SCDA-107

Comprehensive Evaluation and Corridor Management Plan

November 2012

Caltrans

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Solano Transportation Authority
...working for you!

SR-12 Comprehensive Evaluation and Corridor Management Plan

November 2012

Prepared for:

California Department of Transportation

Metropolitan Transportation Commission

Sacramento Area Council of Governments

San Joaquin Council of Governments

Solano Transportation Authority

Prepared by:

ATKINS

* Final Comprehensive Evaluation and Corridor Management Plan, November 2012. This plan is subject to change with respect to findings and/or conclusions. It should also be noted that these findings and/or conclusions may not ever be programmed due to various reasons, including but not limited to, engineering judgment and/or budget constraints.

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ATKINS

Appreciation is extended to the groups and individuals listed below and to numerous other participants in the preparation of this report and the complex process of corridor management planning for SR-12.

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Metropolitan Transportation Commission

Sacramento Area Council of Governments

San Joaquin Council of Governments

Solano Transportation Authority

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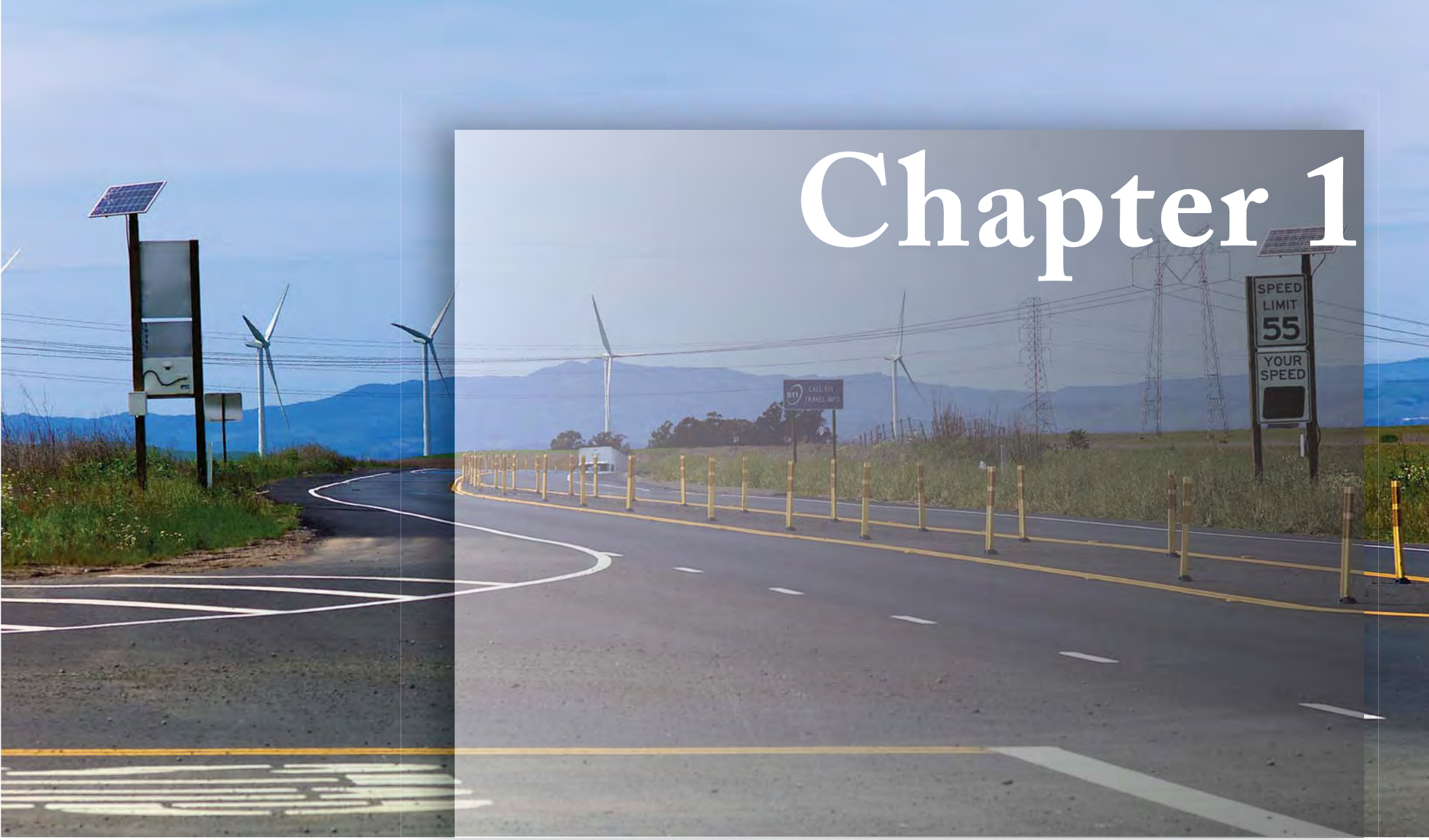
Acronyms

AB	Assembly Bill
BART	Bay Area Rapid Transit
Caltrans	California Department of Transportation
CDFG	California Department of Fish and Game
CESA	California Endangered Species Act
CHP	California Highway Patrol
CMA	Congestion Management Agency
CMAQ	Congestion Mitigation and Air Quality
CMP	Corridor Management Plan
CRHR	California Register of Historical Resources
CTC	California Transportation Commission
ESA	Environmental Site Assessment
FAST	Fairfield and Suisun Transit
FESA	Federal Endangered Species Act
FHWA	Federal Highway Administration
ITIP	Interregional Transportation Improvement Program
ITS	Intelligent Transportation Systems
LOS	Level of Service
MPO	Metropolitan Planning Organization
MTC	Metropolitan Transportation Commission
NRHP	National Register of Historic Places
OBAG	One Bay Area Grant
PA/ED	Project Approval/Environmental Document
PDT	Project Development Team
PID	Project Initiation Document
PQS	Professionally Qualified Staff
RTIP	Regional Transportation Improvement Program
RTPA	Regional Transportation Planning Agency
RWQCB	Regional Water Quality Control Board
SACOG	Sacramento Area Council of Governments
SCS	Sustainable Community Strategies
SCT/LINK	South County Transit
SHOPP	State Highway Operations and Protection Program
SJCOG	San Joaquin Council of Governments
STA	Solano Transportation Authority
STIP	State Transportation Improvement Program
STP	Surface Transportation Program
TAG	Technical Advisory Group
TE	Transportation Enhancement
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
VMT	Vehicle Miles of Travel



Chapter 1

Summary

1

SUMMARY

This report summarizes the evaluation conducted for SR-12 as it passes through the four counties of Napa, Solano, Sacramento and San Joaquin. This 55-mile segment of SR-12 is under the jurisdiction of three California Department of Transportation (Caltrans) Districts (4, 3, and 10); three Metropolitan Planning Organizations (MPOs): the Metropolitan Transportation Commission (MTC), the Sacramento Area Council of Governments (SACOG), and the San Joaquin Council of Governments (SJCOG). The corridor also lies within the jurisdiction of the Napa County Transportation and Planning Agency and the Solano Transportation Authority (STA).

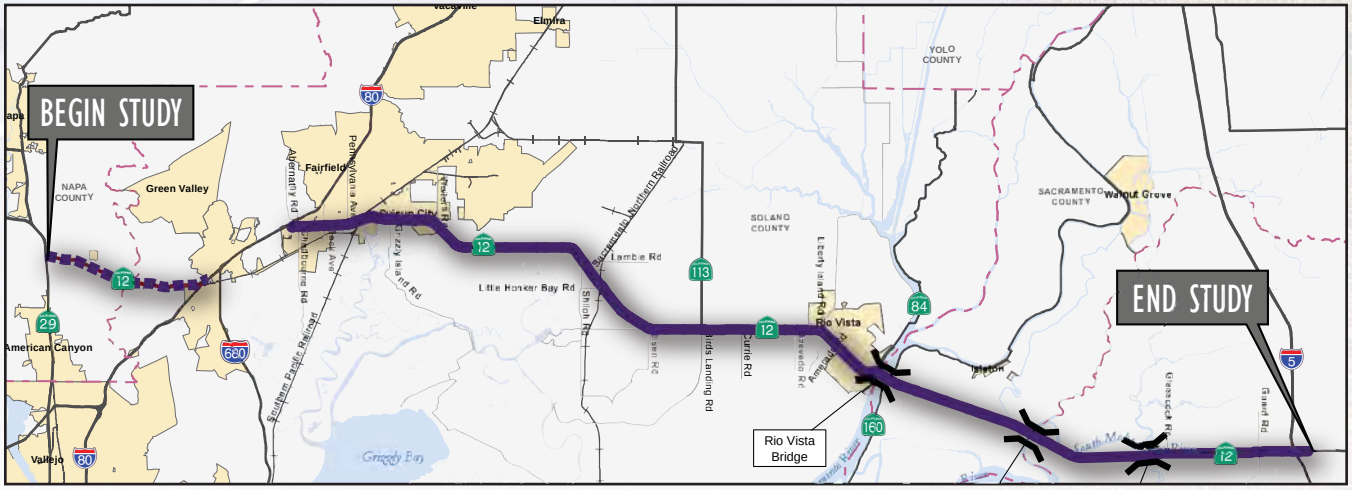
Along its east-west alignment, SR-12 connects I-5 to I-80 and supports the interregional travel needs of commuters, residents, freight companies, and recreational travelers -- many destined for the California Delta. The highway passes over two railroads and three navigable water bodies with movable bridges. The movable bridge over the Sacramento River at Rio Vista allows the passage of commercial shipping to the Port of West Sacramento.

The route passes through developed areas including Suisun City, Fairfield and Rio Vista, rural communities, farmlands and portions of the Delta. SR-12 is a designated Department of Defense Truck Route connecting Travis Air Force Base with the National Interstate Highway System. Agricultural goods move along SR-12 from San Joaquin County to Napa County.

Most of SR-12 passes through lightly developed and agricultural areas. This environment is rich habitat for threatened and endangered species, and passes through protected lands, waterways and marshes. In Sacramento and San Joaquin counties, SR-12 passes through the rich farmland and recreational areas of California's Delta.

Safety is a concern along SR-12 to those that trravel this route. Working collaboratively, Solano, Sacramento and San Joaquin counties, along with Caltrans and the California Highway Patrol (CHP), have implemented a multi-pronged approach to address mobility, operations, and safety along SR-12. This approach includes Legislation, Enforcement, Education and Engineering efforts. Assembly Bill (AB) 112 introduced new legislation that includes double fines and provides for increased enforcement by CHP. Caltrans is implementing State Highway Operation and Protection Program (SHOPP) projects at various locations along the corridor. In combination, these safety measures are making a difference on SR-12 by improving mobility and reducing the frequency and severity of collisions.

Exhibit 1: Corridor Study Area Map



WHY IS A CORRIDOR MANAGEMENT PLAN NEEDED?

SR-12 is of particular interest to those governmental entities that plan, operate and maintain the highway. More importantly, the everyday users of SR-12 care about accidents, travel times and delays. AB 112 is an important first step towards improving travel, mobility and safety on SR-12. The primary deliverable of this work effort is a multi-jurisdictional Corridor Management Plan (CMP) that will provide a long-term vision for SR-12. The CMP addresses questions such as should SR-12 be widened to four lanes? Should the movable bridges at Rio Vista and Mokelumne be replaced? When should major improvements be implemented and what are the costs and benefits? In short, this CMP outlines a roadmap for improving SR-12 that represents a consensus of the involved parties.

The study itself is an excellent example of collaborative planning across multiple jurisdictions. Funding is provided by Caltrans (Districts 4, 3 and 10), MTC, STA and SJCOG. Each agency participated as a member of the Project Development Team that guided the preparation and technical analyses leading to the recommendations included in this planning document.

ROLE OF THE CORRIDOR MANAGEMENT PLAN

Though the CMP inovlved significant cost and technical feasibility analysis, it strictly intended for planning and visioning purposes. It is not intended to serve as a programming or technical engineering document. Any safety or operational analysis mentioned in this document is used for planning purposes and not intended to supplant later engineering analysis by Caltrans during programming, environmental clearance, or alternative selection phases of a project. Such analysis and judgment are an integral part of the narrowing down to a preferred alternative. This is typically performed during the environmental phase of a project, or the phase after project programming. It relies on the data trends over time as well as the most current data available prior to any alternative selection.

Funding for corridor improvements can be complex and involve various agencies and types of funding sources. Some recommended improvements may not be feasible to implement for another ten to twenty years, or until funding is available. The CMP intends to inform future programming decisions.

In the context of this document implementation refers to the corridor planning phase and process. It presents a range of alternatives that will be iteratively re-examined over time in subsequent phases of

The Corridor Management Plan addresses:

- Freight and goods movement
- Future levels of inward commuting to the Bay Area
- Access, mobility and safety
- Future development in Rio Vista
- Increased shipping to the Port of Sacramento
- Travis AFB as an important military installation
- Preservation of the Delta environment
- Design appropriate in some specific locations
- Policy mandates such as Senate Bill 375
- Integration of economic, environmental and equity concerns

the Caltrans project development process (See Chapter 1, page 2, at the end of the section titled "Why is a Corridor Management Plan Needed?").

The CMP differs from other Caltrans system planning documents in that it involves three Caltrans Districts, three MPOs, and two county transportation planning authorities, and discusses corridor-wide approaches to the highway that cannot be addressed by one single District. The document also addresses funding needs and a range of alternatives, whereas other system planning documents usually do not. A more comprehensive public outreach effort was made by this CMP compared to other system planning documents.

A PLAN FOR SR-12

The CMP includes both a short- and a long-term vision for SR-12. Elements of this plan include recommendations for Intelligent Transportation Systems (ITS) roadway capacity improvements, bridge replacements and facilities used by pedestrians, bicyclists and public transit riders.

The plan for SR-12 builds upon a baseline set of improvements that have been recently completed, are planned for construction between now and 2015, or have been advanced in the project planning and delivery process. Many of these improvements are in direct response to the safety initiatives begun in 2007. The baseline improvements may be seen graphically in Exhibit 21 and are summarized briefly from west to east as follows:

- SR-12 Jameson Canyon Project (Napa EA 04-264134, Solano EA 04-264144)
- I-80/I-680/SR-12 Interchange Project Phase 1 (Solano EA 04-0A5300)
- SR-12 Roadway Rehabilitation Project from Walters Road to Currie Road (Solano EA 04-0T10U)
- SR-12 and SR-113 Intersection Improvement Project
- SR-12 Roadway Rehabilitation Project from Currie Road to Liberty Island Road (Solano EA 04-2A6200)
- SR-12 and Church Road Intersection Improvements
- SR-12 Rehabilitation Project between Rio Vista Bridge and Mokelumne Bridge
- SR-12 Bouldin Island Project (San Joaquin EA 10-0G800)
- SR-12 Improvements Project I-5 to Bouldin Island (San Joaquin EA 10-A8404)

The CMP for SR-12 is separated into recommendations for the short term (2015-2020) and the longer term beyond 2020. In general, the recommendations are intentionally not prioritized in order to leave stakeholders the flexibility to implement projects based on funding availability and readiness for implementation. All of the projects

included in the short- and long-term recommendations are important in terms improving operations, mobility and safety along the corridor.

SR-12 is of major economic importance to the counties, cities and communities that lie along this route. Recognizing this, the Solano County Economic Development Corporation is working on an economic study, the "Highway 12 Corridor Economic Analysis," which was completed in September of 2012. Results of this study show that improvements to SR-12 not only improve mobility and safety, but also contribute to expanding the regional economy by neary 10 percent, or the equivalent of $1.8 billion in economic output per year. The study also shows that much of the economic benefit of the activities that occur along the corridor accrue to users at the end points or the corridor.

There is one recommendation that should be acted on as soon as possible. This is finalizing the Rio Vista Bridge alignment. This will be a locally-led effort, although it cannot be completed until a Caltrans compliant environmental process is completed.

The chapters of this report that follow provide more detailed information on the evaluations that were conducted to support the preparation of the CMP. Included in later chapters are discussions of safety, the environmental setting, traffic growth, capacity of the system, waterborne traffic, and costs and benefits. A high level summary of the plan for SR-12 is presented here.

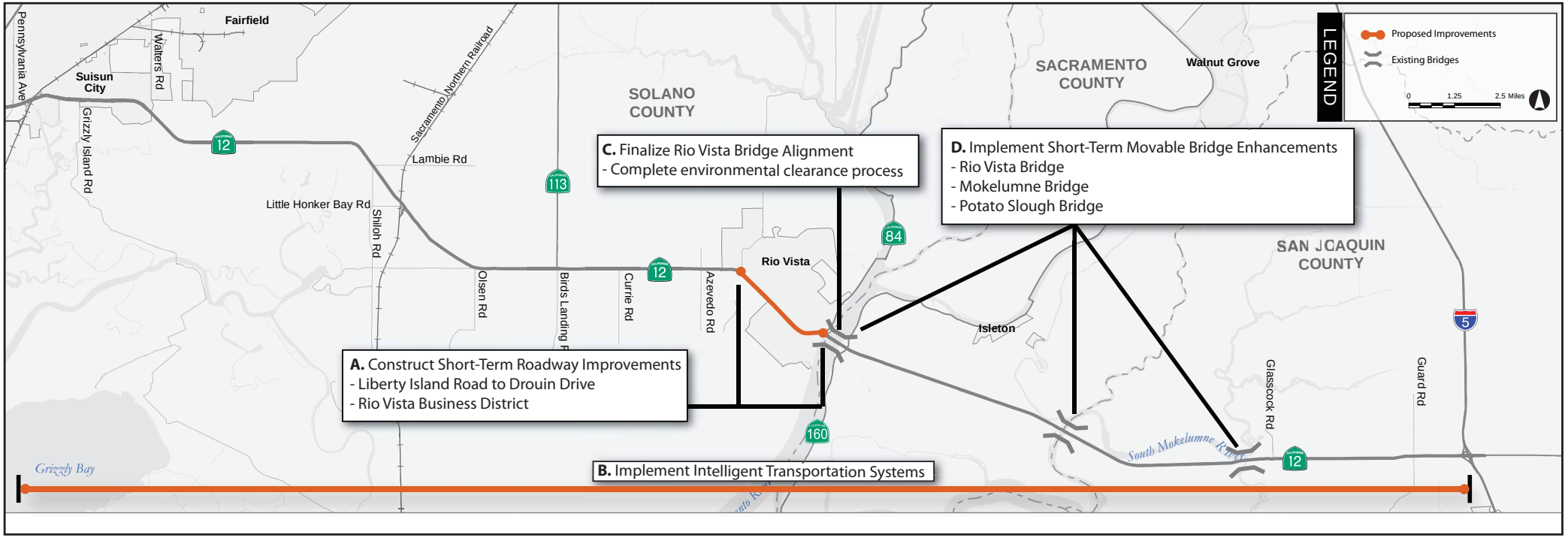
A Short-Term Plan for SR-12 (2015-2020)

The short-term plan for SR-12 builds upon the State Highway Operations and Protection Program (SHOPP) and State Transportation Improvement Program (STIP) funded improvements underway or completed recently by Caltrans. These improvements include a temporary concrete barrier installation, centerline rumble strips and outside shoulder rumble strips, horizontal and vertical alignment correction, left-turn channelization, and improved sections of SR-12 with center channelizers (pylons) in Solano County. Channelizer installations are planned for implementation in Sacramento County. In San Joaquin County, the Bouldin Island Project reconstructs SR-12 with new structural pavement sections that resist settlement, a concrete median barrier with inside shoulders, standard width lanes, outside shoulders and strategically located underpasses to provide passage for agricultural traffic.

The short-term plan addresses non-recurrent delay due to accidents, incidents and weather by the installation of ITS technologies that monitor the roadway and inform motorists. Highway improvement projects are recommended for select segments of SR-12 in and near Rio Vista. Improvements are also proposed on the movable bridge approaches to improve efficiency and safety. Lastly, a budget is proposed to maintain aging bridge operating equipment in the best possible condition over the near term.

Exhibit 2 depicts the short-term CMP for SR-12. These proposed projects are not specifically prioritized in Exhibit 2, but rather in sequential order generally from west to east. The short-term plan is estimated to cost $87 million in

2011,[1] is projected to improve travel time by 5% and reduce vehicle delay by 2,000 hours each day. Each of the elements of this plan is further discussed in the paragraphs that follow.



A. Reconstruct SR-12 from Liberty Island Road to Drouin Drive and Improve SR-12 through the Rio Vista Business District: This improvement strategy includes improvements to the physical roadway for two segments in and near Rio Vista. The first segment -- between Liberty Island Road and Drouin Drive – consists of reconstruction of SR-12 with a concrete median barrier, inside shoulders, standard 12' lanes and outside shoulders. (These improvements are similar to those proposed in the Bouldin Island Project.) The second segment is along SR-12 through the Rio Vista Business District as it approaches the Rio Vista Bridge. Here, better curb definition is recommended along with facilities for pedestrians, bicyclists, landscaping and streetscape improvements.[2]

1 All costs presented in 2011 dollars unless otherwise noted.

2 These improvements may be either 2-lanes (one in each direction) or 4-lanes (two lanes in each direction) depending on which alignment is chosen for the Rio Vista Bridge replacement. This is discussed later in this section and in more detail in the main body of this report.

B. **Implement Intelligent Transportation Systems:** This strategy adds to the ITS equipment presently installed or planned to be installed along SR-12. By tying these ITS technologies to regional transportation management facilities, real time information on the corridor including incident detection can be gathered. Through this detection, a coordinated response from emergency responders can be quickly initiated and motorists can be notified of delays that can inform travel choices such as route or time of travel. In addition, technology to coordinate the traffic signals on SR-12 in Fairfield and Suisun City are included.

C. **Finalize the Rio Vista Bridge Alignment:** Addressing this issue is central to any plan for SR-12. A prior study of the Rio Vista Bridge[3] identified alternative options north and south of Rio Vista and an option that maintains or closely parallels the existing SR-12 alignment. A final decision on this alignment for the Rio Vista Bridge cannot be determined until an appropriate environmental process is conducted. In the short-term, it is recommended that the environmental clearance process be initiated[4] and completed for the Rio Vista Bridge so that the alignment can be established.

D. **Implement Short-Term Movable Bridge Enhancements:** The Rio Vista and Mokelumne River bridges are the oldest and most actively used on the SR-12 corridor. The Potato Slough Bridge is the newest but is unmanned and seldom operated. For the short-term, advance warning devices, surveillance cameras and, where appropriate, signal preemptions are recommended for each bridge approach. Also, a budget is recommended to replace aging controls and equipment that operate the movable spans on these bridges.

SR-12 in the Long-Term (2020-2035)

The long-term plan for SR-12 addresses the more significant capacity issues along the corridor. The long-term plan adds capacity where it is most needed to reduce delay and addresses safety through enhancements to the remaining two-lane segments of SR-12.

The long-range vision includes recommendations to add a lane in each direction on SR-12 in the area of Fairfield and Suisun City, construct a four-lane divided highway from SR-113 to SR-160 and replace movable bridges at the Rio Vista and Mokelumne River crossings. For the balance of the corridor, an enhanced two-lane highway is recommended that includes median barriers, inside shoulders, full 12' lanes, outside shoulders and strategically located acceleration lanes that provide passing opportunities. The outside shoulders are assumed to typically be 10' wide: a 2' rumble strip and an 8' clear shoulder. In some areas, constraints such as environmental considerations may mandate lesser shoulder widths. This context sensitive approach will accomodate both emergency stopping and bicycle use.

[3] SR-12 Realignment/Rio Vista Bridge Preliminary Study (Sept. 2010), AECOM for Solano Transportation Authority
[4] The first step of this process is to complete a Project Initiation Document (PID).

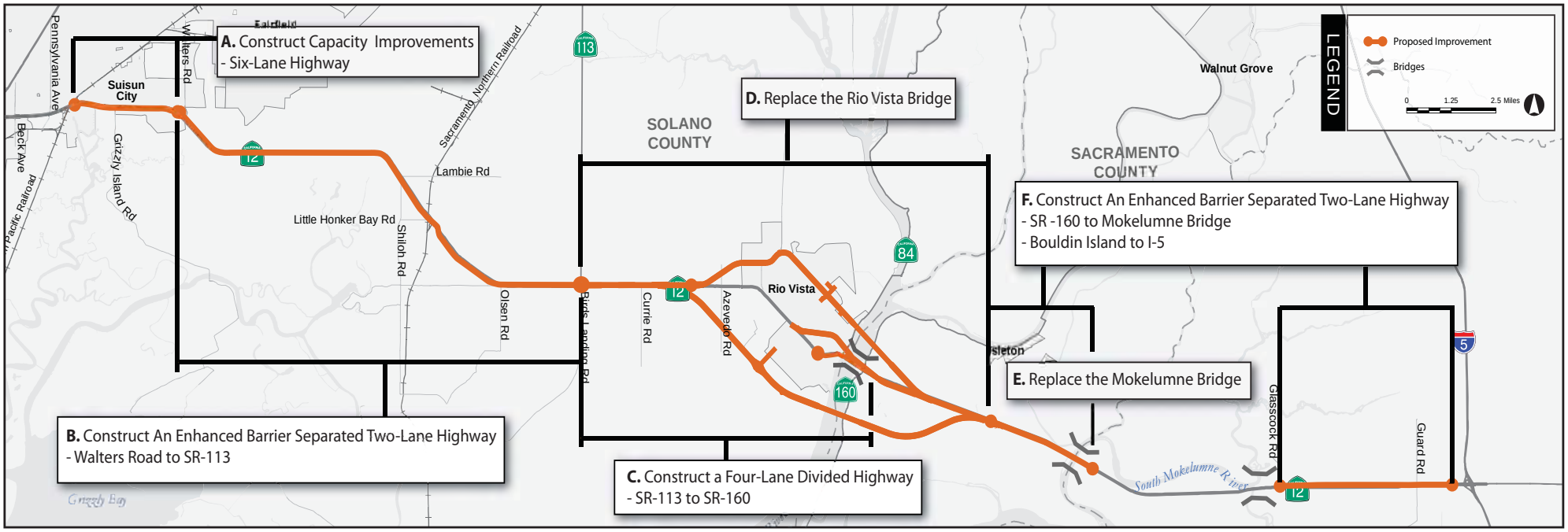


Exhibit 3: SR-12 Long-term Corridor Management Plan (2020-2035)

The long-term plan has capital costs of $1.44 billion in present day dollars. A significant portion of the cost is attributable to the bridge replacements and associated realignments at Rio Vista and Mokelumne River. When compared to SR-12 today, the long-term CMP reduces delay by as much as 6,000 hours per day and significantly improves end-to-end travel times by 30 minutes.

A. **Construct Capacity Improvements in Fairfield/Suisun City:** Throughout this evaluation, significant delays at the intersections through this stretch of SR-12 have been identified. From I-80 east to Beck Avenue, these existing and projected deficiencies are being addressed through the Project Approval/ Environmental Document (PA/ED) under way for the proposed I-80/I-680/SR-12 Interchange. The CMP recommends that similar improvements along SR-12 from Beck Road to Walters Road be implemented. These improvements include construction of interchanges at Beck Road and Pennsylvania Avenue and an additional traffic lane in each direction.

B. **Construct an Enhanced, Barrier Separated Two-Lane Highway from Walters Road to SR-113:** The enhanced barrier separated section includes a permanent median barrier, inside shoulders, full-width lanes in each travel direction, and 10' outside shoulder with bicycle provisions. Intersection capacity enhancements are also included along with acceleration/passing lanes at key locations.

C. **Construct SR-12 as a Four-Lane Divided Highway from SR-113 to SR-160:** This recommendation is directly related to the Rio Vista Bridge replacement discussed above. The bridge and alignments leading to the bridge are recommended to be four-lane divided highways built to expressway standards where appropriate. Some of the bridge study alignments for SR-12 go around Rio Vista and on the west, reconnect to the existing SR-12 just east of SR-113. On the eastern end, some of the alignments reconnect

with existing SR-12 well east of SR-160. The CMP recommends that whether realigned or not, SR-12 from SR-113 to SR-160 should be a four-lane divided highway including the Rio Vista Bridge.

D. Replace the Rio Vista Bridge: The SR-12 Rio Vista Bridge Final Study Report identifies a range of viable alternatives to replace the Rio Vista Bridge. The short-term strategy discussed previously includes a recommendation to conduct the environmental studies necessary to determine which alignment alternative will be selected for the Rio Vista Bridge replacement. In the long-term, the CMP recommends that the Rio Vista Bridge be replaced with an alternative that does not require movable bridge operations to allow the passage of larger vessels to and from the Port of West Sacramento. This can be achieved by either a tunnel under the shipping channel or a high-level bridge that meets the clearance requirement for shipping in the Sacramento River, as identified in the Rio Vista Bridge Study and in accordance with U.S. Coast Guard regulations.

E. Construct an Enhanced, Barrier Separated Two-lane Highway from SR-160 to the Mokelumne Bridge and from the eastern limits of Bouldin Island to just west of Interstate 5: The enhanced barrier separated two-lane highway proposed here has the same characteristics that are described previously under B above, and is modeled after the Bouldin Island Project in San Joaquin County. It includes a fixed median barrier, inside shoulders, 12' travel lanes, and outside shoulders. To the extent possible, the design of all enhanced two-lane segments should anticipate a possible four-lane widening in the far future (i.e., beyond the 2035 horizon year of this evaluation). Because of the significant amount of agricultural traffic in Sacramento and San Joaquin counties, these projects should include strategically located crossings for agricultural vehicles and equipment.

F. Replace the Mokelumne River Bridge: This is one of the most frequently opened bridges in California. Like the Rio Vista Bridge, movable bridge operations at this location result in significant traffic delay on SR-12. The CMP recommends that the Mokelumne River Bridge be replaced with a bridge that provides the vertical clearance requirement appropriate to the primarily recreational boat traffic that passes here and as specified by U.S. Coast Guard regulations.

WHAT COMES NEXT?

While the CMP sets a short- and long-term vision for SR-12 across Solano, Sacramento and San Joaquin counties, it does not address funding shortfalls. This document may, however, be the framework for advocacy and multi-jurisdictional collaboration that can result in various types of enhancements along SR-12. This kind of collaboration took place in 2007 when jurisdictions came together with Caltrans and CHP to advance SHOPP projects and provided enhanced enforcement along the corridor that reduced the frequency of incidents along the corridor.

Given the scarcity of Federal funding for transportation and resulting funding constraints on Caltrans, it falls more and more to local jurisdictions to take a stronger leading role in advancing projects through innovative approaches to funding and project delivery. One of the first steps to advance the projects in this CMP is through the regional transportation planning processes so that eligibility for state and federal funding is established. These projects have strong benefits in terms of safety, travel time savings and operational enhancements that can be used to make the argument that SR-12 needs to be included in regional plans. Through the course of preparing this CMP, it became apparent that much depends on resolution of the Rio Vista Bridge replacement and the re-alignments that are associated with this proposed project. As mentioned previously in the short-term plan, a Caltrans compliant Project Initiation Document (PID) should be started and then followed by PA/ED.[5] At the same time, a general plan for Rio Vista should be prepared that considers how this community will grow in the context of the potential replacement of its namesake structure across the Sacramento River.

The bridge at the Mokelumne River, a dividing line between Sacramento and San Joaquin counties, is where the most frequent delays occur east of Rio Vista. The cause is frequent openings of this low-level structure that impedes both highway and waterborne traffic. As a priority, the CMP recommends that funding plans and opportunities to replace this crossing be researched. Replacement of this structure should eliminate bottlenecks and delays in the corridor.

This study recommends that the Corridor Advisory Committee framework continue to provide a forum for continual coordination and to shape the phasing and implementation of improvements along SR-12 based on the recommendations of this study. The success of this effort can be largely attributed to committed stakeholder involvement and overall guidance provided by

[5] The alignment for the bridge will be identified upon completion of the Project Approval/Environmental Document phase which will take approximately 5 years for a corridor as environmentally sensitive as SR-12.

staff representing the jurisdictions along the corridor and by the SR-12 Corridor Advisory Committee led by elected officials who represent these jurisdictions. The corridor partners should continue to work together to develop funding plans that address the needs of the corridor including replacement of the Rio Vista and Mokelumne River bridges.

STAKEHOLDER PARTICIPATION IN THE STUDY

Extensive stakeholder coordination was conducted over the 18 month period during which data was collected, technical evaluations were conducted, alternatives studied and finally a recommended CMP developed. Four stakeholder groups were assembled to serve in distinct roles in order to assure that all elements of the CMP received jurisdictional and public scrutiny.

Exhibit 4 shows the major milestones of this project and maps these deliverables against the stakeholder outreach plan. The stakeholder groups and their compositions are as described as follows:

Project Development Team (PDT): A group comprised of professional staff from Caltrans Districts, MPOs, Counties, and the Consultant Team who met monthly to direct and guide the study. The PDT was responsible for review of all work plans and products.

Technical Advisory Group (TAG): A group comprised of executives from transportation agencies, city engineers, safety officers and highway patrol, transit agencies, ports, and regulatory agencies. This group met at major study milestones to provide input and guidance.

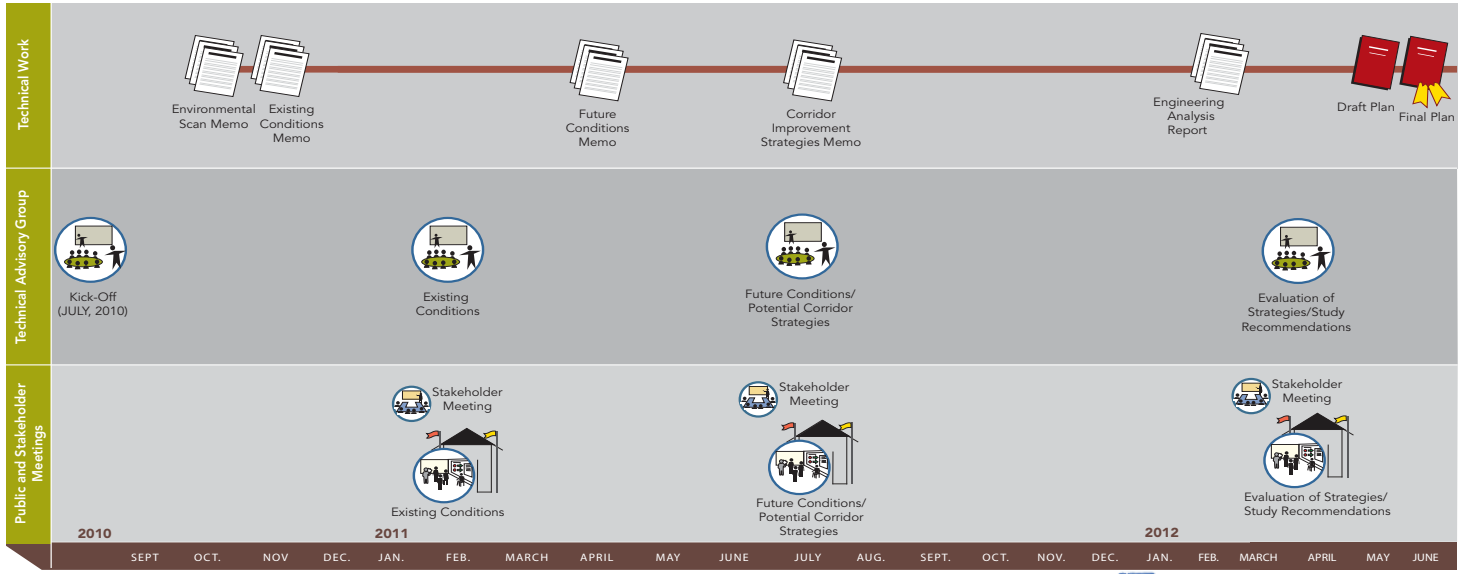


Exhibit 4: SR-12 Workplan and Major Milestones

Corridor Stakeholders: Organized groups with a special interest in the corridor, such as air quality officials, civic and environmental groups, downtown associations, private developers, and pedestrian and bicycle advocates. This group was briefed by members of the PDT at major study milestones and asked to provide input.

Members of the Public at-large: All citizens interested in the corridor were invited to attend open-house forums to review major study work products, ask questions, and provide input.

SUPPORTING DOCUMENTATION

This Summary Report for the SR-12 Comprehensive Evaluation and Corridor Management Plan serves as the final document chronicling the work undertaken by the Project Development Team and stakeholders over the course of this effort. It is intended to provide a relatively brief summary that captures all elements of the workplan and intermediate technical documentation including safety reviews, data collection, operational analysis, forecasting, alternatives evaluations and recommendations.

During the course of this 18 month effort, seven separate technical work products were prepared leading up to this final summary report. These documents consisted of over 500 pages of text, tables, graphics, concept plans and analyses. Each intermediate technical document was reviewed by the PDT, revised and then presented to the TAG, stakeholders and the public for comment and input during several well attended outreach cycles.

These supporting documents are available electronically from the stakeholders who participated in the PDT including Caltrans Districts 4, 3 and 10, the Metropolitan Transportation Commission, the San Joaquin Council of Governments and the Solano Transportation Authority. Contact information may be found in the acknowledgements section of this report. For reference, the supporting documents include the following:

STA Model Evaluation Summary and Future Forecasts, (Feb. 2011)

SR-12 Comprehensive Corridor Evaluation and Corridor Management Plan (From SR-29 to I 5) – Final Existing Conditions Technical Report, (Apr. 2011)

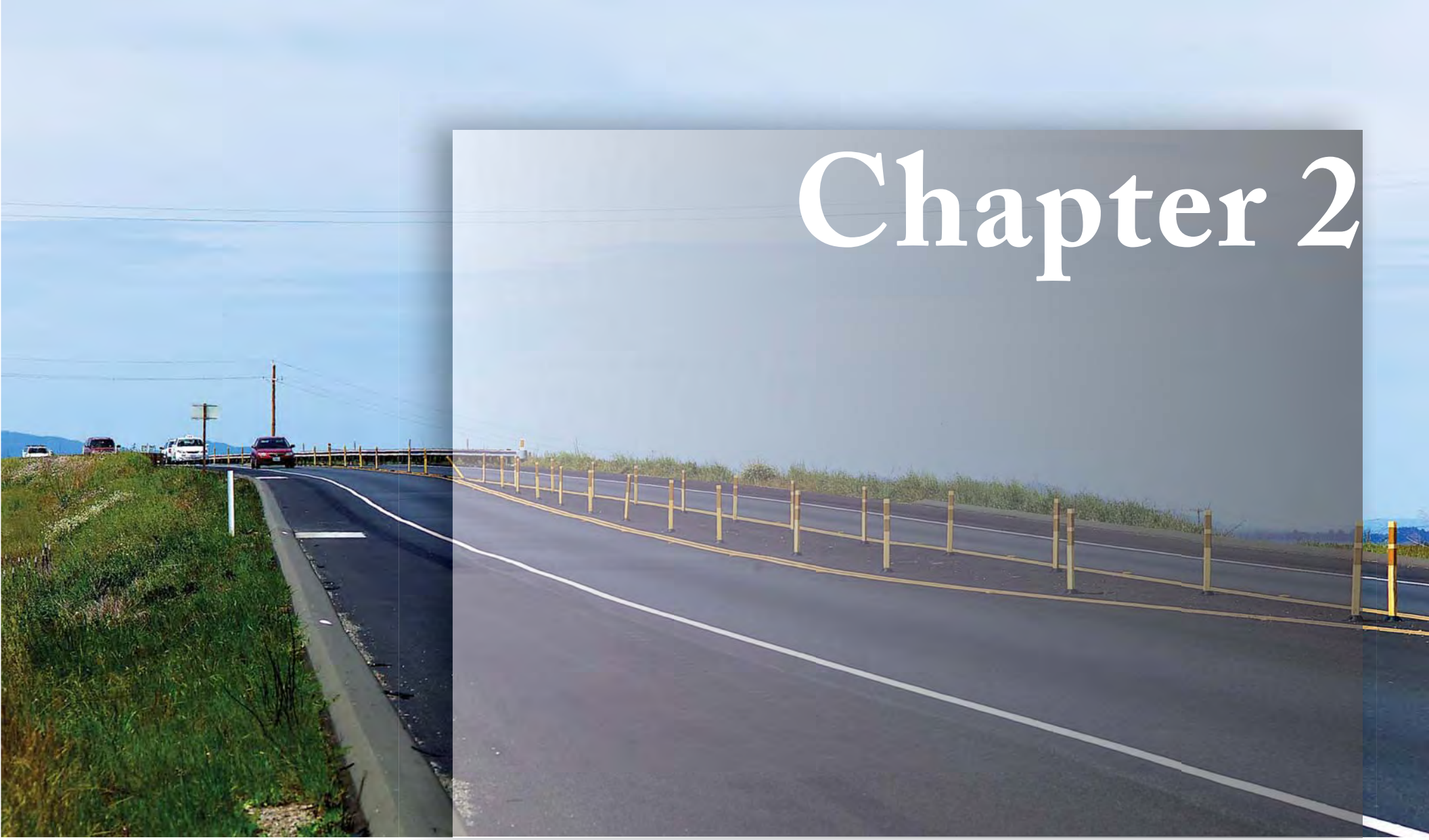
SR-12 Comprehensive Corridor Evaluation and Corridor Management Plan (From I-80 to I-5) – Final Environmental Resources Scan, (Apr. 2011)

SR-12 Comprehensive Corridor Evaluation and Corridor Management Plan (From SR-29 to I 5) – Final Future Conditions Technical Report, (Jul. 2011)

SR-12 Comprehensive Corridor Evaluation and Corridor Management Plan (From SR-29 to I 5) – Corridor Improvement Strategies Final Technical Memorandum, (Oct. 2011)

SR-12 Comprehensive Corridor Evaluation and Corridor Management Plan – Alternatives Analysis Final Technical Memorandum, (Feb. 2012)

Alternatives Analysis for SR-12 – Supplemental Report Conceptual Drawings and Cost Estimates, (Feb. 2012)



Chapter 2

Safety

Safety is a concern on SR-12. Accident rates are higher than average in some locations for similar facilities. When accidents occur they can be severe, resulting in injuries, fatalities and lengthy delays before travel can resume. Ensuring safe travel on SR-12 is a priority of local jurisdictions, cities located along the corridor, residents, motorists, Caltrans and the California Highway Patrol.

DESIGNATION AS A SAFETY CORRIDOR

The counties of Solano, Sacramento, and San Joaquin have worked collaboratively with Caltrans and the CHP to improve safety along the corridor. Several accidents occurred on SR-12 in 2006 and 2007. A multi-faceted strategy was introduced and put in place by 2008. The four key elements of this strategy are:

- Legislation – AB 112 created a safety enhancement-double fine zone on SR-12 between I-80 and I-5.
- Enforcement – AB 112 provided CHP with increased grant funding[1] for expanded enforcement on SR-12.
- Education – A public outreach and education campaign to improve safety on SR-12 by educating the commuting public was initiated in 2007. The campaign includes branding SR-12 as a Safety Corridor, providing updates on enforcement efforts and the status of current and upcoming construction projects.
- Engineering – Throughout the corridor, Caltrans implemented operational and safety enhancements in 2007, including re-striping, radar speed detection, warning signs, changeable message signs, channelizers, rumble strips and a temporary concrete barrier on the centerline between Walters Road and Shiloh/Lambie Road.

Shortly after implementation of this four-elemnt strategy, construction began on a SHOPP project from west of Scally Road to Currie Road in Solano County. This project included shoulder widening, intersection improvements, and vertical and horizontal alignment improvements, and was completed in 2011.

In San Joaquin County, the SR-12 Bouldin Island SHOPP Project is planned to start construction in 2012 for the San Joaquin segment of SR-12. This 4.5-mile project, between the Mokelumne Bridge and the Potato Slough Bridge, will provide full-width outside shoulders with rumble strips, a concrete median barrier, five-foot inside shoulders for the most part adjacent to the concrete barrier, and structural pavement.

[1] Grant funding for enforcement has since expired.

ACCIDENT HISTORY ON SR-12

Three and a half years of accident history on SR-12 was reviewed to understand the frequency and types of accidents that occur along this corridor. The available data was for the years 2006, 2007, 2008 and for the first six months of 2009. This information spans the two year period before SR-12 was designated a Safety Corridor and the 18 months after the designation when increased enforcement and operational and safety enhancements were implemented.

The accident history shows that enforcement and operational and safety enhancements have made a difference. There is a downward trend in the total number of accidents. This trend may be due to the above factors and to fewer vehicle miles traveled (VMT) on the corridor. The reduction in corridor VMT may in turn be a result of construction-realted delays and lower speed limits, changes in fuel proces, and lower regional economic activity. A more significant trend is seen for severe and fatal accidents. Exhibit 5 plots fatal accidents across the corridor for the 3-1/2 year period where it can be seen the

Exhibit 5: Location of Fatal Accidents

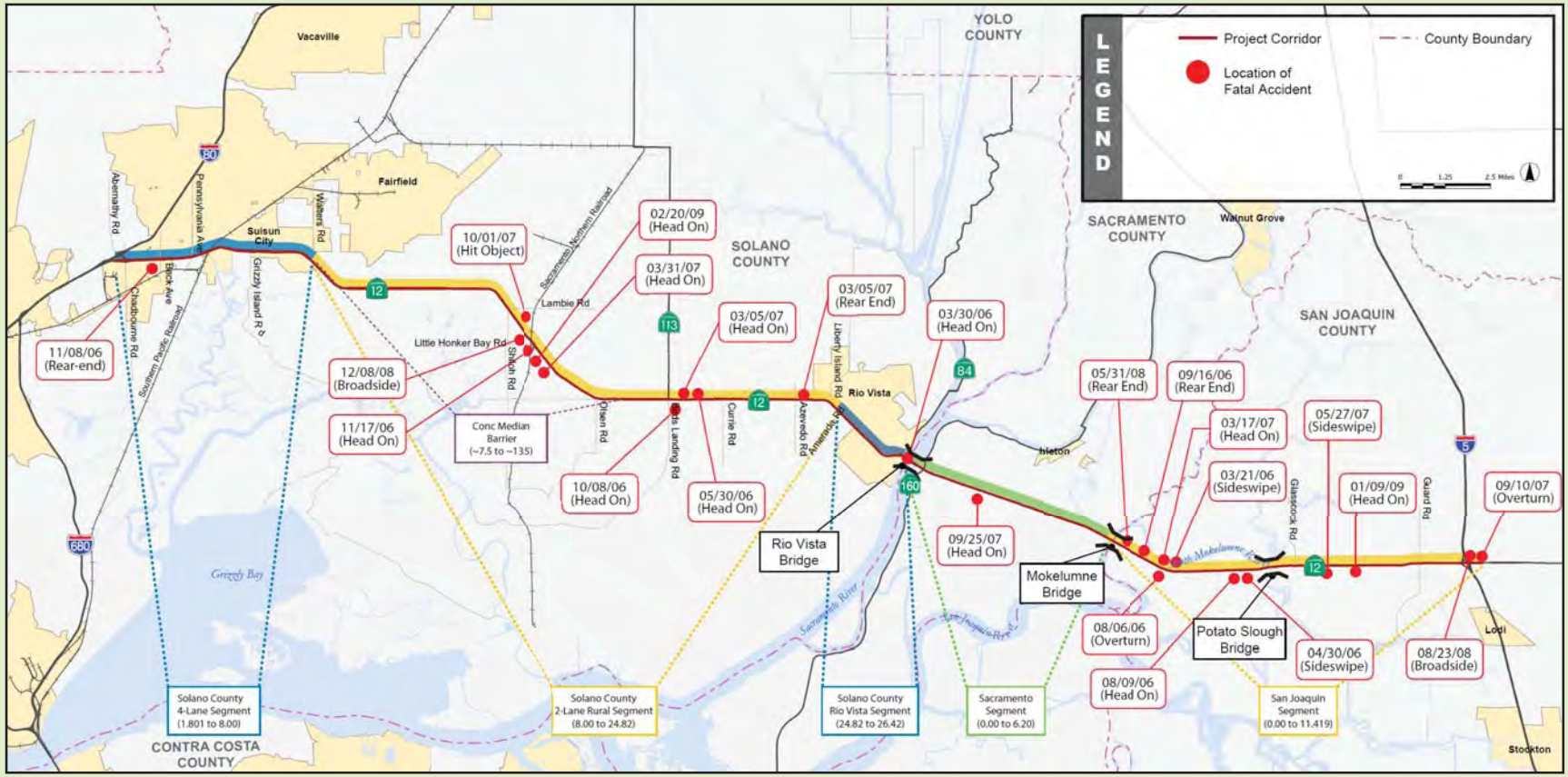


Exhibit 6: Accident Rates by Year

Segment	Accident Rates [1]				
	2006	2007	2008	2009 [2]	All Years [3]
Solano County, 4-Lane (I-80 to Walters)	1.10	1.68	1.51	1.09	1.42
Solano County, 2-Lane (Walters to Rio Vista)	0.75	0.45	0.58	0.72	0.65
Solano County, 2-Lane (Rio Vista)	1.43	0.63	0.55	0.44	0.89
Sacramento County, 2-Lane	1.18	0.70	0.60	0.66	0.87
San Joaquin County, 2-Lane	0.75	0.93	0.65	0.56	0.81
Total	0.92	0.94	0.86	0.77	0.94

Notes:
1 Reported accident rates are "accidents per million vehicle miles traveled."
2 Data does not cover entire year (January to June included).
3 AADT values used to calculate accident rates for individual analysis years were obtained from Caltrans Traffic Data Branch and may differ slightly from the AADT values used in the TASAS reports. As a result, the sum of reported accident rates for all three analysis years may be slightly different than the TASAS rate.

Exhibit 7: Head-on Accidents

Segment	Before Safety Enhancements [1]			After Safety Enhancements [2]		
	Head-On	Fatal	Injury	Head-On	Fatal	Injury
Solano County, 4-Lane (I-80 to Walters)	4	0	3	4	0	1
Solano County, 2-Lane (Walters to Rio Vista)	8	5	2	4	1	3
Solano County, 2-Lane (Rio Vista)	1	0	0	0	0	0
Sacramento County, 2-Lane	5	2	2	4	0	4
San Joaquin County, 2-Lane	7	2	3	4	1	3
Head-On Accidents Total	25	9	10	16	2	11
Other Accidents (Non-Head-On) Total	533 (Non-Head-On)	9	201	323 (Non-Head-On)	3	119
All Accident Totals	558 (All Accident Types)	18	211	339 (All Accident Types)	5	130

Notes:
1 18-month period prior to safety enhancement implementation is January 2006 through June 2007.
2 18-month period following safety enhancement implementation is January 2008 through June 2009.

fatal accidents most often occur on the two-lane rural sections of SR-12 in Solano and San Joaquin counties, and that head-on collisions are the most prevalent cause of fatalities.

Accident rates are expressed as accidents per million vehicle miles of travel. Exhibit 6 shows accident rates for various segments of SR-12. This information clearly indicates a decline in accident rates since enforcement was increased by CHP and operations and safety projects were implemented by Caltrans beginning in 2007. Over this period, fatal accidents dropped from 10 in 2006 to eight in 2007 and three in 2008.

HEAD-ON COLLISIONS

Head-on collisions have been a particular concern on the narrow SR-12 corridor because of the severity of these types of accidents. Of the 23 fatal accidents in the 3-1/2 years analyzed, 12 were head-on collisions. The short-term safety enhancements (centerline rumble strips, no passing zones, etc.) helped reduce head-on collisions.

Exhibit 7 depicts the total accidents for the 18 month period before the safety enhancements were implemented and for

the 18 month period after the enforcement and safety enhancements were in place. As can be seen, total accidents decreased from 558 to 339 over the two 18 month periods. Head-on accidents were reduced from 25 to 16. But most importantly, head-on accidents with fatalities were reduced from nine to two.

	Before Installation (36 Months)	After Installation (24 Months)
Total Accidents	38	41
Injury	16	8
Fatal	1[1]	2[2]
Cross Centerline Fatal	1[1]	0

Notes:
1 Driver allowed vehicle to drift to the right, overcorrected to the left, and then crossed into opposing lane.
2 1st fatality involved trailer/tractor vehicle travelling westbound hitting the end of the temporary barrier with rear wheel and flipping. 2nd fatality involved vehicle travelling eastbound being broadsided by vehicle that failed to stop at stop sign while travelling northbound on Shiloh Road.
Source: Caltrans TASAS accident data.

Exhibit 8: Accidents Before and After the Temporary Concrete Barrier Installation

EFFECTIVENESS OF CONCRETE BARRIERS

In October of 2007, a temporary concrete barrier was installed on the SR-12 centerline from Walters Road to Shiloh/Lambie Road. In the 24 months since the barrier was installed there have been no head-on collisions due to vehicles crossing the center line. The barrier has proven effective at mitigating head-on collisions, as shown in Exhibit 8.

In some circumstances, other barrier types may be appropriate. This could include fiberglass "channelizers" where there is insuffcient right-of-way or pavement width to allow for a concrete barrier. In addition, wood post and metal rail or open swale barriers may be appropriate in the future where there are issues of water movement or wildlife migration.

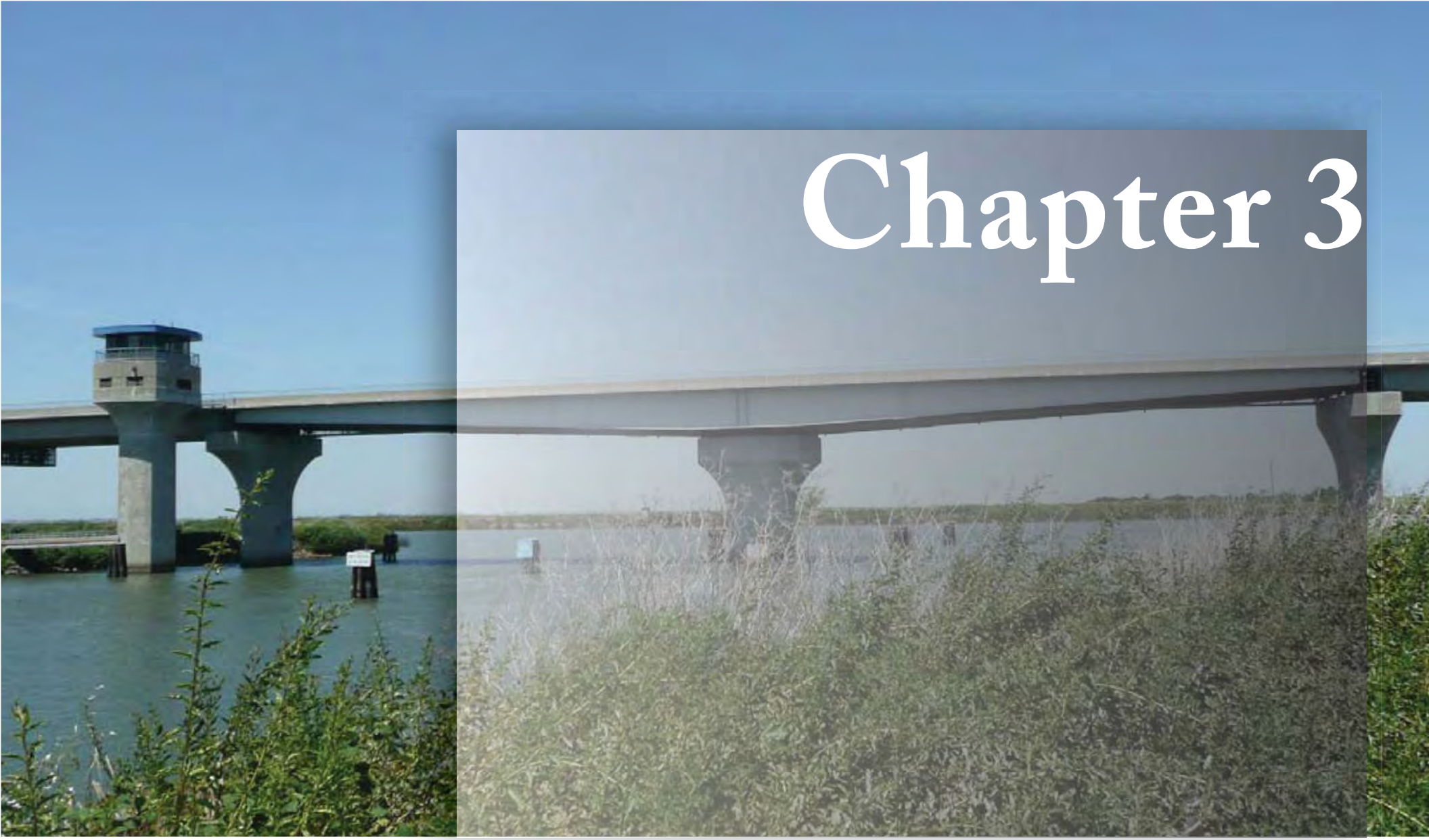
SAFETY CONSIDERATIONS FOR THE CMP

Improving safety is one of the consideration in the recommendations of the CMP for SR-12. The projects in this plan are the next steps after Caltrans completes the current operational, safety and rehabilitation projects along SR-12[2]. As such, each project that is recommended in the CMP will reduce traffic delay and provide for enhanced mobility and safety on the corridor. The principal goals incorporated in the CMP improvements are:

- The CMP projects should include improvements that reduce both recurrent (everyday) congestion and non-recurrent congestion. Strategies that mitigate non-recurrent congestion include ITS installations and additional capacity (lanes), when possible, that allow for traffic management options at incident locations.
- Projects that involve new construction, widening or reconstruction should be evaluated to determine if the horizontal and vertical alignment of SR-12 will improve sight distance and travel along the corridor.

2 Complete road closure of segments of SR-12 identified as Extreme Maintenance Operations to allow for simultaneous repairs and maintenance efforts by Caltrans crews are ongoing activities in the corridor.

- Projects that involve new construction, widening or reconstruction can be an opportunity to provide possible improvements, such as inside shoulders, 12’ travel lanes, and outside shoulders and/or fixed median barriers.
- Intersections that are improved should include left-turn pockets and right-turning lanes where appropriate. Where possible and appropriate, current sight distance standards will be met.



Chapter 3

Environment

SR-12 passes through a highly and considerably sensitive landscape containing protected environmental resources including watersheds, rich farmland and a wide variety of sensitive species. Between Rio Vista and I-5, SR-12 traverses the California Delta; an invaluable resource serving as a water source for more than two-thirds of the State's population and home to many species of fish, birds, mammals, and plants. The Delta also supports agricultural and recreational activities, attracting upwards of 12 million recreational visitors annually for water-based recreation such as fishing, sailing, and water-skiing.

Protecting and maintaining these rich and diverse resources from man-made impacts is a challenge. In addition, nearly the entire corridor is subject to the threat of natural impacts including sea-level rise and the area critically depends on its more than 1000 miles of levees for protection.

An environmental scan of the SR-12 Corridor was conducted in April of 2011. The purpose of the scan was to provide a high-level overview of known environmental resources and potential constraints on the development of transportation improvement strategies in the corridor. The environmental scan relied on information from GIS and resource agency databases, a review of aerial photography, and existing environmental documentation for recently approved projects in the corridor. Information on environmental resources in the portion of the corridor between SR-29 and I-80 can be found in the Initial Study/ Environmental Assessment prepared for the Jameson Canyon Project.[1]

DELTA-FACTS*

Levees (total mileage, 1987): 1,100

Water Supply: Drinking water for 25 million people

Agriculture: Average Annual Gross Value totals more than $2 billion.

Wildlife: 52 mammals, 22 reptiles and amphibian species, 225 birds, 54 species of fish.

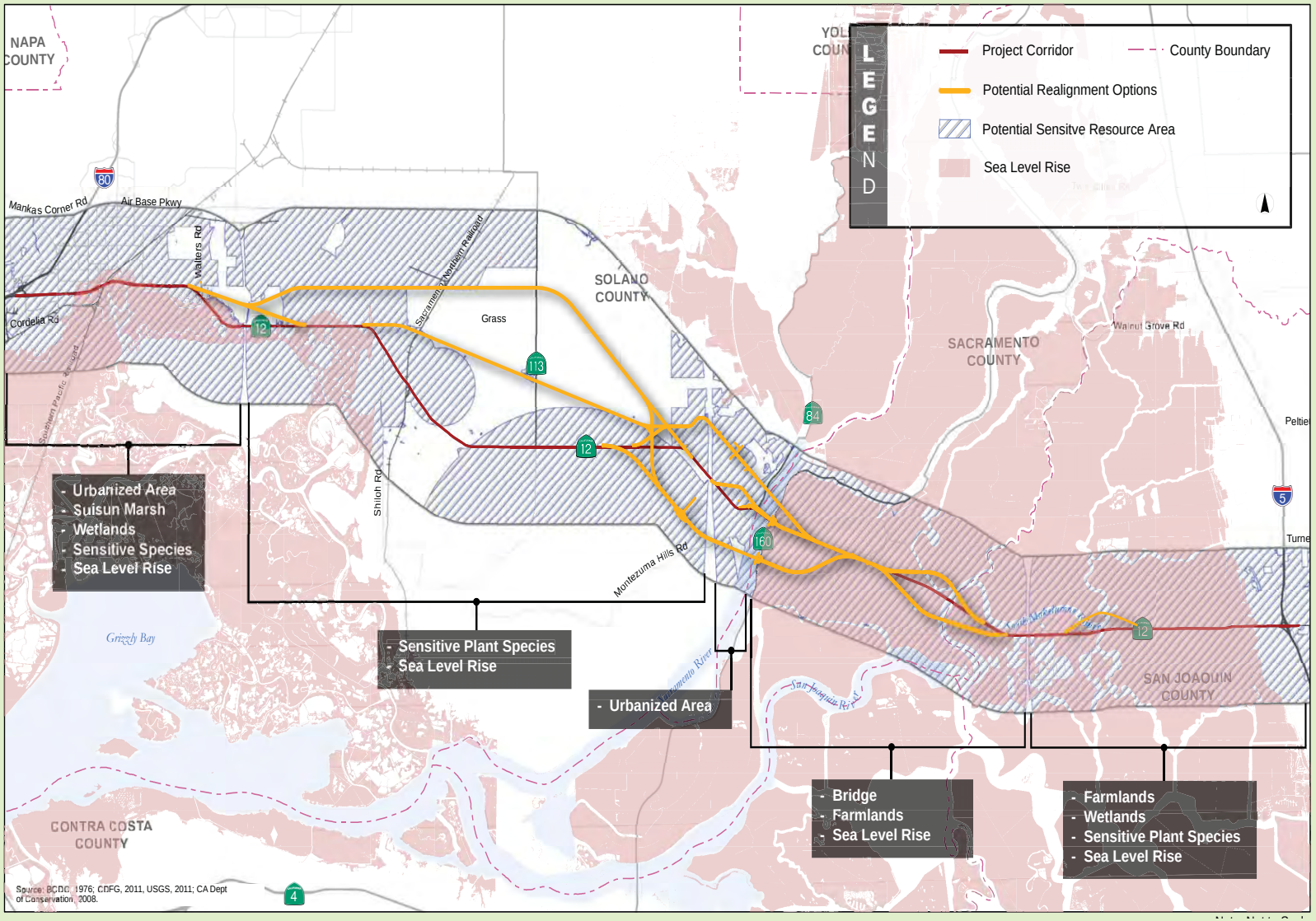
Recreation: Over 12 million visitors annually and 57,000 acres of navigable waterways.

*** Sacramento San-Joaquin Delta http://www.delta.ca.gov/res/docs/Sacto-SanJoaqin_fact.pdf**

Key findings from the scan are summarized in this chapter. Exhibit 9 presents a high level overview of the environmental factors and constraints that were considered in the preparation of the CMP. These constraints can potentially add significant project costs due to the requirement for the development and implementation of appropriate mitigation measures; project design requirements and/or construction techniques to avoid impacts; and/or construction timing restrictions imposed by permitting agencies.

[1] State Route 12 Jameson Canyon Road Widening & State Routes 29/12 Interchange Project Initial Study-Mitigated Negative Declaration (CEQA) and Environmental Assessment with Finding of No Significant Impact (NEPA) (January 2008).

Exhibit 9: Overview of Environmental Constraints



BIOLOGICAL RESOURCES

Wetlands and Waters of the U.S.

Wetlands and waters of the U.S. are protected under Sections 401 and 404 of the Federal Clean Water Act which are administered by the Regional Water Quality Control Board (RWQCB) and the U.S Army Corps of Engineers (USACE), respectively. Lakes, streams and rivers receive additional protection under the California Fish and Game Code. To the extent feasible, projects in the corridor should be designed such that all encroachment of any wetlands or waters of the U.S. are avoided. If these wetlands and other waters cannot be avoided then Certification from the RWQCB and permits from USACE are required to address mitigation for any proposed impacts.

Vernal pools and seasonal wetlands are primarily restricted to the alignment west of Rio Vista with the highest concentration between Fairfield/Suisun City and SR-113. These features occur in relatively undisturbed grassland habitat, but may persist in areas with historic disturbance such as along roadsides, railroads and fallow agricultural fields.

Freshwater marsh occurs at various locations along the corridor, and is typically associated with streams, rivers and sloughs crossing the corridor, but can occur in association with irrigation canals and reservoirs. While some freshwater marsh occurs in channels west of the Sacramento River, the greatest concentration of this habitat along the corridor occurs east of the Sacramento River with notable examples along Jackson Slough and in irrigation canals between Guard Road and I-5.

Threatened and Endangered Species

Habitats in the corridor consist of urban (developed and/or landscaped), non-native annual grassland, vernal pool grasslands, alkaline seasonal wetlands, freshwater marsh, saline/alkaline marsh, riparian, agricultural (row crops), and agricultural (orchards). These habitats potentially support a variety of plant and wildlife species known from the region that are protected under either the California Endangered Species Act (CESA), and/or the Federal Endangered Species Act (FESA).

A total of 30 state- or federally-listed threatened or endangered species have the potential to occur in the corridor. To the extent feasible, projects in the corridor should be designed such that all encroachment on habitat for any of these species is avoided. If habitat for any of these threatened or endangered species cannot be avoided, then a permit under either CESA or FESA (or both) must be obtained prior to any disturbance. A list of these species may be seen in Exhibit 10.

Exhibit 10: State or Federal Threatened and Endangered Species

Plants	
Showy Rancheria clover (*Trifolium amoenum*)	Suisun thistle (*Cirsium hydrophilum* var. *hydrophilum*) (species and its proposed critical habitat)
Mason's lilaeopsis (*Lilaeopsis masonii*)	Keck's checkerbloom (*Sidalcea keckii*)
Contra Costa goldfields (*Lasthenia conjugens*) (species and its critical habitat)	Soft bird's-beak (*Cordylanthus mollis* ssp. *mollis*) (species and its proposed critical habitat)
Invertebrates	
Vernal pool tadpole shrimp (*Lepidurus packardi*) (species and it's critical habitat)	Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*)
Delta green ground beetle (*Elaphrus viridis*) (species and its critical habitat)	Vernal pool fairy shrimp (*Branchinecta lynchi*) (species and its critical habitat)
Conservancy fairy shrimp (*Branchinecta conservatio*) (species and its critical habitat)	Callippe silverspot butterfly (*Speyeria callippe callippe*)
California freshwater shrimp (*Syncaris pacifica*)	
Fish	
Delta smelt (*Hypomesus transpacificus*) (species and it's critical habitat)	Green sturgeon (Acipenser medirostris)
Central Valley steelhead (*Oncorhynchus mykiss*) (species and its critical habitat)	Central Valley spring-run Chinook salmon (*Oncorhynchus tshawytscha*) (species and its critical habitat)
winter-run Chinook salmon, Sacramento River (*Oncorhynchus tshawytscha*) (species and its critical habitat)	
Amphibians	
California tiger salamander (*Ambystoma californiense*) (species and its critical habitat)	California red-legged frog (*Rana draytonii*) (species and its critical habitat)
Reptiles	
Giant garter snake (*Thamnophis gigas*)	
Birds	
California clapper rail (Rallus longirostris obsoletus)	California black rail (Laterallus jamaicensis coturniculus)
Mountain plover (Charadrius montanus)	Swainson's hawk (*Buteo swainsoni*)
California brown pelican (Pelecanus occidentalis californicus)	California least tern (Sternula antillarum (=Sterna, =albifrons) browni)
Northern spotted owl (Strix occidentalis caurina)	
Mammals	
Salt-marsh harvest mouse (*Reithrodontomys raviventris*)	Riparian brush rabbit (Sylvilagus bachmani riparius)

Source: CNDDB and USFWS, 2011.

Critical Habitat

Portions of the corridor have been designated critical habitat for delta smelt, delta green beetle, vernal pool fairy shrimp, vernal pool tadpole shrimp, California tiger salamander, and Contra Costa goldfields. Work in proximity to these areas could be subject to coordination with the U.S. Fish and Wildlife Service (USFWS) and/or National Oceanic and Atmospheric Administration Fisheries.

Sensitive Species of Special Concern

50 special-status species and five sensitive natural communities have the potential to occur in the region surrounding the corridor. To the extent feasible, projects in the corridor should be designed such that all encroachment on habitat for any of these species is avoided. If habitat for any of these threatened or endangered species cannot be avoided, permits or other approvals must be obtained from the USFWS, and/or the California Department of Fish and Game (CDFG) prior to any disturbance.

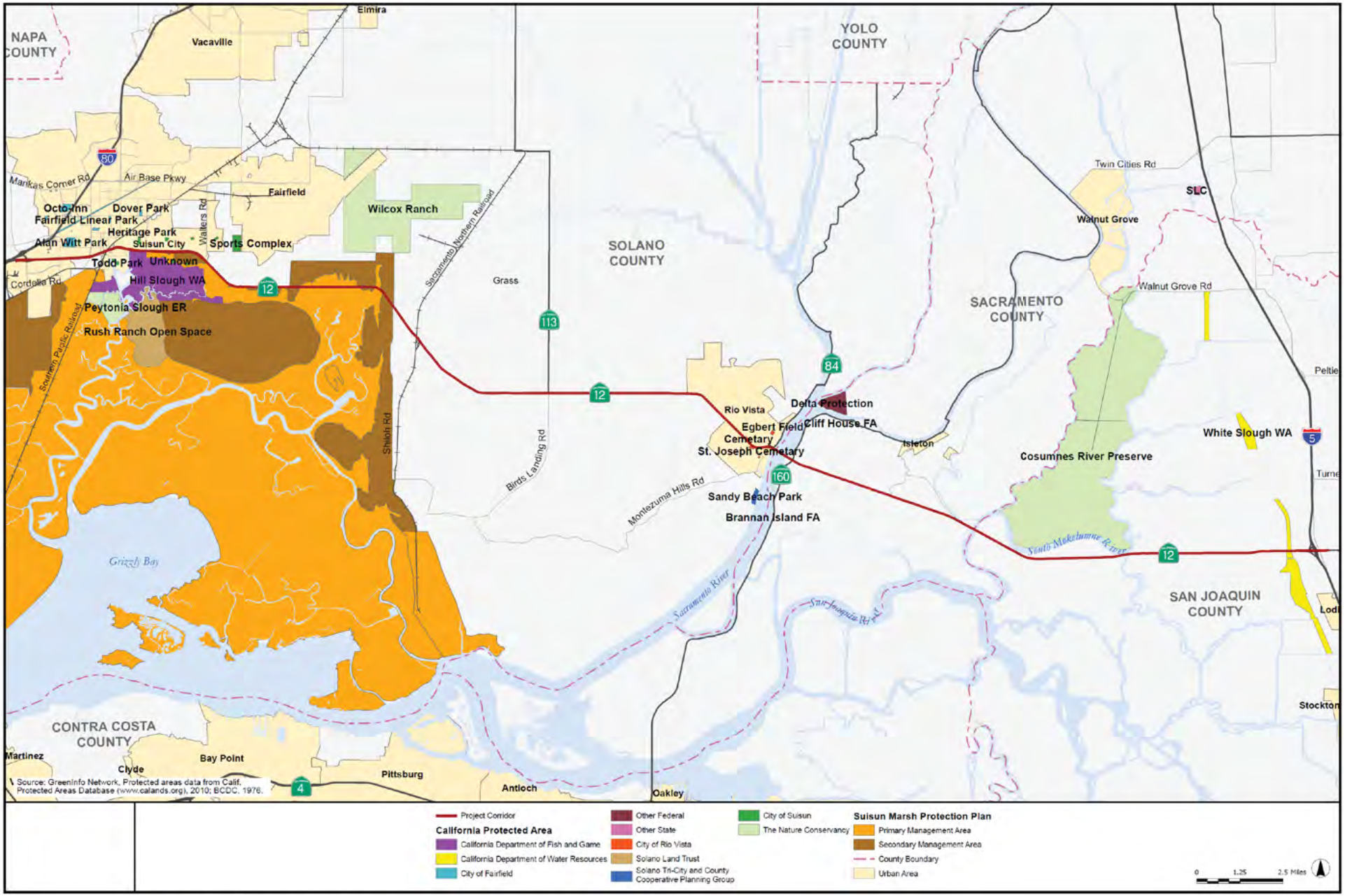
Invasive Species

Ground disturbance related to road improvements along the corridor could promote the proliferation and spread of one or more invasive species. If it is determined that road improvements along the corridor could promote the spread of invasive species, preventative measures should be taken. Such measures could include, but not be limited to, controlled burns prior to ground disturbance, herbicide use prior to ground disturbance, and the careful removal and disposal of mature invasive species prior to construction disturbance.

LAND USE

Protected Areas

Protected areas are shown in Exhibit 11 and include the Suisun Marsh, parks, managed wildlife areas, and preserves. These areas are potential Section 4(f) resources. Federally-funded transportation projects that require the acquisition of right-of-way from these areas will be required to demonstrate that there is no prudent and feasible alternative to the acquisition. In addition, work in the Primary Management Area of the Suisun Marsh could be subject to the Bay Conservation and Development Commission approval.


NAPA COUNTY
Vacaville
Elmira
YOLO COUNTY
SOLANO COUNTY
SACRAMENTO COUNTY
SAN JOAQUIN COUNTY
CONTRA COSTA COUNTY
Fairfield
Wilcox Ranch
Grass
Suisun City
Sports Complex
Alan Witt Park
Octo-Inn
Dover Park
Fairfield Linear Park
Heritage Park
Todd Park
Unknown
Hill Slough WA
Peytonia Slough ER
Rush Ranch Open Space
Rio Vista
Egbert Field
Cemetary
St. Joseph Cemetary
Delta Protection
Cliff House FA
Isleton
Sandy Beach Park
Brannan Island FA
Walnut Grove
Twin Cities Rd
SLC
Walnut Grove Rd
White Slough WA
Cosumnes River Preserve
Grizzly Bay
Sacramento River
Martinez
Bay Point
Clyde
Pittsburg
Antioch
Oakley
Stockton
Lodi
Project Corridor
California Protected Area
California Department of Fish and Game
California Department of Water Resources
City of Fairfield
Other Federal
Other State
City of Rio Vista
Solano Land Trust
Solano Tri-City and County Cooperative Planning Group
City of Suisun
The Nature Conservancy
Suisun Marsh Protection Plan
Primary Management Area
Secondary Management Area
County Boundary
Urban Area
Source: GreenInfo Network, Protected areas data from Calif. Protected Areas Database (www.calands.org), 2010; BCDC, 1976.

Farmland

The majority of the corridor in Sacramento and San Joaquin counties passes through lands designated as Prime Farmland by the Farmland Mapping and Monitoring Program. Federal acquisition of right-of-way in this portion of the corridor could require coordination with the Natural Resources Conservation Service.

The SR-12 corridor also passes through, or runs adjacent to, properties that are under active Williamson Act contracts. Acquiring the land under contract, or portions of the land, would require contract cancelation. Specific findings would be required that there are no proximate non-contracted lands available and suitable for the proposed use or, that development of the contracted land would provide more contiguous patterns of urban development.

Socioeconomic/Community Impacts

All projects involving a federal action (funding, permit, or land) must comply with Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. Of the 11 Census tracts in the corridor, five environmental justice communities were identified based on population and one environmental justice community was identified based on population and income. These five communities are all in the census tracts at the western end of the corridor in Suisun City and Fairfield. All federally-funded projects proposed within these census tracts would require further analysis to ensure compliance with Executive Order 12898.

Historical/Cultural Resources

As part of the environmental scan, multiple cultural resource background studies were conducted for the project corridor; the project corridor is defined here as approximately 150 feet on either side of SR-12. Record searches were conducted at the Northwestern Information Center for Solano County; North Central Information Center for Sacramento County; and at the Central California Information Center for San Joaquin County. These searches included the National Register of Historic Places (NRHP); the California Register of Historical Resources (CRHR); California Inventory of Historic Resources; California Historical Landmarks; California Points of Historical Interest; the Caltrans State and Local Bridge Survey; previously recorded resources; previous studies; and historical maps as appropriate.

Based on the results of the background research conducted within the project corridor, the majority of cultural resources (described below) within the project corridor represent extant historic-era agricultural and engineering structures. No prehistoric archaeological sites have been previously identified within the project corridor. In sum, background research identified 24 previously recorded historic-era resources within the project corridor; 130 previous studies; two NRHP historic properties/CRHR historical resources (both bridges); and at least four resources that should be recorded prior to project implementation by cultural resource specialists that meet Caltrans Professionally Qualified Staff (PQS) standards.

The majority of cultural resources (described below) within the project corridor represent extant historic-era agricultural and engineering structures. No prehistoric archaeological sites have been previously identified within the project corridor. In sum, background research identified 24 previously recorded historic-era resources within the project corridor; 130 previous studies; two NRHP historic properties/CRHR historical resources (both bridges); and at least four resources that should be recorded prior to project implementation by cultural resource specialists that meet Caltrans PQS standards.

Of particular concern are the designations of the Rio Vista and Mokelumne River bridges. The Rio Vista Bridge was originally constructed in 1944 and is a steel truss vertical lift-style drawbridge, the longest in the Delta region. Although this resource is designated as not eligible for listing on the NRHP on the Caltrans Historic Bridge Inventory (2010), it appears to be of local significance and the State Office of Historic Preservation Directory has determined that it needs to be re-evaluated.

The Mokelumne River Swing Truss Bridge represents the only historic property within the San Joaquin section of the corridor. The bridge was built in 1942 was found eligible for listing on the NRHP by Caltrans in 2001 (Supernowicz 2000). This eligibility determination also makes the bridge a historical resource for the CRHR.

Hydrology

The corridor lies within a large drainage area where numerous drainages convey surface runoff that ultimately discharges into the Sacramento River, San Joaquin River, Mokelumne River, Suisun Marsh, and Suisun Bay. Development of projects in the corridor could cross these numerous water courses and result in additional runoff through the creation of new impervious surfaces.

Corridor improvements would occur within extensive areas subject to 100-year flood hazards and sea-level rise inundation. In several areas, the flood depth water surface elevation has been identified and the road surface could be elevated to above the flood elevation. Regardless, because water courses in the area are subject to tidal conditions, sea-level rise could exacerbate flood hazards.

Appropriate hydraulic/hydrologic studies will need to be conducted in order to determine effects of future projects. A Location Hydraulic Study, Summary Floodplain Encroachment Report, and Floodplain Evaluation Report will need to be prepared in order to determine and assess the amount of runoff generated and the effects on existing drainage facilities. The amount of floodplain fill and effects on flood storage capacity and flood flow conveyance will also need to be identified. This will require hydrologic and hydraulic modeling of water crossing structures and displacement of floodplain storage effects.

Water Quality

The corridor passes through several watersheds and two Regional Water Quality Control Board jurisdictions. Runoff from the corridor drains through sloughs, ditches, canals, and other drainages including impaired receiving waters. Because the corridor drains to impaired receiving waters, construction and operation of new projects could affect water quality and a Caltrans Water Quality Assessment Report would be required to identify potential risks to water quality.

In compliance with Caltrans and State Non-Point Discharge Elimination System, a Storm Water Data Report would also be required and stormwater quality Best Management Practices incorporated into project design. Prior to construction of any project improvements, a Storm Water Pollution Prevention Plan would also be required. Construction of projects resulting in fill of wetlands, alteration of drainages, and structure crossings of major channels and flood control features would require a USACE 404 permit, Clean Water Act Section 401 water quality certification, and CDFG Streambed Alteration Agreement.

Soils

The geology and geotechnical conditions for a majority of the corridor, especially in the Sacramento-San Joaquin River Delta area, present many issues as the Delta soils, which consist of peat and clay layers, are highly compressible. Roadways built over these soil conditions are subject to settlement and require long-term maintenance to address pavement cracking, deterioration, and decreased service life.

Highly compressible soils throughout segments of the corridor will require specialized geotechnical engineering solutions to allow for roadway construction and other improvements that may be identified as part of the mitigation strategies for the corridor.

Geology

The organic rich soils of the Sacramento-San Joaquin Delta islands are subsiding at average rates as rapid as 4.8 cm/yr (1.9 inches per year). The SR-12 corridor between the Rio Vista Bridge and Potato Slough Bridge crosses some of the most rapidly subsiding portions of the Delta. Brannon Island (Rio Vista Bridge to Mokelumne Bridge) is now between 2.00 and 2.99 m (6.6 and 9.8 feet) below sea level and is expected to be between 3.00 and 3.99 m (9.8 and 13.1 feet) below sea level by 2050. Bouldin Island (Mokelumne Bridge to Potato Slough Bridge) is more than 5.00 m (16.4 feet) below sea level and could be more than 6.92 m (22.7 feet) below sea level by 2050. Terminus Tract (Potato Slough Bridge to I-5) is relatively stable at 1.00 to 1.99 m (3.3 to 6.5 feet) below sea level.[2] Subsidence of these soils will have major impacts on the design and cost of transportation projects in the corridor.

The San Francisco Bay and Sacramento-San Joaquin Delta areas are in a seismically active region near the boundary between two major tectonic plates, the Pacific Plate to the southwest and the North American Plate to the northeast. These two plates move relative to each other in a predominantly lateral manner, with the San Andreas Fault Zone at the junction. The Pacific Plate, on the west side of the fault zone, is moving north relative to the North American Plate on the east. The relative movement between the Pacific and the North American Plates generally occurs across a 65-mile zone extending from the Point Reyes Fault about 50 miles west of Fairfield to the Great Valley Thrust Belt about 15 miles east of Fairfield.

Paleontology

Paleontological resources are protected by federal regulation under the 1906 Federal Antiquities Act. Database searches of the University of California Museum of Paleontology to identify previously reported vertebrate fossil finds in Solano, Sacramento, and San Joaquin counties indicate nearly the entire SR-12 corridor has high potential for the discovery of these paleontological resources. A Paleontological Resources Monitoring and Mitigation Program may be necessary, if excavation in the

2 Mount, J. and R. Twiss. 2005 (March). Subsidence, Sea-level Rise, and Seismicity in the Sacramento-San Joaquin Delta. California Bay-Delta Authority Science Program: San Francisco Estuary & Watershed Science. Vol 3, Issue 1, Pages 9 and 11.

SR-12 corridor is expected to disrupt deposits that are highly sensitive with respect to paleontological resources.

Hazardous Waste

There are various sites within the SR-12 corridor that are under the oversight of the San Francisco Bay Area Regional Water Quality Control Board for hazardous waste cleanup. Due the presence of known hazardous waste sites and the potential for unknown sites in the corridor, Phase I Environmental Site Assessments (ESA) would be required during the PA/ED phase of transportation projects proposed in the corridor. Depending on the results of the Phase I ESA, Phase II ESAs may be required, as well as the adoption of mitigation and minimization measures to protect workers and the public during construction activities.

Noise

For highway transportation projects with Federal Highway Administration (FHWA) involvement, the Federal-Aid Highway Act of 1970 and the associated implementing regulations govern the analysis and abatement of traffic noise impacts. The SR-12 corridor includes a number of receptors that could be impacted by improvements within the corridor. Noise levels for residential, commercial, and church uses within the corridor would need to be compared to the FHWA Noise Abatement Criteria to determine if abatement measures must be considered.

Climate Change/Sea-Level Rise

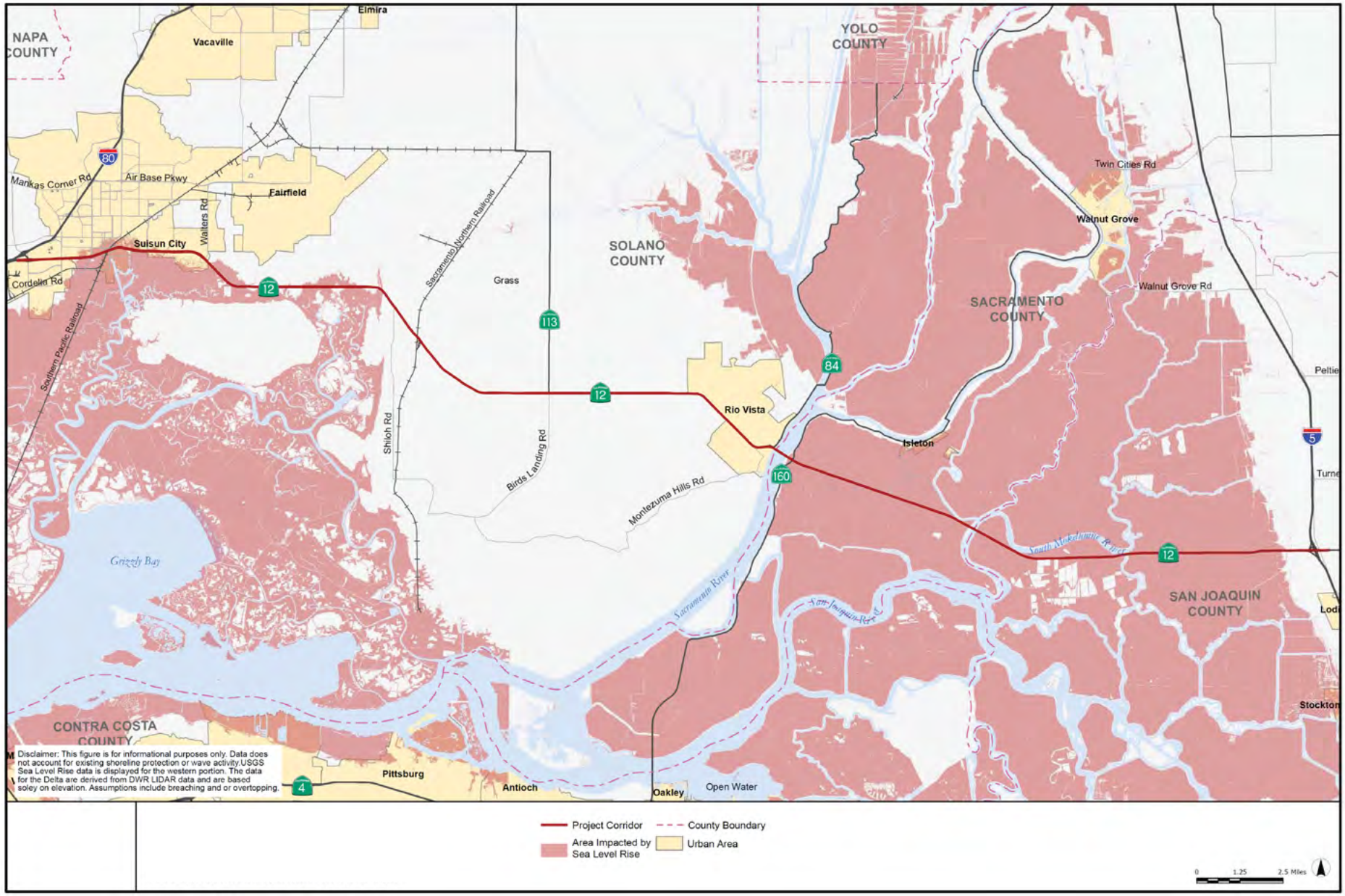
Sea-level rise is a well documented impact of climate changes and the California coastline will experience rising sea levels over the next century unless emissions of greenhouse gases are dramatically reduced from current levels.

Exhibit 12 shows projected sea-level rise inundated areas along the corridor. Towards the western end of the corridor in the vicinity of Suisun City and Fairfield, the sea-level rise inundated areas and the impact of these will need to be evaluated using the latest Caltrans guidance[3] to determine what, if any, mitigation should be included as part of a proposed project.

Sea-level rise, unless mitigated, is also expected to inundate the Delta areas of Sacramento County and San Joaquin County. Managing the issue and consequences of the sea-level rise in the Delta is much

[3] Guidance on Incorporating Sea-Level Rise – For use in the planning and development of Project Initiation Documents, Caltrans Climate Change Workgroup and the HQ Divisions of Transportation Planning, Design and Environmental Analysis (May 2011).

Exhibit 12: Sea-Level Rise Inundated Area



bigger than addressing elevation of SR-12 and needs to be addressed comprehensively through plans for levee improvements that will address long-term viability of this area for both existing and projected sea levels.

Visual Aesthetic

According to Caltrans, SR-12 is not on the state list of eligible or officially designated Scenic Routes. In addition, there are no known recognized scenic viewpoints or resources in the corridor. However, projects proposed in the corridor will require analysis to demonstrate compatibility with the existing visual landscape in the corridor.

As described in this environmental resources scan, the SR-12 corridor passes through an area containing considerable environmental constraints, including human, natural, and physical. Each of these constraints has the potential to limit the range of alternative transportation improvements available for implementation in the corridor. This limitation is primarily due to potential constraints on the acquisition of new right-of-way from sensitive and protected land uses.

Any projects that do require right-of-way acquisition will require extensive coordination with the appropriate agencies during the planning and environmental phases of project development to demonstrate that all efforts have been made to avoid and minimize such acquisitions. This coordination must be taken into account when determining the schedules for the planning (PID and PA/ED), design, and construction phases of projects in the corridor. The environmental constraints in the corridor may also have a significant effect on project costs. Costs could escalate due to the requirement for the development and implementation of appropriate mitigations measures; project design requirements and/or construction techniques to avoid impacts; and/or construction timing restrictions imposed by permitting agencies.

Chapter 4

SR-12 Today

Along the 55-mile length of the corridor, SR-12 passes through a diverse setting that includes urbanized communities, cities, rural settlements, agriculture and recreational areas. SR-12 crosses two major Interstate routes (I-80 and I-5), three State Routes (SR-113, SR-84, and SR-160), two railway lines (Union Pacific and Sacramento Northern), navigable water bodies with three movable bridges (Sacramento River Crossing at Rio Vista Bridge, Mokelumne Bridge, and Potato Slough Bridge) and numerous at-grade and grade separated intersections.

The characteristics of SR-12 vary as much as the environment it passes through. Along this 55-mile stretch, the road is classified as an expressway and conventional highway. The cross-section varies between two and four lanes with varying speed limits that range from 35 mph in Rio Vista to 55 mph in more rural sections. Traffic volumes vary as well from 9,500 vehicles per day in rural Solano County to 42,000 vehicles per day passing through Fairfield and Suisun City. The percentage of truck traffic varies between 7 and 14 percent of the daily traffic volume which equates to between 950 and 3,750 trucks per day on segments of SR-12.

With the exception of the Fairfield/Suisun City areas, there are no parallel highways or routes that offer an east-west travel option. SR-12 is the primary east-west travel way between northern San Joaquin County communities such as Lodi, and Solano County communities such as Fairfield and Suisun City. SR-12 is also the only east-west commuting option for the City of Rio Vista. The lack of competitive alternative routes demonstrates the importance of SR-12 and how prolonged traffic congestion and emergency incidents can impose significant delay to those who travel the corridor.

This chapter describes existing conditions along the SR-12 corridor including geometric characteristics, movable bridge operations which have a significant effect on the corridor, traffic volumes, corridor performance and other transportation systems considerations such as transit service. Planned and programmed improvements including those recently completed or underway are also identified.

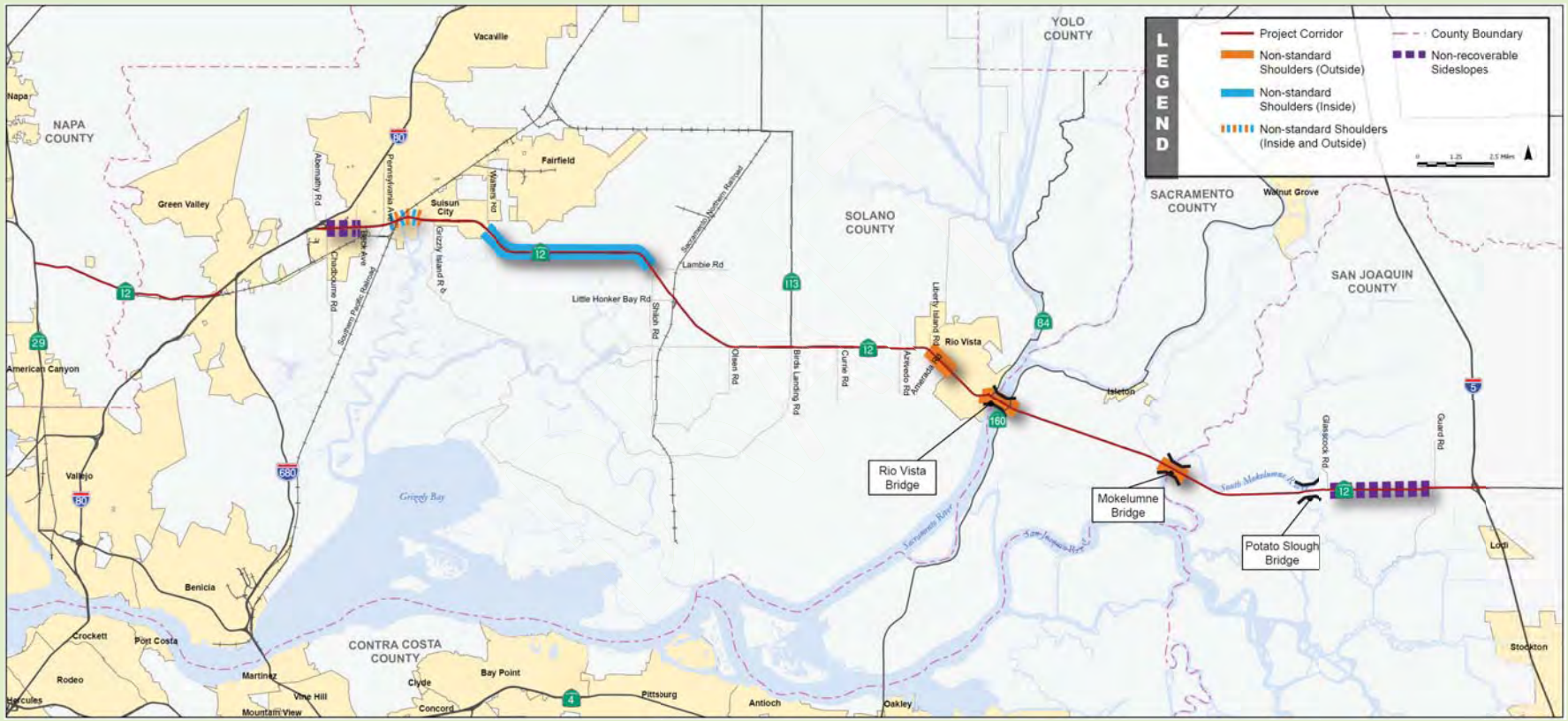
GEOMETRIC EVALUATION

Existing geometry was evaluated throughout the corridor with respect to horizontal alignment (curvature), vertical alignment (hills and grades) and cross-section elements (shoulders, lanes and median treatments). This evaluation was conducted at the start of this study in November 2010. There have been changes along the corridor since that date. Most notably, Caltrans has completed the SR-12 Rehabilitation Project in rural Solano County (Solano EA 04-0T10U) and construction is beginning on the multi-lane Jameson Canyon Project. Exhibit 13 highlights areas where the cross-sections along SR-12 could be improved by providing wider shoulders or improved grading on side slopes.

Jameson Canyon Segment (PM 0-3.3 Napa, PM 0-2.75 Solano)

Today, the Jameson Canyon section of SR-12 is a two-lane conventional highway between SR-29 and I-80 with additional truck climbing lanes at each end of this segment. In its existing configuration, the

Exhibit 13: SR-12 – Segments Where Cross-Sections Could Be Improved



Jameson Canyon section does not meet current Caltrans standards for shoulder width and there are lengths along this section where both the horizontal and vertical alignments do not meet the criteria for a 55 mph design speed.

Construction has started on the SR-12 Jameson Canyon Project (Napa EA 04-264134, Solano EA 04-264144) which will widen and upgrade this segment of SR-12 to a four-lane conventional highway. The project includes a new concrete median barrier and full standard inside and outside shoulders. A Class II bicycle lane will be provided for the entire eastbound direction of Jameson Canyon and, where feasible, in the westbound direction. Intersections will be upgraded to include additional left and right turn lanes. The horizontal and vertical alignment will be improved to a 55 mph design speed. This project is expected to be completed in 2013.

Solano Urban Segment (PM 1.8–7.8)

The Solano urban segment is a four-lane facility passing through the cities of Fairfield and Suisun City. Although the roadway is classified as both an expressway and a conventional highway, the typical section is generally four lanes, with full standard inside and outside shoulders, and either a median concrete barrier (I-80 to Marina Boulevard) or depressed median (Marina Boulevard to Walters Road). Standard outside shoulders are 10 feet, and inside shoulders are five feet or wider. The bridges crossing over Webster Street and the Union Pacific Railroad have narrow shoulders and the adjacent roadways between Webster Road and Marion Boulevard have shoulders below current standards.

This segment has the only bicycle path within the study area. The Central County Bikeway, a Class I bicycle facility, extends from the Union Pacific Railroad to Walters Road on the north side of SR-12. This path ties into the City of Suisun City's local streets near the railroad tracks and consists of an eight- to ten-foot wide concrete path. There are no near-term plans to improve this section of SR-12, although in the long-term, it is proposed to be improved as part of Phase 2 of the I-80/I-680/SR-12 Interchange Project.

Solano Rural Segment (PM 7.8–24.82)

The safety enhancement implementation and recently-completed SHOPP project have improved safety along a majority of this segment. There is a concrete median barrier from just east of Walters Road to just west of Shiloh/Lambie Road. In this section there is no inside shoulder adjacent to the median barrier, but there are standard eight-foot outside shoulders.

East of Shiloh/Lambie Road to Currie Road, the SHOPP project upgraded the roadway to meet current standards and improved horizontal and vertical alignments. There are two passing lanes in each direction in this section. In passing lane locations, the existing shoulder is less than two feet wide.

East of Currie Road, the existing roadway consists of two lanes, centerline rumble strip with channelizers, and rumble strips on the outside shoulders where the width is at least eight feet. The outside shoulder widths vary between zero and eight feet, with much of this section from Currie Road to the City of Rio Vista having shoulders below current standards. Passing is not permitted in this section, except in the short passing lanes. The SR-12 Roadway Rehabilitation Project (West of Currie Road to Liberty Island Road, Solano EA 04-2A6200) SHOPP project will upgrade and rehabilitate this section of SR-12. Construction is scheduled to begin in 2013 and be completed in 2014.

Rio Vista Segment (PM 24.82 – 26.24)

The City of Rio Vista segment is primarily a two-lane conventional highway section with various turn lanes within the City of Rio Vista limits. This segment extends from Church Road to the Rio Vista Bridge. From Church Road to Drouin Drive, the cross section is two lanes with centerline channelizers and a zero- to two-foot outside shoulder. There are steep side slopes that extend from the edge of the shoulder.

From Drouin Drive to the Rio Vista Bridge, there are various right turn lanes, wide outside shoulders, and a center (two-way) left turn lane. There are numerous driveway accesses from adjacent businesses and parking is allowed in some locations along SR-12 within the City of Rio Vista limits. There are stretches of narrow, five-foot sidewalk along SR-12 in Rio Vista. This segment ends at the Rio Vista Bridge.

Sacramento Rural Segment (PM 0.0 – 6.2)

The Sacramento rural segment is a two-lane conventional highway that extends from the Rio Vista Bridge to the Mokelumne Bridge. This segment has mostly standard eight-foot shoulders with rumble strips, but there are several areas where the shoulders are approximately six feet wide. For most of this section, passing is allowed. In areas were passing is not permitted; there is a centerline rumble strip. There are numerous locations where the roadway has settled around cross drainage pipes causing humps to form in the roadway.

San Joaquin Rural Segment (PM 0.0 – 10.8)

The San Joaquin Rural segment is similar to the Sacramento segment and is a two-lane conventional highway from the Mokelumne Bridge to west of the I-5 interchange where the roadway becomes a four-lane conventional highway. There are standard eight-foot wide outside shoulders with rumble strips for most of the segment although there are several lengths that have narrow shoulders ranging from four to six feet in width.

The Bouldin Island Project (San Joaquin EA 10-0G800) will widen and rehabilitate SR-12 between Mokelumne Bridge and Potato Slough Bridge. These improvements will include full-width shoulders, six-foot inside shoulders, and the addition of a concrete median barrier. The SR-12 Improvements Project I-5 to Bouldin Island (San Joaquin EA 10-A8404) will improve the intersections of Tower Parkway, Glasscock Road, Correia Road, and North Guard Road. In addition, the project includes compaction of the existing soils and engineered lightweight fill that together are designed to address settlement and premature pavement failure due to the compressible Delta soils.

MOVABLE BRIDGES

There are three movable bridges along the 55-mile SR-12 corridor. The two oldest bridges – Rio Vista and Mokelumne River – frequently open for marine traffic and these operations result in lengthy delays at the bridge approaches. As the older two bridges were constructed around 70 years ago, more ongoing maintenance and repairs are required. Since these bridges were built, Caltrans standards have changed. Newly designed bridges would provide for pedestrian and bicycle access as well as appropriate shoulders to allow vehicles to pull to the side in case of emergency. The newest bridge at Potato Slough is opened by appointment only and has negligible impact on traffic operations along SR-12. Exhibit 14 summarizes the physical and operational features of the movable bridges.

Rio Vista Bridge

The Rio Vista Bridge crossing the Sacramento River was constructed in 1944 and has a clearance of 18 feet above ordinary high tide. Rio Vista is a lift bridge using counterweights to lift a 310-foot long section on the western half of the bridge. The total length of the bridge including approach structures is 2,890 feet. The bridge is operated 24 hours a day, seven days a week, and regularly opens for sailboats, tugboats, and large barges. The bridge is considered functionally obsolete because of the

lack of shoulders and is also structurally deficient due to the need for repairs to several elements of the bridge.

In 2010, the Rio Vista Bridge was opened approximately 100 times during peak months. This is about half of the opening frequency experienced in 2004 when this bridge cycled just over 200 times during peak months.

The reduction in openings is believed to be due to the economic conditions in 2009 and 2010 which resulted in fewer commercial and recreational vessels passing under the Rio Vista Bridge. Opening the Rio Vista Bridge often results in queues of 200 vehicles extending ¾ of a mile on the approaches and resulting in delays as long as 30 minutes.

As the gateway to the Port of West Sacramento, the Rio Vista Bridge is part of the M-580 Marine Highway Corridor that includes the San Joaquin River, Sacramento River, and connecting commercial navigation channels, ports, and harbors from Sacramento to Oakland. The United States Department of Transportation awarded the Ports of West Sacramento, Oakland, and Stockton a joint $30 million grant through the Transportation Investment to Generate Economic Recovery Grant program. This funding will enable the Ports of West Sacramento, Oakland, and Stockton to begin a Marine Highway, which will take 350 containers on each trip from the Valley to the Port of Oakland, reducing the number of drayage trucks on the already congested highways. The projected increase in shipping could benefit SR-12 by removing truck traffic, but will result in more frequent delays on SR-12 at the Rio Vista Bridge approaches.

Mokelumne River Bridge

The Mokelumne Bridge was constructed in 1942 and has a clearance of eight feet above ordinary high tide. This bridge is a center pivot swing drawbridge. The total length of the bridge including approach structures is 1,436 feet. According to the Caltrans Bridge operating staff, the Mokelumne River Bridge is the most frequently opened bridge in California. Because of the low clearance, the bridge has to open for almost all vessels on the Mokelumne River. The most common vessels are recreational motorboats, sailboats, and house boats. The bridge is considered functionally obsolete because of the narrow shoulders[1].

Similar to the Rio Vista Bridge, the frequency of openings has decreased from approximately 400 in peak months to around 220 openings. Openings at this bridge are estimated to produce queues in the range of 150 vehicles extending over ½ mile during peak travel times.

[1] The Mokelumne River was listed as functionally obsolete in 2010 when this information was first gathered. A review of the same source (the Federal Highway Administration National Bridge Inventory) in April 2012 now shows this bridge as structurally deficient and functional obsolete.

Potato Slough Bridge

The Potato Slough Bridge was constructed in 1991 and has a typical high-tide clearance of 35 feet. This bridge is a center pivot swing drawbridge. The total length of the bridge including approach structures is 2,980 feet. The bridge is opened by appointment only. The higher clearance allows most boats to pass underneath without the need to open the bridge. The bridge is rated as structurally deficient due to the need for repairs to the bridge deck and adjacent elements.

Exhibit 14: SR-12 Corridor Movable Bridges

Bridge	Year Built	Type	Typical High-Tide Clearance	Operation Schedule
Rio Vista Bridge	1944	Lift Bridge (Counterweights)	18'	24 hours/7 days
Mokelumne Bridge	1942	Swing Drawbridge (Pivot)	8'	May-Oct 6am-10pm Nov-Apr 9am-5pm 4 hours advance notice required
Potato Slough Bridge	1991	Swing Drawbridge (Pivot)	35' (Unimpaired)	On-call only (Opened 6 times in 2004) 4 hours advance notice required

PUBLIC TRANSPORTATION

While use of the SR-12 corridor is dominated by personal auto and commercial truck traffic, there is service by three transportation providers. Transit use along the SR-12 corridor is relatively low, but it does provide for important transportation needs. The local transit services provide good connections to the inner San Francisco Bay Area via Fairfield and Suisun Transit (FAST) Route 90 to the El Cerrito del Norte Bay Area Rapid Transit (BART) Station and transfers at the Suisun Amtrak Station to the Capitol Corridor Service, which also serves the Sacramento-Auburn area.

Delta Breeze Route 52 SR-160 Express also provides three round trips per day from Rio Vista to the Pittsburg/Bay Point BART Station. The major transit services operating in the corridor are bus routes provided by FAST, Rio Vista Delta Breeze, and South County Transit (SCT/LINK) in Galt. Exhibit 15 shows weekday transit service in the corridor.

Exhibit 15: Weekday Transit Service in the SR-12 Corridor

Transit Agency/Route	Average Weekday Ridership	Direction	Weekday Service			
			Hours	Frequency (in minutes)		
				Morning	Midday	Evening
Fairfield/Suisun Transit (FAST)						
Express Route 90	840	WB	4:10 AM - 7:30 PM	15-35	60	8-60
		EB	5:00 AM - 8:12 PM	17-43	60	9-33
Local Route 5	185	Circular Route	7:30 AM - 7:22 PM	30	30	30
Local Route 8	95	Circular Route	7:05 AM - 7:00 PM	60	60	60
Rio Vista Delta Breeze						
Route 50 SR-12 Express	20	EB	8:00 AM - 6:30 PM	1 trip	2 trips	2 trips
		WB	5:20 AM - 5:25 PM	3 trips	2 trips	1 trip
Route 52 SR-160 Express	5	NB	5:50 AM - 6:20 PM	1 trip	1 trip – Tuesday only(overlaps AM)	1 trip
		SB	7:00 AM - 7:20 PM	1 trip	1 trip – Tuesday only	1 trip
SCT/LINK						
Delta Route	20	EB	9:00 AM - 5:35 PM	Three round trips between Isleton and Lodi via SR-160 and SR-12		
		WB	10:15 AM - 6:10 PM			

Source: www.fasttransit.org; www.rio-vista-ca.com/transit; www.sctlink.com.

Notes:

1. Route 90 FAST ridership is based on FY 09/10 annual ridership from STA's Transit Program Manager.
2. SCT/LINK Delta Route daily ridership is based on average monthly ridership from STA/LINK. Additional service times to Galt at the beginning and end of day not shown in table.
3. Delta Breeze daily ridership is from July-September 2010, Rio Vista Delta Breeze Summary Report FY 2010-11.
4. FAST local route weekday ridership estimated from FY 09/10 annual ridership.

BICYCLE FACILITIES

The Central County Bikeway Class I bicycle facility extends from the Union Pacific Railroad to Walters Road on the north side of SR-12. It is the only dedicated bicycle facility along SR-12 today. Bicycle facilities planned for the corridor include:

- A 20-mile Class II bicycle lane or Class III bicycle route between the Rio Vista Bridge and Walters Road developed by improving shoulders along SR-12.

- Class II bicycle lane improvements along Jameson Canyon Road from Red Top Road to the Napa County Line as part of the Jameson Canyon (PM 0-3.3 Napa, PM 0-2.75 Solano) Project.
- A 0.6-mile Class I bicycle multi-use path along the north side of SR-12 from Marina Road to the Amtrak Station in Suisun City.

INTELLIGENT TRANSPORTATION SYSTEMS

The existing inventory of ITS infrastructure implemented along the SR-12 corridor is primarily located in the western segment of the corridor from I-80 to the Rio Vista Bridge. The existing ITS elements currently servicing the corridor include Portable Changeable Message Signs and Speed Radar Signs (or Driver Feedback Signs).

Proposed ITS improvements along the SR-12 corridor are mainly concentrated within the eastern segment of the corridor and would expand ITS coverage from the Rio Vista Bridge to I-5. Proposed improvements include the implementation of ITS features such as:

- Extinguishable Message Signs – at either approach of the Rio Vista Bridge;
- Changeable Message Signs – at the intersection of SR-12 and Jackson Slough Road; and
- Traffic Monitoring Stations – installed throughout the eastern segment of the corridor from the Rio Vista Bridge to N. Thornton Road just past I-5.

TRAFFIC CHARACTERISTICS

Traffic characteristics were evaluated at four representative locations along the SR-12 to assess daily variations in traffic volumes. A performance evaluation was conducted by analyzing bottleneck locations, queues, corridor travel times and intersection delays.

Eight data locations (four eastbound and four westbound) were chosen for this analysis. Data locations were chosen to represent typical traffic characteristics for various segments of the corridor. The locations chosen were:

- Between Beck Avenue and Pennsylvania Avenue – 4-lane urban segment located in Solano County.

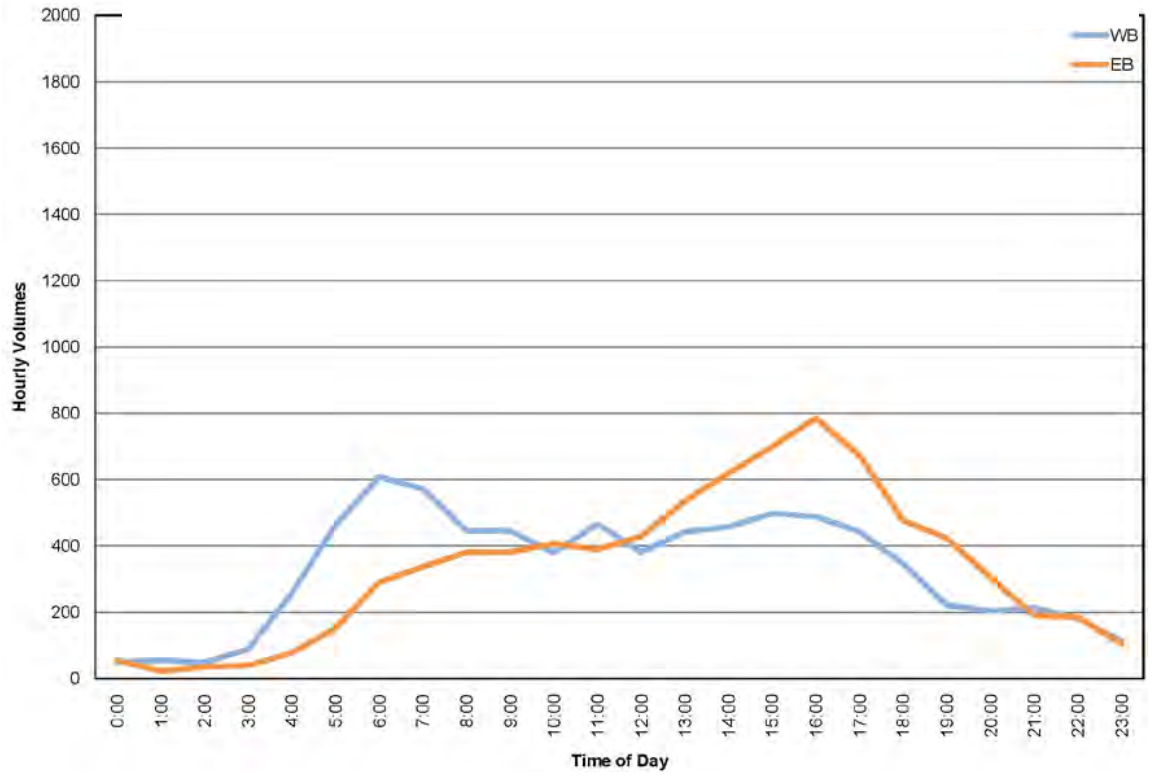
- Between Walters Road and Shiloh Road – 2-lane rural segment located in Solano County.
- Between SR-160 and Brannan Island Road – 2-lane rural segment located in Sacramento County.
- Between West Terminous Road and I-5 – 2- and 4-lane rural segment Located in San Joaquin County.

Hourly traffic volume was obtained from counts conducted in the last week of May and the first week of June 2010, and excluded the Memorial Day weekend days. AM counts were conducted from 5 am to 8 am and PM counts from 3 pm to 6 pm. The traffic count data collected in 2010 was compared to historic traffic data to determine if adjustments should be made to reflect seasonal variations or impacts of recession period economic conditions. This review indicated that on average, the 2010 traffic counts were 8% lower than those collected between 2005 and 2007. The traffic counts used for this evaluation were adjusted upwards accordingly.

Along much of the corridor the morning peak traffic concentrates generally westbound and the afternoon peak traffic generally eastbound. This relationship reverses towards the far eastern segment of the corridor as it approaches I-5.

The afternoon peak hour traffic is most often the highest, but in certain segments such as between Walters Road and Shiloh Road in Solano County, the difference in magnitude between morning and afternoon peak traffic is only slight. Exhibit 16 shows typical hourly traffic profiles for the SR-12 corridor.

Exhibit 16: Hourly Traffic Profiles between SR-160 and Brannan Road



Truck and Heavy Vehicle Traffic

Agricultural goods are transported on SR-12 to Napa County and beyond from the San Joaquin Valley and Delta area. SR-12 is also a Department of Defense truck route and part of the federal Surface Transportation Assistance Act with a designation as a terminal access route. SR-12 provides the most direct route for high priority shipments between the Department of Defense Logistics Agency Distribution Center in Tracy, California and the Travis Air Force Base.

There are a high number of industrial facilities in the City of Fairfield between I-80 and Grizzly Island Road that generate truck trips from I-80 and along SR-12. The Portrero Hills Landfill, accessed from Scally Road, is the destination for waste hauling trucks. Truck and heavy vehicle traffic make up 7 to 14 percent of daily vehicle trips along SR-12. Exhibit 17 presents average daily total traffic and truck traffic for SR-12.

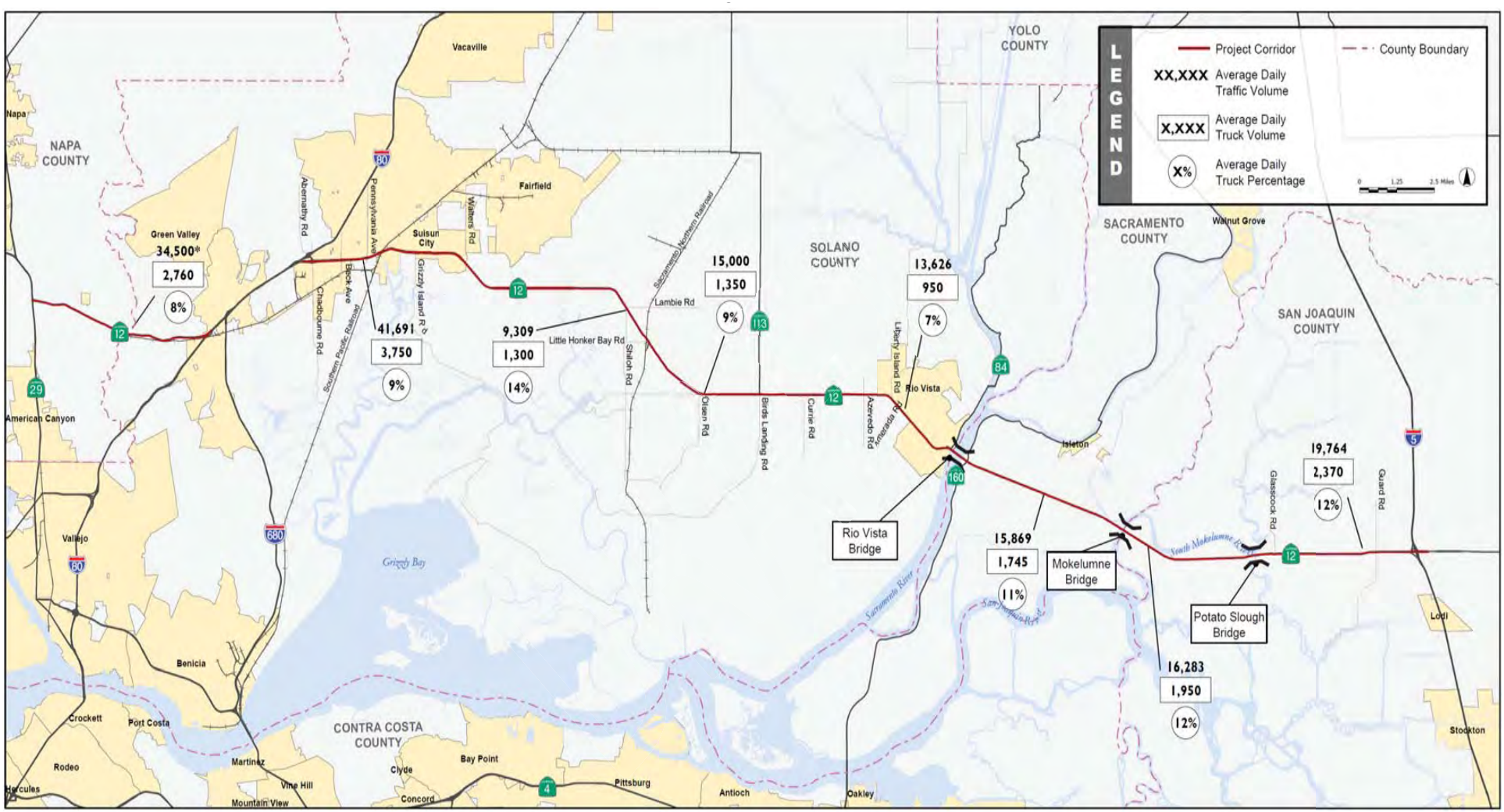
CORRIDOR PERFORMANCE EVALUATION

The existing corridor performance evaluation relies heavily upon the use of available collected data and field observations. This section includes a discussion of the methods and tools used to identify congestion and it presents an analysis of existing conditions with a focus on identifying congested areas, bottlenecks and the causes of these delays. Operational performance of the corridor is quantified using travel times, operating speeds and intersection delay. An evaluation of travel time, speed and delay helps quantify mobility along the corridor.

Travel Speeds

Review of the travel time data indicates the presence of low average speeds (10-25 mph) on the west end of the corridor between I-80 and Walters Road through Suisun City. Lower speeds are observed on segments that carry the highest corridor volumes between Abernathy Road and Walters Road. Slower speeds (25 mph) were also observed in the vicinity of Rio Vista and near the I-5 interchange which can be attributed to the presence of signals and closely spaced intersections. The observed lower speeds in other areas can be attributed to control delay due to signals at intersections. No significant congestion was observed on segments of SR-12 with uninterrupted flow (from Sunset Avenue to Hillside Terrace and from River Road to I-5). Travel speeds for the eastbound direction of travel, in the afternoon, are shown in Exhibit 18.

Exhibit 17: Average Truck Volumes on SR-12

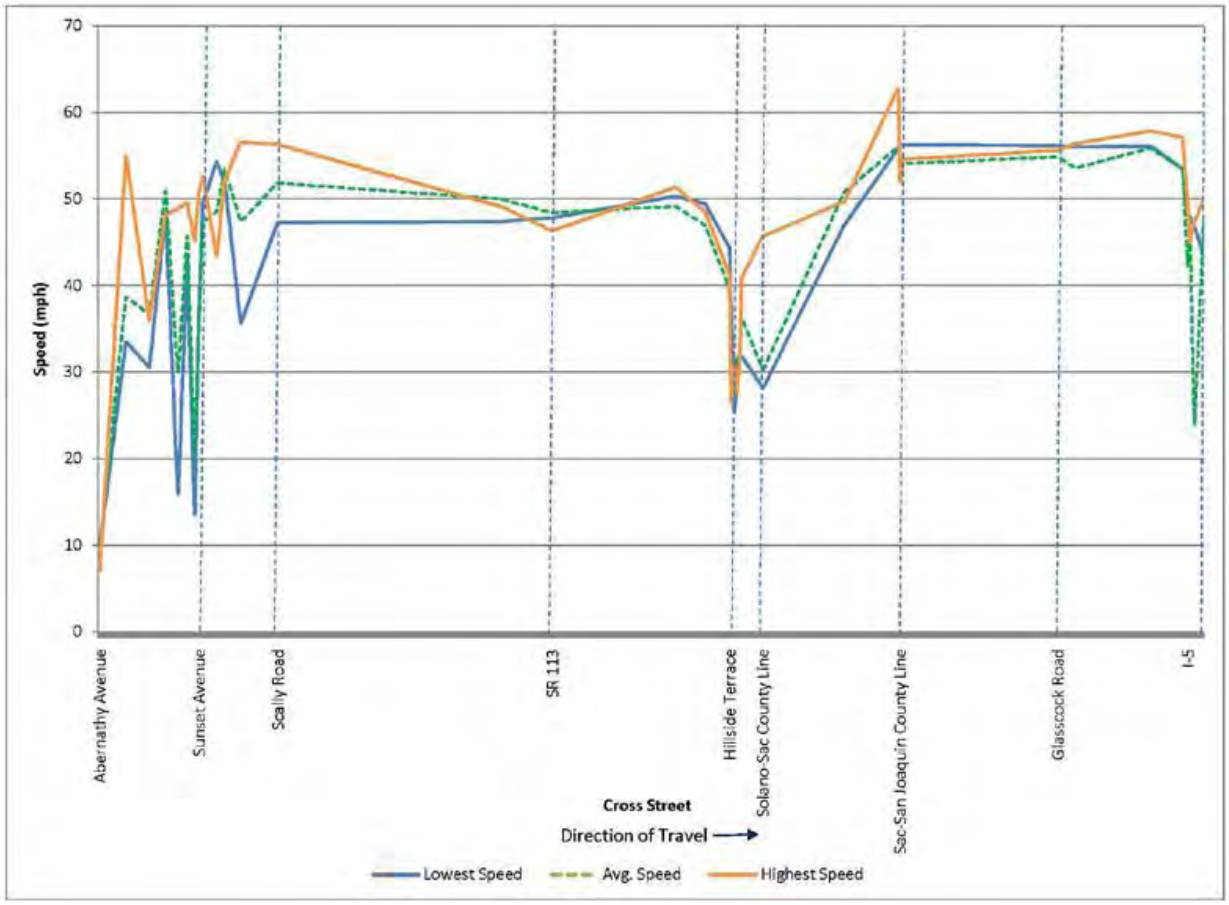


Source: ATKINS Traffic Analysis, 2010.

Delay

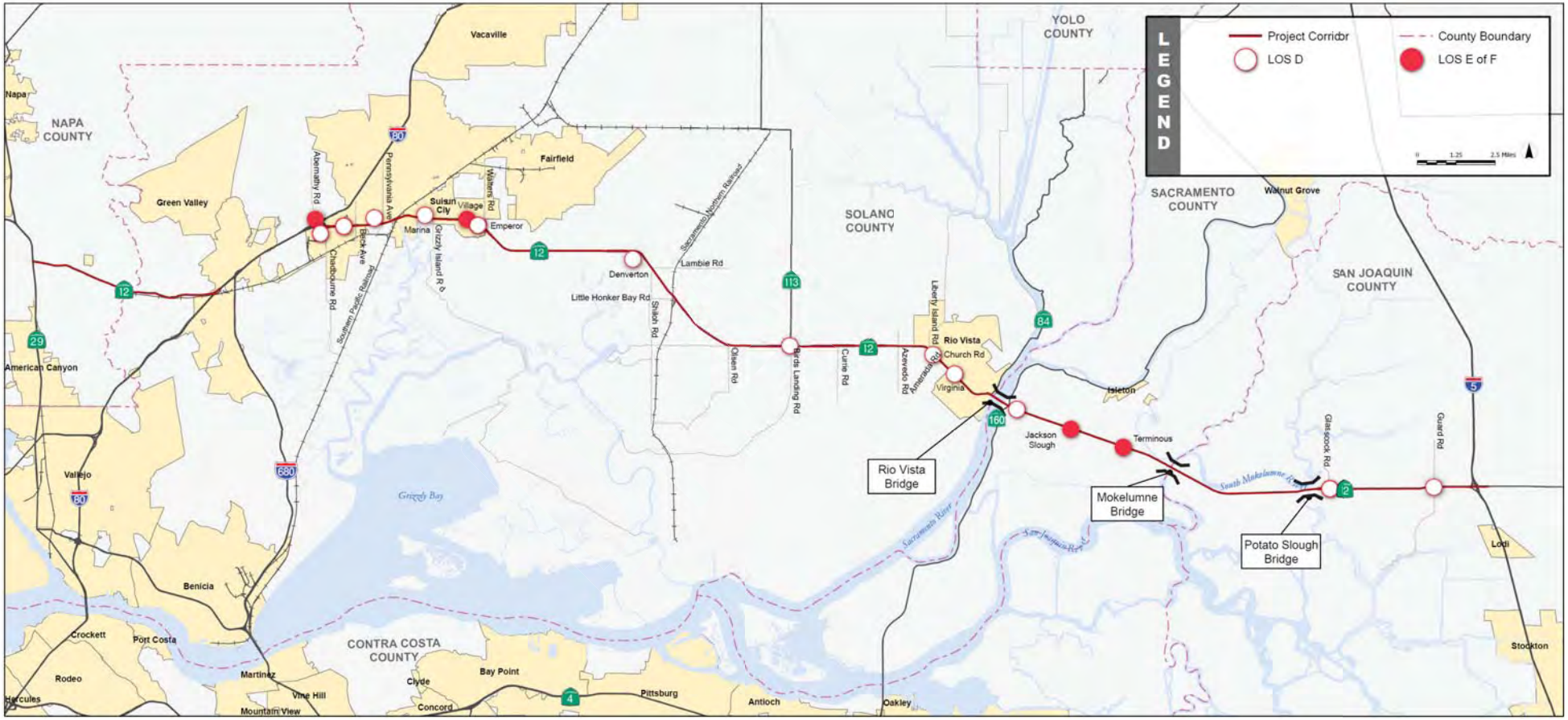
Intersection and mainline SR-12 operations are quantified using Level of Service (LOS) and a corresponding delay and speed value. Intersection LOS ranges from A (which indicates free flow or excellent conditions with short delays), to F (which indicates congested or overloaded conditions with long delays). Existing delays were estimated for intersections (signalized and unsignalized) and roadway links using standard Highway Capacity Manual methodologies. In the existing conditions, delays occur at intersections located along the corridor and at the Rio Vista and Mokelumne River bridges when they are opened for marine traffic. The delay at the bridges is addressed early in this section. Intersections that are at or over capacity and where significant peak hour delays occur are shown in Exhibit 19.

Exhibit 18: SR-12 Corridor Speed Variations in the Eastbound Direction during the PM Peak Period

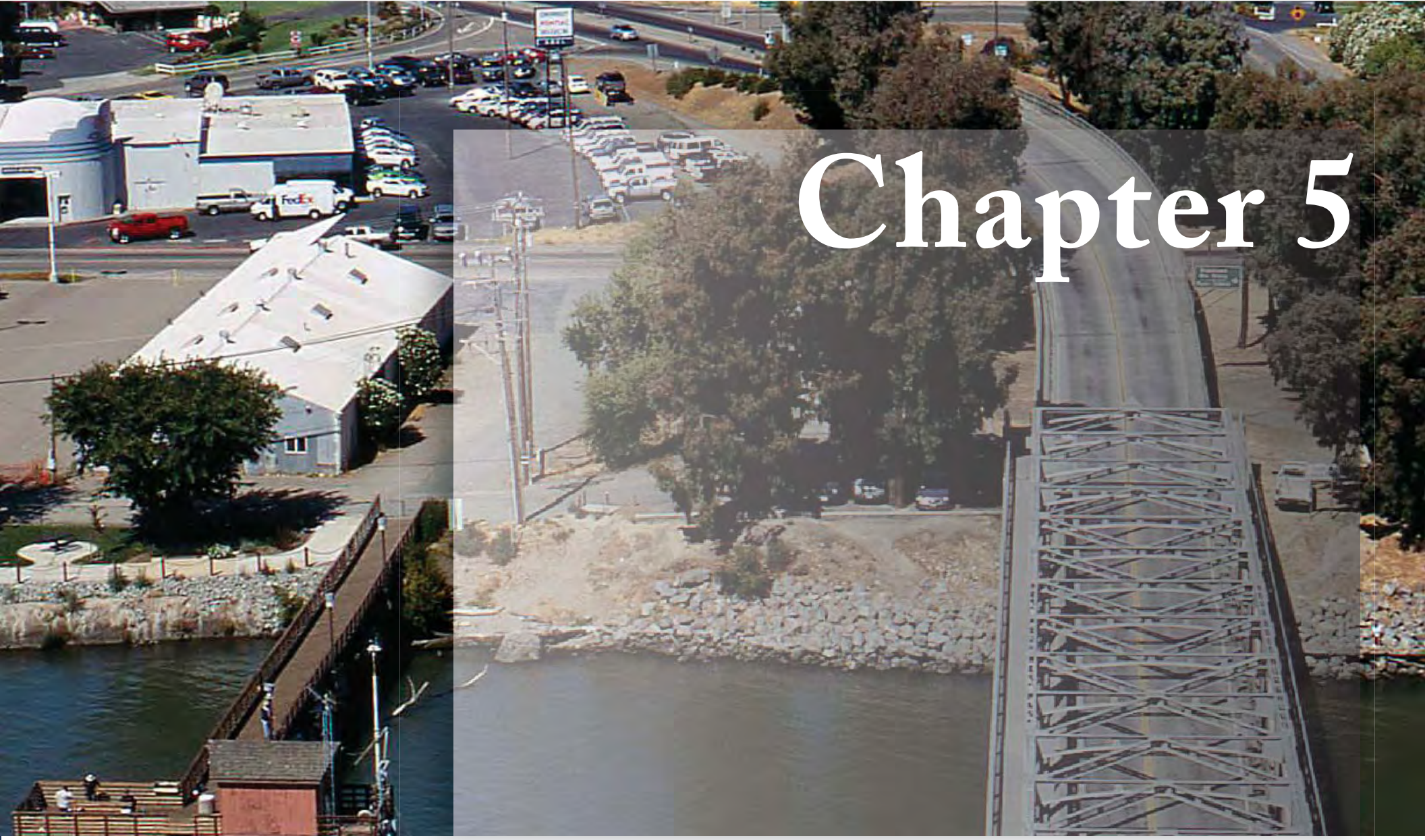


Source: Atkins traffic analysis, 2010.

Exhibit 19: Congested Intersections and Segments on SR-12



Source: ATKINS traffic analysis, 2010



Chapter 5

Forecast for SR-12

The forecast for SR-12 looks out to the years 2015 and 2035 to determine how traffic growth will affect travel on the corridor. The forecast begins with estimates of regional population and employment growth. The estimates used in this forecast were made available from the San Joaquin Council of Governments, the Association of Bay Area Governments, Solano Transportation Authority and the Sacramento Area Council of Governments.

By 2035, population is expected to grow approximately 40% across the SR-12 corridor. The largest population increase of 70% is estimated to take place in Rio Vista and its vicinity. Across the corridor, employment is projected to grow by 50% with the largest concentrations in the developed areas of Fairfield, Suisun City and Rio Vista.

Based upon these forecasts, traffic projections were prepared for SR-12 and the surrounding roadway network. These were used to evaluate the impacts of increasing traffic along SR-12.

TRAFFIC PROJECTIONS

A traffic forecasting model was developed specifically for the purposes of the SR-12 evaluation. Since the limits of this evaluation include Solano, Sacramento and San Joaquin counties, a model with that coverage was desirable. To achieve this, the most recent versions of the Solano County and San Joaquin County models were combined into a single forecasting tool.

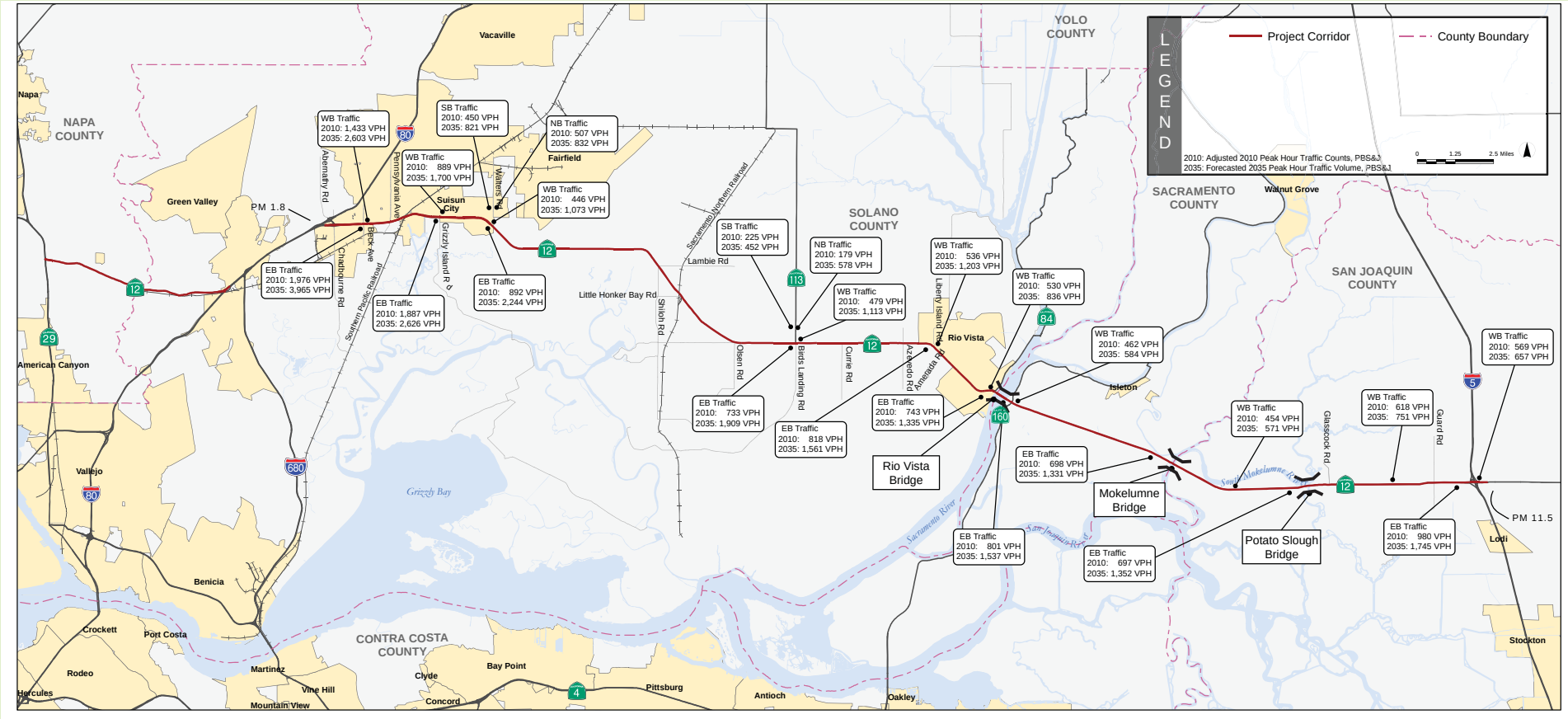
A Model Task Force was established to oversee the development and validation of the combined model for SR-12. The Task Force included representatives from Solano County, San Joaquin County and the Consultant team. Working with this Task Force, the mechanics of developing the model for SR-12 were addressed, the results validated and documented. Once complete, the documentation was forwarded to Caltrans Districts 3, 4 and 10 for review and approval prior to preparing the traffic forecasts for 2015 and 2035.

Much more detail on the development of the SR-12 model, and its application to the corridor, is available in the original technical memorandum entitled SR-12 Comprehensive Corridor Evaluation and Corridor Management Plan, from SR-29 to I-5 – Final Future Conditions Technical Report, Atkins (July 2011). The technical memorandum presents all of the resulting forecasts by analysis year and time of day and a substantial body of work that presents analytical results pertaining to speed, capacity, travel times, bottlenecks and delays.

In summary, the traffic forecasts for 2015 show only modest increases above those that are present today in the corridor. Between 2010 and 2015, total Vehicle Miles of Travel (VMT) on SR-12 is expected to increase by only 14%.

The long-term forecasts of population and employment not just in the corridor, but regionally as well, result in an estimated doubling of VMT on the SR-12 corridor. Basically twice as many cars and twice as many trucks will be on the roadway. Exhibit 20 shows existing and 2035 peak hour directional volumes at selected locations along SR-12. As can be seen, the projected volumes are double and in some cases, more than double the volumes in 2010. Truck traffic is expected to increase significantly in the corridor from an average of 2,400 trucks per day to 4,400.

Exhibit 20: 2035 Traffic Projections (PM Peak Hour)



MOVABLE BRIDGES IN 2035

The impact of movable bridge operations at Rio Vista and the Mokelumne River were noted as being significant causes of delay on SR-12 today. Between now and 2035, the number of vessels passing under the Rio Vista Bridge is expected to be 400 in the peak month, or double the previous high of 200 in 2004. This will result in more frequent and longer openings at the Rio Vista Bridge. The Mokelumne River Bridge is already the most frequently operated bridge in California.

The bridge cycle times at Rio Vista range from 8 to 25 minutes depending on the type and number of approaching vessels. If a 25 minute bridge cycle were to occur at the Rio Vista Bridge in 2035, a queue of vehicles nearly three miles long could result and the average vehicle would be delayed 10 minutes. A long bridge opening cycle at the Mokelumne River Bridge could produce a similar outcome. Frequent and often lengthy cycle times at these two bridges are today one of the most significant causes of recurrent delay on SR-12.

BASELINE IMPROVEMENTS

SR-12 improvement projects that have been recently completed, are underway, or have received funding were identified as a set baseline improvements to be included in the evaluation of future conditions. In general, these projects can be expected to be in place by 2015, or shortly after. Many of these baseline projects are the SHOPP projects being implemented by Caltrans to improve safety on SR-12. The baseline improvements are depicted in Exhibit 21. Proceeding from west to east the baseline improvements are:

- SR-12 Jameson Canyon Project (Napa EA 04-264134, Solano EA 04-264144)
- I-80/I-680/SR-12 Interchange Project Phase 1 (Solano EA 04-0A5300)
- SR-12 Roadway Rehabilitation Project from Walters Road to Currie Road (Solano EA 04-0T10U)
- SR-12 and SR-113 Intersection Improvement Project
- SR-12 Roadway Rehabilitation Project from Currie Road to Liberty Island Road (Solano EA 04-2A6200)
- SR-12 Bouldin Island Project (San Joaquin EA 10-0G800)
- SR-12 Improvements Project I-5 to Bouldin Island (San Joaquin EA 10-A8404)

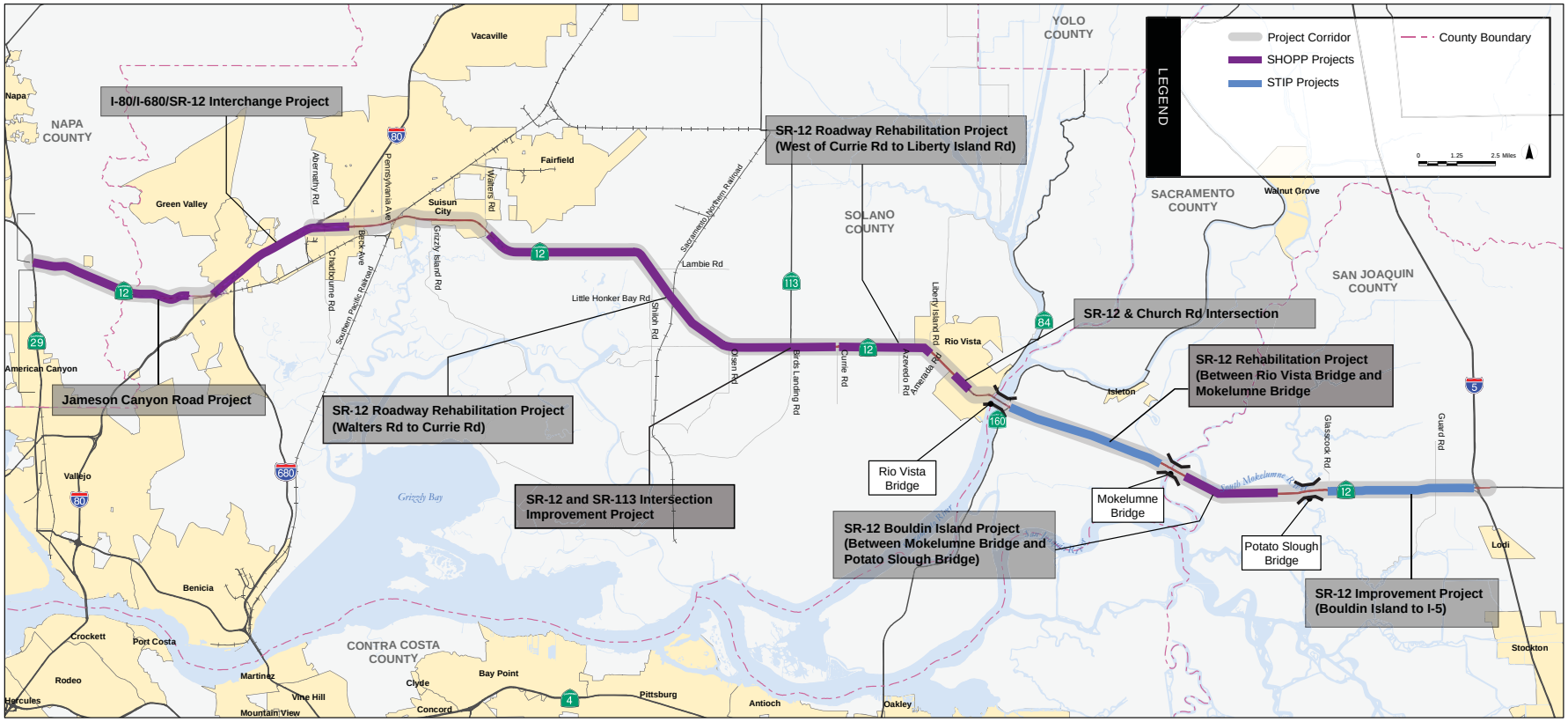


Exhibit 21: Baseline Improvements

BOTTLENECKS AND QUEUES

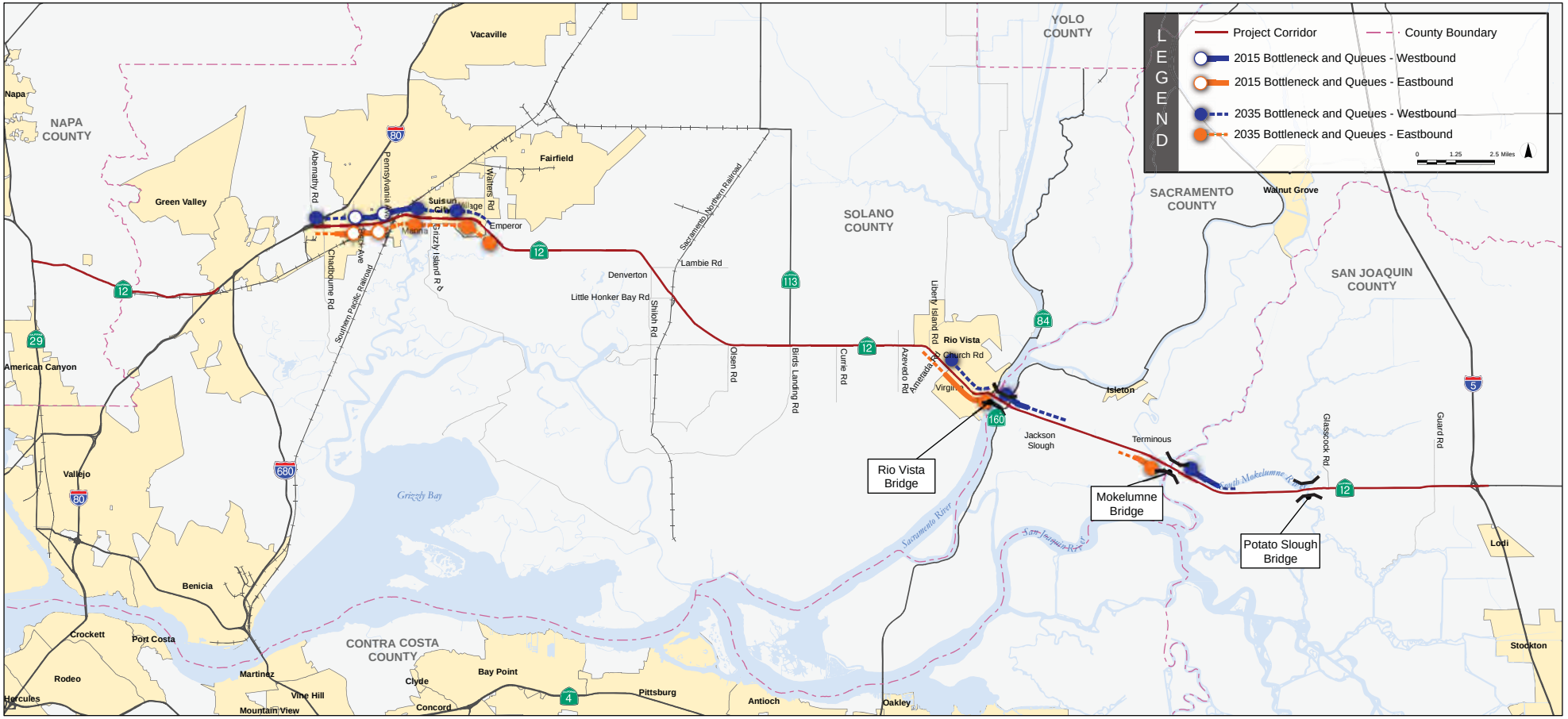
SR-12 exhibits a consistent pattern of bottlenecks and queues. Bottlenecks are locations where traffic demand exceeds capacity. In the queues formed behind these bottlenecks, speeds are erratic and often stop and go. Exhibit 22 depicts the locations of recurrent bottlenecks and queues in the SR-12 corridor.

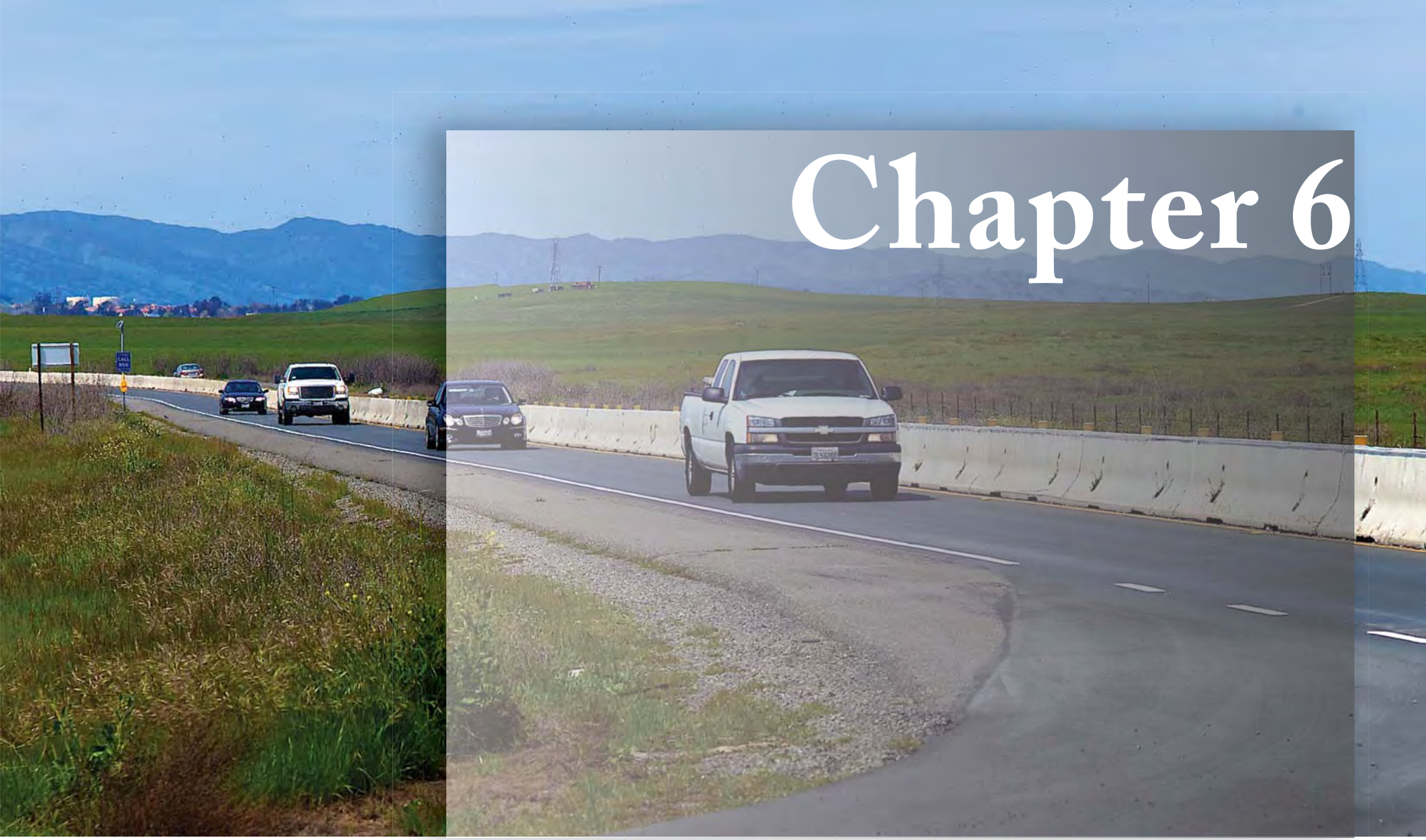
The first location that exhibits bottlenecks is the four-lane section of SR-12 passing through Fairfield and Suisun City. The cause of the bottlenecks and associated backups are the traffic signals located along SR-12 in this area. Vehicles on SR-12 back up while traffic from side streets enters onto or crosses SR-12. Due to added trips from commercial and residential develoment along the corridor, the traffic volume is over capacity during peak traffic hours. By 2035, the queues created by these bottlenecks will extend from Walters Road to I-80 in both directions.

Moving eastward, the second location that shows bottlenecks is Rio Vista and the Rio Vista Bridge. Backups extend from approaches to the bridge when it operates during periods of peak traffic. A third westbound bottleneck occurs at the intersection of Church Road and SR-12.

The third location eastward is at the Mokelumne River Bridge approaches, both east and westbound. These occur due to frequent openings of this bridge. Bottlenecks such as those described in these paragraphs are often the most severe indicators of congestion and should be addressed as part of any mitigation strategy.

Exhibit 22: Location of Bottlenecks and Queues for the Future Years 2015 and 2035





Chapter 6

Options for SR-12

Three distinctly different strategy options for SR-12 were initially developed in a workshop fashion on April 14, 2011, with the members of the Project Development Team. The PDT workshop participants included transportation professionals representing Caltrans, Metropolitan Planning Organizations, counties and the consulting team charged with preparing this study.

The draft corridor improvement strategies were presented to the Technical Advisory Group, stakeholders and general public during outreach activities that were held in the summer of 2011. Based on input received during the outreach, the corridor improvement strategies were evaluated. This chapter describes the three strategy options and presents the evaluation of these options.

CONCEPTUAL STRATEGIES CONSIDERED

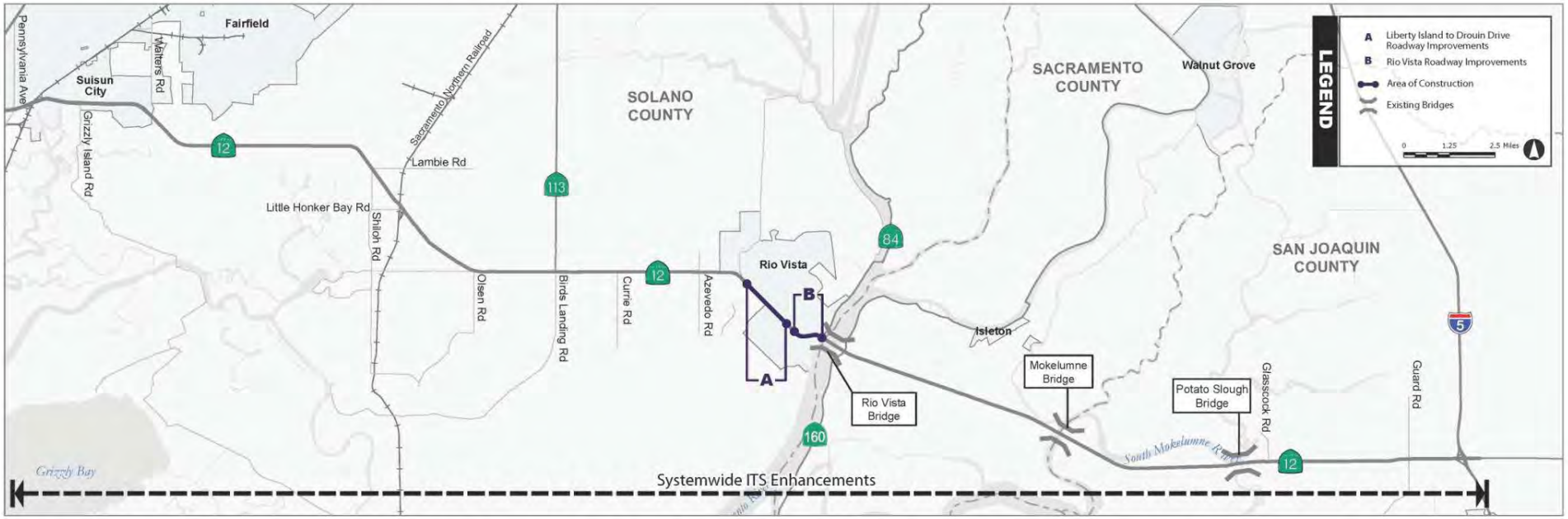
The strategy options considered are not specific recommendations for improvements in the corridor, but have been defined to explore three possible outcomes for improvements to SR-12. Using the results of this evaluation, an overall plan for short- and long-term improvements for the corridor is recommended and presented elsewhere in this document. The conceptual strategies are described as follows:

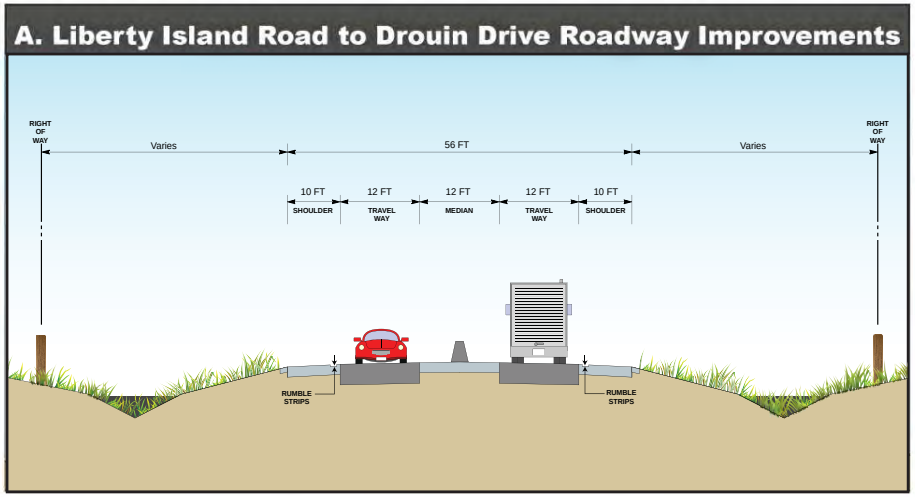
Gap-fill Strategy

The gap-fill strategy builds upon the work along SR-12 that is presently underway, recently completed or funded for implementation in the near term. These improvements were described as the “Baseline” condition in Chapter 5 and are shown in Exhibit 21.

Essentially, the gap-fill strategy is the next step towards incrementally improving safety and travel along the SR-12 corridor. The gap-fill improvement could be implemented in the short-term between now and 2015. The key components of the gap-fill strategy include corridor wide Intelligent Transportation Systems (ITS) deployments to improve safety, reliability and capacity, alignment and shoulder improvements west of Rio Vista and improvements to SR-12 in downtown Rio Vista that enhance vehicular circulation, pedestrian circulation, landscaping and the streetscape in general. Elements of the gap-fill strategy are shown in Exhibit 23.

Exhibit 23: Gap-fill Strategy

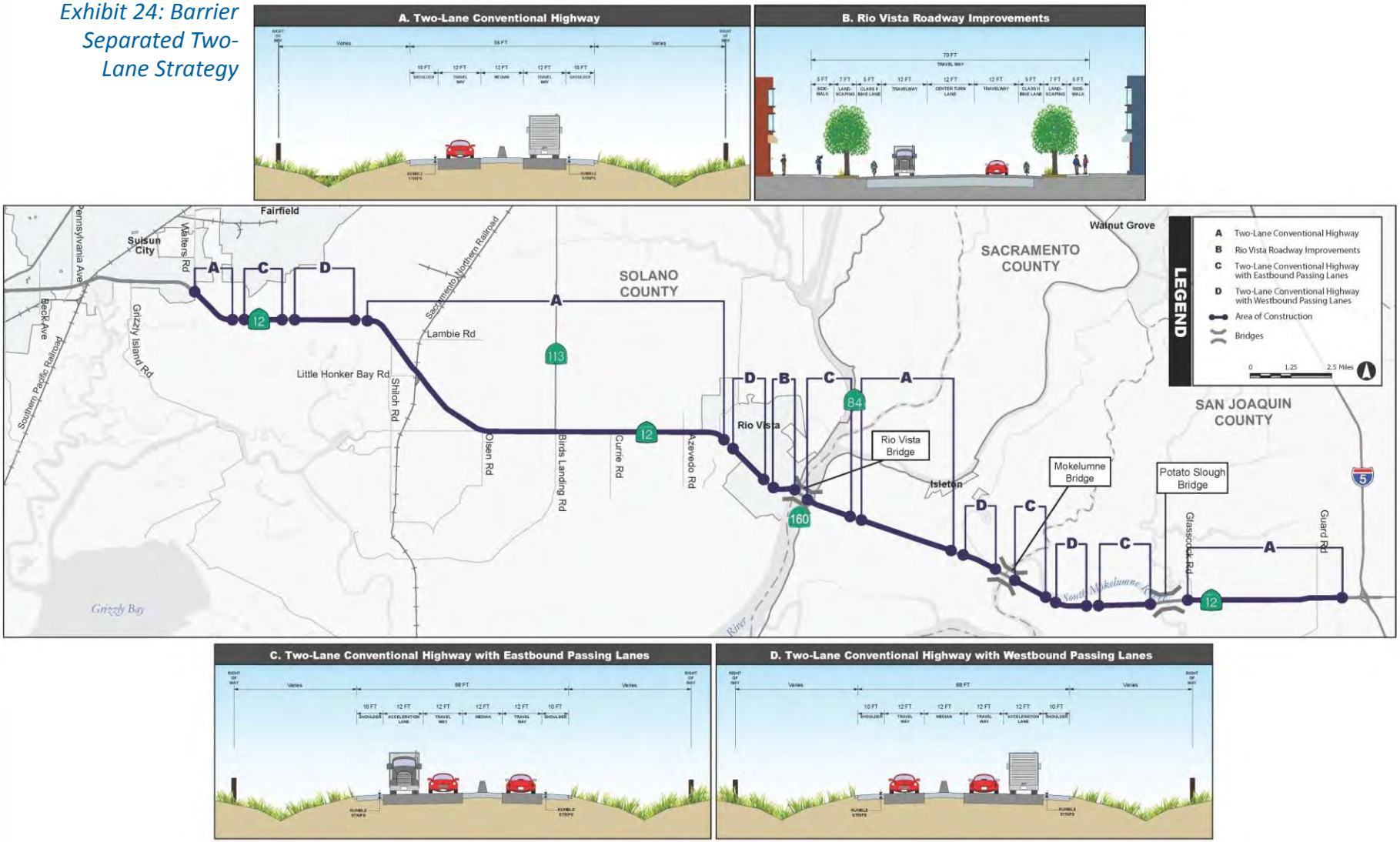




Barrier Separated Two-Lane Strategy

This strategy consists of implementing a consistent two-lane cross-section consisting of concrete median barrier, inside paved shoulders, standard 12' lanes and paved outside shoulders. This option also includes acceleration lanes that allow for passing of slower moving vehicles at key intersections along the corridor. The elements of this cross-section will improve operations and safety, but other than the benefits of the passing lanes, the option does not add new capacity on SR-12.

Exhibit 24: Barrier Separated Two-Lane Strategy



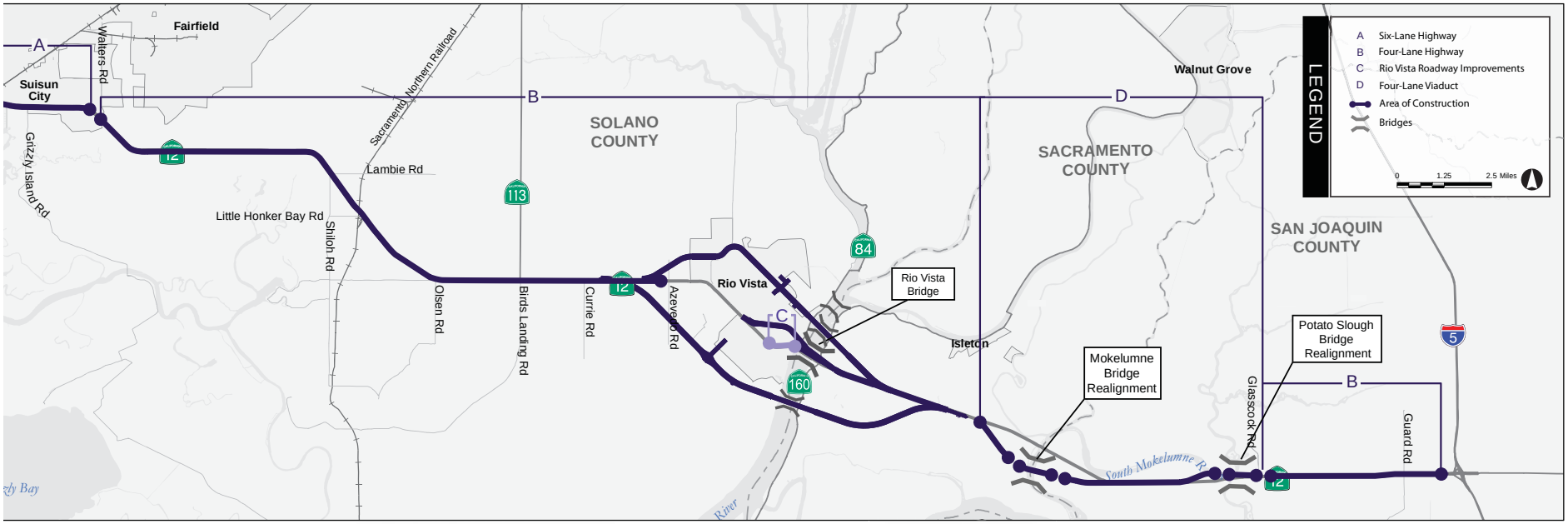
This concept involves improvement of, or re-construction of, much of the corridor to incorporate these elements to the cross-section and in doing so, considers the geotechnical requirements imposed by peat soils in the Delta areas located in Sacramento and San Joaquin counties. The barrier separated two-lane strategy is illustrated in Exhibit 24.

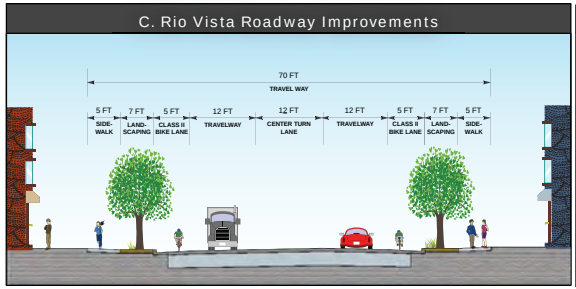
Four-Lane Strategy

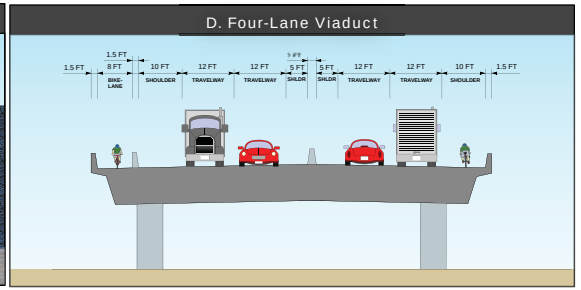
As its name implies, this concept looks at upgrading all of the existing, two-lane segments of SR-12 to a four-lane divided highway. It can be considered the ultimate improvement for the corridor through 2035.

This alternative incorporates six-lane improvements in the Fairfield/Suisun City areas with interchange and intersection improvements consistent with the long-range plans for the I-80/I-680/SR-12 interchange improvements under development by Solano County. Additionally, this concept examines realignments associated with replacing bridges at Rio Vista, Mokelumne, and Potato Slough so that these crossings can accommodate two lanes of traffic in each direction.

Exhibit 25: Four-Lane Strategy







As part of the evaluation of the four-lane concept, consideration will also be given to the implementation of a four-lane expressway option that allows for higher speeds and restricts access. Exhibit 25 presents the four-lane strategy.

COMMON ELEMENTS FOR ALL STRATEGIES

Several elements have been identified that will be included in all, or most of the conceptual alternatives. For instance, all strategies will include a common ITS architecture. Other common elements for the conceptual alternatives include proposed improvements to public transportation, bridge approach improvements, pedestrian and bicycle improvements and provisions for agricultural crossings. These elements are discussed in the sections that follow.

Pedestrian and Bicycle Facilities

Today, the only dedicated bicycle facility along SR-12 is in Solano County between Main Street (Suisun City) and Walters Road. All three of the conceptual alternatives include bicycle and pedestrian facilities in the Rio Vista Business district located along the SR-12 approach to the Rio Vista Bridge.

The four-lane strategy adds bicycle lanes on new bridges that cross the Sacramento River at Rio Vista, the Mokelumne River and Potato Slough. Additionally, the four-lane option includes new bicycle facilities in the area of Travis Air Force Base.

Transit

All three strategies include two new park and ride lots that will enhance transit access along the SR-12 corridor in Solano County. The westernmost park and ride facility is located at the intersection of SR-12 with Walters Road in Suisun City. To implement this facility, bus routes will need to be adjusted and FAST Route 6 will travel further east on SR-12 and connect with the proposed park and ride lot.

A second park and ride facility is proposed near the intersection of SR-12 and Drouin Drive, west of Rio Vista. This facility will offer better connectivity to the regional transit routes that link Rio Vista with Isleton, Fairfield, Suisun City, the Pittsburg/Bay Point BART Station and Antioch. This proposed park and ride lot is located directly adjacent to transit lines 50 and 52 (operated by the City of Rio Vista transit services).

Intelligent Transportation Systems

A conceptual ITS architecture was established for the entire SR-12 corridor. This builds upon existing ITS in the corridor and improvements to ITS that are part of the baseline projects previously identified. The benefits and costs of this conceptual ITS architecture are included in each of the three conceptual alternatives that are examined in the analysis and include:

- Traffic Monitoring Stations (1 mile spacing)
- Changeable Message Signs (Approximately 2 miles upstream of major intersecting routes)
- Surveillance Cameras (1 mile spacing)
- Speed Feedback Radar Signs (3 mile spacing)
- Highway Advisory Radio Transmitters (5 mile spacing)
- Fiber Optics Communications Backbone (Corridor-wide)
- Traffic Responsive, Coordinated Traffic Signals (I-80 to Walters Road)

Movable Bridge Enhancements

For the gap-fill and barrier separated two-lane strategies, a budget is provided for upgrades to bridge equipment and controls. In addition, bridge specific warning features are proposed on the approaches to the movable spans at Rio Vista, Mokelumne River and Potato Slough. These features include:

- Advance warning signs with flashing beacons
- Advance message signs that notify of a bridge opening
- Surveillance cameras on each approach
- Signal pre-emption at the Rio Vista Bridge to clear nearby intersections of traffic

The four-lane strategy includes roadway realignments and new, high-level bridges at each of the three crossings that will eliminate the need for these advance warning features.

Agricultural Crossings

The Bouldin Island Project (presently in design) located in San Joaquin includes one crossing for agricultural traffic. For this evaluation, two additional agricultural crossing are assumed although the exact locations cannot be determined at this time.

OTHER CORRIDOR-WIDE CONSIDERATIONS

There are two other considerations that have an impact on the conceptual alternatives for the SR-12 corridor. These are 1) soil conditions and 2) sea-level rise. Each of these is discussed separately in the sections that follow.

Soil Conditions

To understand the implications of soil conditions on pavement design, with regard to cost and construction staging, two resources were evaluated. The first was soil survey information from the United States Department of Agriculture and the second was pavement designs used by Caltrans for the existing and pending SHOPP projects in the SR-12 corridor. In addition, the basic findings of these reviews and the implications on this study were communicated to staff at Caltrans Districts 4 and 10 to determine if the conceptual conclusions were reasonable for a study of this type and level of detail.

From Rio Vista Bridge to Mokelumne Bridge, the floodplain soils have high organic content in the form of peat and muck; they are subject to subsidence. East of Mokelumne Bridge to about midway between Potato Slough Bridge and I-5, the Delta islands and tracts are mostly peaty muck. The valley plain soils to the east do not contain peat.

Soils with peat and muck (which are subject to subsidence) are addressed by either removal of the soils if the pockets are small enough, or by preloading with extra soil over time (i.e., surcharge) or by other methods. On SR-12, Caltrans has addressed these areas that are substantially composed of peat and muck soils by using the surcharge method followed by specially engineered roadway bases that include wick drains. This approach (and the associated costs) has been incorporated into SR-12 improvements from Rio Vista to midway between the Potato Slough Bridge and I-5.

Sea-Level Rise

Exhibit 12 in Chapter 3 shows SR-12 inundated due to rising sea levels towards the western end of the corridor in the vicinity of Suisun City and Fairfield. Sea-level rise, unless mitigated, is also expected to inundate the Delta areas of Sacramento County and San Joaquin County.

Sea-level rise is a well documented impact of climate changes and the California coastline will experience rising sea levels over the next century unless emissions of greenhouse gases are dramatically reduced from current levels. There are isolated areas of potential inundation that may impact SR-12 east of Suisun City and south of Fairfield. Potential inundation could possibly be addressed by changes in roadway elevation or realignments to the north but this needs more detailed evaluation that is beyond the scope of this effort.

The Delta areas of Sacramento and San Joaquin counties are an entirely different situation. These areas are below the existing sea level due to subsidence and they are protected by levees that protect this area as prime agricultural land, an environmental resource that is important to the California water supply, and a vibrant recreational area. Managing the issue and consequences of the sea-level rise in the Delta is much bigger than addressing elevation of SR-12 and needs to be addressed comprehensively through plans for levee improvements that will address long-term viability of this area for both existing and projected sea levels.

Climate change science is evolving as are the methods, best practices and justifications for addressing sea-level rise as it is related to transportation infrastructure. In May 2011, Caltrans issued Guidelines on Incorporating Sea-Level Rise which provides a comprehensive method to address sea-level rise in PIDs. Projects that result from this study of SR-12 will need to have PIDs prepared and at that time, the methodologies set forth in the Caltrans guidance on this subject will need to be followed to determine and justify whether and to what extent mitigation for sea-level rise is applicable to specific projects in the SR-12 corridor.

EVALUATION METHODOLOGY

Each of the conceptual strategy options is compared to the Baseline case previously presented. The Baseline case represents the status quo, or SR-12 as it will be in 2015 if no other improvements are planned and implemented for the corridor. Therefore, the evaluation considers four cases for both the years 2015 and 2035. These are 1) Baseline Case, 2) Gap-fill Strategy, 3) Barrier Separated Two-lane Strategy and 4) Four-lane Strategy.

For each case evaluated, the methodology consists of two basic activities that provide input into a comparative analysis framework. The first is an evaluation measure based on performance metrics that are used to assess benefits for each conceptual strategy for both the short-term (2015) and the long-term (2035). The second activity is the development of capital cost estimates for implementation of the conceptual strategies and estimates of maintenance costs over a uniform life-cycle. This information is then used to estimate a cost-effectiveness rating for each of the proposed improvements that make up a conceptual strategy alternative.

EVALUATION MEASURES

In general, the evaluation measures build upon those under development by regional agencies to address the requirements of Sustainable Communities Strategies (SCS) based on Senate Bill 375. These measures are now being refined and applied to the Regional Transportation Planning Process. Because of differences in the timeline for this SR-12 project and the development of regional plans that comply with the SCS, the specific computational methodology used here is generally consistent with, but not identical to, the evolving methodologies that will be used in regional plans. Each is described as follows:

Transportation System Effectiveness

This measure focuses both on mobility in the corridor and the state, or condition of the transportation asset. The primary metric of mobility is per-trip travel time for motorized auto and transit modes that use the SR-12 corridor. A second set of metrics – daily and peak hour Vehicle Miles of Travel – is also used to compare transportation efficiency of the alternatives. In this case, a lower peak hour VMT indicates congestion and unmet peak hour demand in the SR-12 corridor.

The assessment of the physical state of the transportation asset is addressed by identifying centerline miles of pavement areas with poor ride-quality or which need rehabilitation. Bridges, which are particularly relevant on the SR-12 corridor, are assessed based on the data in the Federal Highway Administration 2010 National Bridge Inventory. The criterion used is a bridge sufficiency rating of less than 80%.

Safety

Safety is a paramount issue along SR-12. Roadway improvements that are presented in conceptual alternatives have been developed to enhance safety by including cross-sections with full-width shoulders, median barriers, enhanced alignments and ITS features. The criteria used to assess the safety features that are proposed in the roadway cross-sections and alignment improvements is centerline miles of safety enhanced roadway.

Collisions and incidents along SR-12 can result in unpredictable travel times and often very long delays while incidents are cleared. This is referred to as non-recurrent delay which differs from normal recurrent delay due to predictable patterns of traffic congestion.

Intelligent Transportation Systems is proposed for all of the conceptual alternatives. ITS can reduce non-recurrent delays and notify motorists of such delays in advance such that, if possible, alternative routes can be taken or travel may take place at a different time-of-day. Changes in non-recurrent vehicle hours of delay are also used as a measure of safety enhancement in this evaluation.

Economic Vitality

Highways such as SR-12 contribute to economic vitality by providing reliable travel times to businesses, commuters and recreational travelers. Freight and goods movement, whether by road, rail or water, relies upon efficient, reliable travel times on transportation facilities. SR-12 is a route with a relatively high percentage of truck traffic that serves industry and agriculture.

Three movable bridges are located along the SR-12 study area. These are 1) Rio Vista Bridge over the Sacramento River, 2) the Mokelumne Bridge over the Mokelumne River in San Joaquin County and 3) the Potato Slough Bridge over Potato Slough, also in San Joaquin County. Whereas the Potato Slough Bridge is seldom operated, the Rio Vista and Mokelumne bridges are operated frequently and result in substantial delays to roadway traffic at these locations.

The metric used to evaluate economic vitality in this analysis is daily Vehicle Hours of Delay. This measure includes recurrent delays due to congestion, delays due to bridge operations and non-recurrent delays due to accidents and incidents on the SR-12 corridor.

Environment

SR-12 travels through a sensitive environmental area that extends through Solano County and the Delta areas of Sacramento and San Joaquin counties. Additionally, the corridor passes through the built up areas of Fairfield, Suisun City and Rio Vista.

Recent construction projects (such as the recently completed Solano County SR-12 SHOPP project) have shown that environmental impacts are a serious concern even when the project is built within existing right-of-way. Conceptual improvements that require new right-of-way to be acquired for widening or new alignments can be expected to have even greater impacts on the built and natural environments.

The environmental impacts in this analysis are assessed based on two criteria. The first criterion is areas where proposed construction activity is within existing right-of-way and the second criterion is where new right-of-way is required. Both criteria are measured in terms of acres. In addition, as part of the environmental comparison of alternatives, reductions in greenhouse gases are evaluated in terms of CO2 emissions.

Healthy Communities

Transportation improvements can promote a better quality of life by improving air quality and through health benefits gained from increased bicycling and walking. Health can also be improved by reductions in particulate emissions. Estimates of fine and coarse particulate emissions are provided for each of the conceptual alternatives.

Health benefits associated with walking and bicycling can be encouraged by the provision of adequate facilities that promote these modes of travel. To compare these facilities, three criteria are used. The first is miles of bike friendly roadways which are defined in this analysis as roadway miles that do not have dedicated bicycle facilities, but do have full 12-foot travel lanes and an outside shoulder width of at least five feet. The second criterion is miles of dedicated bicycle lanes and the third is miles of dedicated pedestrian pathways, or sidewalks.

SUMMARY OF EVALUATION RESULTS

In the alternatives analysis, each of the conceptual improvement strategies was refined and detailed. This process included the preparation of conceptual improvement drawings, engineering evaluations, cost estimates and a traffic analysis. The three strategy options were first evaluated using measures that are grouped in terms of 1) Transportation System Efficiency, 2) Safety, 3) Economic Vitality, 4) Environment and 5) Healthy Communities. These evaluations were conducted without consideration for cost which was considered later in the evaluation of cost-effectiveness. As noted previously, this work was done at the Corridor Planning level and will require extensive additional work before projects based upon this study are selected and implemented.

In terms of the measures described, the four-lane strategy performed best in terms of system efficiency, safety and healthy communities. This was due to the relatively large expansion of capacity in the corridor that effectively mitigated all of the projected bottlenecks in the Fairfield/Suisun City area and the delays at the movable Rio Vista and Mokelumne bridges. Exhibit 22 in Chapter 5 depicts the bottlenecks and queues that are mitigated by the four-lane strategy but are still present in the gap-fill and two-lane strategy options.

The four-lane strategy has the most impact on the environment due to the amount of construction required in existing rights-of-way and new right-of-way required. The gap-fill strategy, because of the relatively small scope of construction that is included in this strategy, results in the smallest environmental impact.

These conclusions are indicated in Exhibit 26 which includes both quantitative measures and a qualitative ranking that is expressed using dots with different levels of shading. These dots are qualitative rankings for each area of system performance – transportation effectiveness, safety, etc. That is to say the solid dots denote the best performance relative to the baseline case and the dots with progressively less shading indicate relatively lower performance for the areas evaluated.

This simple ranking provides a high-level overview of each scenario over the 55-mile length of the corridor. In some cases, the actual differences between certain metrics are rather subtle when the best and next best ranked alternatives are compared. However, in every case, there is at least one metric in each of the evaluation areas that shows a difference compelling enough to warrant an overall, qualitative ranking relative to the other scenarios. For instance, under the environmental evaluation

criteria, the differences in CO2 emissions are not particularly significant, but the number of new acres of right-of-way with the potential for environmental impact is significant.

Cost-effectiveness was considered next and is expressed as project cost per hour of vehicle delay reduction. The life-cycle cost of the three strategies (which includes additional maintenance costs over time), ranges from $102 million for the gap-fill strategy to $2.9 billion for the four-lane strategy. The more modest barrier separated two-lane strategy has a life-cycle cost of $397 million.

The four-lane strategy with a life-cycle cost of $2.9 billion is eight times the cost of the barrier separated two-lane strategy. This is due to the extensive realignments required to four-lane the three movable bridges, the cost of the bridges and the amount of new right-of-way required, including environmental mitigation.

The finding that the four-lane strategy performs the best but costs substantially more than the other two alternatives is hardly surprising. To assess benefits based on expenditures, a cost-effectiveness calculation was performed that produces a cost for each hour of vehicle delay that is reduced over the life-cycle. In the case of this metric, a lower cost for each hour of vehicle delay reduction is the best outcome.

The gap-fill strategy has a cost-effectiveness estimate of $4.2 per hour of delay reduction, the barrier separated two-lane strategy $14.5 per hour saved and the four-lane strategy $38.1 per hour saved. To put these in perspective, an hour of delay as perceived cost to the user ranges from $5 per hour for a casual trip for a personal reason to $50 per hour for large truck stuck in traffic due to an accident, or incident. In the Bay Area, the average value of time is about $14. Using this figure, it can be generally concluded that a strategy which has a cost per hour of delay saved of $14 or less will repay itself over time. Obviously, the lower the cost the better and both the gap-fill and barrier separated two-lane strategies exhibit costs that are much lower than the average perceived value of time.

This does not mean that the gap-fill strategy should be chosen over the two- or four-lane strategy options. While the gap-fill is effective at what it does, it does not address areas of the corridor that are capacity constrained. In other words, the project areas of heavy congestion in the corridor are not addressed in this option. The gap-fill projects are best thought of as efficient short-term strategies. The most effective plan for the SR-12 corridor will need to combine elements of all three strategy options.

COST-EFFECTIVENESS ANALYSIS

The cost-effectiveness analysis is a systematic evaluation of the cost and benefits of an improvement. The analysis evaluates incremental differences between a base case and an improvement strategy or alternative. The analysis helps determine the cost required to realize the benefits from a proposed strategy or alternative. This type of analysis is typically employed during a planning level study to assess and prioritize system-wide alternatives or a sub set of all improvements (packages) within each alternative.

The cost-effectiveness analysis expresses benefits (savings in delay) in a format ($/hour) that can be easily related to a users perception of their value of time which is ephemeral and typically varies by trip purpose. Typically, value-of-time ranges from $5 to $50 where the lower end of the spectrum represents trips similar to recreational trips and the higher value represents trips similar to commercial vehicle trips. In general, the average value of travel time in the Bay area is between $14 and $15. Improvement strategies with an estimated rating of $14 or less per hour of delay saved can be thought of as cost effective in that the cost to construct and maintain the strategy is offset by user cost benefits.

While this analysis provides an economic evaluation of the proposed benefits, it is but one of the inputs for the decision making process and should be combined with other factors including non-tangible factors, safety benefits and environmental constraints to develop an overall strategy recommendation.

A cost-effectiveness analysis was conducted for each of the three strategy options. Each improvement strategy was further sub divided into logical sub set of improvements or packages based on logical termini, physical proximity, potential implementation timelines and homogeneity of the various packages. Benefits of each of the individual packages were quantified and compared against projected cost of construction, operation and maintenance of such improvements. Exhibits 27 through 29 summarize the results of this analysis.

Exhibit 26: Summary of Strategy Options Evaluation

Evaluation Categories	Baseline		Gap-fill		Two-Lane		Four-Lane	
	2015	2035	2015	2035	2015	2035	2015	2035
Transportation System Effectiveness			○		◎		●	
Average Peak Hour Travel Time (mins)	78	87	75	83	73	78	53	56
Daily VMT	485,000	831,200	485,500	831,200	485,800	848,600	495,000	882,000
Daily VHT	17,300	28,000	15,950	24,650	15,240	24,600	14,240	20,220
Improved pavement (Centerline miles)	N/A		2.5		13.4		25.3	
Number of Bridges with Sufficiency Rating < 80%	2		2		1		0	
Safety			○		◎		●	
Safety enhanced roadway (Centerline miles)	N/A		2.6		31.1		39.0	
Daily non-recurrent delay (vehicle hrs)	584	6,300	470	5,200	460	5,210	50	1,350
Economic Vitality			○		◎		●	
Daily non-recurrent delay (vehicle hrs)	584	6,300	470	4,800	460	5,210	50	1,350
Daily recurrent delay (vehicle hrs)	6,770	10,510	6,360	9,910	6,290	9,660	3,410	6,390
Total daily delay (vehicle hrs)	7,354	16,810	6,830	14,710	6,760	14,460	3,460	7,755
Environment			●		◎		○	
Construction within existing ROW (acres)	N/A		20.0		197.7		214.1	
Construction outside existing ROW (acres)	N/A		5.9		44.2		399.2	
CO2 Emissions (tonnes/year)	51.4		49.2		48.9		46.8	
Healthy Communities			○		○		●	
Fine Particulate Emissions (tonnes/year)	6.7		6.2		6.2		5.6	
Coarse Particulate Emissions (tonnes/year)	10.9		10.3		10.3		9.5	
Bike friendly Roadways (miles)	33.6		35.3		35.6		39.7	
Dedicated Bikeways (miles)	2.9		3.3		3.3		23.1	
Dedicated pedestrian pathways (miles)	2.7		3.3		3.3		3.3	
Cost Effectiveness			●		◎		○	
Capital Cost (millions)	N/A		$84		$354		$2,828	
O&M Life Cycle Cost (millions)	N/A		$18		$43		$90	
Life Cycle Cost (millions)	N/A		$102		$397		$2,918	
Cost Effectiveness Index (dollars per person hour of delay saved)	N/A		$4.2		$14.5		$38.1	

○ Good ◎ Better ● Best

Pkg	Dir.	ID	Mitigation Improvement	Life-Cycle Mobility Benefits (Veh-hr of delay saved)	Capital Costs	Life-Cycle Costs	Cost - Effectiveness ($/veh-hr of delay saved)
GP1	Both	1	Implement corridor-wide ITS System	18,805,405	$24,100,000	$37,000,000	$2.0
GP2	Both	2	Improve bridge operations at the Rio Vista, Mokelumne and Potato Slough bridges including implementation of advance ITS elements	5,613,210	$9,800,000	$12,200,000	$2.2
GP3	Both	3	Construct standard width shoulders and improve pavement surface between Liberty Island Road and Drouin Drive including median channelizers	0	$33,400,000	$34,800,000	-
GP4	Both	4	Construct streetscaping and pedestrian walkway improvements with curb and gutter improvements for intersections through Rio Vista (Church Road to Rio Vista Bridge)	0	$16,400,000	$18,000,000	-
			Total	24,418,615	$83,700,000	$102,000,000	$4.2

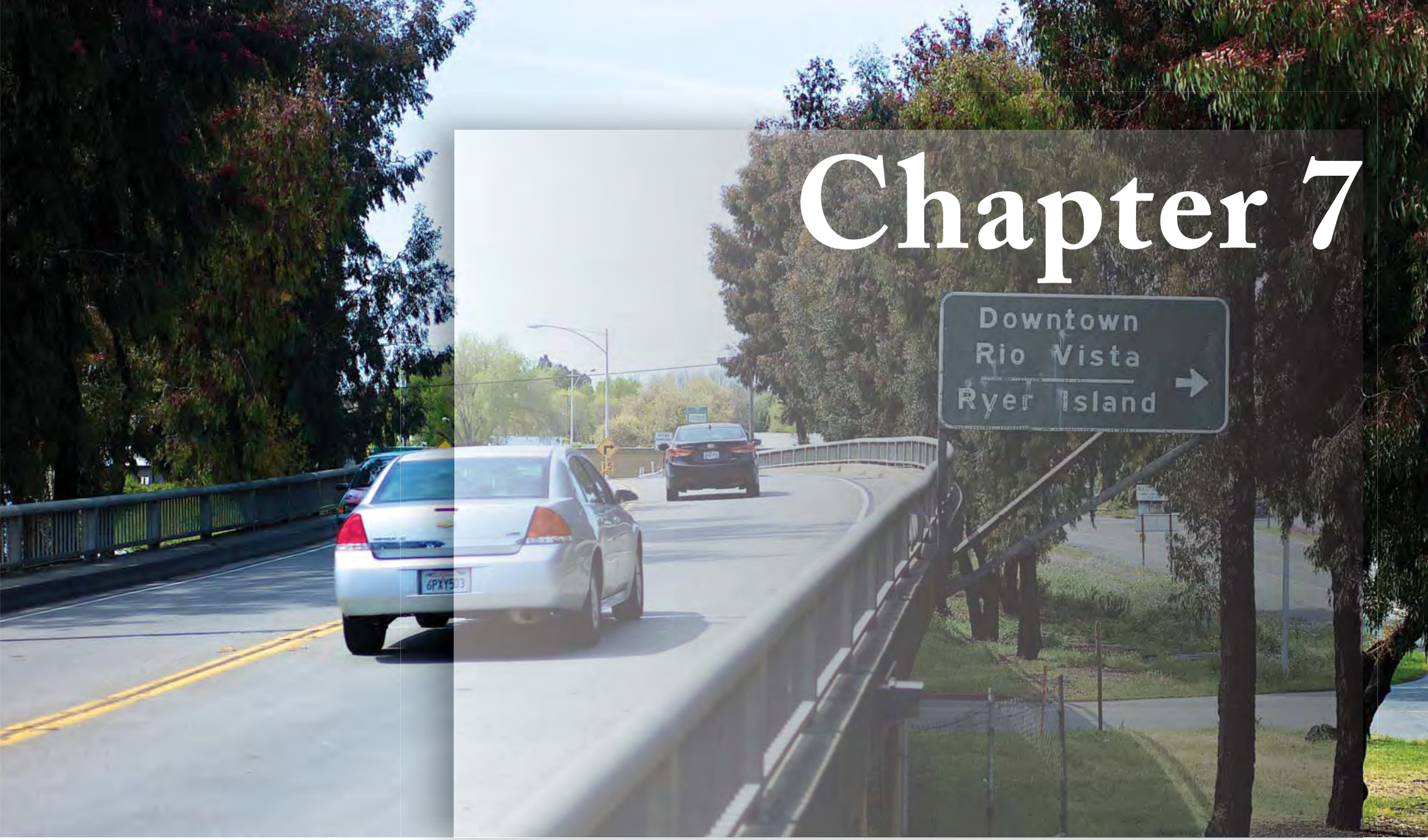
Exhibit 27: Life-Cycle Cost-effectiveness Analysis for the Gap-fill Strategy

Pkg	Dir.	ID	Mitigation Improvement	Life-Cycle Mobility Benefits (Veh-hr of delay saved)	Capital Costs	Life-Cycle Costs	Cost - Effectiveness ($/veh-hr of delay saved)
BT1	Both	1	Implement corridor-wide ITS System	18,805,405	$24,100,000	$37,000,000	$2.0
BT2	Both	2	Improve bridge operations at the Rio Vista, Mokelumne and Potato Slough bridges including implementation of advance ITS elements	5,909,592	$9,800,000	$12,200,000	$2.1
BT3	Both	3	Construct standard width shoulders, include passing lanes and improve pavement surface between Walters Road and Rio Vista (Church Road)	1,053,975	$172,800,000	$184,100,000	$174.7
BT4	Both	4	Construct streetscaping and pedestrian walkway improvements with curb and gutter improvements for intersections through Rio Vista (Church Road to Rio Vista Bridge)	0	$16,400,000	$18,000,000	0
BT5	Both	5	Improve shoulders, pavement and construct median barrier between Rio Vista and Mokelumne bridges	289,755	$86,700,000	$90,100,000	$310.9
BT6	Both	6	Improve shoulders, pavement and construct median barrier between Mokelumne and Potato Slough bridges	579,510	$19,300,000	$25,200,000	$43.5
BT7	Both	7	Construct standard width shoulders, include passing lanes and address pavement issues between Potato Slough Bridge and I-5	796,650	$24,700,000	$30,500,000	$38.3
			Total	27,434,887	$353,800,000	$397,100,000	$14.5

Exhibit 28: Life-Cycle Cost-effectiveness Analysis for the Barrier Separated Two-Lane Strategy

Exhibit 29: Life-Cycle Cost-effectiveness Analysis for the Four-Lane Strategy

Pkg	Dir.	ID	Mitigation Improvement	Life-Cycle Mobility Benefits (Veh-hr of delay saved)	Capital Costs	Life-Cycle Costs	Cost-Effectiveness ($/veh-hr of delay saved)
FL1	Both	1	Implement corridor-wide ITS system	5,340,000	$28,900,000	$49,800,000	$9.3
FL2	Both	3	Construct Phase II of the I-80/680/SR-12 interchange which includes interchanges at Beck and Pennsylvania Avenue Construct intersection improvements from Civic Center to Walters Road Construct six-lane roadway between Abernathy and Walters Road	48,426,495	$62,900,000	$75,100,000	$1.6
FL3	Both	4	Construct standard width shoulders Construct a four-lane roadway between Walters Road and Rio Vista (Church Road)	6,349,713	$227,000,000	$249,600,000	$39.31
FL4	Both	5	Construct pedestrian improvements, landscaping and the streetscape improvements in downtown Rio Vista (Church Road to Rio Vista Bridge)	733,520	$18,300,000	$19,900,000	$27.1
FL5	Both	2	Construct new alignment for the Rio Vista Bridge	8,203,655	$984,765,102	$997,500,000	$121.6
FL6	Both	6	Construct new alignment for SR-12 between Mokelumne and Potato Slough bridges and associated changes to access points	5,387,690	$1,422,100,000	$1,433,300,000	$266.0
FL7	Both	7	Construct a four-lane cross section from Potato Slough Bridge to I-5	2,079,965	$83,900,000	$92,600,000	$44.5
			Total	76,521,038	$ 2,827,900,000	$2,917,800,00	$38.1



Chapter 7

Recommended Strategy for SR-12

The recommended strategies for SR-12 are based on all the factors considered in this evaluation. One of the keys is the pressing need to continue improving safety. At the same time, the strategies need to provide for predictable travel times along the corridor for the residents, businesses and recreational travelers. Finally, the strategies need to be compatible with the sensitive physical environment through which this route passes.

The section presents a roadmap intended to help shape the next phase of improvements on SR-12. It has been developed through a rigorous technical evaluation and an extensive stakeholder engagement process. The plan includes both short-term and long-term strategies for SR-12. The short-term recommendations can be implemented over the next five years and will make a difference in terms of safety and mobility along the corridor.

The long-term recommendations address the complex issue of adding capacity where needed to accommodate growth and how to balance these needs against potential impacts to the built and natural environment. The recommended long-term strategy is to invest in major improvements where they are needed most and where these investments will produce the greatest benefit. Every project proposed for SR-12 should contribute to enhanced mobility, operations, and safety for the corridor.

SHORT-TERM STRATEGY (2015–2020)

The short-term strategy for SR-12 is based on addressing immediate and critical issues for the corridor. The short-term strategy continues building on the current safety initiatives for the corridor by improving segments of the corridor and implementing a corridor-wide ITS program designed to improve safety and reduce congestion due to accidents, incidents and weather.

The short-term recommendations are projects that can be completed in the 2015-2020 timeframe, subject to funding availability. The life-cycle cost of the short-term strategy recommendations is $105 million and includes those common improvement items related to transit service, bicycle and pedestrian facilities that are outlined in Chapter 6.

Exhibit 2 presented earlier in this document depicts the short-term improvement strategy recommendations. Each is summarized here as follows:

Identify a specific alignment for the Rio Vista Bridge Replacement

This report incorporates the findings of the recently completed Rio Vista Bridge Replacement Study. Alignment options from this Replacement Study include options which pass either north or south of Rio Vista or follow the existing alignment for SR-12.

It became clear as this evaluation progressed that the issue of which alignment should be chosen must be resolved in order to detail a long-term plan for SR-12. To achieve this, the City of Rio of Vista should initiate a general planning process to understand how the alignment can affect the future of the City and develop a point of view on which is the best outcome from the City's perspective.

However, the City of Rio Vista cannot specify this alignment along a route under Caltrans jurisdiction. To define the alignment for SR-12 and the Rio Vista Bridge crossing over the Sacramento River, a Caltrans compliant environmental review process must be initiated and completed. The first step is the PID that meets Caltrans needs.

Implement a Comprehensive ITS Program Throughout the SR-12 Corridor

Non-recurrent congestion due to accidents or incidents accounts for as much as half of the delays experienced on highways. ITS technologies can cost-effectively reduce delays due to non-recurrent congestions by coordinating and dispatching emergency response, and by notifying motorist of delays so they can decide whether to change route, or time of travel.

The ITS elements recommended for SR-12 include detection to measure volume and speed, surveillance to observe the corridor in order to understand how it is operating, and motorist information via various channels (i.e. internet, radio or cell phone) and though changeable, or variable message signs. The roadside ITS elements need to be connected to the regional traffic control center(s) in order to be effective.

Complete Selected Roadway Improvement in the Vicinity of Rio Vista

The current safety improvements on SR-12 touch almost every mile of the corridor. There are two contiguous segments that are not scheduled for improvement under the current programs. These are 1) Liberty Island Road to Drouin Drive and 2) Drouin Drive through the Business District of Rio Vista to the Sacramento River. Both are in Solano County.

The Liberty Island Road to Drouin Drive segment is a rural cross-section. It is recommended that this be reconstructed to provide an alignment meeting current standards with a concrete median barrier, inside shoulders, standard width lanes and outside shoulders. The Solano Transportation Authority has proposed adding this project to the SHOPP list.

Implement Movable Bridge Enhancements

The movable bridges at Rio Vista and Mokelumne River are major sources of delay on SR-12. The Rio Vista Bridge often has long cycles of opening and closing to safely accommodate commercial vessels to and from the Port of West Sacramento.

Travel on Mokelumne River primarily consists of smaller recreational vessels. But due to the low vertical clearance at this bridge, it is one of the most frequently operated in California.

The bridge enhancements in the short-term are directed at two different needs on these bridges. First, additional advance warning devices are recommended on the vehicle approaches to all three of the movable bridges along SR-12. Secondly, the Rio Vista and Mokelumne River bridges are both over 70 years old. It is recommended that the bridge operating equipment be updated.

LONG-TERM STRATEGY (2020–2035)

As in other analyses of SR-12, this evaluation finds that in the long-term, significant investment will be needed in this corridor to safely and efficiently accommodate projected growth. The recommended strategies presented here are focused on projects that address the capacity needs of the corridor and deliver meaningful benefits to those who travel SR-12.

These recommended strategies are shown graphically in Exhibit 3 in the first Chapter of this document. These proposed improvements have life-cycle costs estimated at $1.5 billion, of which just over half, or $800 million, is for the proposed Rio Vista Bridge Replacement Project. Each is also discussed as follows.

Implement the Rio Vista Bridge Replacement

This project – the replacement of the Rio Vista Bridge – is the single most important investment that can be made to improve SR-12. It is not just because vehicular traffic will benefit, but also to benefit shipping to the Port of West Sacramento. The alignment chosen to achieve the bridge replacement will shape the future growth pattern of Rio Vista.

In order to realize the full benefits of the bridge replacement, it is recommended that the crossing, whether a bridge structure or alternatively a tunnel, allow passage for all vessels that are anticipated to transit the Sacramento River. In other words, if a bridge is constructed, a fixed, high-level bridge is recommended.

Construct a Four-Lane Divided Highway from SR-113 to SR-160

This section of SR-12 is anticipated to carry the highest traffic volumes in long-term. Here the corridor must accommodate both the east-west traffic on SR-12 and north-south movements for the intersecting routes of SR-113 and SR-160. The exact nature of this project is dependent on selection of an alignment for the Rio Vista Bridge Replacement.

Implement the Mokelumne River Bridge Replacement

With only eight feet of vertical clearance, the bridge at the Mokelumne River opens frequently for almost all of the waterborne traffic that passes here. This bridge, originally built in 1942, has opening/closing cycles that can last eight minutes or more and result in frequent delays at the bridge approaches.

The recommended strategy is to replace the Mokelumne River Bridge with a fixed span bridge that meets the vertical clearance requirement for this water body. The bridge needs one lane of traffic in each direction for the foreseeable future, but should be built wide enough that four lanes (two lanes in each direction) can implemented if needed.

Construct Capacity Improvements in Fairfield/Suisun City

Improvements are proposed on SR-12 from I-80 to Beck Avenue as part of Phase 1 of the I-80/I-680/SR-12 Interchange Improvement Project being advanced by Solano County. This evaluation has shown that these improvements to SR-12 are warranted and that in the long-

term, Phase 2 of the Interchange Project, which adds capacity to SR-12 between Beck Avenue and Walters Road, will be needed as well.

The Phase 1 improvements are included in the Baseline case. The recommended strategy is to implement the Phase 2 improvements on SR-12 in the long-term. These improvements include an additional lane in each direction for a total of three through lanes in each direction and intersection improvements that include conversions to grade-separated interchanges at some locations.

Construct Barrier Separated Two-Lane Improvements

For those sections of SR-12 not addressed in the strategies above, a barrier separated two-lane improvement is recommended. Moving from west to east, this improvement strategy is recommended between Walters Road and SR-113 (Solano County), between SR-160 and the Mokelumne River (Sacramento County), between the Mokelumne River and the Bouldin Island Project (San Joaquin County) and from the Bouldin Island Project east to the existing multi-lane highway just before the I-5 interchange. The barrier separated two-lane improvement will include a fixed median barrier, inside shoulders, standard width travel lanes and an outside shoulder that accomodates a rumble strip and allows for both emergency and bicycle use.

EVALUATION OF THE RECOMMENDED CORRIDOR STRATEGIES

The recommended corridor strategies were evaluated against the baseline scenario for the short-term and long-term using the same metrics as those used for the comparative analysis of the baseline and conceptual improvement strategies in Chapter 6. The evaluation derived information from conceptual improvement drawings, engineering evaluations, cost estimates and a traffic analysis.

The comparative evaluation was supplemented by cost estimates and a cost-effectiveness evaluation to provide an indication of the cost for per hour of delay time saved on a life-cycle basis. This methodology is discussed in more detail in Chapter 6 of this document.

The evaluation is summarized in Exhibit 30 where it can be seen that the recommended strategies, both short- and long-term, produce positive benefits for all the evaluation criteria when compared to the Baseline case. In many cases, these improvements can be considered significant. For instance, total delay on corridor is reduced by about 30% which translates to a savings of 5,000 hours of delay per

Exhibit 30: Evaluation Measures for the Recommended Corridor Strategy

Evaluation Categories	Baseline		Recommended Strategy		Percent Change*	
	Short-Term (2015-2020)	Long-Term (2020-2035)	Short-Term (2015-2020)	Long-Term (2020-2035)	Short-Term (2015-2020)	Long-Term (2020-2035)
Transportation System Effectiveness						
Average Peak Hour Travel Time (mins)	78	87	69	63	11%	27%
Daily VMT	485,000	831,200	489,360	860,060	1%	3%
Daily VHT	17,300	28,000	14,780	22,540	14%	19%
Improved pavement (Centerline miles)	N/A		39.1		N/A	
Number of Bridges with Sufficiency Rating < 80%	2		0		200%	
Safety						
Safety enhanced roadway (Centerline miles)	N/A		42.1		N/A	
Daily non-recurrent delay (vehicle hrs)	584	6,300	120	4,345	79%	31%
Economic Vitality						
Daily non-recurrent delay (vehicle hrs)	584	6,300	120	4,345	79%	31%
Daily recurrent delay (vehicle hrs)	6,770	10,510	4,670	7,600	31%	27%
Total daily delay (vehicle hrs)	7,354	16,810	4,790	11,945	34%	29%
Environment						
Construction within existing ROW (acres)	N/A		214.1		N/A	
Construction outside existing ROW (acres)	N/A		163.2		N/A	
CO2 Emissions (tonnes/year)	51.4		46.4		10%	
Healthy Communities						
Fine Particulate Emissions (tonnes/year)	6.7		5.8		13%	
Coarse Particulate Emissions (tonnes/year)	10.9		9.7		11%	
Bike friendly Roadways (miles)	33.6		42.1		25%	
Dedicated Bikeways (miles)	2.9		3.5		79%	
Dedicated pedestrian pathways (miles)	2.7		9.3		244%	
Cost-Effectiveness						
Capital Cost (millions)	N/A		$87	$1,443	N/A	N/A
O&M Life Cycle Cost (millions)	N/A		$18	$52	N/A	N/A
Life Cycle Cost (millions)	N/A		$105	$1,495	N/A	N/A
Cost-Effectiveness Index ($ /person hr of delay saved)	N/A		$4.3	$22.7	N/A	N/A

Note: *Positive values indicate improved conditions.

day. This savings in delay reduces travel times, contributes to improved air quality and promotes the overall economic vitality of the SR-12 corridor.

In terms of cost-effectiveness, the short-term improvement strategies in this recommendation are extremely efficient with a cost of $4.30 for each hour of delay saved. The cost-effectiveness rating for the long-term strategy recommendations is, at $22.70, quite good given that there are two major bridge replacements in these recommendations.

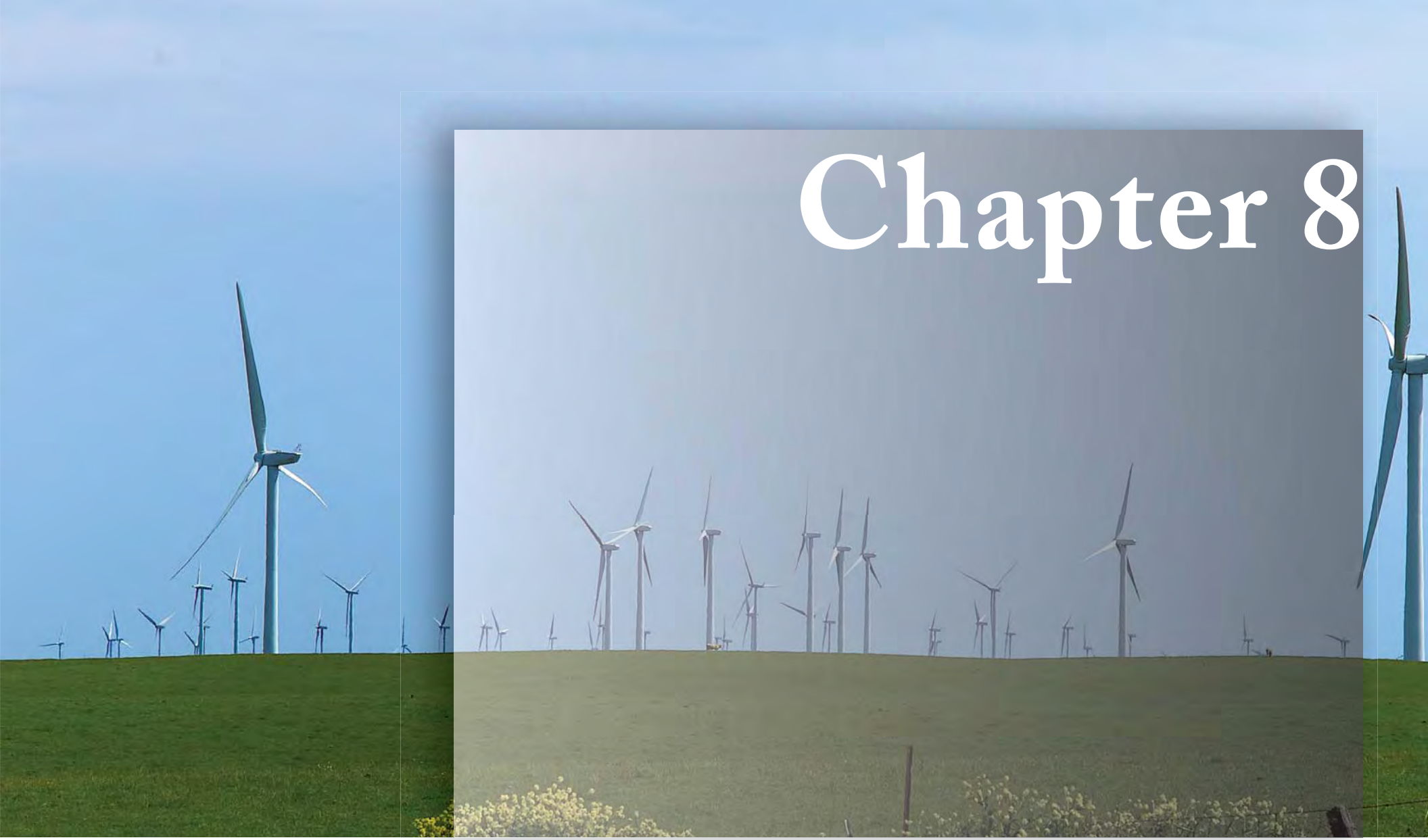
It is worth noting that the full four-lane improvement evaluated in Chapter 6 costs nearly $3 billion and reduces delay by 77 million hours. The long-term recommended strategies presented here achieve 85% of the delay reduction for the full four-lane project while costing one-half as much - $1.5 billion. Exhibits 31 and 32 summarize the cost-effectiveness evaluations for each of the short- and long-term recommended strategies outlined in this Chapter.

Exhibit 31: Life-Cycle Cost-Effectiveness Analysis for the Short-Term Strategy

ID	Mitigation Improvement	Life-Cycle Mobility Benefits (Veh-hr of delay saved)	Capital Costs	Life-Cycle Costs	Cost-Effectiveness ($/veh-hr of delay saved)
1	Implement corridor-wide ITS System	18,805,405	$24,100,000	$37,000,000	$2.0
2	Improve bridge operations at the Rio Vista, Mokelumne and Potato Slough bridges including implementation of advance ITS elements	5,613,210	$11,000,000	$12,300,000	$2.1
3	Construct standard width shoulders and improve pavement surface between Liberty Island Road and Drouin Drive including concrete median barriers, inside shoulders, standard width lanes and outside shoulders	0	$34,200,000	$35,500,000	-
4	Construct streetscaping and pedestrian walkway improvements with curb and gutter improvements for intersections through Rio Vista including intersection treatments designed to enhance traffic safety for bridge approaches	220,050	$18,000,000	$19,500,000	$88.6
	Total	24,418,615	$87,300,000	$104,300,000	$4.3

ID	Mitigation Improvement	Life-Cycle Mobility Benefits (Veh-hr of delay saved)	Capital Costs	Life-Cycle Costs	Cost-Effectiveness ($/veh-hr of delay saved)
1	Construct Phase II of the I-80/I-680/SR-12 Interchange which includes interchanges at Beck and Pennsylvania Avenues Construct intersection improvements from Civic Center to Walters Road Construct six-lane roadway between Abernathy and Walters Road	48,426,495	$62,900,000	$75,000,000	$1.6
2	Construct standard width shoulders, include passing lanes and improve pavement surface between Walters Road and SR-113	1,400,000	$183,600,000	$192,100,000	$137
3	Construct a four-lane roadway between SR-113 and River Road Construct pedestrian improvements, landscaping and the streetscape improvements in downtown Rio Vista (Church Road to Rio Vista Bridge)	2,250,000	$61,600,000	$64,400,000	$28.6
4	Construct a high-level bridge or tunnel for the Rio Vista Bridge	8,190,360	$827,090,000	$839,800,000	$102.5
5	Construct an improved two-lane segment (expandable to four-lanes) with improved shoulders, pavement and construct median barrier between the Rio Vista Bridge and Mokelumne Bridge	290,800	$95,600,000	$99,000,000	$340.4
6	Construct a new mid-level bridge for the Mokelumne River Crossing	3,700,000	$167,800,000	$169,100,000	$45.7
7	Construct an improved two-lane segment (expandable to four-lanes) with improved shoulders, pavement and construct median barrier between the Mokelumne Bridge (east end of the Bouldin Island Project) and just west of I-5	1,374,398	$44,000,000	$55,700,000	$40.5
	Total	65,632,053	$1,443,000,000	$1,495,100,000	$22.7

Exhibit 32: Life-Cycle Cost-Effectiveness Analysis for the Long-Term Strategy



Chapter 8

Funding Considerations for SR-12

Funding the diverse range of short and long-term corridor improvement strategies recommended for SR-12 will be as complex as the characteristics of the corridor itself. Most noteworthy is the passage of MAP-21, a two-year (as opposed to a traditional 6yr reauthorization), $105 billion surface transportation bill signed by President Obama on July 6 which will provide funding for surface transportation programs at current levels, extending user fees and the Highway Trust Fund through fiscal year 2016. The legislation also includes needed reforms for expanded innovative finance, improved efficiency with program consolidation, streamlined project delivery, and improved accountability with performance measures.

MAP 21 is federal legislation, and does not address the uncertainty of future state legislation and local political support for user fee based transportation funding scenarios.

The intent of this discussion of funding considerations for SR-12 is to identify how existing local, state, and federal transportation funding programs may apply to the various improvement strategies being recommended. These considerations recognize that the SR-12 corridor spans three counties where the same local, state, and federal transportation funding programs are administered uniquely by the respective administering agencies.

The considerations also recognize that with the diverse range of corridor improvement strategies over a short and long-term planning horizon, there are opportunities for a diverse range of transportation funding sources and strategies to be employed to deliver individual projects over time. While it is not the intent of this study to recommend specific funding strategies to deliver the recommended corridor improvement strategies, this discussion of funding considerations does present a series of potential next steps to support both the standard progression of project development and positioning of projects for competitive funding programs.

Short-Term Improvements (2015-2020)

The recommended short-term corridor improvement strategies include:

- operational and safety improvements;
- intelligent transportation systems;

- existing bridge rehabilitation; and
- pedestrian and bicycle streetscape enhancements.

Consistent with the history of recent operational and safety improvements constructed within the SR-12 corridor as well as those funded for construction by 2015, the State Highway Operations and Protection Program is a Caltrans administered, statewide funding program targeted to operational and safety improvements on the state highway system. Funding in the SHOPP is divided into multiple categories based on project type. Currently there are eight SHOPP categories including: major damage restoration, collision reduction, mandates, bridge preservation, roadway preservation, mobility, roadside preservation, and facilities. Funding levels for individual categories are subject to specific state and federal funding program shares and actual program revenues received. Total SHOPP revenues are established in consultation between Caltrans and the California Transportation Commission (CTC) and adopted by the CTC as part of the State Transportation Improvement Program fund estimate every two years in conjunction with the biennial STIP update.

As a statewide program with total funding consistently below identified needs, funds are programmed to individual projects based upon established statewide priorities and the existing conditions of a given highway location. Caltrans Districts are responsible for the continual monitoring of their respective highway system network to identify deficiencies, the development of project initiation documents to establish the purpose/need, scope and cost of specific projects to address deficiencies, and the recommendation to Caltrans Headquarters for funding of projects. As part of the biennial STIP update, Caltrans Headquarters recommends a four-year SHOPP program for the adoption of the CTC. Only the highest priority projects fitting within the adopted SHOPP revenues are programmed for construction.

As part of the 2007 SHOPP, over $20 million in SHOPP funds were provided for the construction of safety and operational improvements on SR 12 in Solano County. This significant series of improvements upgraded almost 13 miles of the highway to current design standards including 12-foot lanes and 8-foot shoulders, improved intersections with the construction of left-turn lanes, and the full reconstruction of the roadway with horizontal and vertical realignments to improve sight distance. These improvements were completed in early 2011.

As part of the 2012 SHOPP, Caltrans has programmed over $77.8 million in SHOPP for roadway and bridge improvements on SR-12 in both Solano and San Joaquin counties. The largest of these projects totals approximately $45 million from the roadway preservation category of the SHOPP. This project will fully reconstruct the five-mile section of SR-12 on Bouldin Island in San Joaquin County

to provide standard 12-foot lanes, 8-foot outside shoulders, and a 2-foot inside shoulder needed to accommodate a concrete median barrier. The 2012 SHOPP also programs over $8 million from the bridge preservation category for the replacement of the Mokelumne River Bridge control house and the rehabilitation of the bridge deck. This programming of SHOPP funds provides direct support of the recommended existing bridge rehabilitation improvement strategy.

In addition to SHOPP funds, operational and safety improvements on SR-12 have also recently been delivered using STIP - Regional Transportation Improvement Program (RTIP) funds. The STIP is a CTC administered, statewide funding program targeted to various transportation projects including highways, local roadways, and transit. Different from the SHOPP program, the STIP program is generally focused on transportation system expansion such as adding new lanes. The STIP is divided into two main funding categories. The Interregional Transportation Improvement Program (ITIP) is funded with 25% of the total STIP funds and is available for projects recommended by Caltrans based on statewide priority. The RTIP is funded with 75% of the total STIP funds and is further divided by formula into individual county shares available for projects recommended by each county. Total STIP revenues are established in consultation between Caltrans and the CTC and adopted by the CTC as part of the State STIP fund estimate every two years in conjunction with the biennial STIP update.

As part of the 2006 STIP Augmentation, the San Joaquin Council of Governments programmed $21.5 million of RTIP funds in San Joaquin County to a series of intersection improvements between I-5 and Glasscock Road that began construction in May 2012. This project also includes an extensive package of ITS elements from I-5 in San Joaquin County to Rio Vista in Solano County including changeable message signs and traffic monitoring cameras.

Federal Transportation Funding Programs

ITS elements in Solano County are also eligible projects within the current competitive funding programs administered by the MTC with federal Surface Transportation Program (STP) and Congestion Mitigation and Air Quality (CMAQ) funds. As both the Metropolitan Planning Organization and Regional Transportation Planning Agency (RTPA) for the nine-county San Francisco Bay Area, MTC receives the regional share of the STP funds distributed by state formula to urbanized and non-urbanized areas of the State. Similarly, MTC receives the CMAQ funds distributed by the State to those regions that qualify as non-attainment or maintenance areas for National Ambient Air Quality Standards. While regional STP funds can be used for a variety of transportation purposes, CMAQ funds must be used on projects the demonstrate air quality benefits. Due to the competitive nature of the

MTC programs and the connectivity to the CMAQ program, ITS projects proposed in Solano County would need to demonstrate significant project benefit to transportation system performance as well as air quality.

Pedestrian and bicycle streetscape enhancements in Solano County are eligible for a variety of state and federal funding programs. As noted previously, MTC administers several funding programs with federal STP and CMAQ funds applicable to these types of improvements. With the recently adopted One Bay Area Grant (OBAG) Program, MTC has included 50% of the federal Transportation Enhancement (TE) funds distributed through the STIP to the nine counties in the San Francisco Bay Area into a single program with STP and CMAQ to address a wide range of transportation projects that support MTC's long-range Regional Transportation Plan goals.

Through the OBAG Program, the Solano Transportation Authority, as the Congestion Management Agency (CMA) for Solano County, will receive approximately $18 million over four years (2012/13 – 2015/16) to directly identify projects for funding including projects that meet the criteria of MTC's Bicycle and Pedestrian Improvements, Transportation for Livable Communities, and Safe Routes to School categories. Additionally, with the remaining 50% of the TE funds distributed to Solano County through the STIP, the Solano Transportation Authority has the opportunity to recommend projects such as pedestrian and bicycle streetscape enhancements for funding by the CTC.

Long-Term Improvements (2020-2035)

The recommended long-term corridor improvement strategies include:

- operational and safety improvements;
- bridge replacements; and
- highway widening.

As identified for the recommended short-term improvement strategies, the SHOPP program provides a dedicated funding source for state highway operational and safety improvements, including bridge rehabilitation and replacement. The challenge with the SHOPP program funding is its limited ability to fund large projects and the reactionary nature of its funding prioritization. However, the 2012 SHOPP does include $45 million to fully reconstruct the five-mile section of SR-12 on Bouldin Island

in San Joaquin County to provide standard 12-foot lanes, 8-foot outside shoulders, and a 2-foot inside shoulder needed to accommodate a concrete median barrier. This project scope is consistent with the long-term recommendations for an enhanced barrier separated two-lane highway for many of the rural sections of SR-12. The division of these rural sections of SR-12 between natural break points, such as bridges, also provides the opportunity for these improvements to be phased relative to the availability of funding over multiple SHOPP cycles.

With respect to full bridge replacements, the SHOPP program is generally limited from funding capacity increasing projects. However, in 2011 the CTC approved the Caltrans recommendation to allocate $470 million in SHOPP funds as part of a larger funding package to replace the Gerald Desmond Bridge at the Port of Long Beach with the widening of the bridge from four to six lanes. While this type of investment from the SHOPP program, both in scope and magnitude, is atypical, it does suggest the opportunity for the SHOPP to be matched with other funds to deliver larger capacity increasing bridge replacements exists, however challenging it may be.

STIP funds which are split between the RTIP and ITIP are the more typical state transportation funding programs to support capacity increasing state highway projects. Funding recommendations by Caltrans for the ITIP are guided by priorities set in Caltrans' Interregional Transportation Strategic Plan (ITSP). The greatest challenge with the ITIP is the statewide competitiveness of the program for state highways that carry significantly higher volumes of interregional traffic. Typically projects that receive ITIP funding are successful due to matching the ITIP with other funds including RTIP and local funds. As noted previously, the RTIP is funded with 75% of the total STIP funds and is divided by formula into individual county shares available for projects recommended by each county. While the RTIP receives the largest share of the STIP program funds, the division of funds by a population based formula to the counties results in the majority of the funding being available for projects in the larger urbanized areas of California.

In the recent 2012 STIP that provided new RTIP capacity to the counties for a two-year period covering state fiscal years 2015/16 and 2016/17, Sacramento County was provided with a RTIP funding target of $30 million, San Joaquin County a target of $25 million and Solano County a target of $15 million. In recognition that the size and cost of many capacity increasing projects far exceeds the biennial RTIP shares for even the larger counties, the CTC STIP guidelines allow for counties to advance future RTIP shares to deliver larger projects. The actual ability for counties to advance future RTIP shares as well as even program projects up their share targets is subject to the total capacity of the RTIP program and competing projects in other regions. To better address this situation in the nine-county San Francisco Bay Area, MTC coordinates share advances among all nine counties. Such a strategy can support the delivery of larger projects in the nine counties within the pool of individual county RTIP shares.

Over the last 20 years in California the funding from local sources, including county transportation sales tax measures and transportation impact fee programs, has increasingly exceeded transportation funding from state and federal programs. While these local programs have been extremely successful in delivering projects, including the ability to advance projects through debt financing, the politics of establishing such programs varies greatly from one county to the next. This includes the ability for transportation measures to pass the two-thirds county voter threshold and transportation impact fees being supported by local development and growth interests. There are also challenges for these types of local programs to fund specific types of transportation projects. For transportation impact fee programs tied to new development, funds are generally restricted to capacity increasing projects as well as those cost not attributable to existing deficiencies. For county transportation sales tax measures, funds are often dedicated to specific purposes and projects that must be identified as part of the voter approved sales tax expenditure plan.

In San Joaquin County there exists both a 30-year transportation sales tax measure (2011–2041) and a regional transportation impact fee program. The transportation sales tax measure specifically identified the safety and operational improvements on SR-12 between I-5 and Bouldin Island which are currently under construction. The regional transportation impact fee program does not include any improvements on SR-12 in the study corridor. In Sacramento County there exists a 30-year sales tax measure (2009-2039) that includes a transportation mitigation fee program as part of the funds included in the voter approved project expenditure plan. This measure does not identify any improvements on SR-12. In Solano County there have been several attempts to pass a countywide transportation sales tax measure with current efforts focused on a regional transportation impact fee program. It is possible that some portion of the recommended long-term improvement strategies in Solano County could be funded through one of these two types of programs in the future.

Over the long-term, replacing the Rio Vista Bridge on SR-12 as it passes over the Sacramento River is a critical infrastructure need. This project is expensive and the recent bridge replacement study indicates that the capital cost could run in the range of $800 to $900 million in 2011 dollars. Given this high cost, bridge tolls and public-private-partnerships are funding and delivery strategies should be examined to understand how these may contribute to accelerating the replacement of the Rio Vista Bridge.

In 2009, the consulting firm ERA/AECOM issued a preliminary funding strategy assessment that looked at a wide range of local, State and Federal funding options. This evaluation also considered bridge tolls as a possible funding source. This report is comprehensive and provides a good

assessment of the various funding sources and strategies. The major change since this report is issued is that the Rio Vista Bridge currently rated as structurally deficient whereas in 2009 it was not.

The ERA/AECOM report concluded that bridge tolls could generate capital funds using non-recourse revenue bonds in the range of $500 to $800 million depending on funding assumptions including when tolls begin to be collected and the term of the toll revenue bonds. Preliminary estimates done in this study also find that bridge tolls could generate between $500 million and $1 billion in bond proceeds. Again this depends on the structure and terms of the bond.

As to the question can tolls be used to fund the Rio Vista Bridge replacement? The answer is yes. The existing future traffic crossing the Rio Vista Bridge even when traffic diverting from the bridge is accounted for, can when using a toll rate structure similar to other bridges in the Bay Area pay for 50% or more of capital investment needed to replace the Rio Vista Bridge.

Partnerships can take the form of Public-Public or Public-Private. The goals of these partnerships are to manage risks and accelerate project delivery. The structures can range from conventional Design-Bid-Build project delivery where the private sector tasks construction costs and schedule risks to concessions where the private sector designs, builds, operates, maintains and finances the asset over a period of time to generate a return on investment.

Public-Public sector partnership can involve sharing of maintenance costs, operating partnerships and structures that enhancement credit and in the case of the Federal government benevolent lending programs such as the Transportation Infrastructure Finance and Innovation Act. Increasing, the delivery of large scale projects such as the Rio Vista Bridge requires complex partnerships with both the public and private sector to advance these projects through finance and delivery. These kinds of partnerships need to be evaluated to see if there are combinations of funding sources, construction efficiencies and operational responsibilities that can advance the delivery of the Rio Vista Bridge.

As the report also recognized, new state legislation would be required to allow for the use of toll financing on the Rio Vista Bridge replacement. Such legislation is needed to allow for both the collection of tolls and authorization of bond sales while defining the project scope and designating the administering authority. One of the significant challenges with the application of tolling the Rio Vista Bridge is the local political support. Through the larger SR-12 East Rio Vista Bridge Relocation Study, prepared by the Solano Transportation Authority in 2010, concerns were expressed by residents of the City of Rio Vista for the impacts of tolls on local residents with consideration requested for local resident exclusions. Additionally, as part of the public outreach for the SR-12 Corridor Study,

a survey of agricultural and trucking stakeholders indicated no support for tolls as a way to finance improvements in the corridor.

The final transportation funding sources that are applicable to the recommended long-term corridor improvement strategies are federal grants. Federal grants can include "earmarks" simply designated by Congress and discretionary grants awarded to projects based upon competitive processes. With the uncertainty of how federal transportation funding will be structured as part of pending federal transportation reauthorization bill, it is difficult to suggest what discretionary programs may exist in the future and if Congress will continue designating earmarks.

The Solano Transportation Authority was recently successful in securing existing federal Defense Highway grant program funds for the SR-12 East Rio Vista Bridge Relocation Study due to the direct access to Travis Air Force Base from SR-12. The continued existence of Travis Air Force Base could maintain the opportunity to receive similar federal funds in the future. New federal programs, such have been suggested for goods movement, could also be applicable to the recommended long-term corridor improvement strategies provided that such relationships can be demonstrated and effectively presented with political support.

Next Steps

With the diverse range of corridor improvement strategies over a short and long-term planning horizon, there are opportunities for a diverse range of transportation funding sources and strategies to be employed to deliver individual projects over time. As such, this study recognizes that there will be a natural phasing of projects across the full SR-12 study corridor and that this phasing is likely to be influenced by both the availability of funding and the priorities identified in this Corridor Plan. To support both the standard progression of project development and the positioning of projects for competitive funding programs it is recommended that the partner agencies on the SR-12 Corridor Study:

- Advance preliminary engineering and environmental clearance on individual projects;
- Complete a detailed bridge toll study for the Rio Vista Bridge;

- Develop an assessment of the SR-12 corridor that identifies its state and national significance to the economy, trade, and national defense; and
- Maintain an interregional organization of local elected officials to support the advocacy for corridor funding.

Preliminary engineering and environmental clearance of individual projects is important to be able to substantiate project scopes, costs and public support. This project information is often critical in competing for additional project funding and being able to demonstrate project readiness when funding opportunities become available. For state funding programs preliminary engineering, referred to as a Project Initiation Document is required to program additional STIP or SHOPP funds to environmental clearance, right-of-way acquisition, final design, and construction.

While environmental clearance may cost several millions of dollars on individual projects in the long-term corridor improvement strategies, preliminary engineering may be limited to several hundreds of thousands of dollars. This low cost of preliminary engineering is further supported by recent updates in Caltrans' PID guidelines that allow for less detailed PIDs to be used on locally funded state highway projects or to program STIP funded highway projects through environmental clearance. PIDs are also good candidates for STIP Planning, Programming, and Monitoring funds, federal STP funds, and federal earmarks. The cost of SHOPP project PIDs are funded within the SHOPP program, but the prioritization of these efforts must be coordinated with Caltrans.

Specific to the Rio Vista Bridge replacement, a detailed bridge toll study could be completed concurrent to environmental clearance to take advantage of data, including traffic forecasts, developed during this phase of project development and to support the selection of the preferred project alternative. The intent of such a study is to fully analyze and document investment grade toll revenue projections and tolling implementation. More general to the full SR-12 corridor, an assessment of the state and national significance of SR-12 to the economy, trade, and national defense will help position SR-12 for various funding opportunities. These opportunities could be new federal transportation programs through the federal transportation reauthorization bill targeted to goods movement or national defense. Similarly at the state level there may be future transportation funding programs like the Proposition 1B Trade Corridor Improvement Fund.

An interregional organization of local elected officials, such as the existing SR-12 Corridor Advisory Committee, is an effective means to provide ongoing coordination and uniform support for the delivery of project on the SR-12 corridor. This support includes the promotion of awareness of corridor needs to state and federal officials and the advocacy for funding of projects.

* Final Comprehensive Evaluation and Corridor Management Plan, November 2012. This plan is subject to change with respect to findings and/or conclusions. It should also be noted that these findings and/or conclusions may not ever be programmed due to various reasons, including but not limited to, engineering judgment and/or budget constraints.