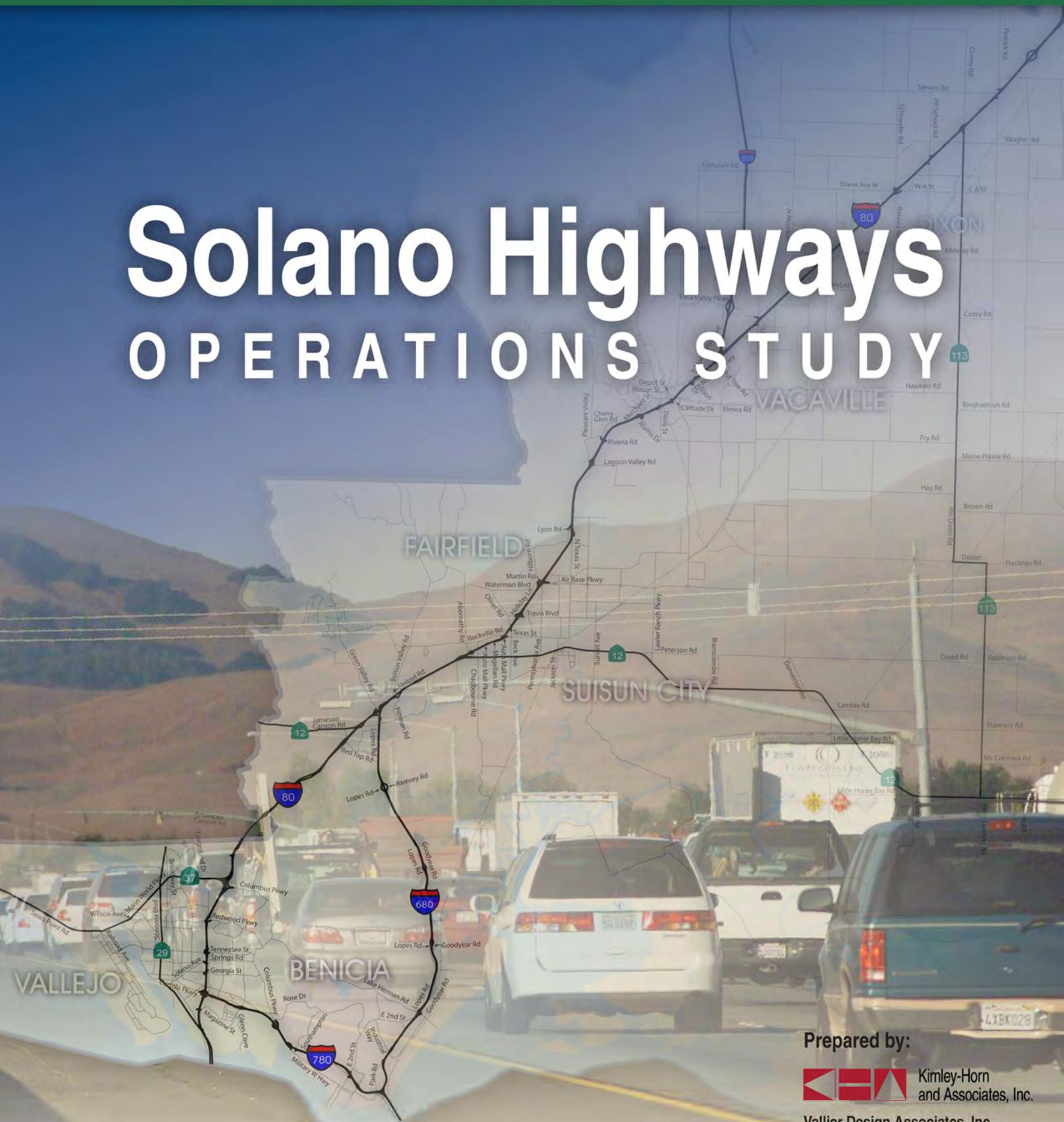


# Solano Highways OPERATIONS STUDY



Prepared by:



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February 22, 2010

Prepared for:

And the Solano Highways Partnership:



## Acknowledgments

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# SOLANO HIGHWAY OPERATIONS STUDY - EXECUTIVE SUMMARY

This Executive Summary provides an overview of the Solano Highway Operations Study. The overall study consisted of four main parts: Background Research and Literature Review, Operations Improvement Analysis, Visual Design Guidelines and Public Outreach.

## **BACKGROUND**

The Solano Transportation Authority's planning, programming and project delivery duties are guided by the Comprehensive Transportation Plan (CTP), which plans for all forms of transportation and prioritizes projects, identified in the following CTP plan elements:

- Arterials, Highways and Freeways
- Transit
- Alternatives Modes

Using the goals of the CTP for direction, STA staff completed studies and plans to identify priority transportation projects that will achieve those goals. The goal of the Arterials, Highways, and Freeways element is to *"Develop a balanced transportation system that reduces congestion and improves access and travel choices through the enhancement of roads"*.

Caltrans annually provides grant opportunities through the State Transportation Planning Grant program for several categories including a Partnership Planning Grant where corridor studies are eligible. The STA has completed the Solano Highway Operations Study to follow up and update the STA's previous I-80/I-680/I-780 Corridor Major Investment and Corridor Study (2004) and MTC's Freeway Performance Initiative (FPI) (2007). The Solano Highway Operations Study was developed cooperatively under the direction of the Solano Highways Partnership (SoHIP) consisting of representatives from STA, MTC, Caltrans (Districts 3 and 4), and the cities of Benicia, Dixon, Fairfield, Vacaville and Vallejo. Under this study, operational improvements and recommendations for a long range Intelligent Transportation System (ITS) including ramp metering, closed circuit television cameras (CCTV), vehicle detection and highway advisory radios (HAR) are presented.

## **OPERATIONS IMPROVEMENT ANALYSIS**

The Solano County I-80 and I-680 North Freeway Performance Initiative (FPI) studies served as the primary source for the operational improvement assessment. The objective of the FPI was to develop freeway strategic plans for each corridor by performing a technical assessment that included identification of major bottlenecks, determination of the causes of traffic congestion, development of potential mitigation strategies, and an assessment of their effectiveness.

The Solano I-80 FPI study encompassed the 44-mile section of I-80 throughout Solano County from the Carquinez Bridge to the Solano/Yolo County line, and the I-680 North FPI study focused on the portion of I-680 located between the I-80 interchange in Solano County and the Alameda/ Contra Costa County line. Both FPI studies included an assessment of existing (2006/2007), future 2015 and future 2030 conditions. The existing conditions assessment relied on observed data from numerous sources including the Caltrans HICOMP reports, archived travel speed data from the MTC 511 Predict-a-Trip system, the Freeway Performance Monitoring System (PeMS), and a limited number of floating

## SOLANO HIGHWAYS OPERATIONS STUDY - EXECUTIVE SUMMARY

vehicle travel time runs. For the future 2015 and 2030 analysis, the Solano Transportation Authority (STA) countywide travel demand model was used to develop forecasts, and a macroscopic simulation model (FREQ) was used to assess operating conditions. Accident data was derived from the TASAS database to assess safety concerns within the study corridor.

It is important to note that the existing conditions assessment conducted as a part of the I-680 North FPI study was performed prior to the opening of the new northbound span and toll plaza at the Benicia-Martinez Bridge. Since the opening, congestion has decreased in the area around the bridge and toll plaza. Subsequently, follow-up observations in this area were performed and used to update the existing conditions assessment presented in the FPI studies.

Because no FPI study was conducted for the I-780 corridor, additional primary analysis was undertaken as part of this study. This included the development of AM and PM peak period traffic operations models covering I-780 between I-80 and I-680. Existing Condition models were developed using freeway and ramp traffic count data available from the Caltrans Traffic Census and PeMS. The STA countywide travel forecasting model was used to determine traffic growth levels for use in the development of the traffic operations models reflecting projected 2015 and 2030 conditions. Accident data was derived from the TASAS database to assess safety concerns within the study corridor.

The FPI studies (I-80 and I-680) and the I-780 operations analysis conducted as part of this Solano Highway Operations Study identified mitigation strategies that were organized into improvement “packages” which included operational and system management improvements. Some of these improvement packages that were identified included auxiliary lanes, HOV lanes, ITS strategies, general purpose lanes, interchange intersection improvements and ramp metering.

Because the FPI studies only identified ITS deployments as a strategy measure, a Corridor-Level ITS Architecture and Implementation Plan was also developed as part of this study. This Architecture and Plan provides recommendations for policies and agreements that are necessary to ensure that ITS deployments are incorporated into operational improvements programmed along the three freeway corridors in Solano County. It also provides guidance for the design and deployment of specific ITS elements along the freeway corridors including any coordination and information sharing with the local cities, the County and the regional agencies.

### **OPERATIONAL IMPROVEMENT IMPLEMENTATION PLAN**

Based on the findings of the FPI studies, the I-780 operations analysis and the ITS Architecture and Implementation Plan, an overall Operations Improvement Implementation Plan was developed. This Plan started with a review of the improvement packages developed as part of the operational analysis and the ITS Implementation Plan, and then combining or bundling the packages into discrete projects that could be funded and constructed separately. Once the project bundling was developed, each project was prioritized using several factors including the ability to improve congestion, cost and overall feasibility.

The costs for the operational improvements are significantly higher than other system management strategies (e.g., ITS). Moreover, the use of system management strategies greatly reduces the

## SOLANO HIGHWAYS OPERATIONS STUDY - EXECUTIVE SUMMARY

impacts due to non-recurring congestion. Using costs as one of the factors for the bundling and sequencing of projects, system management strategies such as ITS improvements were deemed to be more practical improvements as either standalone projects or embedded within other operational improvements.

As part of the overall project development process, it is recommended that Project Study Reports (PSR) that are prepared for the recommended High Occupancy Vehicle (HOV) lane projects review the feasibility of reversible HOV lanes. This applies to projects that are identified in this Solano Highways Operations Study.

Figures E-1 to E-4 provides a graphical summary of the prioritized projects. Tables E-1 and E-2 provide a summary description of each of the projects and their order of magnitude costs under the horizon year 2015 and 2030, respectively.

In Figure E-2, as of this writing the truck climbing lane has been constructed, and the HOV on I-80 is currently under construction. In Figure E-3, the Year 2015 roadway network includes all of the programmed improvements as shown in Figure E-2. In Figure E-5, the Year 2030 roadway network includes all of the programmed improvements as shown in Figure E-2.

# SOLANO HIGHWAY OPERATIONS STUDY - EXECUTIVE SUMMARY

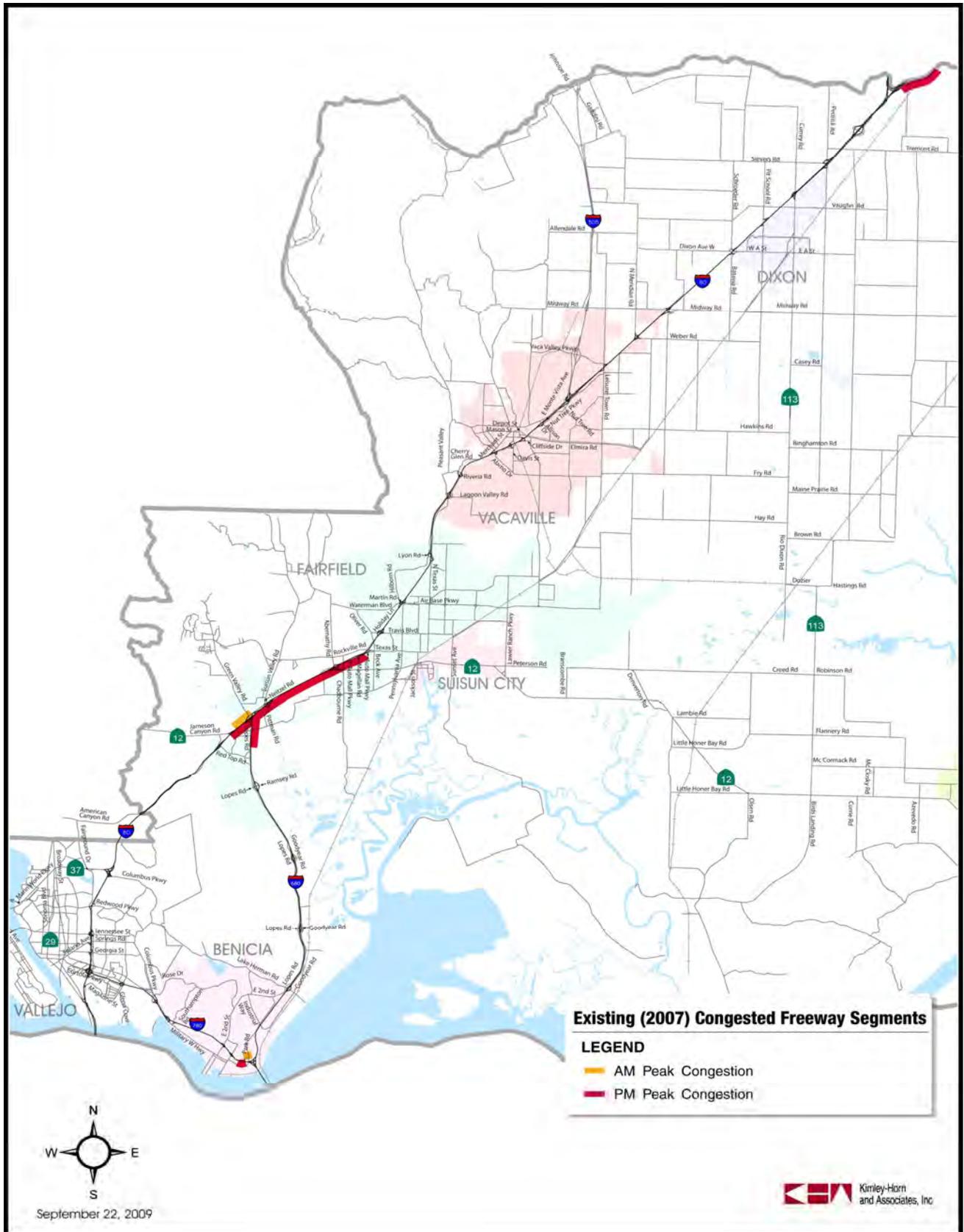


Figure E-1: Existing Congestion

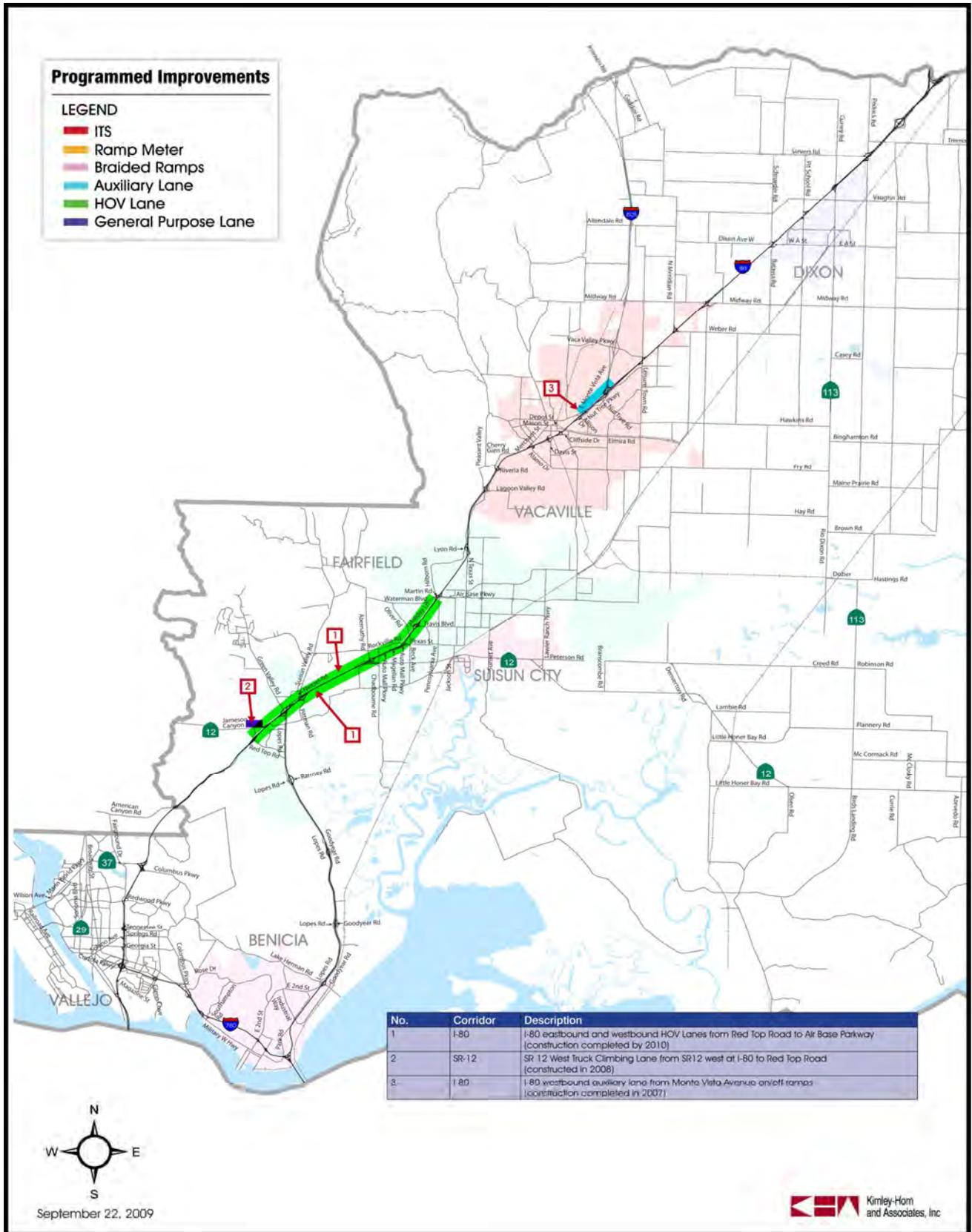


Figure E-2: Programmed Improvements

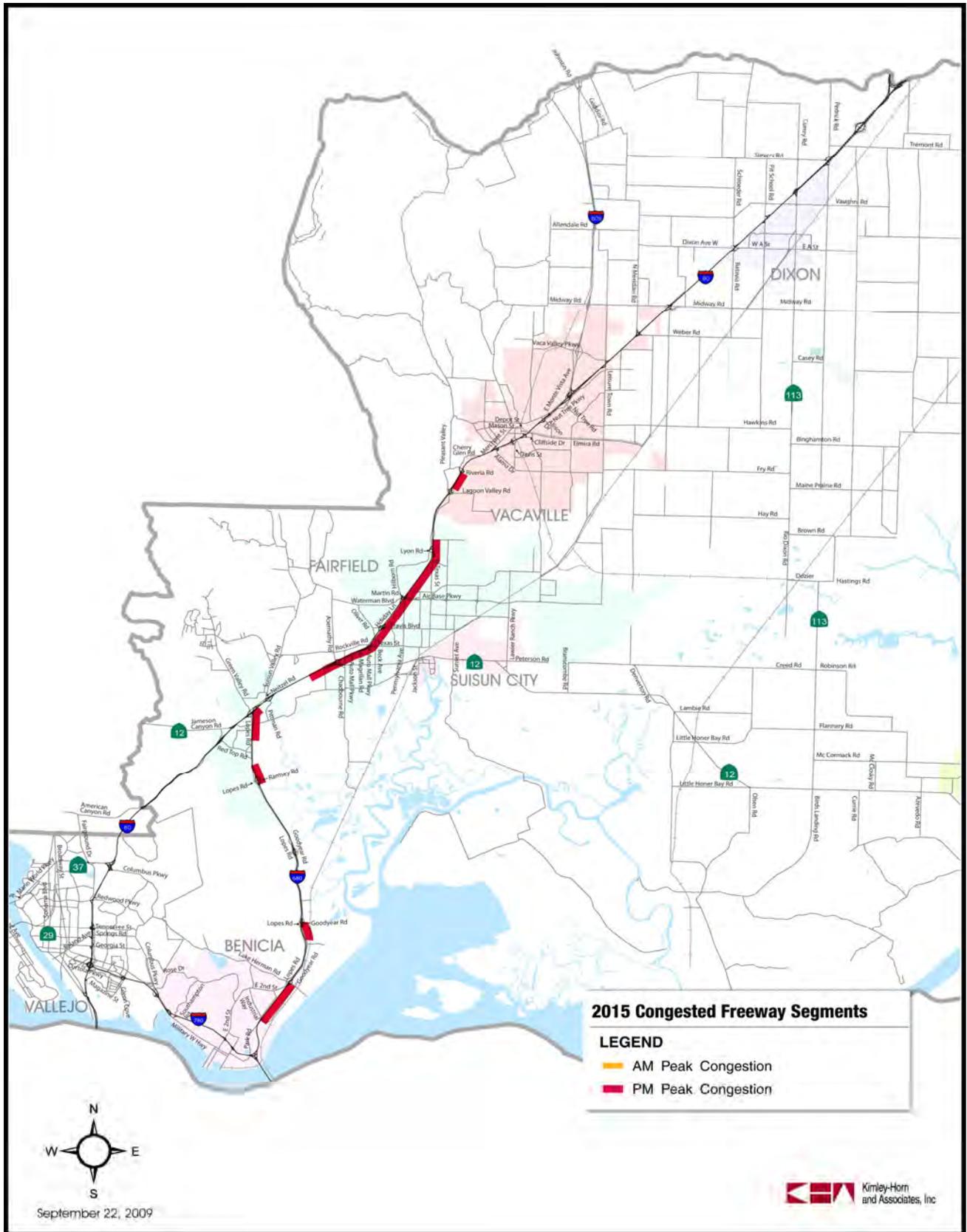


Figure E-3: Year 2015 Congestion

# SOLANO HIGHWAYS OPERATIONS STUDY - EXECUTIVE SUMMARY

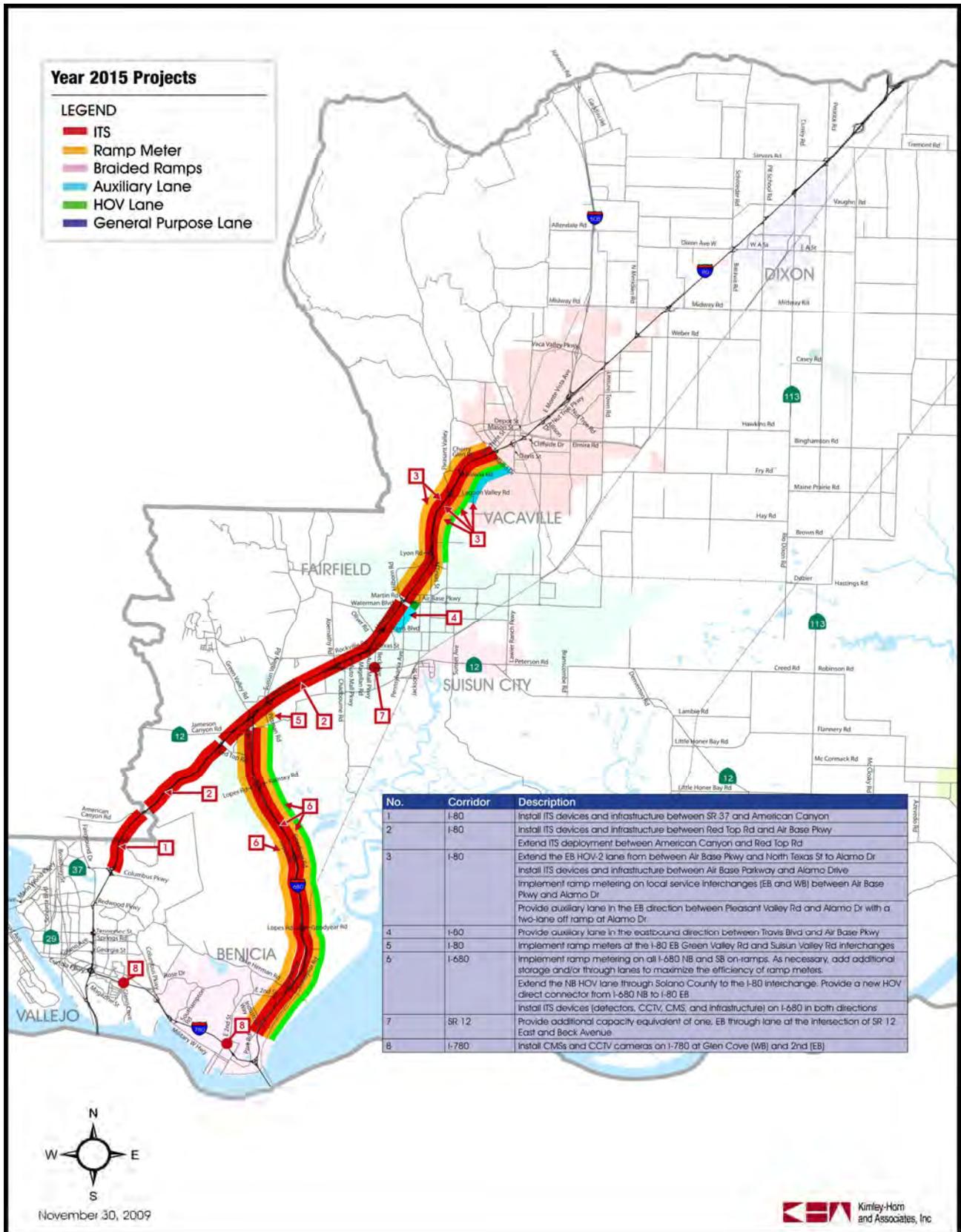


Figure E-4: Year 2015 Proposed Improvements

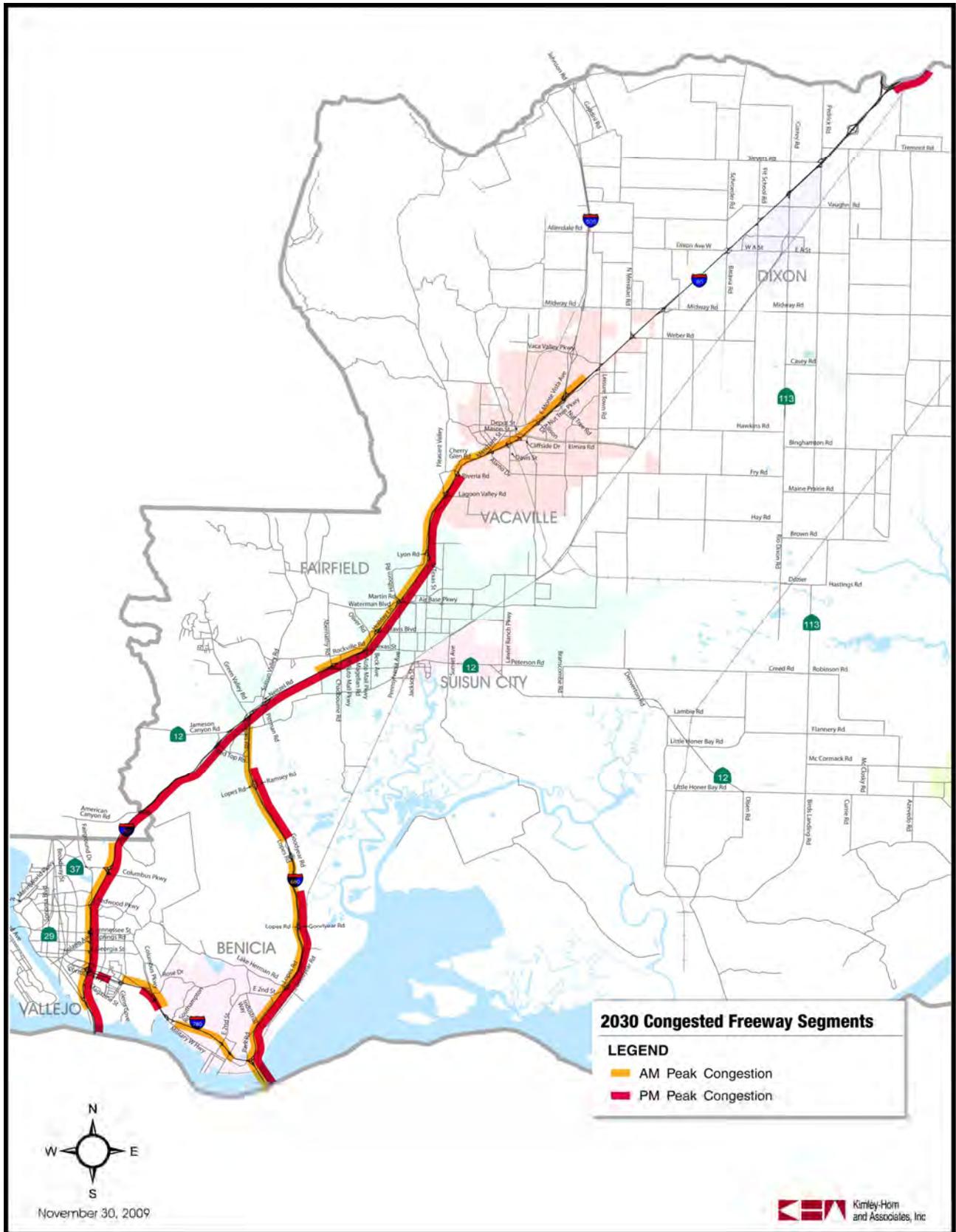


Figure E-5: Year 2030 Congestion

# SOLANO HIGHWAYS OPERATIONS STUDY - EXECUTIVE SUMMARY

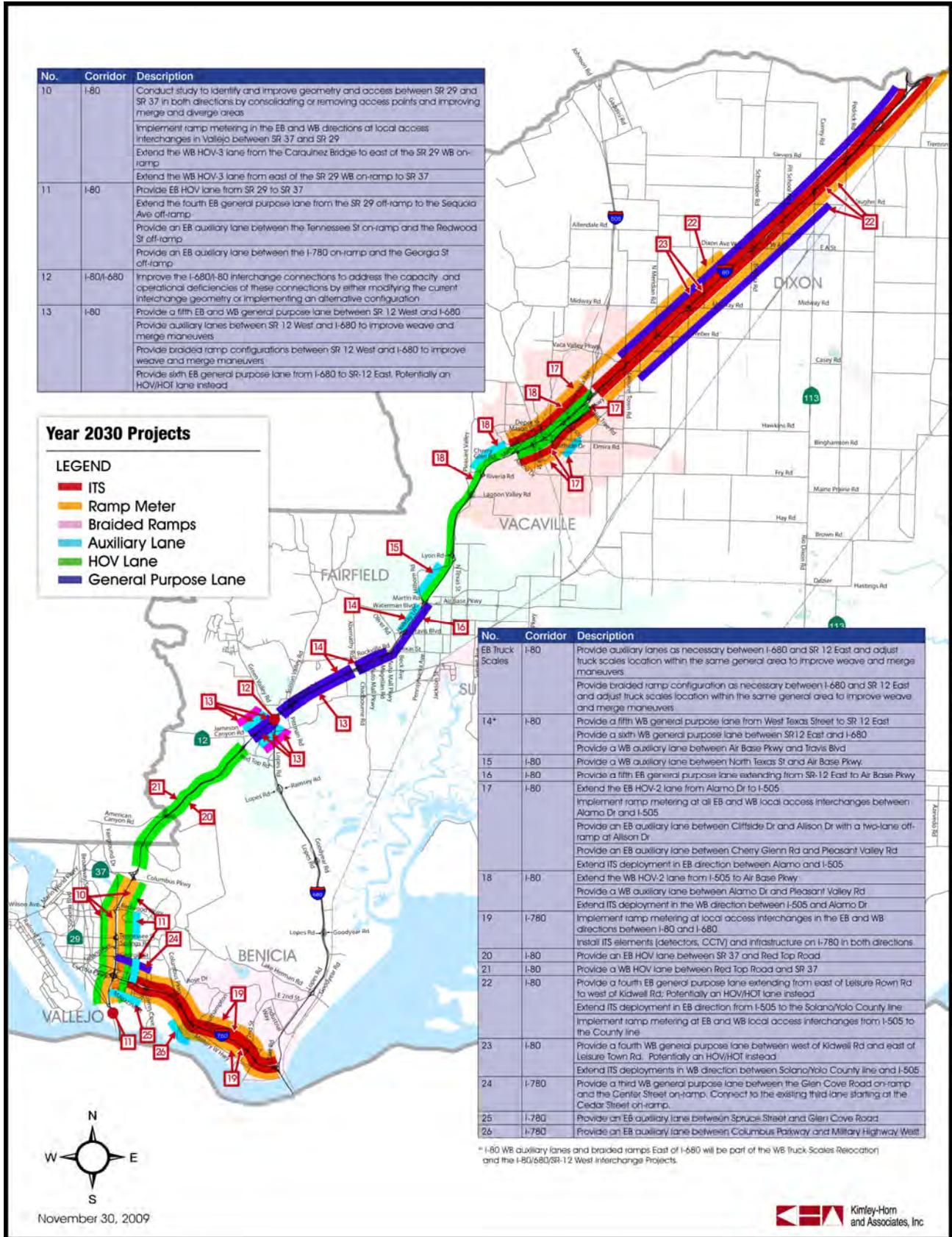


Figure E-6: Year 2030 Proposed Improvements

SOLANO HIGHWAYS OPERATIONS STUDY - EXECUTIVE SUMMARY

Table E-1: Year 2015 Prioritization of Projects			
Priority	Corridor	Description	Order of Magnitude Cost
1	I-80	Install ITS devices and infrastructure between SR 37 and American Canyon Road. This will consist of CCTV cameras, changeable message signs and communications infrastructure.	\$6,500,000
2	I-80	Install ITS gap between Red Top Road and Air Base Parkway. This will consist of CCTV cameras, Highway Advisory Radio and communications infrastructure.	\$6,000,000
3	I-80	Extend the EB HOV-2 lane from between Air Base Parkway and North Texas Street to Alamo Drive.	\$19,000,000
		Install ITS devices and infrastructure between Air Base Parkway and Alamo Drive	\$7,800,000
		Implement ramp metering on local service interchanges (EB and WB) between Air Base Parkway and Alamo Drive. This will include four interchanges with eight on-ramps.	\$2,200,000
		Provide an EB auxiliary lane between Pleasant Valley Road and Alamo Drive. Provide a two-lane off-ramp at Alamo Drive. This includes the EB auxiliary lane between Cherry Glen Road and Pleasant Valley Road.	\$7,200,000
		Subtotal No. 3:	\$36,200,000
4	I-80	Provide auxiliary lane in the EB direction between Travis Boulevard and Air Base Parkway. Install ITS devices and infrastructure.	\$18,000,000
5	I-80	Implement ramp meters at the I-80 EB Green Valley Road and Suisun Valley Road interchanges	\$550,000
6	I-680	Implement ramp metering on all I-680 NB and SB on-ramps. As necessary, add additional storage and/or through lanes to maximize the efficiency of ramp meters.	\$2,700,000
		Install ITS elements (detectors, CCTV, CMS & Infrastructure) on I-680 in both directions	\$9,200,000
		Extend the NB HOV lane through Solano County to the I-80 interchange. Provide a new HOV direct connector from I-680 NB to I-80 EB.	\$44,100,000
		Subtotal No. 6:	\$56,000,000
7	SR 12	Provide additional capacity equivalent of one, EB through lane at the intersection of SR 12 East and Beck Avenue	\$2,900,000
8	I-80	Extend ITS deployment between American Canyon and Red Top Road	\$3,600,000
9	I-780	Install CMS and CCTV cameras on I-780 at Glen Cove (WB) and 2nd Street (EB)	\$1,400,000
<b>Total Year 2015 Improvements:</b>			<b>\$131,150,000</b>

SOLANO HIGHWAYS OPERATIONS STUDY - EXECUTIVE SUMMARY

Table E-2: Year 2030 Prioritization of Projects			
Priority	Corridor	Description	Order of Magnitude Cost
10	I-80	Conduct study to identify and improve geometry and access between SR 29 and SR 37 in both directions by consolidating or removing access points and improving merge and diverge areas.	\$500,000
		Implement ramp metering in the EB and WB directions at local access interchanges in Vallejo between SR 37 and SR 29	\$3,500,000
		Extend the WB HOV-3 lane from the Carquinez Bridge to east of the SR 29 WB on-ramp	\$3,800,000
		Extend the westbound HOV-3 lane from east of the SR 29 westbound on-ramp to SR 37	\$14,900,000
		Subtotal No. 10:	\$22,700,000
11	I-80	Provide an EB HOV lane from SR 29 to SR 37	\$15,200,000
		Extend the fourth EB general purpose lane from the SR 29 off-ramp to the Sequoia Avenue off-ramp	\$3,000,000
		Provide an EB auxiliary lane between the Tennessee Street on-ramp and the Redwood Street off-ramp	\$13,800,000
		Provide an EB auxiliary lane between the I-780 on-ramp and the Georgia Street off-ramp	\$9,200,000
		Subtotal No. 11:	\$41,200,000
12	I-80/I-680	Improve the I-680/I-80 interchange connections to address the capacity and operational deficiencies of these connections by either modifying the current interchange geometry or implementing an alternative configuration	\$100M (allocated)
13	I-80	Provide a fifth EB and WB general purpose lane between SR 12 West and I-680.	\$23,000,000
		Provide WB auxiliary lanes as necessary between SR 12 West and I-680 to improve weave and merge maneuvers	\$2,600,000
		Provide WB braided ramp configurations as necessary between SR 12 West and I-680 to improve weave and merge maneuvers	\$4,200,000
		Provide sixth EB general purpose lane from I-680 to SR 12 East. <i>Potentially an HOV/HOT lane instead.</i>	\$36,800,000
		Subtotal No. 13:	\$66,600,000
EB Truck Scales	I-80	Provide EB auxiliary lanes as necessary between I-680 and SR 12 East and adjust truck scales location within the same general area to improve weave and merge maneuvers	(Part of EB Truck Scales Project)
		Provide EB braided ramp configuration as necessary between I-680 and SR 12 East and adjust truck scales location within the same general area to improve weave and merge maneuvers	(Part of EB Truck Scales Project)

SOLANO HIGHWAYS OPERATIONS STUDY - EXECUTIVE SUMMARY

Table E-2: Year 2030 Prioritization of Projects			
Priority	Corridor	Description	Order of Magnitude Cost
14	I-80	Provide a fifth WB general purpose lane from West Texas Street to SR 12 East	\$9,000,000
		Provide a sixth WB general purpose lane from SR 12 East to I-680	\$11,500,000
		Provide a WB auxiliary lane between Air Base Parkway and Travis Boulevard	\$12,000,000
		Subtotal No. 14:	\$32,500,000
15	I-80	Provide a WB auxiliary lane between North Texas Street and Air Base Parkway.	\$20,000,000
16	I-80	Provide a fifth EB general purpose lane extending from SR 12 East to Air Base Parkway	\$40,300,000
17	I-80	Extend the EB HOV-2 lane from Alamo Drive to I-505	\$19,200,000
		Implement ramp metering at all EB and WB local access interchanges between Alamo Drive and I-505	\$2,800,000
		Provide an EB auxiliary lane between Cliffside Drive and Allison Drive with a two-lane off-ramp at Allison Drive	\$3,500,000
		Provide an EB auxiliary lane between Cherry Glenn Road and Pleasant Valley Road	\$9,200,000
		Extend ITS in EB direction between Alamo Drive and I-505	\$2,300,000
		Subtotal No. 17:	\$37,000,000
18	I-80	Extend the WB HOV-2 lane from I-505 to Air Base Parkway	\$32,800,000
		Provide a WB auxiliary lane between Alamo Drive and Pleasant Valley Road	\$4,400,000
		Extend ITS in the WB direction between I-505 and Alamo Drive	\$2,000,000
		Subtotal No. 18:	\$39,200,000
19	I-780	Implement ramp metering at local access interchanges in the EB and WB directions between I-80 and I-680	\$4,400,000
		Install ITS elements (detectors, CCTV and infrastructure) on I-780 in both directions	\$6,700,000
		Subtotal No. 19:	\$11,100,000
20	I-80	Provide an EB HOV lane between SR 37 and Red Top Road	\$36,000,000
21	I-80	Provide a WB HOV lane between Red Top Road and SR 37	\$36,000,000
22	I-80	Provide a fourth EB general purpose lane extending from east of Leisure Town Road to west of Kidwell Road. <i>Potentially an HOV/HOT lane instead.</i>	\$78,000,000
		Extend ITS in EB direction from I-505 to the Solano County line	\$8,100,000
		Implement ramp metering at EB and WB local access interchanges from I-505 to the County line	\$4,700,000
		Subtotal No. 22:	\$90,800,000

Table E-2: Year 2030 Prioritization of Projects			
Priority	Corridor	Description	Order of Magnitude Cost
23	I-80	Provide a fourth WB general purpose lane between west of Kidwell Road and east of Leisure Town Road. <i>Potentially an HOV/HOT lane instead.</i>	\$132,300,000
		Extend ITS in WB direction between Solano/Yolo County line and I-505	\$8,000,000
		Subtotal No. 23:	
24	I-780	Provide a third WB general purpose lane between the Glen Cove Road on-ramp and the Cedar Street on-ramp. Connect to the existing third lane starting at the Cedar Street on-ramp.	\$4,100,000
25	I-780	Provide an EB auxiliary lane between Spruce Street and Glen Cove Road	\$2,900,000
26	I-780	Provide an EB auxiliary lane between Columbus Parkway and Military Highway West	\$2,900,000
<b>Total Year 2030 Improvements:</b>			<b>\$623,600,000</b>

### PROJECT IDENTIFICATION AND PRIORITIZATION PROCESS

The project identification and prioritization process involved packaging the list of strategy packages identified in the FPI studies and the Corridor Level ITS Architecture and Implementation Plan, developing specific projects and organizing them in priority order. The purpose of developing the specific projects is to combine strategies as appropriate in order to realize the potential synergies when constructing the projects. In addition, combining or bundling the packages into discrete projects will enable each project to be funded and constructed separately. For example, ITS strategies were combined with operational improvement strategies where practical. One such case is where the installation of an auxiliary lane lends itself well to the installation of ITS devices including communications infrastructure, CCTV cameras and vehicle detection.

System management strategies in the short-term scenarios (Year 2015) were left as individual projects. Under these cases, keeping these strategies as individual projects provides the ability to prioritize them in earlier years instead of combining them with an operational improvement that is slated for installation over the long-term (Year 2030).

Once the project bundling was developed, each project was prioritized using several factors including:

- Impact on reducing congestion;
- Cost;
- Balancing corridor improvements; and
- Overall Feasibility

Each project’s impact on reducing congestion during the horizon year forecasts was documented in the FPI studies. Thus, the prioritization of the projects focused more on the timing and location of the projects within those horizon years.

The prioritization for the most part followed the order of the improvement packages identified in the FPI studies. Where there were deviations, these included ranking projects such that other freeway corridors would receive improvements in order to balance the order of the improvements (e.g., Project #6 versus Project #8). Additionally, ITS improvements were combined with other FPI packages (e.g., Projects #17 and #18) in order to realize synergies when constructing the projects. Other HOV gap filling projects were ranked lower except in those cases where they would provide a level of continuity (e.g., Project #11).

ITS coverage alone does not relieve congestion. Thus, the project identification and prioritization process attempted to combine ITS elements with operational improvements. The prioritization also attempted to order the installation of the projects such that meaningful segments of the freeways are covered with successive projects. Additionally, the order of improvements along the different freeway corridors was prioritized such that a balance of improvements could be maintained across the three corridors.

The estimates of costs of each project and subset of each project was based on a high level estimate of quantities for each type of project. The items for the development of the 'Order of Magnitude' cost estimates included, where appropriate, widening, roadway and pavement sections, median and bridge modifications, overhead signs, communications infrastructure, lighting, pavement delineation, CCTV cameras, changeable message signs, and ramp meters. Each project cost includes allowances for project management, engineering, environmental, traffic control and a contingency.

### **Year 2015**

The installation of system management strategies for the short-term was deemed the highest priority for the corridors, particularly for I-80. This was done, as system management are the most cost effective strategies for the corridor under the Year 2015 – this is supported by the mitigation strategies listed in the I-80 FPI report. These types of strategies reduce the amount of non-recurrent congestion as they provide the tools and means to identify, respond to and clear incidents in a timely manner before the incident causes congestion.

The operational improvements for the short term (2015) focused on relieving congestion in the Fairfield and Vacaville areas along I-80. Additionally, the forecast of a series of congested locations and bottlenecks on I-680 in the northbound direction resulted in the need for operational improvements. The I-80 operational improvements ranked higher than the I-680 improvements due to the levels of congestion and cost. With the goal of maintaining a balance between corridors in terms of the order of project priorities, improvements along I-680 (Project #6) were ranked slightly higher than one system management strategy along I-80 (Project #8).

Under Projects #3 and #6, ITS improvements were combined with other operational improvements including HOV lanes, auxiliary lanes and ramp metering. Additionally, ramp metering implementations were packaged such that both directions at each interchange would be combined. As an example, I-680 (Project #6) includes SB ramp metering, even though the implementation of ramp metering along I-680 in the SB direction is not recommended until Year 2030 in the FPI.

The other projects in Year 2015 consisted of standalone ITS improvements along I-80 and I-780, and improvements at the intersection of SR12 East and Beck Avenue. For I-780, the installation of CMS and CCTV cameras at two locations near I-80 and I-680 are intended to provide some form of system

management coverage in the short-term until such time as ITS improvements can be combined with other operational improvements.

For Year 2015, nine projects are recommended for deployment totaling approximately \$131,000,000. Under this year, full ITS coverage along I-680 in the County and on I-80 from the Carquinez bridge to Alamo Drive would be achieved.

### **Year 2030**

Following the same process as Year 2015, the projects identified for Year 2030 were derived from bundling the improvement packages from the FPI and including system management strategies. As an example, Project #17 includes HOV lanes, auxiliary lanes, and ramp metering taken from the I-80 FPI Package F plus the implementation of ITS improvements.

For ramp metering, the projects were bundled such that both directions of the freeway corridors would implement ramp metering. Using Project #17 as an example, ramp metering in the WB direction was added to this project even though it was not part of FPI Package F.

The prioritization of projects was generally divided into segments along the freeway corridors. The areas through Vallejo were ranked the highest followed by areas through Fairfield and Vacaville (I-80 and I-680), through Benicia along I-780 and finally along I-80 to the county line.

The operational improvements along I-80 through Vallejo (Projects #10 and #11) were prioritized higher partly to balance the set of improvements along I-80 to the west along with the cost and amount of congestion forecast for this segment. Additionally, the corridor has been studied at length and based on the level of planning, it is anticipated that this segment may be the most prepared for the installation of the operational improvements. There is already ITS coverage including CCTV cameras, CMS and vehicle detection along this segment. The projects include HOV lanes as part of the project bundle mainly for continuity and synergy of projects, e.g., since auxiliary lanes and ramp metering are recommended, adding in the EB HOV lane (Project #11) would provide continuity of the HOV lane from the Carquinez Bridge.

The improvements at the I-80/680/SR12 interchange (Project #12), while prioritized lower than the I-80 segment through Vallejo, are currently being analyzed and developed, and the overall cost is anticipated to be significantly higher in comparison.

The improvements in the vicinity between SR 12 West and SR 12 East (Projects #13 and #14) are forecast to have significant congestion such that additional general purpose and auxiliary lanes are needed in both directions of I-80. This influenced the high ranking of projects along this segment. The recommendations from the I-80 FPI were modified based on direction in order to account for the segment of I-80 EB that is currently being designed as part of the EB truck scales relocation project. Under this project, auxiliary lanes and braided ramps will be included. However, a sixth EB general purpose lane is not part of the current design.

The operational improvements and ITS installations along I-80, east of Alamo Drive (Projects #17 and #18), round out the recommended priority projects. The HOV lanes in both directions along I-80 between SR 37 and Red Top Road were identified as gap filling projects and thus were prioritized accordingly (Projects #20 and #21).

Along I-780, the installation of ramp metering (Project #19) were ranked lower in priority as the levels of congestion forecast along this corridor are substantially less than the other corridors. However, this project, which includes full ITS coverage was prioritized ahead of the HOV gap filling projects along I-80 (Projects #20 and #21). A third general purpose lane on I-780 between Glen Cove and Cedar (Project #24) and auxiliary lanes along two segments (Projects #25 and #26) round out the list of projects.

For Year 2030, 17 projects are recommended for deployment totaling approximately \$623,000,000. Under this year, full ITS coverage would be achieved along all three freeway corridors in the County.

### **HOV LANE IMPLEMENTATION**

The implementation of HOV (HOV-2 and HOV-3) lanes along the three corridors will take place in phases over the short and long term. The first HOV-2 lane implementation will open in 2009 between Red Top Road and Air Base Parkway. Figure E-7 illustrates the planned implementation of HOV lanes by corridor segment, horizon year and occupancy.

### **HIGHWAY PROJECT PLANNING**

As highway projects are identified in the Solano County area, it is recommended that these future highway planning efforts take into consideration all modes of travel along the study corridors, as well as the impacts of rising sea level, as required by State Law.

# SOLANO HIGHWAY OPERATIONS STUDY - EXECUTIVE SUMMARY

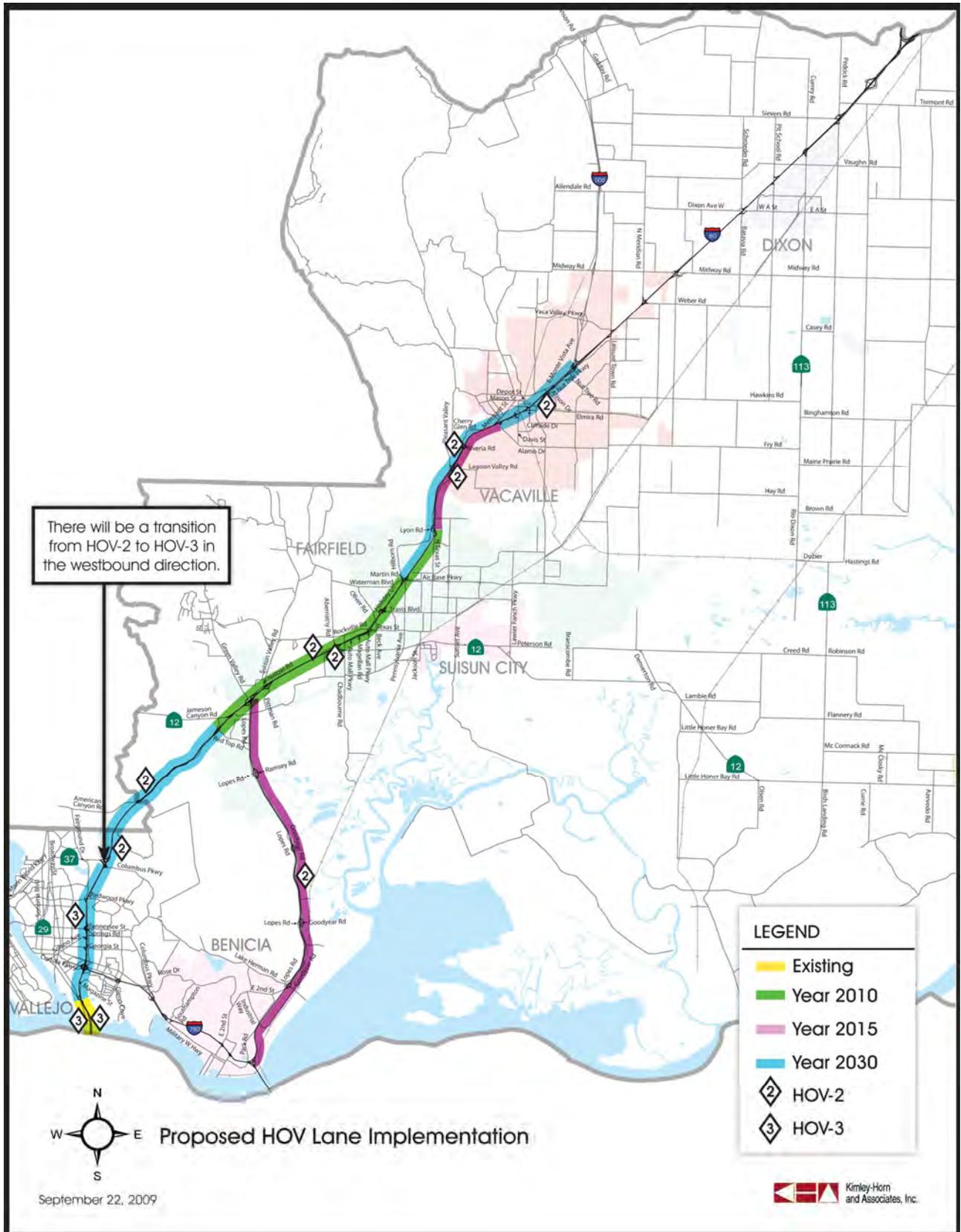


Figure E-7: HOV Lane Implementation

## **VISUAL DESIGN GUIDELINES**

The Visual Design Guidelines are intended as a guide for use by the Cities along the corridor and engineering/design consultants responsible for preparing visual and aesthetic treatments along the corridors. The guidelines provide direction to design efforts so that the corridors maintain a strong sense of identity and character throughout phased development of construction projects. The guidelines are not intended as specifications therefore state and local codes and standards shall be followed by the designers, however, if a standard is specified in this document, it shall prevail.

Goals are broad recommendations that form the baseline for the design theme. Objectives refine the intent of goals by making specific recommendations. Together they help guide the design effort. The goals for the I-80/680/780 Corridor Design are:

- Develop a cohesive landscape and hardscape program for the entire project area
- Develop a gateway, landscape and hardscape palette that is unique and expresses the identity of each city, yet fits into the overall program
- Create a landscape and hardscape program using sustainable, environmentally friendly and maintenance friendly plants and materials

## **Gateways**

The design of the landscape and other design elements will create a continuous impression throughout the I-80/680/780 Corridors. Again, repetition of colors, shapes, materials, textures, key plants and site improvements within each theme will create accents at gateway locations while relating to each other to create a cohesive impression along the interstates. Each gateway location highlights a city's entry point and unique plantings are used to accent main points of interest in each city along the interstate. In many locations, a sign accompanies the unique planting scheme.



## Design Themes

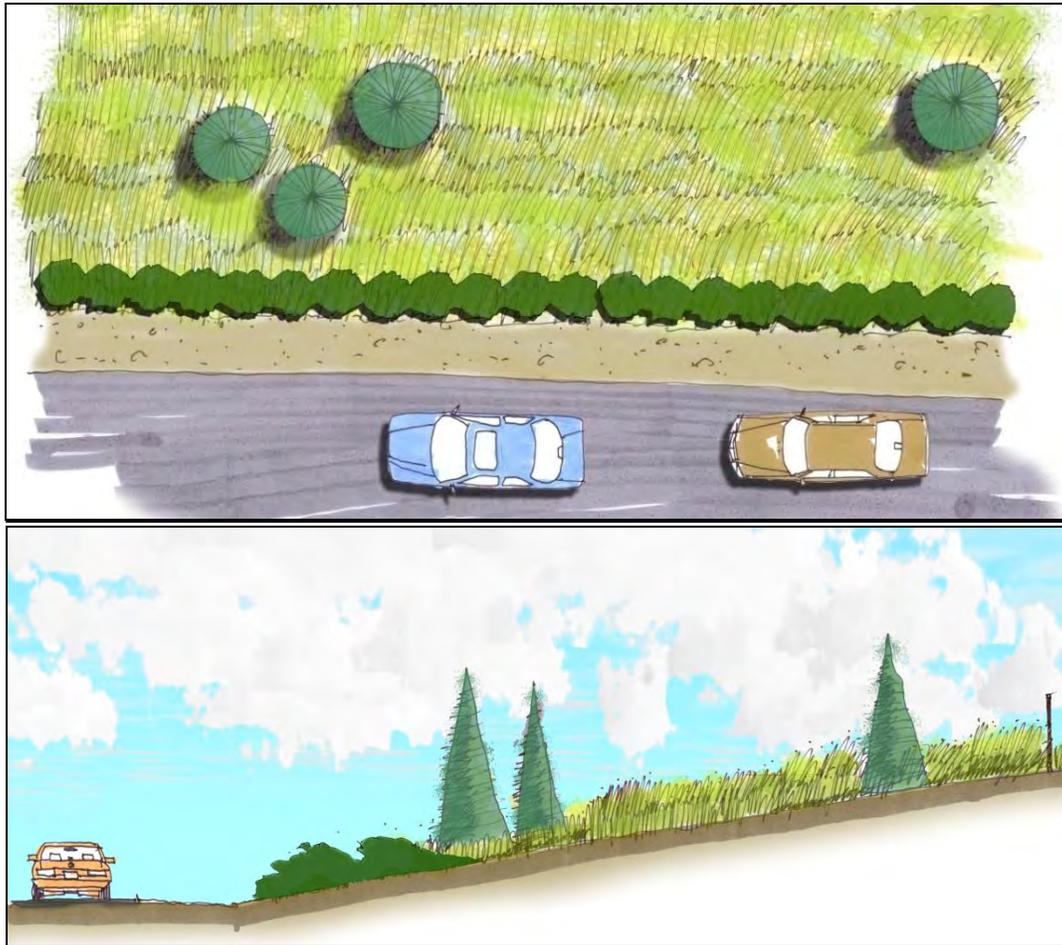
The design theme for the I-80/680/780 Corridors emphasizes strong planting schemes along the edges of the travel way as a unifying element and accents entry points to each City with gateway signage, overpass signage and/or special planting. The corridors were divided into three landscape themes: Nautical, Agricultural and Naturalistic. Within each area and jurisdiction, gateway locations have been identified along with identity colors for each jurisdiction that will be applied to site improvements.

### Nautical Theme

The nautical theme is inspired by the ocean and the patterns ships make in the water. Undulating grasses and drifts of soft branched shrubs represent ocean waves. The 'waves' are interrupted by triangular conifer trees resembling the pointed sails of boats and ships. The grasses and shrubs are slightly monochromatic in color and change with the season from grey, yellow and/or green or by fall

or flower color. The planting scheme will be complimented by gateway signage and treatments that reflect the rich nautical history of both Vallejo, Benicia and Solano County.

The nautical theme is carried through the cities of Vallejo and Benicia. Accent bands or designs illustrate the City's identity color.

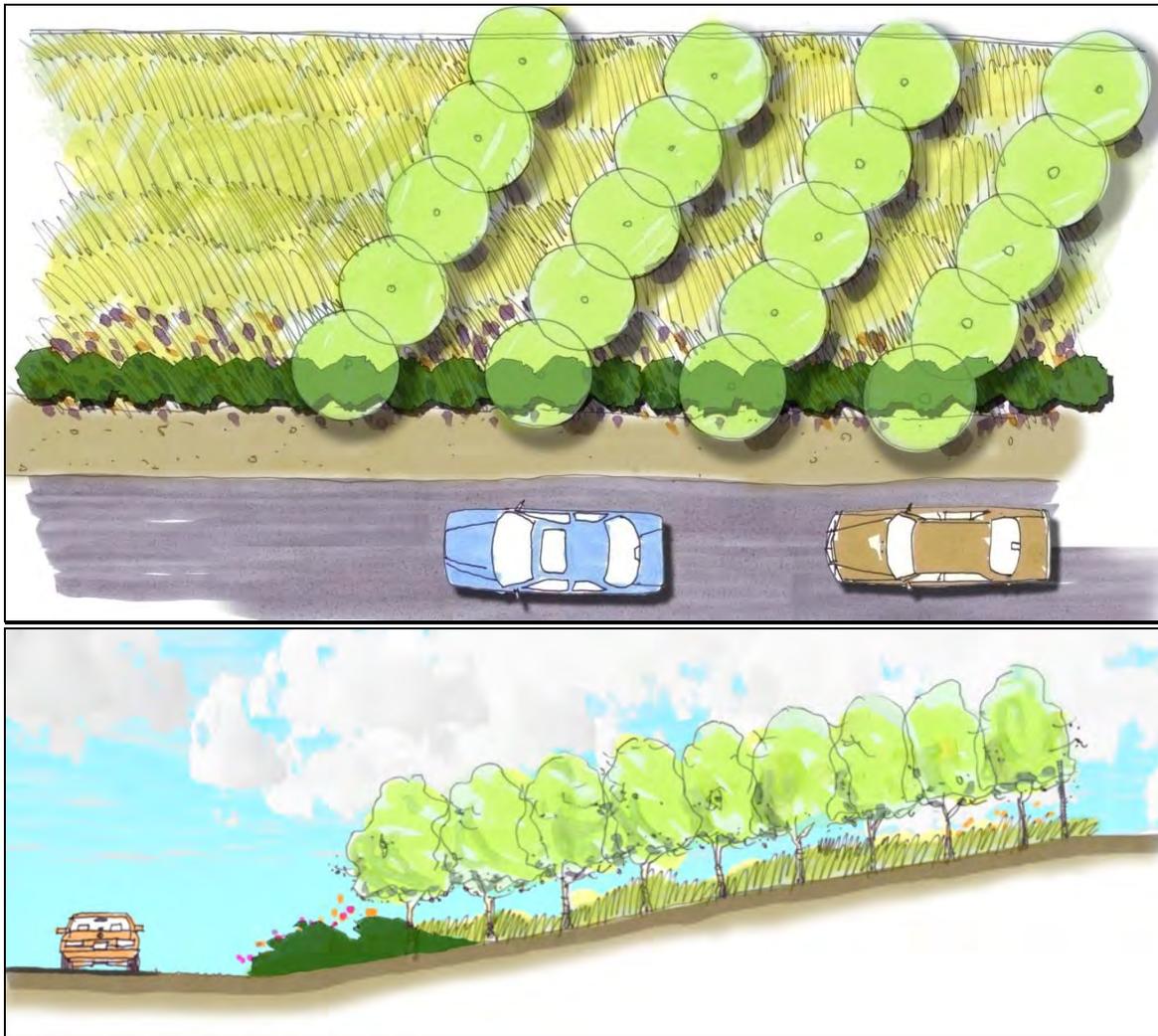


**Nautical Theme**

### Agricultural Theme

The agricultural theme is inspired by the fields of crops and orchards along the Solano corridor. An orchard effect is represented using multiple lines of colorful hedges and flowering trees. Linear patterns of plantings are meant to not only mimic the nearby fruit and vegetable fields, but the tree rows also act as a wind break and visual barrier. The majority of the ground cover planting is of a neutral palette. In specific locations throughout the corridor, accent plantings in a linear pattern with seasonal color can be applied. The planting scheme will be complimented by gateway signage and treatments that reflect the agricultural roots in Dixon, Vacaville, Fairfield and Solano County.

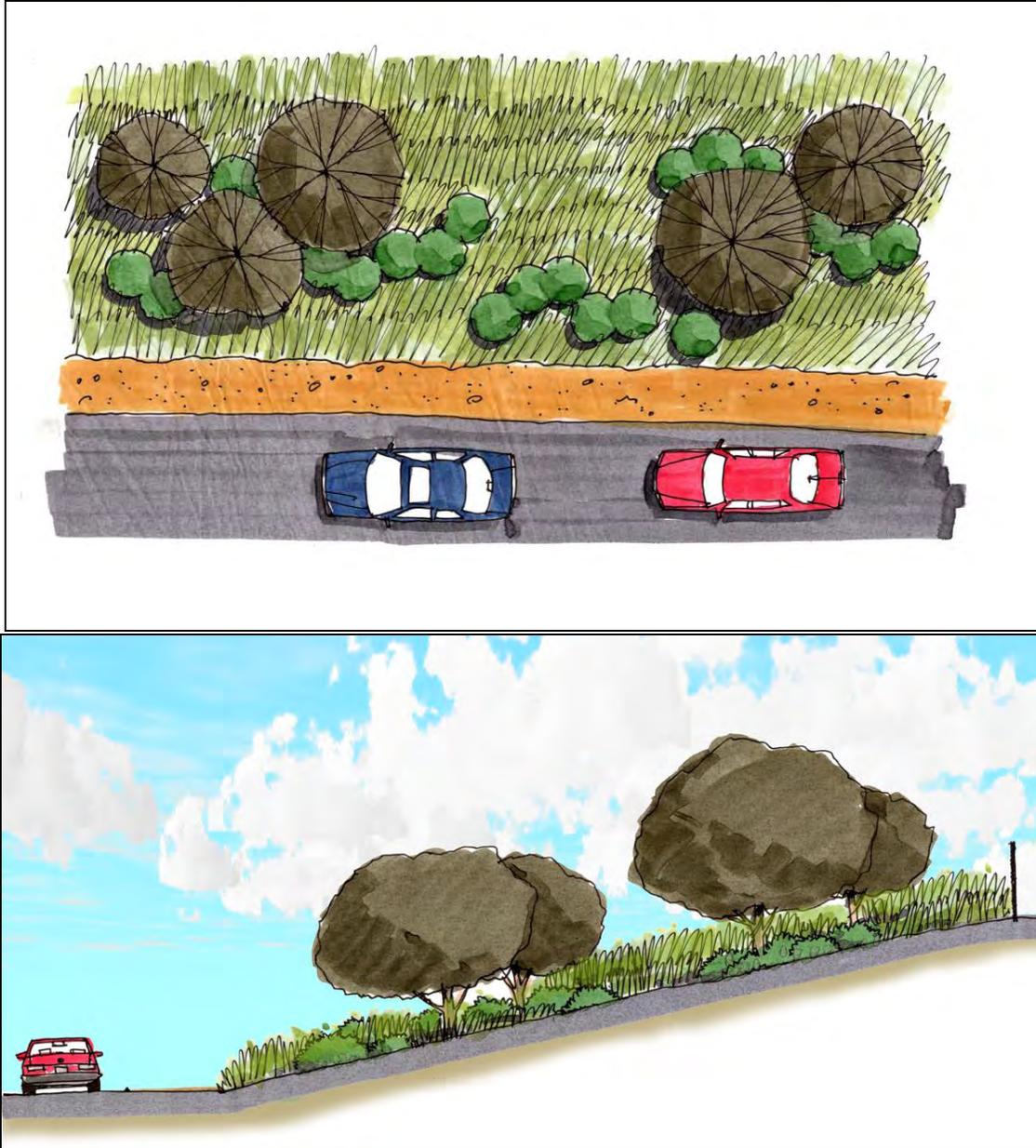
The agricultural theme is carried through the cities of Dixon and Vacaville. The agricultural themed gateways have a similar layout to the nautical themed gateways but differ due to variation in the planting palette and pattern.



**Agricultural Theme**

### Naturalistic Theme

The naturalistic planting scheme is inspired by the native hillside landscape along the Solano corridor. A naturalistic arrangement of planting brings the hillside aesthetic to the road edge using native trees, shrubs, ground covers, wildflowers and grasses. The majority of the ground cover planting is of a neutral palette of drifts of native plants. The naturalistic theme is carried throughout unincorporated areas and in between the gateway landscaping locations in all jurisdictions along the corridors.



**Naturalistic Theme**

### Solano County and City of Fairfield Gateways

The Solano County and Fairfield gateway are a combination of the nautical and agricultural themes. The Solano County gateway uses the stone wall, agricultural orchard planting and the nautical post with all the jurisdictional colors on it and metal cut out letters. The City of Fairfield gateway has an aeronautical theme with agricultural hedgerows planted in association with the gateway feature.

## Design Elements

Several elements occur within the I-80/680/780 Corridor that contribute to the overall themes and create a unified image. These elements become a readable visual sequence along the corridor and help create a coherent image and identity for motorists.

This section outlines the recommended treatment of each element to be incorporated into the design of the I-80/680/780 Corridor. Consultant engineers and designers responsible for design and construction documents for the corridor should consult these guidelines for the recommended treatment of each element. A few of the design elements include:

- Retaining Walls
- Sound Walls
- Underpass Treatments and Abutments
- Structure Treatments – Supports and Railings
- Highway Signage Support Structure

### Retaining Walls

Retaining walls are used to minimize grade or elevation changes that occur along the roadway. There will be two options for retaining walls:

- Cast in place concrete with typical panel of a fractured fin texture with a recessed accent band at the top of the wall or minimal design that is reflective of a community element such as the wall in Benicia
- Custom stamped design in retaining wall such as the walls in Vacaville

### Sound Walls

The sound walls are grey with split face block face and cap accented with two rows of blocks that protrude from the face of the wall every other block to make a dashed pattern at the top of the wall in the third and fifth row from the top. There is a smooth face block band below the cap block and each jurisdiction may paint the surface with their signature color to identify the area as being part of the City.

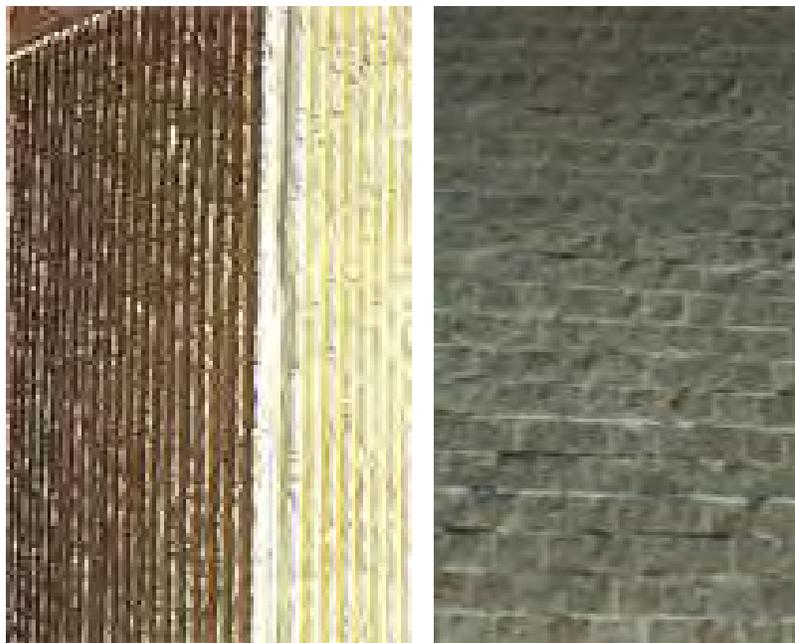


**Sound Wall Treatment**

### Underpass Treatments

The split face texture will be surrounded by smooth concrete banding on all sides. Alternate treatment for the sloped paving may include artistic relief sculptures or designs for jurisdictional identity and enhancement. This would be done through special agreements with Caltrans.

The bridge abutment of the underpass when new will have the 'fractured fin' texture or the split face texture to match the retaining and sound walls. The fractured fin pattern is a standard Caltrans with a vertical pattern with  $\frac{3}{4}$ " relief. The color will match the sound walls and will be surrounded by smooth bands of concrete on all sides.



**Fractured Fin and Split Face Concrete Underpass Treatments**

## Structure Treatments – Supports and Railings

Consistent treatment of overpasses, underpasses and crossings reinforce the I-80/680/780 Corridor theme. Typical new structures should be the same and are natural colored concrete with split face or fractured fin accents consistent with the retaining and sound wall treatments, which further strengthens the relationship between individual elements and the overall themes. The fractured fin pattern is a standard vertical ribbed pattern with  $\frac{3}{4}$ " relief. All structures shall have a smooth accent band running the length of the bridge parapet to allow for the application of identity colors. The pier column is to have rounded edges with an inset fractured fin accent band in the centre of the column on both sides.



**Bridge Structure Treatment**

## Highway Signage Support Structure

Highway signage support structures hold directional and informational signage pertinent to the driver. The recommended structure is the "arc type" and should be used for new and replacement structures as improvements occur so that within 15-20 years signage structures will be unified along the study corridor.



**Freeway Signage Support Structure Treatment**

## PUBLIC OUTREACH STRATEGIES

### Information/Education Tools

To provide a rich educational and informative reference on the various operational improvements that will be considered, an "operations improvement tool box" was developed. This toolbox provides a menu of operational improvements considered and/or recommended for the freeway corridors. In addition, fact sheets were developed for ITS management strategies that include a description of the improvement, a brief synopsis of the pros and cons, identification of the benefits, application of the improvement in other areas of California and the US with specific emphasis on areas similar to study area corridors.

### Toolbox

The toolbox is designed to be an interactive tool that works hand in hand with the fact sheets. The types of operational improvements that are part of the toolbox include:

#### OPERATIONAL IMPROVEMENTS

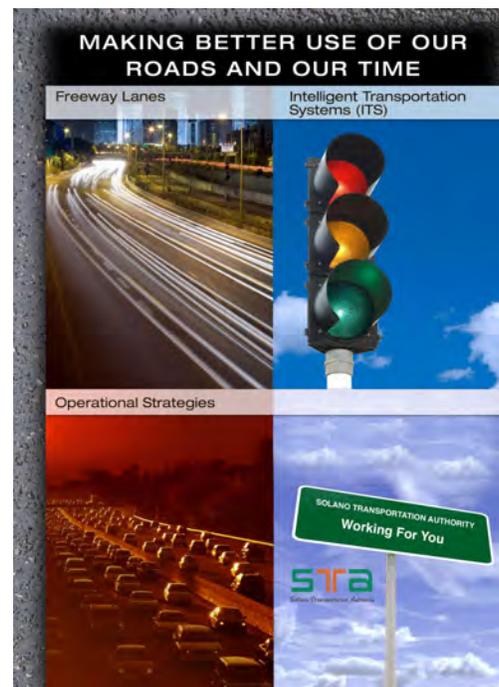
- HOV lanes
- Auxiliary lanes
- Truck climbing lane

#### INTELLIGENT TRANSPORTATION SYSTEMS (ITS)

- Ramp Meters
- Closed Circuit Television (CCTV) cameras
- Vehicle Detection Systems (VDS)
- Changeable Message Signs (CMS)
- Highway Advisory Radio (HAR)
- Communications Network

#### OPERATIONAL STRATEGIES

- Traffic Incident Management
- Emergency Management
- Active Traffic Management
- Diversion Management
- Lane Management
- Speed Harmonization – Variable Speed Limits
- Adaptive Ramp Metering
- Express Lanes (High Occupancy Toll or HOT Lanes)



The toolbox being an interactive tool will enable the STA to post it on the STA website and can also be provided to other agencies for posting on their websites and other public postings.

## Fact Sheets

The purpose of the fact sheets is to provide brief summary material on the key ITS strategies. The intended audience includes the public and other non-technical readers who want more information on what these types of system management strategies are. The fact sheets provide valuable information on what the Solano Transportation Authority can use in its system management set of strategies to manage congestion.

**Closed Circuit Television Cameras**

**FREQUENTLY ASKED QUESTIONS ABOUT CLOSED CIRCUIT TELEVISIONS CAMERAS (CCTV)**

**Specific Locations and Conditions**

Although there are currently over 500 CCTV cameras installed on the Bay Area freeway system, I-680 is the only freeway segment that has a substantial CCTV coverage in Solano County. I-80 has CCTV coverage from the Carquinez Bridge to SR 37.

**Cost**

CCTV cameras range from \$5,000 - \$15,000 each. The cost for purchase of the camera does not include the mounting of the device (i.e., concrete poles, light poles, etc.) or the communications. Mounting costs are based on whether the mounting option exists at the scene or if it has to be built. Communications costs depend on options available (i.e., microwave, hardwire, etc.). The total cost is substantially higher once these additional costs are added to the camera cost.

**Are the CCTV cameras recorded 24/7?**

Video images from the CCTV cameras are sent to the Oakland TMC where TMC operators and the California Highway Patrol have access to them 24 hours a day.

**Do the CCTV cameras record accidents and if so, how is the video used by Traffic Management Centers (TMCs)?**

Caltrans does not record or archive video images.

**Can CCTV cameras be used for "spying" on public forums or for recording vehicle speeds with license plates to assist citations to Re:NEEDs for speeding?**

CCTV cameras are pointed away from private residences. Speeds cannot be legally documented using CCTV cameras for enforcement purposes unless there are posted signs advising the public that the signal is posted as an "enforcement signal".

**What are the challenges to successfully implementing appropriate use of CCTV Cameras in the region?**

The use of fiber is the preferred communications medium along freeway segments primarily for the transport of video images from CCTV cameras to the TMC in Oakland because it has the greatest data carrying capacity and longest transmission distance. Fiber communications are a challenge because there is sparse fiber coverage of the freeways in the County, but most of the CCTV cameras are communicated with using either a leased ISDN or ADN line. Funding is the main challenge.

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