TECHNICAL MEMORANDUM

Broadway Bridge Feasibility Study
Local, State, and Federal Funding

PREPARED FOR:	City of West Sacramento, in cooperation with the City of Sacramento
PREPARED BY:	Economic & Planning Systems, Inc. and CH2M

Introduction

The Pioneer Bluff area in West Sacramento and the Sacramento waterfront areas known as the Docks and Miller Park stand to realize substantial changes as a result of the planned Broadway Bridge. This technical memorandum explores the potential effects and influences of the planned bridge, speaking to preliminary categories of land use implications, based on preliminary consideration of width and placement of the facility. In addition to discussing potential land use implications of the bridge, local funding sources that may be available to fund construction are contemplated.

Economic & Planning Systems, Inc. (EPS) reviewed background reports and other EPS in-house analyses, including the Rail Realignment analysis applying to West Sacramento and Yolo County, as well as the Choice Neighborhoods Initiative market analysis applying to the upper Broadway corridor on the Sacramento side of the proposed crossing. EPS also interviewed developers and other stakeholders in an effort to understand background conditions and considered current trends in key market segments to help understand the implications of the planned bridge.

This technical memorandum begins with a discussion of development trends in the City of West Sacramento and City of Sacramento (Cities) for the residential, office, retail, and research and development (R&D) markets, followed by a summary of the development outlook for Pioneer Bluff. This technical memorandum then examines how development will respond to the Broadway Bridge, based on a variety of stated development dynamics. While other work undertaken by the Cities has evaluated the relative benefits of the different alignments and lane capacities from an engineering standpoint, this technical memorandum primarily focuses on the differences in the alignments and lane capacities in terms of their impacts on development in Pioneer Bluff and surrounding areas. The technical memorandum then presents an analysis of the assessed values expected from new development in West Sacramento, which are used to inform a discussion of funding opportunities and strategies at the federal, state, and local levels. These funding opportunities include development impact fee programs, tax increment funding and bonding, and land-secured financing districts.

Key Findings

This technical memorandum is intended to provide a summary of initial findings and recommendations based on a brief initial investigatory phase that include the following:

- The Pioneer Bluff area, as initially assumed in the analysis of rail realignment potentials which reflects current General Plan expectations, may become a major concentration of office and other redeveloped commercial uses. However, discussions with local developers and considerations of a review of industry trends imply a real possibility the Pioneer Bluff area could go the route of mixed-use neighborhoods with substantial residential development.

- On the Sacramento side of the proposed bridge, development prospects are murky, with several operating fuel tank farms, an underused marina at Miller Park, and a "Docks" project that is not feasible as initially conceived by the City of Sacramento.
- Another possibility applying to both sides of the river is that inertia around existing industrial operations (that are generating tangible cash flow) will contribute to a deliberate and time-consuming transition of uses throughout the Pioneer Bluff and Sacramento waterfront areas. The ability to overcome this inertia depends on larger economic conditions (e.g., economic base growth and diversification), competing supply brought online in major competing portions of the Sacramento core, and other factors.
- Preferred bridge alignment alternatives directly connect to Jefferson Boulevard, improving regional circulation, as well as residential values through the quieting of internal traffic. These alternatives also retain parcel sizes to maximize their development potential.
- Building the infrastructure that eventually will accommodate a four-lane bridge configuration will support destination retail locations on both sides of the bridge. Although city officials in Sacramento are concerned that increased traffic volume may adversely affect neighborhood residents and small merchants in Upper Land Park-Broadway (ULP-Broadway). This additional activity may also provide needed impetus for the adaptive reuse of underused land and building assets in the area.
- The gross assessed values expected for new development areas in West Sacramento are estimated to range between $4.5 billion and $5.5 billion.
- The overall funding capacity for local infrastructure that is sustainable in the new development areas is estimated to range between $475 million and $864 million, depending on the intensity of land development at buildout and the assumed maximum cost burden.
- The estimated bonding capacity for tax increment funding, under an Enhanced Infrastructure Financing District (EIFD) or an Infrastructure Financing District (IFD), is estimated between $229 million and $280 million at buildout, with the remaining capacity coming from development impact fee programs and land-secured funding. Only a portion of this overall capacity will be available for bridge projects.

Development Outlook

The Cities collaborated on the Sacramento Riverfront Master Plan, the goal of which was to support high-density redevelopment in riverfront districts. The Docks Specific Plan and Urban Design Guidelines documents were approved in 2008 and 2009, respectively, for about 1,000 residential units and 240,000 square feet of retail and office. The Northwest Land Park Planned Unit Development (PUD) (now called The Mill at Broadway) was approved in 2011 for up to 825 market-rate, ownership units and 32,000 square feet of commercial development. Other significant planning efforts in the Study Area include the Broadway Vision Plan and Broadway street

Planned Projects in the Sacramento Urban Core[1]

Recently Completed Projects:

- 272 residential units
- 50,000 retail square feet

Under Construction:

- 1,132 residential units
- 420,000 retail square feet
- 475,000 office square feet

Approved, Construction Pending:

- 3,909 residential units
- 380,000 retail square feet
- 85,000 office square feet

Proposed:

- 1,103 residential units
- 845,000 retail square feet
- 560,000 office square feet

[1] Includes West Sacramento and Sacramento areas such as midtown, downtown, the Railyards and other River District projects, R Street corridor, and Broadway corridor.

improvements, which intend to improve the corridor to support successful mixed-use development and improve safety for all modes of travel, including bicycling and walking; and a potential streetcar route connecting West Sacramento, downtown Sacramento, and the Broadway corridor.

Trends in the Downtown Core

Downtown and midtown Sacramento, as well as West Sacramento, are emerging from recessionary market conditions that plagued the Cities, region, and country, with a tremendous amount of public investment and private development activity. The City of Sacramento is continuing to prioritize downtown and midtown development with policy actions and public investment and has paved the way for development of a new arena for the Sacramento Kings, scheduled to open in October 2016, and associated residential and commercial uses along 5th Street between K and L Streets. The R Street corridor, which commenced its revitalization with adoption of a master plan nearly a decade ago, has experienced rapid transformation from its industrial beginnings into a thriving residential and commercial mixed-use district. Elsewhere in midtown and downtown, there are more than 1,200 residential units (including the initial phase of The Mill at Broadway), many of them multifamily units, and nearly 900,000 square feet of commercial space currently under construction. The projected pipeline of projects is sizable, with 5,000 residential units (including remaining phases of The Mill at Broadway) and nearly 850,000 square feet of commercial in projects that have been approved but are not yet under construction or that have been submitted to the City of Sacramento for approval. In total, downtown and midtown Sacramento is slated to accommodate over 6,200 residential units, nearly 90 percent of which are anticipated to be multifamily units, and 1.7 million square feet of retail, office, hotel, and other commercial uses.

This impressive growth is consistent with the City of Sacramento’s approved “In Downtown” initiative, which aims to construct 10,000 housing units in downtown and midtown over the next 10 years. Of these units, 6,000 are intended to be market rate; another 2,500 would be workforce housing, and affordable to households earning up to 60 percent of area median income; and 1,500 would be rapid rehousing opportunities for homeless individuals. The initiative is intended to help projects achieve necessary entitlements by simplifying the development process, encouraging more housing builders to do business downtown, and helping to market the area to new residents as a good place to live.

The Broadway Bridge areas on each side of the river stand to benefit substantially from increased residential and commercial investment in the central city, as they are well-positioned to attract future residents, in particular first-time homebuyers seeking an urban environment at a discounted price point relative to housing in downtown and midtown Sacramento. These trends are reflective of national trends of shifting consumer preferences for highly amenitized, close-in districts appealing to the Millennial and Baby Boomer generations in particular.

Bridge District

In the City of West Sacramento, the Bridge District is under construction with new development. The Bridge District is a 188-acre planned urban community located along the banks of the Sacramento River between the Tower Bridge to the north and the Pioneer Bridge to the south. The Bridge District has entitlements for up to 5,200 residential units, and 7.3 million square feet of commercial development.

Residential and retail development is rising rapidly in the Bridge District since completion of a $22.3 million project to install the roads and necessary backbone infrastructure to accommodate future growth. Housing developments, including Park Moderns, Habitat Modern, The Rivermark, and Capitol Yards, have been completed or will be completed by the end of 2015 that total nearly 500 dwelling units. Plans are moving forward for the Riveredge development, a 273-unit and 16,300-square-foot retail project in the Bridge District. The Barn Project, an outdoor concert and event space, will begin vertical construction in the summer of 2015 and should be complete before the end of the year. In addition, the City of West Sacramento has acquired two significant parcels near the Bridge District from its redevelopment agency that should clear the way for large development projects in the near future. Projected developments include an affordable housing mixed-use project close to Raley Field.

Pioneer Bluff

Pioneer Bluff, an industrial storage and distribution point dating back to the 1940s, was designated for high-density mixed-use development in 1990 in West Sacramento's General Plan, soon after the city's incorporation in 1987. The City of West Sacramento has reinforced this mixed-use vision over the last 25 years, notably in the 2003 Riverfront Master Plan and subsequent land use policy that has prohibited new or expanding industrial uses. Pioneer Bluff is home to corporation yards, fuel terminals, and light manufacturing uses.

Pioneer Bluff fits into a larger vision of a reimagined West Sacramento waterfront, which began to take shape in the 1990s with the Ziggurat building and River Walk Park in the Washington District, followed by relocation of various industrial activities a decade later in the Bridge District to make way for Raley Field. In recent years, the transformation has extended to Pioneer Bluff, resulting in the removal of the Cemex terminal and rail spurs, as well as decommission of a wastewater treatment plant in 2008 and completion of the Mike McGowan Bridge in 2014.

Multiple planned efforts in Pioneer Bluff point to a hastening transition to a mixed-use district.

Pioneer Bluff Reuse Plan. In 2015, the City of West Sacramento was awarded a Strategic Growth Council (SGC) Sustainable Communities Planning Grant and Incentives Program (SCPGI) to prepare a reuse master plan for Pioneer Bluff, as recommended by the Pioneer Bluff Transition Plan, issued in December 2014. The reuse master plan will include a detailed land use, infrastructure, and financing strategy for infill development. The City of West Sacramento intends to integrate the Stone Lock District (discussed below) into the reuse planning efforts to achieve greater cost efficiencies for backbone infrastructure.

While the reuse master plan is not complete, a draft planning study issued by Clark Pacific for its own land holdings in Pioneer Bluff hints at the kind of development that can be expected in the near future. Their plan includes from 900 to 1,400 high-density residential units, from 100 to 150 townhomes, from 120,000 to 150,000 square feet of mixed-use/retail space, and from 150,000 to 175,000 square feet of office space for R&D.

Stone Lock District. The Stone Lock District consists of multiple vacant properties located along the Sacramento River to the north and south of the Barge Canal, though concentrating on the south. The 210 acres making up the district are owned by the West Sacramento Redevelopment Successor Agency. The Cordish Companies proposed five districts that will total up to 890,000 square feet of retail, 2,500 residential units, and 1.7 million square feet of office space. While Cordish Companies' officials have released few definitive details, website renderings of proposed plans included a music venue, as well as pedestrian paths along the canal and mixed-use towers along the waterfront. A music venue or other such entertainment use would be in keeping with the Request for Qualifications (RFQ) released for the site in 2007, which called for destination-oriented commercial uses, such as waterfront restaurants and cafes, as well as a new marina.

ULP-Broadway

The Mill at Broadway, which provides smaller units attractive to the Millennial Generation as well as baby boomer empty-nesters seeking to downsize, is a prime example of the opportunities present in ULP-Broadway. Nearby, redevelopment of a former Safeway store-turned-office space (Broadway, between 9th and 10th Streets) will transform into the new home of The Kitchen, an upscale restaurant, another restaurant yet to be disclosed, and professional office space. Also, there are proposals to construct a mixed-use storage and ownership residential project (Broadway and 3rd Street), expand existing storage space (X and 9th Streets), and construct single-family homes (Broadway and 10th Street).

Further east, several parcels are for sale or in negotiation, with one recent transaction occurring on Broadway at 14th Street with the purchase of a vacant two-story, 12,000-square-foot building and a one-story, vacant 3,100-square-foot annex building. The future land use of this space has yet to be disclosed.

The Broadway Vision Plan, completed in 2012 by the Sacramento Urban Land Institute and the Greater Broadway Partnership, provides a guide for improvements along the Broadway corridor from the Sacramento River to California State Route 99 (SR-99), based on an active outreach effort. The City of Sacramento has since been awarded a California Department of Transportation (Caltrans) grant of $284,000 and contributed nearly $180,000 of local funds to conduct studies to improve multimodal travel, prepare photorealistic simulations of the project vision, and develop block-level cost estimates for improvements. Later this year (2015), the City of Sacramento is expected to present the full set of Broadway street improvements, which may include narrowing from two lanes to one lane in either direction, upgrading gutters to encourage pedestrian activity, adding bicycle lanes, adding landscaped medians, additional and consistent street tree plantings, and other urban design improvements. Planned improvements, however, likely will not occur for another 5 to 10 years.

ULP-Broadway suffers from a roadway network that impedes access throughout the area and compartmentalizes subareas. The Interstate 5 (I-5) and U.S. Route 50 (US 50) freeways, although an asset in terms of regional access, present a physical and psychological barrier separating the existing residential uses in ULP-Broadway from Marina Park, downtown, and the future Docks. In addition, the freeways contribute to toxic air contaminants, noise pollution, and, in concert with a heavy concentration of industrial and automotive land uses and vacant lots along Broadway, result in an urban landscape that is unfriendly to pedestrians, bicyclists, and retail uses that rely on this type of activity. The public housing communities of Alder Grove and Marina Vista, located to the east of I-5, are severely distressed and no longer serve the needs of their residents, prompting the Housing Authority of the City of Sacramento (HACS) to fund efforts to redevelop the exiting public housing sites into a viable and sustainable mixed-income neighborhood.

The Docks

The Docks is a 29-acre site located along the Sacramento riverfront, bordered to the south by US 50, to the east and north by I-5, and to the west by the Sacramento River. While the Docks is close to Old Sacramento and downtown Sacramento, US 50 and I-5 isolate the site from the remainder of the city. Despite accessibility constraints, the City of Sacramento recognizes the Docks as a redevelopment opportunity. The city adopted the Docks Specific Plan and the Docks Urban Design Guidelines in 2008 and 2009, respectively, to provide a vision and to prioritize redevelopment of this site. At buildout, the City of Sacramento envisions the Docks to be a compact, pedestrian-friendly, mixed-use community that will provide approximately 1,000 dwelling units, 43,000 square feet of retail space, and 200,000 square feet of office space.

Despite the adoption of the Docks Specific Plan, there are several key challenges that likely will delay project development. The site has long been used for commercial and industrial activities over the years. As a result, some of the land is either sealed or capped because of soil contamination and remediation. In addition, the Pioneer Reservoir, an overflow receptacle for the City of Sacramento’s combined sewer system, is situated in the center of the Docks. The cost of mitigating the site’s contamination and infrastructure construction pose issues of financial feasibility related to private development. Further, the project’s relative isolation from other parts of the city may influence market demand. Because of these challenges, development in the Docks is considered a long-term prospect.

Railyards

The Railyards is located just north of downtown Sacramento and south of Sacramento’s River District. Major backbone infrastructure is being constructed in the Railyards area, and development is expected to follow. Adopted in 2007, the Sacramento Railyards Specific Plan document provides details for high-density, mixed-use development and a maximum allowance of a variety of land uses. In 2015, developer Downtown Railyard Venture requested entitlement changes that would produce approximately 6,100 units and 2.1 million square feet of commercial uses. Of the 2.1 million square feet of commercial uses, 1.2 million square feet would be taken up by a new medical center and medical offices developed by Kaiser Permanente. These projects appear to be pushing down the total unit count, which could open up opportunities for such areas as Pioneer Bluff. Additional office development is expected, as entitlement changes will allow for an office campus development of one or more users.

Initial Railyards projects include the Sacramento Intermodal Transportation Facility; the new Sacramento County Courthouse, a 12-story, 405,000-square-foot building; and a new Kaiser Permanente hospital. Future infrastructure improvements, such as the I Street Bridge replacement, will improve the area's connectivity to West Sacramento.

Relative Sector Strengths

Residential Development. Demand for new residential growth—in particular, market-rate residential growth—will be bolstered by and will follow continued development in the surroundings areas of downtown and midtown Sacramento, as well as West Sacramento. Downtown and midtown Sacramento, as well as the Bridge District in West Sacramento, continue to expand and evolve with the development of entertainment uses (e.g., the forthcoming Golden 1 Center and surrounding hotel and retail uses) and significant planned and proposed housing development. Of the central city corridors, the R Street Corridor in Sacramento is undergoing continued public and private investment, with recently constructed and forthcoming commercial and residential development. With a notable increase in activity and interest, the Broadway Corridor likely will follow R Street as one of the next corridors to benefit from increased public and private investment, although revitalization likely will emanate from the central portion of the corridor (e.g., the Tower District), where existing amenities and connections between midtown and adjacent neighborhoods are strongest. That said, revitalization and continued residential growth in ULP-Broadway will hinge on the successful implementation of key public and private projects in the area, such as The Mill at Broadway, Broadway Bridge, and Broadway street improvements.

Office Development. A review of market dynamics and discussions with real estate professionals and other stakeholders reveals limited prospects for new office development in the areas surrounding the Broadway Bridge. Though the office market has improved considerably in the Sacramento region since the Great Recession, there is still an abundance of space in the area; not just in outlying areas like Roseville and Rocklin, but even in downtown Sacramento. Office market reports from CBRE show vacancy rates are improving in downtown Sacramento, yet they remain around 15 percent. From Q1 2014 to Q3 2015, vacancy rates have dropped from 18.0 percent to 14.6 percent. Meanwhile, average asking rent prices per square foot have increased from $2.15 to $2.28 in the same time frame. While rents in the downtown core are increasing, industry experts state that for a new office tower to pencil, an entire building would need to rent for $3.50 per square foot before new construction makes sense.[2]

Because justifying new office development in the downtown core is extremely difficult given current conditions and trends, investors hope to capitalize on renovating some of the submarket's aging buildings to attract new users. Significant buildings have traded hands in downtown in the past couple years, including Plaza Five Fifty Five on Capitol Mall, The Senator on L Street, and the California Fruit Building. In each case, the new owners have unveiled plans to aggressively upgrade the existing space to attract tenants. Provided there is a substantial stock of available office space, this option can be viable

[2] "Here's what it will take to build new office towers downtown," Sacramento Business Journal, August 2015.

for investors looking to enter the Sacramento market. This trend is expected to continue in the downtown core and extend to emerging corridors, such as R Street and Broadway.

In the near term, the office markets of downtown and midtown Sacramento are better positioned than areas surrounding the Broadway Bridge to absorb what little regional demand for office space exists. Potential future office space tenants in West Sacramento likely will be opportunistic, and any available space will be confined to small-scale tenants in the creative sector (architects, graphic designers, artists) who are seeking opportunities to locate near the urban core and take advantage of a discounted price point. Office development is most likely to be attracted to the waterfront area of the Bridge District, near Raley Field as the area continues to define itself, while the prospects for office absorption in Pioneer Bluff are much longer term.

Retail Development. The market for new retail development in the area surrounding the Broadway Bridge will be linked to population and household income growth in the Study Area and likely will be confined to neighborhood-serving retail. Also, there is limited potential for destination-oriented retail that leverages the area's unique waterfront assets, such as the Barn Project and plans for a music venue, waterfront restaurants and cafes, and marina at Stone Lock.

R&D. R&D/Flex/Light Industrial describes a building type designed to be versatile, which may be used in combination with office, R&D, and industrial, warehouse, and distribution uses. In the past 2 years, West Sacramento and other Yolo County communities have experienced an increase in R&D/Flex development. Agricultural and food research and innovation has been a leading driver of R&D expansion and absorption. Bayer CropScience moved from Davis to West Sacramento in 2013 with plans to double its workforce. Since moving to West Sacramento, Bayer has invested over $80 million in its biologics R&D operation facilities. In 2013, Odenberg Engineering, Inc. (then Tomra) developed a 60,000-square-foot food-sorting technology building in West Sacramento. Recently, California Safe Soil, a food recycling and fertilizer company, has grown out of its West Sacramento operations and will build a new facility at McClellan Business Park. Early plans for development in Pioneer Bluff, such as the preliminary plans for the Clark Pacific holdings discussed earlier, envision some R&D to take advantage of the large building footprints that will be possible once industrial uses have relocated.

Summary of Development Outlook for Pioneer Bluff

Given the volume of current and projected development activity in the surrounding areas, Pioneer Bluff appears poised to make a transition from an area dominated by industrial uses to one that is primarily residential mixed-use in character, as well as some office and R&D uses. The plans for the Clark Pacific holdings indicate the kind of land use mix that may be expected in future developments.

The timing of mixed use development depends in part on Yolo County's rail realignment project moving forward, which will relocate a stretch of Union Pacific rail line that currently defines the western area of Pioneer Bluff eastside. This relocation will provide additional developable land necessary to help Pioneer Bluff transition, as well as improve the area's traffic circulation.

City officials have stated that the petroleum tank farms are an unacceptable entrance point to both Sacramento and West Sacramento, though it will be difficult to remove existing industrial uses that maintain positive cash flow, however marginal, for the land owners. The tank farm locations have potential as future employment centers, as less environmental remediation is necessary for nonresidential uses.

There is at least some degree of market pressure for the fuel terminals to relocate and consolidate to increase scale, productivity, and margins, though there are challenges to such regional consolidation that likely will require a regional public-private approach to overcome them. The City of West Sacramento has contemplated forming a Community Facilities District (CFD) for services in Pioneer Bluff, which would serve as further encouragement for industrial users to relocate to avoid paying into a district that will provide services (e.g., landscape maintenance) of little utility to industrial users. Pioneer

Bluff also is home to large and influential landowners that have the ability to spur action. Clark Pacific, the largest land owner in Pioneer Bluff at 23 acres, could catalyze transformation of the area itself if they relocate their industrial activity elsewhere as planned.

While mixed-use development in Pioneer Bluff is a likely outcome eventually, residential development is an important element of such a district, and is the most likely near-term use. This should increase land values to support infrastructure development and may seed future office development in the area. While this kind of development is not dependent on plans for the Broadway Bridge, it will require better connectivity to US 50 to flourish.

The transition of industrial areas can be difficult and slow. Significant environmental remediation will be necessary, which takes time, and even significant levels of remediation may not be enough to make certain sites appropriate for residential uses unless built as more expensive and higher density prototypes that may not pencil out in today's markets. In addition, the circulation that currently exists in Pioneer Bluff is adequate for the industrial users that are located there, so they have little motivation to finance improvements like Broadway Bridge.

The City of West Sacramento intends for roughly two-thirds of Pioneer Bluff to develop as office and retail space, an ambitious goal, considering the current trends in the office market discussed earlier. The outlook for the office market is weak in the Sacramento region in general, and any demand likely will be absorbed first in downtown Sacramento, the Bridge District, and the R Street Corridor.

Development Dynamics: Response to Broadway Bridge

The development outlook in Pioneer Bluff will be influenced directly by the proposed Broadway Bridge, which has been needed for more than a decade to address mobility, economic development, and safety concerns. Between 2013 and 2014, the City of West Sacramento was awarded nearly $2 million in funding from the Sacramento Area Council of Governments (SACOG) and Transportation Investment Generating Economic Recovery (TIGER) grants to complete feasibility and environmental studies. Though the realization of this project may be more than 10 years from now, the Broadway Bridge project will be instrumental in shaping the future of development in Pioneer Bluff.

The Broadway Bridge has the potential, with careful consideration and planning, to improve quality of life in the impacted areas and, as a result, enhance the value of future development. The bridge alignment decision must take into account several underlying development forces in the surrounding area that will influence the ultimate success of the project. Regardless of whether the area will convert to commercial or residential/mixed-use concepts, several key facets of land development in the constrained areas on either side of the bridge must be taken into account, as the overall development framework is contemplated.

Impacts of Bridge Alignments

Four bridge alignment alternatives have been proposed. The impacts of each alignment on development outlook and dynamics are described in **Table 1**. The alignments that directly connect to Jefferson Boulevard are preferable in that they quiet internal traffic, which may improve residential values, as well as improve regional circulation. As part of its goal for "Safe Streets, Safe Homes, Safe Community," the draft ULP-Broadway Transformation Plan calls for neighborhood streets to integrate physical features, making them safe for all users, and this sentiment has been reiterated by city officials in West Sacramento. Studies also have found that more walkable neighborhoods possess higher home values.[3] Reducing the amount of confusing roadway options in Pioneer Bluff can help quiet internal traffic which, in turn, can improve safety and calm local streets. Planned improvements to 5th Street have included safety measures, such as intersection, traffic control, striping, and driveway improvements, as well as

[3] "Complete Streets Stimulate the Local Economy," Smart Growth America (n.d.)

the addition of bicycle lanes from 15th to 5th Streets. City officials also would like to see new pedestrian-friendly pathways in the Pioneer Bluff area, though such amenities depend on the removal of the petroleum tanks, as well as remediation of the affected soil.

Value of Walkability

A recent survey found that, in 15 real estate markets from Jacksonville, Florida to Stockton, California, a one-point increase in the walkability of a neighborhood, as measured by WalkScore.com, increased home values by $700 to $3,000.

The same alignments that connect directly to Jefferson Boulevard also do not divide the parcels, to the extent that a realignment of 5th Street would, and parcels must be of sufficient size to attract high-value development to the Pioneer Bluff and Bridge Districts. In addition to higher land values, large parcels enjoy greater efficiencies in providing infrastructure that reduce overall costs.

Alignments A and D also have the benefit of bypassing the tank farms, which may allow for the bridge construction to proceed before the tank farms are removed.

Table 1. Impact Matrix of Broadway Bridge Alternatives

	Alignment Alternative		**Lane Capacity**	
Item	**Alignments A and B[1]**	**Alignments C and D**	**Two Lanes**	**Four Lanes**
Residential/Mixed-Use Outlook	Quiets internal traffic along 5th Street, which may enhance residential values.	Increased traffic on 5th Street reduces walkability and safety that may detract from residential values.	Less traffic may support quiet and calm environment.	Nonarterial design and parking strategies critical to success.
Commercial Outlook	Optimizes parcel size for commercial development.	Extending 5th Street will make parcels too small to develop.	Preferred by small, neighborhood-serving merchants in ULP-Broadway, who value Broadway's walkability.	Will support newer regional retailers like The Kitchen, as well as entertainment-oriented retail destinations in West Sacramento.
Regional Influence	Directs pass-through traffic to Jefferson Boulevard, leveraging the major arterial for best circulation.	Diverts traffic to 5th Street, resulting in suboptimal overall circulation.	Less circulation benefits and traffic reduction, more local serving orientation.	Improved regional circulation, best alleviates traffic from Pioneer Bridge during peak hours.
Industrial Operations	May be possible to build without removing tank farms.	Must remove tank farms.	N/A	N/A

Notes:
N/A = Not applicable
[1]Alignment B may require the removal of the tank farms in order to proceed
Source: U.S. Environmental Protection Agency

Impacts of Lane Capacity

There has been considerable discussion regarding how many traffic lanes the configuration of the Broadway Bridge will accommodate. Increased lane capacity on the Broadway Bridge will improve regional access to the surrounding neighborhoods, bolstering local business activity, while easing congestion at the same time. Developers in West Sacramento, in particular, see the Broadway Bridge as creating value by providing southbound access to I-5 as a means of alleviating traffic on Pioneer Bridge. The draft Transformation Plan for ULP-Broadway lays out three guiding principles and goals as part of its vision statement. Within the larger goal of creating dynamic and livable neighborhoods, the vision statement explicitly states the intention to have the Broadway corridor emerge as a regional destination, an objective that will be substantially furthered by the Broadway Bridge, along with improvements to 5th Street that will strengthen connections to downtown.

The planning discussions surrounding a proposed streetcar connecting West Sacramento and Sacramento have included an alignment running from the Bridge District to Pioneer Bluff along 5th Street, continuing over the Pioneer Bluff Bridge to Stone Locke, and then connecting to Sacramento over the Broadway Bridge. These plans have furthered momentum for riverfront development.

Neighborhood groups in ULP-Broadway are resistant to the high traffic volumes that a four-lane configuration would bring to their neighborhood, which are reflected in the concerns of city officials in Sacramento. City officials in West Sacramento, on the other hand, would prefer to build the infrastructure necessary to eventually accommodate four lanes for better circulation, even if the bridge only contains two lanes in the beginning.

Many existing merchants in ULP-Broadway, predominantly local-serving small businesses, believe higher traffic volumes will detract from the future walkability of the Broadway corridor and hurt their business as a result. On the other hand, increased trip volumes likely would better support retail development that has more of a regional draw, such as The Kitchen. On the West Sacramento side of the bridge, increased circulation from extra lane capacity is expected to help support the proposals of entertainment-oriented retail destinations.

While increased trip volumes can improve retail viability, it is important that bridge traffic be directed to adequate parking provisions that allow visitors to access retail destinations in safe, calm environments. In a mixed-use, urban-village setting, parking facilities should be designed to be shared among many businesses to maximize usage during various peak times. For instance, office uses will use parking during weekday business hours, restaurants will use parking during evenings and weekends, and parks/open spaces will use parking during weekends. On-street parking should be encouraged to reduce the amount of space needed for off-street parking lots or structures. Furthermore, parking strategies should be timed with phased development. After sites are demolished and cleaned, they easily can be used for parking until further stages of development.

Development Value Estimates

EPS is preparing various analyses for the Yolo Rail Realignment Study and has developed assumptions regarding the assessed value of new development in West Sacramento that will occur in the Washington District, Bridge District, Pioneer Bluff, and the Snow Cone project.[4] The results from this analysis (see Table 1) provide a range of assessed values based on low-density and high-density buildout scenarios. The gross assessed value for new development ranges from approximately $4.5 billion to $5.5 billion.

These values will be realized over a long absorption period that will be dictated by the mix of land uses planned by the City of West Sacramento for these development areas. The development values can be leveraged for funding all new infrastructure required to serve this new development, such as circulation,

[4] "Preliminary Draft Report: Yolo Rail Realignment Assessment Area #2—Economic Benefits," EPS, October 2015.

water, sewer, and drainage improvements. Some of this funding capacity should be reserved to fund circulation projects benefiting a larger area of West Sacramento, such as the Broadway Bridge.

Federal, State, and Local Funding Opportunities

The Broadway Bridge project will require funding from federal and state grants and local matching sources. Federal, state, and local transportation funding opportunities examples are discussed below.

Fixing America's Surface Transportation (FAST) Act

This 5-year transportation funding bill was signed into law on December 4, 2015. The bill provides every state with a 5.1 percent increase in formula funds in fiscal year (FY) 2016, followed by annual increases ranging from 2.1 percent in FY 2017 to 2.4 percent in FY 2020—increases that will approximately offset the effect of projected inflation during those years.

The bill includes $225.2 billion from the Highway Trust Fund (HTF) for highway investment, a $20.2 billion increase over 5 years compared to maintaining FY 2015 funding. About one-half of the increase, or $10.7 billion, will support two new proposed initiatives—a National Freight Program and a program of Nationally Significant Freight and Highway Projects. The remainder will provide small annual increases in core highway program funding.

The details of the bill, and its various discretionary and competitive programs, will be clarified over the coming weeks and months. The impact to the Broadway Bridge will most certainly be a positive one, as the bridge's benefits to the regional multimodal transportation network place it in a competitive position for funds available through SACOG or Caltrans. Several of the programs to become beneficiaries of the FAST Act are described below.

Economic Development Administration (EDA)

EDA funds are administered by the U.S. Department of Commerce, with the goal of the program to, "Raise the standard of living for all citizens and increase the wealth and overall rate of growth of the economy by encouraging communities to develop a more competitive and diversified economic base by:

- Creating an environment that promotes economic activity by improving and expanding public infrastructure.
- Promoting job creation through increased innovation, productivity, and entrepreneurship."

EDA funding is targeted to areas that meet certain per capita income and unemployment metrics, resulting from severe short-term or long-term changes in economic conditions. EDA funds are awarded for both capital and noncapital activities. Individual states can be allocated no more than 15% of the national appropriations which, in recent years, has been approximately $500 million. Therefore, California would be eligible for no more than $75 million in any given year. Funds awarded are tied to specific job creation estimates, and post-project agency reporting to EDA is required. Typical federal/nonfederal match is 50/50.

State Highway Account

Caltrans prepared a Preliminary Investigation (PI) for the I-80/US 50 corridor from Davis to downtown Sacramento (see Attachment 1). The PI noted the study corridor currently experiences significant congestion during the AM and PM peak periods at several locations in the eastbound and westbound direction along I-80 and US 50. Furthermore, the SACOG blueprint plan for the Sacramento region projects sizeable increases in vehicle volumes along the corridor over the next 25 years. With the potential for worsening congestion and the subsequent increase in travel times and vehicle emissions, the corridor has been identified in the respective I-80 and US 50 Corridor System Management Plans and Transportation Corridor Concept Reports as an area that will require further capital improvements.

The operational and safety traffic benefits Broadway Bridge would deliver to US 50, specifically the Pioneer Bridge, provides the opportunity to leverage funds administered through Caltrans, such as the State Highway Operations and Protection Program (SHOPP), the interregional component of the State Transportation Improvement Program (STIP), and potential bonding through the Grant Anticipation Revenue Vehicles (GARVEE) program. For more information on the GARVEE program, the *Analysis of GARVEE Bonding Capacity 2015*, presented to the California Transportation Commission, is included as Attachment 2.

Transportation Infrastructure Finance and Innovation Act (TIFIA)

The TIFIA program provides federal credit assistance in the form of direct loans, loan guarantees, and standby lines of credit to finance surface transportation projects of national and regional significance. TIFIA credit assistance provides improved access to capital markets, flexible repayment terms, and potentially more favorable interest rates than can be found in private capital markets for similar instruments. TIFIA can help advance qualified, large-scale projects that otherwise might be delayed or deferred because of size, complexity, or uncertainty over the timing of revenues. Many surface transportation projects, including highway, transit, railroad, intermodal freight, and port access, are eligible for assistance. Each dollar of federal funds can provide up to $10 in TIFIA credit assistance and leverage $30 in transportation infrastructure investment. TIFIA typically funds larger surface transportation projects ($50 million minimum, generally). TIFIA loan amounts have historically been less than 33 percent of eligible costs and Department of Transportation requests that applicants provide a rationale for TIFIA loan requests of up to 49 percent of costs (permitted by statute).

Transportation Investment Generating Economic Recovery (TIGER)

TIGER discretionary grants fund capital investments in surface transportation infrastructure and are awarded on a competitive basis to projects that will have a significant impact on the nation, a region, or metropolitan area. For the TIGER 2015 cycle, $500 million was made available for transportation projects across the country under a seventh round of the highly competitive grant program. The agencies' successful award of $1.5 million in TIGER planning funds for the Broadway Bridge environmental/preliminary engineering phase sets the stage for the project to compete for TIGER funds in the 2016 funding round and beyond.

Fixed Guideway Capital Investment Grants ("New Starts")

The Federal Transit Administration (FTA) administers grants for new and expanded rail, bus rapid transit, and ferry systems that reflect local priorities to improve transportation options in key corridors. The ability of the Broadway Bridge to serve the future planned streetcar loop potentially makes it eligible for this discretionary program. These funds are a major contributor to the Downtown Riverfront Streetcar, and require project sponsors to undergo a multistep, multiyear process to be eligible for funding, with a maximum federal share of 80 percent. Projects in the "New Starts" category must have a total net capital cost of less than $250 million and seek a federal share of less than $75 million.

I-5 Subregional Fee

The Cities, Caltrans, Elk Grove, and SACOG have partnered together to develop the 1-5 Subregional Impact Fee Program which serves to mitigate impacts on I-5 by funding local and Caltrans projects which will prevent additional trips from impacting I-5/SR-99. Broadway Bridge is one of the eligible projects identified in the fee program, and $20 million is identified as eligible for impact fee collection. The local agencies will assess the fee on new development. The nature of the fee collection means revenue is not immediately available, but rather collected over time. This can be a component of, or leveraged against, future construction costs.

Active Transportation Program (ATP)

The ATP was created and is being administered by Caltrans and the California Transportation Commission (CTC). The ATP combines many federal and state funding streams previously used for bicycle, pedestrian, safety, and other related purposes into one funding stream with broad eligibilities. Approximately $359 million has been budgeted for ATP Cycle 2 across the state for the 3-year period beginning with FY 2017 and ending with FY 2019. All ATP funds are distributed competitively, with 50 percent of the funds channeled through a statewide competitive program, 10 percent through small urban and rural regions with populations of 200,000 or less, and the final 40 percent being distributed through metropolitan planning organizations (MPOs) in urban areas with populations greater than 200,000, such as the SACOG six-county region. The average awarded ATP amount for 2015 projects in the SACOG region was approximately $1.3 million.

SACOG Regional Programs

SACOG conducts a biennial flexible funding round in which projects are selected for available transportation funds in the four county region comprised of Sacramento, Sutter, Yolo, and Yuba counties. The flexible funds are included in the Community Design, Bicycle and Pedestrian, and Regional/Local funding programs. The flexible funding round allocates regional funds to projects based on federal apportionments of Congestion Mitigation and Air Quality (CMAQ), Regional Surface Transportation Program (RSTP), STIP funds, and SACOG Managed Funds.

The funding round is one of SACOG's means for funding and advancing projects that contribute to the implementation the Metropolitan Transportation Plan/Sustainable Communities Strategy (MTP/SCS) through a well-developed program funding structure and targeted investments in the region's transportation system. The current Broadway Bridge feasibility phase is funded through these programs.

For the 2015 round, the SACOG Board took action on approving final programing target amounts of up to $128,553,000. Due to the reduction in STIP funding, projects recommended for funding were separated into two categories that distinguish between those guaranteed programming in a Tier 1 list, and those that are not guaranteed programming, in a Tier 2 list. The Tier 1 target is $89.7 million and the Tier 2 target is $38.8 million. The maximum allocation in the 2015 round was $4 million for a single project.

California River Parkways Program (CRPP)

The CRPP is a competitive grant program first created under the Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002 (Proposition 50). The program is administered by the Office of the Secretary for Resources and awards funds to public agencies and nonprofit organizations to acquire, restore, protect or develop river parkways. The California Natural Resources Agency will be awarding nearly $7.6 million dollars for eligible projects in 2015. To be eligible for funding, the project must provide two of the five required conditions:

1. **Recreation** – Provide compatible recreational opportunities, including trails for strolling, hiking, bicycling, and equestrian uses along rivers and streams.
2. **Habitat** – Protect, improve, or restore riverine or riparian habitat, including benefits to wildlife habitat and water quality.
3. **Flood Management** – Maintain or restore the open space character of lands along rivers and streams so that they are compatible with periodic flooding as part of a flood management plan or project.
4. **Conversion to River Parkways** – Convert existing developed riverfront land into uses consistent with river parkways.

5. **Conservation and Interpretive Enhancement** – Provide facilities to support or interpret river or stream restoration or other conservation activities.

The City of West Sacramento applied for $500,000 in CRPP funds in 2015 for the Mill Street Pier Rehabilitation Project. Although a relatively small fund amount, this is one of several that may help to bridge a potential funding gap to implement the multimodal components of the project.

The timing and availability of these federal and state funding opportunities will be based on budget allocations made available by the federal and state governments at the time the construction of the bridge project is initiated. Not all of these programs may be available at the time required for the project, and new programs may be developed, providing additional opportunities for the City of West Sacramento.

Shelf-ready Funding Strategy

Funding is currently not committed for the project’s final design, right-of-way, or construction phases. Regional, state, and federal funding trends and policy reinforce that having a shelf-ready project is critical to competing for future funding sources. This trend is likely to continue with the passage of the FAST Act. Agencies have been able to capitalize on limited grant funds, one time infusions of bond funding, and cost savings realized by the competitive bidding climate, by having projects in the pipeline that can start construction in a relatively short timeframe. Examples are described below and support the importance of securing additional funds for the Broadway Bridge’s project development, to enable it to compete for future funding opportunities:

- **TIGER** – Previous rounds of TIGER include project readiness as part of the evaluation criteria for this highly competitive program. TIGER guidance specifically identifies project readiness to include “planning approvals, NEPA, and other environmental reviews/approvals.”
- **STIP** – STIP guidelines adopted by CTC state that, “The Commission may not allocate funds to local agencies for design, right-of-way, or construction prior to documentation of environmental clearance under the California Environmental Quality Act. As a matter of policy, the Commission will not allocate funds for design, right-of-way, or construction of a federally funded project prior to documentation of environmental clearance under the National Environmental Policy Act.”
- **Proposition 1B** – For projects using funds from the Highway Safety, Traffic Reduction, Air Quality, and Port Security Bond Act of 2006 (Proposition 1B), the CTC employed a competitive performance-based process to select projects for funding. In many cases, the primary evaluation criteria was a project’s ability to start construction as quickly as possible. This criteria was repeatedly reinforced during subsequent allocation rounds by the CTC as the state benefited from a strong competitive bidding environment resulting in $2 billion in project cost savings. These savings were rapidly reinvested in additional capital work that was “shovel ready” and could maximize the return on taxpayer investment.

To assist the agencies with a funding strategy for future phases of the Broadway Bridge, **Table 2** summarizes potential fund sources, and notes whether the program is eligible for capital versus noncapital funds, is a discretionary or competitive program, and applies a target amount for each fund source. These are targets only, and are subject to significant variations, based on the regional, state, and federal actions taken over the life of the project. As Table 2 shows, the majority of fund sources available are either eligible for capital costs only, or their evaluation criteria are geared towards a shelf-ready project. Most programs are highly competitive, and some are more applicable than others to the Broadway Bridge project. Table 2 separates fund sources into two tiers. Tier I includes fund sources previously identified and/or programmed for the project, as well as those that both Cities have partnered on for similar projects. Tier II funds would require further evaluation and/or agency action based on the preferred alternative, which will be determined during the environmental phase. Assumed

Tier I fund estimates would provide approximately $100-130 million (current dollars). With total project costs (current year) estimated between $140-260 million, additional fund sources would be required to fully fund the project.

Table 2. Potential Funding Sources

Fund Source	Capital	Project Development	Competitive	Discretionary	Funding Strategy/Implementation	Amount
Tier I						
FTA (New Starts)	✓		✓		Confirm streetcar connections and alignments	$20-25 million
TIGER	✓		✓		Refine 2015 TIGER application with streetcar benefits; adhere to TIGER PA/ED schedule and budget	$15-20 million
I-5 Subregional Corridor Mitigation Fee	✓			✓	Summarize I-5 benefits	$20 million
SACOG Regional Funding Programs	✓	✓	✓		Consistency with regional planning and delivery goals	$5-10 million
Active Transportation Program	✓		✓		Quantify bicycle/pedestrian benefits	$5-7 million
Infrastructure Financing District	✓			✓	Revenue streams not immediately available- materialize several years after project initiation	$40-50 million
Tier II						
TIFIA	✓				Loan for Capital Costs	$50 million minimum
STIP (IIP), SHOPP	✓		✓		Caltrans approval and prioritization required	$10-15 million
One Time Tax/Local Impact Fees	✓	✓		✓	At the discretion of the local agencies	$5-10 million
Sacramento County Measure A	✓				Requires City of Sacramento sponsorship/support in 2016 renewal	$10-15 million
CPUC Section 130	✓		✓		Jefferson/15th crossing improvements (if necessary)	$3-5 million
EDA	✓	✓	✓		Confirm eligibility based on per capita income and/or unemploy-ment rates within project impact areas	Funding range based on long-term job creation forecasts
Total Funding Range Shown						$180-225 million

Local Funding Options

Local funding options, secured by tax increment, land development values, and land-secured funding programs, and detailed in **Table 3**, include the following:

- Development impact fee programs.
- Tax increment funding through EIFDs and IFDs.
- Tax increment bonding secured by tax increment.

- Community Revitalization Investment Authority (CRIA).
- Land-secured financing districts:
  - Mello-Roos CFDs.
  - 1915 Assessment Districts (ADs).
- Increased sales and use taxes generated by new development.
- Other fees and exactions.

The primary candidate to secure funding resources resulting from redevelopment activity is the property tax increment streams generated via implementation of an IFD or EIFD. IFDs and EIFDs may be formed over noncontiguous geographies and can capture incremental increases in property tax revenue from future development that would otherwise accrue to the local jurisdiction's General Fund. These tax increment revenues can be used to finance public capital facilities or other specified projects of communitywide significance but cannot be used for operations or maintenance of those facilities. IFD/EIFD revenues may be pledged to support the issuance of municipal bonds.

Realizing substantial tax increment revenues relies on achieving substantial levels of redevelopment to increase property values and realize new property tax revenues. Revenue streams sufficient to support the issuance of debt materialize commensurately with redevelopment in the EIFD geography, likely from 5 to 7 years after project initiation. Use of other public financing mechanisms, such as a Mello Roos CFD, as a bridge or gap financing mechanism, may accelerate the ability to issue debt.

Table 3. Matrix of Bridge Funding Mechanisms (3 pages)

Mechanism	Description	Responsibility
Developer Equity	Developers may fund portion of infrastructure and facilities with private capital and/or commercial lending. Portion of such investment may be subject to reimbursement.	Developers raise and organize private financing. Development Agreement(s) will specify terms of credits or reimbursement for such investments.
County Capital Projects/ General Fund	The County's Capital Projects budget includes funding from the Capital Fund and other reserves, grants, departmental funding, bond financing and the General Fund.	Policies governing the development and selection of Capital Improvement Projects are set forth in the Budget Policies and Goals approved by the Board of Supervisors each year.
Utility Fees and Charges	Bonds may be issued secured by a utility rate charge base (water and sewer) to finance sewer and water utilities. Utility connection charges from new development can fund utility infrastructure improvements.	Cities collect utility fees and charges.
Regional Transportation Funding	Transportation Authority may fund a portion of certain region-serving transportation facilities.	Funding is from State, federal and regional sources.
County Development Impact Fees	Existing Development Impact Fees fund local-serving streets, parks, and public facilities. Utility connection fees help fund utility infrastructure.	Builders are required to pay fees at building permit issuance. County is responsible for implementing fee program and updating as appropriate.

City Area Development Impact Fee	Local Area Development Impact Fees (LADF) can be established by ordinance to fund infrastructure and/or reimburse initial developers for "oversizing" of facilities relative to their proportional share of costs.	Builders are required to pay fees at building permit issuance. Developers may construct certain facilities included in the LADF and receive fee credit for such investments.
Mello-Roos Community Facilities District (CFD)	Allows public agency to levy a special tax to pay debt service on bonds sold to fund construction and/or acquisition of public capital facilities; special taxes may also directly fund facilities and services.	County may form and administer CFDs to fund certain operations and maintenance costs.
Infrastructure Financing District (IFD)	IFDs can pay for regional scale public works by diverting property tax increment revenues for 30 years to finance highways, transit, water systems, sewer projects, flood control, child care facilities, libraries, parks, and solid waste facilities. IFDs cannot pay for maintenance, repairs, operating costs, and services.	To form an IFD, the County must develop an infrastructure plan, send copies to every landowner, consult with other local governments, and hold a public hearing. Every local agency that will contribute its property tax increment revenue to the IFD must approve the plan. Once the other local officials approve, the city or county must still get the voters' approval to: –Form the IFD (requires 2/3 voter approval) –Issue bonds (requires 2/3 voter approval) –Set the IFD's appropriations limit (majority voter approval)

California Infrastructure and Economic Development Bank (I-Bank)	I-Bank provides accessible low-cost financing options to eligible applicants for a wide range of infrastructure projects through the Infrastructure State Revolving Fund (ISRF Program). ISRF Program funding is available in amounts from $50,000 to $25,000,000 with terms of up to 30 years.	Applications for loan funds are accepted on a continuous basis but are subject to fairly stringent lending criteria, including a 5 year history of stable property tax collection for land-secured debt.
Other Non-Project Funding	State and Federal grants can help pay for qualifying facilities. Other tax funding, such as a dedicated sales tax increase, can also fund capital improvements and operations and maintenance.	County can pursue grants to fund local infrastructure and facilities. Other tax increases will require voter approval

Source: EPS

Other public revenues could be deployed but may be limited by political, fiscal, and other considerations. Other public revenue sources that theoretically could be used include general fund contributions, revenue bonds, municipal lease financing mechanisms, and voter-approved tax measures.

The assessed values shown in **Table 4** may be leveraged for local infrastructure funding opportunities. **Table 5** shows the potential ranges of infrastructure funding possibilities for the identified local sources.

New development remains feasible with an overall infrastructure cost burden of between 10 and 15 percent of development value. Given the estimated development values developed by EPS, the overall feasible infrastructure cost burden that is sustainable in the new development areas is between $475 million and $864 million, depending on the intensity of land development at buildout and the assumed maximum cost burden.

Between $229 million and $280 million may be able to be leveraged from bonds secured by tax increment under an EIFD or IFD. The remaining capacity may come from development impact fee programs and land-secured funding. It should be noted that only a portion of this overall capacity will be available for bridge projects. The ultimate capacity only occurs at buildout, which will be long after all infrastructure improvements are required.

Table 4. Projected West Sacramento Net New Assessed Value at Buildout

Item	Existing Assessed Value			Projected Net New Assessed Value: Low Density			Projected Net New Assessed Value: High Density		
	Residential	Commercial	Total	Residential	Commercial	Total	Residential	Commercial	Total
West Sacramento Subareas									
Washington District	$417,929	$4,187,612	$4,605,541	$146,582,071	$236,062,388	$382,644,459	$178,082,071	$289,312,388	$467,394,459
Bridge District	$47,836,411	$85,858,445	$133,694,856	$1,060,163,589	$1,439,961,555	$2,500,125,144	$1,308,243,589	$1,779,101,555	$3,087,345,144
Pioneer Bluff	$0	$46,711,769	$46,711,769	$946,660,000	$706,588,231	$1,653,248,231	$1,112,701,747	$847,948,231	$1,960,649,978
Snow Cone	$677,857	$9,149,438	$9,827,295	($677,857)	$677,857	$0	($677,857)	$30,112,189	$29,434,332
Total West Sacramento	**$48,932,197**	**$145,907,264**	**$194,839,461**	**$2,152,727,803**	**$2,383,290,031**	**$4,536,017,834**	**$2,598,349,550**	**$2,946,474,363**	**$5,544,823,912**
Increased AV Parcels [1]	**$18,249,378**	**$0**	**$18,249,378**	**$912,469**	**$0**	**$912,469**	**$912,469**	**$0**	**$912,469**
Total W. Sac (incl. Increased AV Parcels)	**$67,181,575**	**$145,907,264**	**$213,088,839**	**$2,153,640,272**	**$2,383,290,031**	**$4,536,930,303**	**$2,599,262,019**	**$2,946,474,363**	**$5,545,736,381**

"new_av"

Source: Preiliminary Draft Report, "Yolo Realignment Assessment Area #2 - Economic Benefits", October 2015.

[1] The improved value of residential parcels not identified to redevelop and located within 500 feet of the current rail line to be removed is estimated to increase by 5%, based on a review of academic literature.

Table 5. Estimated Locally Sourced Infrastructure Funding Capacity

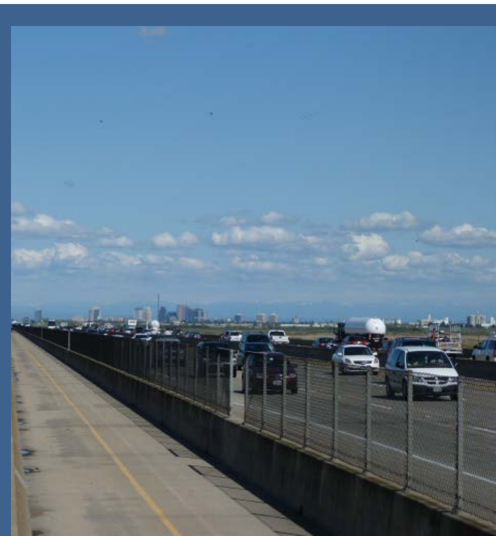
Item		Low Density Capacity	High Density Capacity
Projected New Assessed Value [1]	*a*	$4,536,000,000	$5,545,700,000
Project Total Assessed Value [1]	*b*	$4,749,100,000	$5,758,800,000
Estimated Local Infrastructure Funding Capacity (Lower Threshold) [2]	*c = b * 10%*	$474,910,000	$575,880,000
Estimated Local Infrastructure Funding Capacity (Higher Threshold) [2]	*d = b * 15%*	$712,365,000	$863,820,000
Secured Property Taxes from New Development	*e = a * 1.00%*	$45,360,000	$55,457,000
Estimated Maximum Tax Increment Funding [3]	*f = a * 50.4%*	$22,861,000	$27,950,000
Estimated Bonding Capacity for Tax Increment Funding [4]	*g = f * 10*	$228,610,000	$279,500,000

[1] See Table 4.

[2] Assumes that the total infrastructure funding capacity for all new infrastructure ranges from 10% to 15% of the total assessed value from new development. This includes the costs for all new infrastructure required to serve new development such as roads, water, sewer, drainage, and other circulation improvements.

Attachment 1
Caltrans Interstate 80/United States 50 Davis to Downtown Sacramento Preliminary Investigation





Interstate 80/United States 50 Davis to Downtown Sacramento Preliminary Investigation

Office of Travel Forecasting and Modeling
Caltrans, District 3
June, 2014

Table of Contents

1. INTRODUCTION

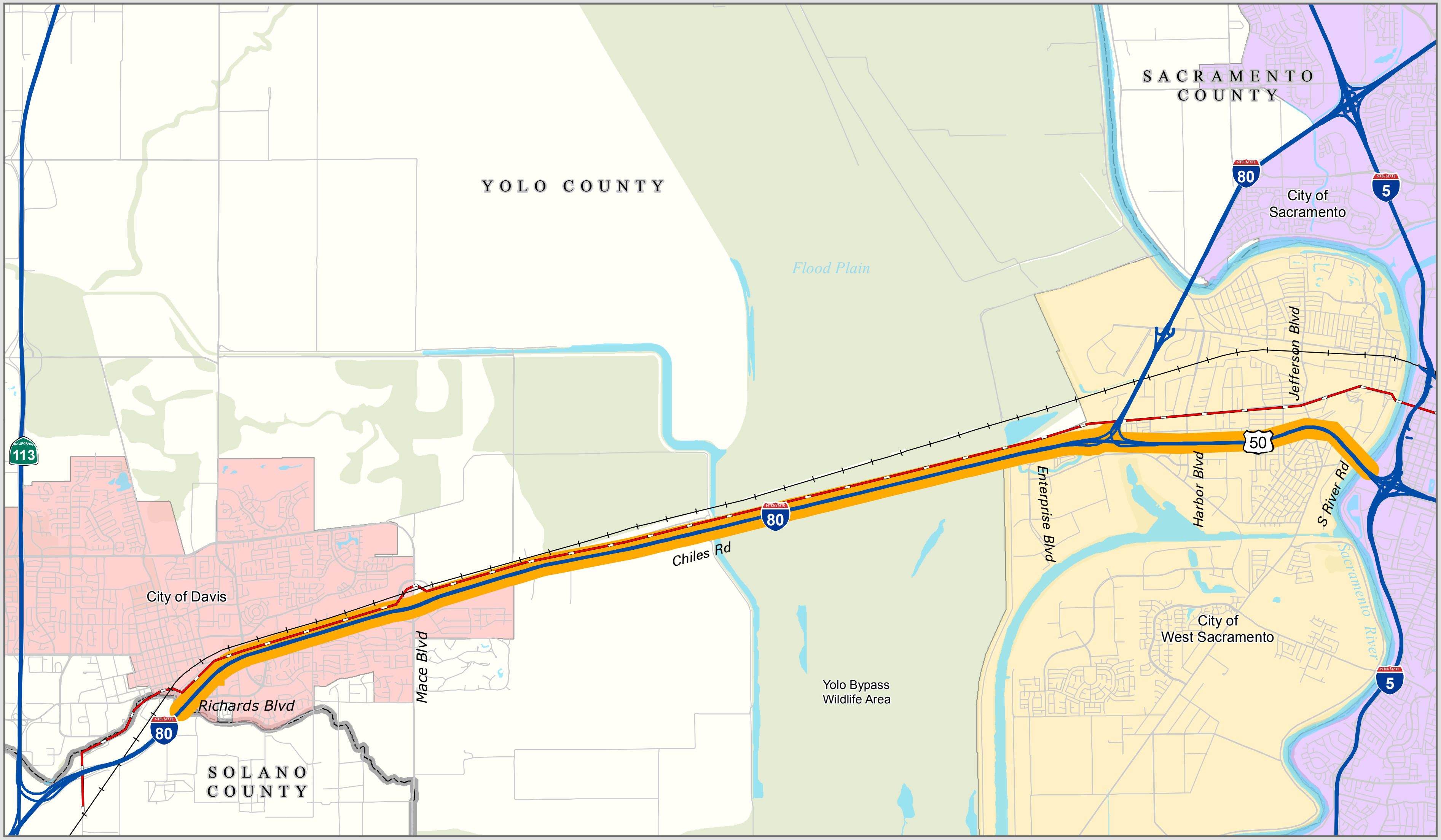
The freeway segments along Interstate 80 (I-80) and United States 50 (US 50) linking the City of Davis with downtown Sacramento have been identified in their respective Corridor System Management Plans (CSMPs) and within the SACOG Metropolitan Transportation Plan (MTP) as requiring capital improvements over the next few decades to address current and future congestion. While the CSMP process identified improvements in a general sense, a link is needed between this and the project development process, beginning with the Project Initiation Document (PID) phase. The Preliminary Investigation (PI) study will serve as this link by identifying and prioritizing specific improvement projects based on their costs and benefits. This PI recommends a future 2035 selected facility alternative to handle the travel demands of the next 25 years and contains a prioritized list of specific State Highway System improvement projects to arrive at this future.

SETTING

Interstate 80 is the primary freeway serving the movement of people and goods between the San Francisco Bay Area and the eastern United States. Within the Sacramento region, the route mainly serves commute traffic to/from the San Francisco Bay Area, though it also carries seasonal recreational traffic and is a primary corridor for goods movement. Within the corridor, the Yolo Bypass Wildlife Area and floodplain limits east-west linkages, funneling many modes and forms of transportation into the narrow corridor between Davis and Sacramento. Within a cross-section of less than a quarter mile exists the Capitol Corridor inter-regional rail, Interstate 80, and a dedicated Class I multi-use bicycle and pedestrian path, linking Davis with downtown Sacramento.

United States Route 50 begins within the study area at the I-80 interchange in West Sacramento and continues over 3,000 miles to the east coast of the United States. Within the Sacramento region, US 50 carries mostly regional commute traffic and recreational traffic traveling to/from the Lake Tahoe Basin.

The study corridor follows the historical route of I-80 for over 13 miles, roughly within the bounds of Yolo County, and connects the City of Davis with the City of Sacramento. The limits extend along I-80 for 9.5 miles from near the Yolo/Solano County line to the I-80/US 50 interchange and continue 3.3 additional miles along US 50 (also signed as business I-80) to the Yolo/Sacramento County line, terminating prior to the US 50/I-5 interchange. The freeway within the study area functions principally as a three lane, mixed-flow facility between the cities of Davis and West Sacramento and varies between a three and four lane, mixed-flow facility through the City of West Sacramento to the Sacramento River. Ramp metering is currently operational at five on-ramps within the corridor and auxiliary lanes are present between many of the interchanges in West Sacramento. Figure 1 presents the limits of the PI along the I-80 and US 50 corridors, while Figure 2 shows the existing lane configuration and traffic control.



LEGEND		DESCRIPTION	
Project Study Corridor	Capitol Corridor	The study corridor follows the historical route of I-80, roughly within the bounds of Yolo County, connecting the City of Davis with the City of Sacramento. The limits travel along I-80 for 9.5 miles from near the Yolo/Solano County line to the I-80/US 50 interchange and continue 3.3 additional miles along US 50 (also signed as business I-80) to near the Yolo/Sacramento County line, terminating just prior to the US 50/I-5 interchange.	NOT TO SCALE
State Highway System	Regional Bicycle Route		

FIGURE 1: Study Area

While the majority of the corridor is an at-grade facility, two segments contain substantial bridge structures, adding a major constraint to any potential improvements. The first of these is a pair of structures along I-80 spanning the Yolo Bypass, a primary wildlife and agricultural area that experiences seasonal flooding. These bridge structures total over 2.2 miles in length at a height of approximately 16 feet above the ground. The second is a structure that begins in the middle of the Jefferson Blvd. interchange and extends across the Sacramento River for 0.8 miles, before meeting with the I-5/US 50 interchange. The portion of the corridor that travels through West Sacramento is threaded through a narrow right-of-way that would require additional acquisition to accommodate any widening.

PURPOSE AND NEED

The study corridor currently experiences significant congestion during the AM and PM peak periods at several locations in the eastbound and westbound direction along I-80 and US 50. Furthermore, the SACOG Blueprint plan for the Sacramento Region projects sizeable increases in vehicle volumes along the corridor over the next 25 years. With the potential for worsening congestion and the subsequent increase in travel times and vehicle emissions, the corridor has been identified in the respective I-80 and US 50 Corridor System Management Plans and Transportation Corridor Concept Reports as an area that will require further capital improvements.

The Caltrans District 3 Mobility Action Plan supports a vision for a network of HOV lanes on all freeway facilities in the Sacramento region, with the study corridor providing a principal link in the proposed network. Without completing the network of HOV lanes, the incentive for carpooling is significantly decreased, and consequently, the effectiveness of HOV lanes across the entire region is compromised.

The intent of this study is to determine what transportation scenario for the future will best accommodate current and future needs, while remaining consistent with the goals and policies of Caltrans and its partners. The resulting projects should provide for more efficient and environmentally friendly travel along the corridor, while considering both the supply and demand sides of the transportation system.

STUDY APPROACH

The process for determining a list of phased state highway system improvement projects contains two parts. The first is to determine the ultimate future configuration of the corridor. This may involve keeping the current travelway cross-section, adding a mixed-flow lane, adding a high-occupancy vehicle (HOV) lane, or adding a high-occupancy toll (HOT) lane. Upon determination of the selected alternative, the projects required to achieve this ultimate cross-section, including complimentary projects such as ramp metering and auxiliary lanes, will be phased to generate a prioritized list of projects.

To this end, the remainder of the report contains the following chapters:

- Chapter 2: Existing Conditions
- Chapter 3: Future Year Alternatives
- Chapter 4: Travel Demand Forecasts
- Chapter 5: Future Conditions Analysis
- Chapter 6: Improvement Project Prioritization
- Chapter 7: Conclusions and Recommendations

Chapter 2 provides an overview of the current facilities along the corridor and their existing performance and level of service. Several potential future alternatives for the corridor are detailed in Chapter 3 and analyzed using the Highway Capacity Manual methodologies and microsimulation software in Chapter 5. Between these chapters, the future travel forecasts and their development are detailed. Chapter 6 presents the prioritization and phasing of the projects needed to deliver the future build alternative. Finally, a discussion of the overall findings of the report will be included in Chapter 7.

2. EXISTING CONDITIONS ANALYSIS

A description of the existing facilities, the analysis methods, and their results are provided in this chapter.

EXISTING FACILITIES AND VOLUMES

The study corridor between Davis and downtown Sacramento is truly a multi-modal corridor. I-80 and US 50 carry on average over 140,000 vehicles, with YoloBus carrying approximately 1,000 passengers on an average weekday[i]. The Capitol Corridor inter-regional rail service carries nearly 3,000 passengers on the 30 weekday trains that parallel I-80/US 50[ii]. Additionally, a regional Class I bicycle path, located on the north side of the Yolo Bypass Causeway bridge structure, connects the cities of Davis, Sacramento, and West Sacramento, serving several hundred daily users.

The roadway cross-section for the corridor varies significantly, providing between three and six directional lanes at different locations, through a combination of mixed-flow and auxiliary lanes. While the majority of on-ramps along the corridor are free-flow, five ramp meters are currently operational, smoothing out momentary spikes in volume during peak hours. Figure 2 illustrates the existing cross-section for the study corridor and the locations and lane configurations of ramp meter installations.

No singular traffic data source was available to provide data for the entire corridor over the same time period. Data from the Caltrans Performance Measurement System (PeMS), the Caltrans Transportation System Network (TSN), previous traffic studies, and manual counts were collected during the peak travel seasons between 2009 and 2012. A conservative approach that erred towards higher values was used to balance the volumes from the various time periods and collection methods. The final balanced existing traffic volumes used for the study are show in Figures 3A and 3B.

ANALYSIS METHODS

For the existing traffic operations analysis, three principal methods were employed for evaluating the corridor: the Caltrans Performance Management System (PeMS), the *Highway Capacity Manual (HCM), 2010* and a microsimulation model, created for the corridor using VISSIM software. All three utilized Level of Service (LOS), which describes a facility's operational conditions by assigning a letter grade between A and F (best to worst).

PeMS is a statewide performance measurement system in California that collects and uploads data in real-time to the internet. Detectors are located on highway mainlines and ramps, producing data that includes vehicle volumes, travel speeds, and vehicle classifications. Besides aiding in data collection and microsimulation model calibration and validation, PeMS also has the ability to identify existing bottlenecks. Unfortunately, PeMS data is not available for all locations along the corridor, necessitating additional data collection and analysis methods.

The *HCM* provides criteria for analyzing freeway segments during peak hours for two mainline (basic and weaving) and two ramp junction (merge and diverge) types. The descriptions of each segment are provided following Figures 2 & 3.

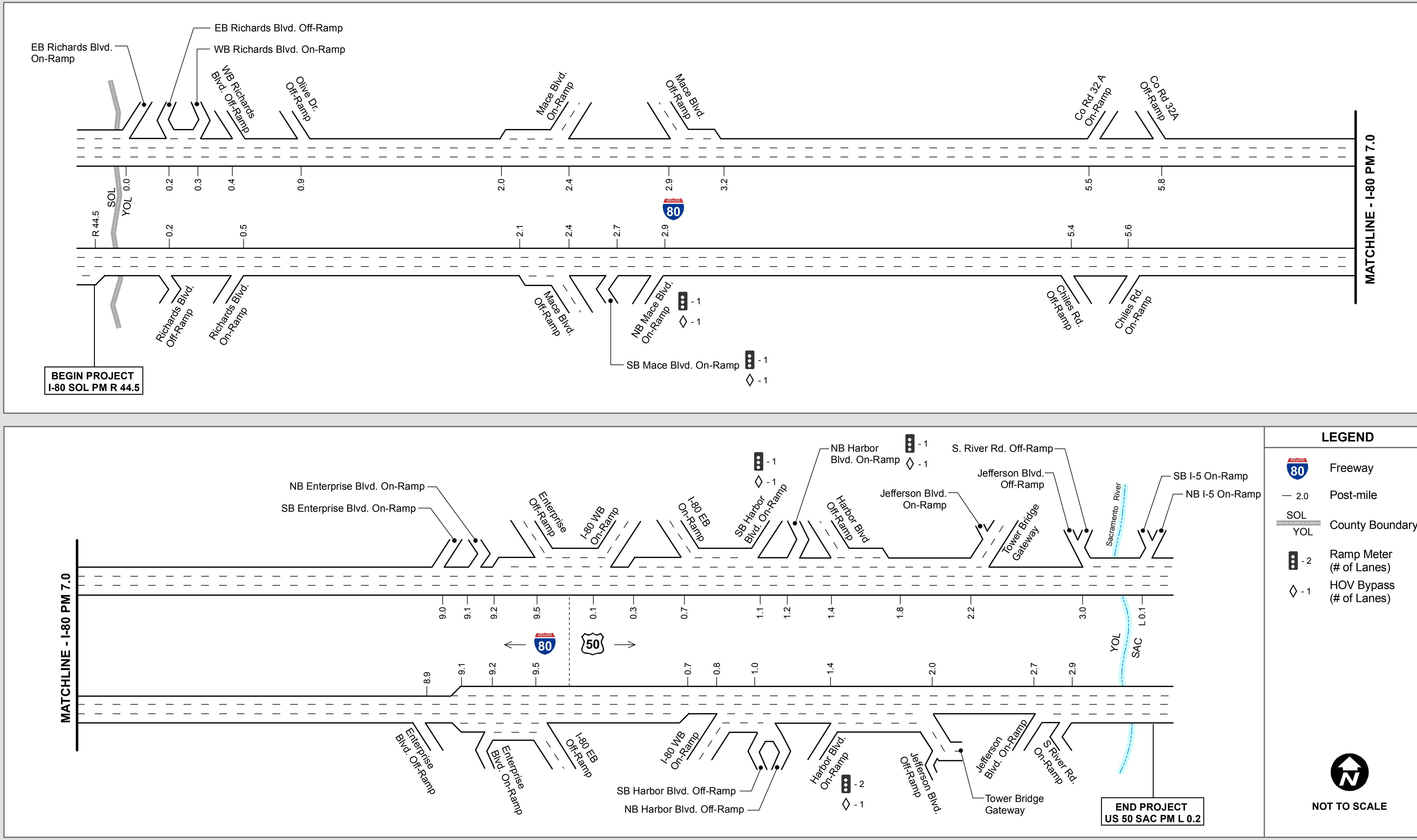


FIGURE 2: Existing Conditions - Lane Configuration and Traffic Control

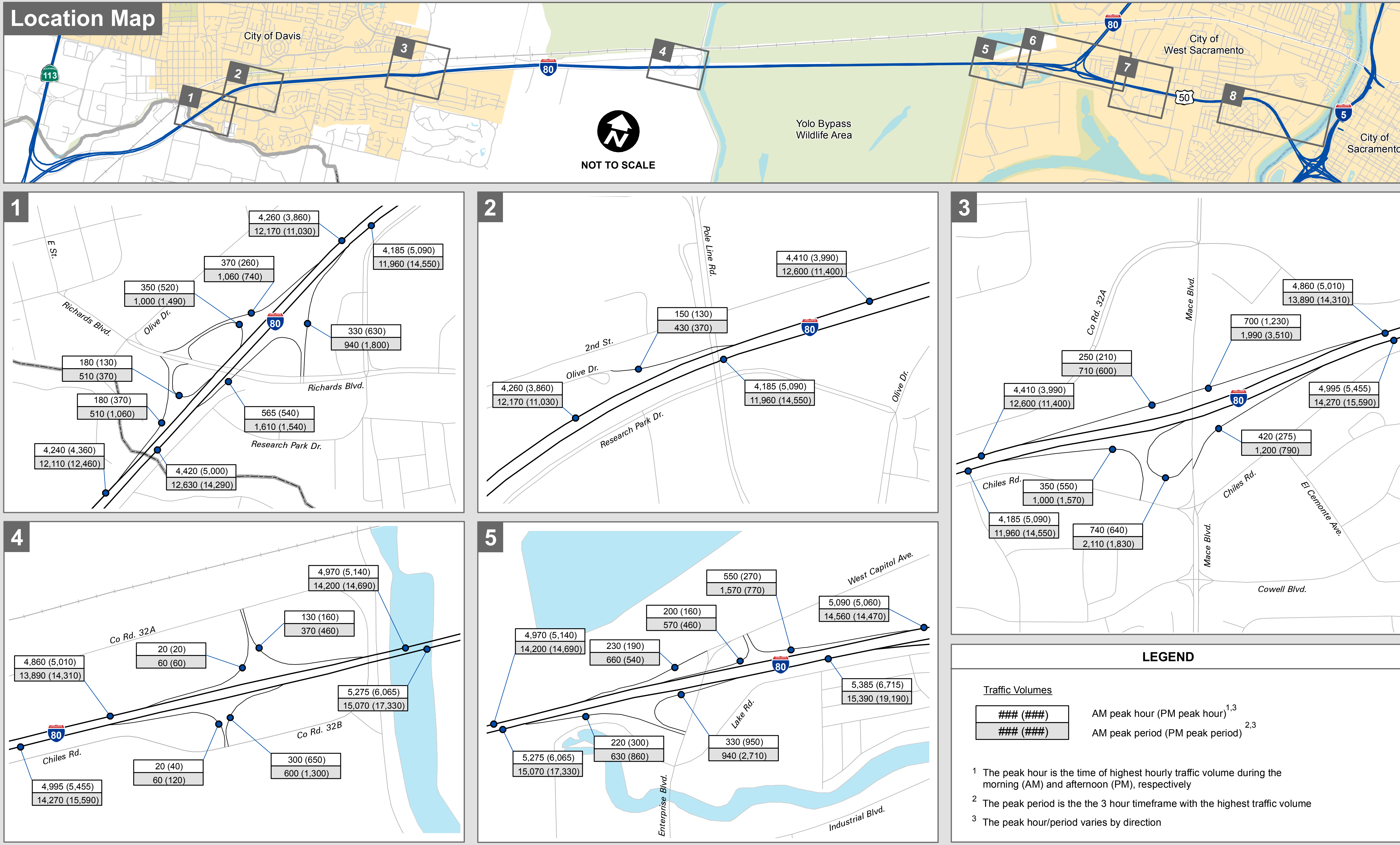


FIGURE 3A: Existing Traffic Volumes

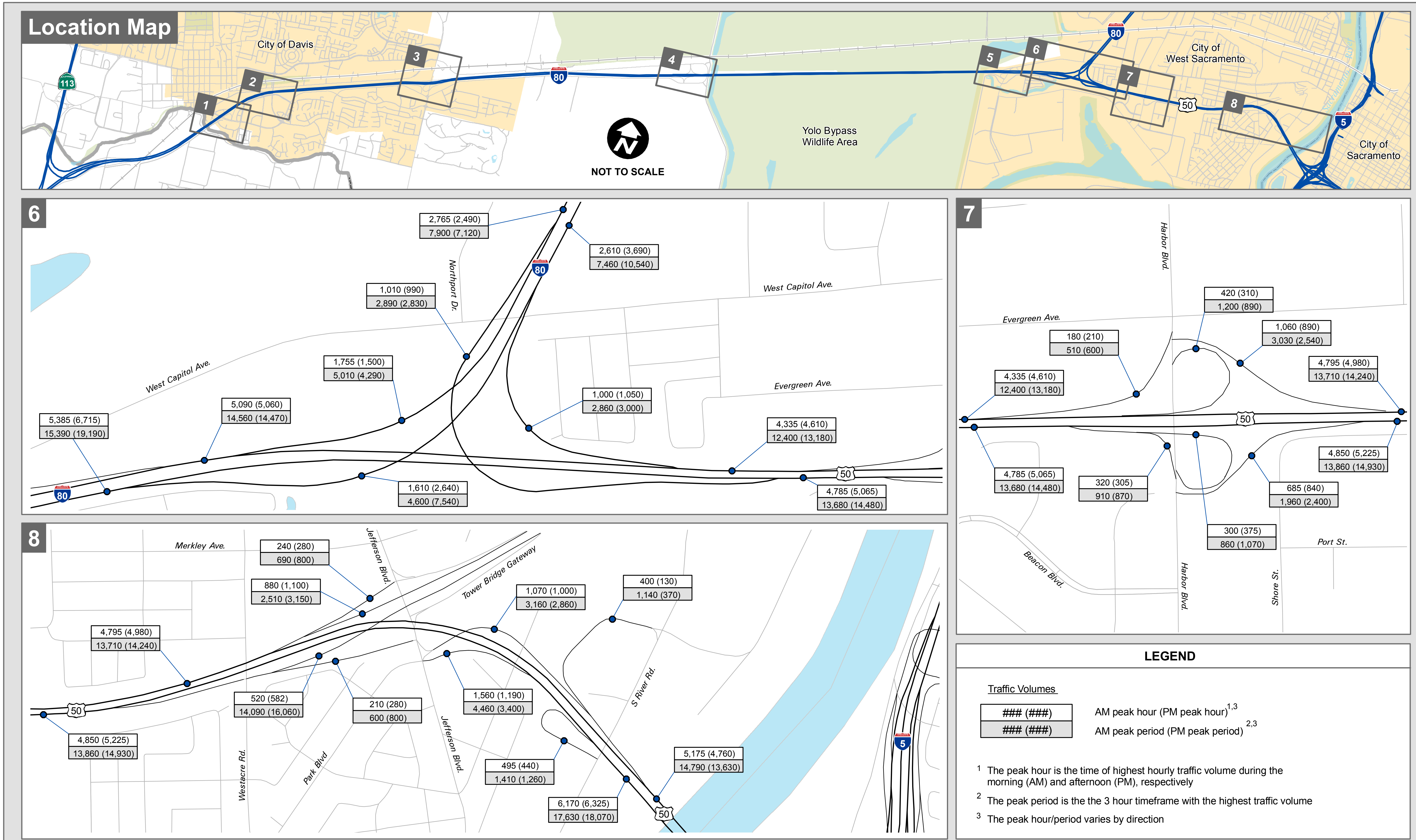


FIGURE 3B: Existing Traffic Volumes

- Ramp Merge – the 1,500 foot influence area downstream of an on-ramp gore point
- Ramp Diverge – the 1,500 foot influence area upstream of an off-ramp gore point
- Weaving Segment – a segment that occurs when the distance between an on-ramp and downstream off-ramp is less than 2,500 feet
- Basic Segment – includes all freeway segments that don't meet the criteria for weaving, merge, or diverge analysis

LOS for each analysis type is calculated using density in passenger cars per mile per lane (pc/mi/ln) for the 15 minute period with the highest volume during the morning and afternoon. Table 1 describes the LOS thresholds from the *HCM, 2010*.

TABLE 1: Highway Capacity Manual Freeway LOS Thresholds

Level of Service	Description	Density (pc/mi/ln)	
		Basic Segment	Ramp Merge/Diverge & Weaving
A	Unrestricted operations; drivers operate at free-flow speeds	≤ 11	≤ 10
B	Free-flow speed is generally maintained; merging and diverging maneuvers noticeable to drivers	> 11 - 18	> 10 - 20
C	Maneuverability within the traffic flow begins to become restricted; influence area speeds may begin to decline from free-flow	> 18 - 26	> 20 - 28
D	Drivers experience decrease in comfort from the inability to freely maneuver; influence area turbulence becomes intrusive	> 26 - 35	> 28 - 35
E	Facility is saturated, any disruption causes a breakdown in flow; turbulence felt by nearly all drivers	> 35 - 45	> 35
F	Demand volume exceeds capacity, total breakdown in flow; ramp and freeway queues begin to form	> 45	N/A

Source: *Highway Capacity Manual* (2010). Transportation Research Board, Washington, D.C..

The *Highway Capacity Manual* describes eight instances where this freeway analysis methodology may be limited in accurately describing conditions on a particular facility[iii]. Of these eight, five are relevant to the I-80/US 50 corridor currently or in the future, including:

1. The methodology does not account for the delays caused by vehicles using alternative routes or vehicles leaving before or after the analysis period.
2. Multiple overlapping breakdowns or bottlenecks are difficult to analyze and cannot be fully evaluated by this methodology.
3. The methodology can address local oversaturated flow but cannot directly address systemwide oversaturation flow conditions.
4. The completeness of the analysis will be limited if freeway segments in the first time interval, the last time interval, and the first freeway segment (in all time periods) have demand-to-capacity ratios greater than 1.00.

5. The existence of HOV lanes on freeways raises the issues of the operating characteristics of such lanes and their effect on operating characteristics on the remainder of the freeway. The methodology does not directly address separated HOV facilities and does account for the interactions between HOV lanes and mixed-flow lanes and the weaving that may be produced.

Given these limitations, it was determined that microsimulation modeling was the preferred means to analyze future conditions along the corridor. VISSIM models were created, analyzing 3-hour time periods during the morning and afternoon peak periods that exhibited the highest volumes. The roadway network for these models includes the corridor and all nearby influence areas.

To determine that the model accurately represented current conditions, a rigorous calibration process was undertaken. Vehicle fleet composition was altered and driver behavior characteristics were adjusted from default values using PeMS data, field observations, and the values used for previous studies within the area and across California. Further sensitivity testing was conducted in the model validation step to ensure that the model accurately replicated existing conditions with changes in inputs (e.g., volumes).

PEMS ANALYSIS

In addition to aiding in data collection, PeMS was used to identify several recurring bottlenecks along the corridor. These bottlenecks were verified by field observations. The locations, descriptions, and causes are listed below in Table 2.

TABLE 2: Bottlenecks Identified by PeMS

Freeway/ Direction	Location	Description	Cause
I-80 Eastbound	Near Yolo County Line	Stop and go traffic between SR 113 and the Yolo County Line during the PM peak hour	Successive outside lane drops before Richards Blvd.
	Chiles Rd. Interchange	Bottleneck sometimes extending miles back to Richards Blvd., with travel speeds averaging around 15 mi/hr, during the entire 3 hour PM peak period	Traffic bypassing the high-capacity Mace Blvd. interchange travels along county roads and enters at the low-capacity Chiles Rd. interchange; bottleneck becomes self-reinforcing as more people use bypass as congestion worsens, further increasing congestion
	Jefferson Blvd. Interchange	Minor bottleneck resulting in reduced speeds during the PM peak hour	A series of factors, including very high traffic volume entering from Jefferson Blvd., the close proximity to the S River Rd. on-ramp, and weaving behavior in anticipation of the US 50/I-5 interchange
I-80 Westbound	Enterprise Blvd. Interchange	Stop and go traffic between the I-80/US 50 interchange and the westernmost Enterprise Blvd. on-ramp during the AM and PM peak hours	Short weaving section between interchanges and successive outside lane drops

HCM ANALYSIS

Analysis using the *Highway Capacity Manual* methodology was conducted for all study segments and ramp merge/diverge influence areas along the corridor. Table 3 through Table 6 present the LOS for ramp merge, ramp diverge, weaving segment, and basic methodologies, respectively, while Figure 4 combines these results into a single graphic.

TABLE 3: Ramp Merge Analysis – Existing Conditions

Freeway/Direction	From	Time Period	Density (pc/mi/ln)	LOS
I-80 Eastbound	Richards Blvd	AM	27.0	C
		PM	27.2	C
	Mace Blvd SB	AM	29.8	D
		PM	29.6	D
	Mace Blvd NB	AM	30.9	D
		PM	29.9	D
	Chiles Rd	AM	33.1	D
		PM	**35.3**	**E**
US 50 Eastbound	Jefferson Blvd	AM	31.1	D
		PM	31.1	D
	South River Rd	AM	28.3	D
		PM	28.3	D
US 50 Westbound	Jefferson Blvd	AM	14.3	B
		PM	17.5	B
	Harbor Blvd NB	AM	12.7	B
		PM	13.8	B
I-80 Westbound	Enterprise Blvd NB	AM	28.1	D
		PM	25.8	C
	Enterprise Blvd SB	AM	30.6	D
		PM	31.9	D
	Chiles Rd	AM	30.2	D
		PM	31.4	D
	Mace Blvd	AM	23.8	C
		PM	21.9	C
	Richards Blvd	AM	19.7	B
		PM	21.4	C

Notes: 1. Density and LOS determined using HCS 2010
2. **Bold** values indicate substandard operations
Source: Caltrans, 2012.

TABLE 4: Ramp Diverge Analysis – Existing Conditions				
Freeway/Direction	To	Time Period	Density (pc/mi/ln)	LOS
I-80 Eastbound	Richards Blvd	AM	32.2	D
		PM	32.2	D
	Mace Blvd	AM	14.4	B
		PM	16.2	B
	Chiles Rd	AM	34.1	D
		PM	33.6	D
	Enterprise Blvd	AM	**35.6**	**E**
		PM	**36.6**	**E**
US 50 Westbound	Harbor Blvd	AM	10.4	B
		PM	10.9	B
I-80 Westbound	Chiles Rd	AM	34.2	D
		PM	**35.5**	**E**
	Mace Blvd	AM	17.6	B
		PM	19.4	B
	Olive Dr	AM	31.6	D
		PM	30.1	D
	Richards Blvd NB	AM	31.2	D
		PM	29.6	D

Notes: 1. Density and LOS determined using HCS 2010
2. **Bold** values indicate substandard operations
Source: Caltrans, 2012.

TABLE 5: Weaving Segment Analysis – Existing Conditions					
Freeway/ Direction	From	To	Time Period	Density (pc/mi/ln)	LOS
I-80 Eastbound	Enterprise Blvd	I-80/US 50 Interchange	AM	25.4	C
			PM	**N/A**	**F**
US 50 Eastbound	I-80/US 50 Interchange	Harbor Blvd	AM	32.5	D
			PM	32.2	D
	Harbor Blvd	Jefferson Blvd	AM	**36.6**	**E**
			PM	**43.2**	**E**
US 50 Westbound	Harbor Blvd	I-80/US 50 Interchange	AM	20.7	C
			PM	23.6	C
I-80 Westbound	I-80/US 50 Interchange	Enterprise Blvd	AM	**N/A**	**F**
			PM	34.9	D
	Richards Blvd NB off-ramp	Richards Blvd SB on-ramp	AM	29.5	D
			PM	29.5	D

Notes: 1. Density and LOS determined using HCS 2010
2. **Bold** values indicate substandard operations
Source: Caltrans, 2012.

TABLE 6: Basic Freeway Segment Analysis – Existing Conditions					
Freeway/ Direction	From	To	Time Period	Density (pc/mi/ln)	LOS
I-80 Eastbound	Solano/Yolo County Line	Richards Blvd Interchange	AM	23.9	C
			PM	24.4	C
	Richards Blvd Interchange	Mace Blvd Interchange	AM	22.8	C
			PM	25.0	C
	Mace Blvd Interchange	Chiles Rd Interchange	AM	28.7	D
			PM	27.7	D
	Chiles Rd Interchange	Enterprise Blvd Interchange	AM	31.1	D
			PM	33.1	D
US 50 Eastbound	South River Rd Interchange	Yolo/Sacramento County Line	AM	25.8	C
			PM	22.3	C
US 50 Westbound	Yolo/Sacramento County Line	South River Rd Interchange	AM	25.8	C
			PM	23.7	C
	Jefferson Blvd	Harbor Blvd	AM	19.3	C
			PM	21.2	C
I-80 Westbound	Enterprise Blvd Interchange	Chiles Rd Interchange	AM	28.7	D
			PM	31.1	D
	Chiles Rd Interchange	Mace Blvd Interchange	AM	27.8	D
			PM	29.9	D
	Mace Blvd Interchange	Richards Blvd Interchange	AM	24.5	C
			PM	29.9	D
	Richards Blvd Interchange	Solano/Yolo County Line	AM	17.7	B
			PM	18.0	B

Notes: 1. Density and LOS determined using HCS 2010
2. **Bold** values indicate substandard operations
Source: Caltrans, 2012.

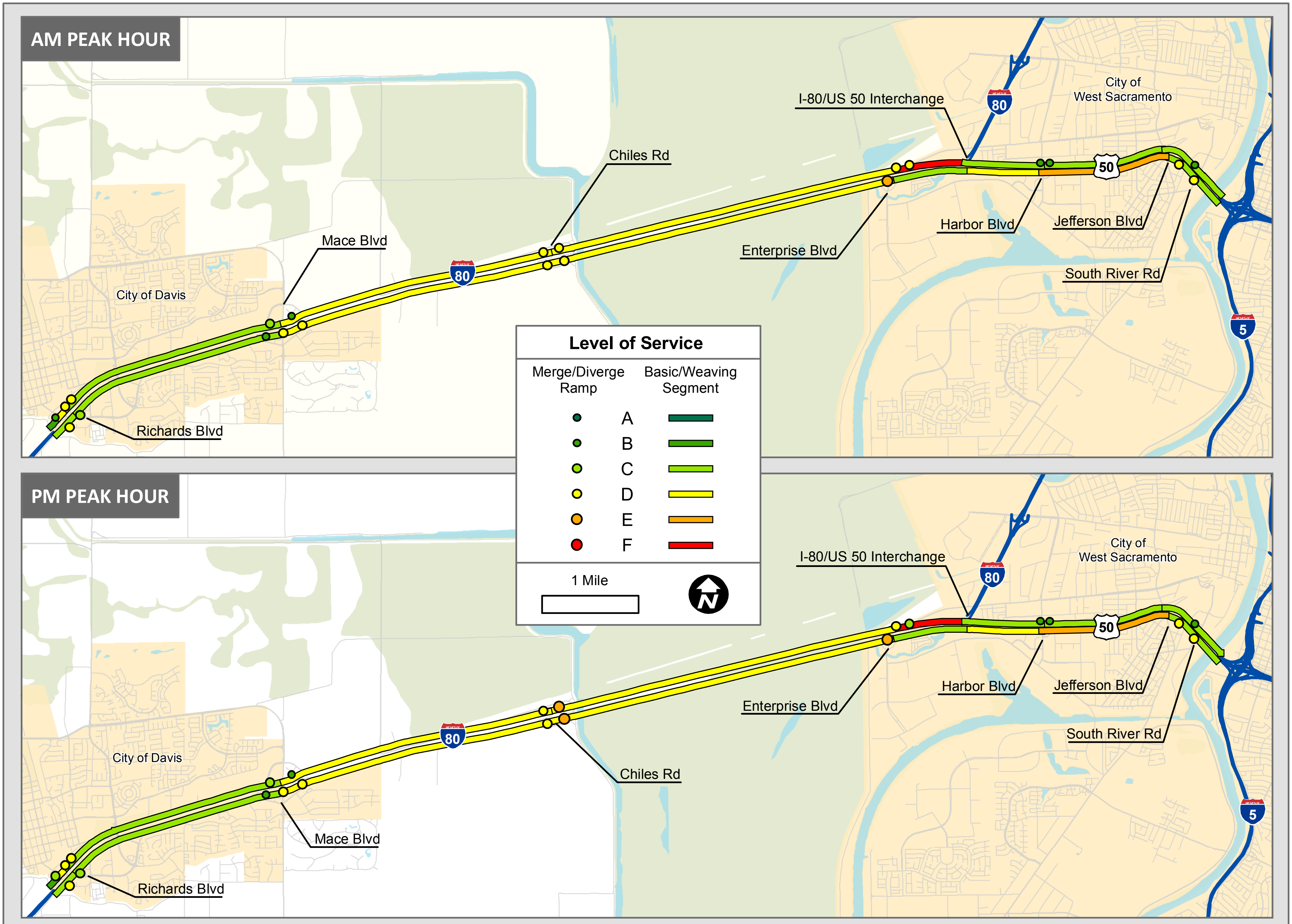


FIGURE 4: Existing Conditions - HCM Level of Service

The HCM method, while limited, provides some insight into existing bottlenecks and congestion within the study area. No LOS values for the basic segments exceed LOS D, indicating relatively stable conditions throughout the corridor. The weaving segment analysis reveals the highest number of locations, four (two each during the AM and PM peak hours), that exceed LOS D. The eastbound Chiles Rd. interchange on-ramp during the PM peak hour (LOS E) is the only merge segment that exceeds LOS D, while eastbound Enterprise Rd. during the AM and PM peak hour and westbound Chiles Rd. during the PM peak hour all function at LOS E.

Overall, the results of the HCM analysis indicate that the current mainline cross-section for the corridor is generally sufficient; however, geometric design issues (tight interchange spacing, insufficient merge distances, and successive lane drops) and the inefficient use of alternative corridors, limit mainline capacity at certain locations. This results in bottlenecks that limit downstream capacities and, by extension, the overall effective capacity of the corridor.

MICROSIMULATION ANALYSIS

Microsimulation models were created for the three hour morning and afternoon peak periods using VISSIM software. The models were calibrated and validated, in part, using PeMS and, therefore, present similar results. The VISSIM model, though, takes it a step further by quantifying the existing conditions for various measures of effectiveness (MOEs), with the further intention of modeling future conditions. Table 7 contains values for a range of corridor-wide, directional performance measures that will be used later to compare future scenarios. All metrics are sorted by peak period and direction.

TABLE 7: Existing Conditions Measures of Effectiveness Values

MOE	Eastbound		Westbound	
	AM Peak Period	PM Peak Period	AM Peak Period	PM Peak Period
Vehicle-Miles Traveled	171,050	190,560	168,090	180,640
Average Travel Time (minutes)	12:54	23:47	12:12	13:09
Average Speed (mph)	59.0	32.0	62.6	58.1
Total Delay (vehicle-hours)	393	3,049	202	466
Average Delay (seconds)	1:36	12:28	0:54	1:52

Note: MOEs developed using VISSIM 4.3
Source: Caltrans, 2012.

During the AM peak period, 56,356 vehicles utilized the freeway within the study limits. The PM peak period, with significantly higher volumes and levels of congestion, served 62,139 vehicles along the corridor. Average travel speeds were faster in the westbound direction than the eastbound direction for both the AM and PM peak periods. The most congestion is experienced in the eastbound direction during the PM peak period, with average delays of twelve and a half minutes. By contrast, the least amount of delay is noticed during the AM peak period in the westbound direction, with delay of less than one minute.

Travel speed is one measure that can also be utilized at a smaller scale than the corridor-level. Within the micro-simulation model, segments were created between ramp terminals to better understand the effect that specific improvements and bottlenecks have on vehicle speeds, both downstream and upstream. Figure 5 shows the segmental corridor travels speeds for the AM and PM peak periods from the microsimulation model.

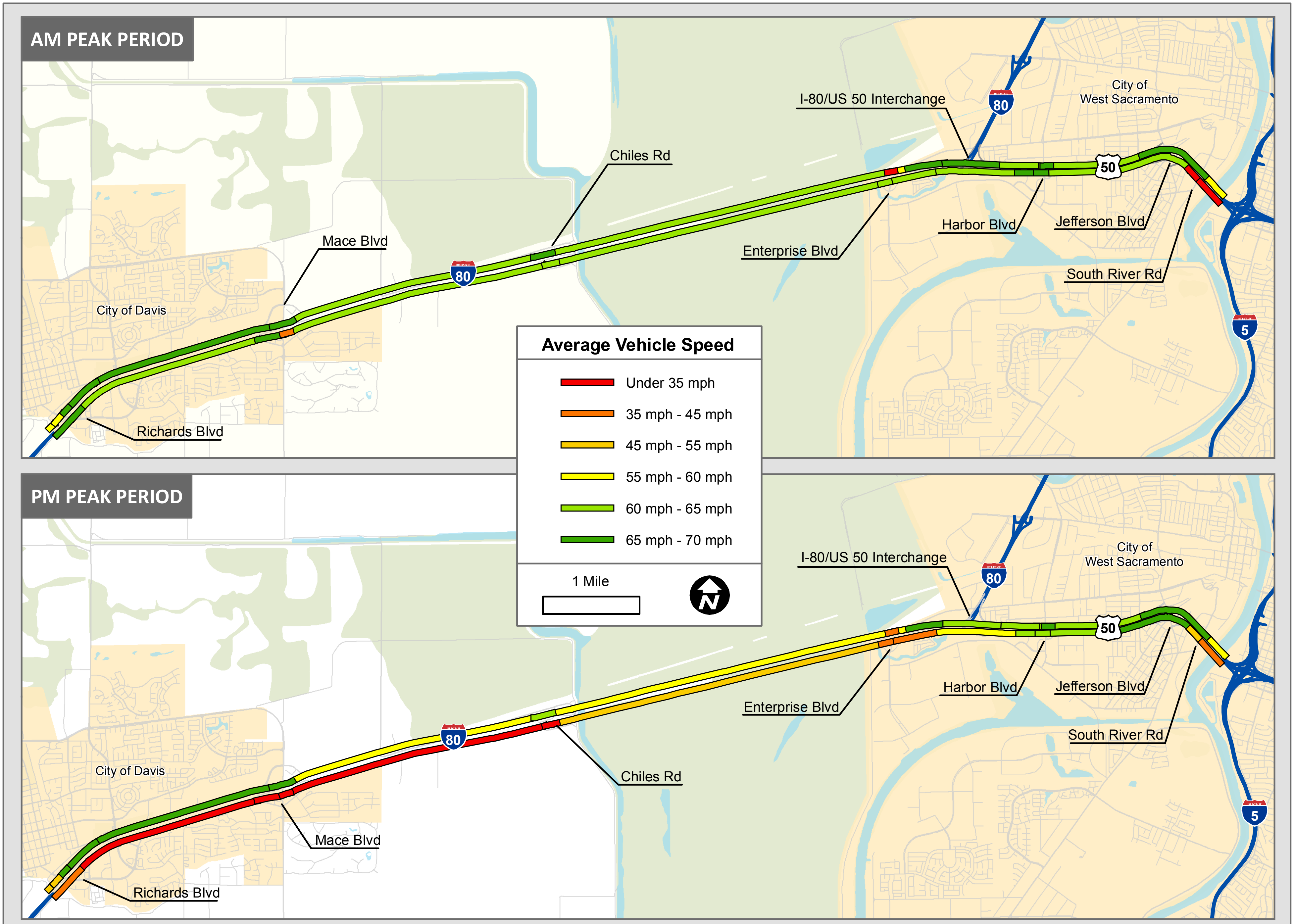


FIGURE 5: Existing Conditions - Segmental Travel Speed (from microsimulation model)

3. FUTURE YEAR ALTERNATIVES

Upon consultation with external stakeholders and Caltrans staff, consensus for three future alternatives for the corridor was reached for the 2035 design year. The No Build Scenario contains improvements that will likely occur without changes to the roadway cross-section, including TOS elements such as ramp metering or changeable message signs and off-corridor improvements that may affect travel along the corridor (e.g., improvements to parallel corridors and nearby intersections). The Mixed-Flow Lane and HOV Lane scenarios build upon the No Build Alternative improvements and add widening for an additional lane in each direction within the study limits.

NO BUILD ALTERNATIVE

In determining the future improvements to be included in the No Build Alternative, a series of documents relating to the corridor were examined, including the *Transportation System Development Program – District 3* (Caltrans, 2011), the *I-80/Capitol City Freeway Corridor System Management Plan* (Caltrans, 2009), the *Ramp Metering Development Plan* (Caltrans, 2011), the *US 50 Corridor System Management Plan (*Caltrans, 2009), the *Caltrans District 3 Mobility Action Plan* (Caltrans, 2010), and the *2035 Metropolitan Transportation Plan/Sustainable Communities Strategy (SACOG, 2011).*

The types of projects listed in these documents along the corridor included ramp metering, interchange reconstruction, ramp widening, and signalization of ramp terminal intersections. Given the uncertain future of transportation funding, a conservative approach was taken in determining the inclusion of future projects along the corridor in the 2035 No Build Alternative. Only projects that were either currently programmed or met criteria for cost-effectiveness (i.e., limited right-of-way acquisition and structural modifications), thus eliminating potential impediments to project development, were included. The No Build alternative improvements are shown in Figure 6 and include the following:

- At Richards Blvd., reconstructing the north side of the interchange, replacing the loop on/off-ramps with a diamond configuration and adding ramp metering in both directions
- At Mace Blvd., widening the eastbound on-ramp to include two metered mixed-flow lanes with an HOV bypass lane and constructing a 2000 ft. transition lane from the ramp gore point and adding ramp metering in the westbound direction
- Adding restrictive ramp metering at the eastbound Chiles Rd. slip ramp to discourage traffic bypassing the Mace Blvd interchange
- Signalizing the northernmost Jefferson Blvd ramp terminal intersection and adding turn pockets
- At the South River Rd. interchange, widening the EB on-ramp approach and installing a double-lane ramp meter, and redesigning the intersection at the terminus of the WB on-ramp
- Constructing an additional bridge crossing the Sacramento River from 15th Street in West Sacramento and Broadway in Sacramento. Bridge would accommodate all modes with a single vehicle lane in each direction.
- Widening Chiles Rd. from two to four lanes between Ensenada Dr. and I-80 EB off-ramp

While the nascent Sacramento River Crossing is included in the No Build alternative, no final alignment has been determined. The crossing could occur as modeled or could be located as far south as Lincoln Rd. and Sutterville Rd. in West Sacramento and Sacramento, respectively. A change in the location of the crossing may have a significant impact on traffic operations along the corridor.

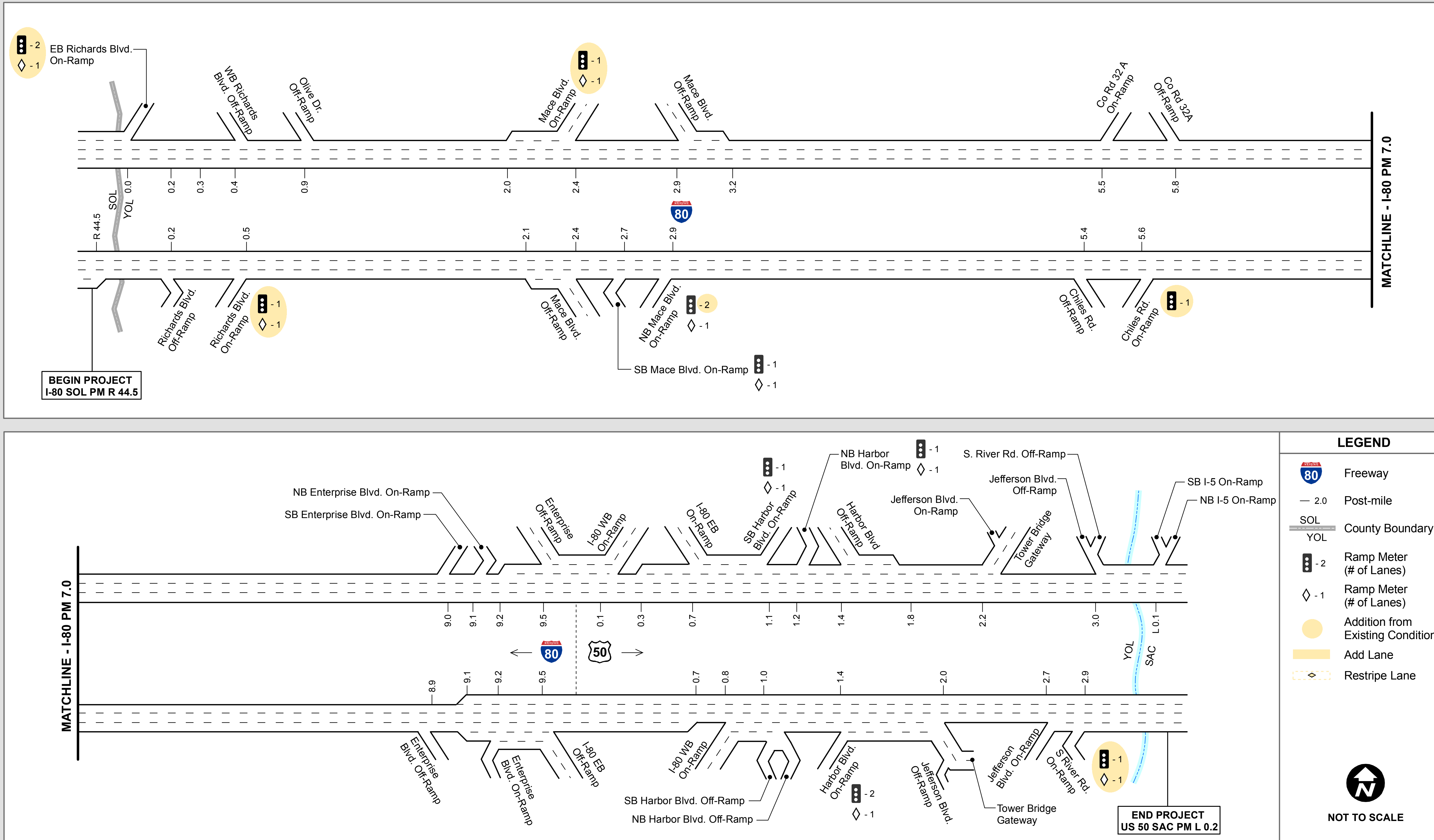


FIGURE 6: 2035 No Build Alternative - Lane Configuration and Traffic Control

MIXED-FLOW LANE ALTERNATIVE

The Mixed-Flow Lane Alternative includes all the improvements in the No Build Alternative and adds an additional lane in each direction over the majority of the corridor. A specific description of the lane additions are provided below and illustrated in Figure 7.

- Widening from I-80 EB SOL PM 44.6 to YOL PM 9.1
- Widening from US 50 EB YOL PM 0.7 to SAC PM L 0.0
- Widening from US 50 WB SAC PM L 0.2 to YOL PM 1.8
- Widening from US 50 WB YOL PM 0.3 to I-80 WB SOL PM R 44.5

The type of widening would vary by location, but generally would be achieved through widening to the inside on I-80 between the Solano/Yolo County Line and Mace Blvd. and to the outside between Mace Blvd. and Enterprise Blvd. (including structural modification to Yolo Bypass causeway). On US 50, the lane addition would require a combination of widening to the inside and outside and would likely require ROW acquisition between Harbor Blvd. and Jefferson Blvd. and structural modification between Jefferson Blvd. and the Yolo/Sacramento County line.

HOV LANE ALTERNATIVE

The widening required for the HOV Lane Alternative would be the same as for the Mixed-Flow Lane Alternative; however, the lanes would be stripped for HOV lanes as illustrated in Figure 8. In addition to the widening, a portion of the route would not require widening for HOV lanes, only re-striping. This includes:

- Restriping from I-80 EB YOL PM 9.1 to US 50 EB YOL PM 1.8
- Restriping from US 50 WB YOL PM 0.7 to YOL PM 0.3

Per Caltrans District 3 policy, the lanes would operate with HOV restriction during the weekday AM and PM peak periods only (6:00 – 10:00 am and 3:00 – 7:00 pm) and serve as mixed-flow lanes at all other hours. Lanes would be stripped contiguously without barrier or buffer separation, with drivers being free to enter and exit at any time.

OTHER ALTERNATIVE CONSIDERATIONS

Three additional alternatives were considered, but were not pursued for further study for various reasons. High-Occupancy Toll (HOT) lanes were considered, due to the possibility for utilizing the excess capacity within HOV lanes during peak hours. However, an outreach study of HOT lanes in the Sacramento area along I-80 concluded that the public does not currently favor this facility type. Additionally, a single reversible median lane was also considered, but the directional traffic split did not meet the threshold in the Caltrans *High-Occupancy Vehicle Guidelines*[iv]. Lastly, a transit alternative that proposed the addition of a third track for the Capitol Corridor heavy rail service was proposed. This idea was rejected, though, since it was determined that the funding source for this study was not appropriate for analyzing transit projects, and the ability to accurately determine its impact on corridor-wide travel would be limited.

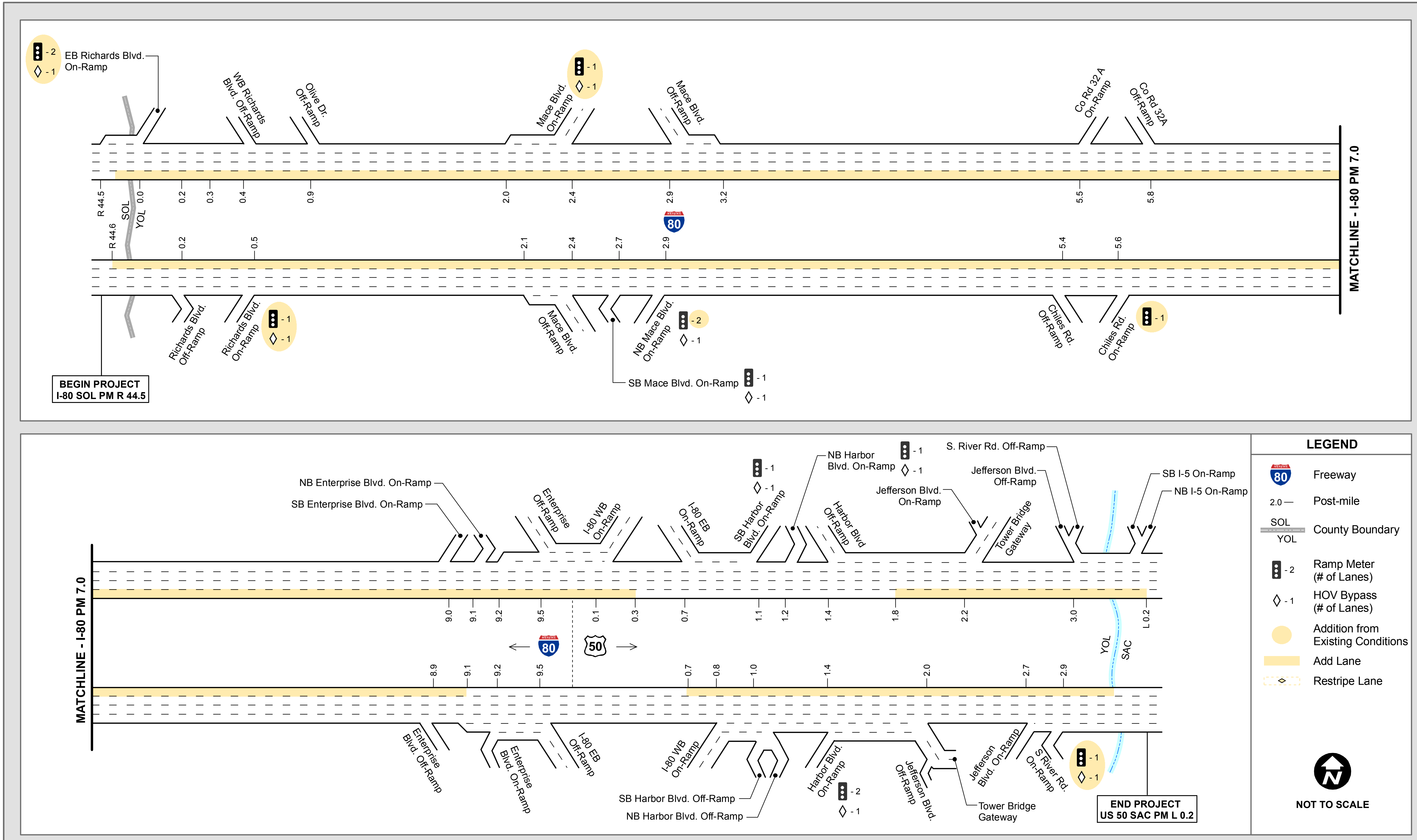


FIGURE 7: 2035 Mixed Flow Lane Alternative - Lane Configuration and Traffic Control

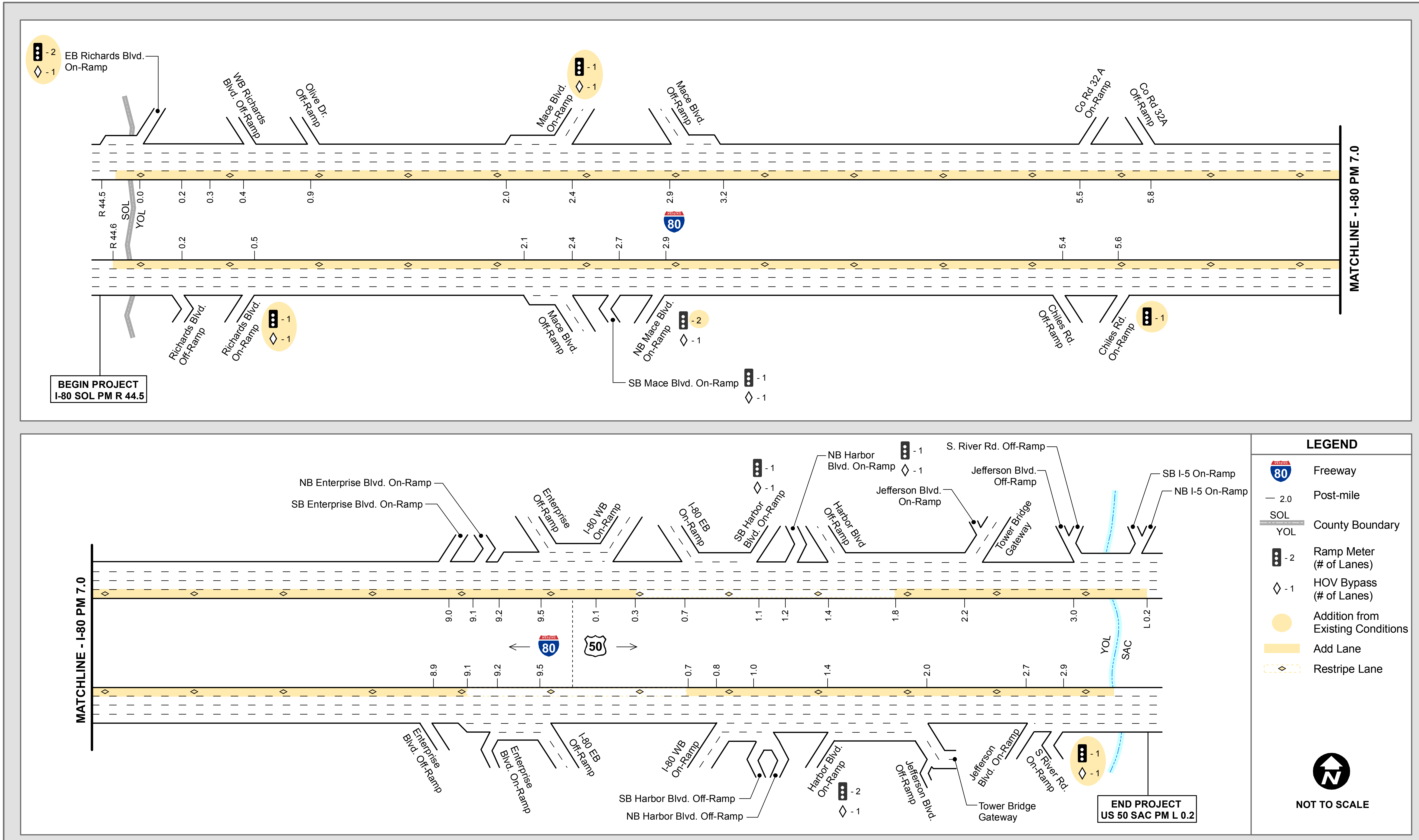


FIGURE 8: 2035 HOV Lane Alternative - Lane Configuration and Traffic Control

4. MODEL DEVELOPMENT

Future year forecasts were developed for the design year (2035) for the three alternatives: No Build, Mixed-Flow Lane, and HOV Lane. The forecasts were developed using the Sacramento Regional Activity-Based Simulation Model (SACSIM) travel demand model developed by the Sacramento Area Council of Governments (SACOG).

SACSIM MODEL

The SACSIM model was recently developed to replace the traditional four-step SACMET model, originally developed by SACOG in the early nineteen nineties. The SACSIM model is an activity-based tour model that provides a level of detail not seen in traditional travel demand models. In contrast to the SACMET model, which models trips at the TAZ level, the SACSIM uses parcel level data to simulate the tours, or series of trips, that make up an individual's daily travel pattern. The SACSIM model incorporates the Sacramento Region's Blueprint Transportation and Land Use Plan and latest transportation and land use adjustments that resulted from the Metropolitan Transportation Plan Sustainable Communities Strategy.

A critical advancement that the SACSIM model made over the SACMET is the ability to better account for induced travel. In this case, induced travel refers to increases in traffic volume that occur solely as a result of increases in highway capacity and, consequently, higher travel speeds. Induced travel (or induced traffic) relies on the economic theories of supply and demand and is commonly used as an umbrella term that includes the related phenomena of induced development, latent demand, and diverted traffic. When used broadly, induced travel accounts for vehicle volume increases from six sources:

- Trips diverted from other roadways
- Trips that previously occurred at different times
- Trips that altered their destination (i.e., new employment choice)
- Trips that altered their origin (i.e., new home choice)
- Shifts from other modes (transit, bicycling, walking)
- New discretionary trips that would not have occurred otherwise

The typical four-step travel demand model only partially accounts for two of these, trips diverted from other roadways and alternative modes. The SACSIM model, however, improves on this by accounting for most of the short-term traveler response effects to additional roadway capacity. This includes all sources listed above, save induced development.

This presence of induced demand has been recognized for over fifty years through studies ranging from corridor-level to nationwide. The general consensus is that elasticity of demand ranges for vehicle-miles traveled (VMT) range from 0.5 to 1.0 (i.e., for every 10% increase in roadway capacity, VMT increases by between 5% and 10%, when controlling for other factors such as population, employment, and income). Table 8 presents the percentage of traffic volume increases that are attributed to induced demand for a sample of studies conducted recently in California.

TABLE 8: Literature Review of Travel Demand Elasticities with Respect to Additional Capacity			
Source	Elasticity	% of Capacity	Description
Hansen and Huang, 1997[1]	0.6-0.9	60-90%	Measure of VMT change with respect to capacity on California Highways A refinement of the most widely cited and respected inducted demand study by Hansen et. al from 1993
Cervero, 2003[2]	0.4	40%	Path analysis study conducted for 24 California highway expansion projects between 1980 and 1994 that estimates both short term and long term effects of supply increases and splits induced demand into behavior shifts and land use shifts.
Mokhtarian, 2002[3]	N/A	0%	Matched-Pairs study comparing traffic volumes on 16 similar freeway segments in California between 1976 and 1996. Study found no difference in volume growth between improved and unimproved segments.
Cervero and Hanson, 2000[4]	0.56	56%	Improvement on previous studies that accounts for the two-way relationship between induced-demand and induced-investment using data from California freeways.
Averages:	**0.43**	**43%**	

Sources:
[1] Mark Hansen and Yuanlin Huang (1997). "Road Supply and Traffic in California Urban Areas," Transportation Research A, Vol. 31, No. 3, pp. 205-218.
[2] Robert Cervero (2003). "Road Expansion, Urban Growth, and Induced Travel: A Path Analysis," Journal of the American Planning Association, vol. 69, no. 1, pp. 145–163.
[3] Patricia Mokhtarian, et al. (2002), "Revisiting the Notion of Induced Traffic Through A Matched-Pairs Study," Transportation, Vol. 29, pp. 193-202.
[4] Robert Cervero and Mark Hansen (2002). "Induced Travel Demand and Induced Road Investment: A Simultaneous Equation Analysis," Journal of Transport Economics and Policy, vol. 36, no. 3, pp. 469–490.

Comparing model runs with and without capacity enhancements, the SACSIM model appears to realistically account for induced demand. The percentage of added capacity filled with induced demand varies between 20 and 60 percent, well within the ranges of published research in California over the last 25 years.

GROWTH FORECASTS

The anticipated growth in traffic volume forecasted by the SACSIM model over the next 25 years occurs in four forms: external to external, external to internal, internal to external, and internal to internal. External to external growth describes new trips that originate outside the limits of the study and use the corridor to arrive at destinations outside the study area. For instance, a trip that begins in Fairfield and utilizes I-80 to travel to Rocklin would be considered an external to external trip. Internal to internal trips are those that begin and end in the corridor (e.g. from Davis to West Sacramento), while internal to external and external to internal trips link origins and destinations inside the corridor to those outside.

Examining the model outputs reveals a significant increase in external to external trips and also those with origins and destinations in West Sacramento. This growth can be attributed to increased regional and inter-regional travel demand, and anticipated development along the West Sacramento waterfront and in the Southport Area.

TRAVEL DEMAND MODEL ALTERNATIVES

Travel demand forecasts were developed for the three future year alternatives: The No Build, Mixed-Flow Lane, and HOV Lane. Each alternative was modeled separately within the SACSIM model. The 2035 SACSIM model, which includes all of the planned transportation projects and projected future land uses contained in the SACOG MTP and Blueprint Plans, was used as the baseline model. The No Build Alternative removed the planned HOV lanes along I-80 between Mace Blvd. and Enterprise Blvd. to simulate No Build conditions. The Mixed-Flow Lane and HOV Lane alternatives added their respective lanes along the entire corridor, traversing I-80/US 50 for the entirety of Yolo County. The peak period volumes for the three alternatives are included in Figures 9A and 9B.

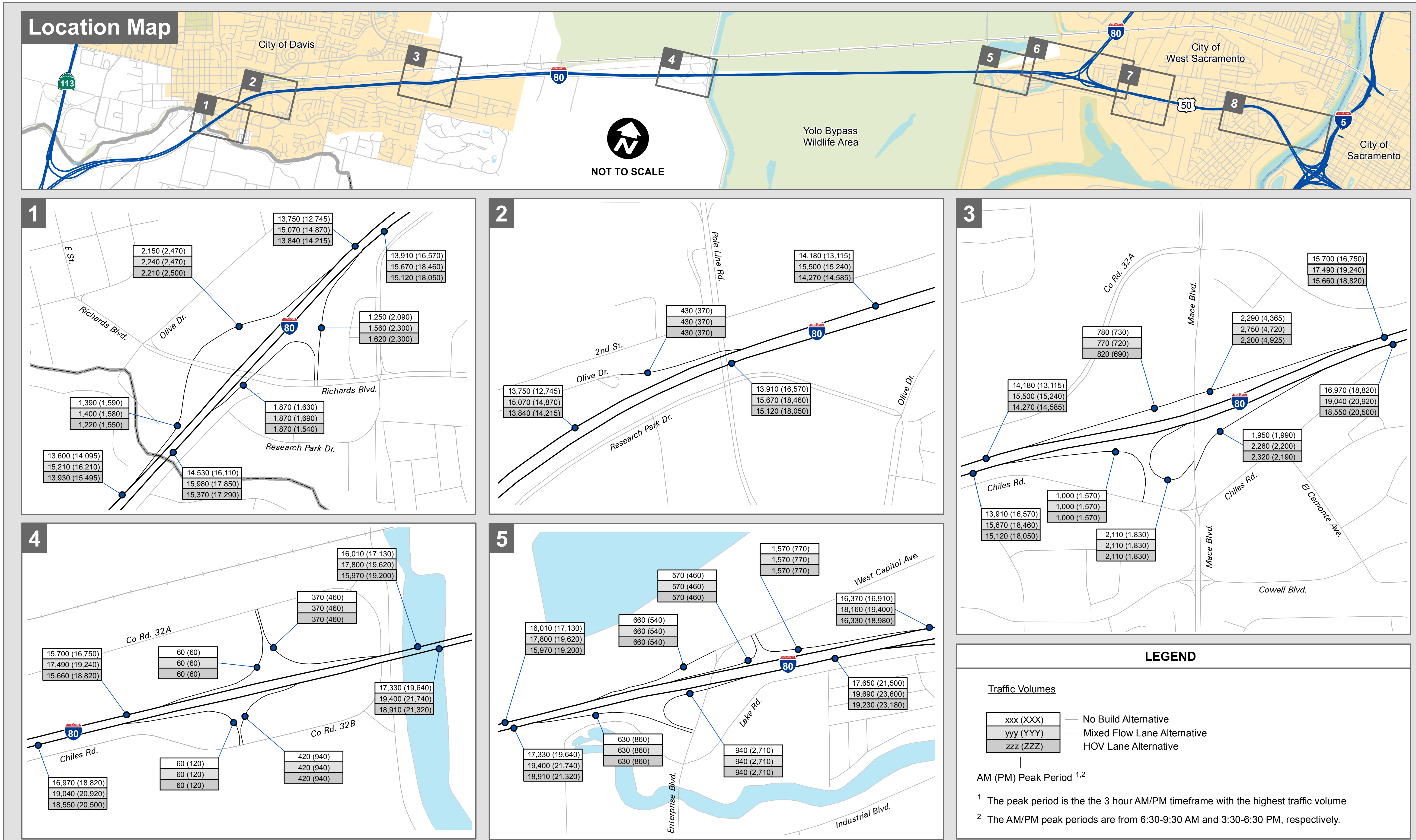


FIGURE 9A: 2035 Traffic Volumes

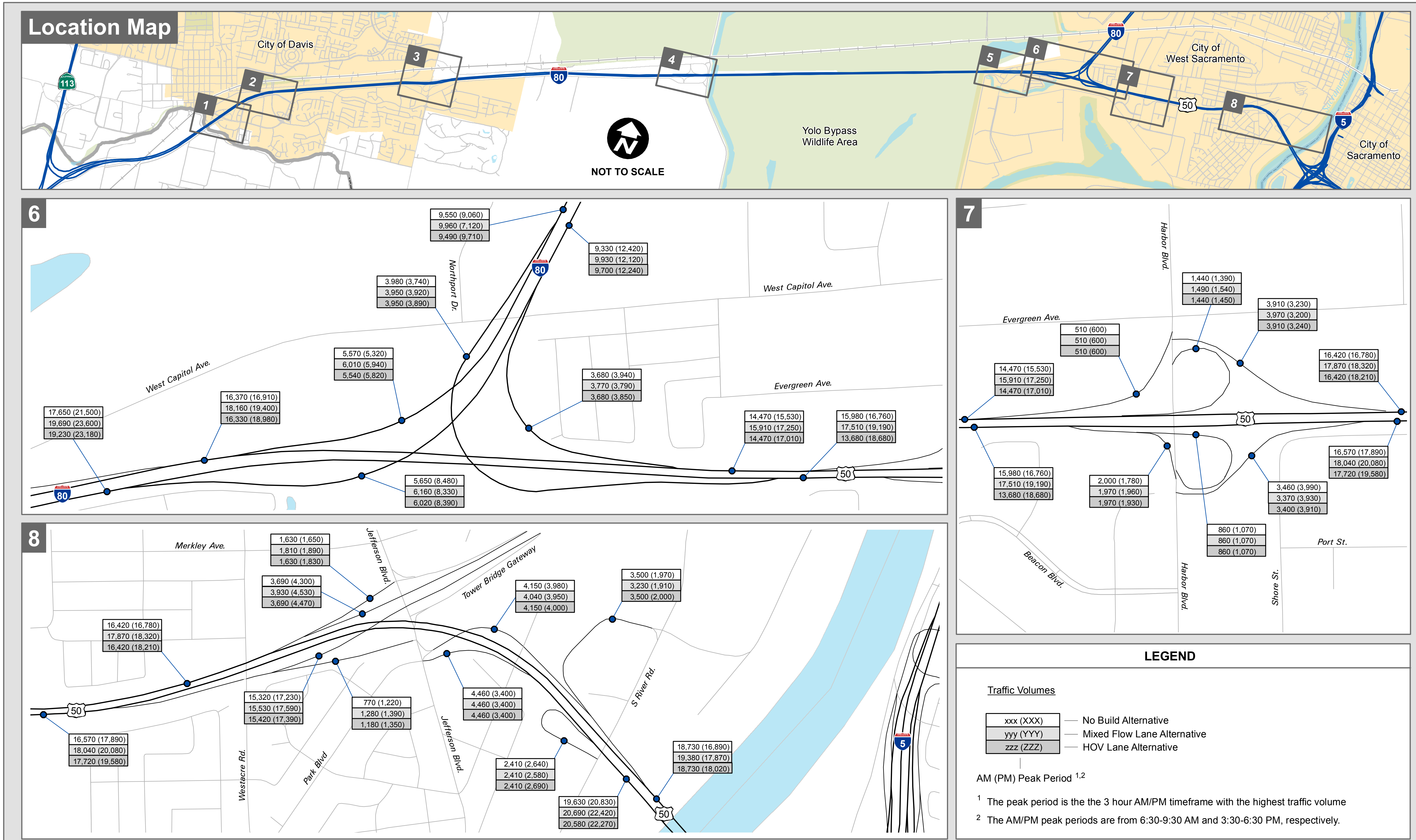


FIGURE 9B: 2035 Traffic Volumes

MICROSIMULATION MODEL

To account for capacity constraints that the SACSIM model only partially accounts for, the volume growth from the SACSCIM model was output into a five zone Origin-Destination (O-D) matrix composed of: western external on I-80, eastern external on US 50, central external on I-80, the City of Davis, and the City of West Sacramento. The growth from these O-Ds was assigned to specific routes at the intersection and ramp level within each zone through an iterative process that accounted for local travel times and local network capacities. This process was completed for all three future year alternatives.

Once the future year volumes were assigned to the network, the next step was determining future year vehicle composition. The two major components of this are the percentage of heavy vehicles (trucks) and the percentage of high-occupancy vehicles (HOVs). Corridor-level growth rates for heavy vehicles are difficult to determine and typically remain fairly constant; therefore, their composition was assumed to remain the same as existing.

Vehicles allowed in HOV lanes include vehicles with two or more occupants, motorcycles, and low emissions vehicles that qualify for either the green or white stickers. The percentage of total motorcycles and low-emissions vehicles in HOV lanes is negligible (less than 1%) and their presence wasn't accounted for in this study.

One of the primary justifications for the construction of HOV lanes over mixed-flow lanes is their purported ability to shift users from single occupancy vehicles to carpools, transit, and HOV use and, by extension, increase the percentage of HOVs on the road. No evidence has been produced showing that peak period, non-barrier separated HOV lanes consistently increase overall vehicle occupancy[v,vi]. This suggests that users of this type of HOV lanes are a combination of violators and existing, captive carpools diverted from mixed-flow lanes. Existing HOV percentages along the corridor were based on average vehicle occupancies during the AM and PM peak periods. After bottoming out in the mid-1990s, vehicle occupancies have been on the increase in California and nationwide. This study assumes that this trend of modest vehicle occupancies will continue into the future. To remain conservative, the HOV's percentage of total traffic was assumed to increase from existing by two percent for the AM and PM peak periods across all three future alternatives.

In the real-world, HOVs, eligible low-emissions vehicles, and motorcycles are not the only vehicles that use HOV lanes. Violators also make up a significant proportion of HOV lane volume, with rates varying by region, district, facility, and the level of congestion. The most recent survey in the Sacramento region found an average HOV lane violation rate of 10.15% of total HOV users[i]. This percentage was used to create a subset of roadway users outside of eligible HOV lane vehicles that would use HOV facilities. The percentage of total vehicles that would be HOV violators, along with heavy vehicles and HOVs by peak period are shown in Table 9.

TABLE 9: General Vehicle Composition by Peak Period					
Analysis Year	Peak Period	Single Occupant Vehicles	High-Occupancy Vehicles	Heavy Vehicles	Violators
2010	AM	77.9%	12.8%	8.0%	1.3%
	PM	73.7%	18.4%	6.0%	1.9%
2035	AM	75.7%	14.8%	8.0%	1.5%
	PM	71.5%	20.4%	6.0%	2.1%
Source: Caltrans, 2013.					

A transportation network was constructed in VISSIM that went beyond the study interchanges analyzed in the study, including both upstream and downstream freeway segments and local street intersections, in an attempt to capture their effects on traffic operations within the corridor. The VISSIM microsimulation model network extended from approximately SR 113 in the West to I-5 in the East and included the portions of the local street system that may influence corridor operations.

5. FUTURE CONDITIONS ANALYSIS

Given the limitations of HCM analysis discussed in Chapter 2, future conditions were analyzed exclusively using the VISSIM microsimulation model created for the corridor. A detailed description of all three alternatives can be found in Chapter 3.

NO BUILD ALTERNATIVE

The No Build Alternative maintains the existing roadway cross-section across the entire study area. A total of 63,320 vehicles utilized the corridor during the AM peak period, while 66,990 vehicles utilized the corridor during the PM peak period. The results from the No Build Alternative model runs are included in Table 10.

TABLE 10: No Build Alternative Measures of Effectiveness Values

MOE	Eastbound		Westbound	
	AM Peak Period	PM Peak Period	AM Peak Period	PM Peak Period
Vehicle-Miles Traveled	199,968	217,405	199,558	218,925
Travel Time (vehicle-hours)	27:52	35:54	12:58	18:31
Average Speed (mph)	27	21	59	41
Total Delay (vehicle-hours)	3,799	6,149	635	2,357
Average Delay (seconds)	16:34	24:34	1:41	7:15

Note: MOEs developed using VISSIM 4.3
Source: Caltrans, 2012.

The results from the microsimulation model indicate a very congested future for the corridor under the No Build Alternative, particularly in the eastbound direction. The free flow travel time for the corridor of approximately twelve minutes would be more than doubled during the AM peak period and nearly tripled during the PM peak period in the eastbound direction. Only minor delays would be realized in the westbound direction during the AM peak period, while users during the PM peak period could expect delays of over seven minutes.

Overall, the corridor demand would exceed capacity for the AM and PM peak periods, resulting in an extension of the peak period, as demand from the peak periods would be forced to spill into the adjacent non-peak hours. Therefore, the cumulative vehicle-hours of delay of 12,940, from combining the AM and PM peak periods, may underestimate the total daily delay.

Examining the travel speeds by segment, several bottlenecks appear to be responsible for the majority of the delay for the No Build Alternative. In the AM peak period, bottlenecks occur in the eastbound direction at the entrance to the corridor, west of Richards Blvd, at the weaving segment between Enterprise Blvd. and the I-80/US 50 interchanges, and at the weaving segment between the Jefferson Blvd. on-ramp and the I-5 interchange. In the westbound direction, bottlenecks occur at two weaving segments: between the I-80/US 50 and Enterprise Blvd interchanges and between the I-5/US 50 interchange and the Jefferson Blvd./South River Rd. off-ramp. During the PM peak period in the eastbound direction, the entire corridor operates below 45 mph, indicating that the demand volume for the corridor exceeds the capacity. In the westbound direction the chokepoints are the same as during the AM peak period. Figure 10 illustrates the segmental travel speeds for the No Build Alternative for the AM and PM peak periods.

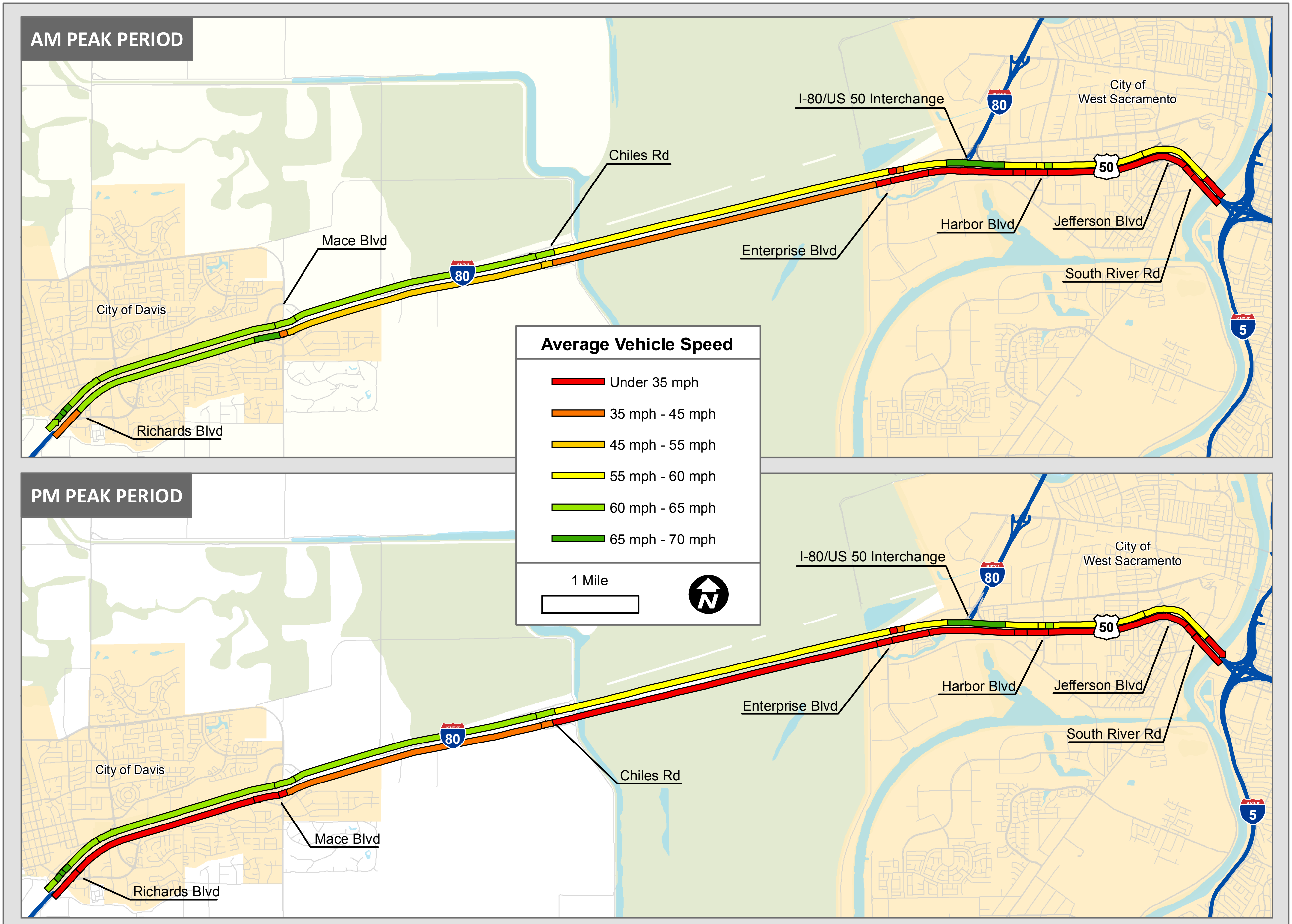


FIGURE 10: 2035 No Build Alternative - Travel Speed by Segment

MIXED-FLOW LANE ALTERNATIVE

The Mixed-Flow Lane Alternative adds a mixed-flow lane to the existing roadway cross-section across the majority of the study corridor. During their respective peak periods, 68,610 AM and 76,770 PM vehicles utilized the corridor. The results from the Mixed-Flow Lane Alternative model runs are included in Table 11.

TABLE 11: Mixed-Flow Alternative Measures of Effectiveness Values

MOE	Eastbound		Westbound	
	AM Peak Period	PM Peak Period	AM Peak Period	PM Peak Period
Vehicle-Miles Traveled	211,109	249,438	205,869	240,928
Travel Time (vehicle-hours)	20:28	19:31	12:32	12:49
Average Speed (mph)	37	39	61	60
Total Delay (vehicle-hours)	2,575	2,801	413	567
Average Delay (seconds)	9:9	8:13	1:15	1:33

Note: MOEs developed using VISSIM 4.3
Source: Caltrans, 2013.

The results for the Mixed-Flow Alternative suggest that conditions may slightly improve from existing during the PM peak period, while somewhat worsening during the AM peak period. Eastbound operations should be fairly similar for both peak periods, with average travel speeds just below 40 mph. Vehicle-miles traveled, however, would be eighteen percent higher during the afternoon peak period. Similarly to the eastbound direction, average travel speeds, travel time, and vehicle delay would be very similar in the westbound direction for both the AM and PM peak periods. Average travel speeds would be around 60 mph and average delay would be slightly over one minute. The total daily vehicle-hours of delay for this alternative would be 6,356, nearly fifty five percent higher than existing.

While a tangible improvement over the No Build Alternative, several segments during both peak hours operate below 35 mph, when examining the segmental travel speeds. The primary bottlenecks appear to be freeway entrances to the corridor on I-80/US 50 in each direction and the weaving segment between the Enterprise Blvd. ramps and the I-80/US 50 interchange during both peak periods. Figure 11 displays the segmental travel speeds for the Mixed-Flow Lane Alternative for the AM and PM peak periods.

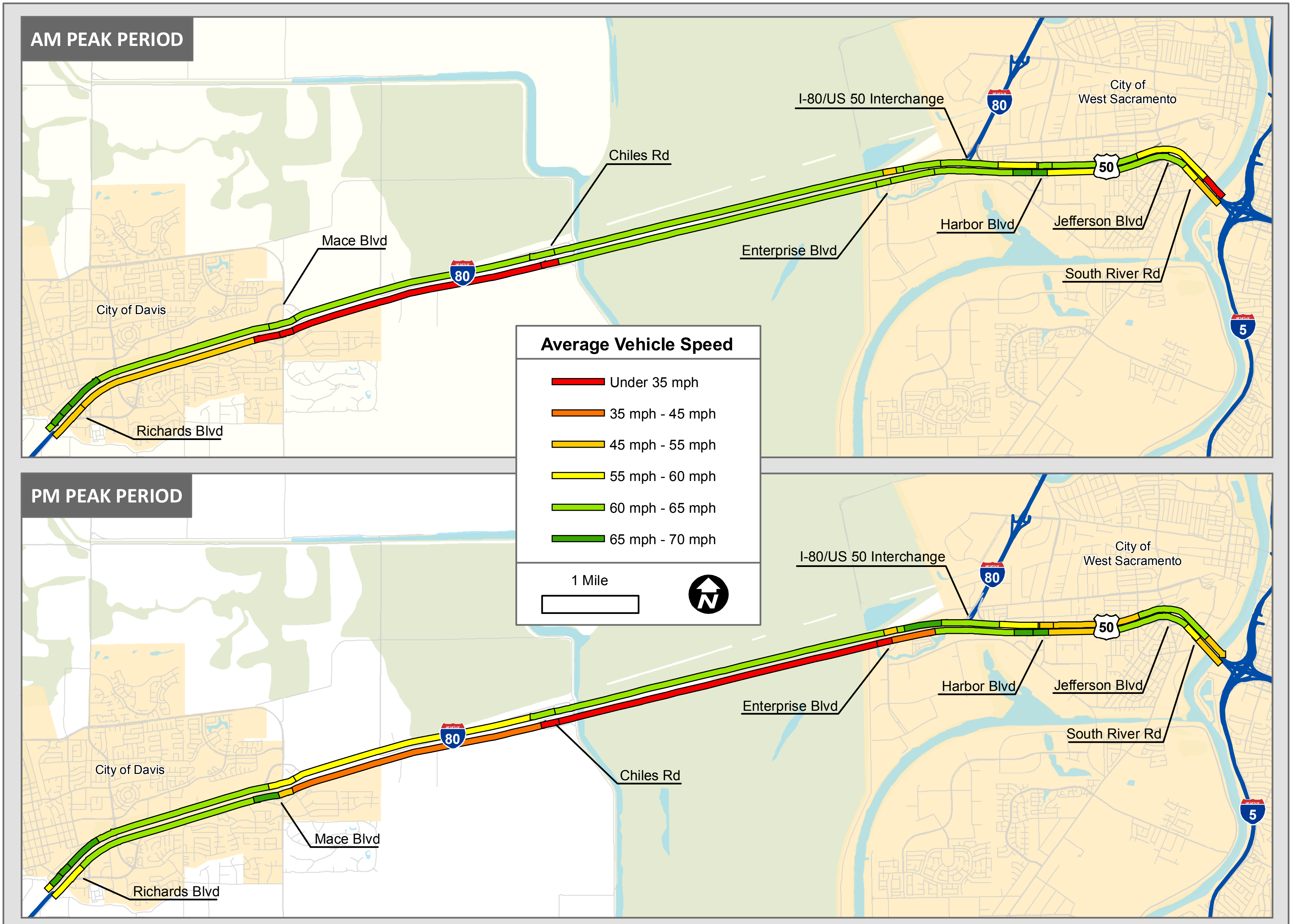


FIGURE 11: 2035 Mixed Flow Alternative - Travel Speed by Segment

HOV LANE ALTERNATIVE

The HOV Lane Alternative adds an HOV lane across the entire corridor. During their respective peak periods, 67,060 AM and 75,580 PM vehicles utilized the corridor. The results from the HOV Lane Alternative model runs are included in Table 12.

TABLE 12: HOV Alternative Measures of Effectiveness Values

MOE	Eastbound		Westbound	
	AM Peak Period	PM Peak Period	AM Peak Period	PM Peak Period
Vehicle-Miles Traveled	206,512	236,264	185,532	232,394
Travel Time (vehicle-hours)	17:44	23:37	12:41	15:46
Average Speed (mph)	43	32	60	48
Total Delay (vehicle-hours)	1,724	3,889	372	1,416
Average Delay (seconds)	6:25	12:18	1:24	4:30

Note: MOEs developed using VISSIM 4.3
Source: Caltrans, 2013.

Similarly to the No Build and Mixed-Flow alternatives, the eastbound direction appears to net the highest level of congestion and delay. The total travel time in the eastbound direction is approximately 17 minutes and 23 minutes during the AM and PM peak hour, respectively. The average travel speed is 43 mph during the AM peak period and 32 mph during the PM peak period. In the westbound direction, the AM peak period experiences only minor delays with an average delay for the entire corridor of slightly over a minute and average speeds over 60 mph. During the PM peak period, average speed falls to 48 mph and average delay increases to four and a half minutes. Travel speeds are noticeably higher for the HOV lanes than for the mixed-flow lanes. The total vehicle-hours of delay for this alternative would total 7,401, eighty percent higher than existing.

When examining the segmental travel speeds for the HOV Lane Alternative, similar bottlenecks are observed for the AM and PM peak periods, though their effect is much more severe during the afternoon. These bottlenecks coincide with those found in the No Build and Mixed Flow Lane alternatives. For the PM peak hour, the worst congestion is experienced in the eastbound direction, west of Enterprise Blvd. This entire stretch operates below 35 mph. In the westbound direction, a bottleneck also occurs at the Enterprise Blvd interchange, extending over a mile upstream. The AM peak period experiences three eastbound and two westbound bottlenecks. The greatest delay is caused in the eastbound direction at Chiles Rd. and between Jefferson Blvd. and the I-5/US 50 interchange. Figure 11 displays the segmental travel speeds for the Mixed-Flow Alternative for the AM and PM peak periods.

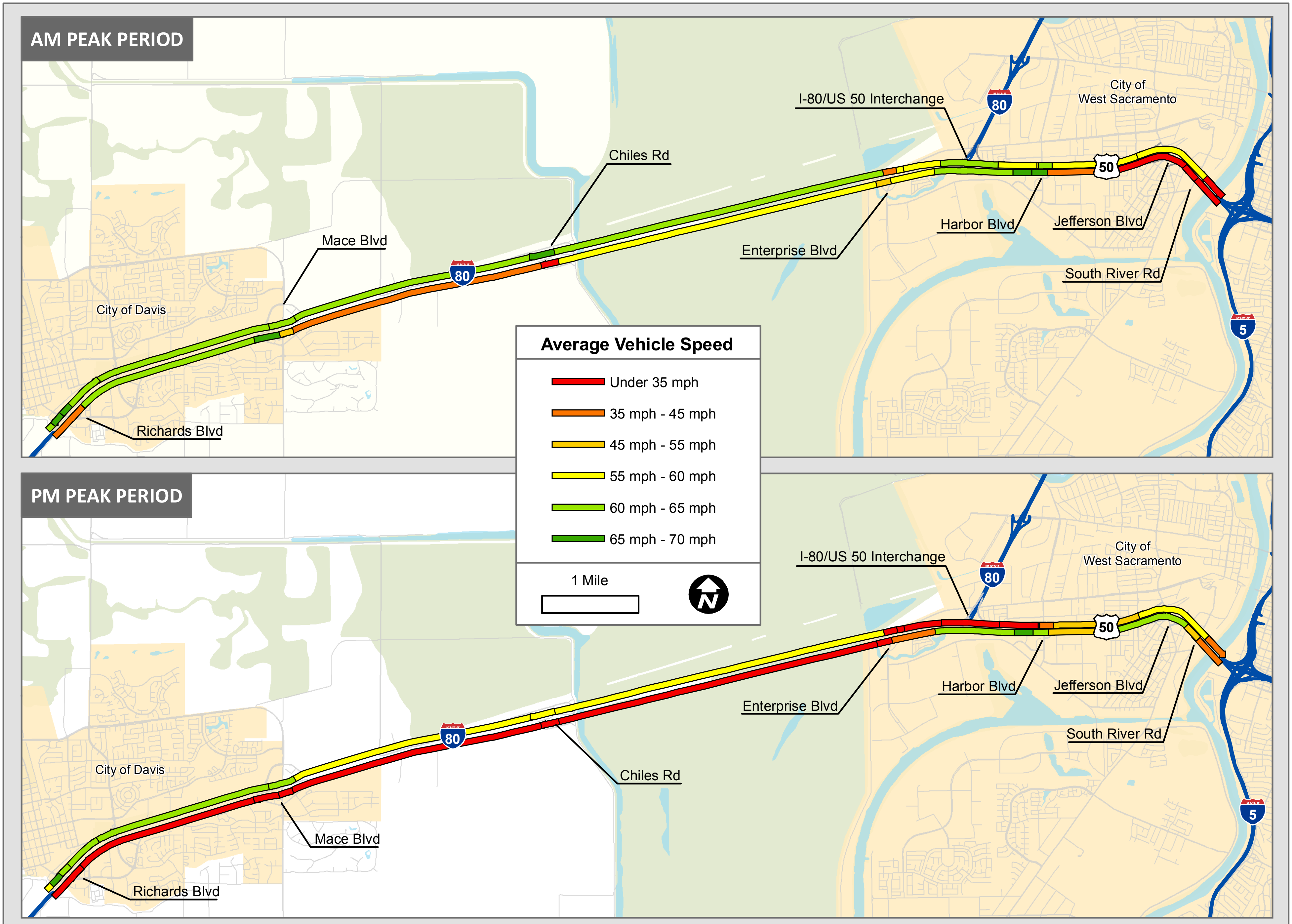


FIGURE 12: 2035 HOV Lane Alternative - Travel Speed by Segment

ALTERNATIVE COMPARISON

Regardless of the alternative, it appears clear that congestion in the design year will be significantly worse than exists currently if the growth projections from the SACSIM Model are realized. The following tables in this section compare the three alternatives over a range of MOEs by time period and direction.

In the eastbound direction, the HOV Lane Alternative outperforms the other two alternatives during the AM peak period across all measures of effectiveness. Travel time along the entire corridor is approximately two and a half minutes less than the Mixed-Flow Lane Alternative and ten minutes less than No Build. In the westbound direction, no alternative separates itself outside the margin of error in terms of vehicle delay and average travel speed, though the No Build and HOV Lane alternatives produce considerably less vehicle-miles traveled. Table 13 compares the three alternatives during the AM peak period by direction.

TABLE 13: AM Peak Period Alternative Comparison

MOE	Eastbound				Westbound		
	No Build	Mixed-Flow Lane	HOV Lane		No Build	Mixed-Flow Lane	HOV Lane
Vehicle-Miles Traveled	199,968	211,109	206,512		199,558	205,869	185,532
Travel Time (vehicle-hours)	27:52	20:28	17:44		12:58	12:32	12:41
Average Speed (mph)	27	37	43		59	61	60
Total Delay (vehicle-hours)	3,799	2,575	1,724		635	413	372
Average Delay (seconds)	16:34	9:9	6:25		1:41	1:15	1:24

Note: MOEs developed using VISSIM 4.3
Source: Caltrans, 2013.

In both directions during the PM peak period, the Mixed-Flow Lane Alternative significantly outperforms the other two alternatives across all measures of effectiveness, except vehicle-miles traveled. In the eastbound direction, the average delay is four minutes less than the HOV Lane Alternative and sixteen minutes less than the No Build. In the westbound direction, the results aren't as drastic, but the savings are still substantial, with travel time savings of three minutes and six minutes over the HOV and No Build alternatives, respectively. The one statistics that is not viewed as a positive for the Mixed-Flow Lane alternative is vehicle-miles traveled (VMT). One of the primary factors in vehicle emissions is VMT, and the higher value in both directions (likely due to induced demand) may indicate that any reduction in congestion from the lane addition may be offset by increased emissions from additional vehicles. Table 14 compares the three alternatives during the PM peak hour by direction.

TABLE 14: PM Peak Period Alternative Comparison							
MOE	Eastbound				Westbound		
	No Build	Mixed-Flow Lane	HOV Lane		No Build	Mixed-Flow Lane	HOV Lane
Vehicle-Miles Traveled	217,405	249,438	236,264		218,925	240,928	232,394
Travel Time (vehicle-hours)	35:54	19:31	23:37		18:31	12:49	15:46
Average Speed (mph)	21	39	32		41	60	48
Total Delay (vehicle-hours)	6,149	2,801	3,889		2,357	567	1,416
Average Delay (seconds)	24:34	8:13	12:18		7:15	1:33	4:30

Note: MOEs developed using VISSIM 4.3
Source: Caltrans, 2013.

The three alternatives were also compared specifically during the worst hour in the morning and afternoon for both travel speed and travel time, these results are shown in Table 15.

TABLE 15: Peak Hour Alternative Comparison					
Alternatives		Eastbound		Westbound	
		Average Speed (mph)	Travel Time (min:sec)	Average Speed (mph)	Travel Time (min:sec)
No Build	AM	28.3	26:56	57.0	13:23
	PM	21.5	35:19	38.3	19:58
Mixed-Flow Lane	AM	36.4	20:54	60.1	12:43
	PM	38.6	19:42	58.6	13:2
HOV Lane	AM	40.9	18:36	58.9	12:58
	PM	31.8	23:57	43.9	17:25

Note: MOEs developed using VISSIM 4.3
Source: Caltrans, 2013.

When focusing exclusively on the peak hours, the general results and trends are similar to the peak period as a whole. The Mixed-Flow Lane Alternative outperforms the other alternatives during the PM peak hour, while the HOV Lane Alternative has the highest travel speeds and lowest travel time during the AM peak hour. Figure 13 compares the peak hour travel times graphically.

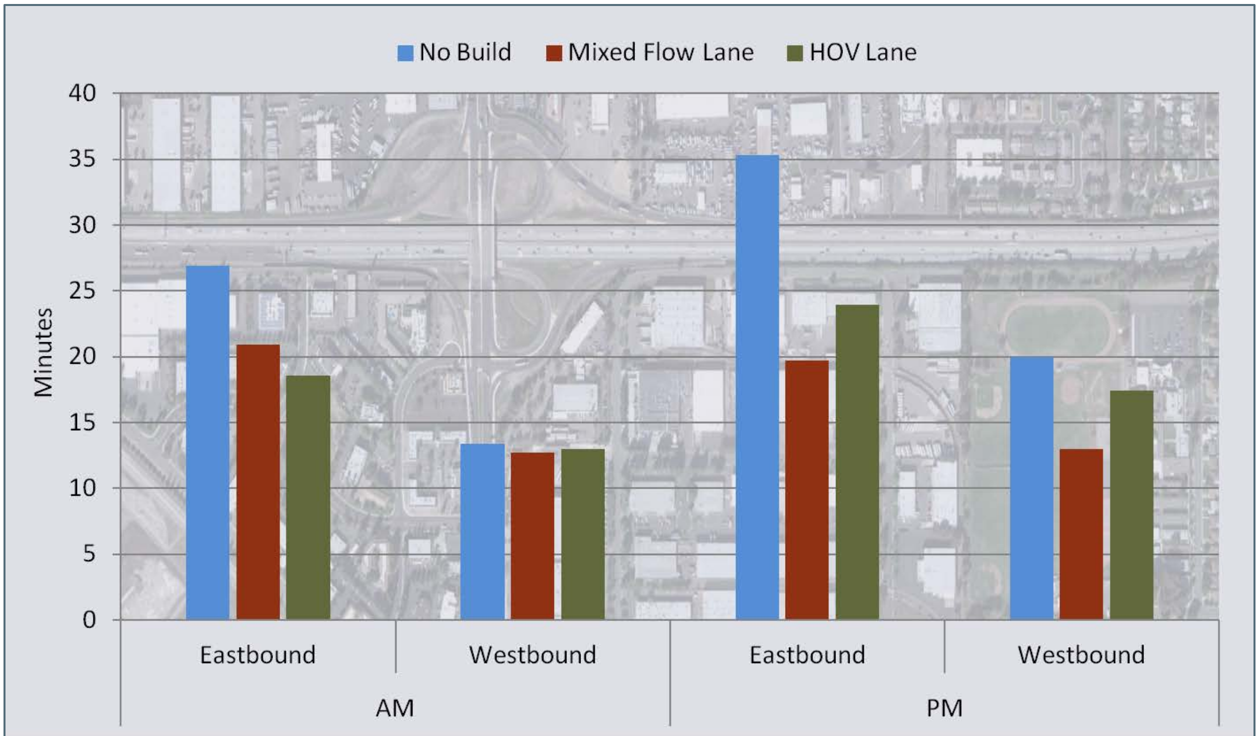


FIGURE 13: PEAK HOUR TRAVEL TIME ALTERNATIVE COMPARISON

ALTERNATIVE ANALYSIS

Upon thorough examination of the corridor's potential future, it is apparent that no alternative or amount of widening will completely relieve congestion. After observing bottlenecks appear at similar locations across time periods and alternatives, it is clear that some fundamental characteristics of the corridor prevent more efficient operations. With regards to interchange spacing, the Caltrans Highway Design Manual states the following:

> *The minimum interchange spacing in urban areas shall be one mile in urban areas and, two miles in rural areas, and two miles between freeway-to-freeway interchanges and local street interchanges.*

Every interchange in West Sacramento violates these standards. In the eastern third of the corridor, two freeway to freeway and four local street interchanges are present over a distance of 3.8 miles. Per the highway design manual, these facilities should be distributed over a distance of more than eight miles. It is not a coincidence that the two worst violators of these standards are also responsible for the greatest delay. The distance between the Enterprise Blvd. and the I-80/US 50 freeway interchanges is 0.75 miles, 1.25 miles below minimum standard. Additionally, the distance between the South River Rd. Interchange and the I-5/US 50 interchange is 0.6 miles, less than a third of the minimum distance. No amount of widening can alleviate the congestion caused by the insufficient weaving distance between these two sets of interchanges.

Given this limitation, though, both the Mixed-Flow Lane and the HOV Lane alternatives appear to provide benefits over the No Build Alternative. In terms of vehicle delay and travel speed, the HOV Lane Alternative performs marginally better during the AM peak period, while the Mixed-Flow Lane Alternative performs significantly better during the PM peak period. In sum, the Mixed-Flow Lane Alternative results in 5,921 peak period vehicle-hours of delay compared with 7,075 vehicle-hours of delay for the HOV Lane Alternative. Conversely, the HOV Lane Alternative produces 32,440 fewer daily vehicle-miles traveled than the Mixed Flow Lane Alternative.

Assuming that a build alternative is selected, it appears that the HOV Lane Alternative is the most likely to move forward. Mixed-flow lane projects are difficult to gain approval due to their inability to pass federal air quality conformity standards[vii], resulting in few urban freeway mixed-flow lane projects being proposed within the Sacramento Region over the next 25 years. HOV lanes for a portion of the study area are listed in the 2035 Metropolitan Transportation Plan for the region and are planned as an ultimate facility over the entire corridor within the Caltrans HOV vision for the Sacramento area. Without a build alternative that performs conclusively better across all MOEs, the HOV Lane Alternative was selected over the Mixed Flow Lane Alternative for further examination based on these outside factors and the existing momentum that their implementation holds within the region.

6. IMPROVEMENT PROJECT PRIORITIZATION

After determining that the HOV Lane Alternative is the most appropriate for the corridor, the next step is determining the phasing of not just the HOV lanes, but all future improvement projects along the corridor. Chapter 6 contains a proposal for five phases of project development that would be required for the corridor to reach its ultimate facility.

SELECTED ALTERNATIVE EVALUATION

Since it is unlikely that HOV lanes and the other operational improvement projects along the corridor could be funded and constructed simultaneously, improvement projects were prioritized and phased. Sensitivity testing was conducted to determine which projects address bottlenecks in the order of the greatest severity. Besides purely operational benefits, the projected phasing also attempted to take into account cost, constructability, region-wide HOV lane connectivity, and their ability to incentivize carpooling. Once a proposed phasing was settled upon, each phase was simulated and compared to determine the impacts of each.

PHASING DESCRIPTION

For this analysis, three types of projects with the potential for operational improvement were considered: ramp metering, auxiliary lanes, and HOV lanes. The projects within each phase are listed in Table 16 and illustrated in Figure 14.

TABLE 16: Future Phasing Project List

Phase	Project Type	PM	Description	Cost
1	Ramp Meter	I-80 EB YOL PM 0.4	At Richards Blvd EB on-ramp, install single lane ramp meter with HOV bypass lane	$600,000
	Ramp Meter	I-80 WB YOL PM 0.1	At Richards Blvd WB on-ramp, install double lane ramp meter with HOV bypass lane	$2,180,000
	Ramp Meter	I-80 EB PM 2.8/3.2	At Mace Blvd EB on-ramp, widen the eastbound on-ramp to include two metered mixed-flow lanes with an HOV bypass lane and construct a 2000 ft. transition lane from the ramp gore point	$2,100,000
	Ramp Meter	I-80 WB YOL PM 2.5	At Mace Blvd WB on-ramp, install single lane ramp meter with HOV bypass lane	$480,000
	Ramp Meter	I-80 WB YOL PM 5.6	At Chiles Rd. EB on-ramp, install a restrictive single-lane ramp meter to discourage traffic bypassing the Mace Blvd. interchange	$460,000
	Ramp Meter	I-80 EB YOL PM 2.9)	At South River Rd EB on-ramp, install single lane ramp meter with HOV bypass lane	$25,080,000
2	Bus/Carpool Lane	I-80 EB YOL PM 2.4 to 9.1	In the eastbound direction, widen to construct an HOV lane on I-80 from near roughly Mace Blvd. to Enterprise Blvd.	$161,439,000
	Bus/Carpool Lane	I-80 WB YOL PM 9.2 to 2.5	In the westbound direction, widen to construct an HOV lane along I-80 from roughly Enterprise Blvd. to Mace Blvd.	$161,754,000

TABLE 16: Future Phasing Project List

3	Auxiliary Lane	I-80 EB SOL PM R 44.6 to YOL PM 0.1	Extend I-80 EB outside lane drop from SR 113 at SOL PM R 44.6 approximately 2,000 feet to YOL PM 0.1 to form an auxiliary lane that terminates at Richards Blvd	$1,291,000
	Bus/Carpool Lane	I-80 EB YOL PM 9.1 to US 50 YOL PM 0.7	In the eastbound direction, restripe outside mixed-flow lane as HOV lane from near Enterprise Blvd. to the interior of the I-80/US 50 interchange	$4,646,000
	Bus/Carpool Lane	US 50 EB YOL PM 0.7 to 1.4	In the eastbound direction, widen to construct an HOV lane along US 50 from the interior of the I-80/US 50 interchange to the interior of the Harbor Blvd. interchange	$6,898,000
	Bus/Carpool Lane	US 50 YOL PM 1.8 to 0.3	In the westbound direction, restripe outside mixed-flow lane as HOV lane along US 50 from the beginning of the WB Harbor Blvd. transition lane to the interior of the I-80/US 50 interchange	$2,100,000
	Bus/Carpool Lane	US 50 YOL PM 0.3 to I-80 YOL PM 9.2	In the westbound direction, widen to construct an HOV lane along I-80/US 50 from the interior of the I-80/US 50 interchange to near Enterprise Blvd.	$28,105,340
4	Bus/Carpool Lane	I-80 EB SOL PM R 44.6 to YOL PM 2.4	In the eastbound direction, realign Phase 3 auxiliary lane widening between SR 113 and Richards Blvd to the outside at I-80 EB SOL PM R 44.6 (eliminating exit-only lane at Richards Blvd.) and extend as an HOV lane to YOL PM 2.4	$23,185,000
	Bus/Carpool Lane	I-80 WB YOL PM 2.5 to SOL PM R44.5	In the westbound direction, widen to construct an HOV lane along I-80 from Mace Blvd. to just past the YOL/SOL county line	$24,232,000
5	Auxiliary Lane	US 50 EB YOL PM 2.9 to SAC PM L 0.2	Construct an auxiliary lane between the South River Rd. on-ramp and the I-5 freeway off-ramp	$20,801,000
	Auxiliary Lane	US 50 WB SAC PM L 0.2 to YOL PM 2.6	Construct an auxiliary lane between the I-5 on-ramps (US 50 WB SAC PM L 0.2) and the South River Rd./Jefferson Blvd. off-ramp (US 50 WB YOL PM 3.0); widen ramp to two lanes before the S. River Rd./Jefferson Blvd split, with one lane feeding each ramp; extend a merge area 2,000 feet past the ramp to I-80 WB YOL PM 2.6	$44,385,000
	Bus/Carpool Lane	US 50 WB YOL PM 1.4 to SAC PM 0.0	In the eastbound direction, widen to construct an HOV lane along US 50 from near Harbor Blvd. to near the junction with I-5	$157,056,960
	Bus/Carpool Lane	US 50 WB SAC PM L 0.2 to YOL PM 1.8	In the westbound direction, widen to construct an HOV lane along US 50 from near the I-5 junction to the beginning of the WB Harbor Blvd. transition lane	$155,668,740

****Planning Level Cost Estimates**

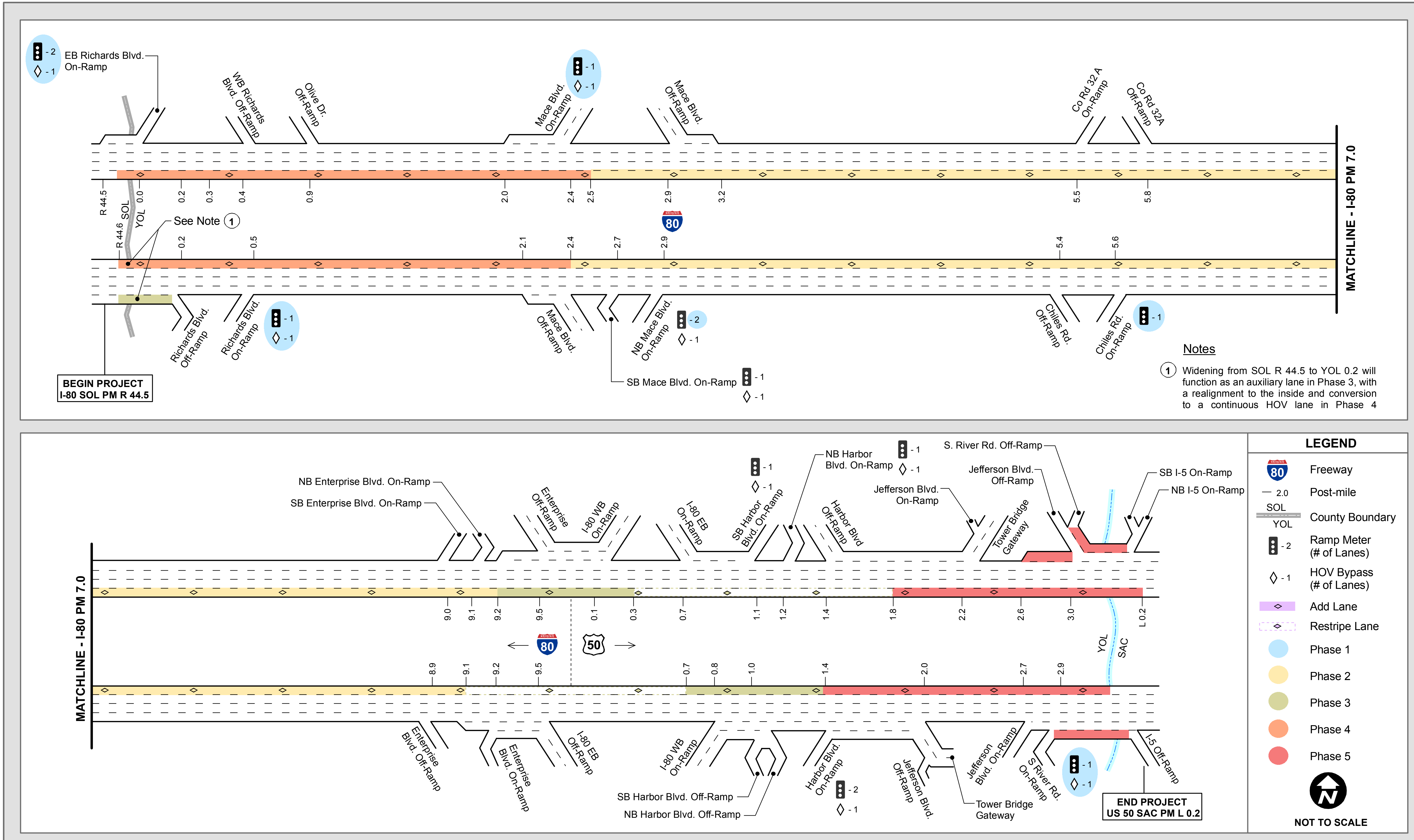


FIGURE 14: 2035 Selected Alternative (HOV Lane) - Phasing

PHASING ANALYSIS

The peak hour was chosen as the more relevant analysis time period, since it is more suited to identify incremental improvements than the three hour peak period. Each phase was analyzed for average travel speed and overall corridor travel time. The results of this analysis are presented in Table 17.

TABLE 17: Peak Hour Phasing Comparison

Phase	Peak Hour	Eastbound		Westbound	
		Average Speed (mph)	Travel Time (min:sec)	Average Speed (mph)	Travel Time (min:sec)
No Improve-ments	AM	30.1	25:16	56.6	13:30
	PM	18.4	41:28	40.8	18:44
1	AM	27.3	27:52	58.9	12:58
	PM	20.4	37:19	36.5	20:56
2	AM	35.6	21:24	55.4	13:48
	PM	19.3	39:31	41.5	18:24
3	AM	32.9	23:12	58.9	12:58
	PM	18.1	42:03	59.5	12:50
4	AM	34.4	22:10	59.5	12:51
	PM	18.1	42:04	61.4	12:25
5	AM	46.6	16:20	59.3	12:53
	PM	32.0	23:51	61.1	12:30

Note: MOEs developed using VISSIM 4.3
Source: Caltrans, 2013.

Given the large amount of data, travel times were also compared graphically to provide further result legibility. A comparison of peak hour travel times is presented in Figure 15.

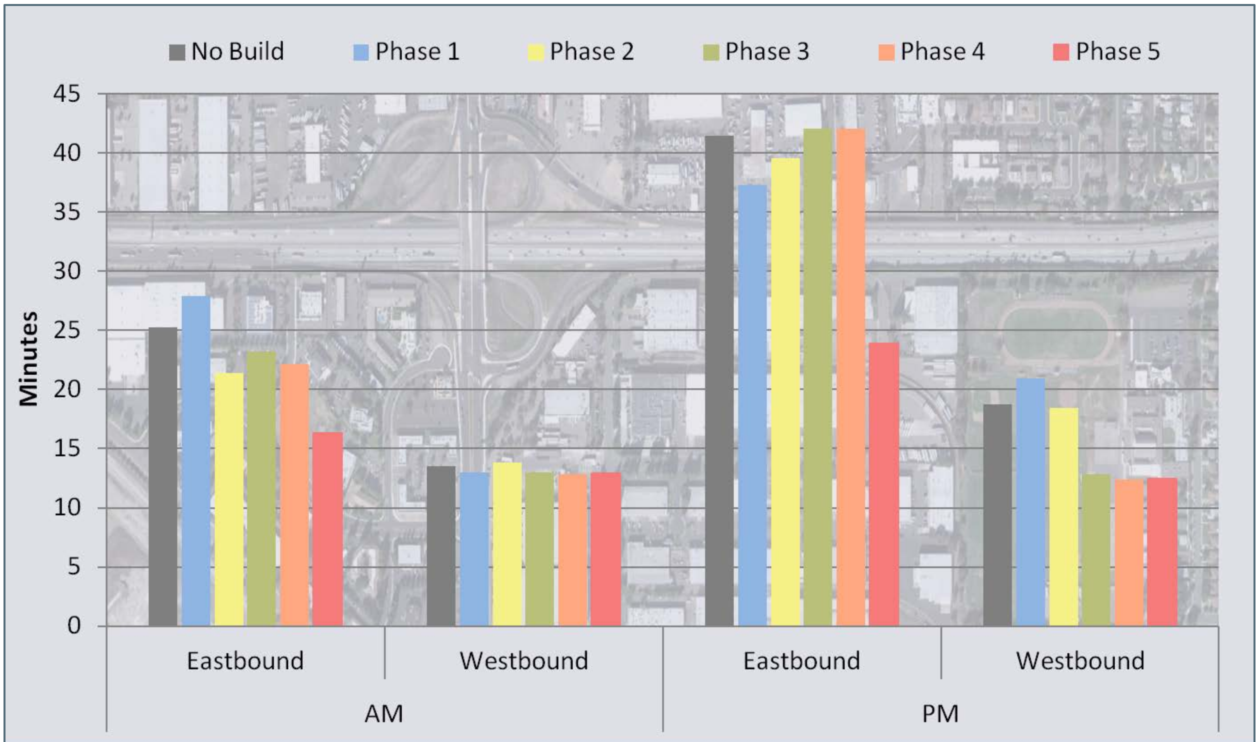


FIGURE 15: Peak Hour Phasing Travel Time Comparison

With the exception of some minor, counterintuitive travel time increases in the eastbound direction that could be considered to fall within the margin of error of the model, several key findings can be gleaned from the results of the phasing models. These findings include:

- For a corridor with this level of congestion, ramp metering shows little improvement as a stand-alone solution in 2035. The benefits of ramp metering would likely show up in less congestion conditions, such as existing or in 2035 after the addition HOV lanes
- The addition of any improvement project in the westbound direction has little effect on travel times during the AM peak hour.
- In the PM peak hour, improvements in the westbound direction show little benefit until Phase 3, with Phases 4 and 5 having little effect
- In the eastbound direction during both peak hours, only minor operational advantages are realized with Phases 1 through 4, while Phase 5 reduces travel times by 35 percent during the AM peak hour and 43 percent during the PM peak hour from No Build

Based on a segmental travel speed analysis, a bottleneck still occurs at Chiles Rd. (AM peak hour) or Enterprise Blvd (PM Peak Hour) even after Phase 5 improvements. This indicates that little noticeable benefit would be realized from the Phase 5 improvements alone, because the demand would never reach this segment due to upstream bottlenecks.

Perhaps the most important finding produced from the phasing analysis is that the corridor will experience little travel time, delay, or speed improvements in the eastbound direction without construction of all five phases. The HOV lanes envisioned in the SACOG Metropolitan Transportation Plan would provide little net benefit on their own by the year 2035 in alleviating the worst congestion within the study limits. Consequently, a commitment should be made to either construct improvements across the entire corridor by the design year or consider using the funding and resources elsewhere.

7. CONCLUSIONS & RECOMMENDATIONS

This report analyzed three future roadway cross-sectional alternatives: No Build (existing), adding a mixed-flow lane, and adding an HOV Lane. The Mixed-Flow Lane and HOV Lane alternatives both provided benefits over No Build and it was determined that the HOV Lane alternative was the most likely to proceed forward due to both the operational benefits and outside factors. The study's key findings include:

- If the growth within the 2035 SACOG MTP is realized, vehicles volumes and congestion along the corridor will increase overall, irrespective of the alternative selected
- The Mixed-Flow Lane and HOV Lane alternatives, if constructed in their entirety, would both provide tangible operational improvements over the No Build Scenario; however, both would result in significantly higher VMT than No Build
- Interchange spacing issues in West Sacramento will prevent the corridor from operating free from congestion now and into the future, regardless of the number of total lanes, due to short weaving distances
- No improvement in operations in the most congested direction (eastbound) will be realized without full construction of HOV lanes across the entire corridor by the 2035 design year; without a commitment to achieve full build-out of the corridor, the justification for construction of any widening is questionable

Changes to some key assumptions or design characteristics of the project described herein could have a major effect on the results. If a standard ramp meter design is installed at Chiles Rd rather than a special-case, restrictive design, operations along the corridor will be significantly worse and HOV lanes will be significantly less effective. The placement and characteristics of any additional Sacramento River Crossings could considerably alter the traffic volumes entering and exiting the corridor at the westbound gate. Also, the addition of HOV lanes along US 50 and I-80 at the entrances to the corridor and freeway-freeway connectors, providing a seamless link between adjacent facilities, may encourage further HOV use along the corridor.

Large amounts of growth in inter-regional and regional travel and new developments within West Sacramento are assumed by the year 2035. Recessionary events, general plan changes, or behavioral shifts in the way people travel over the next 25 years cannot be totally accounted for in long-range planning. If any of these change fundamentally, the future design of the corridor should be re-examined.

The projects identified in the US 50/80 PI will take many years to implement and will require several different funding sources to bring to fruition. Caltrans will continue to work with its local and regional partners to plan, program, and construct individual projects and segments as upcoming transportation funding opportunities become available.

In addition, Caltrans will continue to remain engaged with the Cities of Sacramento and West Sacramento as developments are proposed which may impact US 50/80. This will allow Caltrans, the City, and the applicant developer to review, analyze, and coordinate the mitigation of direct and cumulative significant impacts to US 50/80 relating to the specific land use proposal and, as appropriate and indicated by an objective nexus study, provide for developer contributions for the needed improvements to US 50/80. It is hoped that this PI can be used to streamline that process.

Prior to programming and constructing the proposed improvement projects, a Project Initiation Document (PID) must be prepared for each project or group of projects to identify the purpose and need, scope, cost, and schedule. As an initial step, Caltrans will begin to include the highest priority projects into the Three-Year PID Work Plan. This allows resources to be allocated for PID development and to compete for funding. During this process, a substantive public and stakeholder outreach dialogue would occur regarding the projects.

[i] Counts received from Yolo County Transportation District in January, 2012.

[ii] Counts received from Capitol Corridor in January, 2012.

[iii] *Highway Capacity Manual* (2010). Transportation Research Board, Washington, D.C..

[iv] Caltrans (2003). "*High-Occupancy Vehicle Guidelines*". Retrieved from www.dot.ca.gov/hq/traffops/systemops/hov/files/hov_guidelines/HOV%20Guideline.pdf

[v] May, Adolph (2007). *Determining the Effectiveness of HOV Lanes*, University of California Berkeley TO 5326 (6326), UCB-ITS-PRR-2007-17, 2007. Retrieved from www.path.berkeley.edu/PATH/Publications/PDF/PRR/2007/PRR-2007-17.pdf

[vi] Kwon, J., Varaiya, P. (2007). *Effectiveness of California's High Occupancy Vehicle (HOV) System*, Transportation Research Part C. Retrieved from robotics.eecs.berkeley.edu/~varaiya/papers_ps.dir/TRC_342.pdf

[vii] Caltrans (2003). "*High-Occupancy Vehicle Guidelines*". Retrieved from www.dot.ca.gov/hq/traffops/systemops/hov/files/hov_guidelines/HOV%20Guideline.pdf

Attachment2

Analyses of GARVEE Bonding Capacity 2015

Analyses of
GARVEE
Bonding Capacity
2015

Analyses for the
California Transportation Commission
April 2015

State Treasurer John Chiang

Table of Contents

Executive Summary

These analyses are provided to the California Transportation Commission ("Commission") to assist in its compliance with the provisions of Government Code Sections 14550 through 14555.9 requiring the Commission to prepare, in conjunction with the State Treasurer's Office ("STO"), an annual analysis of California's bonding capacity for issuing Grant Anticipation Revenue Vehicles ("GARVEE") bonds and notes. GARVEE bonds are capital market borrowings which are repaid from federal transportation funds that are deposited into the State Highway Account. The bonding capacity takes into account the current maximum annual debt service of the State of California (California Department of Transportation) Federal Highway Grant Anticipation Bonds ("GARVEE Bonds") Series 2008A ("Series 2008A Bonds").

Legislation was enacted to ensure California had the necessary state legislative authority to make use of this financing tool for accelerating high priority transportation projects. The legislation became effective January 1, 2000, and was further amended by AB 438 (Chapter 113, Statutes of 2001), AB 3026 (Chapter 438, Statutes of 2002), SB 1098 (Chapter 212, Statutes of 2004), and SB 1507 (Chapter 793, Statutes of 2004).

The issuance of additional GARVEE bonds is subject to Government Code Section 14553.4, which states that the State Treasurer may not authorize the issuance of additional bonds if the annual debt service on all outstanding GARVEE obligations would exceed 15 percent of the total amount of federal transportation funds deposited into the State Highway Account in the State Transportation Fund for any consecutive 12-month period within the preceding 24 months. Thus, current and future bonding capacity analyses must take place in the context of this "statutory cap."

There are other factors which also affect bonding capacity, such as maturity structures, interest rates, and policy decisions. Accordingly, these analyses continue the approach of prior analyses by providing "sensitivity analyses" under different scenarios, with varying assumptions for maturity dates and interest rates. This method should continue to assist the Commission in examining and responding to future applications under the context of alternative scenarios.

On March 10, 2004, the State of California ("the State") issued $614,850,000 of GARVEE Bonds Series 2004A ("Series 2004A Bonds") in order to pay a portion of the costs of acquisition of right-of-way and/or construction costs for eight federal-aid State Transportation Improvement Program ("STIP") projects approved by the Commission. The Series 2004A Bonds fully matured on February 1, 2015 and all eight projects were completed. On October 16, 2008, the State issued a second series of GARVEE Bonds, the Series 2008A Bonds, in the amount of $97,635,000. As of April 1, 2015, the Series 2008A Bonds have an outstanding principal balance of $49,315,000. The maximum annual debt service of the outstanding Series 2008A Bonds is $11,393,231.25 in Fiscal Year 2015-16. The Series 2008A Bonds carry underlying ratings of 'A2' from Moody's Investors Service, 'AA' from Standard & Poor's, and 'A+' from Fitch Ratings.

The analyses for 2015 show a bonding capacity ranging from a low of approximately $3.06 billion to a high of approximately $5.77 billion under varying market conditions and amortization periods. The $3.06 billion bonding capacity level results from a 6-year amortization with an assumed interest rate of 2.63 percent under a Market Sensitivity Case scenario, and the $5.77 billion bonding capacity level results from a 12-year amortization with an assumed interest rate of 2.36 percent under a Base Case scenario.

The 2015 analyses show that the bonding capacity has increased by approximately 10.3 percent for a 6-year final maturity amortization period when compared to the same analyses of 2014, and has increased by approximately 12.7 percent for a 12-year final maturity amortization period when compared to the same analyses of 2014. Primary factors contributing to the increase in bonding capacity from 2014 are: 1) a significant decrease in the total outstanding principal balance and the corresponding maximum annual debt service and 2) a decrease to the assumed weighted average interest rates at the long end of the curve for this year's 12-year amortization analyses. The weighted average interest rates used in the 12-year amortization analyses are 30 basis points lower than the rates used previously. These differences also reflect a flattening of the yield curve in the 6- to 12-year range when compared to last year's analyses.

These analyses demonstrate that a wide range of circumstances, including policy, revenues, and market factors, can affect the existing capacity for future State GARVEE financings. Therefore, the analyses should be used as a tool for understanding the implications of alternative project applications and the related potential GARVEE bond structures that the Commission may be asked to consider over the coming year.

I. Purpose of Analyses

The following analyses are provided to assist the Commission in meeting the requirements of SB 928 (Chapter 862), sponsored by the STO to ensure that the State has the necessary legislative authority to make use of this financing tool for accelerating high priority transportation projects. The analyses relate specifically to the requirements in Section 14553(b) of the Government Code, pursuant to which the Commission and the STO shall annually prepare an analysis of the bonding capacity of federal transportation funds deposited in the State Highway Account in the State Transportation Fund. The analyses have been performed consistent with the GARVEE bonds bonding capacity guidelines provided in Government Code Section 14553.4, whereby the STO may not authorize the issuance of additional GARVEE bonds if the annual debt service on all outstanding GARVEE obligations in any fiscal year would exceed 15 percent of the total amount of federal transportation funds deposited into the State Highway Account in the State Transportation Fund for any consecutive 12-month period within the preceding 24 months.

The following analyses are intended to measure the capacity of the State Highway Account to support future issuance of GARVEE bonds, given:

1. the historical record of federal deposits to the State Highway Account;
2. requirements preceding any issuance of additional bonds under the Master Trust Indenture; and
3. the "statutory cap" on total outstanding GARVEE bonds.

II. The Series 2008A GARVEE Financing

The Series 2008A Bonds are secured by the Master Trust Indenture dated February 1, 2004, as amended and supplemented by a Second Supplemental Indenture dated October 1, 2008, by and among the State Treasurer, the Commission and the Department. The Series 2008A Bonds and all future bonds and obligations issued under the Master Trust Indenture are secured solely by the Trust Estate, as defined in the Master Trust Indenture, which consists solely of federal transportation funds. The primary source of federal transportation funds is the amount appropriated to the State by the federal government pursuant to Federal Aid Authorization, pursuant to Title 23 of the U.S. Code authorizing federal funding of state transportation projects.

The Department entered into a Memorandum of Agreement with the Federal Highway Administration ("FHWA") in anticipation of reimbursement by FHWA for debt service and other bond-related costs associated with the federal-aid projects approved by the FHWA.

The Master Trust Indenture provides for the issuance of additional bonds on parity with each outstanding series of GARVEE Bonds. Any additional parity bonds or other bonds issued on a basis subordinate to the outstanding GARVEE Bonds must comply with the "statutory cap."

The Series 2008A Bonds provided $98,000,000 for the construction of two federal-aid State Highway Operation and Protection Program ("SHOPP") projects approved by the Commission: Placer County – Interstate 80 Pavement Rehabilitation and Nevada and Sierra Counties – Interstate 80 Pavement Rehabilitation. Both projects have been completed.

III. Need for Sensitivity Analyses

There are multiple factors that will influence the State's future capacity to issue GARVEE bonds. These factors include the final maturity, interest rates and the available revenues for the additional bonds test. For this reason, no single bonding capacity analysis is sufficient for purposes of guiding the Commission's evaluation of the potential for future use of GARVEE bonds. In order to facilitate an informed consideration of future applications with structures and terms not yet known to the Commission, we have performed a series of "sensitivity analyses" under alternative scenarios. The final maturity of the bonds and the assumed interest rates are the primary variable factors that are incorporated into our sensitivity analyses.

IV. Information Sources

Pledged Revenues:

In performing these bonding capacity analyses, the STO is using data obtained from the Department regarding deposits into the State Highway Account in the State Transportation Fund from federal transportation funds. The amounts provided by the Department represent federal funds that can be legally pledged under the Master Trust Indenture for payment of the Bonds. The federal transportation funds that are legally available for payment of debt service include those derived from Federal Aid Authorization under Title 23, including apportioned funds (i.e., National Highway System, bridges and the federal surface transportation programs, and amounts available under minimum guarantees) with corresponding Obligation Authority.

Starting with the 2009 bonding capacity report, to be consistent with Section 14553.4 of the Government Code, the total annual federal aid receipts, without exceptions, have been used to calculate the annual GARVEE bonding capacity. This information was provided on a monthly basis over the period of January 2013 through December 2014. See **Attachments A-1 and A-2** for the monthly deposits data and related calculations. The additional bonds test is based on the highest consecutive 12 months of pledged revenue deposits during the prior 24-month period. These historic annual deposits are a known quantity at any given point in time, but are clearly subject to change over time, and must be re-examined at the time of each potential GARVEE bond issuance.

Final Maturities:

The analyses in the report assume that any additional GARVEE bonds issued in 2015 will have final maturities in 2021 and 2027.

Interest Rate Assumptions:

Estimates of potential interest costs under various scenarios were developed by the STO based on the 'A' high-grade municipal bond index published by Municipal Market Data ("MMD"), a widely used industry benchmark. The interest rate assumptions used for the analyses are based on the weighted average coupon, using a level debt solution for each final maturity (or amortization period), which reflects the structure of the Series 2008A Bonds.

V. Summary of Alternative Assumptions

For the 2015 bonding capacity analyses, we used the MMD ‘A’ municipal bond index. Since the Series 2008A Bonds carry underlying ratings of ‘A2’ from Moody’s Investors Service, ‘AA’ from Standard & Poor’s, and ‘A+’ from Fitch Ratings, we have assumed that a new issuance of GARVEE Bonds in the current environment would also carry underlying ratings that are split among the ‘A’ and ‘AA’ grades.

The two alternative scenarios for market conditions used in these analyses are as follows:

1. **Base Case:** Interest rates are based on the February 27, 2015 MMD ‘A’ municipal bond index.
2. **Market Sensitivity Case:** Base Case plus 100 basis points.

Many observers believe that over time interest rates could increase from the current levels. For this reason, and based on the expected short-term maturity structure of the State’s current and future GARVEE obligations, a 100 basis point increase in interest rates is used for the market sensitivity analyses.

Two alternatives for the final maturity of the bonds were analyzed for each case. The table below summarizes the range of assumptions for the sensitivity analyses. The different scenarios for each factor combine for a total of four different analyses.

Factors	Range of Assumptions
Final Maturity	Two scenarios: at 6 and 12 years from date of issuance
Assumed Interest Rates	Two scenarios: one at ‘A’ MMD market rates on February 27, 2015 and one at 100 basis points above the February 27, 2015 ‘A’ MMD market rates

See **Attachment B** for the detailed assumptions used in each sensitivity analysis.

It should also be noted that the current analyses, by necessity, require significant simplification as compared to the myriad of structuring nuances that would be involved in actual bond sales. As a result, certain ambiguities or alternative interpretations could lead to somewhat differing results in practice. One example of a simplification, common to all scenarios, is the assumption that all GARVEE bonds within the capacity of a given scenario would be issued in a single year and not staggered over multiple years, as typically would be expected in a bonding program of significant magnitude.

If, instead, such bonds were staggered and this financing structure was assumed to have a fixed “end date” represented by the assumed final maturity used in each scenario, each resulting measure of maximum bonding capacity would have to be adjusted downward. This would be necessary because the GARVEE bonds issued in subsequent years would have a shorter period during which to amortize principal before the fixed end date. This would increase the annual debt service necessary for a given par amount of bonds, causing a reduction in total bonding capacity, assuming a fixed amount of annual revenues for each scenario.

Alternatively, this simplification would not have this constraint on capacity if future financings were assumed to be structured on a “rolling maturity” basis; that is, with each GARVEE bond issued in subsequent years within each scenario having exactly the same underlying terms, such as total years to maturity and interest rate, regardless of the timing of any future bond issuance. This latter simplification would also assume a fixed amount of annual revenues for each scenario.

This discussion is offered as an example, which is by no means exhaustive, of the implications of the necessary simplifications involved in any analysis of bonding capacity given current uncertainty about the actual conditions that will exist at the time of any future issuance of GARVEE bonds or obligations. Therefore, care should be exercised in using these analyses to avoid erroneous interpretations or conclusions.

VI. Summary of Results

A flatter yield curve compared to last year in which the weighted average interest rates at the long end of the curve are lower than a year ago, coupled with significant decreases in the total outstanding principal balance and maximum annual debt service since last year, resulted in a higher bonding capacity in 2015 than last year. As of February 27, 2015, the weighted average interest rate for ‘A’ rated bonds with a 6-year final maturity was 1.63 percent (an increase of 0.12 percent compared to last year’s level) and for ‘A’ rated bonds with a 12-year final maturity was 2.36 percent (a decrease of 0.30 percent compared to last year’s level). The variation between maturities is attributable to a flatter MMD yield curve in the 6- to 12-year range compared to last year’s MMD yield curve. Also, due to the significant increase of federal receipts beginning in calendar year 2011, these analyses continue to indicate a much higher bonding capacity than in the years prior to the federal receipts increases. The Department projects that the annual federal receipts will remain at the elevated $3.4 billion level in calendar years 2015 and 2016.

The analyses show that a bond issuance with a 6-year maturity corresponds to a bonding capacity ranging from approximately $3.06 billion (Market Sensitivity Case) to approximately $3.16 billion (Base Case). These levels represent an increase of approximately $285.42 million and $294.98 million, respectively, compared to 2014, or an increase of approximately 10.3 percent for a 6-year maturity compared to last year’s levels.

The Commission policy established 12 years as the maximum maturity for GARVEE bonds. If future bond issues are structured with a 12-year amortization period consistent with the current Commission policy and at current interest rate levels, the remaining capacity for issuance of GARVEE bonds would be from approximately $5.44 billion (Market Sensitivity Case) to approximately $5.77 billion (Base Case). These levels represent an increase of approximately $613.99 million and $654.54 million, respectively, compared to 2014, or an increase of approximately 12.7 percent for a 12-year maturity compared to last year’s levels.

Under the current analyses, a longer amortization period would increase the additional bonding capacity. If the Commission policy changes to allow a longer maximum maturity, the bonding capacity would change accordingly.

The following table summarizes key results of our analyses based on the actual federal aid receipts deposited into the State Highway Account in 2014. Detailed worksheets supporting the results can be found in **Attachments C, D-1, and D-2**.

Summary of Results for GARVEE Bonding Capacity Sensitivity Analyses		
Final Maturity Amortization Period	**Base Case February 27, 2015 'A' MMD Scale**	**Market Sensitivity Case Base Case plus 100 Basis Points**
6 years	$3.17 billion	$3.06 billion
12 years	$5.77 billion	$5.44 billion

VII. California Transportation Commission Policy

The Commission adopted a GARVEE policy in December 2003. This policy extends through the next Federal Transportation Reauthorization Act. The current transportation reauthorization act has been extended through May 31, 2015.

The policy, contained in Commission Resolution No. G-03-21, is as follows:

- Debt Limit. The Commission limits annual GARVEE debt service to 15 percent of qualifying federal revenues. This limit will be calculated on the basis described in Section 14553.4 of the Government Code (i.e., 15 percent of the total amount of federal transportation funds deposited in the State Highway Account for any consecutive 12-month period within the preceding 24 months). In 2004, SB 1507 amended the statutory cap from a 30 percent limit to a 15 percent limit, which aligned it with the Commission's policy.

- Term. Each bond is structured for debt service payments over a term of no more than 12 years.

- Project Selection. The Commission selects projects for accelerated construction through the use of GARVEE bonding. The selection will be made through the programming process for the STIP and the SHOPP. The Commission will select projects that are major improvements to corridors and gateways for interregional travel and goods movement. Major improvements include projects that increase capacity, reduce travel time, or provide long-life rehabilitation of key bridges or roadways.

VIII. Recent Events

The Department does not anticipate any new GARVEE bond issuance in the near future.

IX. Conclusion

As the above analyses show, the ultimate capacity existing for the State's future GARVEE financings will depend on a wide range of circumstances over time, including market conditions, maturity structures, revenues, and other factors that may be considered by the Commission.

We are hopeful that these analyses will be useful in considering the structuring options that are available for GARVEE financings, in addition to meeting the immediate goal of assisting the Commission in preparing its annual report.

ATTACHMENT A-1

FEDERAL DEPOSITS INTO THE STATE HIGHWAY ACCOUNT

Cumulative 12-Month Federal Deposits into the State Highway Account Over 24-Month Period, ending December 31, 2014

Period Covered	12-Month Total Revenues Deposited	
Jan 13 - Dec 13	**$3,687,684,103.76**	
Feb 13 - Jan 14	**$3,738,829,061.11**	
Mar 13 - Feb 14	**$3,795,961,650.23**	**Highest 12-Month Total**
Apr 13 - Mar 14	**$3,762,163,201.85**	
May 13 - Apr 14	**$3,758,236,404.79**	
Jun 13 - May 14	**$3,781,030,401.48**	
Jul 13 - Jun 14	**$3,716,125,793.45**	
Aug 13 - Jul 14	**$3,709,642,384.79**	
Sep 13 - Aug 14	**$3,721,902,147.35**	
Oct 13 - Sep 14	**$3,669,954,838.84**	
Nov 13 - Oct 14	**$3,569,659,641.55**	
Dec 13 - Nov 14	**$3,556,749,575.78**	
Jan 14 - Dec 14	**$3,468,062,693.10**	**Lowest 12-Month Total**
	$3,687,384,761.39	**Average 12-Month Total**

Source: California Department of Transportation

ATTACHMENT A - 2

FEDERAL DEPOSITS INTO THE STATE HIGHWAY ACCOUNT

	Monthly Deposits of Legally Pledged Federal Transportation Fund				
	2010	2011	2012	2013	2014
Month	**Deposit Amount**	**Deposit Amount**	**Deposit Amount**	**Deposit Amount**	**Deposit Amount**
January	$234,302,379.53	$389,063,404.04	$289,148,449.88	$266,012,158.70	$317,157,116.05
February	$130,134,373.39	$155,558,369.65	$213,989,165.30	$200,005,121.39	$257,137,710.51
March	$213,127,122.15	$236,920,034.82	$438,321,351.25	$278,582,563.78	$244,784,115.40
April	$172,566,406.90	$185,631,604.91	$231,244,325.22	$340,139,440.60	$336,212,643.54
May	$130,817,619.08	$399,251,077.85	$312,928,985.45	$270,273,817.64	$293,067,814.33
June	$300,743,391.19	$303,302,807.89	$269,369,114.62	$285,289,981.72	$220,385,373.69
July	$273,125,617.57	$183,338,941.67	$450,815,965.63	$362,969,334.38	$356,485,925.72
August	$263,609,660.26	$582,687,851.42	$403,368,240.18	$296,088,386.72	$308,348,149.28
September	$314,225,529.17	$315,712,808.68	$406,397,077.43	$368,002,029.29	$316,054,720.78
October	$195,447,409.45	$414,379,161.36	$398,397,382.31	$480,449,043.79	$380,153,846.50
November	$242,323,185.78	$456,066,414.04	$284,658,403.31	$256,150,740.49	$243,240,674.72
December	$323,798,884.94	$251,221,938.27	$222,659,793.42	$283,721,485.26	$195,034,602.58
TOTAL	$2,794,221,579.41	$3,873,134,414.60	$3,921,298,254.00	$3,687,684,103.76	$3,468,062,693.10
Monthly Average	$232,851,798.28	$322,761,201.22	$326,774,854.50	$307,307,008.65	$289,005,224.43

Source: California Department of Transportation.

ATTACHMENT B

DETAILED ASSUMPTIONS
FOR SENSITIVITY ANALYSES

Summary of Assumptions for GARVEE Bonding Capacity Sensitivity Analyses		
Base Case – Current Market Conditions		
Factors	Assumptions	**Comments**
Final Maturity	6 and 12 years	Analyses run at each final maturity listed at left.
Interest Rates	1.63% and 2.36%	Rates indicated relate to each respective final maturity above; listed rates represent the weighted average coupon for a bond issue sizing with level annual debt service.
Annual Revenues	$3,795,961,650.23	The Treasurer may not authorize the issuance of the bonds if the annual debt service on all outstanding GARVEE obligations would exceed 15 percent of the State's historical annual deposits in the State Highway Account from federal funding.

Market Sensitivity Case – Alternative Market Conditions		
Factors	Assumptions	**Comments**
Final Maturity	6 and 12 years	Analyses run at each final maturity listed at left.
Interest Rates	2.63% and 3.36%	Rates indicated relate to each respective final maturity above; listed rates represent the weighted average coupon for a bond issue sizing with level annual debt service.
Annual Revenues	$3,795,961,650.23	The Treasurer may not authorize the issuance of the bonds if the annual debt service on all outstanding GARVEE obligations would exceed 15 percent of the State's historical annual deposits in the State Highway Account from federal funding.

ATTACHMENT C

DETAILED WORKSHEET
FOR SENSITIVITY ANALYSES

OVERVIEW OF GARVEE BONDING CAPACITY ANALYSES

The bond test requires that the annual payment obligations of all outstanding notes in any fiscal year do not exceed 15 percent of the total amount of Federal Transportation Funds deposited into the State Highway Account for the highest consecutive 12-month period within the preceding 24 months. The maximum Annual Debt Service on the outstanding Bonds has been subtracted from the highest 12 consecutive months of deposits during the preceding 24 months in order to calculate the remaining Additional Debt Capacity.

	(Dollars in Thousands)
Base Case	
Maximum Par Amount of Bonding Capacity	$3,164,682
Interest rate	1.63%
Maximum Assumed Annual Debt Service *	$558,001
Term of Bond Issue	**6**
Market Sensitivity	
Maximum Par Amount of Bonding Capacity	$3,059,910
Interest rate	2.63%
Maximum Assumed Annual Debt Service *	$558,001
Term of Bond Issue	**6**
Base Case	
Maximum Par Amount of Bonding Capacity	$5,771,028
Interest rate	2.36%
Maximum Assumed Annual Debt Service *	$558,001
Term of Bond Issue	**12**
Market Sensitivity	
Maximum Par Amount of Bonding Capacity	$5,435,351
Interest rate	3.36%
Maximum Assumed Annual Debt Service *	$558,001
Term of Bond Issue	**12**

*15% of legally-pledged Federal Transportation Funds deposited into the State Highway Account less maximum annual debt service for the Series 2008A Bonds.

(white / non-shaded)	= Base Case Scenarios based on February 27, 2015 'A' MMD Scale
(yellow / shaded)	= Market Sensitivity Case Scenarios based on February 27, 2015 'A' MMD Scale Plus 100 Basis Points

GARVEE BONDING CAPACITY

Base Case

Highest 12-Month Revenue ($ in 000's)	**$3,795,962**
Debt Service Test (15% of Revenue)	**$569,394**
Less: Existing Maximum Annual Series 2008A D/S	**-$11,393**
Remaining Maximum Annual Debt Service Capacity	**$558,001**

(Dollars in Thousands)

	6 Years	**12 Years**
Assumed Date of Issuance	2015	2015
Assumed Final Maturity	2021	2027
Assumed Interest Rate[(1)]	1.63%	2.36%
Par Capacity	**$3,164,682**	**$5,771,028**
Annual Debt Service Required	$558,001	$558,001

[(1)] The assumed interest rates are based on the February 27, 2015 'A' MMD bond scale. The rates used are the weighted average coupon for a level debt service bond sizing based upon the final maturity in each scenario.

ATTACHMENT D-2

DETAILED SUMMARY TABLES
FOR SENSITIVITY ANALYSES

GARVEE BONDING CAPACITY

Market Sensitivity Case

Highest 12-Month Revenue ($ in 000's)	**$3,795,962**
Debt Service Test (15% of Revenue)	**$569,394**
Less: Existing Maximum Annual Series 2008A D/S	**-$11,393**
Remaining Maximum Annual Debt Service Capacity	**$558,001**

(Dollars in Thousands)

	6 Years	**12 Years**
Assumed Year of Issuance	2015	2015
Assumed Final Maturity	2021	2027
Assumed Interest Rate[(1)]	2.63%	3.36%
Par Capacity	**$3,059,910**	**$5,435,351**
Annual Debt Service Required	$558,001	$558,001

[(1)] The assumed interest rates are based on the February 27, 2015 'A' MMD bond scale (increased by 100 basis points (1%) for market fluctuations). The rates used are the weighted average coupon for a level debt service bond sizing based upon the final maturity in each scenario.