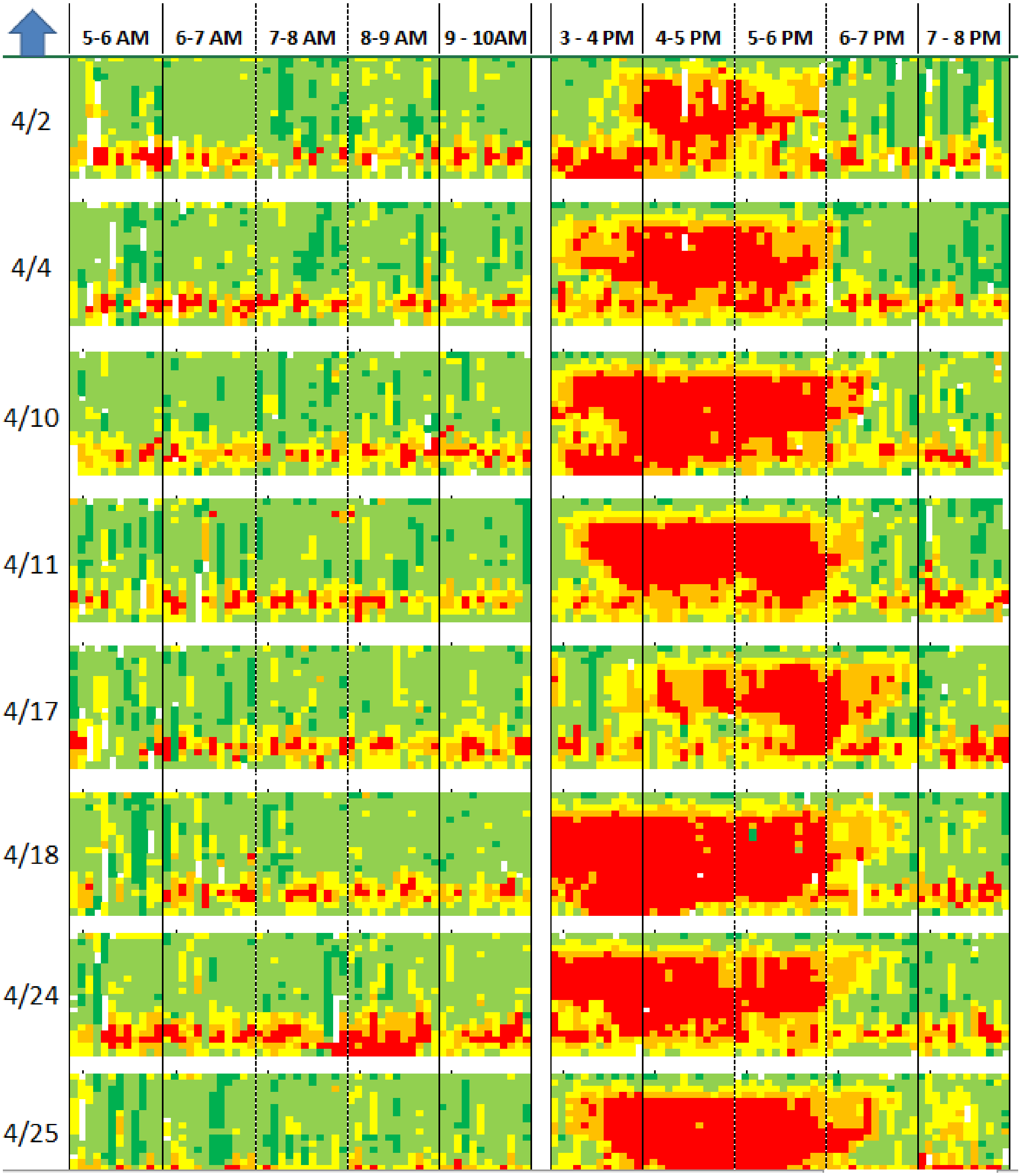


Figure 7- Weekday Heat Map- Vallejo Eastbound

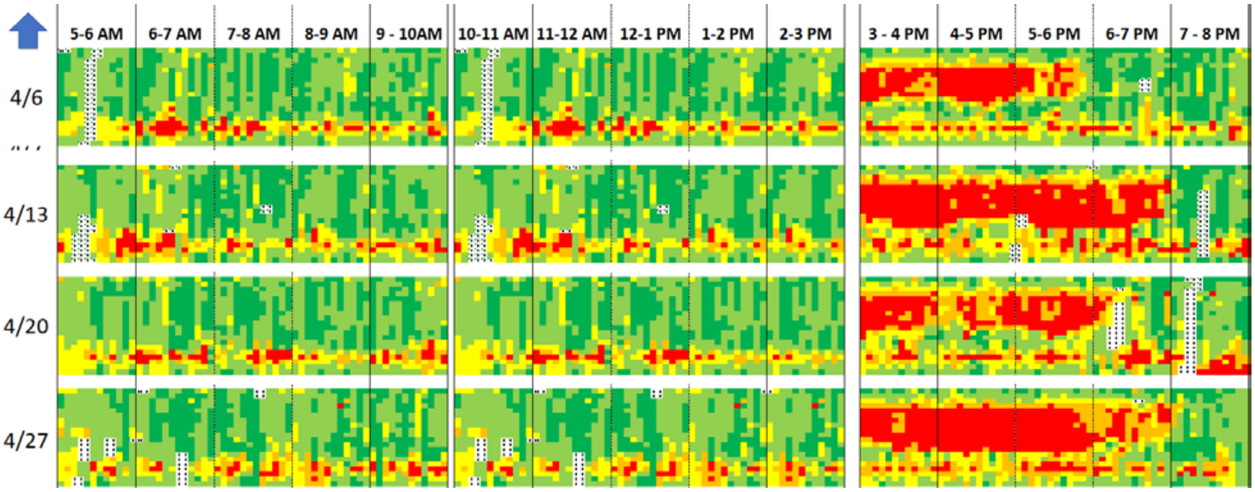


Figure 8- Saturday Heat Map- Vallejo Eastbound

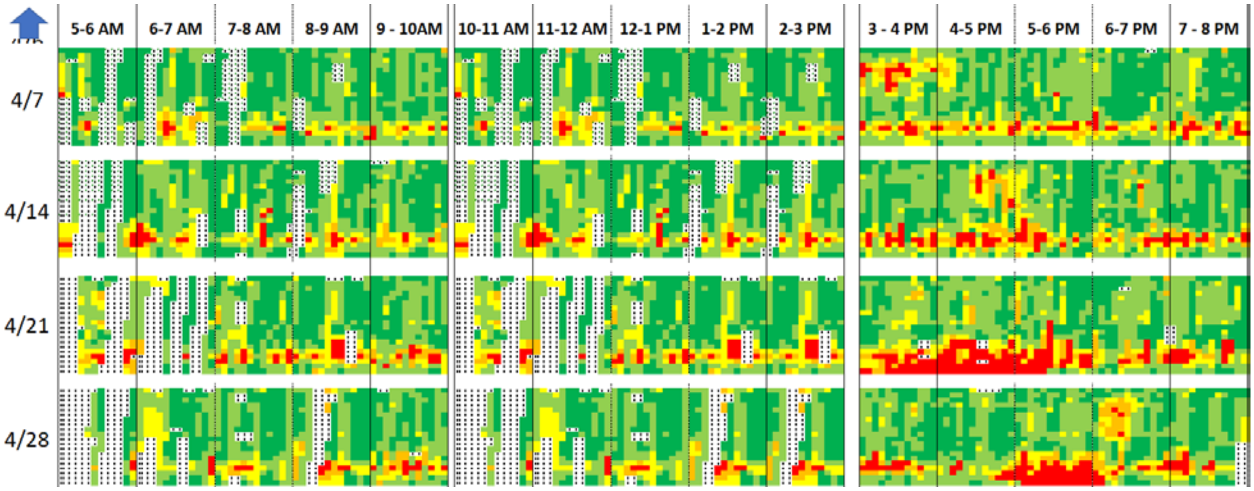


Figure 9- Sunday Heat Map- Vallejo Eastbound

Vallejo – Westbound

Figures 10 to 12 show speed heat map for I-80 eastbound in Vallejo, for weekday, Saturday, and Sunday, respectively. Based on the data presented in the speed profiles, in the westbound direction the following comparisons are made:

- During weekdays, along I-80 westbound, mostly short and isolated slowdowns occur. There is one congestion location after the I-780 on-ramp that persists throughout the day.
- On Saturdays, during the AM peak period there is no congestion. During the MD and PM peak periods, there are queues at I-780 onramp which sometimes extend to Tennessee Street.

- On Sundays, during the AM peak period there is no congestion. During the MD and PM peak periods, there are queues from I-780 on-ramp that extend to SR 37. This pattern of congestion is worse then either weekdays or Saturday.

- Overall, in this segment, the congestion on Sunday afternoon exceeds the congestion on the weekdays or Saturday during their respective peak periods.

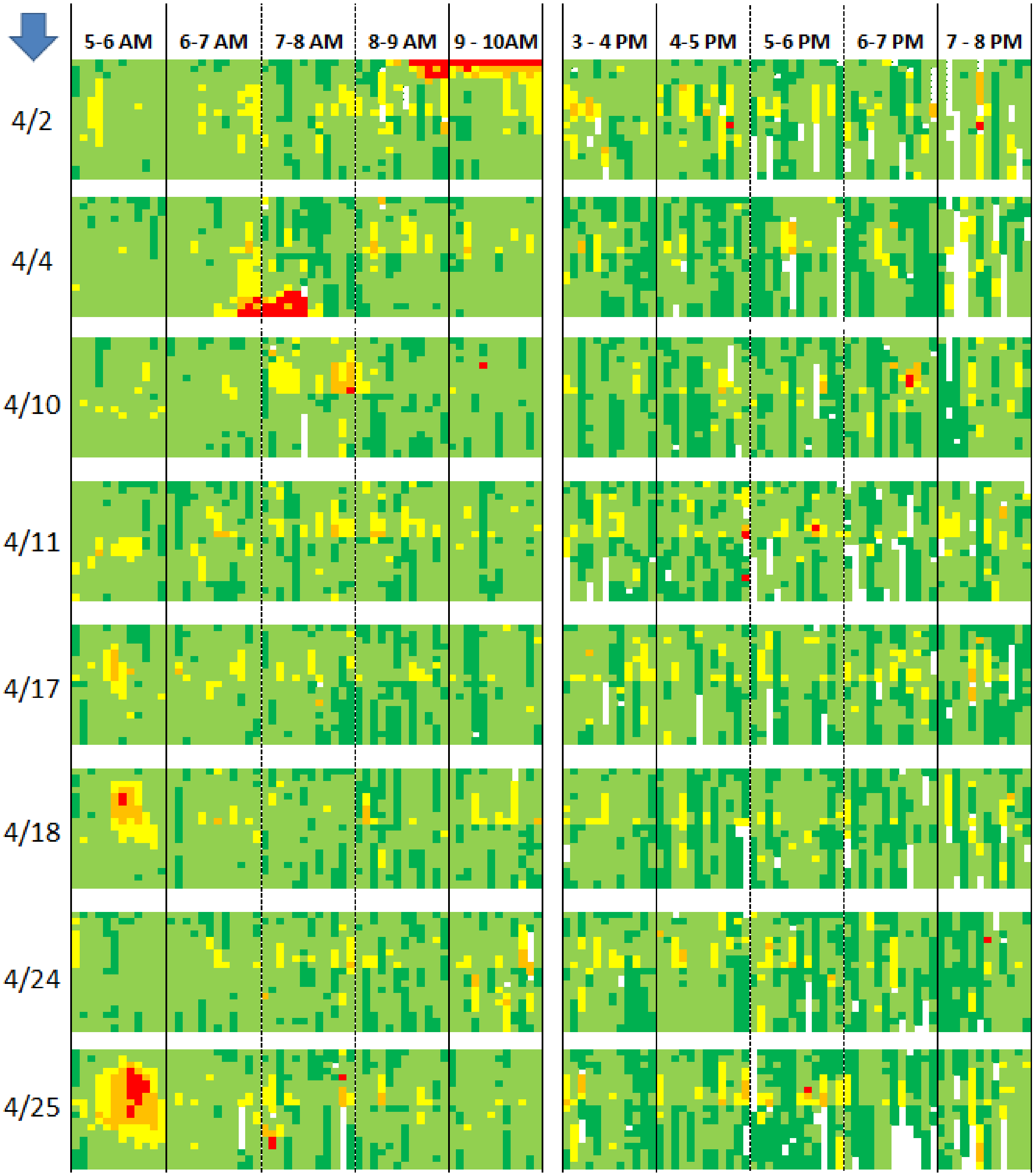


Figure 10- Weekday Heat Map- Vallejo Westbound

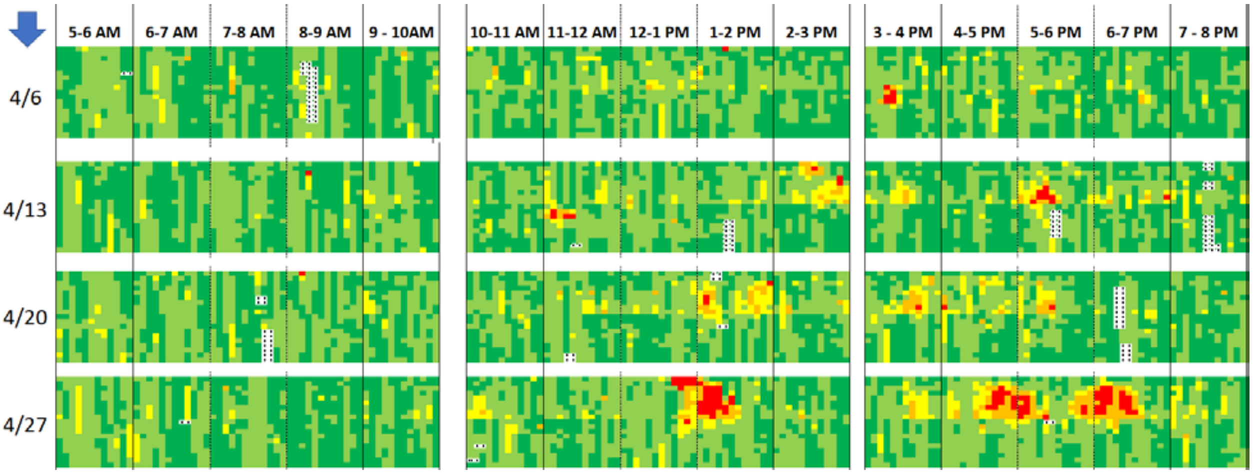


Figure 11- Saturday Heat Map- Vallejo Westbound

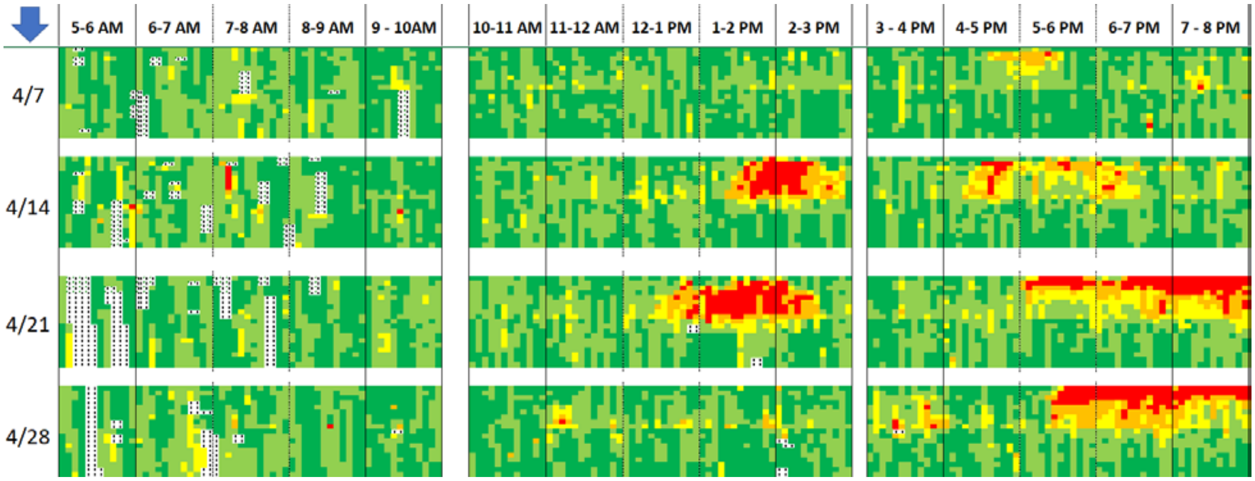


Figure 12- Sunday Heat Map- Vallejo Westbound

Weekday and Weekend Volume and Speed Comparison

For the weekend volume analysis, we chose Saturday, April 20, 2019 as the speed heat map analysis generally showed Saturday to be worse in terms of slowing and congestion than Sundays in most locations. In addition to April 2019, weekend volumes for February and July 2019 were compared with weekday volume in April 2019. Figures 13 and 14 show comparisons between February and July weekend volumes and April weekday volumes along I-80 corridor in the cities of Fairfield and Vallejo, respectively. The comparison indicates that the peak weekday volumes in April are higher than the peak weekend (Saturday) volumes in the months of February and July.

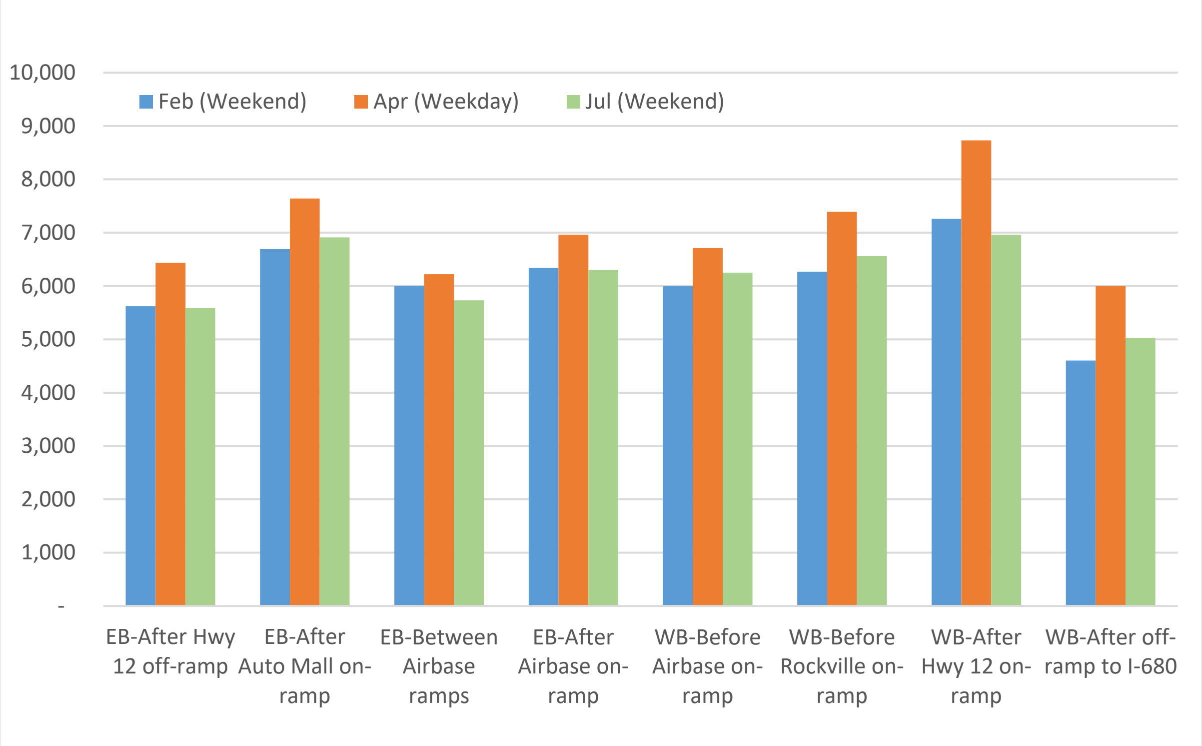


Figure 13- Volume Comparison – Fairfield Peak Hour Volumes

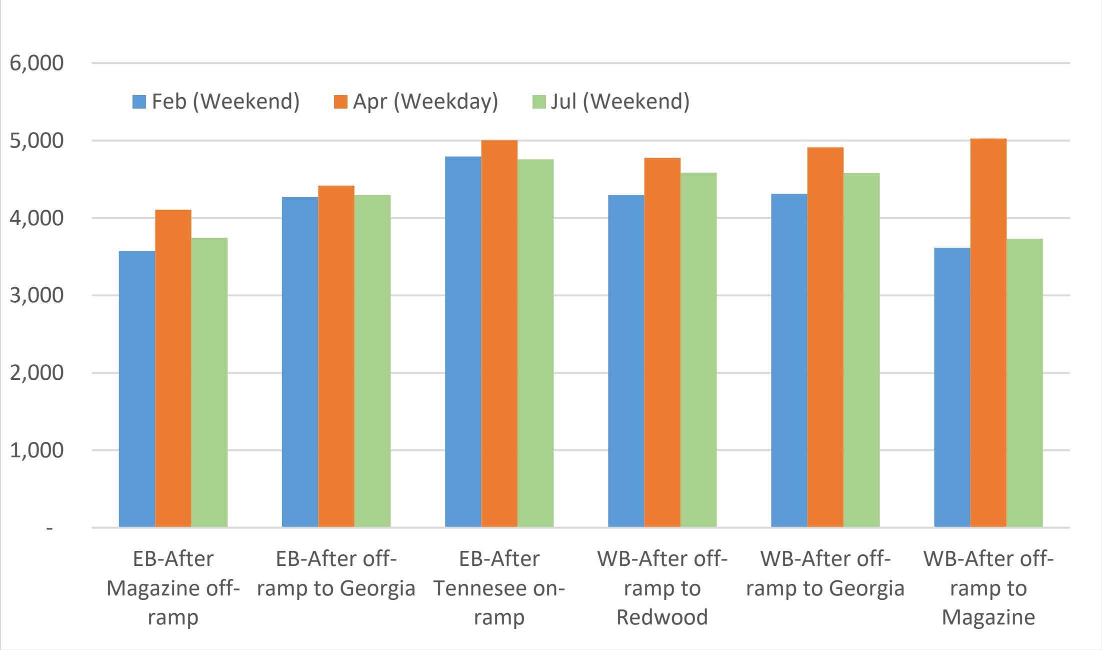


Figure 14- Volume Comparison – Vallejo Peak Hour Volumes

In the following section, we compare the average volume and speed during AM and PM periods between Thursday April 25, and Saturday April 20 for several locations along I-80 within the study area. Figures 15 to 22 show comparisons between Saturday and Thursday volume and speed at these locations along I-80 corridor in cities of Fairfield and Vallejo.

Fairfield – AM Peak Period

Figures 15 and 16 compare Thursday and Saturday volume and speed during the AM peak period at several locations along I-80 in Fairfield. Generally, Saturday has lower volume and slightly higher speeds. During AM peak period, both Thursday and Saturday are congestion free in both directions.

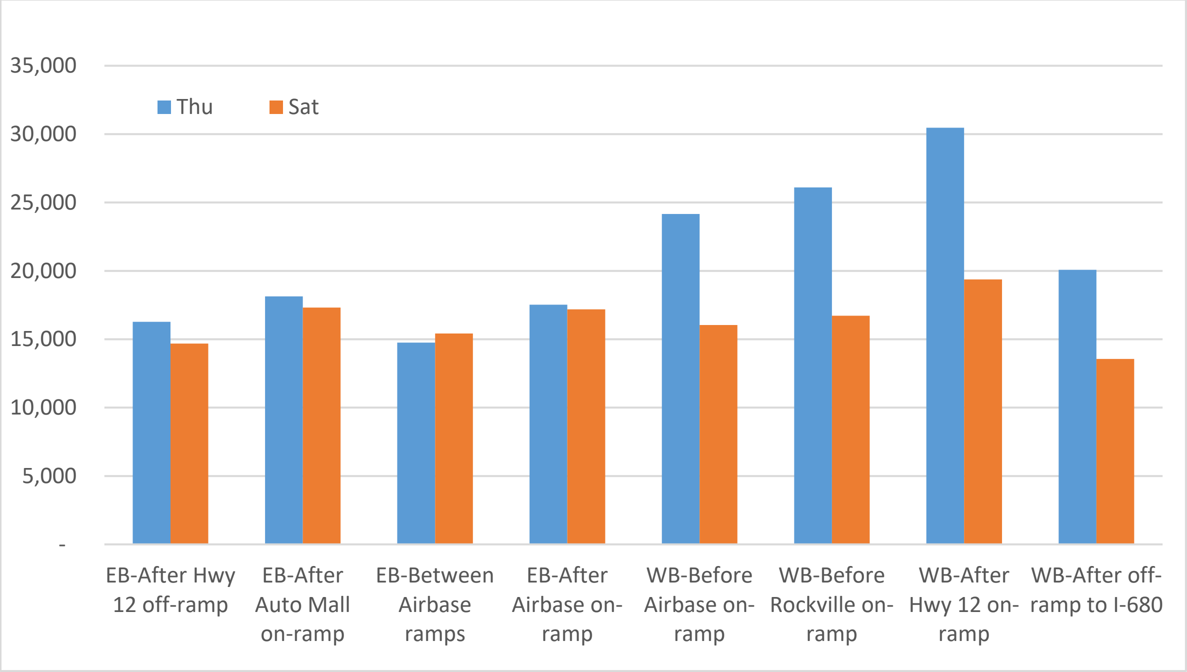


Figure 15- Volume Comparison – Fairfield - AM

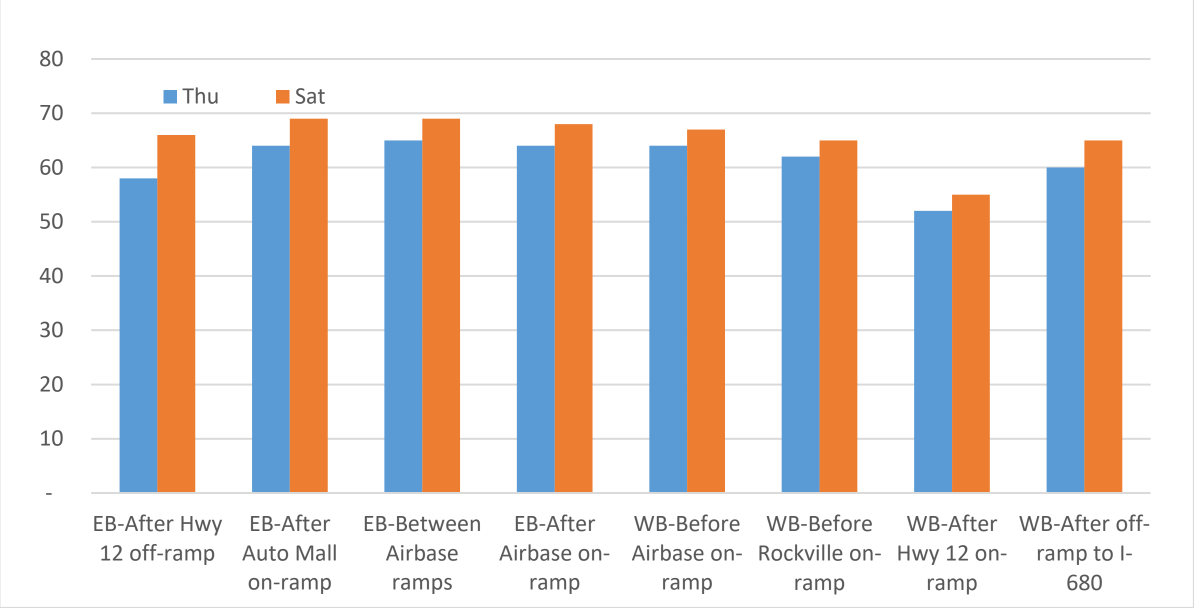


Figure 16- Speed Comparison – Fairfield – AM

Fairfield – PM Peak Period

Figures 17 and 18 compare Thursday and Saturday volume and speed during the PM peak period at several locations along I-80 in Fairfield. Saturday has lower volume eastbound, but higher volume westbound compared to Thursday. Eastbound, between Travis Blvd and Manual Campos Pkwy, speed is low and similar on both days. However, west of Travis Blvd, Saturday speeds are higher than Thursday. Westbound, speeds are slightly higher on Saturday, but on both days, speeds are close to free flow speed.

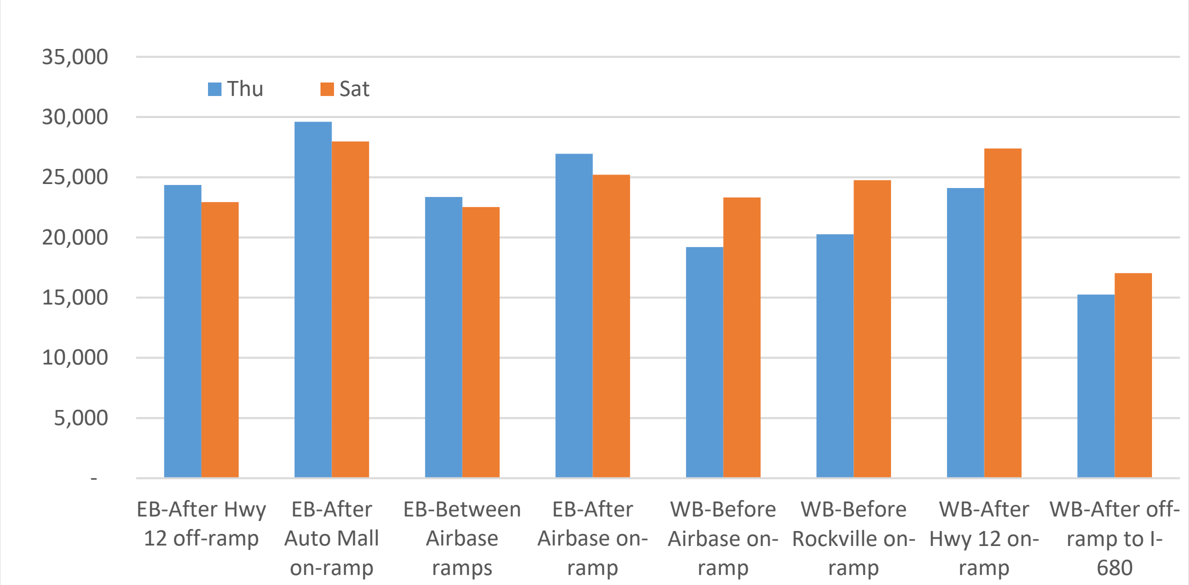


Figure 17- Volume Comparison – Fairfield - PM

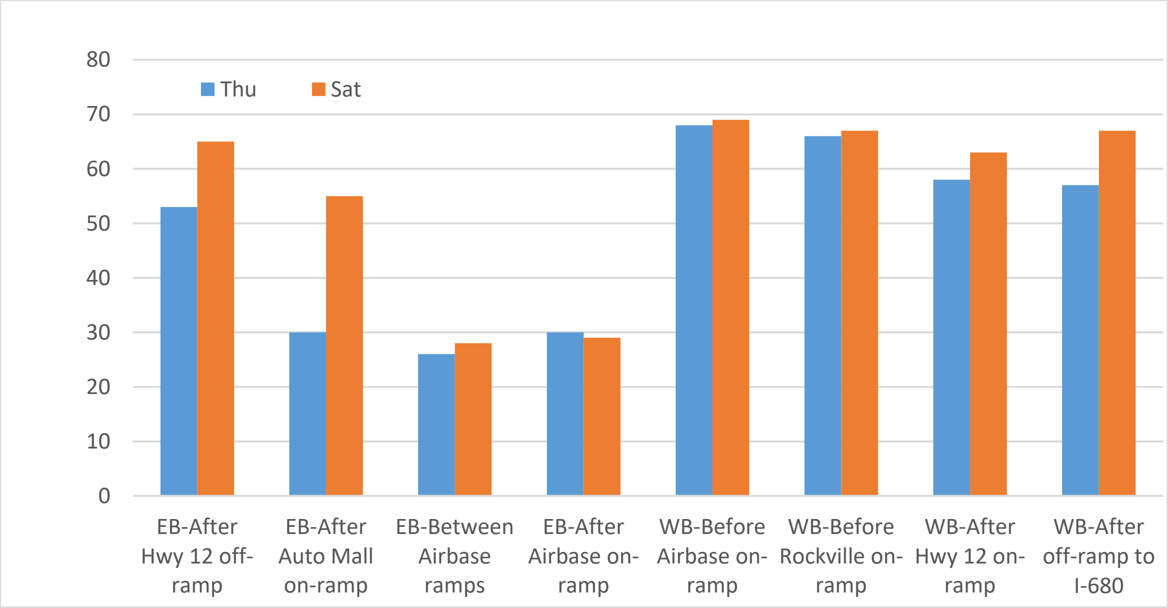


Figure 18- Volume Comparison – Fairfield - PM

Vallejo – AM Peak Period

Figures 19 and 20 compare weekday and Saturday volume and speed during the AM peak period at several locations along I-80 in Vallejo. In most locations in both directions, volumes are lower and speeds are slightly higher on Saturdays. Note that both days are congestion free during the AM peak period.

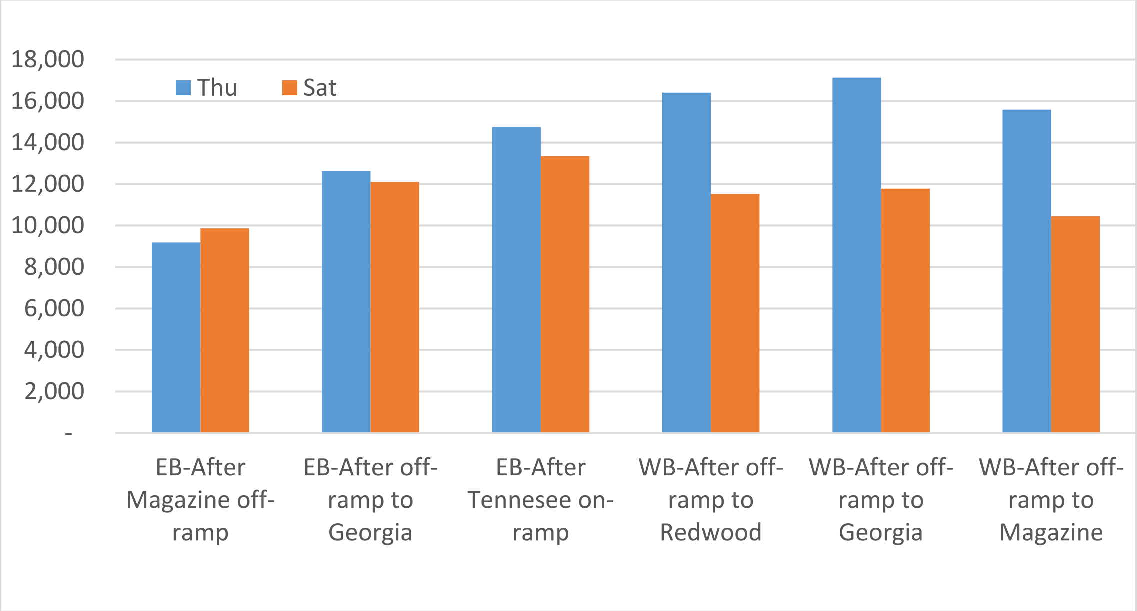


Figure 19- Volume Comparison – Vallejo - AM

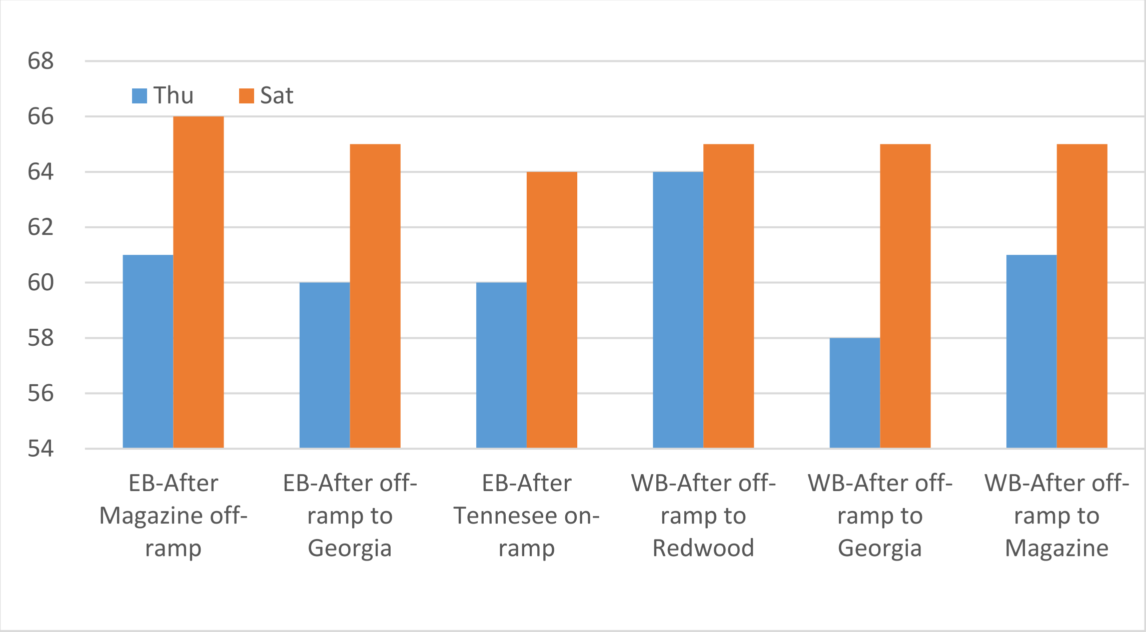


Figure 20- Speed Comparison – Vallejo – AM

Vallejo – PM Peak Period

Figures 21 and 22 compare weekday and Saturday volume and speed during the PM peak period at several locations along I-80 in Vallejo. Saturday volumes are slightly lower eastbound and higher westbound. Eastbound, speeds between Magazine and Redwood streets are low and similar on both days, however, Saturday has significantly higher speed west of Magazine St. Westbound, both days operate with similar speeds, near free flow speed.

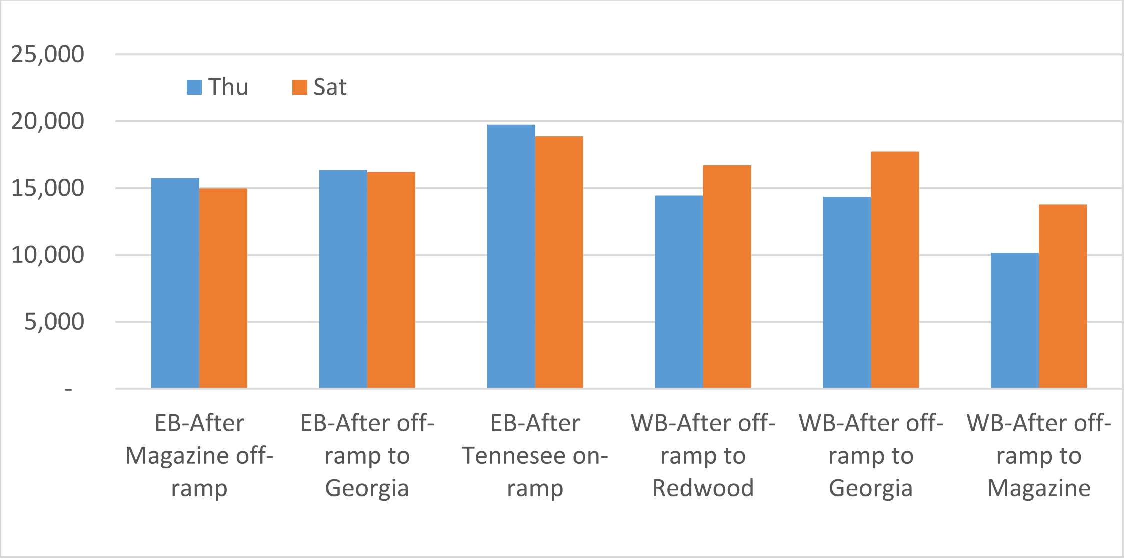


Figure 21- Volume Comparison – Vallejo - PM

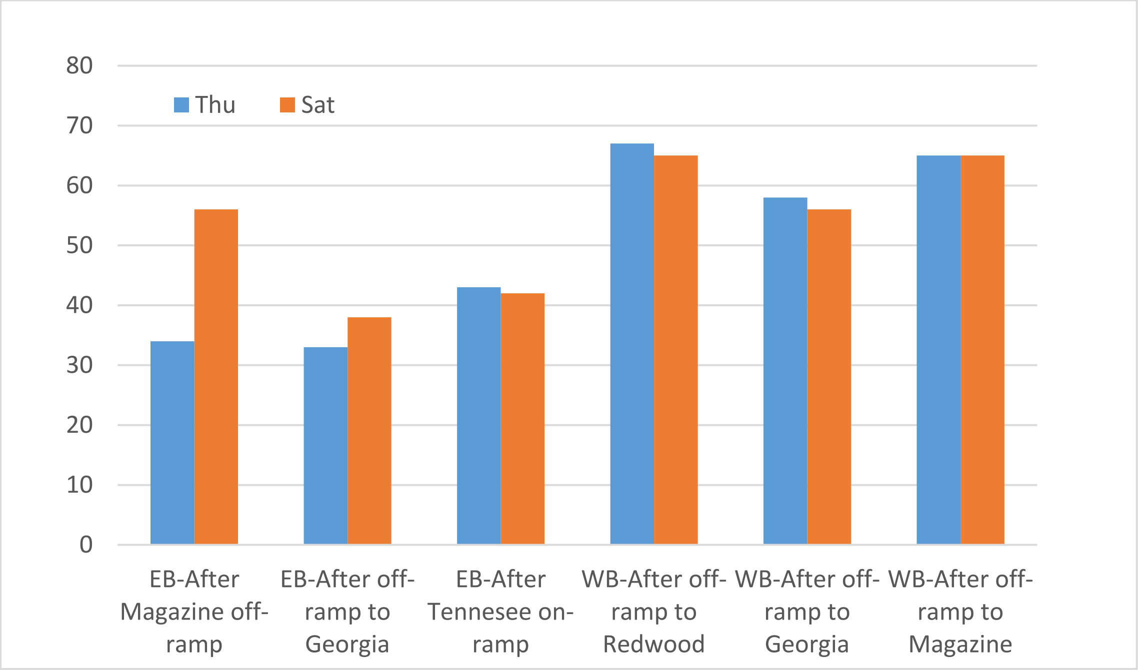


Figure 22- Speed Comparison – Vallejo - PM

Summary

Typical weekday, Saturday and Sunday have three distinctive traffic patterns along I-80 in Fairfield and Vallejo study areas.

- During typical weekdays, the PM peak period is the most congested
- Saturdays have congestion during MD and PM peak periods, but generally not as severe as weekdays
- Sundays generally have little congestion except in isolated locations.
- Thus, overall, the weekday conditions are worse than weekend, although significant congestion is noted on Saturdays at some locations.
- In general, the improvements proposed based on assessment of weekday patterns and congestion should also mitigate weekend congestion as it is not as severe as weekday as for the most part volumes are lower and speeds are higher on weekends.

Appendix C

Base Year Travel Demand Model Memorandum

CAMBRIDGE
SYSTEMATICS

Think Forward

Memorandum

TO: Caltrans

FROM: Cambridge Systematics and TJKM

DATE: March 3, 2021

RE: Base Year Travel Demand Model (Solano County)

This memorandum summarizes the development of the I-80 CMCP base year travel demand model. Cambridge Systematics' (CS) and TJKM have focused on the Solano Napa Activity Based Travel Model (SNABM) along with the model developed by Fehr and Peers (F&P) and DKS Associates (DKS) for the Yolo I-80 Managed Lanes Project.

The I-80 CMCP study area extends from the Contra Costa / Solano County Line through to Yolo and Sacramento Counties. Multiple travel demand models are being used to cover this entire study corridor. It is necessary to extract traffic data from the SNABM as well as the Sacramento Activity Based Travel Model (SACSIM19) to understand the traffic volumes along the entire corridor.

The scope of work includes running SNABM and to also SACSIM19 data previously developed for the Yolo I-80 Managed Lanes Project. The I-80 CMCP corridor has been divided into nine segments - traffic data for segments 1 through 5 will be extracted from the SNABM model and 6 through 9 from the SACSIM19 model. See Figure 1.

This memo summarizes the model enhancements and network updates that were performed to improve the SNABM model for two reasons:

- Match SNABM model volumes with observed traffic counts; and
- Reconcile the volumes of SNABM to that of the SACSIM19 at the Solano-Yolo County border

The intention is the resulting traffic numbers covering the entire corridor form one set of consistent data to the extent feasible. A key focus of this document is on the travel demand model calibration and validation, and documenting the model results along the entire corridor.

Figure 1: I-80 CMCP Study Area and Segments

Network Review and Updates

Prior to performing model validation, the SNABM Model System highway network was carefully reviewed and updates were made where the model network representation was incorrect for the Year 2019. For the entire I-80 corridor, modeled mainline and ramp links were reviewed for number of lanes and geometric accuracy. Another important review item was to check the sequencing of the mainline and ramp segments along the corridor including the HOV access and egress points coding. Some network coding errors were identified and corrected. **Appendix C-1** shows the details.

Model Validation Data

Model validation requires a good set of traffic counts against which model results can be compared for a base year. An extensive set of traffic counts were obtained and were used for validation of the traffic model. These traffic counts were essential in the overall validation process to ensure a comprehensive representation of traffic conditions throughout the I-80 CMCP corridor.

Available traffic counts on freeways, expressways, and arterials were obtained from Caltrans PeMS and counts from the MTC travel model. Counts along with I-80 mainline location were compared against the model as part of the validation. The count data were summarized and geocoded to fit the model roadway link segments for comparisons. Data sets are briefly described below.

The SNABM model has been validated throughout Solano County as well as within the I-80 corridor using traffic counts. Daily validation was conducted using all available counts. Model Volumes were compared to traffic counts on a variety of statistics, such as validation by facility type and area type to give an overall indication of the quality of the model. Validation tables were also developed at several locations on key freeways such as I-80 and all the county-county border crossings. Tables 1-3 show that the model volumes match traffic counts within the acceptable error.

The California Statewide Freight Forecasting and Travel Demand Model (CSF2TDM) was also examined since this is the only data source for full statewide travel patterns. However, a comparison of the Statewide model and MTC travel demand model external trip tables showed that the total trips from outside the region to MTC counties were very different in magnitude and distribution and changing these would result in issues that could not be addressed as part of this work scope. Therefore, this source was not used for .

Model Validation Statistics

This section of the document presents the model validation comparisons. Model results were compared against the ground counts at different levels. Model validation targets were established before applying the model to the base year. This was done to ensure that validation targets would be objectively set. The key measure of model validation here is percent root mean square error (percent RMSE), comparing model results to count data. Root mean square error is a statistical measure that corrects for the sign of the error. For example, in a set of validation results, sometimes the difference between counts and model results will be positive and sometimes they will be negative. Cumulative errors, if these negative and positive differences are added together, could seem small (as negative and positive errors offset each other) and this will mask the true deviation between the model results and the validation counts. RMSE adjusts for sign difference and thus provides a better measure for overall error rates. Corridor-level traffic validation was also conducted using the counts described in the previous section. **Tables 1 – 3** show these comparisons.

Table 1 shows observed to model volume comparisons by roadway by facility types. Percent RMSE and Percent Error are presented in Table 1. This paints a picture of how acceptable level of accuracy is for the model. Ideal or target % RMSE is within 40%. At all counts locations level the model %RMSE is 41% and model is performing very well at freeways and the %RMSE is 24% which is way below the target of 40%. Expressways are also within 40% (they are 26%). Arterials are not validated within our target value but still the model is acceptable for the freeway corridor application with a little post-processing of the raw model forecasts. Typically regional models perform well at higher functional classification categories.

Table 1: SNABM Daily Validation by Facility Type (All of Solano County)

Facility Type	Observed Traffic Counts	2015 Estimated Volumes	Daily Validation		
	Sum of Counts	Sum of Model Volumes	Target % RMSE	%RMSE	Percent Error
Freeways	3,288,180	3,178,518	40%	24%	-3%
Expressways	606,692	645,598	40%	26%	6%
Arterials	1,206,174	1,047,429	40%	58%	-13%
All counts	**5,101,046**	**4,871,545**	**40%**	**41%**	**-4%**

Table 2 shows how the model is performing in the eastern end of the I-80 corridor. This table shows the actual counts compared to the model. It is a straight comparison of numeric and percent difference. No need of %RMSE comparisons since we are comparing one count at a time. At this location the model is well within 10% of the observed traffic counts.

Table 2: SNABM I-80 Validated Traffic Volumes at Key Locations

I-80 Location	Observed Traffic Counts	2015 Estimated Volumes	Daily Validation	
	Sum of Counts	Sum of Model Volumes	Difference	Percent Error
Solano Contra Costa (WB)	125,001	126,889	1,888	2%
Contra Costa - Solano (EB)	125,001	117,659	-7,342	-6%
Solano-Yolo (EB)	84,151	83,150	-1,001	-1%
Yolo -Solano (WB)	84,120	83,150	-970	-1%

Table 3 shows model comparison along I-80 corridor at 17 different locations. These comparisons are from the model run before corrections and adjustments to the model. These comparisons show that the model is performing well at multiple locations. At most locations the model is within 10% of the observed counts. The model is way low at Canyon Rd, Red Top Rd. and Hwy 12. **Table 4** shows the same comparisons after the model adjustments. The adjustments helped the locations where the model was way low. The differences were brought closer with the adjustments, at the same time some locations got a little worse compared to before adjustments but still are within 10% for most cases. **Table 5** shows the comparison differences side-by-side for both scenarios for ease of understanding.

Table 3: SNABM Daily Validation on Interstate 80 before adjustments

I-80 Location	Observed Traffic Counts	2015 Estimated Volumes	Daily Validation	
	Sum of Counts	Sum of Model Volumes	Difference	Percent Error
I-80 Carquinez Br	125,000	116,197	-8,803	-7%
I-80 west of 780	125,000	120,330	-4,670	-4%
I-80 east of I-780	152,000	138,269	-13,731	-9%
I-80 American Canyon Rd	139,000	108,840	-30,160	-22%
I-80 Red Top Rd	136,000	116,701	-19,299	-14%
I-80 west of Hwy12	171,395	118,335	-53,060	-31%
I-80 east of I-680	190,231	194,685	4,454	2%
I-80 east of CA 12E	175,318	176,577	1,259	1%
I-80 W Texas Rd	151,382	168,339	16,957	11%
I-80 Travis Blvd	164,375	154,377	-9,998	-6%
I-80 Pleasant Valley Rd	167,226	180,552	13,326	8%
I-80 Elmira Rd	169,000	189,872	20,872	12%
I-80 Vaca Valley Pkwy	136,000	143,331	7,331	5%
I-80 Dixon Ave	132,000	144,761	12,761	10%
I-80 Stratford Ave	131,000	132,214	1,214	1%
I-80 Tremont Rd	135,000	142,107	7,107	5%
I-80 Solano-Yolo Border	140,000	142,282	2,282	2%

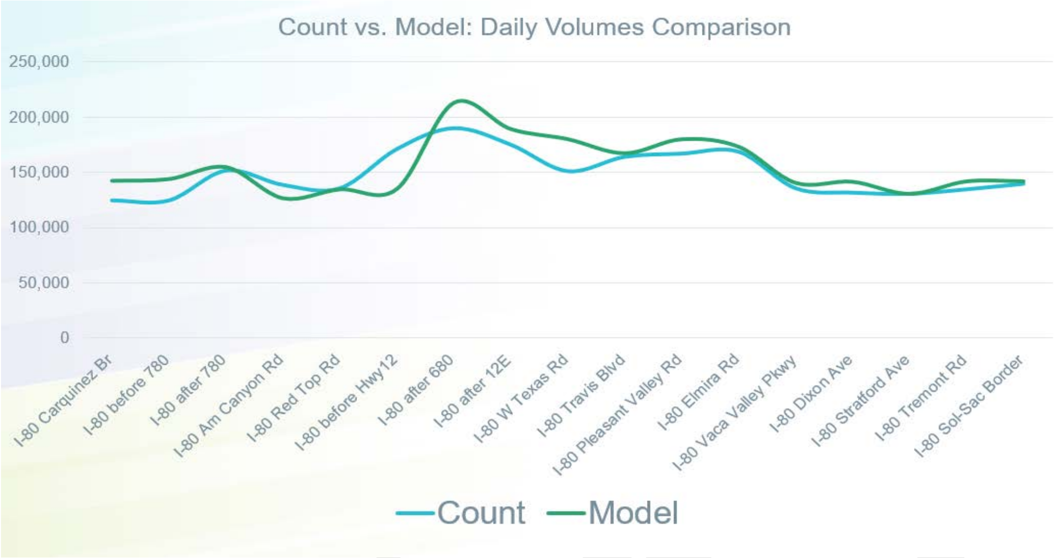
Table 4: SNABM Daily Validation on Interstate 80 after adjustments

Screenline	Observed Traffic Counts	2015 Estimated Volumes	Daily Validation	
	Sum of Counts	Sum of Model Volumes	Difference	Percent Error
I-80 Carquinez Br	125,000	141,981	16,981	14%
I-80 west of 780	125,000	143,543	18,543	15%
I-80 east of 780	152,000	154,356	2,356	2%
I-80 Am Canyon Rd	139,000	126,162	-12,838	-9%
I-80 Red Top Rd	136,000	134,253	-1,747	-1%
I-80 west of Hwy12	171,395	134,533	-36,862	-22%
I-80 east of 680	190,231	212,626	22,395	12%
I-80 east of 12E	175,318	188,893	13,575	8%
I-80 W Texas Rd	151,382	179,724	28,342	19%
I-80 Travis Blvd	164,375	166,924	2,549	2%
I-80 Pleasant Valley Rd	167,226	179,649	12,423	7%
I-80 Elmira Rd	169,000	172,868	3,868	2%
I-80 Vaca Valley Pkwy	136,000	140,136	4,136	3%
I-80 Dixon Ave	132,000	141,148	9,148	7%
I-80 Stratford Ave	131,000	130,146	-854	-1%
I-80 Tremont Rd	135,000	141,457	6,457	5%
I-80 Sol-Yolo Border	140,000	141,627	1,627	1%

Table 5: SNABM Daily Validation on Interstate 80 before and after adjustments

I-80 Location	Before Adjustments	After Adjustments	Change
I-80 Carquinez Br	-7%	14%	Got a little worse. Model shifted from low to high
I-80 west of 780	-4%	15%	Got worse. Model shifted from low to high
I-80 east of 780	-9%	2%	Improved
I-80 Am Canyon Rd	-22%	-9%	Improved
I-80 Red Top Rd	-14%	-1%	Improved
I-80 west of Hwy12	-31%	-22%	Improved
I-80 east of 680	2%	12%	Got a little worse
I-80 east of 12E	1%	8%	Got a little worse
I-80 W Texas Rd	11%	19%	Got a little worse
I-80 Travis Blvd	-6%	2%	Improved
I-80 Pleasant Valley Rd	8%	7%	Improved slightly
I-80 Elmira Rd	12%	2%	Improved
I-80 Vaca Valley Pkwy	5%	3%	Improved
I-80 Dixon Ave	10%	7%	Improved
I-80 Stratford Ave	1%	-1%	About the same
I-80 Tremont Rd	5%	5%	About the same
I-80 Sol-Yolo Border	2%	1%	Improved slightly

Figure 2: I-80 Corridor Daily Volumes Comparison: Counts vs. Model



SNABM and SACSIM19 Consistency Adjustments

The traffic volumes of SNABM had to be reconciled with volumes from SACSIM19 at the county borders for mainly three facilities – I-80, I-505 and SR-113. While the volumes on these facilities in both the models were in the same range, they needed to be brought closer while still achieving reasonable validation to the traffic counts. This exercise required balancing the volumes at the borders without losing the accurate calibration of the individual models. External trip tables in the SNABM were factored and model was re-run to get new traffic volumes. This changed the validation on I-80 somewhat but the numbers are still under the acceptable limit as shown in Tables 4 & 5. But more importantly the volumes got better at the border area of these two models. Please see Table 6 for the details.

Table 6 – SNABM and SACSIM19 Volume Comparison at the Solano-Yolo Border

Location	Facility	SNABM Un-adjusted Volume	SNABM Adjusted Volume	SACSIM19 Volume
I-80 Solano / Yolo Border east of SR 113	I-80 EB		64,783	64,518
	II-80 WB		64,784	64,540
SR 113 Solano / Yolo Border south Russell Blvd	SR 113 NB		10,631	10,667
	SR 113 SB		10,643	10,335
Solano / Yolo Border East i=of I-80	I-80		17,714	17,801
	I-80		17,713	16,968

I-80 Corridor Volumes by Vehicle Classification

Model is estimating that 75% to 80% of the traffic on I-80 corridor will be drive alone and 15-20% will be shared ride vehicles and less than 5% trucks. <add details of truck traffic from other sources/comparisons> Figures 3-5 show the details.

Figure 3: I-80 Eastbound Year 2015 Daily Model Volumes by Vehicle Class

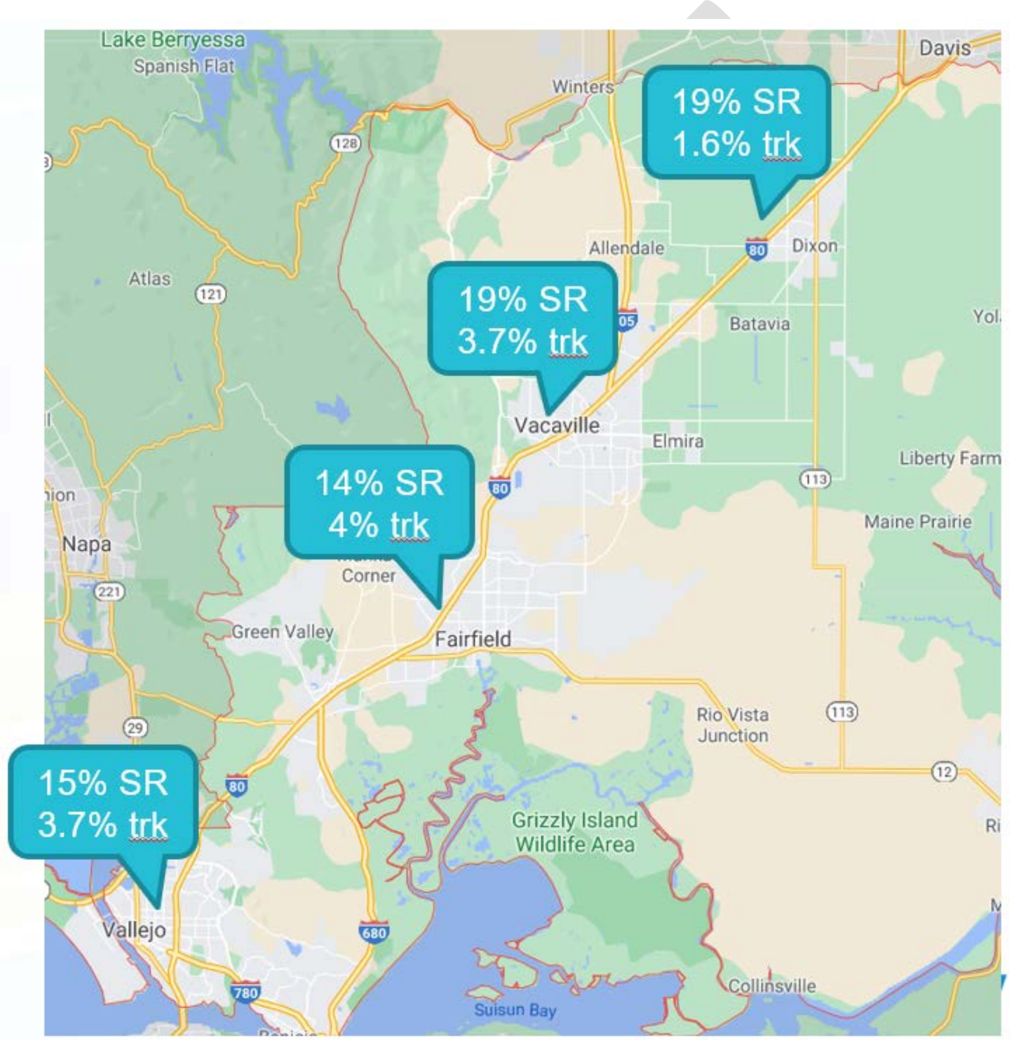


Figure 4: I-80 Eastbound Daily Volumes by Vehicle Class

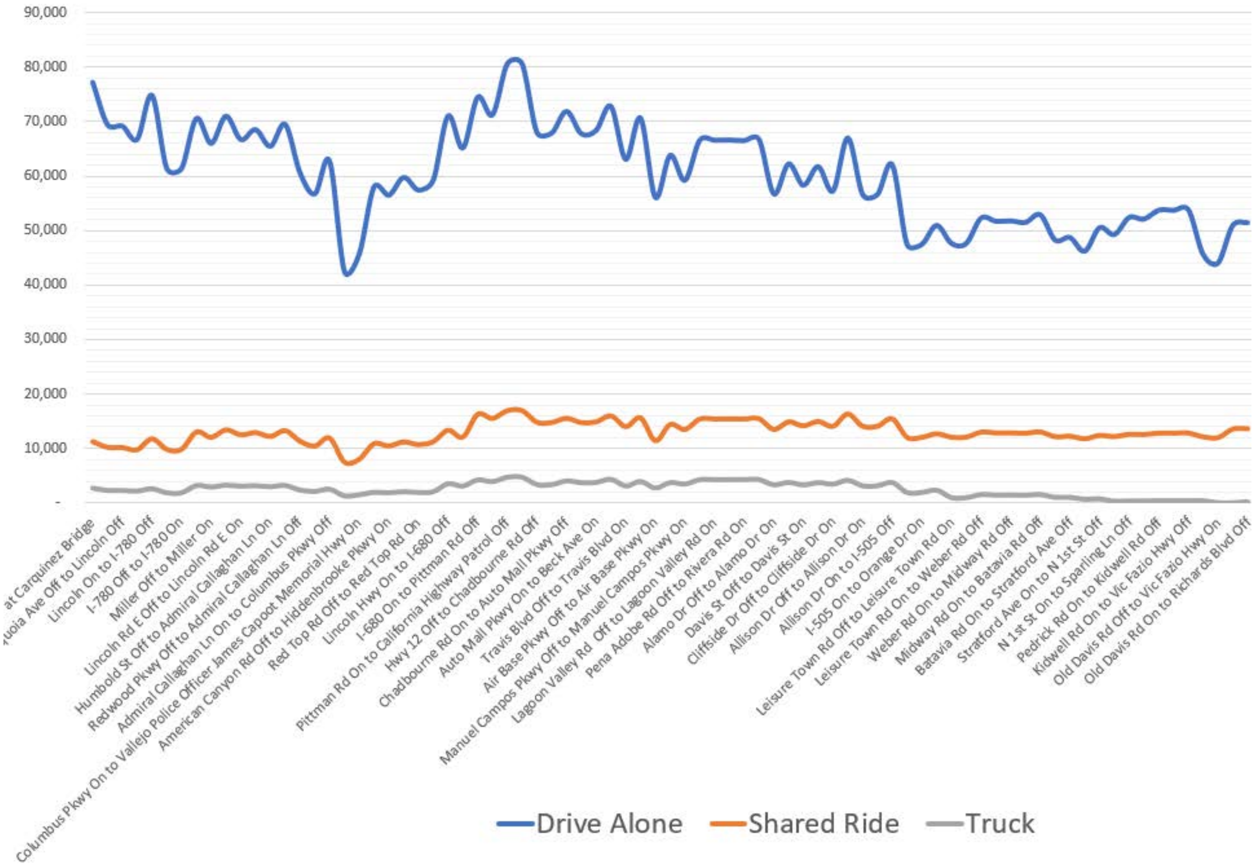
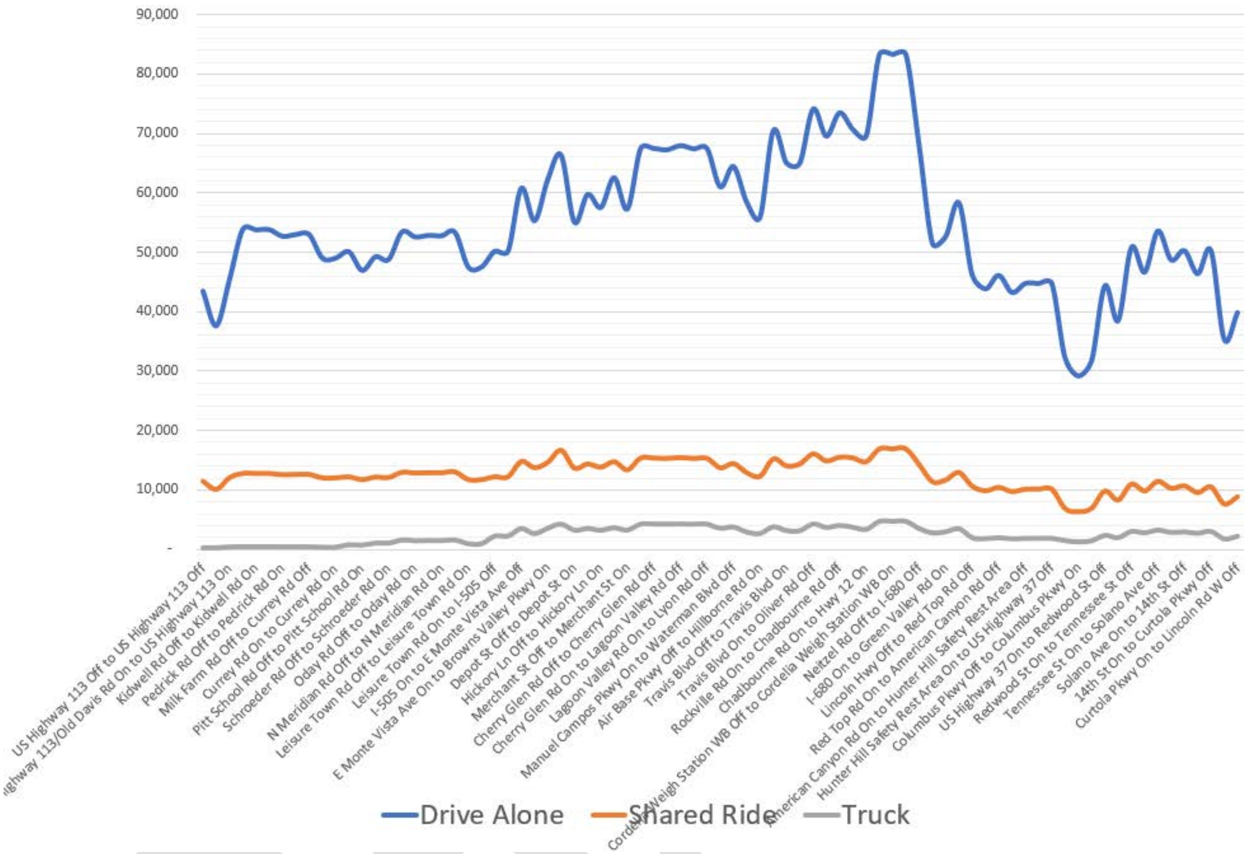


Figure 5: I-80 Westbound Daily Volumes by Vehicle Class



SNABM Mode Shares

Mode shares for entire Solano Count show that only 1.1% transit and 1.5% TNC. Walk and Bike shares together are 9.4% with walk share being majority of it. Auto trips are 88% of the mode shares. More details are presented in **Table 7.**

Table 7: SNABM Solano County Mode-Shares

Mode	Mode Share
Drive Alone	53.6%
Shared Ride 2	20.8%
Shared Ride 3+	13.6%
BART	0.1%
Bike	1.4%
Walk	8.0%
Commuter Rail	0.0%
Express Bus	0.1%
Ferry	0.3%
Local Bus	0.5%
TNC	1.5%
Total	**100%**

Note: TNC – Transportation Network Company

Conclusion

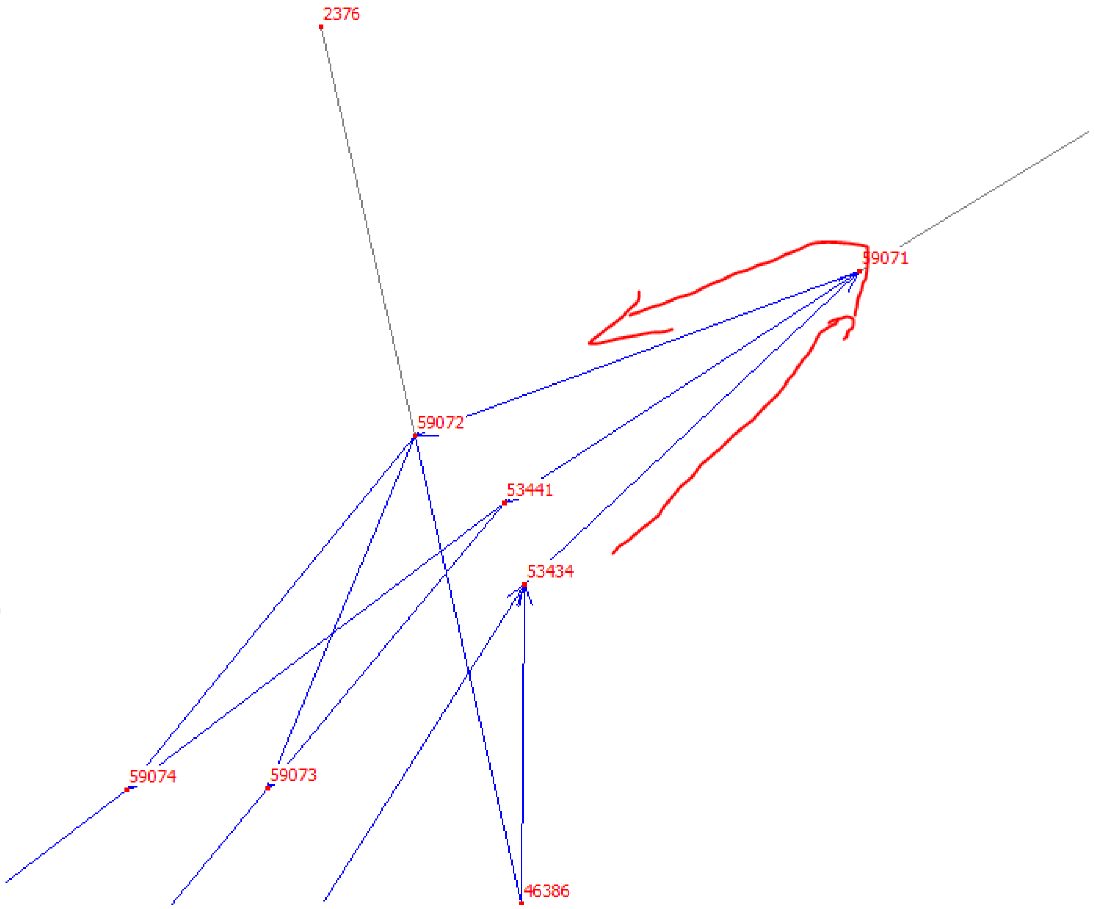
In summary, after the model comparisons, balancing exercise, new model runs and comparison of data at the model borders and in the overall corridor, the SNABM model is ready for use in the CMCP effort.

Appendix C-1:

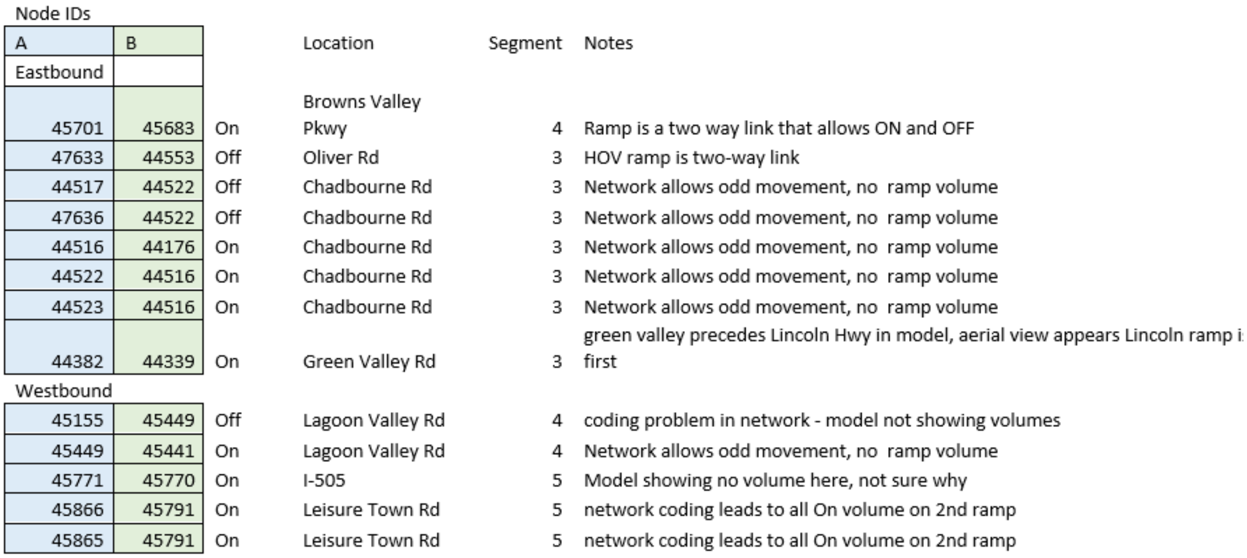
Network Review, Verifications and Corrections

Examples of network review and corrections are shown in this section of the document.

External network coding issue: Traffic moving from EB back around to WB at this node, 99071. The ramp volume here does not add up to the mainline volume before and after this node. CS reviewed and send feedback and TJKM verified and corrected the issue.

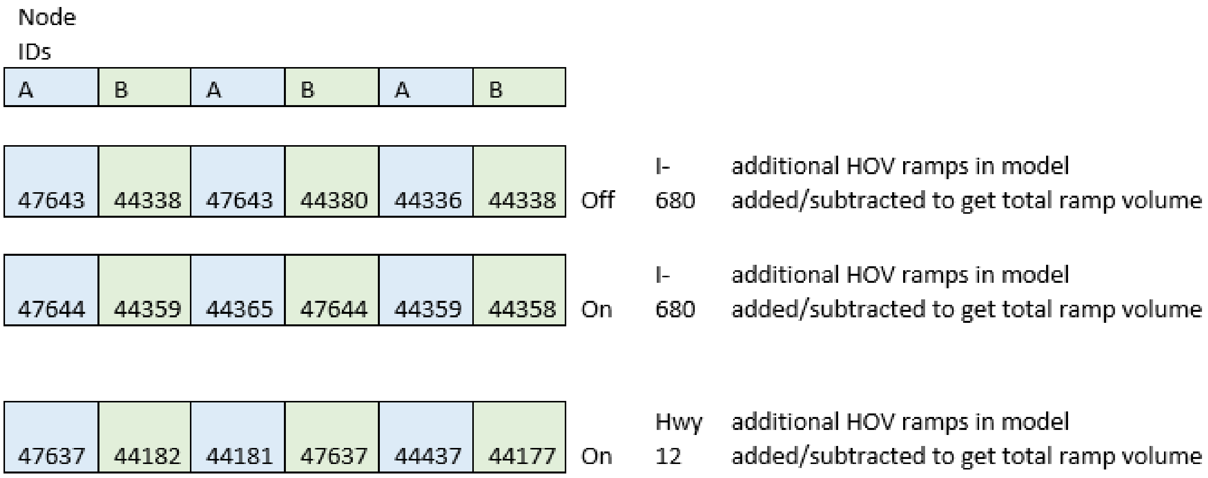


List of locations where CS noticed where there seem to be problems in the network. TJKM performed necessary corrections.



Node IDs					
A	B		Location	Segment	Notes
Eastbound					
45701	45683	On	Browns Valley Pkwy	4	Ramp is a two way link that allows ON and OFF
47633	44553	Off	Oliver Rd	3	HOV ramp is two-way link
44517	44522	Off	Chadbourne Rd	3	Network allows odd movement, no ramp volume
47636	44522	Off	Chadbourne Rd	3	Network allows odd movement, no ramp volume
44516	44176	On	Chadbourne Rd	3	Network allows odd movement, no ramp volume
44522	44516	On	Chadbourne Rd	3	Network allows odd movement, no ramp volume
44523	44516	On	Chadbourne Rd	3	Network allows odd movement, no ramp volume
44382	44339	On	Green Valley Rd	3	green valley precedes Lincoln Hwy in model, aerial view appears Lincoln ramp i first
Westbound					
45155	45449	Off	Lagoon Valley Rd	4	coding problem in network - model not showing volumes
45449	45441	On	Lagoon Valley Rd	4	Network allows odd movement, no ramp volume
45771	45770	On	I-505	5	Model showing no volume here, not sure why
45866	45791	On	Leisure Town Rd	5	network coding leads to all On volume on 2nd ramp
45865	45791	On	Leisure Town Rd	5	network coding leads to all On volume on 2nd ramp

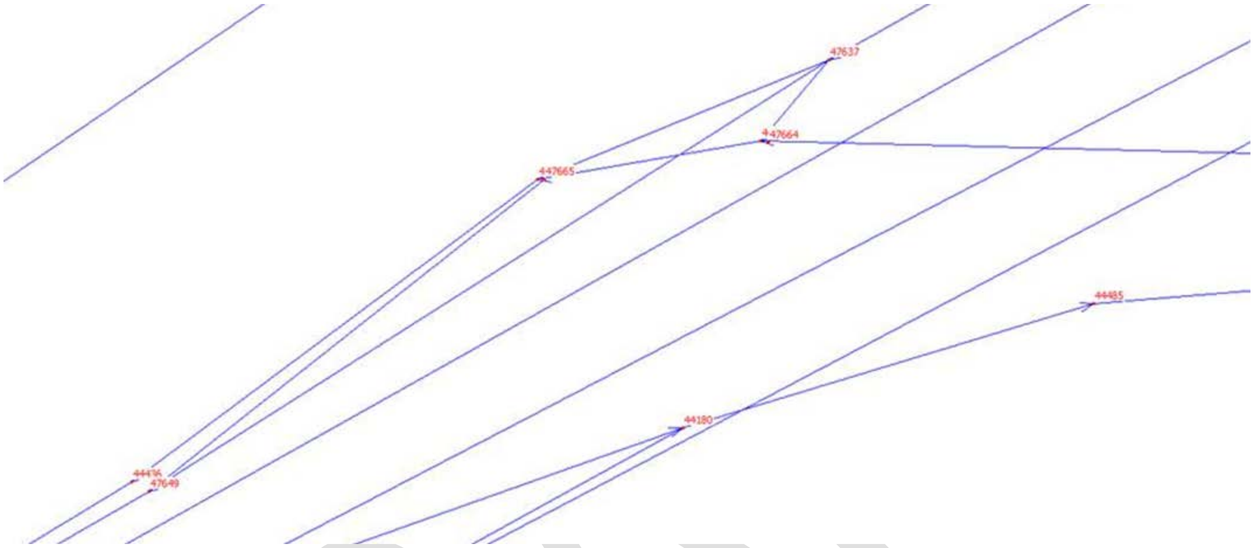
HOV/GP access & egress coding checks for the questionable links. TJKM performed necessary corrections.

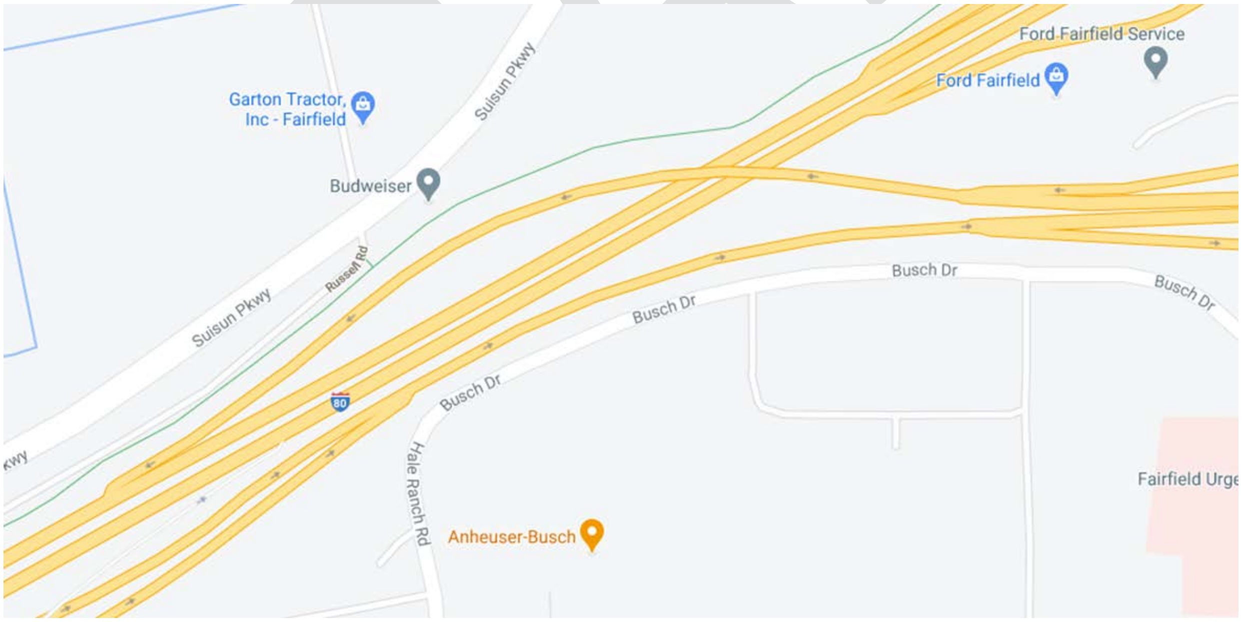


Node IDs								
A	B	A	B	A	B			
47643	44338	47643	44380	44336	44338	Off	I-680	additional HOV ramps in model added/subtracted to get total ramp volume
47644	44359	44365	47644	44359	44358	On	I-680	additional HOV ramps in model added/subtracted to get total ramp volume
47637	44182	44181	47637	44437	44177	On	Hwy 12	additional HOV ramps in model added/subtracted to get total ramp volume

HOV/GP access & egress coding:

Screenshots of the third location in the list. The on ramp from Hwy 12 is represented in the model by two links, one to the GP lanes one to the HOV lanes, but also a third link that connects to the GP lane before the ramp, which allows two-way traffic. This is an example of one of the situations where multiple link volumes are needed to find the volume of one ramp.





Appendix D

Microsimulation Analysis Results

1.0 Analysis Results – Microsimulation Modeling

This document summarizes the microsimulation analysis results for Vallejo and Fairfield study areas. The Measure of Effectiveness (MOE) were obtained from the microsimulation model for I-80 freeway corridor, which included ramps modeled in the microsimulation network. Many different MOEs can be extracted and used for analysis of the future operating conditions. The following measures of effectiveness were extracted from the models and analyzed for existing and future build scenarios, for the Vallejo and Fairfield area microsimulation corridors. These are common MOEs used from simulation models and they are consistent with some of the key measures required for CMCP analysis per the California Transportation Commission CMCP guidelines.

- Average Speed – Average speeds of all vehicles during the AM and PM peak periods. Network wide average speed data was obtained from network performance results generated by VISSIM. Data was extracted for each hour of the AM and PM peak periods for I-80.

- Vehicle Hours of Delay (VHD) - Total delay of all vehicles in the network or of those that have already exited it during the AM and PM peak periods. In VISSIM, the average delay is calculated for all observed vehicles compared to a trip without any other vehicles, signal controls or other required stops. VISSIM provides total delay as part of network performance output. Data was extracted for each hour of the AM and PM peak periods for I-80.

- Vehicle Miles of Travel (VMT) - Total distance of all vehicles in the network or of those that have already exited it during the AM and PM peak periods. VISSIM provides total distance traveled as part of network performance output. Data was extracted for each hour of the AM and PM peak periods for I-80. It is important to note that the differences in VMT between future baseline and future with project scenarios represents shifts in demand between facilities but does not account for possible induced demand. The models used do not have feedback loops to possible land use changes or changes in trip making that would capture induced demand, thus the VMT differences are due to one facility attracting trips from other facilities, rather than new trips, longer trips or trips taken during different time periods.

- Vehicle Hours of Travel (VHT) – Total hours of travel of all vehicles in the network or of those that have already existed it during the AM and PM peak periods. VHT is calculated by dividing VMT with average speed for I-80.

- Speed Profile – Average speed of all vehicles along various segments of I-80. A speed profile was generated for each hour of the AM and PM peak periods.

- Travel Time – Travel time of vehicles along the I-80 by direction. Data was extracted for each of the AM and PM peak periods.

- Travel Delay – Travel delay of vehicles along the I-80. Data was extracted for each of the AM and PM peak periods. VISSIM calculates delay as any length of time exceeding the free-flow travel time.

1.1 Existing Scenario (2019)

Existing Fairfield and Vallejo models were calibrated to replicate the existing condition. Calibration results show that volume, congestion, and bottleneck locations and extents in both models replicate the existing conditions. Given the variety and mixture of quality of the volume data available due to COVID-19 conditions, we conclude that the simulation models are well calibrated to key existing conditions parameters and are ready to be utilized for future alternative analyses. The detailed Base Year Travel Demand Model calibration memorandum was submitted to Caltrans and in included in Appendix D-1. The existing and future traffic demands used for microsimulation are included in Appendix D-2.

1.1.1 Networkwide Measures of Effectiveness (MOE)

I-80 Fairfield Study Area

The results of the microsimulation model analyses for the VMT, VHD, VHT and average speed for the Existing Scenario for the I-80 Fairfield Study Area are summarized in Table 1. The average speeds along I-80 in the study area during the AM and PM peak period are 62 and 45 mph, respectively. Traffic flows are close to free-flow speeds during AM and slower during the PM peak period in Fairfield study area.

Table 1: I-80 Fairfield Study Area Corridor Wide MOE – Existing Scenario

MOE	AM Peak Period (6 to 10)	PM Peak Period (3 to 7)
Average Speed (mph)	61.7	45.4
Vehicle Hours of Delay (VHD)	415	3,438
Vehicle Miles of Travel (VMT)	439,292	503,612
Vehicle Hours of Travel (VHT)	7,116	11,091

I-80 Vallejo Study Area

The results of the microsimulation model analyses for the VMT, VHD, VHT and average speed for Existing Scenario for the I-80 Vallejo Study Area are summarized in Table 2. The average speeds in the study area during the AM and PM peak period are 62 and 42 mph, respectively. Traffic flows are close to free-flow speeds during AM and slower during the PM peak period in Vallejo study area. During evening commute, eastbound direction is congested.

Table 2: I-80 Vallejo Study Area Corridor Wide MOE – Existing Scenario

MOE	AM Peak Period (6 to 10)	PM Peak Period (3 to 7)
Average Speed (mph)	61.9	41.5
Vehicle Hours of Delay (VHD)	177	1,848
Vehicle Miles of Travel (VMT)	196,294	210,408
Vehicle Hours of Travel (VHT)	3,171	5,073

1.1.2 Speed Profile

I-80 Fairfield Study Area

Figure 1-1 and Figure 1-2 show the bottleneck along I-80 general purpose and managed lanes during existing AM peak period for eastbound and westbound direction, respectively. Figure 1-3 and Figure 1-4 show the bottleneck along I-80 general purpose and managed lanes during existing PM peak period for eastbound and westbound direction, respectively. These figures illustrate speeds on the freeway during the peak period in ten mile per hour increments, with the dark red indicating the lowest speeds (essentially stopped conditions of zero to ten miles per hour), up to free flow at over 60 miles per hour in dark green. The horizontal (X) axis indicates the time/hour, and the vertical (Y) axis indicates the location along the corridor.

During the AM peak period, the traffic flows at almost free flow speeds. There is some traffic slowdown in the westbound direction after the Highway 12 on ramp. During the PM peak period, eastbound traffic is congested. After Airbase Parkway, the HOV lane ends and the highway narrows from five lanes to four lanes. This creates a bottleneck that extends to Pittman Road/Suisun Valley Road. Eastbound traffic during the AM and westbound traffic during the PM periods run almost at free flow speeds with short and isolated slowdowns.

Figure 1-1: Calibrated Weekday Mainline Speed – Fairfield AM Peak Period-Eastbound

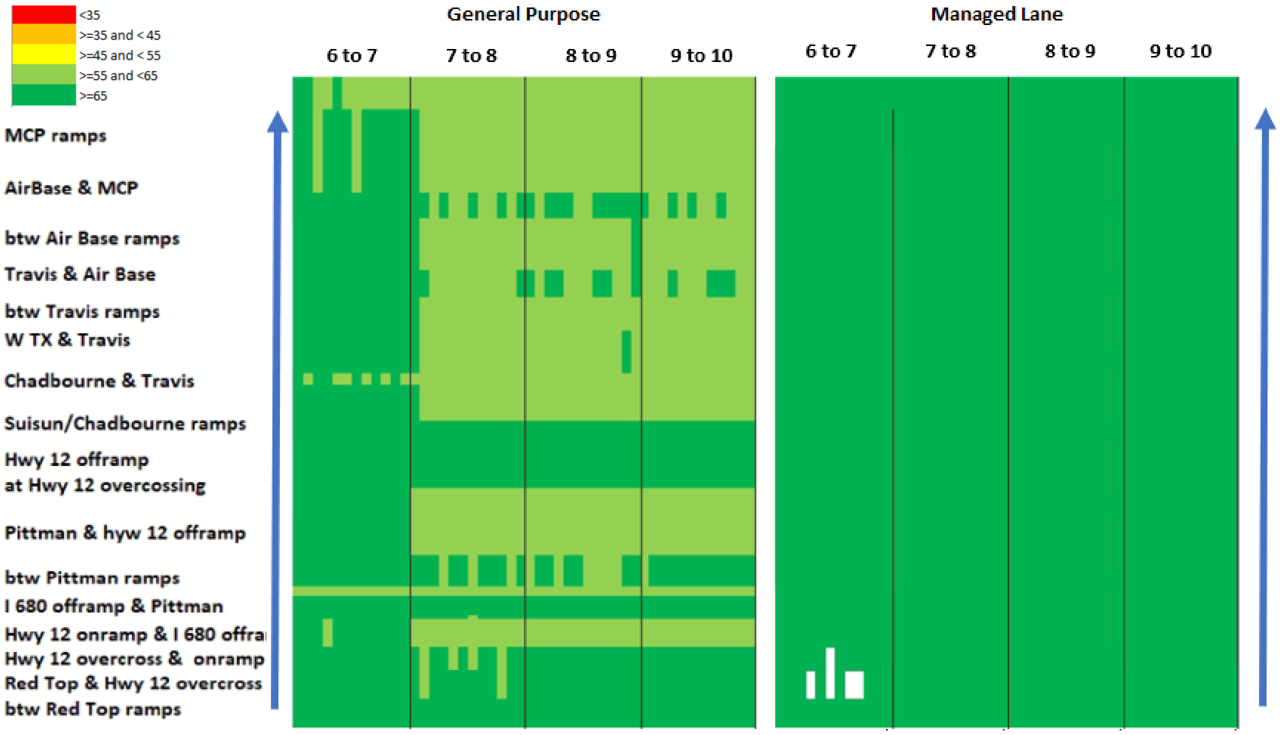


Figure 1-2: Calibrated Weekday Mainline Speed – Fairfield AM Peak Period-Westbound

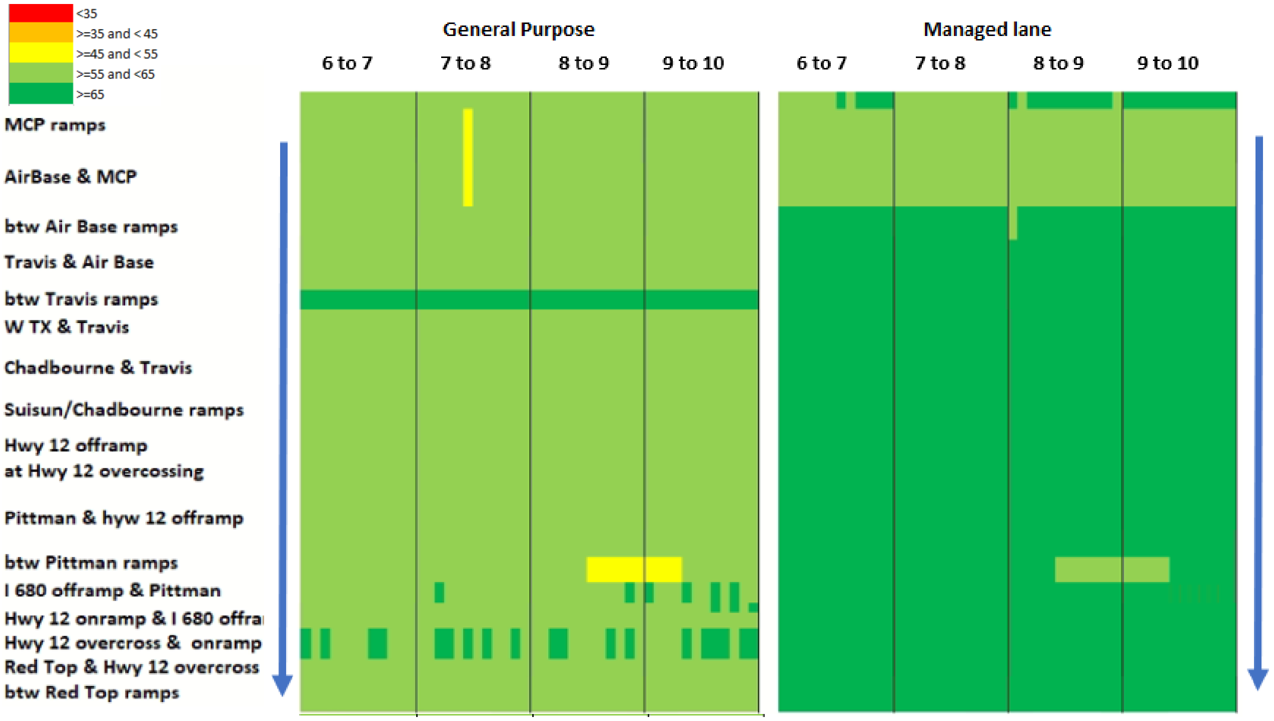


Figure 1-3: Calibrated Weekday Mainline Speed – Fairfield PM Peak Period – Eastbound

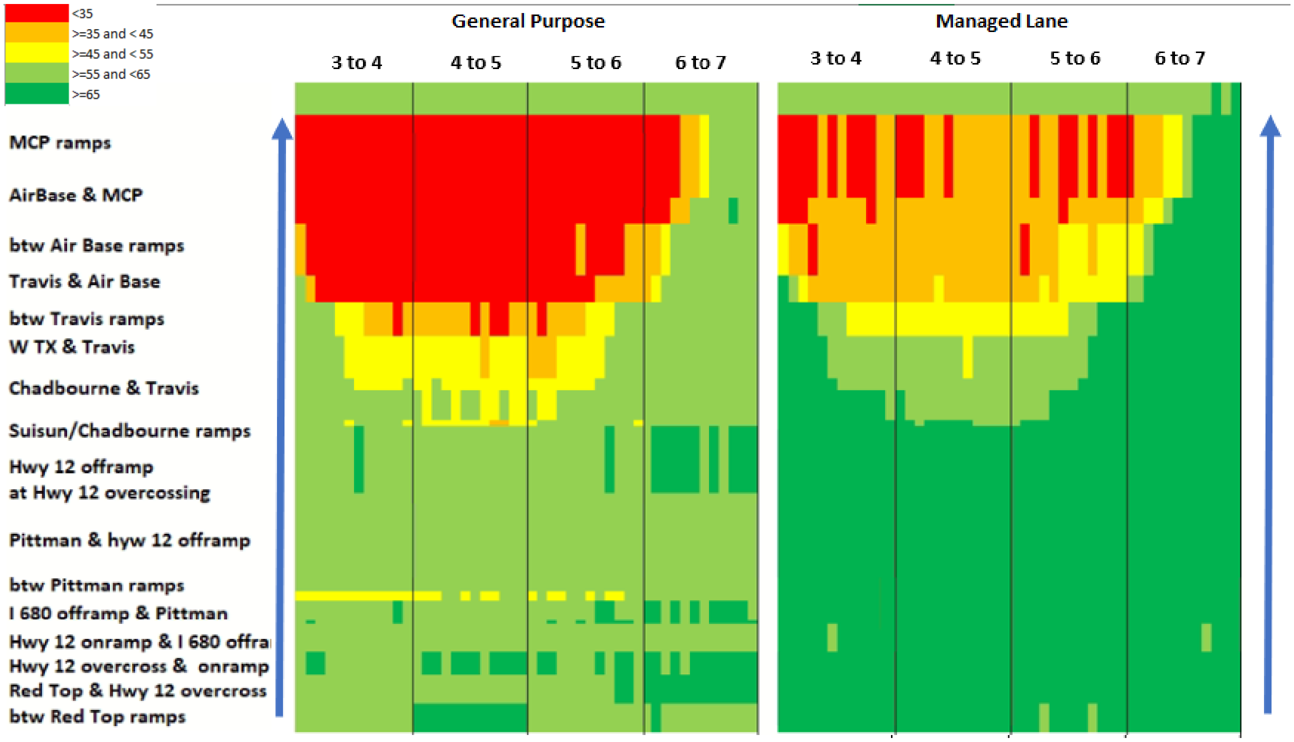
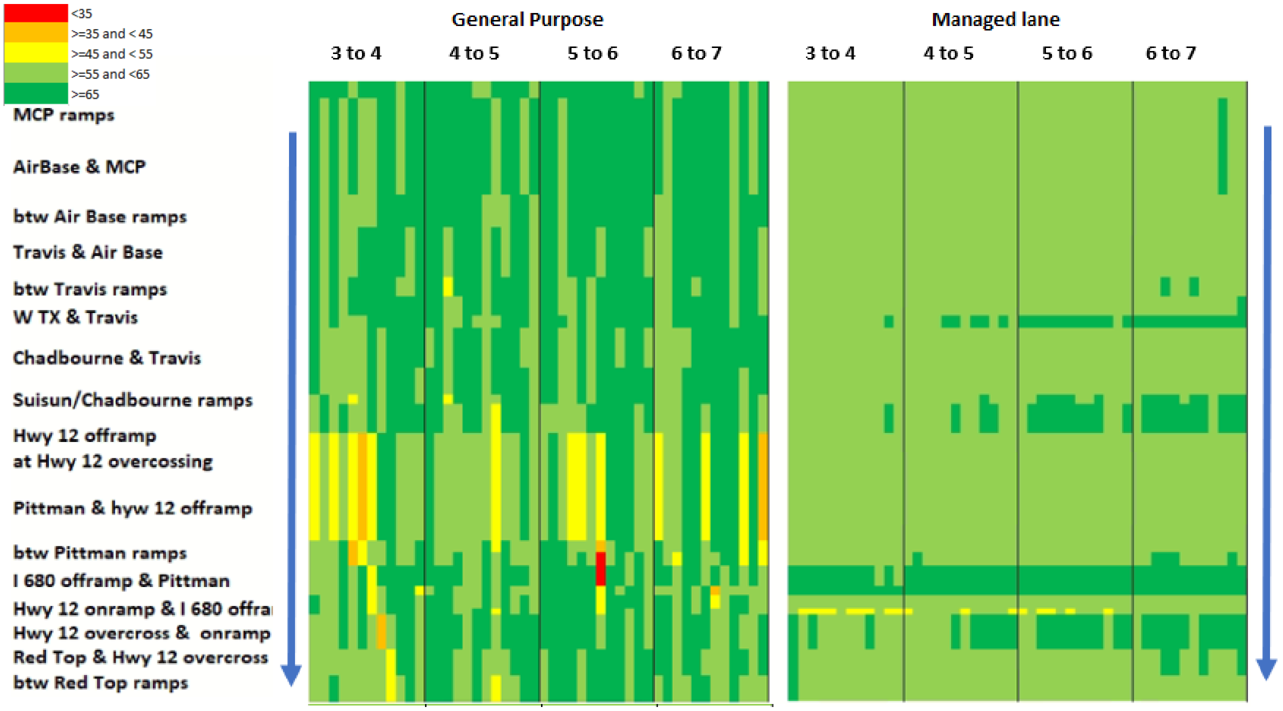


Figure 1-4: Calibrated Weekday Mainline Speed – Fairfield PM Peak Period – Westbound



I-80 Vallejo Study Area

Figure 1-5 and Figure 1-6 show the bottleneck comparison on the I-80 corridor eastbound and westbound directions during the AM period and PM period, respectively. During the AM peak period, the traffic in eastbound direction slows between the bridge toll plaza and off-ramp to Sonoma Boulevard. Along the remaining I-80 eastbound segments and entire westbound segments, the traffic moves with speeds higher than 55 mph, except for a few scattered spots with lower speeds.

During the PM peak period, eastbound traffic operates at very slow speeds. There are two eastbound bottlenecks that are currently integrated and affect one another. One bottleneck occurs approaching the on ramp from Tennessee Street. According to PeMS data, the mainline throughput before this on ramp is around 4,400 vehicles per hour, while the estimated ramp volume is around 1,000 vehicles per hour (note that the ramp volume estimate is based on 2012 ADT data and is the only available volume source at this location). The high volume, combined with some weaving which occurs downstream approaching the Redwood Street off-ramp creates the bottleneck. Travel time data suggests that drivers likely avoid the rightmost lane in the vicinity of the on ramp and they yield to the on ramp traffic. The queue from this bottleneck reaches to the next bottleneck after the I-780 on ramp. At this location, the PeMS volume before the on ramp is around 3,500 vehicles per hour, and the PeMS volume for the on ramp is around 1,300 vehicles per hour. The on ramp lane continues to the highway, and after a very short 180 foot weaving area, the rightmost lane of the mainline drops while the on ramp lanes continue to the freeway. This geometry and volume combination suggests that the on ramp volume force-merges onto I-80 aggressively, and mainline traffic will also likely be forced to yield to the merging on ramp traffic.

Figure 1-5: Calibrated Weekday Mainline Speed – Vallejo AM Peak Period

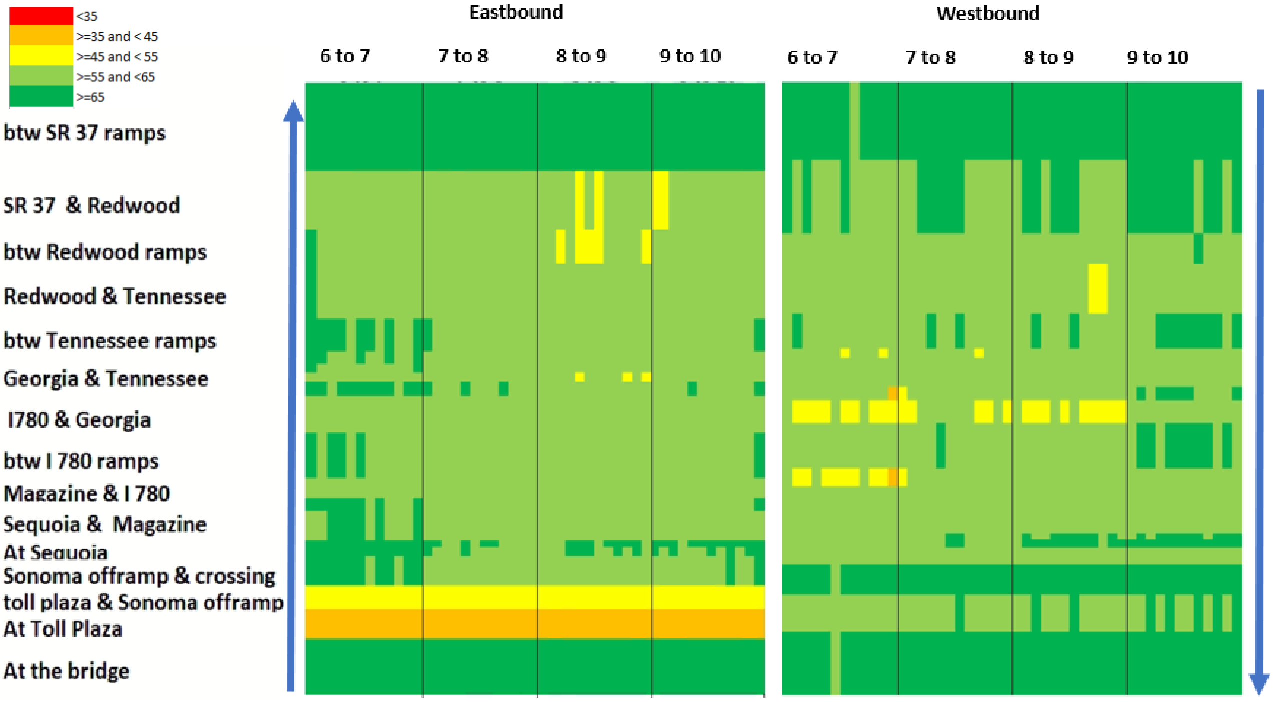
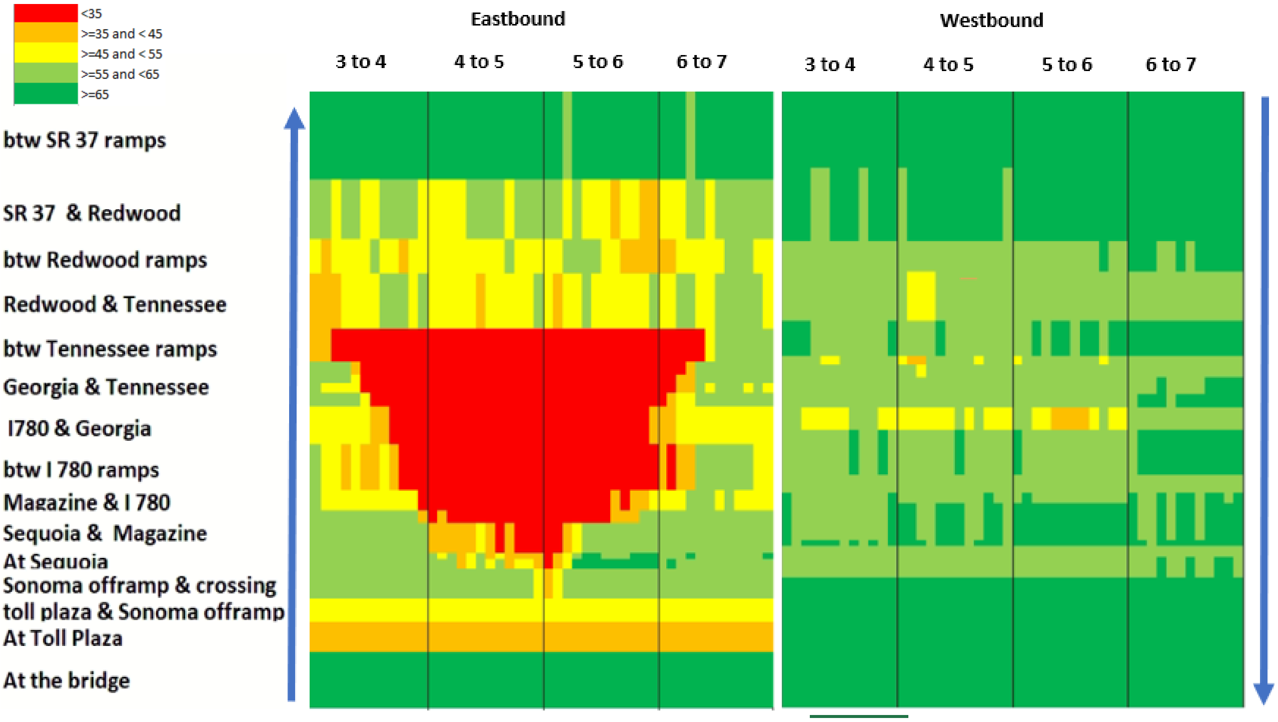


Figure 1-6: Calibrated Weekday Mainline Speed – Vallejo PM Peak Period



1.1.3 Travel Time and Delay

I-80 Fairfield Study Area

Table 3 and Table 4 summarize the average travel times and average vehicle delays for base year/existing scenario during AM and PM peak periods, respectively. VISSIM calculates delay as any length of time exceeding the free-flow travel time. During AM peak period, there is no delay in eastbound direction and less than a minute average delay in westbound direction.

Table 3: I-80 Fairfield Study Area Hourly Travel Time and Delay – Calibrated AM

Segment	Average Travel Time - minutes				Average Delay - minutes			
	6:00-7:00	7:00 - 8:00	8:00 - 9:00	9:00-10:00	6:00 - 7:00	7:00 - 8:00	8:00 - 9:00	9:00-10:00
Eastbound – GP	9:21	9:27	9:30	9:26	0:04	0:10	0:13	0:10
Eastbound – ML	8:37	8:51	8:54	8:49	0:00	0:00	0:00	0:00
Westbound – GP	9:59	10:11	9:46	9:38	0:11	0:10	0:09	0:04
Westbound - ML	8:55	8:57	8:43	8:52	0:00	0:00	0:00	0:00

Note: GP – General Purpose, ML – Managed Lane

During PM peak period, the average delay in eastbound direction is approximately 7 minutes, 8 minutes in general purpose and 5 minutes in managed lane. As mentioned earlier, there is bottleneck after Airbase Parkway where the HOV lane ends and the highway narrows from five to four lanes. This creates a bottleneck that extends to Pittman Road/Suisun Valley Road.

Table 4: I-80 Fairfield Study Area Hourly Travel Time and Delay – Calibrated PM

Segment	Average Travel Time - minutes				Average Delay - minutes			
	3:00 - 4:00	4:00 - 5:00	5:00 - 6:00	6:00 - 7:00	3:00 - 4:00	4:00 - 5:00	5:00 - 6:00	6:00 - 7:00
Eastbound – GP	19:39	19:08	17:44	11:36	10:22	9:52	8:27	2:19
Eastbound – ML	16:54	15:13	13:35	9:32	7:37	5:56	4:18	0:16
Westbound – GP	9:33	9:31	9:30	9:25	0:11	0:10	0:09	0:04
Westbound - ML	8:54	8:55	8:55	8:52	0:00	0:00	0:00	0:00

Note: GP – General Purpose, ML – Managed Lane

I-80 Vallejo Study Area

Table 5 and Table 6 summarize the average travel times and average vehicle delays for baseline scenario during AM and PM peak periods, respectively. VISSIM calculates delay as any length of time driven with a speed lower than speed limit of 65 mph. During AM peak period, there is less than a minute delay in both directions.

Table 5: I-80 Vallejo Study Area Hourly Travel Time and Delay – Calibrated AM

Segment	Average Travel Time - minutes				Average Delay - minutes			
	6:00-7:00	7:00 - 8:00	8:00 - 9:00	9:00-10:00	6:00 - 7:00	7:00 - 8:00	8:00 - 9:00	9:00-10:00
Eastbound	06:14	06:24	06:29	06:21	0:18	0:28	0:33	0:26
Westbound	06:11	06:07	06:07	06:01	0:44	0:40	0:40	0:34

During PM peak period, the average delay in eastbound direction is approximately 4 minutes. As mentioned earlier, there are two major bottlenecks in eastbound direction: near Tennessee Street on ramp and near Redwood Street off-ramp. In westbound direction, delay is less than a minute.

Table 6: I-80 Vallejo Study Area Hourly Travel Time and Delay – Calibrated PM

Segment	Average Travel Time - minutes				Average Delay - minutes			
	3:00-4:00	4:00 - 5:00	5:00 - 6:00	6:00-7:00	3:00-4:00	4:00 - 5:00	5:00 - 6:00	6:00-7:00
Eastbound	9:03	12:45	11:35	7:25	3:08	6:50	5:39	1:29
Westbound	6:05	6:07	6:07	5:58	0:38	0:41	0:40	0:32

1.2 Future No Build (Baseline)

1.2.1 Networkwide Measures of Effectiveness (MOE)

I-80 Fairfield Study Area

The results of the microsimulation model analyses for the VMT, VHD, VHT and average speed for Future No Build Scenario for the I-80 Fairfield Study Area are summarized in Table 7. The average speeds in the study area during the AM and PM peak period are 48 and 34 mph, respectively. During AM peak period, the average speeds are projected to reduce from 62 mph in existing conditions to 48 mph in future no build scenario. During PM peak period, the average speeds are projected to reduce from 45 mph in existing conditions to 34 mph in future no build scenario.

Table 7: I-80 Fairfield Study Area Corridor Wide MOE – Future No Build Scenario

MOE	AM Peak Period (6 to 10)	PM Peak Period (3 to 7)
Average Speed (mph)	48.1	34.0
Vehicle Hours of Delay (VHD)	2,881	8,056
Vehicle Miles of Travel (VMT)	516,623	564,825
Vehicle Hours of Travel (VHT)	10,734	16,630

I-80 Vallejo Study Area

The results of the microsimulation model analyses for the VMT, VHD, VHT and average speed for Future No Build Scenario for the I-80 Vallejo Study Area are summarized in Table 8. The average speeds in the study area during the AM and PM peak period are 50 and 29 mph, respectively. During AM peak period, the average speeds are projected to reduce from 62 mph in existing conditions to 50 mph in future no build scenario. During PM peak period, the average speeds are projected to reduce from 41 mph in existing conditions to 29 mph in future no build scenario.

Table 8: I-80 Vallejo Study Area Corridor Wide MOE – Future No Build Scenario

MOE	AM Peak Period (6 to 10)	PM Peak Period (3 to 7)
Average Speed (mph)	50.3	29.0
Vehicle Hours of Delay (VHD)	1,035	4,357
Vehicle Miles of Travel (VMT)	222,939	227,989
Vehicle Hours of Travel (VHT)	4,435	7,855

1.2.2 Speed Profile

I-80 Fairfield Study Area

Figure 1-7 and Figure 1-8 show the bottleneck comparison on the I-80 corridor eastbound and westbound directions during the AM peak period, respectively. During the AM peak period, the traffic flows at almost free flow speeds in the eastbound direction. In the westbound direction, congestions occur after the Highway 12 on ramp and before Suisan/Chadbourne ramps. Congestion after Highway 12 on ramp shows deterioration of an existing slowdown at this segment. Congestion before Suisun ramps is not present in existing conditions and occurs in future no build scenario due to higher demand.

Figure 1-7: Future No Build Weekday Eastbound Speed – Fairfield AM Peak Period

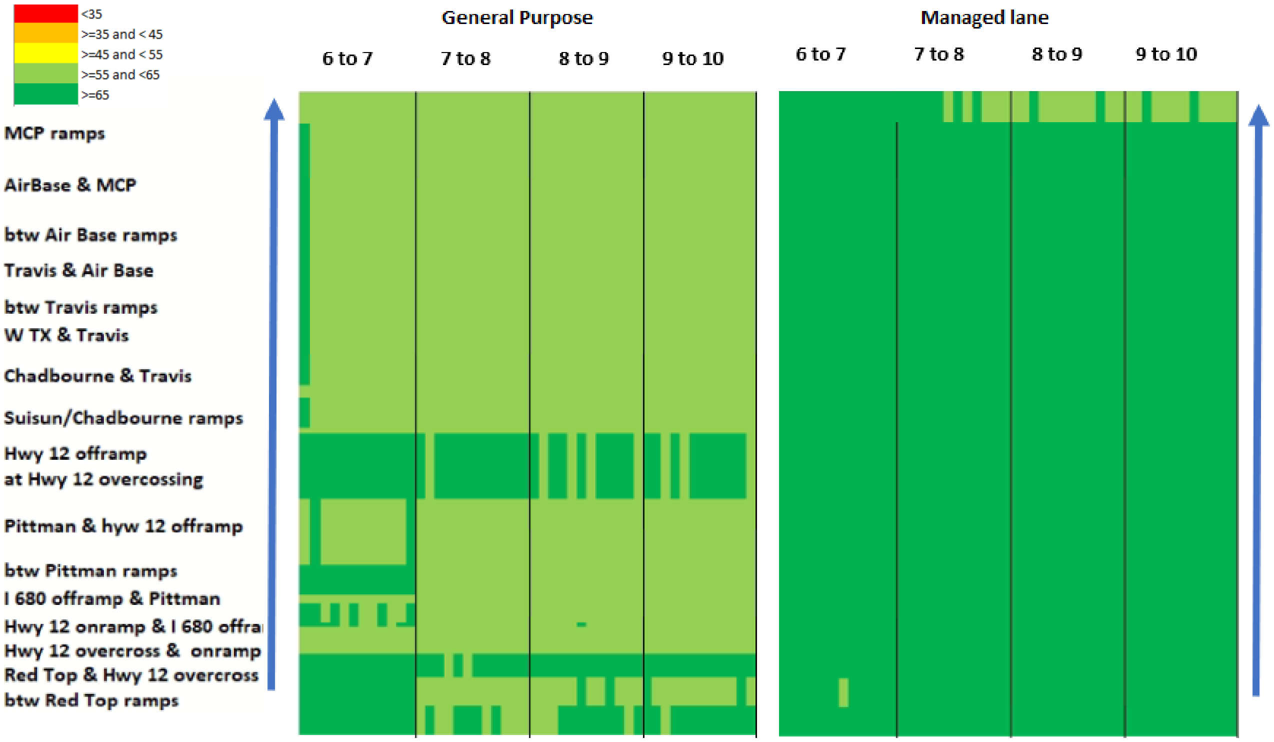


Figure 1-8: Future No Build Weekday Westbound Speed – Fairfield AM Peak Period

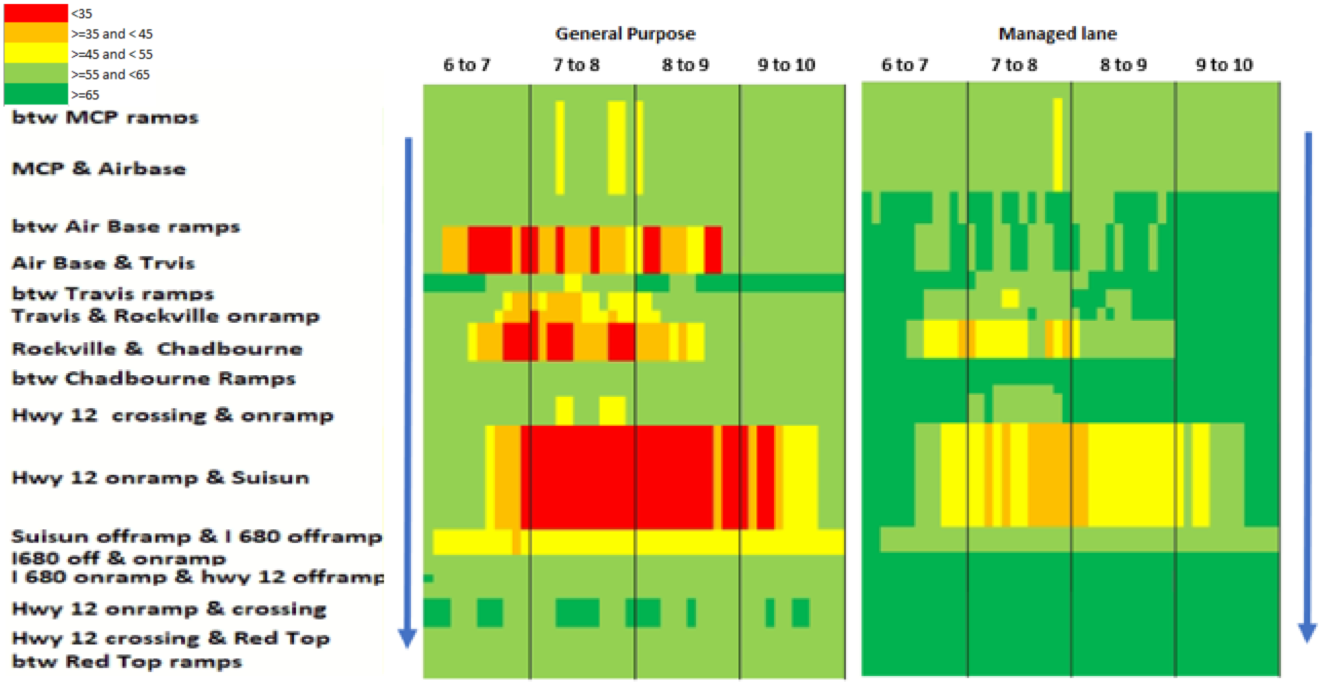


Figure 1-9 and Figure 1-10 show the bottleneck comparison on the I-80 corridor eastbound and westbound directions during the PM peak period, respectively. During the PM peak period, the eastbound direction is projected to be congested with bottlenecks near the I-680 off-ramp and after Airbase Parkway. In the westbound direction, traffic flows are almost at free flow speeds. During both AM and PM peak periods, the congestion is projected to be longer in the future no build scenario than in existing conditions.

Figure 1-9: Future No Build Weekday Eastbound Speed – Fairfield PM Peak Period

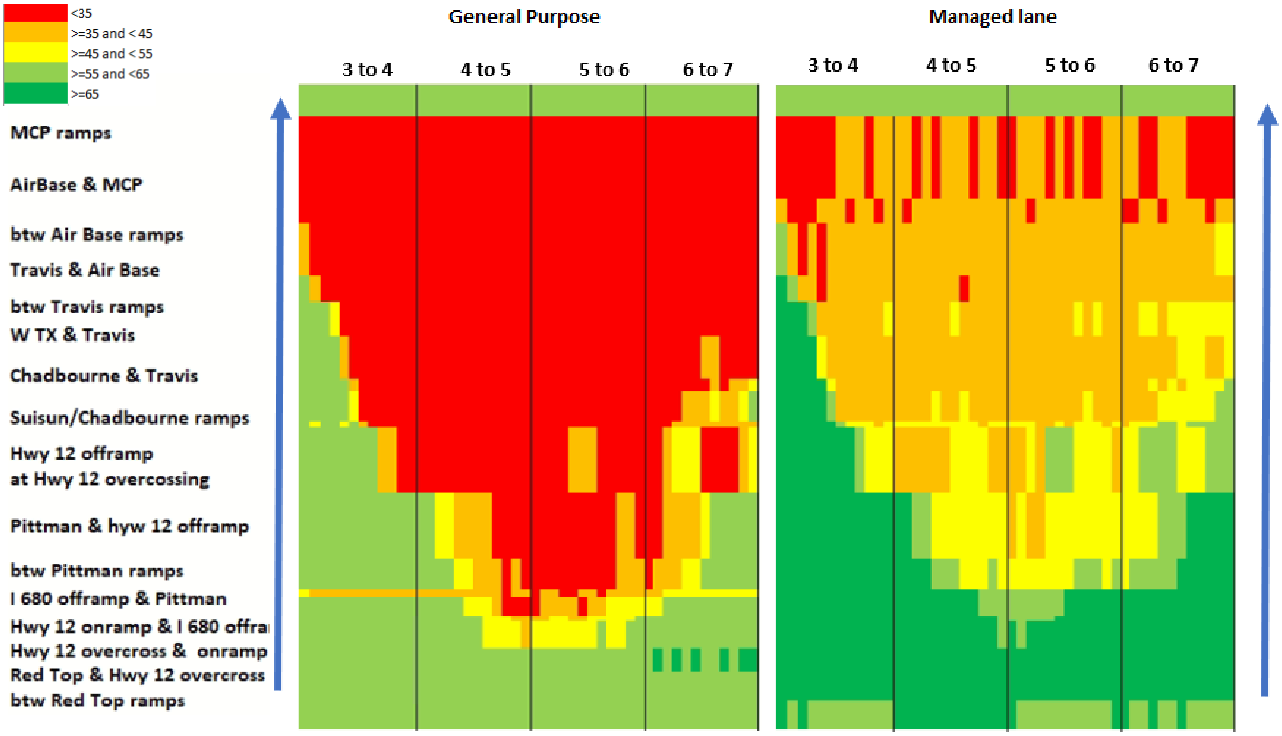
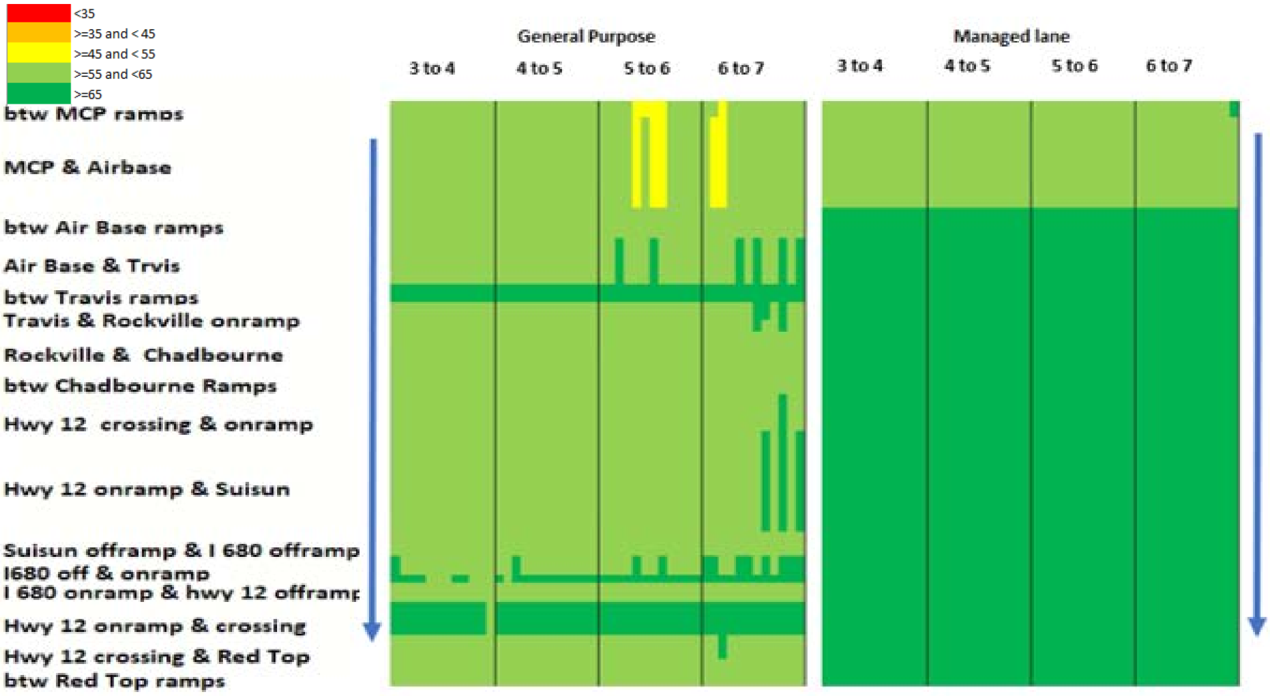


Figure 1-10: Future No Build Weekday Westbound Speed – Fairfield PM Peak Period



I-80 Vallejo Study Area

Figure 1-11 and Figure 1-12 show the bottleneck comparison on the I-80 corridor eastbound and westbound directions during the AM period and PM period, respectively. During the AM peak period, the traffic in the eastbound direction slows between the bridge toll plaza and off-ramp to Sonoma Boulevard, similar to existing conditions. In the westbound direction, congestion occurs near I-780 which extends till Redwood Parkway. This congestion is not present in existing conditions and occurs in future no build scenario due to higher demand.

During the PM peak period, eastbound traffic is projected to operate at very slow speeds. The existing congestion near Tennessee Street on ramp is projected to increase till Carquinez Bridge under future no build scenario. In westbound direction, the traffic flows at high speeds, with few scattered spots of low speeds near I-780 and Tennessee Street.

Figure 1-11: Future No Build Weekday Mainline Speed – Vallejo AM Peak Period

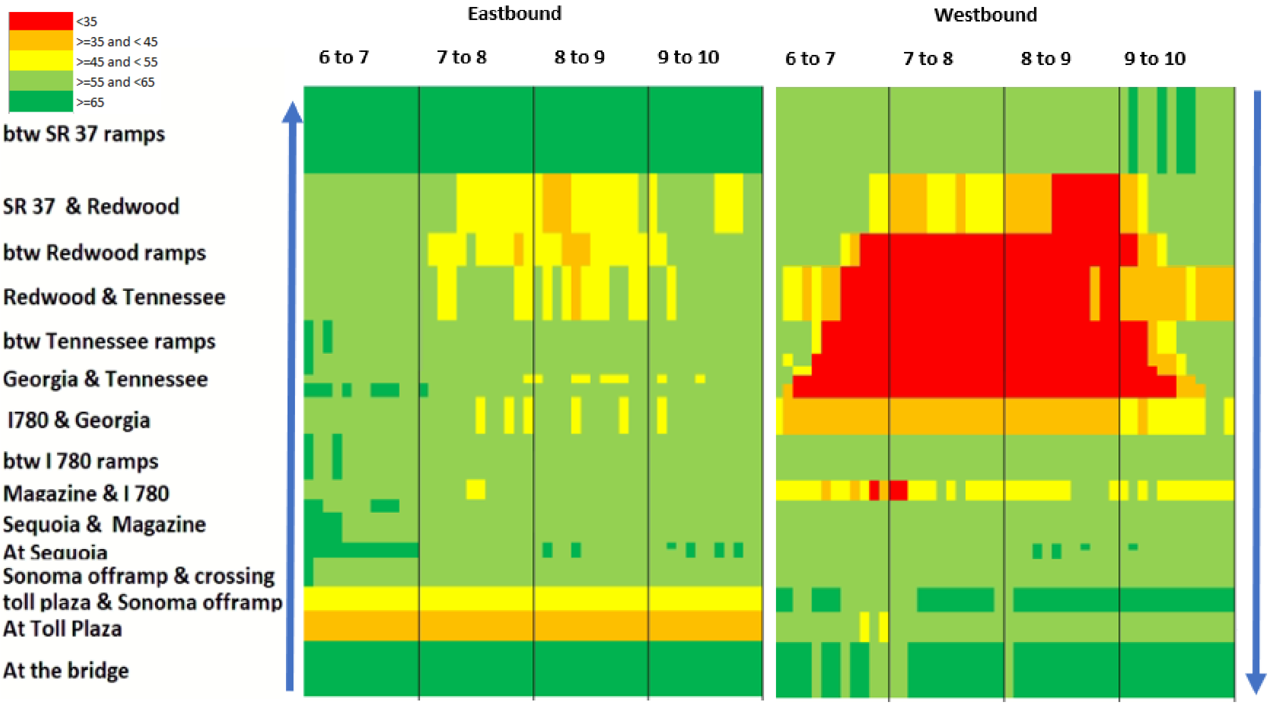
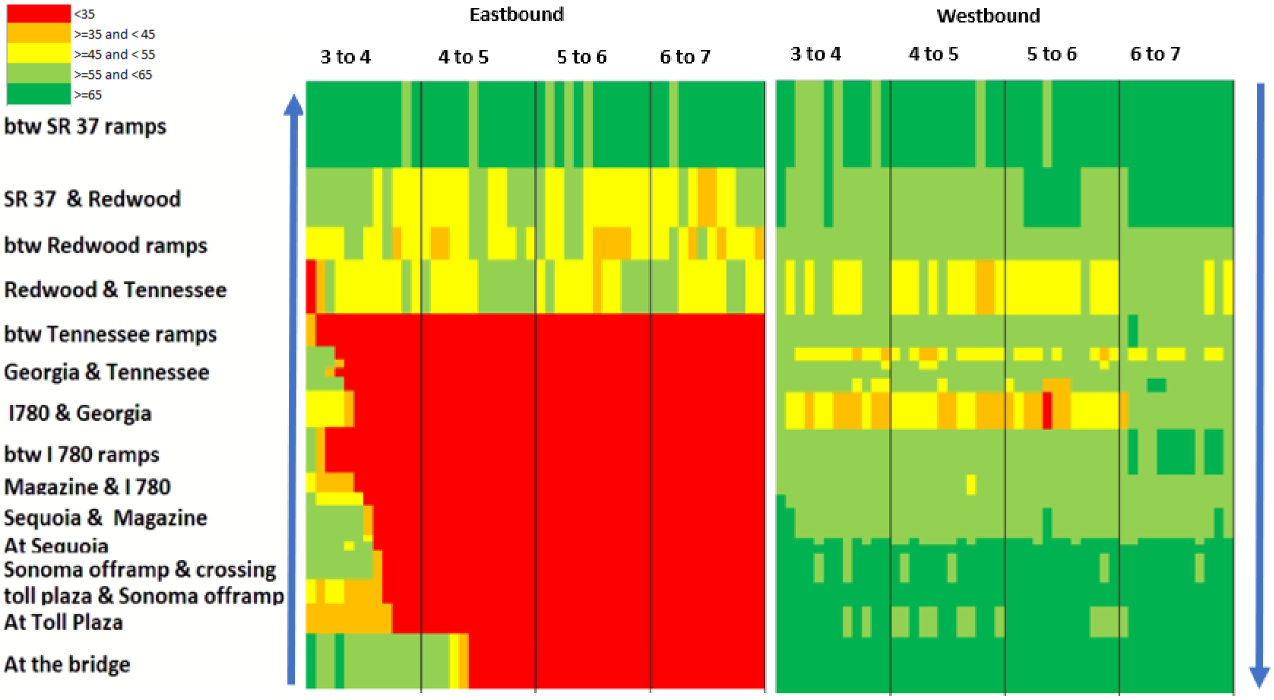


Figure 1-12: Future No Build Weekday Mainline Speed – Vallejo PM Peak Period



1.2.3 Travel Time and Delay

I-80 Fairfield Study Area

Table 9 and Table 10 summarize the average travel times and average vehicle delays for Future No Build scenario during AM and PM peak periods, respectively. During AM peak period, similar to existing conditions, there is no delay in eastbound direction. Average delay in westbound direction is 3 minutes, 4 minutes in general purpose and 2 minutes in managed lane.

Table 9: I-80 Fairfield Study Area Hourly Travel Time and Delay - Future No Build AM

Segment	Average Travel Time - minutes				Average Delay - minutes			
	6:00-7:00	7:00 - 8:00	8:00 - 9:00	9:00-10:00	6:00 - 7:00	7:00 - 8:00	8:00 - 9:00	9:00-10:00
Eastbound – GP	9:26	9:36	9:39	9:38	0:09	0:19	0:22	0:21
Eastbound – ML	8:41	8:55	8:57	8:55	0:00	0:00	0:00	0:00
Westbound – GP	12:25	15:29	13:48	11:59	3:04	6:08	4:27	2:38
Westbound - ML	11:05	13:29	12:14	11:00	1:44	4:08	2:53	1:39

Note: GP – General Purpose, ML – Managed Lane

During PM peak period, the average delay in eastbound direction is 15 minutes in general purpose and 10 minutes in managed lane. In westbound direction, there will be around one minute delay in general purpose or managed lane.

Table 10: I-80 Fairfield Study Area Hourly Travel Time and Delay - Future No Build PM

Segment	Average Travel Time - minutes				Average Delay - minutes			
	3:00 - 4:00	4:00 - 5:00	5:00 - 6:00	6:00 - 7:00	3:00 - 4:00	4:00 - 5:00	5:00 - 6:00	6:00 - 7:00
Eastbound – GP	21:49	27:01	28:55	21:41	12:32	17:44	19:38	12:25
Eastbound – ML	18:23	20:42	21:15	17:20	9:07	11:26	11:59	8:03
Westbound – GP	9:48	9:52	11:12	10:31	0:27	0:31	1:51	1:10
Westbound - ML	9:08	9:13	10:28	9:52	0:00	0:00	1:07	0:31

Note: GP – General Purpose, ML – Managed Lane

I-80 Vallejo Study Area

Table 11 and Table 12 summarize the average travel times and average vehicle delays for Future No Build scenario during AM and PM peak periods, respectively. During AM peak period, there is less than a minute delay in eastbound direction. In westbound direction, the average delay is expected to increase from no delay in exiting condition to approximately 3 minutes in future no build scenario.

Table 11: I-80 Vallejo Study Area Hourly Travel Time and Delay - Future No Build AM

Segment	Average Travel Time - minutes				Average Delay - minutes			
	6:00-7:00	7:00 - 8:00	8:00 - 9:00	9:00-10:00	6:00 - 7:00	7:00 - 8:00	8:00 - 9:00	9:00-10:00
Eastbound	06:17	06:39	06:49	06:30	0:22	0:44	0:54	0:35
Westbound	08:30	10:20	09:27	07:07	3:03	4:53	4:00	1:41

During PM peak period, the average delay in eastbound direction is projected to increase from 6 minutes in existing conditions to approximately 14 minutes in future no build scenario. In westbound direction, average delay will be less than a minute in future no build scenario.

Table 12: I-80 Vallejo Study Area Hourly Travel Time and Delay - Future No Build PM

Segment	Average Travel Time - minutes				Average Delay - minutes			
	3:00 - 4:00	4:00 - 5:00	5:00 - 6:00	6:00 - 7:00	3:00 - 4:00	4:00 - 5:00	5:00 - 6:00	6:00 - 7:00
Eastbound	12:05	20:38	24:13	23:13	6:09	14:42	18:18	17:18
Westbound	06:15	06:19	06:17	06:06	0:48	0:52	0:51	0:39

1.3 Future Build Scenario 1 (HOV 2+)

1.3.1 Networkwide Measures of Effectiveness (MOE)

I-80 Fairfield Study Area

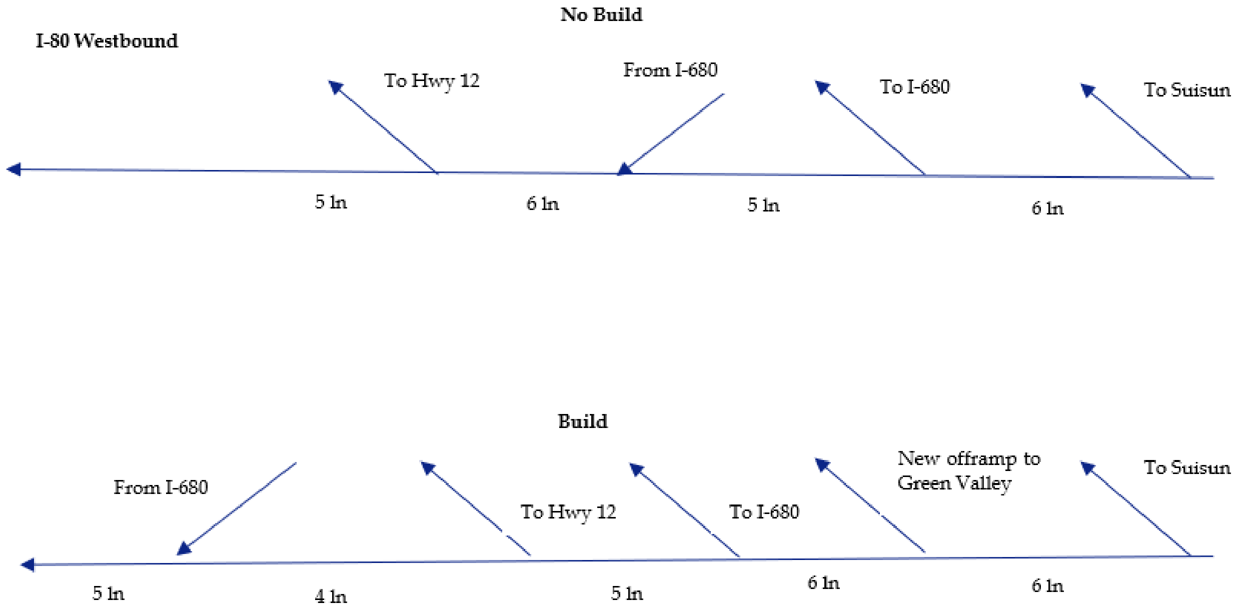
The results of the microsimulation model analyses for the VMT, VHD, VHT and average speed for Future Build Scenario 1 for the I-80 Fairfield Study Area are summarized in Table 13.

Despite our initial expectation, during AM peak period, the average speeds are projected to reduce from 48 mph in no build scenario to 37 mph in future build scenario 1. This is due to new bottlenecks that are projected by the model in westbound direction near I-680, as described below:

In the No build scenario in the westbound direction, there is currently a slowdown at the truck scales and at the lane drop after Hwy 12 on ramp. These contribute to metering the traffic from Hwy 12 on ramp. In build scenarios, the slowdown at the truck scale is resolved, and there is auxiliary lane between Hwy 12 and the truck scales. These changes contribute to higher throughput upstream of the offramp to I-680 in build scenarios. The extension of auxiliary lane in the build scenarios also provides the opportunity to adjust the existing ramp metering rate, allowing higher flow rate at this on ramp. Based on model results, it seems that this higher throughput worsens the traffic operation upstream of the off-ramp to I-680 and creates a new bottleneck, as shown in the heat maps for build alternatives, westbound, during AM peak. The proposed geometry is also quite different in build scenarios around offramps to I-680 and Hwy 12. In No Build, these offramps are 3,300 ft apart. In the build scenarios, they are coded 900 ft apart. The provided conceptual future design was not clear but showed these ramps very close to each other. Shorter distance between these two offramps that carry 5,000 vehicles during peak hour also contributes to the new bottleneck in build scenarios. Number of lanes around this area are also different in No build and build scenarios. Figure 1-11 shows the key differences between No Build and build scenarios along westbound before Suisun Valley Road and after Hwy 12 offramp.

These changes do not create a bottle during PM peak, because westbound is not as congested as AM peak. During the PM peak period, the average speeds are projected to increase from 34 mph in no build scenario to 60 mph in future build scenario 1.

Figure 1-13 Geometry Difference Between No Build and Build – I-80 westbound



This finding requires further detailed review and may require reassessment of the proposed improvements in this area.

Table 13: I-80 Fairfield Study Area Corridor Wide MOE – Future Build Scenario 1

MOE	AM Peak Period (6 to 10)	PM Peak Period (3 to 7)
Average Speed (mph)	36.7	60.1
Vehicle Hours of Delay (VHD)	6,424	834
Vehicle Miles of Travel (VMT)	536,390	596,475
Vehicle Hours of Travel (VHT)	14,607	9,925

I-80 Vallejo Study Area

The results of the microsimulation model analyses for the VMT, VHD, VHT and average speed for Future Build Scenario 1 for the I-80 Vallejo Study Area are summarized in Table 14. The average speeds in the study area during the AM and PM peak period are 60 and 57 mph, respectively. During AM peak period, the average speeds are projected to increase from 50 mph in no build scenario to 60 mph in future build scenario 1. During PM peak period, the average speeds are projected to increase from 29 mph in no build scenario to 57 mph in future build scenario 1.

Table 14: I-80 Vallejo Study Area Corridor Wide MOE – Future Build Scenario 1

MOE	AM Peak Period	PM Peak Period
Average Speed (mph)	60.4	57.1
Vehicle Hours of Delay (VHD)	296	529
Vehicle Miles of Travel (VMT)	226,682	244,140
Vehicle Hours of Travel (VHT)	3,753	4,276

1.3.2 Speed Profile

I-80 Fairfield Study Area

Figure 1-14 and Figure 1-15 show the bottleneck comparison on the I-80 corridor during AM peak period for eastbound and westbound directions, respectively. These figures illustrate speeds of general purpose and managed lane. During the AM peak period, the traffic flows at almost free flow speeds in the eastbound direction. In the westbound direction, congestion occurs after the Highway 12 on ramp and before Suisan/Chadbourne ramps. In both directions, managed lane has higher speeds than the general purpose lane.

Figure 1-14: Future Build Scenario 1 Weekday Eastbound Speed – Fairfield AM Peak Period

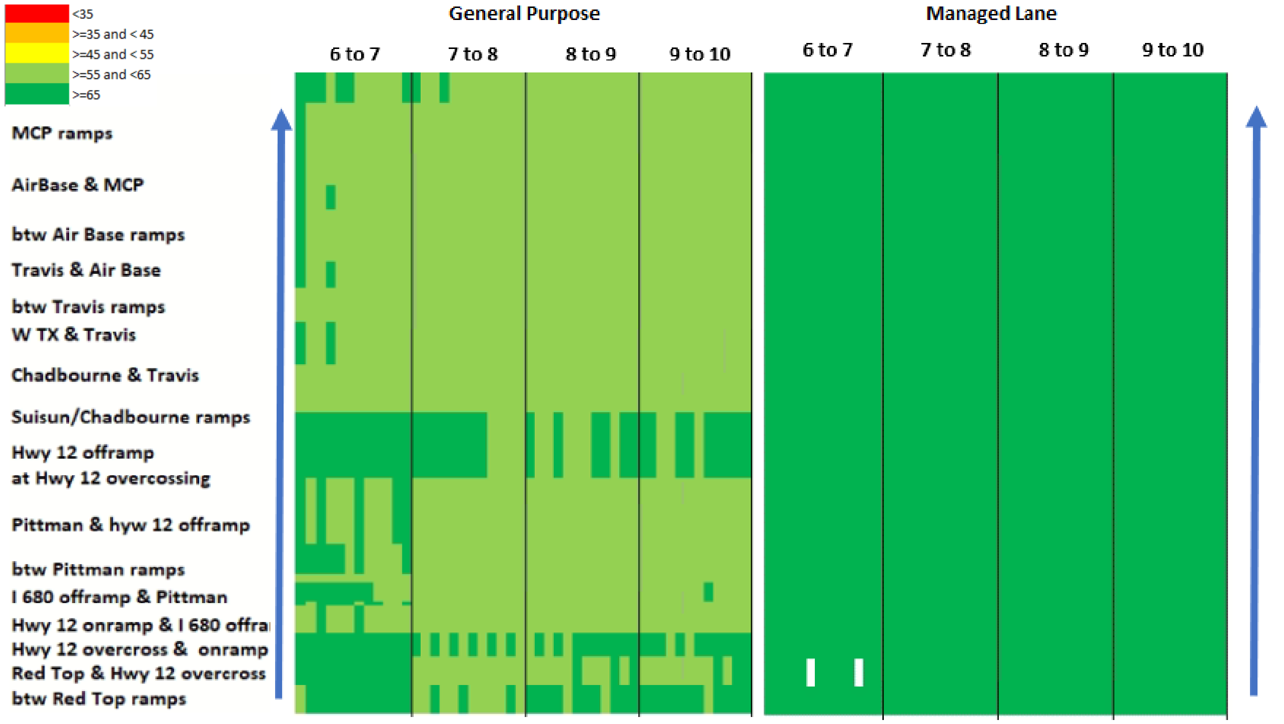


Figure 1-15: Future Build Scenario 1 Weekday Westbound Speed - Fairfield AM Peak Period

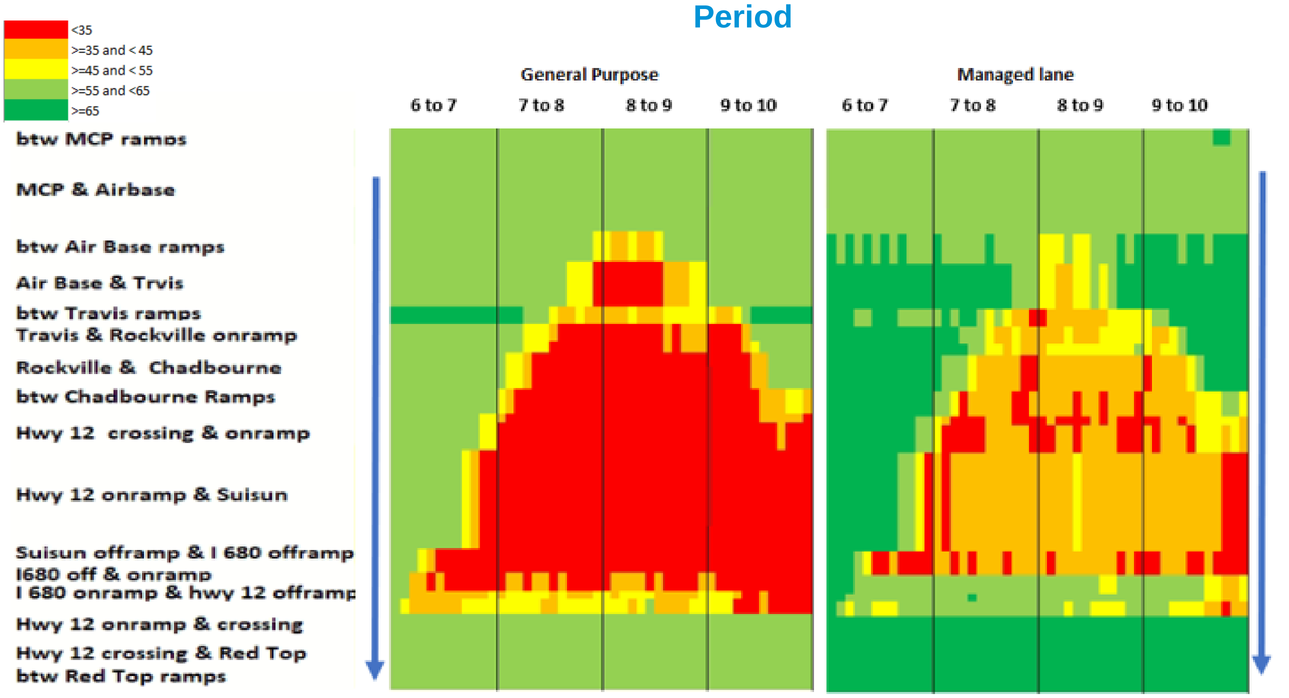


Figure 1-16 and Figure 1-17 show the bottleneck comparison on the I-80 corridor during PM peak period for eastbound and westbound directions, respectively. During PM peak period, in eastbound direction, there no bottlenecks. The bottleneck under future no build scenario near I-680 off-ramp and after Airbase Parkway will not be present under future build scenario 1 due to the addition of the HOV lane. In the westbound direction, traffic flows are almost at free flow speeds.

Figure 1-16: Future Build Scenario 1 Weekday Eastbound Speed – Fairfield PM Peak Period

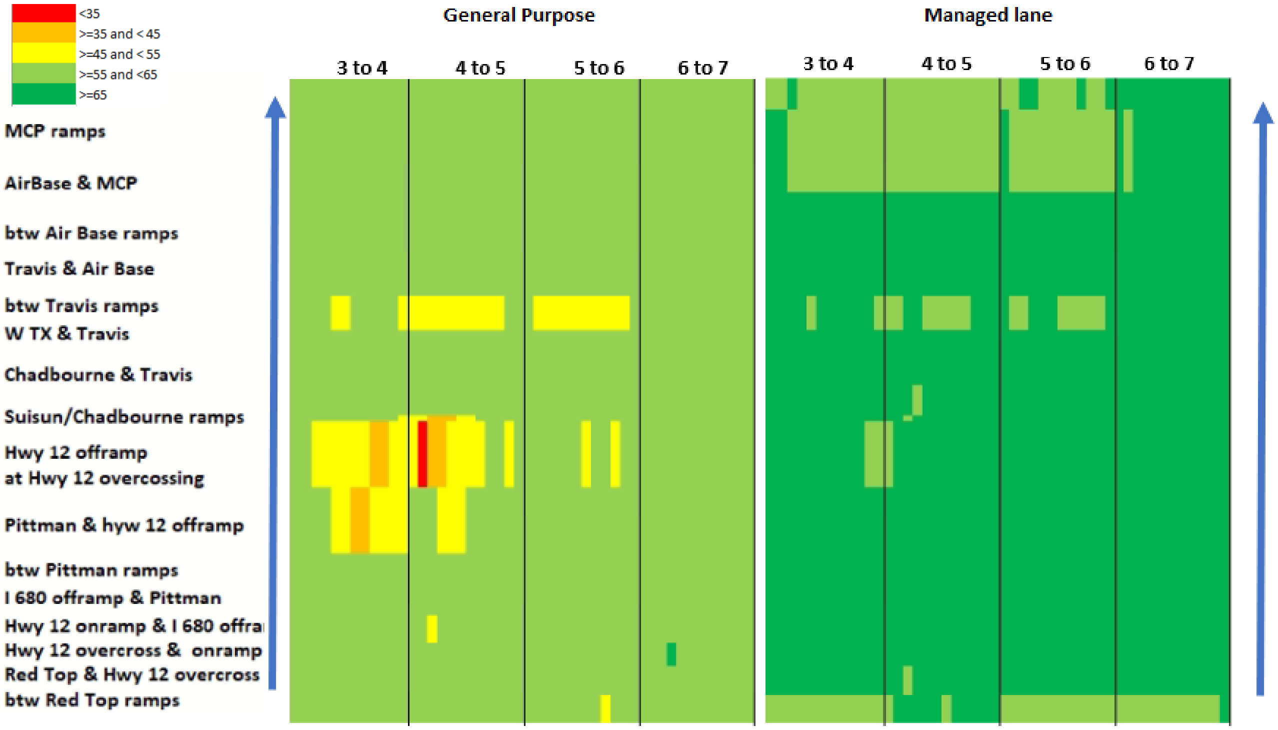
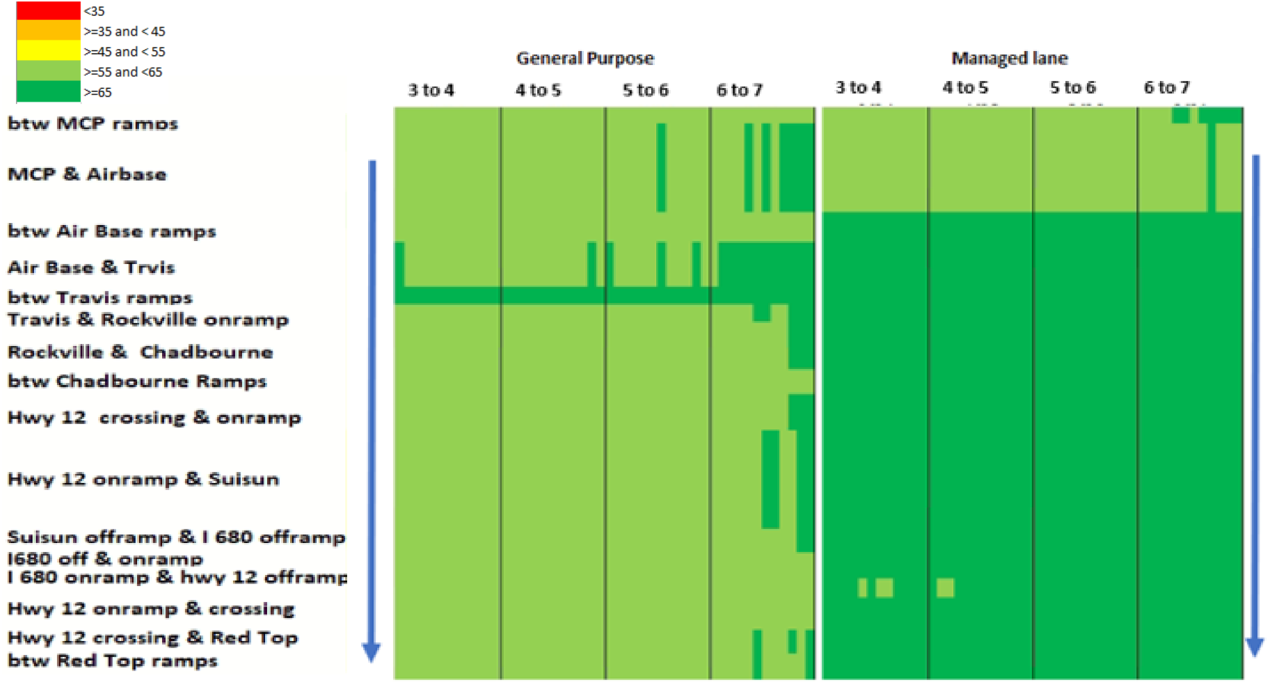


Figure 1-17: Future Build Scenario 1 Weekday Westbound Speed – Fairfield PM Peak Period



I-80 Vallejo Study Area

Figure 1-18 and Figure 1-19 show the bottleneck comparison on the I-80 corridor during AM peak period for eastbound and westbound directions, respectively. During the AM peak period, the traffic in the eastbound direction slows between the bridge toll plaza and off-ramp to Sonoma Boulevard, similar to existing and future no build conditions. In the westbound direction, traffic flows are almost at free flow speeds. There is congestion in no build scenario near I-780 which extends to Redwood Parkway. This congestion will be mitigated due to the addition of the HOV lane.

Figure 1-18: Future Build Scenario 1 Weekday Eastbound Speed – Vallejo AM Peak Period

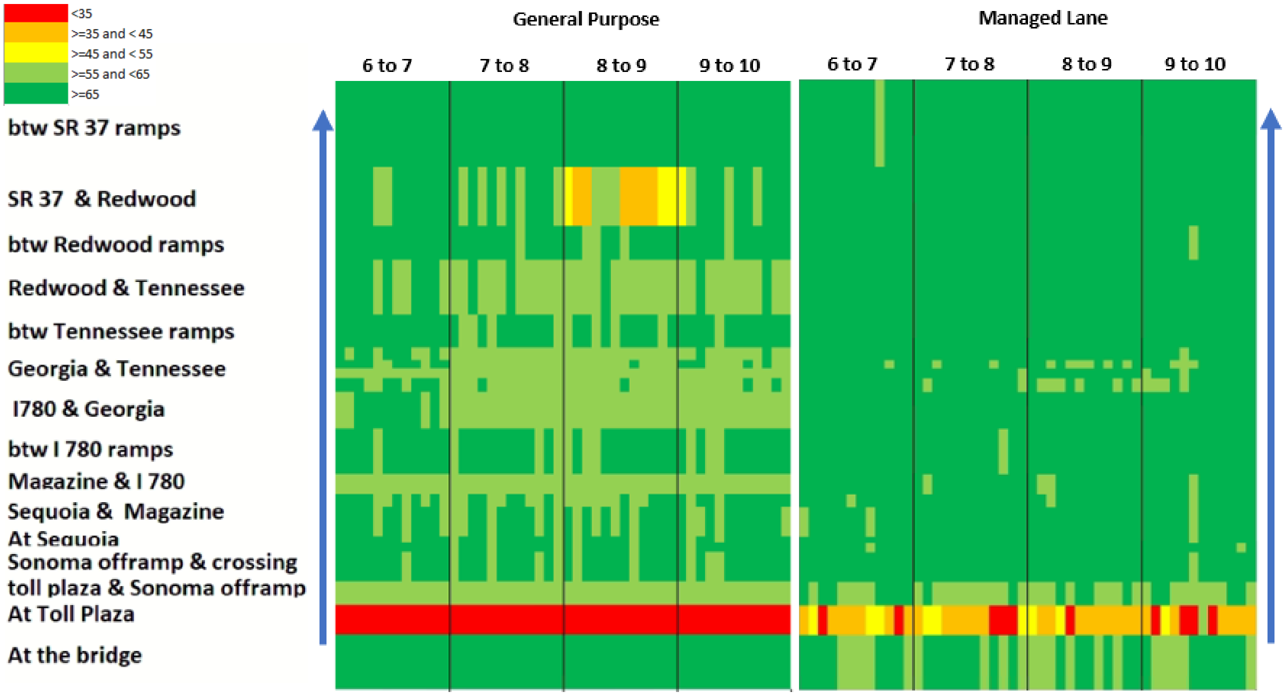


Figure 1-19: Future Build Scenario 1 Weekday Westbound Speed – Vallejo AM Peak Period

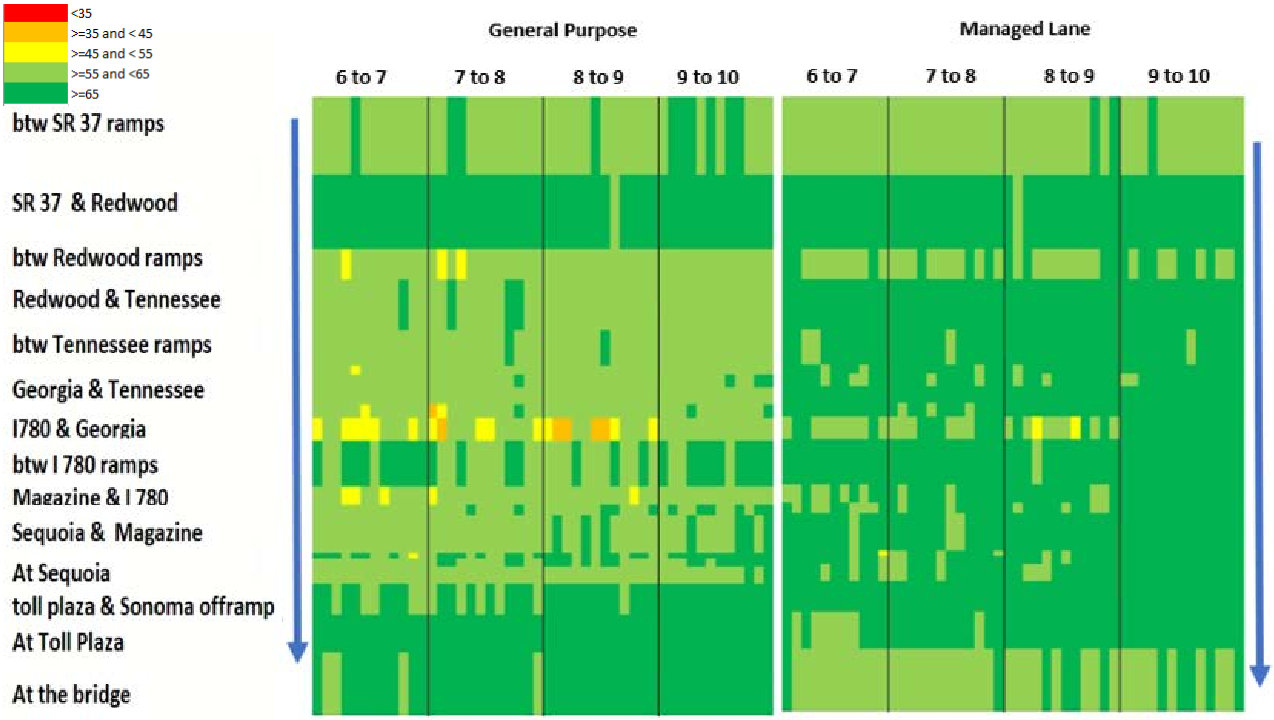


Figure 1-20 and Figure 1-21 show the bottleneck comparison on the I-80 corridor during PM peak period for eastbound and westbound directions, respectively. During PM peak period, in both eastbound and westbound direction, traffic flows close to free-flow speeds. The traffic in eastbound direction slows between the bridge toll plaza and off-ramp to Sonoma Boulevard.

Figure 1-20: Future Build Scenario 1 Weekday Eastbound Speed – Vallejo PM Peak Period

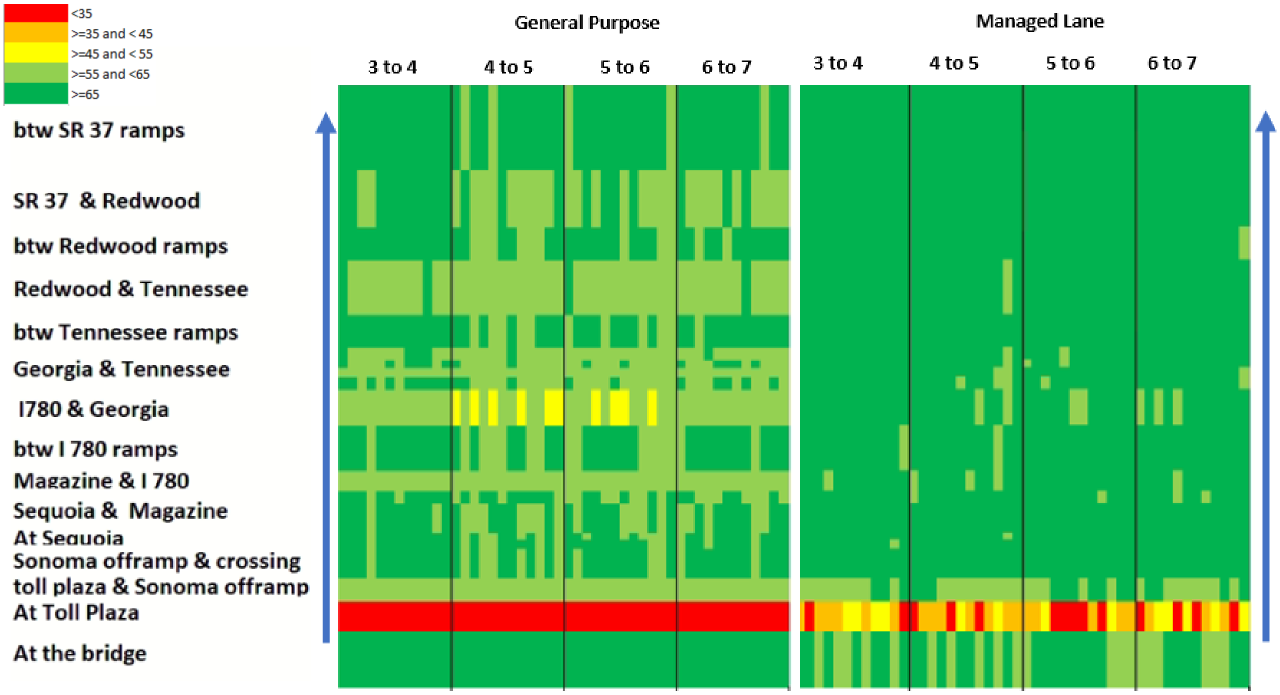
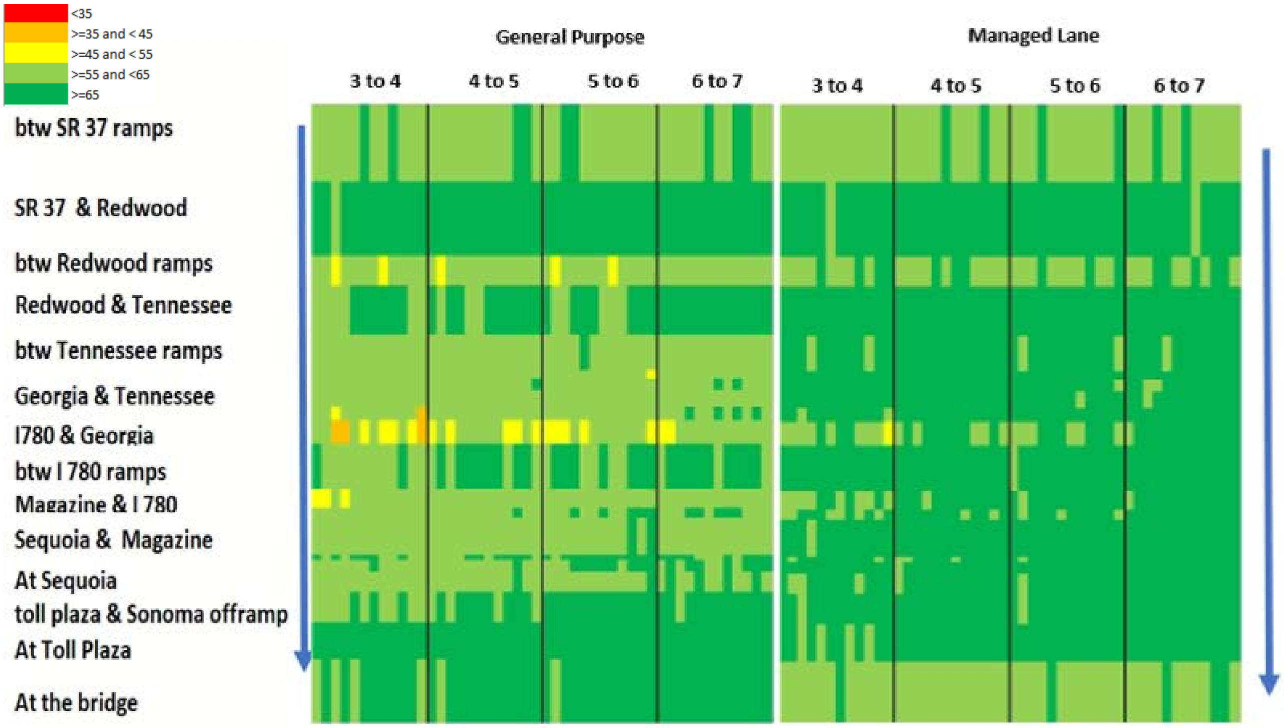


Figure 1-21: Future Build Scenario 1 Weekday Westbound Speed – Vallejo PM Peak Period



1.3.3 Travel Time and Delay

I-80 Fairfield Study Area

Table 15 and Table 16 summarize the average travel times and average vehicle delays for Future Build Scenario 1 during AM and PM peak periods, respectively. During AM peak period, similar to future no build scenario, there is no delay in eastbound direction. In westbound direction, the average delay is approximately 10 minutes in general purpose and 7 minutes in managed lane. The average delay for managed lane in westbound direction will be approximately a minute.

Table 15: I-80 Fairfield Study Area Hourly Travel Time and Delay - Future Build Scenario 1 AM

Segment	Average Travel Time - minutes				Average Delay - minutes			
	6:00-7:00	7:00 - 8:00	8:00 - 9:00	9:00-10:00	6:00 - 7:00	7:00 - 8:00	8:00 - 9:00	9:00-10:00
Eastbound – GP	9:23	9:29	9:29	9:28	0:07	0:12	0:12	0:12
Eastbound – ML	8:34	8:44	8:44	8:42	0:00	0:00	0:00	0:00
Westbound – GP	12:56	21:32	24:49	20:36	3:35	12:11	15:28	11:15
Westbound - ML	11:36	18:08	20:04	17:43	2:15	8:47	10:43	8:22

Note: GP – General Purpose, ML – Managed Lane

During PM peak period, there will be minimal delay in both eastbound and westbound directions.

Table 16: I-80 Fairfield Study Area Hourly Travel Time and Delay - Future Build Scenario 1 PM

Segment	Average Travel Time - minutes				Average Delay - minutes			
	3:00-4:00	4:00 - 5:00	5:00 - 6:00	6:00-7:00	3:00-4:00	4:00 - 5:00	5:00 - 6:00	6:00-7:00
Eastbound – GP	10:26	10:24	10:04	9:45	1:09	1:07	0:48	0:28
Eastbound – ML	9:27	9:24	9:15	9:03	0:10	0:08	0:00	0:00
Westbound – GP	9:38	9:43	9:41	10:06	0:17	0:22	0:20	0:45
Westbound - ML	8:58	9:03	9:04	9:29	0:00	0:00	0:00	0:08

Note: GP – General Purpose, ML – Managed Lane

I-80 Vallejo Study Area

Table 17 and Table 18 summarize the average travel times and average vehicle delays for Future Build Scenario 1 during AM and PM peak periods, respectively. VISSIM calculates delay as any length of time exceeding the free-flow travel time. During both AM and PM peak periods, there will be minimal delay in both eastbound and westbound directions.

Table 17: I-80 Vallejo Study Area Hourly Travel Time and Delay - Future Build Scenario 1 AM

Segment	Average Travel Time - minutes				Average Delay - minutes			
	6:00-7:00	7:00 - 8:00	8:00 - 9:00	9:00-10:00	6:00 - 7:00	7:00 - 8:00	8:00 - 9:00	9:00-10:00
Eastbound – GP	6:13	6:24	6:44	6:26	0:18	0:29	0:49	0:30
Eastbound – ML	6:05	6:13	6:33	6:16	0:09	0:18	0:38	0:21
Westbound – GP	6:24	6:20	6:18	6:10	0:57	0:53	0:51	0:43
Westbound - ML	6:09	6:06	6:05	5:58	0:42	0:40	0:38	0:31

Note: GP – General Purpose, ML – Managed Lane

Table 18: I-80 Vallejo Study Area Hourly Travel Time and Delay - Future Build Scenario 1 PM

Segment	Average Travel Time - minutes				Average Delay - minutes			
	3:00-4:00	4:00 - 5:00	5:00 - 6:00	6:00-7:00	3:00-4:00	4:00 - 5:00	5:00 - 6:00	6:00-7:00
Eastbound – GP	7:29	7:18	6:36	6:26	1:33	1:22	0:40	0:31
Eastbound – ML	7:08	7:00	6:22	6:16	1:13	1:05	0:26	0:20
Westbound – GP	6:11	6:12	6:07	6:01	0:44	0:45	0:40	0:35
Westbound - ML	5:59	6:01	5:54	5:52	0:33	0:34	0:27	0:26

Note: GP – General Purpose, ML – Managed Lane

1.4 Future Build Scenario 2 (HOT 2+)

1.4.1 Networkwide Measures of Effectiveness (MOE)

I-80 Fairfield Study Area

The results of the microsimulation model analyses for the VMT, VHD, VHT and average speed for Future Build Scenario 2 for the I-80 Fairfield Study Area are summarized in Table 19. The average speeds in the study area during the AM and PM peak period are 38 and 60 mph, respectively. During AM peak period, the average speeds are projected to reduce from 48 mph in no build scenario to 38 mph in future build scenario 2. This is due to new bottleneck in westbound direction near I-680. During PM peak period, the average speeds are projected to increase from 34 mph in no build scenario to 60 mph in future build scenario 2.

Table 19: I-80 Fairfield Study Area Corridor Wide MOE – Future Build Scenario 2

MOE	AM Peak Period (6 to 10)	PM Peak Period (3 to 7)
Average Speed (mph)	38.2	60.1
Vehicle Hours of Delay (VHD)	5,941	841
Vehicle Miles of Travel (VMT)	544,873	596,217
Vehicle Hours of Travel (VHT)	14,253	9,926

I-80 Vallejo Study Area

The results of the microsimulation model analyses for the VMT, VHD, VHT and average speed for Future Build Scenario 2 for the I-80 Vallejo Study Area are summarized in Table 20. The average speeds in the study area during the AM and PM peak period are 60 and 58 mph, respectively. During AM peak period, the average speeds are projected to increase from 50 mph in no build scenario to 60 mph in future build scenario 2. During PM peak period, the average speeds are projected to increase from 29 mph in no build scenario to 58 mph in future build scenario 2.

Table 20: I-80 Vallejo Study Area Corridor Wide MOE – Future Build Scenario 2

MOE	AM Peak Period	PM Peak Period
Average Speed (mph)	60.3	58.5
Vehicle Hours of Delay (VHD)	301	415
Vehicle Miles of Travel (VMT)	226,485	239,333
Vehicle Hours of Travel (VHT)	3,755	4,089

1.4.2 Speed Profile

I-80 Fairfield Study Area

Figure 1-22 and Figure 1-23 show the bottleneck comparison on the I-80 corridor during AM peak period for eastbound and westbound directions, respectively. These figures illustrate speeds of general purpose and managed lane. During the AM peak period, the traffic flows at almost free flow speeds in the eastbound direction. In the westbound direction, congestion occurs after the Highway 12 on ramp and before Suisan/Chadbourne ramps. In both directions, managed lane has higher speeds than the general purpose lane.

Figure 1-22: Future Build Scenario 2 Weekday Eastbound Speed – Fairfield AM Peak Period

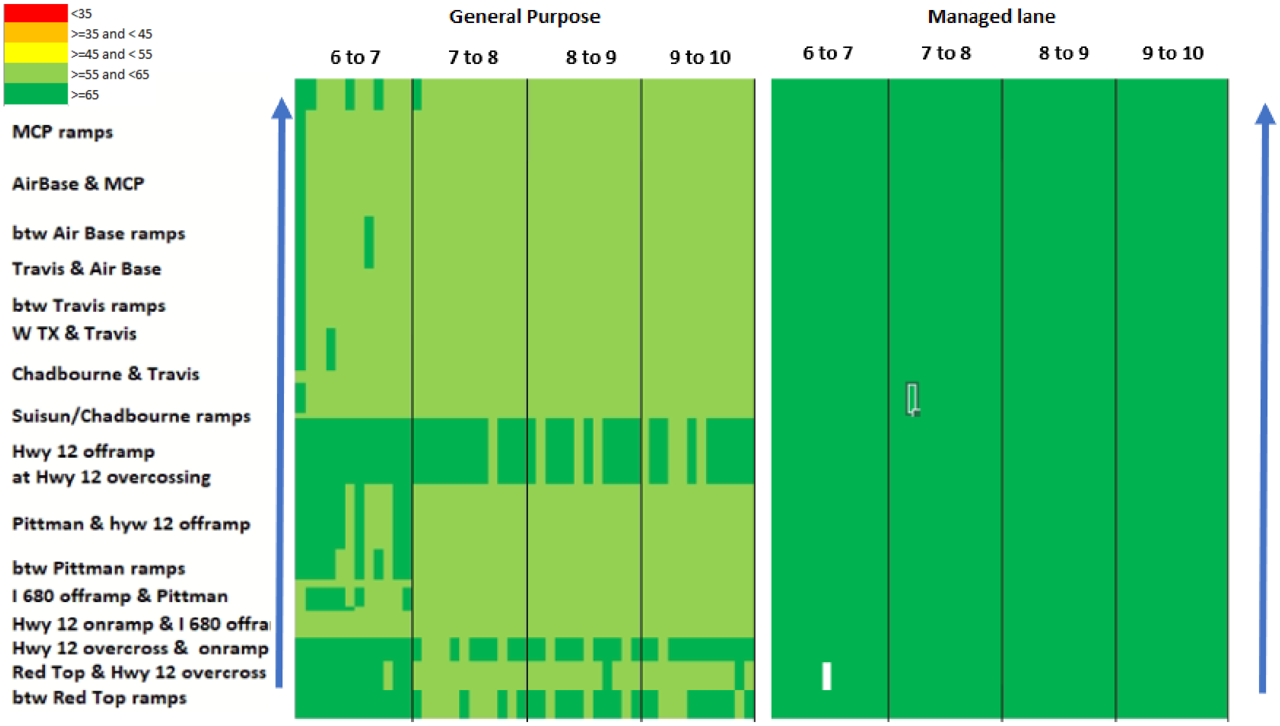


Figure 1-23: Future Build Scenario 2 Weekday Westbound Speed – Fairfield AM Peak Period

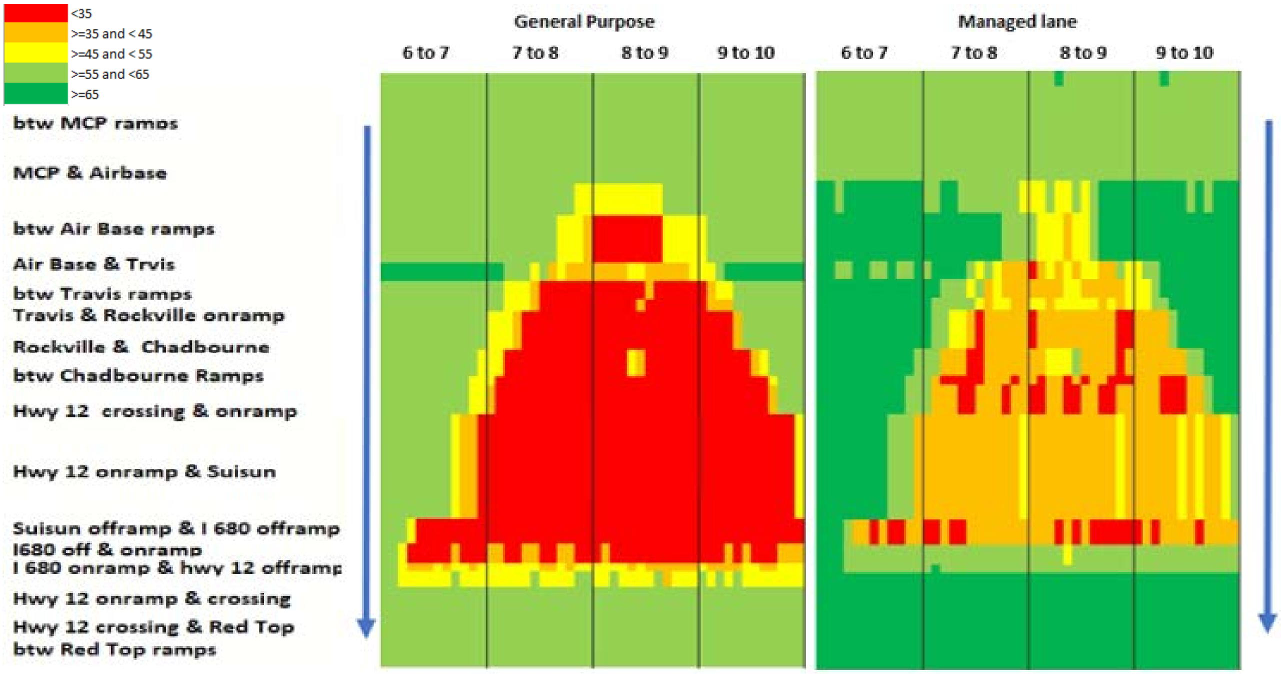


Figure 1-24 and Figure 1-25 show the bottleneck comparison on the I-80 corridor during PM peak period for eastbound and westbound directions, respectively. During PM peak period, in eastbound direction, there no bottlenecks. Similar to future build scenario 1, the bottleneck under future no build scenario near I-680 off-ramp and after Airbase Parkway will not be present under future build scenario 2. In the westbound direction, traffic flows are almost at free flow speeds.

Figure 1-24: Future Build Scenario 2 Weekday Eastbound Speed – Fairfield PM Peak Period

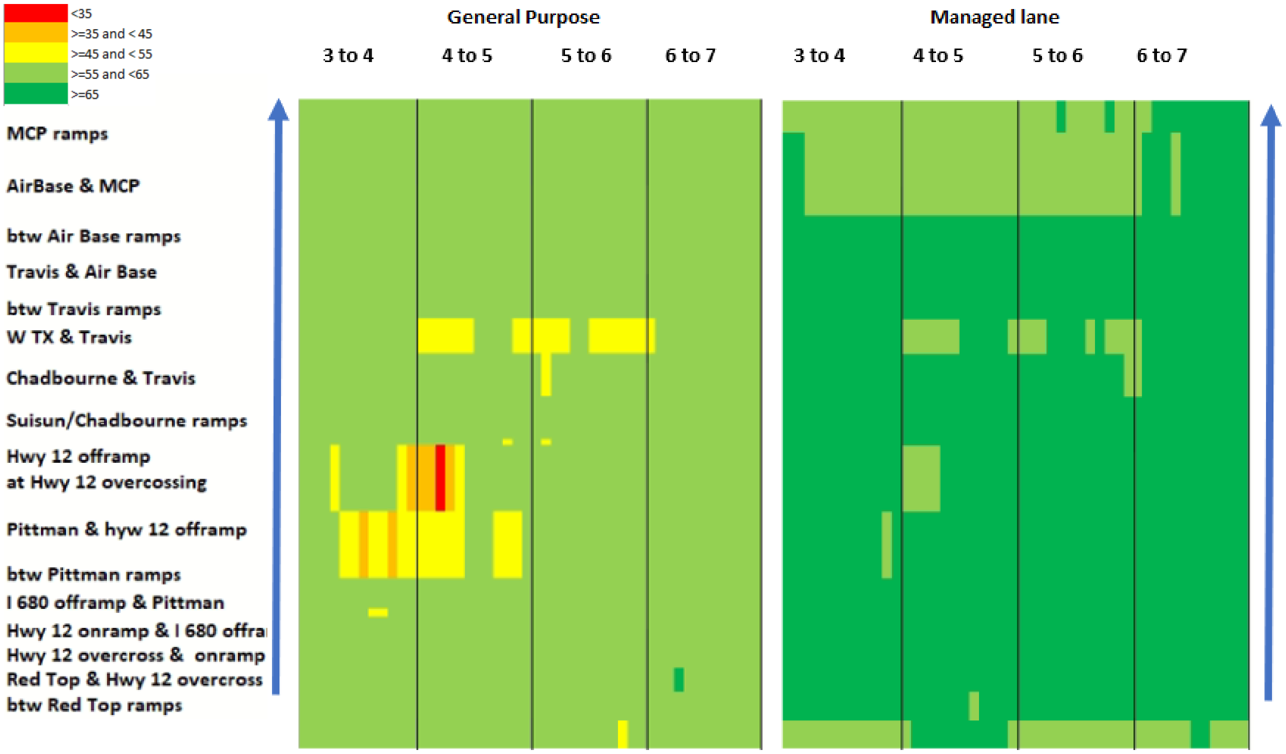
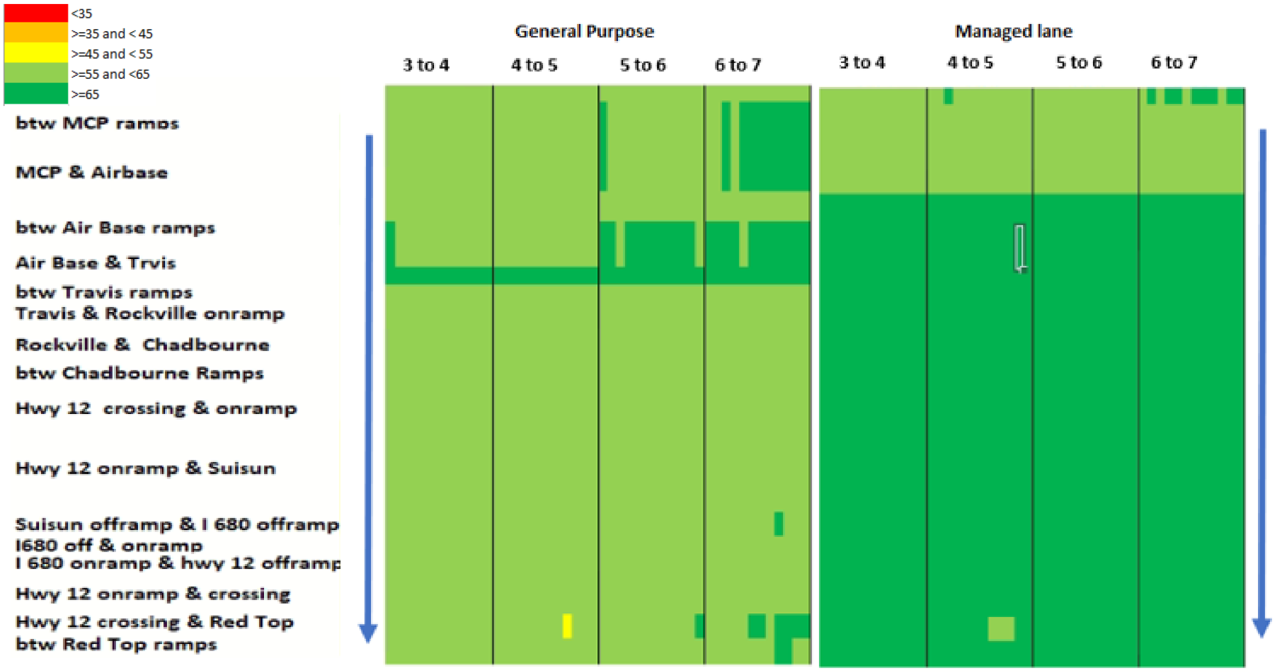


Figure 1-25: Future Build Scenario 2 Weekday Westbound Speed – Fairfield PM Peak Period



I-80 Vallejo Study Area

Figure 1-26 and Figure 1-27 show the bottleneck comparison on the I-80 corridor during AM peak period for eastbound and westbound directions, respectively. During the AM peak period, the traffic in the eastbound direction slows between the bridge toll plaza and off-ramp to Sonoma Boulevard, similar to existing and future no build conditions. In the westbound direction, traffic flows are almost at free flow speeds.

Figure 1-26: Future Build Scenario 2 Weekday Eastbound Speed – Vallejo AM Peak Period

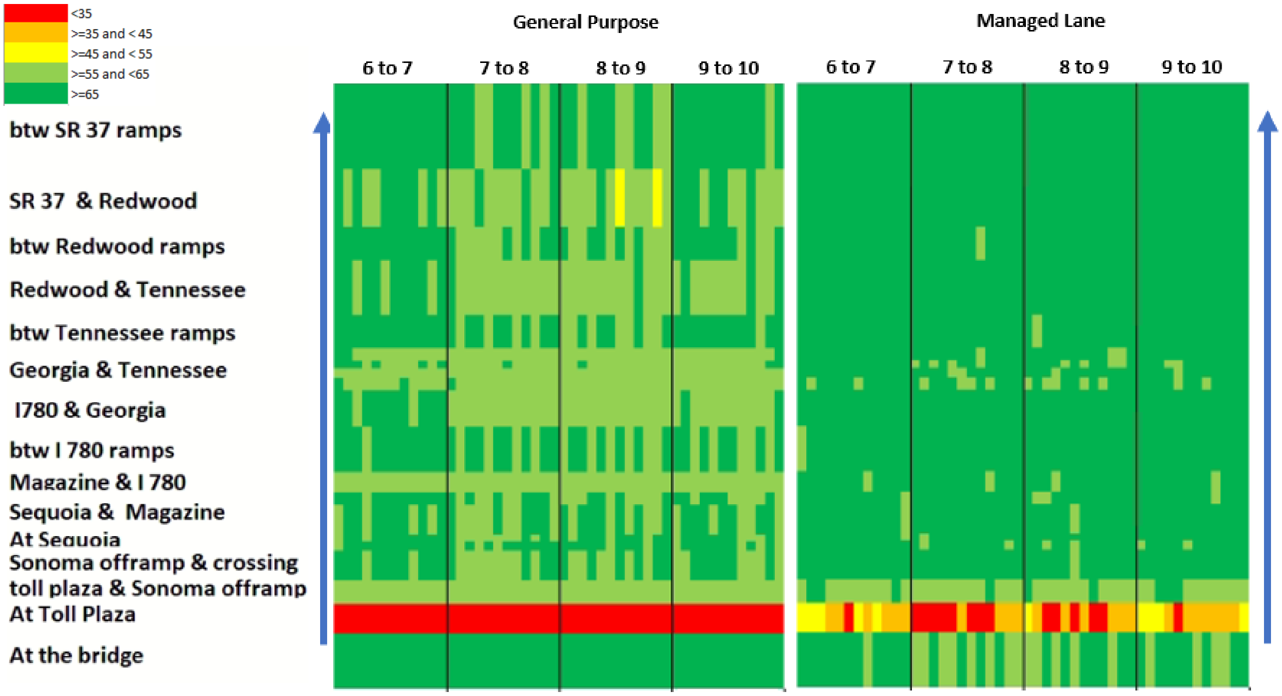


Figure 1-27: Future Build Scenario 2 Weekday Westbound Speed – Vallejo AM Peak Period

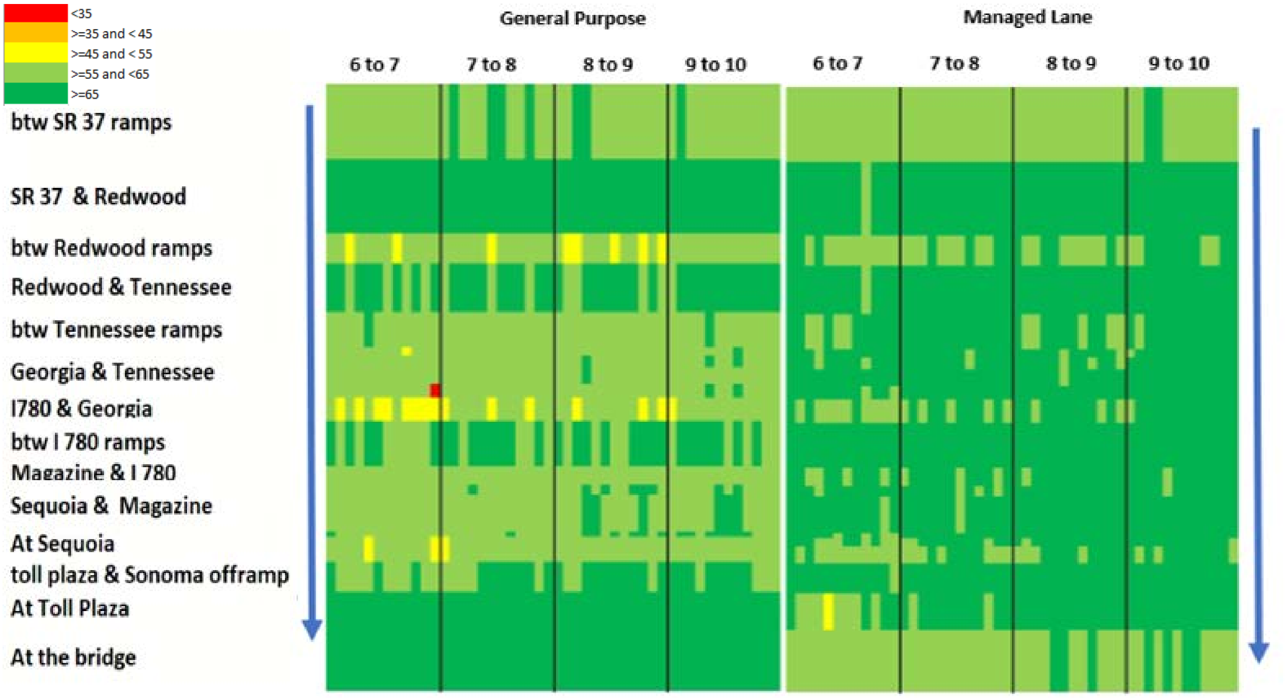


Figure 1-28 and Figure 1-29 show the bottleneck comparison on the I-80 corridor during PM peak period for eastbound and westbound directions, respectively. During PM peak period, in both eastbound and westbound direction, traffic flows close to free-flow speeds. The traffic in eastbound direction slows between the bridge toll plaza and off-ramp to Sonoma Boulevard.

Figure 1-28: Future Build Scenario 2 Weekday Eastbound Speed – Vallejo PM Peak Period

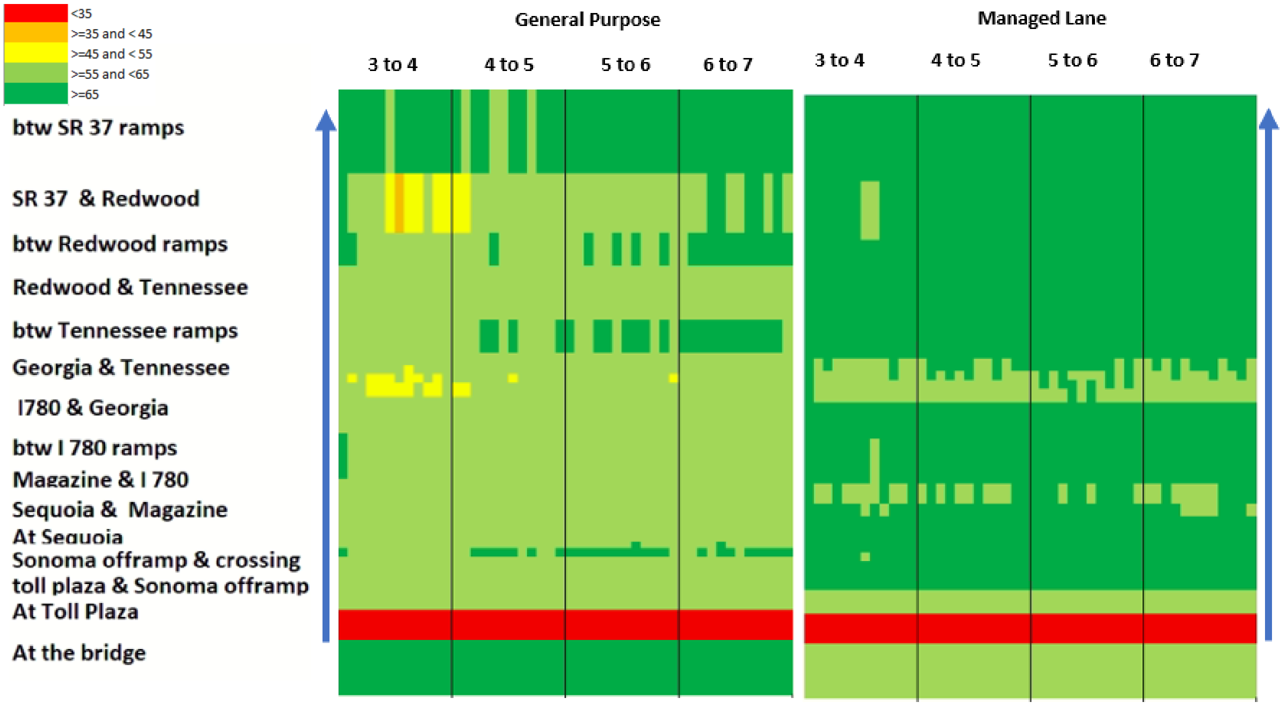
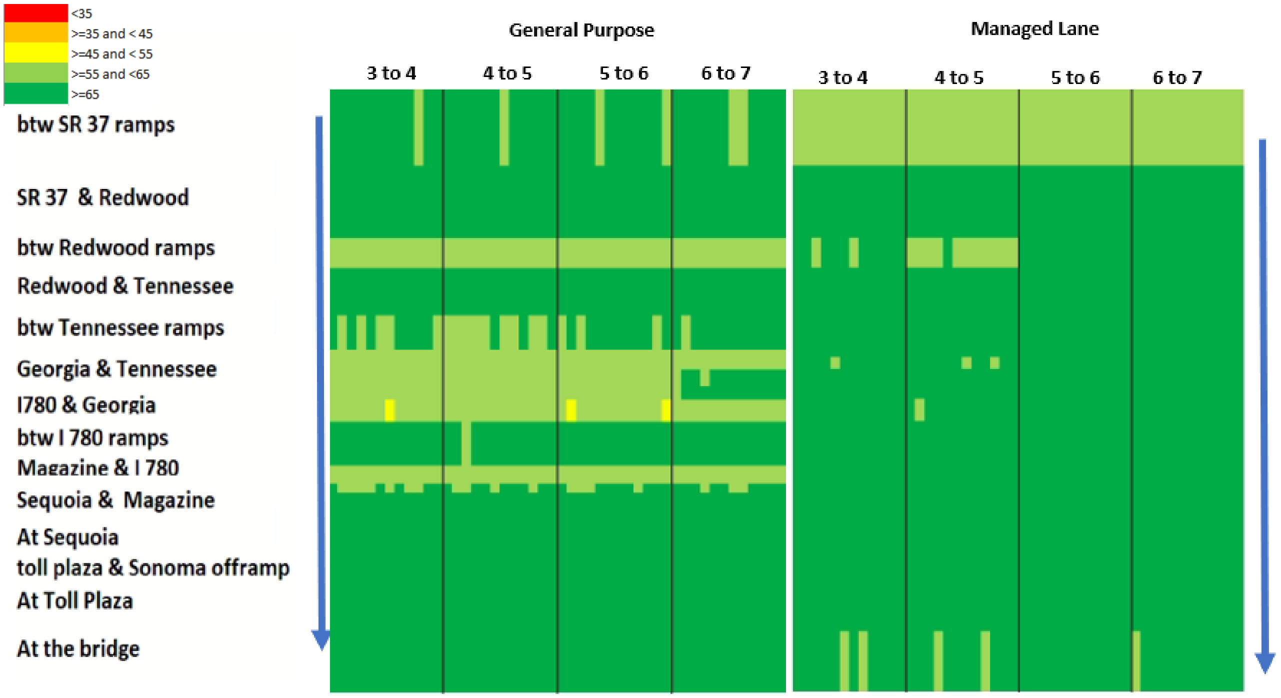


Figure 1-29: Future Build Scenario 2 Weekday Westbound Speed – Vallejo PM Peak Period



1.4.3 Travel Time and Delay

I-80 Fairfield Study Area

Table 21 and Table 22 summarize the average travel times and average vehicle delays for Future Build Scenario 2 during AM and PM peak periods, respectively. During AM peak period, there is minimal delay in eastbound direction. In westbound direction, the average delay is approximately 9 minutes in general purpose and 7 minutes in managed lane.

Table 21: I-80 Fairfield Study Area Hourly Travel Time and Delay - Future Build Scenario 2 AM

Segment	Average Travel Time - minutes				Average Delay - minutes			
	6:00-7:00	7:00 - 8:00	8:00 - 9:00	9:00-10:00	6:00 - 7:00	7:00 - 8:00	8:00 - 9:00	9:00-10:00
Eastbound – GP	9:23	9:29	9:29	9:28	0:06	0:12	0:12	0:12
Eastbound – ML	8:35	8:43	8:43	8:41	0:00	0:00	0:00	0:00
Westbound – GP	12:46	21:16	23:46	17:16	3:25	11:55	14:25	7:55
Westbound - ML	11:28	17:59	19:20	15:01	2:07	8:38	9:59	5:40

Note: GP – General Purpose, ML – Managed Lane

During PM peak period, there will be minimal delay in both eastbound and westbound directions.

Table 22: I-80 Fairfield Study Area Hourly Travel Time and Delay - Future Build Scenario 2 PM

Segment	Average Travel Time - minutes				Average Delay - minutes			
	3:00-4:00	4:00 - 5:00	5:00 - 6:00	6:00-7:00	3:00-4:00	4:00 - 5:00	5:00 - 6:00	6:00-7:00
Eastbound – GP	10:29	10:27	10:09	9:46	1:12	1:10	0:52	0:30
Eastbound – ML	9:33	9:36	9:20	8:57	0:17	0:19	0:03	0:00
Westbound – GP	9:39	9:48	10:00	10:08	0:18	0:27	0:39	0:47
Westbound - ML	9:01	9:10	9:24	9:29	0:00	0:00	0:03	0:08

Note: GP – General Purpose, ML – Managed Lane

I-80 Vallejo Study Area

Table 23 and Table 24 summarize the average travel times and average vehicle delays for Future Build Scenario 2 during AM and PM peak periods, respectively. During both AM and PM peak periods, there will be minimal delay in both eastbound and westbound directions.

Table 23: I-80 Vallejo Study Area Hourly Travel Time and Delay - Future Build Scenario 2 AM

Segment	Average Travel Time - minutes				Average Delay - minutes			
	6:00-7:00	7:00 - 8:00	8:00 - 9:00	9:00-10:00	6:00 - 7:00	7:00 - 8:00	8:00 - 9:00	9:00-10:00
Eastbound – GP	6:13	6:24	6:51	6:25	0:17	0:29	0:56	0:30
Eastbound – ML	6:04	6:14	6:39	6:15	0:09	0:18	0:43	0:19
Westbound – GP	6:20	6:16	6:18	6:08	0:53	0:50	0:51	0:42
Westbound - ML	6:06	6:03	6:05	5:58	0:39	0:36	0:39	0:31

Note: GP – General Purpose, ML – Managed Lane

Table 24: I-80 Vallejo Study Area Hourly Travel Time and Delay - Future Build Scenario 2 PM

Segment	Average Travel Time - minutes				Average Delay - minutes			
	3:00-4:00	4:00 - 5:00	5:00 - 6:00	6:00-7:00	3:00-4:00	4:00 - 5:00	5:00 - 6:00	6:00-7:00
Eastbound – GP	7:02	6:49	6:41	6:37	1:07	0:53	0:45	0:41
Eastbound – ML	6:44	6:34	6:28	6:24	0:49	0:38	0:32	0:28
Westbound – GP	6:04	6:08	6:05	5:59	0:38	0:41	0:38	0:33
Westbound - ML	5:53	5:58	5:55	5:49	0:27	0:32	0:28	0:23

Note: GP – General Purpose, ML – Managed Lane

1.5 Future Build Scenario 3 (HOT 3+)

1.5.1 Networkwide Measures of Effectiveness (MOE)

I-80 Fairfield Study Area

The results of the microsimulation model analyses for the VMT, VHD, VHT and average speed for Future Build Scenario 3 for the I-80 Fairfield Study Area are summarized in Table 25. The average speeds in the study area during the AM and PM peak period are 37 and 57 mph, respectively. During AM peak period, the average speeds are projected to reduce from 48 mph in no build scenario to 37 mph in future build scenario 3. This is due to new bottleneck in westbound direction near I-680. During PM peak period, the average speeds are projected to increase from 34 mph in no build scenario to 57 mph in future build scenario 3.

Table 25: I-80 Fairfield Study Area Corridor Wide MOE – Future Build Scenario 3

MOE	AM Peak Period (6 to 10)	PM Peak Period (3 to 7)
Average Speed (mph)	37.3	56.9
Vehicle Hours of Delay (VHD)	6,251	1,376
Vehicle Miles of Travel (VMT)	541,398	590,018
Vehicle Hours of Travel (VHT)	14,512	10,369

I-80 Vallejo Study Area

The results of the microsimulation model analyses for the VMT, VHD, VHT and average speed for Future Build Scenario 3 for the I-80 Vallejo Study Area are summarized in Table 26. The average speeds in the study area during the AM and PM peak period are 62 and 60 mph, respectively. During AM peak period, the average speeds are projected to increase from 50 mph in no build scenario to 62 mph in future build scenario 3. During PM peak period, the average speeds are projected to increase from 29 mph in no build scenario to 60mph in future build scenario 3.

Table 26: I-80 Vallejo Study Area Corridor Wide MOE – Future Build Scenario 3

MOE	AM Peak Period (6 to 10)	PM Peak Period (3 to 7)
Average Speed (mph)	61.8	60.4
Vehicle Hours of Delay (VHD)	211	293
Vehicle Miles of Travel (VMT)	226,558	244,074
Vehicle Hours of Travel (VHT)	3,664	4,040

1.5.2 Speed Profile

I-80 Fairfield Study Area

Figure 1-30 and Figure 1-31 show the bottleneck comparison on the I-80 corridor eastbound and westbound directions during the AM period and PM period, respectively. These figures illustrate speeds of general purpose and managed lane. During the AM peak period, the traffic flows at almost free flow speeds in the eastbound direction. In the westbound direction, congestion occurs after the Highway 12 on ramp and before Suisan/Chadbourne ramps. In both directions, managed lane has higher speeds than the general purpose lane.

Figure 1-30: Future Build Scenario 3 Weekday Eastbound Speed – Fairfield AM Peak Period

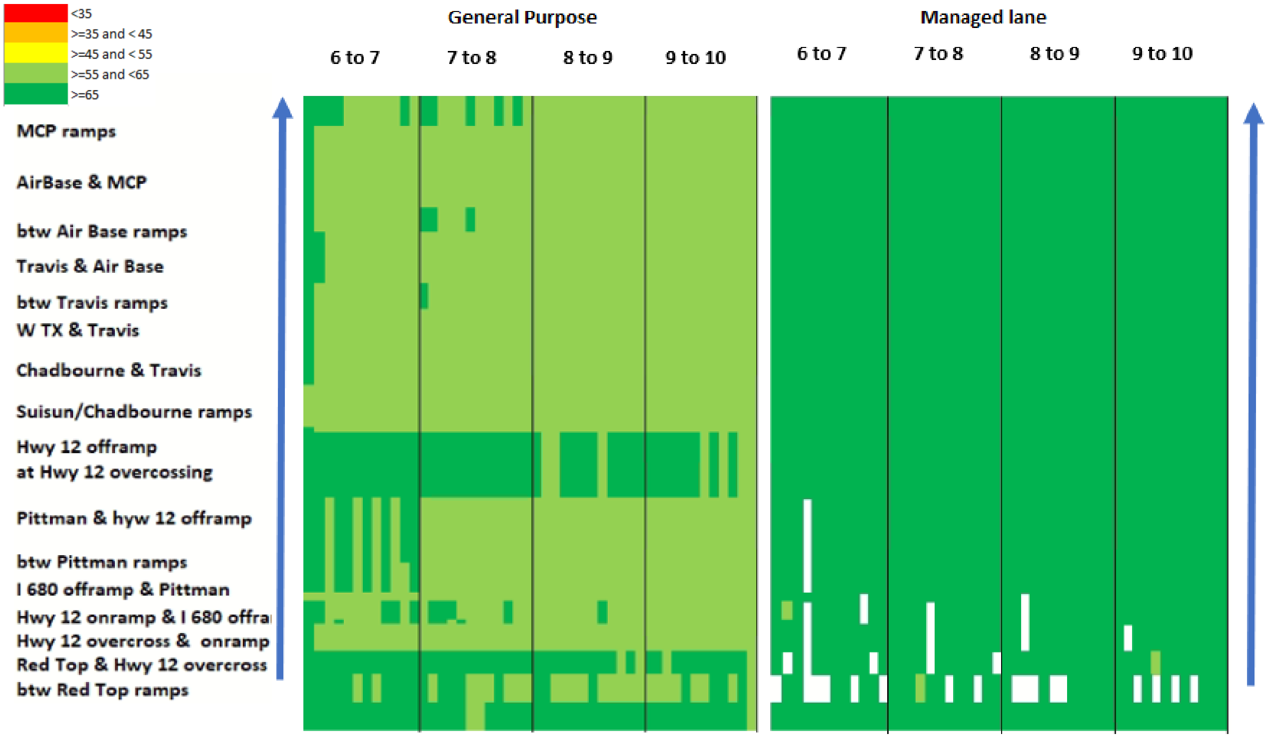


Figure 1-31: Future Build Scenario 3 Weekday Westbound Speed – Fairfield AM Peak Period

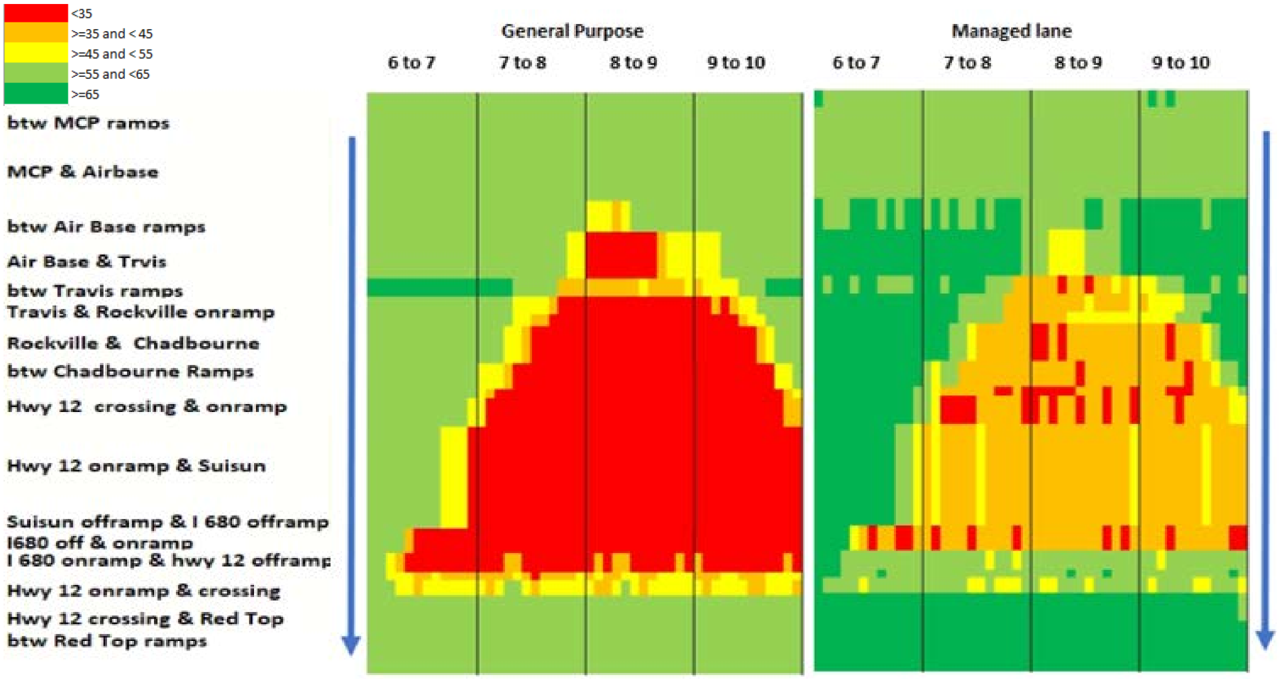


Figure 1-32 and Figure 1-33 show the bottleneck comparison on the I-80 corridor during PM peak period for eastbound and westbound directions, respectively. During PM peak period, in eastbound direction, there no bottlenecks. Similar to future build scenario 2, the bottleneck under future no build scenario near I-680 off-ramp and after Airbase Parkway will not be present under future build scenario 3. In the westbound direction, traffic flows are almost at free flow speeds.

Figure 1-32: Future Build Scenario 3 Weekday Eastbound Speed – Fairfield PM Peak Period

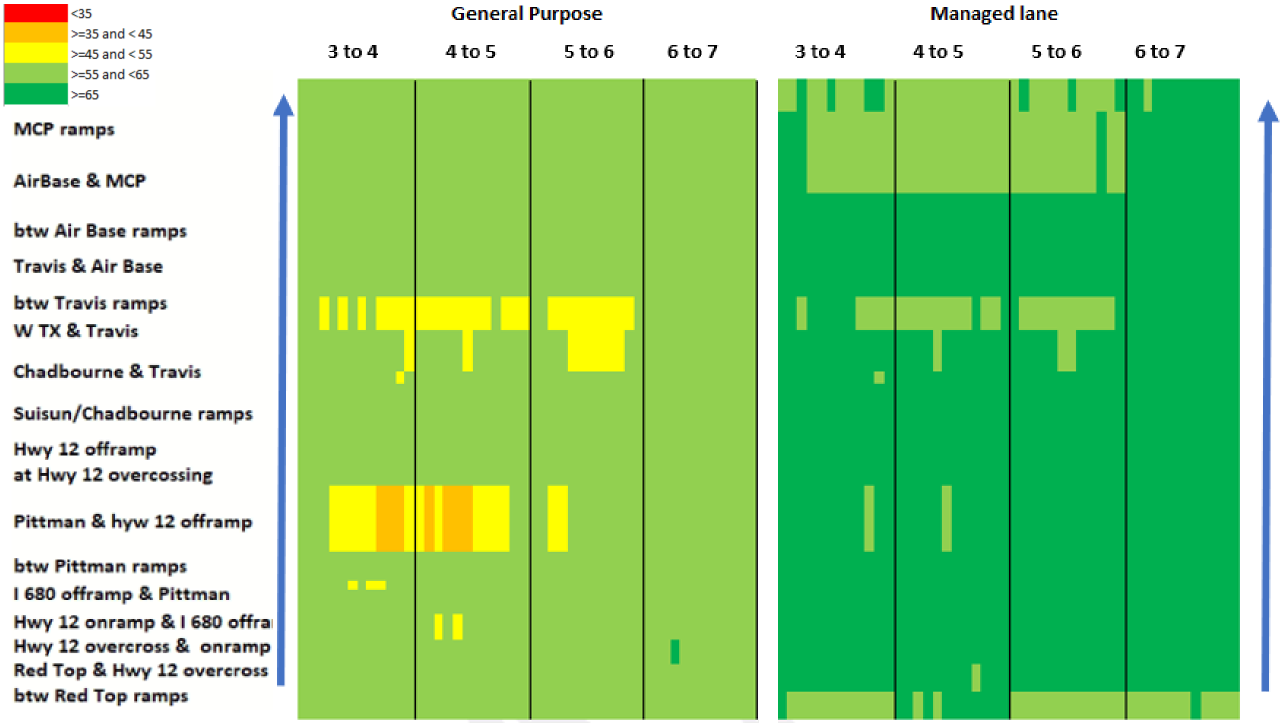
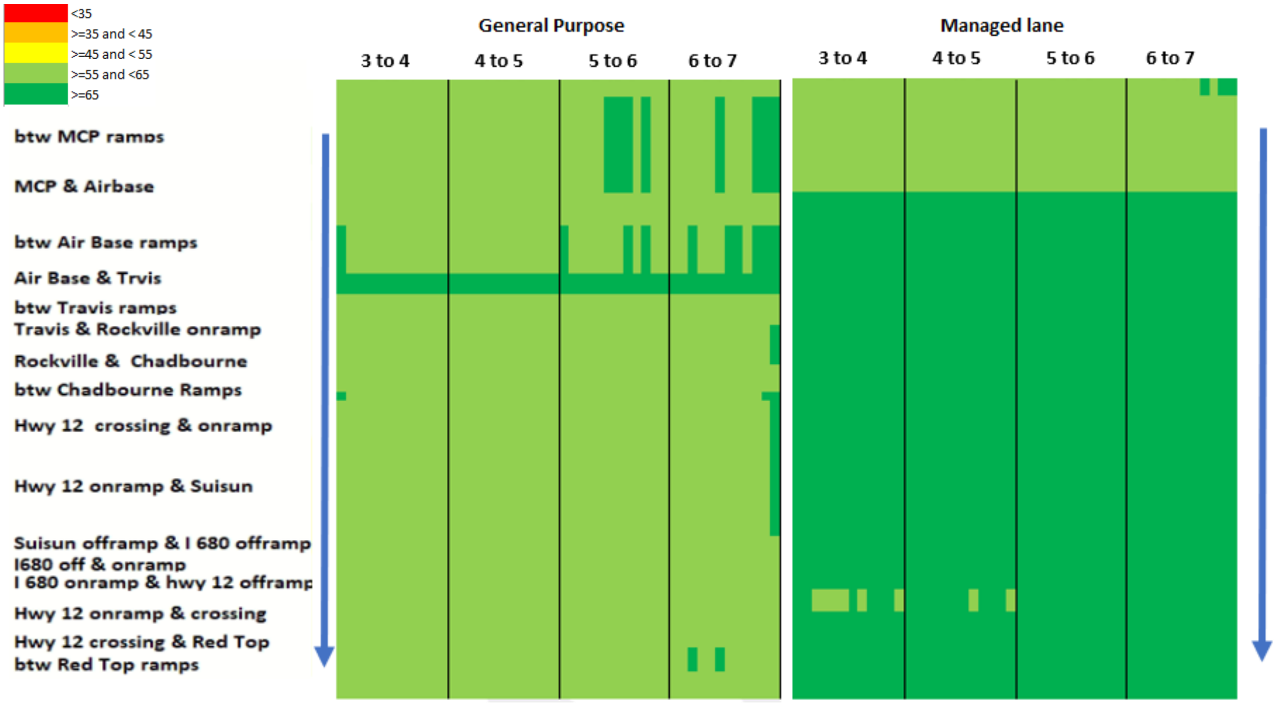


Figure 1-33: Future Build Scenario 3 Weekday Westbound Speed – Fairfield PM Peak Period



I-80 Vallejo Study Area

Figure 1-34 and Figure 1-35 show the bottleneck comparison on the I-80 corridor during AM peak period for eastbound and westbound directions, respectively. During the AM peak period, the traffic in the eastbound direction slows between the bridge toll plaza and off-ramp to Sonoma Boulevard, similar to existing ad future no build conditions. In the westbound direction, traffic flows are almost at free flow speeds.

Figure 1-34: Future Build Scenario 3 Weekday Eastbound Speed – Vallejo AM Peak Period

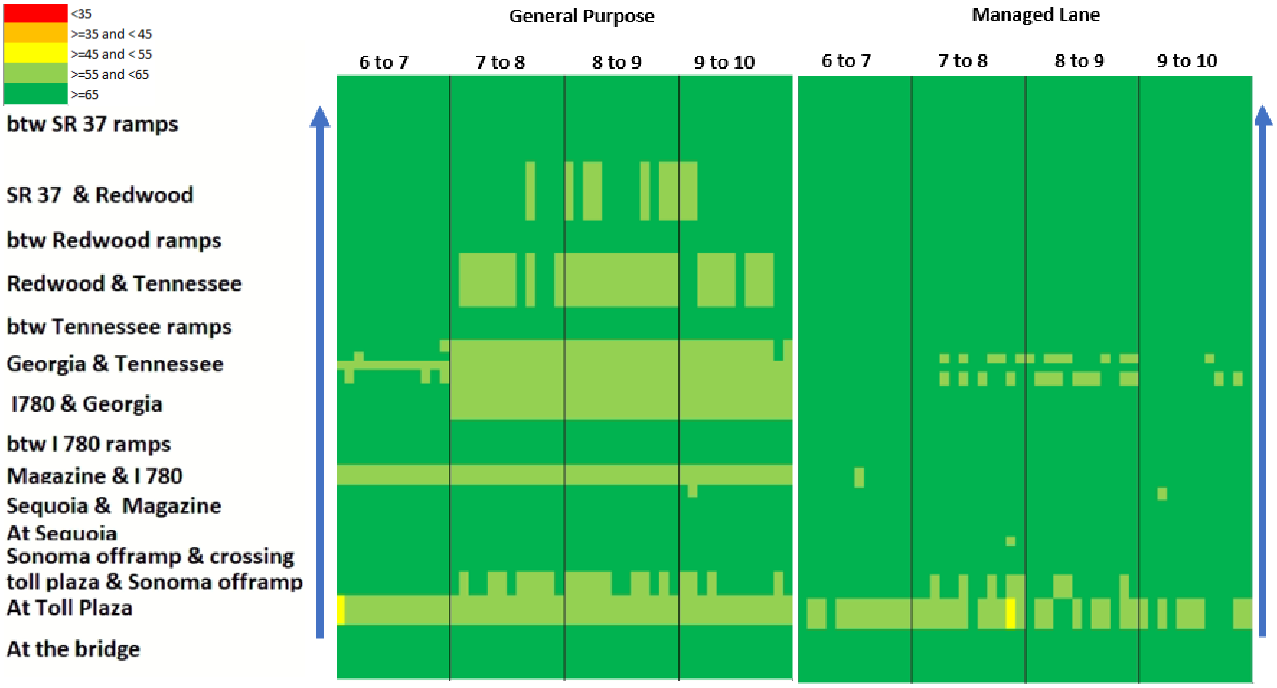


Figure 1-35: Future Build Scenario 3 Weekday Westbound Speed – Vallejo AM Peak Period

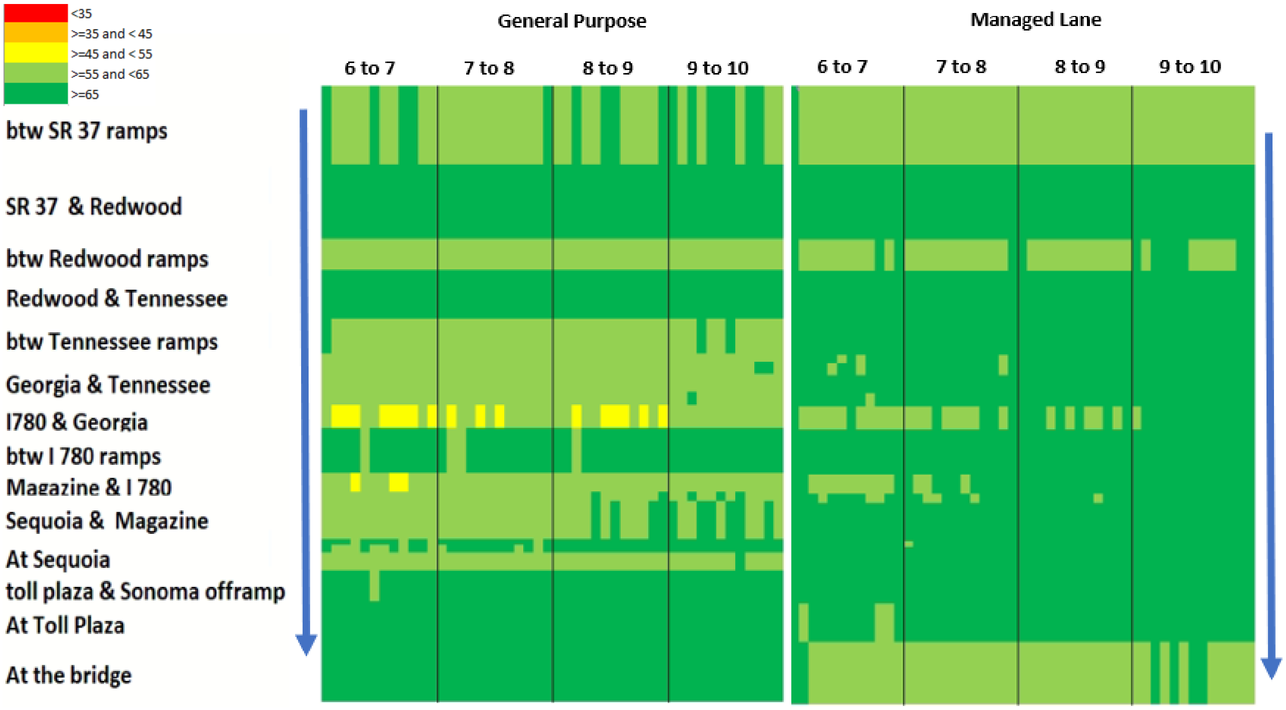


Figure 1-36 and Figure 1-37 show the bottleneck comparison on the I-80 corridor during PM peak period for eastbound and westbound directions, respectively. During PM peak period, in both eastbound and westbound direction, traffic flows close to free-flow speeds. The traffic in eastbound direction slows between the bridge toll plaza and off-ramp to Sonoma Boulevard.

Figure 1-36: Future Build Scenario 3 Weekday Eastbound Speed – Vallejo PM Peak Period

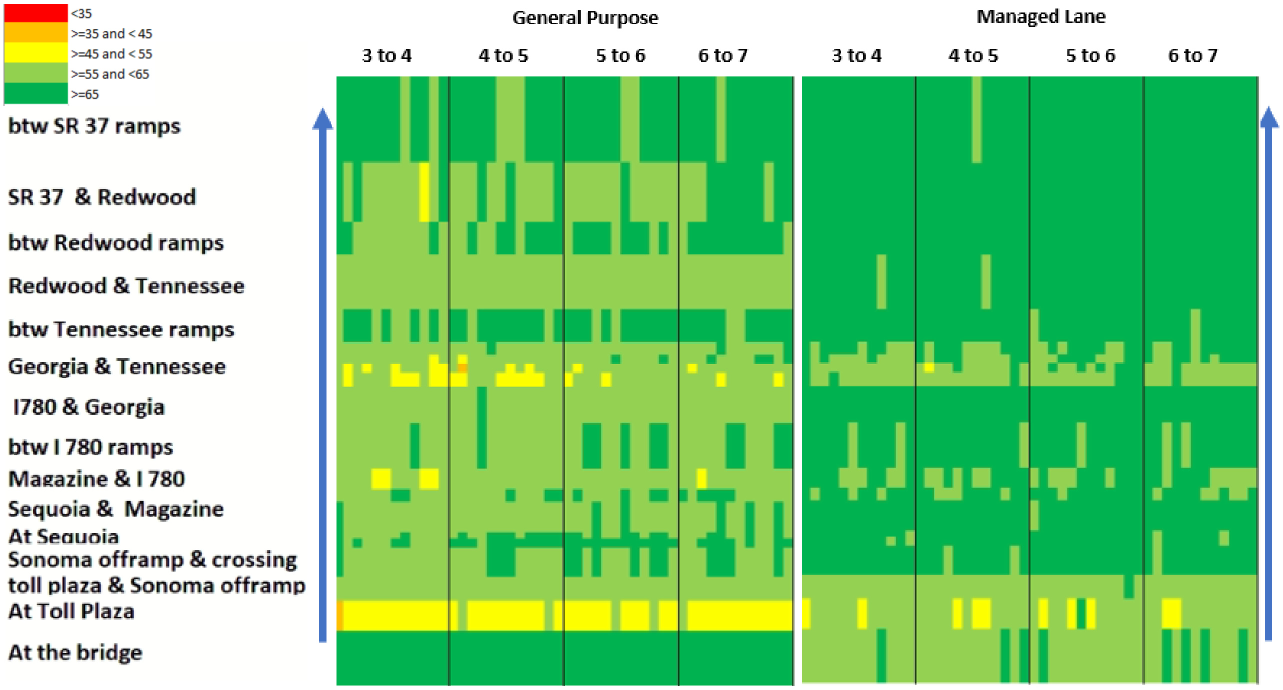
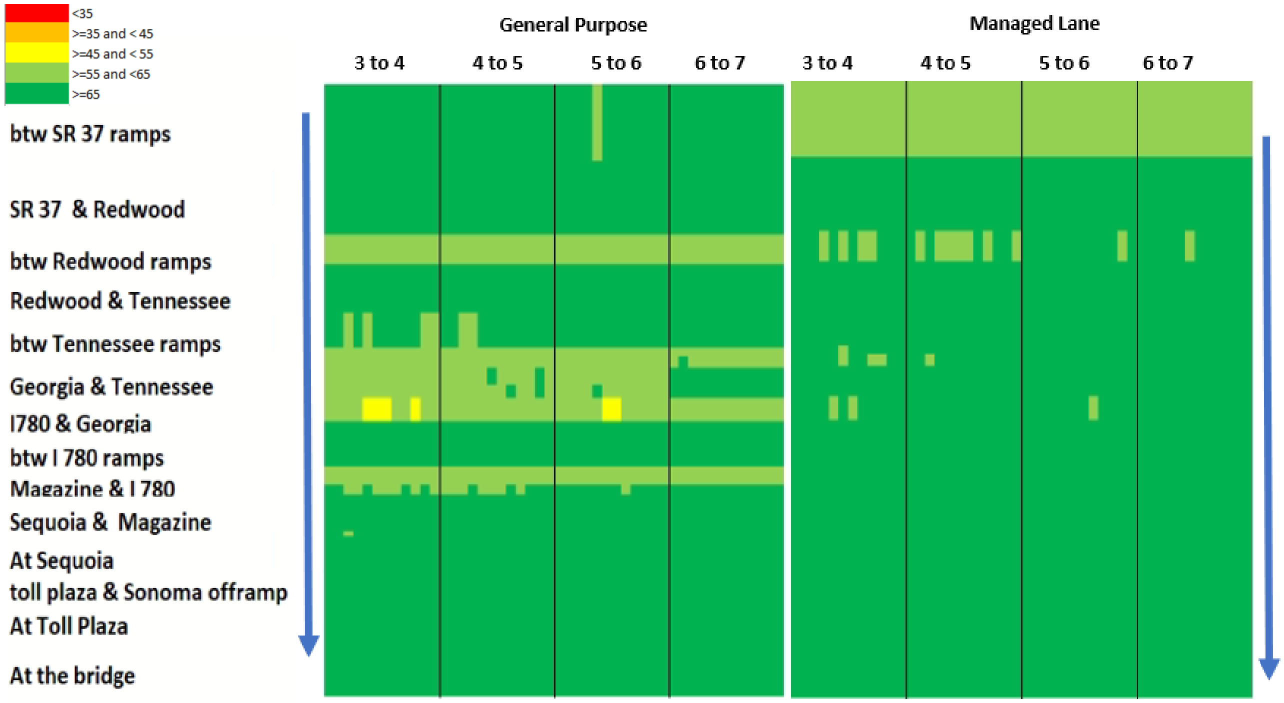


Figure 1-37: Future Build Scenario 3 Weekday Westbound Speed – Vallejo PM Peak Period



1.5.3 *Travel Time and Delay*

I-80 Fairfield Study Area

Table 27 and Table 28 summarize the average travel times and average vehicle delays for Future Build Scenario 3 during AM and PM peak periods, respectively. VISSIM calculates delay as any length of time exceeding the free-flow travel time. During AM peak period, there is minimal delay in eastbound direction. In westbound direction, the average delay is approximately 10 minutes in general purpose and 7 minutes in managed lane.

Table 27: I-80 Fairfield Study Area Hourly Travel Time and Delay - Future Build Scenario 3 AM

Segment	Average Travel Time - minutes				Average Delay - minutes			
	6:00-7:00	7:00 - 8:00	8:00 - 9:00	9:00-10:00	6:00 - 7:00	7:00 - 8:00	8:00 - 9:00	9:00-10:00
Eastbound – GP	9:25	9:28	9:31	9:31	0:08	0:11	0:15	0:14
Eastbound – ML	8:39	8:42	8:46	8:43	0:00	0:00	0:00	0:00
Westbound – GP	12:24	20:42	24:24	19:24	3:03	11:21	15:03	10:03
Westbound - ML	11:10	17:37	19:29	16:28	1:49	8:16	10:08	7:07

Note: GP – General Purpose, ML – Managed Lane

During PM peak period, there will be minimal delay in both eastbound and westbound directions.

Table 28: I-80 Fairfield Study Area Hourly Travel Time and Delay - Future Build Scenario 3 PM

Segment	Average Travel Time - minutes				Average Delay - minutes			
	3:00-4:00	4:00 - 5:00	5:00 - 6:00	6:00-7:00	3:00-4:00	4:00 - 5:00	5:00 - 6:00	6:00-7:00
Eastbound – GP	10:40	11:14	10:15	9:51	1:23	1:57	0:58	0:34
Eastbound – ML	9:48	10:13	9:21	9:07	0:31	0:57	0:05	0:00
Westbound – GP	9:46	9:45	9:45	9:37	0:25	0:24	0:24	0:16
Westbound - ML	9:05	9:06	9:05	8:57	0:00	0:00	0:00	0:00

Note: GP – General Purpose, ML – Managed Lane

I-80 Vallejo Study Area

Table 29 and Table 30 summarize the average travel times and average vehicle delays for Future Build Scenario 3 during AM and PM peak periods, respectively. VISSIM calculates delay as any length of time exceeding the free-flow travel time. During both AM and PM peak periods, there will be no delay in both eastbound and westbound directions.

Table 29: I-80 Vallejo Study Area Hourly Travel Time and Delay - Future Build Scenario 3 AM

Segment	Average Travel Time - minutes				Average Delay - minutes			
	6:00-7:00	7:00 - 8:00	8:00 - 9:00	9:00-10:00	6:00 - 7:00	7:00 - 8:00	8:00 - 9:00	9:00-10:00
Eastbound – GP	5:58	6:07	6:15	6:07	0:02	0:12	0:19	0:12
Eastbound – ML	5:52	5:59	6:05	5:59	0:00	0:03	0:10	0:03
Westbound – GP	6:19	6:15	6:15	6:07	0:52	0:48	0:48	0:40
Westbound - ML	6:05	6:04	6:03	5:57	0:39	0:37	0:37	0:30

Note: GP – General Purpose, ML – Managed Lane

Table 30: I-80 Vallejo Study Area Hourly Travel Time and Delay - Future Build Scenario 3 PM

Segment	Average Travel Time - minutes				Average Delay - minutes			
	3:00-4:00	4:00 - 5:00	5:00 - 6:00	6:00-7:00	3:00-4:00	4:00 - 5:00	5:00 - 6:00	6:00-7:00
Eastbound – GP	6:39	6:31	6:27	6:23	0:44	0:36	0:31	0:28
Eastbound – ML	6:23	6:22	6:17	6:15	0:28	0:27	0:22	0:19
Westbound – GP	6:08	6:06	6:05	5:59	0:41	0:39	0:39	0:33
Westbound - ML	6:00	5:58	5:53	5:53	0:33	0:31	0:27	0:27

Note: GP – General Purpose, ML – Managed Lane

1.6 Alternative Comparison and Summary

Table 31 summarizes microsimulation model MOE comparison of Fairfield and Vallejo models. VMT, VHD and VHT are summarized including both AM and PM periods and both eastbound and westbound directions. In Fairfield model, the VMT for future build scenario is about 6% higher than no build scenario and delay is about 30% less in future build scenario than no build. In Vallejo model, the VMT for future build scenario is about 4% higher than no build scenario and delay is about 90% less in future build scenario than no build.

Table 31: Alternative Comparison – Fairfield and Vallejo

Scenario	VMT	VHD	VHT	Difference VMT from Baseline	Difference Delay from Baseline	Difference VHT from Baseline
Fairfield Microsimulation Study Area						
Existing	954,911	3,991	18,535	-	-	-
Future No Build (Baseline)	1,075,798	9,580	25,926	-	-	-
Future Scenario 1 (HOV 2+)	1,128,776	6,992	24,204	5%	-27%	-7%
Future Scenario 2 (HOT 2+)	1,140,709	6,677	24,067	6%	-30%	-7%
Future Scenario 3 (HOT 3+)	1,142,019	5,859	23,273	6%	-39%	-10%
Vallejo Microsimulation Study Area						
Existing	406,863	2,025	8,246	-	-	-
Future No Build (Baseline)	450,928	5,392	12,290	-	-	-
Future Scenario 1 (HOV 2+)	470,822	825	8,030	4%	-85%	-35%
Future Scenario 2 (HOT 2+)	465,818	716	7,844	3%	-87%	-36%
Future Scenario 3 (HOT 3+)	470,632	504	7,704	4%	-91%	-37%

1.6.1 Vehicle Miles Travel Comparison

Figure 1-38 and Figure 1-39 show VMT comparison for the Fairfield and Vallejo microsimulation study area, respectively. Figures show VMT comparisons for existing and future scenarios by time period and direction of travel. As shown in the figures, the VMT will be higher in future build scenarios than the future no build scenario. The increase in VMT in build scenarios is caused improved traffic flow due to the corridor improvements, but as noted do not account for possible induced demand that could result from increased capacity or improved speeds and reduced delay. This increased VMT is based on shifting of trips and the ability of more trips to get through during the peak periods with the improved conditions.

Figure 1-38: VMT Comparison - Fairfield Microsimulation Study Area

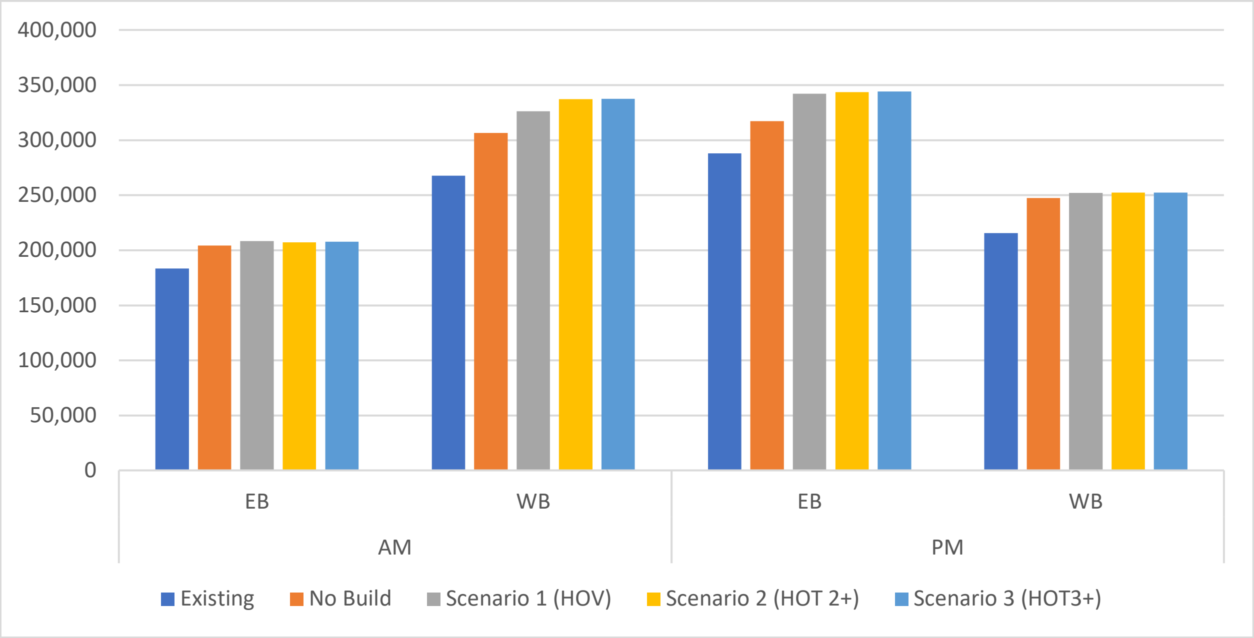
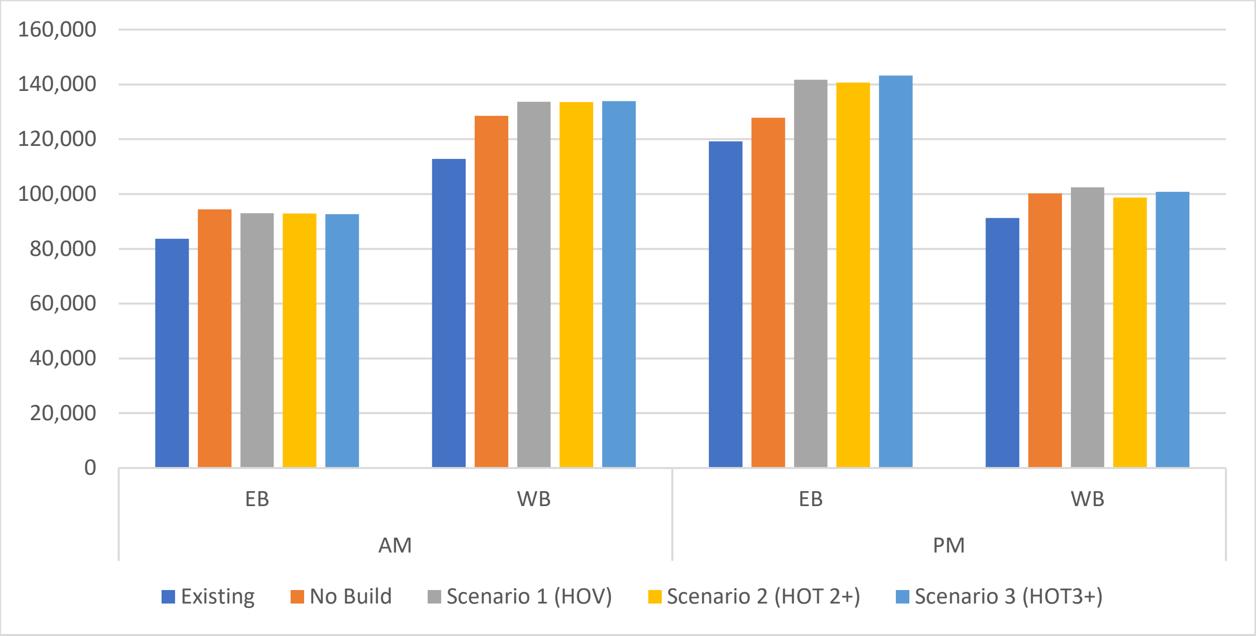


Figure 1-39: VMT Comparison - Vallejo Microsimulation Study Area



1.6.2 Vehicle Hours of Delay Comparison

Figure 1-40 and Figure 1-41 show VHD comparison for the Fairfield and Vallejo microsimulation study areas, respectively. The figures show VHD comparisons for existing and future scenarios by time period and direction of travel. Overall, the build scenarios have less delay than the no build scenario. In Fairfield, during AM peak period, the westbound direction in build scenarios is projected to experience higher delays due to higher demand and weaving near Highway 12. During the PM peak period, the build scenarios will have less delay as compared to no build in both directions. The most significant reduction in delay occurs in the PM peak in the eastbound direction.

Figure 1-40: VHD Comparison - Fairfield Microsimulation Study Area

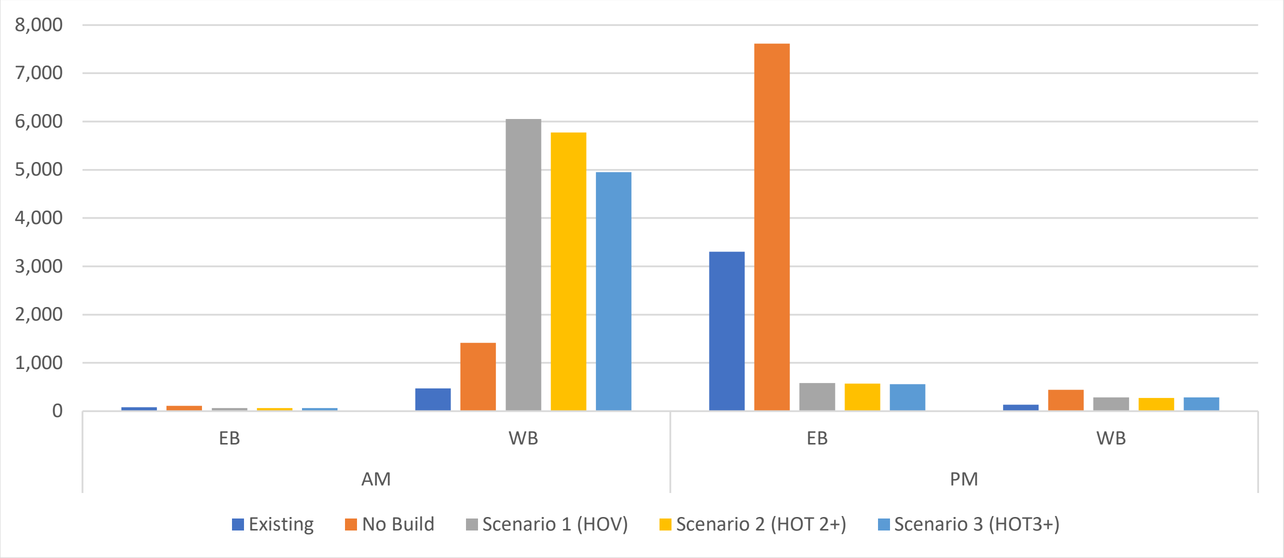
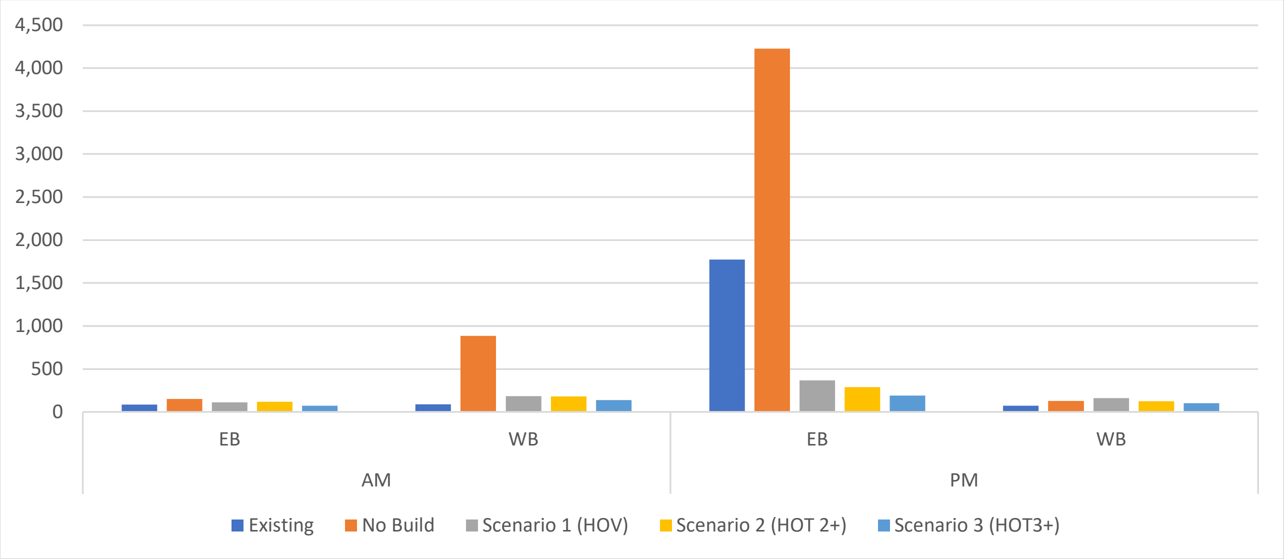


Figure 1-41: VHD Comparison - Vallejo Microsimulation Study Area



1.6.1 Vehicle Hours of Travel Comparison

Figure 1-42 and Figure 1-43 show VHT comparison for the Fairfield and Vallejo microsimulation study area, respectively. The figures show the VHT comparison for existing and future scenarios by time period and direction of travel. Overall, the build scenarios have less hours of travel compared to the no build scenario. The exception is in Fairfield during AM peak period, in the westbound direction under the build scenarios the freeway is projected to experience longer travel times due to higher demand and weaving near Highway 12. During PM peak period, build scenarios will have fewer hours of travel than no build in both directions.

Figure 1-42: VHT Comparison - Fairfield Microsimulation Study Area

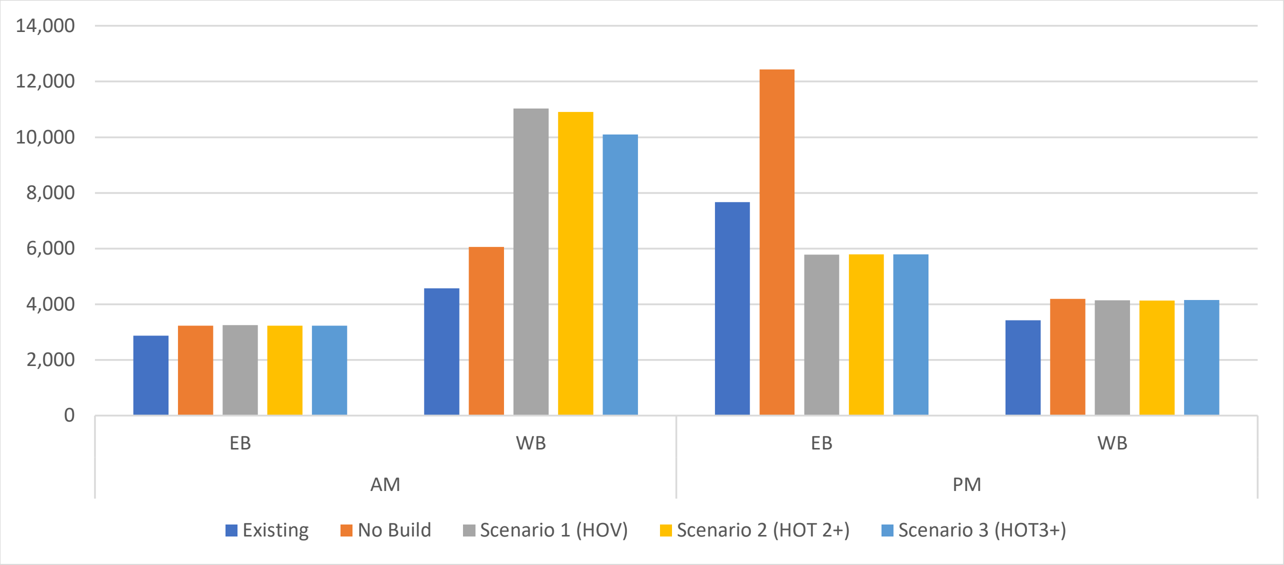
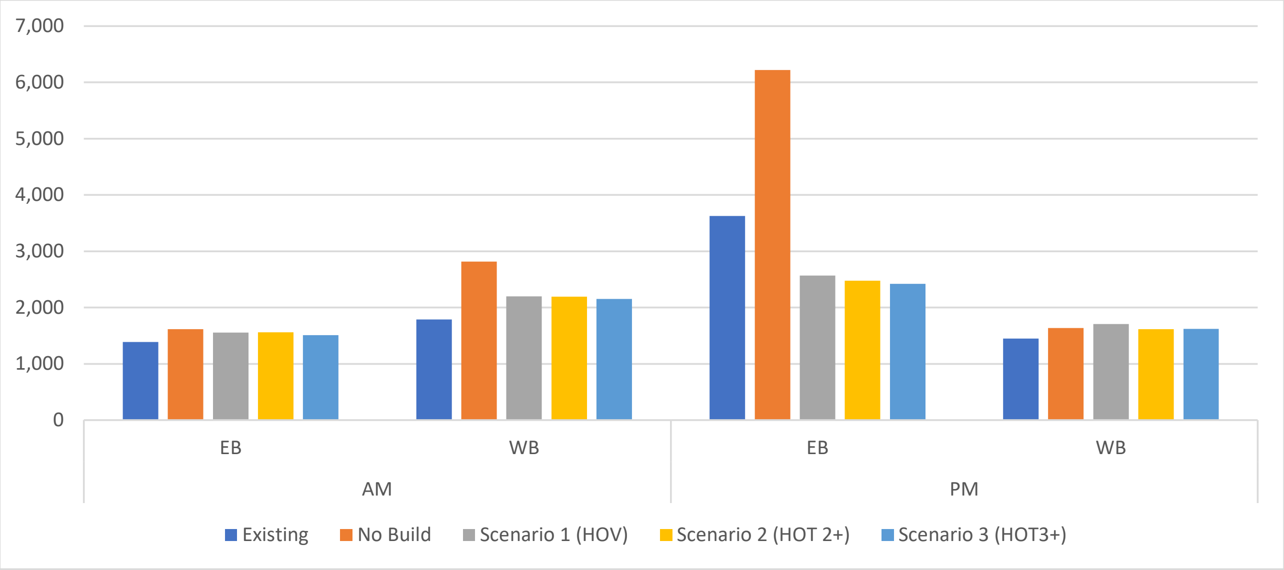


Figure 1-43: VHT Comparison - Vallejo Microsimulation Study Area



In summary, all three future scenarios which were assessed using the simulation model (completing the HOV lane, building HOT 2+ or HOT 3+ lanes) provide benefits to the freeway operations by generally reducing delay, reducing travel times and increasing speeds during the peak hours. The exception is in the Fairfield modeling area in the westbound direction during AM peak period which is shown by the modeling data to experience more delay and higher travel times. This is due to higher demand and weaving near the Highway 12 interchange reconfiguration. If the Highway 12 interchange project is moved forward, the design team should more carefully review this location and attempt to eliminate the weaving issues and associated congestion.

Appendix D-1

Microsimulation Model Development and Calibration

Technical Memorandum

TO: Caltrans D3/D4

FROM: Cambridge Systematics

DATE: May 21, 2021

RE: I-80 Corridor Base Year Microsimulation Model Development and Calibration

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This memorandum summarizes the calibration and validation process undertaken by the Cambridge Systematics (CS) team for the two Vissim microsimulation models along the I-80 corridor segments in the cities of Fairfield and Vallejo. Key model development and adjustment parameters and model results for existing conditions are summarized.

The objective of model calibration is to obtain a good match between the model performance metrics and the observed field measurements of the same metrics. Meeting calibration targets depends largely upon the quality of available data. Due to the COVID-19 pandemic and related Caltrans directives on data collection (no in-field data collection after March 2020), the team was unable to collect new data in the field, thus available historical data sources were used and applied. Typically, the goal is to collect all the data, including volume, speed, bottleneck and travel time data, simultaneously on one or several days so that the data are consistent throughout the corridor and are from the same days and same time periods. Such an approach ensures consistency in data throughout the corridor and reduces impacts of day-to-day variations, seasonal impacts, incident conditions, weather impacts, or other elements that influence roadway operations. For example, with a simultaneous data collection effort, the conservation of flow is ensured in the volumes along the corridor (volumes match from one interchange to the next, including queued vehicles) and the speeds are measured at the same time as the volumes are measured. As this was not possible due to the COVID-19 conditions, not all the standard calibration criteria can be met because of lack of consistent, cohesive, and reliable data in some locations along the corridor.

However, the CS team was able to gather sufficient historical data to create a fully working model that accurately replicates most of the existing conditions in the field. The modeling team has focused primarily on the model's congestion patterns and bottleneck locations to ensure that those match the field observed conditions adequately. Secondarily, focus was put on matching volumes to the extent feasible given the nature of the available volume count data. Note that the speed data were obtained from Caltrans Performance Measurement System (PeMS) and the National Performance Management Research Data Set (NPMRDS) and these data are very accurate and reliable for the days observed. Thus, as demonstrated in this memo, the model accurately replicated congestion and bottlenecks, and also replicates volumes well, while not specifically meeting every volume calibration threshold.

Model Development

The model development process was summarized previously in the submitted *"I-80 Corridor Base Year Microsimulation Model Development"* memorandum. As noted in that memorandum, the target date for model calibration and replication was selected to be April 25, 2019. This date was selected as a typical weekday with average amounts of recurrent congestion (not the worst nor the best day of April) and a time period with average seasonal impacts, no holidays or major incident impacts, and when schools were fully in session.

Data Collection

PeMS data for mainline and ramp volumes for April 25, 2019 were used, where available. At locations where reliable data on that day were not available, PeMS data from other days with the best available PeMS station reporting were used, followed by data available from Caltrans or other sources. The other sources used for volumes included Caltrans published ADT volumes that were factored to 2019 and factored to the peak periods, as applicable, and available turning movement counts at the ramp intersections.

The Caltrans 2018 ADT vehicle classification report was used to inform the heavy vehicle percentage during the model development. NPMRDS travel time and speed data were used for calibration of the corridor travel speeds, bottlenecks, queues and duration of queues.

All traffic signals were coded according to the timing plans provided by Caltrans or the cities of Fairfield and Vallejo. Ramp meter controller data were also collected from Caltrans and were coded in Vissim to approximate the locally traffic responsive timing operations from the field controllers.

The Solano-Napa travel demand model (TDM) was used to extract a seed origin-destination trip table for each of the microsimulation study areas. The trip tables represent existing travel patterns and travel demand along the corridor and at each interchange on and off-ramp.

This memorandum further summarizes the existing traffic conditions; bottleneck conditions; calibration approach; and calibration results in terms of speed, volume and congestion replication for both the Fairfield and Vallejo microsimulation models.

Fairfield Model

Existing Traffic Conditions – Fairfield Modeling Area

The I-80 model in Fairfield starts from west of the Red Top Road ramps and extends to east of Manuel Campos Parkway. Figure 1 shows the portion of the I-80 corridor Study Area that is covered by the Fairfield Model.

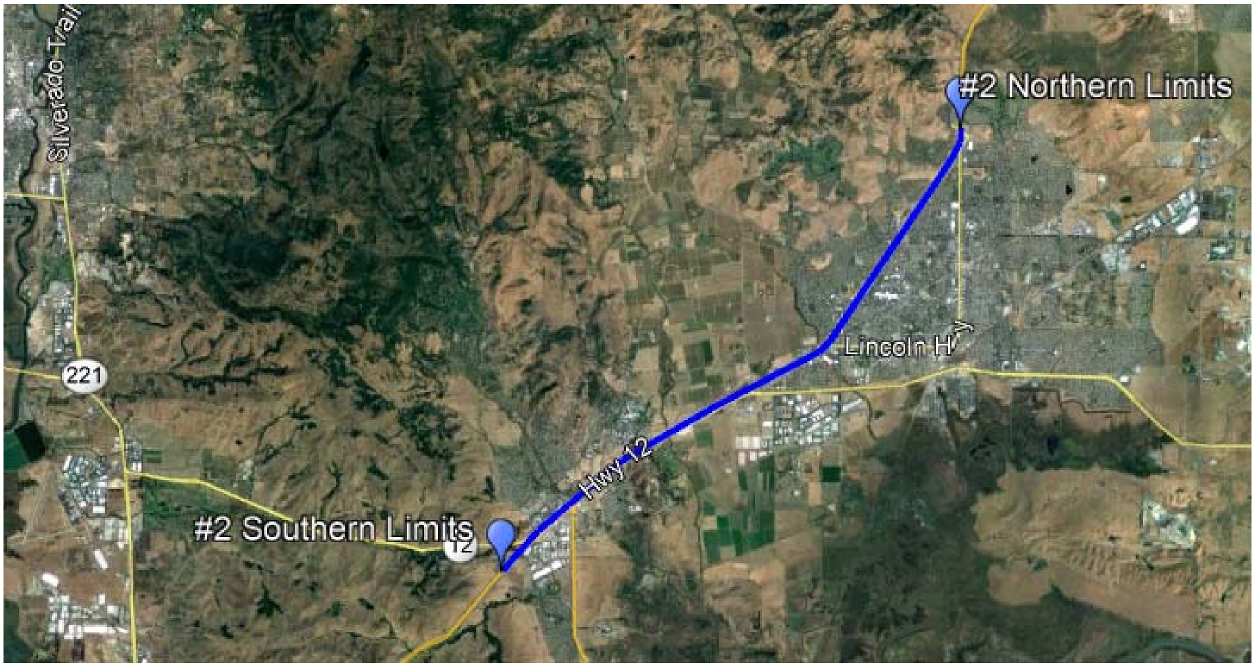

Figure 1- Fairfield Model Study Area

During the AM peak period, the traffic in this modeling area runs almost at free flow speeds. Some traffic slowdown occurs in the westbound direction after the Highway 12 on-ramp. During the PM peak period, eastbound traffic is congested. After Airbase Parkway, the HOV lane ends and the highway narrows from five lanes to four lanes. This creates a bottleneck that extends to Pittman Road/Suisun Valley Road. Eastbound traffic during the AM and westbound traffic during the PM periods run almost at free flow speeds with short and isolated slowdowns. Figure 2 and Figure 3 show observed speed heat maps from NPMRDS for eastbound and westbound traffic, respectively. These heat maps display the speeds at each location along the corridor and are color coded so that the locations of slower speeds and bottlenecks stand out (orange and red color) in terms of both temporal extent and distance of the queues and bottlenecks.

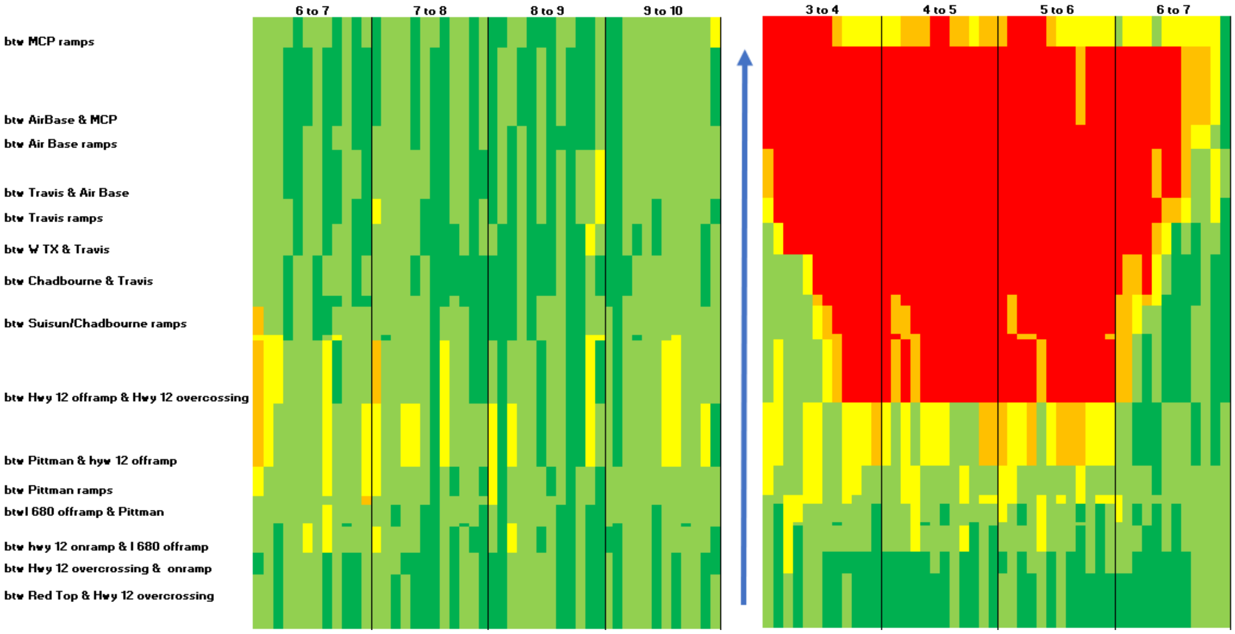

Figure 2- Fairfield Observed Speed Heat Map (NPMRDS)- Eastbound

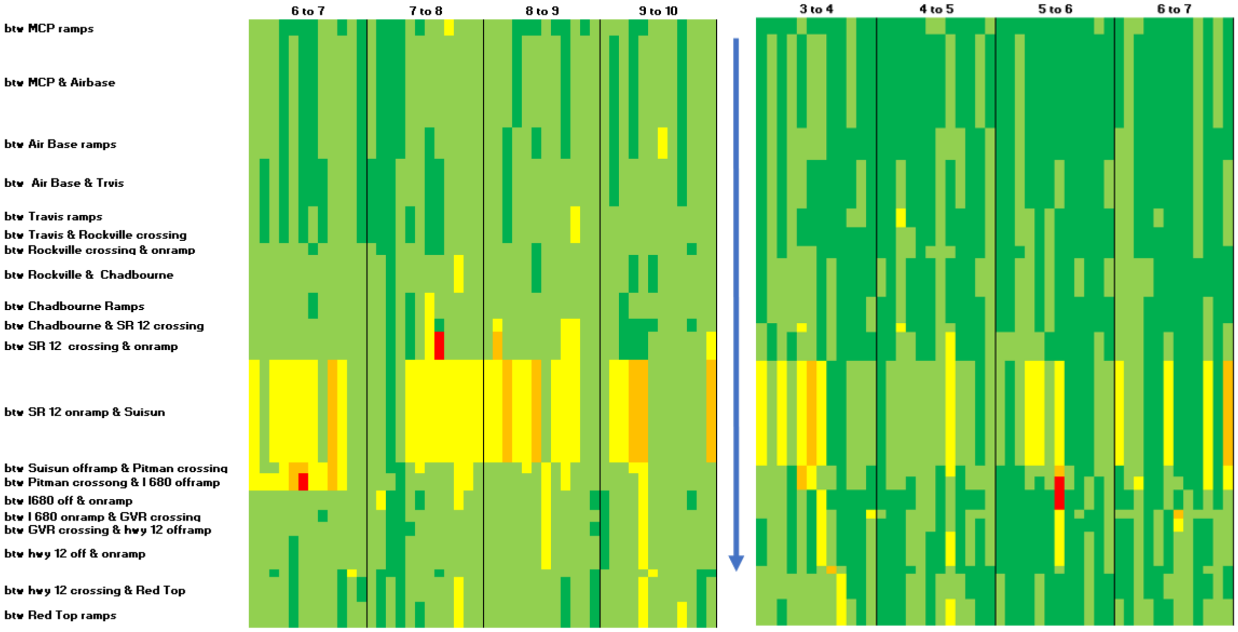

Figure 3- Fairfield Observed Speed Heat Map (NPMRDS)- Westbound

Fairfield Model Calibration Approach

The calibration process consisted of an iterative process where results were obtained from the model, a comparison of model and field data was made, modeling parameters were adjusted, and the models were simulated again. This process was repeated until the most desirable results were obtained given the available data. The model was then run ten times with different random seed values and the average results from those runs were obtained, thus avoiding the potential undesirable stochastic effects of simulation that can create outlier runs that can skew results. It is important to note that the same calibration parameters were utilized for both AM and PM simulation periods. The most significant modifications that were made during the calibration process included:

- **Demand Adjustments:** The seed trip tables from the travel demand model were adjusted to approximate observed segment counts once they were used in the Vissim network. This process was initially done through the Origin Destination Matrix Estimation (ODME) features in Visum, and was further refined manually as part of the simulation calibration.

- **Lane Changing Parameter Adjustments:** Lane changing model parameters were modified to reflect the real-world behavior. At merging segments, the right most lane traffic merges aggressively to avoid getting stuck before the lane drops, whereas the adjacent lane traffic drives cooperatively to provide the necessary space for this lane change. Also, the lane changing distances for freeway off-ramps were increased from default values to reflect how people actually drive along I-80. This modification seeks to represent a more realistic lane changing pattern on multi-lane freeways in northern California and I-80 than the default Vissim driving parameters.

- **Car-Following Parameter Adjustments:** The car-following model parameters were modified to reflect how people actually drive along I-80. These parameters control when a vehicle starts to adopt the lower speed of the preceding vehicle, and what is the desired headway and safety distance that drivers like to keep from the preceding vehicle. Ultimately, these parameters affect the freeway's capacity.

As discussed in the separate model development memorandum, trip tables from the travel demand model (from the Solano/Napa regional model) consist of 13 user groups such as drive alone, shared ride with 2 passengers, shared ride with 3 passengers, etc. The ODME process was performed in a way to preserve the ratio that initially existed between these user groups. The estimated trips resulting from the Visum ODME process were then used in Vissim to run the simulations. Demand and driving behavior were iteratively changed to replicate both the observed counts and congestion patterns.

Both the AM and PM models share the same driving behaviors, as would typically occur in the field. Parameters on arterial streets were kept as default. The model uses Wiedemann 99 car-following rules, which are meant to represent driving behaviors on freeway facilities. For some freeway segments, some of the Wiedemann 99 car-following and lane changing parameters were modified. The CS team defined six driving behaviors for different types of segments along the corridor. These behaviors are listed in Table 1.

Table 1. Driving Behavior Based on Network Conditions

Condition	Driving Behavior
Lane Drop	cooperative
Merging	cooperative
Merging- high volume (>500 veh/hr)	aggressive lane change
HCM-Basic segment	Basic
HCM-Non Basic- Non merging segments	Non-Basic
1st lane in merging segment	highly aggressive lane change
2nd lane in merging segment	highly cooperative lane change

Table 2 shows Vissim parameters that were changed during the calibration and their default values.

Table 2. Defaults Values for Altered Driving Behaviors

Driving Behavior Model	Parameter	Unit	Default
Car-following	CC0	ft	4.92
	CC1	sec	0.9
	CC2	ft	13.12
Lane Changing	Max deceleration/ own	ft/s^2	-13.12
	Min headway	ft	1.64
	Safety distance reduction factor		0.6
	Max Deceleration Cooperating Braking	ft/s^2	-9.84
	Cooperating lane change		no
	Max speed difference	mph	6.71

The following provides a brief description of each of the parameters:

CC0: StandStill distance. The average desired standstill distance between two vehicles. A higher value means larger standstill distance and lower capacity, and directly impacts jam density.

CC1: Headway time. Time distribution of speed-dependent part of desired safety distance. Higher value means more cautious drivers and lower capacity.

Safety Distance = CC0+CC1*speed

CC2: Following variation. Restricts the distance difference (longitudinal oscillation) or how much more distance than the desired safety distance a driver allows before he/she intentionally moves closer to the car in front. Higher value means more cautious driver and lower capacity.

Maximum deceleration-own: Upper bound of deceleration for own vehicle. Higher absolute value means more aggressive lane changing behaviors.

Minimum Headway: Defines minimum distance that should remain in front or rear of the vehicle after completing a lane change.

Safety Distance Reduction Factor: It only applies during lane change, reduced the total safety distance by this factor. Once lane change is completed, it goes back to 1.

Maximum Deceleration for Cooperating Breaking: Maximum deceleration during cooperative breaking to let another vehicle switch to their lane.

Cooperative Lane Changing: If this option is checked, when vehicle sees a merging car, they move to the adjacent lane if possible, to make space and allow another vehicle switch to their current lane.

Maximum Speed Difference: Higher values mean increased congestion in the left lanes; lower values means speeds in the left lanes are closer to free flow speed.

Table 3 shows the adjusted values for selected parameters.

Table 3. Adjusted Parameters' Values

Parameter	Default	Basic	Non-Basic	Cooperative	Highly Cooperative	Aggressive Lane Change	Highly Aggressive Lane Change
CC0	4.92	5.5	8.5	8.5	8.5	D*	D
CC1	0.9	1.05	1.05	1.05	1.2	D	D
CC2	13.12	15.12	15.12	16.12	23.12	D	D
Max deceleration/ own	-13.12	D	D	D	D	-14.12	-16.12
Min headway	1.64	D	D	D	1.54	D	1.24
Safety distance reduction factor	0.6	D	D	D	0.3	0.4	0.10
Max deceleration cooperative break	-9.84	D	D	D	-15.84	D	-12.84
Cooperating lane change	No	D	D	Yes	Yes	Yes	Yes
Max speed difference	6.71	D	D	D	9.71	D	D

* D stands for Default Value

Fairfield Model Calibration Results

Volume Comparisons

Figures 3 to 10 show the scatter plots comparing the observed (x-axis) and model (y-axis) volumes for both mainlines and ramps for each hour of the AM and PM peak periods and for each direction. During both AM and PM peak periods, the eastbound and westbound I-80 simulated volumes closely match the existing counts. The scatter plots show that the observed counts were reasonably replicated with both R-squared values and linear regression line slopes close to 1.0, indicating a close correlation between counts and model predictions. Please note that a few erroneous counts and counts that were inconsistent with adjacent locations are excluded from these plots. As noted, most of the historical volume data is good and provides consistency throughout the corridor, but some of the counts were deemed to be not valid after detailed review and consistency checks were performed. Those were the counts that were removed from these comparisons.

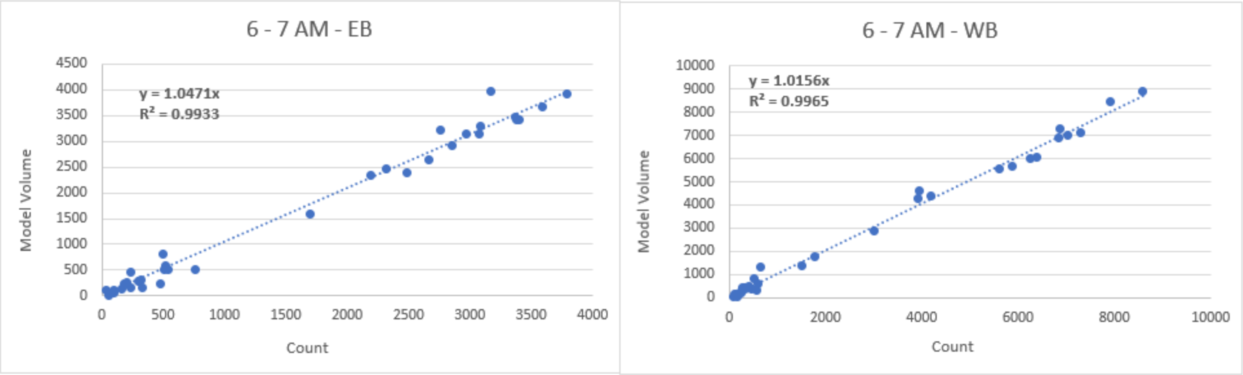

Figure 3- Replicated Counts – Fairfield – 6 to 7 AM

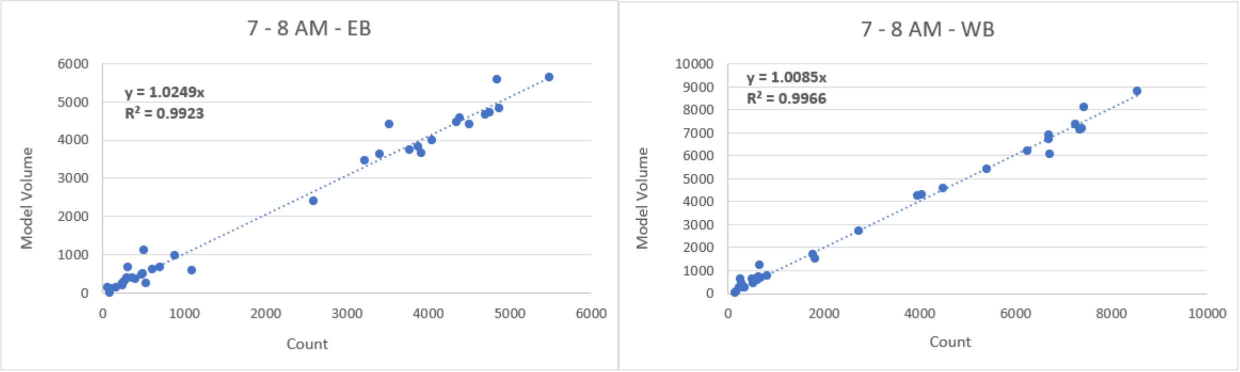

Figure 4- Replicated Counts – Fairfield – 7 to 8 AM

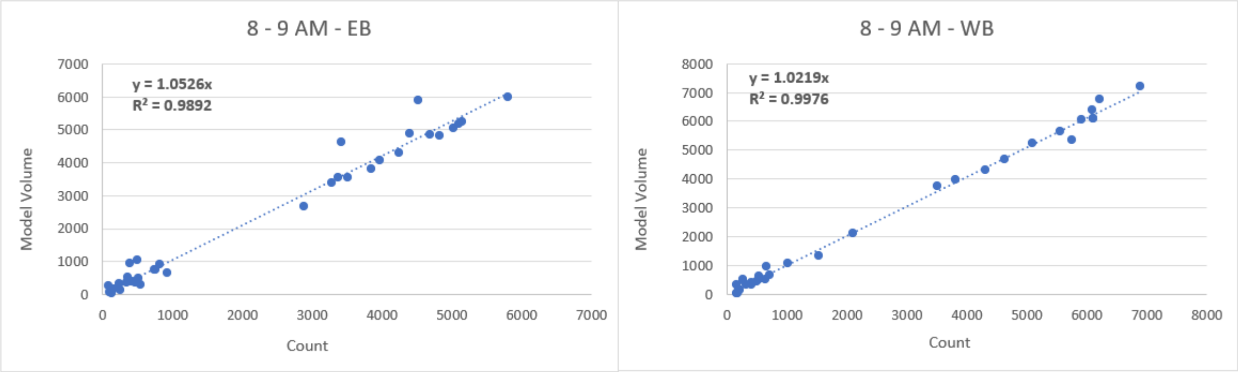

Figure 5- Replicated Counts – Fairfield – 8 to 9 AM

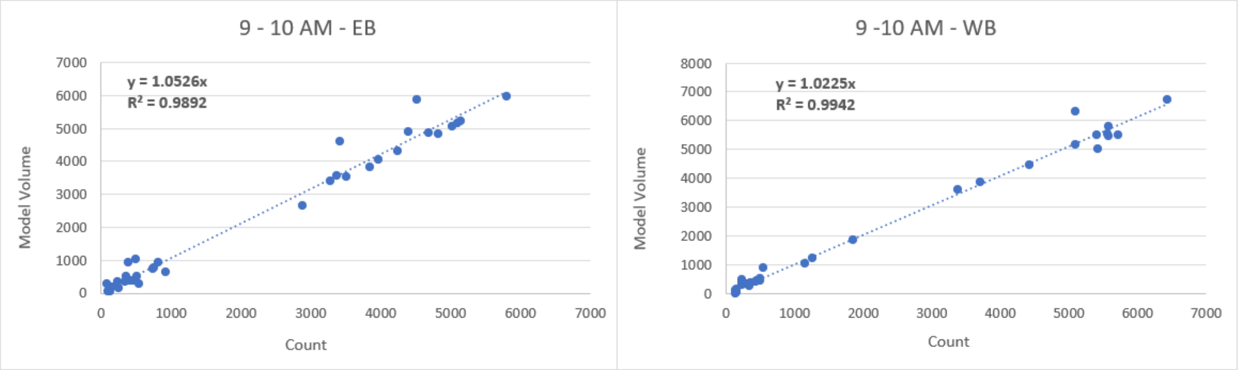

Figure 6- Replicated Counts – Fairfield – 9 to 10 AM

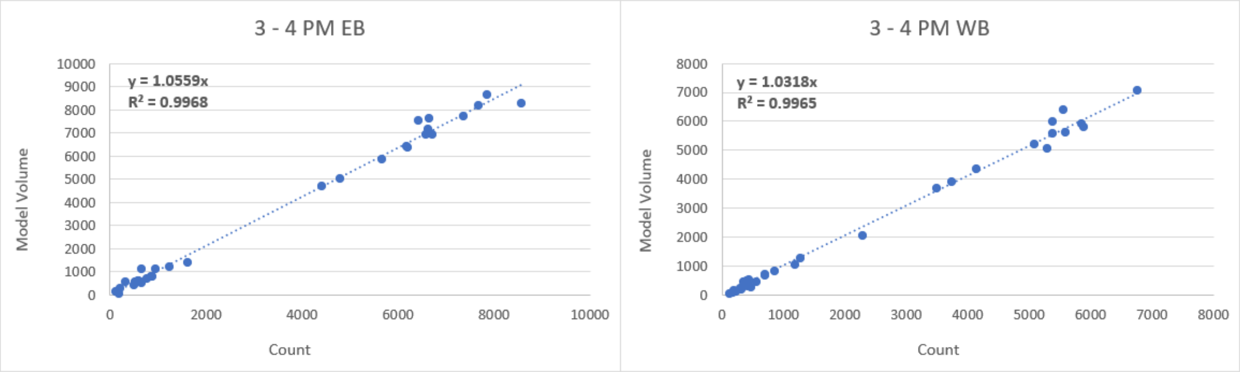

Figure 7- Replicated Counts – Fairfield – 3 to 4 PM

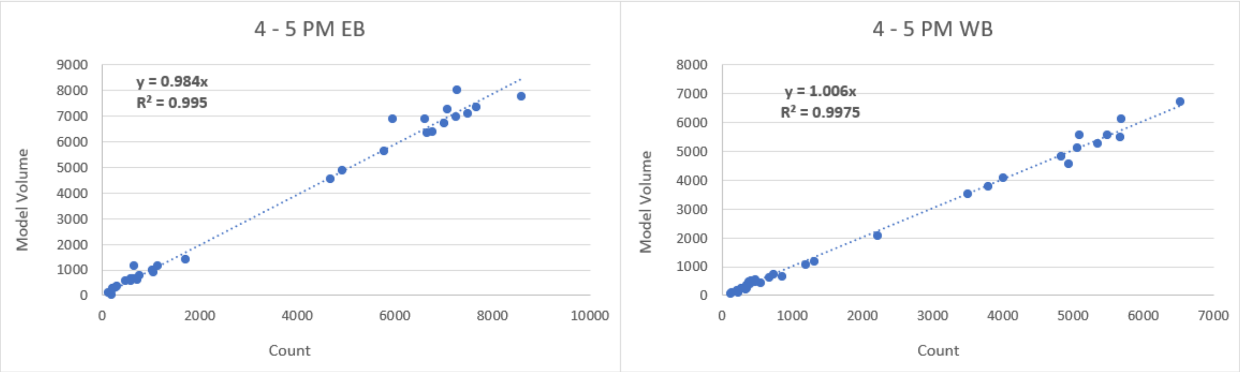

Figure 8- Replicated Counts – Fairfield – 4 to 5 PM

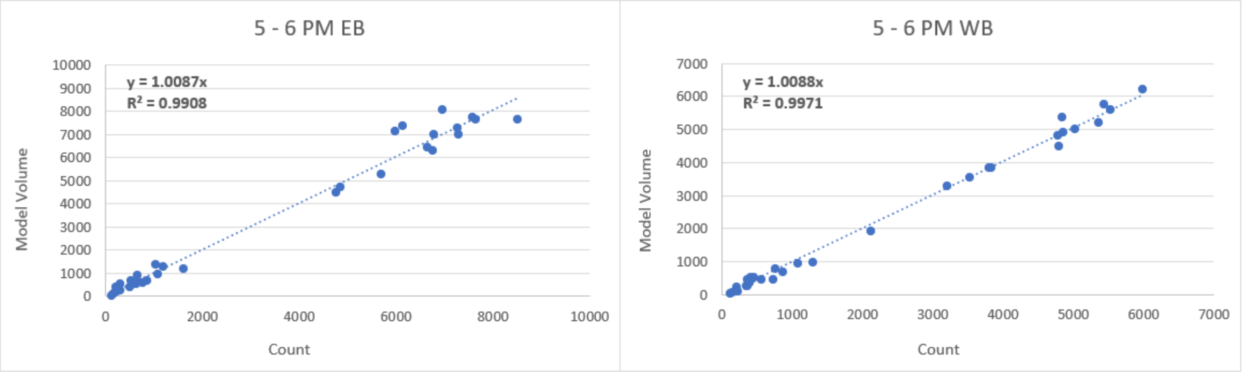

Figure 9- Replicated Counts – Fairfield – 5 to 6 PM

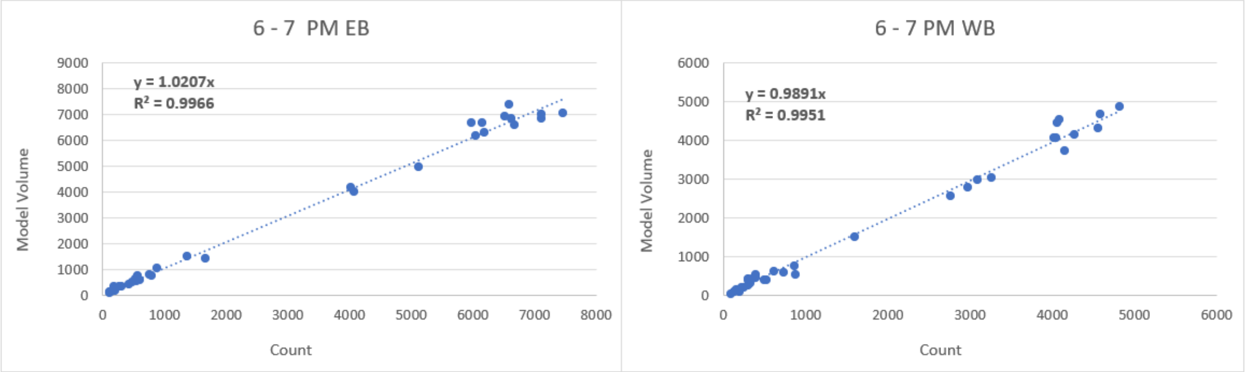

Figure 10- Replicated Counts – Fairfield – 6 to 7 PM

Congestion Pattern and Speed Replication

Figures 11 to 14 compare the observed and modeled speed heat maps for each direction in each peak period. In each figure, observed speeds are on the left side and the modeled speeds are on the right side, with the arrow between them indicating the direction of flow. As can be seen in the figures, the congestion patterns, bottleneck locations, queue lengths and durations, and queue build-up and dissipation are replicated well by the model.

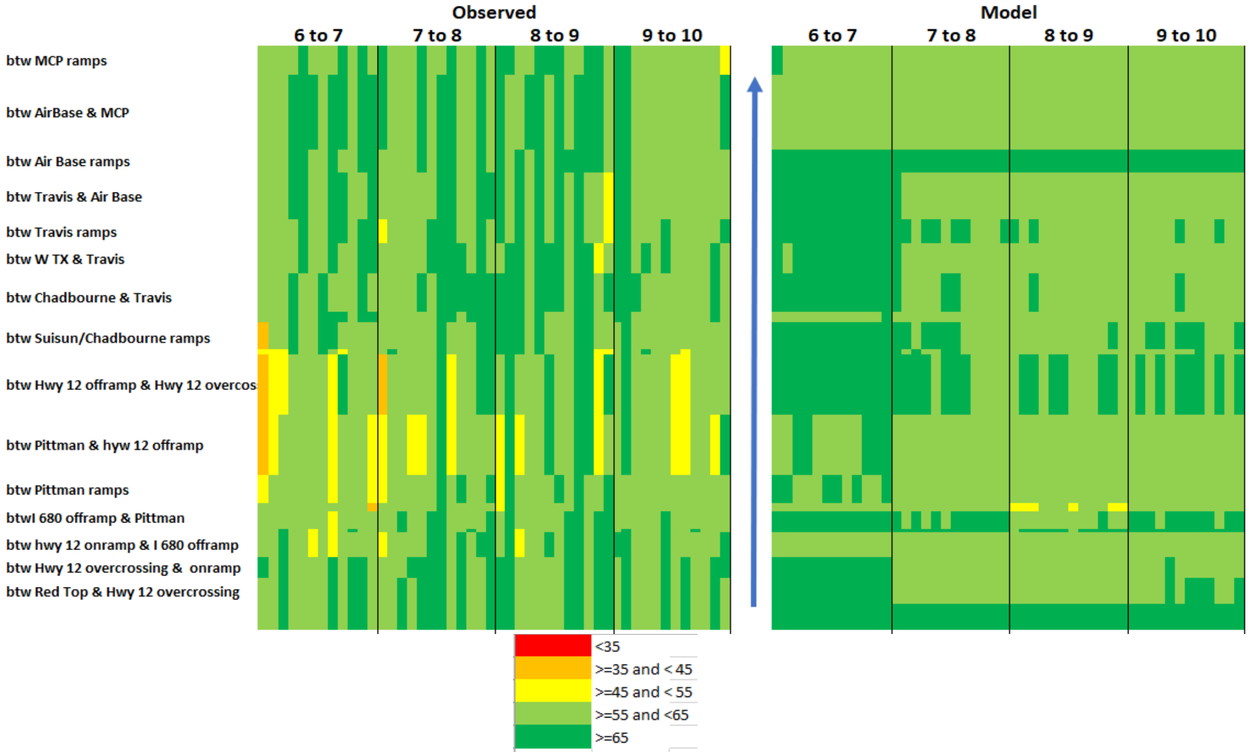

Figure 11- Eastbound Speed Comparisons – Fairfield –AM

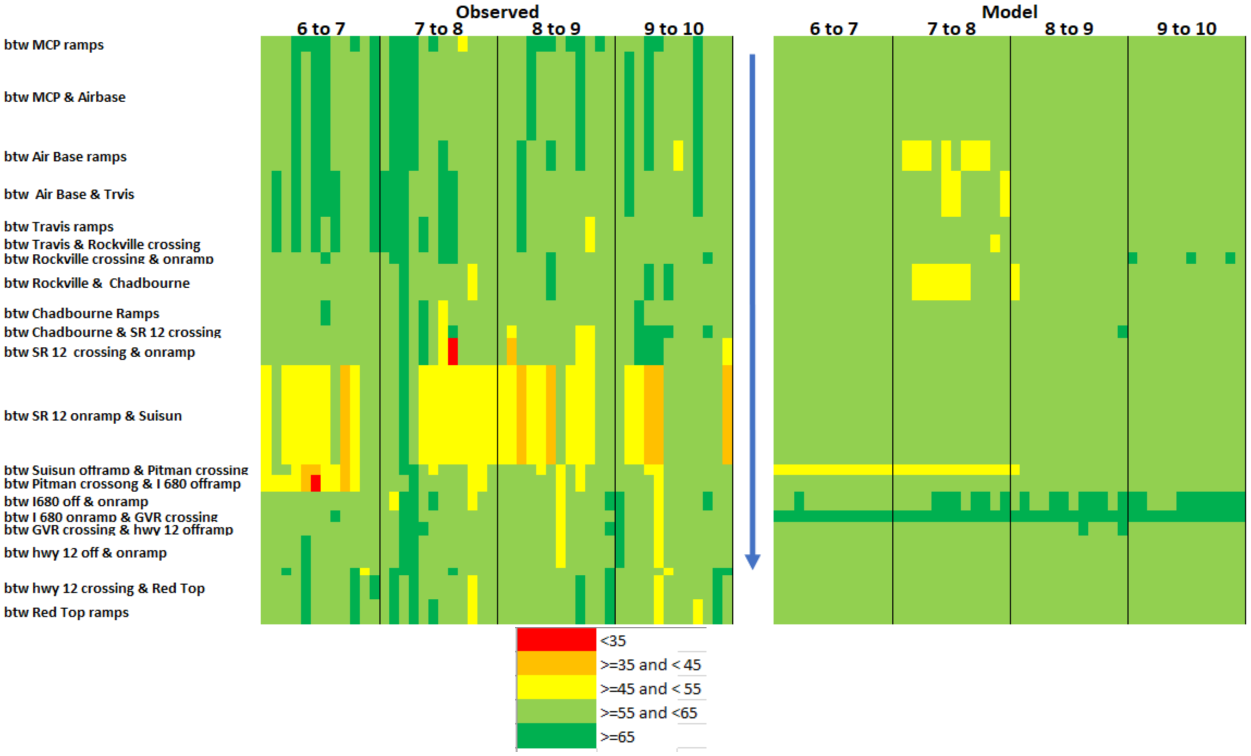

Figure 12- Westbound Speed Comparisons – Fairfield –AM

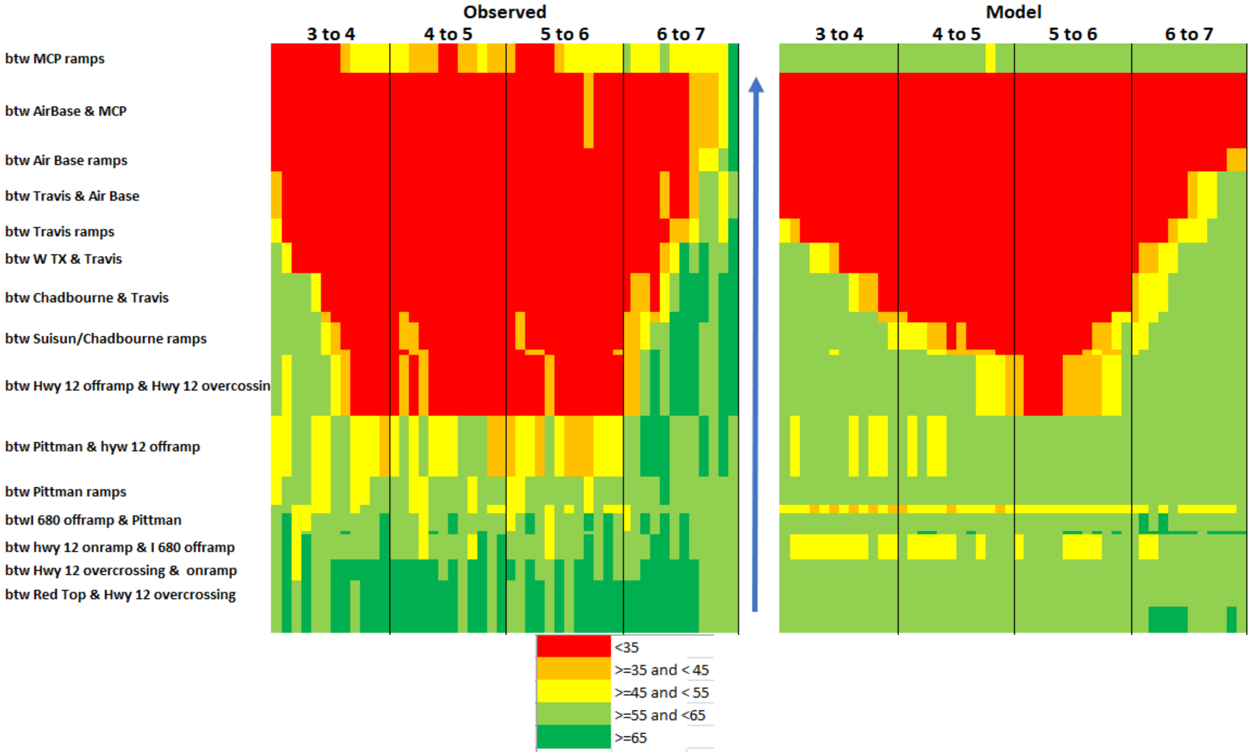

Figure 13- Eastbound Speed Comparisons – Fairfield –PM

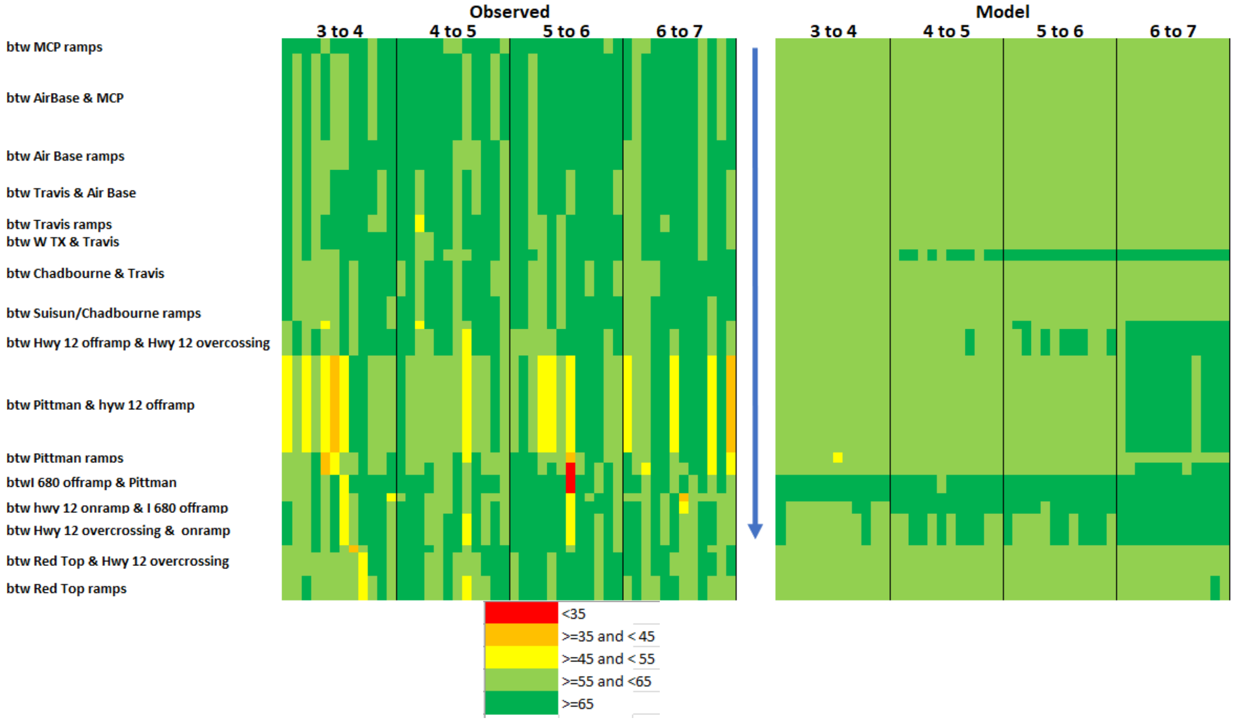

Figure 14- Westbound Speed Comparisons – Fairfield –PM

Vallejo Model

Existing Traffic Conditions – Vallejo Modeling Area

The I-80 model in Vallejo begins at the Alfred Zampa Memorial Bridge on the western edge of the model and extends to the east of Columbus Pkwy/ SR 37 interchange ramps. Figure 16 shows the portion of the I-80 corridor Study Area that is covered by the Vallejo Model.

Figure 16 - Vallejo Model Study Area

During the AM peak period, the traffic in eastbound direction slows between the bridge toll plaza and off-ramp to Sonoma Blvd. Along the remaining I-80 eastbound segments and entire westbound segments, the traffic moves with speeds higher than 55 mph, except for a few scattered spots with lower speeds.

During the PM peak period, eastbound traffic operates at very slow speeds. There are two eastbound bottlenecks that are currently integrated and affect one another. One bottleneck occurs approaching the on-ramp from Tennessee Street. According to PeMS data, the mainline throughput before this on-ramp is around 4,400 vehicles per hour, while the estimated ramp volume is around 1,000 vehicles per hour (note that the ramp volume estimate is based on 2012 ADT data and is the only available volume source at this location). The high volume, combined with some weaving which occurs downstream approaching the Redwood street off-ramp creates the bottleneck. Travel time data suggests that drivers likely avoid the rightmost lane in the vicinity of the on-ramp and they yield to the on-ramp traffic. The queue from this bottleneck reaches to the next bottleneck after the I-780 on-ramp. At this location, the PeMS volume before the on-ramp is around 3,500 vehicles per hour, and the PeMS volume for the on-ramp is around 1,300 vehicles per hour. The on-ramp lane continues to the highway, and after a very short 180 foot weaving area, the rightmost lane of the mainline drops while the on-ramp lanes continues to the freeway. This geometry and volume combination suggests that the on-ramp volume force-merges onto I-80 aggressively, and mainline traffic will also likely be forced to yield to the merging on-ramp traffic.

Figures 15 and 16 show observed speed heat maps (based on NPMRDS data) for eastbound and westbound traffic in the Vallejo model.

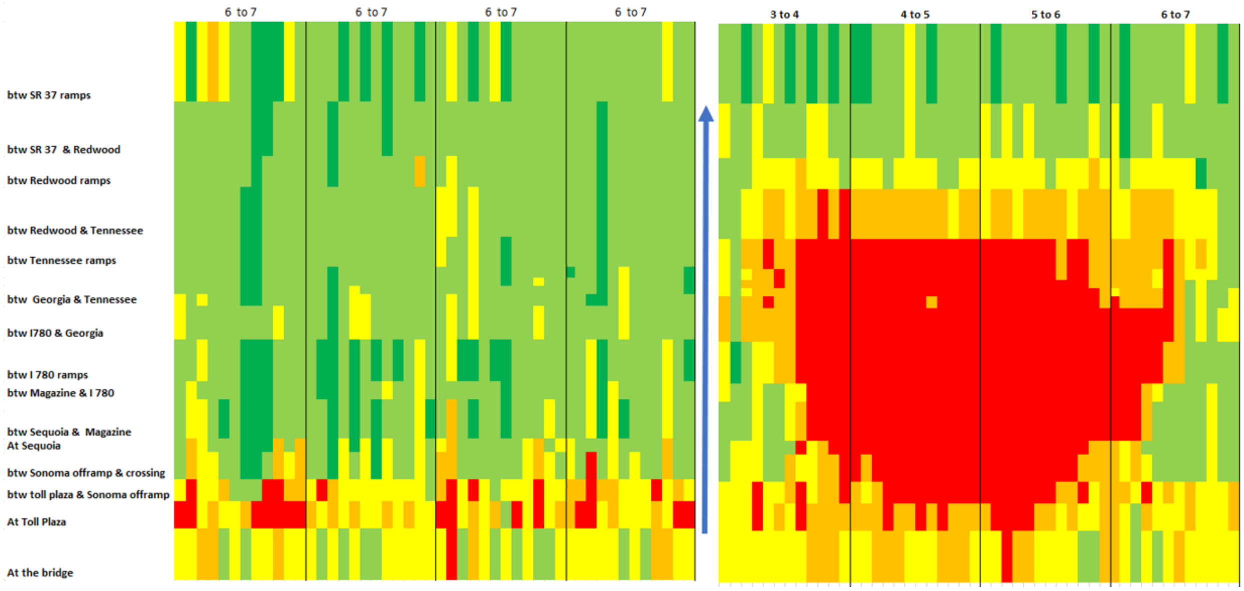

Figure 15- Vallejo Observed Speed Heat Map (NPMRDS)- Eastbound

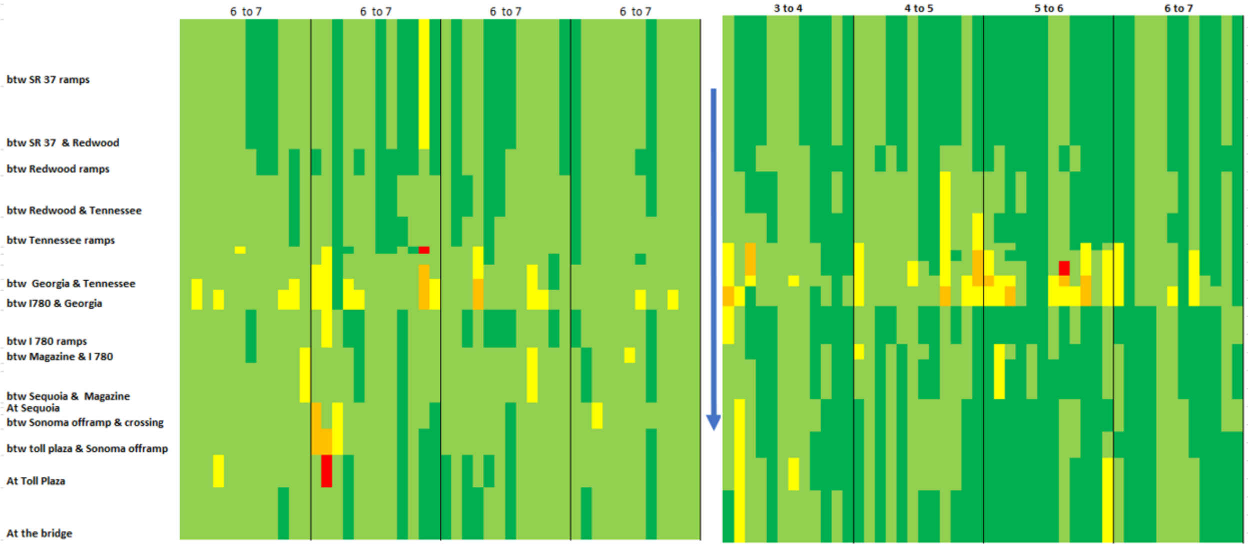

Figure 16- Vallejo Observed Speed Heat Map (NPMRDS)- Westbound

Vallejo Model Calibration Approach

Similar to the methods described for the Fairfield model above, the CS team used the ODME functions in Visum to tune the seed demands to the observed counts, and then used those ODME estimated trips in the Vallejo Vissim model. As with the Fairfield model, for the Vallejo model the team used six adjusted driving behaviors at different segments along the corridor. Table 4 shows the adjusted value for each behavior used in the Vallejo model.

Table 4. Adjusted Model Parameter Values

Parameter	Default	Basic	Non-Basic	Cooperative	Highly Cooperative	Aggressive Lane Change	Highly Aggressive Lane Change
CC0	4.92	5.5	8.5	8.5	8.5	D*	D
CC1	0.9	1.05	1.2	1.15	1.4	D	D
CC2	13.12	14.12	20.12	19.12	27.12	D	D
Max deceleration/ own	-13.12	D	D	D	D	-14.12	-17.12
Min headway	1.64	D	D	D	1.54	D	1.24
Safety distance reduction factor	0.6	D	D	D	0.4	0.4	0.15
Max deceleration cooperative break	-9.84	D	D	D	-15.84	D	D
cooperating lane change	No	D	D	Yes	Yes	Yes	Yes
max speed difference	6.71	D	D	D	10.71	D	D

* D - Default Value Applied

In addition to the car-following and lane changing model parameters, to replicate the ramp volume throughput and force-merge conditions described above at very heavy volume merge locations, additional changes to the standard conflict areas in the Vissim model were required. At both the Tennessee Street and I-780 on-ramp locations in the Vissim model, the ramp traffic was set to force-merge into the mainline, meaning some mainline traffic would need to yield to the on-ramp traffic. This behavior was required to replicate both the simulated ramp flows and the bottlenecks and slow operating speeds.

Vallejo Model Calibration Results

Volume Comparisons

Figures 17 to 25 show the scatter plots comparing observed and model volumes for each hour of the AM and PM modeling periods and for each direction. During both AM and PM peak periods, the eastbound and westbound I-80 simulated volumes closely match existing counts. The scatter plots show that the observed counts were reasonably replicated with both R-squared values and linear regression line slopes close to 1.0.

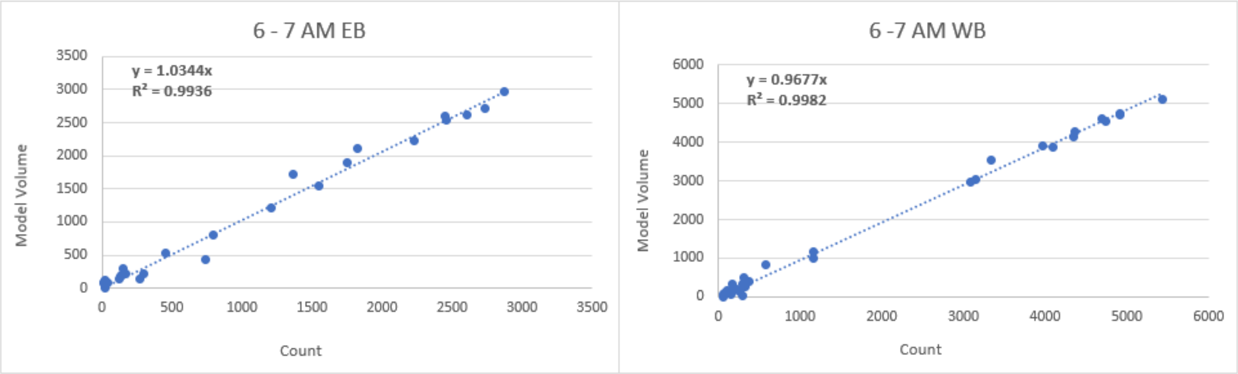

Figure 17- Replicated Counts – Vallejo – 6 to 7 AM

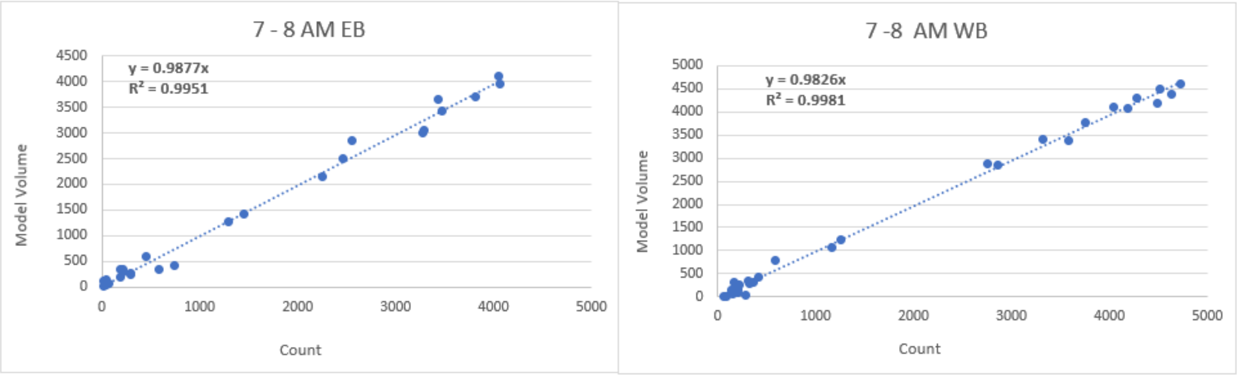

Figure 18- Replicated Counts – Vallejo – 7 to 8 AM

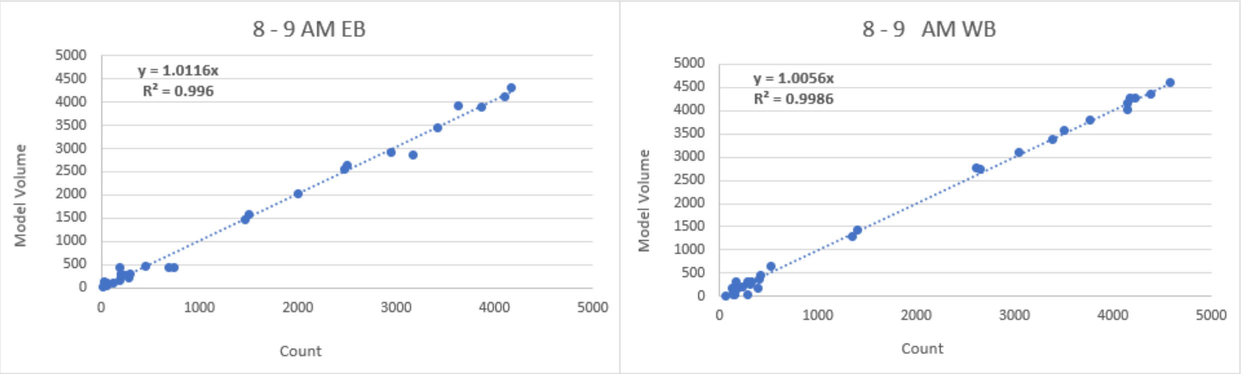

Figure 19- Replicated Counts – Vallejo – 8 to 9 AM

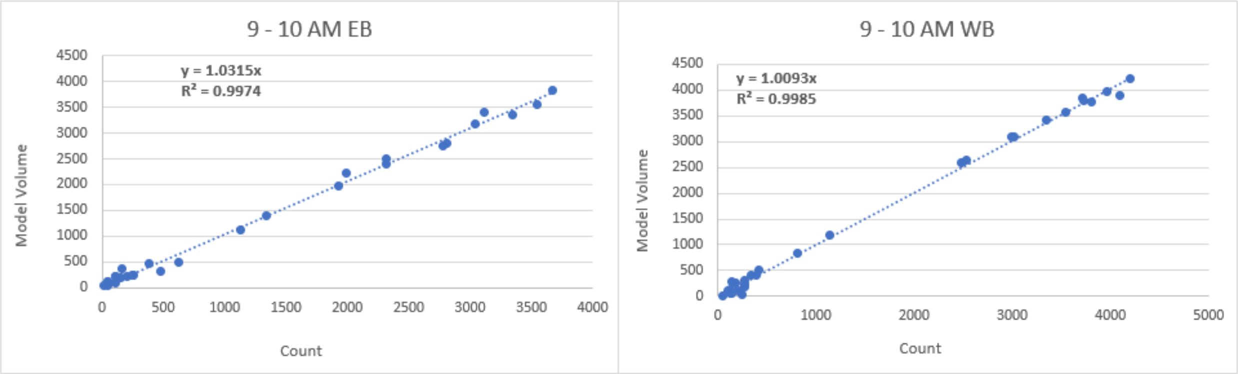

Figure 20- Replicated Counts – Vallejo – 9 to 10 AM

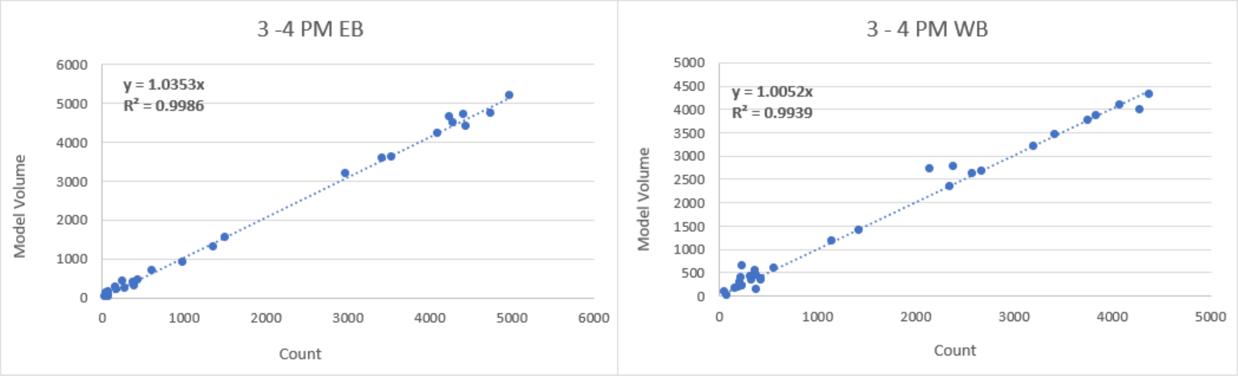

Figure 21- Replicated Counts – Vallejo – 3 to 4 PM

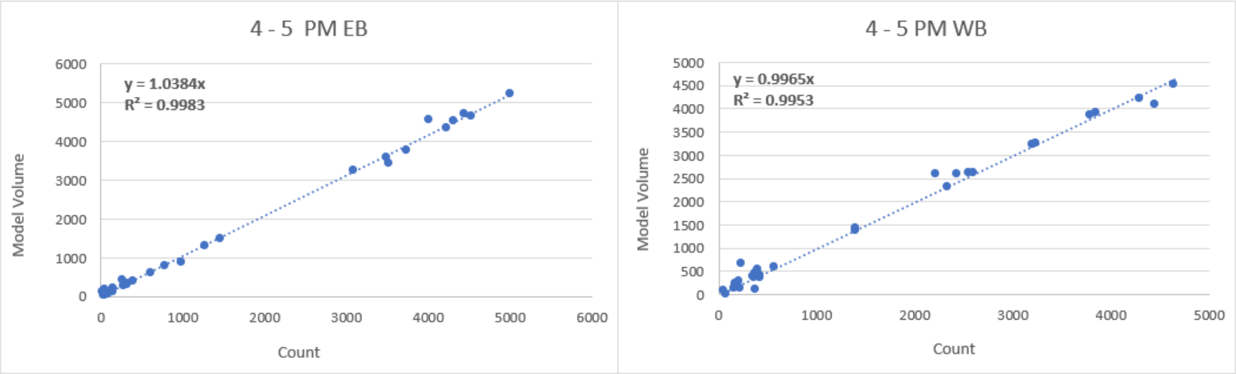

Figure 22- Replicated Counts – Vallejo – 4 to 5 PM

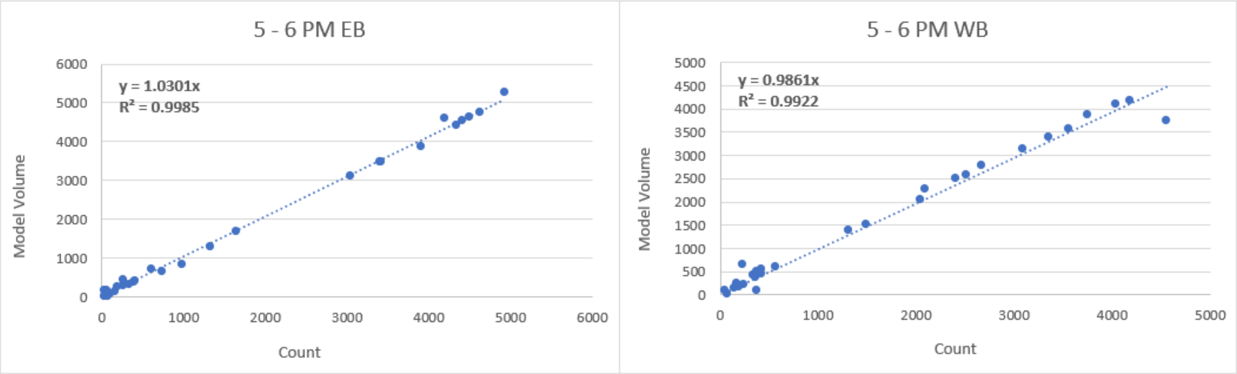

Figure 23- Replicated Counts – Vallejo – 5 to 6 PM

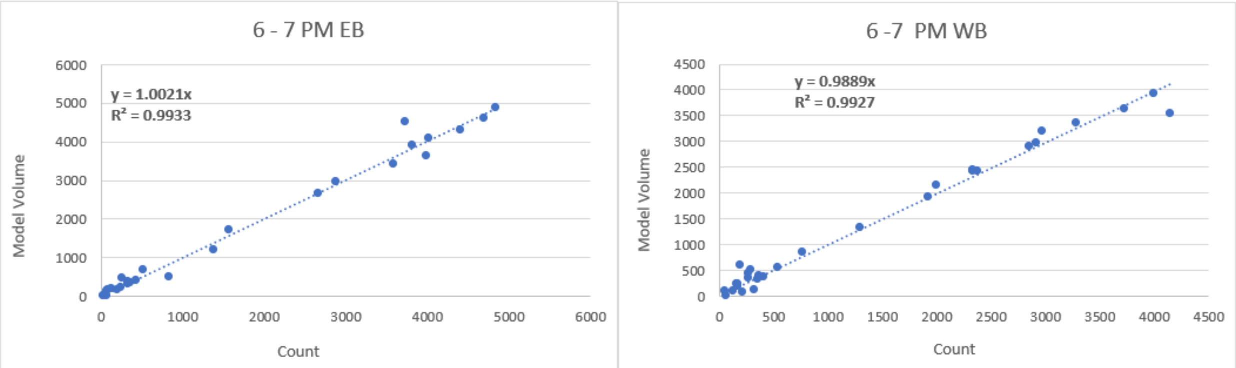

Figure 24- Replicated Counts – Vallejo – 6 to 7 PM

Congestion Pattern and Speed Replication

Figures 25 to 28 compare the observed speed heat maps on the left, and the model results heat maps on the right. As can be seen in the figures, the congestion patterns, bottleneck locations, queue lengths and durations, and queue build-up and dissipation are replicated well by the model.

Not that the model does not replicate the Carquinez Bridge toll plaza operations, as the model analysis segment begins east of the bridge when drivers exist the toll plaza.

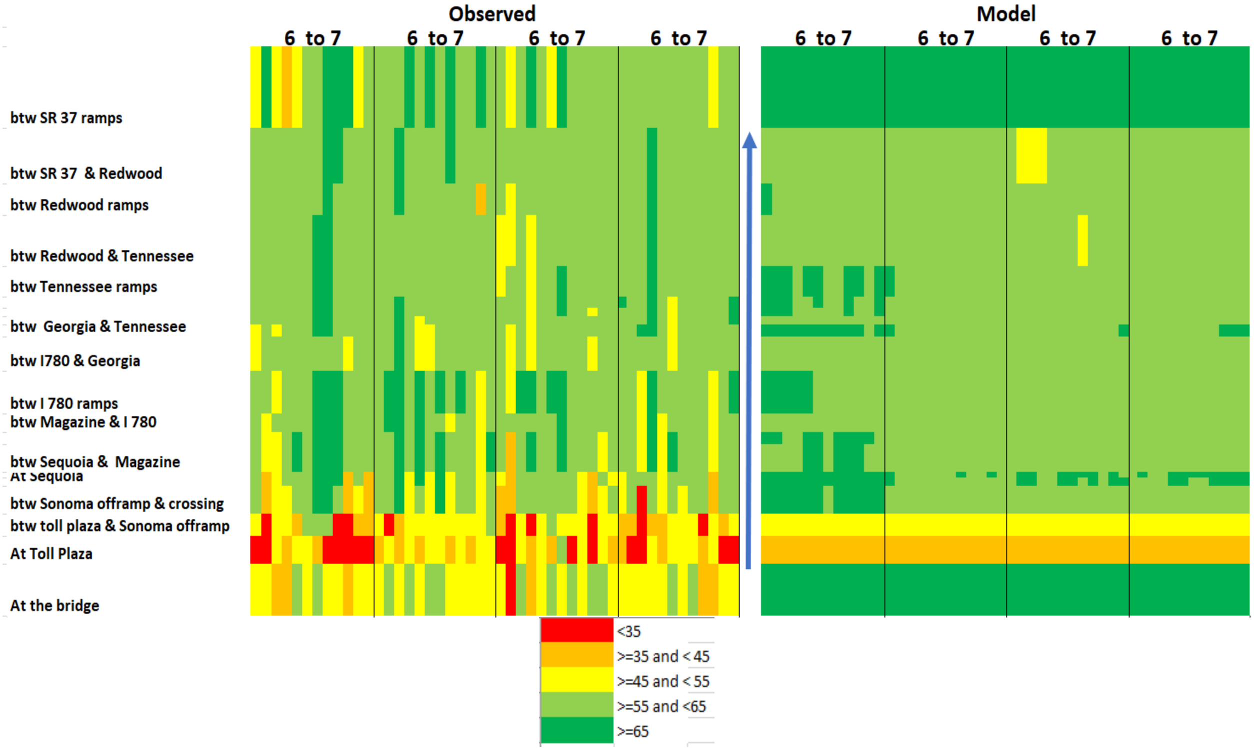

Figure 25- Eastbound Speed Comparison – Vallejo –AM

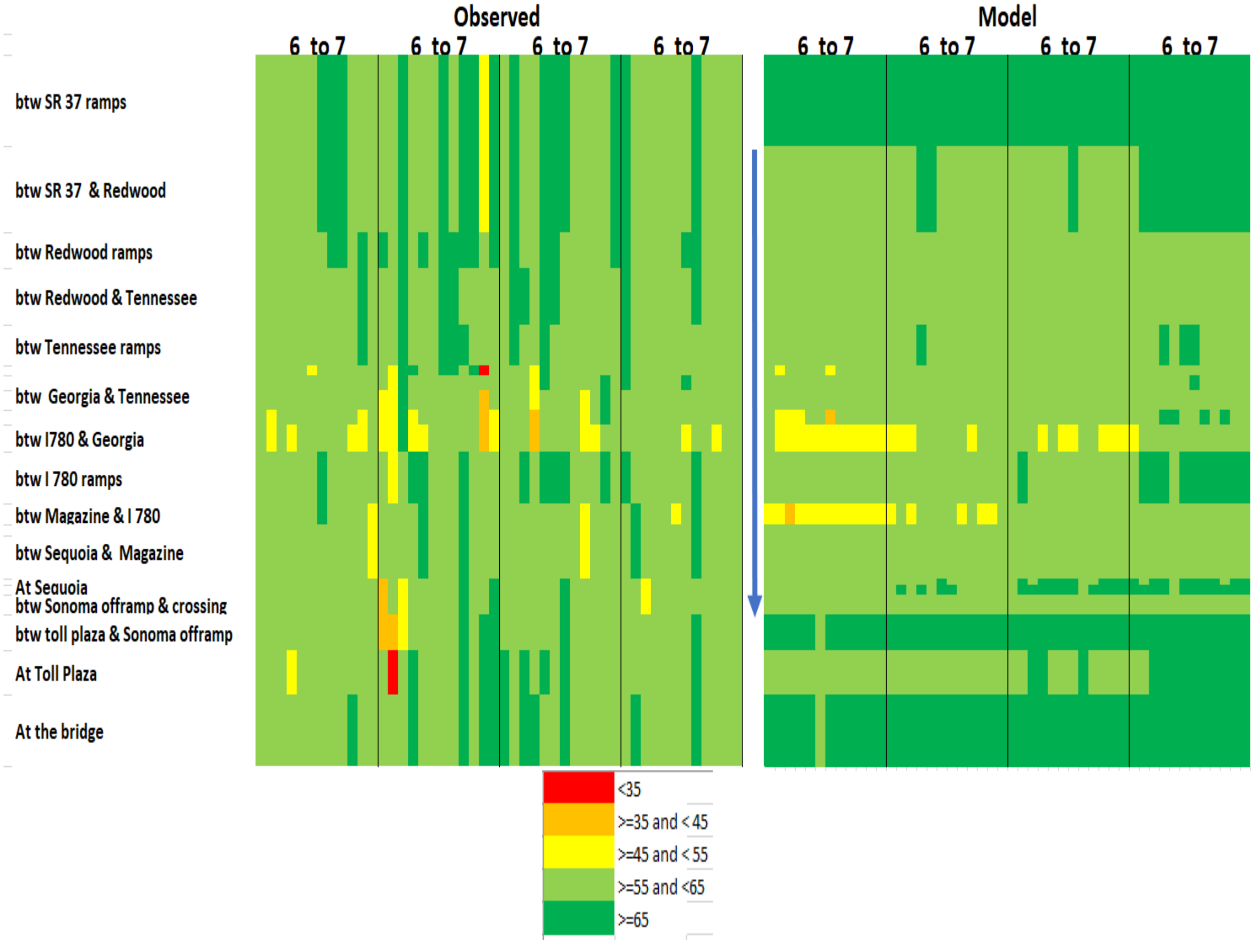

Figure 26- Westbound Speed Comparison – Vallejo –AM

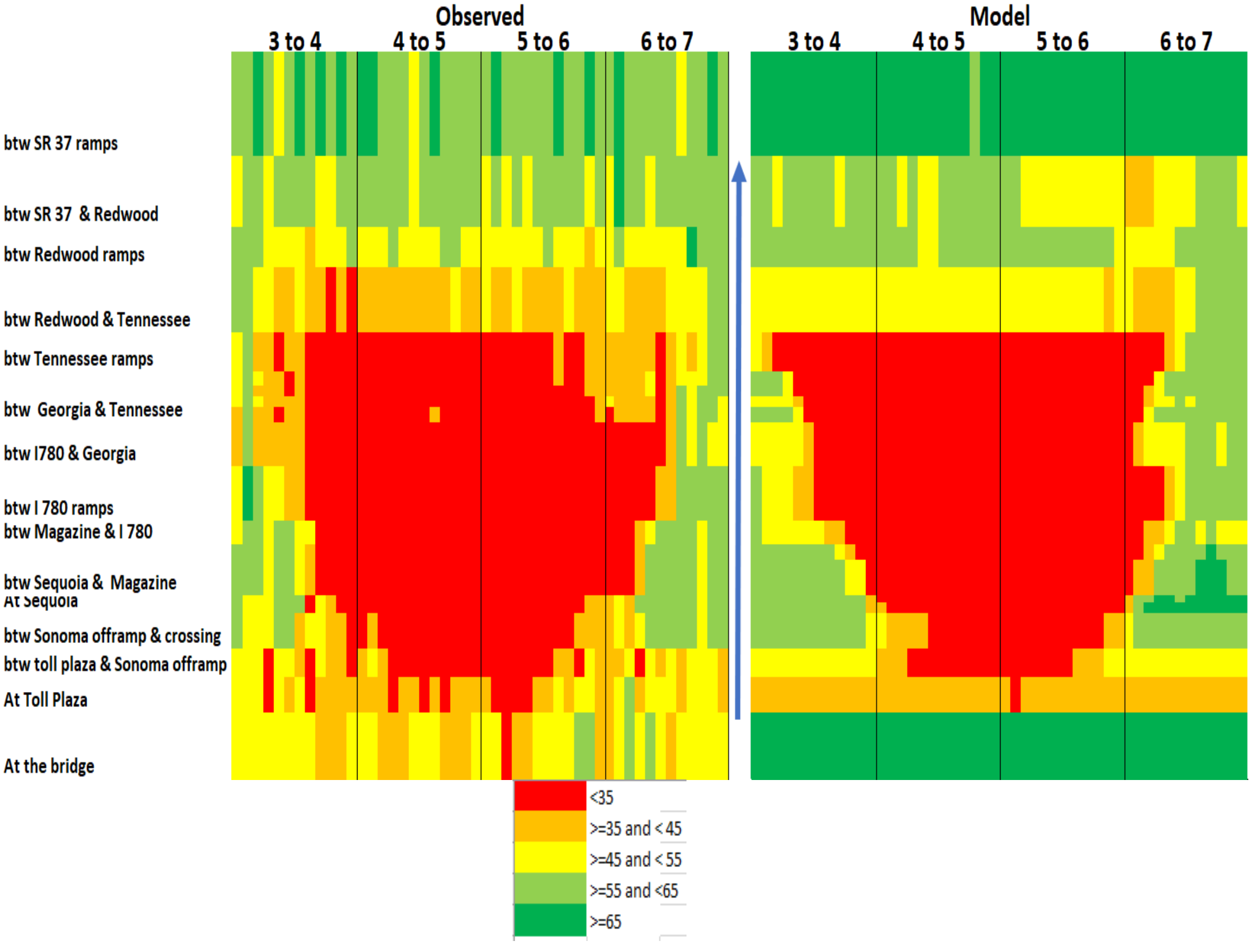

Figure 27- Eastbound Speed Comparison – Vallejo –PM

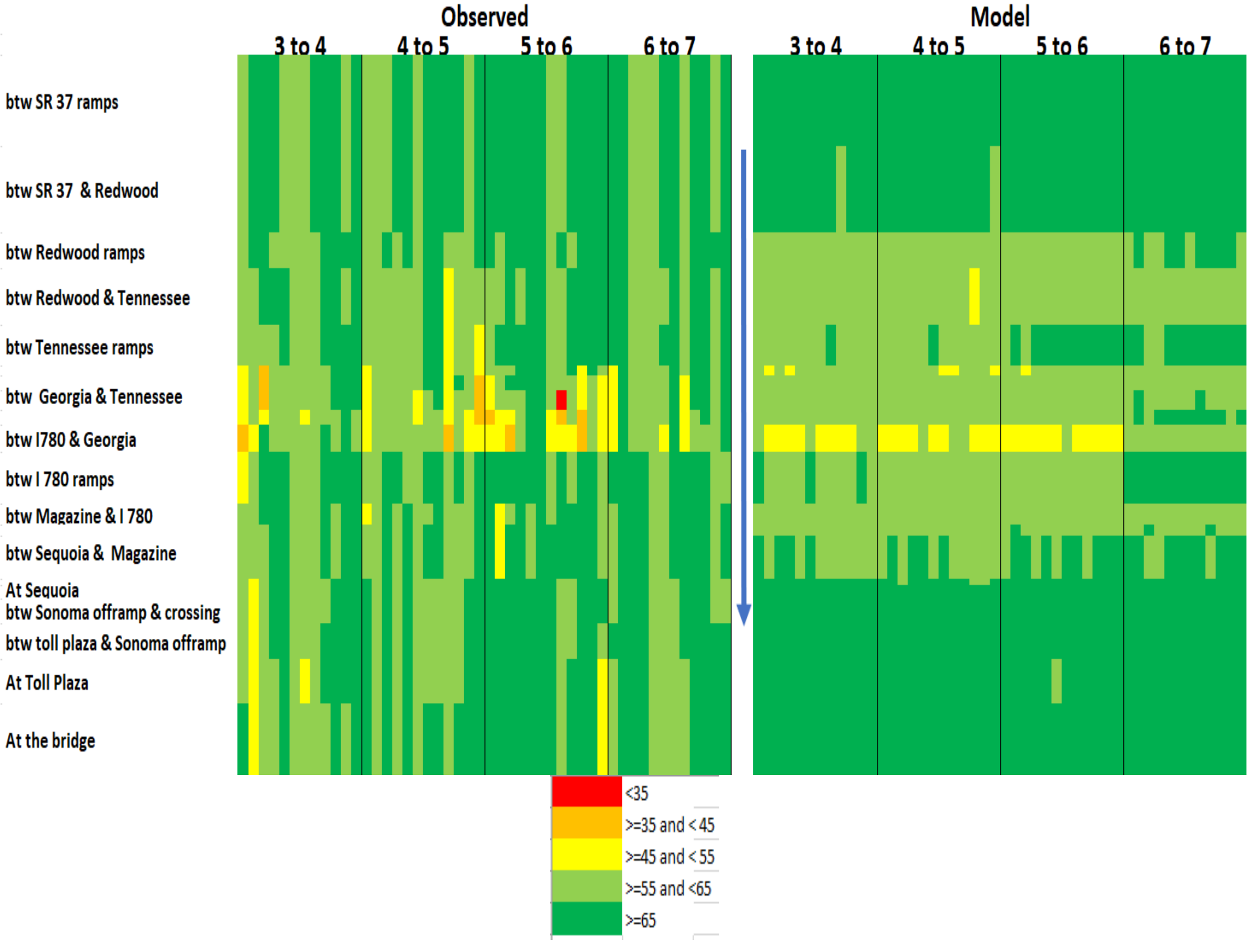

Figure 28- Westbound Speed Comparison – Vallejo –PM

Summary

In both Fairfield and Vallejo models, the same sets of parameters and adjustments were used during AM and PM peak periods. The general approach for adjusting driving behavior parameters is similar in both models. Calibration results show that volume, congestion, and bottleneck locations and extents in both models replicate the existing conditions. Given the variety and mixture of quality of the volume data available due to COVID-19 conditions, we conclude that the simulation models are well calibrated to key existing conditions parameters and are ready to be utilized for future alternative analyses.

Appendix D-2

Microsimulation Model Traffic Demand

Vallejo – AM Peak Period Demand – Existing and Future Scenarios

Flow Diagram	Type	Dir	Segment	Base	No Build	Scenario 1	Scenario 2	Scenario 3
N2	Mainline	NB	before Sonoma	10,891	11,933	11,307		
N3	Mainline	NB	at Magazine	10,146	11,178	10,672		
			at Magazine-GP			9,818	9,818	10,138
			at Magazine-ML			854	854	534
N5	Mainline	NB	at I780	9,418	10,626	9,963		
N6	Mainline	NB	at Georgia	13,701	15,338	14,640		
			at Georgia-GP			13,323	13,323	13,908
			at Georgia-ML			1,318	1,318	732
N7	Mainline	NB	at Solano	14,484	16,248	15,660		
N8	Mainline	NB	at Tennessee	13,629	15,436	15,444		
N9	Mainline	NB	before Redwood	15,412	17,473	17,510		
N10	Mainline	NB	at Redwood	12,779	14,458	14,648		
			at Redwood-GP			13,623	13,623	14,062
			at Redwood-ML			1,025	1,025	586
N11	Mainline	NB	at CA 37	7,812	8,980	8,957		
N13	Mainline	NB	after CA 37	11,410	13,295	13,342		
S1	Mainline	SB	before CA 37	15,040	18,224	19,005		
S2	Mainline	SB	at CA 37	13,381	15,413	16,341		
S5	Mainline	SB	at Redwood	13,427	14,989	15,972		
			at Redwood-GP			13,896	13,896	14,055
			at Redwood-ML			2,076	2,076	1,917
S6	Mainline	SB	before Tennessee	17,849	20,314	21,739		
S7	Mainline	SB	at Tennessee	16,665	18,940	20,025		
S8	Mainline	SB	at Solano	17,461	19,322	20,354		
			at Solano-GP			17,708	17,505	17,708
			at Solano-ML			2,646	2,850	2,646
S9	Mainline	SB	at Georgia	17,152	19,757	20,614		
S10	Mainline	SB	at I780	13,577	15,646	16,498		
S11	Mainline	SB	at Magazine	15,748	17,958	18,856		
			at Magazine-GP			17,536	17,536	17,724
			at Magazine-ML			1,320	1,320	1,131
S12	Mainline	SB	after Maritime	14,169	16,107	15,936		
S13	Mainline	SB	after Sonoma	17,543	20,740	20,429		
R1	ON	SB	Sonoma	3,375	4,632	4,493		
R2	ON	SB	Maritime	-	-	-		

Flow Diagram	Type	Dir	Segment	Base	No Build	Scenario 1	Scenario 2	Scenario 3
R3	OFF	SB	Maritime	2,338	2,730	3,020		
R4	ON	SB	Magazine	758	879	101		
R5	OFF	SB	Magazine	577	653	653		
R6	ON	SB	I780	2,748	2,966	3,011		
R7	OFF	SB	I780	4,197	4,910	4,881		
R8	ON	SB	Georgia	622	798	764		
R9	OFF	SB	Georgia	971	897	945		
R10	ON	SB	Solano	662	1,332	1,205		
R11	OFF	SB	Solano	537	775	773		
R12	ON	SB	Tennessee	1,333	1,156	1,103		
R13	OFF	SB	Tennessee	1,183	1,374	1,715		
R14	ON	SB	Redwood	4,422	5,325	5,767		
R15	OFF	SB	Redwood	2,930	3,029	3,322		
R16	ON	SB	CA 37 EB	5,041	4,985	5,228		
R17	ON	SB	CA 37 WB	174	169	166		
R18	OFF	SB	CA 37 EB	2,239	2,549	2,440		
R19	OFF	SB	CA 37 WB	1,660	2,811	2,664		
R20	ON	NB	CA 37 EB	2,732	3,322	3,343		
R21	ON	NB	CA 37 WB	866	993	1,042		
R22	OFF	NB	CA 37	5,671	6,359	6,342		
R23	ON	NB	Redwood	704	881	650		
R24	OFF	NB	Redwood	68	-	-		
R25	OFF	NB	Redwood	2,565	3,015	2,862		
R26	ON	NB	Tennessee	1,783	2,037	2,066		
R27	OFF	NB	Tennessee	1,053	1,069	504		
R28	ON	NB	Solano	198	256	288		
R29	OFF	NB	Solano	322	444	412		
R30	ON	NB	Georgia	1,105	1,353	1,432		
R31	OFF	NB	Georgia	396	473	568		
R32	ON	NB	I780	4,678	5,186	5,245		
R33	OFF	NB	I780	500	448	479		
R34	OFF	NB	I780	2,028	2,280	2,215		
R35	ON	NB	Magazine	1,801	2,175	1,985		
R36	OFF	NB	Magazine	656	667	544		
R37	OFF	NB	Sequoia	88	88	91		
R38	OFF	NB	Sonoma	1,016	1,653	1,324		

Vallejo – PM Peak Period Demand – Existing and Future Scenarios

Flow Diagram	Type	Dir	Segment	Base	No Build	Scenario 1	Scenario 2	Scenario 3
N2	Mainline	NB	before Sonoma	15,699	17,618	18,694		
N3	Mainline	NB	at Magazine	15,396	17,252	17,724		
			at Magazine-GP			16,306	16,484	16,661
			at Magazine-ML			1,418	1,241	1,063
N5	Mainline	NB	at I780	13,331	14,555	14,664		
N6	Mainline	NB	at Georgia	18,658	20,349	20,373		
			at Georgia-GP			17,724	17,928	18,132
			at Georgia-ML			2,648	2,445	2,241
N7	Mainline	NB	at Solano	18,733	19,995	20,625		
N8	Mainline	NB	at Tennessee	17,385	18,623	20,271		
N9	Mainline	NB	before Redwood	20,703	22,754	23,354		
N10	Mainline	NB	at Redwood	17,193	18,435	18,829		
			at Redwood-GP			16,569	16,757	17,134
			at Redwood-ML			2,259	2,071	1,695
N11	Mainline	NB	at CA 37	12,804	14,444	15,068		
N13	Mainline	NB	after CA 37	18,505	22,473	22,427		
S1	Mainline	SB	before CA 37	13,049	14,711	14,896		
S2	Mainline	SB	at CA 37	10,569	11,878	12,036		
S5	Mainline	SB	at Redwood	12,730	13,695	13,647		
			at Redwood-GP			11,873	12,009	12,418
			at Redwood-ML			1,774	1,638	1,228
S6	Mainline	SB	before Tennessee	16,873	18,388	18,286		
S7	Mainline	SB	at Tennessee	15,327	16,903	16,778		
S8	Mainline	SB	at Solano	15,987	17,529	18,075		
			at Solano-GP			15,545	15,906	16,448
			at Solano-ML			2,531	2,169	1,627
S9	Mainline	SB	at Georgia	14,778	16,342	16,916		
S10	Mainline	SB	at I780	10,179	11,359	12,234		
S11	Mainline	SB	at Magazine	10,278	11,367	11,463		
			at Magazine-GP			10,661	10,661	10,775
			at Magazine-ML			802	802	688
S12	Mainline	SB	after Maritime	9,941	10,980	10,917		
S13	Mainline	SB	after Sonoma	12,470	14,015	13,788		
R1	ON	SB	Sonoma	2,528	3,035	2,870		
R2	ON	SB	Maritime	-	-	-		

Flow Diagram	Type	Dir	Segment	Base	No Build	Scenario 1	Scenario 2	Scenario 3
R3	OFF	SB	Maritime	672	739	680		
R4	ON	SB	Magazine	335	352	134		
R5	OFF	SB	Magazine	1,426	1,776	2,715		
R6	ON	SB	I780	1,525	1,785	1,944		
R7	OFF	SB	I780	5,126	5,611	5,629		
R8	ON	SB	Georgia	526	627	947		
R9	OFF	SB	Georgia	1,810	2,073	2,038		
R10	ON	SB	Solano	600	887	879		
R11	OFF	SB	Solano	930	1,446	1,225		
R12	ON	SB	Tennessee	1,590	2,071	2,522		
R13	OFF	SB	Tennessee	1,546	1,485	1,508		
R14	ON	SB	Redwood	4,142	4,693	4,640		
R15	OFF	SB	Redwood	2,317	2,616	2,705		
R16	ON	SB	CA 37 EB	5,328	5,538	5,393		
R17	ON	SB	CA 37 WB	1,088	1,115	1,102		
R18	OFF	SB	CA 37 EB	1,938	2,220	2,180		
R19	OFF	SB	CA 37 WB	2,480	2,834	2,860		
R20	ON	NB	CA 37 EB	4,322	6,214	5,584		
R21	ON	NB	CA 37 WB	1,378	1,815	1,776		
R22	OFF	NB	CA 37	6,264	6,547	6,491		
R23	ON	NB	Redwood	1,875	2,556	2,730		
R24	OFF	NB	Redwood	-	-	-		
R25	OFF	NB	Redwood	3,510	4,319	4,525		
R26	ON	NB	Tennessee	3,319	4,131	3,083		
R27	OFF	NB	Tennessee	1,572	1,600	636		
R28	ON	NB	Solano	223	228	281		
R29	OFF	NB	Solano	727	906	1,013		
R30	ON	NB	Georgia	802	552	1,265		
R31	OFF	NB	Georgia	504	596	732		
R32	ON	NB	I780	5,830	6,391	6,441		
R33	OFF	NB	I780	1,067	1,485	1,712		
R34	OFF	NB	I780	2,695	3,179	3,097		
R35	ON	NB	Magazine	1,697	1,967	1,748		
R36	OFF	NB	Magazine	237	302	897		
R37	OFF	NB	Sequoia	66	64	72		
R38	OFF	NB	Sonoma	2,277	3,284	2,863		

Fairfield – AM Peak Period Demand – Existing and Future Scenarios

Flow Diagram	Type	Dir	Segment	Base	No Build	Scenario 1	Scenario 2	Scenario 3
N1	Mainline	NB	before Red Top	12,648	13,766	14,068		
N2	Mainline	NB	at Red Top	12,057	13,006	13,303		
N3	Mainline	NB	after Red Top	12,516	13,500	13,729		
N5	Mainline	NB	I 680	13,585	15,139	15,373		
N6	Mainline	NB	at Pittman	20,719	23,033	23,231		
N7	Mainline	NB	after Pittman	21,832	24,389	24,639		
N8	Mainline	NB	before Hwy12	20,769	24,389	24,639		
N9	Mainline	NB	after Hwy 12	16,879	20,033	20,237		
	Mainline	NB	after Hwy 12-GP	16,204	19,432	19,832	20,034	20,034
	Mainline	NB	after Hwy 12-ML	675	601	405	202	202
N10	Mainline	NB	at Chadbourne	18,573	21,357	21,616		
N11	Mainline	NB	at Auto Mall	17,586	18,979	19,068		
	Mainline	NB	at Auto Mall-GP	16,707	18,220	18,686	18,686	18,877
	Mainline	NB	at Auto Mall-ML	879	759	381	381	191
N12	Mainline	NB	after Auto Mall	18,376	21,120	21,087		
N13	Mainline	NB	at Travis	16,969	18,812	18,805		
N15	Mainline	NB	at Airbase	15,053	16,517	16,536		
	Mainline	NB	at Airbase-GP	14,150	15,691	15,874	15,874	16,205
	Mainline	NB	at Airbase-ML	903	826	661	661	331
N16	Mainline	NB	after Airbase	17,537	19,383	19,446		
	Mainline	NB	after Airbase-GP	16,660	19,350	18,862	18,668	18,668
	Mainline	NB	after Airbase-ML	877	33	583	778	778
N17	Mainline	NB	at Manuel Campos	15,851	17,656	17,719		
N18	Mainline	NB	after Manuel Campos	18,427	20,933	21,061		
S1	Mainline	SB	before Manuel Campos	23,915	28,720	29,630		
S2	Mainline	SB	at Manuel Campos	22,246	26,257	27,167		
S4	Mainline	SB	at Airbase	22,127	24,760	24,611		
	Mainline	SB	at Airbase-GP	21,242	23,027	22,642	22,642	22,396
	Mainline	SB	at Airbase-ML	885	1,733	1,969	1,969	2,215
S5	Mainline	SB	after Airbase	27,289	33,201	33,093		
S6	Mainline	SB	at Travis	25,078	30,728	30,788		
S8	Mainline	SB	at Rockville	24,184	28,173	28,772		
	Mainline	SB	at Rockville-GP	22,975	25,638	26,758	26,470	26,182
	Mainline	SB	at Rockville-ML	1,209	2,536	2,014	2,302	2,589
S10	Mainline	SB	at Chadbourne	25,536	29,772	31,540		

Flow Diagram	Type	Dir	Segment	Base	No Build	Scenario 1	Scenario 2	Scenario 3
S11	Mainline	SB	after Hwy12	32,724	39,938	40,399		
	Mainline	SB	after Hwy12-GP	31,088	36,743	36,764	36,764	36,360
	Mainline	SB	after Hwy12-ML	1,636	3,195	3,636	3,636	4,040
S12	Mainline	SB	at Pittman	29,279	36,927	37,500		
S13	Mainline	SB	at I 680	19,449	25,460	26,337		
	Mainline	SB	at I 680-GP	18,671	23,933	24,757	24,493	24,493
	Mainline	SB	at I 680-ML	778	1,528	1,580	1,844	1,844
S14	Mainline	SB	after offramp to Hwy12	15,616	18,615	19,401		
S15	Mainline	SB	after Green Valley Rd	16,517	19,649	20,737		
S16	Mainline	SB	at Red Top	15,904	17,608	18,244		
S17	Mainline	SB	after Red Top	17,010	20,123	21,302		
R1	OFF	NB	to Red Top	591	760	765		
R2	ON	NB	From Red Top	458	493	426		
R3	ON	NB	From Hwy 12	2,492	3,198	3,212		
R5	OFF	NB	to I 680	1,423	1,559	1,567		
R6	ON	NB	from I 680	9,005	9,921	9,830		
R7	OFF	NB	to Pittman	1,871	2,026	1,973		
R8	ON	NB	From Pittman	1,113	1,356	1,408		
R10	OFF	NB	to Hwy12	3,890	4,356	4,402		
R11	ON	NB	from Hwy12	493	-	-		
R12	OFF	NB	to Chadbourne	69	75	93		
R13	ON	NB	From Chadbourne	1,269	1,399	1,472		
R16	ON	NB	Beck Ave	1,540	1,739	1,795		
R17	OFF	NB	Travis	2,946	4,047	4,076		
R18	ON	NB	Travis	1,475	1,795	1,820		
R19	OFF	NB	Airbase	3,391	4,091	4,090		
R20	ON	NB	Airbase	2,484	2,867	2,910		
R21	OFF	NB	Manuel Campos	1,686	1,727	1,727		
R22	ON	NB	Manuel Campos	2,575	3,276	3,343		
R23	OFF	SB	Manuel Campos	1,669	2,464	2,464		
R24	ON	SB	Manuel Campos	2,623	1,847	1,945		
R25	OFF	SB	Waterman	680	855	1,430		
R26	OFF	SB	Waterman	2,061	2,489	3,072		
R27	ON	SB	Waterman	5,162	8,441	8,482		
R28	OFF	SB	Travis	2,211	2,473	2,305		
R29	ON	SB	Travis	1,422	2,204	2,379		
R30	ON	SB	Travis	691	782	898		

Flow Diagram	Type	Dir	Segment	Base	No Build	Scenario 1	Scenario 2	Scenario 3
R31	OFF	SB	Oliver	3,006	5,540	5,293		
R32	ON	SB	Oliver	3,029	4,745	5,550		
R33	OFF	SB	Suisun	3,445	4,975	5,260		
R34	ON	SB	Suisun	1,768	1,828	2,478		
R35	ON	SB	Hwy 12	7,188	10,165	8,859		
R36	OFF	SB	Pittman	3,313	2,875	2,766		
R37	OFF	SB	I 680	9,830	11,467	11,163		
R38	ON	SB	I 681	476	734	778		
R39	OFF	SB	Hwy 12	4,309	7,579	7,713		
R40	ON	SB	Green Valley Rd	901	1,034	1,336		
R41	OFF	SB	Red Top	614	2,041	2,493		
R42	ON	SB	Red Top	1,107	2,515	3,058		

Fairfield – PM Peak Period Demand – Existing and Future Scenarios

Flow Diagram	Type	Dir	Segment	Base	No Build	Scenario 1	Scenario 2	Scenario 3
N1	Mainline	NB	before Red Top	18,602	21,889	22,757		
N2	Mainline	NB	at Red Top	17,543	20,625	20,937		
N3	Mainline	NB	after Red Top	18,549	21,759	22,729		
N5	Mainline	NB	I 680	22,285	27,113	26,672		
N6	Mainline	NB	at Pittman	30,721	36,093	34,989		
N7	Mainline	NB	after Pittman	33,452	40,699	40,021		
N8	Mainline	NB	before Hwy12	32,536	40,699	40,021		
N9	Mainline	NB	after Hwy 12	28,019	33,779	33,251		
			after Hwy 12-GP	26,338	31,076	30,924	30,924	31,256
			after Hwy 12-ML	1,681	2,702	2,328	2,328	1,995
N10	Mainline	NB	at Chadbourne	29,620	35,613	35,271		
N11	Mainline	NB	at Auto Mall	24,662	29,371	29,047		
			at Auto Mall-GP	22,196	25,259	27,014	26,724	27,014
			at Auto Mall-ML	2,466	4,112	2,033	2,324	2,033
N12	Mainline	NB	after Auto Mall	28,317	33,864	33,228		
N13	Mainline	NB	at Travis	26,214	30,693	29,966		
N15	Mainline	NB	at Airbase	22,249	24,664	24,954		
			at Airbase-GP	18,244	19,484	22,708	22,708	22,708
			at Airbase-ML	4,005	5,179	2,246	2,246	2,246
N16	Mainline	NB	after Airbase	26,144	28,855	29,787		
			after Airbase-GP	21,438	22,795	27,404	27,106	27,404
			after Airbase-ML	4,706	6,060	2,383	2,681	2,383
N17	Mainline	NB	at Manuel Campos	22,713	25,349	25,794		
N18	Mainline	NB	after Manuel Campos	27,284	31,336	31,763		
S1	Mainline	SB	before Manuel Campos	21,397	25,421	25,492		
S2	Mainline	SB	at Manuel Campos	18,592	21,801	21,797		
S4	Mainline	SB	at Airbase	17,402	20,254	19,673		
			at Airbase-GP	16,706	19,039	18,689	18,689	19,083
			at Airbase-ML	696	1,215	984	984	590
S5	Mainline	SB	after Airbase	21,220	25,072	24,677		
S6	Mainline	SB	at Travis	19,229	22,240	21,878		
S8	Mainline	SB	at Rockville	19,844	23,234	23,407		
			at Rockville-GP	18,852	21,375	22,003	21,535	22,471
			at Rockville-ML	992	1,859	1,404	1,873	936
S10	Mainline	SB	at Chadbourne	20,768	24,185	24,558		

Flow Diagram	Type	Dir	Segment	Base	No Build	Scenario 1	Scenario 2	Scenario 3
S11	Mainline	SB	after Hwy12	26,010	30,288	30,111		
			after Hwy12-GP	24,710	28,168	28,304	28,304	28,907
			after Hwy12-ML	1,301	2,120	1,807	1,807	1,204
S12	Mainline	SB	at Pittman	23,525	26,966	26,857		
S13	Mainline	SB	at I 680	15,489	17,546	17,451		
			at I 680-GP	14,870	16,493	16,753	16,753	17,102
			at I 680-ML	620	1,053	698	698	349
S14	Mainline	SB	after offramp to Hwy12	12,774	14,186	14,005		
S15	Mainline	SB	after Green Valley Rd	14,256	15,853	15,738		
S16	Mainline	SB	at Red Top	13,567	15,111	15,026		
S17	Mainline	SB	after Red Top	14,457	16,189	16,115		
R1	OFF	NB	to Red Top	1,059	1,264	1,820		
R2	ON	NB	From Red Top	1,005	1,134	1,792		
R3	ON	NB	From Hwy 12	5,627	8,437	8,095		
R5	OFF	NB	to I 680	1,890	3,082	4,151		
R6	ON	NB	from I 680	10,998	13,206	10,768		
R7	OFF	NB	to Pittman	2,563	4,226	2,451		
R8	ON	NB	From Pittman	2,731	4,606	5,032		
R10	OFF	NB	to Hwy12	4,517	6,920	6,770		
R11	ON	NB	from Hwy12	403	-	-		
R12	OFF	NB	to Chadbourne	3,076	3,906	3,698		
R13	ON	NB	From Chadbourne	4,274	5,741	5,717		
R16	ON	NB	Beck Ave	2,477	3,246	3,194		
R17	OFF	NB	Travis	4,579	6,417	6,456		
R18	ON	NB	Travis	2,906	3,179	3,543		
R19	OFF	NB	Airbase	6,872	9,208	8,554		
R20	ON	NB	Airbase	3,895	4,191	4,833		
R21	OFF	NB	Manuel Campos	3,431	3,506	3,993		
R22	ON	NB	Manuel Campos	4,571	5,987	5,969		
R23	OFF	SB	Manuel Campos	2,805	3,619	3,695		
R24	ON	SB	Manuel Campos	1,333	1,398	1,028		
R25	OFF	SB	Waterman	692	1,009	1,063		
R26	OFF	SB	Waterman	1,830	1,937	2,089		
R27	ON	SB	Waterman	3,817	4,818	5,004		
R28	OFF	SB	Travis	1,991	2,832	2,799		
R29	ON	SB	Travis	1,782	2,501	2,730		
R30	ON	SB	Travis	403	430	449		

Flow Diagram	Type	Dir	Segment	Base	No Build	Scenario 1	Scenario 2	Scenario 3
R31	OFF	SB	Oliver	1,571	1,937	1,650		
R32	ON	SB	Oliver	1,757	1,941	2,172		
R33	OFF	SB	Suisun	1,075	2,602	2,789		
R34	ON	SB	Suisun	242	1,612	1,767		
R35	ON	SB	Hwy 12	5,242	6,103	5,554		
R36	OFF	SB	Pittman	2,885	3,320	3,253		
R37	OFF	SB	I 680	8,036	9,420	9,406		
R38	ON	SB	I 681	651	804	738		
R39	OFF	SB	Hwy 12	3,366	4,164	4,184		
R40	ON	SB	Green Valley Rd	1,481	1,667	1,733		
R41	OFF	SB	Red Top	689	743	712		
R42	ON	SB	Red Top	890	1,079	1,088		

Appendix E

Cal B-C Calculations and Assumptions

Parameters

This page contains all economic values and rate tables.
To update economic values automatically, change "Economic Update Factor."

General Economic Parameters

Year of Current Dollars for Model	2016	
Economic Update Factor (Using GDP Deflator)	1.00	*1*
Real Discount Rate	4.0%	*2*

Travel Time Parameters

	Value	Units	
Statewide Average Hourly Wage	$ 27.34	$/hr	*3*
Heavy and Light Truck Drivers			
Average Hourly Wage	$ 20.44	$/hr	*3*
Benefits and Costs	$ 10.97	$/hr	*4*
Value of Time			
Automobile	$ 13.65	$/hr/per	*5*
Truck	$ 31.40	$/hr/veh	*5*
Auto & Truck Composite	$ 18.95	$/hr/veh	*6*
Transit	$ 13.65	$/hr/per	*5*
Out-of-Vehicle Travel	2	times	*5*
Incident-Related Travel	3	times	*7*
Travel Time Uprater	0.0%	annual incr	

Vehicle Operating Cost Parameters

Average Fuel Price			
Automobile (regular unleaded)	$ 3.18	$/gal	*8*
Truck (diesel)	$ 3.00	$/gal	*8*
Sales and Fuel Taxes			
State Sales Tax (gasoline)	2.25%	%	*9*
State Sales Tax (diesel)	7.50%	%	*9*
Average Local Sales Tax	0.50%	%	*9*
Federal Fuel Excise Tax (gasoline)	$ 0.184	$/gal	*9*
Federal Fuel Excise Tax (diesel)	$ 0.244	$/gal	*9*
State Fuel Excise Tax (gasoline)	$ 0.278	$/gal	*9*
State Fuel Excise Tax (diesel)	$ 0.160	$/gal	*9*
Fuel Cost Per Gallon (Exclude Taxes)			
Automobile	$ 2.65	$/gal	
Truck	$ 2.40	$/gal	

Parameters

This page contains all economic values and rate tables.
To update economic values automatically, change "Economic Update Factor."

General Economic Parameters

Year of Current Dollars for Model	2016	
Economic Update Factor (Using GDP Deflator)	1.00	*1*
Real Discount Rate	4.0%	*2*

Non-Fuel Cost Per Mile			
Automobile	$ 0.313	$/mi	*10*
Truck	$ 0.429	$/mi	*11*
Idling Speed for Op. Costs and Emissions	5	mph	

Accident Cost Parameters

Cost of a Fatality	$ 9,800,000	$/event	*12*
Cost of an Injury			
Level A (Severe)	$ 466,400	$/event	*12*
Level B (Moderate)	$ 127,000	$/event	*12*
Level C (Minor)	$ 64,900	$/event	*12*
Cost of Property Damage	$ 2,700	$/event	*13*
Cost of Highway Accident			
Fatal Accident	$ 10,800,000	$/accident	
Injury Accident	$ 148,800	$/accident	
PDO Accident	$ 9,700	$/accident	
Average Cost	$ 185,600	$/accident	
Statewide Highway Accident Rates			
Fatal Accident	0.006	per mil veh-mi	*14*
Injury Accident	0.29	per mil veh-mi	*14*
PDO Accident	0.55	per mil veh-mi	*14*
Non-Freeway	1.05	per mil veh-mi	*15*

Sources: 1) Office of Management and Budget (OMB), 2) Review of OMB and State Treasurer's Office data, 3) Bureau of Labor Statistics (BLS) OES, 4) BLS Employment Cost Index, 5) USDOT Department Guidance, 6) California Department of Transportation TSI and Traffic Operations, 7) IDAS model, 8) AAA Daily Fuel Gauge Report, 9) California Board of Equalization, 10) AAA Your Driving Costs, 11) American Transportation Research Institute, 12) USDOT VSL, 13) NHTSA, 14) TASAS summary 2013, 15) TASAS summary 2009

Memo

To Caltrans District 3 and District 4
From Caltrans DRMT
Cc Steer
Date 8 November 2021
Project Capitol Corridor I-80 Modeling
Project No. 230805012

Capitol Corridor Ridership Forecasts for the I-80 Project

Background

In July-September 2021, Steer prepared ridership forecasts for Caltrans using the California mode-share model to support the I-80 project along the Capitol Corridor. Four different timetables were evaluated over the following milestone years:

- **Schedule 1 (2028):** Hourly service
- **Schedule 2 (2032, 2040):** Half-hourly service between Sacramento and Oakland
- **Schedule 3 (2040):** Half-hourly service via the West Bay
- **Schedule 4 (2040):** Half-hourly service via the West Bay and Vallejo

The different frequencies for each schedule by segment are summarized below.

Table 1: Summary of Frequencies by Schedule

Segment	Base		Schedule 1	Schedule 2	Schedule 3	Schedule 4
	WD	WE				
North of Roseville	1	1	1	1	1	1
Roseville-Oakland*	1	1	3	10	36	36
Sacramento-Oakland*	15	11	18	33	36	36
Sacramento-San Jose	7	7	7	8	35	35

Note: WD refers to weekday frequencies, and WE refers to weekend frequencies.
*** Note that these segments overlap with each other.**

Growth

Note that for baseline 2028/2032/2040 growth, the no-action growth estimates are based on Woods & Poole socioeconomic forecasts only and do not consider factors like congestion pricing, transit-oriented policy changes, and other non-COVID societal factors/policy factors designed to encourage transit uptake, etc. We did not include scenarios or assumptions around the impacts of COVID.

COVID-19 disclaimer

Please note that these forecasts were prepared using pre-COVID data on ridership patterns, trip tables, and socioeconomic forecasts; they do not include any adjustments for COVID impacts. Amtrak's market research of past customers in California suggest that there will be a significant decline in rail travel, especially commute-related rail travel, even after the pandemic is over.

Forecasts

The ridership forecasts are summarized in the table below. Each subsequent section will discuss the forecasts for each schedule with more explanation of the results. Note that more detailed disaggregated information is presented in the spreadsheets shared with Caltrans (the most recent version was shared on October 6, 2021).

Table 2: Summary of Forecasts

Schedule	Year	Base Ridership [A]	Proposed Ridership [B]	Incremental Ridership [C]
Schedule 1	2028	2,077,200	2,339,400	262,200
Schedule 2	2032	2,215,300	3,384,800	1,169,500
Schedule 2	2040	2,466,600	3,778,200	1,311,600
Schedule 3	2040	2,466,600	7,148,000	4,681,400
Schedule 3 Hercules	2040	2,466,600	6,984,200	4,517,600
Schedule 4	2040	2,466,600	7,311,800	4,845,200

Note: B = A + C

Schedule 1

According to the Caltrans-provided timetable, the Schedule 1 timetable includes:

- 110 mph service from Martinez to Sacramento;
- hourly service;
- conceptual South End Shift at North Elmhurst to Coast Sub; and
- extension of several trains to Roseville.

Due to the multitude of service changes, the impacts of service changes on the forecasts are discussed for each segment:

1. **Roseville**: There's an increase from 1 to 3 trains (although all trains still serve the same time period); the frequency elasticity is on the lower side at 0.27 (which is reasonable as the increase in service options are limited – the first and last trains operate only 90 minutes apart).
2. **Sacramento-Oakland:** There's a small increase in frequency from 15 weekday/11 weekend to 18 daily round-trips (approximately hourly service), which has an implied 1.21 raw frequency elasticity, on the high side. When removing the impacts of travel time changes (assuming they are the same as Oakland-SJC segment), there's a more reasonable frequency elasticity of 0.69.
3. **Sacramento/Oakland-San Jose:** Travel times are very attractive in this segment, which is driving the increase (as frequencies aren't changing).

Table 3: Southbound travel times for Schedule 1

Stations	Base	Schedule 1
Sacramento	0:00	0:00
Richmond	1:27	1:21
Emeryville	1:39	1:33
Oakland Jack London	2:00	1:43
Santa Clara – Great America	2:52	2:29
San Jose	3:17	2:40

For example, Sacramento – Oakland sees a 14% decrease (17 minutes off a 2-hour trip in the Base) in travel times.

Schedule 2

According to the Caltrans-provided timetable, the Schedule 2 timetable includes:

- 110 mph service from Martinez to Sacramento and non-moveable bridge at Martinez;
- half hourly service between Sacramento and Oakland;
- conceptual South End Shift at North Elmhurst to Coast Sub; and
- extension of several trains to Roseville.

Due to the multitude of service changes, the impacts of service changes on the forecasts are discussed for each segment:

1. **Roseville**: increase in service from 1 to 10 rail trips per day. This means that some passengers who were previously traveling to Sacramento (for higher rail frequencies) will now find it more attractive to use Roseville, and passengers from Auburn/Rocklin may also decide to travel longer to use Roseville to take advantage of the service increase here. The raw frequency elasticity at Roseville alone of 1.09 is on the high side, but it does not account for these station choice shift dynamics going on. When including the shifting of passengers from Auburn/Rocklin, it implies a frequency elasticity of 0.48 (which does not include the portion of Sacramento passengers who might shift to Roseville). This number is reasonable.
2. **Sacramento-Oakland:** half-hourly service in the Sacramento-Oakland corridor (an approximate doubling of service) – frequency elasticity is 0.49, which is in the right range for such a large frequency increase.
3. **Sacramento/Oakland-San Jose:** There are three factors in play here:
    - a net loss in ridership when adjusting for the impacts of Ardenwood (1 station) replacing Fremont and Hayward (2 stations),
    - an increase in ridership from the travel time savings in the whole corridor, and
    - the increase in ridership from the frequency increase from 7 round trips a day to 8.

    Note that the 110mph trains represent a travel time savings from Sacramento of 2-6 minutes between Davis/Oakland, 10-12 minutes at GAC/SCC, and 22 minutes at SJC. Note that these travel time savings are more significant than some of the previous re-routing via Coast Line scenarios looked at in recent years.

    On net, travel time savings drive much of the changes in this segment and thus there is an overall increase in ridership.

        - Station pairs with larger decreases in travel times have higher increases in ridership (e.g., OAC to SJC sees +35% increase in ridership)
        - Station pairs with smaller decreases in travel times have lower increases in ridership (e.g., SAC to SJC sees +23% increase in ridership)

Schedules 3 and 4

Both Schedules 3 and 4 involve crossing the Bay via the proposed Transbay Tube and travel between Oakland and San Jose via the West Bay. Given this similarity, these schedules are discussed together. According to the Caltrans-provided timetable, the Schedule 3 and Schedule 4 timetables include:

- 110 mph service from Roseville to San Jose via Franklyn Canyon and Transbay Tube; and
- half hourly service.

Schedule 4 additionally removes the Martinez stop and adds stops at American Canyon, Vallejo, and Hercules.

Note that the model was not explicitly designed to forecast a Transbay crossing and therefore results should be considered high-level. More detailed analysis is being done as part of the Link21 program to better understand the impacts of cross-bay service.

Due to the multitude of service changes, the impacts of service changes on the forecasts are discussed for each segment:

1. **Roseville**: increase in service from 1 to 36 rail trips per day. This means that some passengers who were previously traveling to Sacramento (for higher rail frequencies) will now find it more attractive to use Roseville, and passengers from Auburn/Rocklin may also decide to travel longer to use Roseville to take advantage of the service increase here.
    - **Schedule 3**: The raw frequency elasticity at Roseville alone of 0.44 is on the high side for such a large frequency increase, but it does not account for these station choice shift dynamics going on. When including the shifting of passengers from Auburn/Rocklin plus the addition at Watts, it implies a frequency elasticity of 0.31 (which does not include the portion of Sacramento passengers who might shift to Roseville). This number is reasonable.
    - **Schedule 4**: The raw frequency elasticity at Roseville alone of 0.53 is on the high side, but it does not account for these station choice shift dynamics going on. When including the shifting of passengers from Auburn/Rocklin plus the addition at Watts, it implies a frequency elasticity of 0.25 (which does not include the portion of Sacramento passengers who might shift to Roseville). This number is reasonable. It is higher than the frequency elasticity for Schedule 3 because there are travel time savings (12 minutes in the NB direction between Auburn and Sacramento) and because there are additional trips to American Canyon, Vallejo, and Hercules (which replace Martinez).
    - Note that the distribution of Roseville/Watts/Sacramento ridership is driven in part by parking cost assumptions; Roseville parking is currently free[1] and is assumed to be significantly expanded (and also available at Watts) to accommodate the significant increase in train frequency. People may well choose to drive a few more miles to get free parking to Roseville/Watts instead of using Sacramento.
2. **Sacramento-Oakland:** half-hourly service in the Sacramento-Oakland corridor (an approximate doubling of service)
    - **Schedule 3:** frequency elasticity is 0.24, which is in the right range for such a large frequency increase.
    - **Schedule 4:** frequency elasticity is 0.21, which is in the right range for such a large frequency increase.
3. **Sacramento/Oakland-San Jose:** There are two main factors in play here:
    - a net increase in ridership from shifting to the West Bay instead of the East Bay.
    - the increase in ridership from the frequency increase from 7 round trips a day to 35 (5 times the existing service levels).

Note that Schedule 4 has fewer trips to the West Bay, as the re-route via Vallejo has a slightly longer travel time. Additionally, most of the Martinez trips (72% in pre-COVID FY2019) are to points North, meaning that the West Bay does not gain as much from the addition of three new stations (American Canyon, Vallejo, and Hercules) as they will have similar travel patterns to Martinez.

Schedule 3 – Hercules adjustment

After the Schedule 3 forecasts were prepared, Steer was asked to evaluate the impact of adding a station stop at Hercules, while adding travel time losses for trips through Hercules (e.g., Sacramento to Oakland).

- **New ridership at Hercules** – this was pivoted of off the Schedule 4 forecasts which did involve adding Hercules
- **Loss of ridership due to travel time increase for through trips** – a -0.6 travel time elasticity was applied from previous forecasting work on the travel time impacts of trips through Hercules

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[1] https://www.capitolcorridor.org/stations/roseville/

Solano/Yolo/Sacramento I-80
Comprehensive Multimodal Corridor Plan
Project Charter

PLANNING STUDY

1. General Project Information	
Project Name:	Solano/ Yolo/ Sacramento Interstate 80 (I-80) Comprehensive Multimodal Corridor Plan (CMCP)
County/Route/Post Mile:	I-80 SOL/80/0.0 – SOL/80/R44.720, YOL/80/0.0 – YOL/80/R11.718, SAC/80/M0.0 – SAC/80/R10.989 US 50 YOL/50/0.0 – YOL/50/3.156, SAC/50/L0.0 – SAC/50/L0.350
Project Sponsors:	Sue Takhar, Caltrans District 3 and Jean Finney, Caltrans District 4
Charter Purpose:	The purpose of the Planning Study Charter is to document key agreements between Caltrans District 3, District 4, and partner agencies on the essential elements of the project scope, cost, schedule, and deliverables. This charter will also provide guidance on external communication.
Project Description:	To create a CMCP for the I-80 Corridor in Solano, Yolo, and a portion of Sacramento Counties to better identify needs and agree on multimodal transportation improvements for the corridor.

2. Technical Advisory Committee				
	Name	**Department/ Agency**	**Telephone**	**E-mail**
Project Sponsor	Sue Takhar	Caltrans District 3	(530) 741-4564	sukhvinder.takhar@dot.ca.gov
Project Sponsor	Jean Finney	Caltrans District 4	(510) 286-6196	jean.finney@dot.ca.gov
Project Manager	Dianira Soto	Caltrans District 3	(530) 741-4905	dianira.soto@dot.ca.gov
Team Members:	Alex Fong	Caltrans District 3	(530) 634-7616	alexander.fong@dot.ca.gov
	Brian Alconcel	Caltrans District 3	(530) 741-5710	brian.alconcel@dot.ca.gov
	Jess Avila	Caltrans District 3	(530) 741-4533	jess.avila@dot.ca.gov
	Sathish Prakash	Caltrans District 3	(530) 741-5177	sathish.prakash@dot.ca.gov
	Shannon Roberts	Caltrans District 3	(530) 740-4989	shannon.roberts.@dot.ca.gov
	Stephen Yokoi	Caltrans District 4	(510) 286-5621	stephen.yokoi@dot.ca.gov
	Zhongping (John) Xu	Caltrans District 4	(510) 286-5577	zhongping.xu@dot.ca.gov
	John McKenzie	Caltrans District 4	(510) 286-5556	john.mcKenzie@dot.ca.gov
	Kyle Pratt	Caltrans District 4	(510) 286-5591	kyle.pratt@dot.ca.gov
	Florigna Feliciano	Caltrans Headquarters (HQ) Division of Transportation Planning	(916) 651-6010	florigna.feliciano@dot.ca.gov

	Josh Pulverman	Caltrans HQ Division of Rall and Mass Transit (DRMT)	(916) 657-3863	josh.pulverman@dot.ca.gov
	Shannon Simonds	Caltrans HQ DRMT	(916) 653-1205	shannon.simonds@dot.ca.gov
	Chris Dougherty	SACOG	(916) 319-5173	cdougherty@sacog.org
	Sam Shelton	SACOG	(916) 340-6251	sshelton@sacog.org
	Jessica Stratton	California Highway Patrol	(415) 557-1094	JMStratton@chp.ca.gov
	Adam Noelting	Metropolitan Transportaton Commission (MTC)	(415) 778-5366	anoelting@bayareametro.gov
	Therese Trivedi	MTC	(415) 778-6767	ttrivedi@bayareametro.gov
	Jose Perez	YCTD	(530) 402-2826	jperez@yctd.org
	Anthony Adams	Solano Transportation Authority (STA)	(707) 399-3215	aadams@sta.ca.gov
	Janet Adams	STA	(707) 424-6075	Jadams@sta.ca.gov
	Robert Guerrero	STA	(707) 399-3211	rguerrero@sta.ca.gov
	Brent Rosenwald	STA	(707) 424-6075	brosenwald@sta.ca.gov
	Jim Allison	Capitol Corridor Joint Powers Authority	(510) 464-6994	JimA@capitolcorridor.org
	Laverne Bill	Yocha Dehe Wintun Nation	(530) 796-3400	LBill@yochadehe-nsn.gov / thpo@yochadehe-nsn.gov

3. Stakeholders *(e.g., those with a significant interest in or who will be significantly affected by this project)*

- For list of Stakeholders see Attachment A.

4. Project Scope Statement

Project Purpose/Describe the needs this project addresses

The purpose of this effort is to create a CMCP through multimodal analysis and inter-agency collaboration. The plan will describe, analyze, and evalaute transportation facilities along the I-80 Corridor, and identify needs, gaps and trends associated with multimodal modes of transportation, some of which include transit, arterial, rail, bicycle, and pedestrian elements. The plan will prioritize projects, and provide a basis for qualifying for funding through Senate Bill 1 Solutions for Congested Corridors Program and other potential local, regional, State, and federal funding sources.

Objectives *Describe the measurable outcomes of the project/study*

- Identify existing and future conditions.
- Develop and prioritize a list of multimodal transportation improvements and strategies.
- Develop funding strategy for corridor improvements.

Deliverables *List the high-level "products" to be created (e.g., Collecting Data, identify alternatives, components of the plan etc.)*

- Published CMCP.
- A list of prioritized multimodal transportation improvements and strategies.
- A plan to monitor and evaluate the corridor performance and to update the CMCP.

Scope *Provide a brief description of the study (attach location map of the project)*

The CMCP incorporates the entire I-80 corridor in Solano and Yolo Counties and portion of Sacramento County, ending at the State Route 51 (SR 51) junction in the city of Sacramento. Additionally, the CMCP incorporates the United States 50 (US 50) corridor in Yolo and Sacramento Counties, starting at the I-80 junction in the city of West Sacramento and ending at the Interstate 5 (I-5) junction in Sacramento. The corridor also, includes the Capitol Corridor passenger rail line, freight rail, ports, local parallel arterial roadways, transit routes, bicycle and pedestrian facilities. Study area map is attached (see Attachment D).

Milestones *Propose start and end dates for Project Phases (e.g., time frames for each deliverables) and other major milestones*

- Scope Effort and Team Formation (December 2019 –April 2020)
- Data Collection (March 2020 – June 2021)
- Conduct Performance Assessment (Existing Baseline) (July 2020 – July 2021)
- Conduct Performance Assessment (Future Baseline) (July 2020 – July 2021)
- Select and Prioritize Solutions (June 2021 – September 2021)
  Project Evaluation and Selection
  Recommend Potential Projects and Timeframe Strategies (short, medium, and long-term)
- Develop Corridor Performance Plan to Monitor and Evaluate Progress (August 2021 – November 2021)
- Draft Corridor Plan (August 2021 – September 2021)
- Publish Final Corridor Plan (October 2021 - November 2021)
- Public Engagement (Tentative Dates: October 2020 and May 2021)

Major Known Risks (including significant Assumptions) Identify obstacles that may cause the project to fail.

Risk	Risk Rating (Hi, Med, Lo)
Lack of or inadequate coordination may lead to disagreement with needs assessment as well as project selection and prioritization, which may delay the CMCP development.	High
Delay in the approval of the statewide Modeling and Forecasting contract and/or the District-led Public Partcipation Engagement Contract (PPEC) 5 and associated task orders will affect document development, which may lead to delay in schedule.	Medium

Constraints *List any conditions that may limit the project team's options with respect to resources, schedule, or budget*

- Consultant resources (PPEC 5 and Modeling and Forecasting statewide contract procurement)
  - Public Engagement
    - In-person challenges due to COVID-19
  - Technical Analysis Requirement:
    - Challenges with combining two regional models and conduct project performance evaluation.
    - Need for additonal time to combine two regional models
- Staff resources
  - Need for additional resources (mapping, studies, surveys, etc.) to adequately address tasks.
  - Need for additional time or staff to meet project goals

External Collaboration *Will project success depend on coordination of efforts between the project team and one or more other individuals or groups or projects*

Project success is dependent on the collaboration between Caltrans Districts 3 and 4, local, regional, and State stakeholders. .

5. TAC Roles and Responsibilities

TAC

The TAC will serve as a working group to collaborate efforts in compiling necessary data for inclusion in the CMCP as well as ensuring CMCP participation within each TAC member's jurisdiction and/or interest group (transit, rail, port, etc.).

Roles

- Attend monthly TAC meetings scheduled for the last Wednesday of every month beginning March 2020 through November 2021. If meetings are not needed, they may be canceled.
- Consistent and active participation in the development of the CMCP.
- Serve as the point of contact for the represented agency or group.
- Disseminate information to their represented agency and provide feedback to the TAC based on the needs of their agency or group.
- Authority to make decisions or speak on behalf of the represented agency or group.
- Participate in and coordinate public engagement activities.

Responsibilities

- Provide assigned agreed upon deliverables in a timely fashion.
- Identify and prioritize multimodal improvements, strategies and programs that meet the goals of the CMCP.
- Participate in public outreach activities.

6. Stakeholders Roles and Responsibilities

Stakeholders

This group is comprised of key stakeholders along the I-80 Corridor in District 3 and District 4. Caltrans will keep stakeholders apprised of the CMCP progress. The stakeholders will then ensure information is being shared with leadership/management within the Corridor and provide input/feedback.

Roles

- Consistent and active participation in the development of the CMCP.
- Serve as point of contact for represented agency or group.
- Disseminate information to their represented agency or group and provide feedback to the stakeholder group based on the needs of their agency or group.
- Authority to make decisions or speak on behalf of the represented agency or group.
- Participate in public engagement activities.

Responsibilities

- Review and provide input on deliverables.
- Assist in outreach events.

7. Communication Strategy *(specify how the project manager will communicate to the Project Sponsor, Project Team members and Stakeholders, e.g., frequency of status reports, reviews, frequency of Project Team meetings, Outreach, etc.)*

- TAC meetings to occur monthly, on the last Wednesday of every month, as needed. Meetings may be canceled based on milestones and CMCP schedule (see Attachment B for schedule).
- Stakeholder meetings to occur on the second Tuesday on a quarterly basis. Meetings may be canceled based on milestones and CMCP schedule (see Attachment B for schedule).
  - Caltrans will inform stakeholders of the CMCP process and progress.
- Utilize Caltrans PPEC 5 to assist with stakeholder and public communication and outreach, including meeting facilitation and information dissemination via multiple media formats.
- District 3 Steering Committee and STA Board will be regularly updated on CMCP status.

8. Sign-off

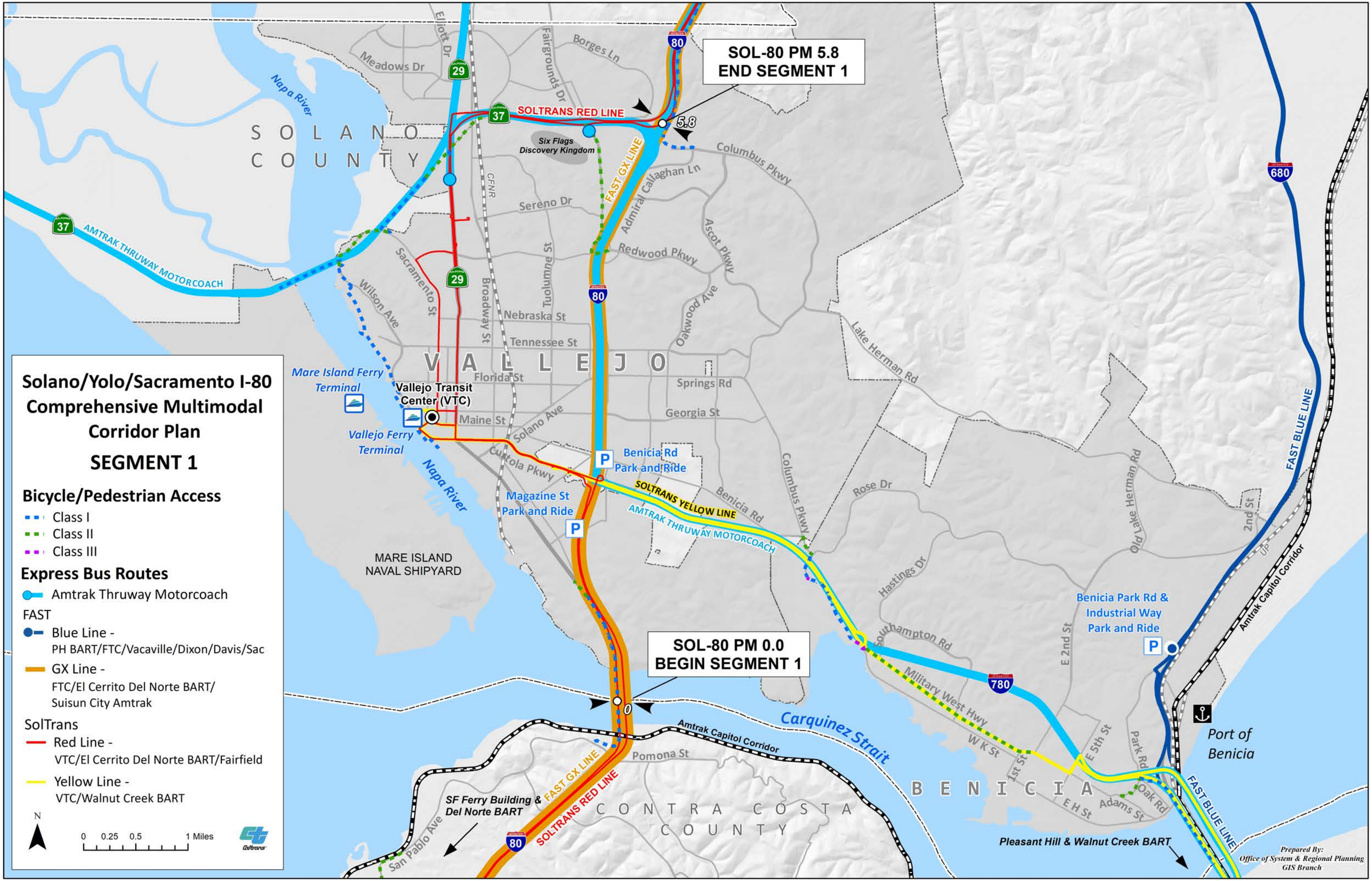
	Name	Signature	Date (MM/DD/YYYY)
Project Sponsor(s)	Sukhvinder (Sue) Takhar, District 3 Deputy District Director – Planning, Local Asistance, and Sustainability (DPLAS)	Sukhvinder Takhar	6-8-2020
	Jean Finney, District 4 Deputy District Director -- Transportation Planning and Local Assistance	Jean CR Finney	06/08/2020
Project Manager	Dianira Soto, District 3 Corridor Planning Manager, DPLAS	Dianira Soto	06/08/2020
Project Manager	Zhongping (John) Xu, District 4 - Senior Transportation Planner, System Planning East Bay/Santa Clara County Branch		6/8/2020

9. Notes (not all inclusive: past studies, e.g., PI, TCR's etc.)

- District 3 I-80 Corridor System Management Plann (CSMP)
- District 3 US 50 CSMP
- District 3 I-80 Preliminary Investigation
- District 3 Regional Concept of Transportation Operations
- District 3 and District 4 Vulnerability Assessments
- District 4 Solano I-80 Comprehensive Corridor Plan
- District 4 I-80 East Corridor System Management Plan
- District 4 Bike Plan

10. Attachments (location map of the study area, roles and responsibilities of team members, etc.)

- Stakeholders list (Attachment A)
- TAC and Stakeholder Meeting Schedule (Attachment B)
- CMCP Tasks Schedule (Attachment C)
- Study area map (Attachment D)


Solano/Yolo/Sacramento I-80 Comprehensive Multimodal Corridor Plan
SEGMENT 1
Bicycle/Pedestrian Access
Class I
Class II
Class III
Express Bus Routes
Amtrak Thruway Motorcoach
FAST
Blue Line - PH BART/FTC/Vacaville/Dixon/Davis/Sac
GX Line - FTC/El Cerrito Del Norte BART/Suisun City Amtrak
SolTrans
Red Line - VTC/El Cerrito Del Norte BART/Fairfield
Yellow Line - VTC/Walnut Creek BART
N
0 0.25 0.5 1 Miles
Caltrans
SOL-80 PM 5.8
END SEGMENT 1
5.8
SOL-80 PM 0.0
BEGIN SEGMENT 1
0
SOLANO COUNTY
VALLEJO
BENICIA
CONTRA COSTA COUNTY
MARE ISLAND NAVAL SHIPYARD
Napa River
Carquinez Strait
Port of Benicia
Six Flags Discovery Kingdom
SOLTRANS RED LINE
SOLTRANS YELLOW LINE
FAST GX LINE
FAST BLUE LINE
AMTRAK THRUWAY MOTORCOACH
Amtrak Capitol Corridor
Mare Island Ferry Terminal
Vallejo Transit Center (VTC)
Vallejo Ferry Terminal
Benicia Rd Park and Ride
Magazine St Park and Ride
Benicia Park Rd & Industrial Way Park and Ride
SF Ferry Building & Del Norte BART
Pleasant Hill & Walnut Creek BART
80
29
37
680
780
Meadows Dr
Elliott Dr
Fairgrounds Dr
Borges Ln
Columbus Pkwy
Admiral Callaghan Ln
Sereno Dr
Redwood Pkwy
Ascot Pkwy
Sacramento St
Wilson Ave
Broadway St
Tuolumne St
Nebraska St
Tennessee St
Oakwood Ave
Lake Herman Rd
Florida St
Springs Rd
Georgia St
Maine St
Solano Ave
Curtola Pkwy
Benicia Rd
Rose Dr
Old Lake Herman Rd
Hastings Dr
Southampton Rd
Military West Hwy
W K St
1st St
E 2nd St
E 5th St
Park Rd
E H St
Adams St
Oak Rd
2nd St
Pomona St
San Pablo Ave
CFNR
UP
P
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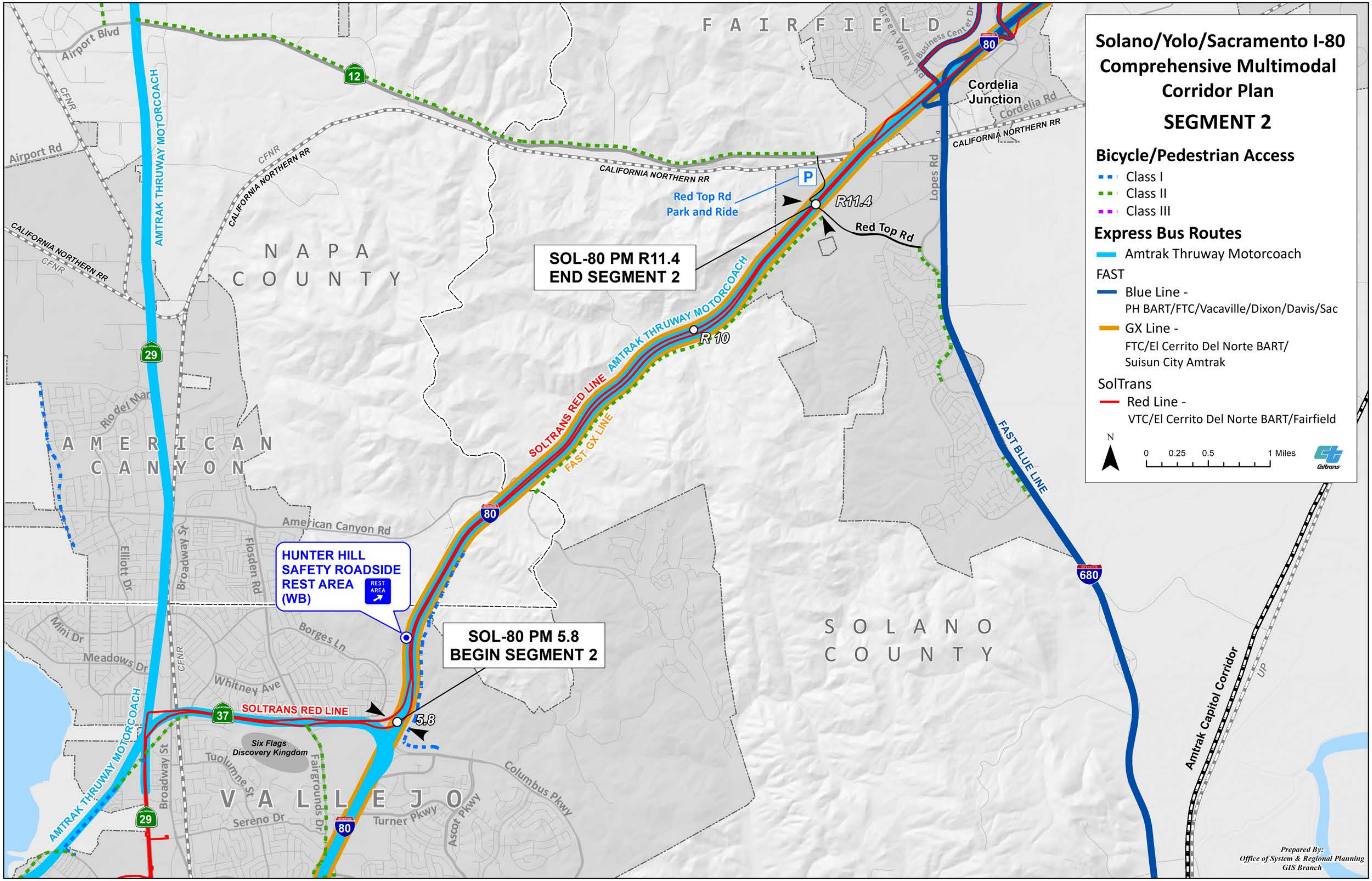
Solano/Yolo/Sacramento I-80
Comprehensive Multimodal
Corridor Plan
SEGMENT 2
Bicycle/Pedestrian Access
Class I
Class II
Class III
Express Bus Routes
Amtrak Thruway Motorcoach
FAST
Blue Line -
PH BART/FTC/Vacaville/Dixon/Davis/Sac
GX Line -
FTC/El Cerrito Del Norte BART/
Suisun City Amtrak
SolTrans
Red Line -
VTC/El Cerrito Del Norte BART/Fairfield
N
0
0.25
0.5
1 Miles
FAIRFIELD
Cordelia Junction
Cordelia Rd
Green Valley Rd
Business Center Dr
80
CALIFORNIA NORTHERN RR
Lopes Rd
Red Top Rd
Park and Ride
P
R11.4
Red Top Rd
SOL-80 PM R11.4
END SEGMENT 2
AMTRAK THRUWAY MOTORCOACH
R 10
SOLTRANS RED LINE
FAST GX LINE
FAST BLUE LINE
680
Airport Blvd
12
CFNR
Airport Rd
CALIFORNIA NORTHERN RR
NAPA COUNTY
29
Rio del Mar
AMERICAN CANYON
American Canyon Rd
Elliott Dr
Broadway St
Flosden Rd
HUNTER HILL
SAFETY ROADSIDE
REST AREA
(WB)
REST AREA
Mini Dr
Meadows Dr
Borges Ln
Whitney Ave
SOL-80 PM 5.8
BEGIN SEGMENT 2
37
SOLTRANS RED LINE
5.8
Six Flags
Discovery Kingdom
Tuolumne St
Fairgrounds Dr
Columbus Pkwy
VALLEJO
Sereno Dr
Turner Pkwy
Ascot Pkwy
SOLANO COUNTY
Amtrak Capitol Corridor
UP
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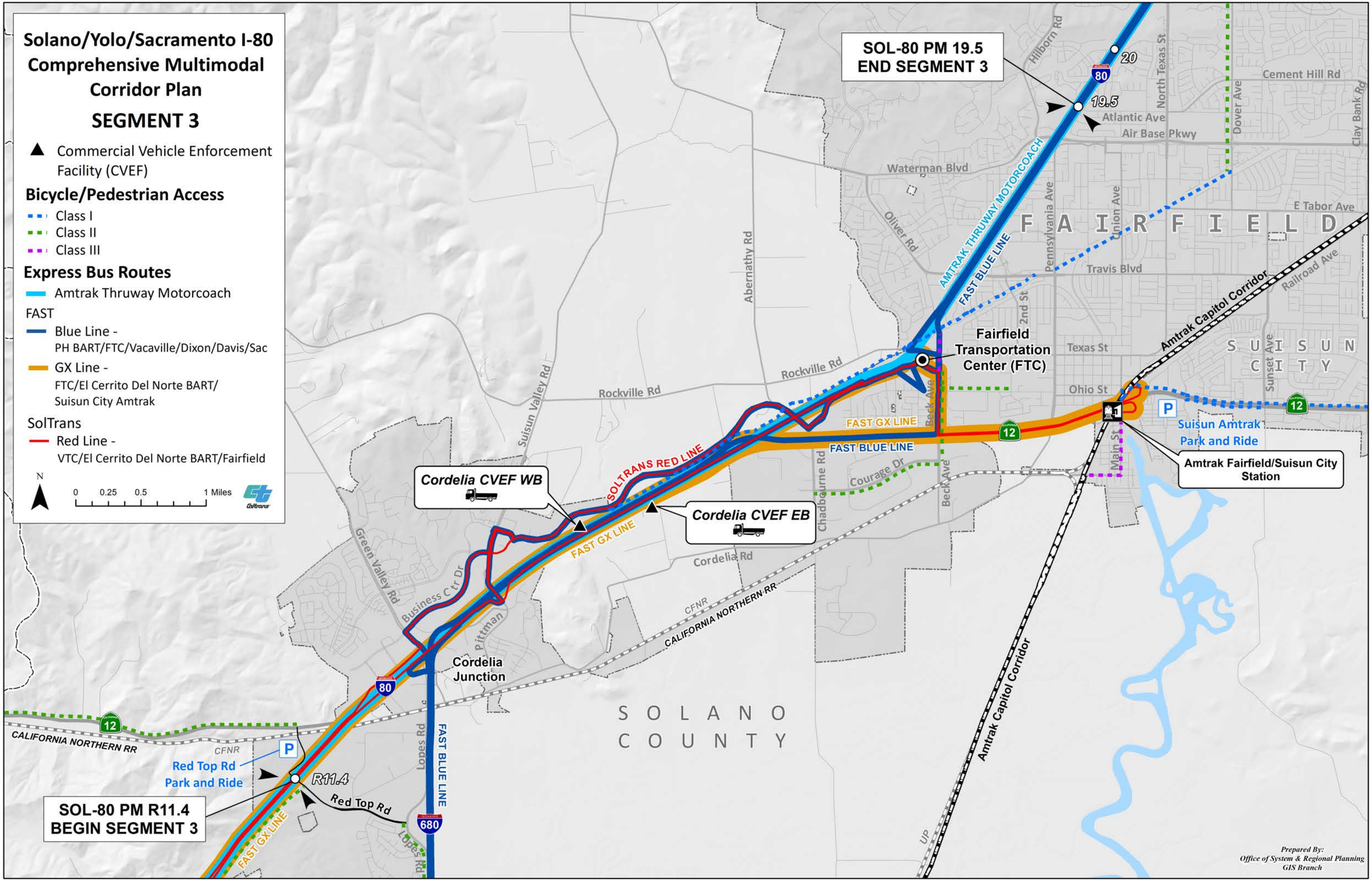
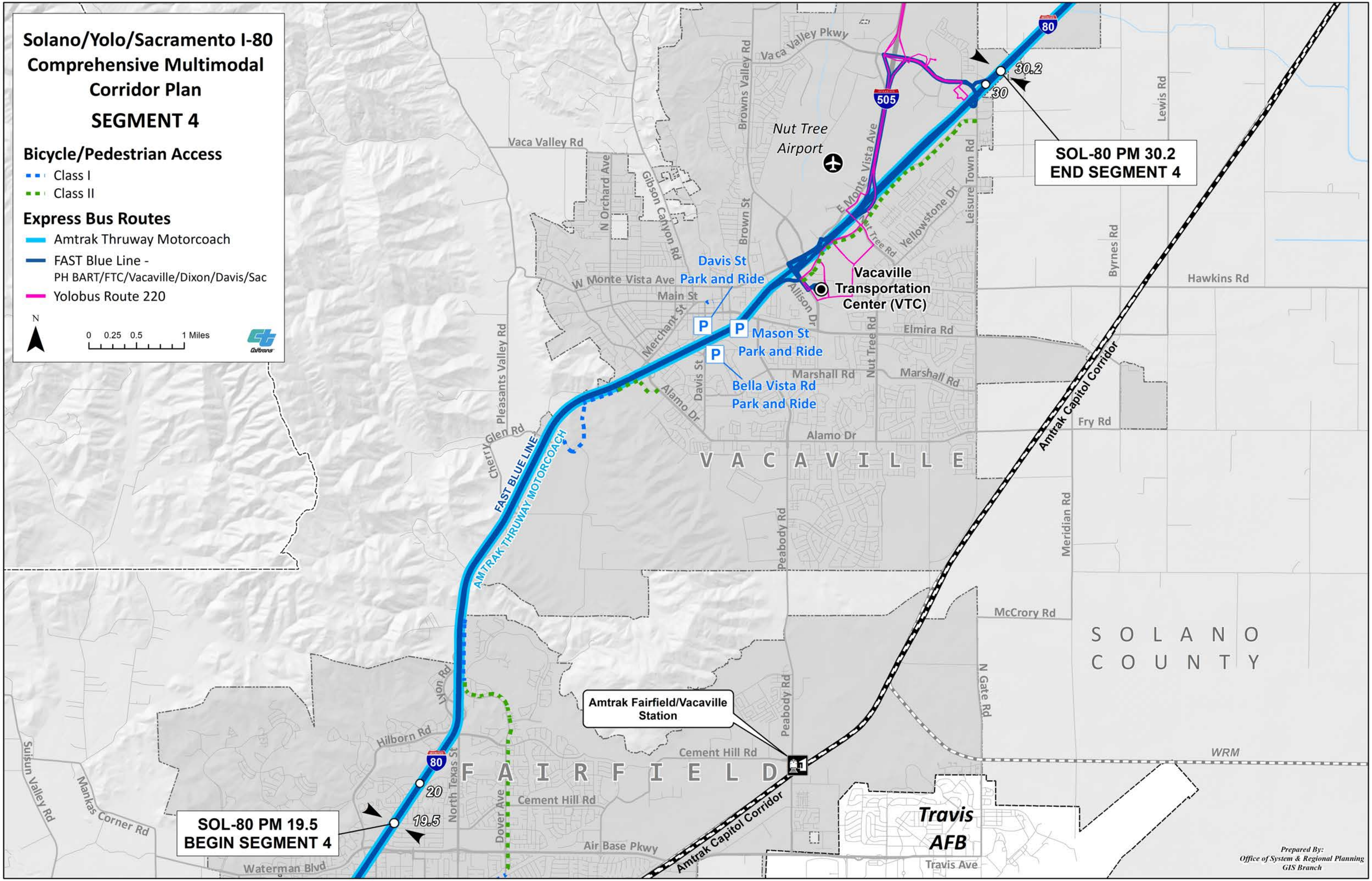
Solano/Yolo/Sacramento I-80 Comprehensive Multimodal Corridor Plan

SEGMENT 3



Solano/Yolo/Sacramento I-80 Comprehensive Multimodal Corridor Plan

SEGMENT 4



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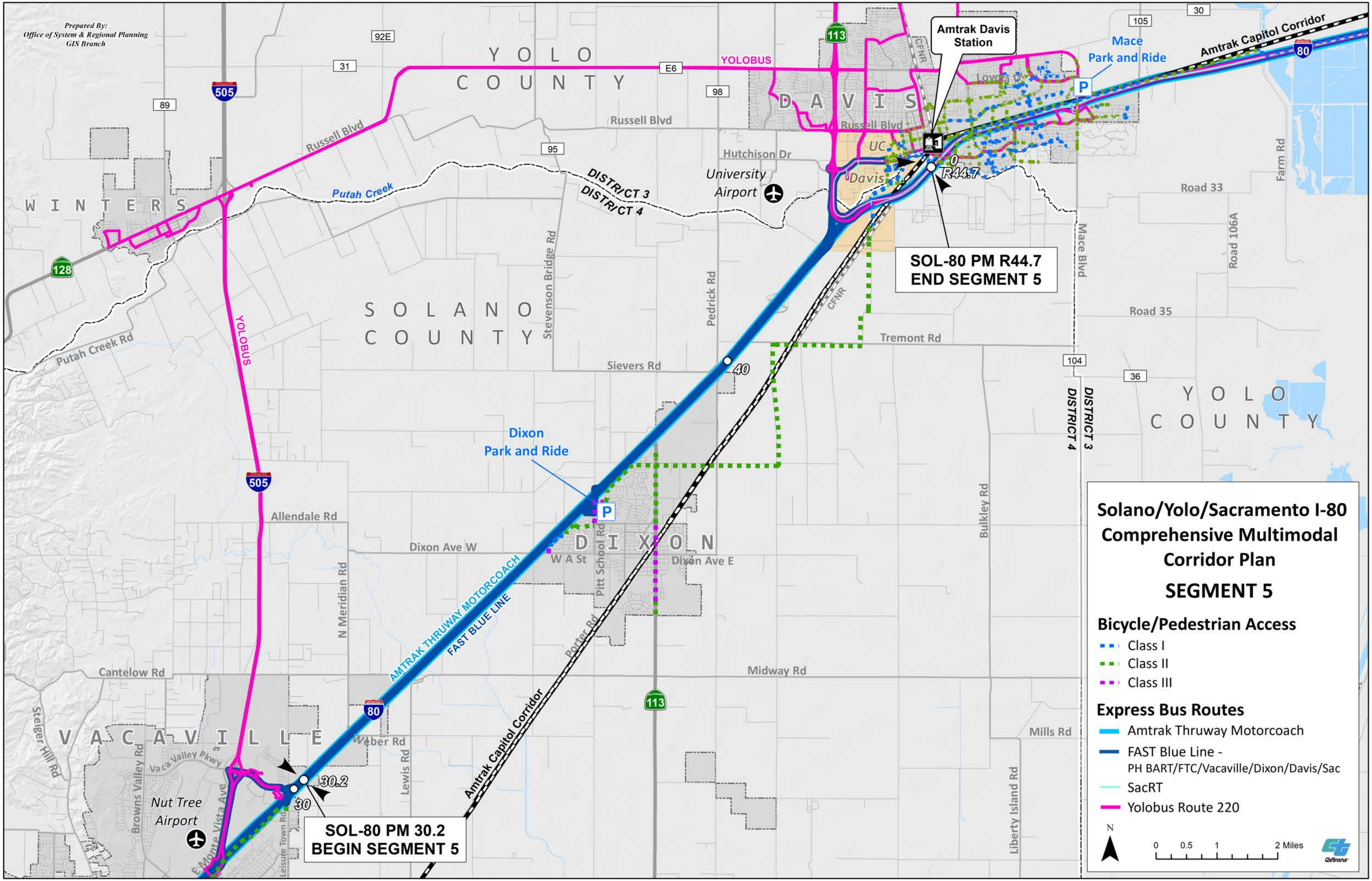


Solano/Yolo/Sacramento I-80 Comprehensive Multimodal Corridor Plan

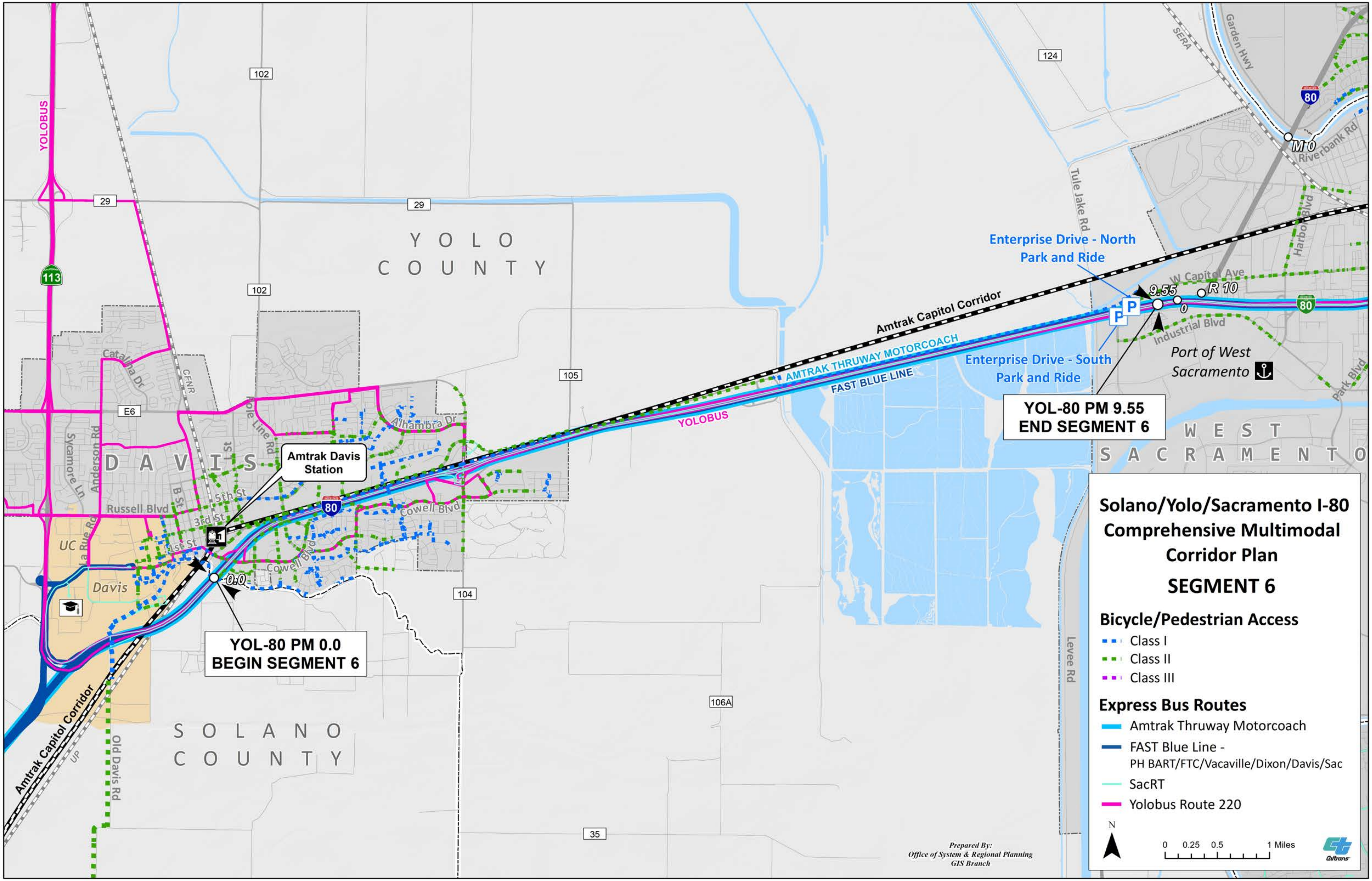
SEGMENT 5

Bicycle/Pedestrian Access

- Class I
- Class II
- Class III

Express Bus Routes

- Amtrak Thruway Motorcoach
- FAST Blue Line - PH BART/FTC/Vacaville/Dixon/Davis/Sac
- SacRT
- Yolobus Route 220



Solano/Yolo/Sacramento I-80 Comprehensive Multimodal Corridor Plan

SEGMENT 6

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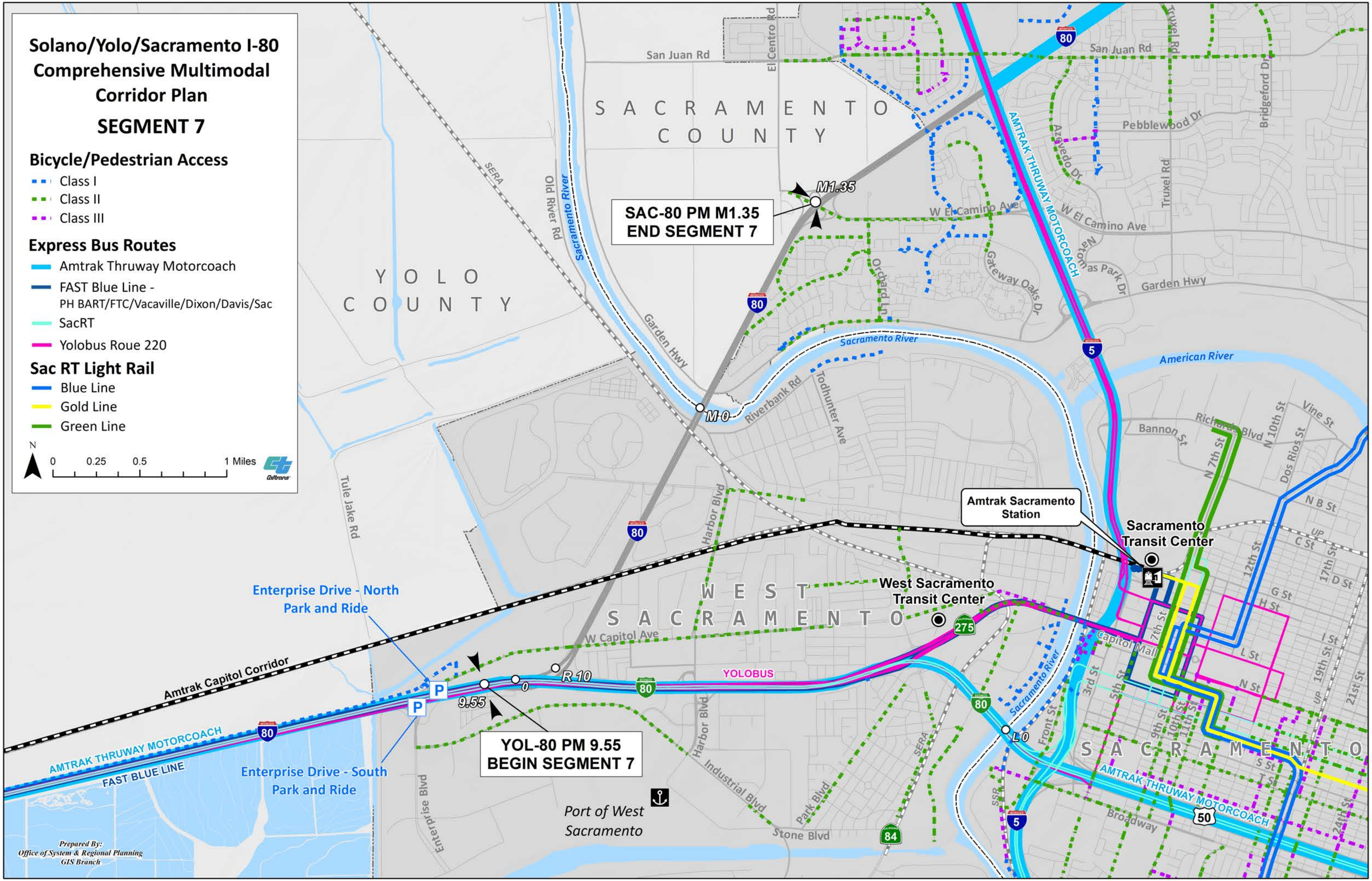
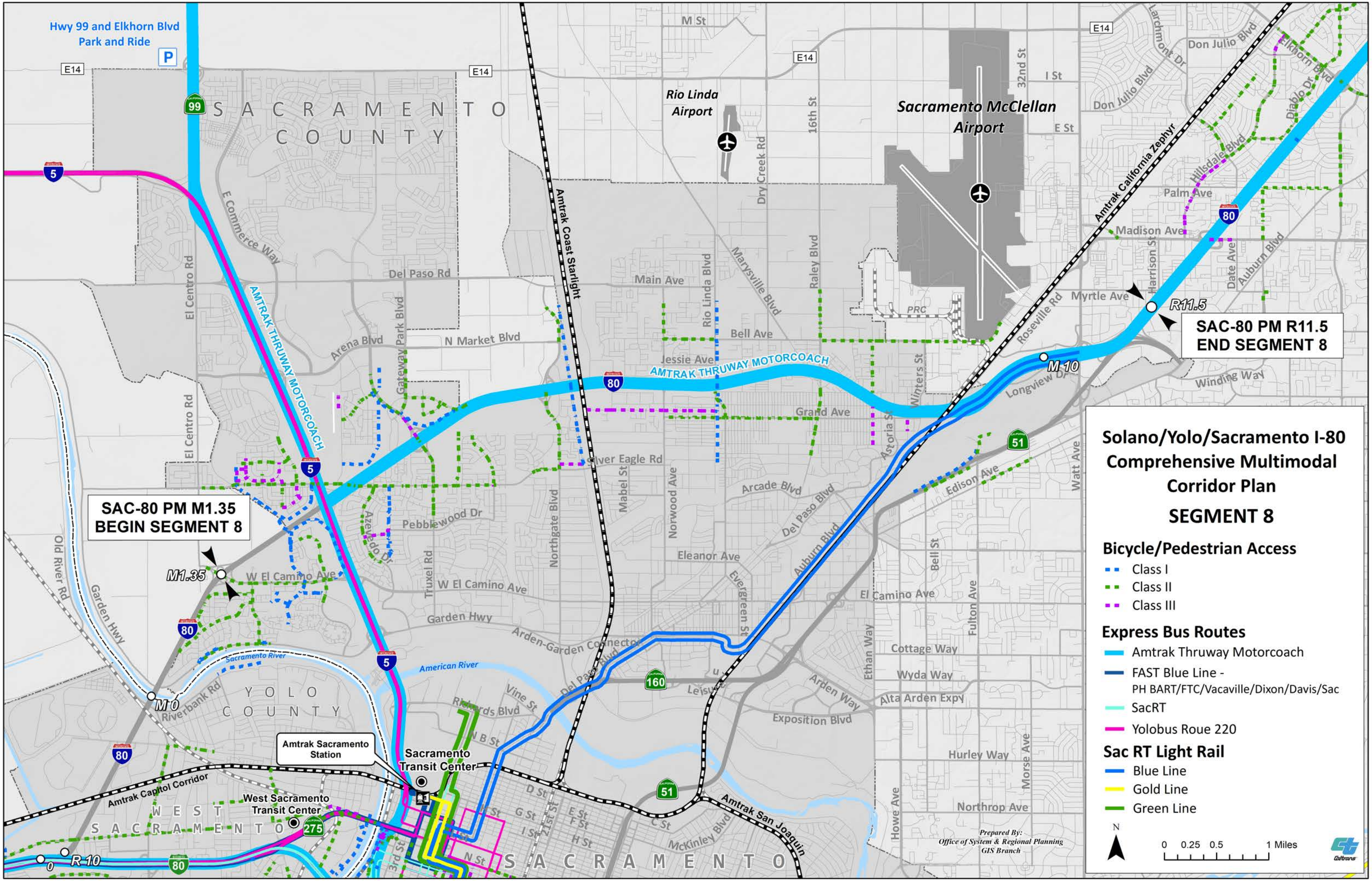
Solano/Yolo/Sacramento I-80 Comprehensive Multimodal Corridor Plan

SEGMENT 7



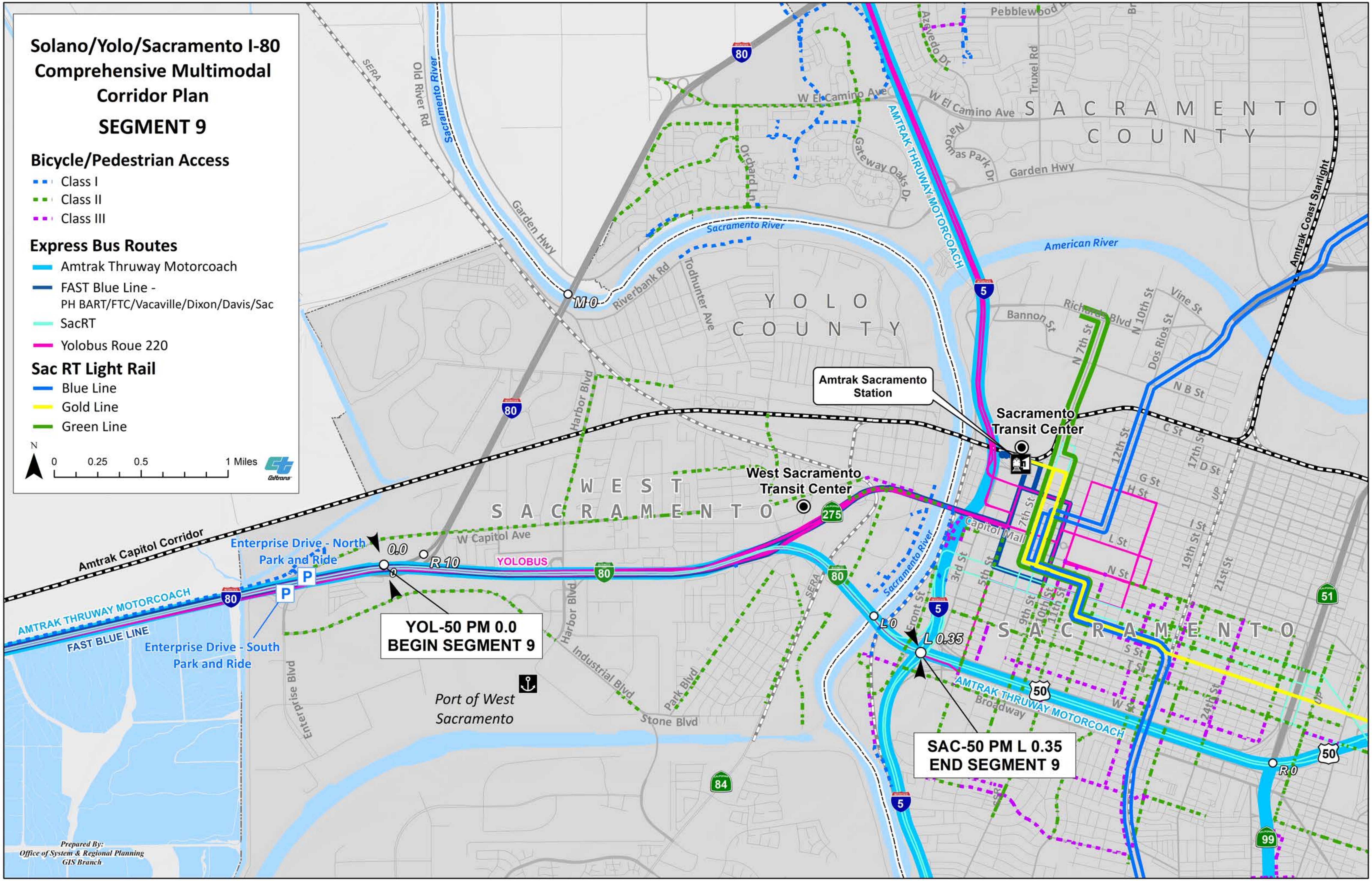


Solano/Yolo/Sacramento I-80 Comprehensive Multimodal Corridor Plan

SEGMENT 8

Solano/Yolo/Sacramento I-80 Comprehensive Multimodal Corridor Plan

SEGMENT 9



Bicycle/Pedestrian Access
- Class I
- Class II
- Class III

Express Bus Routes
- Amtrak Thruway Motorcoach
- FAST Blue Line - PH BART/FTC/Vacaville/Dixon/Davis/Sac
- SacRT
- Yolobus Roue 220

Sac RT Light Rail
- Blue Line
- Gold Line
- Green Line

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